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IN the supply department, maintaining an economical quantity of stores, there is possibly more room than anywhere else for saving money. H. C. Pearce, general storekeeper of the Southern Pacific Company, has made a systematic study, the results of his wide experience during many years, and we are to have the benefit of that study. The publication of it begins with this issue, and enough of the paper will appear serially to enable the readers, or rather the practical students of this overwhelmingly important subject, to begin independent and properly guided investigations of the losses due to lack of complete organization and intelligent watchfulness. Mr. Pearce indicates, although he does not preach from that text, that somewhat radical reorganization in the supply departments of many roads will be productive of economies. The purchasing agent has either a misleading title and authority, or else is a misplaced officer. The details of purchasing are nearly the least important of his functions. When Sir William Van Horne went to the Canadian Pacific his first great anxiety was for a real storekeeper. He searched the world and discovered—Sir Thomas Shaughnessy!

W. M. ACWORTH begins in this issue a series of "Studies in Railway Economics"— a somewhat oppressive title for his simple and convincing statements of the principles governing railway rate making. His book on this subject, "The Elements of Railway Economics," published five years ago, has had probably a wider and more careful reading by practical railway men than any other similar publication. It has already done a world of good, as its well told basic principles have slowly percolated to the general public. The present series begins with a summary of the unquestionable bases of rate making, easily readable, and we should all read it again—lest we forget. There is reason to expect that the articles in this series will help materially in developing the art of making rates of the least possible burden, combined with qualities of certainty in service, designed primarily to increase commerce. With full publicity and a better knowledge of the facts which Mr. Acworth is making clear, we may safely rely on intelligent regulation to prevent unreasonable rates. Mr. Acworth has a record which entitles him to close attention. He has so far in his numerous studies and writings been unrefuted, not criticizable for expressions of fact or opinions, and this although his statements are cleanly and clearly made. He is at present in this country and doubtless will be glad to receive criticisms or comments.

THE extent to which the traffic and business of St. Louis is being "destroyed" by the so-called bridge arbitraries at that city is indicated by figures which have been compiled by the Merchants' Exchange. They show that the total traffic handled by the St. Louis lines in 1910 was by far the largest in the city's history. A statement which was issued by the Merchants' Exchange says:

"Taking eleven months as a basis and approximating the month of December on an equal basis, the total tonnage of 1910 will amount to about 51,961,190 tons, or several millions of tons in excess of any former year, fully demonstrating that the St. Louis mercantile and manufacturing concerns have kept well to the fore in the progress of the times and have continued to hold its pre-eminent position as a trade center in the supplying of the great and growing territory tributary to this market. Approximating the total inbound and outbound tonnage for the year at 51,961,190 tons, when compared with 44,527,940 in 1909, it shows an increase over the former year of 7,433,250 tons, or 16.6 per cent. Of the amount incoming, both local and that passing through the St. Louis gateway, the total is estimated at 31,565,690 tons as against 27,326,838 a year ago, an increase of 4,238,852, or 15.5 per cent., while the shipments are placed at 20,395,500 tons, against 17,201,102 a year ago, a gain of 3,194,398, or 18.1 per cent. When compared with 1907, the former record period, the total tonnage movement this year shows an approximate gain of 4,140,605 tons, or 8.6 per cent., being 51,961,190 and 47,820,585 tons, respectively. Of the amount the inbound movement for 1907 was 29,445,669 tons, while contrasted with 31,565,690 this year, shows a gain of 2,120,021, or 7.1 per cent., while the outgoing figures were 20,395,500 tons in 1910 and 18,374,916 in 1907, an increase of 2,020,584, or 10.9 per cent."

In view of the fact that it is contended by certain shippers, newspapers and members of the Municipal Assembly of St. Louis that the bridge arbitraries are oppressing terribly the manufacturing and commercial interests of that city, one wonders how fast the growth would be if the arbitraries were abolished!

AGE LIMITS.

A COURT in Indiana has before it a case in which it is called upon by the State Railway Commission to compel a superintendent of the Cleveland, Cincinnati, Chicago & St. Louis to tell the ages of certain telegraph operators who figured in a collision and who presumably are believed to be partly or wholly responsible for it. The superintendent, no doubt, in his refusal, follows the "advice of counsel" and the supposition is that the company is ashamed to let it be known how young these operators are. The age limit, minimum or maximum, is a wholly arbitrary rule for safe-guarding railway trains, whether we consider enginemen, trainmen or telegraphers. The railway which compels conductors to retire on pension at 65 or 70 years probably thereby reduces the income of a few men who would do their duties properly a year or two longer and possibly more; and a road that refuses a boy of 18 a place as telegrapher may deprive itself of a smart and careful operator; but there must be a limit and the only workable limit is an arbitrary one. To make it variable would bring on all sorts of difficulties in administration. Employers, whether principals like a manufacturer or agents like a railway superintendent, very generally lack grit to undertake the unpleasant task of retiring a man of 60 if the man himself is unwilling to be retired; and in such cases there would be little help in a rule authorizing superintendents to exercise discretion. At least no one has dared to try it on a large scale. And a superintendent who should be authorized to take on boys of 18, in some cases (cases of bright boys) would often have difficulty in refusing employment to less promising lads. Twenty-one therefore is probably as reasonable a limit as can be agreed on. This, however, does not necessarily keep bright young fellows away from the service. A superintendent with many employees under 21 years of age could have the satisfaction of knowing that he could take the opportunity of training young men during their apprenticeship more thoroughly, and thus make sure that he would have higher qualifications when the young men should reach the age of 21.

The more rigid enforcement of a limit, both in taking on the young and forcing out the old, would be a blessing in disguise. And not much disguised, either, if fully availed of. If a superintendent were compelled to take boys at 18 or lose them, and at the same time to wait three years before entrusting them with responsibilities, he could at once make his training school a real force instead of the loose and indefinite thing that it often is. Every station or signal cabin employing an agent (or man in charge) who is worth as much as $75 a month ought to be an actual or potential training school. An agent who is not a good teacher should be marked as less valuable than a teacher. All the agents should be kept as nearly uniform in their standards as possible, consistent with a high standard. A traveling teacher, to keep up the standards if a big enough man, with suitable authority, would be a most profitable investment. If the telegraphers' brotherhood should pursue the foolish course of objection to a process like this, designed as it is to improve efficiency, it would be high time for some road to make a determined fight for its full rights, in a policy so clearly beneficial to the public. An interesting thing about the age limit at the other end of the scale is the appearance of signs here and there that an earlier retiring age would be acceptable to some of the men. The pension systems now in force in this country certainly have proved beneficial thus far, and the idea seems destined to spread. When the pension is wholly a gift from the employer, however, it is obvious that the making of the years-limit younger will be more difficult than if the employees themselves contribute. Participation by employees in the support of a fund seems, therefore, a thing to be encouraged. We have wandered slightly from our point—the necessity of a *rigid* limit against excessive youth. This and the limit against old age are two separate questions, but the energetic superintendent will do well to agitate either or both, separately or together; for the main desideratum is to have what in civic and political matters is called an active public sentiment. As to just what the youth limit should be—whether 21, 22, or 20, it would be a good thing if roads having a satisfactory standard should have the merit of their system advertised a bit. The youth limit is no mere academic question. Sometimes 21 seems to be too young. A number of items in the last government accident bulletin, which was reprinted in the *Railway Age Gazette* of November 11, afford suggestive illustrations. For example, collision No. 14 was due to misconduct or negligence on the part of a telegraph operator 23 years old, who had been in the service three months; another operator 22 years old who had seen only two months' service; and a train despatcher 27 years old who had sat in the despatcher's chair only four weeks, though he had been a telegrapher for over five years.

THE WASTE IN THROUGH PASSENGER SERVICE.

SOME of the Western lines recently have made substantial reductions in their passenger service. These have not been merely the usual winter curtailments, but have been made uncommonly heavy for the purpose of to some extent offsetting the large increases in operating expenses that have been experienced since the middle of the calendar year 1910. Probably there is no other part of the railway business in which there is so much room for effecting economies in service without impairing its efficiency as in through passenger business. If Mr. Brandeis had directed his attention to this phase of railway operation he might have suggested some changes which would have been both more practical and more beneficial both to the railways and the public than those he did suggest.

If you will study the schedules of through trains between any two large cities in this country the waste involved in the passenger traffic will at once become apparent. Take, for instance, the passenger train service between Chicago and St. Paul. A number of roads are active competitors for the traffic between Chicago and the Twin Cities. The principal competitors are the Chicago & North Western, the Chicago, Milwaukee & St. Paul and the Chicago, Burlington & Quincy. On these three lines three trains leave Chicago daily between 10 p. m. and 10:16 p. m. which reach St. Paul between 9 a. m. and 10:45 a. m. Three other trains leave Chicago between 6:30 p. m. and 6:35 p. m. and reach St. Paul between 6:55 a. m. and 7:20 a. m. Three more trains leave Chicago at 9:30 a. m. and arrive at St. Paul between 9 and 10 p. m. Although there are nine of these fast trains, there are practically only three times during the day that a traveler can leave Chicago for St. Paul on a fast train on one of these lines, and only three times a day that he can arrive in the latter city from Chicago.

Reading the schedule the other way, three trains on these roads leave St. Paul for Chicago between 8:40 a. m. and 9 a. m., and all arrive in Chicago at 9 p. m. Two other trains leave St. Paul at 7 p. m. and 7:20 p. m. and reach Chicago at 7 a. m. and 7:05 a. m. Three more leave St. Paul between 8:30 p. m. and 8:45 p. m., and reach Chicago between 8:45 and 10 a. m. Three more leave St Paul at 10:30 p. m. and arrive at Chicago between 10 and 11 a. m. So, although there are 11 of these trains, there are practically only four times a day that a passenger can leave St. Paul for Chicago on them, and practically only four times a day that he can arrive on them in Chicago.

The passenger business between Chicago and the Twin Cities is very heavy. The service is splendid. But everyone who has traveled often between Chicago and St. Paul knows that only in certain parts of the year are most of these trains ever crowded to anything like their capacity. In fact, we think it is seldom that most of them have all the lower berths in the sleeping cars occupied, and it is seldom, indeed, that many of the upper berths are taken. These facts regarding the passenger service between Chicago and the Twin Cities might be duplicated with facts regarding the service between Chicago and St. Louis, between Chicago and Kansas City, between Chicago and Omaha; in fact, between any two large centers of population in the country where there is active railway competition.

Suppose that one-half, or even one-third, of these trains were taken off and the schedules of the remainder were so rearranged that they would leave the terminals at more different times. The reduction in expense that would result is obvious, and is it not equally obvious that the service to the public would be improved? Undoubtedly, there are cer-

tain hours of the day when it is more convenient for travelers to depart from and arrive at a city than at other hours; but it is not true that all travelers want to depart and arrive at the same hour. Under the arrangement suggested it would be possible for travelers to depart and arrive at the same hours they do now, though they would not be able to choose between so many trains; but a traveler cannot ride on more than one train at one time, anyway. In addition, those who do not want to leave and arrive at the same hours that the majority do would be able to leave and depart at other times which would be more convenient for them. If the railways would take the money that they thus saved on through service and devote it to providing additional local service, either by means of steam trains or motor cars, both their through and their local traffic would be better served. The additional expenditure on local service would tend to forestall the construction and competition of electric lines; and the experience of electric railways shows that additional local traffic might be built up which would be profitable. It may be said that an arrangement under which the through trains on different roads had different hours of arrival at and departure from terminals would reduce the stimulus to the different managements to try to attract passengers by providing the best possible equipment, avoiding over-crowding, etc. But it would seem that each road would be prompted to continue to provide good service in order to tempt passengers to leave terminals on its trains even though they did not depart at the exact time when the traveler most preferred to leave.

There are two great obstacles in the way of the adoption of any such plan. One is the competition between the railways themselves. We hear a great deal from academic students of railway matters to the effect that competition between railways no longer exists. When they make such statements they have in mind merely competition in rates. Even competition in rates has merely been reduced, not eliminated. The fact that it has been greatly reduced has rendered more intense another and equally important form of competition—that in service. When railways have the same rates between two points the only means they have for attracting business from each other is to give superior service. The only possible way by which a reasonable reduction and rearrangement of through passenger service could be secured would be by some form of concerted action between the railways under which the relative advantages which each enjoys under competitive conditions would be preserved. In England the railways have entered into pooling arrangements under which, while the number of trains run has been reduced, the quality of the service given to the public has been improved in the way that is here suggested, and only by the adoption of some such means could similar results be obtained in the United States.

It is doubtful whether under the anti-pooling section of the Interstate Commerce act and the Sherman anti-trust act the railways could now legally make any agreement to reduce their passenger service even though it involved a rearrangement of time-cards so as to give better service. Even if the law would permit it, it is probable that any attempt to do this would be met with denunciation from the press and hostile demonstrations of public sentiment. As has often been remarked in these columns, one of the main reasons why the railways do not give the best practicable service to the public is that the public will not let them.

But certainly some consideration ought to be given to the matter of the economic waste in passenger service. Passenger earnings per train mile increased only from 97 cents in the unprosperous year 1898 to $1.27 in the very prosperous year, from a passenger standpoint, 1908, or but 30 per cent. Freight revenue per train mile increased meantime from $1.73 to $2.65, or 53 per cent. There must have been, meantime, owing to improvements in service, a larger proportionate increase in passenger train expenses per mile than in freight train expenses per mile. The average number of passengers per train mile for the entire country is still absurdly low, being only 54. In other words, the average train does not haul an ordinary coach load. Where it is so obviously practicable for the railways to save money in a way that will benefit both them and the public it would seem there ought to be some way for them and the public to co-operate to bring about these desirable results.

THE INCREASE OF RAILWAY TAXES.

IT was during a period that may be roughly stated as about two years preceding the fiscal year ended June 30, 1909, that there was a good deal of legislation in various states and in various forms increasing the taxation of railways. New tax laws in general, including those relating to railways, require from a year to 18 months to show results. There is, first, a certain period before the operation of the law; another period before the assessment of the taxes; and another lapse of time, more or less, before they are paid and become public, though this is modified by the allotment of the proportion of taxes for each month in the monthly reports. We are now beginning to see in their fullness some of the returns either from this antecedent legislation dating back two or three years or from other forms of increase. Thus in 1909 the New Haven company paid in taxes $3,446,125, a sum almost certain to be decidedly increased this year. It was nearly 6½ per cent. of gross earnings, more than 42 per cent. of net earnings and $1,723 per mile operated. But even these figures—representing about seven-sixteenths of the New Haven's annual dividend of 8 per cent.—shrink by comparison with railway taxation in New Jersey, where the Delaware, Lackawanna & Western taxes have increased 230 per cent. in 20 years and from 5.4 per cent. on gross earnings to 9.2 per cent.; and where the six leading railways paid in 1909 more than $2,195 per mile and one paid $4,300 a mile.

The cases cited are extreme ones and apply to railway lines with high traffic density, both absolutely and in ratio to mileage. But in its application to the whole country the general truth remains that there is a steady tendency upward in railway taxation. The returns of Poor's Manual show that for 1909, as compared with 1908, railway taxes increased from $82,377,619 to $90,790,949, or about 10.2 per cent., as compared with 2.8 per cent. in mileage, 4.4 per cent. in gross earnings, 5 per cent. in capital stock and 3.7 per cent. in funded debt. Unfortunately, too, this comes at a time when it adds its load to the other financial burdens that the railways are carrying in the shape of increased wages and high cost of supplies. It would be a considerable increment were those two factors constant. Added to them the new taxation doubles its seriousness.

But, besides its expansion, American taxation of railways has its elementary flaws. It has been said with truth that in our many state commonwealths about every form of taxation has been in force that the wit of man could devise. There is state taxation, local taxation and, in some states, mixed systems. In some states the tax goes to the state treasury, in others to the municipalities. Sometimes the state acts merely as a collector who distributes the tax receipts locally. There is taxation of gross earnings and taxation of capital, including debt, sometimes on a basis of par value, sometimes on a basis of market values. But, perhaps, the most inequitable phase of all is the double taxation from which the railway investor suffers. He buys, for example, a bond issued by a railway company in another state which has taxed the corporation fully on all its forms of capitalization—stock and debt; yet he must pay his local or state tax, or both, on his holding. And the railway corporation, in consequence, incurs a double burden—first the direct taxation, and, secondarily, the higher interest return demanded by the extra-state invetsor before he will buy the bond.

The situation calls for two remedies. First, the harmonizing of tax systems and methods in the various states. This, obviously, need not and would not affect the *rate*. The state carrying a heavy state debt and high expenditures may adopt a different rate from the state with little or no debt and low expenses. But in justice to the railways, to say nothing of avoidance of complexities, a state's system of assessment and collection should harmonize with that of sister states; and included in the plan should be such a harmony of tax legislation as

would take into consideration the railway bondholder and exclude double taxation. The second remedy is the modification of arbitrary and absolute assessment of the railways in the direction of taxing actual values. The non-dividend paying line should not be classed in the same taxation group as the dividend payer. This does not mean that the "poor" railway line should be exempt as to its realty, plant, stock and bonds, but merely that its market values should be recognized. This applies to the railway the taxation rule for private property. Some states already have adopted that rule, exercised usually through tax commissioners. It should be the rule in all.

In this matter of taxation the railway corporation, like other public corporations from which returns are exacted, suffers serious disadvantage. It cannot, like the individual or the private corporation, mask in any considerable degree its financial condition. It runs against that common but inequitable impulse of legislative human nature which favors the impersonal rather than the personal tax and forgets that, in the end, they come together. And it confronts constantly that strange legislative and popular fallacy that the chartered privilege, no matter what may be its public benefit, calls for a repayment. In point of fact, the reverse is true and, other things being equal, the public service corporation far exceeds the private enterprise as a promoter of the public weal. New communities almost universally—sometimes old and great states like Canada—express from taxation of railway enterprises. It is a paradox of railway history that the public and legislative sentiment that erstwhile treated the railway as a foster child should now so far rebound to the other extreme, with undue taxation as one of its exponents. That the railway corporations have too often been to blame does not palliate the policy of levying on them all imposts alike unscinetific and unjust.

Letters to the Editor.

THE ILLINOIS MANUFACTURERS' ASSOCIATION.

Chicago, December 27, 1910.

To the Editor of the Railway Age Gazette:

I have read with much interest and hearty approval the able editorial in your issue of December 23, entitled "More Misrepresentation from the Illinois Manufacturers' Association." The article, while severe, is nevertheless amply justified by the facts, and I feel impelled by my natural interest in this vital question to so express myself.

Shortly after the attitude of the Illinois Manufacturers' Association toward the all-important freight rate question was declared, we felt strongly inclined to resign our membership in conjunction with other manufacturers who held similar views. It was thought, however, that we might accomplish more good by remaining within its ranks than by withdrawing, and thus encourage those gentlemen in its board of directors who were honestly, consistently and vigorously advocating a policy of fair play towards the railways, and who were capable of appreciating the equities of the situation.

When recently I found that in the approaching election, those gentlemen who were known to favor such a policy were relegated to retirement from the board, we declined to continue our membership.

E. B. LEIGH,
President Chicago Railway Equipment Company.

TREAT THE CAUSE, INSTEAD OF SYMPTOMS.

Dallas, Texas, November 17, 1910.

To the Editor of the Railway Age Gazette:

The communication entitled, "A Friendly Discussion of Poor Passenger Service," and your comment on it (November 11) constitute a sort of criticism, which, if kept up, should result in benefit both to the railways and their patrons. The subject is one which this writer has frequently discussed through the press during the last ten years. Formerly in the railway service, but long since out of it without a grouch, having been upon "both sides of the counter," he entertains the hope that he may be able to contribute something of value. The views entertained, and here expressed in outline, are based upon experience in the railway service, subsequent observation as a traveling newspaper correspondent, and information gained from railway officers.

Long observation in stations, on trains, around court houses, state capitals, at political conventions, picnics, etc., has convinced this writer that drastic anti-railway measures receive support, not so much because the people care for them per se, as because individuals, having been the victims of poor service, are animated by a spirit of revenge.

At a certain railway station a train was bulletined to arrive and depart on time. It came in eleven hours late, after the bulletin had been raised twenty-two times, on the instalment plan. During the long wait, the writer heard more talk favorable to reduction of passenger rates than he has ever heard at any political gathering. Other converts to the 2-cents a mile propaganda are nightly made upon a railway which does not permit its train auditors to take up and pass along the tickets of through passengers, but, instead, requires each succeeding auditor to wait upon the passengers in person no matter how often it may become necessary to interrupt their sleep. Last summer still more converts were made at a state labor convention, when delegates, about to depart, were curtly refused stop-over privileges at an intermediate point although tendering full fare to such place. One of the offended persons was a high state officer. It was said that no exceptions could be made. True, they could not then be made; but why make fool rules in the first instance? In this case, a few of the delegates, having urgent business at the intermediate point, stopped over, paying full fare in and out; but the company lost the extra fares of a larger number of delegates who wanted to stop for less urgent reasons, and it sent all of these home envenomed against railway corporations.

The *Railway Age Gazette* is correct in its suggestion that it is impossible for railway managers to control their employees as the employees of a store are controlled, for the reason that the former are scattered over thousands of miles, whereas the latter are within a single building and under the manager's eye. True; but too much time, money and thought are devoted to fighting for business at competitive points as compared with "looking after fences" at way stations where the railways enjoy a monopoly.

The comparison with a department store is not apt; but, how about the concerns which employ traveling salesmen, fruit tree agents, book agents, etc., who scatter over the entire country—are not their patrons treated like "the customers of a store"?

Truth is, there is a great deal of incivility and pigheadedness on both sides of the counter. Two vital differences, not generally recognized, distinguish the mercantile business from the railway business. Railway employees often forget that although patrons may be expert shoppers, they are not expert travelers. On the other hand, not many patrons of the railways take into account that ticket agents and trainmen are forced to transact business hurriedly. The customers of a store come in a steady stream throughout the day; those of a railway in bunches from one to 15 minutes before train time, but they expect to buy a ticket a yard long in less time than they can purchase a yard of ribbon.

Railway men from top to bottom need to learn that "A soft answer turneth away wrath." It would help some, too, if railway patrons were to learn the same proverb. However, it gives the writer pleasure to say that many on both sides of the counter have learned it, and that, upon the whole there has been improvement along this line—that the railway service has improved since he left it, as a railway friend declares. There are men in the railway service, in various stations, who are diplomats, and they are invaluable both to the railways and to the public.

Fighting drastic anti-railway measures is but treatment of symptoms; to redress the so-called minor grievances of the public would very likely remove the cause.

TOM FINTY, JR.

THE SUPPLY DEPARTMENT.*

BY H. C. PEARCE,
General Storekeeper, Southern Pacific Company.

I.

The supply department, or what is commonly known as the stores department, of our railways, is an innovation of the last 10 years. Prior to that time, with the exception of the Middle West and the Northwest, the materials and supplies on our large railway systems were mostly specified, cared for and accounted for by the users. The railways had purchasing agents, but they were little more than clerks, under the direction of the general managers, and bought practically what was specified by the several departments. They were traders rather than systematic buyers. In all matters of moment they simply placed the orders as directed by the heads of the departments. The maintenance of the necessary stock, distribution and accounting, was done by the mechanical, or other department using the material. Little or no attention was paid either to what was bought, how it was maintained, or where it was used. In some instances the accounting department maintained a supervision over this work, but it was merely from an accounting viewpoint.

ORIGIN.

The growing roads in the Middle West and the Northwest recognized the necessity for a supply department, owing primarily to long distances from the market, the growing and varied character of their roads, but more particularly from a progressive and economical standpoint. This department was established and maintained on some of these roads as long ago as 25 years; notably the Chicago & North Western; the Chicago, Milwaukee & St. Paul; the Union Pacific; the Burlington, and the Great Northern. The last 10 years have brought great consolidation, new methods and economies, particularly as to the system of buying from manufacturers on specifications. This necessitated a more thorough and complete supply organization, and today, with one exception, there is not a system of any importance that has not a supply department, the business of which is to provide, distribute and account for all materials.

The importance and extent of this work can best be understood by the following figures:

Material and supplies used in the operation and maintenance of 29 principal railways, representing a little over 50% of the total mileage of the United States, as reported to the Interstate Commerce Commission as expended during the year ending June 30th, 1908, was	$408,636,376
This is made up of approximately 40,000 items, and represents a permanent investment of	131,331,587

From this will be seen the necessity of a thorough organization under an officer equipped by experience and judgment, who should report to and be supported by the chief executive officer. That there should be no divided responsibility as between the buyer and the officer who is responsible for maintaining and supplying what is required must be of first importance.

PURPOSE.

The real purpose of such a department is substantially as follows:

First: To provide material that is needed at the lowest cost and with the *lowest possible permanent investment.*

Second: As large consumers to take full advantage of the markets and freights, buying so far as possible direct from the manufacturers.

Third: Proper inspection and test to see that the railway gets what it pays for.

Fourth: To maintain standards by seeing to it that only materials covered by the specifications are ordered and supplied.

Fifth: To properly, promptly and economically care for, handle and account for all materials.

Sixth: Husband resources by keeping materials in as few places as possible, and in such shape that they may be ready to use or move whenever required.

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GENERAL PLAN OF ORGANIZATION.

Organization and system are the foundation upon which depends the success of any undertaking, and in laying out any general plan it must be broad enough and flexible enough to meet all conditions, and always along practical lines. After a thorough, practical working organization is established, the rest is merely a matter of detail and the meeting of conditions. The accompanying chart, which I here submit, will serve to graphically outline the organization. It can be increased or decreased to meet the size and conditions of the property.

The basis is a storekeeper, located at any point where sufficient unapplied material is maintained to occupy the entire time of one or more men to do the work. At points where there is not sufficient material maintained to employ the time of one man handling and accounting, this work can be done by any other department maintaining an organization, but so far as the handling and accounting of the material is concerned, they are responsible for and report to the division storekeeper.

On each division, located at its division shops, there should be a division storekeeper, who should have charge of and be responsible for all unapplied materials on the division, reporting directly to a general storekeeper.

On each system or general manager's jurisdiction, there should be a general storekeeper, who should have charge of and be responsible for all unapplied materials under the general manager's jurisdiction. Reporting to him directly should be the division storekeepers, stationery storekeeper and traveling storekeeper, or inspector of stores. He, in turn, should report directly to the officer in charge of materials and supplies, who may have the title of either vice-president in charge of materials and supplies, general manager or supply agent, who in turn should have reporting directly to him the general storekeeper, purchasing agent, engineer of tests, and fuel agent, and who should in turn report to the chief executive officer.

THE OFFICER IN CHARGE OF MATERIAL AND SUPPLIES.

This is purely an executive office, and should be presided over by a thoroughly practical man, who has had detail experience in the buying, distribution, handling and accounting for railway materials, and thoroughly acquainted with the detailed organization. It is essential that he should know personally the conditions which surround each detail of operation of the department, and the atmosphere which prevails at all points, so that he may intelligently and promptly pass on all matters which are brought before him, and with a personal knowledge of the surrounding conditions. He must have a good general knowledge of the detailed workings and purpose of all other departments, should be absolutely honest and fair, and, above all, must have the entire confidence and support of the chief executive officer; without this his very best efforts will fail.

It is not necessary to maintain a large bureau or office; all records and data must necessarily be prepared by sub-heads. The heads of the departments are in position to call for and obtain any information desired at any time. There is absolutely no excuse for the duplication of work. All contracts should be handled by him, and all changes in standards be issued from his office. He should be a member of the committee on standardization, because upon him and his organization will depend, more than any other department, the maintaining of standards.

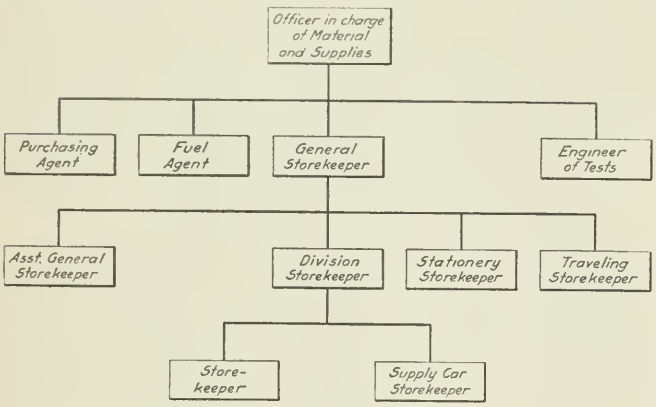
His knowledge of the necessity for promptness in handling requisitions, the placing of orders, tracing and the movement of material to the work, will enable him to force the sub-heads to work toward the end of cutting out every unnecesary move, reduce the permanent investment for material, and, at the same time, give better service.

He should be in constant touch with the other departments. work proposed, financial conditions, matters of policy, and, above all, should be in a position to encourage and direct the work of his sub-heads. He should be in constant touch with the detailed working of his organization, and not allow his office to become

so exclusive that the sub-heads, such as the purchasing agent, general storekeeper, engineer of tests and others, may feel that they are not privileged to consult with him at all times. They should understand that they are not only privileged, but it is their duty to consult and advise with him constantly. This confidence must exist if the organization is to be useful. By eliminating the detail of bureau work from his office, he is in a position to give these matters the necessary personal time, as well as to give ample time to investigation and keep in touch with the various departments, and the general policy of the owners.

THE PURCHASING AGENT.

It is not necessary that the purchasing agent should have a knowledge of the practical application of the material which he buys, in fact, with our large systems it is hardly possible. Many of our best purchasing officers have little or no knowledge of the material they buy. They are fully protected by the specifications, tests and store inspection. He should be a keen, wide-awake business man, absolutely honest and fair, a good seller as well as a good buyer. The selling is as important as the buying, and in many respects more so. He should maintain a thorough and complete office system and records. All requisitions for material should go to him. A system of bids and prices should be maintained; in fact, the unit of efficiency for his office is *prices* and *deliveries*. His organization must be so systematized as to handle the requisitions in the least possible time,



Supply Department Organization.

which means that his data should be so arranged that it can be as promptly applied as the material on the shelves of the storehouses. Every day saved in the handling of requisitions saves complaints and delays, places the material that much closer to the user, and in the same proportion reduces the investment. Material covered by contract or agreement should be so tabulated and arranged that the orders can be placed in every case the day the requisitions are received. There is no excuse for any delay in placing the requisitions for material covered by contracts or agreements, the order being merely a matter of form to check against prices and deliveries. Competition should be encouraged and competitive bids obtained and tabulated.

All scrap, surplus and obsolete material should be sold by him. This will be found a great economy to his company, and requires the exercise of excellent business judgment.

The full power of the purchasing officer should be concentrated on three things:

First: The buying of material at the lowest possible price.

Second: Obtaining the quickest possible deliveries.

Third: Selling scrap, obsolete and surplus material to the best advantage.

THE GENERAL STOREKEEPER.

The general storekeeper should be the active executive of the organization, and must be a thorough organizer, disciplinarian, tireless worker, and have a thorough detailed knowledge of all matters pertaining to the providing, handling, distribution and accounting for materials, as well as a good knowledge of the operations of the various departments, particularly the mechanical and maintenance of way. It should be his duty, not only to provide and care for material, but to know that it is properly applied to the company's requirements. His office should be largely executive, dealing directly with the division storekeepers, where the details of the work and records are kept. He must be in accord with the operating department at all times, and keep informed of the progress of its work. His time will be occupied in maintaining the organization, strengthening the weak places, inspection, providing facilities, anticipating demands, curtailing expenditures, cutting off unnecessary purchases, sorting over and making over second-hand and obsolete materials, arranging for sale of obsolete and unused materials and tools, and in every way maintaining an organization which will *provide for actual requirements*—one which will deliver material that is actually needed to the work in the least possible time. On him devolves, probably more than any other officer, the maintenance of standards. His unit of efficiency is *percentage of actual purchases to disbursements* and *permanent investment for material.*

THE FUEL AGENT.

The segregation of locomotive fuel from the other material under a fuel agent, on roads where the conditions and the volume of business may warrant, is for the purpose of more direct supervision. The fuel agent should have a good knowledge of the location and kind of fuel available. He should strive to establish competition among the different producers. He should arrange to provide the quality of coal which is most economical and suitable for the particular class of equipment and service operating on each division or district. He should so arrange the delivery of fuel as to keep up the necessary supply with the least possible amount of stock fuel on hand, and keep in mind the need of the service.

Fuel inspectors should report to him.

THE ENGINEER OF TESTS.

It is important that the engineer of tests should report to the officer in charge of material and supplies in order that delays may be prevented. His position is to make sure that the company gets exactly what the specifications call for. His organization should be so arranged that material can be inspected promptly so that deliveries will not be delayed. He should investigate and test materials offered for sale whenever so desired by the general supply officer. He should, in conjunction with the mechanical engineer, assist in the preparation of the specifications for material. In this alone, his detail knowledge of the service and the use of materials will make him of great value. The greatest care should be observed in preparing the specifications to see that they are made along practical and economical lines, taking into consideration, of course—first, the service desired; second, the markets and prices, and prepare them in such a way that they will neither be extravagant nor restrict their manufacture.

THE DIVISION STOREKEEPER.

The division storekeeper is to the division what the general storekeeper is to the system, and in addition must maintain the working organization and records. He should have full charge of all unapplied material on the division and all requisitions originating on the division should be sent to him so that they may be filled so far as possible from material on the division. They should then be sent to the general storekeeper when necessary for completion, the general storekeeper filling the requisitions from unapplied material from any part of the system, and if the necessary material is not in stock, ordering the same purchased.

Necessarily the division storekeeper should be located at the principal shops of the division, in order to avail himself of the company's facilities for repairing and making over material. He must have accurate and first knowledge of all work going on, as well as contemplated, and keep in active touch, not only with the

division officers, but with the men actually doing the work. He should have charge of the supply cars operating over his division, sorting of scrap, the application of surplus and obsolete material, and the accounting on his division under the direction of the auditor. He should maintain a general stock of material for the division at his headquarters, moving it from the general store in carloads, and distributing it over his division in supply cars, or by other means whenever it may be necessary to meet emergencies.

THE STATIONERY STOREKEEPER.

The stationery storekeeper should be a man that has a practical knowledge of forms used, different weights of paper and methods of padding; in other respects his organization should be identical with that of the division storekeeper, except that it should handle only stationery, and for the entire system.

THE TRAVELING STOREKEEPER OR INSPECTOR OF STORES.

The traveling storekeeper should be the lieutenant of the general storekeeper, and must be primarily an accountant, for the reason that he will constantly be called upon to take charge of division stores, owing to sickness, absence, or changes, and must be so equipped that he can operate the division from the office. He must be able to go into an office at any and all times and check it up, to see that the work is being handled properly and in accordance with established methods. He should, of course, also have a good practical knowledge of the material and its uses, and be able to direct its proper handling and application. However, as most division stores have practical men of this character in their organizations, it is not only absolutely essential that the traveling storekeeper should be able to operate the store or the division in a general way. It is important he should have a thorough knowledge of the organization as a whole in order to attain his full value as a representative of the general storekeeper on the ground.

ANNUAL REPORT OF THE INTERSTATE COMMERCE COMMISSION.

[The first part of this report was noticed last week, page 1264.]

Accidents.—The report gives the usual brief summary of accidents for the year ending June 30. These figures, as published in the government's quarterly bulletin, have been given in the *Railway Age Gazette,* November 11, page 925. Reference is made to the fact that the accident law has now been changed, so that beginning with the current fiscal year the commission will abandon the inconsistency of presenting two separate reports of accidents each year. The new law authorizes the commission to investigate accidents, but, says the report, "the commission has not yet been able to take action under this act, for the reason that to secure proper and adequate investigation of railway accidents under suitable conditions, and for the purpose aimed at in the passage of the law, it will be necessary to employ permanently a number of men of experience, character, and ability; and there is as yet no appropriation sufficient to provide for such employment and for the necessary traveling and clerical expenses. To investigate train accidents generally throughout the country with a view to locating the blame in particular cases must indeed be considered as practically out of the question, as there are so many accidents occurring on the extensive railway mileage of the United States that the expense of conducting inquiries by competent men would be almost prohibitive. It is not believed, however, that the law contemplates such numerous investigations. Its purpose, as we understand it, is not to examine the details of the collisions and derailments occurring every month, but rather to formulate, for the benefit of Congress and the public, the lessons to be learned from typical accidents. This object can be accomplished at a reasonable cost."

Brief reference is made to the records of the last year, compared with preceding years, and the commission renews its recommendation for the extension of the use of the block system.

Safety Appliances.—The railways are making marked improvements in their practice and are guarding better against violations of the laws. Most of the roads are increasing the number of inspection points and making other changes, but there is still room for further improvement. The commission believes that it was the intention of Congress, in the original safety appliance act, that train men should not have to ride on the tops of cars to work the hand-brakes, yet the practice still prevails, and the deaths and injuries classed as falling from cars and those due to overhead obstructions continue to pile up large records every year. A suit to test the lawfulness of the practice of requiring train men to operate hand-brakes is now pending in the federal court for the Western district of Pennsylvania (U. S. vs. B. & O., 176, Fed. 114). During the last fiscal year the commission reported to the law officers of the government 431 violations of the safety appliance act, and 140 of these were contested by the roads. In 130 of these, verdicts were rendered in favor of the government, and the amount of penalties recovered aggregates $51,400. The commission has published an index-digest of all decisions under the safety appliance acts. The decisions of the courts as to the meaning of the safety appliance acts are now pretty generally in accord, but several important cases are still pending in the Supreme Court of the United States.

Safety Appliance Standards.—Standards for the construction and application of grab-irons, ladders, sill-steps, hand-brakes, running-boards, etc., were prescribed by the commission on October 13, in accordance with the law of April 14 last. These standards, which were settled upon at conferences with the railway officers, have been heretofore set forth in the *Railway Age Gazette.* The commission asks Congress to relieve the carriers from compliance with this law in the case of cars which were under construction at the time the law was passed. The law provided for relief only in case of cars which were actually in use when the law was passed; it should have said when the law went into effect.

Hours of Service Law.—The commission notified 1,314 roads to comply with this law, but only 949 have obeyed the notice. The suit contesting the law, which was instituted by the Baltimore & Ohio, was decided in the circuit court in favor of the government, but it is now pending on appeal in the Supreme Court of the United States. Among the reasons given by railways, in their reports, for requiring employees to be on duty excessive hours, are "leaky valves," "hot boxes," "burst air hose" and other causes of that kind; and the commission calls for an amendment to the law so that the railways shall not have so much latitude in determining what is an "unavoidable accident" warranting disregard of the terms of the law. The practice of some of the roads in this respect has already been corrected or improved by correspondence. During the past year, the commission has received 188 complaints of violation of the law, mostly concerning telegraph operators. Of these complaints 136 have been settled by correspondence or otherwise and 52 are now under investigation. In several cases two telegraph offices are maintained at the same station in close proximity, one being operated during the day and the other during the night. The railways insist that this is not unlawful. The case which was instituted against the Atchison, Topeka & Santa Fe in Illinois, April 21, 1909, to test the lawfulness of the company's arrangement of hours of telegraphers, is now pending in the United States Supreme Court.

Block Signal and Train Control Board.—Brief reference is made to the work of this board, the annual report of which will be issued as a separate document. The twenty-second annual convention of State Railway Commissioners, which was held in Washington, November 15-17, is also noticed, and members of Congress are informed that they will be furnished with copies of the published proceedings of that convention.

The National Congress of Chile has authorized the executive to invest $1,375,000 in the acquisition of the railways owned by the Copiapo Railroad Company.

PROSPERITY OF CANADIAN RAILWAYS.

BY J. L. PAYNE,
Comptroller, Department of Railways and Canals.

The railways of Canada increased their net earnings in 1910 by 32.3 per cent. This may seem like commencing with the climax and working backward; but from that fact radiates a story of strength and prosperity which will not lose in force by an anomalous introduction. The growth of railway interests during the year was merely a reflex of the advancement which took place in all the material circumstances of the Dominion. It was a significant and concrete earnest of things to come; for Canada may be said to have just entered upon her larger heritage in this northland.

The increase in mileage over 1909 was 627 miles of main line, 79 of second track and 393 of yard track and sidings. Of the increase in main line, 519 miles was in the four western provinces. This was natural, for it is in that portion of the dominion that development is chiefly in progress. The new mileage of 1910, however, had no reference to the Grand Trunk Pacific, which is under construction from ocean to ocean, although the company had 1,500 miles of line in actual operation. It is running a regular service between Winnipeg and Edmonton, and before the wheat movement began this autumn it completed its freight connection with Fort William at the head of Lake Superior. Of new trackage of all sorts 3,818 miles have been put in operation within four years.

The whole of the mileage of the Grand Trunk Pacific is still officially regarded as being under construction. Business over the completed sections is being carried on by special permission of the railway commission, in which respect it is in the position of several other lines throughout the dominion. The term "under construction" is exceedingly comprehensive; yet, under the popular definition, at least 4,500 miles were so classified on June 30. It might be said that the Hudson Bay Railway is under construction, since the dominion government has completed surveys and given contracts for two large steel bridges over the Nelson river. That will be a unique line, in that it will be one of the best equipped on the continent, so far as roadbed and rolling stock are concerned, and yet is not likely to be in operation for longer than four months in each year. Its mission will be to carry out from 120,000,000 to 200,000,000 bushels of wheat during the season of navigation through Hudson Straits, and if it succeeds in doing this at a saving of two cents per bushel to western producers it will justify the expenditure of $25,000,000 for construction and equipment by the government.

Capital kept pace with mileage. The increase for the year was $101,816,271, which brought the grand aggregate up to $1,410,297,687. This total comprised $687,557,387 of stocks, and $722,740,300 of bonds. To this might properly be added the $190,753,063 received by railways in cash subsidies, plus the cost of government owned lines—$118,018,751—and if this sum were divided by the mileage it would show a capital cost of $69,510 per mile. That, however, would be a delusive result if the object in view were to ascertain the actual outstanding capital liability per mile of line. The government railways have not issued stock or bonds, and the subsidies were in the nature of gifts pure and simple. Liability is one thing and cost another. Moreover, there is a very considerable volume of capital duplication. The larger lines have absorbed smaller roads in many cases and issued their own obligations to cover the cost of purchase or control. Without going into details, which would necessarily be elaborate to clarify the account, let it be said at once that a carefully prepared statement shows that the real outstanding and live liability of Canadian railways amounted on June 30 last to $52,612 per mile. There can be no suggestion of overcapitalization in such a situation.

Associated closely with the foregoing is the account with respect to aid. It is decidedly complicated. No one can compute in dollars the assistance which the federal and provincial governments, as well as municipalities, have given. The cash is easily followed. It amounts to $190,753,063, of which $1,789,723 was paid to railways in 1910. But what value shall be attached to the 32,040,378 acres of land granted by the dominion government, or the 9,926,993 acres alienated by the provinces of British Columbia, New Brunswick and Nova Scotia? Quebec gave 13,324,950 acres of land; but redeemed nearly all at 52 cents per acre. The Canadian Pacific, on the other hand, which still holds over 12,000,000 acres, sold 975,030 acres during 1910 at an average of $14.84 per acre. Within quite recent years it has been popular to give guarantees of bonds, instead of cash or land subsidies, and obligations of that character were outstanding on June 30 to the extent of $127,336,357. To all this must be added the cost of 1,815 miles of the Grand Trunk Pacific, which is being constructed by the government between Winnipeg and Moncton, and which will not fall below $125,000,000. Here is a very big account, which cannot in the final total reach less than $700,000,000. No other country has done so much for transportation.

The public service of railways in 1910 involved carrying 35,894,575 passengers and 74,482,866 tons of freight. These figures represent an increase of 3,211,267 passengers and 7,640,608 tons of freight over 1909—the largest expansion of any year in the history of Canadian railways. In order to condense what would otherwise be a long story, the following items with respect to traffic are selected:

	1909.	1910.
Passenger density	84,342	99,742
Passengers per mile of line	1,355	1,451
Passenger journey—miles	62	69
Passengers per train	51	59
Freight density—tons	545,991	635,321
Freight haul—miles	197	211
Tons per train	278	311
Cars per train	16.37	18.15
Tons per car	16.98	17.13

These facts in succinct form illuminate the opening observation with respect to net earnings. They show that heavier units are commencing to affect quite materially the trainload and carload. Canada in these respects, however, is still behind the average of the United States. The number of passengers per train is precisely the same as that shown by American statistics; but the average tons per train is 77 less and the number of cars per train 11.6 less. In length of passenger journey and freight haul, however, Canada leads the world. This is due to our peculiar geographical position, which practically makes all traffic move either east or west, and for long distances.

It is perhaps worthy of special reference that 3,075,298 of the increased tonnage for 1910 came within the classification of manufactures merchandise and miscellaneous. They constitute the best paying classes of freight. Products of agriculture made up 17.31 per cent. of the traffic, products of animals 3.71, products of mines 35.11 and products of forests 17.54—a total of 73.67. This left 26.33 for the higher grade commodities, which was 4.34 per cent. above the showing of United States railways for 1909. Canada, however, falls below her neighbor in volume of manufactures.. It may not be amiss to say at this point that the statistical schedules and classifications in force in Canada and the United States are in all respects identical; so that comparisons may be made with accuracy in all the aspects of operation.

Gross earnings aggregated $173,956,217, and showed a gain of $28,899,881 over 1909. The operating expenses amounted to $120,405,440, or $15,805,356 more than for the preceding year. It will be seen that the relative difference between income and outgo suggests the probable practice of rigid economy. This would have been both sane and natural after the rather trying experiences of 1908 and 1909, with wages and the cost of material steadily ascending and revenue shrinking. Yet an analysis of operating expenses reveals a liberal policy in all that related to physical upkeep. For example, maintenance of way and structures showed an advance of 2.23 per cent. over 1909, while

equipment ran 1.03 ahead of that year. These figures would indicate substantial betterments, especially as these divisions combined made up 44.05 of the total. The saving occurred under the head of transportation, which is precisely where it should be found in a sound system. When a railway starts out to economize unwisely, it invariably skimps roadbed and equipment. When it saves prudently, the reductions may always be looked for in the conduct of transportation, which is invariably the chief avenue of waste. To make the operating situation plain the following comparisons may be given:

	1909.	1910.
Way and structures	$21,153,274	$27,035,603
Equipment	21,510,304	26,002,301
Traffic expenses	3,798,825	4,366,177
Transportation	54,284,587	58,928,171
General expenses	3,853,094	4,073,188
Total	$104,600,084	$120,405,440

There was a slight decrease in the average receipts per passenger per mile, and a small increase in the rate per ton mile for freight, the figures in one case being 1.866 cents and in the other .739 cents. The United States rates are about the same. Happily, there is nothing approaching an organized agitation on this side of the line for a two cent passenger fare. It could not be defended, and would seriously cripple, if not destroy, many of the smaller roads which are barely able to make one hand wash the other under present conditions. It would be difficult to prove that any line in Canada makes a clear and considerable profit out of its passenger traffic. The passenger density is too low in a country which has the highest railway mileage per 100 of population in the world.

One or two other features in connection with earnings and operating expenses are worthy of accentuation. For example, there were 24 reporting railways which in 1910 showed a deficit. On the other hand, twelve roads had net earnings amounting to 97 per cent. of the total. This latter fact emphasizes very strikingly the tendency toward centralization of transportation power. In the railway world the larger absorb the smaller, and thus demonstrate an analogy with the natural kingdom. And who shall say this process does not, in the final reckoning, serve in the best way the broad interests of the people for whom railways are built? The year 1910 also gave proof of the rising cost of train operation. Twelve years ago it required 77.9 cents to run a train one mile; now it costs $1.41. Train earnings have also increased; but, while the income from that source has grown by 70.8 per cent. since 1899, the operating cost has advanced by 80.8 per cent.—and in one way and another all the activities of a railway, no matter in what direction, are centered in the running of trains. Earnings per passenger, per ton, per passenger train mile, per freight train mile and per mile of line showed encouraging increases in 1910; while, per contra, the cost of operation per train mile rose from $1,309 to $1,409.

A brave effort is being made year by year to strengthen the motive power and to add to the car supply of Canadian railways. In 1910 the increases were: Locomotives 110, passenger cars 138, freight cars 1,934 and company's cars 789. The total was brought up to 4,079 locomotives and 132,681 cars of all classes. The increase in freight equipment was chiefly in box cars. There was an actual decrease in flat cars. What was perhaps more significant than increase in numbers was the addition to capacity. In 1907 the average capacity of box cars was 27.6 tons; in 1910 it was 29.1 The service performed by each freight car was 622 tons, which was 55 tons better than for the preceding year. Per 1,000 miles of line the equipment of 1910 was as follows: Locomotives 165, freight cars 4,840, and passenger cars 174. This showing is not nearly so good as the situation in the United States discloses; but it is rapidly improving. In Ontario the available supply of cars is probably quite up to the American average; but in the western provinces the requirements of new mileage are not so large

On June 30 there were on the pay rolls 123,768 employees, in addition to which outside operations required a staff of 10,709. Numbers are ascertained by counting noses on a particular day, and, while a better method has not been devised, it is not by any means satisfactory. A comparison of the aggregate of wages paid during the year is safer. In 1910 the sum paid to employees of all classes was $67,167,793, as against $63,216,662 in 1909, and $58,749,493 in 1907. The growth revealed by these figures is much larger than by placing numbers side by side, and it tells the story of the rising cost of labor. It also throws a strong light on the operating situation. For example, it has already been pointed out that the relative increase in the cost of conducting transportation was not so large in 1910 as were the increases for maintenance of way and equipment; but the wages paid under the head of transportation amounted to $32,091,952 in 1910, as against $24,656,585 in 1909. The saving effected in that division did not, therefore, apply to wages. In this relation it may be instructive to compare numbers of employees and the average rates of pay in the United States and Canada:

	United States.		Canada.	
	Number per 100 miles.	Average daily pay.	Number per 100 miles.	Average daily pay.
General officers	2	$12.67	2	$10.72
Other officers	3	6.40	3	4.73
General office clerks	30	2.31	28	1.94
Station agents	15	2.08	12	2.16
Other station men	58	1.82	51	1.65
Enginemen	24	4.44	18	4.12
Firemen	26	2.67	20	2.53
Conductors	18	3.81	13	3.30
Other trainmen	49	2.56	32	2.12
Machinists	20	2.98	12	4.40
Carpenters	26	2.43	17	2.52
Other shopmen	83	2.13	62	2.19
Section foremen	18	1.96	18	2.18
Other trackmen	136	1.38	122	1.58
Switch tenders, crossing tenders and watchmen	19	1.73	7	1.57
Operators	17	2.30	12	2.20
Floating equipment	4	2.31	1	2.19
All others	90	1.98	71	1.95

Accidents in 1910 may be dismissed with the shortest possible reference as an unavoidably distressing feature of railway operation. From the movement of trains 524 persons, of whom 60 were passengers, were killed, and 1,441 were injured, of whom 270 were passengers. It was rather a bad year for accidents to passenger trains, the second worst in our history. One passenger in every 598,243 was killed, and one in every 132,943 injured. Collisions accounted for the death of 2 passengers and derailments for 44. Of employees 214 were killed and 926 injured. There have been many worse years, so far as employees are concerned. At highway crossings 63 persons were killed and 61 injured. There is a well-sustained movement in progress for the elimination or protection of level crossings, and during the year 1910 the number of subways and overhead bridges increased by 66, while electric bells and watchmen were multiplied materially. Strange to say, there was an actual decrease in the number of gates in use.

Twenty-three years ago Grover Cleveland, in his capacity as president of the United States, created great anxiety on this side of the boundary by a threat of commercial non-intercourse with Canada. At intervals since that period other statesmen have spoken thoughtlessly along the same line. The word "thoughtlessly" is used advisedly, because these influential people had not paused to measure the close identity of commercial interests on the northern half of this continent. They had not, for example, taken cognizance of the railway situation. This alone ought to make for permanent peace and reciprocity. The interwoven character of transportation relations was pronounced in 1887: it creates a positive and permanent unity today. There are at this moment 22 distinct American railway corporations with lines in Canada. These roads represent a capital liability of $110,000,000 and 1,703 miles of track. They did in 1910 a volume of freight business aggregating 15,447,776 tons. On the other hand, Canadian railways own and operate hundreds of miles of line in the United States.

Summing up, very briefly, and at the cost of repetition, it cannot be too clearly understood that Canada has entered upon a period of commercial expansion which must lead to a corresponding development of railway interests. The year 1910 created a

new record in volume of traffic and value of earnings; but the figures in those regards will inevitably swell with the growth of production. It is known that 325,000 settlers came into the Dominion during the year just closed, and in that fact alone lies an inestimable potentiality. The decennial census will be taken in April next, and it is confidently expected to reveal an increase in population of at least 80 per cent. That will signify a nation of nearly 8,000,000. Every man, woman and child is either a producer or a consumer, often both, and every penny's worth produced or consumed means traffic. The Canadian people, although highly prosperous, have but recently acquired that faith in the future of their country which finds expression in noble enterprises. They had grown timid while waiting; but now they have become aggressive. As they push out to the limit of their strength, the tale of their progress and achievements will, among other things, be splendidly told in larger and more surprising railway statistics than were created in 1910.

STUDIES IN RAILWAY ECONOMICS.

BY W. M. ACWORTH.

I.

Five years ago I published a small book on the subject of Railway Economics.[1] I stated in the preface that what I had written was only an instalment of what I had meant to write and added that I should be grateful for any criticisms, and trusted that the complete work when published would benefit by them. Though the book has found a wider audience than I had expected and has been translated into several foreign languages—Magyar and now Japanese among them—the criticisms I had hoped for have unfortunately failed to reach me. It was perhaps expecting too much that readers would take the trouble to communicate with me personally, but the kindness of the Editor of the *Railway Age Gazette* now offers me the hospitality of his widely read columns to put forward my tentative conclusions on various points, and I am, therefore not without hope that competent critics both in England and in America will discuss in the columns of the *Railway Age Gazette* some of the points which I may raise.

Let me briefly summarize the scheme of my published book as far as it went. I began by showing that, though a railway was nothing more than a specialized road, a railway undertaking really comprised three distinct functions: owning the road, owning the vehicles that run on it, and carrying for hire; and I pointed out that in this respect a railway was different from all other undertakings concerned in transport.

Turnpike trusts and canal companies own the road, but do not carry on it; tramway undertakings, which are most nearly analogous to railways, have only a modified ownership and non-exclusive use of their road; while barge owners, road carriers, omnibus and steamship companies, and the like, have no ownership in their road at all. Railway rates, I pointed out, combine two things: interest on capital provided and charges for services rendered, made up—in our own country and dealing with railway rates as a whole—in the proportion of 8 shillings ($2) out of every £1 ($5) interest on capital provided, and 12 shillings ($3) charge for services rendered.

I went on to show that the capital of a railway is enormous in proportion to the business done (it takes an average English company about ten years to turn over its capital once); that this capital is spent once for all and immobilized on the faith of traffic which may or may not come, and which can only be attracted at rates which must be guessed at in advance. I showed further that, while large traffic is necessary to make possible low rates, low rates are necessary to secure large traffic. Then, on the side of railway expenditure, I pointed out that capital is spent for the sake not of any particular traffic, but of the business as a whole; that the same thing applies to the greater part of the current expenditure, almost the whole of permanent way expenditure, a large part of locomotive cost, and perhaps an even larger part of what is called traffic expenses. From this I drew the conclusion that it is impossible to base railway rates on cost of service; for the cost of any particular service is not an objective fact, but a subjective estimate. And I further showed that, if it were, which it is not, possible to base individual rates on cost of service, to do so would be in the interest neither of the railway undertaking, nor of the public which it served. For by doing so the railway would lose a great deal of traffic which can contribute some portion, though not the whole, of the general expenses of the undertaking, and the public would find the traffic in bulky and low priced goods, and even in medium priced goods over long distances, shut out altogether, while such goods as would still be carried, deprived of the help of the goods shut out, would have to bear the whole railway expenses unaided, and so would find their own rates much raised.

Having shown that rates could not and should not be based in practice on cost of service, I went on to assert that in principle they never had been so based either on state railways, or on the railways of private companies, and I said that the belief that the German state railways do so base their rates was entirely erroneous. I asserted that everywhere, on state railways, as much as on private railways, freight rates and (though in a less degree) passenger fares were based on what the traffic could bear. I discussed at length the meaning of this phrase, and pointed out that it was a principle, not as had been supposed of extortion, but of moderation and restriction, and suggested that "tempering the wind to the shorn lamb" was really the right way to describe it. I further pointed out that, so far from being a principle special to railways, it was a principle universally accepted through all the range of business, whether for sale of goods, or for sale of services, and also accepted in public affairs as embodied in the common canon of taxation "equality of sacrifice." It is perhaps worth pointing out that since I wrote, the principle has with very general acceptance been pushed further in the matter of national taxation. Fierce as was the attach on Mr. Lloyd-George's budget of 1909, few people ventured to dispute the justice of the broad principle that old-age pensions, by which poor people only benefit, should be paid for largely by increased income tax, super tax, and enhanced death duties, levied solely from the class who could never directly benefit by these pensions. I may add that I analyzed at some length from another point of view the phrase "what the traffic can bear," and I showed that "can bear" means sometimes "is capable of bearing without being crushed out of existence," and at other times "will consent to bear without going off to a rival route."

The rest of the book sketched in outline the historical development of the existing English rate situation, showing that in the main it has grown up in response to the demands of an extending trade, but that the state has interfered in every increasing measure, and I gave some reasons for thinking that the three most important interventions of the state: the fixing of maximum rates, the law of undue preference, and the restriction on increase rates, had not, on the whole, resulted in the advantage to the public which they were designed to secure. I wish to emphasize the point that throughout the book, wherever I was dealing not with local history but with general principles, I claimed, and believed that I had good reason to claim, that those principles were of universal application. I desire to emphasize this point for two reasons: In the first place, German critics, whose competence and courtesy I fully acknowledge,[2] have ignored my point. They have said in effect, "Mr. Acworth's book is interesting as showing the point of view from which railways are regarded in the native country of private enterprse, but Germans, of course, believe in a state system and so look at the matter

[1] The Elements of Railway Economics. Oxford; at the Clarendon Press. 1905.

[2] Dr. von der Leyen in Archiv für Eisenbahnwesen, and Dr. von Wittek, ex-Austrian Minister of Railways, in the preface to his translation of my book.

with other eyes." My submission is that this is not so. I submit that the economic principles applicable to railways are applicable to all railways alike; that state enterprises do and must build their railways in the same manner as private enterprise, equip them in the same manner, operate them in the same manner, and fix the rates on them in the same manner. The second reason why I desire to emphasize the university of the economic principles underlying railway management is that I wish to make it a starting point in what follows. If there be, as I believe there are, general principles of universal application, we can test the railway policies of different periods and different countries, by showing how far they conform to the underlying principles, and this is what I propose to do in the articles that will follow.

I have said that there is a common but erroneous belief that the German tariff is based on cost of service. There is indeed a historical foundation for this belief. The present German tariff began with a system in which there were only three scales of rates, all on a mileage basis: (1) so much per ton per mile for small consignments (i. e., less than five tons); (2) a lower rate per ton per mile for consignments of five tons (i. e., half car loads); (3) a still lower rate per ton per mile for consignments of ten tons (i. e., full car loads). There were also terminal charges on all three classes.

It is true that this tariff was not really based on cost of service, for any railway man knows that it does not cost ten times as much to convey a truck 100 miles as to convey it 10 miles, but cost of service was intended to be the basis, and, no doubt, was believed to be the basis by the theorists, who have always had considerable influence on German rate making.

The modern German tariff, though it still preserves the fundamental distinction between (1) small consignments, (2) five-ton lots, and (3) ten-ton lots, has departed widely from the original idea. There are two classes for small consignments, there are four classes for five-ton lots, and five classes for ten-ton lots. And the classification in each category is substantially based on the consideration of what the traffic can bear.

Further, the departure from the original idea is clearly made manifest in a peculiarity of the German tariffs: the terminal charge is less for short-distance than for long-distance traffic. Now it will hardly be argued that it costs more to load and unload and marshal a wagon going from Cologne to Düsseldorf than a wagon going from Cologne to Breslau. The only possible excuse for the distinction is that short distance traffic cannot (in this case it is more probable will not) bear the full rate. Then again the ordinary tariffs are still on a pure mileage basis, i. e., the conveyance rate for 5,000 miles is precisely ten times that for 50 miles. But in the case of the lower class of small consignments and the lowest class of ten-ton lots this basis is departed from and the rates are calculated on a sliding scale—*"a base de' croissante,"* to use a more expressive French phrase. There can be no other explanation than that the logic of facts is too strong for theory, and it has been found necessary to temper the wind to the shorn lamb, and let off the lower class traffic more lightly than the traffic of higher value. I may just add that the vast proportion of German traffic—I believe nine-tenths of the whole—goes in ten-ton lots, and, of course, the bulk of this is the lowest class, and, therefore, the difference between the sliding scale rate and a rate based on sheer milage is of the utmost practical importance.

(To be Continued.)

The Ecuadorian Legislature has recently approved a contract between A. Henry Higginson, an American, and Edward Morley, an Englishman, for the construction of a railway line which, starting from Puerto Bolivar and passing through the cities of Cuenca and Azogues, shall eventually terminate at Biblian. The traction will be either steam or electricity, and the gage is to be 3 ft. 6 in.

A LETTER TO STATION AGENTS.

BY A. B. ALLEN.

In a great many cases it seems to be a hard matter for the station agent to realize just what his duty to his employer comprises. I refer particularly to personal disposition, what people vaguely term personality. The local agent is certainly a true medium through which the great public is influenced for or against his particular company and for or against railways as a whole.

Transportation is the principal business of a railway, but as railways develop and push further and further into virgin territory, and the towns grow, these railways become representative of immense wealth in properties, including lands, equipment, terminals, etc. This is a natural outcome, and could not be otherwise. Complications arise, property disputes, and differences of all kinds with the people develop, and as the railway must necessarily defend itself, many cases go to court.

This is one way by which the railways are forced into politics. Their troubles and their politics naturally furnish much meat for flaring and deceiving headlines for sensational newspapers, and the newspapers are, of course, the great contemporary educators of the people. This goes on and on, and thus a large proportion of our citizenship is influenced against railways as a whole.

Accordingly, assuming that our patrons are often in this frame of mind, the minute that a piece of their freight goes astray, or when demurrage or storage accrues, they are ready to upbraid the railways, denouncing them as robbers. Not all patrons adopt this course, and of those who do, not all really cherish the full spirit of their argument, but "every little helps" to influence the general spirit of your community one way or the other.

The local agent, being the most important and direct connecting link between the railways and the people, can do more toward disorganizing the attacks of politicians and newspapers, than can any other medium at the command of the company. The agent is the man who can get at the masses if he is of the right spirit.

The agent, in towns of any size, is in many cases one of the leading citizens. He is often a member of one or more of the civic bodies, probably active in the lodges, and his business as the railway representative brings him in contact with many people every day, and many of these people need an application of proper influence.

As an employee of your company, it is up to you to be a loyal and interested employee. If you are not loyal, it is because you do not like your job or your employer, and it is your duty to quit. Mail your resignation on the next train. This of course applies to every branch of the service, but in this article, I am talking about the agent. Therefore, if you have decided to continue in the service, forever hold your peace, and give the company the full benefit of your loyalty and good will. The company does not want you unless you do feel that way. The company wants capable and ambitious men, and there is always room for them ahead. While your present salary or environments may not be just as you would like, there is usually a reason for its status. Possibly you are not worth more. It is the right thing to ask your superior officers for a raise of salary or for improvements, but if they give you a refusal, it is because there are consistent reasons, and your way out is to improve your ability, and seek promotion from your present position.

Therefore whether you are receiving $30 or $300 a month, it is up to you to be satisfied. To be satisfied is to be loyal, and to be loyal is to further your company's popularity in every legitimate way. This point is brought out for the reason, that with every large corporation there exists a considerable faction of the employees commonly known as "dynamiters"—chronic soreheads and disturbers. They are a disloyal, unhappy, un-

satisfactory element. These individuals are not often found out at their true worth by the officers, for the reason that they mostly knock among themselves, and they are just smart enough to shut up when their superiors are around. As a usual thing, however, this disposition is reflected in their work and they rarely advance. It is merely a case of the law of compensation, and they are the real sufferers. Do you belong to this class?

Having pointed out the destiny of the "dynamiter," and shown why your present position should be interesting to you, I want to indicate what you should do or should refrain from doing to successfully transmit this happier state of mind to the people on whom the company depends for a livelihood. Right action on your part will be far reaching in results. When anyone comes into your office and berates the company on account of lost freight, late trains, legislation and what not at once, in a diplomatic way, defend your employer with plausible arguments. I have known many instances where the agent sided right in with the complainant, possibly because it was the path of least resistance, or because the employee happened to be a sorehead. This generates the wrong brand of influence and the patron hurries to gossip it with the next sympathizer. If you are the agent, your force hear you, and they naturally follow in your footsteps. I know of good sized stations where the entire force is always sore, while at other similar stations, where the conditions are the same or worse, the whole force are interested and happy, reflecting exactly the spirit of the agent. These do the most satisfactory work, and are by far the most appreciated by the officers. Does the grocer allow the public to come into his store and deride his service and his stock? Not much. Combat every attack by a courteous but firm counter argument for your employer. Point out the probable why and wherefore for lost and damaged freight, show that you will gladly make immediate effort to repair the wrong, explain how storage and demurrage are an obligation by law, as is also a switching charge. The people by their abuse of such privileges, are the very ones who brought about these conditions. In quoting service to patrons, do not promise anything not justified by the tariff. In other words, follow the tariff literally and keep within the law. I refer particularly to storage, switching charges and the like. In the long run this makes and retains friends for the company.

We cannot bear too strongly on courtesy and system, two positive elements most necessary in the local office. Courtesy includes a genial greeting on the street or in the office, prompt counter attendance, and an effort to aid and assist patrons and others with all the information possible. This makes friends for you and for the road. System includes organization. Your force and their work should be arranged so that there is a regular routine of duties with a place for every book and every blank. This facilitates changes in force when these are necessary, and aids the men to more readily concentrate their efforts; and they are much more contented. System, neatness, and cleanliness go hand in hand. If these are adhered to, your actual service to the public is of proper class, and is a business getter.

One thing more. Where there are two or more competing roads in your town, the several agents should form themselves into a Local Agents' Association, such as there are in large cities, for the purpose of agreeing on the interpretation of tariffs, and other points, so that each road will have all lawful privileges and no more.

These are the things you can do and should do. It is for your own benefit and for the benefit of your company. A moral obligation devolves on you. Be interested, loyal, ambitious, and such disposition will necessarily bring about a happy condition. It cannot be otherwise.

The first section of the Uruguayan branch line, which will eventually run from Nico Perez to Treinta y Tres, has just been opened. The section in operation extends between Treinta y Tres and Jose Battle y Ordonz.

WATERWAYS: THEIR POSSIBILITIES AND LIMITATIONS.*

BY FREDERIC A. DELANO.
President Wabash Railroad.

There is no more important subject today than that of waterways. It involves great questions of public policy, and every true and loyal citizen of the United States is interested in seeing those questions settled right—settled without reference to personal bias or party prejudice, and in a way justified by the conditions. All the facts upon which opinions must be based are facts for the engineer and the economist to determine after careful investigation. It is important that those facts should be accurately determined and correctly recorded. Therefore, in my discussion of this subject I shall endeavor to keep in mind these principles.

I do not believe that the development of waterways, solely in the interest of the general public, would hurt the railways. Even if I thought otherwise, I hope that I should have enough public spirit to advocate that which I believe to be for the general good. Whatever is for the public good ought to be done even if in consequence some special interest suffers. For the same reason that I do not think railway men should discuss such a large question of public policy from the railway standpoint, I do not think shippers should discuss it merely from the shipper's standpoint. The question that ought to be considered by all is whether development of waterways is the best way to secure cheaper and more adequate facilities for transportation; and when I say "cheaper," I have in mind the entire economic cost of transportation, including not only the rates that the shipper pays to the owners of the boats, but also what the public pays in taxes for the improvements and construction of the waterways.†

When we consider the cost of railway transportation, we do not consider merely the cost of moving the engines and the cars. We consider also the cost of providing and maintaining the roadway, the stations and other structures. Obviously, all costs incidental to the soliciting of freight, insuring it in transit, interest on capital invested, and charges for replacements and betterments are applicable to waterways as well as to railways; and we must not deceive ourselves by reason of the fact that some of these expenses are borne by the general government, instead of by the traffic moved.

TRANS-OCEANIC WATERWAYS—HARBORS.

The question of developing trans-oceanic waterways is mainly one of deepening harbors. Sea-going steamships have attained such draft that no harbor with a depth less than 20 to 40 feet can accommodate the largest of them. Any place that is to remain or become a great port must have a harbor dredged to these depths, for the large steamships make for economy in transportation, and only to such ports can the large steamships come.††

The development of harbors seems a proper, and even necessary function of the general government. Every commercial interest in the country (including railways) benefits by it; and for this very reason, private capital would have no incentive to engage in it, even if it were given the opportunity.

The increasing capacity and draft of sea-going vessels which necessitates the dredging of harbors to great depths, has a most

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*An address before the Rivers and Harbors Congress, Washington, D. C., December 8, 1910.

†The public often ignores this expense and we have very little data in this country which is reliable. In Europe it is different. There the Governments endeavor to keep accurate information on such matters; and on the much used canals of Germany and France, that portion of the expense per ton of freight carried, by reason of interest on the first cost of the waterways runs from approximately one mill to four mills per ton mile.

††Ocean carriers may be roughly classified as follows:
(a.) Carriers of the first class, plying between the large ports of this country and Europe; 26 to 35 feet depth of draft;
(b.) Carriers of moderate draft, which may be classed as second grade —the better classes of "tramp" steamers and the less important liners; draft 16 to 24 feet;
(c.) Carriers of the third class—less important steamers and more common "tramp" steamers; draft 12 to 16 feet.
Obviously, harbor depths must be maintained with due regard to the class of business transacted.

important bearing on the question of the development of inland waterways. It is sometimes contended that we should dredge our rivers and dig our canals so wide and deep that vessels can carry goods directly and without trans-shipment between cities situated on them and all the ports of the world. Some of the people of Chicago have visions of ocean vessels loading in their harbor, steaming down through the drainage canal, the Illinois river and the Mississippi river, and thence to Europe; also through the Panama canal to the Orient; or by the Great Lakes and St. Lawrence canals, to Europe. Such thoughts are idle dreams, and the trend of economic conditions in ocean transportation make any such suggestions increasingly impossible. It might, for example, have been considered with the class of vessels which were used on the ocean twenty-five or more years ago. It cannot be considered with the class of vessels which are economical and necessary today, for, regardless of the relative depths of waterways, vessels which must withstand the buffetings of the waves and storms of the ocean must be built much more strongly and, therefore, at much greater cost than vessels for inland carriage. The average cost of an ocean steamship per ton of capacity is $71; of a steamship on the Great Lakes, $41.50; and of river tow boats and barges capable of carrying 10,000 tons of freight on an 8½ ft. draft, only $12.*

A lake or ocean vessel is poorly constructed for navigating a canal or tortuous river, even with a moderate current; its ratio of length to beam is too great and it cannot be maneuvered at slow speed. Furthermore, a vessel costing $71 per ton of capacity cannot be operated economically where it must, perforce, be navigated slowly.

COASTWISE ROUTES.

Trans-oceanic waterways are mainly connections, and not competitors of railways. The relations between the coastwise routes and the railways are widely different. In some cases, coastwise water lines compete with railways; in others, rail-and-water lines compete with railways; in others again, rail-and-water lines compete with rail-and-water lines.

It is often said that our merchant marine is declining. This statement is not strictly correct. The part of our merchant marine engaged in foreign trade is declining, the reduction in its tonnage between 1889 and 1909 being from 999,619 to 878,523 tons. But the tonnage engaged in our coastwise traffic increased between the same years from 3,211,416 to 6,451,042, or over 100 per cent. This increase is mainly attributable to three things:

(1) To the monopoly of the coastwise traffic which the government gives to American vessels, and but for which it is improbable that our ships would have been able to meet the competition of foreign vessels any better in our own waters than the high seas.

(2) To the fact that many large industrial concerns have acquired and operate lines of boats to handle their own traffic; and

(3) To the fact that many railway lines have acquired coastwise steamship lines, or at least controlling interests in them, make favorable through rates and issue bills of lading in connection with them, and use their own soliciting staffs or other well developed soliciting organizations to get traffic for them.

There is much criticism of the railways for getting control of steamship lines engaged in coastwise and lake traffic. But experience indicates that the control of such steamship lines by either large industrial corporations or railways is requisite to the development of a larger water traffic. A railway can go anywhere that traffic is available. A steamship line can skirt only the fringe of the country, and can touch that fringe at only a few places, the number of harbors capable of receiving a good-sized boat being much smaller than the number of stations on a railway. The amount of freight originating at the relatively few places at which a steamship can be docked is comparatively small. Before it can get a large and regular traffic, some agency must cause commodities to be laid down at places where it can pick them up. A large industrial corporation, such as the Standard Oil Company, the United Fruit Company, or the United States Steel Corporation, can cause a great amount of freight to be concentrated at points where its own boats stop. A railway with a soliciting staff represented at every point on 2,000 to 5,000 or even 10,000 miles of line, may similarly cause enough freight to be concentrated at certain places to make profitable the regular operation of large steamship lines from those places. But—except under conditions peculiarly favorable to water transportation—a steamship line which has not the co-operation of a large industrial concern or a large railway cannot get traffic with such regularity and volume as to enable it to compete effectively, permanently and on a large scale against well-organized railways having strong soliciting staffs and giving regular and dependable service.

In an admirable book by Professor Smith, of the University of Pennsylvania, called "The Ocean Carrier," the great vicissitudes surrounding ocean transportation are pointed out. The business is essentially very hazardous and must either be done on a very large scale in order to distribute the risk, or be backed by very powerful corporations. Marine disasters or lean traffic years are overwhelming to any small vessel owner, even though the profits of an occasional good year are sometimes very large. Coastwise water transportation, like other ocean transportation, is cheaper than rail transportation, and when its lower cost is supplemented by efficient steamship management it is of great economic benefit. In Europe it is common for the railways to make practically as low rates per ton mile for short distances as for long distances. While this does not agree with the economic principles of transportation, it serves to make the railways valuable as feeders for the waterways, because the railway with relatively high long distance rates cannot compete with the waterway, whereas the comparatively low *short* distance rate enables them to act as assembling agents for the waterway.

THE GREAT LAKES.

The most rapid growth in our water-borne commerce during the past twenty years has been on the Great Lakes. Between 1889 and 1906 the gross tonnage of vessels used on the Mississippi and its tributaries increased 31 per cent.; on the Atlantic Coast and Gulf of Mexico, 82.5 per cent.; on the Pacific coast, including Alaska, 133.3 per cent.; on the Great Lakes and the St. Lawrence river, 160 per cent.; and meantime the gross tonnage of the vessels used on our other inland waterways declined 74 per cent. During the same period the net tons hauled on the Great Lakes and the St. Lawrence river increased 200 per cent.; on the Atlantic coast and the Gulf of Mexico, 166 per cent.; on the Pacific coast, including Alaska, 57 per cent.; and the net tons hauled on the Mississippi river decreased 6 per cent., and on all other inland waters, 65 per cent. The rapid growth of commerce on the Great Lakes has been largely due to the wise policy of the government in developing harbors and in deepening the Sault Ste. Marie canal. It has also been largely owing to the course of large industrial corporations and of the railways in acquiring control of or putting on the Great Lakes large steamship lines. These things have contributed to its increase for precisely the same reasons that they have helped to stimulate our coastwise traffic.

You may be disposed to reply that the important thing that has built up the coastwise and lake traffic has been the very low rates which the water lines have made. It is true that their rates have been much lower than those by rail. But the fact is that a water line which seeks to attract business from a competing railway merely by low rates is very apt to get worsted. This is illustrated by the existing conditions on the Great Lakes. The report of the Bureau of the Census on Transportation by Water, issued in 1906, from which many of the statistics that I have cited are derived, shows that the total shipments on the Lakes in 1906, excluding bunker coal, were about 73,000,000 tons, and that of this amount about 43,000,000 tons were iron ore or its products, practically all of which, of course, was carried in vessels owned by large industrial corporations—the steel manufacturers. Of

*A modern freight car costs approximately $20 per ton of capacity.

the rest of the traffic, very much the greater part was carried in vessels owned by coal operators, lumbermen, and railways, leaving only a comparatively small part for other boat lines. Practically all of the shipments of package freight were carried by railway boat lines. While the traffic on the lakes has been increasing so rapidly, that of the railways running between the same points that are reached by the boats has increased even more rapidly. Why have not independent boat lines taken the business away from the railways and the water lines they control? There are independent water lines and they make low rates. The answer is that the railway (and substantially the same thing is true of water lines controlled by railways) has a soliciting force and offices everywhere that are accessible to the shipper and when he delivers it goods it issues him a bill of lading which is a merchantable and bankable paper and most absolutely protects him against loss of and damage to his goods, while when he wants to make a shipment by an independent boat line he has to go and hunt up a captain who may have two or three boats available, and who will give him a mere receipt for his goods which affords him little or no protection against loss and damage. To be on the safe side, he must incur the trouble and expense of insuring the goods while in transit. Even if he can save a small amount, this will not compensate him for the trouble and time of hunting for someone to carry his goods and for the risk incidental to water transportation. Indeed, it is safe to say that not to exceed 20 per cent. of the tonnage carried on the Great Lakes is carried by *common carriers*. The railway steamship lines, and half a dozen or more independent lines, are common carriers; but the great bulk of the tonnage is carried by vesesls owned by the shippers or by "tramp" steamers that are chartered to the shippers.

As already stated, the railway has the great advantage that it can send for goods anywhere, pick them up anywhere, and carry them without trans-shipment to any point to which the shipper may want them to go. No independent boat line can attract business away from a steamship line owned by the same industry whose commodities it transports; and it is also difficult, although not so hard, to attract traffic away from a boat line owned by a railway, because the railway can to a very large extent influence the routing of traffic which may be carried by its boat line. Even if an independent boat line builds up a good business, there is nothing to prevent some rival boat line coming in, cutting rates, and taking a large part of it away; for it is easy for a group of men to get together a fleet of vessels by charter and form a line to compete for any traffic; but the vulnerability of independent boat lines tends to prevent them from being established. In other words, the very freedom of waterway competition militates against waterway competition.

It is chiefly due to these conditions that the boat lines on the Great Lakes have in the main passed into the control of the large industrial corporations and the railways. One of the results of their control by these large interests is that the public has to rely for water transportation mainly on the lines controlled by railways; for the steamships owned by the large industrial corporations are private carriers and handle only commodities shipped by their owners. Therefore, if the public gets any of the benefit of the low rates they make, it is only in the form of low prices for the commodities they sell. Whether the benefit is passed along to the ultimate consumer in this form, I must leave to your own observation.

CANALS CONNECTING GREAT WATERWAYS.

No wiser and more effective expenditure of public money for waterways could be made than for the purpose of deepening and widening rivers and digging canals to connect large bodies of water when the distance between the waterways is not too great. The best example in the world of such connecting canals is the Sault Ste. Marie canal. The American canal at Sault Ste. Marie was first opened to navigation in 1855. During the forty years to 1895, 101,244,462 tons of freight passed through it. During the next 11 years, ending in 1906, after the canal was improved, 343,288,393 tons passed through it. The development of this canal, which is 2.7 miles long and 25 feet deep, has cost $13,000,000, or $4,800,000 per mile. Its great value consists not merely in its ability to handle a large traffic, but in the fact that it makes more available and useful the great waterways it connects. Its cost was large, considering its length, but all the great ship canals have cost very large sums. The Suez canal, which also was built to connect great waterways, is nine miles long, 31 ft. deep, and cost over $1,100,000 per mile. The Kaiser Wilhelm canal, 61 miles long and 29½ ft. deep, cost $656,000 a mile. The Manchester Ship canal, 35.5 miles long and 26 ft. deep, cost $2,100,000 per mile. These very large figures show that the longer it is necessary to make a ship canal to render it useful, the more dubious becomes the desirability of building it. When it must be made more than a comparatively few miles long, its cost is apt to become so very great as to make it an entirely uneconomical means of transportation if to the rate paid by the shipper is added an allowance for interest, maintenance and depreciation on the originai undertaking.

This subject should not be passed without mentioning our splendid undertaking at Panama. True, this undertaking may cost from eight to ten millions per mile of canal, but as an undertaking for the benefit of the world at large, it is one of the greatest ever conceived. No one can foresee the economic effect which may flow from the Panama canal. We can see its military value to us. We can see that it will bring the Pacific coast nearer to our Atlantic seaboard; but, by the same token, it will also give our European competitors easier access to our Pacific markets. We can readily see that it will be an advantage as a new route for the manufacturing centers on our east coast to the west coast of South America, and between our own west coast and the east coast of South America. Incidentally, an interesting effect of the Panama canal will be to sound the death knell of the last great sailing vessel world route—that from San Francisco to Europe. The tramp steamer plying through the canal will certainly put the last of these "wind-jammers" out of business.

NAVIGABLE RIVERS.

A widespread public demand for the general improvement of the navigable rivers of the United States has been voiced within recent years. This demand is generally premised on the assumption that the greater commercial use made of the rivers of Europe is due to their having been developed by the governments to a greater extent than our rivers have been, and that similar action by our government is necessary to make our rivers equally useful transportation facilities. But the fact is that our navigable rivers in their present condition are better able to carry a large traffic than are those of Europe. The maximum depth attained on the rivers and canals of France is 8.5 ft., while most of the traffic is carried on water varying in depths from 1.5 to 5 ft. The depths of the rivers in Germany vary from 3 to 6 ft., except on the lower reaches of some of the larger streams, where there are depths of from 8 to 10 ft.; and the canals and canalized rivers vary from 2.6 ft. to 10 ft., 4 to 6 ft. being most common. The Rhine and the Elbe, on which 67 per cent. of Germany's water commerce is carried, have together only 617 miles of channel, with a depth of as much as 4½ ft., which is the minimum depth of the Mississippi, the Illinois river and the Illinois state canal between Chicago and New Orleans, a distance of 1,657 miles. There are in the United States 40 streams, with a length of 2,600 miles, which have a depth of 10 ft.; and 70 more, with a length of 3,200 miles, which have a depth of 6 to 10 ft. Practically all the traffic on the waterways of Belgium, France and Germany is carried in shallow barges varying in capacity from 100 to 1,000 tons. One thousand ton barges are practically confined to the Rhine in Germany and the Seine in France. The great bulk of the traffic is carried in barges having drafts of 2 to 6 ft. and capacities of 150 to 600 tons, and which are commonly towed in trains at from 2½ to 4 miles an hour. It would be perfectly feasible to handle

a big traffic with such barges as these on a very large proportion of the rivers of the United States. If some of our rivers, such, for example, as the Hudson, which has ample depth and width for navigation by large vessels, and which runs in the direction of large currents of traffic, were located in Europe, they would be bearing a heavy commerce.

The main reason why the commerce on our navigable rivers is so much smaller than on those of Europe is not that our rivers are potentially less efficient facilities of transportation, but that our railways are more efficient than their railways and make lower rates. The average rate per ton per mile on the railways of France is 14 mills, and on those of Germany, 13 mills. It is not possible to state the average rates per ton per mile on European waterways, but the figures given in the report of the British Royal Commission on Canals and Waterways, which was published early in the present year, indicate that the average rate per ton per mile on the waterways of Germany is about 5 mills, and on the waterways of France about 6 mills. This takes no account of the fact that in Europe the haul by water between any two points is usually considerably greater than the haul by rail. If the water rates were estimated on the basis of the shorter distances by rail, they would be higher, but they would still be much lower than the rail rates. The governments of continental Europe so regulate the rates of the railways as to make them rather inflexible, while the boats are allowed to give all the flexibility to their rates necessary to secure business. In view of these differences in the water and rail rates of Europe, it is not surprising that the boats on the rivers, despite their relative shallowness, have been able successfully to compete against the railways.

Railway rates in the United States are very much lower than they are in Europe. The average railway rate per ton per mile in this country in 1909 was but 7.63 mills, and the rates on roads having great densities of traffic, or handling mainly cheap and bulky commodities, are much lower.*

The average rate per ton per mile on all traffic of the Pennsylvania Railroad, for example, is 6.3 mills; of the Illinois Central, 5.8 mills; of the Lake Shore & Michigan Southern, 5.27 mills; and of the Chesapeake & Ohio, 4.33. Furthermore, our railways have been allowed in the past freely to adjust their rates so as to meet water competition, and even destroy it.

The policy of both the railways and the government of the United States in reference to railway rates recently has been changing to a marked degree. Until lately, the tendency of railway managers was voluntarily, or under the stress of fierce competition, to reduce rates to a lower and lower basis. This unrestrained competition caused unfair discrimination between localities. The efforts of the government and of the railways to stop unfair discrimination necessarily have reduced competition, and thereby checked the downward tendency of rates. The increasing costs of railway operation have had a similar effect. If railway managers are allowed to carry out their present plans, rates will be advanced somewhat. Furthermore, the Mann-Elkins act has amended the Interstate Commerce act in ways that will tend to prevent the roads from meeting water competition as they have in the past. They often have made lower rates for longer, than for shorter hauls, in order effectively to meet at points on navigable rivers, competition which did not exist at intermediate points. If they had been required to reduce all their rates to the same basis as those made to meet such competition, they would not have tried to meet it. Under the revised Interstate Commerce act the commission is given wide discretion to determine when a railway may make a lower rate for a longer haul; and according as the commission exercises its discretion will depend how and to what extent the roads may in future meet water competition. Another provision of the Mann-Elkins act absolutely prohibits a railway from raising a rate that has been reduced to meet water competition, unless since the rate was fixed some change in conditions has occurred other than the elimination of water competition. This restriction on advances in rates is sure to operate as a hindrance to their reduction. With railway rates tending upward, rather than downward, and also tending to become less flexible, it is quite possible that the opportunity for the development of traffic on our navigable rivers is improving.

*This oft-quoted figure of the average ton mile rate in this country is made up by taking the average of all the tonnage of the country. It includes the movement of less than carload package freight; the movement of business over mountain ranges where the rates are necessarily high; it includes the movement of live stock, perishable freight, citrus fruits, and many high class commodities on which speed is a requisite.

CANALS AND CANALIZED RIVERS.

A great many intelligent persons concede that the traffic on the inland waterways of the United States, except the Great Lakes, has declined, while that on the waterways of Europe has increased, because of the cheap and superior service of our railways, and contend that we can make our waterways successful competitors of our railways only by making our waterways greatly superior to the waterways of Europe. They, therefore, advocate digging canals and canalizing our rivers to depths exceeding those attained on such waterways in any other country. One of the plans is for a 14 foot waterway from Chicago to New Orleans. It is questionable if the results would be worth the cost. The aim of public policy should be to cause the provision of such facilities of transportation as will be able to handle our commerce at the least economic cost; and in economic cost I include the taxes the public would have to pay in order to provide and maintain deep waterways. The report of the British Royal Commission shows that the expenditures of France on its rivers up to 1905 averaged $30,000 a mile, and on its canals, $102,675 per mile. The average density of traffic on French waterways in 1905 (that is, the number of tons handled one mile per mile of waterway per year) was 420,000 tons. Germany had spent on its waterways an average of $30,300 per mile, and on its canals, an average of $42,250, and the average density of traffic on them was 1,500,000 ton miles. The canalization of the Main cost $95,000 per mile. The construction of the Teltow canal cost $390,000 per mile. The interest and maintenance charges paid by the government of France on its waterways amounted to 4.2 mills per ton mile of traffic handled, which, added to the average rates which the shippers paid to the boats, *makes the economic cost of water transportation ten mills.* The interest and maintenance charges paid by the government of Germany amount to about .84 mills per ton mile, which, added to the average rate of 5 mills, makes the total economic cost of water transportation almost 6 mills. The greatest density of traffic on any river in Europe is on the Rhine, where it amounts to 11,400,000 ton miles. To get the depths advocated in this country would require very much greater public expenditures than those that have been made in Europe. Indeed, it might in many cases involve expenditures approximating those for the Kaiser Wilhelm and the Manchester Ship canals, the former of which cost $656,000 per mile, and the latter $2,100,000.

The capitalization of the railways of the United States is $59,259 per mile of line, and this, of course, includes equipment and terminals, as well as roadway. The number of tons carried one mile per mile of line by our railways in 1909 was 953,986. The density of traffic of some of our large railways rivals that of the greatest waterways of Europe. The number of tons hauled one mile per mile of line by the Delaware, Lackawanna & Western in 1908 was 3,886,814; by the Philadelphia & Reading, 4,164,131; by the Pennsylvania Railroad, 4,723,834; and by the Bessemer & Lake Erie, 5,564,712, or over 13 times as much as the average density of traffic per mile on the waterways of France, and almost four times as much as on the waterways of Germany.*

These figures indicate to my mind that if, in order to provide inland water transportation which will be able to compete effectively against the railways, it is necessary to dig canals and to canalize rivers to depths of 14 or 20 feet or more, we might better

*A density of three million tons of freight per mile of road on single track lines is not at all uncommon in the United States, and this movement is in addition to a very considerable passenger traffic.

forego having effective water transportation facilities and use our money to provide facilities for transportation by rail.

To dig a waterway 14 feet deep would be to provide one that would not be any more useful than the Mississippi river already is for most of its length and than numerous other streams are. For over 95 per cent. of the vessel tonnage on the Great Lakes draws over 14 feet of water, and over 80 per cent. of this draws over 18 feet. It is evident, therefore, that lake vessels could not be used on a 14 foot waterway, and, of course, ocean steamships could not be used where lake steamships could not be. Even if the Lakes-to-the-Gulf waterway were made sufficiently deep for lake vessels, and it were economical for them to use it, all water transportation on tributary streams would have to be carried in shallower draft vessels, requiring transfer. Would it not be better to serve the entire Mississippi river basin with tow boats and barges which, like the much abused freight car, could go anywhere within the sphere of navigability, say 5,000 to 8,000 miles? Isn't the real problem to find an economical vehicle of transportation adaptable in a large river system like the Mississippi River and its tributaries; a vehicle which shall do for that river system what the freight car does on our system of railways?

The stern reality is that even if a 14 or a 21 foot waterway were dug, it would never be used by deep draft boats. As I have already said, a large vessel cannot be profitably navigated on a narrow channel, because the interest on its high cost makes it uneconomical. Colonel Symons estimated that it would cost 38 per cent. more to carry grain with a lake freighter on a ship canal than it would with a tow boat and barges, and it was in consequence of his investigations and conclusions that the state of New York decided to deepen the Erie canal only to 9 feet, instead of making a ship canal of it. Colonel Symons' estimate did not allow for the greater cost of building and maintaining ship canals, but referred only to the expense that would be incurred by the owners of the boats. The operation of a deep draft vessel in a river channel having any considerable currents might be even more expensive than on a ship canal.

Furthermore, I assume that no one would advocate making not only the Mississippi, but all of its navigable tributaries, 14 or 20 feet deep; yet if the Mississippi were made a deep waterway while streams emptying into it were not, even if it proved practicable to navigate deep draft vessels on the Mississippi, they could not be navigated on the tributary streams, and then one of two things would happen—either the vessels in which goods were loaded on the smaller streams would be sent through to destination with the goods—in which case the deep draft vessels would not have them to haul—or the goods would have to be transferred to the deep draft vessels, and transferring goods from boat to boat is as expensive as, and often even more expensive than transferring them from car to car. It seems to me that to develop a waterway system in this way would be like building the main line of a railway with a broad gage and the branches with a narrow gage; So far as I can learn, it is the opinion of practically all of the United States army engineers who have investigated the subject, that a tow boat with 6 or 9 feet draft, towing barges with a combined capacity of 8,000 or 10,000 tons, would be able to handle traffic cheaper on the Mississippi river, even if it were deepened 14 feet or 21 feet, than could a lake vessel with a deep draft; and the tow boat and barges would be able to navigate many of the shallow tributaries as well as the Mississippi, which would avoid the cost of transferring freight originating on the branch rivers. Needless to say, the cost of dredging the Mississippi river and its tributaries to a minimum depth of 6 feet or even 9 feet, and maintaining that depth, would be very much less than the cost of digging it to a uniform depth of 14 feet. It would seem, therefore, that all that reasonably could be asked, or that ought to be asked of the general government, so far as our navigable rivers are concerned, is that it shall dredge them to depths sufficient to accommodate towboats and barges such as can now be operated on the greater part of the Mississippi river drainage system. To do more than this would involve an expenditure which would not be justifiable—which, in other words, would not make the *total* cost of water transportation less than it is by rail, whether it made it cheaper for the shipper or not.

If the government provided such channels as I have indicated; if the municipalities or private corporations provided modern and adequate water terminals; and if the water lines made rates, gave service, and formed soliciting staffs adapted to competing effectively with the railways, the water lines on our rivers would be as well situated to compete with railways as are those on any waterways in the world, except, of course, the oceans and the Great Lakes; and unless good water terminals were provided and the steamboat companies formed soliciting staffs, issued bankable and negotiable bills of lading and in other ways gave service which was as good in proportion to the rates charged as that of the railways, they would be as unsuccessful in competing for business, even if the government dug the rivers 20 feet deep, as are the independent boat lines on the Great Lakes now in competing with the railways or with the steamship lines owned by the railways and large industrial corporations.

I do not say that if all these things were done, river steamships would be able to compete successfully against the railways, and I feel very sure that if the water lines were subjected to the same kind of regulation as the railways are, they would continue for an indefinite time to be unable to compete with the rail lines.*

I merely say that under any circumstances *these* are conditions that must be met if our *inland waterways* other than the Great Lakes are ever to compete successfully against the railways. Whether, when the results that would be obtained are so entirely problematical, it is worth while to go on and spend millions in dredging the rivers and equipping water terminals, is for the public to decide.†

Up to 1907, the government had spent over $208,000,000 on the improvement of the Mississippi valley waterway system alone. Between 1880 and 1906, canals and canalized rivers having a length of 2,841 miles, which had cost $73,168,000, were abandoned. Up to that time our total expenditures on canals and canalized rivers had been $283,208,863. The total Congressional appropriations for the survey, improvement and maintenance of harbors and waterways had been $552,943,525, and many millions of dollars have also been spent by the various states. We all know that a large part of these expenditures has been unwise, and certainly before expenditures are entered on which would be very much greater than any made in the past, the projects on which it is proposed to make them should be studied to much better purpose than like projects have been in the past.

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*Although I have never seen the statement made, I believe it is a fact—and one worth determining by careful test—that it takes less power to move five thousand tons, or ten thousand tons of freight loaded on cars, on a railroad the grades of which do not exceed three-tenths of one per cent., than to move the same tonnage on a canal or canalized river. Train resistance on a smooth and level track is less than the resistance of moving a boat through water.

The reason that the public have been misled as to the comparative cost of rail transportation and water transportation is that in the case of rail transportation the shipper pays the entire cost, including terminal service, and on top of this cost, a profit to the transportation company, whereas in the case of water transportation, the shipper pays only the bare cost of carriage, and no interest on the money invested in the waterways, in the harbors and terminal improvements, nor in the maintenance and upkeep of the waterways.

Furthermore, the interruption of water transportation in our Northern waters is more than a serious inconvenience. It puts the burden of heavy interest charges for the entire year upon the traffic which can be handled only in the summer months.

†A fact often overlooked in considering the cost of transportation as a whole, between producer and consumer, is the cost of assembling freight at the initial point or distributing it at terminal points. In this respect, while the railways have a great advantage, yet even with the railways, the cost of assembling farm products in many of our states (as pointed out in a recent report of the Department of Commerce and Labor) is greater than the freight paid by the farmer from his initial station to the point at which he markets his produce. In other words, a farmer who has to haul his produce eight miles to a railroad station, at a cost of, say twenty cents per ton mile, is spending as much as he would pay the railroad for two hundred and ten miles of transportation at the average rates prevailing over the whole country.

Thus, it is fair to expect that good roads and automobile trucks will contribute much in the future towards cheapening the cost of assembling and distributing freight; and that there is much to be gained by intelligent public expenditures in the direction of improving the public highways and so reducing the cost of haulage to and from shipping points, whether these shipping points be stations of railways or of waterways.

Shop Section.

THE general shop kink competition, announced to close January 15, will include kinks of all kinds used in connection with the maintenance and repair of cars and locomotives. A prize of $50 will be awarded for the best collection of three kinks and a prize of $25 for the second best collection. Contributors may submit more than three kinks, allowing the judges to base their decision on what they consider to be the best three in each collection. Kinks not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

A CAR department competition, an extended announcement of which was made in the *Railway Age Gazette* of December 2, will close on February 15. The only requirement is that the paper submitted cover some subject or subjects of interest and importance to the foremen of the car department. Obviously, the more practical the paper the greater its value. You have gained splendid results in doing a certain class of work, or from a piece of equipment, or by changing your methods or the material, or by devising new arrangements for manufacturing or assembling it. Tell us clearly just what you did and the results obtained. Every foreman has interesting and valuable information concerning the work of his department which will be helpful to his fellows. It is just this sort of material that we want to bring out. The length of the article was not specified in the announcement which was made last month. Make it just as long or as short as you think best in order to tell your story clearly. The best paper will be awarded a prize of $35 and the second best a prize of $20. Papers that are not awarded a prize but are accepted for publication will be paid for at our regular space rates.

ANOTHER engine house kink competition will be held, to close March 15. The results of the first competition of this kind appeared in the October Shop Number and were exceptionally good. However, this is a large field and there are very few engine houses that do not have good kinks which have not yet been illustrated. A prize of $35 will be awarded for the best collection of two kinks and a prize of $20 for the second best collection. More than two kinks may be submitted, allowing the judges to base their decision on what they consider to be the best two in each collection. Kinks accepted for publication, but not awarded a prize, will be paid for at our regular space rates.

THE four papers submitted in the competition on Increasing Shop Output, which are published in this number, come from four entirely different sources, and, as might be expected, differ from each other greatly. The first prize article, coming from Mr. Burrhus, an assistant to the general foreman, is practical, showing exactly how the output was greatly increased at one shop without increasing the cost of operation. Mr. Perritt, a blacksmith foreman, tells of the different factors which he has found of value in improving the efficiency of a smith shop by increasing the output and at the same time reducing the number of employees. Mr. Maier, an enginehouse foreman, in his article on Lost Motion, emphasizes the importance and necessity of having what might be termed a clearing house for improved shop methods on roads which have a number of repair shops and repair yards. This has been tried with a certain degree of success, but not to the extent proposed by Mr. Maier. For the first time since we have inaugurated the competitions in the Shop Numbers a contribution has been received from Mexico While Mr. Stone does not belittle the effect of shop kinks and similar methods of handling the work in detail, he does believe and tries to emphasize the greater importance of improved organization and its effect upon shop output.

THE first prize of $35 in the competition on Increasing Shop Output, which closed December 15, has been awarded to H. L. Burrhus, assistant to the general foreman, Erie Railroad, Susquehanna, Pa. Mr. Burrhus has clearly outlined some of the more important methods which were used in increasing the output of the shop with which he is connected 50 per cent. in one year without any increase in the cost of operating as compared to the previous year. The second prize of $20 has been awarded to W. C. Reyer, general foreman, Nashville, Chattanooga & St. Louis, at Nashville, Tenn. Mr. Reyer's paper will be published in the February Shop Number, and describes in detail a number of changes that have been made at his shop within the past eight months which have greatly increased the output without a corresponding increase in the cost of operation. The six other contestants all presented first-class papers. They were C. J. Crowley, piecework inspector, Chicago, Burlington & Quincy, West Burlington, Iowa; H. Holder, general foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.; Charles Maier, enginehouse foreman, West Jersey & Seashore, Atlantic City, N. J.; J. F. Perritt, blacksmith foreman, Seaboard Air Line, Jacksonville, Fla.; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; and C. E. Stone, general car foreman, National Railways of Mexico, Talleres de Santiago, Mexico, Mex.

W. H. SNYDER, assistant general foreman of the New York, Susquehanna & Western, Stroudsburg, Pa., has been awarded the first prize of $35 for the best collection of two kinks submitted in the car repair kink competition which closed November 15. C. C. Leech, foreman of the Pennsylvania Railroad at Buffalo, N. Y., has been awarded the second prize of $20. In announcing the names of the contestants in this competition in the *Railway Age Gazette* of December 2, Mr. Leech's name was omitted by mistake and that of S. S. See, of the Norfolk & Western, was substituted. Mr. See did not, however, enter the competition. The other three contestants, A. G. Pancost, draftsman, at Elkhart, Ind.; F. Rattek, of Brighton, Mass.; and Theodore Rowe, general foreman of the Jackson street shops of the Great Northern at St. Paul, Minn., are all entitled to considerable credit, as will be seen by examining the contributions which are reproduced in this number. The judges had considerable difficulty in awarding the prizes. In doing so they took into consideration the different car repair kinks which have appeared in the *Railway Age Gazette* during the past six months, some of which were practically duplicated by contestants in the competition which has just closed.

A MECHANICAL department officer, who has had many years experience in shop work, beginning at the bottom, and who has been more than ordinarily successful as a shop superintendent, had this to say in discussing the matter of scientific management: "If you will take all the improved machinery, improved shop facilities and equipment, high-speed steel, individual motor-driven tools and improved methods, and will place them on one side, and on the other hand have a man who thoroughly understands the handling of men—if I had to choose between them I would far sooner have the latter than the former. As a matter of fact, the results in greater output and higher efficiency under the direction of such a man without up-to-date facilities would be far greater than all the modern facilities you could provide. without such a man. That is one of the reasons why the betterment or efficiency engineers have failed. The methods which they propose and the basic principles upon which they work are all right, but they do not seem to know how to supplement this by developing men who are capable of handling men."

SCIENTIFIC MANAGEMENT.

Of those who testified on scientific management in connection with the freight rate hearing before the Interstate Commerce Commission at Washington in November, two, Harrington Emerson and H. L. Gantt, were professional efficiency engineers. Most of the others were connected with manufacturing concerns, including James M. Dodge, chairman of the Link-Belt Company; Henry R. Towne, president of the Yale & Towne Manufacturing Company.; H. L. Hathaway, of the Tabor Manufacturing Company; H. V. Scheele, head of the planing department of the Brighton Mills; John R. Williams, a printer, of New York; and Frank B. Gilbreth, a contractor, of New York. Of those who testified only one, Mr. Emerson, has had extended experience in railway work. Mr. Gilbreth, as a contractor, has done work for the railways, and Mr. Gantt has had some experience as a consulting expert with one road, but hardly enough—possibly three days a month for a year or less—to qualify him as an expert in that line of work. The other gentlemen all testified as to the results which had been gained in their manufacturing plants by the introduction of scientific management principles. Apparently none of them were at all familiar with repair work in the mechanical department of a railway. Judging by the results obtained in their own plants, as testified to by the above-mentioned gentlemen, conditions must have been pretty bad in some of them before the efficiency work was inaugurated. The basic principles underlying scientific management are correct. We believe in them absolutely and that great savings are possible where they are properly applied. The trouble has been that the efficiency engineers, although they have grasped these principles and formulated them, have not understood how to apply them. Mr. Emerson, for instance, was given a fair trial in the mechanical department on the Santa Fe (three years) and claims to have saved the road $5,000,000 in that time. We do not wish to question his sincerity in making this statement or his method of calculating these results. Suffice to say that many of us, and among them some of the men who were associated with him in the work, have studied the annual reports of the Santa Fe carefully and have been unable to check this result.

Mr. Emerson has been exceedingly frank in telling those in charge of the operation of railways that they were extremely wasteful. Surely he will not object if, with equal frankness, and in a calm, friendly, unprejudiced manner, we try to point out where he has made mistakes in applying his principles. Moreover, in drawing attention to the most important defect, let us base it on part of his own testimony at Washington. Possibly no feature of that testimony has given Mr. Emerson more satisfaction than the telling of one of his own experiences at the Railway Club of Pittsburgh. In his paper on the Fundamental Principles of Efficiency presented before that club, he directed attention to a road that maintained its freight cars at the low unit cost of $37 per year, and criticized other roads which maintained their cars at a higher cost. Mr. Emerson says that L. H. Turner, superintendent of motive power of the Pittsburgh & Lake Erie, criticized this figure as being entirely too low, and then went back to his office and found that his own road was maintaining cars at a cost of $31.01 per year; the inference being that Mr. Turner did not know what his own road was doing. Benjamin Baker, in commenting on this incident in the current number of the *Review of Reviews,* has this to say:

> "In all parts of the railway business outside of the traffic department, exceedingly few of the higher railway officials are entitled to be called experts. Their occasional utter failure as accountants is certified by such things as the coal graft on the Pennsylvania and the recent car repair scandals on the Illinois Central; more humorously by the case of the railway vice-president, named in Mr. Emerson's testimony, who declared at a meeting of the Railway Club of Pittsburgh that an annual cost of $37 for freight cars was an absurdly low estimate—only to find when he overhauled his own figures that his own road was doing it for $31.01. These higher officials are not prevailingly mechanical engineers, civil engineers or fuel experts, and had they the professional training of such men, they have not had the time, and rarely the inclination, to master the mass of detail that is necessary to the mechanical engineer who undertakes to make a specialty of scientific management."

Mr. Turner's discussion at the Railway Club of Pittsburgh does not warrant drawing any such conclusions concerning his knowledge of the cost of repairs to freight cars. Because this incident has been so widely quoted, it may be well to tell exactly what happened, as reported in the official proceedings. Mr. Emerson made the statement that "one railway in the United States maintains its freight cars for $37 per year. Another one in similar service spends over $100. The $37 cars cost $100 less to build and weigh 6,000 lbs. less for the same capacity. At $37 on 50,000 cars there is an annual saving of $3,150,000 in maintenance cost alone below the rival figures." In discussing this paragraph Mr. Turner said:

> "Men employed as managers of mechanical departments of railways are in self-defense and in justice to themselves bound to take exception to some statements made and figures given in Mr. Emerson's paper. For instance, he states that one road maintained its cars for $37 each per year. Freight cars are making about 8,400 miles per year; this brings the cost per car mile for repairs to $0.043, and it is stated that these cars were 6,000 lbs. lighter and cost $100 less to build than those of another road that spent $100 per year for maintenance. This seems inconsistent, as weight in a car, if properly distributed, adds strength and will reduce the cost of maintenance. The light car should ordinarily cost more to keep it going. It is safe to say that $0.070 per car mile is a very fair average figure for maintenance throughout the country. While the figures given are undoubtedly correct, a statement should have been made as to the conditions under which the two roads were working. The $37 man may have had a lot of new equipment, or may have been slighting his work, while the $100 man possibly had a lot of old equipment, badly run down, and may have been trying to build it up and do the work that his predecessor had neglected."

Those of us who have worked under Mr. Turner, or have been intimately associated with him, realize that he never spent a dollar of his company's money unless he was reasonably sure that it was going to bring good returns, and that the equipment on the Pittsburgh & Lake Erie is maintained and operated in a most efficient manner. On the other hand, he is big enough and broad enough to look into any new device or method which may be brought to his attention, and to adopt it if it can be shown that it will make a saving or improve conditions in his department. Mr. Emerson undoubtedly selected the figure, $37, as being the lowest one he could find for a standard to work to. What qualities, then, in Mr. Turner, have made it possible for him to at least equal, and possibly better, the standard of the efficiency engineer? Roughly and briefly Mr. Turner possesses two qualities which Mr. Emerson does not, and which are largely responsible for his success—he understands men thoroughly and knows how to handle them, and he is diplomatic. These far outweigh the value of Mr. Emerson's scientific management principles, and, include many of them which Mr. Emerson has stated in such a mechanical manner as to be hardly recognizable in the practical, common sense way in which Mr. Turner applies them. The efficiency engineer, in almost every case that has come under our observation, seems to lack both the knowledge of the handling of men and the diplomacy that is to be expected from those who step in and tell the other fellow how to run his business.

* * * * *

No one who knows Mr. Emerson will accuse him of stupidity. In starting in his work on the Santa Fe he established certain attainable standards. Where did he get them? Largely from the records of the mechanical department of the Chicago & North Western. This road has never employed a so-called efficiency engineer or formulated any fundamental principles of efficiency. Why, then, should its records be so far ahead of others that an efficiency engineer should adopt them as a goal towards which to work? Surely its shops were not modern! It had no bonus system, and as a matter of fact, it had not even piece work. Its men were and are paid by the day. Yes, but it did have at its head Robert Quayle, a man who understands men and knows how to handle them, and he has had more of the same type of men under him. True, he has numerous other qualities which in a smaller degree are responsible for his success, but this one far outweighs all the others.

Mr. Emerson must be given credit for good work on the Santa Fe. Many of his ideas are good, and had they been coupled with the diplomacy and tact in managing men such as possessed, for instance, by Robert Quayle, L. H. Turner or A. W. Wheatley, his record would undoubtedly have been far better, and it is doubtful if the Santa Fe management would have ever allowed him to leave the road. As a matter of fact, possibly a fair share

of his success at Topeka was because the shop superintendent, John Purcell—smiling Johnnie, as some of his friends delight to call him—early in the game appreciated the value of some of Mr. Emerson's ideas and put his shoulder to the wheel in helping to install them in a practical manner. John Purcell is another man who, in a marked degree, understands how to handle men.

* * * * *

To the hard-headed practical shop manager the methods introduced on the Santa Fe in the early stages of the work, which showed concrete practical results, were the improvements made in the care of belts; the improvements in machine tools, shop equipment and handy devices; and the introduction of a shop schedule. Good results were obtained from all of these. The ideas, however, were not original with Mr. Emerson. Fred W. Taylor, the dean of efficiency engineers or scientific management, formulated the rules which were used for the care and maintenance of belting, and Mr. Emerson has freely given him credit. Many of the shop kinks are said to have been copied from those in the Chicago shops of the Chicago & North Western. The idea of the shop schedules was taken from the same place, but was considerably elaborated in introducing it at Topeka. Mr. Emerson must be given credit for a keenness in perception in recognizing these good things. His bonus system was apparently well suited to conditions existing on the Santa Fe at the time of its introduction, but many shop managers who have looked into it carefully feel that it is not so well suited to railway shop conditions in general.

Mr. Emerson must also be given credit for some of the impetus which has been given to the rapid development in motive power department efficiency during recent years. The publicity which was given to his work on the Santa Fe has caused mechanical men throughout the country to consider it carefully, and has undoubtedly stirred many of them to greater efforts and in many ways has been an inspiration to them. It is not hard to trace results of this work on other roads, although it must be admitted that such of Mr. Emerson's principles as appealed to other railways have been applied by them in a most common sense manner with a view to fitting them to suit the local conditions.

* * * * *

The general impression given by the efficiency experts at Washington was misleading. They will probably admit it, but say in defense that the attitude of one of the railway attorneys was so offensive that they were forced to do so. The problem is not merely one of accepting the principles of efficiency as you would buy a machine tool; rather it is to educate and develop men to recognize their value and to correctly apply them. This is not a matter of a day or a year, but of a generation, and can have no effect on the freight rate question, which belongs to the present. Efficiency men will not deny this if approached in the proper manner.

Fred Taylor sounded the call to arms many years ago; and, as with all reformers, took an impractical stand far in advance of his time. Nevertheless, men have recognized the underlying principles of his doctrine, and you would be surprised at the number of railway men who have studied and pondered over them. Not a little of the advance which has been made in recent years in the railway mechanical department may be more or less clearly traced to this, and it is quite probable that the agitation at Washington will stimulate it still more. The possible danger lies in the fact that some road may adopt an efficiency engineer as a universal panacea for all its troubles, with inevitable discouragement and a set back. Working hand in hand, and under the direction of a broad gage man who knows how to handle men, the efficiency engineer may give good results, but the treatment should be taken in homeopathic doses. As one of the efficiency engineers who testified at Washington has since remarked: "The danger lies in the fact that some of the railways may employ so-called efficiency engineers who have been connected with some phases of efficiency work in manufacturing plants, but do not comprehend it thoroughly. They are merely camp followers and are offering their services cheap. As a matter of fact, there is only a small handful of men who have the experience and knowledge requisite to carry this work on successfully."

* * * * *

We believe in the fundamental principles of efficiency, but we know also that their application has been seriously misunderstood by efficiency engineers. We have been fortunate in arranging for a series of articles on the mistakes of efficiency engineers written by one who is thoroughly familiar with the work of both the railways and industrial organizations, and who is capable of discussing the matter in a calm, unprejudiced manner. The first article in this series appears in this issue and refers to the extravagant claims and statements that have been made by efficiency engineers, which have been both unnecessary and unwise.

MECHANICAL ARTICLES DURING DECEMBER.

THE following articles of interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of December 2:

Firebox and Tube Failures. Papers presented before the New York Railroad Club by D. R. MacBain and the Western Railway Club by J. W. Kelly, both emphasize the importance of careful investigation and study of firebox and boiler conditions to reduce the cost of maintenance and the number of boiler failures. A great deal of the trouble in severe winter weather is caused by the unequal expansion of the sheets, due to lack of protection from cold blasts while the firebox is being cleaned over the ash pit.—December 9, page 1103.

The Introduction of All-Steel Cars, by W. H. Radcliffe. It is urged that the period of transition from wooden to steel passenger cars be made as brief as possible, because of the fact that the wooden cars act as buffers in a collision, when they are included in a train with steel cars, and suffer severely.—December 9, page 1117.

Facilitating the Flow of Traffic Through Terminals. A correspondent suggests that the M. C. B. defect card be done away with, and that the so-called "protection" inspection as now conducted at interchange points be abolished.—December 16, page 1139.

Quality of Steam and Factor of Evaporation in Locomotive Tests, by J. E. Gardner and L. W. Wilson. A diagram is presented by which it is possible to quickly determine the factors of evaporation as based on 98.5 per cent. dry steam, which is the usual condition encountered in locomotive tests.—December 16, page 1140.

Recent Mallet Articulated Locomotives. Locomotives of this type for the St. Louis & San Francisco and the Chesapeake & Ohio are illustrated and described. Information concerning the service results being obtained on the Chesapeake & Ohio is also included.—December 16, page 1144.

Van Horn-Endsley Spark Arrester. This spark arrester has been thoroughly tested on the locomotive testing plant at Purdue University and in actual service on the Chicago & North Western. The results of these tests, which were made with lignite as well as with bituminous coal, are fully described.—December 23, page 1181.

Balanced Compound Atlantic Type Locomotive for the Santa Fe. These locomotives are illustrated and described. They contain several improvements over the same type of locomotive which has been used with great success in passenger express service on the Santa Fe during the past few years.—December 23, page 1189.

Cars and Locomotives Built in 1910 and Motive Power and Rolling Stock Ordered in 1910.—December 30, pages 1219 and 1257.

NEW BOOKS.

Effect of Key-ways on Strength of Shaft. By Herbert F. Moore. Published by the University of Illinois, Urbana, Ill.

Bulletin No. 42 of the engineering experiment station of the University of Illinois records the results of tests made to determine the relative strength of solid shafts and those with key-ways. The sizes of the shafts tested varied from 1¼ in. to 2¼ in., and for each size the weakening effect of key-ways of different proportions was determined. The shafts were tested in simple torsion and also under combined twisting and bending. The proportions of the key-ways used corresponded with common practice, in which the width is ¼ the diameter of the shaft

and the height of the key ⅛ of that diameter. In nearly all shafts tested the total length of the key-way was about four times the diameter of the shaft. Shafts were also tested with the key-ways for the Woodruff system of keying, but the results do not show any material difference between them and the plain keys. The average efficiency of shafts with the plain key ways was .85, and that with the Woodruff system .845, efficiency being defined as the elastic strength of the shaft with a key-way divided by the elastic strength of the shaft without a key-way. The test resulted in the determination of an equation for the efficiency of a shaft with a key-way, which is represented as follows:

$$e = 1 - 2w - 1.18h$$

where e equals the efficiency of the shaft with a key-way, w equals the width of the key-way divided by the diameter of shaft, and h equals the depth of the key-way divided by the diameter of the shaft. It is explained that the equation should not be used for shafts much beyond the sizes of those used in the experiments. A diagram is also given which affords a convenient graphical method of applying the formula. Incidentally, the properties of cold rolled shafting in regard to strength and stiffness were determined, and the average value of the modulus of elasticity in shear (torsion) of cold rolled steel shafting was found to be 11,985,000. The elastic limit in torsion of cold rolled steel shafting was 38,940 lbs. The final results of the tests are given in a table showing the power which can be transmitted in torsion by cold rolled shafting at 100 r. p. m. from 1 in. to 2½ in., varying by 1/16 in., with key ways of usual proportions and when the shafting is stressed to the elastic limit. For example, a 1 in. shaft when stressed in torsion to the elastic limit will transmit at 100 r. p. m. 9.5 h. p.; 1½ in. shaft will transmit 32 h. p.; 2 in. shaft will transmit 75.9 h. p.; 2¼ in. shaft will transmit 108.2 h. p., and 2½ in. shaft will transmit 148.3 h. p. In this table no allowance is made for bending action, and as the steel is worked to the elastic limit a suitable factor of safety should be used. Copies of Bulletin No. 42 may be obtained by applying to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Proceedings of the American Railway Tool Foremen's Association. 42 pages, 6 in. x 9 in. Secretary, O. T. Harroun, Chicago & Alton, Bloomington, Ill.

The second annual meeting of this association was held in Chicago, July 12-14, 1910. The subjects discussed include the tool room check system; the using, treating, dressing and tempering of high speed steel; the use and care of pneumatic tools, and the tool room—past, present and future. A complete account of the convention was published in the *Railway Age Gazette* of August 5, 1910.

Proceedings of the Traveling Engineers' Association. 392 pages, 6 in. x 9 in. Secretary, W. O. Thompson, master car builder, New York Central & Hudson River, Buffalo, N. Y.

The eighteenth annual convention of this association was held at Niagara Falls, Ont., August 16-19. The papers were well prepared and the discussions were lively. Among the more important subjects considered were fuel economy; superheat; how can the traveling engineer best educate the fireman to become a successful engineer; the latest developments in air brake equipment and their effect on train handling; locomotive lubrication, and new valve gears. An account of this convention appeared in the *Railway Age Gazette* of August 26, 1910.

Proceedings of the International Master Boiler Makers' Association. 194 pages, 6 in. x 9 in. Secretary, H. D. Vought, 95 Liberty street, New York.

The fourth annual convention of this association was held at Niagara Falls, Ont., May 24-27, 1910. The most important subjects considered were the standardizing of pipe flanges for boilers and templets for drilling them; radical departures in boiler and firebox designs; inequality of expansion in locomotive boilers; staying the front portion of the crown sheet on radial stay boilers; steel versus iron tubes; flexible versus rigid staybolts; the best method of applying flues; proposed federal boiler inspection, and the standardizing of blueprints. An account of the convention appeared in the *Railway Age Gazette* of June 3, 1910.

Proceedings of the Master Car and Locomotive Painters' Association. 150 pages, 6 in. x 9 in. Secretary, A. P. Dane, Boston & Maine, Boston, Mass

The forty-first annual convention of this association was held at St. Louis, September 13-16, 1910. Among the more important subjects considered were the use of an oil emulsion as a cleaner; the need of a practical painter in the engine house; the effect of steam on the glue holding veneer; the use and abuse of inert pigments; substitutes for white lead for interior painting; organization of the paint shop force; the effect of repeatedly cutting in with a body color on the burning off period; ideal car paint shop, and the painting and maintenance of canvas roof. An account of the convention appeared in the *Railway Age Gazette* of October 7, 1910.

Proceedings of the International Railway General Foremen's Association. 100 pages, exclusive of advertising; 6 in. x 9 in. Secretary, L. H. Bryan, Two Harbors, Minn.

The sixth annual convention of this association was held at Cincinnati, Ohio, May 3-7, 1910. Among the more important papers presented and discussed at the meeting were those on self-cleaning ash pans; commercial gas as a fuel; advisability of installing hot water washout and filling systems; oxy-acetylene welding; superheaters; location and point of water delivery to the boiler, and an address by Professor Herman Schneider on the work of co-operative schools at Cincinnati. An account of the convention appeared in the *Railway Age Gazette* of May 6, 1910. The program for the next annual convention to be held in Chicago, July 25-27, is more practical and includes such subjects as: How can foreman best promote shop efficiency; shop kinks; methods of shop organization, and the wheel fit on axles.

Letters to the Editor.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.

Bellefontaine, Ohio, January 6, 1911.

I want to take this opportunity to wish every member of the International Railway General Foremen's Association a happy and prosperous year. We have many things to be thankful for in the history of our association, and present indications for our future success cannot be too highly estimated.

Now that the holidays are over and we all feel at our very best, I think it is a good time to ask every member of the association to commence immediately to pull towards our convention in July; when you take hold to pull, see that you have at least a new member in each hand to bring along. I know you are all built of the best material, and for that reason I know you can be depended on to carry out my request. If you want any information, or application blanks, our secretary, L. H. Bryan, of Two Harbors, Minn., will be glad to assist you in every possible manner.

Did you ever stop to think how much you have done for this association? If you haven't done much, now is your opportunity. Have you gained in technical knowledge required by railway general foremen since you have been a member of this organization? If you haven't, I can tell you why! *You have not taken an active part in the association's work!* Now, if you find you have not been as *active* as you might have been, start right away and make up for lost time and show us you mean business. We need your coöperation and activity. Will you let us have it? Of course, you will! I venture to say there is not one member of this association who would decline when called upon to step to the front with the royal banner of the International Railway General Foremen's Association.

I am going to keep in close touch with our secretary to see how many applications you will have sent in by March 1, 1911.

Sincerely and fraternally yours,

C. H. VOGES,
President.

Car Repair Kinks.

FIRST PRIZE.

BY W. H. SNYDER.

Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

TORCH FOR HEATING STEEL PARTS.

A crude oil burner for heating damaged parts on steel underframe or all-steel cars is shown in Figs. 1, 2 and 3. The end of the torch (Fig. 3) may be made in any shape or length required for properly directing the flame on the different parts of the underframe of the car. This end is screwed on the short piece of 1¼-in. pipe which fits on the end of that part of the

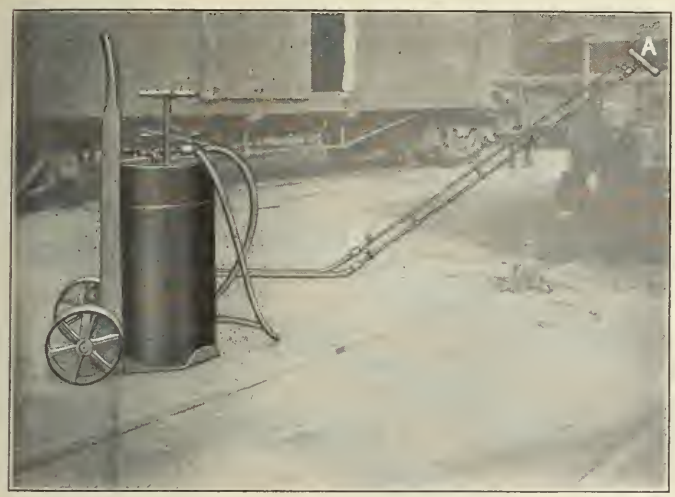


Fig. 1—Crude Oil Torch for Heating Damaged Parts of Steel Underframe or All-Steel Cars.

burner which is shown in detail in Fig. 2. The end shown in the photograph is used for heating two center sills at one time, this operation requiring only a comparatively short amount of time. The burner is regulated by the two globe valves at B, one of which controls the compressed air and the other the oil. The oil reservoir is mounted on a two-wheel truck, so that it may easily be handled about the yards and over the tracks. The hose from the compressed air line is connected just back of the globe valve at the rear of the top of the tank, and air is admitted to the

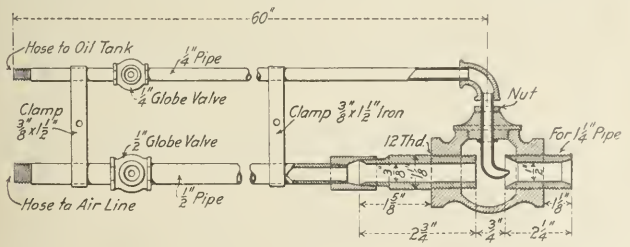


Fig. 2—Arrangement of Air and Oil Pipes and Mixing Chamber for Crude Oil Torch.

top of the tank. This pressure forces the oil out through a pipe, which extends to within 1½ in. of the bottom of the tank, and through the hose to the burner. Air from the top of the tank is forced through the second piece of hose which extends to the burner. The cheapest grade of crude oil is used, cutting the cost down to one-half of what it formerly was with a kerosene burner.

PORTABLE RIVET FURNACE.

The portable furnace for heating rivets shown in Fig. 4 is simple in construction and economical in the use of compressed air. The latter point is quite important, for as a general rule too little attention is paid to the way in which compressed air is used about a shop or a repair yard, and a large amount of it is wasted. A 2-in. pipe, about 10 in. long, with a funnel at its lower end 4 in. in diameter and 4 in. long, is screwed into the

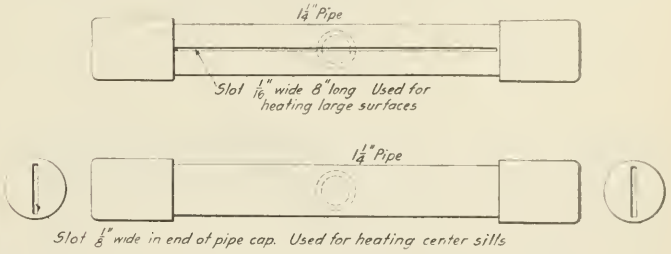


Fig. 3—Typical End Pieces or Burners for Crude Oil Torch.

bottom of the fire pot. The ⅜-in. air pipe is clamped so that it discharges through a 3/16-in. nozzle in the end of the pipe directly up through the center of the funnel, the top of the pipe being about on a level with the lower part of the funnel. With this arrangement a suction is set up and air from the outside is forced up through the fire. It is possible to heat the rivets as fast as they can be driven in the car, with the air valve opened only one-quarter of a turn. The method of connecting the



Fig. 4—Portable Furnace for Heating Rivets.

compressed air line to the furnace is also of interest. The hose A, which is connected to the air line, discharges through the end of the T to the hose B, which is connected to the air hammer, while the other connection from the T carries air to the blast pipe. In this way it is possible to operate the forge and the hammer from one air connection, doing away with the use of a second piece of hose.

JACKS FOR STRAIGHTENING STEEL TRUCKS.

The two jacks shown in Fig. 5 are available not only for use in connection with straightening trucks, but also for other work in connection with the repair of the bodies of steel freight cars. The upper one is used for pulling the sides of the steel truck inward when they have been sprung out too far. The

jack is so placed that the two eyes at its ends project through the truck pedestals. Bars are then placed through the eyes and the ends are pulled inward by turning the nut at the center of the jack. The lower jack is used for forcing the

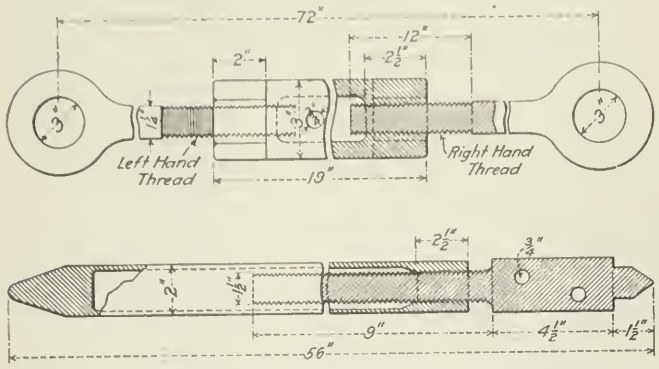


Fig. 5—Jacks for Straightening Steel Trucks and the Bodies of Steel Freight Cars.

sides outward when they have been bent in. The construction and operation are simple, bars for turning the screw being used in the ¾-in. holes in the head at the right hand end.

SECOND PRIZE.

BY C. C. LEECH.

Foreman, Pennsylvania Railroad, Buffalo, N. Y.

TWELVE-TON PORTABLE PNEUMATIC JACK.

A 12-ton portable air jack, with a 20 in. lift, which may be used to advantage in the car repair yard, is shown in Fig. 6. The cylinder is of cast iron, 18 in. in diameter inside. The wheels are mounted on an axle that fits in the wrought iron

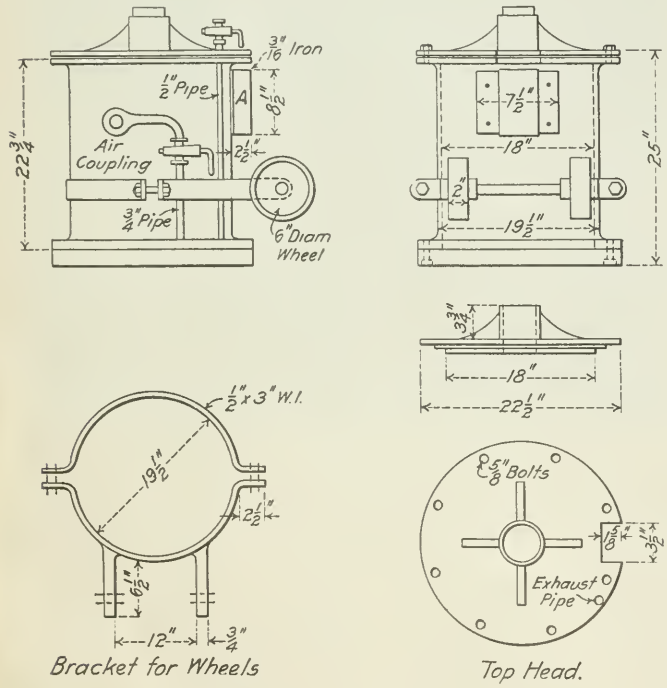


Fig. 6—12-ton Portable Pneumatic Jack.

bracket, which is clamped to the cylinder. A wooden handle, 60 in. long, is flattened at one end to fit loosely into the pocket A, the top flange and cover of the cylinder being cut away to clear the handle. The jack can thus be readily moved about the yard. An air coupling is provided for connecting it to the air line.

CLEANING JOURNAL PACKING.

For cleaning packing which has been removed from journal boxes, a tank has been constructed of heavy galvanized iron, fitted with a steam coil, as shown in Fig. 7. The waste is allowed to remain in this tank 24 hours, at the end of which time most of the oil has been drained to the bottom and through the

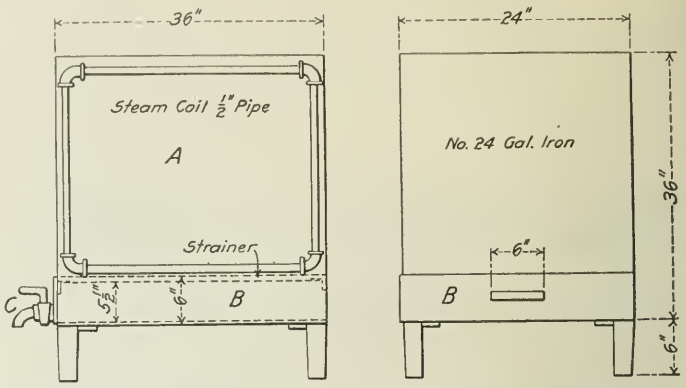


Fig. 7—Tank for Removing the Oil from Old Journal Box Packing.

strainer into the compartment B. The oil as it accumulates may be drawn off through the cock C, after which it may be again strained and prepared for use. The compartment B is so arranged that it may be removed occasionally for cleaning. When the waste is removed from the tank it is placed on the cleaning table shown in Fig. 8 and is thoroughly shaken and cleaned.

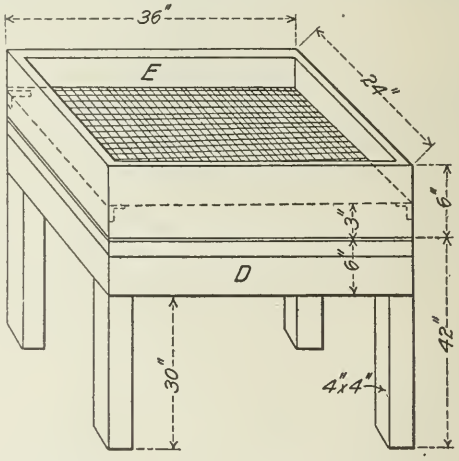


Fig. 8—Table for Cleaning Journal Box Packing From Which the Oil Has Been Removed.

the dirt and dust passing through the screen, which has openings ½ in. square. After this treatment the waste is saturated with fresh oil by the method described below.

PREPARATION OF JOURNAL BOX PACKING.

For preparing packing for use in journal boxes, three tanks are provided, as shown in Fig. 9. In each of the two larger tanks, A and B, are placed 80 lbs. of waste and 560 lbs. of oil. After the waste has had sufficient time to become thoroughly saturated, 240 lbs. of oil are drained off, leaving 320 lbs. of oil to 80 lbs. of waste, or 4 lbs. of oil to each pound of waste. The third tank C is smaller than the other two, and is used for the preparation of old waste which has been reclaimed, as described above.

RECLAIMING JOURNAL BEARINGS.

Many repair yards follow the practice of putting new bearings in journal boxes when a pair of wheels is changed. Very often the old bearings are only slightly worn and are good for considerably more service. Ordinarily the journals from which

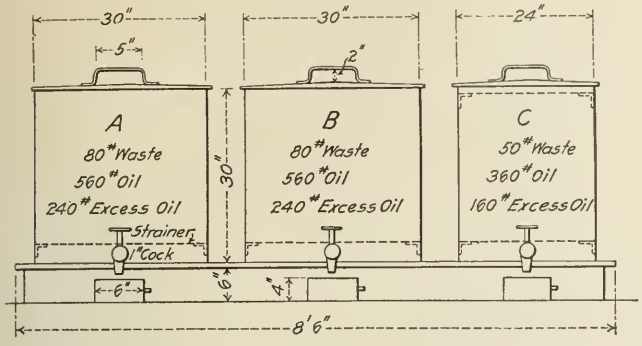


Fig. 9—Tanks for Preparing Journal Box Packing.

they are removed are worn smaller than the standard and the bearing, when placed on another journal, will not fit down on the crown. In order to use the bearings again it is necessary to refit them to the journal so that they will have a proper bearing. The device shown in Fig. 10 has a number of rollers of different

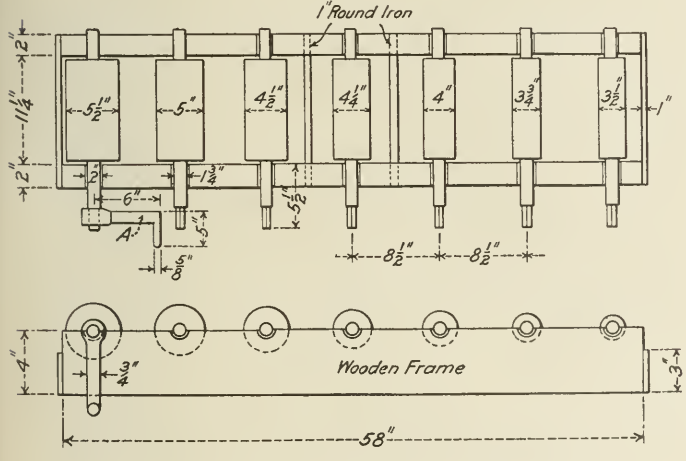


Fig. 10—Rollers Used in Refitting Journal Brasses.

diameters. The operator covers one of these, which corresponds to the diameter of the journal for which he wishes to use the brass, with black lead, after which he places the bearing on the roller and turns it by means of the handle A. The bearing is then removed to a convenient bench fitted with a clamp so it may be held rigidly while it is being scraped.

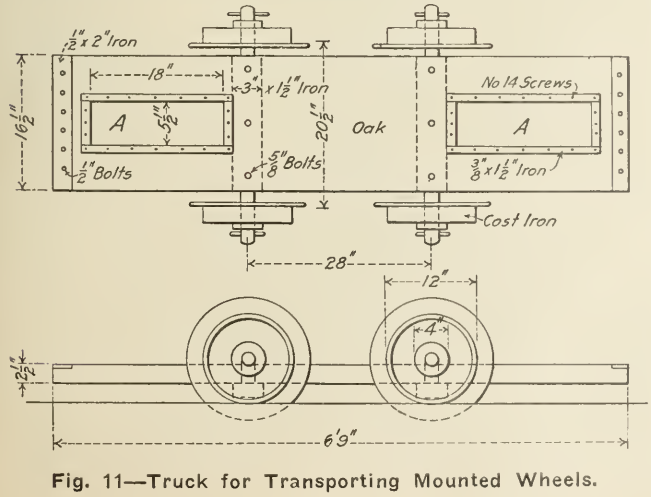


Fig. 11—Truck for Transporting Mounted Wheels.

TRUCK FOR HANDLING MOUNTED WHEELS.

In most car repair yards narrow gage lorry tracks are provided between every other pair of repair tracks for the transportation of supplies and material. One of these tracks at our shop starts near the wheel storage tracks. The truck shown in

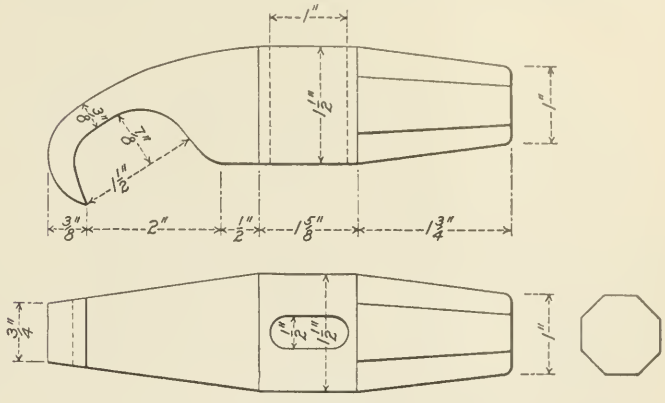


Fig. 12—Car Inspector's Hammer.

Fig. 11 may be placed on the narrow gage track and a pair of wheels rolled on it; the wheels drop in the cavities A, which are 5½ in. wide, and are thus held from rolling off while the truck is being moved about the yard. Mounted wheels, which are removed from the cars, may be transported about the yard in the same way.

CAR INSPECTOR'S HAMMER.

A convenient form of car inspector's hammer, made of low-grade steel, with a hooked end for lifting journal box slides, uncoupling steam hose, and useful for a variety of purposes, is shown in Fig. 12.

COMBINATION BAR AND NAIL PULLER.

The combination steel bar and nail puller shown in Fig. 13 is

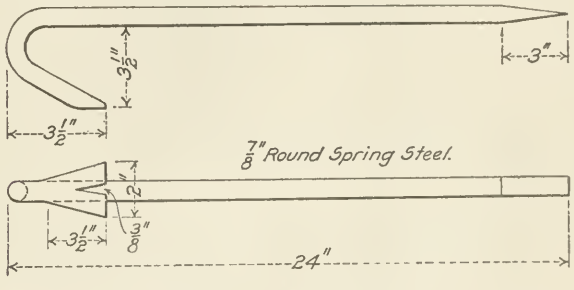


Fig. 13—Combination Steel Bar and Nail Puller.

a most convenient tool for use in a car repair yard; it may also be used in connection with the removal of small bolts.

WRENCH FOR OPERATING HOPPER DOORS.

The wrench shown in Fig. 14 is convenient for operating the winding bar for closing the hoppers on freight cars. The square ends on the winding shafts vary in size on the different classes of equipment, and such a wrench is necessary unless a number

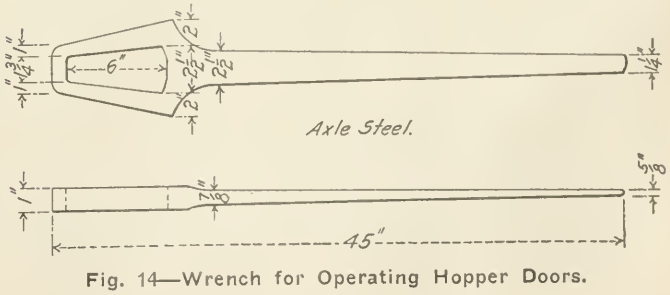


Fig. 14—Wrench for Operating Hopper Doors.

of different size wrenches are available at different points throughout the yard.

PORTABLE YARD DERRICK.

A handy yard derrick, operated by air and used in handling heavy material in the repair yard and for unloading lumber, is shown in Fig. 15. Details of the air cylinder and boom are

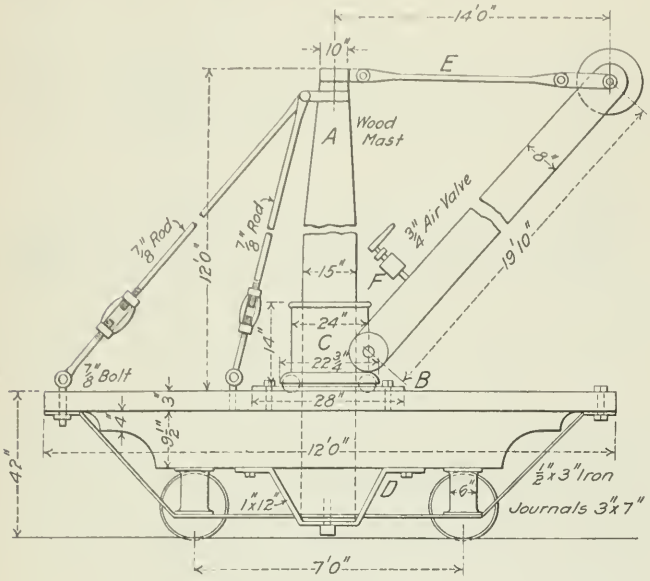


Fig. 15—Portable Air Operated Derrick.

shown in Fig. 16. Our derrick is used on 6 ft. gage track, but a similar car could be used equally well on standard gage, especially if outriggers or clamps were used when very heavy loads were handled. The car is of heavy wooden construction, well braced, and the mast is of oak, braced by a heavy bracket. The casting C, to which the boom is fastened, swings freely around the mast, operating on cast iron balls which fit in a groove or runway. A rope is fastened to the top of the boom for swinging it from side to side. The collar at the top of the mast, to

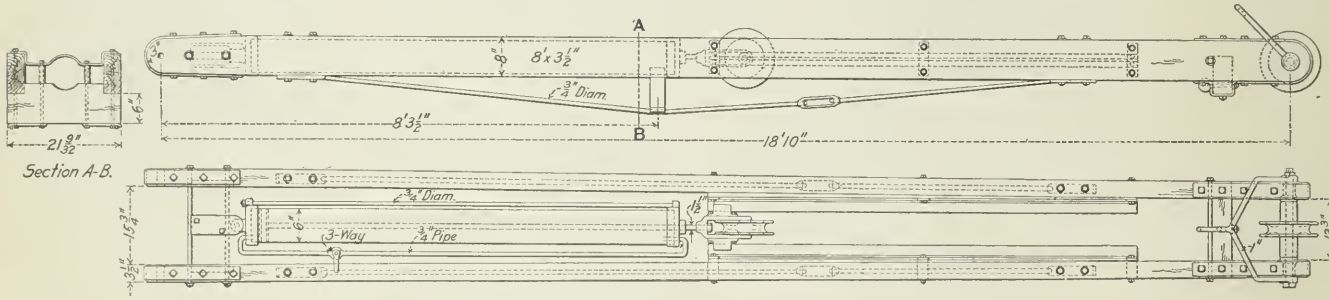


Fig. 16—Boom and Air Cylinder Used on Portable Yard Derrick.

which the tie rod E is attached, is arranged to revolve easily about the mast. The air cylinder is constructed of wrought iron pipe and is arranged so that air may be admitted at either end by means of the 3-way valve F. The stroke of 7 ft. is doubled by weaving the chain around the sheave which is fastened to the end of the piston rod. As may be seen, the end of the piston rod is fitted with a crosshead which runs in guides, thus preventing the rod from being bent or distorted.

BY F. RATTEK,

BRIGHTON, MASS.

REPAIRING BATTERED THREADS ON BOLTS.

To the car repairman the two-piece die and die holder, shown in Fig. 17, are worth their weight in gold for running over old bolts that have become rusted or have battered ends. Instead of starting at the end of the bolt, as is done with the standard die, the two pieces are placed over the threaded portion, the holder is slipped over them and the die is screwed off the bolt.

EMERGENCY JOURNAL BEARING.

The journal brass shown in Fig. 18 may often be used to splendid advantage for curing or overcoming a hot box without replacing the axle, provided the journal is not too far gone. The



Fig. 17—Die for Repairing Mutilated Threads on Bolts.

repairman must, of course, use good judgment. Instead of holding the car and removing the wheels, it is often possible to save the journals for several thousand miles additional service by applying the brass shown. It has a babbitt lining, which is cast on

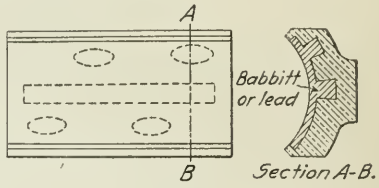


Fig. 18—Emergency Journal Bearing.

an arbor the same diameter as the journal on which it is to be used. It must not be bored, filed or fitted, and must not be used on newly turned journals.

BY THEODORE ROWE.

Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.

TURNING STEEL-TIRED CAR WHEELS.

Some time ago we installed a 42-in. Putnam coach wheel lathe in the Jackson street shops. Great things were expected of it, for the makers claimed a record of something like 22 pairs of wheels in a 10-hour day. We managed to turn out seven pairs a day, and sometimes eight, although this appeared to be the limit, owing to the fact that too much time was required for pulling the tailstock back and running it forward again after the wheels had been put in place. Often as much as 10 or 15 minutes was required for doing this. To remedy this difficulty we removed the hand rigging for doing this work and fitted up an air cylinder, as shown in Fig. 19. With this arrangement it was possible to make the change in from two to two and a half minutes, thus allowing an output of from 12 to 13 pairs of wheels in nine hours. As may be seen, the air cylinder is mounted on a hardwood block, which is placed directly back of the base of the machine and is connected to it by the ¾-in. steel plate. By means of the three-way cock, air may be admitted to either end of the cylinder, enabling it to operate in both directions. We also made and applied a 48-in. scale on the side of the tailstock and in a location convenient to the operator. The scale is graduated in 1/16-in. for a distance of 24 in., so that the operator can

readily set his calipers accurately. These appliances, from a practical standpoint, help greatly to make the machine up-to-date and modern.

CRANE FOR HANDLING STORAGE BATTERIES.

The storage batteries used in connection with the electric lighting of passenger equipment have to be handled frequently

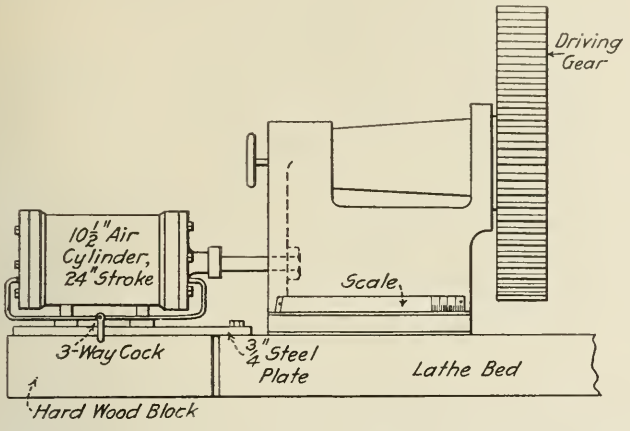


Fig. 19—Application of Power Traverse to Tailstock of Car Wheel Lathe.

in connection with flushing them with water. These boxes weigh about four or five hundred pounds apiece when filled, and it is necessary to lift them about 3 ft. from the floor. Several workmen have been hurt in doing this by having fingers pinched or hands crushed. To overcome the difficulty in handling the boxes, a jib crane and an air hoist were constructed, as shown in Fig. 20. With this crane it is possible for one man to safely

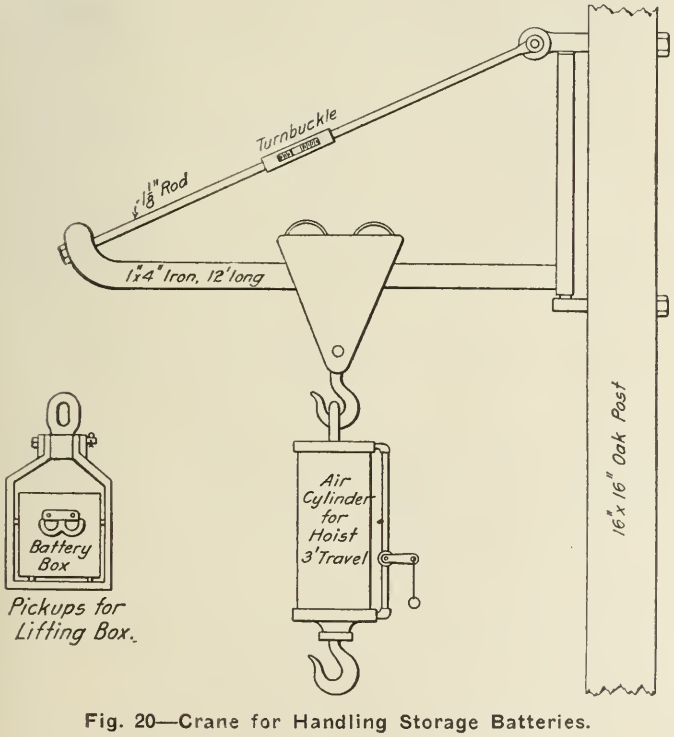


Fig. 20—Crane for Handling Storage Batteries.

lift and clean a set of batteries in a comparatively short time; formerly three or four men were required for this work. With an air pressure of 90 or 100 lbs., the capacity of the crane is about two tons. This type of crane can also be used to advantage for serving lathes, planers or other machines which handle heavy work in the machine shop. As may seen from the drawing, its construction is simple.

JACKING UP COACHES.

Modern passenger car equipment has grown so heavy that something better than a hand or ratchet jack is required for lifting the cars in order to remove or replace the trucks. We have constructed four 17-in. air jacks (Fig. 21), one of which is placed under each corner of the car. The two jacks at each end are connected with the same air line and are operated by the same valve, so that the end of the car is raised evenly. These

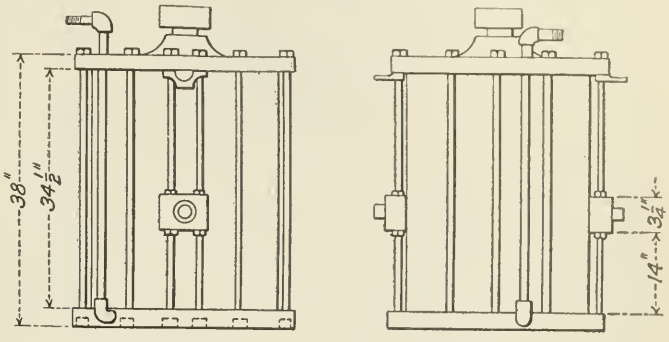


Fig. 21—17-Inch Air Jack for Lifting Coaches.

jacks have been in service for eight months and have not required any repairs, and it looks now as if they would operate indefinitely without requiring any. The use of these jacks has greatly reduced the amount of time required for removing and replacing the trucks when it is necessary to change the wheels. The cylinders of the jacks are constructed of ½-in. boiler steel, which is rolled to the proper size for boring and is welded instead of being riveted. A two-wheel buggy has been constructed which carries the jacks in such a way that the load is evenly balanced and they can be conveniently moved from place to place about the yard or through the shop. The handle

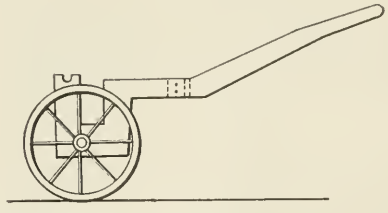


Fig. 22—Buggy for Transporting Air Jacks.

of the buggy (Fig. 22) is raised and the uprights, which have U's at the top, are pushed under the two lugs on the jack. By lowering the handle the jack is raised off the ground and may be pushed about the yard.

BY A. G. PANCOST.
Draftsman, Elkhart, Ind.

PREPARING WASTE.

Cotton or woolen waste, in order to give the best service for use in journal boxes of freight or passenger cars, should be thoroughly soaked in oil, after which the surplus oil should be allowed to drain off. Waste prepared in this way can be packed more firmly about the journal and will give much more satisfactory results than if it is placed in the box too wet. A box, or tank, for preparing the waste is shown in Fig. 23. The inside is lined with heavy galvanized iron, and two cleats are placed on the inside of the box about 8 in. from the top, as shown. These support a tray, which has for its bottom a 1/16-in. mesh wire netting. The tray is only about one-half the length of the box, and may be shifted from one end to the other. The lower part of the box is filled with oil and waste. After the waste has become thoroughly saturated, it is transferred to the

tray, and the surplus oil is allowed to drain off. It is removed from the tray in dope buckets as it is needed.

CAR REPAIRMAN'S SIGNAL.

Repairmen who are working on cars standing on tracks which lead to other parts of the yard should be protected by a con-

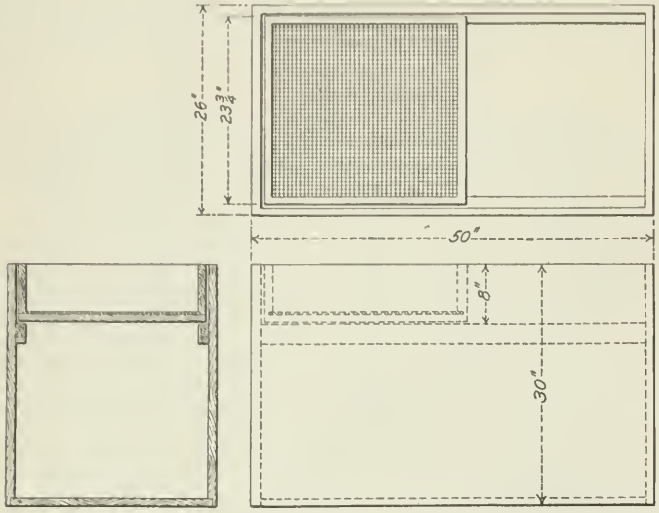


Fig. 23—Tank for Preparing Journal Box Packing.

spicuous and substantial signal in order to caution trainmen against entering the repair track either with other cars or with a switching locomotive. The ordinary flag is unsatisfactory, as it soon becomes soiled and may easily be lost, torn or blown away by the wind. To overcome this, the signal shown in Fig.

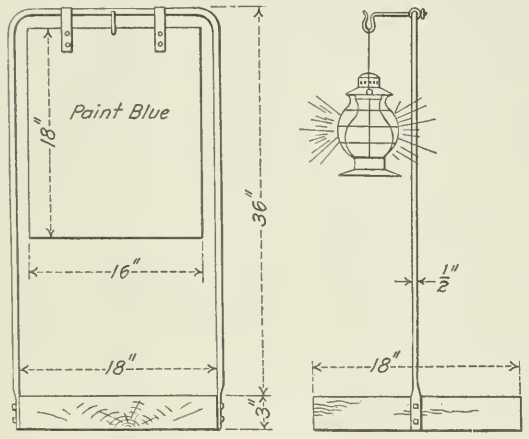


Fig. 24—Substantial Signal for Use of Car Repairmen.

24 has been constructed. The block which forms the base is heavy and insures the signal remaining in an upright position. One of these signals is left near each end of all entrance tracks to the repair yard and is always at hand when required. When in use it is placed in the center of the track. The banner should be painted occasionally, but this is the only attention which it will require.

STORAGE OF REPAIR MATERIAL IN THE YARDS.

Car inspectors in charge of the work in a large yard must be prepared at any moment to shoulder their tools and look over a train that is either entering the yard or preparing to leave it. The inspector does not, of course, know just what material he will need for repairs, and if he did he would probably be unable to carry it for any distance. It is therefore desirable to provide some arrangement for storing a limited supply of the parts which are most often required convenient to the places where repairs may have to be made. This is particularly true in the case of such articles as air hose, knuckle locks, pins, cotters, bolts, etc. A box, similar to the one shown in Fig. 25, may be used to good advantage for storing such material. These boxes are placed on two ties partly sunk in the ground, and are located from 150 to 250 ft. apart on the side of the yard that is most convenient to the workmen and about 8 ft. from the track. In addition to these small boxes, others, about three times as large, are placed from 500 to 600 ft. apart alongside of the yard

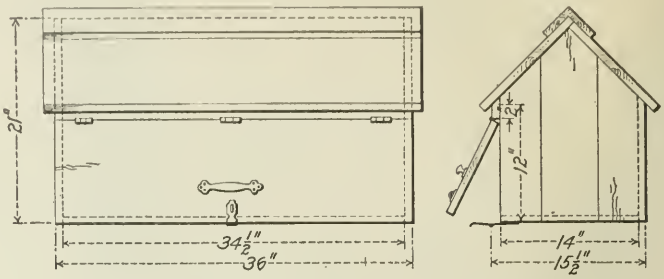


Fig. 25—Box for Storage of Car Repair Material.

and are used for the storage of oil, waste and heavy tools. These centers for supplies may also be used as dumping places for scrap material which is gathered up about the yard and is picked up by a work train at regular intervals. This method of storing material in a convenient place for the repairmen not only enables them to do more and better work, but prevents the material from being scattered promiscuously through the yard and being lost or destroyed by exposure to the weather.

RACK FOR STORING COUPLER KNUCKLES.

In car repair yards where a large amount of work is done, including foreign cars, it is necessary to carry quite a large amount and variety of coupler knuckles. As many of these knuckles do not differ greatly in construction, it is advisable to keep the different types piled separately and have them properly labeled, so that no time will be lost in finding the proper one.

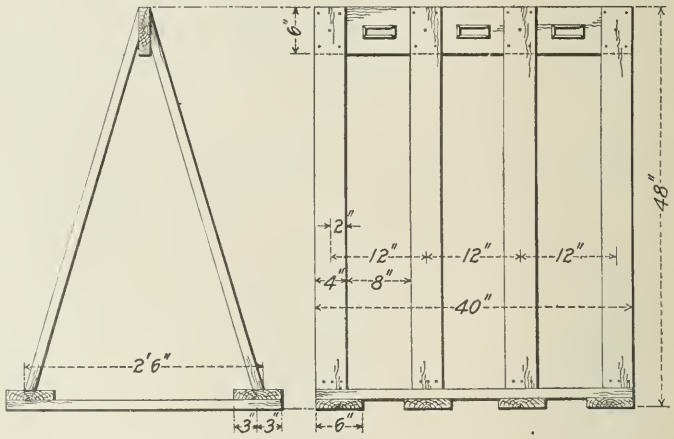


Fig. 26—Rack for the Storage of Coupler Knuckles.

Because of their shape, it is difficult to arrange them to advantage without some means of support. The rack shown in Fig. 26 has been devised for this purpose. A piece of tin, bent so that it will hold a card, is tacked above the top of each space and contains the name of the knuckle stored below. Besides adding to the neat appearance of the yard, the stock of knuckles can readily be accurately checked at any time without unnecessary handling.

POLISHING JOURNALS.

It is often necessary to re-turn the journals on car axles and after turning them they should be polished with emery. Fig. 27 shows a simple but efficient device for doing this. The two wooden pieces are of well-seasoned oak or hickory. The opera-

tor places these blocks about the journal, as shown, and drops the leg which is hinged to the lower block. Two sheets of fine, well-oiled emery cloth are inserted between the blocks and the

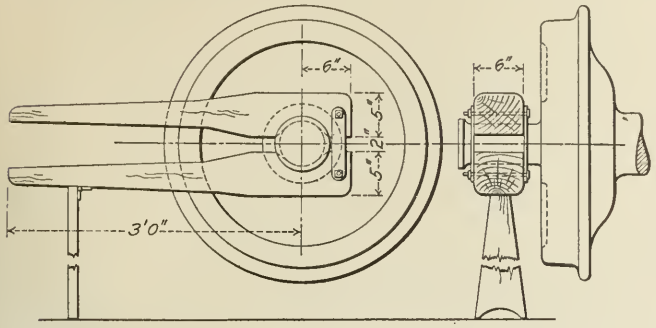


Fig. 27—Device for Polishing Newly Turned Journals.

journal; the lathe is started up and the operator places his weight on the outer end of the top block. In a short time a smooth, polished surface is obtained.

INSPECTORS' EMERGENCY REPAIR CART.

At terminals where all trains change engines and crews, and the inspectors are allowed only from two to ten minutes to thoroughly inspect the train, speed and accuracy are required on the part of all concerned in order that the train may leave the

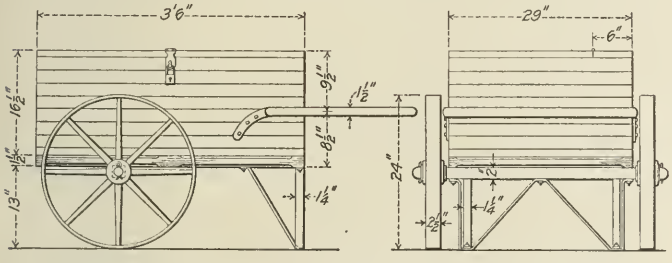


Fig. 28—Car Inspectors' Emergency Repair Cart.

terminal on time and in safe condition. It is necessary to have any tools or repair material that may be needed close at hand. A cart, which contains an emergency equipment, used for making speedy repairs to hot boxes, is shown in Fig. 28. This is always kept near the station and contains dope cans, waste, oil, special packing tools, jacks, blocking, extra journal brasses, etc. The use of this emergency cart has made possible the prompt handling of repairs to hot boxes.

APPRENTICE OR CONTINUATION SCHOOL OF CINCINNATI.

F. B. Dyer, superintendent of the Cincinnati schools, in an address before the National Society for the Promotion of Industrial Education, Boston, Mass., November 18, spoke at length on the work of the continuation school which was established in Cincinnati in 1909. He said: "This school is not a trade school, but is designed for the intellectual improvement of those boys who are already apprentices. It catches the boy in the shop and brings him to the school. The attempt was made to get apprentices to attend the night schools, but with little success. The apprentice is a daytime proposition. He has not the physicial endurance to work all day and go to school at night. The period of apprenticeship is a critical one, as the boy at this age needs guidance and right ideals kept steadily before him. He needs to have an intellectual interest created in his work in order that he may be ambitious to become, instead of a mere hand, the master of an honorable craft. The board of education provides the school and the teachers; the manufacturers release the boys one-half day a week and pay them, if they attend the school, their regular wages; if they do not attend, they are docked. About 250 machine shop apprentices are enrolled. The school runs 48 weeks a year, 8 hours a day. The teachers are allowed two half days to visit the boys in their shops, consult with the foremen and gather material for the school work. The boys are graded according to their intellectual ability—the immature coming the first part of the week and the mature the last part.

"The course of study consists of an hour of blue print reading and free hand drawing, an hour of shop science, an hour of applied mathematics and a general hour for cultural purposes, including civics, industrial geography and history, reading, etc. The method is distinctly practical and objective. While the mathematics is arranged so that topics follow a proper sequence, the mathematical principles are applied directly to the machines in use in the shops, and all non-essentials are eliminated. The school operates at night for adult workers, and on Friday night the foremen meet and discuss phases of their work. This school has been in operation a year and a half. The attitude of the boys toward the work and their employers is wholly changed. The foremen state that the output of the boys has increased rather than diminished, as the added interest and intelligence more than compensate for the loss of time. The expense of operating the school is about $3,000, or $15 a student per year. The board of education has so much faith in the idea that it has secured the proper legislation to permit the establishing of continuation schools for youth who go to work, until they are sixteen years of age, with power to compel attendance 8 hours a week in day time. The board has set aside $15,000 for this purpose in the year 1911. The next school to be opened is for sales girls who are over sixteen years of age. Certain firms have agreed to send at least 200 under the same conditions as the boys who now go. The compulsory continuation schools will be opened upon a large scale early in 1911."

A NEW THEORY OF BELT DRIVING.

Under the above title Selby Haar, of the General Electric Company, at Schenectady, N. Y., presented a paper at the recent meeting of the American Society of Mechanical Engineers in New York. It consisted largely of experimental data from German sources and particularly the results of experiments by Professor Kammerer and C. Otto Gehrckens. Prof. Kammerer's conclusions are as follows:

a The effective pull on a belt is not reduced so much by centrifugal force as the currently accepted method of calculation would lead one to expect. In other words, the maximum allowable tension in a belt apparently increases with the speed.

b The coefficient of friction increases with the speed and reaches values far above that usually assumed.

c The maximum efficiency of transmission is not limited by the speed.

d The coefficient of friction is larger for large pulleys than for smaller ones.

e A wooden pulley has a higher coefficient of friction than an iron one, at least when new.

f Transmission is more efficient, and the coefficient is higher when the smaller pulley drives.

g A belt operates with higher efficiency and usually with less creep when the tight side is on the bottom.

h A properly placed idler improves the efficiency of transmission.

i The neutral layer is symmetrically located in the belt so that the effective diameter is the sum of the pulley diameter and the thickness of the belt.

j At any speed the sum of initial tension and centrifugal force is constant.

In closing the paper Mr. Haar said: "It appears proved that the maximum allowable tension in a belt is not constant and neither is the belt velocity, even though the pulleys revolve at constant speed. The efficiency of a belt is shown to be quite high, just as high as a good gear transmission, the overall effi-

ciency of the belt transmission being considerably reduced by larger bearing friction losses. This shows that the improvements should come in the bearings, as by the use of ball or roller bearings, for example. The exceptional flexibility of a belt transmission has made it a favorite for many difficult problems. We shall close with the following remarkable—and, we are afraid, over-enthusiastic—prophecy of Mr. Gehrckens: '11,900 ft. per min. is no limit to belt speeds at present. Belt pulleys have run at 98,000 ft. per min. Brown, Boveri & Co. have reached 74,000 ft. per min.; the Schuckert Company run flywheels at 19,600 ft. per min., and so do American manufacturers. Air resistance is an important feature at such speeds. When air is excluded the resistance decreases to one-half, and in a vacuum it is almost nothing...*..*..*..We are by no means close to the limit of belt speeds, and the capacity of the belt does not commence to increase until high speeds are reached. Steam turbine speeds are so high that some reducing device must be provided and for this purpose the belt is the simplest and most practical connecting link. With transmissions at such high speeds the construction must be painstaking and the crowning of the pulley is an important feature.'"

A number of members discussed the paper, all of them disagreeing with the author as to the advisability of using extremely high speeds. The general opinion seemed to be that it was much better to run belting under 5,000 feet per minute in all cases except for main drives, and that in many cases there was greater economy in not exceeding 4,000 feet per minute, even at the loss of belt efficiency, owing to the fewer delays than where belts were strained too tight and run too fast.

MAKING PILOT RIBS.

BY S. S. SEE.

Foreman of Planing Mill, Norfolk & Western, Roanoke, Va.

Not only is the bevel different on each end of a pilot rib, but each rib differs from the one next to it, no two being alike except the corresponding ribs on each side of the center rib. The device used for cutting these ribs, as shown in the accompanying illustrations, is simple in construction and is easier and quicker

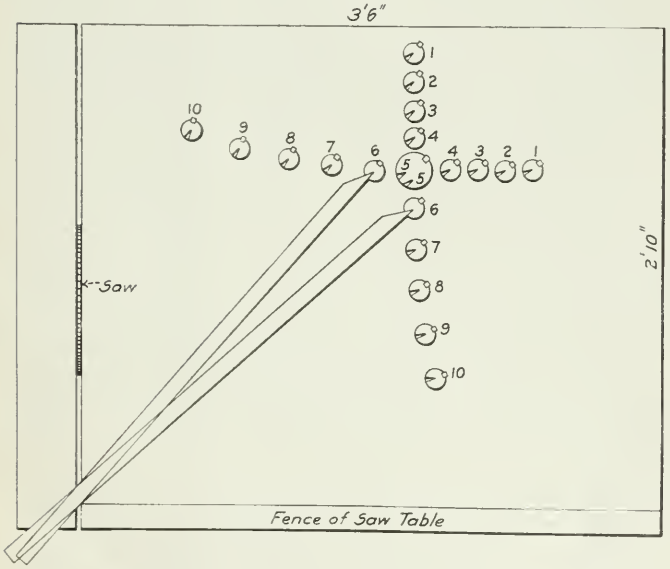


Fig. 1—Device for Cutting Bevel on Ends of Pilot Ribs.

to operate and more accurate than the usual method of laying out each rib with a templet. It does not require a skilled mechanic to operate it and may be used with any type of cut-off saw. The device is made of hard wood, securely braced so that it will not warp, and of about the dimensions shown on Fig. 1. It is securely bolted to the saw table to prevent it from moving out of line when in use. Each of the stops, which are numbered from 1 to 10, in two rows, represents a different bevel. These stops are 1½ in. in diameter and have small keys glued to them to keep them from turning. When not in use they are pushed down so that the tops are level with the top of the board. When in use they project above the board ½ in. and are held in place by the button or small piece on the underside of the board, which

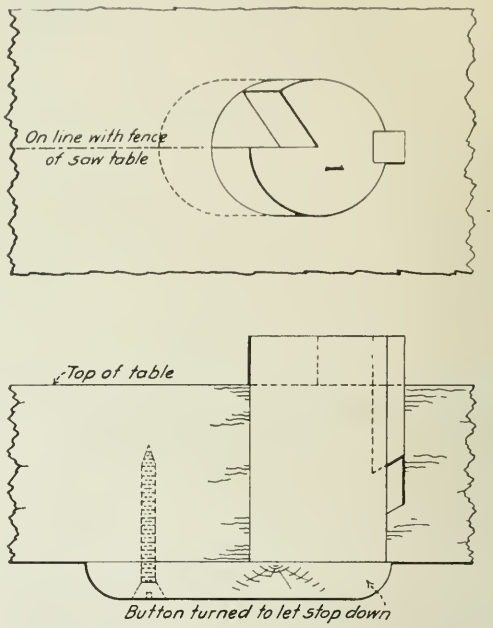


Fig. 2—Detail of Stop Used for Cutting Bevel on Ends of Pilot Ribs.

swings about the screw, as shown in Fig. 2. The material to be cut is first prepared by dressing it to the proper size. To show how the board is used, assume that the long rib is to be cut. The material is placed on the device with one edge resting against the end of the fence on the saw table and one end projecting over stop No. 1, similar to the first position shown in Fig. 3, with the edge lined up with the side of the notch, as shown. The other end is then cut off and the bevel thus formed is placed in

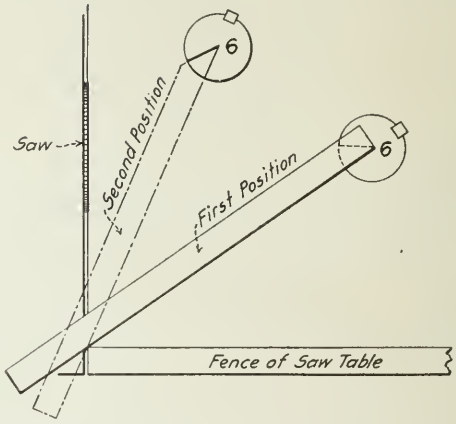


Fig. 3—Showing How the Ends of the Pilot Rib are Cut to the Proper Bevel.

the notch of the corresponding stop No. 1. The proper bevel is then cut on the other end of the rib. In this condition the rib would be a little too long, a point projecting above the top of the bumper beam. By means of a special stop this point is cut off at right angles to the beveled edge at the top of the rib, and it is then ready for use.

THE MISTAKES OF THE EFFICIENCY MEN.

BY ONE WHO HAS WORKED WITH THEM.

I

EXTRAVAGANT STATEMENTS AND CLAIMS.

From the reports in the daily press, as well as in some of the technical journals, it would appear that railway managers are opposed to what are termed "efficiency methods." The battle seems to be on between them and the efficiency men. It is unfortunately true that in certain quarters a real gulf exists between those who are preaching the gospel of efficiency and those who are working out in a practical way the problems which confront them in railway operation. It is but natural to expect that railway managers, who have spent years in efforts to raise the standard of railway service and to operate at the lowest ratio consistent with safety and efficiency, should view with distrust the claims that efficiency men make, after what, to a veteran, is but a cursory investigation of condtions. It is even doubtful if in many cases any investigation whatever has been made beyond a comparison of actual costs of units of output or service with certain assumed ideals.

There can be no logical discussion of any question without an agreement upon the points to be discussed. The difference between the railway man and the efficiency engineer is often due to the point of view. There is no initial meeting of the minds. Prejudice may exist on both sides but the blame can generally be laid at the door of the efficiency men. The principle of efficiency, which has always existed, is being stabbed in the house of its friends. And more than to anything else, efficiency men can lay the blame for their failure effectively to impress the average railway manager to their proneness to extravagant claims and carelessly arrived at conclusions. Discount their assertions 50 per cent. and most railway men will agree with them.

Extravagant claims are of two kinds: *First,* misrepresentation, either wilful or through ignorance, and, *second,* extravagant in the sense that, even though possible of proof, their mere assertion creates a prejudice against them and thus prevents a fair trial of proof. And of the two, the second is the more insidious. A claim based upon misrepresentation or ignorance is proved to be untrue when the facts are known; and the discovery of the facts is in itself a most important step in an investigation into high costs or low efficiency. But a claim that, because of its extravagance, immediately calls for a flat denial, even though having foundation in fact, is usually thrown out without a hearing. To such claims on the part of efficiency men is due the apparent absence of agreement between them and those whom they would enlighten. The astonishing thing is that the efficiency men continue to make the same fatal mistake; and it is unjustifiable because it is so unnecessary. Examples of failure of efficiency schemes are legion.

An efficiency expert in the employ of a large concern had not been long on the job when he informed the manager in no uncertain terms what could be saved and how it could be done. There was no doubt either as to the amount or the method. As action did not immediately follow, the efficiency man telegraphed the manager of the company urging him not to delay because every hour's delay meant an actual loss of one hundred dollars. Perhaps there was a leak somewhere in the plant; the management may not have been all that it should; and it is not unlikely that the amount named might have been saved through efficiency methods. But why was it necessary to invite criticism by making the bold claim and thus create a prejudice at a time when cooperation was the one important thing?

Another efficiency engineer, after making a study of a manufacturing plant, reported that by the purchase of four more of a certain machine tool (doubling the number of that type of tool then in use) the output of the plant could be doubled without the necessity for spending another dollar. This claim startled the president and his chief engineer (perhaps it amused them), especially in view of the fact that plans had been made and materials ordered for a general extension of the plant for the sole purpose of increasing the output. If by purchasing four machines at an approximate cost of $16,000, the output could be doubled, it were criminal to erect additional buildings at great expense. Credit should be given the management for investigating the basis of such an apparently extravagant claim. It was found that the efficiency engineer meant that, as among all the machine tools in the plant, only these four were being run double shift in order to keep the balance of the equipment running but one shift; four additional machines also running double shift would make it possible to run the entire plant day and night and thus increase the output two-fold. It is hardly necessary to add that the original plan to enlarge the plant was not abandoned.

A third extravagant claim is that used to illustrate the alleged enormous waste in railway operation. It has done yeoman service on various occasions. It runs something like this: A locomotive in first-class condition is but 50 per cent. efficient if the track and roadbed have been allowed to deteriorate 50 per cent. If, in addition, the engineman has an efficiency of but 50 per cent., the result is to reduce the efficiency of the locomotive to 25 per cent. If, further, the fuel used has but half the heat units it should have, the combination of poor track, engineer and fuel results in an efficiency of but 12½ per cent., or a waste, or inefficiency, of 87½ per cent. The argument appears logical enough, but however compelling it may be to the layman, the railway manager knows that such conditions do not exist. Except in extreme cases no roadbed is allowed to deteriorate to such an extent as to carry but half the traffic it should. There cannot be such a combination of poor roadbed, locomotives and cars, men, fuel, etc., for the reason that long before these factors are allowed to deteriorate sufficiently to affect the net results materially, the remedy is discovered and applied. Locomotives are taken out of service and shopped before their condition has any appreciably damaging effect upon traffic. Engineers who are unable to meet their schedules must promptly give way to those who can.

It must be admitted that not unusually there is a basis in fact for many of the extravagant assertions of the efficiency men. It is because this is true that their claims not only do not accomplish what they are intended to, but, on the contrary, have the effect of obscuring actual conditions. That machine tools in most manufacturing and railway shops are not operated as efficiently as they should be, that the cost of maintenance is high, that the efficiency of the average workman is low, that fuel and supplies are being wasted, that locomotives and cars are not always repaired economically, is unquestionably true. And it is important that the truth in this respect should be told. The plain truth, however, is sufficient; and although it requires frequent repetition, it needs no embellishment. It is an encouraging sign that, although not bearing the insignia of the efficiency men, there is an ever increasing number of those who not only recognize the principles that underlie efficiency methods, but who are successfully applying them. This is the leaven that shall leaven the lump.

The Bolivian Antofagasta Railway is building at an approximate cost of $4,520,000 gold a line of railway from Rio Mulatos on the Antofagasta (Chile) and Bolivia Railway—to Potosi. The track is leveled on about 8 miles from Rio Mulatos. Thus, in less than two years' time, Potosi, the center of the largest tin-bearing area in Bolivia, will have an easy outlet for the transport of its minerals by rail down to the port of Antofagasta. The Antofagasta line will be constructed up via Oruro to La Paz, and ultimately from thence to the port of Tacna, on the Pacific coast. The import trade of Potosi will be facilitated by the same means, and it is confidently expected that by the reduction in freights and the influx of laborers, the new line will enable lower grade tin and copper ores, the quantity of which is incalculable, to be worked from Potosi to Rio Mulatos.

Increasing Shop Output.

FIRST PRIZE.

HOW THE OUTPUT OF A LOCOMOTIVE REPAIR SHOP WAS INCREASED.

BY H. L. BURRIUS.

Assistant to General Foreman, Erie, Susquehanna, Pa.

Importance of Knowing Costs.—The successful foreman is the one who can give actual figures on the cost of labor and material for every job done in his department. With this knowledge he can instantly tell whether it is being run successfully or not, and he is in a position to decide on a better way of handling the work. Decreasing labor cost and increasing material cost is not successful management. A foreman may point with pride to the great amount of work his department is turning out when due to this cause, but what about the company he is working for? It will lose money.

Keep Down the Supply of Material.—In some shops the foremen do not think it worth their time to consider the cost of material. In cases where material is required and is not on hand they will order at least twice the quantity required, with the result that a large amount of money is tied up in the store department for material that may not be needed for the next 60 days. The result of this poor business method is far reaching, for the money that should be used for the pay roll is tied up in the store room on useless material.

Following are a few ideas that were worked out in a shop where the output was increased 50 per cent. in one year with no increase in the cost over the previous year.

Shop Schedule.—The repairs on an engine were classified and each class was given a certain number of days to be in the shop. Each department was given a schedule of the length of time allowed for the repairs for which it was responsible. This schedule also showed when the parts were to be received so that the foremen could not have the excuse that he had not received the work in time. With this system it was easy to locate the weak points and find the foreman who was the cause of the engine not leaving the shop on schedule time.

Advance Information as to the Repairs Required.—The general foreman was notified at least 15 days before an engine was due for the shop. At the same time he was given a condensed report of work that would be required, or of any thing that was not just right and would need attention. He would then send a copy of the notice and report to each foreman, who in turn would get out a list of any castings or heavy forgings that would be required and were not on hand. This one point made a great gain, for it not only gave the store department an opportunity to get material, but work throughout the shop could be handled in quantities instead of one or two pieces at a time.

Facilitating Delivery of Material.—All departments and erecting pits were spaced off and numbered, with a view of reducing the time required to deliver material to the engines. How easy (?) it is for a man to go up and down the shop with a truck load of material looking for some engine that does not happen to have a number 20 in. high painted on it. On the other hand if told to deliver material to space 25 he knows the exact location and the easiest way to get there without loss of time.

Engine Failures Posted in the Back Shop.—A large blackboard was placed in the back shop on which were listed the daily engine failures and their causes. Every road has engine failures and the best way to overcome them is to educate the men to do their work in a manner that will not cause a failure. This board was the direct cause of getting the men so interested in the good record of the shop that men from one department would check over work from another with the view of preventing an engine failure which would be charged against their shop.

An Unusual Kind of Staff Meeting.—Of course, every shop has a foremen's staff meeting, but how many shops hold staff meetings with the workmen? This gets the master mechanic and general foreman in close touch with every department. Each department should elect one man to be its representative and to hold that position for at least six months. Every month the department representatives, master mechanic and general foreman should hold a meeting and discuss shop conditions and different ideas of getting out the work. Some valuable ideas will be brought out at these meetings and weak points will be discovered and corrected, all tending to increase the output and at the same time decrease the unit cost. Some foremen do not take kindly to suggestions made by their men, but if these can be brought before the men's meeting and thoroughly discussed, it will often lead to some good point that has been overlooked.

Reclaiming Scrap.—Near the center of the shop a space was marked off for a scrap pile. One man was given the job of taking care of it. He had to sort it over and return good material to be used again; the scrap material he transferred to the scrap bins. It is unnecessary to give any figures on the amount of money that was saved. However, where two and three men had been kept busy wheeling out scrap to the scrap bins, all scrap is now delivered to the bins by this one man who looks after the shop scrap pile.

Co-operation.—It requires the hearty co-operation of every man in the shop to increase the output and at the same time decrease the unit costs. Ideas must be developed to secure and maintain the interest of every man. No one man can install and maintain a perfect system in a large shop without the help of every employe. Don't lose sight of the fact that the success of the company you are working for is your success, and increased output at a decreased cost means an increase in your present salary.

IMPROVED ORGANIZATION AND ITS EFFECT ON SHOP OUTPUT.

BY C. E. STONE.

General Car Foreman, National Railways of Mexico, Talleres de Santiago, Mexico.

While shop kinks, labor-saving machinery and good shop facilities contribute their part to increased output, their importance is secondary. The standard is set almost wholly by the man in charge on the basis of his ability to organize and handle men. The first and most important requisite is that he be a man in the fullest meaning of the word; being that, he will command the confidence and respect of his employers as well as of his employees. If he can maintain discipline and retain the good will and respect of his employees and the hearty co-operation of his fellow officers in the other departments his battle is almost won and a high standard is assured. He should ever strive to control himself and be able to administer a reprimand or give instructions even under the most trying circumstances without loosing his temper or using profanity, for that will lower him in the estimation of all present quicker than any other fault he may have. He should be a keen student of human nature and be able to look on all sides of any question.

He should be wholly devoid of partiality in settling controversies and handle every case strictly on its merits, not hesitating about applying the needed remedy. To err is human; therefore, when an error has been made, he should take the party at fault to one side and in a friendly manner attempt to show him the error of his ways and make him see that it is necessary to be more careful; if the error is on account of ignorance, he should be able and willing to impart the necessary information to prevent its repetition. If the person so handled is the right kind of a man the foreman has made a better em-

ployee for his company and a friend and supporter for himself. If one or two warnings do not have the desired effect the sooner the man is dismissed the better for all concerned.

Promotion from the ranks keeps hope alive and fosters ambition and is absolutely essential to increased output or high shop standards. The rank and file should be given to understand that vacancies higher up will be filled from their numbers, but strictly on a basis of ability. The writer is not an advocate of the seniority rule, and believes that it is detrimental to high efficiency, as it tends to keep ambitious men away from the shops where it is the rule and thus lowers competition.

The successful foreman must know what he wants to do and how he can best do it; then he must have confidence in himself that will inspire initiative, and the persistence and courage to keep everlastingly at it, until by sheer force of purpose he makes an impression. To be successful he must be conversant with the detail work of each of the branches over which he has supervision. Here he is the expert adviser as well as the expert organizer; he should clearly define the jurisdiction and authority of his subordinate foreman of each branch of the service and then grant them perfect autonomy so far as handling their men is concerned, making them understand that they are responsible for the results. He should keep in close touch with his foremen and invite their confidence, always treating them as men and making them feel that his time is at their disposal whenever they need assistance or advice about their work, at the same time teaching them the value and importance of self-reliance. He should transact all business with the foreman direct, never going to the men, as that weakens the foreman's prestige with them.

The duties of the several branches of the mechanical department are closely interwoven with each other, and harmony and co-operation between the men in charge of the different branches is of the greatest importance and must be maintained at any cost, or the standard of efficiency will be lowered. Study the conditions of your shop and see that each branch of the service has the right amount of help to keep pace with the other departments. This having been done and harmony and co-operation firmly established you will find that a good many points have been added to the shop output. Teach your foremen to specialize, as that is an important factor in increasing the amount of work turned out by each individual. Establish a friendly competition between the different branches, giving due praise to the foreman who has made the best record. Encourage the other fellow and put him on his mettle to make a greater effort; show him where he has made a mistake or why he has fallen behind, and instruct him how to overcome the weakness in his system of working and will nearly always deliver the goods.

Keep your foremen inspired and they in turn will inspire the men and your shop output will be increased far more than you had dared to hope for, and you will be surprised at the amount of suggestions you will receive tending to create greater facilities for further increases; some of these will be practical and can be put in operation to prove their value. In conversing with your superiors do not attempt to rob your subordinates of any improvement or record that they have made that is deserving of special mention, but give them the credit they deserve.

Last but not least, remember that it is the idle moments that test the character and that the foreman who uses his idle moments to improve his mind and add to his stock of knowledge easily leads in the race. Next in importance is to watch your leaks very closely; do not allow the waste of any serviceable material, be it old or new. Keep close watch of the scrap bins, as that is your principal leak, and unless properly taken care of will offset all your other efforts at securing a high efficiency. Systems for handling the work and shop kinks are local conditions and no fixed rule governing these will produce good results in all shops. There are many of these, all more or less beneficial, but the ones that will best serve the purpose must be left to the man on the ground, who knows the conditions existing at that particular place.

LOST MOTION.

BY CHARLES MAIER.

Engine House Foreman, West Jersey & Seashore, Atlantic City, N. J.

A well designed piece of machinery, even though it be ever so complicated, if all parts are properly fitted and put together and well lubricated will work smoothly, each part doing its share of the work. Lost motion or friction if it happens to be in a critical part or throughout the machine can reduce the efficiency to such an extent that the cost of the output will be considerably increased. All this is nothing new, but the comparison of a railway organization with it is so convenient that I have been tempted to mention it. If we could take up all the "lost motion" or eliminate all the friction in the railway organizations of the country the annual saving would probably be enormous. I am not going to try to show where all this lost motion or friction exists, because I cannot, but that some does exist I do know. All railways have numerous repair shops and repair yards, each of which is undoubtedly in charge of a capable man. However, no one of these men can be expected to have become so efficient in his work that he cannot learn something from another in the same line of work. A certain job may be handled in one place in an altogether different manner and considerably quicker and cheaper than at other places on the system. Some of the other places may be doing other jobs quicker and cheaper.

Every repair point that handles a job on which more time is spent on account of the method of doing it than is required at another point has lost motion that should be taken up. If the methods of doing similar work at all repair points could be compared the general efficiency would be considerably increased. This could be accomplished by sending out circulars from some designated office to all repair points asking for a detailed explanation as to how a certain job is handled at that point; when all replies are received they should be sorted out and sent to each repair point so each will have the benefit of the others' experience. When any of these places discover a new kink that will facilitate doing a piece of work it should be sent direct to the central office and from there distributed to all repair points doing that class of work. Some roads do have a system of collecting shop kinks but it is not on as broad a scale as this and is not conducted as systematically. Suggestions or kinks come in at random and may never get further than the division on which they originate. Notices should be posted at all repair points asking the men to send any new ideas they may have direct to the office collecting them and if any man, be he a mechanic or laborer, does send in a new idea that is worth adopting give him substantial credit for it in some form. Most every man would like to get up some new and better method of doing a job or some new tool, and he would be stimulated considerably if he thought he was going to get something for it. An annual pass over the division if given as a reward for a new suggestion would encourage not only the man receiving it but all his fellow employees.

Mechanics often have good ideas on handy tools to do certain jobs or quicker methods of doing them, but cannot get them in shape for various reasons. They may be kept so busy they do not have time to make tools, or perhaps a narrow-minded foreman will not permit them to try new methods. Some foremen of this class seem to think a man is trying to tell them their business if he makes a suggestion. Some of these suggestions may seem trivial but they may apply to operations all over the system and in the aggregate the saving effected would be considerable.

Some of the most successful industrial concerns have been doing this for years with splendid results. The employees make suggestions, some of which are patented and the employee receives an annual royalty. The result is that each employee is using his or her brains continually, on or off duty, trying to get some new idea in connection with their work. Instead of a comparatively few officials trying to overcome all the difficulties that present themselves the entire organization is at it all the time. A concentration of this kind is bound to produce results and create a better feeling between officials and employees.

INCREASING THE OUTPUT OF A SMITH SHOP.

BY J. F. PERRITT.

Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.

In reading over the announcement of the competition on Increasing Shop Output, I was attracted by the following sentences relating to the department I am most interested in: "The blacksmith shop never could quite keep up with the work; now you are easily doing so, although you have more work to do and have not increased your force. How did you bring it about?" Without presuming to be an authority on the management of the smith shop, I shall attempt to answer this question by describing the practices and principals by which the output of one smith shop was increased, although the force suffered a slight decrease.

The Relation of the Smith Shop to the Other Departments.—The problem that confronts the management of a railway repair plant is the general output. But it is a fact generally admitted that the blacksmith shop, being practically the initial point of the general run of repairs, should at all times be in advance of the other iron working departments. Otherwise, the boiler shop and machine shop would be held back and the heads of these departments prevented from making the showing they might be capable of.

Building Up An Organization.—In order to place the smith shop in advance of the other departments and to keep it there, more than one problem has to be recognized and dealt with. Probably the first of these is to build up the organization by securing good workmen who are sober, steady and conservative men. In this day when workmen are more educated and refined (thanks to our public school system), there is no great difficulty in doing this, except that it requires time. Once the organization is perfected it is hazardous to break into it, even temporarily, by employing a smith who is lazy, a hard drinker or an agitator. In using the word agitator I wish to be plainly understood. A good union man is a credit to himself and his craft. But an agitator is of no service to a union, or a shop, or himself. After successfully organizing a shop it is necessary to exercise great care in order to maintain the organization. The men should be treated kindly and firmly and with a uniformity that will insure their respect and confidence in the foreman. If a man is not genteel enough to appreciate this sort of treatment and shows a disposition to take advantage of it, don't demoralize good conditions by quarreling with and threatening him; dismiss him from the service. The men will be better off without such a man among them.

If, as in most cases, the men are working under certain shop rules or an agreement, agreed to and signed by the superintendent of motive power, the foreman should preserve a strict regard for these rules by living up to them to the very letter. By so doing he can with a greater impunity exact the same of his men. Should any irregularities originate, sufficient to lead the men to believe a grievance has been perpetrated against them, settle it by the rule book. If the rules are not explicit enough to determine a satisfactory settlement, a spirit of fairness will prompt the foreman to willingly refer the matter to the general foreman or master mechanic for a ruling.

Classification of Work.—Next to, or in connection with organizing the shop, should come the classification of the work. It should be distributed among the men in accordance with their ability. This will insure a more speedy and accurate output, and to a certain extent eliminates the necessity of the foreman closely watching and measuring each piece of work turned out, thus giving him more time to attend to his other duties and for studying out and making improvements. The field of blacksmithing, like many other trades, is so broad that one man can not cover all of it and give perfect satisfaction in all of its branches. For instance, a smith may be perfectly at ease working a frame, rocker arm, or mud ring, who could not, in a given time, make a respectable wrench or hammer to save his life, while a very ordinary smith, not able to give satisfaction on the former pieces, would be perfectly at home with the latter. Often it is the small jobs that prove to be the most puzzling and lots of time is lost in turning them out if they are not given to a smith familiar with them.

There are three fires in the average smith shop that are looked on as special fires, whether they are so designated or not. They are the spring fire, the tool fire, and the frame or heavy fire. In a number of shops only one man is familiar with any one of these three classes of work. This is all wrong, as circumstances may deprive the smith shop of the service of either of these men for days or weeks, or for an indefinite period. It is, therefore, necessary to have more than one man familiar with each different class of work. Where thermit is used for welding frames, more than one man should be taught to handle it. It is next to an impossibility for the foreman to superintend every job of this kind and give sufficient attention to his other duties.

In classifying the work, however, it will not be necessary, nor would it be justice to the men, to keep them on one kind of work all the time if they are capable of doing other and better work than the kind usually assigned them. Numerous opportunities will arise which will permit the foreman, without endangering the output, to try a man on a different class of work and if he proves capable of doing it satisfactorily, he becomes more proficient and consequently a more valuable employe.

Tools and Equipment.—After organizing the shop forces and classifying the work, comes the important feature of equipping the shop with tools. Only a limited amount of work can be gotten from a man's backbone and muscle, but the amount of work to be gotten from the use of improved tools is unlimited; at least the limit has never been reached. As a matter of fact, with the general run of work in the average railway shop, a special tool can be made to help with or complete pretty nearly every job. The class of tools demanded for the smith shop is regulated by the number or kind of machines installed therein. If a foreman has bulldozers, bolt headers, and forging machines, his task will be confined chiefly to making dies and formers for these machines. But even without these machines, he is expected to get results and to continually increase the output and decrease the cost. If the management will not buy the necessary equipment, it is up to the smith foreman to build machines or air presses of such shapes and dimensions as are required to do the work. Work which cannot be done on the air machines, must be done with steam hammer dies and formers and punches. A great number of these tools can be built similar to tools used in other shops, or tools illustrated in railway papers and magazines. Not an easy task to be sure! But with each good, serviceable tool, the output is increased so materially that the foreman and his men feel amply rewarded for their efforts. It is bad policy to ignore a suggestion from one of the men regarding his ideas of a tool. If the ideas are practicable adopt them. If impracticable, reason with and convince him of the fact. You may need his ideas again some day, and the co-operation of the men with the foreman in making improved tools is a good thing to encourage.

With the average railway management changing standards from time to time, and purchasing engines or cars of a different type or build from those already in service every few months, the necessity for making tools to cheapen the cost of repairs never ceases. When not able to make all the tools required at once, the foreman should make tools for the work that gives him the most trouble. If this is done he will much more quickly find time to build the others needed. However, a smith shop might be literally stocked with good tools, and if they are not kept in order so that they can be found quickly when wanted, the company will not be getting the full value of them, nor will the foreman be increasing the output as he might. Hence making and having tools is not the whole problem. They should be arranged and kept systematically so that no time will be lost in finding them when needed, and also that the foreman can at any time look them over and see just what tools he has and their condition.

Take Advantage of Hot Metal.—One of the practices most effective in increasing the output is to take advantage of a piece

of hot metal. For instance, a machinist orders one knuckle pin. It takes more time to heat an axle (of which these pins are usually made), than it does to make the pin. And as a smith can easily make two of these in one heat, have him do it and while the other portion of the axle is half hot and the fire is in prime condition for heating it again, if you can spare the time make a dozen or more. The smith foreman thus saves time and keeps ahead of the machine shop. This practice is helpful in making many pieces, such as knuckle pins, wrist pins, piston nuts, brake hanger studs, guide blocks and any standard article blocked from a heavy piece of metal.

Co-operation of Other Departments.—Increasing the smith shop output becomes more easy if the smith foreman can induce the various foremen of the other departments to send their repair work to him as promptly and orderly as is practicable. Time is saved in doing this work collectively, but is lost if it has to be done piecemeal.

The stock of iron and steel on hand should be watched closely and a sufficient amount should be ordered each month to take care of the work.

One of the best methods of getting and keeping a body of hustling blacksmiths, is for the foreman to get busy himself in attending to his duties, thus setting an example for his men. An indolent foreman does not place himself in a position to consistently expect much from his men. The idea that when one is promoted to a foremanship he ceases to work, is all wrong. The promotion means work, and hard work if one cares to succeed.

THE LOCOMOTIVE REPAIR SHOPS OF THE BURLINGTON AT HAVELOCK, NEB.

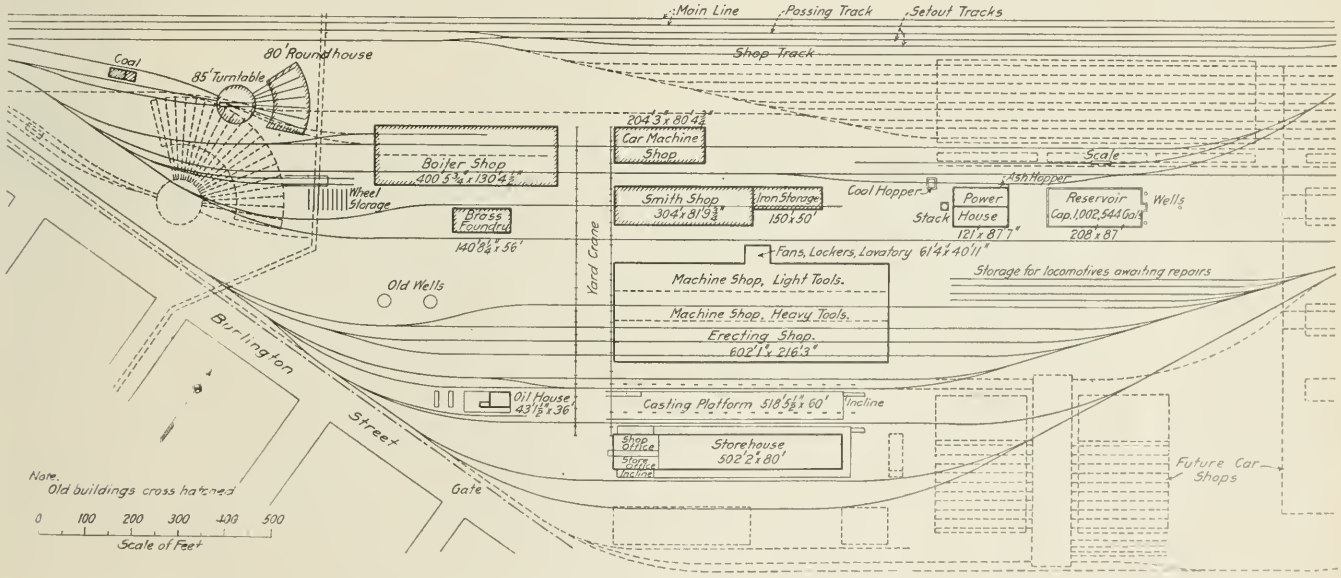
[WITH AN INSET.]

The original locomotive shops of the Chicago, Burlington & Quincy at Havelock, Neb., were built in 1893 and 1894. In recent years there has been felt the necessity for larger and better facilities for repairing locomotives at that point. The introduction of heavier power for both freight and passenger service, and the large number of Mallet compounds in use, rendered the old shop equipment inadequate for handling this work in an economical and rapid manner. Havelock is located about 4 miles east of Lincoln, Neb., on the main line between Chicago and Denver. Lincoln is an important point, as it is the junction of the lines running between St. Louis, Mo., Kansas City, Kan., and Billings, Mont., and between Chicago and Denver, as well as the termini of several branch lines.

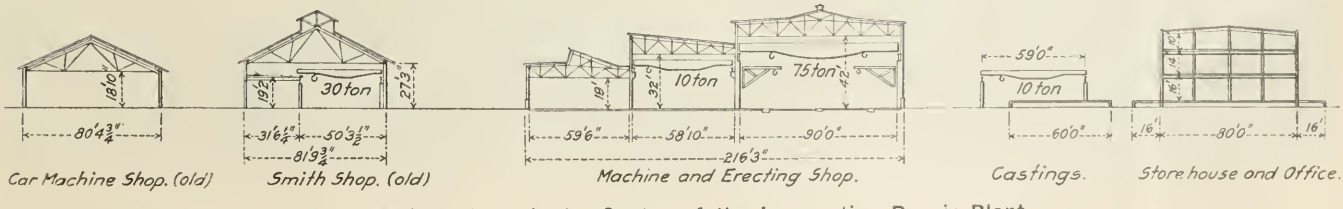
During the past year substantial improvements have been made in the plant at Havelock by the addition of a new power plant, a large locomotive erecting and machine shop, a storehouse, a casting platform with an overhead crane, and an oil house. The new buildings, together with those now existing and shown as shaded areas on the general plan, will give a shop layout as follows: Erecting and machine shop, 600 ft. x 215 ft.; boiler shop, 400 ft. x 130 ft.; smith shop, 300 ft. x 80 ft.; storehouse, 500 ft. x 80 ft.; power house, 120 ft. x 87 ft.; car machine shop, 200 ft. x 80 ft.; brass foundry, 140 ft. x 56 ft.; and oil house, 65 ft. x 36 ft. The oil house basement is 101 ft. x 38 ft. The enclosed superstructure is 66 ft. x 38 ft.; the balance is covered by a steel canopy, 35 ft. x 38 ft., and is open at the sides.

The new erecting shop has longitudinal tracks with space for 36 locomotives under repairs. There are three tracks, each 600 ft. long and equipped with pits. General repairs, not including new fireboxes, will be made in 15 days, and 45 engines per month will be the normal capacity of the shop. There are now about 600 locomotives on the Burlington lines west of the Missouri river, which will be tributary to the Havelock shops for general repairs.

The location of the new buildings was determined by the projection of a crane runway which would join the ends of the old buildings with those of the new; as shown on the plan the 80-ft., 40-ton, yard crane extends between the three old buildings and the end of the new erecting shop and the storehouse platform. The names marked on the old shops indicate the purpose for which they will be used when the new shops are in operation.



General Arrangement of the Havelock, Neb., Locomotive Repair Shops of the Chicago, Burlington & Quincy.



Cross-section Through the Center of the Locomotive Repair Plant.

That marked "Boiler Shop" is the old erecting shop. The old smith shop is to be converted for the present into a woodworking shop for locomotive cabs, underframes and other woodwork required about a locomotive shop. The old boiler shop will be converted into a smith shop and the old power house is to be used as a brass foundry.

ERECTING AND MACHINE SHOP.

This building is similar to some of the western shops built in recent years in that it has a longitudinal erecting shop. It is different from those shops, however, in that the boiler work is not done in the same building and the machine shop is located on one side only of the erecting shop instead of on both sides, as at the Topeka, Kan., shops of the Santa Fe and the Parsons, Kan., shops of the Missouri, Kansas & Texas.

The building consists of an erecting bay and two machine bays, and has a cross section wholly unlike any other longitudinal shop in this country. The erecting shop has a height of 42 ft. under the roof trusses, a clear width of 90 ft. and a distance between track centers of 30 ft. 6 in. Three tracks run the entire length of the erecting shop. The machine bays are each 60 ft. wide, center to center of columns. The bay in which the heavy motor-driven tools will be located has a clear height under roof trusses of 32 ft., while the small tool bay, which will contain both group and motor-driven tools, has a height of 19 ft.

A substantial steel construction forms the framework of the building. The walls are built on 1-in. channel studding tied with iron straps to the steel girths, and covered with galvanized expanded metal, wired on. To the expanded metal is applied four coats, or layers, of cement plaster each ¾-in. thick, which gives a wall having good weather-resisting qualities and enough thickness to imbed the steel and protect it from destructive corrosion. The base walls up to the windows are of brick.

The floor of the erecting shop is of concrete cast in 5-ft. squares, and has 1½-in. crowning between the tracks for drainage to the pits. The floor of the machine bays consists of a course of 3-in. Burnettized Oregon fir laid on tamped Platte river sand, the boards being nailed together. Over this sub-floor is laid a wearing surface of 1⅛-in. maple factory flooring nailed with heads countersunk ¼ in. The roof of the building consists of 2-in. fir sheathing laid on 6 in. x 14 in. purlins and covered with five-ply pitch felt and gravel laid according to the Barrett specification. All of the window frames, sash and doors are of wood, and these portions, together with the roof, floor, tool room partitions and work benches, comprise all of the combustible material in the building.

The erecting shop is equipped with two 4-motor girder cranes, each having a main hoist capacity of 75 tons and an auxiliary hoist capacity of 15 tons. Serving the outside tracks are four



General View of the Havelock Locomotive Repair Shops, Chicago, Burlington & Quincy.



Erecting Shop Showing Two 75-Ton Girder Cranes and Four 3-Ton Traveling Wall Cranes.

3-motor 3-ton traveling wall cranes, two on each side of the shop. This type of crane is found only in one other locomotive repair shop in the country—in the erecting shop of the Pennsylvania Railroad at Altoona, Pa., which was last built.

Steam, air, water and lighting service connections are provided in the pits, making it unnecessary to have hose and lamp cords on the floor of the shop. This system has been worked out thoroughly and a substantial and convenient arrangement is the result. The pipes are carried overhead and down alternate central columns, where valves are provided. The air pipe is first connected to the top of a small vertical drum at each drop. The outlet pipe passes through the bottom of the drum with the inlet pipe near the top. A drip pipe is provided for draining water from the drum, and in this way comparatively dry air will be supplied to pneumatic tools and hoists. The lighting of this shop as well as that of others is in the nature of general illumination, 110-volt alternating current, multiple enclosed arc lamps being used throughout, except in the smith shop, where flaming arc lamps appear to be more desirable on account of the smoke.



Heavy Machine Bay of the Erecting and Machine Shop.

The lye vat for cleaning the locomotive machinery is at one end of the erecting shop. It is made of concrete with cast iron grid plates around it in the floor. The vat has a sheet iron cover and is built with flues for carrying off the vapor from the hot water.

The middle, or heavy, machine bay is equipped with a 3-motor girder crane having a capacity of 10 tons and a span of 58 ft.



Small Machine Bay of the Erecting and Machine Shop.

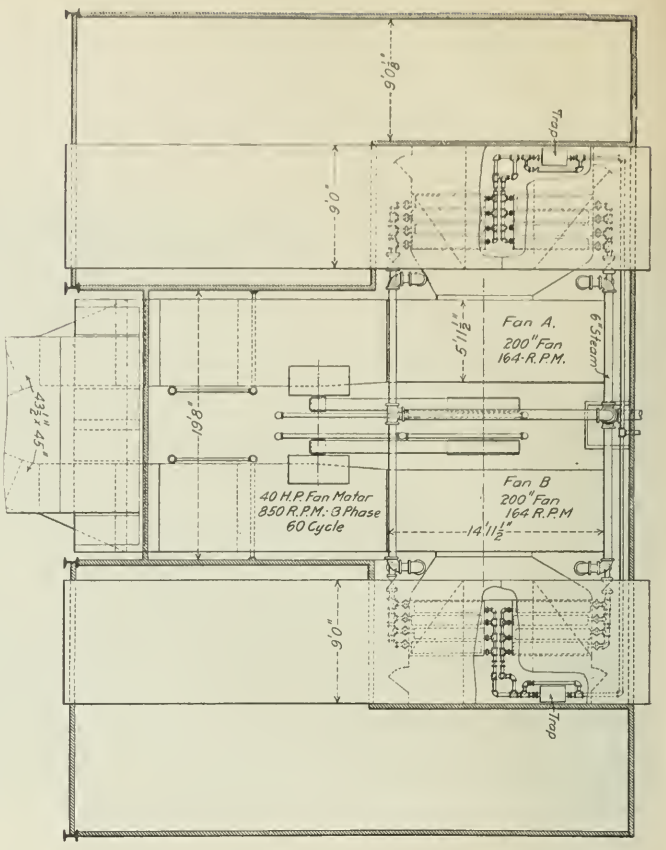
As soon as shop requirements indicate that it is needed another crane of the same capacity will be installed on the same runway. All of the cranes in the shop, as well as those over the casting platform and runways, were built by the Niles-Bement-Pond Company. Direct current at 220 volts is used for the operation of all cranes in the shops. At the north side of the small machine bay at the center of the building is a projection 60 ft. long by 40 ft. wide containing the toilets, lavatories, lockers and fans for heating the building. The hot blast system of heating employs two immense fans 120 in. in diameter, each driven by a 40 h. p. electric motor. The fans were supplied by the Bicalky Fan Company, Buffalo, N. Y., and the cast iron radiating units are Vents radiators made by the American Radiator Company. Under normal conditions sufficient heat will be obtained from the exhaust system, though provision is made at the power house for a live steam supply when necessary.

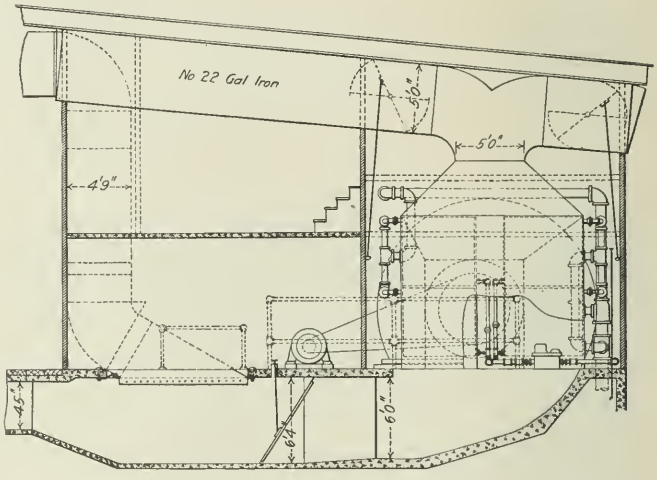
Located at different places in the shop are 6 combination urinals and drinking water fountains built of slate. The end doors of the shop have a vertical lift and are balanced, their movement being controlled by pneumatic cylinders. Most of the machine tools are driven direct by alternating current motors; the cranes and a few of the tools by direct current motors; and groups of small tools, including those in the tool room, by shafting. There are six groups of these tools and all of the shafting is 3 in. in diameter, making a uniform size for the couplings, hangers and pulley bore.

The location of tools in the machine shop is plainly shown on the large plan, which also indicates the kind of motors and the various groups of tools, including those driven by shafting and those intended for special work.

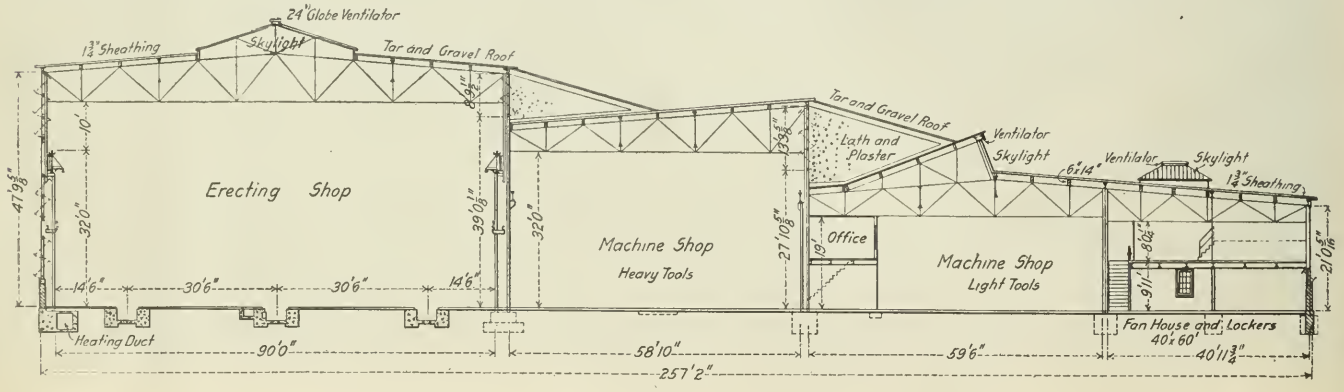
POWER HOUSE.

The east building of the group is the power house, a building thoroughly modern in every respect. The structure is of brick with a concrete roof, water-proofed with a 5-ply felt, pitch and gravel covering. Special attention has been given to the economical handling of coal and ashes, the former being handled by an inclined belt conveyor from the usual depressed track hopper to concrete bunkers situated in front of and above the boilers. This conveyor was supplied by the Stephens Adamson Manufacturing Company, Aurora, Ill. Ashes are elevated from the ash tunnel beneath the boilers to an overhead bin by means of a skip hoist operated by a motor. The boiler room is equipped with four 400-h. p. Stirling boilers, furnished by the Babcock & Wilcox Company and arranged in two batteries. Space is also provided for the installation of two additional 400-h. p. units. The boilers are equipped with the improved Green chain grate stokers. Other boiler room equipment consists of two Blake pot valve 14 in. x 8 in. x 12 in. outside end packed plunger type duplex boiler feed pumps and a 3,000-h. p. Stillwell feed water heater located on a platform above the boiler feed pumps. The chimney is made of reinforced concrete 200 ft. high and 9 ft. in diameter at the top, built by the General Concrete Construction Company. A Locke damper regulator is installed to control the draft.

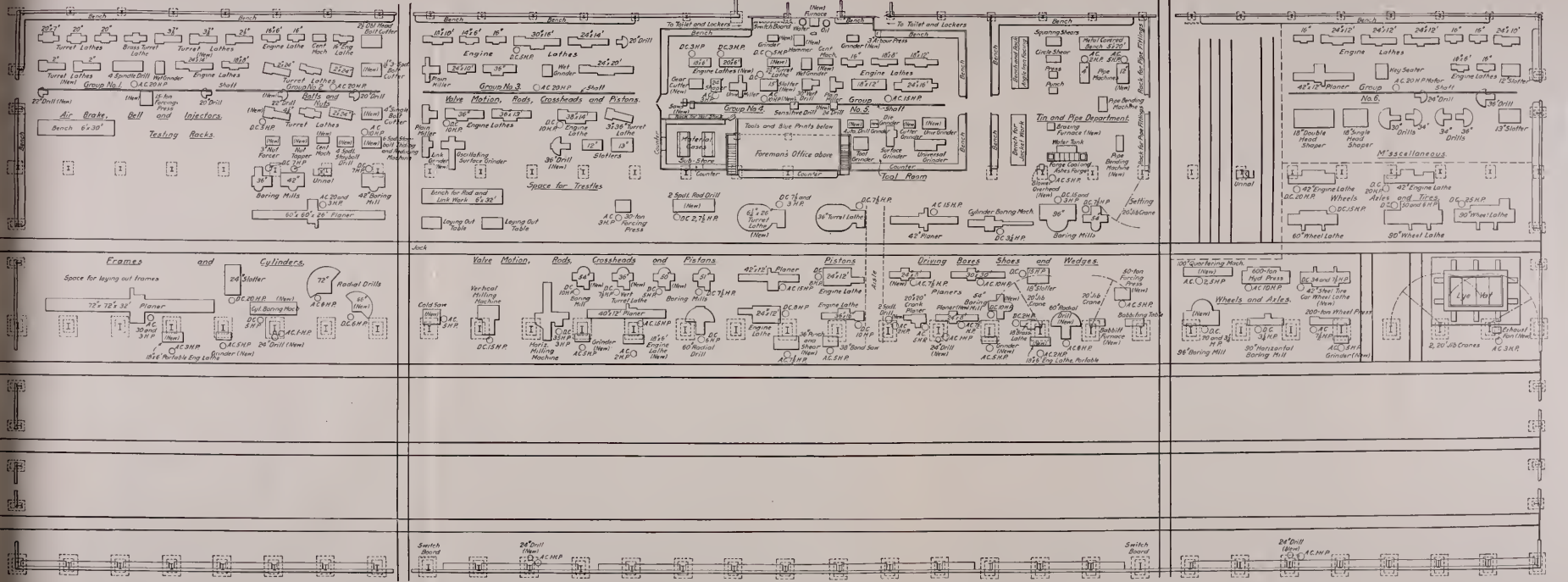




Arrangement of the Fan Room for the Heating System of the Machine and Erecting Shop.



Cross-section Through the Erecting and Machine Shop Building.



ARRANGEMENT OF MACHINE TOOLS IN THE CHICAGO, BURLINGTON & QUINCY LOCOMOTIVE REPAIR SHOPS AT HAVELOCK, NEB.

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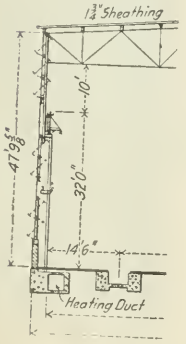
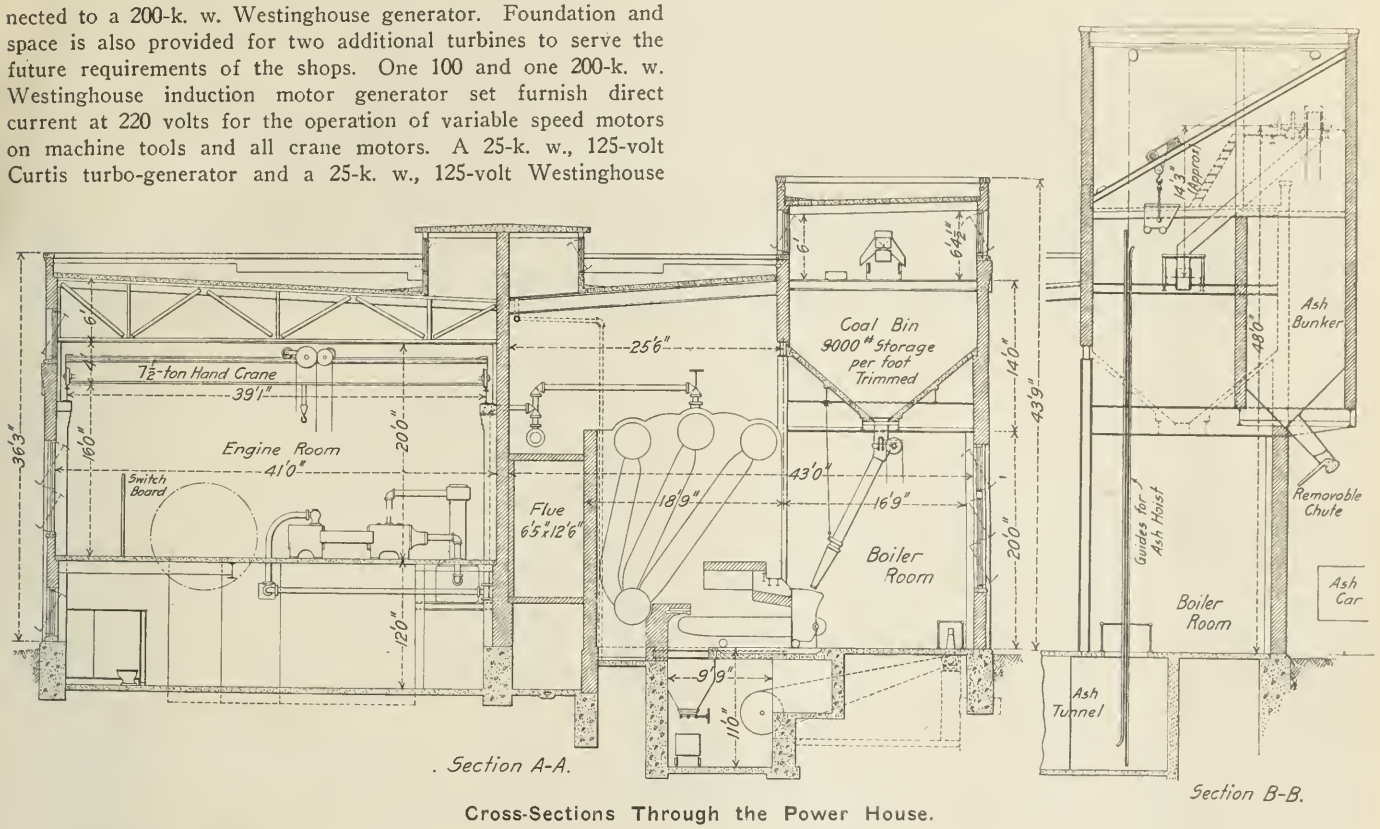
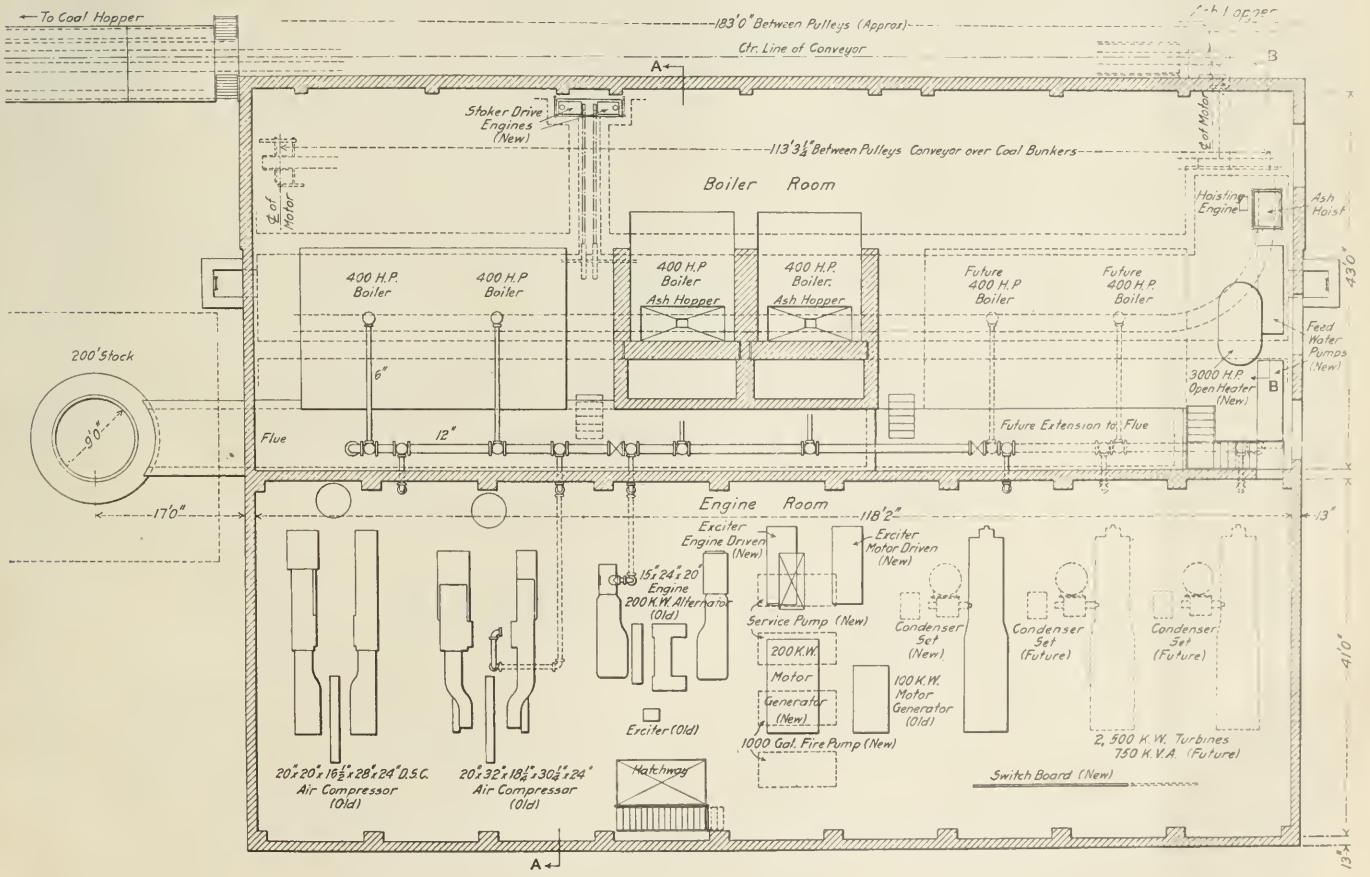


Three-phase, 60-cycle, alternating current at 440 volts is generated for lighting and the operation of all constant speed motors throughout the plant. The current is supplied by one 750 kilo volt ampere Westinghouse Parsons turbine and a 300-h. p. 15 in. x 24 in. x 20 in. Erie Ball cross compound engine direct connected to a 200-k. w. Westinghouse generator. Foundation and space is also provided for two additional turbines to serve the future requirements of the shops. One 100 and one 200-k. w. Westinghouse induction motor generator set furnish direct current at 220 volts for the operation of variable speed motors on machine tools and all crane motors. A 25-k. w., 125-volt Curtis turbo-generator and a 25-k. w., 125-volt Westinghouse motor generator set are provided for exciting and auxiliary lighting purposes. The equipment for compressed air consists of an Ingersoll-Sergeant cross compound, two-stage, 20 in. x 32 in. x 18¼ in. x 30¼ in. x 24 in., class G air compressor having a capacity of 2,100 cu. ft. of free air per minute, and a Franklin



Cross-Sections Through the Power House.



Plan of Power House, Showing Arrangement of the Apparatus.

duplex 20 in. x 20 in. x 16½ in. x 28 in. x 24 in., two-stage compressor of 2,000 cu. ft. capacity. These are part of the old power plant equipment. Located in the basement of the engine room are two 16 in. x 14 in. x 18 in. Warren duplex service and fire pumps. A 5¼ in. x 4¾ in. x 5 in. Blake duplex pump for furnishing drinking water to the various shop buildings and a Westinghouse-LeBlanc No. 4 motor-driven condenser for handling the steam from the 750-k. v. a. turbine are also provided.

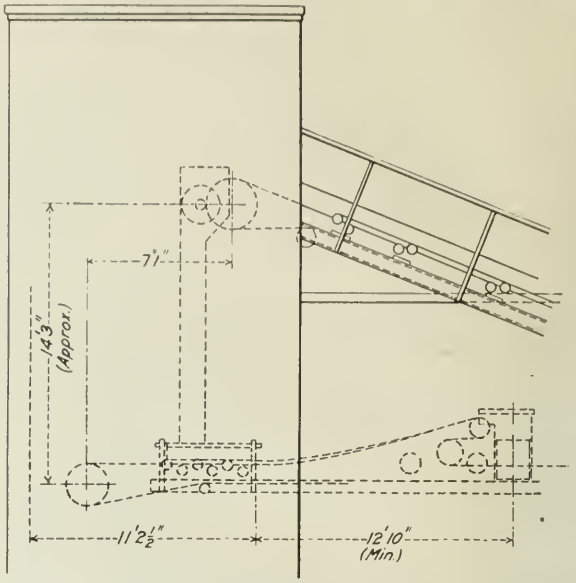
Adjacent to the power house is a large concrete reservoir 206 ft. x 85 ft., having a capacity of 1,000,000 gal., which contains the water supply for the shops. This reservoir is also used for cooling purposes, the discharge from the turbine condenser being sprayed through Koerting nozzles. An auxiliary reservoir furnishes the supply of drinking water, and is so arranged that the excess overflows into the main reservoir.

All piping between the power house and the various buildings is carried in concrete tunnels, the larger sections of which have the bottoms, sides and tops cast solid. Where the space required for piping is not large the tunnels are in the nature of conduits with removable concrete slab tops. The power transmission wiring is entirely overhead construction, being carried on steel towers and wood poles.

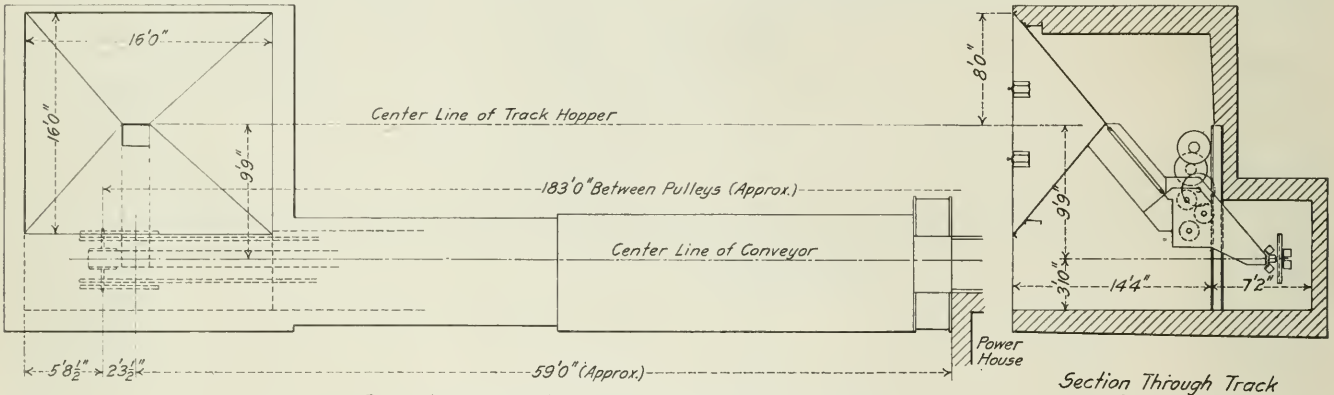
STOREHOUSE.

This building, which is intended to be the main distributing center for material used on the Western grand division, is of slow burning mill construction with brick walls, and is one of the largest railway store buildings in the country, being 500 ft. long by 80 ft. wide and three stories high. Surrounding the building on three sides is a platform 16 ft. wide to facilitate the handling of material. One hundred feet of the first and second floors of the west end of the building is reserved for office use. On the first floor offices are provided for the superintendent of shops and the storekeeper, and on the second are located the stationer, the medical examiner with an emergency hospital fully equipped, and the telephone exchange. There is also space for the apprentice school and a meeting room. The offices are all finished in yellow pine, varnished, and have plastered walls. On the first floor are also located the cases for holding the material handled in largest quantities and the receiving and shipping rooms. The stationer's stock room and material cases for handling small stock are on the second floor, while all material in original packages which is not worked over in the storehouse, or is of bulky nature, is stored on the third floor. The material cases are arranged in three rows.

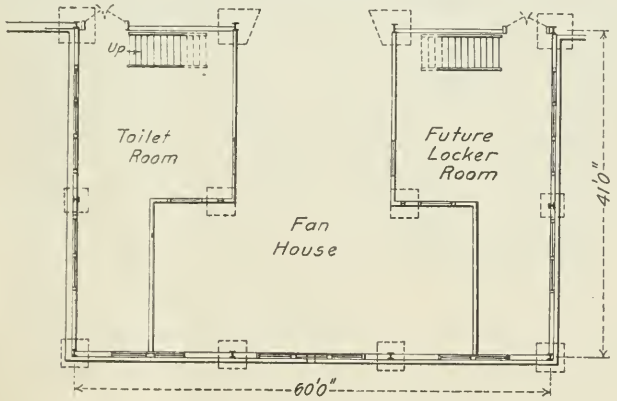
An interesting fact regarding the design of the store building is that a form of material case was first adopted and the window spacing arranged to give a maximum of light between cases.

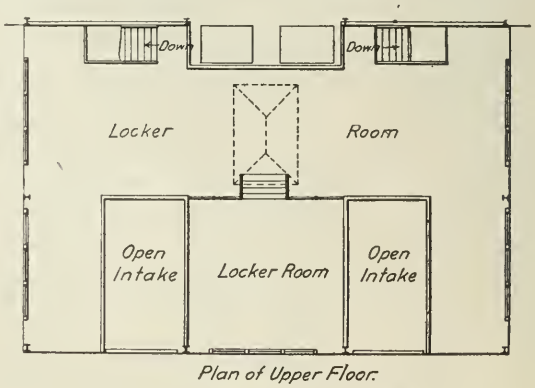


Elevation Showing Relation of Conveyors.



Coal Hopper West of the Power House.





Plan of the Lower and Upper Floors of the Addition to the Machine Shop Containing the Fan and Locker Rooms.

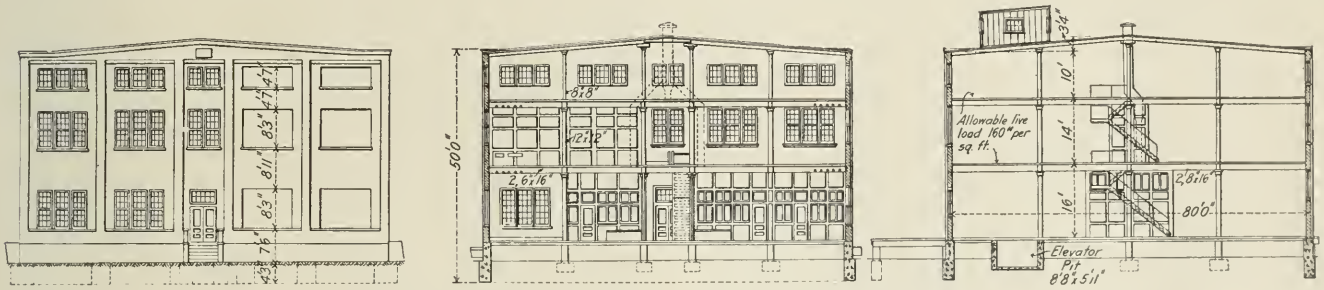


Storehouse, Havelock Shops, Chicago, Burlington & Quincy.

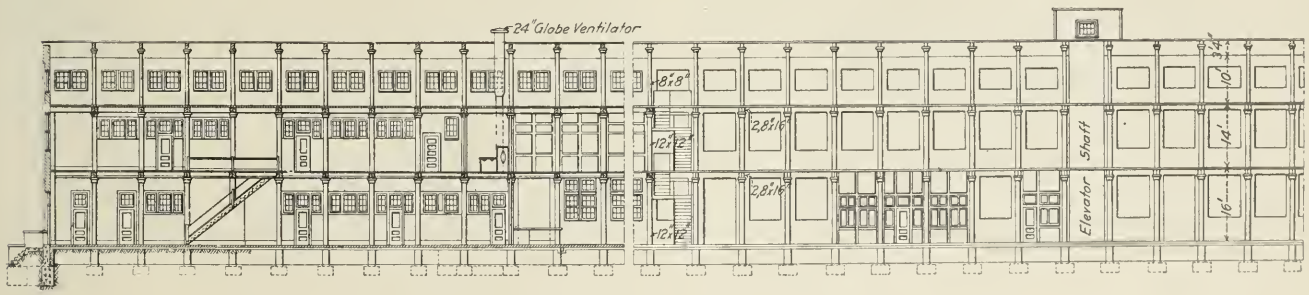
The material cases are 5 ft. wide at the bottom and are separated by a space of the same width. This arrangement gives a case spacing of 10 ft. center to center and 7 ft. of window between two adjacent cases. The office portion of the building is heated by direct radiation, while the storeroom is warmed by an indirect system having duplicate fans, motor-driven, which induce the air through banks of American Radiator Company "Vento" cast iron heating units using exhaust steam from the power house. Two motor-driven elevators are installed in the building, one being located in the receiving room and the other in the shipping room. The building is lighted throughout by incandescent lamps with all wiring in conduit.

CASTING PLATFORM.

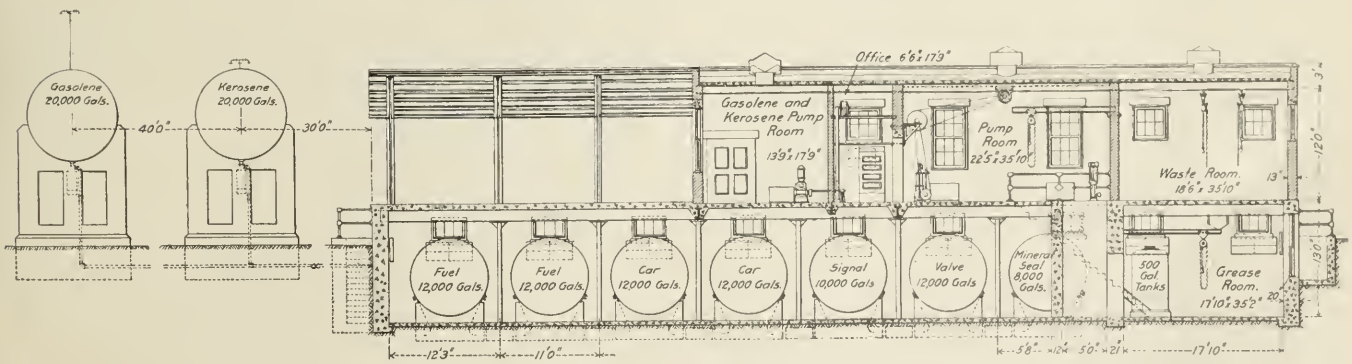
Adjacent to the erecting and machine shop, and separated from the material platform along the north side of the storehouse by track clearance, is a casting platform 518 ft. long by 60 ft. wide. Over this platform is a crane runway with a 10-ton, 59-ft. span girder crane which is arranged to serve the track along the north side of the platform and deliver material to a point underneath, where it may be handled by the yard crane for distribution to all



End Elevation and Sections Through the Storehouse.



Longitudinal Section Through the Storehouse.

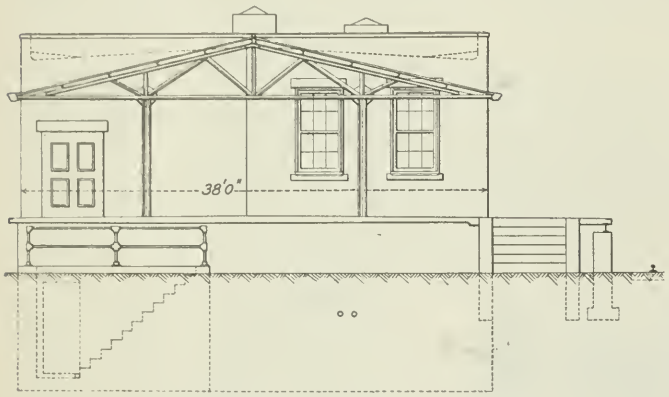


Longitudinal Section Through the Oil House.

shops. This crane is provided with a large magnet for lifting heavy iron and steel pieces.

OIL HOUSE.

West of the erecting shop and storehouse, and at a distance of 220 ft. from both buildings, is the oil house. This structure, which is built entirely of concrete below the platform line, has side walls of brick and a roof of concrete, water-proofed with a 5-ply pitch felt and a gravel covering. Special attention has been given to the fire risk in order to make the building entirely fireproof, and no combustible material has been used in its construction. Tanks for the storage of the various oils with the exception of kerosene and gasolene are located in the basement of the building and under the platform. Kerosene and gasolene are stored outside in two elevated tanks, each having a capacity 20,000 gal. These oils are handled to the storage tanks from the cars by motor-driven power pumps located in a separate compartment on the west side of the building. From the tanks kerosene and gasolene are distributed and barrels are filled by gravity. For handling oils stored in the tanks located in the



End Elevation of the Oil House.

basement and used in considerable quantities five Gilbert & Barker power pumps, each having a capacity of 40 gal. per minute, are provided. Ten Bowser self-measuring pumps are also located in the pump room for handling as many different kinds of oils in small quantities. The power pumps are driven from line shafting run by a 3-h. p. 440-volt Westinghouse alternating current motor. A compartment 18 ft. by 36 ft. is provided for the storage of baled waste. For the easy handling of this material an overhead trolley has been installed.

The entire work of construction is under the direct supervision of F. H. Clark, general superintendent of motive power of the Burlington system, to whom we are indebted for the foregoing details. All engineering work, including the design and construction of buildings, is being handled by Westinghouse, Church, Kerr & Company, working in conjunction with Thomas Roope, superintendent of motive power of the lines west of the Missouri river, and Willard Doud, shop engineer of the Burlington system.

FOREIGN RAILWAY NOTES.

The *Frankfurter Zeitung* reports that China has consented to the plan of constructing a railway from Baikal lake on the Trans-Siberian Railway, through the Gobi desert to Pekin direct. It is believed that Russia will build from Baikal lake to Kiatchka, and that China will complete the remaining 900 miles. When this section has been constructed, the Trans-Siberian Railway will be shortened by over 600 miles.

The federal railways in the State of Bahia, Brazil, have been leased to a syndicate of Paris bankers, and extensions of the lines have been provided for. The Frenchmen secured control of 1,875 miles of railway. The cost of the extensions is estimated at $35,000,000, for which federal bonds will be issued.

CLEANING PASSENGER EQUIPMENT AT TERMINALS.

BY J. H. PITARD.

Master Painter, Mobile & Ohio, Whistler, Ala.

The question of the best and most economical method of cleaning passenger equipment at terminals has seemingly narrowed to the question of the chemical composition and comparative merits of the various cleaning compounds, if we may judge from the expressions of some whose articles appear in the trade journals. Originally, the purpose of terminal cleaning was to maintain passenger equipment in a neat and sanitary condition, but in recent years its scope has greatly broadened, and it has become an auxiliary of the paint department in prolonging the life of paint and varnish, thus extending the term of service of the equipment. Its success, however, in this particular depends largely on the coöperation of the department that builds the car, the department that paints it, the purchasing department that provides the paint, varnish and cleaning compounds, the terminal cleaning department that cleans it, and the transportation department whose disposition of the equipment has an important bearing on its future appearance and durability.

A neatly kept passenger equipment appeals to the stockholder and the traveling public; it is a traveling advertisement for the company, and if properly cleaned, greatly extends the term of service by affording a measure of protection to the paint and varnish. Terminal cleaning is a feature of railway economy which when considered in its various relations to successful railway operation is of greater importance than would appear at first sight, and is second only in importance to the painting department, under whose jurisdiction it rightly belongs. Notwithstanding its importance, however, it is in some instances the most neglected of any of the departments of railway work, the work being intrusted to careless or inexperienced workmen without proper supervision or instruction.

As stated above, successful terminal cleaning involves several departments, first of which are those of design and construction; these should aim to produce a plain surface—a surface free of carvings, sharp corners, ledges or any protuberances that offer a lodging or hiding place for water, dirt and microbes. The car should have a smooth level surface on which a smooth job of painting may be done, as this is essential to proper future cleaning; the smoother the surface, the easier the cleaning. The painting should be done with a view to withstanding the elements and the abrasive effects of cleaning compounds. It should have a good surface and a moderately thick body of varnish in order that the surface may not become threadbare under the effects of repeated terminal cleaning. The varnish should be thoroughly dry before the car is placed in service. If it is exposed to the sun prematurely, it becomes soft and absorbs the dirt, and probably blisters or cracks; perfect cleaning under such conditions is impossible.

Where the selection of paint materials and terminal compounds devolves on the purchasing department, it is a menace to the successful and uninterrupted progress of a terminal cleaning system on account of the lack of practical knowledge of suitable material for the work in question. A poor cleaner will destroy a good varnish, and a good cleaner will sometimes produce unsatisfactory results when used over a poor varnish. Either combination would be unsatisfactory in the matter of maintaining an up-to-date terminal cleaning system. Where such matters come within the scope of the mechanical department, and all materials, both varnishes and cleaners, are subjected to practical tests, and their strong or weak points are demonstrated previous to their adoption, the results should be, and usually are, satisfactory.

Much depends also on the handling or disposition of the equipment by the transportation department after it enters service in order that the regular routine of terminal cleaning may not be interrupted. Passenger cars when not required for immediate service, are occasionally placed on a siding, broadside

to the sun, and thus neglected until the paint and varnish are badly affected by the elements, when they might have had the protection of the car shed. At other times cars are held indefinitely at points on the system where terminal cleaning is not performed, and they are sometimes cleaned at one end of the line with a standard cleaner, and at the opposite end with a cleaner that is an unknown quantity. If injury to the varnish is the result, it is a difficult matter to ascertain which of the cleaners is responsible for it. These are some of the obstacles often met with in terminal cleaning, for which the transportation department is largely responsible, and which might be obviated by an established system of terminal cleaning, supported by the mutual coöperation of all the departments concerned.

Ideal conditions favorable to the terminal cleaning department are perhaps seldom to be found; therefore conditions as they exist govern the operations of this department. No small degree of skill or practical experience is necessary in order that it may be able to adjust itself to varying conditions as they arise, and while no iron-clad rules can be formulated that will exactly fit every case, there are certain rules or customs which may be generally observed to advantage in conducting the work of this department. In addition to maintaining the passenger equipment in a cleanly condition, particular attention should be given to supplementing the work of the painting department, as far as possible, in combatting the effects of the elements on paint and varnish. While oxygen (of which water, H_2O, is partly composed), is essential to organic life, it is destructive to all inorganic substances, and is therefore an enemy to paint and varnish. For this reason water as a cleaning agent of paint and varnish should be avoided as far as conditions will permit. When water is used for this purpose it is simply supplementing the destructive effects of rain to which a pasenger car is constantly exposed while in service. The best cleaners are those that contain no water in their composition, and are most effective in removing dirt and least destructive to paint and varnish; neither should they have affinity for oxygen, nor contain coarse abrasive powder which, while it facilitates the dislodgment of dirt, gradually but surely destroys the varnish.

As to the frequency and best method of applying such cleaners, the conditions of service will determine; cars having a long run, and possibly through tunnels, will require more frequent application than those having a short run and where other conditions are more favorable. But in no case should a cleaner containing abrasive substance be used as long as the surface can be kept presentable by simply wiping with dry waste. During rainy weather a thin film of oil on the surface affords much protection to the varnish. This may be effected by an occasional oiling with the oil contained in the cleaner, minus the abrasive substance, and lightly wiping with cotton waste. It is the custom on some roads to clean the surface every 30 days with an oil cleaner and alternate with water cleaning. This method defeats the object aimed at in adopting an oil cleaner in lieu of water in order to counteract the destructive effects of water on paint and varnish.

In order that terminal cleaning may be made effective, and become an auxiliary of the paint department in extending the life of paint and varnish, and thereby extending the term of service of the equipment, the terminal cleaning department should by all means be placed under the supervision of the paint department, and a practical man, familiar with the nature of paint and varnish, should be at its head. Exhaustive tests of the various cleaners should be made and a record kept for future reference. A regular routine of cleaning should be established and rigidly enforced; its effect on paint and varnish should be closely observed. If the results are not such as to add to the life of the paint and varnish and extend its term of service, it is evidence that improvement of the system is needed and should be made without delay.

The Swedish State Railways have recently put on third-class sleeping cars for the first time.

FOUR-CYLINDER BALANCED SIMPLE LOCOMOTIVES, CHICAGO, ROCK ISLAND AND PACIFIC.*

In November, 1909, two Atlantic type locomotives, having four simple cylinders arranged on the balanced principle and using superheated steam, were placed in passenger service on the Chicago, Rock Island & Pacific. This road had a number of simple engines equipped with superheaters, and also balanced compound locomotives, both of which classes had proved to have important advantages. Economy in fuel and water consumption and increased hauling capacity had resulted from the use of superheated steam; and easier riding qualities and greater ease on track and bridges from the application of the balanced feature. In order, therefore, to secure in one engine the advantages of both classes of locomotives it was decided to combine the important features of each in a four-cylinder balanced simple locomotive using superheated steam.

A comparison of the dynamic wheel loads at high speeds of the design here illustrated with those of an ordinary design of two-cylinder Atlantic type locomotive brings out forcibly the advantage of the balanced engine in its less injurious effect on the track. Assuming a two-cylinder Atlantic type locomotive with driving wheels 79 ins. in diameter and a stroke of piston of 26 ins.; at 85 miles per hour, a vertical disturbance of 22,760 pounds per axle is caused by the excess weight in the counterbalances required to balance the reciprocating parts. A normal axle load of 52,900 is thus increased to 75,660 pounds and decreased to 30,140 pounds with each revolution of the driving wheels, giving an increase of dynamic over static weights of 43 per cent. Considering each driving wheel separately, there is a vertical disturbance of 16,100 pounds; or a normal wheel loading of 26,450 pounds is increased to 42,550 pounds and decreased to 10,350 pounds during each revolution of the driving wheels, a difference of 61 per cent.

Considering the balanced simple locomotive with 73-in. driving wheels and a 26-in. stroke; at 85 miles per hour, the vertical disturbance per axle is only 975 pounds and the normal axle loads of 58,000 pounds are increased to 58,975 and decreased to 57,025 pounds during each revolution, giving a difference of only 1.6 per cent. Taking the individual wheel load of 29,000 pounds, the vertical disturbance is 6,780 pounds, making the maximum 35,780 and the minimum 22,220 pounds, a difference of 23 per cent. of the normal. As the centers of gravity of the equivalent counterbalances for the reciprocating parts of the right and left wheels are 187 degrees apart, they approximately counterbalance each other when each axle is considered as a whole; while the vertical disturbances per wheel are approximately only one-third as great as in the two-cylinder engine.

SERVICE TESTS.

The engines are in service on the Illinois division, between Chicago and Rock Island, a distance of 181.1 miles; and are hauling some of the fastest and most important passenger trains. All the grades are short, and the maximum is only 40 feet to the mile, or 76 per cent.; there are long stretches of practically level track. None of the curves are sharp, the worst being 4 deg 30 min.

As the passenger power on this division includes a number of two-cylinder simple and four-cylinder balanced compound Atlantic type locomotives, exceptional opportunity has been afforded to make comparison between the three classes working under identical conditions with a view to determining the relative cost of operation and maintenance as well as reliability of service. Full advantage of this opportunity has been taken by the Rock Island officials and careful records have been kept to permit of just comparison.

A series of comparative tests, covering a period of two weeks from December 29, 1909, to January 9, 1910, was made to determine the relative coal consumption of the three classes. The

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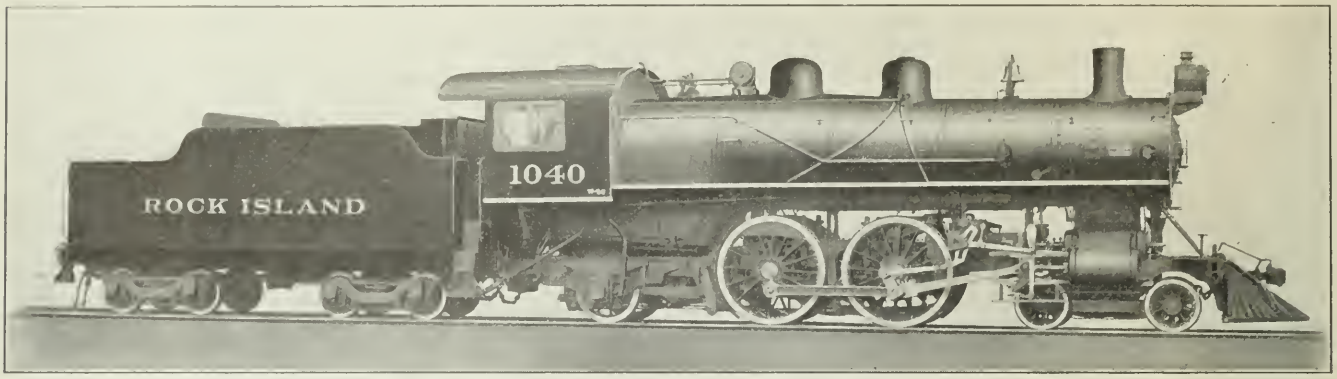
* Abstract of Bulletin No. 1007, American Locomotive Company, New York.

locomotives tested were 1016, a two-cylinder single expansion engine; 1045, a four-cylinder balanced compound engine; and 1041, a four-cylinder balanced simple locomotive. In each case, the tests were made with regular trains, Nos. 7 and 8, west bound and east bound, respectively, between Chicago and Rock Island. The results of six trips for each locomotive, three trips in each direction, were recorded. With the exception of one trip of locomotive 1045, east bound from Rock Island to Chicago, on which the train was composed of eight cars, the train on every trip consisted of seven cars and the tonnage hauled was approximately the same in all the trials. As the tests were conducted during very severe weather, the results obtained represent the performance of each locomotive under the worst conditions, and, consequently, bring out most clearly the relative efficiency with respect to fuel consumption of the three classes.

A summary of the average results of the test is given in the accompanying table, which requires little explanation. It shows that locomotive 1041 used, on the average, 13.3 per cent. less water per trip than the four-cylinder balanced compound, and 11.7 per cent. less than the two-cylinder simple locomotive. Calculated on the basis of the equivalent of water from and at 212 deg. Fahr., the table shows a saving in favor of the four-cylinder balanced simple locomotive with superheater of 13.2 per cent., as compared with locomotive 1045, and 11.8 per cent. as compared with locomotive 1016. On the ton-mile basis, using the tonnage behind the tender or the paying load, there is a difference in favor of the same engine of 12.4 and 12.6 per cent. water, as compared, respectively, with the single expansion and compound engines.

The results also indicate considerable economy in fuel consumption for the superheater locomotive; on the paying ton-mile basis the saving was 6.7 per cent. over the balanced compound and 16.9 per cent. over the two-cylinder locomotive. There was little difference in the average quality of the coal used on the three locomotives, though that given to locomotive 1041 was a little lower in percentage of combustible material than the coal used by its competitors.

Although a comparison of the average results of all the tests probably indicates truly the advantages of the four-cylinder balanced simple superheater locomotive under actual operating conditions, possibly more accurate conclusions as to the efficiency of the three designs could have been drawn, had the same crew



Four-Cylinder Balanced Simple Atlantic Type Locomotive with Superheater; Chicago, Rock Island & Pacific.

COMPARATIVE TEST, SHOWING RELATIVE FUEL CONSUMPTION OF A 2-CYLINDER SIMPLE, A 4-CYLINDER BALANCED COMPOUND AND A 4-CYLINDER BALANCED SIMPLE SUPERHEATER LOCOMOTIVE.

DECEMBER 29, 1909, TO JANUARY 9, 1910.

	Summary. Total Average of Tests.			Saving in per cent. of Locomotive 1041 over	
Engine	1016	1045	1041	1016	1045
Type	4-4-2, 2-cyl. Simple.	4-4-2, 4-cyl. Bal. Comp.	4-4-2, 4-cyl. Bal. Simple Superheater.	....	....
Total weight (pounds)	180,000	199,400	202,000	....	....
Weight on driving wheels (pounds)	102,000	105,540	116,000	....	....
Total square feet of heating surface	2,825.5	3,209	2,715	....	....
Total square feet of grate area	44.86	50.40	42.8	....	....
Working pressure (pounds per square inch)	185	210	170	....	....
Cylinders (diameter and stroke)	21 in. x 26 in.	15 & 25 in. x 26 in.	17½ & 17½ in. x 26 in.	....	....
Tractive effort (pounds)	24,700	22,500	29,600	....	....
Mileage since No. 1 or 2 repairs	24,623	34,324	12,680	....	....
Distance between terminals	181.1	181.1	181.1	....	....
Total time taken between terminals	5H. 5M. 56S.	5H. 7M.	5H. 58M. 45S.	....	....
Actual running time between terminals	4H. 32M. 20S.	4H. 46M. 36S.	4H. 34M. 13S.	....	....
Number of stops	6.33	7.15	14.6	....	....
Miles per hour (based on actual running time)	39.96	37.98	39.63	....	....
Number of cars in train	7	7.165	7	....	....
Weight of cars (pounds)	802,480	812,851	808,114	....	....
Average temperature of feed water (degrees Fahr.)	42.3	42.18	42.16	....	....
Average steam pressure by gage (pounds per square inch)	177.3	195.4	170.5	....	....
Total weight of water fed to boiler per trip (pounds)	112,818.7	114,264	99,563.9	11.7	13.3
Total weight of water fed to boiler per hour (pounds)	22,120	22,324	16,650	....	....
Factor of evaporation	1.2293	1.2317	1.2283	....	....
Equivalent water fed to boiler from and at 212 deg. (pounds)	138,694	140,738	122,294	11.8	13.2
*Equivalent water fed to boiler from and at 212 deg. per ton-mile (pounds)	1.907	1.911	1.670	12.4	12.6
Equivalent water fed to boiler from and at 212 deg. per lb. of coal used (pounds)	6.65	7.47	7.00	....	....
Equivalent water fed to boiler from and at 212 deg. per lb. of dry coal used (pounds)	7.07	7.77	7.47	....	....
Per cent. of moisture in coal	5.95	3.91	6.28	....	....
Per cent. of combustible in coal	84.47	84.36	83.81	....	....
Weight of coal as used (pounds)	20,852	18,832	17,465.8	16.2	7.2
*Weight of coal as used per ton-mile (pounds)	.2868	.2557	.2385	16.9	6.7
Weight of dry coal as used (pounds)	19,612	18,095	16,369	16.5	9.5
*Weight of dry coal as used per ton-mile (pounds)	.2696	.2456	.2236	17.1	9.0
Weight of combustible as used (pounds)	17,613	15,886	14,638	16.9	7.75
Weight of combustible as used per ton-mile (pounds)	.2422	.2157	.1999	17.5	7.3

NOTE.—Test made during severe weather with a range of temperature from 2.5 deg. F. to 36.5 deg. F., including heavy storms and numerous delays; water measured by gage stick through manhole and coal by actual weight.

*Based on tonnage behind tender, or paying load.

run the engine on all the tests, thereby eliminating the factor of efficiency of the engineer and fireman. The best runs from the standpoint of fuel consumption of both locomotive 1045 and 1041 were made with the same crew. Between these two runs there was a difference of 18.4 per cent. in favor of locomotive 1041 in the amount of coal consumed per paying ton-mile; while in the equivalent amount of water fed to the boiler from and at 212 deg. per paying ton-mile there was a saving of practically 14 per cent.

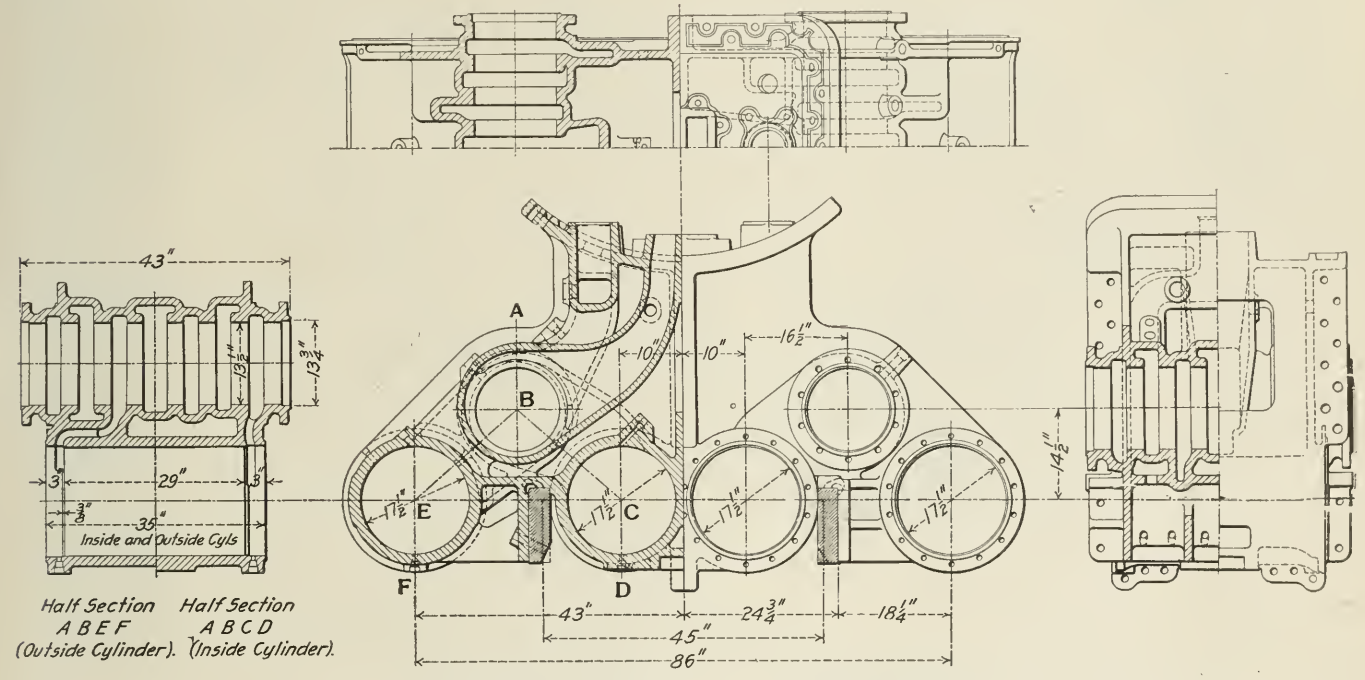
Comparison of the records of the cost of maintenance of the balanced simple locomotive with similar records covering the same period for the balanced compound and two-cylinder simple Atlantic type locomotives running on the same division shows that in the principal items of cost, outside of fuel and wages of the crew, such as running repairs, handling at roundhouse and lubrication, the expense per engine mile is practically the same for all three classes of locomotives. In the item of the cost of fuel the tests constitute convincing proof of the greater efficiency of the four-cylinder balanced superheater locomotive as compared with the two other classes.

sense exceptional for this class of locomotive, but are typical of their daily performance. The four-cylinder balanced simple Atlantic type locomotive has no difficulty in making practically the same schedule as the four-cylinder balanced compound and the two-cylinder simple Atlantic type locomotives with one and two more cars and two and six more stops respectively. The satisfactory performance of these locomotives viewed from every standpoint proves the merits of the characteristic features of the design, which are equally applicable to heavier classes of power adapted to meet the requirements of the most severe passenger service.

DESIGN.

The design, which was prepared by the American Locomotive Company, was carefully worked out with reference to the particular conditions of the service for which the engines were intended. Every detail was given close attention, and in its special features the design throughout follows the best precedents of European as well as American locomotive practice.

As will be seen from the illustrations, the four cylinders are arranged in accordance with the practice followed in the well-



Cylinders of the Balanced Simple Locomotive.

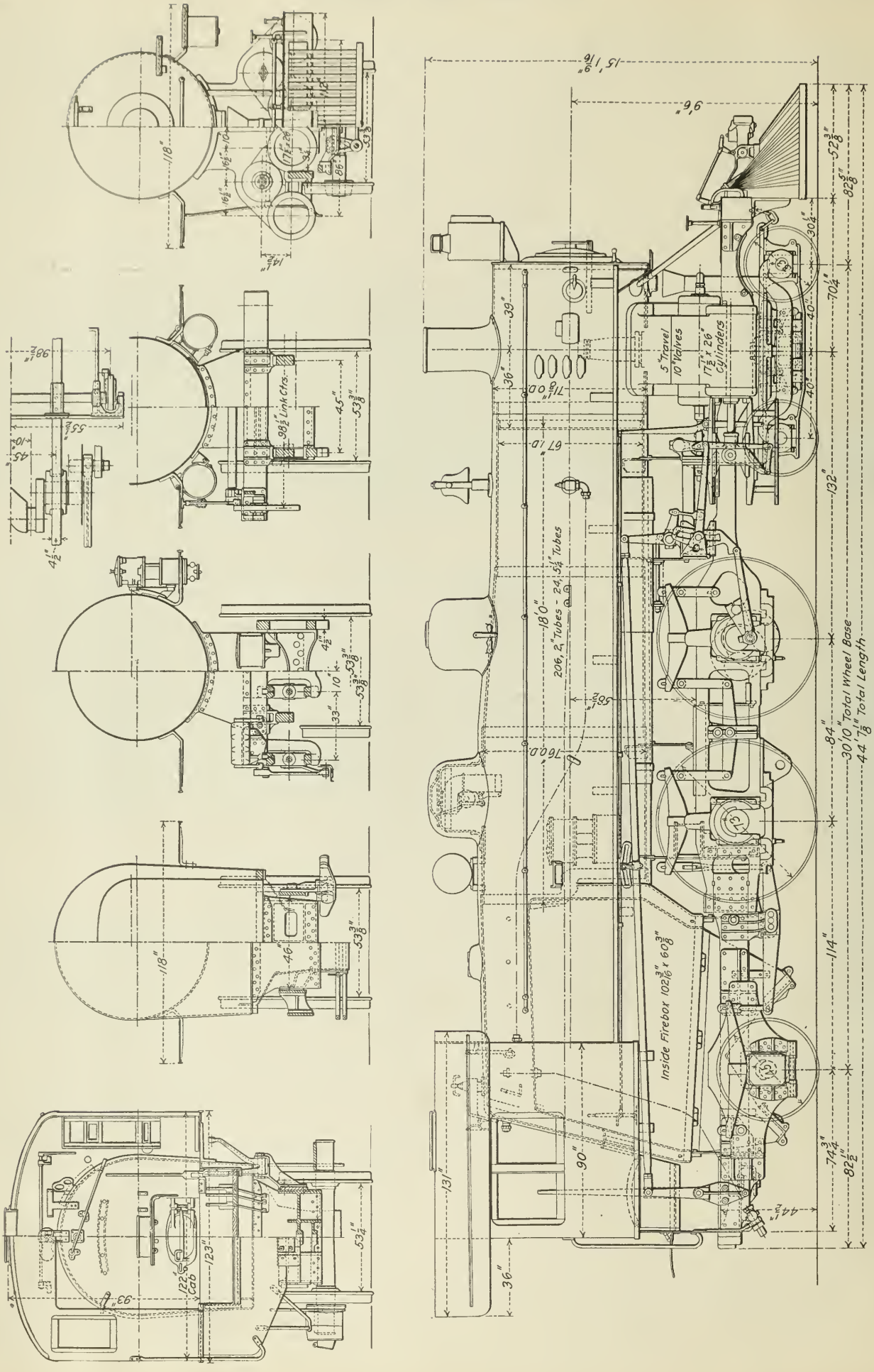
The comparative train record of these locomotives is equally as good as their fuel record. Each of the two locomotives has made a number of runs of particular merit and worthy of note because of fast speeds maintained. On June 30, 1910, locomotive 1040, with train No. 25, composed of five cars of an aggregate weight of 341.3 tons, made up 21 minutes in running from Bureau to Rock Island, a distance of 67 miles. That is, it cut down the regular schedule time by about 20 seconds per mile. The average speed on this run, including one stop, was 58.2 miles per hour. The 22.5 miles between Sheffield and Geneva were made in 19 minutes, or at an average speed of 71.3 miles per hour. The engineer driving the locomotive on this occasion stated that it was necessary to keep it eased off across the prairies, and that he had never in his long service seen a locomotive that could run so fast and do it so easily.

On March 23, 1910, locomotive 1041 made a notable trip with train No. 26, east bound, from Rock Island to Chicago, a distance of 181.1 miles. The train consisted of six cars, having an aggregate weight of 329 tons. Including six regular stops aggregating 38 minutes, the average speed maintained was 40.84 miles per hour. The highest speed attained on this trip was 56.75 miles per hour.

Though the two runs cited are noteworthy, they are in no known Von Borries balanced compound locomotive, all being set in the same transverse and horizontal planes. In order to obtain a satisfactory length of 84 ins. for the main rod, the cylinders are placed about 3 ft. further ahead of the front driving wheels than is the usual practice in locomotives of the 4-4-2 type of wheel arrangement. This change in the normal position of the cylinders was accomplished, however, with an increase of only 2 ft. in the length of the tubes.

The cylinders are in two castings, each with a half saddle. Each casting contains an inside and outside cylinder, with a common steam chest placed above and between them. All four cylinders are connected to the front pair of driving wheels, the main rods of the inside cylinders being connected to the cranked axle of those wheels.

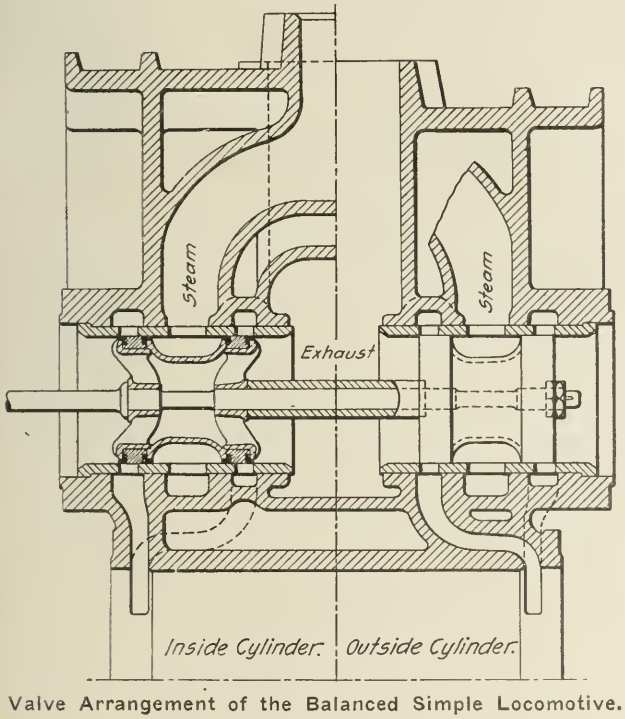
An efficient and simple valve motion, which involves no complications in the cylinder construction, is employed, and is shown in one of the illustrations. The two cylinders on each side are served by two 10-in. hollow piston valves mounted on a single stem and actuated by a simple arrangement of the Walschaert valve gear. Superheated steam is conveyed to the center of the portion of the common steam chest which each valve occupies by branches of the cored steam passage, which divides at a point a short distance from its connection with the steam pipe. The



Side Elevation and Cross-sections of Four-Cylinder Balanced Simple Locomotive; Chicago, Rock Island & Pacific.

inner ends of the two valves distribute the steam to the outside cylinder and the outer ends serve the inside cylinder. With this arrangement, the necessary admission of steam simultaneously to opposite ends of the two cylinders is secured without resort to crossed steam passages, or other complications of the cylinder construction, and with a simple design of valve having a minimum number of packing rings to keep in repair. The valve stem packing is subject only to exhaust pressure. As the effect of this arrangement is equivalent to that of an outside and inside admission valve for the outer and inner cylinder, respectively, the valve gear connected to the crosshead of the outside cylinder is accordingly arranged for an outside admission valve. The piston valve, which is of special design for use with superheated steam, is shown in one of the illustrations.

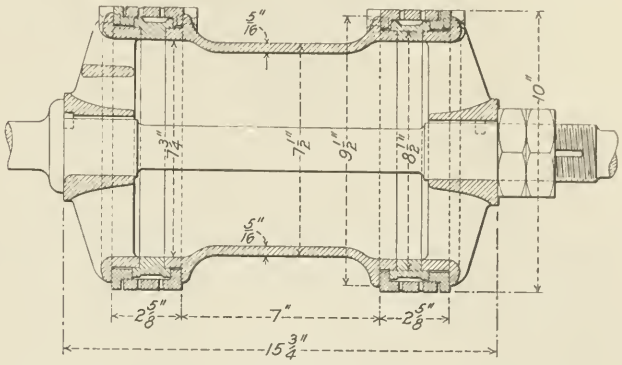
The Walschaert valve gear is a simple, compact and satisfactory design for this type of gear. The link is carried in a cast steel bracket bolted to the front of the yoke or cross tie, located a little ahead of the front driving wheels. A longitudinal bearer extending between this cross tie and the guide yoke furnishes support for the bearings of the reverse shaft, the forward extending arm of which is connected by means of a link to the radius bar. As the center line of the steam chest is 22¾ in. inside the vertical center of the link, a rocker arm is used to transmit the motion of the link to the valve. This rocker arm is carried in a bearing secured to the guide yoke, and its outer arm has a pin connection with the upper end of the combination lever. The inside arm of the rocker shaft is connected to the valve rod through the medium of a block, which works in a yoke in the



Valve Arrangement of the Balanced Simple Locomotive.

rod, the rear end of the valve rod being extended to slide in a guide bolted to the back of the guide yoke. An offset of ⅝ in. is made in the upper end of the combination lever in order to neutralize the effect of the angularity of the main rods on the valve events and secure as nearly equal cut-offs as it is possible to obtain in two cylinders connected at 180 degs. to each other and operated by two valves deriving their motion from a single valve gear.

The superheater is of the fire tube type with side headers. The frames on each side consist of a main frame of cast steel 4½ in. wide with a single front rail 3¼ in. in width cast integral with it, and a slabbed rear section spliced to the main frame immediately back of the rear driving wheel. There is also an outside supplementary frame which carries the trailing journal box and is connected to the inside frame through the medium of heavy steel spacing castings. A strong and substantial system of frame bracing is employed. All the cross ties are of cast steel and have ample bearing on the frames. In addition to the foot plate at the rear of the frames, there is a cross tie between them just ahead of the front end of the firebox; another back of the rear pedestals; one between the front and rear driving wheels, having a bearing of 41½ in. on the upper rails of the frames, and



Piston Valve of the Balanced Simple Locomotive.

one spanning the lower rails of the frames immediately back of the leading pedestals. The frames are further braced together by the cross tie ahead of the front driving wheels, which furnishes the support to the link bracket, and by the heavy guide yoke. The boiler is braced to the frames at all of these points by steel plates. The general dimensions and data are as follows:

General Data.	
Type	4-4-2
Fuel	Bit. coal
Tractive power	29,600 lbs.
Weight in working order	202,000 lbs.
Weight on drivers	116,000 lbs.
Weight on leading truck	49,000 lbs.
Weight on trailing truck	37,000 lbs.
Weight of engine and tender in working order	351,900 lbs.
Wheel base, driving	7 ft. 0 in.
Wheel base, total	30 ft. 10 in.
Wheel base, engine and tender	62 ft. 8 in.
Cylinders.	
Kind	Bal. simple
Diameter	17½ in.
Stroke of piston	26 in.
Valves.	
Kind	Piston
Diameter	10 in.
Travel	5 in.
Wheels.	
Driving, diameter over tire	73 in.
Driving, journals	11 x 11 in.
Engine truck, diameter	33 in.
Engine truck, journals	6 x 12 in.
Trailing truck, diameter	45 in.
Trailing truck, journals	8 x 14 in.
Boiler.	
Working pressure	170 lbs.
Outside diameter of first ring	68⅛ in.
Firebox, width and length	60⅛ x 102 3/16 in.
Tubes, number and diameter	206, 2 in., and 24, 5¼ in.
Tubes, length	18 ft.
Heating surface, tubes	2,521 sq. ft.
Heating surface, firebox	194.5 sq. ft.
Heating surface, total	2,715.5 sq. ft.
Heating surface, superheater	479 sq. ft.
Grate area	42.8 sq. ft.
Center boiler above rail	9 ft. 6 in.
Top of smokestack above rail	15 ft. 1 9/16 in.
Tender.	
Frame	Cast steel
Wheels, diameter	33 in.
Journals	5½ x 10 in.
Water capacity	7,500 gal.
Coal capacity	13 tons

A line of railway is being constructed in Brazil at a cost of $7,738,000, from Oruro, on the Antofagasta-Oruro-La Paz line, to Cochamba, which will tap a region rich in agricultural produce, and which only requires improved means of transport to develop great industries. The first 32 miles of this line will be opened for traffic shortly.

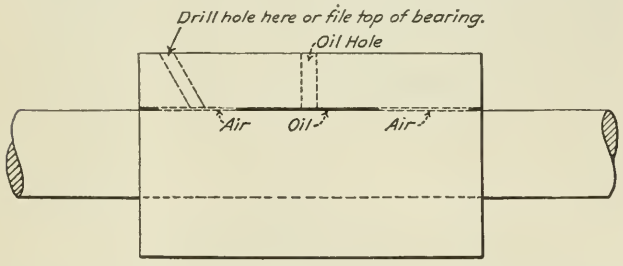
Care and Selection of Shop Equipment.

SELECTION AND USE OF MACHINE TOOLS.

BY W. P. SPADE.
Corning, N. Y.

Improvements in Turret Lathe Construction.—In the brass room a large number of jobs of threading and box tool forming are now being done with tool post tools. Why? Because we do not have a turret lathe catalogued by a single tool manufacturer in this country on which the turret will swing a 12-in. collapsible head or box tool holder over the turret slide. I have reference to a head such as made by the Geometric Tool Company; as near as memory serves me one of its 11 in. outside diameter heads will cut up to about 5 in. diameter. After being called on to write the specifications for a tool equipment for a large concern I took this question up with a manufacturer's agent and had a 20-in. Monitor lathe raised so that the turret would swing a 12-in. head over the turret slide. It greatly increased the value of the lathe with a small increase in cost.

Lubrication.—Gear box drives that make possible a quick change of speeds are used extensively. This type of drive requires several more bearings than the cone drive and since, as a rule, they fit very close there is room for but a light film of oil, and the oil grooves are often too small. On starting a new machine I keep it well lubricated with the hope that none of the bearings will stick, but there is usually some trouble. I immediately tear the machine down and enlarge the oil holes and grooves for the following reason: The shaft is a neat fit in the bearing with only .001 in. or .002 in. clearance. The oil flows only a short distance either side of the oil hole and is prevented from going further by the air which is compressed ahead of it and which can not escape because of the thin film



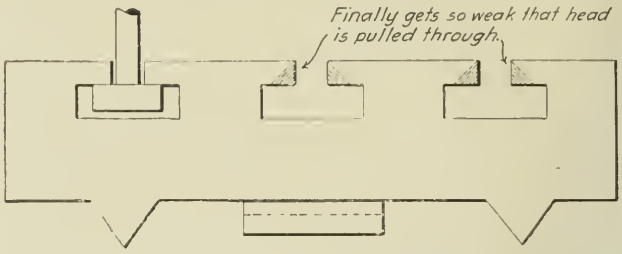
Illustrating Lack of Lubrication of Journals and How it May be Remedied.

of oil or grease which was placed on the shaft in fitting up. As a result the shaft is cut at each end of the bearing. To overcome this, drill a small hole through the bearing near each end as shown on the sketch, or file a small groove in the bearing near the ends.

Have Driving Wheel Lathe Suitable for Trailing Wheels.—Don't neglect in selecting the next driving wheel lathe to have the distance between the centers sufficient to take in trailer wheels—the ones that have the outside bearings. Some shops are having considerable extra expense turning tires on these wheels, because the lathe in use will not handle them. Even if you do not have any of these engines on your road now you may in the future and the extra expense for a properly equipped lathe is small.

Abuse of T Slots in Planer Platens.—I have seen a number of planer platens ruined in a few years' service from a simple cause due to pure carelessness. Most manufacturers make the T slots considerably larger than the standard square head bolt. The foreman instead of having a special bolt made uses standard bolts. The small heads gradually wear off the metal, as shown on the sketch, until they pull through the slot. The same thing is true of vertical boring mill tables. I have seen three planer platens ruined in one shop from this cause.

Worn Bushings.—Carelessness in renewing worn bushings in machine tools is expensive. I have seen many dollars' worth of gearing worn and broken because of the shaft having a large



Showing How the T-Slots on Planer Platens Are Destroyed.

amount of loss motion. The gears tend to work on the points of their teeth and break.

Sensitive Drills.—I have never seen a locomotive repair shop with too many sensitive drills, and I have seen some large shops that did not even have one. Get three or four of these and see how they turn the work out and keep down drill breakage.

Engine Lathe Ways.—A couple of tool makers still build lathes in which the tailstock is guided by right angle ways. In recommending lathes be careful to specify a V guided tailstock, as with the V guides all wear is automatically taken up and the centers remain in alinement.

THE CARE AND SELECTION OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY JOHN V. LE COMPTE.
Foreman, Baltimore & Ohio, Garret, Ind.

Selecting Machine Tools.—Great care should be exercised in the selection of machine tools. Many good machines are on the market today for which splendid results are claimed if given a fair trial; therefore, machine specialists should be selected to purchase machinery who thoroughly understand the needs for which the machines are required and who are competent to select the best machines on the market for these needs. Experience has taught that to purchase a machine nearly meeting the requirements for a few dollars less on the day of purchasing, yet not meeting the requirements as a whole, is exceedingly expensive in its failure to produce the results desired. The power to be transmitted, as well as the speed required, should be given careful consideration. The installing of the machinery in the shop so that the work performed can be handled most effectively is an important factor. If the line of work to be performed is heavy, the machine should be installed within reach of the crane, or be in position to utilize an air or electrical lift in part with other machines.

Arranging Machine Tools.—Modern practice of installing machines of like kind in near proximity has proven effective in handling and performing work, as the material to be machined by a line of machines can be delivered to the section of shop where they are installed, often saving a second handling. This practice has not only proven true in reference to lathes, boring mills, slotters, milling machines, planers, etc., but also with drill presses.

Drill Presses and Drill Grinders.—The up-to-date drill press, built for high speed, must have a plentiful supply of work delivered to a point near at hand. Drill presses installed near each other can supply the various demands made upon them with quick despatch when all classes of work performed by them are delivered to a convenient point from which the operators may

draw as occasion demands without the loss of time. Drill presses with two, three or a larger number of spindles can be used effectively on many lines of work, but such presses without a lateral motion are badly handicapped; especially is this true in drilling and fitting up eccentrics and eccentric straps, as machines with four spindles with lateral motion can be used effectively on them. A drill grinder should also be installed, as the operators of the drill presses cannot afford to lose time from operating their machines if effective results are to be accomplished and the machines kept in constant operation. This grinder should be installed near the drill presses and a competent operator put in charge. He should be supplied with a drill cupboard to contain all sizes of drills desired so the grinder can immediately supply the demands of the drill press operators without loss of time. The operator of the grinder should be held responsible for the drills.

Tool Grinder.—What the drill press grinder accomplishes for the effective output of the drill press, the tool grinder can accomplish for the shop at large. This machine is indispensable in an up-to-date machine shop. If one machine tool grinder can supply the shop, it should be located near the center of the shop and should be in charge of a competent man, who thoroughly understands the correct way in which the different tools should be ground. He should have a sufficient stock on hand, ground, ready to be delivered to the various machine operators. All special tools used on the various machines should be placed in charge of this operator and an enclosure should be built around the machine containing shelves upon which the stock of tools, after having been ground, may be placed awaiting demands thereon. All tools, with the exception of possibly two or three used by an operator on a continuous job of like work should be kept in this room, thus saving the extra expense of having a large stock of high speed tools scattered about the shop at the various machines.

Dressing Tools.—Another saving feature is the manner of handling tools when they are in need of dressing. They should be taken once a day, by a helper appointed to this task, to the tool dresser. When dressed they should be delivered to the grinding room, where they are immediately ground and placed in stock, eliminating any necessity upon the part of any machine operator of sending a helper with possibly one tool from one department to another.

Check System.—The grinding room, as well as the drill press cupboard, tool room, blue print room, etc., should be operated by the check system. Every machine operator should be supplied with a given number of checks, the same number appearing on them as is used by the operator in reporting for work. These checks are used in securing drills, machine tools, blue prints, etc., as demands require. A record is kept at the office of the number of checks given each employee, and he is held responsible for them.

Air Leaks.—All connections, both by pipe, hose, etc., for transmitting air, should be inspected daily to detect any loss of air because of leaky hose, valves or joints in pipes. This duty may be coupled with that of the shop oiler, whose chief duty is to lubricate all shafts, as well as to report bearings running hot or pulleys slipping which he may be unable to adjust or repair.

General.—No economy can be found in purchasing a cheap grade of high speed steel, having a cold shop in winter, or failure to supply the department with a sufficient number of helpers to keep the shop clean or help the operators on the various machines when their services are needed. While care in the selecting of machine tools is important and up-to-date shop equipment is an absolute necessity, yet to produce the quantity of work consistent with good workmanship is a more serious problem. A system must be established, and to this end a competent foreman with an able corps of assistants must be appointed who are thorough mechanics and who know what machines can accomplish the best results on different kinds of work. The range of work that can be done on the turret lathe is broader than ever, and such work can be performed more cheaply than on any other machine. The vertical turret boring mills, as well as those not having a turret, are to-day supplanting the lathes in nearly every line, except work between centres. The slab milling machine in its line of work is supplanting the planer, as the time required in milling some classes of work is only about 50 per cent. of that required by the planer. The above are only a few of the many advantages to be gained if a progressive up-to-date foreman is in charge and a good system is installed.

CARE AND SELECTION OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY W. H. SNYDER.

Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

The care and selection of shop tools is a most important factor in any shop; without the proper tools much valuable time is often wasted in studying and scheming how a job can best be done. The tools used in the average boiler shop, as a rule, show very hard treatment and in many cases the cause of this is misuse. With a little more care on the part of the men the condition and appearance of the tools would be much better. Take, for example, the power punch in a shop where they do not have a regular operator for doing all the punching. You will often see men try to force a 13/16 in. punch through a ¾ in. die; in punching half holes punches and dies may be saved by using a piece of iron the same thickness and holding it against the piece that is being punched. By so doing you actually punch a full hole and it is much easier on the punch and die. One man should be detailed to do all the punching and shearing. By so doing the cost of maintenance of the punch and dies will be reduced to a minimum.

CARE OF PNEUMATIC TOOLS.

The use of pneumatic tools should receive the most careful attention of all workmen, and especially of the foreman directly in charge. An air hammer should never be put in service without first being well oiled with a good grade of suitable oil; if it continues in service it should be oiled every two hours without fail. Pneumatic tools are like a human being; without the proper nourishment and care they will very soon be a total wreck and useless for service. Never connect an air hose to an air hammer or motor without first blowing the hose out well. There is nothing that will ruin a pneumatic tool quicker than the dirt or grit that is liable to collect in an air hose. At our shop all pneumatic tools have to be delivered to the tool room every evening before the men go home; the hammers are put in a tank containing equal parts of signal oil and kerosene. This keeps them well oiled and prevents them from gumming up. In giving the tools out in the morning the hammers are drained out and given a good oiling with pneumatic tool oil. The motors are also well oiled before they are handed out.

CARE OF MACHINERY.

When installing machines see that they are put on a good foundation, regardless of the size of machine. Level up each machine carefully. The countershaft should not be overlooked; if it is not properly put up, squared, leveled and lined up you will have no end of trouble with the belts. Always keep the machine tools clean and the oil holes open. All revolving parts should be well oiled at all times. Too little attention seems to be given to this important matter.

Never hammer any part of a machine. Never lay anything on the shears or ways. Keep the machine looking neat, as if it was your own personal property. By observing the few points here laid down you will bring credit to yourself and your foreman and keep the cost of machinery and tools to minimum.

CARE AND TREATMENT OF BELTING.

Belts are expensive, and with improper treatment can soon be ruined. Lacing belts with the ordinary rawhide lace seems to receive little consideration. In most of the shops every man has

his own way of lacing and some belts are sure to receive improper treatment, especially those running on cone pulleys. There should be one man in every shop detailed to do all the belt lacing. The lacing giving the best results should be adopted as a standard. The shifting of a cone belt from one cone to another, if the proper care is not exercised, will soon stretch the belt out of shape and it will have a tendency to creep on the next cone. When it is desired to change the speed of the lathe be careful to have the belt next to the cone it is to be shifted on. If you fail to do this you will soon have the belt stretched on one side and it will have a tendency to creep. If the creeping is not stopped the belt will soon be ruined. When you notice a belt commencing to creep on the next cone turn it over or turn it end for end. This will oftentimes save it. Never use rosin or any kind of belt dressing that will hang to the pulley or that will have a tendency to collect on the side of a pulley.

SELECTING TOOLS.

In selecting tools and machinery every foreman should be on the lookout for tools and devices that will assist in increasing the output. The foreman must be in position to give satisfactory reasons showing and proving to his employer that the additional equipment and investment will be a paying proposition.

CARE AND SELECTION OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY JOHN M. HAMM.

Machine Foreman, Lehigh Valley, Sayre, Pa.

It is a question as to which is the more severe handicap to a shop—a poor system of doing the work, or machinery that will not allow the maximum output of high speed steel. In making a tour of the railway shops throughout the country, it was found that in many places the machinery was secured from machine tool builders who gave the transportation department the most freight business, regardless of the efficiency of the machinery.

Foremen Should Visit Other Shops.—It is the practice of some shop managements to send their foremen to visit different shops, thus keeping them in touch with new shop kinks and machine tools, especially those advertised in mechanical papers, thereby educating their forces to all changes that take place in railway shop practice.

Class of Machine Tools.—In order to get the maximum output it is absolutely necessary to get the most powerful, simple to operate, belt driven machines that are on the market. It does not pay to hold a part of an $18,000 engine on an old machine for five hours, where it could have been done on a modern machine in two hours, as the length of time required to repair an engine determines the number of engines required by a railway company.

Soliciting Information.—Many foremen have adopted the practice of soliciting information in regard to shop practice or machine tools from every mechanical man with whom they come in contact, thereby obtaining a vast amount of valuable information.

New Tools to be Purchased.—When it has been decided to secure a new tool of a certain kind, it is customary in many shops for the shop superintendent to ascertain the opinion of his general foreman and foremen before deciding on the make of machine to be purchased, in order to secure the best machine possible.

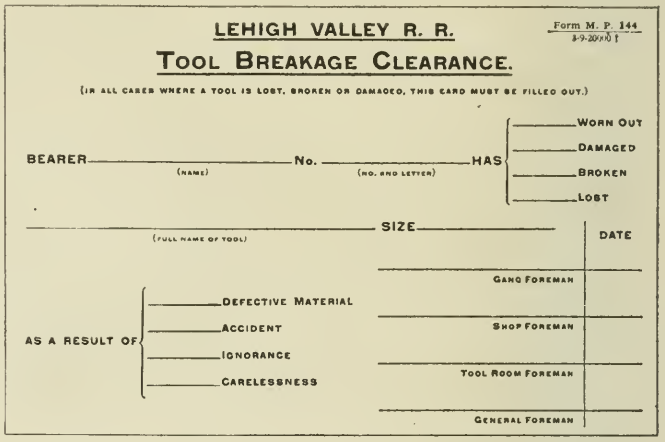
Supply of High Speed Steel.—An important question is the care and supply of high speed steel. The most common method is to have a letter or number for every shape and size required in the shop, and a reasonable supply of every kind kept in a rack designed for the purpose and located in the tool room, thus permitting a machine operator to go to the tool room and secure any kind of tool desired without delay. This method eliminates the old practice of having a number of tools of a kind at every machine to avoid tool-dressing delays, and also of having a large amount of money tied up in high speed steel.

Cleaning & Oiling Machines.—In order to avoid large repair charges, it is essential to keep all bearings properly lubricated; all pipes and oil holes should be cleaned occasionally with kerosene, so that oil may be properly received by the bearings.

Care of Bolt Slots.—Bolt-heads that do not fit the slots are very injurious to the platens of planers and the tables of slotters and boring mills—more so than one would imagine who was not in daily contact with this condition.

Belting.—All belting should be under the supervision of one man. In small shops it is customary for him to oil line and counter-shafting and perform all belt work. His duties require that all belts are to be changed about until not a place can be found where a worn-out belt cannot be used advantageously.

Plenty of Hand Tools.—It is a mistake to deny mechanics hand tools that are required in their work. Using wrenches that do not fit and having men about the shop borrowing from their


LEHIGH VALLEY R. R.

Form M. P. 144

TOOL BREAKAGE CLEARANCE.

(IN ALL CASES WHERE A TOOL IS LOST, BROKEN OR DAMAGED, THIS CARD MUST BE FILLED OUT.)

BEARER _____ (NAME) No. _____ (NO. AND LETTER) HAS { _____ WORN OUT, _____ DAMAGED, _____ BROKEN, _____ LOST }

_____ (FULL NAME OF TOOL) SIZE _____ DATE

AS A RESULT OF { _____ DEFECTIVE MATERIAL, _____ ACCIDENT, _____ IGNORANCE, _____ CARELESSNESS }

GANG FOREMAN

SHOP FOREMAN

TOOL ROOM FOREMAN

GENERAL FOREMAN

Tool Breakage Clearance Card, Lehigh Valley.

fellow-workmen, is a serious handicap to the output, as men cannot be expected to make schedule time on a job unless they have the tools.

Care of Small Tools.—The method of giving every employee a certain number of checks to secure tools of all kinds from the tool room is most satisfactory, inasmuch as checks are demanded before the tools are disbursed. It is practically impossible for a man to damage or lose a tool without the tool room foreman knowing of it through the medium of the checks. In order to preserve discipline and have every foreman know how the tools are used or abused, it has been found advantageous to have a foreman make out a clearance card for damaged tools as shown in the illustration.

CARE OF TOOLS AND MACHINERY.

BY WILLIAM G. REYER.

General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

The care of tools and machinery in a railway machine shop is a trying proposition. Lots of the machinery now in use was not built for the use of high speed steel. The result is that nearly every shop has a large amount of equipment which should be sold as scrap. Today the tool or machine is forced to the limit with little regard for the machine itself. It is not, will your cutting tool stand, but is the machinery strong enough? Many machine tools over five years of age have to be strengthened to do the required work, and the foreman finds a majority of his tools too weak or the belts too light to keep up with what is expected of them. The rush of today seems to bring the apprentices up to overlook the proper care of shop tools; very few of them seem to realize that taps, dies, reamers, air drills and small twist drills are expensive. Their idea seems to be that it is all right if they break these tools, "the foreman told me to push this work and I could not help it." The trouble is they do not think.

You will find about half of the work turned out will not stand inspection if the foreman is not continually on the lookout. Let the operator understand you want the work pushed, but at the same time demand a proper fit and workmanlike finish. High-speed steel is expensive and the operator should be instructed not to throw it away when it is worn too short for him to use, but should turn it over to the foreman, who will find it can be worked over to advantage. The foreman should see that the proper shape tool is used on all new classes of work; also work out any handy jig to shorten the time of operation. Should the operator suggest a certain style of tool, clamp or jig, listen to him and in many cases you will find it will be to the company's interest to try his suggestions.

Use as heavy cutting steel as the machine will take; it will carry off the heat and allow heavier cuts with a coarser feed. I would recommend the solid tool instead of the use of the tool holder. See that each operator has his own tools, blocks, bolts, clamps and wrenches—this is very important. He should not have to wait for anything. Always have a job ready for him to go on; do not wait for him to come to you.

If any of the machine tools need attention, do not wait or say, "I can't spare it now." Remember, a stitch in time saves nine. The tool room is one of the most important departments in a railway shop. Of all departments, it should have a wideawake, up-to-date foreman; here is where your shop tools should be taken care of. By shop tools, I mean taps, dies, reamers, cutters, punches and such like. The foreman should be able to design and make any special tool required. I make it a practice to keep in close touch with my tool room foreman and it has repaid me in lots of handy and valuable tools. To illustrate—we were experiencing lots of trouble in getting air-pump cylinders bored to the proper smoothness and correct finish. The machine we were doing the work on was worn and I was being repeatedly advised that the work was not satisfactory. Pumps were reported running hot because of badly bored out air cylinders. I explained to the tool room foreman and told him to get up a reamer to do the work. He made one, with inserted teeth, the shank of which fits in the boring mill. It is doing splendid work and the air brake department is now satisfied. This is only one of a great number of handy and useful tools he has devised.

Another department that is very useful and important is the machine repair gang; this is another place where an up-to-date and resourceful foreman is needed. Very often a machine will break down or the parts wear out just at the time when it is needed most. Your repair man must be able to devise a quick and at the same time a durable way to repair the machine. He should see that all shafting, countershafting and pulleys are kept properly tightened; this will prevent a lot of trouble. See that all your machinery is on concrete foundations; this is a benefit for both motor and belt driven machines.

I would recommend the more general use of boring mills, turret lathes and slotters. All such work as cylinder packing rings, piston heads, strap rod brasses, eccentrics and eccentric straps are more economically done on the boring mill than on the lathe. Another labor saver is the taper bolt-turning machine. We turn bolts on this machine and keep them in stock; when bolts are needed they are taken from stock and the holes are reamed to suit. We carry bolts in all sizes and lengths and have only to true out the hole and get a bolt out of stock to fit. The important point is to see that the taper reamers are kept sharp and to the proper taper and that the cutters on the machine are ground properly.

Pneumatic tools are real labor savers. The foremen should instruct his men in the proper use and care of these tools; the main thing is to see that the air drills are properly lubricated. More air drills are ruined from the lack of oil than from any other cause. The air hammer should be more generally used in the erecting shop. Remember, the operator will more than double the output with it over the old way of using hammer and chisel. Instruct your apprentices early how to use the air hammer.

One of the handiest appliances for the roundhouse and erecting shop is a tool box mounted on a truck; have the box made large enough to hold all necessary tools to suit the operator's special work. This saves time and material. To illustrate, the man that works on guides will find it handy to keep liners, temporary bolts, washers, extra guide blocks, files, chisels, copper hammer—in fact, all necessary appliances to do his work—in this box. By following this plan you will get out more work at a reduced cost. The same applies to the men that work on valves, brakes and all special lines of work. I believe in specializing your men wherever you can, as this will increase the output and at the same time take care of your small tools, as each man is responsible for the tools under his care.

SELECTION AND MAINTENANCE OF MACHINE AND HAND TOOLS.

BY AN "OLD RAILROADER."

SELECTION OF MACHINE TOOLS.

This is a matter that needs careful attention and study: *First,* to determine the work that is to be handled. *Second,* the amount of work that will have to be handled each day in order to keep up the supply so that all orders may be filled promptly and with the least possible delay. *Third,* the make of machine, taking into consideration its strength and ease of manipulation, and accessibility for making repairs. *Fourth,* the nature of power used to drive the tool, as upon this depends a greater or less percentage of fixed charges that have to be taken care of. There should be no question as to which is the best power for any machine shop, no matter what size or number of machines it contains. Electric drive should be used; its first cost may be greater than the others, but it will return it in the saving at the coal bin and water meter, not taking into consideration the expense connected with countershafts, belts, line shafts and their accessories. *Fifth,* the cost of the machines, while most important from the standpoint of first cost, does not amount to much compared to the repair charges if a cheap lot of machines are selected. A machine or a number of machines represent so much money at interest; it is the rule in selecting stocks or bonds for investment to get the best and safest from the most reliable brokers. The same method should be pursued in buying tools of any description. Get only the best machine for the line of work you are going to handle, and from reputable firms who have the backing to make good any claim they put forward for their tools.

In the final selection of machine tools care should be taken that no unnecessary tool is put on the list. As stated at the beginning of this article, the kind of work to be handled should be carefully considered as to its weight, length, diameter and other dimensions. Upon these depend the sizes of lathes, planers, drill presses, boring machines, shapers, etc. Some makes of shapers will do the same work far cheaper than planers, and in one-third the time if handled properly. No useless machine should be installed. What is meant by this is plain to anyone who has had occasion to go through a railway machine shop, with few exceptions.

A 32 in. x 32 in. x 12 ft. planer is being used to machine a crosshead 28 in. long, clamped with a piston rod to a pair of V blocks; on the other side of the shop a 36 in. or 42 in. triple-geared engine lathe, with a 16 or 20 foot bed, and capable of taking 9 ft. to 12 ft. between centers, is being used to machine a crosshead pin measuring not over 12 in. in length and 5 in. in diameter, or, it may be working on a packing casting for piston valve rings 12 in. in diameter. Another lathe, 20 in. in diameter and 8 ft. between centers, is being used to turn up frame bolts 1¼ in. in diameter and 12 in. or 16 in. in length. This is also true of drill presses. A 36 in. vertical drill or a larger radial drill will be seen in use with a 3/16 in. or ¼ in. drill, drilling

knuckle-joint pins or similar work. A 30 in. shaper, 12 in. lathe and a 12 in. sensitive drill could have handled all of the above work, leaving the larger machines for more suitable work. There are many foremen and shop superintendents who never seem to realize that a planer or lathe used for short work for any length of time will rarely do a good job when used to its limit as to length. This should not be lost sight of when installing machinery in any shop, either railway or otherwise.

Many railways are concentrating their heaviest machinery at two or more central points and either sending material out finished or sending engines into these shops for the heavier class of repairs. This leaves only the lighter work to be handled at division terminals, and as a result lighter machines may be used at these points.

CARE OF MACHINE TOOLS.

Foremen in charge of machine shops are directly responsible for machines, as the care or abuse that they receive depends upon the methods pursued in handling the men and the work. It is the foreman's duty to see that all machines are properly cleaned and oiled and that no abuse of any kind is given any part of the machines, either by throwing work on the tables or ways or the use of any part of a machine for an anvil block in driving out bushings, centering bolts, etc. When the men and apprentices see that they must take care of machines as if they were their own, there will be smaller repair bills and fewer idle machines. Each man will take a pride in his machine and make every effort to beat his neighbor. This will in the end work to the foreman's advantage as well as to the owner's. At least ten minutes should be allowed each week to every man or boy to clean any cuttings, etc., from under the crossfeeds and carriages of lathes and around the gears of all machines. The life of the machine depends on this and it will yield a far better return than the same amount of work applied directly to output.

The writer has in mind a small lathe that was on exhibition at Philadelphia in 1876. It was placed in a tool and brass room the same year and at this writing, after being used continuously, is in far better condition than machines that have been in use only two years, proving that it pays to take care of a machine by keeping it clean and properly oiled. The foreman is directly responsible for the selection of work for each machine tool, and if the machine is abused by doing work that should be done on a more suitable tool the men should not be blamed, as they are only doing as directed.

THE ABUSE OF HAND TOOLS.

This is also chargeable to the foremen, if they fail to impress on the men the importance of taking care of hand tools. The expense for this class of equipment goes up, with the result that the money thus spent is nine times out of ten diverted from the amount allowed for labor, which results in short time or a reduction in force; in nearly all cases the parties at fault are not the ones to suffer.

As a rule, there is enough supervision in all shops and repair yards, if properly handled, to see that abuses of any kind are stopped. Following are a few cases to show how expenses for tools are increased by neglect on the part of foremen and leading mechanics: Holes to be tapped are not drilled to the proper size and taps are broken in trying to start, some using a hammer to drive them, others grinding the tap with the mistaken idea that it will help. Drilling the holes too large results in a poor fit and perhaps leads to an accident in a short time. Reamers are run at excessive speed, especially on car work, due in the majority of cases to having men that do not know how to handle air motors. There is not enough care taken when laying out holes in patches or reinforcing plates, etc. Nor is there enough attention paid to the drilling or punching of holes. This is the main cause for the use of reamers in steel car repairs. There were over 200 reamers, from 9/16 in. to 1 1/16 in., sent in to the tool room from one repair yard for regrinding and tempering in nine days a year or so ago, and they were continually calling for more tools.

The manner in which air motors and hammers are handled is as bad, if not worse. Instead of being placed on a rack or some other receptacle when not in use they are thrown on the ground and the motors are rarely shut off. As yards are made up of all kinds of filling it is easy to estimate how long a motor will last. Anything that is in the way or repair parts that are needed for cars are likely to be thrown on the motor or the hose. The damaging of hose by the careless handling of material often causes unnecessary expense and delay. To illustrate: A certain gang had considerable trouble with a particular motor for a couple of days and also with air hammers. They could not be made to work right and after the second trip to the shop it was decided to send a man to the yard to locate the trouble, as the tools worked properly at shop when tested. He found that the trouble was due to the hose and not to motor; the inner lining was loose and the action of air in flowing to the motor closed it, with the result that no air could reach the motor.

The above cases serve to show that the fault can often be traced to the foremen and leading men, inasmuch as they fail to instruct the men and follow it up to see that the instructions are carried out. In case the men placed in charge do not know enough to instruct those in their charge blame must be placed on those higher up.

Anyone that has had any experience in the handling of men, either in locomotive or car repair shops or yards, can tell at a glance in going through them whether they are managed by a practical mechanic or not, and this without looking at the condition of the machines or tools, but by the way repair parts and material are distributed and handled.

The managements, if they look over the expenses for tools and repair parts at the end of any period, can easily tell the kind of men they have—a large expense account shows plainly that no care is given to this matter and a low expense account indicates care and ability on the part of the foreman, all other conditions being equal.

FOREIGN RAILWAY NOTES.

Less than three years of extensions of Brazilian lines, building of new lines into the south of Brazil, and a discreet policy in the matter of buying stocks in the old companies has not only brought about a unification of the railways, but has brought a practical monopoly of the railway systems of all south Brazil which connect the city of Sao Paulo, and thereby Rio de Janeiro and points in the states of Minas Geraes and Espirito Santo with the southernmost cities of Brazil and with River Platte and Paraguayan points. The management of the interest thus involved has not materially changed, except that the capitalists in control are mostly American rather than Canadian, and that the strong influx of French capital brought about by the sale of much stock in France has given the syndicate a distinctively French-American rather than Canadian-American complexion as before. Effectively, the leaders in the movement are the incorporators of the Brazil Railway Company of Portland, Maine, in whose name are held not only the concessions for Sao Paulo-Rio Grande railways, but the lease of the Sorocabana Railway, which forms the connection for the former with Sao Paulo. Of late it has acquired controlling interests in the Paulista and Mogyana railways in the State of Sao Paulo. The success of this movement toward unification is the beginning of a new era in railway building and operation in Brazil. Heretofore the operation of a Brazilian railway by private capital has been contingent upon a guaranteed profit from federal or state governments. The one exception has been that of the British-operated Leopoldina railway system.

A line to connect Tupiza with Uyuni on the Antofagasta Railway is also under construction, at an approximate cost of $9,075,000. Tupiza is the center of another area of vast mineral wealth.

EDUCATING APPRENTICES ON THE SANTA FE.*

BY F. W. THOMAS.

Supervisor of Apprentices, Atchison, Topeka & Santa Fe, Topeka, Kan.

School Work.—In each shop a building or room has been set aside, known as the apprentice school room, in which the boy is required to spend two hours a day, two days a week. Here he is taught free-hand and mechanical drawing, practical shop arithmetic, the simpler elements of mechanics, and certain geography and history relating entirely to the road. The school rooms are furnished with drawing tables, blackboards, cabinets, models, maps, and other paraphernalia common to an academy or college lecture room. A technical and practically educated man presides over these school rooms and is known as the apprentice school instructor. His services, as well as the school room, a set of first-class drawing instruments, a drawing table, stationery, etc., are furnished the apprentice absolutely free. Furthermore, the apprentice is paid his regular rate while attending school. The instruction given the boys while in the apprentice school room is individual; a boy just completing his apprenticeship and a youngster just starting out may be working side by side. There is really no class instruction, and the boys are not treated as a class, but each one is instructed individually.

There is no bunching of boys together, rushing the duller and slower boys over the course, or holding back the quick, energetic boys, but each one progresses just as fast as his ability or capacity will permit. Each individual must be thoroughly familiar with the work at hand before he is allowed to proceed to some higher branch or more difficult work. No text books are used, but standard lesson sheets, written and printed in the office of the supervisor of apprentices, are sent to each of the schools. These lessons are simple, but they are prepared with the idea of teaching and drilling the boy along a certain line, giving him what he actually needs in the trade he is learning, leaving out all foreign subjects and frills. Each lesson refers to some part of a locomotive, car, shop tool, or feature common to railway work. As an illustration, all problems in fractions are of a denomination found on a machinist's scale, that is, 64ths, 32nds, 8ths, 4ths, etc. Mechanics in railway shops have no use for 7ths, 9ths, or 13ths of an inch. The drawing lessons, both mechanical and free-hand, like the problem sheets, are taken from some part of an engine, car or shop tool. The boys are taught how to draw these parts, and to readily read and interpret a mechanical drawing or blueprint. We care nothing about his ability to draw a tree, a horse, or a wagon. Everything taught him in school has some direct bearing on the trade he is learning. Teaching a boy subjects foreign to his trade, giving him lessons in drawing of objects other than those with which he is familiar and with which he daily comes in contact, tends to make his mind wander and often makes him dissatisfied with his vocation.

Apprentice school instructors are selected with great care. As a rule, young men are preferred to older ones, as there is a greater tendency for younger instructors to "mix" with the boys and to become a part of them, join with them in the organization of their teams of sport, and really become a part of their lives; an apprentice boy feels much freer in talking with younger apprentice instructors, than he does with older ones. These apprentice school instructors are young men thoroughly educated in college, university, and shop, and are thoroughly familiar with the standard practices and usages of the mechanical department. The function of the school room and of the apprentice school instructor is to teach the boy to use his brains along with his hands and eyes, to reason out, and to understand the work in the shop as he progresses.

Shop Instruction.—The apprentices are required to work in the shop like any journeymen, but they have the advantage of having a first-class, skilled mechanic to instruct and guide them. In the smaller shops a man is designated as shop instructor; and in the larger shops there is one man for each department, or one for each 25 or 30 apprentices, whose entire time is devoted to them. Any other duties given him must be subservient to his duties as shop instructor. He first explains the various parts of a machine, and the functions of each part; he teaches the boy how to chuck a certain piece of work in the machine, how to set his cutting tools, the speed to use, etc. He keeps within sight or hailing distance of all the boys under his care, and is ready at all times to render them assistance. The shop instructors are recruited from journeymen who have been in the service for sometime, men who are familiar with all of the machines in the shop, and thoroughly familiar with the standards, rules, methods and practices of the company. He must be a man of patience, a man with a boy-loving heart, one whose personal character is not only clean and elevating, but whose actions and conversation are such that the boy will look up to him with pride and honor. When the boys are in trouble he advises them, when they are sick he visits them—in fact, he encourages them in everything that goes to make them clean, honorable citizens, and above all, to be first-class mechanics. The boy entering our shops at the age of 16 is at a critical point in life and is in need at this time, above all others, of some strong but patient directing hand to guide and direct him. The apprentice system on the Santa Fe is not a merciless machine moving in a certain fixed path, but is flexible and humane from the very beginning. The abuse of any boy, however exasperating the case may be, is absolutely prohibited. Profanity towards a boy by either shop instructor or foreman is unknown, and although their teachings and instructions may be mechanical, they are of such a parental nature as to remove them from the mere mechanical.

The requirements for becoming an apprentice are not rigid, nor do we inquire particularly into the boy's life or character, neither do we require character letters. If the boy has been through the fifth grade of the public schools and is strong physically, and apparently bright, we give him a trial and in the first six months our shop and school instructors are able to determine his fitness for the trade he is indentured to learn. A few boys come to us who are really deficient in education, boys who have had to leave school in their tender years to assist in supporting a widowed mother, or younger brothers and sisters, and for these we have a night school where they are taught the branches in which they are deficient; as soon as they have progressed to a certain point they are released from night school and continue their work in the regular apprentice school. While such boys are often a little more expensive to train, we have really gained some of our best young mechanics from that source. The night schools are not considered a punishment and do not in any measure reflect on the boy's ability. It is a splendid opportunity for him to advance more rapidly, to learn a little more, so that he can keep pace with his more fortunate brother. The instructors exercise a modified military and parental discipline over the boys; the military discipline will insure immediate obedience and subordination; the parental discipline will assure the boys of the personal interest taken in them, and serve to teach them the importance of living a clean life, and the value and importance of becoming honest citizens.

At the smaller shops where we have four to six boys, we have a traveling instructor who spends his time at two or more places. He is both shop and school instructor. We turn out from these smaller points some of our best mechanics, especially for roundhouse work. The last year of their time is served in one of the larger shops where they may have the advantage of a greater variety of machines. Every apprentice is required to have a standard set of shop tools, these being sold to the apprentices at cost price by the company. This scheme provides a first-class set of tools at reasonable cost and with easy terms of payment. The company also furnishes each apprentice a tool box free of cost.

The instructor keeps a complete personal record of each boy —the progress he makes in shop and school, his shop efficiency,

* Abstract of a paper read at the annual convention of the National Society for the Promotion of Industrial Education.

class and quality of work performed, and his personal habits. These records are sent monthly to the office of the supervisor of apprentices, and are copied on his personal record. By requiring this, the instructor must keep close tab on all of his boys, and the headquarters can in a moment give a complete record of each boy on the system.

The greatest difficulty we have in inducing the better class of boys to go into the shops as apprentices is the practical social ostracism they must undergo. As a general rule, men working in railway shops are known as mechanics, some of whom have little pride as to their personal appearance, leaving their day's work with hands and face grimy and greasy, and often wearing the same overalls or clothing on the way home in which they work in the shop. We have been endeavoring to impress on our young men the importance of cleaning up before leaving the work at the shop, bathing frequently, and changing their clothes as often as their financial circumstances will permit; and to cease loafing on the street or at disreputable places. If they go to shows or places of amusement, to select the best kind, even if it is necessary to go less frequently; to be polite and courteous to everybody at all times. The effect of such instruction has been noted at a number of places—in fact, the personal appearance and social conditions at some of these places have been revolutionized. Such teaching has also made them more orderly in their work, keeping their shop tools, hand tools, and jigs clean and in the right place, no time being lost in hunting for calipers, scales, etc.

The apprentice boys are encouraged in athletics and here, as well as in the shop and school room, they are taught the value and honor of clean sport. While it may take years to fully accomplish what I might call the social elevating feature of this work, yet wherever we have an apprentice school, it has even now a decidedly elevating moral effect on the shop body. Furthermore, the apprentice schools are now regarded by the local shop officials as a necessary adjunct to the shop. The apprentice school is no longer considered an experiment; it is considered a necessity, and each master mechanic has a particular pride in his school, and no visitor to the shop is allowed to leave until he has visited the apprentice school room and is made thoroughly acquainted with the method of handling apprentices. The higher officials, the president, vice-president, and superintendent motive power, always favor these schools with a visit whenever they are in the vicinity.

Considerable objection for a time was raised to the establishment of the apprentice schools on account of the cost. While we know exactly what it costs us to educate each apprentice, we also know what the apprentice is doing, and although the Santa Fe is spending from $35,000 to $40,000 a year training boys for its future needs, yet with the help of the school and shop instructor, these boys are accomplishing enough more work to more than pay for the cost of instructing them. Our primary object is to make mechanics for our shops. We can hire all the mechanical engineers we want, hire all the draftsmen we need, employ all the college men we want, but our pressing need, not only ours but that of the railways and manufacturing plants all over the country, is first-class skilled mechanics. The mechanics we graduate are certainly better suited and fitted to our needs than those we can hire, for they know the Santa Fe ways, Santa Fe methods, and Santa Fe standards. It is a common occurrence for gang-foremen to put in bids in advance for some apprentice that they know will shortly be out of his time.

Under the old system of indenturing a boy to learn a trade, where the master acted towards the boy as a father to a son, good, all-around mechanics were the result, but under our modern method, there are not enough fatherly employers. The foreman of the shop is too busy to stop, to help or to show a boy. The boy is simply turned loose in the shop to rise or fall, and to pass away the four years, eventually leaving at the expiration of his apprenticeship, knowing really very little of the trade he was apprenticed to learn. The labor unions of the country have limited the number of apprentices in some shops to such an extent, that even if they were properly trained, there are not half enough to meet the demand.

Nothing will ever take the place of apprenticeship. There is no trade school or training school in the country that will turn out young men or boys who are capable of entering a shop and competing with the average mechanic; while they may be taught considerable "book learning," their practical instruction must of necessity be limited. There is nothing that will take the place of practical experience. Manual training in our public schools and trade schools may bring out the talent, may display the genius, but the boy, even after completing such a course has no conception of time, no idea of the practical use of jigs, templets, etc. If a boy's mind is imbued with the idea that as soon as he graduates from a training school, he can enter a modern shop, and can work alongside regular journeymen, competing with them, he has been deceived. If a boy desires and intends to follow a trade for a livelihood, he should attend our public schools until he has reached the age of sixteen and then should enter a shop as an apprentice. Further schooling, I believe is unnecessary and in a measure is time wasted. By starting out upon his apprenticeship at the age of sixteen or seventeen, he will have completed it by the time he has reached his majority, and will be fully prepared to enter upon his life's work.

While the remuneration paid apprentices learning a trade has increased during the past few years, it is still too small. Many boys who would make first-class mechanics accept positions which have practically no future to offer, but whose immediate returns are greater than that of an apprentice during his four-year course. Apprentices must be paid living wages, sufficient for them to have nutritious food and to wear comfortable clothes. You cannot expect to develop the best in a boy when his body is lacking nutritious food and is not warmly clothed.

All apprentice instruction is during the daylight hours. Any corporation or manufacturing plant that requires the apprentices to return regularly at night to attend school is courting failure. The boys we have, the boys we desire, in fact the boys from whom we can make our best men, have an abundance of red blood coursing in their veins and must have some hours for recreation and play. After they have worked all day in the shop they are entitled to some time for recreation. While we are historically familiar with a number of men who during their childhood endured all kinds of privations and hardships to obtain an education, men who when boys after a day's work studied at night by dimly lighted lamps, thirsting for knowledge, these are rare exceptions and the historian deemed it of sufficient importance to record the fact. There are thousands of others who have studied at night and who are still living in the night. The present age offers so much to detract the boy; there are so many more places of amusement, so many more free entertainments, and the writer believes the boys should be allowed to enjoy themselves all they possibly can while in their teens. An apprentice boy who has worked in a modern shop all day is physically unfit to study in the evening. We have endeavored to make our apprenticeship system as attractive as possible. We want our boys to be as happy and contented in serving their apprenticeship as it is possible to make them; we aim to make them so contented and happy while learning their trade, that they will gladly continue in our service after completing their apprenticeship.

The Sorocabana Railway in Brazil has been modernizing its service by putting on up-to-date American day coaches, sleeping cars, American locomotives, and other equipment from the United States. Undoubtedly, as the French-American syndicate takes over the actual control of other Sao Paulo railways their equipment will be similarly modernized. Both the Paulista and the Mogyana have a diversity of gages, and the unification and standardization of these lines will mean a considerable sale for American steel rails.

General News Section.

The Pennsylvania Railroad has just finished the planting of 2,000 young trees at Vineyard, near Harrisburg, to be cultivated for the making of ties.

At Buc, France, December 30, Maurice Tabuteau broke the world's aviation distance record by flying continuously for seven hours and forty-five minutes making in that time a distance of 362.66 miles.

The Buffalo & Susquehanna has notified all employees that the demerits entered against them on the discipline records have been wiped off, so that the new year can be begun by each man with a clean record.

The Lake Shore & Michigan Southern is now running trains on the right hand track throughout all of its double track lines. The last division to be changed from left-hand running was that at the eastern end of the road. This was done December 27.

In the 24 hours ending at midnight, December 12, the Southern Pacific Company moved 915 cars over the Tehachipi mountain in central California. This record includes 80 passenger cars, hauled by 19 engines; and 835 freight cars, hauled by 46 engines.

The westbound Overland Limited express train of the Southern Pacific was stopped by two robbers on the morning of January 3, nine miles west of Ogden. Utah, and the valuables of about 100 passengers were taken; a negro porter who disregarded a command of one of the robbers was shot dead, and another porter was fatally injured. One passenger was slightly wounded. The robbers held the train for about an hour, but did not attempt to enter the express car.

Senator La Follette, of Wisconsin, succeeded in his request that the senate print the testimony which has been taken by the Interstate Commerce Commission in its numerous and protracted hearings on the question of authorizing a general increase in freight rates. The copy, which has been sent to the printer, fills 10,000 typewritten sheets. Some of the railways and a few shippers have bought copies of this testimony in mimeograph form, a single set of which cost, it is said, $1,400. Seventy sets have been sold.

The "Clearance Bill" introduced in Congress at the last session by Representative Martin of Colorado is to be the subject of a hearing by the House committee. It will be opposed by the legislative committee of the American Railway Association. The bill provides that the maximum width of locomotives in service after Jan. 1, 1912, shall be 10 feet 6 inches over all, maximum height of all cars to top of running board 14 feet 2 inches, that no structure of any kind, including tunnels, rock cuts, etc., shall be closer to any track than 6 feet 11 inches, that overhead clearances be 20 feet in all cases and that tracks must be 12 feet 6 inches apart, center to center, in all cases.

The Pennsylvania Railroad has ordered from the Western Electric Company a complete installation of telephones, with selector calling apparatus, for the use of the train despatcher and train directors between Philadelphia and West Philadelphia. Between these points there are six main tracks and part of the way eight. Ordinarily all orders for unusual movements are given from Tower A at Seventeenth street, close to the Broad street terminus, but there is a despatcher's office at Tower S at Thirty-second street, from which orders can be given in emergencies; and the calling apparatus is arranged so that orders can be sent to any one of the fifteen telephone stations in this territory as readily from Tower S as from Tower A. At Tower A, the calling apparatus is provided in triplicate so as to enable any one of the three operators to call any station without delay.

The special commission appointed in Massachusetts by the legislature to examine the property of the New York, New Haven & Hartford, with a view to seeing whether it was overcapitalized, has made its report and reaches a conclusion favorable to the company; that is to say, that the assets are sufficient to secure the outstanding stock and debts. The statement presented was as of June 15, 1910. The aggregate valuation of the property is not published, but it is said to have been found to be very much greater than the total amount of stock and bonds.

Some of the trains in the subway of the Interborough Rapid Transit Company, New York City, are now equipped with automatic electric apparatus for giving the all-right or starting signal. This signal is given in the cab of the motorman by an electric bell, and the bell is energized by a circuit which is closed only after every door in the train has been shut. It is estimated that with this arrangement the starting signal can be given about four seconds earlier than is practicable by the use of the hand bell rope.

The Interborough Rapid Transit Co., New York, has notified the Public Service Commission that it is an unconstitutional body, and that its orders of December 23 and December 28 will not be complied with. These orders pertain to the running of trains in the subway sufficient to provide seats for as many passengers as offer themselves each fifteen minutes throughout the day and night. This order was made on December 28, and is a modification of an order made in April last ordering the company to run sufficient trains to provide seats for all passengers in each period of thirty minutes. In his letter President Shonts says that the terms of the order of December 28 are impossible of performance; that the order makes no provision for the temporary prevention of the company from complying with it by accident or other controlling emergency for which the company is not responsible, and that in this respect it is unjust and unreasonable; that the order deprives the company of the right of management and protection of its property; that the order illegally substitutes the judgment of the Public Service Commissioners for the judgment of the Interborough company's directors and stockholders; that the order impairs the obligation of contracts to which the company is party in violation of the constitution of the United States; and furthermore that the law under which the commission purports to act, known as the Public Service Commission law, is unconstitutional as not having been duly enacted in accordance with the laws of the state of New York. The commission has fixed January 12 for the rehearing. The order requires the company either to reduce from 30 to 15 minutes the "period of observation," or given time within which sufficient seats are supposed to be supplied for all passengers, or to operate the maximum service at all hours. The complaint has been that the company has been bunching its trains at the end of the half-hour period, a dearth of trains being produced thereby during all but the last five minutes of each period.

William E. Corey.

Judge Elbert H. Gary, chairman of the board of directors of the United States Steel Corporation, announced on January 3 that William E. Corey had resigned his position as president. Judge Gary said in part: "The resignation will take effect at the pleasure of the board of directors and it is the present opinion of the members of the finance committee that there should not be elected a successor as president in the immediate future, if at all. The finance committee may recommend the election of two vice-presidents who will be expected to take charge of the commercial and manufacturing departments. It is intended to strengthen the whole organization in every respect practicable and useful." Judge Gary said further that the relations between Mr. Corey and the members of the board and the finance committee and all the officers of the corporation have been most pleasant and agreeable. It will be remembered that Mr. Corey succeeded Charles M. Schwab to the presidency in 1903. Since March, 1907, Mr. Corey's position has been subordinate to Judge Gary's as chairman of the finance committee and of the board of directors. Since that time all public utterances on the corporation's affairs have come from Judge Gary.

It is said that Mr. Corey will continue to be a director in the corporation.

Brains Wanted.

There is a railway problem, of course, and no one dissents from the proposition that the roads should be compelled to deal justly with the public and that rates should be as low as consist-

ent with the rights of the owners and the interests of the public. But entirely too many shallow minds are fooling with this problem. Perhaps most of them are inspired by good intent * * *. —*Houston (Texas) Post.*

Conductors' and Trainmen's Pay Increased.

A committee of managers representing the western lines and representatives of the conductors' and trainmen's unions reached an agreement at Chicago on December 29, under which the wages of the conductors and trainmen on these lines, estimated to number 75,000, are to be given an advance in wages of 10 per cent. The aggregate amount of the increase will be about $5,000,000 a year. The companies were represented in the negotiations by A. W. Trenholm (C., St. P., M. & O.), chairman; C. W. Kouns (A. T. S. F.); T. J. Foley (I. C.); J. W. Maxwell (St. L. S. W.); A. Price (C. P.); F. H. Ustick (C. B. & Q.); George H. Emerson (G. N.); W. R. Scott (S. P.); C. H. Hubbell (C. R. I. & P.), and H. B. Earling (C. M. & St. P.). The Order of Railway Conductors was represented by A. B. Garretson, president, and the Brotherhood of Railroad Trainmen by W. G. Lee, president. The following are the railways that are parties to the agreement and the articles of agreement:

Atchison, T. & S. F.—Eastern Lines.
Atchison, T. & S. F.—Western Lines.
Atchison, T. & S. F.—Coast Lines.
Gulf, Colorado & Santa Fe.
Santa Fe, Prescott & Phoenix.
Canadian Northern (B. of R. T. only).
Chicago & Alton.
Chicago & Northwestern.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & Puget Sound.
Chicago, Milwaukee & St. Paul.
Chicago, St. Paul, Minneapolis & Omaha.
Colorado & Southern.
Duluth, South Shore & Atlantic.
El Paso & Southwestern.
Ft. Worth & Denver City (including Wichita Valley).
Frisco System (including lines in Texas).
Great Northern.
Illinois Central.
Indianapolis Southern.
International & Great Northern.
Kansas City Southern.
Minneapolis, St. Paul & Sault Sainte Marie.
Missouri, Kansas & Texas.
Missouri Pacific System.
New Orleans, Texas & Mexico (O. R. C. only).
Beaumont, Sour Lake & Western (O. R. C. only).
Orange & Northwestern (O. R. C. only).
Northern Pacific.
Oregon Railroad & Navigation Co.
Oregon Short Line.
Quincy, Omaha & Kansas City.
Rock Island Lines (except Yardmen).
St. Louis, Brownsville & Mexico (O. R. C. only).
St. Louis Southwestern System.
St. Joseph & Grand Island.
San Antonio & Aransas Pass.
San Pedro, Los Angeles & Salt Lake.
Sunset-Central Lines
Houston & Shreveport (O. R. C. and Yardmen).
Houston, East & West Texas (O. R. C. and Yardmen).
Houston & Texas Central.
Galveston, Harrisburg & San Antonio.
Louisiana Western.
Texas & New Orleans.
Morgan's Louisiana & Texas.
Southern Pacific Co.—Pacific System.
Texas & Pacific.
Trinity & Brazos Valley.
Union Pacific.
Yazoo & Mississippi Valley.

Article A.—An increase of ten (10) per cent. on existing rates is granted conductors, brakemen, flagmen and baggagemen in passenger service.

Article B.—It is agreed that the railways will not make reductions in crews or increases in mileage for the purpose of offsetting the increase of wages given passenger trainmen.

Article C.—An increase of ten (10) per cent. on existing rates is granted conductors, brakemen and flagmen in all freight, work, wreck, mixed, pusher and helper service. This increase not to apply to pusher or helpers now paid yard rates.

Article D.—Upon roads having a better basis for a day's work, or for payment of overtime or other rates or allowances in passenger, freight, mixed, work, wreck, pusher or helper service, the adoption of the foregoing rates and rules shall not operate as a reduction thereof.

Article E.—The increases granted by the Conference Committee of Managers to also apply to all rates for special or incidental service as specified in the individual schedules.

While the Canadian Pacific signed the agreement, its employees declined tentatively to accept it.

The Railway Strike in Italy.

The Italian railway strike has been postponed until the end of January, to give the government and parliament time to amend the bill granting the employees an increase of pay aggregating $4,000,000 annually. Objection to the measure is made on the grounds that the increase should be greater and proportioned differently. The government is taking precautions to insure railway service by recruiting emergency locomotive drivers.

Railway Signal Association.

Secretary C. C. Rosenberg, Bethlehem, Penna., has issued the December number of the *Journal* of the association, containing the doings of the annual meeting which was held at Richmond, Va., last October. It appears from this report that the changes in the constitution which were proposed at the meeting have all been adopted by letter ballot, except that which proposed a change in the dividing line between the East and the West. Instead of this, the association adopted the alternative amendment abolishing the dividing line, and the Board of Direction, which is the new name of the executive committee, will now consist of 15 members. It is expected that with this enlargement the question of geographical representation will take care of itself. The principal amendments, aside from this, are that correcting inequality in the votes of representative members who represent several different railways and that requiring the president to consult the Board of Direction in making appointments of members of committees.

Central Railway Club.

The annual meeting and dinner of the Central Railway Club will be held at the Statler Hotel, Buffalo, N. Y., on Thursday, January 12. The features of the business session in the afternoon will be the annual reports and a paper by W. O. Taylor on "Lubrication for High Pressure Slide and Piston Valve Locomotives," both non- and superheated type. The result of the vote for officers for the ensuing year will also be announced.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held in New York, January 4, a paper by Henry Earle Riggs, M. Am. Soc. C. E., entitled The Valuation of Public Service Corporation Property was presented for discussion. This paper was printed in the November number of *Proceedings*.

American Society of Mechanical Engineers.

At the next meeting of the American Society of Mechanical Engineers, on January 10 in New York, a paper will be read on "Mechanical Handling of Freight," by Samuel B. Fowler, of Boston, Mass. The subject will be discussed by railway officials and officers of large supply houses.

International Railway General Foremen's Association.

The International Railway General Foremen's Association will hold its next convention in Chicago, July 25-27, 1911, instead of in May.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.
American Association of Local Freight Agents' Association.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.
American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio.
American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Sept. 17-19, 1911; St. Louis, Mo.
American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 6, 1911; Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except July and August; annual, Jan. 18-19, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., New York; Jan. 10; New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal, annual, last week January.

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y. Next annual meeting, Jan. 12, Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday; annual, Jan. 17, 1911; Chicago.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Duluth, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Pittsburgh.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; second Wed.

INDIANAPOLIS RAILWAY AND MECHANICAL CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILROAD CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., except June, July, August; alternately at St. Paul and Minneapolis, Minn.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.

RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911; Toledo.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York; Jan. 17.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago; annual, Jan. 17-19, 1911; Chicago.

Traffic News.

The Canadian Railway Commission has ordered the express companies of Canada to file with the commission within three months tariffs showing reductions in rates of at least 10 per cent.

A press dispatch from Ottawa says that the Canadian Pacific and the Canadian Northern, both of which roads run their own sleeping cars, are to reduce the prices of upper berths to correspond with the reduction which is to be made by the Pullman Company.

The Goodrich Transportation Company, which operates a boat line on the Great Lakes from Chicago, has brought suit in the federal court at Chicago to enjoin the Interstate Commerce Commission from compelling it to comply with the commission's regulations regarding the methods of accounting to be used by inland water lines. It states that but 20 per cent. of the business of the company is interstate, and that, therefore, the enforcement of the commission's rule as to it would be unreasonable.

N. E. Weeks, for the past 25 years chairman of the New England Passenger Association, and George H. Watson, secretary of the same for 12 years, terminated their services in these offices on December 31. In accepting the notices of their intention not to accept re-election, the association passed complimentary resolutions; and testified to the sincerity of the views expressed by giving the retiring officers a complimentary luncheon. The luncheon took place at the Boston Athletic Association, on Wednesday, December 21. There was a poem by Cy Warman.

The railways carrying freight to the Rocky mountain region have filed their tariffs, showing rates reduced in accordance with the decisions made by the Interstate Commerce Commission in the Spokane and cognate cases; and the merchants—or, at least, some of them—can truly say that they have succeeded "beyond the dreams of avarice"; for, according to a press despatch from Washington, the reductions "vary from 9 to 110 per cent." We expect from our Washington correspondent, in time for use in next week's issue, a photographic reproduction of one or more of the tariffs in which the carrier agrees to transport the shipper's goods for nothing and in addition to present the consignee with a bag of gold, of value equal to 10 per cent. of the price that would have been charged as freight under the former tariff.

Proposed Joint Traffic Commission with Canada.

Chairman Knapp, of the Interstate Commerce Commission, and J. P. Mabee, chief commissioner of the Canadian Railway Commission, have concluded the negotiations which they have had in hand for several months past and have recommended the creation of an international commission to regulate traffic between this country and Canada. The report has been sent to the secretary of state and the diplomatic representatives of the two countries will present to their respective legislatures a treaty to carry out the recommendations. The report says that for control of through rates, through routes, and other matters properly the subject of joint regulation, the establishment of such an international commission would be advantageous to both countries; that the regulation to which international carriers should be subjected is substantially similar to that provided for interstate carriers of the United States; that the International Commerce Commission should consist of four members, the chairman and one member (to be named by the President and Governor General) of the commission of either country; that the control of this commission should extend to telegraph, telephone and express companies; that international carriers by water should not be so controlled except when and to the extent they unite with rail carriers of either country in forming through mixed water and rail routes. Two provisions of the treaty as outlined by Messrs. Knapp and Mabee are that the international commission shall not hear claims for reparation and that it shall not prosecute criminal proceeding against shippers or carriers.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 85-A, giving a summary of car shortages and surpluses by groups from August 18, 1909, to December 21, 1910, says:

"The total surplus for this report is 62,118, an increase of 8,203 cars. Of this increase, 6,868 are coal and gondola, and 1,473 flat cars. The large increase in coal is apparently due to the holiday season. While the total box car surplus is practically unchanged, the situation by groups shows a decreased surplus in the East, South and Northwest, with increased surplus in the West, Southwest and in Canada. There is little change in the shortage figures, the total showing a decrease of 1,191 cars, chiefly box and miscellaneous.

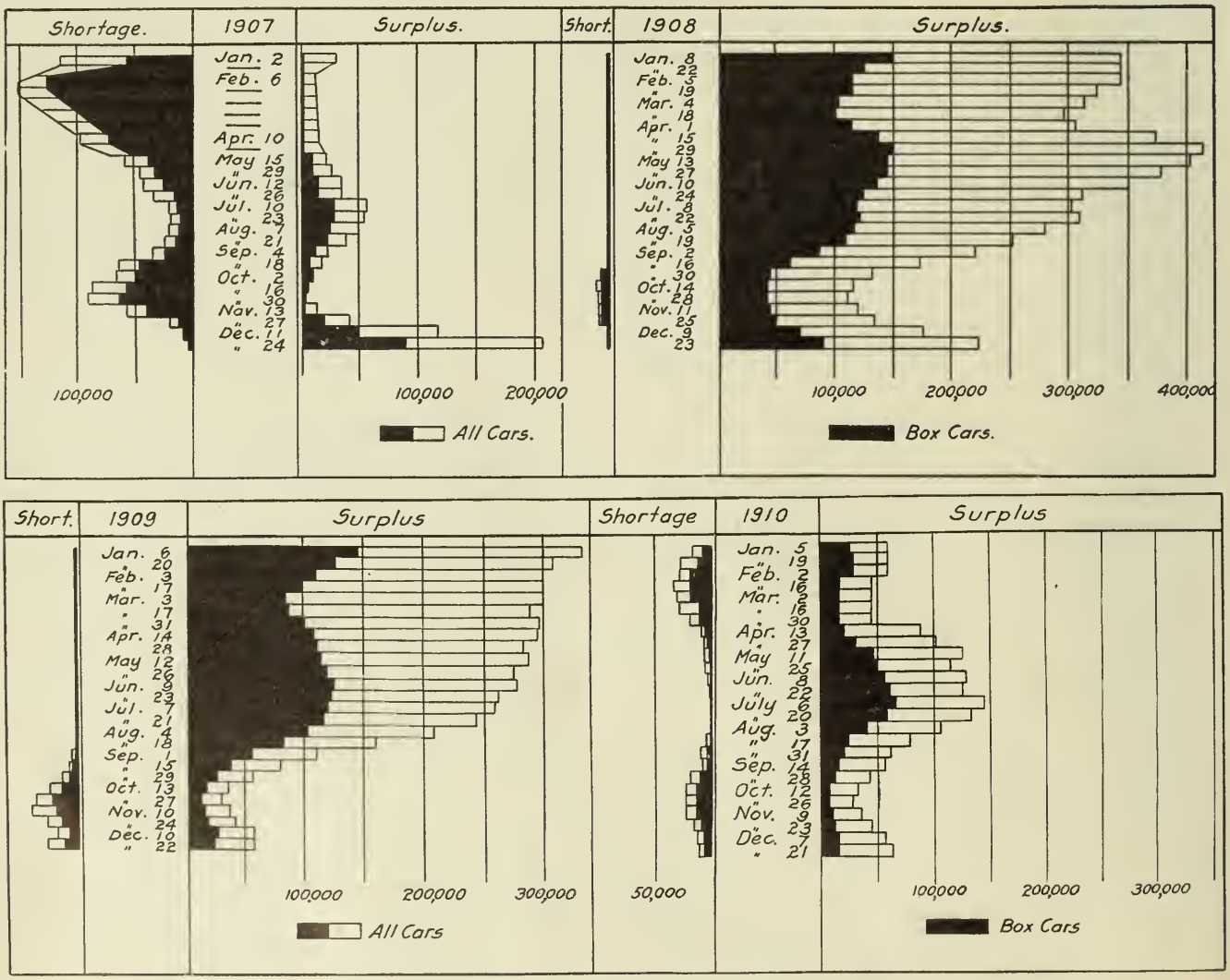
The total surplus is 3,764 cars greater than for the corresponding period in 1909, this being the first report during 1910 that shows an increase over the 1909 figures. Analysis by classes, however, develops that the box car surplus is 7,831 cars less than last year, while coal car surplus shows an increase of 10,436. The total shortage is 13,351 cars less than last year, the reduction being about evenly divided between box and coal cars."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts show the total surpluses and shortages in the years 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—December 21, 1910	8	279	868	897	304	2,348	151	31	150	166	498
" 2.— " 21, 1910	26	2,511	160	2,650	3,812	9,133	5	0	1,246	247	1,498
" 3.— " 21, 1910	25	1,285	383	6,690	2,334	10,692	428	0	305	864	1,597
" 4.— " 21, 1910	10	289	17	338	663	1,307	1,202	290	1,276	0	2,768
" 5.— " 21, 1910	19	53	20	404	420	897	1,341	600	50	18	2,009
" 6.— " 21, 1910	21	3,859	950	2,369	4,842	12,020	640	1	86	103	830
" 7.— " 21, 1910	4	317	376	823	598	2,114	0	0	0	0	0
" 8.— " 21, 1910	15	1,819	129	1,259	1,945	5,152	64	90	8	17	179
" 9.— " 21, 1910	11	1,363	100	403	775	2,641	250	0	0	0	250
" 10.— " 21, 1910	21	2,304	1,425	1,769	6,024	11,522	408	4	3	51	466
" 11.— " 21, 1910	5	2,374	930	47	941	4,292	509	0	0	101	610
Total	165	16,453	5,358	17,649	22,658	62,118	4,998	1,016	3,124	1,567	10,705

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF OCTOBER, 1910. (SEE ALSO ISSUES DECEMBER 9, 16, 23 AND 30.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta & West Point	93	$55,066	$38,661	$103,189	$12,885	$16,999	$5,032	$28,899	$5,061	$68,876	$34,313	$273	$4,409	$30,177	—$7,519
Atlantic & St. Lawrence	167	68,899	26,158	105,134	34,829	19,689	3,805	54,132	2,609	115,064	—9,930	.....	8,452	—18,382	—66,752
Buffalo & Susquehanna *R.R.*	269	144,113	8,871	159,196	29,983	29,838	1,613	52,924	5,400	119,758	39,438	.....	2,600	36,838	—
Butte, Anaconda & Pacific	46	84,502	7,108	96,983	13,866	17,442	548	39,537	1,777	73,170	23,813	.....	2,000	21,813	—13,275
Chicago & Alton	1,025*	792,304	421,003	1,305,758	208,738	204,128	39,104	500,991	38,845	991,806	313,952	—277	32,700	280,975	—245,793
Chicago, Rock Island & El Paso	153†	44,879	20,635	72,439	9,103	10,593	1,083	23,629	2,751	47,159	25,280	—129	3,250	21,901	—23,522
Cincinnati & Muskingum Valley	148	54,496	25,080	84,885	11,052	11,872	1,949	34,503	1,512	60,888	23,997	.....	3,740	20,257	—14,051
Detroit & Mackinac	360‡	66,711	26,317	99,021	10,842	18,009	2,335	32,275	2,382	65,843	33,178	—135	8,250	24,793	—10,437
Detroit, Grand Haven & Milwaukee	190	125,912	47,659	194,863	36,282	19,392	6,326	80,922	4,381	147,303	47,560	—57	3,009	44,494	7,674
Eastern Ry. Co. of New Mexico	227	45,461	23,119	75,020	17,627	11,750	1,092	27,900	2,542	60,911	14,109	.....	4,735	9,374	—28,032
Fort Worth & Rio Grande	196	75,296	31,496	113,240	21,627	11,015	3,519	38,408	4,053	78,622	34,618	.....	2,141	32,477	17,259
Indianapolis Southern	179	76,145	22,066	103,306	27,419	14,864	2,670	35,287	1,859	82,099	21,207	.....	4,000	17,207	—4,189
Kansas City, Mexico & Orient	740§	133,598	46,440	189,964	30,917	31,672	7,978	77,420	9,426	157,412	32,552	.....	2,617	29,935	—3,174
Lehigh & Hudson River	96	127,577	3,738	133,302	14,365	19,819	1,084	40,429	2,770	78,467	54,835	.....	3,100	51,735	—402
Lehigh & New England	170	82,090	977	83,937	12,573	9,616	1,185	20,876	3,022	47,272	36,665	.....	1,500	35,165	6,743
Louisville, Henderson & St. Louis	200¶	66,021	36,910	108,943	28,725	11,828	4,204	33,668	2,728	81,153	27,790	483	2,666	25,607	5,952
Midland Valley	324	93,764	36,747	138,167	21,367	5,074	2,433	33,836	5,952	68,662	69,505	1,352	6,401	64,456	24,643
Missouri & North Arkansas	365	46,663	21,694	74,116	19,481	12,056	1,904	27,280	2,998	63,719	10,397	.....	4,250	6,147	—2,356
Nevada Northern	165	105,552	11,913	121,602	6,358	12,241	469	25,922	4,433	49,423	72,179	.....	3,122	69,057	—12,933
Pecos & Northern Texas	296‖	123,920	26,773	156,645	13,971	26,218	2,280	45,189	4,827	92,485	64,160	.....	3,834	60,326	—14,365
Quincy, Omaha & Kansas City	262	46,931	22,271	75,609	26,303	10,898	1,403	30,694	3,193	72,491	3,118	.....	3,000	118	5,398
Richmond, Fredericksburg & Potomac	83	83,874	71,642	178,318	24,333	22,381	2,686	59,319	5,681	114,400	63,918	.....	200	63,718	4,791
St. Louis, San Francisco & Texas	243*a*	70,822	33,117	109,278	18,083	15,295	2,997	57,011	3,875	97,261	12,017	.....	1,554	10,463	10,833
San Antonio & Aransas Pass	724	325,174	101,853	449,400	61,596	44,353	4,536	128,699	8,892	248,076	201,324	.....	9,000	192,324	39,020
Southern Ry. Co. in Mississippi	280	69,990	30,945	107,849	21,520	6,595	1,762	40,991	4,196	75,064	32,785	.....	4,596	28,189	2,782
Southern Kansas Ry. Co. of Texas	125	123,177	18,668	146,658	15,187	28,128	2,231	41,795	3,786	91,127	55,531	.....	1,553	53,978	—17,183
Spokane & Inland Empire	177	44,972	61,428	111,948	15,259	8,235	1,444	30,658	7,002	62,598	49,350	7,614	4,200	52,764	—15,120
Spokane International	141	83,508	24,236	112,555	18,663	5,735	2,310	30,544	3,488	60,740	51,815	.....	3,585	48,230	13,758
Texas Central	268	64,223	30,335	102,547	13,782	9,083	1,149	30,414	3,795	58,223	44,324	288	2,636	41,976	—2,320
Toledo, Peoria & Western	248	65,920	41,964	117,297	20,426	22,943	2,373	41,994	3,101	90,837	26,460	.....	5,000	21,460	—4,345
Toledo, St. Louis & Western	451	280,766	39,822	341,283	51,663	38,833	8,122	109,952	11,179	219,749	121,534	.....	13,900	107,634	—12,057
Ulster & Delaware	129	74,300	20,694	99,830	14,153	12,995	1,055	38,190	2,330	68,723	31,107	127	3,300	27,934	—4,893
Virginia & Southwestern	188	96,543	16,076	116,519	12,471	25,253	1,471	32,372	3,894	75,462	41,057	.....	4,523	36,534	698
Washington Southern	36	31,315	35,698	87,053	11,272	8,179	1,117	29,305	2,945	52,818	34,235	.....	2,345	31,890	5,344
Western Ry. of Alabama	133	67,830	44,951	123,704	16,044	19,920	4,864	30,689	5,261	76,778	46,926	—126	3,891	42,909	1,525
Wichita Valley	257	62,211	26,486	94,553	10,462	5,543	784	28,174	2,203	47,166	47,387	.....	2,500	44,887	14,033
FOUR MONTHS OF FISCAL YEAR, 1911.															
Atlanta & West Point	93	$189,686	$161,572	$384,634	$51,192	$69,154	$20,544	$109,843	$18,546	$269,279	$115,355	$740	$17,637	$98,458	$8,270
Atlantic & St. Lawrence	167	242,874	123,730	406,983	120,834	79,829	16,268	189,066	11,543	417,540	—10,557	.....	33,809	—44,366	—87,912
Buffalo & Susquehanna *R.R.*	269	436,763	31,711	489,766	107,043	82,987	6,223	157,392	18,848	372,493	117,273	.....	8,471	108,802	—
Butte, Anaconda & Pacific	46	337,057	44,752	405,289	49,057	64,182	2,751	159,421	7,375	282,786	122,503	.....	9,500	113,003	—8,045
Chicago & Alton	1,025*	3,227,496	1,666,813	5,252,212	739,476	771,177	152,066	1,847,857	136,848	3,647,424	1,604,788	—7,399	144,600	1,452,789	—549,341
Chicago, Rock Island & El Paso	153†	161,352	82,605	271,499	36,172	42,679	4,926	85,772	10,902	180,451	91,048	—940	13,700	76,408	—54,253
Cincinnati & Muskingum Valley	148	227,101	92,930	340,531	51,829	46,621	8,785	133,520	5,866	246,621	93,910	.....	14,440	79,470	—28,319
Detroit & Mackinac	360‡	266,100	127,053	418,413	43,660	63,718	8,975	130,521	10,305	257,179	161,234	3,124	33,413	130,945	6,292
Detroit, Grand Haven & Milwaukee	190	352,036	238,687	684,815	119,850	76,762	25,370	311,605	17,349	550,936	133,879	—20	12,036	121,823	—60,622
Eastern Ry. Co. of New Mexico	227	165,588	94,560	280,101	74,285	40,101	3,812	99,320	9,955	227,474	52,627	.....	16,539	36,088	—90,981
Fort Worth & Rio Grande	196	195,710	111,979	332,473	65,280	38,093	14,057	137,401	15,129	269,960	62,513	.....	10,271	52,242	15,248
Indianapolis Southern	179	298,292	94,529	409,073	87,777	59,627	11,637	142,660	6,812	308,513	100,560	.....	16,000	84,560	21,600
Kansas City, Mexico & Orient	740§	449,314	170,870	654,771	125,317	137,741	29,468	299,017	31,448	622,991	31,780	.....	22,483	9,297	—80,134
Lehigh & Hudson River	96	431,167	19,252	458,821	64,473	58,938	4,861	145,978	13,948	288,198	170,623	.....	12,400	158,223	3,426
Lehigh & New England	170	340,803	4,859	349,986	45,837	39,634	4,547	86,143	11,602	187,763	162,223	.....	6,000	156,223	31,542
Louisville, Henderson & St. Louis	200¶	247,074	152,030	426,610	107,685	45,483	17,818	127,362	10,029	308,377	118,233	1,602	10,667	109,169	9,850
Midland Valley	324	257,448	130,309	413,013	79,408	69,510	8,357	120,275	18,891	296,441	116,572	4,133	25,604	95,101	—3,814
Missouri & North Arkansas	365	181,155	112,127	315,097	84,669	48,400	8,115	111,178	12,184	264,546	50,551	.....	17,000	33,551	—3,551
Nevada Northern	165	415,716	49,247	481,535	30,790	51,471	1,328	97,943	15,837	197,369	284,166	.....	12,612	271,554	—32,365
Pecos & Northern Texas	296‖	416,962	109,427	551,992	71,308	81,462	8,107	160,687	18,646	340,210	211,782	.....	11,184	200,598	—35,419
Quincy, Omaha & Kansas City	262	152,259	90,113	265,533	91,938	39,557	5,573	108,535	11,028	256,631	8,902	.....	12,000	—3,097	47,309
Richmond, Fredericksburg & Potomac	83	381,034	258,872	728,389	120,413	89,552	11,845	247,713	22,218	491,741	236,648	.....	800	235,848	28,911
St. Louis, San Francisco & Texas	243*a*	232,139	94,721	344,648	68,908	47,335	11,613	183,051	14,642	325,549	19,099	.....	5,718	13,381	5,664
San Antonio & Aransas Pass	724	1,152,369	411,197	1,645,121	214,109	191,570	19,511	497,874	37,172	960,236	684,885	.....	36,000	648,885	163,437
Southern Ry. Co. in Mississippi	280	187,244	126,461	336,902	87,868	25,079	11,289	142,849	14,153	281,238	55,664	.....	18,378	37,286	11,420
Southern Kansas Ry. Co. of Texas	125	390,291	76,389	486,694	62,930	90,863	7,987	149,846	16,632	328,258	158,436	.....	9,014	149,422	—56,429
Spokane & Inland Empire	177	164,361	262,661	450,737	70,817	34,131	6,835	118,308	28,535	258,626	192,111	55,848	16,800	2,311,159	—161,855
Spokane International	141	294,912	92,664	410,412	70,240	22,165	9,789	107,906	13,027	223,127	187,285	.....	14,342	172,943	47,981
Texas Central	268	178,702	126,354	331,963	59,285	39,094	5,360	111,083	15,466	230,288	101,675	1,144	10,373	92,445	3,434
Toledo, Peoria & Western	248	259,668	173,449	458,343	77,334	83,371	9,406	160,372	12,650	343,133	115,210	.....	20,000	95,210	—3,373
Toledo, St. Louis & Western	451	1,055,824	183,318	1,320,377	186,288	158,081	33,647	433,233	39,413	850,662	469,715	.....	55,600	414,115	—41,056
Ulster & Delaware	129	285,580	206,711	515,017	66,570	50,304	6,795	185,863	9,465	318,997	196,020	144	13,200	182,964	—4,735
Virginia & Southwestern	188	355,872	55,707	426,586	49,509	89,862	5,983	118,113	12,761	276,228	150,358	.....	18,094	132,264	4,920
Washington Southern	36	132,984	135,413	352,360	39,517	28,262	5,043	123,102	9,605	205,529	146,831	.....	9,379	137,452	23,971
Western Ry. of Alabama	133	220,040	150,441	404,296	66,534	73,947	20,174	105,232	19,951	285,838	118,458	—853	15,563	102,042	11,791
Wichita Valley	257	171,478	102,745	292,750	49,119	21,115	2,476	97,614	8,624	178,948	113,802	.....	10,045	103,757	14,675

Mileage operated on October 31, 1909.—* 998 miles; † 111 miles; ‡ 347 miles; § 660 miles; ¶ 218 miles; ‖ 152 miles; *a* 132 miles; — indicates Deficits, Losses and Decreases.

INTERSTATE COMMERCE COMMISSION.

The commisison has suspended until May 1, 1911, tariffs on milk and cream, showing increased rates, presented by the Erie, the Lake Shore & Michigan Southern, the Pennsylvania Company, and a number of other roads in central territory.

Mr. Lyon, for the commission, and Mr. Brandeis, for the eastern shippers, have filed their briefs preparatory to the final argument, which is to be heard next week, before the commission, on the question of increased rates in the long distance freight tariffs of the trunk line railways. Mr. Lyon's "brief" fills 89 pages, and includes 50 statistical tables, while Mr. Brandeis' "brief" is a document of 178 pages.

The commisison on December 29, changed to April 15, the date to which a large number of freight tariffs are suspended. These tariffs, which deal mostly with "tap-line" rates, were suspended until January 5 with the expectation that before that date they could be heard and the commission could reach a decision as to whether or not they should be allowed to go into effect, but there has not been time to fully consider the cases.

Complaint Dismissed.

Empire Wall Paper Co. v. Boston & Maine et al. Opinion by Commissioner Clements:

Under the circumstances disclosed by the record in this case the commission is unable to find that the initial carrier was under the duty of routing the shipment other than as indicated in the shipper's instructions. (20 I. C. C. 1.)

Pabst Brewing Co. et al v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane:

Following *Liebold Co. v. D., L. & W.*, 17 I. C. C. 503, complainants' claims for reparation on various shipments of beer from Milwaukee, Wis., to points on the Pacific coast and in Colorado, Wyoming, western Nebraska, and New Mexico are denied. (19 I. C. C. 584.)

S. Running v. Chicago, St. Paul, Minneapolis & Omaha. Opinion by Chairman Knapp:

Complainant asks reparation in the amount represented by the difference between the published rate charged on his shipments of strawberries from Menomonie Junction, Wis., to St. Paul, Minn., and the rate which he understood to be in force; but in the absence of any proof that the rate exacted was or is unreasonable for the exclusive use of an iced refrigerator car between the points of shipment and destination, the complaint must be dismissed. (19 I. C. C. 565.)

R. Prahlow v. Indiana Harbor Belt et al. Opinion by Chairman Knapp:

Inasmuch as the record does not disclose a through rate in excess of the combination of locals, nor a case of misrouting, complainant's contention that the rates exacted were unreasonable is not sustained.

Although the commission adheres to the principle as to weighing announced in *Romona Oolitic Stone v. Vandalia R. R. Co.*, 13 I. C. C. 115, it is not of opinion that substantial justice requires its application to the switching service here involved. (19 I. C. C. 572.)

Differences in Pepper Rates Upheld.

Crombie & Co. et al. v. Southern Pacific et al. Opinion by the Commission:

A classification named same rating on "pepper" as on "chile pepper." Subsequently a commodity rate on "pepper" was established. The commodity rates should be strictly applied and such a rating on "pepper" does not take out of the classification any other article specifically named therein, however analogous, such as "chile pepper." (19 I. C. C. 561.)

Naming a Specific Rate for a Specific Consignee.

George N. Pierce Co. v. New York Central & Hudson River. Opinion by Commissioner Lane:

The charges collected by defendant for the transfer of five cars of less-than-carload freight, originating without the state of New York, from the Black Rock freight station in Buffalo, N. Y., to the private siding of complainant in Buffalo, found discriminatory because similar service was given by defendant without charge to other consignees whose traffic was handled under similar conditions. Reparation awarded.

The practice of naming specific consignors and consignees as entitled to certain service is objectionable not only on account of form but because it may often effect, as in the present instance, an actual discrimination between persons similarly situated and equally entitled to the carrier's service. (19 I. C. C. 579.)

Minimum on Empty Beer Kegs.

Fred Miller Brewing Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane:

A 20,000-lb. minimum is excessive as applied to consignments of empty beer kegs in refrigerator cars, but is not excessive with respect to empty kegs and bottles, mixed, or to straight shipments of empty bottles. Reparation awarded as complainant's shipments of empty beer kegs. (19 I. C. C. 590.)

No Discrimination Against Ashland.

City of Ashland v. New York Central & Hudson River. Opinion by Chairman Knapp:

Maintenance of rail-lake-and-rail rates from eastern points to Ashland, Wis., which are higher per 100 lbs. than rail-and-lake rates from same points of origin to Duluth, Minn., is not prohibited by act to regulate commerce. (20 I. C. C. 3.)

Discrimination Against Rome, Miss.

Davenport Commercial Club v. Yazoo & Mississippi Valley. Opinion by the commission:

Rate of 23 cents per 100 lb. on cypress lumber, from Minot, Miss., and Rome, to Davenport, Iowa, found unreasonable and unduly discriminatory in so far as it exceeds rate of 21 cents contemporaneously in effect from same points of origin to Rock Island, Ill., and Moline. (20 I. C. C. 19.)

Semianthracite Coal Rate Unreasonable.

Northern Anthracite Coal Co. v. Delaware, Lackawanna & Western. Opinion by Commissioner Clements:

Defendant's present rates per gross ton for the transportation of semianthracite coal, originating at Bernice, Pa., from Waverly, N. Y., to Binghamton, found unreasonable, and reasonable rates prescribed for the future. (19 I. C. C. 549.)

Correct Method of Weighing.

Wheeler Lumber, Bridge & Supply Company v. Astoria & Columbia River et al. Opinion by the commission:

Where a carload of lumber was weighed twice and showed a variation, the weight obtained in weighing car both trucks at a time preferred to one obtained by weighing them separately. Return of overcharge required. (20 I. C. C. 10.)

Condition Necessary to Granting Reduced Fare Upheld.

National Association of Letter Carriers v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Clark:

Defendants tendered in their tariffs special reduced round-trip fares on the certificate plan in connection with convention of complainant, such reduced fares being conditioned on the presentation of 1,000 or more certificates; less than 1,000 certificates were available for visé and therefore reduce fare for return trip was denied. The tariff provisions are binding and must control. Complaint dismissed. (20 I. C. C. 6.)

STATE COMMISSIONS.

John Y. Boyd, a member of the Pennsylvania State Railroad Commission, has resigned, his term of office having expired and he not desiring to be reappointed.

The Railroad Commission of Louisiana has held that the present rates on telegraph messages between points located on different telegraph lines are excessive, and has ordered that the charge between points on different telegraph lines shall not exceed 40 cents for the first 10 words and two cents for each additional word.

The Railroad Commission of Iowa has sent to all of the large express companies operating in the state, an order requiring reductions of from five cents to twenty cents per 100 lbs. in rates on merchandise. The commission declares that the express companies are making excessive profits in that state.

The California State Railroad Commission has issued an order requiring the Southern Pacific and the Atchison, Topeka & Santa Fe to fix rates from Los Angeles to San Joaquin Valley points at the same ratio as is in force between the valley points and San Francisco. The decision was the result of a protest made by the Associated Jobbers of Los Angeles.

The Railroad Commission of Louisiana, after investigating the rates on sand and gravel, finds so many cases of discrimination that a uniform schedule of rates on a mileage basis is ordered on sand and gravel in carloads, minimum weight 80,000 lbs. The rates fixed by the commission are graded from 1½ cents per 100 lbs. for 30 miles and less to eight cents per 100 lbs. for distances over 300 miles.

The Minnesota Railway Commission has directed the railways in that state hereafter, in order to keep the valuations of their properties up-to-date, to report not only the quantity of material used in the improvements and extensions, but also the cost of each item. The original valuations were based on the estimated cost of reproduction, and the commission considers it necessary, in order to keep the valuations up-to-date, to have a record of both the quantities of materials used and the prices paid.

In 1910 the New York Public Service Commission, Second district, had presented to it for action 2,071 cases. These included 1,438 complaints settled without formal orders, 371 formal complaints and 262 applications from various corporations for authorization by the commission. During the year the commission disposed of and closed 1,670 cases. During the three years of the commission's existence 5,496 cases have been presented to it for action. In addition to daily sessions and consideration of disposition of cases, the commission held 554 hearings, covering a period of 196 days. During the year the commission authorized capitalization to the amount of $151,048,108. In 1909 there was authorized $142,855,036; in 1908, $92,253,900; for the last six months of 1907, $17,730,745.49, a total for the three and a half years of the commission's existence, of $403,887,789.

The Wisconsin railway commission asks in its annual report for legislation to increase its authority for the regulation of the issuance of railway securities. The commission's construction of the law was overruled in a case between it and the Minneapolis, St. Paul & Sault Ste. Marie. The commission says that under the interpretation put on it by the state supreme court, the law is now of little value as a means of ascertaining many important facts relating to past issues of securities of public service corporations. It thinks the law should enable it to compel the roads to make their past financing a matter of public record and should prescribe the purpose for which securities may be issued, leaving it to the commission to ascertain whether the purposes of a proposed issue are within the terms of the statute and whether the character and amount of securities proposed to be issued are reasonably required for such purpose.

The Railroad Commission of Louisiana has ordered the Texas & Pacific to cease to lease for or without a consideration a part of its railway property exclusively to one shipper. The commission found that the Texas & Pacific had a contract with J. W. Thompson & Co., by which J. W. Thompson & Co. were to furnish the Texas & Pacific with gravel and in exchange were granted certain privileges in the use of facilities for storing gravel. In addition, the Thompson company paid the Texas & Pacific a rental for bins belonging to the railway and used for storing gravel, and also a rental for certain loading and unloading facilities at a dock. "The commission cannot agree with the position taken by the beneficiary of this extraordinary contract that a common carrier may lease any portion of its properties to him for his exclusive use when there are other shippers desiring to use them for the purpose of shipping the same or similar commodities."

The Louisiana Railroad Commission in a complaint that the passenger train service on the Thibodaux branch of the Texas & Pacific is inadequate finds that the railway company is to blame. The defendant operates a combination passenger and freight train between Donaldsonville and Thiboudaux, scheduled to leave Donaldsonville at 12:20 p. m., and arrive at Thibodaux at 2:00 p. m.; this train seldom leaves Donaldsonville on time, and very rarely arrives at Thibodaux before 4 or 5 o'clock —the distance being 30 miles. The commisison has made a full and complete investigation in this case, having inspected the service. According to the company's records this train did not arrive at Thibodaux, on time, a single day from October 1 to October 21. The country through which the Thibodaux branch runs is thickly settled and the traffic is heavy. There is no reason why the public should be subjected to annoying and unreasonable delays because a railway company desires to combine its passenger and freight business in order to curtail expenses. The company should furnish a separate passenger train to leave Donaldsonville at about 12:20 p. m., daily, and arrive in Thiboudaux not later than 2 p. m., or it should arrange, at once, to carry out its present schedule, if it can be done.

COURT NEWS.

In the United States District Court at Philadelphia, January 4, the Philadelphia & Reading Railway, the Lehigh Valley Railroad and the Bethlehem Steel Co., convicted of violation of the law by cancelling demurrage charges and for failure to observe published tariffs, were fined $40,000 each and ordered to pay the costs of prosecution.

The Supreme Court of the United States has sustained that clause of the interstate commerce law which makes the initial carrier liable for loss of freight even though the loss occur at some point beyond its own line. This clause was the so-called "Carmack amendment" to the Hepburn law, passed in 1906. A persistent fight was made in court against the amendment as a radical departure in legislation. Its constitutionality was attacked by several railways on two grounds: one that it interfered with the liberty of contract and the other that it imposed liability upon the initial carrier for loss on connecting lines when the former had no part in the management of the latter. In effect, the initial carrier was made responsible for other companies' wrongs. The decision was read by Justice Lurton.

The United States Circuit Court of Appeals at New Orleans has decided, in a suit for the enforcement of the safety appliance laws, which arose in Texas, that each defective car is the unit on which the offenses are to be based. That is to say, the car, not the train, is the measure of the offense. In a case where three defective cars were hauled in a single train it is right to collect, not a single penalty, but three penalties. The defendant was the St. Louis Southwestern. In view of the purpose of the act to protect life and limb by the enforced equipment of every car, the Court (Judge Selby) holds that the construction contended for by the defendants would be so narrow as to defeat the intent of Congress.

The New York State Court of Appeals has sustained the state comptroller in his assessment of the franchise tax on new stock issued by the New York Central & Hudson River in January, 1907. The amount of the tax depends on the amount of dividends paid, and the company had claimed that it had not paid the full 6 per cent. dividend on this stock for the entire year. The court upholds the comptroller's assessment on the basis of the whole outstanding stock at the end of the tax year. Chief Judge Cullen writes the opinion. As the company had paid 6 per cent. on the whole of its stock that had been at any time outstanding, the tax therefore should have been assessed on the theory that the whole of the company's stock was a 6 per cent. dividend-paying issue. The company had contended that the assessment should be on the average amount of stock during the year and the average amount of dividends paid.

It is reported in Havana that the President of Cuba has decided to contract with the Cienfuegos, Palmira & Cruces Railway & Power Co. for constructing and operating a line from the Paradero de Caonao to Manicaragua, with a branch from Caonao to Cruces.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Edgar H. Boles has been appointed assistant general solicitor of the Lehigh Valley, with office at New York.

John W. Newlean, auditor of the Chicago Great Western at Chicago, has been appointed general auditor of the Illinois Central and the Yazoo & Mississippi Valley, with office at Chicago.

C. F. Krebs, formerly comptroller of the Illinois Central and the Yazoo & Mississippi Valley, has been appointed auditor of the Chicago Great Western, with office at Chicago, succeeding John W. Newlean, resigned to accept service with another company.

W. B. Biddle, vice-president of the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute, with offices at St. Louis and Chicago, has been appointed also vice-president of the St. Louis, Brownsville & Mexico. J. H. Elliott, vice-president and general manager of the Beaumont, Sour Lake & Western, and the New Orleans, Texas & Mexico, and vice-president of the Orange & Northwestern at Beaumont, Texas, has been appointed also vice-president of the St. Louis, Brownsville & Mexico, with office at Houston, Texas.

William J. Harahan, assistant to the president of the Erie Railroad at New York, has been elected a vice-president, and will have charge of the engineering department, F. L. Stuart, chief engineer, having resigned. Mr. Harahan was born December 22, 1867, at Nashville, Tenn. He began railway work in 1881 as a messenger and was afterward clerk in the superintendent's office of the Louisville & Nashville, at New Orleans, La. In 1884 he was made an apprentice in the shops of that company, and two years later entered the engineering department of the same road. From 1889 to 1890 he was engineer of maintenance of way of the Cincinnati division of the Chesapeake & Ohio, and then for two years was in charge of structures on the Baltimore & Ohio Southwestern. In 1892 he was appointed roadmaster and later trainmaster of the Pontiac division of the Illinois Central, and from April to October, 1895, was assistant superintendent of the Freeport division, becoming superintendent in October. In August, 1896, he was transferred as superintendent to the Louisville division, and in May, 1901, he was appointed chief engineer, remaining in that position until September of the following year, when he was appointed assistant general manager. In June, 1904, he was made general manager, and in February, 1905, was elected fourth vice-president. He left the service of the Illinois Central in June, 1907, to become assistant to the president of the Erie Railroad. Although Mr. Harahan is to be at the head of the engineering department, he has had unusually broad training in both the operating and the executive departments. In his executive work on the Erie, especially, he has shown himself to be a diplomat in the broad and best sense of the word.



Courtesy, United Press Syndicate.
W. J. Harahan

Operating Officers.

Frank Toucey has been appointed an assistant superintendent of the Union Pacific, with office at Denver, Colo.

W. H. Lochliter has been appointed inspector of transportation of the Baltimore & Ohio, with office at Baltimore, Md.

C. E. Griggs, division engineer of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed a transportation inspector, with office at Newton, Kan.

Richard Doyle, master of transportation of the Grand Trunk at Durand, Mich., has been appointed a trainmaster of the Chicago & Alton, with office at Springfield, Ill.

A. B. Phillips, superintendent of motive power of the Tonopah & Goldfield, at Goldfield, Nev., has been appointed superintendent of transportation and mechanical departments, with office at Goldfield.

R. J. Sullivan, superintendent of the Missouri, Kansas & Texas of Texas, with office at Greenville, Tex., has resigned to accept a similar position with the Wichita Falls & Northwestern, at Wichita Falls, Tex.

The title of James Berlingett, in charge of the transportation and mechanical departments of the Virginian Railway, is assistant general manager. This corrects an item in our issue of December 16, page 1164.

F. P. Gutelius, general superintendent of the Lake Superior division of the Canadian Pacific, at North Bay, Ont., has been appointed general superintendent of the Eastern division, with office at Montreal, Que.; J. G. Taylor, superintendent of the Alberta division, at Medicine Hat, Alb., succeeds Mr. Gutelius, with office at North Bay.

To take care of the operation of the Winston-Salem Southbound, a new district, called the Winston-Salem district, has been formed, comprising the main line of the Atlantic Coast Line, from Florence, S. C., to Wadesboro, N. C., the Hartsville branch and the Winston-Salem Southbound Railway, from Wadesboro to Winston-Salem, and O. T. Waring has been appointed superintendent and W. H. Johnson, assistant superintendent, both with offices at Florence, S. C.

J. E. Craver, superintendent of the Fargo division of the Northern Pacific at Dilworth, Minn., has been appointed superintendent of the Seattle division, with office at Seattle, Wash. A. M. Burt, superintendent of the Dakota division at Jamestown, N. D., succeeds Mr. Craver, and F. L. Birdsall, superintendent at Staples, Minn., succeeds Mr. Burt. A. J. Sovereign resumes his duty as superintendent of the Dakota division, with office at Jamestown, succeeding Mr. Birdsall.

C. C. Walker, general superintendent of transportation of the Chesapeake & Ohio, at Richmond, Va., has been appointed assistant general manager. E. P. Goodwin, general superintendent, at Huntington, W. Va., succeeds Mr. Walker, and J. R. Cray, superintendent, at Hinton, has been appointed general superintendent of the West Virginia general division. J. W. Heron, in addition to his duties as chairman of the car allotment commission, will have general supervision of coal and coke car distribution, reporting to the general superintendents.

Traffic Officers.

B. C. Wurthmann has been appointed a freight solicitor of the Pennsylvania Railroad, with office at New York.

W. K. Lucas, general agent of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., has resigned.

J. G. Royster, Jr., has been appointed a soliciting freight agent of the Mobile & Ohio, with office at Kansas City, Mo., succeeding C. C. Harvey, resigned.

F. A. Updegraff, assistant superintendent of the Kansas City Terminal Railway at Kansas City, Mo., has been appointed baggage agent, and his former office is abolished.

J. P. De Vaughn, city ticket agent of the Buffalo, Rochester & Pittsburgh at Pittsburgh, Pa., has been appointed district passenger agent, with office at Buffalo, N. Y., succeeding W. U. Tunison, retired.

W. H. Quigg, general freight agent of the Atlanta, Birmingham & Atlantic at Atlanta, Ga., has been appointed a member of the Working Committee on Uniform Classification, with office in the Merchants Loan & Trust building, Chicago.

W. F. Paton, assistant general passenger agent of the National Railways of Mexico, at Mexico City, Mex., has been appointed general passenger agent, with office at Mexico City. E. T. Winchell, chief clerk in the passenger department, has been appointed assistant general passenger agent, succeeding Mr. Paton.

Joseph B. Cabell, second vice-president and traffic manager of the Philadelphia & Gulf Steamship Company at Philadelphia, Pa., has had his office transferred to New Orleans, La. G. B. Dowdy, assistant traffic manager at Philadelphia, has been appointed traffic manager at that place.

F. J. Shubert, assistant general freight agent of the Rock Island Lines, at Kansas City, Mo., has been appointed general freight agent, with office at Kansas City, succeeding R. G. Brown, who has been appointed an assistant general freight agent, and at his own request transferred to Minneapolis, Minn. Fred Smith, commercial agent at Kansas City, succeeds Mr. Shubert.

R. G. Thompson, district passenger agent of the Wabash Railroad, at Indianapolis, Ind., has been appointed division passenger agent, with office at Fort Wayne, and R. S. Greenwood, Michigan passenger agent, having resigned, the Michigan territory will be assigned to Mr. Thompson. George D. Maxfield, general agent, passenger department, at Buffalo, N. Y., succeeds Mr. Thompson, with office at Indianapolis, Ind., and John Maloney, station passenger agent, at Buffalo, succeeds Mr. Maxfield, with office at Buffalo.

H. G. L. Campbell, division freight agent of the Lake Erie & Western, the Ft. Wayne, Cincinnati & Louisville and the Northern Ohio, at Sandusky, Ohio, has been appointed assistant general freight agent of the Toledo & Ohio Central, with office at Toledo, Ohio, succeeding E. L. Jamison, retired. G. M. Weaver, general westbound agent of the New York Central fast freight lines at Chicago, has been appointed assistant general freight agent of the Michigan Central, with office at Detroit, Mich., succeeding C. B. Griggs, assigned to other duties. George Krause, Jr., division freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Cleveland, Ohio, has been appointed assistant general freight agent, with office at Cincinnati, succeeding C. H. Jackson, assigned to other duties. G. M. Kridler, division freight agent of the Lake Shore & Michigan Southern at Youngstown, Ohio, has been appointed assistant general freight agent of the Lake Shore, with office at Cleveland. F. A. Curry succeeds Mr. Campbell. L. E. Oliphant has been appointed chief of the tariff bureau of the Lake Erie & Western, the Ft. Wayne, Cincinnati & Louisville and the Northern Ohio, with office at Indianapolis, Ind. The territory of L. L. Hyde, assistant general freight agent at Peoria, Ill., has been extended to cover stations on the main line of the Lake Erie & Western from Peoria to, but not including Tipton, Ind.

Engineering and Rolling Stock Officers.

Charles Kaighn, engineer of the Midland Valley at Muskogee, Okla., has been appointed chief engineer, with office at Muskogee, a new office.

J. E. Schwitzer, assistant chief engineer of the Canadian Pacific, at Winnipeg, Man., has been appointed chief engineer, with office at Montreal, Que.

Charles E. Johnson, division engineer of the Kansas City Southern, at Mena, Ark., has been appointed chief engineer, with office at Kansas City, Mo.

G. E. Bruner has been appointed roadmaster of the new Winston-Salem district of the Atlantic Coast Line and the Winston-Salem Southbound Railway, with office at Florence, S. C. (See an item under Operating Officers.)

C. T. Hessmer, master mechanic of the Minnesota division of the Northern Pacific at Staples, Minn., has been appointed master mechanic of the Seattle division, with office at Seattle, Wash., succeeding W. B. Norton, assigned to other duties. W. C. Radke succeeds Mr. Hessmer.

T. J. Raycroft, master mechanic of the Sterling division of the Chicago, Burlington & Quincy at Sterling, Colo., has been appointed master mechanic of the Alliance division with office at Alliance, Neb., succeeding F. C. Stuby, assigned to other duties. H. M. Barr succeeds Mr. Raycroft.

Francis Lee Stuart, chief engineer of the Erie Railroad, has been appointed chief engineer of the Baltimore & Ohio, and the Baltimore & Ohio Southwestern, with office at Baltimore, Md., succeeding A. W. Thompson, promoted to general manager. Mr. Stuart was born December 3, 1866, at Camden, S. C., and graduated from Emerson Institute, Washington, D. C., June, 1884. He began railway work in 1884 as a rodman under James L. Randolph, chief engineer of the Baltimore & Ohio, and was afterwards consecutively, levelman, transitman and resident engineer until 1887, when he went to Alabama as engineer for the Cahaba Coal Mining Co., locating railways, building coking plants and opening mines. From 1889 to 1891 he was resident engineer in charge of the heavy construction work of the Briafield, Blockton & Birmingham, and later was engineer of maintenance of way on the same road. From 1891 to 1892 he was engaged in various engineering work near Birmingham, Ala., and then returned to the B. & O. as resident engineer in charge of the construction of 20 miles of the line between Uniontown, Pa., and Morgantown, W. Va., and construction work in the Connellsville region. He was later supervisor in charge of the line from Connellsville to Fairmont. From the spring of 1895 to 1897 he was engineer and contractor on various new railways, and was then appointed assistant engineer on the Nicaragua Canal Commission, in charge of the topographical and hydrographic survey of the San Juan river, from Lake Nicaragua to the sea. After the commission returned to the United States he was left in charge and made the hydrographic survey of Lake Nicaragua, returning to the United States in 1898. He was in charge of the estimates of cost of the various canal varients in Nicaragua, and was held over until the Isthmian Canal Commission was formed. As division engineer, he preceded the commission to Nicaragua and prepared the organization. He resigned during the winter of 1899, and again returned to the B. & O., being made assistant engineer on location and construction. His jurisdiction was gradually extended until January, 1903, when he was appointed district engineer, in charge of development of low grade trunk line improvements for the betterment of the B. & O. in Maryland, Pennsylvania and Ohio. In 1904 he was transferred to Baltimore as engineer of surveys of the entire system, resigning this position in March, 1905, to become chief engineer of the Erie Railroad, which position he now leaves to become chief engineer of the B. & O. Mr. Stuart is a resourceful engineer. He is progressive and thorough, and while with the Erie Railroad he carried out to successful completion work on the four-track tunnel and open cut through Bergen Hill at Jersey City, N. J. He also mastered the problem of putting in foundations for a trestle over a swamp on the summit between the Allegheny and Genessee rivers, into which construction piles had been driven 117 ft. without reaching a foundation which would support the trestles. When the wrecking of the swing span of the drawbridge at Cleveland, Ohio, put the crossing out of commission, he took 95-ft. girders into the shop, braced them together, added counterweights, and, mounting the structure on an old turntable center with a pile foundation, made it possible to resume traffic within a short time, the improvised draw swinging through an angle of 90 degrees to permit vessels to go on their way. He is a director of the American Society of Civil Engineers and of the American Railway, Engineering and Maintenance-of-Way Association.



F. L. Stuart.

OBITUARY.

Joseph Albert Jones, first vice-president of the Gulf & Ship Island, died at Gulfport, Miss., on December 25.

Railway Construction.

New Incorporations, Surveys, Etc.

Atlantic & Gulf Terminal.—This line has been opened for business from Ste. Flavie, Que., on the Intercolonial Railway, to Matane, in the Gaspe peninsula. It is proposed to eventually extend the line to a water terminal in the Gaspe peninsula.

California Roads.—A. M. Bianchi and J. E. McFee are making plans to build an electric line from San Luis Obispo, Cal., to Simeon, and from Cayucos to Paso Robles.

Chicago & Wisconsin Valley.—This company is said to have completed plans for building from Madison, Wis., north to Portage, 30 miles, and expects to begin construction work in April. The survey for an extension further north to Stevens Point, an additional 70 miles, will be made soon, and the entire line is expected to be ready for operation before the close of 1912. The line is eventually to be extended north from Stevens Point via Warsaw to Merrill. (August 26, p. 372.)

Colorado Railroad.—See Colorado & Southern.

Colorado & Southern.—An officer writes that grading contract has been given to Kilpatrick Brothers, Denver, Colo., to build the Colorado Railroad from Dixon, Colo., at Sugar Beet loading station, which is 2.5 miles north of Wellington, to Cheyenne, Wyo., 32 miles. Grading is now under way and it is expected that this work will be finished by July. The bridge work will be carried out by the company's men, also the track laying. The work will be moderately heavy earth work and rock work. The line is being built to carry iron ore, coal, lumber, live stock and merchandise. A. D. Parker, president, and H. W. Cowan, chief engineer, Denver. (August 12, p. 294.)

Coney Island & Brooklyn.—This company is planning to make improvements along its line in the borough of Brooklyn, N. Y., at a cost of about $355,000.

Hagerman Valley & Western.—An officer writes that this company will at once equip 10 miles of its line in Idaho with electric power, and is in the market for wire and other supplies to carry out this work. J. M. Morton, president; H. E. Secor, secretary, and H. S. Lower, general manager, Hagerman, Idaho. (September 23, p. 558.)

Kansas City Southern.—An officer writes that during 1910 this company constructed three new division terminals, complete with buildings and tracks, adding about 50 miles of new track. The company now has grade reduction work under way on 20 miles, which it is expected will be finished by March, 1911.

Louisville & Nashville.—According to press reports, this company will rebuild its line from Edgefield Junction, Tenn., which is 10 miles north of Nashville, to Decatur, Ala.

Louisiana & Arkansas.—An officer writes that surveys are now being made from Jena, La., to Vidalia, 48 miles.

Mexican Roads.—A line is being built from San Geronimo, Mex., to Cerro Azul. The E. L. Doheny interests, Los Angeles, Cal., it is understood are back of the project.

National Railways of Mexico.—It is announced that this company will build a branch from Allende, Mex., which is on the International division, 33 miles south of Eagle Pass, Texas, to Las Vacas, Mex., opposite Del Rio, Texas, 90 miles. The plans for the branch were recently completed and placed in the hands of the government for approval. It is expected to have the line finished about the time the branch of the Kansas City, Mexico & Orient will be finished south to Del Rio. A bridge is to be built at this point over the Rio Grande for the joint use of both these companies.

New Mexico Roads.—Preliminary survey is being made for a line from Springer, N. Mex., to Farmington. W. W. Wannamaker, El Paso, Texas, is said to be back of the project.

Panama-David.—See Panama Railroad.

Panama Railroad.—The Panama Assembly has approved a bill authorizing President Arosemena to receive bids for the construction of the Panama-David Railroad. The plans call for a line from the city of Panama, west to David, in the province of Chiriqui, about 300 miles. The cost of this work is not to exceed $10,000,000, for which the government may issue 5 per cent. bonds. The bids will be opened at the end of four months. (April 8, p. 970.)

Pennsylvania Lines West.—To provide additional facilities for handling traffic on the Indianapolis division, the Pennsylvania Lines are making extensive improvements, including the construction of 25.9 miles of second track. The improvements will eliminate 25 street and highway crossings and two railway grade crossings; this necessitates the construction of four overhead, and 16 undergrade crossings, and the vacation of five highways, formerly crossing the railway at grade. The double-tracking work to be carried out is in two sections, one from Richmond, Ind., to Dublin, 17.6 miles, and the other section from Dunreith to Knightstown, 8.3 miles. The maximum grade will be reduced from 1.1 per cent. to 0.7 per cent., or about 35 ft. to the mile, necessitating a change of grade on 21.3 miles of line. A change of line is also being made on about one mile just east of Knightstown. It will replace a 3 deg. 50 min. reverse curve and a 1 deg. 32 min. curve by a single 1 deg. curve, saving 800 ft. in distance. At other points where the change in grade is considerable an entirely new double-track roadbed is being constructed, and when completed the old route will be abandoned. The double-track road is to be elevated through Cambridge City, Raysville and Knightstown and depressed through Dublin. The company has built 19 concrete arch bridges, 12 steel through floor bridges and three plate girder bridges. The work is about finished on a section of eight miles from Richmond, west, and it is expected that all the improvements will be completed this year.

Phoenix & Eastern.—See Southern Pacific.

Pueblo & Southeastern.—Incorporated in Colorado with $500,000 capital, to build from Pueblo, Colo., southeast to the new town of Wilson, 15 miles. The line will eventually be extended further southeast. William J. Lester, of the Pueblo-Rockyford Irrigation Company, is interested.

Southern Railway.—This company expects to open for passenger and freight traffic soon the low grade double-track line through the city of Lynchburg, Va. This improvement, which has been under way for the last four and a half years, included an entire change of line for several miles from Winesap, which is north of Lynchburg, south to Durmid, and included a 1,300-ft. tunnel under Rivermont, a suburb of Lynchburg; a 120-ft. tunnel under Park avenue; 1,860-ft. steel bridge, 150 ft. high, over the James river; 600-ft. steel viaduct, 115 ft. high, over Harris creek; another 1,000 ft., and 135 ft. high, over Blackwater creek, and one 500 ft. long and 80 ft. high, over Fishing creek; 70-ft. concrete viaduct, carrying Fifth street over the railway yards in West Lynchburg; 150-ft. concrete viaduct, carrying the Lynchburg water supply, and a 150-ft. steel viaduct, carrying a spur track of the Norfolk & Western; also an 80-ft. concrete bridge, carrying Twelfth street. The new line, which runs through the western part of the city, will have lower grades than the existing line. (October 21, p. 760.)

Southern Pacific.—Work has been started, it is said, to change the grade on the Phoenix & Eastern between Kelvin, Ariz., and Winkelman, to avoid floods over the Gila river. The new line is to be 20 ft. higher than the existing one.

Surveys are said to be under way for a line from Yreka, Cal., or Hornbrook, to the Happy Camp mining district.

St. Louis, Bartlesville & Pacific.—The Oklahoma Western Construction Company was organized recently at Bartlesville, Okla., it is said, for the purpose of building this line. The railway company was organized about three years ago to build from Joplin, Mo., west via Vinita, Okla., Bartlesville, Pawhuska, Ponca City, Pine Creek and Tonkawa to Carmen, about 225 miles. Surveys have been made. Residents of Bartlesville raised a bonus of $100,000 and it is understood that financial arrangements have been made in France to carry out the work. Frank Overlees, Bartlesville, is the principal promoter; D. H. Rhodes, chief engineer, 213 Fourth street, Joplin, Mo.

Washington & Choctaw.—Incorporated in Alabama with $200,000 capital, to build from Yellow Pine, in Washington county, Ala., northeasterly to a point 18 miles south of Butler, in Choctaw county. The names of the incorporators are not given.

Railway Financial News.

Boston Railroad Holding Company.—See New York, New Haven & Hartford.

Boston & Maine.—See New York, New Haven & Hartford.

Carthage, Watertown & Sacketts Harbor.—The directors have declared the regular 2½ per cent. semi-annual dividend on the $465,000 common stock, and have declared an extra dividend of 5 per cent. Nearly all of the company's stock is owned by the New York Central & Hudson River.

Central New England.—The New York Public Service Commission, Second district, has authorized the Central New England to make a mortgage securing $25,000,000, and has given the company permission to issue immediately $12,317,000 bonds secured by this mortgage for refunding purposes. The commission refused permission to the Central New England to refund through the issue of these bonds, the interest on $150,000 7 per cent. Newburgh, Dutchess & Connecticut notes, holding that while the principle of these notes may properly be refunded by the issue of bonds, the unpaid interest, which amounts to $102,000, should be paid from income.

Dallas, Cleburne & Southwestern.—See Missouri, Kansas & Texas.

Delaware, Lackawanna & Western.—President W. H. Truesdale has been elected a member of the board of managers, succeeding J. Rogers Maxwell, deceased.

Delaware & Hudson.—Archibald D. Russell, of New York, has been elected a director, succeeding J. Rogers Maxwell, deceased.

Lake Shore & Michigan Southern.—The New York Stock Exchange has listed $8,927,000 additional 4 per cent. bonds of 1906-1931, and has given the company authority to list $6,073,000 additional bonds on notice of sale and delivery. The $8,927,000 bonds have been sold and arrangements have been made for the sale of the $6,073,000.

Missouri, Kansas & Texas.—This company is to ask the Texas legislature to pass a law giving the M. K & T. permission to buy the Dallas, Cleburne & Southwestern, which runs from Cleburne, Texas, to Egan, 10 miles.

New York, New Haven & Hartford.—It is understood that this company has arranged to sell to J. P. Morgan & Co. about 25 per cent. of the $20,012,000 4 per cent. Boston Railroad Holding Company preferred stock, which is held as a free asset in the New Haven company's treasury. This sale will give the New Haven sufficient cash to pay for about $5,500,000 Boston & Maine new common stock out of the total issue of $10,663,700 recently authorized, and now offered to stockholders at 110, each holder of one share of outstanding common or preferred having the right to subscribe to one share of new common. The Boston Railroad Holding Company preferred stock will be unconditionally guaranteed as to its 4 per cent. dividends by the New York, New Haven & Hartford.

See an item in regard to this company in General News.

Oregon-Washington Railroad & Navigation Company.—A valuation of $115,415,000 has been placed on the properties that are to be merged as the Oregon-Washington Railroad & Navigation Company, as follows:

Oregon Navigation	$78,380,000
Oregon & Washington	15,000,000
Columbia River & Oregon Central	950,000
Columbia Southern	1,075,000
Ilwaco	1,000,000
Lake Creek & Coeur d'Alene	790,000
Oregon, Washington & Idaho	3,400,000
Snake River Valley	2,265,000
Umatilla Central	315,000
Idaho Northern	1,400,000
North Coast	7,550,000
Northwestern	2,640,000
Malheur Valley	550,000
Total	$115,415,000

Pittsburgh, Binghamton & Eastern.—This property has been ordered sold under foreclosure, and it is said that claims against the company amount to $3,017,525. No date has as yet been fixed for the sale.

Late News.

The items in this column were received after the classified departments were closed.

R. N. Barrows, who has been southern representative for the Atha Steel Castings Company, Newark, N. J., has taken a position as southern railway representative of the Patton Paint Company of Milwaukee, Wis., and Newark, N. J.

The Canadian Pacific on January 15 will take over the St. Maurice Valley Railway and the New Brunswick & Southern The St. Maurice Valley Railway is 84 miles long and runs from Three Rivers, Que., to Shawinigan Falls. The New Brunswick & Southern is seven miles long.

A joint brief for the railways in official classification territory, in the eastern freight rate case, has been filed with the Interstate Commerce Commission. It is signed by Francis L. Gowen, Clyde Brown, O. E. Butterfield, Hugh L. Bond, Jr., George E. Brownell, Herbert A. Taylor, Edward D. Robbins, Lucien H. Alexander, and J. L. Minnis.

Thirteen lives are believed to have been lost in a rear collision of passenger trains on the Northern Pacific at Cheney, Wash., January 4. Ten or more persons were injured. The North Coast Limited ran into the rear of a Burlington passenger train which was entering a side track, and three cars were wrecked. The Limited when it struck, was running at an estimated speed of 35 miles an hour.

The Chicago, New York & Boston Refrigerator Line has ordered 300 refrigerator cars from the Whipple Car Company. The Boston & Maine, it is said, will place an order at once for 300 passenger cars. It is reported in Pittsburgh that both the Kanawha & Michigan and the Pennsylvania are making inquiries for 3,000 cars each. The Pennsylvania lines west of Pittsburgh are reported to have ordered 20 steel postal cars from the Pressed Steel Car Company.

A suit in equity under the Sherman anti-trust law, alleging an unlawful combination in restraint of trade, has been filed in the United States Circuit Court against thirteen transatlantic steamship companies and twelve of their officers. They are charged with having entered into a conspiracy to monopolize the business of transporting steerage passengers by the formation of the "Atlantic Conference," which allotted to each line a certain percentage of the business, and the members of which are united to suppress all competition by any persons or corporations, other than themselves.

Senator Stephen J. Stilwell, of the Bronx, New York, has introduced a bill in the New York Legislature abolishing the up-state and the New York city public service commissions and establishing in their place two new commissions to be known as corporations commissions. The up-state commission is planned to consist of five members, as at present, at a salary of $10,000 each, the present salary being $15,000 each, and the new commissioners are to be appointed by Gov. Dix. For the present New York city public service commission is substituted a separate corporation commission of five members, one to be elected from each borough, and the salary to be $10,000 each instead of $15,000 as at present. The same powers are given the new commissions as are vested in the Public Service commissions, except in the division of telegraph and telephone supervision.

The Baltimore & Ohio has made a settlement with its machinists, who had been on strike many months. It is understood that the former employees, four or five hundred in number, are to be taken back within thirty to sixty days.

The serious differences as to piece work are said to have been satisfactorily adjusted. The men formerly employed on piece work are to return on that basis, and in shops where piece work has been extended the employees will adopt the piece work basis, having as much time as necessary, but not exceeding thirty days in which to acquaint themselves with the methods.

The fact that some of the men were formerly foremen is not to interfere with their returning to the service as machinists.

All employees reinstated are to be entitled to all their former benefits under the relief feature, including accident and benefit insurance.

Supply Trade Section.

The Spear & Miller Company, Chicago, maker of brake shoes, has removed its office from the Great Northern building to the Railway Exchange.

W. H. Whiteside has resigned from the presidency of the Allis-Chalmers Company, Chicago, and D. W. Call, formerly assistant to the president of the American Steel Foundries Company, Chicago, has been elected to succeed him.

The Block-Pollak Iron Company, Cincinnati, Ohio, announces that Maurice E. Pollak has been elected vice-president and Joseph Michaels, secretary, succeeding Louis Benjamin, who is no longer connected with the company.

The Lackawanna Steel Company will on January 19, 1911, remove its general offices from 2 Rector street, New York, N. Y., to its works at Lackawanna, Erie county, New York. The present New York office will be the address of the assistant to the president, and also a district sales office.

The Harriman Lines have recently closed a standardization contract with the Willard Storage Battery Company, Cleveland, Ohio, for their requirements of train lighting batteries. This contract was awarded to the Willard Company after a thorough service test of all makes of storage batteries extending over a period of two years.

George L. Bourne has resigned as vice-president of the Railway Materials Company, Chicago, and been elected vice-president of the Locomotive Superheater Company, New York, with headquarters at 1115 Peoples Gas building, Chicago. Mr. Bourne was connected with the Railway Materials Company for ten years and previous to that was in railway work.

The United States Light & Heating Company, New York, has built a $500,000 plant at Niagara Falls, N. Y. This plant, though in operation now, will not be completed until next week. The old United States plant in New York, and the Bliss plant in Milwaukee, have been discontinued. The Buffalo plant in Albany, N. Y., is still in operation to meet the large orders.

The McKeen Motor Car Company, Omaha, Neb., shipped a new 55-ft., 200-h. p. steel gasolene motor car to the Charles City Western on December 28. This railway owns an interurban line on which a McKeen gasolene switch engine is being used for construction work. The line is to be operated entirely by gasolene motor cars. A 70-ft. car was shipped to the Arizona Eastern on December 31.

An American legation in a Latin-American country has forwarded copies, with translation, of the specifications for a railway between two local towns, for the construction of which bids are requested. A report, containing a general discussion of the project and the prospects for the successful termination of the same, accompanied the specifications, and can be obtained by interested persons upon application to the Bureau of Manufactures, Washington, D. C.

Tenders are required for the carrying out of surveying operations and the construction of the following sections of railway in Brazil: Sao Pedro to Sao Luiz and S. Barja, Jaguarao to Basilio, and Alegrete to Quarahy. Tenders should be sent before January 12, and should be accompanied by a deposit of 20,000 milreis (about $5,650) and addressed to the Directoriá Geral de Obras e Viacao Ministerio da Viacao e Obras Publicas, Rio de Janeiro. All material which it may be necessary to import for the construction of the above lines will be exempt from customs duties.

TRADE PUBLICATIONS.

Rock Drills.—The Ingersoll-Rand Company, New York, has devoted its bulletin No. 4202 to the illustration, description and advantages of the Sergeant rock drills. It is claimed that the Sergeant drill is today the most powerful, most reliable and most effective independent valve machine on the market, and also the most economical in the matter of repairs and air consumption.

Southern Railway.—This company has issued a list of saw, planing, shingle, stave and heading, sash door and blind, and miscellaneous mills tributary to its line and to the lines of its subsidiaries. This list, prepared by the land and industrial department and dated December 15, 1910, gives the name of the post office at the shipping point, the name of the mill, the kind of timber used and the yearly capacity of each mill for all the mills on its lines. The number of mills is not totaled, and from a superficial examination of the pamphlet the list looks too long to be counted.

RAILWAY STRUCTURES.

Albany, N. Y.—According to press reports, the Delaware & Hudson proposes to centralize its heavy repair work in Albany and put up modern shops at that place.

Ashland, Wis.—The Chicago & North Western has appropriated $25,000, it is said, to make improvements to its ore dock No. 1, at Ashland.

Beaumont, Texas.—The St. Louis & San Francisco has secured property on which to build its proposed freight and passenger station. Architects are now drawing plans for the building, which, it is stated, will cost at least $500,000.

Del Rio, Texas.—See National Railways of Mexico under Railway Construction.

Lynchburg, Va.—See Southern Railway under Railway Construction.

Montreal, Que.—Application has been made to the Board of Control by the Montreal Central Terminus Co. for leave to construct under its charter a central railway terminal at Montreal. The scheme involves a tunnel under the St. Lawrence river which would be used by the New York Central lines and the Delaware & Hudson, it is said. From the North and the West the terminal would be used by the Canadian Northern and the Grand Trunk. The Canadian Pacific Railway is not interested in the project. The company is capitalized at $30,000,000.

Nevada, Mo.—The Missouri Pacific has let a contract for building a new machine shop and a coal handling plant to cost about $75,000.

Newark, Ohio.—The Baltimore & Ohio, according to statements by officers, will build new shops at this point.

Ottawa, Ont.—The Canadian Northern will build a bridge, it is said, over Metcalfe road, south of Billings street.

Philadelphia, Pa.—President McCrea, of the Pennsylvania Railroad, has explained to the board of directors the necessity of improved passenger facilities at Philadelphia, in addition to those being carried out, and upon his recommendation a board of four engineers has been appointed to investigate and report on the many plans and suggestions that have been made.

FOREIGN RAILWAY NOTES.

It is said that the Grand Vizier of Turkey has intimated that the Turkish government favored the enterprise of the Ottoman American Development Company, New York, to build a $1,500,000 railway in Asia Minor. The Americans would begin at Alexandretta and extend the line 180 miles toward the Persian border. The concession has been signed by the Turkish minister of public works and now awaits the approval of parliament.

Lines now projected in Brazil which will probably be in operation within 12 months will bring the total mileage under direct or indirect control of the American operators and French shareholders to a total equal to fully half of the present total railway mileage of Brazil.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Philadelphia & Reading will shortly place an order for the building of 20 passenger locomotives at its shops in Reading, Pa.

The Kentucky & Indiana Bridge & Railroad Company has ordered the two locomotives mentioned in the *Railway Age Gazette* of December 30.

The Nevada Copper Belt has ordered the consolidation locomotive mentioned in the *Railway Age Gazette* of December 30 from the Lima Locomotive & Machine Company.

The Delaware & Hudson, as reported in the *Railway Age Gazette* of December 2, has ordered 11 locomotives from the American Locomotive Company. The order includes 5 ten-wheel locomotives without superheaters, 1 ten-wheel locomotive with superheater, 1 consolidation locomotive and 4 Mallets of the 0-8-8-0 type. The special equipment on these locomotives is the same except where indicated. The specifications for these locomotives are as follows:

Type.	5 Ten-wheel	1 Consolidation locomotive
Simple or compound	Simple	Simple
Weight on drivers	140,000 lbs.	178,000 lbs.
Total weight	Engine, 186,000 lbs.	Engine, 202,000 lbs.
Diameter of cylinders	21 in. diameter	23 in. diameter
Stroke of pistons	26 in. stroke	30 in. stroke
Diameter of drivers	63 in.	57 in. diameter
Type of boiler	Extended wagon top	Straight top
Working steam pressure	200 lbs.	175 lbs.
Heating surface, tubes	2,639	2,103
Heating surface, firebox	150	170
Heating surface, total	2,789	2,273
Tubes, number	350	{ 198 { 30
Tubes, outside diameters	2 in.	{ 2 in. diameter { 5⅜ in. diameter
Tubes, length	14 ft. 6 in.	14 ft. 6 in.
Firebox, type	Narrow radial stay	Narrow radial stay
Firebox, length	96 in.	102 in.
Firebox, width	75¼ in.	75¼ in.
Firebox, material and maker	Carbon steel	Carbon steel
Grate area	50.2	53.3
Tank capacity for water	6,800 gals.	7,800 gals.
Oil capacity	3,000 gals.	3,000 gals.

Type.	Mallet	Passenger and freight locomotive, 4-6-0 type
Simple or compound	Compound	Simple
Weight on drivers	450,000 lbs.	142,000 lbs.
Total weight	450,000 lbs.	Engine, 190,000 lbs.
Diameter of cylinders	{ H. P., 26 in.; { L. P., 41 in.	23 in. diameter
Stroke of pistons	28 in.	26 in. stroke
Diameter of drivers	51 in.	63 in.
Type of boiler	Conical type	Extended wagon top
Working steam pressure	220	170 lbs.
Heating surface, tubes	5,245	1,982
Heating surface, firebox	353	150
Heating surface, total	5,598	2,132
Tubes, number	{ 270 { 42	{ 193 { 26
Tubes, outside diameter	{ 2¼ in. diameter { 5½ in. diameter	{ 5⅜ in. { 2 in.
Tubes, length	24 ft. 0 in.	14 ft. 6 in.
Firebox, type	Wide radial stay	Narrow radial stay
Firebox, length	126 in.	96 in.
Firebox, width	114 in.	75¼ in.
Firebox, material and maker	Carbon acid	Carbon steel
Grate area	99.85 sq. ft.	50.2
Tank capacity for water	9,000 gals.	6,800 gals.
Coal capacity	14 tons	.....
Oil capacity	.....	3,000 gals.

SPECIAL EQUIPMENT.

Axles, engine	(H. L.) Carbon steel, Cunningham treated
Axles, tender	Cambria steel, Coffin treated.
Bellringer	Trojan.
Boiler lagging	Keasby & Matteson sectional magnesia.
Brakes	Westinghouse-American Combined E T 6.
Brake beams	No. 1 Waycott special.
Brake shoes	Diamond S with Christie head.
Brick arch	For oil burning on all except Mallet type.
Couplers	R. E. Janney.
Driving boxes	Cast steel; cypress metal bearings on all except Mallet.
Driving boxes	Cypress bronze bearings on Mallets.
Headlight	Dressel 18 in.
Injector	Hancock.
Journal bearings	Brady Brass.
Piston and valve rod packings	Trojan.
Safety valve	Consolidated.
Sanding devices	Hanlon pneumatic and hand.
Sight feed lubricators	Ohio.
Staying	Radial and Tate Flexible; Taylor Iron.
Steam gages	Ashcroft.
Steam heat equipment	Consolidated on all except consolidation locomotive.
Superheater	Schmidt on all except 5 ten-wheel engines.
Tires	Midvale O. H. steel.
Tubes	Worth Bros.' charcoal iron on all except Mallet.
Tubes	Parksburgh charcoal iron on Mallet.
Valve gear	Walschaerts on all except 5 ten-wheel type.
Valve gear	Baker Pilliod on 5 ten-wheel type.
Wheel centers	Cast steel.
Other specialties	Franklin pneumatic fire door on all; Chicago flange oiler on all; Elvin lubricators on all; Franklin water joints on the Mallet.

The Imperial Government Railways of Japan has ordered 24 Pacific engines and 6 Mallets of 0-4-4-0-C type locomotives from the American Locomotive Company. The cylinders of the Pacific will be 18½ in. x 24 in., the driving wheels will be 63 in. in diameter and the total weight in working order will be 133,000 lbs. The cylinders of the Mallets will be 15½ in. and 24½ in. x 24 in., the diameter of the driving wheels will be 63 in., and the total weight in working order will be 122,000 lbs.

CAR BUILDING.

The Hagerman Valley & Western, Hagerman, Idaho, is in the market for 2 electric motor cars.

The New York, Ontario & Western, as reported in the *Railway Age Gazette* of December 30, has ordered 450 coal cars from the American Car & Foundry Co., to be built at Berwick, Pa. Of these cars 350 will be hopper bottom gondolas, and 100 will be drop bottom gondolas. The hopper cars will have 80,000 lbs. capacity and will weigh 38,500 lbs. The inside measurements will be 33 ft. in length, 8 ft. 11½ in. in width, and 5 ft. ½ in. in height. The over-all measurements will be 34 ft. 6 in. in length, 10 ft. 2¾ in. in width and 9 ft. 4½ in. in height. The bodies will be of wood and the underframes of steel. The drop bottom cars will have 80,000 lbs. capacity and will weigh 36,000 lbs. The inside measurements will be 38 ft. in length, 8 ft. 7 in. in width and 30 ft. in height. The over-all measurements will be 39 ft. 10 in. in length, 9 ft. 9 in. in width and 6 ft. 10 in. in height. The bodies will be of wood and the underframes of steel. The special equipment for both types is the same, as follows:

SPECIAL EQUIPMENT.

Bolsters, truck	Gould cast steel.
Brakes	Westinghouse.
Brake beams	Buffalo No. 2,
Brake shoes	Steel back G. 724.
Brasses	Brady Brass Co.
Carry iron	Flory.
Couplers	Sharon.
Draft gear	Farlow.
Dust guards	D. P.
Journal boxes	Symington.
Roller device	Barber.
Trucks	Gould cast steel.
Wheels	33-in. cast iron.

IRON AND STEEL.

The Pennsylvania Lines West are in the market for 300 tons of bridge steel.

The New York, New Haven & Hartford is in the market for 150 tons of bridge steel.

General Conditions in Steel.—The majority of steel men believe that the present prices will be rigidly maintained until the spring at least. It is thought that even a reduction in prices would not induce the railways to enter the market for any larger orders than were absolutely necessary, at least until after the decision of the Interstate Commerce Commission in regard to the freight rate increase. Last week the prices of structural steel and spikes were reduced until the producers realize only a small profit. The inventories of the middleman are exceptionally meager, so it is hoped that there will be a sharp increase in orders in the near future. The orders of all steel companies at present amount to about 40 per cent. of their capacity.

SIGNALING.

The Chesapeake & Ohio, in a statement of block signal mileage, which was received too late to be included in our table last week, shows that it has increased its automatic mileage during the past year from 48 miles to 183 miles; and on its line through Indiana, formerly the Chicago, Cincinnati & Louisville, the manual block system, operated by means of telephones, is in use the whole length of the road. This makes the totals for the Chesapeake & Ohio system as follows: Automatic, single track, 0; double track 183 miles; manual, single track, 1,543 miles; double track, 126 miles; total both kinds, 1,852 miles. The non-

automatic includes 242 miles controlled manual, two-thirds of this being single track. In the new automatic block signaling, the block sections average 2½ miles in length, and the distant signals are on separate posts.

The Evolution of Corrugated Metal Culverts.

BY PERRY VAN HORNE.

It is probably not generally known, but it is a fact nevertheless, that corrugated metal culverts have been in use in certain localities in the United States for over a quarter of a century.

Originally they were made with cheapness paramount, hence of very light gage galvanized steel, with no pretensions other than that of temporary, or at the best uncertain, longevity. Many of these culverts have long since disintegrated, the result of varying deteriorating elements of the earth in which they were imbedded; others, it is claimed, are still in a fair state of preservation.

Ten years or more ago a commendable tendency was evidenced on the part of various corrugated culvert manufacturers to consider the future. They commenced to operate in the belief that corrugated metal culverts, if made of the right thickness and of a quality of metal superior to galvanized steel, could reasonably be expected to give practical and lasting service. With this in view, the use of extreme light gage metal, which had theretofore prevailed, was discouraged, and increased gages such as Nos. 18 and 16 for smaller sizes and No. 14 for the largest were adopted as a fair standard.

Still later experiments were commenced and have continually progressed toward developing a metal on a commercial basis which should surpass steel and equal or excel, from the standpoint of anti-corrosive characteristics, the well-known old-time iron products. That metal meeting these requirements has been perfected is now a matter of common knowledge to the trade.

In recent years calculations based on the adoption of heavy gages and material of this superior quality, properly galvanized, have been substantially confirmed, with the natural result that corrugated culverts have continued to grow in demand, to undergo improvement and to give satisfaction. Today they are not only recommended by metallurgical chemists and specified by engineers generally, but are also in satisfactory use by the United States government, various foreign governments and under the heaviest traffic-bearing railways, city streets and country highways everywhere. And they are supplanting in a large degree all other kinds of culverts.

Up to about four years ago the common style of corrugated culverts was cylindrical and riveted. About that time a new and novel idea was evolved in a corrugated culvert made of upper and lower sections with lateral flanges, to be shipped knock-down and nested and set up by the use of bolts. This culvert was also characterized by the embodiment in its manufacture of still heavier gages of metal than had ever before been used—including for the smaller diameters Nos. 16, 15 and 14, and for the larger sizes Nos. 12 and 10 gage metal of special anti-corrosive properties, overcoming to a great extent the common criticisms regarding lightness and the effects of corrosion so common to ordinary steel. These better grades of heavier gage culverts—both the round-riveted and the nestable, by reason of their comparative lightness and strength and their ease in handling, hauling and installing—have accomplished much toward revolutionizing permanent road improvement.

The *Engineering News*, a well-known technical journal, commenting editorially on corrugated metal culverts, in its issue of January 20, 1910, had the following to say:

"To an engineer of the old school, accustomed to build always with an eye to permanence and solidity, the idea of putting a culvert of thin corrugated iron under an earth embankment may seem like a crude makeshift, which ought to be condemned offhand without discussion. Very likely the first use of corrugated iron for culverts was a makeshift; but experience appears to show that under certain conditions culverts of this apparently flimsy construction have made good.

"Such culverts are exceedingly cheap, are very light to transport and place, and have so much elasticity and 'come and go' that they will stay in place when unequal settlement occurs where a much heavier culvert would be cracked and broken. For temporary work such culverts are especially advantageous, as they are cheap to place and can be re-covered if the bank is removed.

"The rapid rusting out of sheet iron or steel exposed to the alternate wetting and drying that a culvert receives naturally occurs as a foremost objection to corrugated iron culverts, but some of these metal culverts are said to have been in service for some fifteen years. By using a special grade of metal of high purity the resistance to corrosion is expected to be so greatly increased that the culverts may fairly be classed as permanent construction."

A state highway engineer of a western state (Missouri), in a bulletin some time since issued on the subject of Bridges and Culverts, had the following to say regarding corrugated metal culverts:

"Large quantities of corrugated metal for pipe-culverts and similar products are put on the markets, some of which give good satisfaction, while others do not. Some of the pipe used for culverts in this state has stood but two years, while others have been in use six times that period and are still good. * * * A good weight and quality of corrugated pipe will last fifteen or twenty years. The difficulty is to know when you are getting a good quality, and for this reason we advise great care in buying corrugated culvert pipe. Do not buy unless you feel sure of the quality—there are all kinds on the market."

The state highway commissioner of an eastern state (Pennsylvania), in a bulletin lately published on the subject of Supervisors and Their Duties, says:

* * * "From this fact comes the corrugated metal pipe which has been on the market for several years past. If made of ordinary steel, the use of such pipe cannot be condemned too strongly, but if made of special material containing so small a percentage of impurities as to be practically pure iron, it will be found an economical investment for a township."

The sentiments expressed in the foregoing quotations have been corroborated in numerous papers and reports from time to time by the most eminent engineers and metallurgical chemists in this country. Dr. Allerton S. Cushman, formerly assistant director and chemist, U. S. Department of Agriculture, Office of Public Roads, in a bulletin recently published said among other things:

* * * "It seems to be a fact that carefully made metal in which the ordinary impurities are cut down to mere traces and in which the heat treatment has been carefully controlled, is much more resistant to corrosion than ordinary types of metal with a comparatively high percentage of impurities. * * * The demand for this type of metal appears to be growing, and it has been largely used for the manufacture of road culverts. * * * The fact that this new metal has been largely specified by culvert manufacturers, even at a somewhat added cost, is the best evidence that it is meeting a long-felt want in this and allied industries."

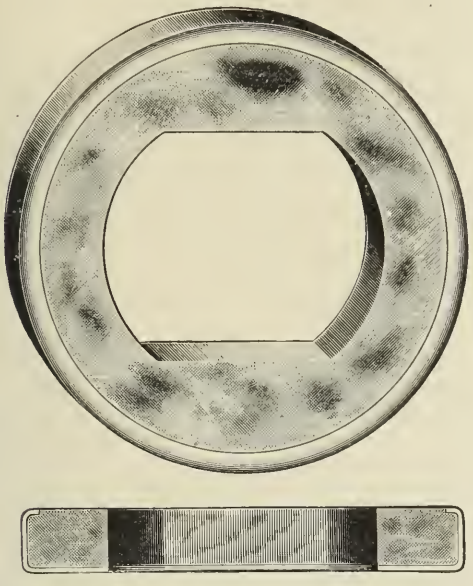
Thus it appears that corrugated culverts made of such recognized rust-resisting galvanized material as No-Co-Ro Metal, American Ingot Iron and Toncan Metal, instead of ordinary steel, and of the proper gages, properly galvanized—giving the service that they have for years past—are recognized and accepted as a very formidable and worthy suitor for practical and general adaptability in the culvert field at large.

It is a safe assertion that were it possible to compile a general consensus of conscientious opinions of reliable authorities as well as laymen who have investigated the merits of these improved metals as compared with ordinary steel, the great majority would express themselves as unequivocally in favor of the complete elimination of steel in the manufacture of corrugated culverts.

If any one feature is likely to militate more seriously than another against the prospective future success and permanence of corrugated culverts—whether of steel or the purer metals—it is the continued detrimental exploitation of thin gage, flimsy material. If people will persist in buying too light weight and otherwise inferior corrugated culverts for no other reason than that they are cheap, only to reap dissatisfaction, as they certainly must in a comparatively short time, they should at least be fair enough to withhold judgment until they have given the better culverts a trial and not prematurely and indiscriminately condemn the various other worthy corrugated culverts, made of purer metal and heavier gages, any of which may be bought at a reasonable price, with general satisfaction assured.

Goetze Gaskets and Valve Disks.

The leaks in flange joints and unions on steam boilers, steam engines, steam pipes, apparatus, etc., are partly due to a faulty construction of the joints or couplings; insufficient strength of the flanges and covers; imperfect, rough, uneven and deeply corroded surfaces; to the surfaces being out of parallel; and an insufficient number of coupling screws, or placing them at uneven distances. Leaks are also caused by rigid piping, i. e., piping which cannot sufficiently expand and contract, as well as in piping and other appliances subjected to excessive pressure from water hammer, resulting from an insufficient slope to allow the condensed water to



Goetze Valve-Gasket With Two Sides Flat Inside.

run off. The chief cause of leaks, however, is to be found in the use of packing material incapable of continuously withstanding the influence of high temperature of steam and water or high pressure gases and acids.

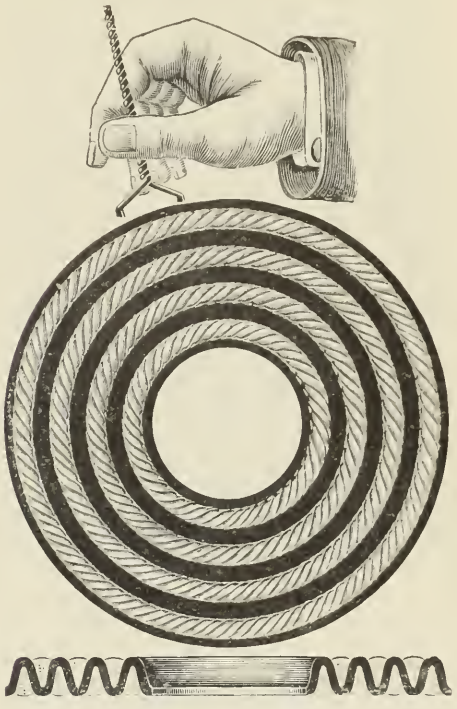
The Goetze copper and metal gaskets here illustrated provide a packing material which will comply with all requirements. They are so arranged as to present a surface that conforms to every irregularity in the flanges, while effectively resisting high pressure and temperature. The Goetze elastic corrugated copper gaskets with asbestos lining No. 2 are made of chemically pure copper and the best asbestos. Only a few turns on the flange bolts brings each copper corrugation snugly against the flange surface and at the same time crowds each wall of asbestos against the same surface. Through the use of elastic copper and metal gaskets on flange joints it has become possible to use long-distance conduits for steam under a pressure exceeding 15 atmospheres, the joints being kept tight for a number of years.

The Goetze copper valve disk with asbestos inlaid has all the elasticity needed for tight closing and is adapted for great durability under the most unfavorable conditions. All sizes suitable for Jenkins valves and other valves of similar construction are kept in stock.

GOETZERIT SHEET PACKINGS.

In spite of the advantages of Goetze copper and metal gaskets, there are those who wish to cut their own packings from the sheet, or who for some reason do not want a metal or shaped gasket. For such, Goetzerit, a sheet packing, has been perfected. It is made in both red and white, from asbestos fiber, compressed under an exceedingly high pressure and impregnated with a substance which, it is claimed, makes it absolutely proof against the action of superheated and saturated steam. Goetzerit white packing is especially recommended for oils, benzine, petroleum acids, ammonia, gas, alkaline products, etc. It does not squeeze out and decrease the inside diameter of the piping, and cannot be blown out, even at the high steam pressures now in use.

Goetzerit red packing is made in any desired thickness in sheets 36 in. square. The white is made in sheets 45 in. square. Ready-made Goetzerit gaskets for standard and extra heavy flanged fittings of from 1 to 24 in. are also made. Another kind of packing is known as Self-Lubricating high-pressure packing. It is equally suited for saturated and superheated steam and for hot and cold water and is impregnated by an infusible fat which is proof against heat and is said to

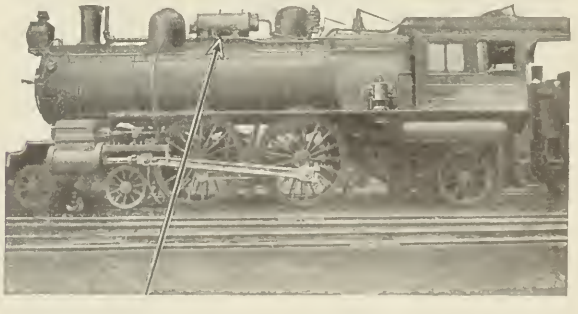


Goetze No. 2 Gasket.

have practically inexhaustible lubricating ability. It is prepared for all kinds of stuffing boxes and is manufactured in sizes from ¼ to 2 in. square. These packings are manufactured by the American Goetze Gasket & Packing Company, New Brunswick, N. J.

Curtis Turbines for Train Lighting.

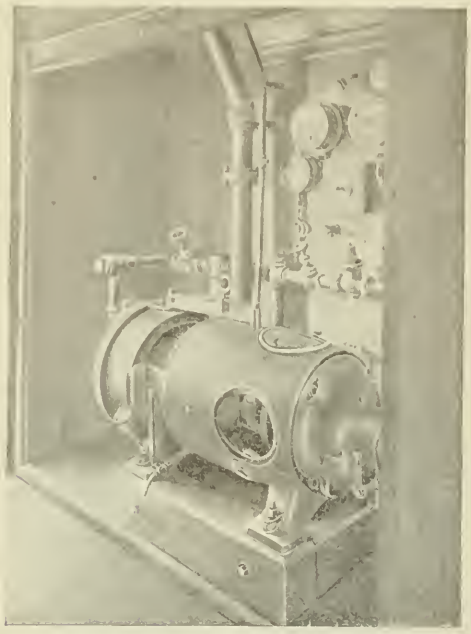
Curtis turbo-generators installed on a locomotive or in a baggage car, as shown in the illustrations, meet the most exacting demands of train lighting service. These sets consist of a Curtis turbine direct connected to an electric generator. They form compact, sturdy units so simple in construction that they require practically no attention. At the present time, when railways are making every effort to insure the greatest degree of safety to



Curtis Turbo-Generator as Applied to a Locomotive.

passengers, these sets are meeting with great favor, as their use eliminates all danger from fire or explosion due to the leakage of illuminating gas in case of an accident. The superior quality of the light due to the excellent voltage regulation of the Curtis turbine is a feature which will be appreciated by the passengers. Each car is brilliantly illuminated with a steady light. This service permits the use of electric cooking and heating utensils in buffet and dining cars, and of electric toilet articles in drawing and sleeping cars. For suburban service no aux-

iliary equipment is required, and the Curtis turbine affords a simple and economical equipment, dispensing with batteries, boosters and regulators. Over 300 Curtis turbines are now in use on steam railways, and many railways have adopted this sys-



Curtis Turbo-Generator Installed in a Baggage Car.

tem as a standard equipment for train lighting. There are 67 of these turbines now in service on the Chicago, Burlington & Quincy, 42 on the Great Northern, 42 on the Northern Pacific, 43 on the Chicago, Milwaukee & St. Paul, and a smaller number on a large number of other roads. These turbines are supplied by the General Electric Company, Schenectady, N. Y.

Tractor for 100-ft. Turntable.

The increasing use of Mallet locomotives of great weight and length has brought the railways face to face with the difficult problem of turning these locomotives. In the first place, they are very heavy, the weight running to 350 tons and over, but what makes the problem of turning even more difficult is the great length of wheel base. Furthermore, if a table but slightly longer than the locomotive is used it will be very much more heavily loaded at the end under the locomotive than under the tender, even when the tender is fully loaded with coal and water. To make it possible to balance such locomotives under all conditions would require the construction of turntables of excessive length, the direct and indirect expense of which would be enormous.

The other alternative is to turn the engine on tables merely long enough to carry them without making any attempt at balancing. When one realizes that this means carrying an unbalanced load of upwards of 50 tons in some cases on the trucks at one end of the table it will readily be seen that a powerful tractor must be used. Geo. P. Nichols & Bros., Chicago, have recently developed an electric tractor for this class of service which in general arrangement and appearance is similar to their standard electric tractor, but with a tractive effort increased to meet the severest requirements. The illustration shows one of these tractors handling the Virginian engine No. 600 on a 100 ft. turntable. This locomotive weighs 315 tons and is 96 ft. 4 in. long. The tractor is one of four of the same power in service on the Virginian. Similar equipment is in successful service on other railways, performing equally heavy duty.

The Clark Blow-Off System.

Notwithstanding the many improvements made in the performace and maintenance of locomotive boilers by the use of purified water and by putting soda ash in the tank, it is a matter of common observation that when locomotives come in for repairs many of them have the tubes and fireboxes badly scaled and have a large amount of mud and lime sediment in the barrel of the boiler and in the water leg. Although conditions have vastly improved, it is still necessary on many railways to wash out boilers frequently—usually once a week. When in service they do not render maximum performance on account of the scale accumulation preventing the more direct transmission of heat through the sheets, or because of priming the water is carried to the cylinders, making it necessary to run with partly opened throttle, giving less initial pressure. Also a larger consumption of expensive cylinder oil results when boilers are priming. These are still the ordinary experiences in locomotive opera-



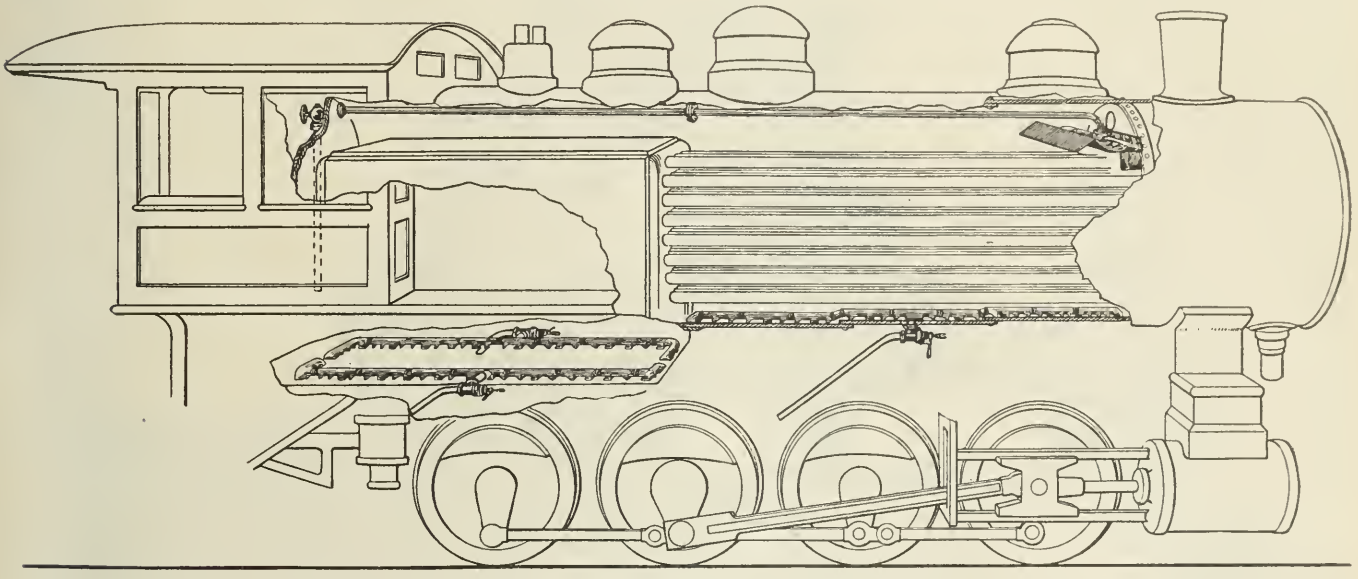
100-ft Turntable with a Nichols Electric Tractor.

tion on many railways and they are the cause of extra expense which could be saved by the use of recently improved devices for systematically blowing off the boiler in service. The heavy expense is due, first, to the labor involved in the frequent washing of boilers, to the attendant damage to the tubes and sheets by stresses due to unequal expansion; there is the further loss of mileage while the engine is so frequently in the roundhouse for washing out. The effort to prevent foaming and the accumulating of sludge and scale by the ordinary blow-off valves is not effectual, because their action is local and not general. A blow-off valve at the front of the firebox removes the mud and some scale which has dropped down from the immediate vicinity of the valve opening, but it is proved that it does not remove it from the side water legs by the amount found accumulated in this portion when the engine is in for boiler washing. Blow-off valves are also used in the front course of the boiler shell, but they, too, only remove the mud from that immediate vicinity and a large accumulation is found farther back, which requires that the boiler be washed out the same as if the blow-off valves had not been used.

It is necessary to have the current of water move at high velocity in all parts of the boiler where mud accumulates, so it will carry the sediment along with it; to secure this the area of the passages must be restricted. With a valve opening directly into the water space there is a flow from all directions toward this opening, and the volume is so large that it fills the outlet without attaining a high velocity, and the object of a general cleaning is defeated. The Clark blow-off system successfully corrects this fault by placing brass ducts around the mud-ring, and along the bottom of the boiler for the length of the shell. The openings are funnel shaped and the distance between them gradually decreases as the distance from the blow-off valve increases. In service the blow-off valve is opened and closed rapidly, causing a rapid flow of water into each orifice which carries with it a large amount of sediment. This operation should be performed at least three times a day and always after the engine has been standing long enough for the suspended matter to settle.

The lighter suspended matter floating on the surface of the water becomes mixed with the bubbles as steam is formed, and with alkali waters gives constant trouble from foaming. Skimmer blow-off valves have been used with beneficial results for many years, but with a single opening into the water level their action, like that of the ordinary blow-off valve, is entirely too local, and only removes the foam and lighter suspended matter from the surface immediately surrounding the opening. In the Clark system the skimmer bar extends the full width of the boiler and is placed at the top of the tubes near the front tube sheet. Long experience has shown that a skimmer in this location with an apron and openings extending across the bar clears most of the water surface, removing the foam and alkali material which is not precipitated. Where purification plants are in use there is often a surplus of alkali which causes foaming; here the skimmer is especially useful. The skimmer valve in the Clark system of blow-off is located on the boiler head, and should be opened a few seconds at least twice a day when the engine is using steam. It should also be opened a few seconds at any time the boiler is foaming.

The Clark blow-off system was invented by an engineer in Illinois, but heretofore has been like a prophet without honor in his own country. It has been developed in England and used in the far-off countries of India, Australia, South Africa and South America. More recently it has been introduced on a dozen railways in the western part of the United States with such success that many orders are now being received for it. The practical results derived from this system are that the boilers can go ten times as long without washing out, thus saving loss of mileage, and that the fuel economy is greater, due to the absence of scale and mud on the heating surface. It also prevents the water being carried over with the steam to the cylinders. There are also incidental economies connected with boiler repairs when this device is used. A report from one of the lines which is using the Clark blow-off system says: "There is a remarkable reduction in the cost of light boiler repairs, such as broken staybolts, rolling of tubes, etc. When boilers are washed frequently the repairs due to irregular expansion and contraction are considerable. Boilers are seldom washed without having to renew staybolts and tighten tubes. An engine on this line which is equipped with the Clark blow-off has now run two periods of 41 days each without a broken staybolt."



The Clark Blow-Off System.

Information regarding this device may be obtained from the exclusive agents, the Horace L. Winslow Company, Old Colony building, Chicago.

Cyclone Chain Hoist.

The 40-ton Cyclone chain hoist made by the Chisholm & Moore Manufacturing Company, of Cleveland, Ohio, was described on page 1100 of the December 2 issue of the *Railway Age Gazette*, but unfortunately an error was made in giving the address of the company as Chicago. If any of our readers have written to the wrong address for additional information concerning these hoists they will understand why their letters have not been answered, and will confer a favor by writing to the proper address.

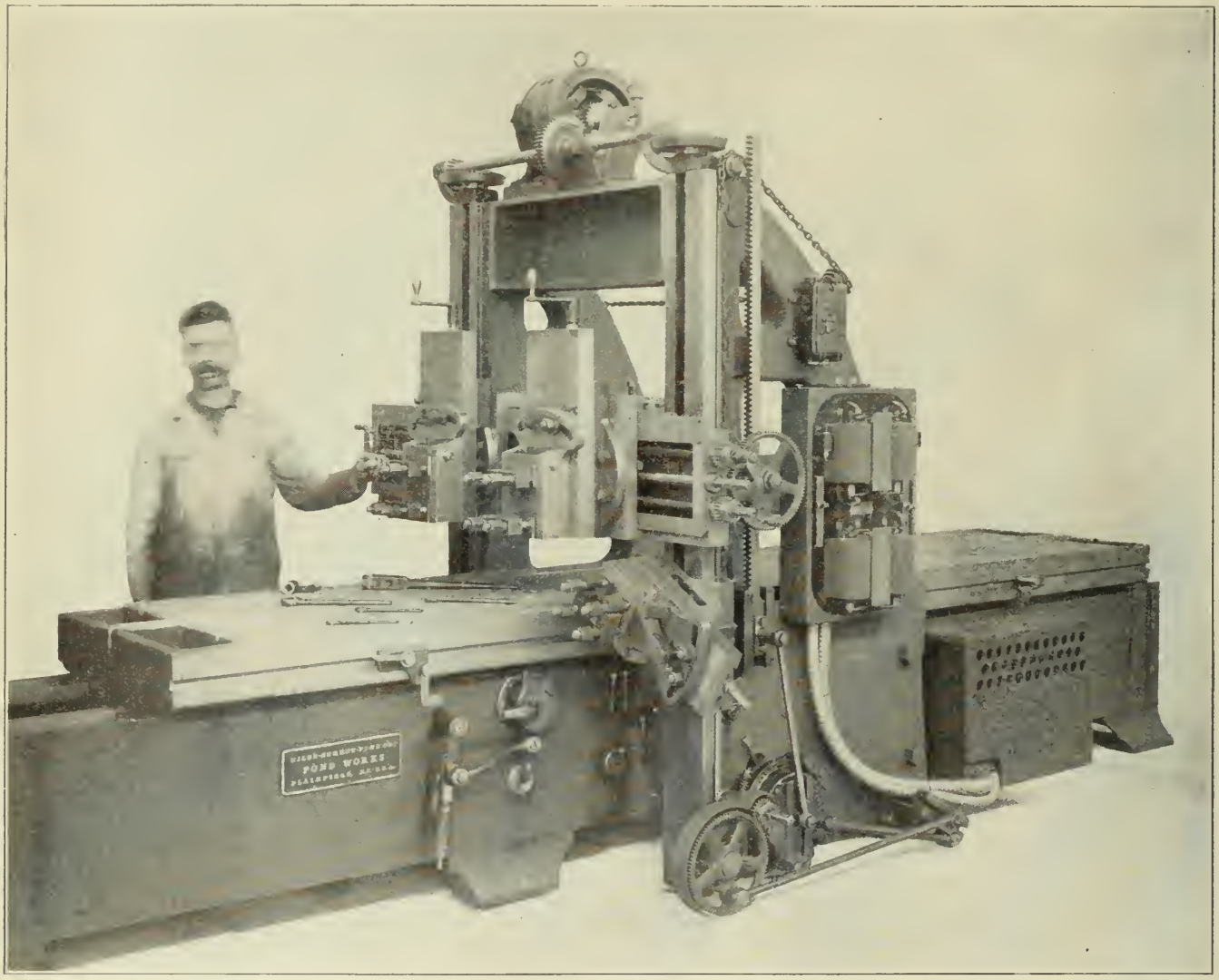
Events are shaping toward the realization of a Transcaspian Railway connecting Russia and India. An international company will be formed in which Russia, Great Britain and Persia will be predominant, but in which French, German and other interests will be welcomed. It is proposed to build 1,600 miles of line at an estimated cost of about $105,000,000. It is figured that passengers and mails could be carried by the proposed road from London to Bombay in seven or eight days.

Shop Equipment.

Pond Reversing Motor Planer.

The Pond works of the Niles-Bement-Pond Company, New York, has put on the market a reversing motor planer which is specially adapted to locomotive work. It offers an entirely new method of driving and reversing at variable speeds and is the outcome of years of experimenting. It has proven itself absolutely reliable under the most severe and adverse conditions and overcomes all the undesirable features of the belt and gear-box drives, doing away with all clutches, either pneumatic or magnetic, and all shifting belts. As shown in the illustration, a motor with speeds varying from 250 to 1,000 r. p. m. is direct connected on the left side of the machine, out of the way of the operator, with the controlling box on the right. The pilot switch, located on the bed of the machine, is operated by dogs fastened to the table. This pilot switch operates the controlling mechanism which reverses the machine by reversing the direction of rotation of the motor. The controlling mechanism is made up of four solenoids which operate sheet copper contact connections to the motor. On the controller are mounted two index scales, one controlling the cutting speeds and the other the return speeds. Each scale is provided with 13 graduations, by means of which the same number of different motor speeds may be obtained. The cutting and return speed regulation is entirely separate, so that the slowest cutting speed may be used with the maximum return speed. The cutting speeds obtainable on the standard type of planers vary from 25 to 40 feet and the return speeds from 60 to 100 feet, but these, of course can be changed to suit individual requirements. It will be seen from the illustration that the pilot switch may be controlled by hand, which enables the operator to have greater control over his work. For example, in working castings with hard spots or thin walls, by operating the pilot switch, the speed of the table may be decreased at will. The action of the controller is such that it is possible to stop the table within a limit of ⅛ in. by throwing the pilot switch to the neutral position. Reversing is accomplished so positively that a stroke of 4½ in. can be taken on a 96-in. machine while operating at a comparatively high speed.

The kinetic energy stored in the work, planer table, armature and other moving parts of the machine is absorbed by the braking action of the opposing torque of the fields on the rotation of the armature, and is accomplished without the least shock, jar or hesitation. The current generated by this action passes into the starting resistance, and then off as heat, the result accomplished being exactly the same as if some form of mechanical brake had been applied to the motor to bring the planer to a stop, with the difference, however, that the action is perfectly smooth, there are no wearing or frictional surfaces to contend with, and it needs no adjustment. The overload on the motor at the instant of reversal is never over 50 per cent. The entire drive of the planer is on the floor, or near the floor, where it is readily accessible. Owing to the absence of the usual belts, clutches, etc., the variable speed planer occupies a minimum floor space. The Pond reversing motor planer is in use at the West Albany shops of the New York Central, and the Juanita shops of the Pennsylvania.



Pond Planer With Electric Reversing Mechanism.

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THE state of New York has at last made appreciable progress in the abolition of highway grade crossings—at least in New York City. The annual report of the Public Service Commission for the First district, noticed in another column, shows how the legislature has granted $250,000 for this purpose during the past year, and how it ought to appropriate $600,000 this year. These are large figures, but the commission has before it a large problem. The state's appropriation is intended to defray one-fourth the cost of these works—which means that New York City needs $2,400,000 this year. As the city has only about one-twentieth of the state's crossings the reader will see why we do not mention the estimated needs of the whole state—the figures would be staggering. And yet the only way to deal with this subject is to grapple with it, directly. There is no possible evasion, no chance for a flank movement. This has been shown by the experience of those cities which have abolished crossings, and of the state of Massachusetts. In the city of Chicago alone mountains of gravel have been used in this work, and it has all had to be paid for in hard cash, mostly by the railways. Probably the grade crossings within the city limits are in more pressing need of abolition, as a whole, than those in the rest of the state, but it will not do to assume that New York City is all like Broadway and Forty-second street; some of its solitudes will vie with the interior of Kentucky in wildness. Every important town in the state has dangerous crossings, and it is only by thinking in millions that the problem can be even approached. Not only the commission for the second district of New York state, but the commissions of 40 states have before them this same problem. To defer or ignore it means a continued record of deaths and injuries, except as the speeds of trains are rigidly limited.

A MOVEMENT is under way at St. Louis for the formation of a federation of commercial organizations in that city, and it is proposed to bar from it all organizations having railways or railway men as members. The purpose, it is said, is to save the organization from the embarrassment that results when litigation with railways regarding rates and similar matters is conducted by an association to which they or their officers belong and contribute. This is an interesting case of separating the sheep from the goats. Perhaps, however, it is more consistent than the policy followed by a good many commercial organizations. For example, while the railways entering Chicago belong to the Chicago Association of Commerce and contribute to its support, this association has become one of the most active organizations in the country in carrying on agitation and litigation against them. It solicits and accepts their money and fights them with it. For some time after the Hepburn act was passed we heard a great deal of talk about co-operation between the railways and the shippers. The plan to form a federation of commercial organizations at St. Louis from which railways and railway men shall be barred is, we fear, a good illustration of the extent to which in most places such co-operation has not materialized. The traffic managers of industries and of commercial organizations have always been quite willing to co-operate with the railways to bring about lower rates or better service; but most of them have consistently fought in the last ditch, and often by methods the most unfair and even unscrupulous, every proposition the adoption of which would benefit the railways. It is not merely the Illinois Manufacturers' Association that has been unfair; everybody knows it is; but even commercial organizations which in the past have been very moderate and reasonable have apparently lost the last vestige of the spirit of co-operation since the controversy over advances in freight rates began. The *Chicago Evening Post,* in an editorial in its issue of January 3, called attention to the fact that the railway officers who contributed articles to its annual review number were much fairer in their utterances than was the traffic director of the Chicago Association in an interview at about the same time. It remarked that the spirit shown by the railway officers was "in direct contrast with the rather astonishing interview" given by the traffic director of the association, who, it said, "spoke as if the railways were surreptitiously trying to raise rates, and as if he were challenging their right even to make such an attempt." Thus, the *Evening Post* continued, "we have the surprising spectacle of seeing this great association appear as an anti-railway crusader. Can the interests of the manufacturers who compose it be separated from and set over against those of the railways? Is not the prosperity of the one inextricably interwoven with the prosperity of the other?" If commercial organizations are to be conducted in future as many of them have been in the recent past, we imagine railway officers will not be very much pained if they be excluded from

their membership. Probably a good many of them feel that this segregation of the sheep from the goats can do the railways no harm, since many of the commercial associations have been making the railways the goat for some time, anyway.

THE SCREW REVERSE GEAR.

THE screw reverse gear may be regarded as a well-established detail of standard practice on foreign locomotives. Vaughan Pendred, whose book on "The Railway Locomotive," is not confined to British practice, says, "The reversing lever has been superseded in all modern locomotives by a hand wheel and quick thread screw." The screw reverse lever has been used experimentally on a few locomotives in this country, usually where the master mechanic was an Englishman who had had practical experience with it and understood its advantages, but it has never been adopted as a standard by any of our railways.

The necessity for greater force in the reverse mechanism was recognized in this country 30 years ago, when steam power reverse gears were used on locomotives weighing only 50,000 lbs. on drivers and with cylinders 18 in. by 24 in. They were applied to passenger engines on fast runs where the friction of the flat and unbalanced slide valve made it difficult to adjust the reverse lever while running. A steam reverse gear designed by Wm. E. Good was used in 1882 by the Reading Railroad on its fast trains between Philadelphia and New York, and one designed by W. P. Henszey of the Baldwin Locomotive Works was used about the same time on the Central of New Jersey. With the introduction of piston valves and the use of springs or counter-weights to balance the link and other overhanging weight, the labor required to move the reverse lever was reduced. The power reverse cylinders were then abandoned, and not generally used again until the advent of the large Mallet locomotives with two sets of valve gears.

The Walschaert valve gear fortunately has the weight of the heavy link supported on trunnions, but the heavy reverse arm, hanger and radius rod are unbalanced, and these, together with the frictional resistance of the link block, valve rod, stuffing box and valve packing, place a heavy load on the reverse lever. The Stephenson link on large engines is heavy and not always balanced, and these, with the valves and the four large eccentric straps, must be moved when any change in the cut-off is made. On any type of modern American locomotive the work of moving the reverse lever is laborious and sometimes dangerous; thus it is not surprising that engineers hesitate to change the cut-off often, even when running at moderate speed, and at high speed there is a positive disinclination to work the engine at the most economical cut-off where it involves a frequent movement of the reverse lever. Good engineering requires a change in cut-off corresponding with the change in load and speed; in stationary engines this is obtained by the governor or a power regulator. The economical use of steam on the locomotive requires a similar regulation, and if it must be by manual control, then the engineer should be provided with a mechanism by which the cut-off can be easily and accurately adjusted.

The proper regulation of the cut-off is a matter affecting not only the fuel economy, but it has largely to do with irregular wear of pins, axles and tires. If the cut-off is not properly adjusted to the load and the speed excessive compression results, causing the irregular action of forces throughout the engine, which is one of the principal causes of wear and of frequent shopping for repairs. A reverse gear that will admit of and encourage the change of cut-off while running, to secure the most advantageous distribution of steam, will effect an important economy, not only of fuel, but in the cost of repairs. The screw reverse has a slight objection in that it does not permit the engineer to move the valve so directly that he may detect any slight defect, or a lack of lubrication, but the extensive use of the device on foreign roads indicates that the engineer in time is able to detect these conditions.

The power reverse gears on Mallet locomotives may answer the purpose, but they do not appear to be desirable or satisfactory substitutes for the reverse lever on large engines of ordinary types. For large passenger engines there is a pressing need for something better than the reverse lever for regulating the cut-off, and one of the locomotive builders is now designing a screw reverse lever for this purpose. There are so many designs for this detail in use on English and French railways that there should be no difficulty in selecting one which has been developed from long service, and any of our railways desiring to experiment with the screw reverse rigging can find already at hand good designs for that purpose which only need to be adapted to the peculiarities of the American locomotive.

TYPE OF THE RAILWAY STOCKHOLDER.

A FEW weeks ago a railway stockholder in a letter to the *Wall Street Journal* used these words:

"I happen to be a stockholder in several railways and it is absolutely unnecessary to mail their very voluminous and expensive annual reports to every stockholder. They are never read and go into the waste paper basket. They need only advertise that reports will be sent when asked for."

The quoted words, direct attention to the division of various types of railway stockholders into distinctive groups. Unfortunately the group of which the author of the quoted words is a member undoubtedly, is much larger than any other single group —this not merely in a masculine classification, but because so many stockholders are women. Stockholders of that sex have, indeed, in one company particularly, already risen to a clear majority of the shareowners; and the feminine interest would probably rise still higher were the trustees for women to be included. Taking a woman as a shareowner holding her railway stock absolutely, there is also, undoubtedly, a national tendency of her sex to increase numerically on the stock lists of old dividend paying lines. This follows, for one cause, from the natural tendency of the feminine shareowner, partly from ignorance, to hold on to her investment. She is, almost necessarily, a standpatter, certainly so as compared with the investing and more changeful man. The Hetty Greens, even of the most modified and diluted pattern, are few and far between. From time to time we hear edifying discourse on theories or plans to uplift the sex to the Woman of Affairs. But their effect thus far has been slight, and the railway stockholding woman remains lethargic; or the object and sometimes the victim, of advice.

She is to be pardoned rather than pitied. Not so her analogue in the other sex who rejects contemplating his copious report on his railway interest, and flings into the waste basket the compilations of figures on which a host of accountants and clerks have worked for months; who is almost, if not quite, as scornful of the published abridgments; and, what is worse, in his character as a citizen has no conception of the meanings of the word publicity until may be he has a harsh awakening. He may be dismissed from further consideration. But above and beyond him are other types of his sex, interesting if not edifying for brief study.

Ignoring the day by day speculator, who is not in any proper sense a railway shareholder, there is, first, the group in whose vision mere price is biggest. Their direct objectives are the market quotation, the opportunity for the time investment profit by sale more or less remote—less remote if their shares rise, more if they fall. Some superficial watch they keep on general or special conditions, on fact or rumor, but only as they affect the price. A little higher up is the stockholder of a more hybrid type. With the idea of market price and remote possibilities of the distant future, he joins the motive of rate of return on his railway investment. He is a combination of investor and speculator in about equal parts. If he finds an investment with a better return, even though with somewhat lower security, he is off to transfer his holdings, not infrequently to his ultimate cost. He shades upward into the shareholder who watches moderately not only general but special railway conditions, who has an eye, though a somewhat languid one, on net earnings, on decisions of the courts, and on legislation. The three foregoing groups

may be roughly bunched as non-active types. They are neither negative nor positive. Perhaps half of them will take the trouble to sign the annual proxy blank of the railway corporation and will glance hastily through the annual report. But they never file it away for reference. Internal conditions of their property they almost never seek.

At the top of the list is the stockholder of facts and figures for whom the voluminous and detailed annual report, as well as the minor and intermediate reports by months and half-years, carries not only its meanings, but its responsibilities. He reads not only the text of the railway report but delves, at some important points at least, into its figures. He does not deem it a waste of time to seek out the annual statement of the previous year and make comparisons. The noted divergences in such matters as cost of maintenance, in the ratio of expense of operation to gross receipts, in fixed charges. He may be a small holder, yet he habitually sends in his proxy. Ideally he should attend regularly the stockholders' meeting, but there, as yet, the line is drawn. But he watches his investment closely; he marks the news or comment which bears on it; the conservation of his railway dividend is more the object of his solicitude than the dividend itself; and, in his deeper moods, he has definite and ethical views on the relation of his railway to the public as well as to himself, and brackets his citizenship with his fraction of railway ownership.

It is on that final type of stockholder, champion of publicity, the man moreover whose opinion on the railway security, whether stocks or bonds, reaches as an influence far beyond himself, that the amplified railway report never goes to waste. He is not so many as he ought to be. But he is an increasing force and happily he tends to increase more and more as railway problems thicken. He is the man on whom good railway management has its best reliance and from whom bad management has most to dread.

Letters to the Editor.

THE MANNERS OF THE INTERBOROUGH.

NEW YORK, December 31, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

My attention has been called to an editorial on page 1173 of the issue of the *Railway Age Gazette* of December 23, 1910.

While we welcome just criticism and have become accustomed to unjust criticism, my only comment is that the statements regarding the inactivity of this company to relieve congestion in the subway are untrue. It appears to me that before a railway gazette should commit itself to such an editorial a reasonable effort should have been made to ascertain the facts.

FRANK HEDLEY,
Vice-President and General Manager, Interborough Rapid Transit Company.

[We said nothing of "the inactivity of this company to relieve the congestion in the subway," so that this inspiring subject is left entire, virgin soil for Mr. Hedley to cultivate. His abrupt denial was quite unnecessary. There is room left, however, for saying much of what has been done to increase the length of trains, the number of trains, shorten the schedules, open the doors and, above all, afford a fair measure of decent regard for people. Bad manners should not be a continuous performance. A very little does harm enough to the relation between the railways and the public.—EDITOR.]

USE OF BRIDGES IN EXHAUST NOZZLES.

ST. PAUL, MINN., December 6, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I note a short article in the *Railway Age Gazette* of November 25, 1910, in regard to the use of bridges in exhaust nozzles used in connection with inside stacks. In the March and August, 1908, issues of the *American Engineer & Railroad Journal*, I presented and discussed the formula $D = .49N\sqrt{L}$ L for stack diameters and showed also that L should be about 10N to 12N, the letters referring to dimensions as shown on the accompanying sketch.

A bridge of sufficient width to divide the exhaust into two jets would therefore reduce the distance from the nozzle to the choke of the stack for the best results, and this explains why a nozzle with a bridge sometimes gives better results with inside

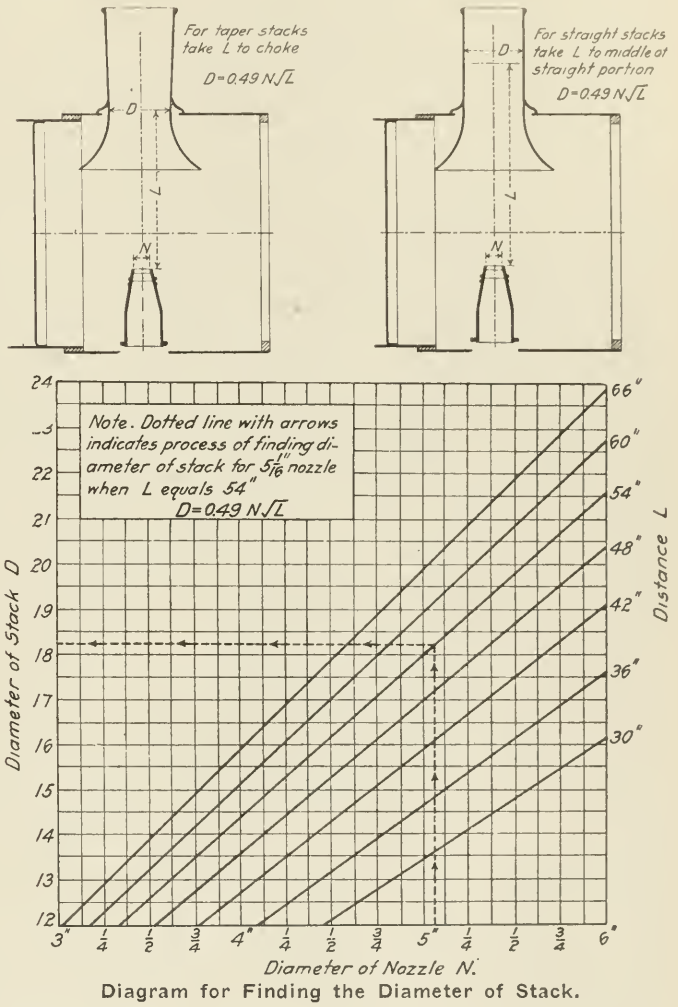


Diagram for Finding the Diameter of Stack.

stacks, where L is necessarily short, than a single nozzle of equal area. These formulae are based on the Master Mechanic's tests made in 1896, 1903 and 1906, and agree with all that are comparable.

The present Master Mechanic's formula cannot be depended on to give proper stack diameters, as the diameter of the smokebox does not affect the proper size of the stack except as it affects L in the formula $D = .49N\sqrt{L}$ L. W. E. JOHNSTON.

INCONVENIENT TICKETS.

BOSTON, MASS., Dec. 12, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

A perusal of the letters which you have recently published under the head "Friendly Criticisms of Railways," etc., leads me to write in regard to a few things that are annoying, and, so far as I am able to see, without reason.

Some time ago the fare between Boston and Portland was $2.30, and recently it has been raised to $2.50, to which I make no objection; but you are now compelled to buy a ticket of three or four times the size of the regular ticket, on which it says, "in consideration of the reduced fare at which this ticket is sold," etc., etc. Inasmuch as the fare has been increased it would seem as if there were a little sarcasm in this wording Furthermore we are now compelled to buy this ticket on the day it is to be used. A few days ago a friend of mine had

such a ticket that he had bought some time previously, and the conductor refused to take it. It seems to me that this is the height of absurdity and a useless annoyance to passengers. A ticket is merely a certificate that a certain sum of money has been paid for a certain thing, and it should be taken for that, no matter when it was purchased. One would think from the wording on this ticket that there was some other kind of a ticket that was sold at a higher price, but I believe there is no higher priced ticket; the wording is obsolete.

There is another annoyance which I see no reason for, though it is one of long standing. When a parlor-car ticket is purchased in some offices it is necessary for the passage ticket to be procured beforehand. In other offices this is not necessary, and it seems to me an absurd requirement and one that is annoying. A person may go to the parlor car office thoughtlessly before purchasing his transportation ticket, and then finds that he must go first to the other window. There he may find a long line of people waiting. This rule should be done away with.

Recently I was annoyed in New York. I attended the meeting of the American Society of Mechanical Engineers and used a certificate. I went to the Grand Central station to get a ticket to Boston on the day before coming and was informed that they could not issue the ticket until the next day. There happened to be nobody at the window and nobody would have been kept waiting. It is quite a long process to get a ticket with a certificate, inasmuch as one has to sign his name, and various extra things are done by the ticket seller. The next day, when I was able to get my ticket, I kept a lot of people waiting and they became all out of patience. This I regard as entirely unnecessary and a great nuisance. In connection with certificates I do not see any reason why it should be necessary to pay 25 cents when you pass in the certificate for validation.

Still another annoyance: the New York Central Lines have recently issued an order, which is being carried out on the Boston & Albany, that a ticket reading in one direction cannot be used in the other. They have objected to taking such tickets from me and refused to take such a ticket from a lady of my acquaintance whose husband had bought her two tickets reading one way in order to save her the trouble of purchasing a return ticket. If there is one thing that has been well established it is that a ticket reading in one direction is good in the opposite direction. The New Haven road prints on its local tickets that they are good in either direction, and this ought to be on all railway tickets. I am inclined to think that if this Boston & Albany matter was brought to the attention to the Massachusetts Railroad Commissioners they would make short work of it.

Such annoyances as these are among the things that cause people to be down on the railways. I am friendly to the railways, but I am nevertheless annoyed by many of their useless rules.

F. W. DEAN.

[We, like our correspondent, think that railways often make rules which do more harm than good. To prevent being cheated by dishonest passengers it is necessary sometimes to impose regulations which are decidedly inconvenient to the honest ones; but from long-continued custom this method of protecting revenue has in many cases been carried to absurd extremes. For the benefit of our correspondent, we can explain some of the things that he complains of, though it is doubtful if there is any valid defense for them. A limited ticket is advantageous to the railway in that it obviates the necessity of keeping the accounts open a long time to check the use of tickets which the buyers keep in their pockets perhaps for weeks. Theoretically there is, probably, a ticket sold at a higher price between Boston and Portland, but, as our correspondent suggests, it is quite likely that the legitimate reason for the two rates over such a short distance has long since vanished and the present inconvenience to the passengers is no doubt much greater than the convenience to the railway company. If a limit is reasonable it is not necessary to allege a reduction in the price of the ticket as the reason for the limitation. The habit of limiting tickets persists with the passenger men, because they need a limit on short-trip local tickets to prevent a dishonest conductor from stealing them and selling them to persons who can make money by having them used a second time. This would be unnecessary if our railways could devise some way to have passengers always surrender their tickets on entering trains, for then it would be possible to have a complete audit and do away with the present loose practice of having conductors hunt up passengers with tickets while the train is running from station to station. In every case, however, where railways have tried this reform they have been obliged, we believe, to give it up. The traveling public will not cheerfully put up with the delay and inconvenience of paying as they enter. The rule is now working successfully on street cars, and we believe could be modified so as to be workable on heavy local trains, where necessary; but no one has yet elaborated a satisfactory plan. The present custom is of 75 years' standing, but it must be admitted that it is the most unbusinesslike custom in the railway business. The requirement that a passenger buying a ticket at the Pullman office shall show his railway transportation was adopted to prevent mistakes. It is no doubt true that, without the rule, mistakes would occur; but in all probability the correction of these mistakes would be a small burden as compared with the inconvenience imposed upon passengers by the present plan. The "certificate plan" of issuing tickets to conventions was adopted to prevent the use of convention tickets by passengers not attending the convention, but we have no doubt that the railways would make just as satisfactory profits under a simple regulation to have tickets endorsed by the secretary of the convention. Any organization which had an unbusinesslike secretary, or which abused the privilege seriously, could be refused the privilege a second time. As to requiring local tickets to be used in only one direction, it is a convenience in the auditing department to know in which direction a ticket is used, but in view of the convenience afforded to passengers by the freedom enjoyed on the New Haven road we should think that any traffic manager would himself make short work of the restrictive rule without waiting for a state railway commission to act in the matter. As to the inconvenience of using a ticket which is four times the size of a local ticket, we think our correspondent ought to be thankful that he does not have to use one ten times as large as the small tickets—as passengers often do.—Editor.]

The discussion of extending Jamaica's railway system by building branch lines brings out some interesting facts. Of the 184 miles of railway now in operation, the main lines being from Kingston via Spanish Town to Montego Bay and from Spanish Town to Port Antonio, 120 miles were built between 1890 and 1896 by an American syndicate which had acquired from the Jamaican government the 64 miles already in operation. When this syndicate defaulted in payment of interest on its indebtedness in 1900 the government took over the lines with obligations amounting in round numbers to $11,500,000. In operating these lines an annual deficit of about $340,000 is incurred, from which the sum of $121,662, set aside annually as a sinking fund, must be deducted to obtain the net annual deficit. As the sinking fund now amounts to nearly $1,300,000, it is estimated that after thirty years the railway debt will be entirely paid off. The increased prosperity of the island, from the wonderful extension of its fruit trade, which is largely promoted by the railways, more than offsets the deficit incurred in operating the lines. The fruit business, which was only $15,000 in 1869 and $350,000 in 1879, increased to $1,500,000 in 1889, to $4,000,000 in 1899, and to $7,500,000 in 1909. The shipments of fruit, chiefly bananas, to the United States last year from the consular district, embracing Port Antonio and Port Maria, amounted to $3,243,896. Although the railways are operated at a loss, they contribute so largely to the promotion of the general business of the colony that the advocates of the building of branch lines contend that the general benefits will far outweigh any small deficit likely to be incurred in operating such extensions.

STUDIES IN RAILWAY ECONOMICS.

BY W. M. ACWORTH.

II.

I start, then, from the point that all railways alike, whether they be in state or in private hands, must base their rates on what the traffic will bear. Now, what the traffic will bear is not an abstract formula to be arrived at on theoretic considerations, but an actual figure to be worked out in each individual case by careful and detailed examination of special and individual facts. If this be accepted as a starting point, and if it be accepted further that rate making is the essential crux of railway management, much follows.[3] It may be said: rate making, though most important, is not all important. True, there is the question of what may be called broadly, facilities. But after all facilities are very much a question of price. We can all have express service on the humblest branch line, if we choose to pay for a special train; and the German railways will carry goods at English speed, provided the consignor will pay *Eilgut* rate, which is four times that of the normal tariff. Then there are the departments of railroading that come under the head of engineering and operating. But no one will contend that the testing of steel, or the tamping of sleepers, or the firing of an engine is essentially different according as the railway is publicly or privately managed.

On the whole it seems to me clear that, as an abstract question, state management or private management must stand or fall on the consideration of which of the two systems is likely best to adjust rates to what the traffic can bear.[4] Now it is evident that, from the point of view of rate fixing and tariff making the ideal manager (it is convenient to personify under this name the whole organization concerned with the matter) must possess certain characteristics. He must possess knowledge, not to say omniscience. He must know intimately the geographical and economic situation, not only of the whole territory directly tributary to his line, but also of all the adjoining territory that can indirectly be laid under contribution, or that enters into competition with it actually or potentially. The sources of his traffic, not only actual but potential, the points of distribution, and the points of ultimate destination must all be familiar to him. He must have an intimate acquaintance with the nature of every article known to commerce, its value, its bulk in relation to value, the extent to which other articles, quite different possibly in bulk and value, can be substituted for it. He must have present in his mind the possibility of slow or rapid increase[5] of production and consumption. And so on, and so on.

So far, there is once more nothing to choose between a state and a private undertaking. Walking encyclopædias are none too common on either side. But, given omniscience as near as we can get it, in the second place we must demand that the manager shall be impartial. In other words, when he makes a tariff, he must fix his mind solely on the consideration of what the traffic will bear, and be free to disregard entirely the pressure of any outside consideration. He has to raise his revenue by apportioning equitably the burden over the whole traffic, and he must constantly bear in mind that, if one category of traffic escapes its fair share of the burden, either the necessary net revenue falls short (what the necessary net revenue is we must consider later), or the rest of the traffic has to pay more than a fair share.

The legal procedure of a civilized country is the outcome of two thousand years of development. When we seek to obtain justice between man and man, how do we set about it? We choose a man of high character and keen intellect, who has spent his life in learning the general principles of law. We take security that he is personally quite disinterested in the matter in dispute. We protect him in every possible way from pressure by the friends of the parties to the dispute. We arrange that these parties shall have every opportunity to put before him their side of the case, both with reference to the law and with reference to the facts, and then we leave him to give his judgment publicly, with the reasons for or against it, with full confidence that it will be given with intelligence and in good faith. And when it is given we enforce it without hesitation with all the powers of the state. But, as the best of men is but man at the best, we recognize that he may go wrong, and, accordingly, we provide for an appeal, possibly even for a further appeal. But when the judgment of the court of final appear is given, though we recognize in full that it may be wrong, we also recognize that in the old Roman phrase it is to the interests of the state that there should be an end of disputes; and the final judgment stands, and the parties have to order themselves accordingly. Now, as it seems to me, there is a real analogy here to the business of rate fixing. The analogy is not perfect, for economic rights are seldom as capable of as precise ascertainment and definition as legal rights; but it is real; and the requirements, therefore, are much the same in the two cases. To fix rates, we want the best expert available. We need to secure his impartiality and his freedom from outside influence, and then we must accept his decision, abide by it, and enforce it.

Now we agreed that expert knowledge was just as likely to be found in a state official as in the manager of a private company. But from whom are we most likely to secure our second desideratum, impartiality undisturbed by outside influence? Consideration of the normal organization of a private company and of a state undertaking will enable us to supply the answer. Take first the company. The manager of a private company is responsible to a board of directors who represent the shareholders, being, indeed, frequently large shareholders themselves. Their interest is—indeed it is a common reproach made against them—the dividend, and nothing but the dividend. We may assume that, being ordinary human beings and disliking unnecessary friction, they will sympathize with Turgot's theory that in levying contributions it is desirable to pluck the maximum of feathers from the goose with the minimum of squawking. In other words, their natural tendency will be to support their manager in refusing to shear any individual lamb too close and in getting as much wool as possible from the lamb that can afford to lose it without making it suffer so much that its bleatings will be audible.[6] In the essential position of manager, directors, and shareholders alike there is nothing to induce them unduly to prefer one locality to another, or one trade to another. In the interest of their own undertaking they will not kill a single goose that is either laying golden eggs at the moment, or is likely to begin to lay eggs in the future. Indeed, if they are intelligent, they will desire to multiply to the utmost possible extent the breed of golden-egg-laying geese. The individual trader at A will naturally object strongly to any adjustment of

[3] Theoretically, of course, the idea that each rate must be based on what the traffic can bear would imply a separate bargain for each separate consignment. The amount of wind the lamb can stand must depend upon the thickness of the lamb's coat, and the lamb's coat is changing in thickness all the time. But in practice it is only possible to deal with traffic in categories, and if a railway made too many categories it would waste half its income in ascertaining accurately the precise amount that each category could properly be called upon to pay. To give a homely example, English observers are sometimes tempted to believe that the trousers of every French infantry soldier are of the same length. If this be true, the reason is obvious, that adapting the length of each pair of trousers to the height of each soldier would cost more in adjustment and complications than the value of the cloth that would thereby be saved.

[4] I am, of course, aware that the question between State ownership and private ownership is often decided on quite other grounds. The Belgians and the Swiss, for instance, adopted State management because they feared the domination of foreign capital. The Australians because capital could only be obtained on the credit of the State. The Italians, as the only way of ending the inextricable tangle of relationship between the State and its lessees. The Germans [Bismarck originally intended the purchase of the North German railways to be carried out, not by the Kingdom of Prussia, but by the German Empire], partly for strategic reasons, partly in pursuit of a policy of unification. And so on. I am speaking in the text of the matter in the abstract, and apart from the particular local considerations of any particular nation.

[5] The Austrian State railway administration publishes for the use of its staff a dictionary giving in reference to each article in the classification some such information as I have suggested in the text as an essential part of the working equipment of the ideal manager.

[6] I must postpone for future consideration, but will not omit to notice the point that the commercial management will strive to get not merely a reasonable but an excessive dividend.

rates that may enable traders at B or at C to compete in a market where he has a monopoly. But the natural instinct of directors and shareholders will be to support their manager in over-riding this objection, an objection which it is commonly considered ought not in the public interest to prevail.

So much for commercial management. Now let us see how far impartiality is likely to be secured under a state railway system. At the head of the state railway system there must be in some shape or other a manager responsible to parliament. In other words, a person who is first and foremost a politician, and only in the second place a railway man. Is it reasonable to expect impartiality from a manager of railways with a seat in parliament, a member of a government whose life may come to a sudden end any day unless some important town, or some important trade can be, in American phrase, "placated"?[7]

One of the cardinal doctrines of the old Manchester school used to be that in some mysterious, and, as far as I know, entirely unexplained, way, the purely selfish interest of each individual member of the community coincided with the general interest of the whole. If I may venture to criticise the conclusions of colleagues, for each of whom individually I have the utmost respect, it appears to me that the Majority Report of the recent commission on Irish Railways rests upon a somewhat similar fallacy—for fallacy it seems to me undoubtedly to be. In that report it is proposed that the Irish railways shall be managed by a body of delegates elected from the several provinces of Ireland. I am unable to understand how the efforts of Ulster and Leinster and Connaught and Munster, each to get somewhat more than their fair share at the expense of the others, would work out into a consistent policy for the benefit of Ireland as a whole. If the railways of a country are to be managed in the interests of the country as a whole, it seems to me quite indefensible to entrench men elected for the express purpose of representing sectional interest in the seat of government.

I sum up my argument as far as it has gone as follows: The fundamental difficulty of railroading is the making of rates. The making of rates in the interest of the whole country requires two qualities in the highest degree: expert knowledge and impartiality; and whereas expert knowledge is equally attainable under both systems, impartiality is much more likely to be attained under a system of private ownership. We have now to consider whether private ownership implies any countervailing drawbacks.

[7] It will be said, no doubt, that the state railway management of Germany is above suspicion of partiality. I question whether the same thing would be said with much confidence of state management in any other country, unless perhaps India, and in both cases the reason is the same. The manager is not responsible to a popular legislature, and is, therefore, not amenable to political pressure. I would invite those persons who believe that impartiality is possible with State management in a democratic country, to study the history of Australasian railways, which is one long story of attempts, more or less successful from time to time, and for a time, to protect the railways against the politicians.

BUSH TRAIN SHED AT BALTIMORE.

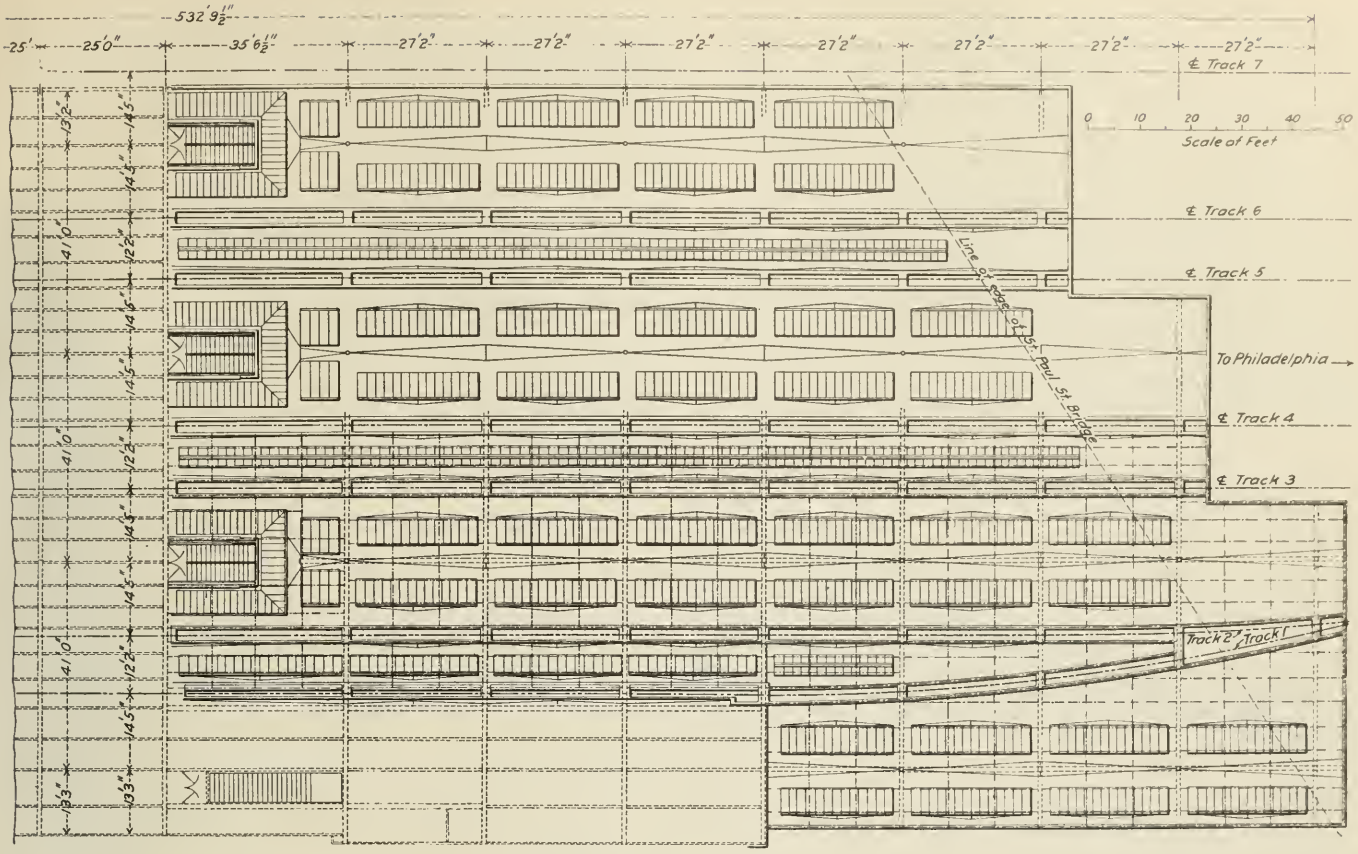
The new station which the Northern Central, a subsidiary of the Pennsylvania Railroad, is building at Baltimore was described in the *Railway Age Gazette* of November 12, 1909, page 928. The station tracks will be protected with the Bush train shed, installations of which at Hoboken, N. J., Scranton, Pa., and Chicago have been described in these columns.

The installation is novel in that it is the first Bush train shed to be put over depressed tracks. The station is between Charles and St. Paul streets, the main waiting room being at the street level and the tracks being 18 ft. below. A covered lobby, 330 ft. long, extends along the track side of the station from the bridge which carries Charles street over the tracks; and an enclosed lobby, 50 ft. wide, extends across the seven passenger tracks from a point at the middle of the station. The accompanying plan shows half of the platform layout, being the portion from this transverse lobby or passenger bridge to St.

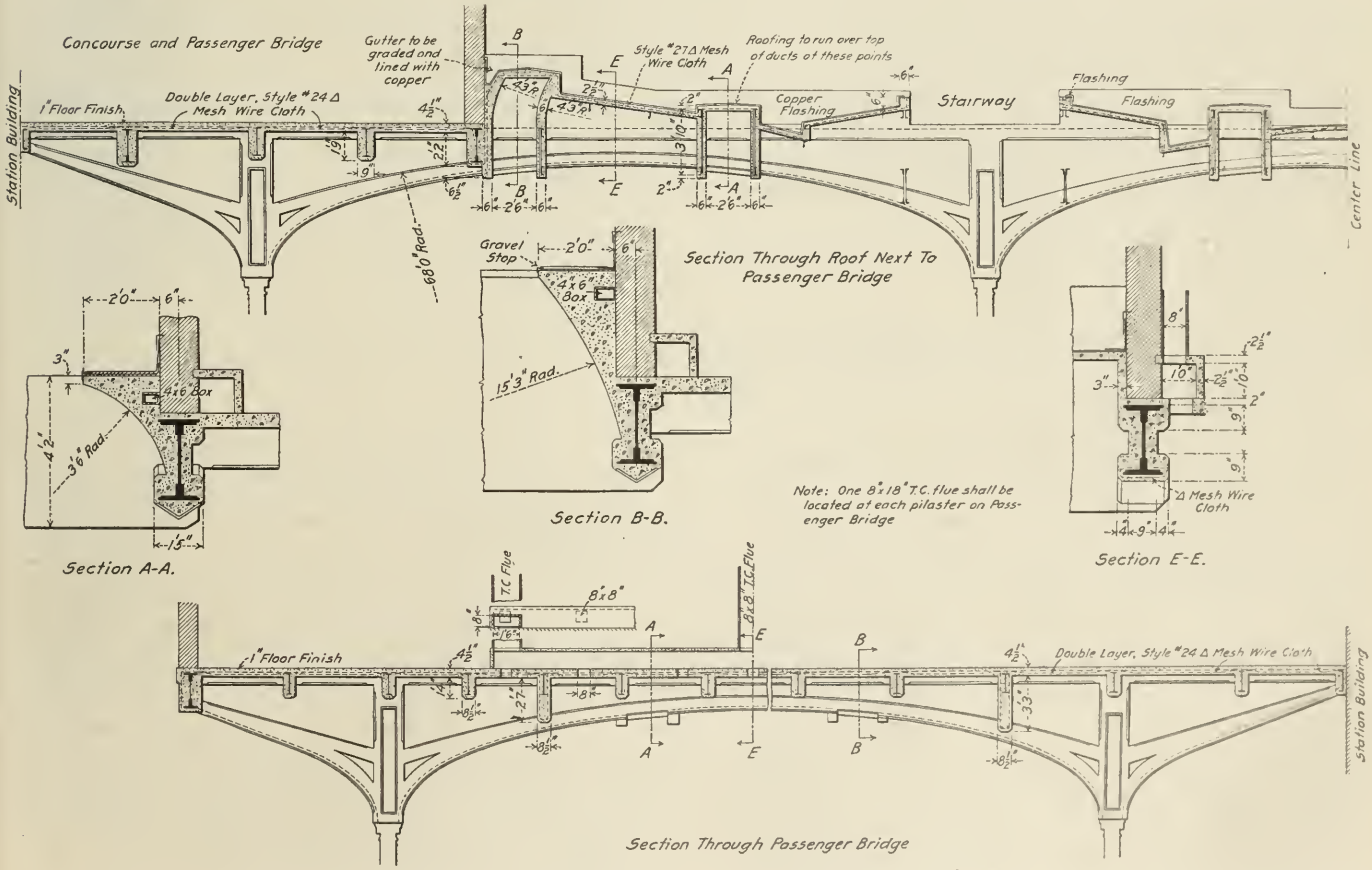


New Station at Baltimore and Site of Train Shed, Looking Toward Charles Street.

The passenger bridge is not yet built, and the wooden sheds are temporary.



Half Plan of Train Shed.

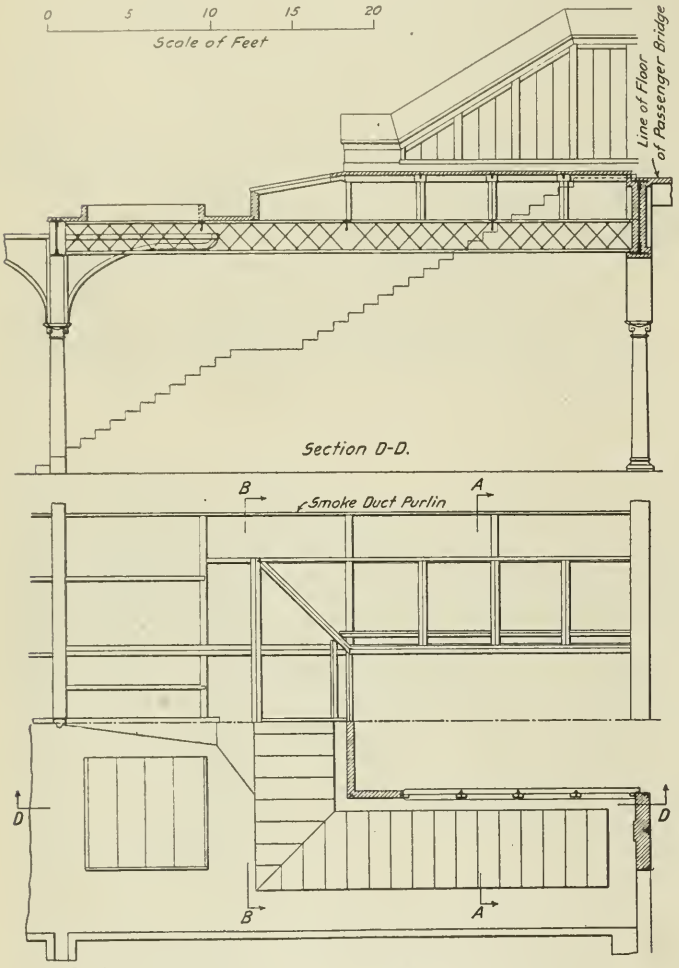


Details of Shed Construction under Passenger Bridge.

Paul street. The photograph shows the site of the shed. The total length of each platform is about 530 ft.

Covered stairways connect the passenger bridge with each train platform. One of the stairways is shown in the accompanying detail drawing. It will be noted that special provision is made for giving ample light at the stairways. A skylight runs around the three sides and the purlin at the inner edge of this skylight is a lattice girder instead of a web girder, so as to shut off the minimum amount of light.

The most interesting problem arising in the design was the taking care of smoke under the passenger bridge. The design of the smoke ducts between bridges is similar to those in previous installations. The under side of the passenger bridge, being flat and divided by floor beams parallel to the track, made a series of pockets for smoke to collect, each of which had to be drained of smoke. The accompanying details show a section through the passenger bridge and a section through the shed next

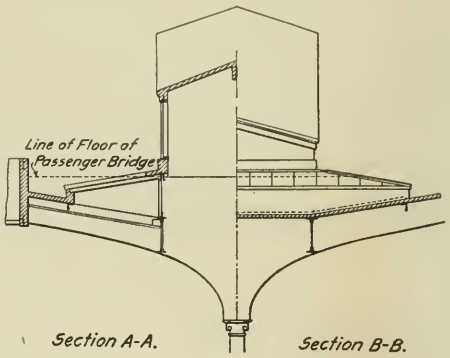


Stairway to Train Platform, Baltimore Station.

to the passenger bridge, showing the connection of the smoke ducts with the side walls of the bridge and with the concourse already mentioned, which connects with the passenger bridge. The sides of the smoke duct run alongside of the concourse and are turned outward to deflect the smoke away from the walls of the concourse. As shown in sections A-A and B-B, smoke rising through this duct and the ducts over the other tracks is also deflected out from the wall of the passenger bridge, at the points where they connect with the bridge. The section through the passenger bridge shows how the smoke under it is taken care of. The concrete encasing the floor beam just outside the center line of the track is carried down to a greater depth. Each of the five pockets thus left between the floor beams over the two tracks is pierced with 8 in. flues, which open into a 12-in. horizontal duct from which vertical flues are carried up alongside of the inner faces of the walls of the passenger bridge, as shown in the section through the passenger bridge, and in section E-E. The pockets just outside (that is, toward the center of the platform) of the deepened floor beams are also provided with flues, as some smoke and gases may get beyond these beams.

The roof of the shed is not connected to the street bridges, but is simply carried up to them, running only as far as the sidewalk girder of the Charles street bridge, and extending 20 or 30 ft. under the St. Paul street bridge. These bridges are askew, and the line of the edge of the St. Paul street bridge is indicated on the plan by the dotted line at the right hand side of the drawing, there being no skylights under the bridge.

The roof of the shed is drained by down-drain pipes inside of every other column. The details of these drains differ somewhat from previous sheds. There is a cast-iron screen over each



drain-pipe which is easily lifted out so that it and the drain-pipe can be cleaned. The 5-in. drain-pipe down through the column (the inside diameter of the cast iron column is 5 in.), is threaded into the cast socket in which the screen rests, and also into a plate at the foot of the column. These joints are made water-tight, so that no water can get in the annular space between the drain-pipe and the inside of the column. From the foot of the column the water is carried to a small catch basin; there being one of these basins on the center line of the platform at each column which carries drainage. The basin is covered with a manhole at platform level to give access to it. From the catch basin a drain connects to the city sewers.

The train shed will be erected under traffic. This design of shed is patented by Lincoln Bush, New York.

COST OF TRACK LAYING.

BY H. C. LANDON,

Division Engineer, Erie Railroad, Hornell, N. Y.

In connection with a recent article [*Railway Age Gazette*, June 3, 1910], on cost of track laying with modern track laying machinery, the cost and progress of track laying by the old methods may be interesting.

In 1905 and 1906, while engineer of maintenance of way of the Buffalo & Susquehanna, I was in direct charge of all track laying, ballasting, etc., between Wellsville and Buffalo, and had, in fact, previous to this time, had charge of all the track laying of the B. & S. from 1898, about 110 miles in all. I have not got the data of the cost of this work, except that, with the low price of labor, the cost, including labor, rental of engines, cars, etc., did not exceed $275 per mile. As much as 5,700 ft. of track has been laid in a single day, with about 65 men, through the winding valleys of the branches of the Susquehanna river south of Wharton, Pa.; and the average kept up very close to a mile a day where any considerable grade was ready ahead of the track layers.

On the line between Wellsville and Buffalo there were a large

number of bridges to be constructed as the track laying advanced; the steel for the bridges was brought over the new line, so that the track layers hardly became organized for rapid work before they were stopped for a period of two or three days to two months while the new structures were being erected. During this period, of course, the track layers were ballasting the new tracks or engaged in completing unfinished track on troublesome fills. The laborers, especially the spikers and members of the iron gang, had had previous experience and had, in general, become quite expert.

About one-third of the men were Hungarians and the balance Italians. No natives were employed. While at first the Slavs were decidedly the better laborers, some of the Italians became expert in spiking and in handling the rail so that spike gangs and iron gangs were made up of Italians and Hungarians, making a rivalry which expedited the work considerably.

Two truck gangs were always employed, passing each other by using a portable turntable or by lifting the heavy truck body from the wheels.

Good camp cars and a well equipped blacksmith car were provided. A combined gasolene engine and pump and a tank of about 10,000 gals. capacity, which could be quickly taken down and erected, formed part of the equipment, so that the track laying engine could be kept as close as possible to the work.

The longest stretch of grade which was ready for the track, and where no large bridges intervened to delay the work, was between Belvidere and Belfast and White Creek bridge, and on this stretch the track laying gangs showed what they could do when the organization was well in hand. This work, of course, does not in any way compare with some feats in the West over level country; but among winding roads of the East it does compare very favorably.

The biggest day's work on this stretch was 5,000 ft. on May 30, 1905, and the average for the six miles was 4,600 ft. a day. On July 2, 1905, north of White Creek bridge, 5,900 ft. was laid in one day near Belfast, including delay of several hours placing a small bridge at Transit bridge. The average for this one gang during the time employed was about 4,400 ft. a day. Other smaller gangs were employed out of Arcade and Hamburg working north and south to reach important large structures nearby, and, while these did not accomplish so much in a single day, their average was about 50 ft. per man.

The track laying gang was made up about as follows:

1 Foreman	$4.00 per day		$4.00
2 Assistant foremen	3.00 "	"	6.00
12 Spikers and nippers	1.50 "	"	18.00
36 Trackmen	1.50 "	"	$4.00
2 Tie tiers	1.50 "	"	3.00
2 Tie spacers	1.50 "	"	3.00
1 Spike puller	1.50 "	"	1.50
4 Bolters	1.50 "	"	6.00
2 Rail unloaders	1.50 "	"	3.00
4 Tie unloaders	1.50 "	"	6.00
1 Water boy	1.25 "	"	1.25
Total			$105.75

Behind the supply train, full tieing:

1 Foreman	$3.00 "	"	$3.00
24 Laborers	1.50 "	"	36.00
1 Timekeeper	2.00 "	"	2.00
Total			$41.00

At storage yard, loading rail and ties:

1 Foreman	$3.00 "	"	$3.00
24 Laborers	1.50 "	"	36.00
1 Engine and crew	40.00 "	"	40.00
Total			$79.00
Total, in all			$225.75

The average amount of track laid per day was over 4,000 ft. At 4,000 ft. a day the cost per mile would be $297.97. As much material was received while the track laying was in progress, the expense of rehandling in the supply yard was avoided.

The auditor's books, when rail laying was completed between Wellsville and Buffalo, indicated that the entire cost for laying 98.1 miles of track was $29,515.45, or $300.85 a mile. Of this 98.1 miles of track, 85 miles was main track and the balance sidings, Y tracks, and passing tracks.

The labor cost included building turnouts, etc. This is the total cost of labor, including engine and train crew, fuel, supplies, and rental of engine, and cost of office force. All rail laid was 80-lb. A. S. C. E. section.

There is no question but that ordinarily, where there is sufficient track building in sight, an efficient track laying machine, together with an efficient organization, will effect considerable economy and aid in completing the work in a shorter time, but the grade and smaller structures should be ready so that the track building can be continuous. With a good track laying machine, moderate curvature and light grades, very much more than a mile of track a day should be accomplished. If the structures are close together and track cannot be laid in any considerable stretches at a time, a well organized gang of good laborers will be as effective.

THE INITIAL CARRIER'S LIABILITY.

The United States Supreme Court in the case of the Atlantic Coast Line Railroad Plaintiff in Error v. Riverside Mills sustained the decision of the lower court in holding the initial carrier liable for damages occuring off its own lines. An abstract of the opinion follows:

This was an action to recover the value of goods received by the Atlantic Coast Line Railroad at a point on its line in the state of Georgia for transportation to points in other states. The agreed statement of facts showed that the goods were safely delivered by the Atlantic Coast Line Railroad to connecting carriers, and were lost while in the care of such carriers, and the question is whether the initial carrier is liable for such loss.

The stipulated facts showed that the goods were tendered to the Atlantic Coast Line Railroad and through bills of lading were issued. * * *

On the reverse side of the bill of lading were certain conditions, one of which was that "No carrier shall be liable for loss or damage not occurring on its portion of the route."

The court below, on this state of facts, instructed a verdict for the plaintiff [Riverside Mills] on which there was judgment for the amount of the verdict, and, upon motion of the plaintiff, an attorney's fee of $100 was ordered to be taxed as part of the costs in the case. Thereupon error was assigned, and this writ of error sued out by the railway company.

After making the above statement, Mr. Justice Lurton delivered the opinion of the court:

The goods of the defendants in error were lost by a connecting carrier to whom they had been safely delivered. Though received for a point beyond its own line and for a point on the line of a succeeding carrier, there was no agreement for their safe carriage beyond the line of the plaintiff in error, but, upon the contrary, an express agreement that the initial carrier should not be liable for "a loss or damage not occurring on its own portion of the route." Such a provision is not a contract for exemption from a carrier's liability as such, but a provision making plain that it did not assume the obligation of a carrier beyond its own line, and that each succeeding carrier in the route was but the agent of the shipper for a continuance of the transportation. It is therefore obvious that at the common law an initial carrier under such a state of facts would not be liable for a loss through the fault of a connecting carrier to whom it had, in due course, safely delivered the goods for further transportation. Liability is confessedly dependent on the provision of the act of Congress regulating commerce between the states known as the Carmack amendment of January 29, 1906. The twentieth section of the act of February 4, 1887, as changed by the Carmack amendment, reads as follows:

"That any common carrier, railway, or transportation company receiving property for transportation from a point in one state to a point in another state shall issue a receipt or bill of lading

therefor, and shall be liable to the lawful holder thereof for any loss, damage, or injury to such property caused by it or by any common carrier, railway or transportation company to which such property may be delivered or over whose line or lines such property may pass, and no contract, receipt, rule or regulation shall exempt such common carrier, railway, or transportation company from the liability hereby imposed. Provided, that nothing in this section shall deprive any holder of such receipt or bill of lading of any remedy or right of action which he has under existing law.

"That the common carrier, railway or transportation company issuing such receipt or bill of lading shall be entitled to recover from the common carrier, railway, or transportation company on whose line the loss, damage or injury shall have been sustained the amount of such loss, damage, or injury as it may be required to pay to the owners of such property, as may be evidenced by any receipt, judgment, or transcript thereof."

The power of Congress to enact this legislation has been denied, first, because it is said to deprive the carrier and the shipper of their common law power to make a just and reasonable contract in respect to good to be carried to points beyond the line of interstate carrier; and, second, that in casting liability upon the initial carrier for loss or damage upon the line of a connecting carrier the former is deprived of its property without due process of law. * * *

The general doctrine accepted by this court, in the absence of legislation, is, that a carrier, unless there be a special contract, is only bound to carry over its own line and then deliver to a connecting carrier. That such an initial carrier might contract to carry over the whole route was never doubted. It is equally indisputable that if it does so contract, its common law carrier liability will extend over the entire route.

The English cases beginning with *Muschamp* v. *Lancaster Railway Company,* decided in 1841, down to *Bristol etc. Railway* v. *Collins,* have consistently held that the mere receipt of property for transportation to a point beyond the line of the receiving carrier, without any qualifying agreement, justified an inference of an agreement for through transportation and an assumption of full carrier liability by the primary carrier. The ruling is grounded upon considerations of public policy and public convenience, and classes the receipt of goods so designated for a point beyond the carrier line as a holding out to the public that the carrier has made its own arrangements for the continuance by a connecting carrier of the transportation after the goods leave its own line. There are American cases which take the same view of the question of evidence thus presented.

Upon the other hand, many American courts have repudiated the English rule which holds the carrier to a contract for transportation over the whole route, in the absence of a contract clearly otherwise, and have adopted the rule that unless the carrier specifically agrees to carry over the whole route its responsibility, as a carrier, ends with its own line, and that for the continuance of the shipment its liability is only that of a forwarder. The conflict has, therefore, been one as to the evidence from which a contract for through carriage to a place beyond the line of the receiving carrier might be inferred.

In this conflicting condition of the decisions as to the circumstances from which an agreement for through transportation of property designated to a point beyond the receiving carrier's line might be inferred, Congress by the act here involved has declared, in substance, that the act of receiving property for transportation to a point in another state and beyond the line of the receiving carrier shall impose on such receiving carrier the obligation of through transportation with carrier liability throughout. But this uncertainty of the nature and extent of the liability of a carrier receiving goods destined to a point beyond its own line was not all which might well induce the interposition of the regulating power of Congress. Nothing has perhaps contributed more to the wealth and prosperity of the country than the almost universal practice of transportation companies to cooperate in making through routes and joint rates. Through this method a situation has been brought about by which, though independently managed, connecting carriers become in effect one system. This practice has its origin in the mutual interests of such companies and in the necessities of an expanding commerce. * * *

Along with this singleness of rate and continuity of carriage there grew up the practice by receiving carriers, illustrated in this case, of refusing to make a specific agreement to transport to points beyond its own line, whereby the connecting carrier for the purpose of carriage would become the agent of the primary carrier. The common form of receipt, as the court may judicially know, is one by which the shipper is compelled to make with each carrier in the route over which his package must go a separate agreement limiting the carrier liability of each separate company to its own part of the through route. As a result the shipper could look only on the initial carrier for recompense for loss, damage or delay occurring on its part of the route. If such primary carrier was able to show a delivery to the rails of the next succeeding carrier, although the packages might and usually did continue the journey in the same car in which they had been originally loaded, the shipper must fail in his suit. He might, it is true, then bring his action against the carrier so shown to have next received the shipment. But here, in turn, he might be met by proof of safe delivery to a third separate carrier. In short, as the shipper was not himself in possession of the information as to when and where his property had been lost or damaged and had no access to the records of the connecting carriers who, in turn, had participated in some part of the transportation, he was compelled in many instances to make such settlement as should be proposed.

This burdensome situation of the shipping public in reference to interstate shipments over routes including separate lines of carriers was the matter which Congress undertook to regulate.

It must be conceded that the effect of the act in respect of carriers receiving packages in one state for a point in another and beyond its own lines, is to deny to such an initial carrier the former right to make a contract limiting liability to its own line. This it is said is a denial of the liberty of contract secured by the Fifth Amendment to the Constitution.

This power to regulate is the right to prescribe the rules under which such commerce may be conducted. "It is," said Chief Justice Marshall, in *Gibbons* v. *Ogden,* "a power vested in Congress as absolutely as it would be in a single government having in its constitution the same restrictions on the exercise of the power as are found in the Constitution of the United States." It is a power which extends to the regulation of the appliances and machinery and agencies by which such commerce is conducted. Thus, in *Johnson* v. *Southern Pac. Ry.,* 196 U. S., 1, an act prescribing safety appliances was upheld. And in *Interstate Commerce Commission* v. *Illinois Central R. R. Co.,* 215 U. S., 452, it was held that the equipment of an interstate railway, including cars used for the transportation of its own fuel, was subject to the regulation of Congress. * * *

It is obvious, from the many decisions of this court, that there is no such thing as absolute freedom of contract. Contracts which contravene public policy cannot be lawfully made at all, and the power to make contracts may in all cases be regulated as to form, evidence, and validity as to third persons. The power of government extends to the denial of liberty of contract to the extent of forbidding or regulating every contract which is reasonably calculated to injuriously affect the public interests. Undoubtedly the United States is a government of limited and delegated powers, but in respect of those powers which have been expressly delegated, the power to regulate commerce between the states being one of them, the power is absolute, except as limited by other provisions of the Constitution itself.

Having the express power to make rules for the conduct of commerce among states, the range of congressional discretion as to the regulation best adapted to remedy a practice found inefficient or hurtful, is a wide one. If the regulating act be one directly applicable to such commerce, not obnoxious to any other

provision of the constitution, and reasonably adapted to the purpose by reason of legitimate relation between such commerce and the rule provided, the question of power is foreclosed. "The test of power," said Mr. Justice White, speaking for this court in the Employers' Liability Cases, cited above, "Is not merely the matter regulated, but whether the regulation is directly one of interstate commerce, or is embraced within the grant of power conferred on Congress to use all lawful means necessary and appropriate to the execution of the power to regulate commerce."

That a situation had come about which demanded regulation in the public interest was the judgment of Congress. The requirement that carriers who undertook to engage in interstate transportation, and as a part of that business held themselves out as receiving packages destined to places beyond their own terminal, should be required as a condition of continuing in that traffic to obligate themselves to carry to the point of designation, using the lines of connecting carriers as their own agencies, was not beyond the scope of the power of regulation. The rule is adapted to secure the rights of the shipper by securing unity of transportation with unity of responsibility. The regulation is one which also facilitates the remedy of one who sustains a loss, by localizing the responsible carrier. Neither does the regulation impose an unreasonable burden upon the receiving carrier. The methods in vogue, as the court may judicially know, embrace not only the voluntary arrangement of through routes and rates, but the collection of the single charge made by the carrier at one or the other end of the route. This involves frequent and prompt settlement of traffic balances. The routing in a measure depends upon the certainty and promptness of such traffic balance settlements, and such balances have been regarded as debts of a preferred character when there is a receivership. Again, the business association of such carriers affords to each facilities for locating primary responsibility as between themselves which the shipper cannot have. These well-known conditions afford a reasonable security to the receiving carrier for a reimbursement of a carrier liability which should fall upon one of the connecting carriers as between themselves.

But it is said that any security resulting from a voluntary agreement constituting a through route and rate is destroyed if the receiving carrier is not at liberty to select his own agencies for a continuance of the transportation beyond his own line. This is an objection which has no application to the present case. This action was for loss and damage arising from several distinct shipments to different places beyond the line of the plaintiff in error who was the initial or receiving carrier. The presumption from the absence of anything to the contrary in the record is that the routing was over connecting lines with whom the plaintiff in error had theretofore made its own arrangements and rate. This record presents no question as to the right of the initial carrier to refuse a shipment designated for a point beyond its own line, nor its right to refuse to make a through route or joint rate when such route and rate would involve the continuance of a transportation over independent lines. We, therefore, refrain from any consideration of the large question thus suggested. The shipments involved in the present case were voluntarily received by an initial carrier who undertook to escape carrier's liability beyond its own line by a provision limiting liability to loss upon its own line. This was forbidden by the Carmack amendment and any stipulation and condition in the special receipt which contravenes the rule in question is invalid.

Reduced to the final results, the Congress has said that a receiving carrier, in spite of any stipulation to the contrary, shall be deemed, when it receives property in one state to be transported to a point in another involving the use of a connecting carrier for some part of the way, to have adopted such other carrier as its agent, and to incur carrier liability throughout the entire route, with the right to reimbursement for a loss not due to his own negligence. The conditions which justified this extension of carrier liability we have already adverted to. The rule of the common law which treated a common carrier as an insurer grew out of a situation which required that kind of security for the protection of the public. To quote the quaint but expressive words of Lord Holt, in *Coggs* v. *Bernard,* when defending and applying the doctrine of absolute liability against loss not due to the act of God or the public enemy, "this rule," said he, "is a public establishment contrived by the policy of the law for the safety of all persons, the necessities of whose affairs oblige them to trust those sort of persons that they may be safe in their ways of dealing."

If it is to be assumed that the ultimate power exerted by Congress is that of compelling co-operation by connecting lines of independent carriers for purposes of interstate transportation, the power is still not beyond the regulating power of Congress, since without merging identity of separate lines of operation it stops with the requirement of oneness of charge, continuity of transportation and primary liability of the receiving carrier to the shipper, with the right of reimbursement from the guilty agency in the route. That there is some chance that this right of recoupment may not be always effective may be conceded without invalidating the regulation. If the power existed and the regulation is adapted to the purpose in view, the public advantage justifies the discretion exercised and upholds the legislation as within the limit of the grant conferred upon Congress. * * *

But it is said that the act violates the Fifth Amendment by taking the property of the initial carrier to pay the debt of an independent connecting carrier whose negligence may have been the sole cause of the loss. But this contention results from a surface reading of the act and misses the true basis upon which it rests. The liability of the receiving carrier which results in such a case is that of a principal for the negligence of his own agents.

In substance Congress has said to such carriers, "If you receive articles for transportation from a point in one state to a place in another, beyond your own terminal, you must do so under a contract to transport to the place designated. If you are obliged to use the services of independent carriers in the continuance of the transit, you must use them as your own agents and not as agents of the shipper." It is, therefore, not the case of making one pay the debt of another. The receiving carrier is, as principal, liable not only for its own negligence, but for that of any agency it may use, although, as between themselves, the company actually causing the loss may be primarily liable.

In *Seaboard Air Line* v. *Seegers,* 207 U. S. 73, 78, legislation by the State of Georgia imposing a penalty on common carriers for failure to adjust damage claims within forty days was held to neither deny due process nor the equal protection of the law. Speaking by Mr. Justice Brewer, the court said of the reasonableness of the requirement and classification, that "the matter to be adjusted is one peculiarly within the knowledge of the carrier. It receives the goods and has them in its custody until the carriage is completed. It knows what it received and what it delivered. It knows what injury was done during the shipment and how it was done. The consignee may not know what was in fact delivered at the time of the shipment, and the shipper may not know what was delivered to the consignees at the close of the transportation. The carrier can determine the amount of the loss more accurately and promptly and with less delay and expense than anyone else, and for the adjustment of loss or damage to shipments within the state forty days cannot be said to be an unreasonably short length of time."

The conclusion we reach in respect to the validity of the amendment has the support of some well-considered cases. Among them we cite: *Smeltzer* v. *Railroad,* 158 Fed. 649; *Railroad* v. *Mitchell,* 91 N. W. Rep., 735; *Railroad* v. *Scott,* 118 S. W. Rep., 992.

The judgment included an attorney's fee taxed as part of the costs. * * * The judgment was erroneous to this extent, and the provision for an attorney's fee is stricken out, and the judgment thus modified is affirmed.

ANNUAL REPORT OF NEW YORK STATE PUBLIC SERVICE COMMISSION, FIRST DISTRICT.

The New York State Public Service Commission for the first district (New York City), has issued advance sheets of the principal part of its annual report. The commission has held 134 formal and 185 informal meetings during the past year and has considered 2,711 matters (not including those relating to rapid transit) of which 194 were formal cases. Fifty-three of these formal cases remained undetermined at the end of the year. In the formal cases 527 hearings were held, generally before one commissioner. The report gives the number of formal cases in each of nine separate classes. The rules have been revised so that a larger proportion of the matters coming before the board are now dealt with informally. A large part—half a dozen pages—of the summary now issued deals with rapid transit. This subject, however, is made up almost wholly of a large number of unsettled questions, and this part of the report, therefore, consists mainly of data which will be of general interest only after the commission decides the important questions now before it relative to the authorization of new subway lines.

Statistics are given of the 75 companies under the jurisdiction of the commission—railways, street railways, gas and electric companies—including statistics of the business done by them during the past year, accompanied by comparisons with preceding years.

The question of securing adequate service on railways of the city during rush hours is referred to as a difficult one, and statistics are given of the rapid growth of the traffic on these lines. Comparison is made of the number of persons riding on surface, elevated and subway lines in the city, with the population of the city, and it appears that in 1898 the number of rides per capita was 228, while in the year 1910 it was 320. The commission is proceeding persistently in the cause to secure the forfeiture of the franchises under which are maintained about 25 miles of street railway track in the streets of the city, none of which is used. A suit against one company has already been successful, and in two or three other cases the companies have voluntarily agreed to take up the tracks; and the commission looks for the speedy removal of all abandoned tracks in the city.

Elimination and Protection of Grade Crossings.—There have been during the year 32 cases involving grade crossings in New York City. Of these cases, 12 were on motion of the commission for the elimination of 27 grade crossings; 4 on motion of the commission for additional safety precautions at 28 grade crossings; 2 on motion of the commission to restrict the operation by the New York Central of freight trains over the numerous crossings on Eleventh avenue, Manhattan; 1 upon complaint for additional protection of one grade crossing; 1 upon application of a company for the elimination of grade crossings which were already covered by a proceeding determined by the commission; 1 upon application of a company for eliminating one grade crossing by discontinuing it; 9 upon application of the city of New York to determine the manner of opening of new streets across railways, embracing 11 grade crossings, and 2 upon application of railways to cross existing railways, embracing 2 grade crossings.

The total number of grade crossings on steam railways in the city of New York is 494; of these 433 are the crossings of public streets across steam railways and 61 are private roads across steam railways. Ninety-eight crossings are on the New York Central in Manhattan, 223 on the Long Island in Brooklyn and Queens boroughs, and 85 on the Staten Island railway.

In the matter of protection, the 433 public crossings and 61 private crossings are grouped as follows:

Public Crossings.		*Private Crossings.*	
Protected by gates and flagmen	161	Protected by farm gates	12
Protected by flagmen only	71	Protected by bells	2
Protected by bells only	47	Protected by signs	32
Protected by bells and semaphores	3	No protection	15
Unprotected except by sign	151	Total	61
Total	433		

The number of accidents at grade crossings during the last three years were as follows:

1908—Killed, 21; injured, 41. 1909—Killed, 23; injured, 35. 1910—Killed, 16; injured, 32. Total—Killed, 60; injured, 108.

Two-thirds of the fatal accidents occurred on Long Island.

The commission has under way at the present time proceedings for the elimination of 20 grade crossings in the Borough of Queens (Long Island). The proceedings as to nine of these, located in Flushing, will cost $1,100,000. Formal determination as to these locations was made on December 31. To meet this cost there is an appropriation made by the legislature last year for use in Queens county of $200,000. The Long Island Railroad Company has agreed to bear the remaining cost of that elimination, estimated at $700,000. The remaining Queens proceedings before the commission involve the elimination of crossings, the estimated cost of which will be about $3,000,000. To meet the state's share of this expense, no appropriation has been made, but the commission has requested an appropriation by the coming legislature of $400,000 for use in Queens county.

The commission has under way at the present time proceedings for the elimination of seven grade crossings in the Borough of Richmond (Staten Island). The estimated cost of eliminating five of these is $200,000. The last session of the legislature appropriated $50,000 for use in Richmond and all of this will be necessary for the elimination of these five grade crossings. The city is to appropriate $50,000 as its share. The commission has asked the next session of the legislature to appropriate $50,000 for Richmond.

The commission is also asking for an appropriation from the next legislature of $50,000 for use in the elimination of grade crossings in Brooklyn, and $100,000 for Manhattan and the Bronx.

Although there are over 400 grade crossings in New York City, up to 1910, only $9,000 of state appropriation had been used in the city on elimination of grade crossings. In 1910 the legislature appropriated $250,000, and for 1911 this commission has requested, as stated above, $600,000. This amount is not for administrative expenses, but to help pay the cost of a substantial start in elimination in New York City of the grade crossings of steam railways, at which in three years 60 were killed and 108 injured.

SNOW SHEDS ON THE GREAT NORTHERN.

On March 1, 1910, a snow slide at Wellington, Wash., near the mouth of the Cascade tunnel, struck two trains and seven locomotives on the Great Northern, resulting in the loss of many lives and considerable property. Several similar disasters occurring about the same time on roads crossing the Western mountain ranges called renewed attention to the danger of travel during the winter months on roads in such locations. The only means of preventing such accidents on lines that must be located at the foot of steep snow-covered slopes is to build sheds over the tracks to carry slides safely across the right-of-way. Such sheds have been in service for many years on mountain roads, and in most cases have proved an efficient protection. They have usually been built of timber, but, in speaking of this practice, Committee No. IX of the American Railway Engineering and Maintenance of Way Association in its report to the 1909 convention, made the following recommendation:

"Snow sheds are expensive to construct and expensive to maintain, and the railway should be located, if possible, so as to prevent the necessity of their construction. Their use should be confined to localities which require protection from mountain snow slides, and then they should be constructed of more permanent material than is now ordinarily used."

Following the accidents of last winter, the Great Northern took immediate steps to further safeguard its line through the Cascade mountains, and this work of protection was considered of such great importance that the company has spent more than $1,500,000, and at the most dangerous point has had built a reinforced concrete shed which sets a new standard for this type of construction. The plans for this work were so satisfactory to the

state railway commission of Washington that it included in a recent report the following comment on the proposed concrete sheds:

"The proposed permanent construction of steel and concrete is a very high-grade example of modern building practice and the plans have been worked out sufficiently in detail so that, in our opinion, no question can be raised as to their strength and ability of the structures to meet any demand that may be made upon them. They will be fireproof and should last for generations, and that they will provide absolute safety from slides there is not the slightest question. Any railway track so protected is, in our opinion, as safe for travel as any stretch of equal length picked from the average of the total main track in the United States."

The concrete shed is at Wellington, where the most disastrous slide of last winter occurred. It is 870 ft. east of a long wooden shed, which was built several years ago, and as this open space is to be covered at once by a wooden shed, the track will be protected at this point by a continuous shed of wood and concrete for about 1½ miles. To provide additional space for tracks and to allow as much as possible of the concrete shed to be anchored to the solid rock, a lateral cut of about 50 ft. was made, involving some very heavy rock excavation. The method of anchoring to the rock is well illustrated in Figs. 1 and 2. The face of the rock cut varies from a vertical wall to an irregular slope, and the design of the retaining wall and anchoring was varied to meet these conditions. The cross section shown in Fig. 1 is that for locations where the roof of the shed forms a continuation of the natural slope, and no fill is required behind the retaining wall. Since the wall is not under earth pressure, it is made with a uniform thickness of 6 in. For the location shown in Fig. 2, where the retaining wall is backed by a solid rock face for only a portion of its height, an earth fill is required to make the surface slope continuous with the roof of the shed. In this case the wall thickness is made 7 in. at the top and increased ¼ in. per foot of height down to the top of the vertical rock face, and from that point down it is 6 in. as in the other design. Fig. 3 shows the cross section used in earth cuts, the footing being extended back 19 ft. so the weight of fill will provide stability against overturning. The wall is braced on the rear side by 10 in. buttresses spaced 10 ft. center to center. In this design the retaining wall is made 9 in. thick at the top and increased in thickness ¼ in. per foot of height, making it 17 in. thick at the top of footing.

The roof slab is 10 in. thick designed for a load of 1,100 lbs. per square foot, this value being assumed to allow ample strength to resist the impact of heavy stones and trees being carried down in snow slides. The roof is given a pitch of 1 to 5, and projects 3 ft. beyond the outer column to prevent the material in the slide dropping down and injuring the columns or footings. The roof slab is supported on transverse beams 24 in. wide and 39 in. deep, the depth including the thickness of the slab, spaced 10 ft. center to center. The beams are designed for a load of 700 lbs. per square foot of roof surface. The columns are 20 in. × 24 in., with vertical reinforcing bars 1 in. square, banded with ⅜ in. round bars at intervals of 12 in. In all designs 20 in. × 24 in. piers are provided on the inner surface of the rear wall at the same intervals as the roof beams. A compression of 500 lbs. per square inch in the concrete and a tension of 12,000 lbs. per square inch in the bars were allowed in the design. Expansion joints are provided in the roof slab and buttress at intervals of 80 ft., the details of which are shown in Fig. 4.

The design shown in Fig. 3 requires 8 cubic yards of concrete and 1,500 lbs. of steel per running foot. The 3,300 ft. of concrete shed, which is now practically completed, cost about $465,000. The work was done under contract by Grant, Smith & Co. A large rock crusher and concrete mixer was installed

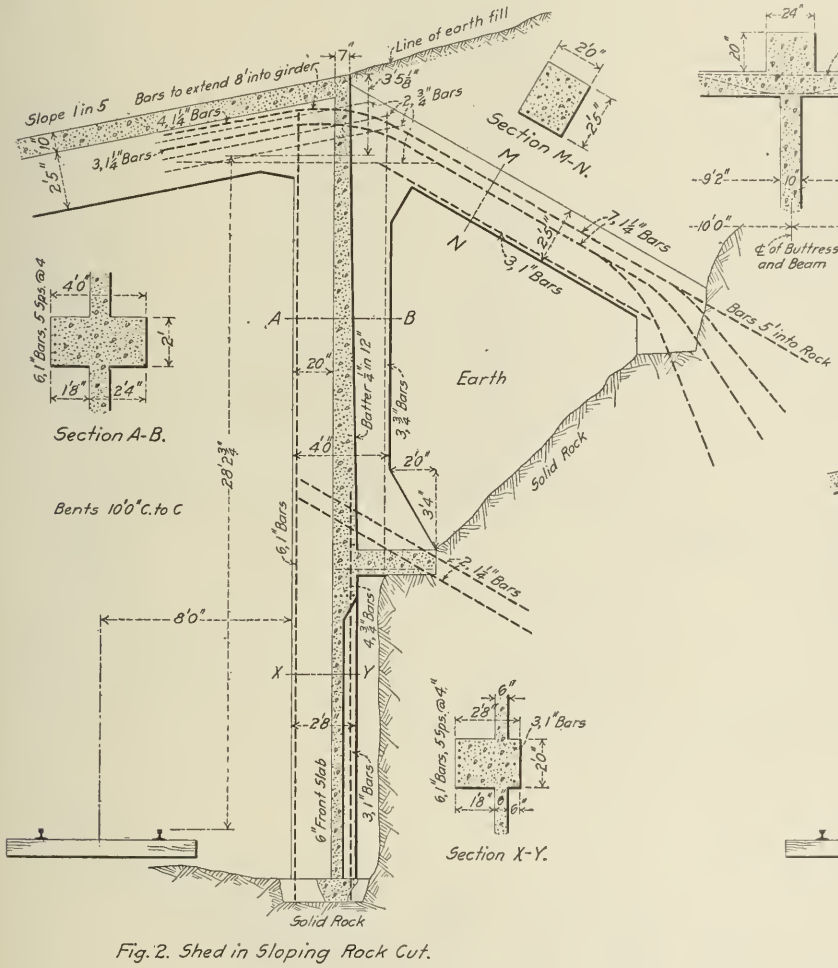


Fig. 2. Shed in Sloping Rock Cut.

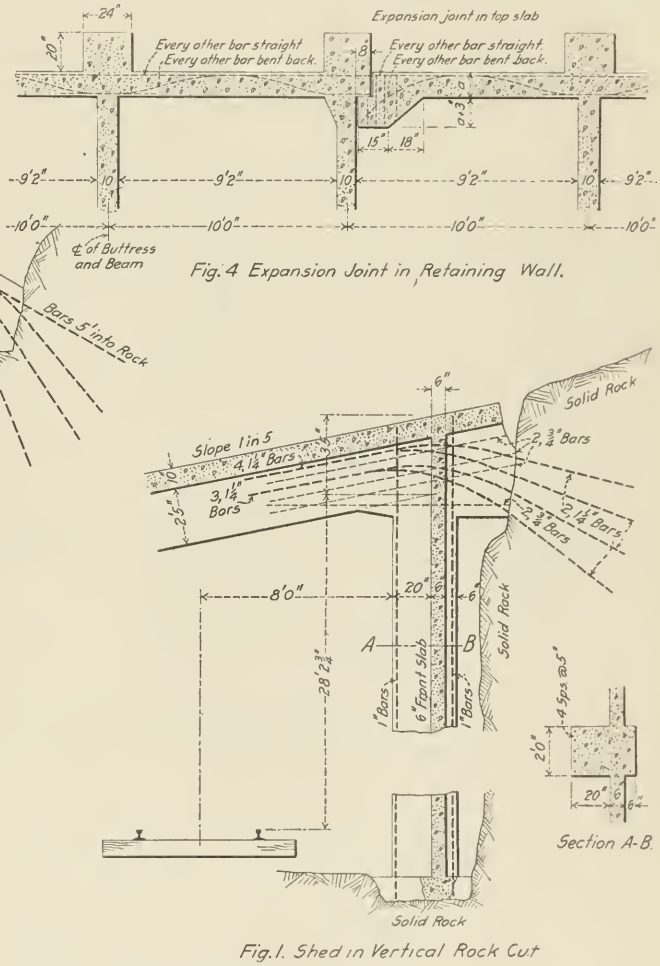


Fig. 4 Expansion Joint in Retaining Wall.

Fig. 1. Shed in Vertical Rock Cut

Figs. 1, 2 and 4—Concrete Shed in Rock Cut; Great Northern.

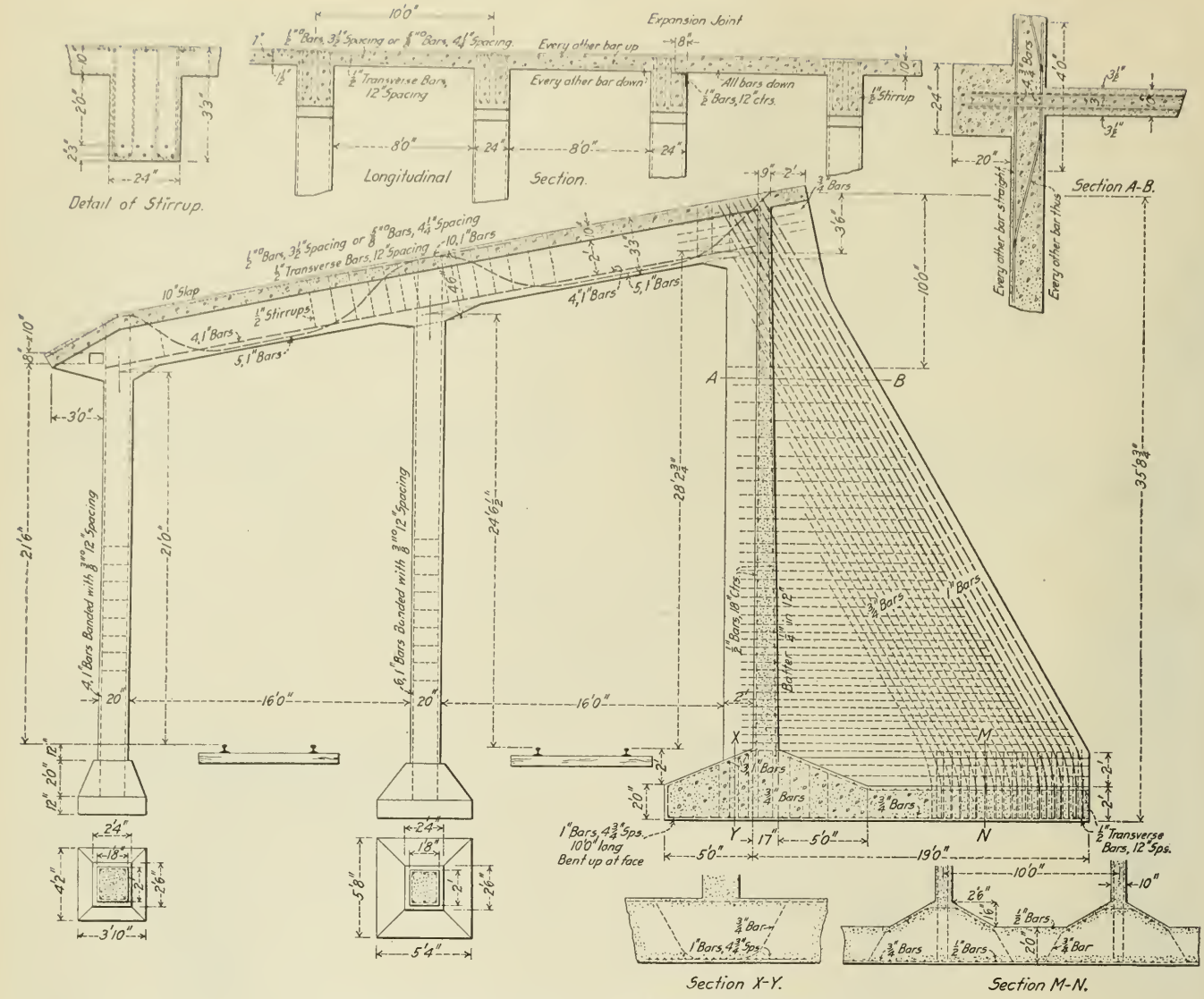


Fig. 3—Concrete Snow Shed with Earth Fill; Great Northern.

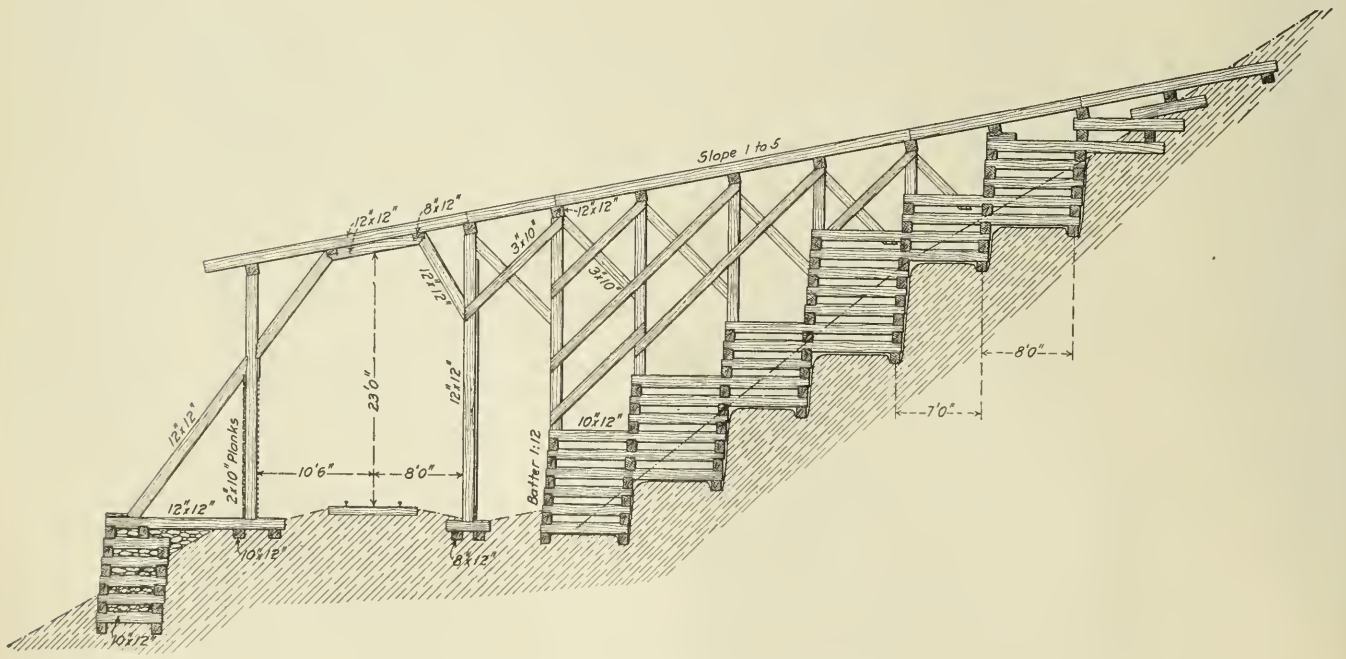


Fig. 5—Timber Snow Shed; Great Northern.

near the east end of the shed, and concrete was handled from the mixer to the forms in small dump cars on a temporary trestle.

In addition to the concrete shed, new wooden sheds have been built at 26 locations, providing protection for 5,411 ft. of track, besides the 17 sheds built in previous years, which cover 7,593 ft. The design of the timber sheds is about the same as those already built. A typical section of single track shed is shown in Fig. 5. The framing and roof are of 12 × 12 timbers, the roof being drift bolted to 12 × 12 longitudinal purlins. The crib work is of 10 × 12 timbers, the lower stick in each case being set in a trench. The posts are braced by 3 × 10 pieces. A number of the wooden sheds were built across draws which required the use of a great deal of additional material to extend the shed a sufficient distance down the draw to provide a path of low resistance for slides. On this account the average amount of lumber per lineal foot of track in some of the sheds is as high as 3,000 to 5,000 ft. b. m. The total cost of the new timber sheds is about $370,000.

For fire protection a 6-in. pipe line is being laid alongside the track from Wellington to Scenic. At frequent intervals standpipes will be located in the sheds, with a coil of hose ready for immediate use. Another innovation in the new sheds will be coal bins containing fuel for locomotives and rotaries in case of need. This provision should serve in many cases to prevent serious blockades.

Some heavy re-location work was begun during the past summer at Berne, 4½ miles east of Cascade tunnel. At this point, by re-locating 2.07 miles of line, the building of sheds was avoided. Smaller changes of line were also made at other points to get the track in a safer location, and in a number of cases buildings were rebuilt or moved out of danger.

THE SUPPLY DEPARTMENT.*

BY H. C. PEARCE.

General Storekeeper, Southern Pacific Company.

II.

GENERAL STORES.

The plan of organization for the general store is shown by the diagram. The general store is the jobbing house of the railway, and should be located at the general manufacturing plant, as conveniently located as possible to the foundries, rolling mills, and forge shops, and always conveniently located for switching and trackage. Where possible the general store should be located at the gateway to the system. Of course this can only be done when the general manufacturing shops are located in the same manner, as it is more desirable to have the general store at the principal manufacturing shops than at the gateway, the purpose always being to have the general store as near the market as possible. The manufacturing shops being the best market the railway company has, the general store must necessarily be connected with it.

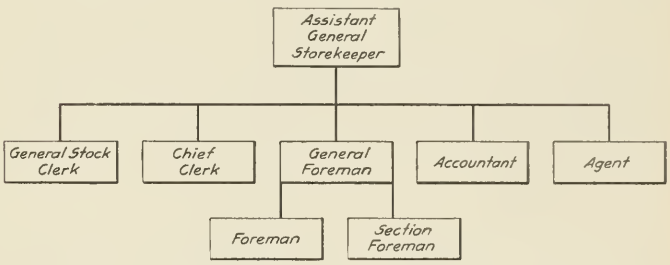
On most large systems, owing to the geographical location of its lines, markets, etc., it is necessary to have two or more general distributing stores, but the fewer the better. The ideal arrangement would be to have only one, for the reason that it means not only elimination of duplication in the organization, but also a great reduction in the investment of material. Generally speaking, it is necessary for the general material yards, that is to say, where lumber, piling, track material, etc., are assembled, to have a separate location, as it is more desirable to have this class of material located a shorter distance from where it is needed in order to save back haul, and more particularly to have it where it is most available for the entire system. The location is selected generally for the purpose of making it accessible to all points on the system in case of emergency, and will be treated in detail later. Were it possible to have the main shops, the general storehouse and general material yard all together at the gateway of the system, it would be the ideal arrangement.

The organization and facilities of the general store must be adequate to meet the maximum requirements. A fallacy of many railway officers is that large store buildings mean large stocks. The opposite is true. Ample room to have a place for everything and everything in its place is the only way a store can be operated economically, and with the minimum stock. It is absolutely essential and of first importance, and must be understood by all storekeepers, that material must be segregated, each kind and size separated, even though it may be necessary to clear off ground and pile it up outside.

While facilities are important and necessary to the economical care and handling of material, still they are of less importance than the organization. Therefore the first thing we must consider is an organization which is adequate promptly and fully to meet all requirements. The general store being the jobbing house of the system, it is really the transfer point, and it is therefore necessary that every detail should be planned along the line of economical and prompt handling.

The real purpose served by the general store is promptness in delivery, and the system must be such as to enable it to ship its goods as quickly as any first-class commercial jobbing house. Therefore its organization is of vital importance. In addition, it also serves the local division where it may be located and the company's principal shops. In this respect it is a division store as well as a general store.

In laying out this plan the writer had in view the prompt filling



General Store Organization.

of requisitions and economical operation. For this purpose it was laid off into sections, as shown. That is, the material was grouped with a view of convenience in handling and economy in operation, and with the further view of having a man in charge of each class of material who should be an expert in this particular class, and who actually handles it, both in and out. For this reason roadway material is put into one section, as it is necessary to have a practical track man in charge of this section. Section 2 contains bolts, nuts, lag screws and washers. This is a heavy stock that requires plenty of space and hard work, but it does not require a skilled or high-priced man to handle it. Section 7 contains air brakes, lubricators, injectors, steam heat equipment, headlight parts, etc. It is necessary to have a man who is an expert in this class of material; and, throughout, material of this same general class is grouped in one section with this purpose in view.

The sections are divided so they can be handled by one man, and only in a few cases is it necessary for a section foreman or storekeeper to have a helper, the idea being that it is better to divide them into additional sections as the volume of business increases rather than establsh a department. In this way we have one man who actually handles all the material in and out of a section, and who is actually responsible for the same.

Each section is operated as a separate store, and the foreman keeps his own stock books. He is furnished with a copy of every order for the purchase of material for his section, keeps his own "freight received" record, unpacks and checks the material into the proper section or shelves, and in every way conducts it as an independent store. Each section has its stock listed in books,

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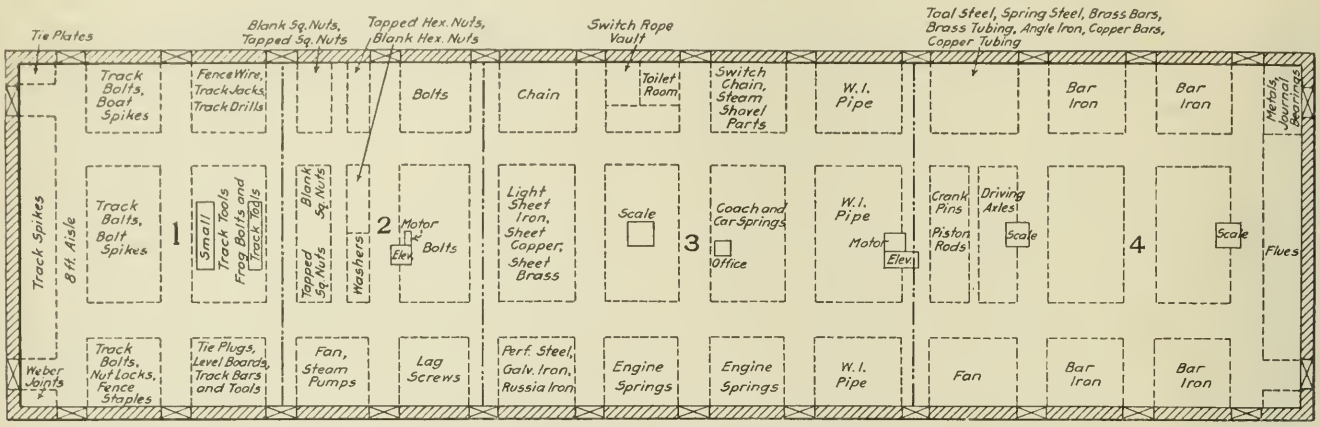
arranged alphabetically. These books show the compartment in which the material is located, technical description of the material, average monthly consumption, amount on hand and amount ordered each month. The stock is taken for requisitioning purposes each month and entered into the proper column. The section storekeeper then enters directly over the item on hand, the amount of unfilled requisitions, then enters after each item the quantity which he estimates will be required to cover a certain period (the basis of his calculation is 30 days) plus the time it takes for delivery and such special conditions as may arise, of material to the division or district served. In this way every unit is working simultaneously, instead of around a circle under a different organization.

Requisitions are made out by sections in accordance with the classification. On all stock items a stock limit is placed, which indicates to the section storekeeper that when he has reached this limit he must place requisition to replenish his stock and what he requires hurried on his requisitions. This is approved by the general stock clerk after he has personally investigated each case to see that it is necessary, and that nothing can be



First Floor Plan; General Storehouse.

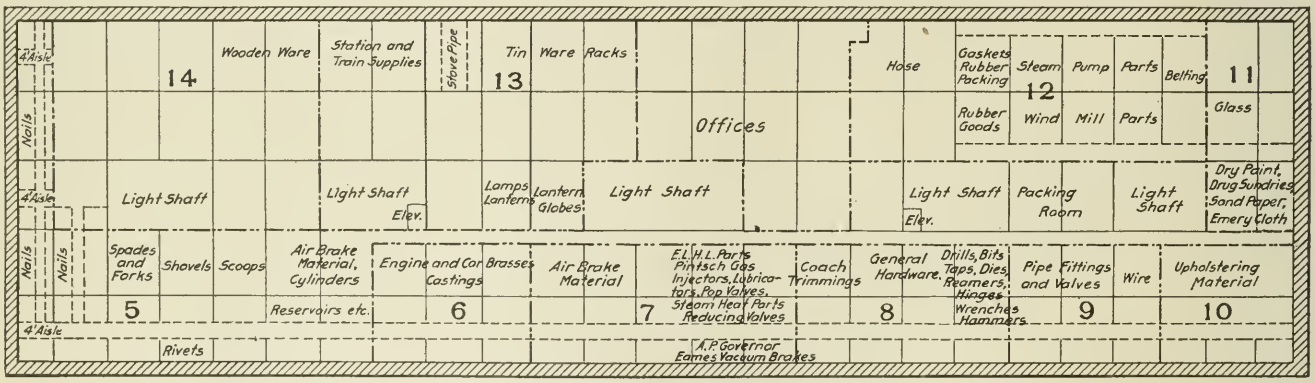
which is noted in the stock book. The stock books are then turned over to the assistant general storekeeper, who, in company with the requisition clerk, goes over each individual item, entering after such item in the stock book the requisition number that covers it, making such changes and corrections as his knowledge of conditions will warrant. The requisition is then made on the purchasing agent for what needs to be purchased, and transfer requisitions for such material as may be transferred from other points.

The entire organization is based on every person in it having a certain specific responsibility. For this reason the organization is in charge of the assistant general storekeeper, who is really the general storekeeper on the ground, but instead of his jurisdiction extending over the entire system his duties are confined to the operation of the general store. This leaves the general storekeeper free to operate over the system, giving each store its full share of attention and consideration.

Reporting directly to the assistant general storekeeper are chief clerk in charge of correspondence and such, general stock clerk in charge of general stock books and requisitions, accountant in charge of accounts, general foreman in charge of all outside work, section foremen in charge of each individual section, or separate store; agent in charge of receiving and billing of company material; supply car storekeeper in charge of delivery

substituted from the storehouses or along the line. Requisition is then made on the purchasing agent.

Each sub or division store is furnished with a general classification, also an indexed classification, showing in which section each class or each item of material is located. The requisitions are given a registered number, and the section to which they are sent noted after same. They go directly to the section to which they belong, where they are filled, package properly addressed, giving reference to the requisition number and section, and the bill attached to the box or package. They pass through the section storekeeper to the invoice or manifest clerk, who invoices or manifests them, after which they are filed in numerical order. The manifesting and invoicing of the day's business is all



Second Floor Plan; General Storehouse.

Reporting directly to the assistant general storekeeper are chief clerk in charge of correspondence and such, general stock clerk in charge of general stock books and requisitions, accountant in charge of accounts, general foreman in charge of all outside work, section foremen in charge of each individual section, or separate store; agent in charge of receiving and billing of company material; supply car storekeeper in charge of delivery done at night. This enables the consignee always to get his invoice or manifest before he receives the material. The section number is placed on the package or box so that the material, when it arrives at its destination, can be taken directly to the section to which it belongs, thus, it is not necessary to open it until it is ready to put away.

Each section storekeeper is required to inspect all material received by him, and is responsible for obtaining what is most suitable for the purpose. He keeps in touch with the user of the material, and calls the storekeeper's attention to any items which are not standard and interchangeable or suitable for the purpose.

He is also required to call attention to any material received which is too good for the purpose for which it is to be used. He also arranges for the inspection of material bought subject to the company's specifications at point of receipt.

The receiving foreman has charge of all material received, also checking, unloading, and delivery to outside aisles of each section. The force is divided into crews under a checker or gang boss. The bills are obtained each morning from the agent, and the bills for each car distributed among the checkers. The checker has a clip file with tally sheets attached to the waybills. The material is all checked, either in the car or on the platform directly outside the car door, and the tallies checked against the waybills. The material is all marked for the section to which it belongs and delivered to the outside aisles of the respective sections. The waybills, together with the original tally sheets, are turned over to the agent, who makes the freight bills and attaches same so that the freight bill, waybills and tally sheets are all together. These tallies are then copied into the "freight received" books.

The shipping foreman has charge of all shipments. His force is divided into crews under checkers or gang bosses, who take the material from the inside aisles of each section, together with the bills, and deliver it into the proper care. The shipping foreman has a schedule of shipping points grouped for the purpose of loading cars so far as possible directly to where the material is to be furnished. Each day he posts a loading list of the cars which are to be loaded and the territory which they cover. The shipping crew takes the material from the aisles of each section and puts it into cars in station order. The shipping bills are then attached to the requisition and this is filed with the agent who does the billing.

SHOP DELIVERIES.

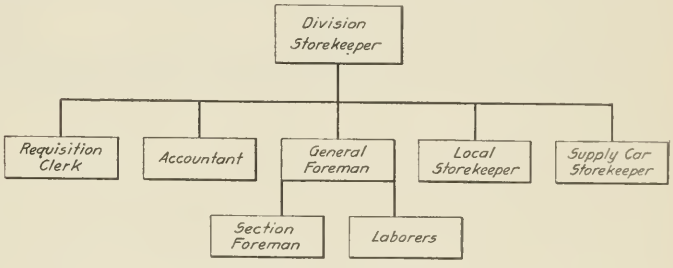
There should be a local telephone exchange for the shops and stores. The pits, machines and forges in the shops should all be numbered and with telephone booths established at different places in the shops. Each section in the storehouse should have a telephone, the number of which corresponds in number to the number of the section. In each of the booths in the shops should be posted the sectional arrangement of the storehouse, showing in which section the various materials are located. Material is all ordered by telephone directly from the section storekeeper, instructing what is wanted, where to be delivered and to what to be charged. All material is delivered by storehouse men and boys. Boys are employed for handling light material and men for the heavy. As soon as an order is received it is put up and a shop order made out, giving description, name of the foreman who ordered the material, number of pit and forge or machine to which it is to be delivered. The foreman's receipt is obtained on the shop order, which is returned and checked off on a blotter kept for this purpose by the section storekeeper. No shop men should be allowed in the storehouse.

The shop orders are numbered, priced and extended each day, and the charges abstracted to the proper accounts. This enables all concerned to know exactly what charges have been made to certain work, and enables the storekeeper to know how much business he is doing every day in order to keep track of the cost of operation. All material made in the shops for stock is made on store orders; that is, the storekeeper makes an order on the various shops for what he requires, exactly the same as he would on an outside firm. All material drawn in connection with the work charged is charged to this order, as well as the labor. When the work is completed it is delivered to the shop delivery crew, which gives a receipt for the material, taking up the duplicate store order and stub, which gives the detail of material and labor, and from which charges are made.

Shipments from the general store should be made in carloads, wherever possible, the division stores distributing to the work by supply cars, a method that will be described in another chapter.

It is the intention that requisitions should be filled as promptly as from any first-class department store. All requisitions for material which should be carried in stock should be filled within twenty-four hours from the time they are received. When the requisitions are received in the morning, they are delivered to the general stock clerk, who registers them and gives them a number as a means of identification. They are then checked against the surplus lists at outside division stores, and any items which can be filled from outside points are so indicated on the margin by the name of the store in pencil after the item, the purpose being to first make available material outside that is not needed, always aiming to keep the surplus concentrated at the general store. The requisitions are then arranged according to sections, and delivered by a messenger to the various section storekeepers, who indicate by a cross after each item whether it is on hand or provided for. They are then returned by the same messenger to the general stock clerk, who first draws off transfer requisitions for such material as can be furnished from outside points, purchase requisitions are made on the purchasing agent for such as must be bought, and the requisitions are then returned to the respective sections for filling, knowing that the material is provided for. Packing and shipment begin at once.

In this way action is obtained first on the material not on hand. For example, while one man is making a requisition on the purchasing agent for material which has to be bought, at the same time another man is making transfer requisitions on other stores for material which is located at other points on the road, and at the same time various section storekeepers in the storehouse are packing and putting up ready for shipment the material on hand, all to be finally assembled by the shipping foreman and forwarded in one car.



Division Store Organization.

Cars are loaded on schedule, that is, they are grouped as to territories so that all material is handled in car lots, practically no material being moved through local freight houses by way freights. Emergency shipments are moved in baggage cars by passenger trains. In this way extra car haulage is saved, but, above all, loss and delay incident to the movement of company material through local freight houses by local trains is avoided.

There is a floor foreman on each floor who has approximately the same duties as a floor walker in a department store. The lumber yards, scrap docks, oil houses and platforms are all operated in the same manner, each in charge of a section storekeeper or foreman, and each having its specified stock and duties to perform.

Details regarding the stock records, accounting and interior arrangement of stock will be given later.

DIVISION STORES.

The plan of physical organization shown by this chart is practically the same as the general store, modified and consolidated to conform to the business. In making these consolidations it should be noted that they do not in any way destroy the general plan of the organization. For example, the accountant and chief clerk are consolidated, one man being sufficient to do the office work in a division organization. The requisition clerk is consolidated with the storekeeper's stenographer, and is located in the office with the storekeeper, practically works with him as his assistant, handling and registering all the requisitions, preparing the requisitions on the general store from the stock books,

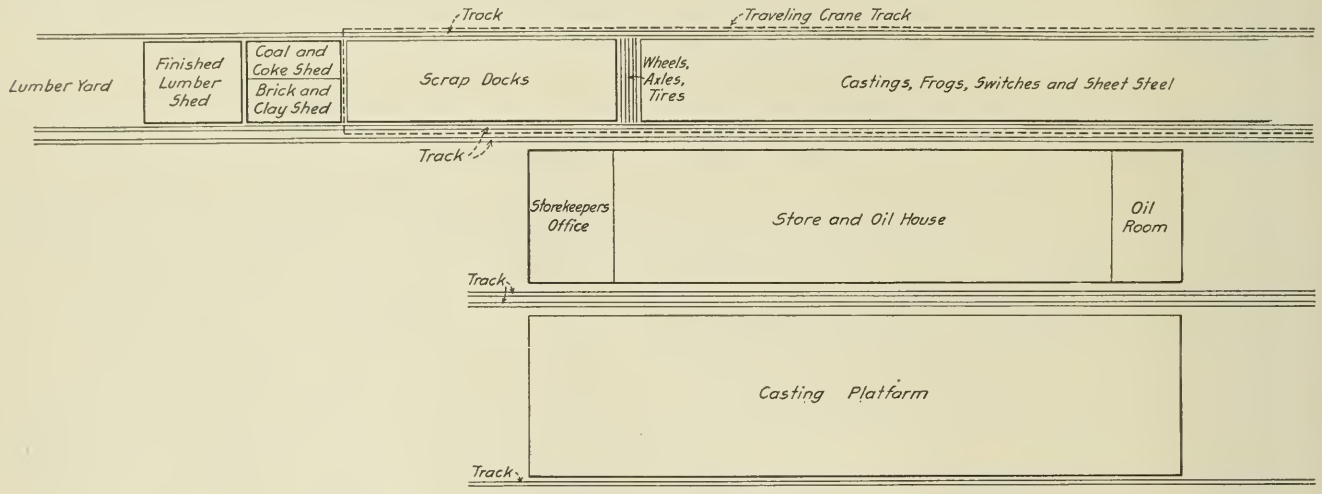
taking charge of and handling all the "hurries" and correspondence in connection with the material and the storekeeper's routine work. This for the reason that the division storekeeper must be personally familiar all the time with his stock and the conditions on the division. The general foreman is consolidated and called a store foreman, is located in the store, and has direct charge of the store. The sections are consolidated into as many as may be necessary in order to conform to the forces.

For an ordinary division store, two section storekeepers inside will be found sufficient. They usually divide the first floor, one man taking one side of the open aisle, which is used as a shipping room, and one the other, their stations being located on the edge of the aisle and close to the delivery counters. In this way they will be in close communication with the shop men who call for material, and be able to advise with them and the counter boys regarding what is needed. They, more than any other men, on account of their close relation with those who are actually applying it, are in a position to make available the material to meet the actual wants that exist.

The inside organization of a well regulated division store would consist of a store foreman, two section foremen (one on each side) and counter men. The section foremen, in addition to taking care of the local shop requirements, receiving stock, etc., would be putting up and getting ready for shipment all material and supplies going outside. On the outside, stationed on the platform, would be an outside foreman, who would have charge of all material on the platform, as well as the outside labor gang. Thus each man would have specific duties laid out to the maximum of his ability and training, and would be expected to be on his particular job all the time. In this way the most efficient and economical work can be obtained.

A typical layout for a division store suitable to meet the ordinary requirements of a division is shown herewith. The division store should be located at the division headquarters. The division storekeeper is the active representative of the supply department on the ground. He is required to know personally what work is going on, what are the immediate requirements, and, above all things, he is required to deliver what is wanted when it is wanted. He should report directly to the general storekeeper.

The division storekeeper makes actual deliveries to the work by means of the supply cars. These cars are in charge of a supply car storekeeper and helper, and serves as the connecting link between the division store and the work. These cars are run on schedule and monthly deliveries are made of all material used for general maintenance and operation, such as agents', pumpers', signal supervisors' and section foremen's supplies. Details regarding the handling of these cars are explained in another chapter.



Layout for Division Store.

The materials and supplies required for maintenance of equipment at outside roundhouses and car-repair points are delivered in like manner at different dates during the month. These cars not only deliver the stock necessary each thirty days to these points, but pick up and bring in all scrap, surplus and obsolete material. The division storekeeper usually will spend from five to seven days on the division in this manner and thus comes personally in touch with the work that is going on, and the actual application of the material.

It must be borne in mind that the supply department's business does not end with the mere filling of a requisition, it is required to follow this material until it is actually put into use, and, further, take charge of, and assemble it after its usefulness has been fulfilled, and arrange for further use or sale as scrap. These are the direct purposes of the supply department.

The division storekeeper is in line for advance as assistant general storekeeper, or general storekeeper. He is the most active representative of the supply department on the ground. He must maintain a thoroughly equipped and economical organization. His stock is regulated almost entirely by the deliveries he receives from the general store, the same as the stock for the general store, and the system, for that matter, is regulated by the deliveries received from the buyers.

Stock books are maintained in the division stores the same as in the general store, in fact, they are copies of them. All stock books and stock lists are written up in loose leaf at the same writing. Thus, if there are seven divisions on a system, the seven stock books are written up at the same time. Therefore not only the same items appear at all points with the same descriptions, but they are located in the same place in the books.

SUB OR LOCAL STORES.

At all points where sufficient material is maintained on hand to occupy the time of one man in handling and accounting, principally at roundhouses and car-repair yards, a storekeeper is employed who reports directly to the division storekeeper. And it is here where the foundation is laid for the personel of the supply departments. These men are selected in the first instance because they want work. They should have a good, common school education. By their daily association with men and things, they learn, not only the actual use of every piece of material, but they come to know by personal observation its exact use, and learn without effort what it is, where it goes, and what best serves the purpose. Further, and of still greater importance, they get the atmosphere and learn the ability of the men around them, who, in turn, advance up the ladder. They know what brings about certain things, and how the business of investigating and operating is conducted. This they learn without cramming, but through every-day work, and for that reason it is never dispelled. If with this the men couple honesty, industry and ambition, there

is absolutely no question but that they will advance. It is from these men that the organization is recruited. These men serve the company's interests best for the reason that they have absolutely nothing else to do but see that the material that is actually needed to do the work is furnished, and that nothing else is maintained. They are being constantly checked up, watched and criticized for having a piece of material or a dollar invested that is not necessary. This watchfulness of the company's material becomes the unit of their efficiency.

There is little doubt but what a man will develop to bigger things if given the opportunity. This is natural. The real trouble in developing men is that not sufficient emphasis is placed on the ground work. There is too much of a tendency to glide over details.

Generals are more easily obtained than privates when there are places to use them. It is a weakness of human nature that men desire to become generals before they have served as privates, but humble details always have been and always will be the basis of success. These men in the capacity of sub or local storekeepers are serving the company's real interests every day, saving them real money, and at the same time equipping themselves for a good living, and, in many instances, a career. It is the early installing of economy, industry and a thorough knowledge of why things are that makes the real capable man later.

CAB SIGNALS AND AUTOMATIC STOPS IN GERMANY.*

Opinions everywhere still differ widely as to the conditions which should be satisfied by a system to prevent overrunning of signals. The first serious attempt in Germany was in February, 1901, when the state railway office called together representatives from nearly all the German states. This meeting at the outset decided to consider only cab signals, not touching the question of automatic application of the air brakes. Experiments were thereupon made in Saxony with the "crocodiles" of the Northern Railway of France and with an audible device operated by carbonic acid. In Baden a "distance brake" was tried. Neither of these produced satisfactory results. In Prussia a special committee was appointed to "examine the many inventions of this kind which were submitted," but nothing useful was found.

The German Railroad Union also considered the question. In December, 1901, the Austrian Railway Ministry called the attention of the union to the fact that the demand for a cab signal continuously recurred. A technical committee of eleven members of the union took up the subject and made extensive inquiries by letter, and answered the Austrian Ministry by saying that audible signals were advisable, but they must be absolutely reliable. But no such devices were known. Automatic stops were considered inadvisable. This committee of eleven reported back in June, 1904, and its answer to Austria was adopted, but with a severe list of requisites. One of these was that "the device may only stop acting if the locomotive is standing still." Switches, if any, must be so constructed that the locomotive cannot be started unless they are in the correct position. The signal must not be given unintentionally by obstructions on the track which do not affect the running of the trains. These dicta were finally adopted by the Union September 3, 1904.

In 1905 a number of devices were submitted, designed to satisfy the conditions which had been laid down. None of them satisfied the conditions, however. But by 1906 there were a few devices sufficiently developed to make it advisable to try them. The Prussian State Railway then devoted considerable funds to systematic trials. Particulars of these trials, just as they were being begun, were published in the *Zeitung des Vereins Deutscher Eisenbahnverwaltungen*, 1907, No. 48.

Double-light distant signals were tried and this pattern is to be substituted for that formerly used. This alteration will be completed in a few years; the limit is the end of 1919. Experiments were made with combined detonating and visible signals on four different railways or divisions. With these three cartridges are placed at a time by a lever operated from the signal cabin. Working these in connection with signal levers, however, made trouble in the winter and they had to be disconnected a part of the time. This arrangement seems not to have found much favor.

In other experiments on four different roads or divisions, sirens and horns were set up at the side of the track to be electrically operated. With these, the head of the train, when it gets within about 1,200 ft. of the distant signal, causes the horn to sound, if the signal is standing at caution, and the sound continues until the head of the train has gone 160 ft. beyond the distant signal. These experiments are not yet concluded. With some express trains the sound of the horn was not loud enough to attract the attention of the engineman. In another case it had to be removed, because the people living nearby were inconvenienced by the noise. On three other roads experiments were made with an electric apparatus, using a brush for contact. This appears to have been an arrangement for showing a visual disk in the cab on approaching a distant signal. Six engines were equipped and contact bars were affixed in connection with all distant signals on a busy section between Wunstorf and Minden. Results not yet wholly satisfactory. The contact brushes were repeatedly damaged by ballast and by other things. Sometimes at high speed the appliance failed to act. On still other roads or divisions experiments were made with the Van Braam apparatus. In this device "slippers" on the locomotive slide on raised treadles, the lifting of this slipper causing a depression of a rod on the engine. Ten express locomotives in the Halle district were fitted with this apparatus; also some in the Hanover district. This apparatus was designed as an automatic stop, but the connection with the brakes was cut out so as to not do anything contrary to the advice of the Union. With this apparatus a recording instrument was in one case tried. There are two of the "slippers," and both of them must be raised before action in the cab will take place. In several cases the slippers were broken because (it would appear) they were hung too near the load limit line. During heavy snow storms the treadles could not be moved into position and the indications of the signals became uncertain and dangerous. It is proposed to have the ground apparatus fixed instead of having it movable and controlled by the distant signal. This would make it simply a marker. The Stettin directorate has made experiments with a wireless apparatus presented by C. Lorenz of Berlin; electromagnetic waves which were continually produced at a sending station were transmitted by induction to the telegraph lines along the track, and from them to a receiver placed on the locomotive. At those places where an approach to a signal was to be indicated, the waves going to the receiver on the locomotive were intercepted by a screen. This brought a wave-detector back to the zero position and a colored disk was shown. The experiments have shown that it is possible, within certain limits, to transmit signals to the locomotives; the strength of the waves, however, became materially reduced as the distance between the sending station and the locomotive increased. Then also the effect which the screen at the distant signal was intended to produce was also produced in another way, for instance by telegraph lines crossing the railway, by iron bridges, by iron signal posts, and even when the locomotive ran through a deep cutting. It is as yet hardly likely that this apparatus will give useful results.

Good results were obtained with a recording alarm. This seems to be a contact fixed at a signal to ring a bell in the cab if the signal is overrun; to stop the bell the engineman must record the overrunning. This apparatus has been tried by five different directorates, and all with good results, and additional orders have been given for the apparatus.

In conclusion, the writer thinks that the Prussian State Railway is warranted by these generally indifferent results in delaying action. Absolute reliability has not yet been attained and certainly not in the case of the Van Braam apparatus. The experiments will be continued and extended, and useful results may be expected.

*Abstract of a paper, by Mr. Hoogen, printed in the *Zeitung des Vereins Deutscher Eisenbahnverwaltungen*, and reprinted, in English, in the Bulletin of the International Railway Congress for November, 1910, page 3616.

General News Section.

The Chicago, Terre Haute & Southeastern, late the Southern Indiana, has dismissed all of its passenger conductors except two; no reason given.

President H. R. Williams, of the Chicago, Milwaukee & Puget Sound, is quoted as having announced that all the locomotives on the Tacoma Eastern, a subsidiary of this road, are to be made oil burners.

The country is now producing pig iron at a yearly rate of about 19,700,000 tons, as against a rate of 31,000,000 tons in February of last year. The total pig iron production in 1910 was in excess of 27,250,000 tons, or more than 1,450,000 tons beyond the best previous record—namely, 25,795,000 tons in 1909.—*Iron Age.*

The directors' room at the headquarters of the Long Island Railroad in the Pennsylvania station, New York City, is now adorned by portraits of all of the presidents of that company, which began its existence in 1834 and which has never undergone a change of name. Mr. Haff, secretary of the company, had a long and difficult task finding the portraits of the earlier presidents.

A. H. Plant, comptroller of the Southern Railway, says that the report that the Southern has determined to discontinue the employment of ticket collectors on passenger trains is without foundation. No change of policy in this matter has been even considered. On the other hand, the results of the employment of special men for this duty has been such as fully to warrant the continuance of the system.

In the favors granted by the king of England on New Year's day, three Americans—that is, Canadians—received notice, and now we have Sir William Mackenzie, president of the Canadian Northern; Sir Donald Mann, first vice-president of the same company, and Sir Thomas Tait, who is just returning to Canada after serving as chief commissioner of the government railways of New South Wales for several years past. All of these gentlemen were born in Canada.

The National Highway Protective Traffic Association has compiled statistics showing that the number of persons killed by vehicles in the streets of New York City during 1910 was 378. These are classified as follows: by horse-drawn vehicles, 158; by street cars, 114; by automobiles, 104. More than half of the 378 persons killed were children under 14 years of age, and in nearly half of these fatalities to children, the records say that the accident was due to the fault of the victim.

The Brooklyn Rapid Transit Company, operating the surface and elevated railways in Brooklyn, N. Y., has submitted to the New York State Public Service Commission, First district, a proposition to operate the Fourth avenue subway, which is being built by the city in Brooklyn, and to build and operate connecting lines, elevated or underground, so that, in connection with subways to be built by the city, the B. R. T. can run trains from Coney Island across the East river and Manhattan island to the shore of the Hudson river.

The Lehigh Valley has made an increase of about 10 per cent. in the wages of its locomotive enginemen, of whom there are about 900. The passenger runners on the heaviest engines are to receive 4.1 cents a mile and on other engines 4 cents; the freight runners will receive on the heaviest engines 4.75 cents a mile; on the next class 4.65 cents, and on other engines 4.50 cents.

The Lehigh Valley has increased the pay of conductors, to take effect from January 1. This increase affects about 1,400 conductors, and it is said that those running through freight trains will be advanced 10 per cent. and those on passenger trains and local freight trains 5 per cent. It is understood that the new rates are on a parity with those granted by the other eastern roads recently.

The Pennsylvania Railroad publishes statistics of the number of trespassers killed and injured on its line, which seem to show that the efforts of the officers of the company to prevent unlawful use of the railway premises by pedestrians and ride-stealers have produced very definite and gratifying results. The number of trespassers killed on the line throughout the system, east and west of Pittsburgh, in 1907 was 916; in the next year 743; the next 633, and in the year just closed 585. This makes a diminution in four years of 36 per cent., a record which we doubt the possibility of finding on the lines of any other large company. An officer of the company says that in the coming year the campaign is to be prosecuted with redoubled energy; new notices are to be put up and every officer and employee will be exhorted to do his best; and requests for the enactment of stringent laws will be presented to the legislatures.

Disastrous Collision in England.

In a collision near Hawes Junction on the Midland Railway, 260 miles north of London, on the morning of December 24, two cars of a passenger train were wrecked and, with five others, were completely destroyed by fire. Nine or more passengers were killed, most of the bodies being burned so as to be unrecognizable. The train was the northbound Scotch express. It was drawn by two engines and ran into two engines (without train) which were moving in the same direction as itself. It appears that these two engines had been standing on the main line and had been forgotten by the signal man who, within a short time before the accident, had had to deal with seven engines waiting to be turned. The two engines of the express were only partly overturned and, from a photograph of the wreck taken after the fire was extinguished, it would appear that the first two passenger cars were crushed against the tender of the second engine as against an immovable wall. If the circumstances are correctly reported the obvious comment of American signal engineers on this collision will be that the crying need at Hawes Junction is an installation of track-circuit route-locking.

Working in Hoosac Tunnel.

In the preparation of the Hoosac tunnel of the Boston & Maine for electric traction, the men drilling into the rock of the roof of the tunnel for the overhead supports, work inside of tents set up on the roofs of the cars of their train; and they are supplied with fresh air by compressors taking their supply from a point near the floor of the tunnel; all this to enable the men to work while engines are passing through the tunnel emitting great volumes of smoke. There are two tracks throughout the length of this tunnel (4¾ miles) and the work train occupies one track, while the trains continue to use the other. The work was begun at the West or North Adams end and it has now proceeded somewhat more than a mile into the tunnel on the westbound track. The workmen protect themselves with large hats and wear goggles; and before going into the tunnel they rub their faces with grease paint. The conductor in charge of the train maintains constant communication by telephone with the train despatcher's office at North Adams.

"Cement Age."

The Cement Age Company has bought *Concrete Engineering* and will consolidate the two papers. Headquarters will remain in New York. R. W. Lesley will continue to be the editor, with Allen Brett, associate editor. A. E. Warner, formerly business manager of *Concrete Engineering*, will become western manager.

New Subways for Boston.

A further extension of the rapid transit system of Boston, Mass., is recommended at a cost of $6,100,000 in reports submitted to the legislature recently by the joint board of the Boston Transit Commission and the Board of Railroad Commissioners. Three separate reports were made. A tunnel from Park street to South Station is recommended and a bill offered providing for its construction by the city and its lease to the Boston Elevated. The continuation of this tunnel from South Station to Andrew square, which lies on the line between South Boston and Dorchester, is also recommended to be constructed under provisions identical to those embodied in the bill for the South Station tunnel. The board does not approve building the West End

loop, which was advocated by residents and business men in Scollay square and Bowdoin square. As outlined in the reports the two tunnel extensions advocated would establish a through line between Harvard square in Cambridge and Andrew square in South Boston—Dorchester by way of Beacon Hill, Park street station and the South Station and other way stations, and the joint board suggests that the trains should make the full run.

J. A. Farrell to Succeed W. E. Corey.

James A. Farrell, the president of the United States Steel Products Company, was unanimously chosen by the finance committee of the United States Steel Corporation to succeed W. E. Corey as president. Judge Gary said in part that Mr. Farrell had been president of the subsidiary company since its foundation in 1903, and had shown great business capacity. He said further that Mr. Farrell had been connected with the steel industry for more than 25 years and was well qualified for the position. The recommendation of the finance committee is practically an election, as the election itself is merely a formality.

Bonuses on the Boston Elevated.

The Boston Elevated Railway has just made its usual distribution of Christmas gifts to its employees. The annual report of the company for the last fiscal year, which is dated December 31, gives the following information on this subject: "The company has continued its liberal policy toward its employees in respect to their wages, as well as in other matters. Compensation for learners during twelve months ending September 30 amounted to $37,813. There was paid during 12 months ending September 30 the sum of $6,869 as a guaranteed minimum wage for new or extra men. There was also paid as increased compensation to long-service men the sum of $71,895. There was paid in pensions the sum of $11,260. There was also paid in 'satisfactory service' money, in sums of $20 or $25 to each of the employees deemed worthy thereof, the sum of $74,130. The aggregate sum of increased payments to employees under the provisions adopted seven years ago, amounted during the year to $201,969."

A Despatcher Who Does Not Like the Telephone.*

When the phones were first put in the operators answered the bells promptly, as they did the telegraphic calls when they first learned to work on a telegraphic circuit, but now it takes as long to get the operators as it did by telegraph; largely because the station men have to do work outside. When an operator's bell rings he has no way of knowing whether it is for orders or for some unimportant message. With the telegraphic call it could be distinguished readily by the distinctive signal.

The telegraph has another advantage: When an operator starts to repeat an order by telephone and has it wrong the despatcher has no way to break him, but he keeps right on repeating it until he has finished, and then the despatcher has to send the order again, which could be avoided with the telegraph.

When a despatcher puts in a call by the selector and before the desired office answers another office gets busy, and when the man called finds the line in use he hangs up his receiver and goes about his work; on the telegraph circuit he could do this and still listen to the sounder.

After a despatcher has called an office, and before finishing with the operator he is necessarily interrupted by another office, he cannot simply tell the first office to wait a minute, as by telegraph, but he loses him altogether and has to go through the calling operation again, as the operator cannot be expected to sit there when he has other work to do.

I believe the telephone has given cause for the ever-increasing questions on a despatcher's circuit. The writer sent an order running a local passenger train one hour late and sent it five times to nine offices, which, when repeated, would total fourteen times it was transmitted on the telephone circuit. While the last operator was getting "complete" to the order, another office broke in and asked how the train was. Station operators seem to grow so they know nothing about what is being done on the line. When a train or engineman asks how another train is, or some ordinary question, the operator "does not know" and the despatcher is broken in on for the information. An assistant trainmaster says that he never receives any answer to a question asked of an operator other than "I don't know; I'll ask the despatcher."

All telephone circuits are installed with a set of rules which protect the despatcher from interference by others on the line. But the trouble creeps in and finally the superintendent or trainmaster finds that he can talk directly to some roundhouse foreman or roadmaster and thinks the business of sufficient importance to interrupt the despatcher's circuit, and this grows contagious. Next day the roundhouse foreman or roadmaster remembers how plainly he heard a man 200 miles away, and uses the same method to reach someone else. They will and do get in on the despatcher's circuit.

It is true that orders can be repeated faster on a telephone, and it is not so much work to call on the telephone, but messages cannot be sent so fast as by telegraph. If a message is transmitted fast enough to convey the sense in sentences, the operator cannot copy it, and the circuit remains idle between sentences, which allows others to get in and interrupt the service.

The efficiency of the telephone has decreased at least 20 per cent., due to the fact that the operators have grown back into the rut they were in with the telegraph. The telephone is superior to the telegraph where an operator goes to sleep on duty, but they are learning to cut out the bell when they wish to rest undisturbed.

The writer is well acquainted with two systems of telephones, and has worked both systems, but would welcome the telegraph again and would feel less tired than with the telephone.

With the telegraph a despatcher could get up, step to the window or the water cooler and still listen to his work. Now, with the telephone, you are practically tied as with a halter to the desk for eight to nine hours.

*From a letter in the *Train Dispatchers' Bulletin.*

Electrical Research at Mass. Tech.

The progress of the graduate electrical engineering work at the Massachusetts Institute of Technology is indicated by the number of students who are candidates for Master's and Doctor's degrees, which number is now greater than last year. Under the direction of Professors Pender and Wickenden, research is being carried on in relation to the effects of heat treatment on the magnetic qualities of silicon iron, certain transient phenomena that may occur in long electric circuits, the effect of high frequencies on the permeability of iron, the effective resistance and reactance of steel rails when conveying alternating currents, the selective action of spark gap lightning arresters with respect to frequency, the reflection of light from walls or ceilings, the disruptive strength of rubber insulated coatings on wires, and other things. The subject of illumination and photometry is now taught in the electrical engineering department under the direction of Professor Wickenden, who is the author of a well-known book on "Illumination and Photometry." A preliminary edition of a book on "The Principles of Electrical Engineering" has recently been issued by Professor Pender of this department.

Wood Preservers' Association.

The seventh annual meeting of the Wood Preservers' Association will be held at the Auditorium Hotel, Chicago, January 17-19. The following papers will be read and discussed: What Depths of Penetration Are to Be Expected with the Different Amounts of Preservative Usually Specified? David Allerton, The Kettle River Company, and R. L. Allardyce, International Creosoting & Construction Company, Galveston, Texas; Benefits Derived from Attending the Annual Meetings of the Wood Preservers' Association, William Townsley, Jr., Grasselli Chemical Company, New York; Difficulties Encountered by Plants in the North that Plants Located in the South Do Not Have to Contend With, Andrew Gibson, Northern Pacific Railway; What Per Cent. of Creosote Oil Can Be Withdrawn from Wood by Subsequent Vacuum, C. D. Chanute, O. Chanute & Co., Chicago; Should Sawn and Hewn Ties of the Same Kind of Timber of the Same Degree of Seasoning Be Treated in the Same Cylinder Load? H. J. Whitmore; Is the Covering of Retorts Economical and Practical? R. W. Yarbrough, National Lumber & Creosoting Company, Texarkana, Ark.; Some Results Obtained in This Country in Prolonging the Life of Railway Cross Ties by Preservative Treatment, as Shown by the Records

that Have Been Kept; and a Better Method of Keeping these Records, F. J. Angier, Kettle River Company; General Review of Timber Treating in this Country with Special Reference to Causes that Have Been and Are Retarding Its More Universal Adoption, J. T. Logan, National Lumber & Creosoting Company; Wood Block Paving, Dr. Hermann von Schrenk, Rock Island Lines. In addition to these there will be addresses by E. A. Sterling, forester of the Pennsylvania Railroad; J. H. Waterman, Chicago, Burlington & Quincy, and W. F. Goltra, of the W. F. Goltra Tie Company, Cleveland, Ohio.

No Lobbyists at the Missouri Capital.

As a result of an agreement reached by Governor Hadley of Missouri and C. R. Gray, vice-president of the St. Louis & San Francisco, representing the Missouri lines, the railways of that state will not this year be represented at Jefferson City, the state capital, by lobbyists. They will simply send to the capital a scout in the person of Frank G. Faulkner, assistant superintendent of the Frisco at Rollo, Mo. Mr. Faulkner is a practical railway operating man, and Mr. Gray, in a newspaper interview, defines his duties as follows:

"He will not be a legislative agent in the usual meaning of the term. In fact, he has instructions from the committee not to interfere with any bill for or against the railways. What he will do is to procure copies of all bills introduced that affect the railways and send them to the committee. He will keep the committee informed of the progress of these bills from time to time, and will arrange for the appearance of railway representatives at such hearings as they come up. Our new plan does away with the old-time lobbyist and his system. If a bill deals with passenger traffic we will send a man or men from that department to appear before the House or Senate committee. If it deals with freight traffic an expert in that line will appear for us. If the operating department is most interested it will be a man or men from that department who will submit the argument."

The passing of the railway lobby at Jefferson City is an event of importance in the history of Missouri, for probably never in this country was there a lobby which for a series of years more completely dominated the politics of a state. It practically ran both the democratic and the republican parties, and the methods that it used were thoroughly discreditable.

Railway Signal Association.

In accordance with the revised constitution of this association, the adoption of which was noticed in our issue of January 6, page 54, the board of direction (formerly "executive committee") has been increased in number to 15. This action was taken at a meeting of the old executive committee at Buffalo last week, and the new board is made up as follows: C. E. Denney (president); C. C. Anthony and B. H. Mann (vice-presidents); C. C. Rosenberg (secretary); H. S. Balliet, L. R. Clausen and A. H. Rudd (three past presidents); F. P. Patenall and A. G. Shaver; and the following new members, the first two of whom are to hold office until the next annual meeting and the other four for twelve months longer:

F. C. Stuart, Sunset Route.
J. V. Young, Boston & Maine.
C. A. Christofferson, Northern Pacific.
W. J. Eck, Southern.
E. W. Newcomb, Oregon Short Line.
T. S. Stevens, Atchison, Topeka and Santa Fe.

The board of direction has instructed the several committees as to the work to be done this year, as follows:

Committee I.—Signaling Practice and Standards. (a) Continue investigation and report on a uniform system of signaling. (b) Continue work on standard designs. Progress reports should be submitted at the March and June meetings. (c) Chairman of Committee No. I will advise chairmen of Committee II, III and IV, from time to time of work to be performed by his committee which will affect the work of these committees. A. H. Rudd, chairman of committee.

Committee II.—Mechanical Interlocking. (a) Investigate and recommend a device or arrangement that with slotted or power operated home signals will equally secure the safety of operation of mechanical interlocking apparatus that is at present afforded by the bolt lock in mechanical plants with pipe connected units. (b) Reconsider specifications for concrete foundations for signal apparatus, considering reports submitted by various committees at the last annual meeting and the specifications of the American Railway Engineering & Maintenance of Way Association, and submit reports for discussion at the March and June meetings if possible, and for adoption at the annual meeting. (c) Prepare specifications for interlocking for draw-bridges. Specify particularly the requisites for locking rails and interconnecting rail locks, bridge locks, wedges and the interconnection of these with derails and signals protecting the draw-bridge. (d) Submit floor and lead-out plans for mechanical interlocking cabins. C. J. Kelloway, chairman of committee.

Committee III.—Power Interlocking. (a) Continue investigation and submit the following typical plans for electric interlocking: Circuits for one-arm signal and single switch. Circuits for selecting signals. Switch detector circuits. Route locking circuits. Approach locking circuits. (b) Invetsigate and recommend a device or arrangement which will equally secure the safety of operation of electric interlocking apparatus that is at present afforded by the bolt lock in mechanical plants with pipe connected units. (c) Reconsider and complete specifications for electro-pneumatic interlocking on the lines of the specifications for electric interlocking. (d) Submit plans similar to those mentioned in (a), for electro-pneumatic interlocking. B. H. Mann, chairman of committee.

Committee IV.—Automatic Block. (a) Reconsider specifications for direct current relays, referred back to committee at the last annual meeting, and submit new specifications based as far as possible on the association's present specifications. (b) Continue work on detail specifications for material, taking them up in the order shown in the report submitted at the last annual meeting. (c) Supply typical automatic signal circuits for single and double track railways. A. G. Shaver, chairman of committee.

Committee V.—Manual Block. (a) Submit description of, and circuits for various controlled manual block signal installations now in service in the United States and Canada. (b) Supply similar information and circuits for staff installations. J. B. Latimer, chairman of committee.

Committee VI.—Automatic Stops and Cab Signals. Continue investigation and report the results of tests of any installations which are made during the year. R. C. Johnson, chairman of committee.

Committee VII.—Subjects and Definitions. Prepare definitions for technical terms connected with signaling, particularly any terms which discussions show are not properly defined. C. C. Anthony, chairman.

Committee VIII.—Arrangements. Make all necessary arrangements for the annual meeting. T. S. Stevens, chairman.

Committee IX.—Wires and Cables. (a) Continue investigation, especially in regard to tests for rubber insulation. (b) prepare specifications for wires or cables for any special uses, which are not covered by the adopted specifications. (c) Continue investigation as committee thinks desirable in regard to inspection of wire by wire inspection bureaus, making recommendations accordingly. W. H. Elliott, chairman.

Committee X.—Electric Signaling for Electric Railways. (a) Continue investigation and make further report on the various systems in satisfactory operation. (b) Prepare specifications for A. C. operated automatic signal installations on electric railways. H. S. Balliet, chairman.

Committee XI.—Manual. Review the journals and make report on subjects which have been approved by the association and should be included in the Manual. F. P. Patenall, chairman, Baltimore & Ohio, Baltimore, Md.

Committee XII.—Contracts. (a) Submit recommended form for contracts for joint interlocking plants. If possible, submit brief outline of proposed contract for discussion at the March meeting. (b) Recommend basis for division of expense of construction, operation and maintenance of joint interlocking plants. L. R. Clausen, chairman, C. M. & St. P.

Special Committee.—Promotion of Signaling Education. Continue investigation and compilation of data on all subjects pertaining to signaling. W. J. Eck, chairman.

Special Committee.—Method of Recording Signal Failures. Reconsider forms submitted at the last annual meeting, paying particular attention to the points discussed, and secure information, if possible, from roads using the reports submitted, making a complete report at the annual meeting. J. C. Young, chairman.

Special Committee.—Storage Battery. (a) Continue standardization of parts and accessories of storage cells. (b) Prepare specifications for portable cells. (c) Investigate and report on designs for housing of storage batteries for interlocking and automatic signal work. A. H. Yocum, chairman.

The Chicago Signal Club.

At the meeting of the Chicago Signal Club held, January 9, at Chicago, C. G. Stecher, of the signal department of the Chicago & North Western was elected permanent chairman to succeed W. H. Arkenburgh, who has resigned on account of ill health. D. R. Morris, of the signal department of the Illinois Central was elected vice-chairman, and the duties of the treasurer were combined with those of the secretary. The subject of Fouling Protection was again discussed at length, and much interest was aroused in the debate. The next regular meeting of the club will be held on Monday, January 23, at the offices of the *Signal Engineer,* Chicago. The subject for discussion is the Polarity of Track Circuits on Multiple-Track Lines. All signalmen in Chicago and vicinity are cordially invited to be present.

Railway Supply Manufacturers' Association.

Circular No. 1 of the Railway Supply Manufacturers' Association gives such details as are at present available concerning the plans for the exhibits at the Master Mechanics' and the Master Car Builders' conventions at Atlantic City next June. The exhibits will be, as usual, on Young's Million Dollar Pier, and 76,278 sq. ft. of exhibit space has been provided, an increase of something over 5,000 sq. ft. The price of the space is 40 cents per sq. ft., as before. Space will be assigned on February 16, 1911, at the office of the secretary, J. D. Conway, Oliver building, Pittsburgh, Pa.

Cleveland Passenger Club.

At the annual meeting of the Cleveland Passenger Club, held at the Hotel Euclid on January 6, the following officers were elected for the ensuing year: President, A. J. Kennedy (Santa Fe); vice-president, F. L. Muehlhauser (Eastland Navigation Company); treasurer, William McGreevy (Rock Island); secretary, F. A. Hunt (New York Central Lines); members of the executive committee, C. A. Browne, chairman, J. K. Dillon, W. T. Buss, E. M. Presley, Howard Jolly and E. B. Parsons.

Canadian Society of Civil Engineers.

At a meeting of the mechanical section of the Canadian Society of Civil Engineers, held on January 5, at Montreal, Que., a paper was read on Recent Advances in Machine Tool Construction, by Thomas Reid, of the John Bertram & Sons Company, Dundas, Ont.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents' Association.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and Sept.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Sept. 17-19, 1911; St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich,

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except July and August; annual, Jan. 18-19, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

Association of Railway Electrical Engineers.—G. B. Colegrove, I. C. R.R., Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal; annual, Jan. 24-27, Winnipeg, Man.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, Oct. 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y. Next annual meeting, Jan. 12, Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday; annual, Jan. 16, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday; annual, Jan. 17, 1911; Chicago.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Duluth, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 19, Chicago.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in montn, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago, annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911; Toledo.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York; Jan. 17.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago; annual, Jan. 17-19, 1911; Chicago.

Traffic News.

Shipments of anthracite coal during the last calendar year amounted to 64,905,786 gross tons. This is an increase of 4½ per cent. over the preceding year, but is less than the total for 1907. The Reading carried the largest share of this coal, nearly 12,500,000 tons. The Lehigh Valley was second and the Lackawanna third.

On the Rock Island road conductors now collect cash fares in Chicago suburban territory at the rate of 3 cents a mile. The Illinois 2-cent fare law permits railways to make charges on a 3-cent basis when passengers pay cash instead of buying tickets. Other roads handling a large suburban business in Chicago are already enforcing this rule.

The Merchants' Association of New York has secured from the railways reduced rates for buyers coming to New York city in January, February and March, the same as in former years, but the reduction is not quite so large. Passengers will pay full fare on their journey to New York and will have to pay three-fifths fare returning. The tickets are sold on the certificate plan, as heretofore.

The western, transcontinental and southwestern lines have declined to accept a proposition from the government that they shall equalize the rates for the handling of government troops, employees and freight via the land-grant and non-land-grant railways. On the land-grant railways the government is entitled to reductions from the regular rates, and it desires the non-land-grant railways to meet these reduced rates. The lines referred to probably will make an alternative proposition to the government.

Thomas M. Osborne, until recently a member of the New York Public Service commission, Second district, has made a complaint to the up-state commission against the charge by the New York Central & Hudson River for the taking care of parcels at parcel rooms. Mr. Osborne called attention to the fact that of the lines in New York state 10 cents is charged for every article deposited, but that on the Boston & Albany and on the Pennsylvania Railroad the charge is but five cents, and in England the charge for such service is two pence, or approximately four cents. The commission is asked to make an order requiring all stations in a community above a certain size to fix a reasonable minimum.

The Burlington's Argument for Raising Rates.

The following extracts from the brief which Chester M. Dawes, general counsel of the Chicago, Burlington & Quincy, has filed in the rate advance cases state in a concise way the grounds on which this company bases its contention that it is entitled to higher rates:

"The rate advances amount to and will increase the gross revenues of the Chicago, Burlington & Quincy about $237,200.52 per annum. This is based on the tonnage of the commodities carried in the fiscal year 1910 as estimated from the representative months of September, 1909, and March, 1910. The wage increases already granted to several classes of this company's employees will increase its operating expenses $350,000 for the next fiscal year.

"There are especially pressing demands for expenditures on its existing railways which have been deferred for lack of money but required to enable the company to safely, economically and properly meet the reasonable needs of the public for transportation facilities, of about $8,000,000. There will further be required for several years to come not less than $15,000,000 or $20,000,000 each year in order to keep its property abreast of the times, and to maintain an efficient and serviceable railway. These amounts, if raised, must and should chiefly come out of income.

"The net operating income of the company for the fiscal year of 1910 was $22,481,636.39. By net operating income is meant operating revenue less operating expenses, taxes and balance of rents, income from securities owned and other income and interest. For the past three years the company's net operating income, not deducting amounts expended for betterments, and amounts carried to sinking funds, has averaged $21,070,717 per annum.

"It will be seen that, applied to the minimum estimated value of $530,000,000, the average net income above returns only 3.98 per cent. on the value of the property and 5.26 per cent. on the value for taxation, which is far less than that reasonable and fair return which the owners of the property are entitled under the law and which the public interest in efficient and improved transportation facilities requires they should receive.

"This company rests its right to make the advance in rates now in controversy upon the fundamental propositions which may be briefly stated as follows:

"The company is entitled, as a matter of legal right, to a fair return upon the actual value of its property used for transportation purposes, which value, from whatsoever source in the past created, is measured in its case by at least the cost of presently reproducing its physical plant.

"To obtain such fair return, it necessarily and equally is entitled to charge in the aggregate rates of transportation which, subject to the one limitation that the particular component rates are themselves reasonable and just to the shipper, will produce reasonable return upon the property employed.

"The railway having such right to a fair return, and now being unquestionably within that limit, finds itself confronted with the need of additional revenues to meet wage advances and other proper operating and maintenance charges and to offset diminishing earnings.

"It is not required under the facts and the law to show increased operating expenses and demands as a justification for advancing rates, but they are explanatory and offered as showing the particular occasion of the advances at this time.

"The advances on the commodities selected are small in amount, reasonable in view of the value of the service to the shipper and just and nondiscriminatory with reference to other rates and classes of traffic, and, indeed, transportation costs will thereby be more equitably distributed than at present."

New York Central's Case in the Rate Hearing.

Clyde Brown, representing the New York Central lines, was the first speaker Tuesday before the Interstate Commerce Commission in the hearing on the proposed increased freight rates in official classification territory. He directed his argument particularly to the question as to whether the proposed advances were justified in their application to the principal companies composing the New York Central lines.

The result of operations on the New York Central lines in 1910 compared with 1909, Mr. Brown said, show that for 1910 the surplus would be approximately $1,000,000 as compared to $4,700,000 for 1909, no improvements being made from surplus in either case, a decrease of $3,700,000. If the business of 1909 had been transacted under the wage scale in force April 1, as well as the conditions of service, the increase in the operating expenses for that year would have been $3,590,000.

For the ten months up to October 31, 1910, the surplus earned by the N. Y. C. & H. R. was $1,743,022, but Counsel Brown pointed out that this included the extra dividend of 6 per cent. declared by the Lake Shore & Michigan Southern received by the N. Y. C. & H. R. in March amounting to $2,717,000. If this unusual income had not been received the surplus would have been turned into a deficit of $974,000.

Counsel called special attention to the large expenditures which were being made by the N. Y. C. & H. R., particularly at the new terminals. In this connection and in answer to a question by Commission Prouty, Clyde Brown said the freight terminal on the west side of Manhattan Island was in the streets and had been more or less of a controversy between the city and the company.

"We believe we have a perpetual easement on the streets there," said Mr. Brown, "but there is some controversy as to our exact legal rights, and when plans can be made satisfactory to the company and city for changes, that improvement must be undertaken, and it will be an improvement when undertaken which will be commensurate in magnitude with the Grand Central and electric zone improvement, because it will involve an elevation or depression of tracks, and various conditions are likely to be imposed by the city which it will be necessary to comply with because of the power which the city has to deal with these things."

Commissioner Prouty suggested that when the electric zone

was completed the road would be able to handle a great deal more business. Counsel replied that the question was whether there would be business there in any sort of ratio to the increased terminal charges. The Grand Central terminal was not built with an eye only for increased business in the next five or ten years, but practically for perpetuity.

Counsel pointed out that the amount of capital required to complete the improvements now in progress is $42,000,000. Commissioner Prouty asked whether it had been determined to meet this by the issue of stock and bonds and counsel replied that no determination had been reached so far as he knew. Asked whether the road would not after such an issue still earn 6 per cent. net, counsel replied in the negative, saying that there would be a deficit of about $1,500,000.

Mr. Brown pointed out that as the New York Central leased 2,600 miles of its road and owned 800 miles, its capital expenditures on the leased lines between 1900 and 1909 had been $59,448,348, but no separate account of revenue was kept.

Commissioner Prouty wanted to know why the new terminal was built, in view of the fact that the Grand Central station which was torn down was comparatively modern. Counsel replied that the immediate cause was the terrible accident in the Park avenue tunnel, which was attributed by the public to congestion of traffic and smoke in that tunnel. Legislation was passed prohibiting the use of steam, thus requiring the electrification of the road below a certain point. The fact that the Pennsylvania road was to construct a new terminal in New York had had nothing to do with it.

Referring to the fact that the N. Y. C. & H. R. lines are capitalized at about twice the amount per mile, as compared with the Pennsylvania Railroad Company, Commissioner Lane expressed great curiosity as to the reason therefor. Counsel Brown said one reason was that the Central leased so many lines. Mr. Lane said this was not a sufficient answer. Attorney Gowen interjected the suggestion, which seemed to be satisfactory, that if the western lines of the Pennsylvania were taken into consideration as were the western lines of the Central, the discrepancy of capitalization per mile would be very materially reduced.

Mr. Brown concluded his argument by presenting statistics relative to the financial condition of the several companies composing the Central system. This system, he said, was responsible for a total volume of investment securities now outstanding amounting to $692,777,527. On this amount the investment return was 4.79 per cent. On this great capitalization from gross earnings of $100,000,000, and from large investment profits, the surplus available for improvements in 1910 will be about $1,000,000. There is $42,000,000 additional capital needed to meet works already entered upon, and if the company is to meet the demands of the community it serves, it should raise further $100,000,000. The proposed increased rates would enable the earnings of a surplus of $4,500,000, and counsel held that this was a moderate enough sum for the improvement of its property, and the maintenance of its credit.

Clifford Thorne was the first of the counsel for the shippers to be heard. He announced that he would speak briefly, reserving his main argument for the conclusion of the western rate case. He declared his belief that these questions now before the commission were as important to the country as a whole as any since the Dred Scott case. Whether the revenue yield to the carrier is a fair return upon the capital invested was, in his opinion, the real test which should guide the commission in reaching its decision. In order to find that, it was necessary to find the present valuation of the properties, and he believed that the commission would have to take that matter into consideration.

He decried the idea that the credit of the railways was in any way threatened, and he promised to show later that it was better than the credit of industrial or manufacturing companies. He then took up particularly the rates on live stock, protesting against the proposed increases on behalf of the Iowa shippers. From that state is shipped 40 per cent. of the live stock packed at Chicago, and 40 per cent. of that is shipped East as dressed meat. He protested because the rates from Chicago to New York were advanced from 8 per cent. to 18 per cent., and because live stock was advanced more than dressed meat. The effect of this was to stifle the development of competition in the East against Chicago packers, and to tighten the hold of the latter upon the packing industry.

Attorney Fisher at the afternoon session announced his purpose to show that the only way in which the roads had attempted to meet the burden of proof was on the presumption that the rate structure in effect on January 1, 1910, was just and reasonable. The shippers did not admit this. He proceeded at considerable length to argue that the roads had not met the requirement of the law that they should justify proposed advances.

Mr. Fisher complained that there was nothing before the commission, no statement in dollars and cents, which could be used as a basis upon which to estimate whether the cost to the carrier of the service to the shipper had been increased as has been claimed. He thought that the presumption of the commission should be that, if such figures really existed, they would have been brought forward by the railways because they had the facts at hand and the shippers had not.

Declaring that it was within the power of the commission to obtain at least a prima facie justification for the reasonableness of the increased rates, Attorney Fisher argued that one essential, if not the controlling requirement, should be a physical valuation of the railways.

Commissioner Prouty said that Congress had been asked to have such a valuation made for the very reason that the commission had hesitated to accept a valuation offered by the roads themselves.

"It would probably be the work of years to value these properties. Could we hold up a decision in this case to that extent?" asked Mr. Prouty.

"Yes, I think so," cheerfully replied Attorney Fisher, "unless, of course, the commission thought that there was a crisis in railway affairs. There is no evidence of such a crisis. When the railways come asking for increase of rates in order to secure a proper return on their capitalization they should have something definite to show. The most that they assert is that their surplus will be reduced if they don't get the increases and that is easily to be doubted."

Attorney Fisher protested especially against the advances in the lake and rail rates for which, he said, no justification had been offered in evidence. The only excuse advanced was that it was necessary that the arbitrary differential should be maintained. In other words, the water rates must be increased or otherwise goods would be transported by water. The whole argument, he said, was based on the theory that the lake and rail arrangement was a monopoly in the hands of the railways.

Francis B. James of Cincinnati who followed, also made strong protest against the lake and rail advances, saying that their effect would be to upset all relations of rates in official classification territory.

Attorney James, referring to the proposition of President McCrea of the Pennsylvania road that for every dollar paid out in dividends there should be a dollar put into surplus, declared that there was not a railroad in the country which had done this for any period of time. It had been done spasmodically, but it was untrue as a transportation dogma or principle.

INTERSTATE COMMERCE COMMISSION.

Washington reports say that the commission will have to again postpone the proposed advances in freight rates, both in eastern and western territory, because of lack of time to reach a decision on questions before the commission. It is expected that the roads will make a postponement voluntarily, thus making it unnecessary to issue an order.

Commissioner Clark conducted a hearing at Chicago last week in the case brought by the Crescent Coal & Mining Company against the Baltimore & Ohio for reparation, because the latter charged it demurrage at the rate of $1 per car per day on the cars which the Baltimore & Ohio had brought to Chicago for delivery to the Chicago, Milwaukee & St. Paul, but which the St. Paul, under its regulating embargo, refused to take. Shippers of coal claim that between $300,000 and $400,000 have been collected from them in the last two or three years for delays to cars which have not been the fault of either the shipper or the consignee. Counsel for the Chicago Coal Dealers' Association charged that demurrage is assessed without any investigation on the part of the railways as to whether or not the consignees are prepared to receive delivery of the cars, and that in addition to

the demurrage collected the delays are costly to shippers and consignees. Witnesses for the St. Paul explained that its regulating embargo was adopted for the purpose of preventing the bunching of coal shipments in times of heavy traffic and bad weather, and was really a benefit to the shippers. Commissioner Clark raised the question of why shippers had got an injunction from a state court to restrain the St. Paul from enforcing its embargo when interstate tariffs were involved. It was explained that the injunction had been modified by stipulation of attorneys and it was still further modified by the decision which may be rendered by the Interstate Commerce Commission.

Reparation Awarded.

Hydraulic-Press Brick Co. v. St. Louis & San Francisco et al. Opinion by Commissioner Clark:

Rate on enameled brick found unreasonable. (19 I. C. C. 554.)

J. H. Day Co. v. Baltimore & Ohio Southwestern et al. Opinion by Commissioner Lane:

Complainant's shipments of iron drying racks from Brighton, Ohio, to St. Louis, Mo., were given an improper classification. (19 I. C. C. 577.)

Cleary Brothers v. Chicago & North Western et al. Opinion by Commisisoner Lane:

Rates on beer and other beverages from Milwaukee, Wis., to Gladstone, Mich., and Escanaba, found unreasonable. (19 I. C. C. 588.)

William K. Noble v. St. Louis Southwestern et al. Opinion by Commissioner Prouty:

Unreasonable rate and weight charged for the transportation of one carload of coiled elm hoops from Bell City, Mo., to Jacksonville, Fla. (20 I. C. C. 62.)

McCaull-Dinsmore Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

Rate of 75 cents for transportation of mixed carload of cracked corn and whole corn from Elk Point, S. D., to Anaconda, Mont., found unreasonable and rate of 55 cents established for future. (20 I. C. C. 15.)

Albert Steinfeld & Co. v. Illinois Central et al. Opinion by Commissioner Cockrell:

Joint rate of $1.22 on laundry soap from St. Louis, Mo., to Nogales, Ariz., in force on the date shipment moved, found in view of the circumstances of this case, to be unreasonable at that time. (20 I. C. C. 12.)

DuMee, Son & Co. v. Alabama, Tennessee & Northern. Opinion by Commissioner Lane:

Defendants' rates on compressed cotton linters in carloads, released to a valuation of 2 cents per pound, from Aliceville, Ala., to Philadelphia, Pa., found unreasonable, and reparation awarded. (19 I. C. C. 575.)

Texico Transfer Co. v. Louisville & Nashville et al. Opinion by the commission:

The originating carrier filed a tariff naming a through joint rate. Connecting lines named therein had not concurred, and a higher combination rate was therefore applicable. The combination rate found to be unreasonable and reparation awarded against originating carrier. (20 I. C. C. 17.)

Oregon Lumber Co. v. Oregon Railroad & Navigation Co. et al. Opinion by Commissioner Lane:

A carload of lumber shipped from Baker City, Oregon, to Mammoth, Utah, was loaded to the maximum in bulk permitted by the restrictions of the carrier; the weight of the load was less than the rated minimum of the car, and charges were assessed on the basis of such minimum. The charges should have been on the actual weight. (19 I. C. C. 582.)

Bowles & McCandless v. Louisville & Nashville. Opinion by Chairman Knapp:

Through an error in printing the tariff of the railway, the rate on double-deck sheep cars was shown as $134, where it should have been $44. The rate on single-deck sheep cars was shown correctly at $44. The complainants, therefore, ordered twice as many single-deck sheep cars as they would have needed double-deck cars and were therefore charged $88 for a shipment that should have cost them $44. (19 I. C. C., 563.)

Reparation Denied.

William K. Noble v. Detroit & Toledo Shore Line et al. Opinion by Commissioner Prouty:

Complainant asks reparation on one carload of coiled elm hoops from Newport, Mich., to New York City, based on incorrect weight. Defendants' weighmaster's certificate shows a weight of 66,000 lbs., but complainant contends that the weight did not exceed 56,000 lbs., based on estimated weight of 475 lbs. per 1,000 hoops. The secondary evidence introduced by complainant was not sufficient to establish that this shipment was not properly and accurately scaled. (20 I. C. C. 60.)

William K. Noble v. Grand Trunk Western et al. Opinion by Commissioner Prouty:

Complainant asks reparation on shipment of coiled elm hoops from Mount Clemens, Mich., via Norfolk, Va., to Ripplemead, Va., on a combination rate of 26 cents per 100 lbs. Subsequently a specific rate from Mount Clemens to Norfolk was published. Reparation is demanded on the basis of the through Ripplemead rate of 21½ cents. As the later tariffs could not be used until the commission's tariff rules had been complied with, there is no basis for an order of reparation. Such order should be made upon affirmative evidence that the rate complained of is unreasonable or unjustly discriminatory, which does not appear in this case. (20 I. C. C. 70).

O'Brien Commercial Co. v. Chicago & North Western et al. Opinion by Commissioner Prouty:

Complainant asks reparation on a shipment of furniture and framed wall looking-glasses, shipped in one car, from Rockford, Ill., to San Francisco, Cal. Charges were collected on the furniture on the minimum weight and on the looking-glasses at the actual weight, whereas complainant alleges that the charges should have been made on the actual weight of the entire shipment. As the looking-glasses were not to be used in connection with the furniture, the provisions in the tariffs were properly applied, and that the complaint should be dismissed.

No opinion is expressed as to whether the assignee of a claim for reparation can maintain proceedings in his own name before the commission. (20 I. C. C. 68.)

Rates on Cotton Seed and Cottonseed Products Reasonable.

East St. Louis Cotton Oil Co., v. St. Louis & San Francisco et al. Opinion by Commissioner Clements.

1. Complaint questions reasonableness of rates on cottonseed in carloads from points mainly in Oklahoma, Arkansas, Mississippi, Tennessee, and Missouri to East Et. Louis, Ill., and also alleges unjust discrimination in the relationship of such rates as compared with rates on cottonseed products from the same points of origin at which cottonseed oil mills are located to East St. Louis and to points beyond, principally in Illinois, Indiana, Ohio, Michigan and Wisconsin. The rates applicable to each kind of traffic necessarily must be made with reference to the facts, circumstances, and conditions governing the production, transportation, and marketing of the respective products, and from the record in this case the commission is unable to find that the charges on cottonseed products afford a strict measure for the reasonableness of the rate on cottonseed. In the light of the facts and conditions affecting the particular traffic, the commission does not find the rates here involved to be unreasonable.

2. The general rule is that manufactured products bear higher rates of transportation than does raw material, and it is founded in reason, because ordinarily there is a substantial difference between the value of the one and that of the other, and frequently there is a greater degree of risk incident to the transportation and care of the manufactured product than of the raw material. 3. This general rule is not universal, and is departed from in some instances because the reasons for the distinction are lacking, and in other cases because of countervailing commercial and market conditions and considerations.

4. Respecting contention of complainant concerning its disadvantage because of distance, and that of interveners as to allowing mills in the cotton territory to crush the seed. It is held that it is not the duty of this commission to equalize the profit-and-loss results of competing operations in different localities by overcoming natural and commercial conditions with rate adjustments. (20 I. C. C. 37.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Baltimore & Ohio	4,439*	$5,793,039	$1,214,681	$7,470,106	$819,981	$1,506,209	$162,598	$2,995,919	$162,018	$5,646,725	$1,823,381	—$21,497	$221,276	$1,580,608	—$671,331
Boston & Maine	2,243	2,339,648	1,165,017	3,785,327	448,560	473,494	29,536	1,711,215	88,024	2,750,829	1,034,498	6,306	186,513	854,291	—173,370
Central of Georgia	1,915	780,978	304,479	1,190,542	155,410	174,566	32,285	359,405	37,364	759,030	431,512	6,846	47,114	391,244	26,149
Central R.R. of New Jersey	631†	1,668,978	361,917	2,127,796	224,626	308,255	30,116	579,633	39,019	1,181,649	946,147	—18,397	95,915	831,835	—155,523
Chesapeake & Ohio	1,940	2,131,910	403,230	2,639,073	305,427	502,135	44,550	784,715	56,548	1,693,375	945,698	—548	76,750	868,401	—142,368
Chicago & Eastern Illinois	966	906,763	163,176	1,129,359	116,266	219,383	22,234	414,649	35,702	808,234	321,125	—1,553	32,000	287,572	—41,267
Chicago, Indianapolis & Louisville	616	321,596	121,894	487,569	75,265	74,260	15,119	183,830	16,869	365,343	122,226	.....	22,500	99,726	—77,954
Cincinnati, New Orleans & Texas Pacific	337	636,976	132,083	808,306	109,628	160,881	20,337	234,183	17,709	542,738	265,567	—1,894	21,500	242,173	—49,100
Cleveland, Cincinnati, Chic. & St. Louis	1,982	1,806,353	589,878	2,634,239	319,902	458,592	78,547	1,156,876	60,146	2,074,063	560,176	—9,926	82,000	468,250	—278,345
Colorado & Southern	1,181‡	732,944	107,317	882,988	78,045	169,038	10,970	275,144	21,367	554,564	328,424	—1,919	24,700	301,805	—29,607
Denver & Rio Grande	2,553	1,709,019	412,587	2,210,051	246,963	375,563	44,797	744,452	46,280	1,458,055	751,996	—6,327	70,000	675,669	65,273
Galveston, Harrisburg & San Antonio	1,338	754,011	238,724	1,044,636	124,660	141,936	26,329	353,272	29,456	675,653	368,983	—2,268	29,200	337,515	—40,609
Great Northern	7,274§	4,117,536	1,122,074	5,623,009	459,944	669,012	87,374	1,640,691	94,220	2,951,241	2,671,768	8,613	264,299	2,416,082	—435,108
Gulf, Colorado & Santa Fe	1,518	946,850	272,525	1,293,865	198,473	169,714	23,859	426,536	34,817	853,399	440,466	.....	32,325	408,141	18,974
Illinois Central	4,550	3,750,837	1,028,582	5,383,868	589,903	1,042,166	111,859	1,855,775	115,924	3,715,627	1,668,241	—7,295	211,952	1,448,994	51,634
Kansas City Southern	827	694,464	138,900	921,557	87,957	111,199	29,336	304,953	30,607	564,052	357,505	.....	29,476	328,029	28,814
Lake Erie & Western	886	366,184	59,167	451,392	90,576	87,667	13,891	177,676	12,193	382,002	69,390	.....	19,091	50,299	—75,397
Lake Shore & Michigan Southern	1,663	2,683,366	816,706	4,016,487	697,498	590,590	104,475	1,512,468	82,558	2,987,589	1,028,898	—8,824	147,956	872,118	—629,766
Michigan Central	1,746	1,652,946	568,919	2,507,921	369,939	327,228	61,290	1,063,987	48,055	1,870,499	637,422	—5,647	94,000	537,775	—283,077
Mobile & Ohio	1,114	744,182	121,500	1,003,175	121,639	157,638	30,448	322,218	34,932	666,875	336,300	—1,449	25,460	309,391	—44,208
Nashville, Chattanooga & St. Louis	1,230	760,302	222,873	1,050,184	161,443	198,078	33,130	361,595	26,957	781,203	268,981	—510	22,287	246,184	—16,556
New York Central & Hudson River	3,588	5,280,516	2,256,971	8,453,952	1,108,235	1,401,075	188,069	3,269,662	187,252	6,154,293	2,299,659	38,496	440,996	1,897,159	—515,950
New York, New Haven & Hartford	2,041	2,672,063	2,130,163	5,285,897	570,327	598,967	29,940	2,069,211	146,122	3,414,567	1,871,330	125,542	250,000	1,746,871	8,820
New York, Ontario & Western	546	647,991	89,579	760,571	89,761	124,788	11,323	315,077	17,885	558,834	201,737	—9,792	17,500	174,445	—12,725
Oregon R.R. & Nav. Co.	1,489¶	1,042,323	348,150	1,490,473	161,437	127,038	30,413	493,240	35,087	847,215	643,258	—537	59,227	583,494	111,501
Oregon Short Line	1,595‖	1,439,000	399,631	1,951,641	211,542	184,224	27,123	470,768	42,306	935,963	1,015,678	—3,336	62,044	950,298	—139,929
Philadelphia & Reading	1,022	3,291,450	574,600	4,024,924	296,634	775,426	42,797	1,239,149	64,190	2,418,196	1,606,728	38,113	84,085	1,560,756	31,882
St. Louis Southwestern	769	620,764	122,764	776,839	90,335	107,031	28,025	173,589	22,255	421,235	355,604	—685	18,933	335,986	47,562
St. Louis Southwestern of Texas	703	316,961	92,506	432,862	102,522	76,036	10,171	171,798	16,947	377,474	55,388	—283	8,333	46,772	29,410
San Pedro, Los Angeles & Salt Lake	1,105	461,682	199,027	708,717	96,272	102,413	30,135	256,439	17,390	502,649	206,068	—5,876	29,735	170,457	47,879
Seaboard Air Line	3,028a	1,345,702	358,847	1,893,460	239,469	255,470	62,487	617,007	51,722	1,226,155	667,305	216	65,000	602,521	39,989
Southern Pacific Company	6,193b	5,140,558	2,559,625	8,197,622	1,085,550	977,693	137,742	2,059,085	227,698	4,487,768	3,709,854	50,979	275,054	3,485,779	—412,341
Southern Ry.	7,038	3,699,304	1,248,706	5,351,622	684,845	788,085	133,476	1,715,835	146,732	3,468,973	1,882,649	1,272	185,053	1,698,867	79,564
Texas & Pacific	1,884	1,300,244	341,652	1,718,888	145,040	258,816	19,491	594,880	35,412	1,053,639	665,249	—2,528	85,477	577,244	17,862
Union Pacific	3,473c	3,692,546	920,874	4,985,427	359,208	482,696	128,666	1,258,591	111,697	2,340,859	2,644,568	—13,849	160,300	2,470,419	—171,547
Yazoo & Mississippi Valley	1,372	865,736	256,739	1,190,029	166,814	115,775	14,358	301,319	25,557	623,823	566,206	—567	32,942	532,697	153,815

FIVE MONTHS OF FISCAL YEAR 1911.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Baltimore & Ohio	4,439*	$30,569,219	$7,291,071	$40,154,550	$5,160,318	$7,252,545	$891,217	$14,233,503	$779,472	$28,317,055	$11,837,495	—$2,729	$1,074,222	$10,760,544	—$1,266,068
Boston & Maine	2,243	11,006,718	7,538,029	20,001,219	2,792,093	2,368,810	230,789	8,442,451	440,022	14,274,165	5,727,054	30,142	882,983	4,874,213	—842,877
Central of Georgia	1,915	3,497,613	1,532,070	5,486,494	784,829	896,361	165,321	1,663,627	190,377	3,700,515	1,785,979	34,270	227,064	1,593,185	—35,219
Central R.R. of New Jersey	631†	7,497,122	2,185,662	10,186,256	1,148,429	1,583,773	161,789	2,906,788	193,516	5,994,295	4,191,961	140,621	480,486	3,852,096	—349,456
Chesapeake & Ohio	1,940	10,594,726	2,458,621	13,584,134	1,682,011	2,482,343	224,445	3,847,892	297,400	8,534,091	5,050,043	—12,549	383,750	4,653,744	—430,543
Chicago & Eastern Illinois	966	4,144,204	940,605	5,407,659	565,209	974,358	123,632	1,867,111	161,515	3,691,825	1,715,834	—8,427	157,900	1,549,507	—87,724
Chicago, Indianapolis & Louisville	616	1,811,502	716,098	2,747,771	364,846	363,323	83,508	921,474	72,880	1,806,031	941,740	.....	112,500	829,240	—88,656
Cincinnati, New Orleans & Texas Pacific	337	3,097,393	711,058	4,001,133	437,697	694,074	100,862	1,069,654	88,566	2,390,853	1,610,280	—3,961	107,500	1,498,819	240,021
Cleveland, Cincinnati, Chic. & St. Louis	1,982	8,634,536	3,710,896	13,492,699	1,911,446	2,287,175	451,426	5,494,785	282,771	10,427,603	3,065,096	—38,676	410,000	2,616,420	—1,308,421
Colorado & Southern	1,181‡	3,317,569	808,710	4,334,065	549,001	836,095	60,141	1,353,214	109,949	2,908,400	1,425,665	—5,414	123,500	1,296,751	—87,833
Denver & Rio Grande	2,553	7,922,757	2,615,579	11,002,248	1,422,229	1,758,610	252,143	3,546,147	239,072	7,218,201	3,784,047	1,497	350,000	3,435,545	14,681
Galveston, Harrisburg & San Antonio	1,338	3,381,412	1,124,104	4,738,941	628,034	710,807	128,234	1,659,821	140,573	3,267,469	1,471,472	—18,909	146,000	1,306,563	—8,608
Great Northern	7,274§	21,801,724	6,439,203	30,165,350	4,337,578	3,289,845	438,564	7,887,799	481,606	16,435,392	13,729,958	140,612	1,444,593	12,425,977	—1,548,092
Gulf, Colorado & Santa Fe	1,518	3,715,938	1,422,408	5,471,444	922,301	760,669	120,531	1,947,190	158,569	3,909,260	1,562,184	.....	161,625	1,400,559	51,361
Illinois Central	4,550	17,256,304	5,705,494	26,007,624	3,673,889	5,418,412	554,850	8,459,092	519,015	18,625,258	7,382,366	—34,392	1,023,591	6,324,383	1,492,494
Kansas City Southern	827	3,262,173	722,445	4,408,503	452,724	552,779	129,878	1,429,679	139,936	2,704,996	1,703,507	.....	147,382	1,556,125	353,236
Lake Erie & Western	886	1,879,323	441,515	2,454,154	409,114	447,314	87,194	894,685	59,957	1,898,264	555,890	.....	94,671	461,219	—182,065
Lake Shore & Michigan Southern	1,663	13,916,516	5,298,149	21,602,746	3,690,583	3,272,053	533,511	7,208,461	387,977	15,092,585	6,510,161	—23,302	739,783	5,747,076	—2,221,544
Michigan Central	1,746	8,173,500	3,675,417	13,129,921	2,076,569	1,850,249	395,097	5,114,880	242,882	9,679,677	3,450,244	—19,205	528,450	2,902,589	—1,176,635
Mobile & Ohio	1,114	3,318,471	609,766	4,552,277	546,018	768,077	166,781	1,554,415	162,410	3,197,701	1,354,576	—9,237	123,700	1,221,638	—8,904
Nashville, Chattanooga & St. Louis	1,230	3,374,542	1,254,114	4,923,466	737,247	926,870	174,888	1,749,795	124,683	3,713,482	1,209,984	—2,812	111,435	1,095,737	—81,208
New York Central & Hudson River	3,588	24,911,817	14,600,019	44,054,574	6,297,290	6,966,377	1,070,845	15,713,853	1,111,298	31,159,663	12,894,911	—6,043	1,997,213	10,891,655	—1,451,174
New York, New Haven & Hartford	2,041	13,006,425	11,974,699	27,332,310	3,220,645	2,958,371	146,484	10,028,619	712,966	17,067,084	10,265,226	620,344	1,592,000	9,293,570	—188,997
New York, Ontario & Western	546	3,104,787	974,550	4,243,232	519,549	605,396	60,354	1,492,212	84,266	2,761,777	1,481,455	—22,527	87,500	1,371,428	200,853
Oregon R.R. & Nav. Co.	1,489¶	4,693,672	1,967,084	7,094,655	973,800	648,524	154,434	2,339,195	166,541	4,282,494	2,812,161	3,444	296,135	2,519,470	—642,746
Oregon Short Line	1,595‖	6,726,740	2,375,476	9,627,272	1,318,559	915,973	154,697	2,218,244	216,834	4,824,307	4,802,965	—2,194	309,860	4,490,911	—766,653
Philadelphia & Reading	1,022	14,550,067	3,131,173	18,509,618	1,785,657	3,414,389	224,569	5,762,165	334,881	11,521,661	6,987,957	95,336	420,833	6,662,460	—137,652
St. Louis Southwestern	769	7,581,991	602,681	3,326,439	354,787	525,073	133,622	827,271	107,093	1,947,846	1,378,593	—4,926	94,666	1,279,001	—50,792
St. Louis Southwestern of Texas	703	1,368,145	482,173	1,962,282	446,028	355,712	52,336	797,808	79,668	1,731,551	230,731	—1,182	41,667	187,882	21,261
San Pedro, Los Angeles & Salt Lake	1,105	1,986,212	1,156,623	3,350,373	663,006	485,227	150,385	1,171,493	80,942	2,551,053	799,320	—22,651	130,451	646,218	—318,044
Seaboard Air Line	3,028a	5,665,655	1,858,559	8,388,307	1,205,873	1,141,943	296,265	2,819,851	242,422	5,706,354	2,681,953	—7,552	325,000	2,349,401	36,529
Southern Pacific Company	6,193b	24,691,539	14,146,848	41,516,777	4,921,415	5,084,174	799,020	10,506,083	1,125,173	22,435,865	19,080,912	227,183	1,375,269	17,932,826	—1,565,772
Southern Ry.	7,038	16,643,453	7,111,369	25,666,134	3,189,615	4,182,471	645,818	8,304,753	700,827	17,023,484	8,642,650	7,548	884,993	7,765,205	180,838
Texas & Pacific	1,884	4,866,037	1,812,947	7,181,960	854,598	1,346,153	105,726	2,692,708	175,035	5,174,220	2,007,740	—13,237	250,204	1,744,299	212,560
Union Pacific	3,473c	17,874,324	5,212,498	24,906,611	2,537,112	2,550,955	539,350	5,940,475	544,835	12,112,727	12,793,884	—6,289	745,900	12,041,695	—739,643
Yazoo & Mississippi Valley	1,372	2,975,437	1,089,257	4,335,617	956,742	706,307	74,552	1,339,323	114,908	3,191,832	1,143,785	—3,029	164,942	975,814	362,636

Mileage operated on November 30, 1909.—* 4,460 miles; † 668 miles; ‡ 1,249 miles; § 7,037 miles; ¶ 1,327 miles; ‖ 1,509 miles; *a* 2,987 miles; *b* 6,061 miles; *c* 3,384 miles. — Indicates Deficits, Losses and Decreases.

Not Liable for Fire on Private Spur.

Imperial Wheel Co., v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Harlan.

Upon complaint that the defendant refuses to make a connection with the petitioner's spur track leading to its plant and to operate the track except upon condition that the petitioner shall first release it from liability for loss and damage by fire on the premises caused by sparks and coals from the defendant's locomotives while on the spur track. If the defendant goes beyond its common-law duty as a carrier and undertakes to operate a spur track, doing this for the convenience of the shipper, and in this case without additional charge, such a requirement on its part is not unreasonable. It has no control over the complainant's premises and cannot police them or take other steps to avoid the danger of fire. Under such circumstances it may protect itself against the hazard of fire and consequent loss and damage to the petitioner's property by attaching reasonable conditions to its undertaking to operate the spur track. (20 I. C. C. 56.)

Another Coal Car Distribution Case.

James H. Minds and Julia A. Matz, trading as the Bulah Coal Co. v. Pennsylvania Railroad. James H. Minds, surviving and liquidating partner of James H. Minds and William J. Matz, lately trading as the Bulah Coal Co. v. same. Opinion by Commissioner Harlan:

Upon complaint that the defendant's system of rating mines and distributing its coal-car equipment is discriminatory, it is so found, and *Hillsdale Coal & Coke Co. v. P. R. R. Co.*, 19 I. C. C. Rep., 356, and the other cases in that group of cases, are cited and reaffirmed. The question of damages is reserved for further argument. (20 I. C. C. 52.)

Bad Advice Caused Misrouting.

Independent Supply Co. v. Cumberland & Pennsylvania Railroad et al. Opinion by Commissioner Prouty:

Complainant seeks reparation on four carloads of blacksmith coal shipped from West Virginia points to Los Angeles, Cal., on the ground that the shipments were misrouted. As the shipments were routed in accordance with specific instructions, the fact that one of the defendants advised the routing can not be the basis on which to order reparation. *Poor Grain Co. v. C., B. & Q.*, 12 I. C. C. 545, followed. (20 I. C. C. 66.)

Cotton Seed Rates Reduced.

Memphis Freight Bureau, v. St. Louis Southwestern. Opinion by Commissioner Harlan.

Rates on cotton seed from points on defendant's lines in Missouri, Arkansas, and Louisiana to Memphis found to be unreasonable, and also unduly discriminatory in their relation to rates from the same points to East St. Louis. Reasonable rates established. (I. C. C. 33.)

Anadarko Cotton Oil Co. et al, v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Clements.

Rate on cottonseed oil from certain Oklahoma points to Galveston, Tex., of 31¼ cents found unreasonable to the extent that it exceeds 27½ cents. Rate on cottonseed oil from Ardmore, Durant, Madill, and Tishomingo, Okla., to Galveston, Tex., found unreasonable to the extent that it exceeds 22½ cents. Respecting the refining-in-transit privilege at Dallas, Greenville, Sherman, and Fort Worth, Tex., on oil for export through Galveston, the commission does not endeavor to establish or extend transit privileges in the absence of discrimination, proof of which in this case is wanting; but in a recent tariff the privilege here asked for apparently has been granted. Present rates on cotton seed from Tishomingo, Ardmore, Durant, Madill, and Roff, Okla., to certain points in Texas found unreasonable to the extent that they exceed the rates declared reasonable in the report. Blanket rate on cottonseed oil from all the remaining Oklahoma points involved to certain Texas points found unreasonable to the extent that it exceeds the rate named in the report. Carriers allowed the option either to reduce the group rates on cottonseed oil substantially in accordance with suggestions made in the report, retaining the grouping, or to comply with the suggestions of changing the grouping to some extent. Defendants allowed ninety days within which to present a scheme of rate adjustment in substantial conformity with this report.

A rate reasonable in view of the circumstances and conditions when it is established may, in course of time, become unreasonable by virtue of changed circumstances and conditions. It is manifestly impracticable for the carriers or the commission in such a case to determine at what exact time in the gradual process of changes the rate becomes unreasonable. Neither does it seem that the bona fide action of the carrier in the necessary exercise of their judgment within reasonable limits should always be at their peril of liability for reparation for the difference between rates initiated on their judgment and later changed on the judgment of the commission. Therefore, the awarding of reparation by no means necessarily follows the reduction of a rate, whether by the voluntary action of the carriers or by order of the commission. Whatever may be the nature of the fact, circumstances, and conditions appearing in a particular case where reparation is involved, whether on account of excessive rates or by reason of unjust discrimination, there must be that degree of certainty and satisfactory conviction in the mind and judgment of the commission as would be deemed necessary under the well-established principles of law as a basis for judgment in court. Applying these principles to this case the report herein should not be regarded as a basis for reparation. (20 I. C. C. 43.)

STATE COMMISSIONS.

Comments on the annual report of the New York Public Service Commission, First district, appear elsewhere in this issue.

The Railroad Commission of Texas has issued an order reducing the freight rates on cast iron pipe and on rails and rail fastenings.

The Railroad Commission of Michigan has notified those railways which do not use the block system, that the adoption of the system ought to be carried out immediately.

Prof. Henry Thurtell, a member of the State Railroad Commission of Nevada, has resigned to take a position with the Interstate Commerce Commission as examiner.

The New York Public Service Commission, Second district, has dismissed the complaint against the Coney Island & Brooklyn Railroad which asked the commission to order the company to charge a five-cent fare to Coney Island.

Archibald B. Millar, private secretary to Governor Stuart, has been elected secretary of the Pennsylvania State Railroad Commission to serve from February 1. He succeeds H. S. Calvert, resigned to become a receiver of a Pittsburgh trust company.

The Nebraska State Railway Commission has found that shipments of ginger ale, soda water, cider, etc., are made and returned at variable weights, some on the billing offered by the shipper, some on the weights guessed at by the railway agent and some at actual weights, and that this has produced discrimination as between different shippers. The commission has therefore adopted a scale of estimated weights.

The New York Public Service Commission, second district, has ordered the American Express Company and the Canadian Express Company to reduce their joint rates so as to make the through rate from points on the Canadian Express Company's line to points on the American Express Company's lines lower than the sum of the local rates. This order makes substantial reductions below the present rates on shipment of 100 lbs. or over and even larger reductions on shipments of less than 100 lbs.

The suit of the Indiana Commission in the Indianapolis Circuit Court asking the court to order Superintendent Houghton, of the Cleveland, Cincinnati, Chicago & St. Louis to give the commission the names, ages and addresses, length of service and records of all telegraph operators employed by the road in Indiana, has failed. The judge refused to grant the order. The commission sought this information following a collision at Brightwood, where it was reported the road was employing boys as operators. The court did not hold that the commission could

not obtain the desired information, but ruled that it had followed the wrong procedure, and he doubted if any court had the power to enforce such a request.

The New York Public Service Commission, second district, has made an order granting permission to the Pullman Company to revise its tariff of sleeping car charges within the state of New York. Where the lower berth rate is $1.50, the rate for the upper berth between the same points will be $1.25. Where the lower berth rate is $1.75 or more the rate for the upper berth between the same points will be 80 per cent. thereof. No change is to be made in the price for lower berths unless such change constitute a reduction from the rate now in force. The result of this order reduces the charge for upper berths from $1.50 to $125, from $2 to $1.60, and from $2.50 to $2. The reduction in rates becomes effective February 1, 1911.

The New York Public Service Commission, first district, has dismissed the complaint of Street & Smith, Ainslee's Magazine Company, et al., vs. the Interborough Rapid Transit, in a case in which the magazine companies asked the commission to order the Interborough to make such regulations in regard to the sale of magazines in the subway and elevated as to permit the sale of the plaintiff's publications. Ward & Gow now have the concession for the sale of papers in the subway and the elevated, and have refused to sell Street & Smith's and other magazines unless the plaintiffs would agree to increase the compensation paid to Ward & Gow. The complaint says that the defendant is compelled by its contracts, under which it operates the subways, to furnish its patrons with all reasonable service and facilities, and the sales of magazines comes under that head. The commission does not find this to be the case, and therefore holds that it has no jurisdiction in the matter.

COURT NEWS.

The decision of the Supreme Court in the Mutual Carriers' Liability case is reported at length elsewhere in this issue.

In the United States court at Buffalo, January 9, the Standard Oil Co. paid fines amounting to $23,766. These fines are for the acceptance of unlawful rates on oil shipped from Olean, N. Y., to points in Vermont over the Pennsylvania, the New York Central and the Central Vermont. This suit has been pending many years.

In the federal court at Buffalo, N. Y., January 10, a fine of $500 was imposed on the Michigan Central for violating the law limiting the number of hours that animals may be kept in cars. Judge Holt in delivering the opinion of the court said that the case was one of serious cruelty. Horses were confined in a car for over 40 hours without food or water, in extremely cold weather.

The supreme court of Oregon in the case of Martin v. the Oregon Railroad & Navigation Company, appealed from the court of Umatilla county has sustained the law of Oregon which requires railways to furnish, on demand, suitable cars for perishable freight, that is to say refrigerator cars. The claim was for damages of $2,258, for loss on apples; a loss caused by the failure of the road to furnish refrigerator cars for the shipment of the apples to Eastern points. The supreme court holds that the law in question is a proper exercise of the police power of the state. The claim that the law is an unreasonable regulation of interstate commerce is rejected.

FOREIGN RAILWAY NOTES.

The passenger and freight receipts of the North Western of Uraguay Railway Company for the past year were greater than any in the history of the company.

The most active railway construction work in northern Brazil is on the Northeastern Railway, by the South American Construction Company. Final government approval for about 100 miles of line covers 49 miles from M. Calmon to Iquatu, 13 miles for a branch to Cedro, and 37 miles for a branch connection between the Sobral and Baturite railways; total appropriation, $2,348,000.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Thomas M. Pierce has been appointed general counsel of the Terminal Railroad Association of St. Louis, with office at St. Louis, Mo., succeeding M. F. Watts, resigned.

J. A. Hendry, assistant treasurer of the National Railways of Mexico at Mexico City, Mex., has been appointed general treasurer, with office at Mexico City, succeeding J. M. Frazier, deceased.

C. R. Staples has been appointed claim agent of the Buffalo & Susquehanna Railroad and the Buffalo & Susquehanna Railway, with office at Galeton, Pa., succeeding F. C. Herr, resigned to go to another company.

H. C. Nutt, vice-president of the Camas Prairie, has been elected president, with office at Tacoma, Wash., succeeding J. P. O'Brien, who has been elected vice-president, with office at Portland, Ore., succeeding Mr. Nutt.

W. J. Bienemann, auditor of the Kanawha & Michigan, has been appointed secretary, succeeding G. Morton, resigned, and W. N. King has been appointed general attorney, succeeding Norton Monsarratt, resigned, both with offices at Columbus, Ohio.

Bruce K. Scott, for five years professor of law at the Univeristy of Wisconsin, has been appointed general attorney of the Chicago, Burlington & Quincy, in charge of interstate commerce litigation, with office at Chicago. He succeeds to the office formerly held by Hale Holden, who has been assistant to the president since February, 1910.

John W. Newlean, whose appointment as general auditor of the Illinois Central, with office at Chicago, has been announced in these columns, was born October 28, 1875, in Chicago. He attended public and private schools at Omaha, Neb., and began railway work December 1, 1891, with the Burlington & Missouri River, now part of the Chicago, Burlington & Quincy, in the freight claim department. He went to the Union Pacific in March, 1892, serving for eight years in different capacities in the accounting department. He was then placed in charge of the pay department, and in July, 1901, was appointed to a position under the general auditor, later becoming chief clerk. He was appointed general auditor for the receivers of the Chicago Great Western in February, 1909, and when that road was reorganized in September, 1909, was appointed auditor, which position he resigned to accept his present office of general auditor of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern.

Operating Officers.

M. S. Meeks has been appointed general superintendent and manager of the North Yakima & Valley, with office at North Yakima, Wash.

George Hannauer, superintendent of the Indiana Harbor Belt, at Gibson, Ind., has been appointed general superintendent, and J. W. Callahan has been appointed assistant superintendent.

J. H. Nelson, manager and purchasing agent of the Jacksonville Terminal Company, has been appointed general superintendent of the Florida East Coast, with office at St. Augustine, Fla.

R. T. McGraw, trainmaster of the Denver & Rio Grande at Pueblo, Colo., has been appointed assistant superintendent of the First division, with office at Pueblo, succeeding W. H. Russell, deceased.

W. D. Hodge, chief engineer of the Denver, Laramie & Northwestern at Denver, Colo., has been appointed also general superintendent, with office at Denver, succeeding D. L. Hutchison, superintendent and assistant chief engineer, resigned.

F. E. Weymouth, superintendent of the Northern Pacific, with office at Seattle, Wash., has resigned to engage in other business. As has been announced in these columns, J. E. Craver

has been appointed superintendent of the Seattle division, succeeding Mr. Weymouth.

C. E. Hedrix, assistant superintendent of the St. Joseph & Grand Island, at St. Joseph, Mo., has been appointed superintendent, with office at St. Joseph, succeeding F. T. Slayton, resigned to accept service with another company.

C. E. Brooks, assistant superintendent on the Idaho division of the Oregon Short Line at Pocatello, Idaho, has had his jurisdiction extended over Pocatello yard in addition to the Third district. C. J. Husted, also assistant superintendent at Pocatello, has had his jurisdiction extended to include the Second district, and the office of assistant superintendent G. J. Cunningham at Pocatello has been abolished. J. E. Davis, chief despatcher at Kemmerer, Wyo., has been appointed chief despatcher, with office at Pocatello, succeeding T. C. Collopy, resigned. J. P. Folger succeeds Mr. Davis.

H. H. Morris, trainmaster of the Kanawha coal district of the Chesapeake & Ohio, at Handley, W. Va., has been appointed superintendent of the Huntington division, with office at Huntington, succeeding C. P. Snow, resigned to go into other business. J. B. Harris has been appointed superintendent of the Hinton division, with office at Hinton, succeeding J. R. Cary, promoted. W. R. Turner has been appointed assistant to H. H. Morris, superintendent of the Huntington division, with office at Huntington. E. L. Bock succeeds Mr. Morris, with office at Handley. F. Hatfield has been appointed trainmaster of the Russell, Ky., terminal, and R. K. Meherin has been appointed assistant trainmaster of the Cabin Creek branch, with office at Cabin Creek Junction, W. Va.

As has been announced in these columns, C. P. Stembel, superintendent of the Eastern division of the Minneapolis & St. Louis at Minneapolis, Minn., has had his jurisdiction extended over the entire line, and the office of superintendent of the Western division at Watertown, S. D., has been abolished. Incident to this change in the operating organization, R. E. Ryan, trainmaster of the Iowa Central at Marshalltown, Iowa, has been appointed assistant superintendent of the Western lines of the Minneapolis & St. Louis, with office at Watertown. J. P. Houston, trainmaster at Cedar Lake, Minn., has been appointed assistant superintendent, with office at Ft. Dodge, Iowa, succeeding E. P. Lovell, trainmaster, resigned. R. D. Howie has been appointed trainmaster of the line between Minneapolis and Ft. Dodge, with office at Cedar Lake, succeeding Mr. Houston. H. E. Jones, trainmaster at Watertown, S. D., has been transferred to Marshalltown, succeeding Mr. Ryan.

J. Walter Coon, whose appointment as assistant to general manager of the Baltimore & Ohio, with office at Baltimore, Md., has been announced in these columns, was born January 7, 1872, at Warren, Ill. He was educated in the Chicago high school, and began railway work February 5, 1886, with the Baltimore & Ohio as clerk, and was later file clerk and assistant accountant in the general superintendent's office at Chicago, remaining at Chicago until 1897, when he was transferred as assistant accountant and assistant chief clerk, to Newark, Ohio. In July, 1900, he was appointed accountant at Baltimore, Md., and in March, 1902, was made assistant chief clerk to the general manager. The following year he was made chief clerk to general manager, and in January, 1905, he was appointed chief clerk to third vice-president. Four years later he was appointed assistant to third vice-president, which position he held at the time of his recent appointment as assistant to general manager. His former position of assistant to third vice-president has been abolished.



J. W. Coon.

Chester T. Dike, whose appointment as general superintendent of the Chicago & North Western has been announced in these columns, was born August 13, 1871, at Woodstock, Ill. He graduated as a civil engineer from Cornell College in 1893, and three years previous he had begun railway work with the Northern Pacific. He was employed in various capacities until 1898, when he was made chief engineer of the Iowa, Minnesota & Northwestern, a subsidiary of the Chicago & North Western. In July, 1899, he was made resident engineer of the Chicago & North Western, in charge of construction of the Iowa, Minnesota & Northwestern, and he continued in the engineering department as resident, and then as division engineer until August, 1907. He was then made superintendent of the Pierre, Rapid City & North Western, where he remained for two years, becoming engineer and superintendent of construction of the Chicago & North Western at Pierre, S. D., in July, 1909. In November, 1910, he was promoted to general superintendent of the Minnesota and Dakota divisions of the Chicago & North Western, of the Pierre, Rapid City & North Western, and of the Pierre & Fort Pierre Bridge Railway, with office at Huron, S. D.



Chester T. Dike.

Traffic Officers.

L. G. Parsons has been appointed a commerical agent of the Louisville & Nashville, with office at Indianapolis, Ind.

H. S. Wineland has been appointed a traveling freight agent of the Missouri, Kansas & Texas, with office at Pittsburgh, Pa.

George Breckenridge has been appointed traveling freight and passenger agent of the Northern Pacific, with office at Spokane, Wash.

W. J. Gillerlain has been appointed a traveling passenger agent of the Canadian Pacific, with office at Cincinnati, Ohio, succeeding M. E. Malone, transferred.

F. M. Jenifer, assistant to the traffic manager of the Tonopah & Tidewater at Los Angeles, Cal., has been appointed general freight and passenger agent, a new office.

C. J. Kays, general agent in the passenger department of the Chicago & Alton, with office at Denver, Colo., has resigned to become city passenger agent of the Missouri, Kansas & Texas at Chicago.

J. B. Shackleford has been appointed general freight and passenger agent of the Abilene & Southern, with office at Abilene, Texas, succeeding E. P. Huddleston, resigned to accept service with another company.

Nelson Reed has been appointed agent of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., succeeding W. K. Lucas, whose resignation as general agent has been announced in these columns.

William E. Farris has been appointed assistant general freight and passenger agent of the Buffalo & Susquehanna Railroad and the Buffalo & Susquehanna Railway, with office at Du Bois, Pa., succeeding M. J. McMahon

F. N. Hodgin, agent of the Cincinnati, Hamilton & Dayton at Indianapolis, Ind., has been appointed traveling freight agent, with office at Indianapolis, succeeding Earl Barnett, appointed local freight agent at Indianapolis.

Elmer L. Millflagle has been appointed passenger, baggage and freight agent of the Western Pennsylvania division of the Pennsylvania Railroad, with office at Vance Mill Junction, Pa., succeeding Homer S. Tarr, resigned.

J. W. Hodgen has been appointed a traveling freight agent of the Chicago & Eastern Illinois and the Evansville & Terre Haute, with office at Evansville, Ind., succeeding E. L. Cory, appointed local freight agent at Terre Haute, Ind.

R. C. Clayton, city ticket agent of the Canadian Pacific at Philadelphia, Pa., has been appointed a traveling passenger agent, with office at New York, in charge of the territory from New York to Florida. W. H. Jones succeeds Mr. Clayton.

H. P. Horton, city ticket agent of the Norfolk & Western, at Columbus, Ohio, has been appointed a passenger agent, with office at Columbus, and B. W. Herrman has been appointed general agent, at Cincinnati, succeeding L. V. Finkle, deceased.

R. B. Moore has been appointed an assistant general freight agent of the Atlanta, Birmingham & Atlantic, with office at Atlanta, Ga. W. I. Middleton, traveling freight agent at Atlanta, has been appointed a commercial agent, with office at Macon, Ga.

J. B. Hayes, commercial agent of the Wabash, with office at East St. Louis, Ill., has had his jurisdiction extended to include Alton, Ill., territory, and correspondence relating to business in that territory should be addressed to him as commercial agent at Alton, Ill.

George W. Hinckley, traveling freight agent of the New York Central Lines at Kansas City, Mo., has resigned to engage in other business, and F. W. McCoy, also traveling freight agent at Kansas City, succeeds Mr. Hinckley. Henry P. Gutler, contracting freight agent, succeeds Mr. McCoy, and H. F. Kleine succeeds Mr. Cutler.

William Simmons, chief rate clerk of the Southern Pacific Company, Atlantic Steamship Lines, at New York, has been appointed assistant general freight agent. G. J. Brady, chief clerk, has been appointed assistant general eastern freight agent, and C. W. Evans, chief soliciting agent, has been appointed a commercial agent, all with offices at New York.

R. S. Ruble, assistant general passenger agent of the Union Pacific at Omaha, Neb., has been transferred to Denver, Colo., in charge of passenger traffic in Colorado, except points on the main line; in New Mexico; on the Colorado division to and including Cheyenne, Wyo., and on the line westward from Cheyenne to and including Ogden, Utah. F. B. Choate, general agent at Denver, will have charge of freight traffic only. W. K. Cundiff has been appointed assistant general passenger agent at Omaha, succeeding Mr. Ruble.

C. C. Griggs, assistant general freight agent of the Michigan Central at Detroit, Mich., has been appointed chief of the tariff bureau, with office at Detroit, succeeding T. E. Eisman, deceased. As has been announced in these columns, George M. Weaver succeeds Mr. Griggs. W. C. Lewis, assistant general freight agent at Chicago, has been appointed a division freight agent, with office at Chicago; J. H. Brown, assistant general freight agent at Bay City, Mich., has been appointed a division freight agent, with office at Bay City, and the office of assistant general freight agent has been abolished at Chicago and at Bay City. Mr. Griggs has been appointed also chief of the tariff bureau of the Detroit & Charlevoix.

Walter Nichols, assistant general freight agent of the Cleveland, Cincinnati, Chicago & St. Louis, and the Cincinnati Northern at St. Louis, Mo., has been appointed a division freight agent, with office at St. Louis, and his former office is abolished. Ford Woods, assistant general freight agent at Indianapolis, Ind., has retired, and the office of assistant general freight agent at that place has been abolished. C. R. Lewis, general agent at Indianapolis, has been appointed a division freight agent, with office at Indianapolis, a new office. J. W. Clark has been appointed a division freight agent, with office at Cleveland, Ohio, succeeding George Krause, Jr., promoted. J. W. Hewson has been appointed a division freight agent, with office at Jackson, Mich., a new office.

James L. Clark, general western freight agent of the Lake Shore & Michigan Southern, the Dunkirk, Allegheny Valley & Pittsburgh, and the Lake Erie, Alliance & Wheeling at Chicago, has been appointed a division freight agent, with office at Chicago. E. L. Talcott, general eastern freight agent at Buffalo, N. Y., has been appointed a division freight agent, with office at Buffalo, and the office of general western freight agent at Chicago, and that of general eastern freight agent at Buffalo have been abolished. B. J. Torbron, general agent of the Lake Shore, the Lake Erie & Western, the Toledo & Ohio Central and the Zanesville & Western at Pittsburgh, Pa., has been appointed division freight agent of the Lake Shore, the Pittsburgh & Lake Erie, the Dunkirk, Allegheny Valley & Pittsburgh and the Lake Erie, Alliance & Wheeling, with office at Youngstown, Ohio, succeeding G. M. Kridler, promoted.

Hugh G. L. Campbell, who has been appointed assistant general freight agent of the Toledo & Ohio Central and the Zanesville & Western, with office at Toledo, Ohio, as was previously announced in these columns, was born January 5, 1875, at Buffalo, N. Y. He received a grammar school education at Buffalo, and began railway work in 1892 with the New York Central at East Buffalo. He was rate inspector for the joint rate inspection bureau from 1894 to 1898, and was employed by the Central Railway Clearing House at Buffalo from 1899 to 1902. He then became traveling freight agent of the Lake Erie & Western, and in 1907 became agent of the Merchants' Despatch at Rochester, N. Y. He was appointed commercial agent of the New York Central Railroad and fast freight lines in January, 1908, and in June of the following year was made division freight agent of the Lake Erie & Western at Sandusky, Ohio, from which position he was recently promoted.

C. H. Jackson has been appointed general agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Indianapolis, Ind., succeeding C. R. Lewis, promoted. L. J. Blaker has been appointed a soliciting freight agent and J. E. Pierce, a dairy agent, both with office at Indianapolis. Charles H. King has been appointed general agent, with office at Cincinnati, Ohio, succeeding George Metzger, assigned to other duties. T. M. Devereux has been appointed westbound and dairy agent and E. M. Snell, a traveling freight agent, both reporting to Mr. King. W. H. Gates has been appointed a commercial agent and E. A. Niswonger, a traveling freight agent, both with office at Louisville, Ky. Thomas Peter has been appointed a commercial agent, with office at Columbus, Ohio. S. A. Townsend, commercial agent at Minneapolis, has been transferred to Pittsburgh, Pa., succeeding J. W. Clark, promoted to division freight agent at Cleveland, Ohio. W. S. Wonder has been appointed a soliciting freight agent, with office at Peoria, Ill.

W. H. Ward, assistant general freight agent of the Chicago, Indiana & Southern at Chicago, has been appointed chief of the tariff bureau of that road and the Indiana Harbor Belt, with office at Chicago. C. C. Campbell succeeds Mr. Ward. H. M. Griggs, assistant general coal and ore agent of the Michigan Central, the Lake Shore & Michigan Southern, the Cleveland, Cincinnati, Chicago & St. Louis, the Toledo & Ohio Central, the Chicago, Indiana & Southern, and the Indiana Harbor Belt, with office at Chicago, has had his jurisdiction extended over the Pittsburgh & Lake Erie and the Lake Erie & Western. C. E. Simpson has been appointed chief of the tariff bureau of the Pittsburgh & Lake Erie, with office at Pittsburgh, Pa. E. J. Dowie, industrial agent of the Lake Shore & Michigan Southern and the Pittsburgh & Lake Erie, with office at Cleveland, Ohio, has had his jurisdiction extended over the Lake Erie & Western, the Ft. Wayne, Cincinnati & Louisville and the Northern Ohio.

Louis Wiler Landman, who was recently appointed general passenger and ticket agent of the Michigan Central, with office at Chicago, as previously announced in these columns, was born December 6, 1868, at Waynetown, Ind. He began railway work in 1886 as a telegraph operator on the Indiana, Bloomington & Western, and the next year he went to Danville, Ill., as ticket agent. He was made city passenger and ticket agent of the Ft. Wayne, Cincinnati & Louisville at Ft. Wayne, Ind., in 1889. For seven years from 1890 he was southern passenger agent of the Columbus, Hocking Valley & Toledo; he was then made general traveling agent in the passenger department, which office he held with that road and its successor, the Hocking Valley, until 1904. His next promotion was to general agent in the freight and passenger departments of the Cleveland, Cincinnati,

Chicago & St. Louis at Toledo, Ohio, and a year later he was appointed general agent in the passenger department of all New York Central Lines at Toledo. He became general western passenger agent of the Lake Shore & Michigan Southern at Chicago in 1900, and during the present year was promoted from that position to general passenger, ticket and baggage agent of the Lake Erie & Western at Indianapolis.

William Albert Newman, whose appointment as general freight agent of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, has been announced in these columns, was born March 30, 1878, in Metcalfe county, Kentucky. He was educated at Kentucky University, and began railway work in June, 1897, with the Great Northern at St. Paul, Minn. In August, 1902, he became a clerk in the general freight department of the New York Central and the West Shore at New York, and two years later was appointed traveling freight agent. The next year he was promoted to chief clerk to the assistant general freight agent, and in another year to second assistant general freight agent. In May, 1907, he became assistant general freight agent, with office in New York, from which position he has recently been promoted to general freight agent as above.



W. A. Newman.

Engineering and Rolling Stock Officers.

R. B. Harris has been appointed supervisor of Subdivision No. 3, Allegheny division, of the Pennsylvania Railroad, with office at South Oil City, Pa., succeeding A. G. Follette, transferred.

M. C. Blanchard, roadmaster of the Atchison, Topeka & Santa Fe, at Florance, Kan., has been appointed division engineer, with office at Topeka, Kan., succeeding C. E. Griggs, transferred to the operating department.

J. Singleton, roadmaster of the Rock Island Lines at Sibley, Iowa, has been appointed roadmaster, with office at Des Moines, Iowa, succeeding W. F. Lee, deceased. H. Berend, section foreman at Waterloo, Iowa, succeeds Mr. Singleton.

The chief engineer's department and the engineer of branch lines' department of the Pennsylvania Railroad have been consolidated. Joseph U. Crawford, engineer of branch lines, at Philadelphia, Pa., has been appointed consulting engineer, and H. E. Booz, principal assistant engineer of branch lines, has been appointed an assistant chief engineer, both with offices at Philadelphia, Pa., and their former positions have been abolished.

P. A. Pheney, roadmaster of the Idaho division of the Oregon Short Line, at Glenns Ferry, Idaho, has been appointed roadmaster, with office at Nampa, Idaho, succeeding T. Donovan, deceased. Patrick Brennan succeeds Mr. Pheney. F. Reilly, roadmaster on the Salt Lake division of the Southern Pacific lines east of Sparks at Mina, Nev., has been transferred to Wells, Nev., succeeding A. E. Moquist, and Mr. Moquist succeeds Mr. Reilly.

F. A. Torrey, who has been appointed general superintendent of motive power of the entire Burlington system, was born in Pennsylvania, and when a boy obtained an apprenticeship in a machine shop. He has been connected with the Burlington since 1876, serving consecutively as fireman, engineman, road foreman of engines and roundhouse foreman. From 1895 to 1903 he was master mechanic, and he was then for two years assistant superintendent of motive power. He was appointed to succeed Frank H. Clark as superintendent of motive power of the lines east of the Missouri river in April, 1905, and now succeeds him as general superintendent of motive power.

Horace C. Booz, principal assistant engineer of branch lines of the Pennsylvania Railroad, has been appointed an assistant chief engineer, with office at Philadelphia, Pa., and his former position has been abolished. Mr. Booz was born at Bristol, Pa., August 29, 1875, and was educated in the public schools of his native town, also at Rittenhouse Academy, Philadelphia, and at Lafayette College, graduating from the latter in the class of 1895 as a civil engineer. He entered the engineering department of the Pennsylvania Railroad in June, 1896, as a transitman, and in November, 1899, was promoted to division engineer in the same department, becoming assistant engineer in March, 1901. He was appointed principal assistant engineer of branch lines in May, 1905, which position he held at the time of his recent appointment. In addition to his work as chief engineer of brinch lines, Mr. Booz has been since June, 1902, engaged under the direct authority of Samuel Rea, vice-president of the Pennsylvania Railroad, in the various projects under the latter's supervision, the most important of which was the New York tunnel extension of the Pennsylvania Railroad, and the proposed New York Connecting Railroad.



Horace C. Booz.

Joseph U. Crawford, chief engineer of branch lines of the Pennsylvania Railroad, has been appointed consulting engineer, with office at Philadelphia, Pa., and his former position has been abolished. Mr. Crawford was born at Ury Farm, Philadelphia, August 25, 1842, and was educated at John W. Faires' school, from which he went to the University of Pennsylvania in the class of 1862. He served in the Union Army, and in 1871 entered the service of the Pennsylvania Railroad as senior assistant engineer of the Alexandria & Fredericksburg. He was then principal assistant engineer, and afterwards engineer of the California division of the Texas & Pacific, under Colonel Thomas A. Scott and on his recommendation in 1878 Mr. Crawford was appointed consulting engineer of the government of Japan. On the completion of his work in that country he was decorated by the Emperor of Japan with the Order of the Rising Sun. After his return to America he was employed by Jay Gould to make transcontinental examinations and surveys between the Pacific coast and Salt Lake City, Utah, as well as in Wyoming and Nebraska. In the fall of 1882, he returned to the service of the Pennsylvania Railroad as chief engineer of the Schuylkill Valley Railroad, and in 1886 and 1887, built the Piedmont & Cumberland. Two years later he was appointed assistant to J. N. DuBarry, second vice-president of the Pennsylvania Railroad, and on the death of that officer was appointed engineer of branch lines. In July, 1897, he was appointed chief engineer of the Southeastern & Atlantic, now the Norfolk &



J. U. Crawford.

Portsmouth Belt Line, and of the New York, Philadelphia & Norfolk, and from October, 1898, to May, 1899, he was engineer for the United States government to examine into and report upon the transportation facilities in Cuba. At the time of his recent appointment, Mr. Crawford was chief engineer of branch lines of the Pennsylvania Railroad, and in addition, is a director of various companies associated with the Pennsylvania system.

Purchasing Officers.

L. S. Carroll, purchasing agent of the Chicago & North Western, has been appointed general purchasing agent of the North Western and the Chicago, St. Paul, Minneapolis & Omaha, at Chicago, a new office, and his former title has been abolished. John Ball has been appointed assistant purchasing agent, with office at Chicago. Isaac Seddon, purchasing agent of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn., retains his office and title and will report to Mr. Carroll.

William A. Hammel, whose appointment as purchasing agent of the Atlanta, Birmingham & Atlantic, with office at Atlanta, Ga., has been announced in these columns, was born July 23, 1872, at Baltimore, Md., and received his education in a manual training school and at Washington University. He began railway work in May, 1893, in the engineering department of the St. Louis & San Francisco, and has been in the continuous service of various railway companies up to the present time, with the exception of a period of five years, when he was in private practice as engineer and contractor in and around St. Louis, Mo. He left the service of the St. Louis & San Francisco to go to the Mobile & Ohio as rodman and assistant resident engineer on the extension from Tuscaloosa, Ala., to Montgomery, and then went to the Bolivar, Osceola & Southern, now a part of the St. L. & S. F., as resident engineer. His next position was on the Choctaw, Oklahoma & Gulf, now a part of the Rock Island Lines, as topographic and locating engineer. He was later resident and afterwards division engineer of the Tennessee Central; locating and division engineer of the Lake Erie, Alliance & Wheeling; division engineer, and afterwards locating engineer of the Louisiana Railway & Navigation Company, and for five and a half years resident engineer and assistant chief engineer of the Atlanta, Birmingham & Atlantic, which position he still holds, in addition to his new duties as purchasing agent.

OBITUARY.

J. F. Van Rensselaer, until October, 1910, general agent of the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport at Atlanta, Ga., died at Atlanta on January 3.

United States Senator Stephen B. Elkins of West Virginia, died at his house in Washington, January 5, at the age of 69. Mr. Elkins' prominence in the railway world for the last ten years has been due to his position as chairman of the committee of the senate on interstate commerce, and his name was attached to the revision of the interstate commerce law which was passed in 1903, and also, coupled with that of Representative Mann, to the radical revision made last June. The bill of 1903, by repealing the clause of the law which provided for punishment by imprisonment for making illegal rates, was an important factor in enabling the Interstate Commerce Commission to do more effective work in prosecuting offenders. It was this bill that increased the maximum penalty from $5,000 to $20,000. Mr. Elkins was well known to railway men, however, before he went to Congress, having built a number of railways in West Virginia, in connection with his extensive mining and other enterprises in that state. He was for several years vice-president of the West Virginia Central & Pittsburgh; was president of the Piedmont & Cumberland, and chairman of the board of directors of the Morgantown & Kingwood. Mr. Elkins was born in Ohio, but when a child went with his family to Missouri and was one of the first graduates from the University of Missouri. In 1864 he went to New Mexico and was prominent in politics there. He was made Territorial Delegate in congress and while in Washington married the daughter of Senator H. G. Davis of West Virginia; and in all his subsequent career he was identified with that state. He was Secretary of War from 1891 to 1893 and was chosen senator from West Virginia in 1895.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta Central.—The Railway Commission of Canada has extended the time to July 1, 1911, for the completion of a branch at Rocky Mountain House, Alb.

Arizona Roads.—Surveys are being made for a line from Holbrook, Ariz., to Bear Springs, 58 miles. W. H. Clark, Holbrook, is said to be back of the project.

Atchison, Topeka & Santa Fe Coast Lines.—This company will spend $850,000 for improvements, it is said in Bakersfield and the San Joaquin valley during 1911. The line from Richmond to Bakersfield is being relaid, the roadbed widened and rock ballast is being put in. Many of the wooden culverts and bridges will be replaced with steel and concrete structures. A new station is to be built at Bakersfield.

Boston (Mass.) Subways.—See an item in General News regarding new subways to be built in Boston.

Buffalo & Northwestern.—This company was chartered recently in Oklahoma with $50,000 capital, and headquarters at Buffalo, Harper county. Surveyors have been at work for several weeks in Woods county towards Alva. The plans call for building about 258 miles.

Canadian Pacific.—The Railway Commission of Canada has authorized this company to open for traffic the section of its Ingersoll branch from Ingersoll Junction, Ont., to Ingersoll, 4.8 miles. This company is said to have under consideration the question of building a new connecting line between Nepigon, Ont., and Savanne. It is estimated that the new line will be from 40 to 50 miles shorter than the existing line.

Plans have been made by the Canadian Pacific, it is said, for building a tunnel under the city of Vancouver, B. C., to connect the False creek yards and shops of the company, with the wharves and station on the water front.

Chattanooga & Atlanta.—Incorporated in Georgia with $20,000 capital and office at Menlo, Chattanooga county, Ga. The plans call for building a line to connect two or three existing lines, to complete a through line between Chattanooga, Tenn., and Atlanta, Ga. The incorporators include: E. F. Bloomever, C. N. Fisk, W. P. Means, Chattanooga, and C. A. Land.

Chicago, Milwaukee & Puget Sound.—According to press reports plans have been filed at the land office in Kalispeel, Mont., showing the route of a proposed branch from Clearwater, which is 40 miles east of Bonner, north via Kalispeel to the international boundary, about 200 miles.

Colorado & Southern.—Track laying has been started on the double-track line being built jointly by this company and the Denver & Rio Grande between Pueblo, Colo., and Walsenburg. It is expected to have the first 20 miles ready for operation by February 1, and 24 miles additional, to complete the line, ready for operation about September. (November 18, p. 986.)

Columbus Connecting.—Organized in Ohio with $25,000 capital, to build a belt line around the city of Columbus, Ohio, at a cost of about $6,000,000.

Denver & Rio Grande.—See Colorado & Southern.

Dunkirk, Allegheny Valley & Pittsburgh.—See New York Central Lines.

Grand Trunk Pacific.—An officer is quoted as saying that it is expected to have work on this road from the headwaters of the Bay of Fundy, at Moncton, N. B., west to Prince Rupert, B. C., on the Pacific ocean, finished early in 1913. The company expects to keep about 6,000 men at work during the winter on various sections of the western end of the line. There are to be four tunnels on the Pacific section, aggregating about 2,200 ft., one of which is already finished and another will be pierced in March.

Hagerstown & Clearspring (Electric).—An officer writes that this company proposes to let contracts before March 1, to build from Hagerstown, Md., to Clearspring, 12 miles. There will be one steel bridge. L. N. Downs, Hagerstown, may be addressed.

Imperial Traction Company.—Incorporated in Ontario, to build from Hamilton, Ont., to connect Guelph, Berlin, Stratford, London, Ingersoll and Branford, with a branch to Niagara Falls, also, a branch from a point between Stratford and St. Marie to Grandbend and Sarnia. L. B. Howland, Toronto, may be addressed.

Joplin, Oklahoma & Western.—Surveys have been made, it is said, from Joplin, Mo., west to Carmen, Okla. Construction work is to be started next month at Welch. W. P. Chapman, New York and F. M. Overlees, Bartlesville, Okla., are interested. H. H. Jackson, chief engineer, Chicago.

Kansas Roads (Electric).—Plans are being made to build from Baldwin, Kan., east via Black Jack, Edgerton and Gardner to Olathe, 20 miles. Dr. H. L. Murlin, Baker University, Baldwin, is interested.

Lafourche Valley & Gulf.—Financial arrangements are said to be made and it is expected that work will be started soon, from Donaldsonville, La., northwest to Leesville, 150 miles. F. M. Welch, president, Donaldsonville.

Lake Erie & Northern.—Application has been made for a charter in Canada, to build lines to connect Port Dover, Ont., Simcoe, Waterford, Brantford, Paris and Galt. W. S. Brewster, J. Muir, W. D. Schultz and R. E. Ryerson, all of Brantford, and H. Donly, are interested.

Laramie, Hahn's Peak & Pacific.—An officer is quoted as saying that contracts have been let for completing an extension from Fox Park, Wyo., south to Walden, Colo., and to the coal fields of the Colorado Coal Co.

Lewisburg, Milton & Watsontown (Electric).—This company is now operating cars into Lewisburg, Pa., the Simplex Surface Contact Co. having completed the electrification of the Lewisburg & Tyrone branch between Lewisburg and Montandon. The company is planning to carry out the electrification between Lewisburg and Mifflinburg.

Louisiana Roads.—According to press reports, D. K. and M. J. Jeffris, owners of a number of lumber mills and railway property in Concordia Parish, La., are building a line between the Mississippi and Black rivers in Louisiana, and may eventually extend the line west to Alexandria. John Drake, Chicago, is said to be interested.

Louisville & Nashville.—An officer is quoted as saying that this company will spend about $3,500,000 building an extension into eastern Kentucky, 98 miles. (December 23, p. 1204.)

Milwaukee Western Electric.—This company has finished surveys and secured about 65 per cent. of the right-of-way between Milwaukee, Wis., and Foxlake. The line will have a grade not to exceed 1.3 per cent. There will also be a branch from Sussex to Waukesha. C. A. Chapman, Inc., Chicago, are the engineers. (October 28, p. 811.)

Minneapolis, St. Paul & Sault Ste. Marie.—This company, it is said, is planning to make extensive additions to its yards at Superior, Wis., to accommodate the handling of the ore business from the Cuyuna range. When the improvements are made the yards will be 600 ft. wide and two miles long.

Montana Roads (Electric).—Residents of Big Fork, Mont., Columbia Falls and Butte are said to be back of a project to build an electric line from Columbia Falls, south along the east side of Flathead lake and river to Polson, about 70 miles. The work is to be started in March.

Murray Traction Company.—Surveys are being made, it is said, from Murray, Ky., to the Tennessee river, about 16 miles. N. Ryan, president, Murray.

Nashville-Gallatin Interurban.—Under this name a company will ask for incorporation to build from Nashville, Tenn., northeast to Gallatin, about 30 miles. The plans call for putting up about four steel bridges. It is expected that work will be begun this coming summer. H. H. Mayberry, Franklin, may be addressed.

New York Central Lines.—The Dunkirk, Allegheny Valley & Pittsburgh has given a mortgage, part of the proceeds of which may be used for an extension from the present terminus at Titusville, Pa., to either Oil City or Franklin, where connection is to be made with the Franklin branch of the Lake Shore & Michigan Southern.

North Carolina-Virginia.—Incorporated in Virginia with $5,000 capital, to build from a point in Henry county, Va., via Ridgeway, to a point in North Carolina, six miles. E. C. Wing, president, New York, and M. K. Harris, Danville, Va., is interested.

Oklahoma Short Line (Electric).—Incorporated in Oklahoma, to build an electric line from Oklahoma City, Okla., to Joplin, Mo., 175 miles; also to build a line from Shawnee, Okla., to Denison, Texas, 125 miles. The incorporators include: C. C. Wright, Ada, Okla.; M. J. Bentley, Tecumseh; P. Paddock, Oklahoma City; S. V. Sanders, Albemarle, S. C., and T. E. Armentrout, Kirkwood, Mo.

Pittsburgh & Susquehanna Valley.—This company has given a mortgage for $2,000,000 to secure funds for building an extension from the present terminus near Waltzvale, Clearfield county, Pa., southwest to Patton. The line will reach an undeveloped coal section in the Beaver valley.

Port Bolivar Iron Ore.—A contract has been given to the C. H. Sharp Construction Company, Kansas City, Mo., to build from the Texas & Gulf, at Longview, Texas, to the iron ore fields in Cass county, about 30 miles. (December 16, p. 1167.)

Southwestern Kansas & Colorado.—Right-of-way is being secured, it is said, from Hardtner, Kan., west through Barber, Comanche, Clark and Meade counties, about 100 miles. A. A. White, general manager, Coldwater. The Titus Company, Arkansas City, are the engineers.

Taxco, Naranjo & Guerrero.—An officer writes that this company expects to begin work soon from Taxco, Mex., via San Sebastian to Naranjo, 10 miles, with a branch to Santa Ana, about 21 miles. There will be three steel bridges, each about 20 ft. long, and station buildings are to be put up at Taxco, San Sebastian and Naranjo. The line is being built to carry ore, fuel and general merchandise. H. C. Wilson, president, 52 Dearborn street, Chicago, and F. E. Olendorf, Taxco, is also interested.

United Property Company.—Incorporated in Delaware to build and operate railways, steamship lines, wharves, docks and warehouses. The offices will be at San Francisco, Cal., and Oakland. The directors include H. W. Davis, Wilmington, Del.; F. M. Smith, R. G. Hanford, W. R. Alberger and D. Searles. The new company is said to represent a merger of many of the public utilities companies of Berkeley, Cal, and Oakland, including the ferry lines that connect those places with San Francisco.

Washington Roads (Electric).—Application has been made for a franchise by J. D. Cleary, representing Pennsylvania capitalists, to build an electric line from South Bend, Wash., east to Raymond, about four miles.

Wabash Railroad.—Work is now under way by the William Carmichael Co., St. Louis, Mo., it is said, on 30 miles of double-tracking from Delray, Mich., to Adrian.

Western Maryland.—Right-of-way has been secured, it is said, to build an extension from York, Pa., across Codorus creek, to the northern end of the borough of North York.

Wrightsville, Adrian & Lyons.—This company, which was organized to build from Wrightsville, Ga., southeast to Lyons, about 40 miles, with a number of extensions, has grading work finished on about 35 miles. The company expects to carry out all the work with its own men. T. J. James, president, Adrian. (July, 15, p. 143.)

FOREIGN RAILWAY NOTES.

The Great Western of Brazil Railway has been given the privilege of building about 31 miles from Garanhans to Bom Conselho, on the Sul de Pernambuco Railway.

The preliminary surveys for the proposed railway from the capital of the Dominican Republic to the Cibao district have commenced. One party of engineers is working north and another party will soon be started in the north. A government report on this new line will be loaned to interested firms who apply to the Bureau of Manufactures, Washington, D. C.

Railway Financial News.

Ann Arbor Company.—This company has been incorporated with an authorized capital stock amounting to $7,250,000. The company is to own railway securities and in particular to own the $3,100,000 common stock and the $2,190,000 preferred stock of the Ann Arbor which was recently sold under foreclosure of the $5,500,000 5 per cent. notes of the Detroit, Toledo & Ironton, and which stock, carrying control of the Ann Arbor, was bought by Joseph Ramsey, Jr.

Ann Arbor Railroad.—Farson's Son & Co., New York, are offering $600,000 first lien 5 per cent. equipment notes, series B, dated January 1, 1911 of the Ann Arbor, at prices to yield 5⅜ per cent. on the investment.

Baltimore & Ohio.—In the article on changes in railway ownership and control published in our issue of December 30, we said that the Baltimore & Ohio had sold a controlling interest in the stock of the Valley Railroad Company to the Southern Railway. This we are advised is a mistake.

Canadian Pacific.—This company has increased its dividends from 8 per cent. to 10 per cent. per year by the declaration of a regular quarterly dividend of 1¾ per cent., together with ¾ per cent. dividends declared from land sales. In 1910 the company paid 7 per cent. regular dividends and 1 per cent. extra dividends from land sales.

Carthage, Watertown & Sackett's Harbor.—In addition to the 5 per cent. extra dividend paid December 31, 1910, there was also an extra dividend of 10 per cent. paid in 1909; the regular dividend rate from 1900 to 1908 being 5 per cent.

Cincinnati, Bluffton & Chicago.—This property is to be sold by the receiver at Huntington, Ind., on March 15; the upset price being $800,000.

Cleveland & Marietta.—The directors have declared a dividend of 6 per cent.

Kentucky & Indiana Terminal Railroad.—This is the new name of the Kentucky & Indiana Bridge and Railroad.

Kentucky & Indiana Terminal Railroad.—This company has sold to J. P. Morgan & Co., New York, $5,000,000 first mortgage bonds. The proceeds of the sale are to be used to retire existing mortgages, and the company intends to begin building the new bridge across the Ohio river, between New Albany and Louisville at once.

Metropolitan Street Railway.—A reorganization plan for this company has been filed with the New York Public Service Commission, First district. The plan provides for securities, including new securities to be issued and old securities left undisturbed, to a total amount of about $96,000,000, which is a reduction of about $40.000,000 from the present oustanding securities and obligations. The new securities to be issued are $11,468,000 new fixed charge 4 per cent. bonds, $39,000,000 new adjustment income bonds and $14,000,000 stock. It is estimated that $10,000,000 cash will be required, and this sum is to be raised by an assessment of approximately 17.67 per cent. on the Metropolitan Street Railway stock. The plan does not provide for the participation of the Metropolitan Securities Company, or of the New York City Railway. The plan provides for the participation in the reorganization of holders of personal injury claims, giving them the same terms as the most favored bondholders; no assessment being required of these holders of personal injury claims.

The *Wall Street Journal* says that failure of the Interborough Metropolitan Company, which is the holding company for the Metropolitan Street Railway and the Interborough Rapid Transit, to meet the necessary assessment on the Metropolitan Street Railway stock which it owns, will probably mean the buying in and operation of the Metropolitan Street Railway at foreclosure by Stone & Webster.

National Railways of Mexico.—The gross earnings of the National Railways of Mexico (this company is not shown in our table of monthly earnings and expenses of railways) amounted to $5,247,963 in November, 1910, comparing with $4,946,835 in November, 1909. Operating expenses amounted to $3,041,995 in 1910 and to $3,075,954 in 1909. Net earnings totaled $2,205,967 in 1910, an increase of $335,086 over 1909. Operating ratio in 1910 was 57.97, and in 1909 62.18.

Norfolk Southern.—A special meeting of stockholders has been called for January 30 to vote on the question of making a new mortgage to secure $35,000,000 bonds, the new mortgage to replace the mortgage securing $12,000,000 bonds originally planned under the reorganization. It is understood that holders of nearly, if not fully, 75 per cent. of the stock has indicated approval of the new mortgage, the consent of 75 per cent. of the stock being required to make the new mortgage valid. Of these new bonds, $5,780,000 are to be sold to retire $4,360,000 one-year notes sold in October, and $3,220,000 will be substituted for old bonds in the hands of the trustees which are now held to retire a like amount of underlying bonds. Of the old bonds $9,000,000 were issued ,$5,780,000 being deposited as collateral for one-year and $3,200,000, as noted above, are held to retire underlying bonds.

Reading Company.—It is understood that if the Reading Company makes a bond issue, as is rumored, it will be in connection with refunding the Philadelphia & Reading $18,811,000 consolidated 6 per cent. and 7 per cent. bonds which fall due June, 1911.

Southern Pacific.—The United States Senate has passed a bill to reimburse the Southern Pacific for expenditures made in 1907 in connection with controlling the overflow of the Colorado river. The bill provides for a payment of $773,000.

A press dispatch from Los Angeles, Cal., says that about 15 miles of land along the harbor front, presumably at San Pedro, held by the Southern Pacific and other railways, has been declared public property by Superior Judge Bordwell, in a decision in a suit brought by the Municipal Harbor Commission. It is understood that the Southern Pacific will appeal. The press dispatch says that the estimated value of the land was $5,000,000.

Southern Railway.—See Baltimore & Ohio.

St. Joseph & Grand Island.—Henry Hoffman, J. August Barnard, Willard V. King, Solomon A. Guiterman and George M. Williamson have formed a committee to protect the minority stockholders of the St. Joseph & Grand Island, in the matter of resumption of dividends in the $5,500,000 first preferred stock, of which the Union Pacific owns $1,415,100. George M. Williamson with A. Hickman, No. 37 Wall street, New York, secretary.

Valley Railroad.—See Baltimore & Ohio.

Western Maryland.—William Salomon & Co., New York, are offering $1,500,000 Western Maryland first mortgage 4 per cent. bonds at 87, yielding about 4.70 on the investment. After August 1, 1911, the mortgage securing these bonds will become a direct lien on nearly the entire mileage of the Western Maryland.

Wilmington, New Castle & Southern.—The section of this property between Wilmington, Del., and New Castle, five miles, has been sold under foreclosure to S. Hanford for $100,000.

FOREIGN RAILWAY NOTES.

All freight shipped to Asuncion, Paraguay, must be marked "Transito para Ascunsion," in order to avoid customs duties in Montevideo, Uruguay, and Buenos Aires, Argentina.

The report of the Buenos Ayres Great Southern Railway for the year ended June 30, 1910, show the largest earnings in the history of the company, with the exception of the year previous. The gross earnings were $23,009,620, as compared to $23,247,500 in 1909. This is the first time in sixteen years that the gross earnings did not show an increase over the previous year. This falling off in revenue is directly traceable to the abnormal drought and frosts which prevailed throughout the Argentine Republic and were most disastrous to the crops in the region served by the Buenos Ayres Great Southern. Operating expenses were reduced $72,205 from the year previous, and had it not been for increased contributions to renewal and other funds this reduction would have amounted to $309,875. The net revenue for 1910 was $10,425,860, as compared to $10,591,530.

Supply Trade Section.

F. W. Allen, formerly superintendent of the Buffalo & Susquehanna, at Galeton, Pa., has been made sales agent for the Weir Frog Company, Cincinnati, Ohio.

J. H. Burwell, railway sales agent representing the Seeger Refrigerator Company, St. Paul, Minn., has moved his office from 149 Broadway, New York, to the Grand Central Terminal.

The position of vice-president in charge of sales of the Crawford Locomotive & Car Company, Streator, Ill., has been abolished, and the duties of the office will hereafter be performed by William J. Ball, mechanical engineer.

The Dressel Railway Lamp Works, New York, will furnish a number of 150-candle power oil headlights for installation on Lake Shore & Michigan Southern locomotives in use in the state of Indiana, to comply with the headlight statute in that state.

The Smith locomotive adjustable hub plate, made by The Smith Locomotive Adjustable Hub Plate Company, Pittsburgh, Kan., has been adopted as standard on the Kansas City Southern. It is being tried out by the Delaware & Hudson and the St. Louis & San Francisco.

Charles H. Morgan, prominent as a mechanical engineer and an official of one of the United States Steel Corporation's subsidiary companies, died at his home in Worcester, Mass., January 10. In 1899 he was elected president of the American Society of Mechanical Engineers, New York.

The Lehigh Valley Transit Company, Allentown, Pa., has placed an order with the Westinghouse Machine Company, Pittsburgh, Pa., for one 4,000-k. v. a. turbo-generator set. The turbine is to operate with 175 lbs. pressure, 100 deg. superheat, and a 28-in. vacuum. The generator is designed for 3-phase, 25-cycle operation at 13,300 volts.

D. W. Call, assistant to the president of the American Steel Foundries, Chicago, has been elected president of the Allis-Chalmers Company, Milwaukee, Wis. Mr. Call, who is of Scotch descent, was born near Cleveland, Ohio, and at the age of 17 began his business career in Cleveland. For 23 years he has been engaged in active business life in connection with large manufacturing corporations, both in this country and in Canada.

The Detroit Seamless Steel Tube Company, Detroit, Mich., announces the opening of a branch office at 1333-4 McCormick building, Chicago, in charge of W. E. Marvel, formerly manager of the St. Louis branch of the Buda Company, Chicago. Mr. Marvel will have the title of western sales manager, and will have charge of all western and southwestern business of the company, and also of the Michigan Malleable Iron Company and the Monarch Steel Castings Company, both of Detroit.

The Western Electric Company, Chicago, has this year changed its fiscal year to end December 31, instead of November 30. For the 13 months ended December 31, 1910, its sales amounted to approximately $66,000,000 as compared with $45,000,000 for the 12 months of last year. These sales for 1910 compare with $69,000,000 for the year 1906, which was the largest year in the history of the company. The increase over the past year has been well distributed over the various lines which the company handles. The company during the past year has continued its policy of concentrating the manufacturing at Hawthorne, Ill., and several millions of dollars have been spent there in new buildings. In the latter part of 1910 more new buildings, to cost $1,000,000, were authorized, which will still further increase the capacity of the plant. The company now employs altogether upwards of 24,000 men.

TRADE PUBLICATIONS.

Grip Nuts.—The Grip Nut Company, Chicago, has issued a folder giving valuable information regarding the use of grip nuts in railway service. Figures on the initial economy and amount of service secured from these nuts are clearly presented.

Air Compressors.—The Ingersoll-Rand Company, New York, has published its bulletin No. 3007 on class P B duplex power-driven air compressors. This illustrated bulletin contains 24 pages and gives full information on the advantages of and improvements in these air compressors.

RAILWAY STRUCTURES.

Bakersfield, Cal.—See Atchison, Topeka & Santa Fe Coast Lines under Railway Construction.

Belleville, Ont.—The Railway Commission of Canada has ordered that five piers be used in the construction of a railway bridge over the Moira river at Belleville.

Buffalo, N. Y.—A number of bridges are to be built over Buffalo river in connection with the change of grade work, to be carried out by some of the railways entering Buffalo.

Cape Cove, Que.—See Grand River, Que.

Colima, Mex.—The National Railways of Mexico have let contracts for building new passenger stations at Colma, Iguala and Cuernavaca.

Cuernavaca, Mex.—See Colima, Mex.

Flossmoor, Ill.—The Illinois Central is taking bids on a one-story brick passenger station to cost $10,000.

Galveston, Texas.—Since passage of the ordinance by the City Commission of Galveston closing the necessary streets to allow the building of a union passenger station, preliminary plans have been completed, which provide for a union station to cost $200,000.

Glenn, Ill.—The Chicago & Alton has announced that the location of its new terminal yard 10 miles from Chicago will be known as Glenn, Ill. The yard will cover 295 acres and will cost about $2,500,000. The new yard will take the place of the present terminal at Brighton Park.

Grand River, Que.—The Railway Commission of Canada has approved the plans of the Atlantic, Quebec & Western for putting up a passenger station at Grand River, also for a station at Cape Cove.

Montesano, Wash.—The Northern Pacific will build a passenger station at Montesano.

Ogden, Utah.—The Denver & Rio Grande has completed plans for a new freight and passenger station to face on Twenty-fourth street. Work is expected to begin early in the spring, and the cost of the improvement is estimated at $50,000.

Pullman, Ill.—The Kensington & Eastern has secured a terminal site adjoining the suburban station of the Illinois Central, and plans to build a passenger station at a later date.

Reading, Pa.—The Philadelphia & Reading is said to have approved plans for a new reinforced concrete bridge to be built over their tracks at Penn street, in Reading, to replace the present structure, which has been condemned.

Scranton, Pa.—The city officials and representatives of the Delaware & Hudson, the Central of New Jersey and the New York, Ontario & Western will be asked to consider the question of building a new union station in Scranton. The Central of New Jersey already has under consideration plans for a new station to be built about 15 ft. east of the structure recently destroyed by fire.

Tacoma, Wash.—The Northern Pacific and the Oregon & Washington have made preliminary plans for a double-track bridge to be built over the city waterway at Tacoma. (December 30, p. 1283.)

Watertown, Ont.—The Railway Commission of Canada has authorized the Grand Trunk to put up a new iron bridge to carry the public highway in the township of East Flamboro over the Grand Trunk tracks, to replace the present structure.

Waynesboro, Pa.—The City Council has under consideration the question of building a subway under the railway tracks at Third street, in Waynesboro.

Whiteland, Texas.—The Gulf, Colorado & Santa Fe will build extensive yards at the new town site of Whiteland, McCulloch county. A station will also be built for the joint use of the Santa Fe and Frisco. Work will commence at once and the cost of the station will be about $3,000.

Late News.

The items in this column were received after the classified departments were closed.

Contract will be let at once by the Lehigh & New England to build from Danielsville, Pa., to Tamaqua, 32 miles.

J. W. Leonard, general manager of the eastern lines of the Canadian Pacific has been appointed assistant to vice-president, with office at Montreal, Que.

The Erie, mentioned in the *Railway Age Gazette* of November 11 as having placed some rail orders, has ordered 24,000 tons of rails from the Carnegie Steel Company. The Great Northern is said to have ordered 3,800 tons of rails.

Northern Pacific has made a reduction of 20 per cent. in the freight rates between Duluth and International Falls, effective January 12. The change is brought about by the opening of the Duluth, Rainey Lake & Winnipeg, which has a much shorter line.

The Lehigh Valley has notified the Pennsylvania state railroad commission that it will make rates complying with the law of May 31, 1907. This road had refused compliance and the commission had asked the attorney-general to go to the courts to compel obedience.

Elbert H. Gary, chairman of the United States Steel Corporation, after the yearly dinner, given Wednesday night to steel manufacturers, gave out a statement in which he said that the men present at the meeting agreed that the present prices of steel were "not only reasonable but very low," and agreed in opposing any reduction.

An issue of $7,000,000 of the 5-20-year general lien bonds of the St. Louis & San Francisco Railroad have been sold to Speyer & Co., who are offering them at 87 simultaneously with Speyer Brothers in London, Lazard Speyer-Ellissen in Frankfort, Germany, the Deutsche Bank in Berlin, Teixeira de Mattos Brothers in Amsterdam, and L. Behrens & Soehne in Hamburg. At the subscription price the bonds yield 6¼ per cent.

A press despatch from Lisbon, January 11, says that railway traffic in Portugal has been completely stopped by a general strike of employees; and that at the same time a large proportion of the workers in the stores and warehouses in Lisbon struck. The railway employees had already secured some betterment of their wages and hours, but they want more. Dr. d'Almeida, Minister of the Interior, had been trying vainly to negotiate a settlement for two days. Troops were sent to various places to keep order. There were a few disturbances in some parts of the city.

An advance of 14 per cent. in wages for the maintenance of way men on the Grand Trunk Pacific system has been granted by the conciliation board to whom the matter had been given for adjudication. This is the first decision in three specific cases of demand on the part of maintenance men for increased wages, and a betterment of working conditions, which the conciliation board has been called upon to handle. The remaining two cases are concerned with the men of the Canadian Northern and the Canadian Pacific. Both of these cases, it is expected, will be settled within a fortnight.

Pennsylvania Railroad directors have adopted resolutions to submit to the annual meeting a proposition to increase the capital stock by $100,000,000. President McCrea, in announcing the proposed increase of $100,000,000 in capital stock, said: "The company's needs of this year, to provide for maturing obligations and necessary improvements, require the raising of between $30,000,000 and $40,000,000. It is therefore proposed, should the resolution submitted by the directors to the stockholders meet with favorable action, to make a stock allotment of 10 per cent. at par. It is not the intention at this time to issue any part of the $100,000,000 for which authorization is asked, excepting so much as is necessary to supply this proposed issue of 10 per cent., but the authority is now asked for that the directors may be able to make further issues of stock from time to time in the future as the requirements of the company may make such issues necessary."

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Pittsburgh & Lake Erie is said to be in the market for 24 locomotives. This is not yet confirmed.

The Philadelphia & Reading, it is said, will build 20 locomotives at its shops. This is not confirmed.

The Seaboard Air Line is said to have ordered 10 consolidation locomotives from the Baldwin Locomotive Works.

The Coudersport & Port Allegany has ordered 1 American type locomotive from the Baldwin Locomotive Works.

The New York & Pennsylvania has ordered 1 fifty-ton American type locomotive from the Baldwin Locomotive Works.

The Bingham & Garfield, Salt Lake City, Utah, is said to have ordered 10 locomotives from the H. K. Porter Company. This is not yet confirmed.

The Pittsburgh, Shawmut & Northern has ordered 20 consolidation locomotives and 2 Mikado switching locomotives from the Baldwin Locomotive Works.

The Harriman Lines, it is understood, are negotiating with the Baldwin Locomotive Works for 196 locomotives. The types have not been decided on, so no final order has been given.

The Kentucky & Indiana Bridge Company, mentioned in the *Railway Age Gazette* of January 6, has ordered 2 six-wheel switching locomotives from the Baldwin Locomotive Works.

The Canadian Pacific, as mentioned in the *Railway Age Gazette* of December 30, has ordered 10 switching locomotives, 5 Mallets, 20 consolidation locomotives, and 18 ten-wheel locomotives from the Canadian Locomotive Company, and 10 consolidation and 12 Pacific type locomotives from the Montreal Locomotive Works.

CAR BUILDING.

The Vandalia is said to be making inquiries for 150 freight cars.

The Pennsylvania Lines West have stopped their inquiries for 1,000 hopper cars.

The North Coast has ordered one 70-ft. gasolene motor car from the McKeen Motor Car Company.

The Kanawha & Michigan, as mentioned in the *Railway Age Gazette* of January 6, is considering an order for 2,000 coal cars.

The Seaboard Air Line is said to have ordered 10 coaches and 3 combination passenger and baggage cars from the Pullman Company.

The Northern Pacific has ordered 3 baggage cars and 2 combination baggage and passenger cars from the American Car & Foundry Company.

The Lange Soap Company, San Antonio, Texas, has ordered six 8,000-gal. steel underframe tank cars from the American Car & Foundry Company.

The Great Northern mentioned in *Railway Age Gazette* of December 2, as in the market for 400 hopper cars, has ordered this equipment from the Haskell & Barker Company.

The St. Louis Southwestern, mentioned in the *Railway Age Gazette* of December 30 as being in the market, has ordered 1,500 box cars and 500 furniture cars from the American Car & Foundry Company.

The Baltimore & Ohio is said to have ordered 500 steel-underframe freight cars from the American Car & Foundry Company, and an additional 500 from the Haskell & Barker Car Company. This is not yet confirmed.

The Canadian Pacific, as mentioned in the *Railway Age Gazette* of December 30, has ordered 2,000 freight cars and 750 flat cars from the Canadian Car & Foundry Company, and 200 coaches from the company's Angus shops. It is in the market for 500 stock cars.

IRON AND STEEL.

The Northern Pacific has ordered 600 tons of bridge steel from the American Bridge Company.

The Chicago City Railways are said to be in the market for 15,000 tons of rails. This is not yet confirmed.

The Oregon-Washington Railroad & Navigation Company has ordered 8,000 tons of bridge steel from the American Bridge Company for the double-deck bridge over the Willamette river at Portland, Oregon.

General Conditions in Steel.—There are no indications of improvement in the steel industry at present, but it is generally believed that the bottom has been reached and while there may be further falling off in some lines, the change is likely to be for the better. No reduction in prices is expected.

Cuspidor for Smoking Cars.

The floors of smoking cars and smoking compartments in chair cars are often offensive and unsanitary because cuspidors are not provided, and it is difficult to enforce the order "do not spit on the floor," unless some convenience of this kind is provided. The Modern cuspidor, which is here illustrated, was specially designed to meet this requirement. Its



The Modern Cuspidor.

peculiar feature is in having no top, and the bottom is provided with numerous ribs which extend up level with the top, so that although entirely open one cannot step into it. It will not upset and cannot be kicked over. It can be easily and thoroughly cleaned by turning on the hose. The Modern cuspidor, furnished in brown Japan, is made in three sizes—8 in., 10 in. and 12 in. diameter—and is supplied by Jacob Fitz & Sons Company, Columbus, Ohio.

Edison-Beach Storage Battery Car.

All unnecessary weight is eliminated in this car by using the best materials and designs. Each wheel is as independent as are the wheels of automobiles, and each one is driven by its own motor. Naturally when two wheels are joined together rigidly on the same axle and the car is forced around a curve, the outside wheel travels further than the inside one. Therefore, the inside wheel must slip and grind against the inside rail with consequent increased consumption of power and wear of wheel and rail. The wheels are mounted on roller bearings. Silent chains are used to transmit the power from the motors to the wheels, with consequent quiet running and the absence of all gear noises so common on trolley cars.

The car seats 45, and will hold 100 persons. On each side are two longitudinal seats, the same as in the Hudson & Manhattan tunnel cars. Under the seats are placed the Edison storage batteries—180 in all, and of the A-8 type. A separate set of batteries supplies current for the lights, and these are also kept under the seats. The car will travel 85 miles per charge on the basis of stopping ten times per mile, letting off and taking on passengers. If allowed to run without stops it would probably run 125 miles. The car has reached a speed of 35 miles an hour on a straight and level track.

There are four motors, each of which is rated at 5 h. p., or 20 h. p. in all. The car weighs about 9 tons, and accelerates one mile per hour per second; that is, at the end of the first second after starting, it is traveling at one mile per hour; at the end of the second, two miles per hour; at the end of the third, three miles per hour, etc., until fully accelerated. It is said to consume one-fifth the amount of electricity per car mile that the ordinary trolley car consumes and can be operated on the branch lines of railways at one-eighth the cost of operating a train consisting of a locomotive and one or more cars.

The car is equipped with a Klaxon warning signal on each end, operated by the same batteries that run the motors. They were specially designed for this work, and can be heard as far ahead as the steam whistle of a locomotive. The car is the result of the development in automobiles. It utilizes the roller bearing in the wheels, and is operated by Edison storage batteries, which were primarily designed for operating automobiles. So great have been the refinements in eliminating friction and weight, that whereas the battery equipment in the car will drive it for 85 miles, the same battery in a clumsy, unnecessarily heavy trolley car would not drive it ten miles. The cars are made by the Edison-Beach Storage Battery Car Company, New York.

Improved Lifting Jacks.

The patent granted to Chas. H. Hylander on December 6, 1910, for an improvement on lifting jacks has been assigned to the Duff Manufacturing Company of Pittsburgh, Pa. It prevents the trip lever from permanently dropping in and releasing the raise bar. The standard type of trip jack made by the Duff Company has a lifting capacity of 10 tons. The leverage is compound and double acting, lifting the load a half a notch on both the upward and downward strokes. The load may be dropped from any elevation at the will of the operator by means of the trip lever. While these jacks have given good satisfaction, the makers desired to make them even safer and more reliable; thus the Hylander device was perfected and patented. Attached to the trip lever it prevents the jack from dropping back, and the operator has absolute control of the jack and the load it is lifting at all times. The trip jack is especially valuable in track work, although it is adapted for other classes of work.

The Duff Company manufactures every kind of lifting jack used, and has spent almost 30 years in the development and manufacture of jacks. It is the sole manufacturer of Barrett's automatic lever jacks, the Duff ball bearing screws, Duff-Bethlehem forged steel hydraulic jacks, geared ratchet lever jacks, automobile and motor truck jacks, telescope screw jacks, oil well jacks, pipe forcing jacks, motor armature lifts, traversing bases, etc.

Curtis Train Lighting Turbines for Suburban Service.

The Chicago, Burlington & Quincy, after a careful study of the train lighting problem, has standardized a system for suburban service which is well adapted to meet its requirements. The suburban trains, consisting of standard suburban passenger coaches are lighted by electricity, each coach being equipped with twenty-one 16 c. p. lamps. Four lights are furnished for platform illumination, one for the toilet-room and 16 are placed in the body of the car underneath the deck sash. In the locomotive cab a suitable number of electric lamps are used to illuminate the gages and for portables. The locomotive headlight which has been adopted is a 50 c. p. carbon filament stereopticon lamp, arranged with the usual reflector, and is said to give six times as much light as the oil lamp which is usually used in suburban service. There is a marble panel in the cab of the locomotive equipped with a voltmeter and rheostat, the latter permitting adjustment to meet the varying load on the lamp circuit.

The electric current is supplied by Curtis turbo-generator sets mounted on the locomotives. The sets are iron clad, the covers being fitted with gaskets so that they are storm proof. The turbines take steam at the boiler pressure used on different classes of engines, which varies from 140 to 180 lbs., the governor taking care of these variations. The oil cups are large, making it unnecessary to fill them oftener than once a week. The turbine is direct coupled to a 110-volt generator. In general, operation of these train lighting sets involves only the opening of the steam valves when it is desired to put the turbines in operation, and closing the valves to shut them down. Absolute reliance is placed on the electric lighting equipment, as no other means of illumination is provided. The Chicago, Burlington & Quincy also uses the Curtis turbo-generator for illuminating its through trains.

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THE progress being made in New York City in the abolition of grade crossings was noticed briefly last week. From the report of the commission of the second district, which has since been issued, it appears that in the whole state there ought to be spent this year $6,000,000. The first district commission asks for $600,000; the second district commission for $900,000; and the work for which this money is called for will cost, it is estimated, four times the aggregate sum which is wanted from the state treasury. There are about 9,000 crossings in the state; and, on the very low estimate of $15,000 for each crossing, the complete elimination of these danger spots throughout the state would involve an expenditure of $135,000,000; and it will be seen that even on the basis of the large expenditure proposed by the commissions for this year—the approval of which by the legislature is yet to be tested—the work will take more than 22 years. But progress has been made, as will be appreciated by recalling that when the New York legislature, a few years ago, made its first appropriation for this purpose, the sums granted were such that the time in which it was estimated that the work could be finished was 400 years. The report of the second district says that the amount thus far paid out by the state treasurer on this account is $1,027,831.

PROBABLY typical of conditions in the other five New England states is the census report for 1910 on farm conditions in New Hampshire; and, in a period not remote, it may have an important bearing on the business of the eastern railways. The number of farms in New Hampshire during the decade 1900-1910 decreased from 29,324 to 26,913, or 8 per cent.; but during the same time the value of farm lands increased from $70,124,000 to $85,542,000, or 22 per cent., and of farm implements from $5,163,000 to $5,870,000, or 14 per cent. This was in a state with no large cities and few large towns, and the population of which was almost stationary, rising in the decade from 411,588 to 430,572, or only 4.6 per cent. Here certainly is a suggestion of the dawn of better times on the New England farm—in which the railways must share—and ordinary observation and inference go to confirm the figures. They tell us of new wealth, city-made, taking up the old "abandoned" farms; of easier conditions of farm life due to such forces as the telephone, rural free postal delivery and the coming free rural parcels post; of steadily higher results of rural scientific cultivation—especially in fruit products—under the urgency and instruction of the state agricultural bureaus; and of such incidental evidence as a world's record of an acre of corn in Massachusetts and the many millions of dollars that measure the value of the potato crop of Aroostook county, in Maine. New farm distances from the railway are short, lands still cheap, and natural transportation vantage to the large cities of the East great as compared with the distant West, Northwest and the Pacific slope. The emergence of the New England farm as a railway feeder from the shadows of the long competition of the West must necessarily be slow. But manifest destiny already begins to point to enlargement of its limited freights of hay, potatoes and dairy products to others, with beef and even some of the cereals as ultimates. The situation during the coming decade forecast by those of the past one will be worth the attention of the eastern railway manager whose eye has hitherto been focused on the New England factory.

THE upward curve of railway taxation in the country is strikingly outlined by the returns of the Inter-State Commerce Commission for the first quarter of the fiscal year beginning June 30, 1910—that is to say of the fiscal year 1911. On a basis of an increase of only 1.5 per cent. in average mileage operated, railway taxes have increased from $24,367,510 to $26,815,072, or a little more than 10 per cent. That quarter was one of decidedly increased railway gross earnings from all sources, which rose from $703,700,014 to $745,134,204, or about 6 per cent. Gross operating earnings have been often suggested by authority as a fair basis of taxes and if they hypothetically be accepted as such, the difference of 4 per cent. in the ratio of increase, as compared with taxes still remains conspicuous. Compared with net operating earnings for the quarter the contrast becomes almost lurid. Those earnings fell for the quarter from $266,447,485 to $256,866,900, or about 4 per cent., with a divergence of 14 per cent. from the tax ratio—and, as a measure of a railway's *ability* to pay an additional charge is not the net a better test than the gross? The factor lacking in the figures of the commission is, of course, the fixed charges exclusive of taxes, but taxes are a prime and fundamental fixed charge, the great and disproportionate increase of which continues in the present period with the other heavy burdens which high prices, wage increases and federal and state administrative authority are loading on the railway corporations. The worst of the situation is the obliquity

of the public vision in the matter during our epoch of regulation, present and prospective. How many of our states and their citizens realize not only the absolute size of the railway taxation they profit by but its increment? Where, as to its budget, not to mention a commonwealth like New Jersey, would a state like Connecticut be where the railway taxes pay almost half of the state's annual expenses? And, all the while, it is the corporation that fills the public eye, not the stockholder who bears the final burden and whose rights as to just taxation are identical and co-equal with those of the owner of a dwelling or a shop.

THE EFFECT OF HIGH TEMPERATURES ON LOCOMOTIVE CYLINDERS AND VALVES.

With the rapidly increasing number of locomotives fitted with superheaters and the tendency to use steam at higher temperatures, it is important that more attention be given to the effect of high temperature on the cylinders, valves and other cast iron fixtures which are in contact with superheated steam. Experience thus far in this country has been largely with low or medium degrees of superheat, and where highly heated superheat has been used some difficulty has been found with broken cylinders, warped slide valves and rapid wear of the cylinder packing rings. The various smokebox superheaters of American design increase the temperature 25 to 75 deg. Fahr., giving a total temperature of 452 deg. Fahr. with steam at 175 lbs. pressure. The fire tube superheaters increase the temperature on an average 150 deg., giving a total temperature of 527 deg., or say, 550 deg. with higher steam pressures. In German practice, with either the smokebox or fire tube superheater, the increase in temperature is about 250 deg., giving total temperatures of 600 to 650 deg. This is regarded as highly superheated steam.

These figures must be regarded as an average of widely fluctuating temperatures, and, except when running under uniform conditions as to speed and train resistance, the temperature of the steam will often be much lower and occasionally considerably higher. Tests show that it takes some time after starting from the terminal before the desired degree of superheat is obtained, and that there is a drop with each stop and a further fluctuation of the steam consumption with changes in the speed. After the elements are well heated by a heavy fire and with the throttle partly closed, a smaller volume of steam will pass through the heater tubes with a superheat of above 150 deg. or 200 deg., making a total temperature of 600 deg. After a stop the elements cool off, and when steam is again admitted to the cylinders it may almost be in a saturated condition, thus giving a total fluctuation in temperature of about 200 deg. Fahr. It is this fluctuation in temperature that is likely to cause the most damage to cast iron fixtures of locomotives unless they are especially designed or are made of suitable composition.

Some interesting testimony on this subject will be found in the transactions of the American Society of Mechanical Engineers, 1909, Volume 31, page 989, Symposium on the Effect of Superheated Steam on Cast Iron, consisting of three papers and a discussion covering 50 pages. Among the more important conclusions are the following: (1) "Cast iron varies its behavior under high temperatures, starting from about 450 deg. Fahr., and in many cases it deteriorates in structure and strength to a marked degree. The change of structure or deterioration is much increased by fluctuating temperature." (2) "When the temperature is constant, even though it is as high as 600 or 700 deg. Fahr., the change in cast iron is not serious, but where it varies considerably the metal is certain to develop cracks and distortions that render it unsuitable for steam pipes and other parts under steam pressure." (3) "Cast iron of certain chemical constituents increases materially in volume when subjected to fluctuating temperatures above 500 deg. Fahr. The chemical composition of cast iron has a material bearing on the change of shape and volume and on the development of imperfections."

The effect of unequal heating of metal has been investigated by engineers in the French navy, and the theory advanced seems reasonable and is confirmed by experience. Briefly stated, it is this: When one side of a piece of metal is heated to a higher temperature than the other, the hot side tends to expand and the expansion is resisted by the metal on the cold side. This puts the metal on the hot side in compression and that on the cold side in tension, and if the temperature difference is great enough the metal will be strained beyond the elastic limit. When the hot side is allowed to cool it is shorter than the cold side, because of the strain beyond the elastic limit which has been undergone by both sides. This results in the piece taking a permanent set or becoming bow-shaped away from the side that has been heated. Other testimony presented in the same article shows considerable evidence indicating that gray cast iron subjected to changing temperatures from 450 deg. Fahr. and up gives evidence of an oxidation of the silicon present, forming silica in a micro-crystal form, which upon cooling causes the disintegration of the surface exposed ranging generally along the planes of the graphite, changing an apparently solid wall into one showing many cracks. It is the constant recurrence of these conditions, produced by changing temperatures, that in time not only produces growth but breaks down the structure of the metal.

While these quotations are not intended to create alarm or distrust regarding the superheaters now in use, it is well to call attention to the opinions of engineers who have had a longer experience with superheated steam in stationery and marine service. With the use of superheated steam in locomotives in Germany it was recognized from the first that unequal expansion of cylinders and valves, due to the higher temperatures, would require special designs for these parts, and they were worked out successfully. Our own locomotive builders have given attention to this in their designs of cylinders, and care is taken to make an almost entire separation of the piston valve chamber from the cylinder walls. When highly superheated steam is to be used, it will be found necessary to give more attention to the design of the valves and especially to the packing rings for both valves and cylinders. The composition of cast iron for such purpose is also important, the indications being that high silicon should be avoided and the percentage of this element, especially in parts subject to wear, should not average above 1.50 to 1.75.

The report on superheaters, read at the 1910 convention of the American Railway Master Mechanics' Association, states that the New York Central, with the Cole and Vaughan-Horsey superheaters, uses a special mixture for piston and valve packing rings, and other roads report the life of these rings less than half that obtained when saturated steam is used. The packing rings for piston and valve rods for medium superheat are also made with a higher melting point than those for saturated steam.

The general impression is that the Canadian Pacific is using highly superheated steam in a large number of engines, and that they have not experienced the difficulties due to high temperatures which we have referred to. We have an interesting letter from Mr. Vaughan in this connection, from which we quote a portion to give a better understanding of the Canadian Pacific's experience with superheated steam:

"We have only had one locomotive which really used high superheat. Most of our engines do not exceed 550 deg. Fahr., with perhaps 580 deg. as a maximum; whereas the Schmidt Company has largely advocated about 650. I have always thought that we were using medium superheat, and we have done this not so much because we believed in it or objected to the use of so high superheat, as on account of our failing to get high superheat with the arrangement of fire tube superheaters that apparently proved most satisfactory. With the temperatures we have worked on, which you may say are in the neighborhood of 550 deg. Fahr., we have not experienced any trouble whatever in connection with the cast iron. Our superheater headers, steam pipes and cylinders are cast iron, and while in our

earlier designs we did have a number of failures on account of the cast iron headers cracking, we were convinced that it was because of poor design; that was fairly well demonstrated by headers of a modified design giving no trouble. I think it is safe to say that we have had cast iron headers in use for over five years without experiencing any difficulty from their failure, which, it seems to me, shows that any difficulty experienced on this score is as much a question of design as material. On the engine fitted with the Schmidt superheater, in which very high temperatures were sometimes obtained, we have had trouble with broken cylinders, but I am not in a position to say whether this was due to any deterioration of the iron or to the design of the cylinders.

"Anyone having trouble with cylinders had better look to the foundry practice and to the design of the cylinders. I should feel that the defects are being ascribed to superheated steam largely from the general tendency to always blame any new thing for anything that happens. With superheated steam at 550 deg. Fahr., or thereabouts, we have had sufficient experience to show that in case of any trouble it would be as well to look to the design and material first before assigning the cause of the defect to superheated steam."

The important conclusion to be drawn is that it would not be wise to use medium superheat with a total temperature of 550 deg. Fahr. on old locomotives with flat slide valves and ordinary design of cylinders. Where it is desired to use highly superheated steam—600 to 650 deg. Fahr.—special attention should be given to the composition of the cast iron in the cylinders, valves and packing rings, and to the design of these parts, so that they will not be warped and the wearing surfaces injured by the wide range of temperature to which they are exposed.

NEW BOOKS.

Proceedings of the Forty-fourth Annual Convention of the Master Car Builders' Association. Atlantic City, N. J., June 15 to 17, 1910. J. W. Taylor, secretary, 390 Old Colony building, Chicago.

The noticeable feature of this volume is its unusual size. It contains 853 pages, not including the large number of drawings and tables. The book is 2½ inches thick; half an inch is occupied with illustrations of standards, and another half inch with text describing them. The standards, therefore, take up space equivalent to a volume an inch thick. The report of the Lake Shore emergency brake tests occupies 110 pages, and, in addition, the cuts illustrating it require ¼ in. It is a question whether the drawings of standards and their description in the text should not be bound in a separate volume, leaving the main proceedings to make up a book of moderate size, with opportunity for the inclusion of any unusually long report without producing a bulky volume. Many of the standards remain the same year after year, and the slight changes which are made each year could be issued as a supplement to the proposed separate volume of standards, issued at intervals of three or five years. There would thus be not only a large saving in the cost of publishing the proceedings, but in the space they occupy in the library; the inconvenience of handling a large, heavy volume would be avoided. When books become so large the ordinary binding is hardly sufficient to hold them together if they are subjected to much rough use. The proceedings are well printed and edited.

Proceedings of the Forty-third Annual Convention of the American Railway Master Mechanics' Association. Atlantic City, N. J., June 20 to 22, 1910. J. W. Taylor, secretary, 390 Old Colony building, Chicago.

The report of the Master Mechanics' Association fills a volume of 600 pages. A large portion of it is taken up with tables and diagrams relating to the Lake Shore emergency brake tests and a long report of the committee on superheaters. Other reports of unusual interest are those on mechanical stokers, safety valves, rules for the inspection of locomotive boilers and a report on the proposed consolidation with the Master Car Builders' Association. The proceedings are well edited and printed, and are substantially bound in the usual style.

Letters to the Editor.

TIE PLATES AND TIE DECAY.

PITTSBURGH, PA., December 20, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The assembly in your issue of December 9 of the opinions of so many engineers on so many different railways on the important subject of the use of tie plates in railway construction, is a tribute to the enterprise and industry of your journal in collecting news and information. The illustrations show very fully the many different forms now in use, but of course the quotations given from the different letters received are necessarily limited by the amount of space in your paper that you could devote to this subject without encroaching on the space required by other departments of your work. It seems possible that in the condensation this required there may have been points omitted or overlooked which might have shed a little more light on the subject. In your editorial on the subject you say:

"For preserving gage some sort of bottom projection is considered necessary, and the details illustrated are the result. Some believe that a very slight projection is sufficient, while others favor deep knife edges. When placed across the grain the effect is no doubt bad, for the wood fibers are cut and decay is hastened. Longitudinal ribs are better, for they merely press the fibers apart, but if too close together and too deep, they have been known to cut out blocks of wood from the top of the tie, the deep ribs holding the wood firmly and shearing off the fibers at the bottom edges. With the use of screw spikes the plate with the smooth bottom is apparently sufficient."

Your statement that "when placed across the grain the effect is no doubt bad, for the wood fibers are cut and decay is hastened," is, to say the least, a very doubtful proposition, and one upon which there is a great diversity of opinion. Among your correspondents there are many who are using millions of tie plates which have sharp claws on the bottom which cut across the fiber of the tie, and, while they may not be an entirely perfect device for the purpose required, nevertheless they perform the required function better than any other device at present on the market. If your dictum as stated by you is correct, it would rather appear to be somewhat of a reflection upon the judgment and intelligence of the engineers responsible for the use, at an increased cost, of a device which you pronounce to be without doubt "bad."

In almost every kind of wood construction it is necessary to cut wood across the grain, but in such cases we hear nothing of it being bad or hastening decay. What does prove bad, both in cutting across the grain and longitudinal with the grain of the wood, is when the cutting is done with a blunt instrument which mutilates the fiber. When this is done, the mutilated fiber is, when wet, rapidly reduced to a condition of pomace, which by inaccurate observation might be mistaken for decay.

The best answer to be found to the proposition that cutting across the grain of the tie is deleterious to its life is, that all the rails on all the railways of this country, with infinitesimal exceptions, are held in place by a device of this kind, viz.: the hook headed railway spike, which has kept its place in railway construction ever since the commencement of the railway era, notwithstanding the numerous attempts made to displace it. It is not claimed that it is an ideal fastening, as there may be a better one produced in the future, but take it all around, with its many imperfections, it has given the best results of any device used for this purpose up to date, and while I have had 28 years' experience in the design and manufacture of tie plates and spikes, supplemented by close observation of their results and effects when used in track, I can safely say that while I have seen much mutilation of fiber of ties, resulting from inferior timber, blunt cutting edges, and strain beyond the capacity of the timber to resist it, I have never yet seen during this time a case in which the tie was decayed around the spike hole or aperture left by the claw, and sound outside of it.

I trust that you will review the correspondence you have on this matter, and determine to what extent you were justified in

making so sweeping a statement as that the effect of cutting across the grain of the fiber of the tie hastened decay.

WILLIAM GOLDIE.

[Our statement referred to ribs extending several inches along the bottom of the plate, rather than to lugs, such as those of the Goldie plate. In discussing the destructive effects of projections driven into wood, we would hardly compare lugs 1 in. wide with ribs running the full width of the plate, as ribs parallel to the grain generally do. Timber men have generally accepted the belief that cutting wood fibers across hastens decay more than cutting them lengthwise or forcing them apart. In most woods the cells are long and narrow so that many more cells are exposed (and so admit moisture) in a given area of tranverse section than in the same area of radial or tangential section.—Editor.]

THE SUPPLY DEPARTMENT.*

BY H. C. PEARCE,
General Storekeeper, Southern Pacific Company.

III.

FACILITIES.

Facilities are always a necessary part of the economical operation of any plan, but we must adapt ourselves to conditions as we find them, and usually good facilities come gradually and not in proportion to the requirements. Therefore it is of much greater importance that we have an organization, for if we have the organization we can do business even without facilities.

This can be illustrated by one instance. At Sacramento, on the Southern Pacific, an average business of between nine and ten million dollars a year is done; that is to say, about that amount of material is received and disbursed. The largest store building is 60 ft. × 140 ft. It was built 30 or 40 years ago, yet the organization is such that any material maintained there that is not delivered and on its way within 24 hours from the receipt of the requisition is treated as delayed and disciplined accordingly. The cost of operation will compare favorably with other well regulated stores, and is 50 per cent. cheaper than on many railways where this work is not under one department. The really efficient organization is the one which can deliver the goods whether they have the facilities or not, and get facilities as fast as possible.

As stated in a previous chapter, the ideal location for a general store is at the gateway of the property, and located at the principal manufacturing shops. Or, in other words, it should be as close to the market as possible; and the company's shops being its best market, it should necessarily be there. An economical lay out for a general store is shown herewith. Many supplementary facilities and details can be added to this; but the general outline of the arrangement as here shown would, to the writer's mind, present an ideal arrangement for the prompt and economical handling of most material.

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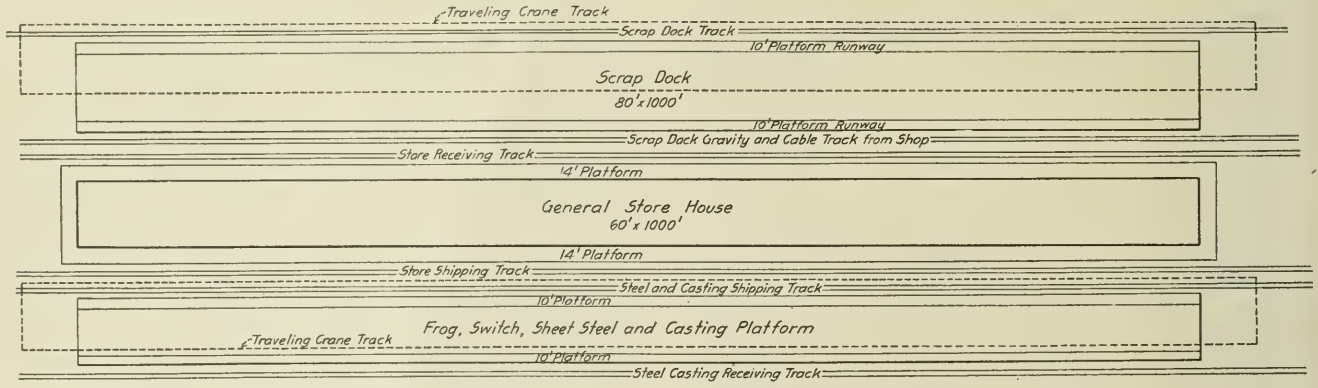
Locomotive cranes equipped with generator and magnet for handling scrap, when not in use for other purposes, are recommended for all general work, for the reason that in addition to answering the purpose of handling all heavy material by power, these cranes can be used for yard switching and moved conveniently around to different places where needed.

There should be located on every division a well-equipped division store. Sub-stores will have to be maintained locally in connection with the oil houses at roundhouses and car repair stations. In all instances enough ground can be cleared off to lay old car sills, on which to erect racks and platforms sufficient to segregate materials. There should always be a shed to protect lumber and materials which might be damaged by exposure.

If I were to say what one facility I consider most important for the proper handling of material, it would be space, and this is always available. The storekeeper who offers as an excuse for the mixed-up condition of material that he has no storehouse or place to put it never will be a storekeeper, no matter what facilities are furnished him.

SCRAP DOCKS.

Probably one of the most necessary facilities for handling scrap, surplus and obsolete materials is ample and sufficient trackage and docks for sorting, receiving and shipping. There should be one general assembling dock located at a point on a system where most of the scrap would naturally accumulate. This would, of course, be at the company's manufacturing plants, where everything possible will be used in its industries, rolling mills, foundries, etc., and everything available worked over for future use. If possible it should be situated at a point as close to the company's source of supply as the road will permit; in other words, at the gateway. It is, of course, necessary to have local scrap docks at the division shops, but the general scrap docks are of first and greatest importance.



Typical Layout for General Store.

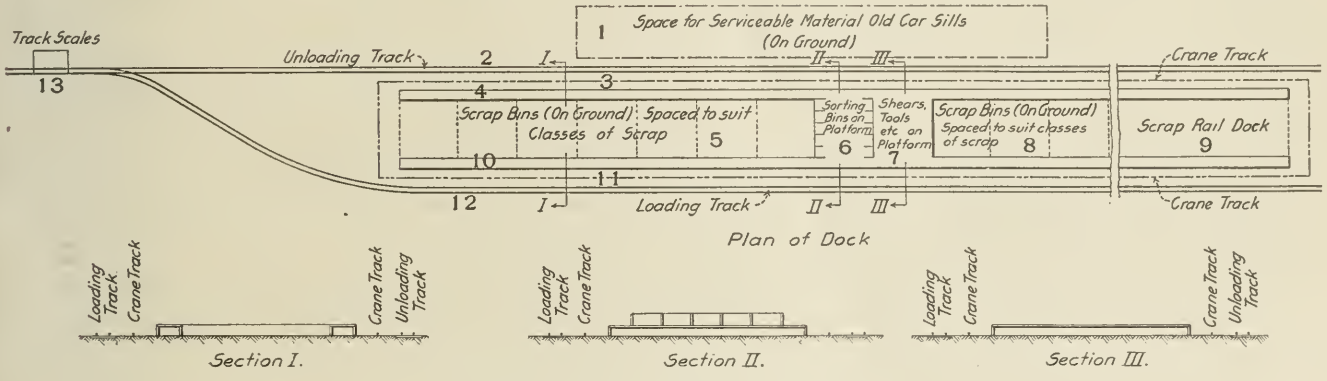
In arranging them the first consideration must be room and trackage, for they must be available by ample track facilities for economical and prompt switching. A modern, general scrap dock with modern appliances is shown herewith. It provides for using electric magnets, either with a locomotive or a gantry crane. The idea is that with the use of the magnet it is not necessary to have docks for the scrap. This expense is thus saved, and the additional room made available, but for sorting it is necessary to have a platform. The magnet picks up the scrap and the operator spreads it over the surface of the dock when he releases the current, thus enabling the men more quickly to segregate the material than they could by picking it out of the pile. The opposite side is utilized for assembling usable material recovered from the scrap. Located here are the shears, hammers, bolt cutters and other necessary tools for working over and making usable such material as can be recovered; at the same time it is all piled up and made accessible for use.

In laying out this plan the writer had in view the use of traveling cranes for loading and unloading, equipped with

generator set and electric magnet. Much money is now lost in handling scrap, in fact a great many roads are actually spending more money in handling and recovering scrap, etc., than it is worth, and unless the very best facilities are provided, and a permanent and efficient organization is maintained solely for the purpose of handling scrap, these losses will be very considerable. A great saving in handling scrap is the good material that is recovered, and no matter how careful men are along the line, at outside and division points, in sorting and handling scrap there is bound to be a large quantity of serviceable material loaded and shipped in as scrap, so that a second or third sorting is necessary. This has been clearly proven by accurate records.

DIVISION DOCKS.

The plan of the docks at division shops must be determined very largely by the conditions and location of the shops and car repair yards, and it must be taken into consideration in laying out these docks that the cost must be figured from the time of the first removal of the scrap. The docks or bins should be located as conveniently as possible to the shops, at the same time being made accessible by tracks, and so arranged that the miscellaneous scrap made in and around the shops can be de-delivered directly from the machine or pits, either by wheel-barrows or by tram cars, with the least possible expense. Scrap coming in from off the division can in many cases be loaded



Arrangement for a General Scrap Dock.

1. Space for serviceable material made from old car sills on ground. 2. Unloading track full length of dock and rail docks. 3. Track on ground for gantry electric crane. 4. Platform 8 ft. wide full length of docks, height of car floor. 5. Scrap bins; no timber used; scrap piled on ground, and spaced to suit various classes of scrap. 6. Sorting bin; on platform about 50 ft. square with 10 small bins, built height of car floor. 7. Platform about 50 ft. square for shears, tools, etc., used for cutting scrap, etc. 8. Scrap bins; same as No. 5. 9. Scrap rail dock; used for rail, fireboxes, boilers, etc.; crane to run full length. 10. Platform, same as No. 4. 11. Track, same as No. 3. 12. Loading track. 13. Track scales. Note.—Scrap dock to have gantry electric crane, 5-ton capacity, at least 50 ft. from leg to leg, with 18-ft. cantilever each end.

in such a way that it can be billed straight through to the general assembling dock, but in many cases this is not possible and should come to the division docks, where it should be sorted over and reloaded. The purpose of this is to give the division the benefit of serviceable material which may be found, and to encourage division officers to exercise greater care in the removal of material that may be used again.

The accumulation of scrap in the car repair yards usually can be loaded up directly from the ground to the cars and shipped to the general assembling docks. Where any considerable quantities are accumulated, bins can be located at convenient points, and the scrap segregated into them in order to keep the tracks clear. About once a week these bins should be cleaned up with the crane and magnet.

The crane and magnet can be utilized, as explained in another chapter, for loading scrap at division points. About every week what there is on hand should be loaded and shipped to the general docks, or for sale, as the case may be. A careful record should be maintained at both division and general stores of the cost per ton of handling scrap of different classes, and a detailed statement in dollars and cents of the material recovered from the scrap should be made up monthly and sent to the general storekeeper.

The scrap docks on our railways are doubtless the best source of education for men engaged in buying and handling material. Here is where we find the results from actual service tests. Here our operating and maintenance officials can teach their men valuable lessons in real economy. They can see the enormous amount of available and usable material which has been removed, either from the track or equipment, that probably, in most cases, could have served its purpose for a longer time. It is apparent that if this material is serviceable at all it could have given its best service where it was. Not only should the loss of material be considered, but the labor connected with replacing it. The truest economy is never to remove anything until it has entirely outlived its usefulness. The volume of usable material recovered from our scrap docks is a living evidence of extravagance, and a campaign along this line, and with this evidence, will bring real results.

SUPPLY CARS.

The supply car is the connecting link between the division store and the users. Here let it be understood that the storekeeper is responsible for all unapplied material, that it is in his stock until it is put in use, and that he is responsible for it until it is actually applied. Each division should be equipped with at least two supply cars, and as many more as the requirements may demand, one car equipped with the necessary tanks for handling and distributing the oil, the other equipped with the necessary shelving to segregate the miscellaneous supplies required. These cars should be of 50,000 or 60,000 lbs. capacity, equipped with 4-wheel passenger trucks, steel or steel tired wheels, heavy underframes, and reinforced draft rigging. One of the cars should have two berths, toilet, a small desk, and, when necessary, a cook stove and small commissary for feeding the men. The oil car should be equipped with both air and hand pumps, the air to be used wherever it is necessary to draw any large quantity of oil, and at the same time the hand pumps can be used for filling smaller orders. The air may be taken from the train pipe and reduced by reducing valve.

In addition to the regular supply cars, as many ordinary cars may be taken as the demands require; for example: a car for spikes, bolts and other track material, a car for available stock, and as many cars as necessary to pick up the scrap and obsolete material which will be offered.

These cars operate over the division on a schedule prepared by the superintendent several days in advance of their movement. This schedule shows the dates and train numbers governing their train movement over the division. These schedules are placed in the hands of all concerned: i. e., trainmasters, yardmasters. division engineers, roadmasters, section foremen, agents, signal supervisors, signal maintainers, pumpers, etc., who are required to be on hand to receive and deliver their material. On the days on which these trains are due, the section foremen and section men are detailed to work inside the station grounds

so as to be able to meet these cars and receive their supplies, and load all surplus and scrap material and tools which they may have on hand. This is assembled at their tool house convenient for loading as soon as the cars are spotted.

The requisitions, after being approved by the proper officials, are turned over to the division storekeeper before the car starts out, who is then in a position to know approximately what stock to put on them. These requisitions are then arranged in station order on clip files and placed in the hands of the supply car storekeeper. The division storekeeper accompanies these cars, with as many of the other division officers are possible, and the roadmasters over their respective districts. The division storekeeper delivers on the ground what he finds to be actually required, with the approval of the division officers on the ground at the time, irrespective of what the requisition calls for, and takes receipt for same on the face of the requisition.

The receiver of tools and other materials is required to return old tools and parts as vouchers for the delivery of the new. These tools and parts are either repaired and made available again, or scrapped. He is also required to turn over all surplus and obsolete material of every kind which he has picked up during the month on his section. The tool house is checked against the standard list of tools, and any surplus or obsolete tools are taken up. He is also allowed to draw additional tools or material which may be found on examination to be necessary, in order to meet the requirements which exist at that time. Gasolene, distillate, etc., are delivered in like manner, and receipts taken. All old material, scrap, etc., delivered is receipted for, and credit allowed the proper section from which it was received.

These cars are required to deliver substantially everything that is used in ordinary maintenance and operation in the way of agents' and section supplies, pumpers' supplies, signal material, and in fact everything with the exception of lumber, which is shipped from the general material yard. They are also required to pick up all scrap, obsolete and serviceable material of every kind found on the right of way, and in and around stations. At the same time a thorough inspection is made of all buildings, and at stated periods the general storekeeper and the superintendents accompany these cars and make a thorough personal inspection of the division. As soon as a carload of scrap or available material is made up, it is billed back to the division or general store, as conditions may determine.

It requires four or five days to cover an ordinary division. The balance of the month these cars are engaged in making deliveries on specified dates to the sub or local stores, roundhouses, car repair yards, etc. The cars go on local freights and are set out at sub-stores, roundhouses and car repair stations. The material is actually delivered by the supply car storekeeper to the local storekeeper. The oil storage is filled from the cars with the air arrangement described above. All surplus, obsolete and scrap in and around the shops and storehouses is picked up and taken back.

In this way a thorough inspection is made of each local repair point each month, and there is absolutely no excuse for surplus material being maintained at these points. The supply car storekeeper, representing the division storekeeper, will see that it is all picked up and brought in, as well as lending whatever assistance may be necessary in delivering and arranging the material that may be required.

These cars have been found of the greatest service; in fact they have, to a great extent, solved the most important question connected with the handling of material; that is, its delivery and the keeping of the road clean of unnecessary and useless material that has been assembled by employees because of uncertain deliveries. These cars are further used for delivering material to large jobs, and going to points where work has been under way and material left over, and picking it up and bringing it in.

(To be continued.)

STUDIES IN RAILWAY ECONOMICS.

BY W. M. ACWORTH.

III.

I promised to revert to the question whether private railway management tended to exact from the trade of the country excessive dividends. Excessive dividends might, I think, fairly be defined as being a return on the capital beyond that given by other undertakings involving corresponding risk. The question may be of some theoretic interest, but is almost without practical importance. For the concrete fact is that there is only one country, and that a country not of private ownership but of state management, Prussia, whose railways yield a return which is excessive according to the definition given above. I leave out France, where a fraction of the total capital raised two generations back yields 10 per cent. and upwards of its nominal par value, but something like 40 per cent. on its modern quotations, while the great bulk of the capital has been raised by bonds with a state guarantee. But if we take the great countries of private enterprise, England, the United States, and Argentina, it will scarcely be argued that the return on capital is excessive. It is true that particular railways have been and are exuberantly prosperous, but the prosperity of the exceptions has been a bait that has attracted into railway construction the vast masses of capital that have received only an average, or a less than average return. On the whole, there is no country where private railways have received, or seem likely to receive, excessive dividends. If there were any serious prospect that the average English dividend would go up to 7 per cent., or 8 per cent., or 9 per cent., the argument that this surplus above normal ought to go to the community that created it and not to private shareholders would have considerable weight. But, as there is no prospect whatever of anything of the sort happening, it is really not practical business to make provision for it.

If then, private companies do not earn excessive dividends, which under a state system might be available for reduction of rates, how can state ownership fulfil the common expectation and reduce rates? Will the state operate more cheaply than a private company? To ask the question of Anglo Saxon readers seems almost the same as to answer it oneself. Does anyone seriously claim that a state organization is more flexible, more accessive to new ideas than a private company? Does anybody suppose that English or American government railways would be exceptionally ready to introduce new methods, to welcome new inventions, to adopt new labor saving appliances? Labor saving appliances are supposed to imply the saving of labor, and this means dispensing with the services of men who are probably meritorious, and almost certainly voters. We all remember the story of the London Vestry which bought horse brooms and then abandoned their use because a number of scavengers objected to being dispensed with. There is no reason to blame either the vestrymen or their surveyor, or to suppose that they were sinners above all that dwelt in the metropolis. The thing is inevitable and the difficulty must be faced, at any rate as long as state railway officials have wives and families to support.

Much the largest item in the cost of operating a railway is the wages of the staff; and that these wages would be higher in proportion to services rendered under a state than under a private system is surely undeniable. Does one doubt, for instance, that in England postmen as a class owe the very large increase in their pay and decrease in their work of recent years to the organized political pressure they have brought to bear on Members of Parliament. Once more, there is no need to blame them. One may even admit that it is right that the state should be an ultra philanthropic employer. For the present purpose it is sufficient to point out that, if wages under a state system eat up a larger share of the receipts than under private management, there is so much less net revenue available for other

purposes, whether those purposes be increase of profit or reduction of rates.*

One change would certainly come under a state railway system. Under the existing system in England, and even more in the United States, every new recruit literally carries a field marshal's baton in his knapsack. Under a state system one cannot doubt that in England at all events we should have the rigidity of civil service rules: a first division recruited solely from the highest educated classes, and a second division with practically no hope of ever rising beyond subordinate positions. Personally I confess to thinking that the new first-class civil service would probably be more inclined to scientific methods and less inclined to worship the great goddess rule of thumb than their predecessors, and so far that would be, to my mind, an advantage. But we have to recognize that to close one of the main avenues still left, by which a young man without money and without influence can work his way up to a high position by sheer force of his own ability, character, and hard work has serious disadvantages, not only to him, but to the state.

I come then to the conclusion that neither from a surplus taking the present form of excessive dividends, nor from economies that can be reasonably expected in operation, is there any fund available which state management could use to reduce rates in the public interest.

One naturally asks further what rates would be reduced and what is the public interest. We may divide, as it seems to me, reductions of rates into two classes, those that will pay the railway and those that will not. By a reduction that will pay the railway we must understand such a reduction as within a reasonable time will so stimulate the traffic in connection with the article on which the rate is reduced, that the net revenue of the railway from the larger quantity at the lower rate will exceed the revenue previously derived from the smaller quantity at the higher rate.

Now reductions of this kind we are entitled to expect from private management, for they are in the interest of the railway itself. If the railway does not make them only two explanations seem possible: either the manager does not understand, or does not take the trouble to attend to his business. We have already agreed that the private manager is likely to be just as expert as the state official; I think we shall also agree that he is even likely to be "fired," to use the somewhat brutal American phrase, if he is careless or lazy. It must, however, be admitted that there may be some reason why reductions that ought to be made are not made. I have defined a reduction that ought to be made as one that will pay within a reasonable time. Now it is clear that the state is longer lived than the individual shareholder, and, therefore, that the time which is reasonably short for the state may be unreasonably long for the shareholder, depending on half yearly dividends. This seems to be a point in favor of state ownership, but, also, once more it is a theoretic point only. All railway history shows that the really great reductions have been made not on state but on private lines. To what country would any student of railway history point as the salient example of steady and rapid rate reduction? Surely the United States of America. And to what country would he point as the salient example of cast-iron rigidity? Equally surely to the kingdom of Prussia. It may not be fair to say that the Prussian rates have been kept up, in spite of a rapid increase in population and an enormous increase of traffic density, because the Prussian railways are in the hands of the state, and that the French rates have been substantially reduced, in spite of a stationary population and a much smaller and almost stagnant traffic density, because the French railways are in private hands. But the facts remain, and they are sufficiently significant to justify a distrust of *a priori* arguments.

Or, again, we read from time to time panegyrics of the state railway system of Australasia, and we are told in glowing terms how they reduce rates to encourage population and to stimulate development in a way which could only be done by a public undertaking. And then we consider the matter in the cold light of statistics, and we find that, with negligible exceptions, up to comparatively recent times the Australasian railways have not earned sufficient net revenue to pay the interest on their debt and, therefore, such rate reductions as they have made must have been made at the risk, if not actually the cost of the general taxpayer. And how far it is wise and just to subsidise railway passengers and consignors, who after all are very far from being the whole population, at the expense of general taxation is a very difficult question.

But this is not all. The claim made on behalf of Australasia naturally leads us to compare the railways of that continent with privately owned railways elsewhere, and I think a comparison between the Australasian states and the state of Texas is not unfair. The railways in Texas have never been a burden on the treasury of the state; yet they seem to give to the community that they serve at least as good a service; and, though railway wages are certainly not lower, a cent will buy at least as much freight service in Texas as a penny in Australasia. And, if it be a question of the development of the increase of wealth and growth of population it will hardly be argued that the country with state ownership can claim the advantage.

Regarding economy of operation, a comparison between France and Prussia is instructive. Prussia is a most favorable example of state administration, owing to the fact that the executive is responsible not to the House of Commons, but to the king, and kings are not subject to political pressure. France, on the other hand, is unfavorable to private management, for the French minister of public works has enormous and indefinite powers over the companies. Prussia seems to have every advantage over France. Gradients are certainly better; on the average the cost of coal considerably less; wages, especially if pensions are included, are certainly not higher; the density of traffic is much greater. Yet the average fare per passenger mile is about the same, while the rate both for minerals and for general merchandise per ton-mile is higher in Prussian than in France.

I have just come across the following quotation† from a recent speech of M. Pattai, president of the Austrian Chamber of Deputies:

"We have always been in favor of the state taking over the railways, but if we had been able to foresee the results of the management, I assure you we should have hesitated a little longer. We are still in favor of the principle, but it does seem to us that our government has performed a remarkable feat when it has succeeded in creating a deficit on the Northern Railway.‡ The government have enlisted an army of new employees; they have gone much too far in the reduction of hours of labor; instead of commercial management they have appointed lawyers to posts that require business men or experts; they have established an entirely unpractical bureaucracy. At the present moment, we are face to face with a deficit of £5,000,000 ($25,000,000). There would be no deficit at all if the return from our railways were that which it ought to be. I repeat that absolute imbecility has characterized the taking over of our railways. We must introduce business ideas into the government service."

(To be continued.)

A consular report says that the state of Bahia, Brazil, has just placed an order, with a French firm in Paris for 40 closed freight cars to be used upon the Nazareth Railway in this state. It is probable that considerable rolling stock for railways in Bahia will be imported within the next few years, but unless American manufacturers get into much closer touch with this market than at present, it is almost certain they will receive few or no orders.

*See further on this point the note at the end of this article.

†Journal des Transports. August 6, 1910.

‡The Northern Railway of Austria while it was a private concern paid a substantial dividend of something like 6 per cent.

JUDSON C. CLEMENTS.

Judson C. Clements, who has been elected chairman of the Interstate Commerce Commission, is the ranking member in point of seniority. He was first appointed to the commission in 1892 and has served continuously ever since. His election is only for a year, it being the understanding that a new chairman will be elected each year, the members being chosen in order of their length of service.

Mr. Knapp was criticised by the traffic representatives of shippers and commercial organizations during the later period of his service as chairman on the ground that he was friendly to the railways. Mr. Clements will not be criticised by them on this ground; he is more apt to be criticized by the railways on the ground that he is unfriendly to them. Perhaps the impression that he has been somewhat hostile in his attitude toward the railways is not justified, but it quite generally exists, and has arisen not merely from the fact that as a member of the commission he has often, when there has been a difference of opinion of the commission, been found on the side of the shippers, but from the further fact that he has several times in public addresses given utterance to views that sounded pretty anti-railway and used language in giving expression to them which was not altogether temperate.



Judson C. Clements

That Mr. Clements is a man of great natural ability, however, and that he is an able lawyer are generally conceded, and the honesty of the convictions on which he has acted and of the opinions to which he has given utterance has never been questioned. Personally, he is a very amiable man with all the courtesy and kindliness of the class of southern gentlemen to which he belongs.

Mr. Clements has written several of the most important opinions of the commission; one of them was that in the maximum rate cases in which the commission ordered quite substantial reductions in the freight rates from Chicago, Cincinnati and other central western points to the Southeast on the ground that they were discriminatory as compared with those from the Atlantic seaboard. It was on the appeal from this case that the Supreme Court of the United States rendered its notable decision holding that the commission by the original Interstate Commerce act was not given the power to fix rates. While the court in this case overruled the commission, there was no question of the ability with which Mr. Clements prepared the commission's opinion.

So far as the public is concerned the principal change in Mr. Clements' duties will be that he will be called on, under the law of 1898, to act as mediator in disputes about wages, and that presumably he will be the representative of the commission in conferences at the White House. Quite possibly, however, the president henceforth may not have so many conferences as he has had during the past year. As a mediator Mr. Clements ought to be well qualified, being, as already mentioned, considerate, amiable and candid. On the commission his influence will be little, if any, greater than heretofore. Like the chief justice of the Supreme Court, he has on vital questions affecting decisions, no more votes than each of his fellow members. The main question now before the commission, that of deciding when and to what extent the railways have "proved" how much money they will make out of proposed advances in transportation rates, may well appal the wisest commissions, and the decision, when it is reached, will, no doubt, be the result of a careful weighing of the conditions by all of the commissioners.

As is well known, the members of the commission have always been appointed with a view to giving the different sections of the country representation. Mr. Clements is the member from the Southeast. His home at the time of his appointment was Rome, Ga. He is a lawyer by profession and was active in public affairs prior to becoming a member of the commission. He began his practice at La Fayette, Ga., in 1869; was county school commissioner up to 1871; a member of the Georgia house of representatives, 1872-76, of the senate in 1877; and a member of the 47th to 51st Congresses (1881-91) from the seventh Georgia district. In politics he is a Democrat. Mr. Clements is almost sixty-one years old. He was born in Walker County, Ga., in 1846. He was educated in private schools; and served as a private and first lieutenant in the Confederate army in 1864-5. He received his legal education at Cumberland University, and was admitted to the bar in 1869.

The report of the Cordoba & Rosario Railway, Argentina, for the year ended June 30, 1910, shows a decrease in earnings from the year before. The gross receipts for 1910 were $3,228,710, and for 1909 were $3,325,148. The operating expenses for 1910 were $1,977,339, and for 1909 $1,980,045. Net earnings for 1910 were $1,251,370, and for 1909 $1,345,104. The prolonged drought affected the cereal crops so seriously that the tonnage of that commodity was reduced by 46.60 per cent. from the year previous. There were, however, satisfactory increases in tonnage of other items of traffic, notably general goods, which made the decrease in tonnage from 1909 only 3.48 per cent. The road in both years operated 180 miles. The number of passengers in 1910 was 204,027; in 1909, 188,901. Receipts from passengers were $343,168 in 1910 and $347,918 in 1909. The number of ton miles in 1910 was 82,428,136, and in 1909 was 81,854,825. Freight receipts in 1910 were $2,685,265, and in 1909 were $2,706,779. The number of train miles run in 1910 was 659,581, and in 1909 was 635,496. The receipts per train mile in 1910 were $4.90, and in 1909 were $5.23. Expenses per train mile were $3 in 1910 and $3.11 in 1909. The profit per train mile was $1.90 in 1910, and $2.12 in 1909. The receipts per mile in 1910 were $17,937, and in 1909 were $18,473. The profits per mile were $6,952 in 1910 and $7,473 in 1909.

THIRD ANNUAL REPORT OF BLOCK SIGNAL AND TRAIN CONTROL BOARD.*

The Block Signal and Train Control Board has made its third annual report to the Interstate Commerce Commission. One year ago plans and descriptions of 835 devices intended to promote the safety of railway operation had been submitted for examination and 511 had been examined and reported upon. During the past year 102 additional devices have been presented for consideration, making a total of 937 to date. During the past year the board has examined plans of 308 devices, and has transmitted to each proprietor a statement of its opinion. One hundred and sixty-six cases remain before the board for consideration. Of the plans examined during the past year 91 covered signal and automatic train-control devices, 103 related to ties, rails, rail fastenings, switches, and other track appliances, 64 were devices relating to the construction and equipment of cars and locomotives, such as couplers, draft riggings, ash pans, headlights, etc., 30 related to adjuncts to the air-brake system and emergency brakes for cars, 9 were mail-bag catching and delivering devices, 7 were automatic hose connectors, and 4 were torpedo placers.

Outside the field of signaling and automatic train-control the board has considered few devices that were believed to possess merit.

Brakes.—In the field of train brakes no important development has taken place during the year. Most of the devices examined were of such character that their use would introduce complications into the brake system. The St. Clair Air Brake was noticed last year. The brake of the California Valve and Air Brake Company, of Los Angeles, Cal., retains all the advantages of the straight air brake and at the same time permits automatic application of the brakes. The disadvantage of being compelled to release, and thus lose braking power, while recharging the auxiliary reservoirs, as is necessary with systems now in use, is overcome, and the use of pressure-retaining valves is not necessary. In this system braking power is not affected by variations in piston travel or leakages in brake cylinder packing leathers, as pressure from the main reservoir is applied direct to brake cylinder pistons, and is thus not dependent upon variations in volume. Auxiliary reservoir pressure is used only in emergency applications of the brake, the triple valve being so constructed that in such applications the pressure stored in the auxiliary reservoirs flows into the brake cylinder and supplements train-pipe pressure. This brake is reported to have been used to a limited extent on a western railroad, but the board has not had sufficient information respecting it to be able to pass a definite opinion concerning its merits.

Headlights.—During the past year considerable discussion has taken place in regard to the use of locomotive headlights of high candlepower. In seven states, Arkansas, Montana, North Carolina, Oklahoma, South Dakota, Texas and Washington, locomotive headlights of 1,500 candlepower or over are required by law; in Indiana locomotive headlights of 1,500 candlepower or over are required by an order of the State Railroad Commission, and in Georgia the law requires electric headlights with 300 watts at arc and reflectors 23 inches in diameter. * * * Various devices have been submitted to the board intended to impart to the headlight while the engine is rounding a curve motion to turn its beam so that it will fall on the track. Most of these devices are crude. It seems unlikely that any apparatus of this kind can be made effective to meet all the conditions of reversed curves, tangents succeeding curves, and variations in curvature, that are found on many railroads, and it is probable that if full advantage is to be taken of the high illuminating power of gas or electric headlights on roads where much curvature exists, any motion of the headlight about its vertical axis must be within the control of the engineman.

The report discusses the merits of and the objections to high power headlights, concluding as follows:

The whole question at the present is in a highly controversial state. On single-track roads, particularly in mountainous country or where fixed signals are infrequent, the high power headlight on a train affords a warning of its approach for a considerable distance, and under favorable circumstances it enables the engineman to distinguish obstructions or unusual objects on the track much farther ahead than is possible with ordinary lights. On double-track roads, and particularly on roads having three or four tracks and equipped with signals placed at frequent intervals, the prevailing opinion seems to be that the electric headlight is not only unnecessary, but is likely to cause serious errors on the part of enginemen in reading color signal lights.

Metal, concrete and composite ties.—Various forms of ties composed of material other than wood and designed to improve the condition of railway track, both with respect to economy and to safety of train operation, have been submitted to the board for examination. A number of designs as found in the tracks of several railways (Bessemer & Lake Erie, Baltimore & Ohio, Erie and Chicago & Alton) have been examined, but no report is given.

Spark arresters.—Several of these devices, designed to reduce the danger of fire set by locomotives along railway rights of way, have been presented for examination, and that of C. A. McCotter, of Indianapolis, has been observed in operation.

Locomotive boilers.—An examination was made of an exploded boiler on the Pennsylvania Railroad, and a member of the board witnessed a test of an improved form of fire box which was conducted at Topeka, September 26, on the Atchison, Topeka & Santa Fe. The test was designed to demonstrate whether this particular form of fire box, the Jacobs-Shupert, could withstand stresses which, in the ordinary form of fire box, in most cases produce ruptured sheets and result in so-called explosions. The test demonstrated that with the crown sections of the fire box raised to a temperature of 1120° F. (the water being 4½ inches below the crown sheet) the construction withstood safely a pressure of 220 pounds per square inch. Under similar conditions a fire box of ordinary construction would probably have failed.

Mail cranes.—A number of mail-bag catching and delivering devices have been presented to the board for examination. All have been examined wholly as related to the question of safety. A device on the Chicago, Rock Island & Pacific between Omaha and Davenport has been observed, and a report made to the superintendent of the railway mail service covering the safety features of the device.

Monographs.—A majority of those who have presented devices to the board for examination have manifested such unfamiliarity with actual railway operating conditions that it has seemed proper this year, as last, that the board should set forth certain principles of correct design and construction of some forms of company equipment, appliances, and structures, with a view to showing the present state of the art in such matters and of directing effort along right lines. With these objects in view, the board has had prepared monographs on the air brake, the car wheel and the electric track circuit. These monographs will appear as appendices not yet issued.

A B C System.—The A B C system of block signaling, which has been in use on the Northern Pacific for about three years past, and an account of which was given last year, has been abandoned on all but one of the divisions where it was in use, and it is to be abandoned entirely. It was introduced on a short section of the line east of Spokane, Wash., in the autumn of 1907; and the success which attended its use on that section led to its extension to the whole of the division and subsequently to other divisions, making an aggregate length of 681 miles of

*Two chapters of this report, one on automatic brake-hose connectors and one giving a list of automatic train-stop inventions presented to the Board, are omitted and will be given in a future issue of the *Railway Age Gazette*. The monographs and appendices referred to, including the Harrington train stop, will also be dealt with hereafter.—EDITOR.

road on which the system was worked. Following a change of officers of the operating department, it was discontinued on the division east of Livingston, Mont., February 27, 1910; and on the lines west of Cheney, Wash., it was discontinued in August. On the remaining divisions, Paradise to Cheney, 204 miles, the change is about to be made.

The interest which was taken in this system by railway officers generally was largely due to the increased safety secured by means of it as compared with the method, common on single-track railways, of conferring on trains the right to the road by means of time tables, despatchers' orders, etc.; and it was in relation to the efficiency of the system as a means of safety—that is, of preventing collisions—that it was considered by this board. It appears, however, that its adoption on the Northern Pacific was largely because of the economy thereby secured in the movement of freight trains, and the reason given by the officers for going back to the old system is that, although in the use of the A B C system they secured the advantages expected, so far as freight trains were concerned, there was a disadvantage in that important fast passenger trains were delayed.

The board has not had opportunity to make a thorough inquiry concerning the situation since it was advised of this change; but a letter from an officer of the road indicates that this delay of passenger trains, together with some inconveniences when line wires were broken or otherwise unavailable for use, was the reason for changing.

As the movements of all trains are under the immediate direction of a despatcher, who has absolute authority throughout his division, it is not clear how freight trains should be unduly favored as compared with passenger trains, except as the despatchers themselves ordered, or at least approved, such favoring.

Where the A B C system has been discontinued, the company has equipped the line from Billings to Livingston, Mont., 116 miles, with automatic block signals. On that part of the line from Cheney to Auburn, 361 miles, the simple manual block system is used. The manual block system will also be used on the line between Paradise and Cheney, 204 miles, when the A B C system is discontinued on that section.

THE BLOCK SYSTEM.

The investigation of block signaling, particularly manual signaling, was begun by the board during the latter part of 1908, and the results were set forth in its last annual report. This work has been continued and extended during the past year, and the results have been briefly summarized and are published as Appendix E to this report. The investigations thus far conducted have not been complete; facilities have been inadequate to permit an exhaustive examination of the problem in all its details. Enough has been learned, however, to make it apparent that the block system, both manual and automatic, on most American railways, is operated far below its maximum efficiency. The most crying present need is reformation in both personnel and methods of operation. For the safe operation of the manual block system, competent and faithful signalmen are absolutely essential. With first-class men, objectionable methods of operation or maintenance may be tolerated without unduly sacrificing safety; but with incompetent or unreliable men even the best methods do not insure safety, no refinement in apparatus or system of rules being sufficient to overcome the weakness due to inexperience, slovenly mental habits, poor training, or lack of proper moral qualities.

The board, in all its preceding reports, has indorsed the recommendation of the commission to the Congress that legislation looking to the compulsory adoption of the block system be enacted. It has not hesitated to do this, because the art of block signaling is well settled. At the present time only about 66,000 miles of railway out of a total of approximately 240,000 miles in this country is operated under the block system, notwithstanding the superabundance of evidence that the system has added immeasurably to safety in railway transportation. The board again urges the recommendation of the commission to the Congress for compulsory legislation requiring its use as the step of foremost importance in promoting safety in railway operation. Relatively inexpensive and simple block systems can, by proper attention to training and discipline of signalmen, be operated with a high degree of success.

The facility with which the space-interval principle can be adopted and put in use is well illustrated by the action of the Baltimore & Ohio Southwestern in July last, when the line of that company from Storr's, Ohio, westward to Vincennes, Ind., and from North Vernon, Ind., to New Albany, over 180 miles, was equipped with all the necessary apparatus for the operation of the simple manual block system in less than one week. Sixty-two offices were equipped with telegraph instruments and batteries. To facilitate the movement of freight trains waiting on long side tracks where the engine of a waiting train could not be near the station, the B. & O. S. W. put in telephones at the remote ends of these side tracks and connected them to the station office.

AUTOMATIC STOPS.

Since its organization the board has examined plans and specifications of 149 signal and automatic train stop devices. Of this number only 16 purely automatic stop devices have been considered to possess sufficient merit to warrant the board in offering to test satisfactory installations. Only two systems, namely, the Rowell-Potter and the Harrington, have so far been fully tested by the board. The Gray-Thurber and the Warthen systems, as well as those of Electrical Automatic Railroad Safety Signal Company and the Railway Automatic Safety Appliance Company's devices, are now in process of installation, and it is expected that they will be fully tested during the coming winter.

Collisions resulting from the weaknesses in the time interval or train despatching system, and the deficiencies in the block system due to untrained or undisciplined signalmen, as well as errors on the part of enginemen and trainmen, have led to public demand for automatic devices. Many seem to believe that the introduction of the automatic train stop would greatly diminish railway collisions of all classes. While it is true that the use of automatic features in the block system itself, as a result of which block signals are actuated directly by the movements of the train, would greatly diminish the number of collisions due to errors in manual block working, the fact should be clearly borne in mind that the automatic stop corrects but one defect, namely, the failure of the engineman to observe, understand, and obey signal indications. It does not in any way insure that the indications displayed will be correct, nor in any way prevent collisions due to the inherent defects of the despatching system nor to improper working of the block system. This, however, should not be construed as in any way minimizing the importance of the automatic stop, for it is a well-known fact that many accidents have been caused by the failure of enginemen to observe, understand, and obey signal indications. Failures to observe signals may be due to fog, snow, signal light not burning, or smoke from other trains; failure to understand or comprehend the signals may be due to complexity in the system of indications or to diversion of the engineman's attention or to his physical incapacity; failure to obey indications that are seen and comprehended are rare, and comprise only those cases where enginemen desiring to make time are tempted to take chances, or to a too liberal interpretation of rules which allow the enginemen some discretion. Experience with automatic stops show that under proper discipline they perform a moral function in that runners are more careful to heed stop signals when it is certain that disobedience of such signals will be detected.

* * * As both of the stops which have been tested are of the mechanical trip type, there is no information available as to the practical performance of other types of train control systems. These other types include contact rail systems, systems requiring the use of short insulated sections of track and the insulation of certain parts of the engine, and systems making use of induc-

tive or magnetic forces. While the results of the tests on the two mechanical trip devices indicate that their use would materially promote safety in railway operation, the board considers it manifestly improper to make any recommendations concerning the compulsory adoption of automatic train stops based on them alone. Such recommendations should be based on the results obtained from tests of all types of devices believed to offer promise of meeting the varied requirements of railway operation. Some types will meet those requirements in one degree and some in another.

As a result of the recent introduction of automatic stops on some electric roads, and for other reasons, there has been some little development during the past year. One electric surface railway in the State of Washington, the interurban line of the Washington Water Power Company, between Spokane, Cheney and Medical Lake, has put mechanical stops in use on 27 miles of its line. Signal engineers have been studying the subject more generally. With the extension of electric propulsion of trains, the problem of the use of train stops becomes simplified.

On steam railways the only sources of mechanical power usually available are the boilers of the locomotives themselves and the steam plants in the shops of the larger yards. Hence, the installation of signaling systems requiring power for their operation has necessitated the installation of engines and pumps for supplying compressed air, or the installation of primary batteries or electrical generators for supplying electrical current for the operation and control of signals. Power generated chemically in primary batteries is expensive, and the losses incident to the transmission of the energy for operating signals over line wires of considerable length are serious.

The substitution of electric propulsion for steam propulsion on railways provides a readily available source of power for signaling or train controlling apparatus which is continuous throughout the length of the road. The electrical energy for propulsion purposes being generated in large quantities is relatively cheap per unit, and for this reason it is believed that the electrification of steam railways will tend materially to effect an increase in the extent and efficiency of signal installations. To even a greater extent is electrification likely to encourage the use of the automatic train stop by providing available power for the operation of these devices which, it is believed, will in many cases be found to require for their operation more power than the usual forms of fixed visual signals.

Negotiations between the Pennsylvania Company and the Gray-Thurber Automatic Train Control and Signal Company have resulted in an installation of the Gray-Thurber system being undertaken on the westward main passenger track on the Pennsylvania lines, between Jacks Run and R. N. Tower, Glenfield, Pa. It is intended to equip two engines, one running regularly in suburban service, the other running regularly in through passenger service. The New York Central has offered facilities for a test of the train-control system of A. H. Fox, between High Bridge and Yonkers, N. Y., on the Putnam division of that road, and the Washington Water Power Company has installed mechanical automatic stops, as already noted. These installations, encouraged by the railway themselves, are significant, and are in line with suggestions in our last report that the art of automatic train control, like the art of signaling, must be developed by those most intimately concerned in its use; namely, the railways themselves.

The most serious obstacles to the practical development of systems approved for experimental test has been the fact that proprietors have lacked the financial means needed to carry on their work. Large sums of money have been spent in private enterprises to develop devices which have been found to possess little merit. It is a matter of common observation, now as for years past, that devices having no merit succeed in attracting capital by methods scarcely less than fraudulent. Inventive faculty and business ability seldom go hand in hand. * * *

While the board confidently expects the automatic stop to be developed to a point where, like the block signal, the car coupler, and the train brake, it will be available to railways generally, and in many situations will constitute one of the factors promoting safety in train operation, the board is led to believe from its study of existing conditions, particularly as found in connection with the means now employed for the safe movement of trains, that the primary cause of the lamentable record of collisions in this country is of so serious a nature as not to be susceptible to complete cure by any mechanical means. It is not to be considered that the automatic stop, or that any automatic device, will be a panacea for all the faults at present existing in train operation. The question really is whether by the introduction of automatic devices the percentage of accidents due to those faults can be reduced.

It is an unwelcome thought that the fundamental responsibility for the relatively large number of collisions in this country is chargeable to railway officers and employees; not to them because they are more careless or less sensible of their responsibilities than men in other vocations, for that cannot be truthfully said, but simply because they possess the qualities, mental or temperamental, which are the cause of these deplorable results, and which are symptomatic of characteristics common to all who have been reared in a new and rapidly developing country. But sober reflection leads inevitably to the conclusion that, outside of the army and navy, the American is not reared with that discipline which becomes a part of the man and governs his actions mechanically, as it were, rather than as the result of reasoning. Such discipline leads to action as one's first duty without question or reason, and the sense of duty is the one predominating quality which influences the man's every action unconsciously and unfailingly. This conclusion is brought home all the more convincingly when one reflects that nowhere in the world have appliances for safeguarding railway transportation been so highly developed as in this country, notwithstanding which nowhere in the world is there a greater proportionate number of accidents of the kind which such advance in the art should prevent. The automatic stop, therefore, while it might be unnecessary under different social conditions, may be expected to add to safety in train operation under the conditions which do exist and must continue to exist in this country until we shall come to appreciate and realize all that may be accomplished by discipline of the right sort. But mere discipline will not suffice alone. There must go with it the spirit which prompts obedience for the pleasure of being approved by one's own conscience.

It being admitted that what is most needed is automatic performance of one's duties rather than automatic mechanical devices, how may it soonest be brought about? The causes that militate against the development of the human machine to perfection of disciplined action are so complex and so interwoven with our social being that many of them can be eradicated only by that slow evolution or growth which results from the operation of natural laws and which can hardly be forced or even guided by the enactment of man-made statutes.

Nevertheless a number of these causes appear susceptible of marked and present improvement. Appeals to conscience may develop a high sense of duty in many men, but the ever-present problem of earning a living, by its very insistence, makes the appeal to self-interest powerful and practical. The pension system as in force on a number of prominent roads and as advocated by the board in its report last year is believed to offer a strong inducement to careful conduct and should be encouraged.

The existence in the regulations of some railway companies of rules that are unfair or non-enforceable, and intended only as an extreme legal precaution to protect the companies, is nearly as bad in its effect upon discipline as the failure of railway officers to rigidly enforce those rules which are proper and necessary to safeguard traffic.

The American Railway Association some years ago prepared, and with painstaking effort has since amended and improved, its standard code of rules governing train operation. It is unable to compel their use or their uniform interpretation and enforcement on individual roads. The causes heretofore mentioned and

others affecting discipline have the bad effect of impelling railway employees to move about from one road to another. This tends to decrease safetly in operation by frequently placing men in unfamiliar surroundings; and the condition is made still more undesirable by the lack of uniformity in rules and procedure on different roads. A case where, on a single track railway 150 miles long, used jointly by the trains of three different companies, a system of whistle signals is used on the trains of one company which is entirely different from that used by the other two, is an aggravated example. Legislation in at least one state requires railway companies to file copies of their operating rules with the state railway commission, and makes any infraction of the rules by an officer, agent, or employee a misdemeanor. From this to a federal requirement of the same nature, and, what is more important, enforcing uniformity, is but a short step and one likely to be advocated in the absence of an improvement in railway procedure in this respect.

The law passed by Congress at its last session (public, 165) authorizing the commission to investigate train accidents, should tend to make for better methods and improvement in personnel by directing public attention to those defects and deficiencies which have resulted in train accidents, and thus lead to their correction. But on the theory that prevention is better than cure, it is obviously the part of wisdom to take all practicable measures beforehand to prevent those evils that have heretofore resulted in collisions rather than to wait for the occurrence of accidents to disclose the existence of the evils. Investigations such as the board has been conducting into block-signal and other operating methods, therefore, should be continued and conducted on a larger and more comprehensive scale than has been done in the past. This is necessary, with or without a law requiring the use of the block system.

Again the board desires to express its obligations to the American Railway Association for its co-operation in securing the consent of railways for the installation of apparatus on their tracks for purposes of test, and to the officers of railways who have extended courtesies which have made it possible to conduct practical investigations in the field.

ANNUAL REPORT OF NEW YORK STATE PUBLIC SERVICE COMMISSION, SECOND DISTRICT.

The most important parts of this report from the standpoint of the steam railway officer, are those dealing with locomotive boiler inspection and with grade crossing elimination. Not that the other subjects are not important, but the news concerning them has been given to the public week by week through the year and do not come now so much in the nature of news. The total number of corporations, municipalities and individuals under the supervision of the commission is 944, of which, however, only 77 are active, operating steam railway corporations; and a large portion of the 155 pages of the report is devoted to gas, electric light and other subjects not having to do directly with transportation.

Boilers.—The board continues to supervise the condition of the locomotive boilers of the state through the instrumentality of only two men, an inspector and his assistant; for the state inspection is entirely supervisory except where cases of serious neglect are found. This system results in cordial co-operation between the commission and most of the railways, the commission recognizing that so long as the railways care for the boilers with proper thoroughness, the right and responsibility of inspection rests with the railway officers. The number of boilers to be looked after is 7,900, of which, however, about 1,500 are not in regular service. During the year 367 inspection trips have been made, and the state inspectors have themselves examined 2,649 boilers. They found 725 defective; 193 with too many broken staybolts; 225 with telltale holes in staybolts filled up; 75 defective steam gages; 125 defective water glasses, and 151 defective gage cocks. More defects were found than during the previous year, the inspectors having had more time to devote to the work. Special attention is being given to breakages of so-called flexible staybolts. On the whole, the inspectors think that the condition of the boilers in the state has been improved during the past year. The number of persons killed and injured in boiler accidents has shown a marked reduction, as follows:

	Killed.	Injured.
In 1908	9	28
In 1909	6	14
In 1910	1	12

All but one of the fatal accidents were due to low water, and the commission intends to investigate every case of low water which results in a failure of the crown sheet. These accidents can be still further reduced by increased care in the maintenance of water glasses, gage glasses, injectors and feed water connections. In most cases of low water the burden of responsibility rests on the engineman, but there have been instances of defective maintenance. Of the 7,900 boilers in the state, the number under ten years of age is 4,775; ten years and under 20 years, 2,221; twenty years and under 30 years, 853; thirty years and under 40 years, 49; forty years and over, 2. The number of new locomotives put in service during the past year was 439—equal to about three times the number put in service in 1909. The commission has found boilers in service carrying too high pressures and proposes to establish the following factors of safety:

Proposed Factors of Safety:

	Boilers now in service.	Boilers placed in service on or after Jan. 1, 1911.
1. Boilers with butt seams, under 30 years, factor	3¾	4
2. Boilers with butt seams, 30 to 40 years, factor	4¼	4½
3. Boilers with lap and cover seams, under 30 years, factor	4	4¼
4. Boilers with lap and cover seams, 30 to 40 years, factor	4½	4¾
5. Boilers with plain lap seams, under 30 years, factor	4¼	4½
6. Boilers with plain lap seams, 30 to 40 years, factor	4¾	5
7. Boilers 41 or more years old to be condemned.		

These figures represent the minimum. The commission would like to see higher factors adopted. By making slight repairs the safety of 500 boilers has been increased during the past year or two; but there still remain 208 locomotives which must be strengthened or withdrawn from service. The commission has conferred with representatives of the Ohio and the Pennsylvania state railroad commissions and those states will probably join New York in the adoption of uniform methods and in the acceptance of each other's inspection reports. The three commissions will arrange for an annual conference.

Crossings.—For grade crossing eliminations the legislature appropriated in 1910 the sum of $350,000 and for the next fiscal year the commission asks for $900,000. The amount actually paid out duing the past year was $121,060, which went toward the payment of the state's share for improvements in Niagara Falls, Westfield, Hamburg, Auburn, Rochester, Bethlehem and Huntington. It does not appear that all of these jobs are finished. The number of cases finished during the past year is seven, and in four of these the railway company bore the whole of the expense. The commission has practically approved a large number of eliminations for which there is as yet no appropriation available. The total number of public highway crossings in the state, including those in the first district, is 9,065, and two-thirds of these have no protection. The number of persons killed at crossings in the state in two years and eleven months has been 271, besides large numbers injured. On account of the increase of population and the enormous increase in the use of automobiles, the number of accidents at crossings is constantly increasing. Both of the great political parties have pledged themselves to take action looking to a remedy for this danger, but nevertheless New York has fallen behind other Eastern states. In Vermont each railway must eliminate one crossing for every 80 miles of road annually, the towns and state paying part, and in Connecticut the railway must abolish one for every 60 miles, wholly at its own expense. Many towns and cities are so deeply in debt that they will never take action. The state is building highways at the entire expense of the state, and surely this is no more important than the elimination of grade crossings.

Tariffs.—About 17,000 tariffs have been filed during the past

year, half of which were from steam railways and the rest from express companies, electric roads, etc. The tariffs filed by the express companies show more decreases than increases. Street and interurban roads have made no important changes in local one-way fares, but they are introducing round-trip and sixty-trip tickets. In steam railway freight traffic the commission finds no general advance in rates and there have been innumerable reductions; but changes in classification have produced many increases. The commission has ordered overcharges refunded on freight to the amount of $11,105.

Steam railway inspection.—The steam railways of the state, 8,160 miles of line, have been inspected during the year. It is found that in track maintenance many roads pursue a temporizing course, spending too much on labor which is partly ineffective because suitable materials are not provided. The ratio of the cost of labor to the total cost of labor and materials varies on different roads from 32 per cent. to 76 per cent. For lack of good ballast or suitable drainage and by reason of other obvious lacks, much labor produces poor results. The commission thinks that probably the state ought to have a dynagraph car so as to more accurately record the quality of the tracks. In the main tracks of the state there are about four million rails, and during the year ending with last June the number broken was 3,885 The railways ought to study carefully to see how much of this breakage is due to imperfections in manufacture, and how much to improper condition of track.

Steam railway equipment has been inspected and particularly with reference to engine failures, spark arresters and ash pans. All of the terminals in which locomotives are housed have been visited. Twelve per cent. of the locomotives of the state were found undergoing repairs or awaiting repairs. A list is given of the defects found in locomotives. In 1909 severe reductions of expenses resulted in insufficient forces in shops and unsatisfactory condition of locomotives, both freight and passenger; but since March, 1910, there has been a decided improvement. In the list of accidents due to defective equipment the principal items are: broken wheels 35; broken axles 18; broken arch bars of trucks 13; defective brake rigging 10, and loose tires 9. In many cases the accidents could have been avoided by more rigid inspection and a higher standard of maintenance. The report indicates that cast iron wheels should be of more suitable design and of better material, but the question of what to do about this seems to be left with the wheel manufacturer and the railways.

For the year ending with October last, the engines of the Boston & Albany failed only once in each 18,000 miles run, which is a great improvement over former records. The records of the Delaware, Lackawanna & Western are also excellent, and the Erie has made notable improvement. The officers of the Erie are putting forth great efforts to reach the highest state of efficiency.

The commission has given careful attention to the enforcement of the law requiring the use in locomotives running through the Adirondack Forest Preserve of some fuel that will not make sparks. The New York Central now has 23 engines burning oil, and the Delaware & Hudson 10. The commission allows the use at night of coal burning engines. A number of coal burning engines have been exempted from the law, but these are carefully watched by the state inspectors. In equipping locomotives and building storage tanks, the New York Central has expended about $25,000, and the Delaware & Hudson $8,500. The cost of oil fuel is less than the commission had expected, and the use of oil burners has passed the experimental stage.

Statistics.—The usual statistics are given of the earnings, expenses and traffic of the steam railways which report to the commission. With the statistics of capitalization are summarized the opinions of the commission on the cases which have come before it during the year as to various questions concerning capitalization.

The commission has found its greatest satisfaction in the large number of personal and local grievances which it has been able to settle without formal proceedings.

PHYSICAL VALUATION AND CAPITALIZATION.

Several statements have been published recently in the newspapers and magazines regarding the results of physical valuation in various states. One of these, by Clifford Thorne, one of the counsel for the shippers in the rate advance cases, was prepared to show that these valuations have shown that the railways in the states where valuation have been made are over-capitalized. A careful check of the figures has been made by Prof. Frank Haigh Dixon, of Dartmouth College, chief statistician of the Bureau of Railway Economics, and the following complete statement prepared by him refutes Mr. Thorne's contention:

INTRODUCTION.

An attempt has been made in this study to compare as accurately as possible the physical value and the capitalization of steam railways in the states in which official valuations have been made, that is, in the states of Washington, South Dakota, Michigan, Minnesota and Wisconsin. The state of Texas is considered only casually for reasons which appear in the discussion. It should be noted that in every case the statistics pertaining to value cover only physical properties. No attempt has been made to secure intangible value, which, as a matter of fact, has been arrived at only in one or two instances by state commissions. The omission of intangible value should be held in mind in comparing physical value and capitalization, for it is at least an open question whether intangible value may not properly be capitalized.

The most significant question involved in the method of physical valuation is the manner in which right-of-way and terminal value is obtained; in other words, whether or not the railway is to be allowed a value for its land greater than that of adjoining land, because the railway corporation must settle all damages created by its entry upon private property, and because it frequently must pay an enhanced price for the land which it purchases due to the knowledge on the part of the landowner that the railway must have it at any price. The methods of valuing such land, so far as they could be discovered, are given in the text. It will be observed that Washington, South Dakota, Michigan and Wisconsin make allowance for this added cost in estimating cost of reproduction, and that the Minnesota Railroad Commission, while disapproving the method in principle, has nevertheless had a valuation prepared upon this basis. In this connection, it should be noted that the valuations of both Michigan and Wisconsin were made for taxation purposes.

Assignment of capitalization to the different states has been made upon the single track mileage, that is, upon the road mileage basis. While this is not the most scientific basis, it is the only practicable one which could be employed, for statistics are in most cases not available for an assignment upon any other plan. With a few notable exceptions, the commissions of the different states present only incomplete and undigested statistical matter in their annual reports.

It is necessary to call attention at this point to a matter of technical detail which becomes, in its application, of very considerable importance. Some of those who have already published comparative statements of value and capitalization have made assignments of capitalization to states upon an erroneous basis. It has apparently been the practice to find the ratio of the aggregate mileage within the state to the total mileage of all the systems traversing the state, and then apply this percentage to their total capitalization to determine the state's proportion of capitalization. This method is simple, but it leads to erroneous results, because it applies to a series of different capitalizations an average percentage, which, as a matter of fact, is applicable to no one of them. The only correct method is to determine the capitalization of each road separately on the mileage pro-rate basis, and then add the results together to obtain the aggregate of state capitalization. This latter method has been followed in this presentation.

So many errors have been discovered in the statistical tables

prepared by the state commissions that these reports have not been relied upon in most cases for total mileage or total capitalization. The Statistics of Railways of the Interstate Commerce Commission has been generally used.

In attempting this comparison of physical value and capitalization, many difficulties have arisen which could not be entirely removed.

1. In the first place, when the valuation has been made by a body other than the railway commission, it has been difficult to identify in every case the corporation whose property was valued, and to assign to such corporation its proper capitalization. Roads reporting their capitalization to the commission are as a rule the operating roads, while the roads are valued under their corporate names whether operating or not. Adjustments have in some cases been necessary, but these adjustments have in no case affected the conclusions drawn.

2. As a result of the intercorporate relationships of the various railways, the aggregate capitalization, even within the limits of a single state, contains more or less duplication. This duplication it has been the purpose of this study to eliminate as far as possible. The most striking case which has been encountered is in Minnesota, where not only is the capitalization of the Chicago, Burlington & Quincy included, but at the same time there is embodied the Great Northern's share of the $215,000,000 bond issue with which the C. B. & Q. stock was purchased. Moreover, in eliminating such duplications, this study has followed the practice of the statistician of the Interstate Commerce Commission, who eliminates collateral trust bonds before computing funded debt per mile for the individual railway corporations. All collateral trust bonds have been eliminated from the aggregate capitalization of the individual road before its stock and bonds have been assigned to the various states. In the same manner, bonds of proprietary companies have been deducted when these proprietary companies appear separately with their own capitalization. A third form of duplication has been corrected by deducting securities held in the treasury. It is evident that securities for which no value has yet been received cannot properly be included in a study which compares capitalization and physical value. Again, securities held in sinking funds have been eliminated from total capitalization. Appropriations to the sinking fund are merely appropriations for the retirement of debt, and the statement that securities are kept alive in a sinking fund is largely a fiction. Finally the total capitalization is increased beyond its proper size for comparison with physical value by the fact that it is frequently issued to cover "other properties" than railways. Railways are frequently engaged in business other than transportation, and no distinction is made between securities issued for transportation and those issued for miscellaneous purposes. So far as it has been possible, capital issues covering "other properties" have been eliminated, but to do this adequately would have required a more extended investigation than was possible at this time. Hence, it is probable that a considerable amount of capitalization is included in the comparative tables which might properly be eliminated because it does not represent railway property. Even with all these deductions there are doubtless other duplications which might be eliminated were a careful study made of the purpose for which capital stock was issued by the various roads, yet it must be clear from the eliminations which have been made that the object is to set up against physical value the securities outstanding in the hands of the public upon which corporations are entitled to earn.

3. It is evident that an allocation of capitalization upon a mileage pro-rate basis is not an accurate figure for a comparative study of this character. It does more than justice to some states, and less than justice to others. A state like South Dakota with most of its mileage single track, and with no valuable terminals gets on a mileage pro-rate far more than its proportion of the capitalization of the roads which operate within its borders, for there is credited to the state a portion of the capitalization which belongs to valuable properties located elsewhere. On the other hand, it is possible that the capitalization of the Washington railways should be increased beyond the amount allotted on a mileage pro-rate, if correct results are to be obtained. An illustration of the inaccuracy of this method is found in Wisconsin, where the Illinois Central, with nothing but branch line mileage in the state and no valuable terminals, has its capitalization assigned to the state on a road mile basis. This difficulty is inherent in the situation. It only serves to make clear the proposition that if railways are to be valued at all, they should be valued as units, and not piecemeal by the separate states.

From what has just been said it must be clear that such a comparison is as presented in this study cannot be conclusive. It has been made in the hope that some degree of accuracy might be reached in a subject which has received of late much inaccurate treatment.

WASHINGTON.

The source of information for the valuation of Washington railways is the "Findings of Fact" of the Railroad Commission of Washington, published in 1909. The results of these findings were embodied by J. C. Lawrence, of the Washington commission, in an article in the *Railway Age Gazette* of February 18, 1910, from which the facts here given were derived. Commissioner Lawrence in this article discusses the methods employed in the valuation of Washington railways, and it will be of interest to quote from his discussion before presenting the statistical results:

> The cost of reproducing right-of-way and terminals was estimated on the basis of market value of adjacent property, plus the additional amount experience has shown a railway company must pay for consequential damages in securing such property. * * *
>
> The unearned increment was allowed in the cost of reproduction. This may be either in the cost of construction of roadbed, structures and equipment or in the right-of-way and terminals. To fail to allow such increased value would be as unfair to the public as to the railways. Take, for instance, the terminals of an established road in an important city which were acquired at a low value, say, for a million dollars; a new line is constructed and, to acquire its terminals contiguous to and of equal value to that of the established road, pays, say, $10,000,000. If the latter road were not allowed the value it paid then it would be deprived of a return on the amount actually and necessarily invested in acquiring its property, and in that way deprived of the property itself, for the value of the use of the property is in reality the property itself. If this value were allowed to the latter road and denied to the former, then traffic tributary to the one would have an advantage over the other, and the construction of additional and competing roads would be discouraged. * * *
>
> The commission concluded that on an established road, maintained to a proper standard of efficiency, there would be no continuing depreciation; that on a newly constructed line there would be a rapid depreciation of certain elements during the first few years. This would apply particularly to ties, and, in a lesser degree, to wooden structures and equipment. On the other hand, there would be an appreciation of roadbed on a new line, due to the seasoning and hardening which follows its use, attributable not only to settling of embankments, thus rendering the condition of the roadbed more permanent and safe, but to the necessary labor involved in raising and widening embankments, cleaning out and widening cuts, safeguarding them from slides and remedying the defects occurring in construction and the contingencies which necessarily follow. Such appreciated value of roadbed would largely affect the depreciation in the value of the other items.
>
> The appreciated value of the roadbed was added to the estimated cost of reproduction new, and from this sum deductions were made to cover the depreciation of all other items. * * * But the depreciated value of a road in profitable operation does not equal its market value. To this depreciated value must be added a sufficient amount to cover the enhanced value due to building up a successful transportation business. It is inconceivable that the value of such a business enterprise under efficient management should depreciate from a market standpoint.

In his discussion of "market value" Mr. Lawrence considers such influences as prices of outstanding securities, density of population, amount, permanency and class of traffic, and value of facilities for doing business.

In view of the fact that the Washington commission has not made any statistical summary of its findings, it has been somewhat difficult to determine whether the entire mileage of the state was valued and what was the length of mileage actually included. In a personal letter under date of December 18, 1910, Commissioner Lawrence writes that the valuation included in their "Findings of Fact" of 1909 covers "the railway mileage in existence at the time of the creation of the commission, June, 1905, approximating 3,300 miles. Since that date the mileage has been increased to a little in excess of 5,000 miles and the commission is now engaged in valuing this new construction."

Yet from the tabular summary presented in the article re-

ferred to, the commissioner seems to account for only 3,016 miles, and this figure has been used in presenting the per mile of line valuations in the table below. In view of the fact that the valuation included only the mileage in existence in 1905, it has been necessary to use the 1905 capitalization as a comparative figure. It has not been found possible to present statistics of capitalization for the exact mileage involved in the physical valuation, but the figure employed, 3,167 miles, is no nearly identical that the worth of the comparison is not destroyed.

WASHINGTON—PHYSICAL VALUATION AND CAPITALIZATION.

	Total.	Mileage.	Per mile.
Physical Value (1905-8):			
Cost of reproduction new	$194,057,240	3,016	$64,343
Present value	175,797,025	3,016	58,288
Market value	195,662,635	3,016	64,875
Capitalization	168,696,670	3,167	53,267

SOUTH DAKOTA.

At the time that this study was made, the report on physical valuation for the state of South Dakota had been completed but had not yet published. Such information as is here given was obtained by correspondence.

In valuing railway lands the commission used the multiple of 250 per cent. as an average, and applied it to all farm and city lands traversed by the roads; that is, it estimated railway land to be worth two and one half times that of adjoining land.

The number of miles valued was 3,953. Although the commission dated its valuation June 30, 1909, it appears that the valuation was begun under an act of 1907, and that much of it had been completed before January 1, 1909. A more accurate comparison of actual conditions would probably have been made had capitalization figures been used for 1908 instead of 1909. However, the 1908 figures have been employed in the case of but one road, the Chicago, Milwaukee & St. Paul of South Dakota, and this was because its intercorporate relationships with the parent company were not fully adjusted on June 30, 1909.

SOUTH DAKOTA—PHYSICAL VALUATION AND CAPITALIZATION.

	Total.	Mileage.	Per mile.
Physical value 1908:			
Cost of reproduction new	$106,494,503	3,954	$26,933
Present value	91,695,132	3,954	23,190
Capitalization	138,850,297	3,954	35,116

MICHIGAN.

The original appraisal of the physical properties of Michigan railways was conducted in 1900-01, under the direction of the Board of State Tax Commissioners. Since that time the tax board has annually presented a table of assessed value of railway property, which by law must be an assessment at what the board considers the actual value of the property, that is, a 100 per cent. assessment. The assessed value is doubtless intended to correspond with "present value" as determined by the original valuation. Yet the tax board in its annual presentation of assessed value omits figures of cost of reproduction new, gives no table of mileage valued, but merely the name of each corporation, and gives no indication that a genuine investigation of railway values has been made. This leads to the inference that no valuation of railway property has been attempted in Michigan since the original valuation by Professors Cooley and Adams. It has seemed best, therefore, to include a comparative statement of valuation and capitalization for the year 1900, as well as the incomplete statement for 1907. In cases where capitalization could not be found for corporations listed in the report of the tax commissioners, the assessed value of such corporations has been deducted from the total in order that the statement presented might be properly comparative.

The method of valuing right-of-way and terminal lands is described as follows by Professor Cooley in his report to the Michigan Board of State Tax Commissioners:

> The question whether the increased cost of right-of-way over and above the value as determined by contiguous property may properly be included in the present value of a railway, is a matter about which there may be a difference of opinion. The true cash value of a thing has been defined as the price upon which a purchaser and a seller mutually agree, and at which an actual transfer takes place. If an attempt were made to purchase an existing right of way, as, for example, an entrance into a city, if the owner were willing to sell at all he surely would take into consideration what it would cost the purchaser to get into the city by any other route, and the prospective purchaser would surely consider what it would cost him by another route. The conclusion finally reached was to add to the value of the right of way, as determined by contiguous property, an amount fairly representing the additional actual cost to the railroad.

MICHIGAN—PHYSICAL VALUATION AND CAPITALIZATION.

	Total.	Mileage.	Per mile.
Physical value 1900:			
Cost of reproduction new	$202,716,262	7,813	$25,946
Present value	166,398,156	7,813	21,298
Capitalization	291,605,232	7,813	37,323
Physical value 1907:			
Present value	204,033,500	8,343	24,456
Capitalization	357,555,907	8,343	42,857

MINNESOTA.

Minnesota has recently completed a most exhaustive physical valuation of railways as of June 30, 1907. This report requires little comment as the very complete statistical presentation explains itself. As already noted, the valuation was made on two different bases, described below as Estimate A and Estimate B. In Estimate A, allowance is made for the price which railways would have to pay for the land for railway purposes, including damages and monopoly prices for land. In Estimate B, land is valued on the same basis as land lying in contiguous territory. The Minnesota commission contended for the valuation represented by Estimate B, the railways maintained that Estimate A was the fairer one. In this connection, reference should be made to the basis employed by the states of Washington, South Dakota, Wisconsin and Michigan.

The capitalization figures are those for June 30, 1907. The considerable reduction in the capitalization figure below that commonly quoted for Minnesota is due to the elimination from the Great Northern's capitalization of $107,000,000, being its proportion of the Chicago, Burlington & Quincy collateral 4's issued jointly by the Great Northern and the Northern Pacific. In view of the fact that the Chicago, Burlington & Quincy capitalization is already included in the total capitalization of Minnesota railways, it is an obvious duplication to include in the capitalization of the purchasing company any part of the bonds with which the Burlington stock was purchased.

MINNESOTA—PHYSICAL VALUATION AND CAPITALIZATION.*

	Total.	Mileage.	Per mile.
Physical value, 1907, Estimate A:			
Cost or reproduction, new—			
Carrying roads	$39,299,471	7,577.71	$52,430
Switching roads	14,435,724	18.72	770,933
Total	411,735,195	7,596.43	54,201
Present value:			
Carrying roads	347,051,336	7,577.71	45,799
Switching roads	13,428,824	18.72	717,160
Total	360,480,160	7,596.43	47,454
Physical value, Estimate B1:			
Cost of reproduction new	373,820,141	7,596.43	49,210
Present value	322,565,107	7,596.43	42,463
Physical value, Estimate B2:			
Cost of reproduction, new—			
Carrying roads	350,106,321	7,577.71	46,202
Switching roads	10,855,227	18.72	579,718
Total	360,961,548	7,596.43	47,517
Present value:			
Carrying roads	299,858,186	7,577.71	39,571
Switching roads	9,848,327	18.72	525,945
Total	309,706,513	7,596.43	40,770
Capitalization:			
Carrying roads	292,299,292	7,577.71	38,574
Switching roads	7,728,404	18.72	412,732
Total	$300,027,696	7,596.43	$39,496

* Estimate A includes multiples on lands for right-of-way, yards and terminals, and allowance for adaptation and solidification of roadbed. Estimate B1 omits from Estimate A multiples on lands for right-of-way, yards and terminals. Estimate B2 omits from Estimate A multiples on lands for right-of-way, yards and terminals, and allowance for adaptation and solidification of roadbed.

WISCONSIN.

The appraisal of the physical properties of Wisconsin railways is in charge of the Wisconsin Tax Commission, and is made primarily for taxation purposes. The original appraisal was made as of June 30, 1903, and annual revisions thereof have been made through the medium of reports by the railways to the

engineer of the commission. The last report, just received, is dated June 30, 1909.

Concerning the method of valuing right-of-way and terminals, Professor W. D. Taylor, then engineer of the commission, made the following statement in a report to the commission, dated January 2, 1905:

To determine the value of the land in the present right-of-way, such lands must be deemed as belonging to the owners of the adjoining lands and to be acquired by negotiations with such owners or under the power of eminent domain, whereby the owners are entitled to just compensation for the land actually taken and for depreciation in the market value of the residue in consequence of the railway crossing the part taken. In ordinary language, the inquiry will be first, what is the fair average market price per acre for ordinary purposes of the land taken, and second, how much is the depreciation in the salable value of the residue of the parcel, lot, or tract with the buildings thereon from which the right of way is severed. The sum of the two items, first, the market price of the land taken, and the second item, depreciation in the salable market value of the residue, will constitute the right-of-way value.

The figures of total capitalization are those reported by the railways to the Wisconsin Railroad Commission on June 30, 1909. The tax commission has valued a number of private unincorporated roads, which have no capitalization. The valuations of these roads have been omitted from the table presented herewith in order to make the comparison more accurate. The mileage figure used in computing capitalization per mile could not be made to agree exactly with the mileage valued, but the discrepancy of 39 miles is not sufficient to disturb the general conclusions.

WISCONSIN—PHYSICAL VALUATION AND CAPITALIZATION.

	Total.	Mileage.	Per mile.
Physical value 1909:			
Cost of reproduction new	$296,803,322	7,098.70	$41,811
Present value	240,718,711	7,098.70	33,910
Capitalization	311,819,128	7,060.00	44,167

TEXAS.

The Texas Railroad Commission estimates the total value of railways in that state up to October 31, 1909, at $212,794,586, or $17,198 per mile of line. The aggregate capitalization on June 30, 1909, including equipment trust obligations and current liabilities, is given as $420,031,677, or $31,910 per mile of line. These two totals have often been compared and conclusions have been drawn from them unfavorable to the methods of railway capitalization. Yet a moment's consideration will show that the two totals have no relation to each other whatever. By the stock and bond law of April 8, 1893, the railway commission was instructed to value the property of the various railways as a preliminary to the approval or disapproval of the issue of additional securities. Valuations were made immediately of all roads then in existence, and changes in the aggregate value of Texas railways since that time have occurred only when new lines have been constructed. In other words, the valuation now so frequently quoted was made in 1894-6, when, following the panic of 1893, land, right-of-way, terminal facilities and construction materials were at their lowest prices. To present that original value as the present value of Texas roads, as the commission has done, is to refuse to give the roads any credit for permanent improvements, for the general settling and seasoning of their properties, or for the advance in value due to the general growth of the community to which the railway has largely contributed.

Whatever may have been the degree of overcapitalization in 1894, no comparison of an 1894 valuation with a 1909 capitalization can have the slightest validity. From 1896 to 1909 there was an increase in the commission's valuation of Texas roads per mile of line of only 9.3 per cent. That this increase does not at all represent the actual increase in investment in Texas roads is shown by a study of gross earnings. Taking an average of the three years 1894-6 as a base, and comparing this with an average for the three years 1907-9 there is found to be an increase in gross earnings per mile of road in Texas of 71.8 per cent. At the same time, capitalization (stocks and bonds) per mile actually decreased 22.24 per cent. between 1896 and 1909.

Charles S. Potts, professor of law in the University of Texas, in his monograph on Railroad Transportation in Texas, expresses the opinion that if a thorough revaluation were made of Texas roads, the margin between actual value and capitalized value would be wiped out in the case of many roads. He quotes R. A. Thompson, for many years chief engineer of the Texas Railroad Commission, in a hearing before the Interstate Commerce Commission, as asserting it to be his deliberate opinion that the physical property of Texas railways valued by the commission at $17,000, was worth on an average $30,000 per mile of line.

It is of interest to observe that the Texas Railroad Commission in its more recent valuations has placed a higher value per mile upon railway property than in its earlier valuations. Between 1894 and 1896, 45 roads with a mileage of 9,105 miles were valued at an average of $15,589 per mile. Between 1905 and 1909, 37 roads, with a mileage of 16,678 miles, were valued at $22,227 per mile.

It is significant that the Texas tax board in 1908 estimated the total value of railway property, tangible and intangible, as $409,957,928, or $31,776 per mile of line. This board in its estimate includes all those elements of value which are omitted by the railway commission.

For the reasons given, all figures for Texas are excluded as worthless from the summary table at the end of this discussion.

RECAPITULATION.

State.	Physical Value. Cost of Reproduction. Total.	Per mile.	Present Value. Total.	Per mile.	Capitalization. Total.	Per mile.
Washington, 1905*	$194,057,240	$64,343	$175,797,025	$58,288	$168,696,670	$53,267
South Dakota, 1908	106,494,503	26,933	91,695,132	23,190	138,850,297	35,116
Michigan, 1900	202,716,262	25,946	166,398,156	21,298	291,605,232	37,323
1907	.....	.....	204,033,500	24,456	357,555,907,	42,857
Minnesota, 1907—						
Estimate A	411,735,195	54,201	360,480,160	47,454	300,027,696	39,496
Estimate B 1	373,820,141	49,210	322,565,107	42,463	.....	.....
Estimate B 2	360,961,548	47,517	309,706,514	40,770	.....	.....
Wisconsin, 1909	296,803,322	41,811	240,718,711	33,910	311,819,128	44,167

* In Washington, *a market value* of $195,662,635, or $64,875 per mile, is also given.

It should be kept clearly in mind by any one who uses the figures given in this pamphlet that this is not, and is not intended to be, a definitive or an absolutely accurate statement of the relation of physical value to capitalization. Its purpose is to point out the difficulties of comparison of these two items within the limits of single states, and to resolve these difficulties so far as available statistics will permit. Further investigation would make possible the production of a multitude of illustrations of the injustice to the railways in most of these western states of the mileage pro-rate method of capital distribution. Although the figures given are those of physical value only, strong arguments might have been advanced for the capitalization of intangible values. But this pamphlet was not designed as a discussion of the principles which should apply in a valuation of railways, nor as an exhaustive discussion of the statistical elements involved.

A line is being constructed from Tacna, Chile, to La Paz, Bolivia. When this line is completed, probably after three years, it will require no more than to link together Tupiza, Bolivia, and Calchagier, Argentine, to establish a through line from Buenos Aires to Tacna, through the South American continent from the Atlantic to the Pacific Ocean, embracing all the ramifications which constitute the Bolivian railway system.

TEST OF SIMPLE ATLANTIC TYPE LOCOMOTIVE ON THE TESTING PLANT AT ALTOONA.

The Pennsylvania Railroad has recently issued Bulletin No. 5, relating to the test of a simple Atlantic type locomotive and a comparison of the results with the test of a 4-cylinder compound Atlantic type locomotive having about the same dimensions of engine, but a somewhat larger boiler. In 1905 this railway published a book of over 700 pages relating to the tests conducted on the testing plant that formed a part of its exhibit at the St. Louis Exposition in 1904. Included in the locomotives tested were four 4-cylinder compound Atlantic type engines. There was not time before the close of the Exposition to make the test of the simple Atlantic type which was included in the program, but it has since been tested on the plant which was removed to and permanently located at Altoona, Pa. The report of the tests of this locomotive is completely illustrated with diagrams and drawings, and contains all essential data similar to the reports for the other locomotives which were published in book form; in addition it gives a comparison of the results with those obtained from the Cole 4-cylinder compound Atlantic type locomotive No. 3000 of the New York Central & Hudson River. This series of tests must be regarded as the most complete and accurate measurements of locomotive performance ever made. Since the publication of the volume covering the St. Louis tests the various data has been used by railway engineers in most European countries, as well as in the United States, as the best available for locomotive boiler and engine efficiency, economy and capacity. Subsequent discussion has shown, as is well known, that there is an important difference in laboratory and road conditions, and for the application of some of this test data it is desirable to know what the ratio is between laboratory and service results. If some of the care taken with laboratory testing were applied to road tests the principal locomotive data might be obtained with greater exactness for service conditions, and this would assist in a further study of these relations and make the laboratory tests of greater value in their application to locomotive performance in actual service.

The completeness and exactness of the work on the locomotive testing plant at Altoona suggests that it would be profitable for railways and locomotive companies to club together and have a series of tests equally complete made of a Mallet locomotive. There are a number of uncertainties connected with the operation of these locomotives, and if their characteristics were as well understood as those of the Atlantic type there would probably be a considerable modification in the design of Mallet locomotives.

The information and data contained in the report of the tests of the simple Atlantic type locomotive is so valuable that we give some of the principal figures and conclusions. The general dimensions of the Pennsylvania simple Atlantic type engine are: Cylinders, 20½ in. x 26 in.; drivers, 80 in.; weight on drivers, 110,000 lbs.; there are 315 two-inch tubes each 15 ft. long; firebox heating surface, 156.86 sq. ft.; tube heating surface, 2162.4 sq. ft.; total heating surface, 2319.26 sq. ft.; grate area, 55.5 sq. ft. The Cole compound, No. 3000, with which this engine was compared, is an engine of nearly the same capacity and the weight on drivers is identical. The principal difference is in the heating surface and grate area, the Pennsylvania engine having 732 sq. ft. less heating surface and 5.6 sq. ft. more of grate area. The ratio of heating surface to grate area in the New York Central engine is 61, and in the Pennsylvania engine 41.8. The coal used in the Altoona tests was from the same mine as that used at St. Louis, and the average analysis is very nearly the same. That used at Altoona was: Fixed carbon, 76.25 per cent.; volatile combustible, 16.13 per cent.; moisture, 1.6 per cent.; ash, 6.02 per cent.; total, 100 per cent.; sulphur, determined separately, .94; B. T. U. per pound of coal, 15,143.

One of the interesting features of the boiler performance was the measurement of the limit of its capacity. Starting with the evaporation of about 15,000 lbs. per hour the rates were advanced by fairly even stages until an evaporation of 30,000 lbs. was obtained. When this latter figure was exceeded the steam pressure could not be maintained, and it was concluded that the boiler could not be expected to deliver more than a maximum of 30,000 lbs. of steam per hour. This was obtained at 160 revolutions, or 38.2 miles per hour, and corresponds to 16 lbs. equivalent evaporation per square foot of heating surface. The quality of the steam with the boiler working at maximum capacity was about 98.5 per cent., or practically dry, and this indicates that there is not a much greater amount of moisture present in steam when the boiler is delivering large quantities than when the evaporation is low.

Basing the boiler horsepower on an equivalent evaporation of 34.5 lbs. of water per horse power hour, the range of the power in tests was 500 to 1,000 boiler horsepower. The maximum was at the rate of .43 h. p. per square foot of heating surface, or 2.32 sq ft. heating surface per horsepower, and 18 h. p. per square foot of grate surface. The equivalent evaporation per pound of coal ranged from 10.69 lb. obtained at the lower rates of combustion, to a minimum of 5.74 lb. at the higher rates of coal consumption per square foot of grate. The efficiency of the boiler also varied with the rates of combustion, being 67.65 at the lower rates and 42.41 at the higher rates.

In discussing the engine performance the report calls attention to the indicator diagrams, and states that the tests at different speeds while running with the reverse lever in the same notch did not have the same actual cut-off in the cylinders, but it became longer as the speed increased, probably due to the springing of the valve motion. This effect was so marked that the cut-off was found to increase from 15.7 per cent. at 80 revolutions per minute to 21.4 at 320 revolutions per minute, while the reverse lever notch remained the same. Steam consumption decreased as the indicated horsepower increased, while the best result was 23.8 lbs. of dry steam per indicated horsepower.

During this test the driving axle bearings were lubricated with oil; the main side rods, except the front end of the main rod, were lubricated with hard grease, and the cylinders with oil by sight feed lubricators. The machine friction was found to be fairly uniform, and the average has been taken as equivalent to 1,687 lbs. drawbar pull. The maximum horsepower of the engine, 1,250, was obtained at 280 revolutions. The drawbar pull and steam consumption corresponding to different speeds are given in the following table:

Nominal speed, r. p. m.	Steam per I. H. P. hour, lbs.	Maximum cylinder horsepower.	Maximum estimated drawbar pull, lbs.
80	32.3	940	16,768
120	28.0	1,075	12,384
160	26.3	1,150	9,602
200	24.9	1,220	7,894
240	24.4	1,240	6,428
280	24.0	1,250	5,325

COMPARISON OF SIMPLE AND COMPOUND ATLANTIC TYPE PASSENGER LOCOMOTIVES.

In the comparison of the results of the tests of the Pennsylvania Atlantic type locomotive and the New York Central 4-cylinder compound Atlantic type locomotive, the former will be known as engine No. 5266 and the latter as engine No. 3000. The equivalent evaporation per pound of dry coal for different rates per square foot of heating surface shows no difference in the two boilers. In other words, the efficiency of a square foot of heating surface in the boiler of No. 5266 was the same as the efficiency of a square foot of heating surface in the boiler of No. 3000, and this was true for all rates of evaporation. When, however, the equivalent evaporation per pound of coal is plotted according to the rate of combustion, the advantage of the larger heating surface per foot of grate in No. 3000 is at once apparent, and this advantage in economical evaporation is maintained throughout the full range of steam delivery of the two boilers. The greatest loss due to poor combustion as indicated by carbonic oxide was only 1¼ per cent., with No. 3000, which is remarkably low; while in the case of No. 5266 in one case it was 9.13 per cent., and in two others 6 per cent. and 7.3 per cent. The more

perfect combustion shown in No. 3000 is in all probability due to the brick arch, as there was no arch in No. 5266.

The most interesting figures in this comparison of simple and compound passenger engines are shown in the engine performances, and especially in the relative steam consumption. The compound locomotive within certain limits operates on less steam per unit of power than the simple locomotive. The data and diagrams from these tests show clearly another fact that is not so generally recognized, and that is that the difference in the water rate or steam per horsepower hour is not a constant difference expressible as a certain definite percentage of saving. When each of the locomotives was developing 600 h.p. there was a difference in the steam per horsepower of about 9.7 lbs., or a saving of 31.8 per cent., while at 1,300 h.p. this saving was but 3.5 lbs., or about 14.9 per cent. The diagrams show that the water rates of the two locomotives would perhaps meet at about 1,600 h.p., were it possible to drive No. 5266 to such a point, and as the high horsepower is obtained as a rule at the higher speeds, the curves would indicate that the simple locomotive was working most economically at its highest speed, while the reverse is true of the compound. The conclusion in regard to steam consumption at different speeds as given in the book on the St. Louis tests is as follows: In general, the steam consumption of the simple engines decreased with increased speed, while that of the compounds increased, which would lead to the conclusion that the steam distribution of the compound was less satisfactory at high speeds than that of the simple.

It would appear at first sight that the curves for coal per indicated horsepower should follow the same law as those for steam, and this would be the case were it not for the fact that as the output of the boiler increases it is at the expense of a greater and greater quantity of coal per pound of water evaporated. While no advantage of the compound is shown at high speeds, one of the most significant results of this comparison is the large increase in horsepower and drawbar pull that may be realized from compounding, without any increase in boiler capacity. This is an important advantage aside from all consideration of economy in the use of fuel. If the simple engine working its boiler to nearly maximum capacity produces 30,000 lbs., of dry steam per hour, it could develop 1,200 h.p., while the compound with the same amount of steam will develop 1,400 indicated h.p. When this is converted into drawbar pull, there is an increased drawbar pull from the compound engine of 1,600 lbs. at 40 miles per hour, 1,184 lbs. at 50 miles per hour, and 962 lbs. at 60 miles per hour. At the last speed the total drawbar pull of the simple engine is 5,775 lbs., and that of the compound engine 6,737 lbs. The bulletin contains complete drawings of the simple Atlantic locomotives and an abundance of tables and diagrams showing the graphic log of every test.

On November 3 the Antung-Chikuanshan section of the Atnung-Mukden Railway, Manchuria, was opened to standard gage traffic. The section is 50 miles long—about 26 per cent. of the present line. As there are already 35 miles of broad gage line at the Mukden end of the railway, and the whole line when finished is to be 170 miles, the work of reconstruction is therefore about half finished. The center section, now 103 miles in length, will, when finished, be only 85 miles, the distance through the mountainous region to be reduced to that extent by tunneling. The total length of these tunnels will be 25,000 ft.; the longest will be 4,884 ft. It is expected that the entire line will be completed by August of next year. American rolling stock is to be used on the new line, while the rails and ties are of Japanese make. The secretary of the South Manchuria Railway says that the bridges were ordered from the United States because American manufacturers were able to supply them within the shortest time. The total length of bridges is 20,000 ft., the longest bridge being 1,830 ft. The widening of the gage between Antung and Chikuanshan has materially shortened the trip between Antung and Mukden.

FEDERAL BOILER INSPECTION BILL.

The bill for regulating the inspection of locomotive boilers, which has been before Congress for the past year and which has been subjected to much discussion and many amendments, has finally been put into such shape that neither the railways nor the employees' brotherhoods make serious objection to it, and in this shape it passed the Senate on January 10. It is now in the House Committee and it may become a law at the present session. The following is the substance of a bill as passed by the Senate:

Section 1. Applies to all interstate railways.

Section 2. From July 1, 1911, it shall be unlawful to use any steam locomotive in moving interstate traffic unless the boiler and appurtenances are in proper and safe condition to move traffic without unnecessary peril to life or limb; and all boilers shall be inspected [by the roads], in accordance with rules to be prescribed, and be able to withstand tests provided by such rules.

Section 3. The President, by and with the advice and consent of the Senate, is to appoint a chief inspector of locomotive boilers (salary $4,000) and two assistant chief inspectors (salary $3,000 each). [These three inspectors seem to be independent of the Interstate Commerce Commission, but all of the other provisions of the bill refer to the commission as the ruling authority.]

Section 4. The chief inspector is to divide the country into 50 districts, and an inspector is to be appointed for each district; salary $1,800, with $600 for office rent, stationery and clerical assistance. These 50 inspectors are to be appointed by the Interstate Commerce Commission after competitive examinations, according to the rules of the Civil Service Commission. The chief inspector is to prepare a list of questions, which, when approved by the Interstate Commerce Commission, is to be used by the Civil Service Commission as a part of its examination.

Section 5. Each carrier shall file its boiler inspection rules, which, after hearing and approval by the commission, shall become obligatory on such carrier. If the rules are not duly filed, the chief inspector shall prepare rules for that carrier. A carrier may change its rules from time to time, on approval by the Interstate Commerce Commission. The general rules for the inspectors are to be prepared by the chief inspector and approved by the commission.

Section 6. Each inspector is to become familiar, so far as practicable, with the boilers in his district; and make personal inspections from time to time as may be necessary to carry out the law and as may be consistent with his other duties. His first duty shall be to see that the carriers obey the law and repair defects promptly. Each carrier must send to the inspector duplicate sworn reports of each inspection and also of what has been done to repair defects found by inspection. An inspector finding a boiler out of order is to notify the carrier in writing and thereafter the boiler must not be used until repaired. Within five days the carrier may appeal to the chief inspector for re-examination and another man must then re-examine, within 15 days; if still dissatisfied, the carrier may within 30 days appeal to the commission, which may overrule the inspector or the chief inspector. Pending either appeal, the inspector's first decision shall stand.

Section 7. The chief inspector shall make an annual report to the commission.

Section 8. Boiler accidents resulting in serious injury or death must be forthwith reported in writing and the chief inspector shall investigate or order investigation. Parts of damaged boilers must be kept so that they can be seen by the inspectors. The commission may at any time call on the chief inspector for a report of any accident and may publish the same with recommendations. Such reports must not be used as evidence in suits for damages.

Section 9. Penalty for violation $100.

Two new stations, Luque and Kilometro 35, have been opened on the Central Argentine Railway's branch from Villa del Rosario to Las Rosas.

WOOD PRESERVERS' ASSOCIATION.

The seventh annual meeting of the Wood Preservers' Association was held in the Auditorium Hotel, Chicago, January 17-19. The first session, devoted to routine business, was called to order at 10 o'clock Tuesday morning by President Walter Buehler, with about 40 members and guests present. The report of F. J. Augin, secretary-treasurer, showed a balance on hand of $457.60 and a membership of 66. The convention held sessions on Tuesday afternoon, Wednesday morning and afternoon for the discussion of papers.

The feasibility of grouping timbers for treatment was discussed by W. F. Goltra, president, W. F. Goltra Tie Co. [This paper will be published later.]

A general review of timber treating in this country was presented by John T. Logan, president, National Lumber & Creosoting Co. He spoke of the progress made in wood preserving on American railways and mentioned the factors which are most retarding the growth of such preservative work. The most important of these factors are, that many railway managers are compelled to curtail expenditures, that many who believe in wood preservation, try so many new methods that the impression is given that the entire process is still in the experimental stage, and that many "get-rich-quick" companies are producing worthless treated timber products that reflect on the quality of all properly treated timber.

F. J. Angier, timber treating engineer, The Kettle River Company, and consulting timber treating engineer, Chicago, Burlington & Quincy, summarized the results that have been obtained in this country in prolonging the life of railway cross ties by preservative treatment as shown by the records that have been kept. The results given were limited by the subject assigned to those shown by records which have been kept, and the writer brought out the fact that in most cases much more valuable data than that preserved in permanent records could be obtained by relying on the memories of men who for many years have made a study of the life of timber. To illustrate the unreliability of records, one case was cited in which a railway company kept a tie record for ten years and the results showed that only 102,000 ties out of a total of more than five and a half million—less than 2 per cent.—were shown as removed for all causes. However, some of which the following is part:

The general average of the life of white oak ties (not treated) reported by twenty-two well-known railways of the northern states, located both east and west of the Allegheny mountains, is eight and one-fourth years, according to a report made by the American Railway Engineering & Maintenance of Way Association. The figures taken into account in this average were supposed to represent the life of ties which had failed by natural decay and not by rail cutting. In the southern states the life of white oak ties is said to average five or six years.

W. L. Breckinridge, of the C., B. & Q., says the average life of untreated white oak ties on that road is ten years; white pine is about five years. He further says that about 90 per cent. of all their untreated ties fail account of decay.

The Atchison, Topeka & Santa Fe has kept a tie record, which shows an average life of about ten and one-half years.

A statement taken from the Chicago & Eastern Illinois's records, made December 31, 1909, shows only 9½ per cent. removed, account of decay, from a total of 111,816 ties treated in the year 1899. From a total of 1,647,605 ties laid during the years 1899 to 1909 inclusive, the records show only 1.1 per cent. removed due to decay. This record was made by placing a dating nail in each tie as treated and laid, and depending upon the section foreman to hand in correct reports of ties put in and taken out of track. It has proven a very unsatisfactory method of keeping a record and doubtless many inaccuracies occur.

A committee that investigated the treated ties on the Illinois Central reported that red oak, gum and beech, treated with zinc-chloride will last at least double that of white oak ties in the south, and equally as long as white oak in the north; and that the percentage of failures so far found is less than white oak in all localities.

The following is taken from a paper written by C. T. Barnum, appearing in the Journal of the Western Society of Engineers for June, 1910:

"The L. & N. in 1882 used large quantities of creosoted piles, stringers and caps, in the construction of trestles and docks, in the vicinity of Pensacola, Fla. All of this material gave a service of over twenty-five years.

"The Forest Service has estimated that proper preservative treatment will increase the life of ties over 200 per cent., poles 100 per cent., posts 300 per cent., piles 700 per cent., mine props 400 per cent. and lumber 300 per cent."

Octave Chanute said that with the German practice of injecting about one-third of a pound of zinc-chloride in a cubic foot of timber, he obtained an average life of eleven and one-half years with hemlock and tamarack ties.

October 1, 1900, 550 red oak ties, treated with one-third pound of zinc-chloride per cubic foot (in this case solution was made of such strength that treatment was carried to point of refusal) were placed in track near Mystic, South Dakota, on the C., B. & Q. These ties were inspected by J. H. Waterman on October 9, 1910, aften ten years' service. Mr. Waterman says: "Not one tie has been removed for any cause. The rail has been changed once or twice. The ties are laid on a 3 per cent. grade and a 12 degree curve. From the surface appearance they will last at least five years more, and I will be disappointed if 50 per cent. are not in track ten years from this date."

The climate around Mystic is comparatively dry; and further, the ballast in which the ties were imbedded is limestone, which in itself absorbs more or less moisture and thus affords protection to the ties.

April 17, 1894, sixty hackberry ties were laid in track just west of Gillette, Wyo., on the C., B. & Q. They were treated with zinc-chloride by the Santa Fe and shipped to the Burlington. A careful record has been kept of these ties, and they were last inspected by Mr. Waterman October 6, 1910. He says:

"Originally there were sixty ties placed in track. Twenty-five per cent. are still in track and apparently in a good state of preservation. They have been in track now over sixteen years."

This is another case of ideal climatic conditions. If these same ties were placed in track in Illinois or in Texas the results would have been altogether different in all probability.

The Committee on Wood Preservation of the American Railway Engineering & Maintenance of Way Association, in their 1909 report, gave the following preliminary deductions:

(1) "Creosoting may be relied upon to preserve piles from twenty to twenty-five or more years, if they are injected with 16 to 24 pounds per cubic foot.

(2) "Creosoting at present cannot be relied upon to preserve ties more than fifteen and one-half to nineteen years, an absolute maximum, unless the ties are protected against mechanical destruction. If badly injected they perish from decay in five to twelve years.

(3) "Burnettizing, when well done, can be relied upon to preserve ties from ten to fourteen years. The amount of injection varies with the proposed subsequent exposure. In arid climates one-quarter pound of dry zinc-chloride per cubic foot may give good results. In moist and warm climates not less than one-half pound per cubic foot should be in-

jected. There are great differences in the thoroughness with which the work can be done.

(4) "The zinc-creosote process has been too recently introduced (1904) in this country to give definite conclusions; it has given ties a life of twelve to eighteen years in the track in Germany."

In another report this same committee says that untreated white oak ties last seven to twelve years, pine five to eight years, chestnut eight and one-half years, cedar fifteen years, tamarack five to six years, hemlock five years, cypress seven to nine years, 75 to 98 per cent. of white oak ties fail from decay, and 2 to 25 per cent. from rail and spike cutting; 75 to 90 per cent. of other ties fail from decay, and 10 to 25 per cent. from rail and spike cutting.

W. A. Clark, chief engineer of the Duluth & Iron Range, says: "In the fall of 1890 we placed in our main track 256 ties, of which eighty-five were white pine, eighty-five tamarack and eighty-six red Norway, all treated by what I understand was the Wellhouse process. The track in which they were placed was at the time single track, but the road was shortly afterward double-tracked and the grade at this point revised so that many of the ties were damaged and could not be used over again at that time. After double-tracking, these ties were in our north-bound track, which carries our light trains to the mining districts. A few of these ties were only removed the past season, but nearly all of them had been removed by 1908. We estimate that the average life of the ties which were not damaged when the double-tracking was done was about fifteen years. I might add that the ties had been seasoned since the winter previous before treating, and they were laid in gravel ballast, which is frozen solid probably an average of five months in the year, which might account for part of their long life."

In closing the paper Mr. Angier outlined the system of keeping a tie record which he developed for the Chicago, Burlington & Quincy, and which was described in the *Railway Age Gazette* of May 6, 1910, page 1124. He shows that this system of keeping a record on 19 divisions laid with ties of varying grades and treated by different systems has proved very satisfactory and has decreased the cost of such records by about $75,000 in ten years plus the interest on that amount.

H. J. Whitmore took up the matter of treating sawn and hewn ties in the same cylinder load. He advocated separate treatments, and in defense of this position brought out the points that timber from which sawn ties are usually cut is, as a rule, of a better grade than that from which hewn ties are cut; that the hewn ties are usually seasoned on line while the sawn ties usually come direct from the mill and are, as a rule, green and not ready for treatment; that the two classes of ties should be kept separate in the track for various reasons, which would require a separation at some time during the handling; and, finally, that the treatment can better be controlled when the two classes are separated.

The covering of retorts was very strongly advocated by R. W. Yarbrough, superintendent National Lumber & Creosoting Co. He assumed a set of conditions and calculated the financial saving directly resulting from using covered retorts. His figures are given below:

I have taken a 7-ft. retort, 132 ft. long and operating under 250 degs. of heat, eight hours a day. If you are not steaming and carry your oil at 150 degs. my figures will be reduced one-half. I have taken the outside temperature to be 60 degs.

The cylinder will have 2,972.68 sq. ft. of surface exposed to radiation. The best authorities give 2.23 B. t. u. lost per sq. ft. per hour for every degree of temperature. We have 250 degs. in retort, outside temperature of 60 degs., leaving a difference in temperature of 190 degs. Take this 190 degs. times 2,972.68 sq. ft. of surface exposed times 2.23 B. t. u. lost for every degree of heat per sq. ft. and we have 1,237,023.37 lost every hour. This only represents the theoretical loss, as in generating this heat from coal and transmitting it in the form of steam is lost 40 per cent. of the calorific power of the coal. Add this 40 per cent. to the 1,237,023.37 B. t. u. lost in retort and we have lost 2,061,705 B. t. u., of heat in one hour. The next thing is to see how many pounds of coal this amounts to. A fair average of the heating value of our coal is 11,000 B. t. u. a pound. Divide this into the 2,061,705 B. t. u. lost in retort and the result will be 187 pounds of coal, which has been burned and for which no useful work has been done. This coal, we will say, is costing $3 per ton at fire room. I will assume we have lost 13 more pounds before it gets to retort, making a total of 200 pounds of coal lost from radiation. This is one-tenth of a ton at $3 per ton, which makes 30 cents for every hour. This, multiplied by eight hours, means a loss of $2.40 worth of coal in eight hours. If we run 300 days out of a year, we have lost $720 for want of retort covering.

Having shown the loss of money by not covering retorts, let us see what it costs to cover same, and whether it pays. I will say that it costs $1,000 to cover the retort. That can be cut in two if a cheaper covering is used. This $1,000 cost will represent an interest charge of 31 cents per day. This taken from the $2.40 saved by covering, leaves a net saving of $2.09 a day. There is another big saving in having retorts covered, and that is, that after you once get them hot, it is very little trouble to keep them that way. That is well recognized by all good operators, and they always strive to change charges as rapidly as possible so as to keep retort.

In commenting on the difficulties met by northern treating plants that are not met in the south, Andrew Gibson, superintendent timber preservation and tie treating plants Northern Pacific, mentioned the following facts: Northern plants must invariably contend with very cold weather at frequent periods between the first of November and the end of March, which, of course, means increased coal consumption and increased care to guard against freezing pipes and consequent damage to plants. During the same period the snow, which is common in the northern states, makes the handling of cylinder cars in the yards very troublesome. The opinion was also expressed that Douglas fir, tamarack and spruce are more refractory to treatment than the average southern woods. The writer mentioned the fact that a great deal of the material consumed in timber treating is imported, and that the northern plants, which are far removed from the coast, have to pay an added amount for the extra freight haul.

William Townsley, Jr., the Grasselli Chemical Company, read a paper on the benefit derived by members from attending the conventions of the Association. The convention closed with a business session Thursday morning. The election of officers for the coming year and the matter of affecting the incorporation of the association were to be taken up at this meeting. Further announcement of this meeting will be given in the *Railway Age Gazette* of next week.

The subject of depth of penetration that can be expected with the amount of preservative usually specified was discussed by R. L. Allardyce, superintendent International Creosoting & Construction Co., and David Allerton, The Kettle River Co. Mr. Allerton brought out the fact that the amount of penetration to the cubic foot depends on the relative dimensions of the stick of timber treated and that the density of the solution used must be taken into account in considering the effectiveness of any penetration. For creosote treatment he gave the following average values for penetrations, which may be expected under ordinary conditions: With a 10-lb. treatment in piling a penetration of 1½ in.; with a 12-lb. treatment in bridge stringers and caps, 1½ in. It is evident that to obtain the same penetration the amount of oil used must be increased as the surface per cubic foot increases. The writer suggests that this increase be made in a

simple arithmetical ratio to the increase in surface. Mr. Allardyce confined his statements to the treatment of southern pines by the full cell method. He gave as average values for piling on a 10-lb. to 12-lb. oil treatment penetrations of ¾ in. to 1½ in.; on 14-lb. to 16-lb. treatment, 1½ in. to 3 in.; on a 20-lb. treatment, 3½ in. to 4 in.; and on the heaviest treatments, 22 lbs. to 24 lbs., from 4½ in. to complete penetration. For treating ties by the straight zinc or Burnettizing process, a 20-lb. treatment on loblolly ties should give a complete penetration, or, at least, up to the last inch or inch and a half of the center of the tie.

C. D. Chanute, of O. Chanute & Company, took up the subject, which was rather fully discussed at last year's convention, concerning the amount of creosote oil that can be withdrawn from wood by subsequent vacuum. The writer submitted the following results of tests:

Some thoroughly dried ties were weighed carefully and then put in the cylinder and the door tightly closed. The cylinder had a capacity of three ties, and on top of the cylinder at the highest end (as the cylinder was on a slight slant), there was connected a small pipe extending about a foot above the cylinder, so that when filling, the fact that the cylinder was absolutely filled could be ascertained, as the creosote was allowed to flow into the cylinder until it came out of this pipe in a solid, liquid stream, showing that there was no foam or air left in the cylinder, after which the valve just above the top of the cylinder was closed.

The cylinder was filled entirely by gravity, no vacuum being produced before filling, and the creosote was allowed to enter the cylinder very gradually so as to produce as little foam as possible. There was also a small pipe connected with the bottom of the cylinder at the lowest point, which was used to catch all drippings, as the cylinder was on a slight slant, as before mentioned.

After filling, a pressure of 100 lbs. per sq. in. was applied for three hours, and steam circulated in the steam coil, keeping the temperature at 180 degs. Fahrenheit. The creosote was then withdrawn as completely as possible, and the ties immediately taken out and weighed, being set in tin troughs on the scales which would catch all drippings, and then allowed to stand in the air for one hour, still in the tin trough, after which the ties were reweighed, and the drippings in the troughs and the drippings from the cylinder after the ties were removed, were weighed, so as to check the drippings of the ties. In all cases this checked very closely. The ties were then returned to the cylinder and heated to the same temperature as before removal, and a vacuum of 25 in. applied for one hour, and this vacuum was obtained in about three minutes, due to the small capacity of the cylinder.

After this vacuum, air was admitted to the cylinder, and the oil extracted allowed to run through the small pipe under the cylinder, caught and weighed. The ties were removed from the cylinder and weighed, being again set in the tin troughs which had been cleaned of the former drippings. The drippings from the cylinder, and the drippings in the troughs, were weighed to check the weight of the ties after the vacuum, and the following results were obtained:

Out of experiments with 12 different ties the results varied from 8.1 per cent. of creosote extracted from planed Loblolly pine to 22.4 per cent. extracted from sawed Loblolly pine.

The writer performed some experiments along this line about 15 years ago, that is, the extraction by vacuum, and obtained about the same results, which seem to show that from 5 to 15 per cent. can be extracted by subsequent vacuum.

SOUTHERN PACIFIC TICKET OFFICE, PALACE HOTEL, SAN FRANCISCO.

The Southern Pacific has opened in the Palace hotel building, 633 Market street, San Francisco, a ticket office, which, for convenience of arrangement, general adaptability to the purpose of a ticket office and beauty of furnishing and decoration, ranks among the finest ticket offices in the country, if, indeed, it is not the very finest. The new ticket office is conducted in addition to the city ticket office in the Flood building, with entrances on both Market and Powell streets.



General View of Southern Pacific Ticket Office.

The office in the Palace hotel has 3,500 sq. ft. of floor space, 50 ft. being on Market street and 70 ft. on New Montgomery street. The entire scheme of arrangement and decoration is novel. The woodwork is Circassian walnut. A large circular counter, 142 ft. long, occupies the center of the room, as shown in the illustration. In the lobby are large tables and comfortable chairs for the convenience of patrons in writing letters, telephoning, etc. On the walls are numerous large photographs picturing the wonders of California, and a frieze runs entirely around the room showing Lake Tahoe, the Sierras, the missions of California, Mount Shasta, Riverside, etc. The most striking feature of the decorative scheme, however, is an immense map of the United States, painted on the western wall of the room. It is 18 ft. high and 52 ft. long., being 6¼ miles to the inch. It took three artists over six months to paint it.

A new feature has been introduced in the making up of interline tickets. Local and Pullman tickets are kept in cases on the main floor, but the interline ticket cases are in the basement,



Booklet Stand.



Writing Tables for Customers.

where there is a force of ticket makers. Under the arrangement in effect, the man behind the counter becomes a salesman only, and devotes his entire attention to the traveling public. When the passenger decided on his route a slip similar to the one illustrated herewith is made out by the salesman and sent by pneumatic tube to the basement, where the ticket is made up by ticket makers who have nothing to but devote their time to this work. As soon as it is prepared, it is sent by pneumatic tube



Ticket-Making Room.

to the main floor. This arrangement has the usual advantages of division of labor where such division is feasible. It makes it practicable to prepare the tickets more quickly than where the salesman has to do it, because under this arrangement the ticket maker does not have his work interrupted by passengers asking questions. It is further advantageous in that it enables the salesman to devote his entire time and attention to the customer, which makes it sure that the latter will be well and tactfully served.

Form 5429 Local. (8-15-10—2M—S-1735)

SOUTHERN PACIFIC CO. Railroad Ticket Order S. P. No._____. Original

San Francisco,_____191__ _____A.M._____P.M

Destination_____

Number of Tickets_____ Class_____ Limit {GOING_____ RETURN_____

Fare (each)_____ Total Am't_____ Cash Rec'd_____ Change_____

Date Departure_____ Train_____ Stop-over? YES NO_____

Going Route—Eastbound

SHOW TRANSFER COUPONS, IF ANY NECESSARY

RAILROAD	FROM	TO	FORM	NUMBER
	SAN FRANCISCO	to		
		"		
		"		
		"		
		"		
		"		
		"		
		"		
		"		

Return Route—Westbound

		to		
		"		
		"		
		"		
		"		
		"		
		"		
		"		
		"		

Passengers' Name

1 _____ Salesman _____

2 _____ Ticket Maker _____

3 _____ Order Rec'd _____ A. M. ____ P. M.

4 _____ Ticket Made _____ A. M. ____ P. M.

Rec'd of S. P. Co. tickets described in this order _____

Cashier's Paid Stamp

	RD BEARD	FULL BEARD	SIDE BEARD	CHIN BEARD	MOUSTACHE	GRAY HAIR	DARK HAIR	LIGHT HAIR	DARK EYES	LIGHT EYES	ELDERLY	MIDDLE AGE	YOUNG	TALL	MEDIUM	SHORT	STOUT	MEDIUM	SLIM	FEMALE	MALE	

Ticket Order Form.

For the foregoing information and for the illustrations published herewith, we are indebted to E. O. McCormick, vice-president, and Charles S. Fee, passenger traffic manager, of the Southern Pacific.

The statistical office of the city of Dusseldorf has published the average daily wages paid to unskilled adult male laborers in 23 cities in Germany with populations of 20,000 or more inhabitants. The high average wage in 1910 was in Munich; it amounted to $.880, as compared with $.547 in the same city in 1893. The low average wage in 1910 was in Stettin, and amounted to $.595, as compared with $.536 in the same city in 1893. The average wage of all the 23 cities in 1910 was $.774, as compared with $.569 in 1893. In 1893 the high average was in Bremen and amounted to $.714, as compared with $.762 in the same city in 1910. The low average wage in 1893 was in Leipsig, and amounted to $476, as compared with $833 in the same city in 1910.

IMPROVEMENT IN SIGNAL DETAILS.*

BY J. S. HOBSON,
Assistant General Manager, Union Switch and Signal Company.

The progress made in our branch of engineering during the past year has been along the lines of developing designs already in general use.

The interlocking and signaling for the new terminal of the Pennsylvania Railroad in New York City is a striking example of this, since, while that installation is the very latest development in railway signaling, it differs little in general principles from similar plants installed during the past five years. The most noteworthy features of this installation comprise means for obtaining the positive control of interlocked signals by the actual position of the switches or switch they govern; the automatic control of such signals by track conditions; the automatic locking of all switches in every route by the entrance of trains thereon, and their automatic release immediately the rear end of a train has passed clear of the fouling point of the track including each switch. The special features further comprise means for giving visual indications to the tower operator of every act of a train in actually locking and releasing levers controlling switch and signal operation, and means for permitting the joint use of all tracks for traffic in either direction between adjacent towers, by the co-action of towermen and track conditions.

There is one somewhat original improvement used here for the first time to any extent; namely, the control of electro-pneumatic valves through magnets actuated by alternating current. The use of alternating current for the operation of signal apparatus has been steadily growing for the past seven years, and the twelvemonth just passed represents a more rapid growth of its use than any previous year. Alternating current was first used to any extent in signal apparatus for the operation of track circuits on electric railways, employing either alternating or direct current for propulsion purposes, but now its use has gradually been extended to the operation of signals, indicators, and locks.

A new field has very lately been opened for signal apparatus on interurban electric railways, the managers of which are taking a very keen interest in this subject, several contracts of this kind having just been closed by this company. On these roads, by modifications in the design of alternating-current relays, transformers, etc., the length of track circuits which can be operated without relaying has been materially increased, and the cost of installing alternating-current automatic block systems reduced accordingly.

The only other striking improvement in signal apparatus has been the development of the electro-mechanical interlocking system, in which the switches and their locks are operated manually and controlled electrically, the signals being electrically operated. This system possesses the combined safety features of manual and power operated interlockings at a cost about midway between the two. Its use is confined to plants where the farthest switch is located within about 800 ft. of the operating levers, and so far it has not been applied to interlockings of any considerable magnitude, or where the rapid operation of switches and signals is necessary, such as in terminal yards. Very many interlockings can be satisfactorily operated by it, and its use is rapidly increasing.

Numerous minor developments in products have been made during the past year, the improving of insulation in electrical material, the standardization of details to fit them for more universal application, and the modification of designs to cheapen the cost of production and expedite delivery of orders. Porcelain and insulating moulded material has been substituted, in many instances, for parts previously made of metal and insulated from their electrical connections by bushings and washers.

Freight rates from Buenos Aires, Argentina, to Asuncion, Paraguay, are, speaking generally, as much as rates from Europe or the United States to Buenos Aires.

* From The *Electric Journal*, Pittsburgh.

General News Section.

The city government of Waterville, Me., has voted to "request" the Maine Central to refrain from using soft coal in the switching engines in Waterville yard.

The Louisville & Nashville has growing, on tracts of land along its lines, about 2,000,000 catalpa trees, many of them on grounds surrounding the homes of track foremen, where they are valuable for shade.

The Pennsylvania Railroad has installed telephones for the use of train despatchers on the line between Renovo and Kane, Pa. A similar change has been made on other sections of the company's lines in the northern part of Pennsylvania.

The train shed of the Nashville, Chattanooga & St. Louis, at Chattanooga, Tenn., was destroyed by fire on the morning of January 10, together with a train of passenger cars. The historic locomotive, "General," which stands in this station, was saved from the flames.

The Lehigh Valley has extended its telephone train despatching wires by putting up a line between Packertown and Bernice, 140 miles, and expects soon to put telephones in use between Wilkesbarre and Sayre, 90 miles. The apparatus is furnished by the Western Electric Company.

A bill has been introduced in Congress by Senator Jones, of Washington, to require railways doing interstate business to adopt uniform operating rules. The purpose seems to be to make compulsory, through governmental intervention, the rules of the American Railway Association.

Governor Tener, of Pennsylvania, in his inaugural address, recommends the radical enlargement of the powers of the State Railroad Commission, the passage of an employers' liability law, and a compulsory strike arbitration law, supervision of mining operations and mining machinery. with a view to the protection of employees, a general revision of taxation laws and state assistance in highway and waterway improvement.

The evening of January 10 was "Union Pacific" night with the Men's Club of the First Presbyterian church of Omaha, Neb. Edson Rich, of the law department of this road, acted as chairman, and talks on railway affairs were made by J. A. Munroe, freight traffic manager; N. H. Loomis, general solicitor; Gerrit Fort, passenger traffic manager; C. J. Lane, first assistant general freight agent; D. C. Buell, director of the educational bureau of information; J. C. Young, signal engineer, and H. J. Stirling, auditor. Some of the speakers told of the effects that are resulting from regulation of railways.

One of the last acts of Governor Campbell of Texas before his retirement from office was to order the attorney general to bring suits against the Missouri, Kansas & Texas Railway of Texas and the International & Great Northern for the forfeiture of their charters. The instructions seems to be based on two grounds. One is that the majority of the stock of each of the roads is owned by outside corporations, which it is contended violates the constitutional requirements of the state that the railways doing business there shall be Texas corporations, and the other is that these roads are insolvent, because their indebtedness is in excess of the value of their properties. The governor also suggested suits against some other railways on the same grounds.

J. C. Clair, industrial commissioner of the Illinois Central, delivered an address in Representatives' Hall at Montpelier, Vt., on January 13, on industrial matters in Vermont, and in the course of his remarks referred especially to the railway question. Mr. Clair is a native of Vermont and an old friend of Governor J. A. Mead, and it was at the personal request of Mr. Mead that the address was delivered. The governor presided at the meeting and introduced the speaker. Mr. Clair described the work being done by the western railways for the development of traffic-producing industries on their lines. Referring to criticisms of inefficiency in management, he said that the railway industry is the only one that has given any tangible evidence to the public of increased efficiency, and called attention to the fact that a locomotive engineer is now hauling nearly 400 net tons per locomotive as against 200 net tons ten years ago, an increase in efficiency of 100 per cent. This increase in efficiency has been brought about by the extensive improvements in the plants, and the people have received the benefit of it because, in spite of the fact that very large increases have taken place in the wages of labor and in the cost of materials and supplies, the price of transportation has not been increased, while prices in other lines have increased.

The Indiana Legislature sustains its reputation as a fertile field for all kinds of legislation to regulate the details of railway operation. The Senate committee has reported favorably on a bill to make railways liable for damages on account of fires along the line, with a proviso that the railway may insure such property. Representative Thornton has a bill providing that when a railway discharges a man for dishonesty, it shall let him see the "spotter" who testified against him. It is said that the brotherhoods are promoting this bill. Representative Hammond has a bill providing for boiler inspection, and another requiring cabooses to be 24 ft. long, with two trucks. It is claimed that small cabooses are dangerous when trains are being pushed, but railway officers declare that their short cabooses are perfectly safe. There is another bill in the Senate providing for inspection of locomotives, and one requiring enginemen and conductors to have had three years' experience in "railroading" before taking charge of a train. A bill to provide compulsory compensation for injured employees is being opposed by the labor leaders. A representative has introduced a bill requiring a trains to "pull up to a station" and unload passengers before switching. The governor recommends elaborate legislation to regulate the issue of stocks and bonds.

Automatic Train Stop Tried at Philadelphia.

The Railway Automatic Safety Appliance Company, of Wilmington, Del., controlling the automatic train stop of Edward M. Cain and John La Barre, made exhibition tests of the device on a track of the Pennsylvania Railroad near the Greenwich pier, Philadelphia, January 5, 6, and 7, and all the tests were successful. The chairman of the Pennsylvania State Railroad Commission witnessed some of the tests, as did a number of officers of the Pennsylvania, the Reading and the Baltimore & Ohio. This is a mechanical trip, consisting of a horizontal arm fixed on the top of a post about 4 ft. high, and so arranged that when in the engaging position it will strike an air valve fixed on the buffer beam of the locomotive. Mr. Cain is a conductor on the Pennsylvania.

The Railway Electrical Engineer.

The *Electric Trunk Line Age* and the *Railway Electrical Engineer,* the official journal of the Association of Railway Electrical Engineers, have been consolidated under the name given at the head of this note. The journal in its enlarged form continues to be the official organ of that organization. C. L. de Muralt, of the firm of Muralt & Co., engineers, and professor of electrical engineering at the University of Michigan, is editor. He is well known in connection with the electrification of the Swiss mountain railways and the Alberg tunnel in Austria, and he has also done work in this country for the Erie Railroad, and on the Detroit river tunnel electrification.

Collision at Batavia.

In a rear collision of westbound passenger trains on the New York Central, at Batavia, N. Y., about 5:30 on the morning of January 13, six passengers were killed and ten or more were injured. Train No. 23, running at 30 or 40 miles an hour, crashed into the rear of train No. 49, which was standing at the station; and the rear car of No. 49, a sleeping car, was completely wrecked, the engine going through this car and a short distance into the one next ahead of it. The roof of the sleeper was thrown over on the roof of a shed at the side of the track. The wreck took fire, and some of the victims were severely burned; others were scalded by steam escaping from the boiler of the wrecked locomotive. The engineer and fireman of No.

23 jumped off and escaped with slight injuries. An officer of the road said that train No. 23 had run past a distant and a home signal set against it. The engineman had been in the service of the road 40 years, and had been an engineman for the last 22 years, with a perfect record. Rain was falling at the time, and was freezing; but it does not appear that there was any fog.

Combined Visible and Audible Signals at Highway Crossings.

At six highway grade crossings the Lehigh Valley now has in use warnings for wayfarers consisting of disk signals, like regular Hall block signals, which are equipped with bells of the usual form and give both a visible and an audible warning when trains are approaching. These signals are at South Plainfield, N. J.; Lodi, N. Y.; Wyalusing, Pa.; Glen Summit, Pa.; Sunnyside, N. J., and Valentines, N. J. The bell, which is a 14 in. gong, is fixed in the lower part of the case and is protected by a wire screen. These signals are controlled by track circuits,



Highway Crossing Signals at South Plainfield, N. J.

so arranged that the bell will begin ringing and the disk will show red when an approaching train reaches a point about 2,000 ft. from the crossing. The light, for the night indications, is in the upper part of the case, as in block signals. There are two signals at each crossing, one on either side of the tracks and both are set at the right of the highway, as seen by a person approaching the railway. The use of these "banjo" signals for this purpose would seem to indicate that the Lehigh Valley is replacing banjos with semaphores in its block signal work. But will not this practice set a mischievous example? Automobilists who enjoy the benefit of these expensive signals at Lehigh Valley crossings will soon want them everywhere; and then, as a next step, to help them maintain their breack-neck speeds, they will ask for distant signals! And the public service commission will have to back up their demand, of course.

Exports of Iron and Steel.

Exports of iron and steel manufactures for the calendar year 1910 exceeded the total of any previous year in the history of the industry. According to the Bureau of Statistics of the Department of Commerce and Labor, the exports of this class aggregated $200,000,000, forming about one-quarter of the total of manufactures exported during the year, valued at $830,000,000. The greatest value of exports of iron and steel manufactures prior to 1910 was in 1907, when it was $197,000,000.

Dinner to J. T. Harahan.

A dinner was given to J. T. Harahan at the Blacktsone Hotel in Chicago on January 13 by a large number of his friends, who are prominent in the railway business. In the course of an address Mr. Harahan denounced the men who as officers of the Illinois Central had betrayed his confidence in them during the last years of his administration. He said it was his deepest regret that anything should have occurred during his administration to warrant criticism of the management of the Illinois Central, and added: "While betrayal of any position of honor and responsibility is much to be deplored, the particular feature of this whole matter which has caused me pain is the treachery to me of men whom I have trained and educated, some of them for more than 30 years, and whom I have caused to be placed in the position they occupy.

"I feel, however, that no man could have anticipated the irregularities which existed and the schemes that were employed to put them into effect, or could have discovered them any quicker than they were. Strong influences were brought to bear to cause us to discontinue the investigation, but these were of no avail and no stone was left unturned to punish the guilty parties."

Regarding government regulation Mr. Harahan said:

"I appeal at this time for some consideration to the railways. In the last few months there has been indications of a more tolerant attitude on the part of the public. I believe that the fair-minded are appreciating the difference between the substance and the shadow, though they have heard much adverse to railway interests. I have much faith that the American public will solve this matter in a way right and proper, but unless this solution shall be found in such a way as to result in increasing the revenues of the roads I cannot at this time foresee the means to provide the additional facilities which are needed to handle properly and expeditiously the ever increasing traffic of the country."

Charles H. Markham, Mr. Harahan's successor, said that Mr. Harahan's retirement was a loss to the railway world. Other speakers were George R. Peck, Charles U. Burch, George W. Parker, E. F. Trabue, W. L. Park and Blewett Lee.

Uniformity in Taxation of Corporations.

Prof. R. A. Seligman, of Columbia University, at the New York state conference on taxation, gave an address on uniformity in taxation, in which he said:

"We have sat by idly and supinely while many other states have made progress. Take, for instance, the recent constitutional amendment of California, which has revolutionized and unified the system of corporate taxation and has resolved the corporate taxes for the state; or take the system even as it is being worked out in Massachusetts, where there has been much attention devoted to this particular phase of the subject during the past decade, and where a far more satisfactory method of apportionment of state and local corporate burdens is being worked out.

"I am not here to demand the adoption of the Californian system. I know that many of our localities are dependent on the revenues from corporations. But if there is any one lesson that may be learned from the practice of our most advanced American states, as well as from that of the chief European states, it is that apart from the amendment of real estate, which ought, of course, to be a source of local revenue, far better results will be reached by a single uniform method of assessment of corporations in the place of the diverse methods that we employ.

"The relative needs of the state government and of the local governments in the proceeds of such unified corporation tax could be carefully studied, and then settled, if necessary, by a method of apportionment. Such a method is by no means new in this state. Take, for instance, the excise taxes. Who does not recognize the immense administrative improvement, reflected at once in the prodigious increase of the yield of the tax, that was effected when the administration of our liquor licenses was taken from the localities with their variations, their inconsistencies and their relative degrees of inefficiency, and turned over to the state government under a unified rule. What has happened in the excise tax would happen again in the corporation tax. The localities would, in all probability, secure under a unified and effective state assessment a larger revenue than they obtain at present, even though they took only a small share of the entire proceeds; while the gain in certainty of assessment, in equality of treatment, in simplicity of administration, would be almost incalculable.

"In short, what I plead for, even as the next step forward, is a thorough investigation of the whole subject of the taxation of corporations."

Governor Wilson's Views of Railway Regulation.

Governor Woodrow Wilson, of New Jersey, in his inaugural address, recommends the granting of power to the public utilities commission to regulate rates, and in general to supervise corporations (railways) in detail (as is done in New York). He says:

We are much too free with grants and charters to corpora-

tions in New Jersey. A corporation exists, not of natural right, but only by license of law; and the law, if we look at the matter in good conscience, is responsible for what it creates. It can never rightly authorize any kind of fraud or imposition. It cannot righteously allow the setting up of a business which has no sound basis, or which follows methods which in any way outrage justice or fair dealing, or the principles of honest industry. The law cannot give its license to things of that kind. It thereby authenticates what it ought of right to forbid. We have a Public Utilities Commission, but it has hardly more than powers of inquiry and advice. It could even, as it stands, be made a powerful instrument of publicity and of opinion, but it may also modestly wait until it is asked before expressing a judgment, and in any case it will have the uncomfortable consciousness that its opinion is gratuitous, and carries no weight of effective authority. This will not do. It is understood by everybody who knows anything of the common interest that it must have complete regulative powers. . . . This can be done, as experience elsewhere has demonstrated, not only without destroying the profits of the business of corporations, but also with the effect of putting it upon a more satisfactory footing for those who conduct it.

Proper regulation, based on thorough and authoritative inquiry, will go far toward disclosing and establishing those debatable values upon which so many questions of taxation turn. There is an uneasy feeling throughout the state, that there are glaring inequalities in our system—or, at any rate, in our practice—of taxation. The most general complaint is that there is great inequality as between individuals and corporations. I do not see how anyone can determine whether there is or not, for we have absolutely no uniform system of assessment. It would seem that in every locality there is some local variety of practice, in the rate, the ratio of assessment value to market value, and that every assessor is a law unto himself. Our whole system of taxation, which is no system at all, needs overhauling from top to bottom. There can be no system, no safety, no regulation in a multitude of boards. An efficient Public Utilities Commission will be a beginning toward a system of taxation as well as toward a system of corporate control. We cannot fairly tax values until we have ascertained and established them.

An Automatic Unloader.

The gondola car shown in the accompanying illustration posed for the photographer just after having discharged its lading by turning a somersault. The car was loaded with sheet bars,



An Automatic Unloader.

some of which are seen on the ground, and it appears that, while the train was running at a moderate speed, these bars shifted so seriously as to cause the car to jump the track. It fell down a bank about twenty feet high, and, making one complete turn, in which practically all the contents of the car were thrown out, it landed right side up in the bed of the stream, and with one of its own trucks resting on its floor, as shown in the picture. Concerning the name of the road on which this accident occurred, we have nothing to say, except that it was not the road whose initials appear on the car. This combination unloading operation is one which, apparently, Mr. McMyler never thought of, or, at least, never attempted.

American Electric Railway Association.

On January 27 a conference of executive officials of member companies of the American Electric Railway Association will be held. The program is proposed to be as follows: Thomas N. McCarter, president of the Public Service Railway Co., Newark, N. J., will speak on Return on Investment. George H. Davis, of Ford, Bacon & Davis, New Orleans, La., will speak on The Adjustment of American Street Railway Rates to the Expansion of City Areas. Bentley W. Warren, general counsel of the Boston & Northern Street Railway, and the Old Colony Street Railway, Boston, Mass., will speak on Discount on Securities, and Clarence Deming, associate editor, *Railway Age Gazette*, will speak on Railway Arbitration; with an Example.

Traffic Club of New York.

At the meeting of the Traffic Club of New York held on January 17, Walker D. Hines, general counsel and acting chairman of the executive committee of the Atchison, Topeka & Santa Fe, spoke on the Recent Revision of the Interstate Commerce Law. The annual dinner of this mlub will be held at the Waldorf-Astoria on February 4. The speakers include: John A. Dix, governor of New York; William A. Glasgow, Jr., Philadelphia, Pa.; Thomas J. Freeman, receiver of the International & Great Northern; and J. Adam Bede, Pine City, Minn.

Empire City Passenger and Ticket Agents' Association.

At a meeting of the Empire City Passenger and Ticket Agents' Association, held on January 14 in New York, the following officers were elected: President, George R. Chesbrough, of the Delaware & Hudson; vice-presidents, H. T. Safford, division passenger agent of the St. Louis & San Francisco, and Frank Riley, of the Pennsylvania; secretary and treasurer, Raymond Walton, city ticket agent of the Missouri Pacific.

Chicago Transportation Association.

The Chicago Transportation Association held its annual banquet at the Wellington Hotel on January 16, and the officers who were elected at the December meeting for the ensuing year, as announced in the *Railway Age Gazette* of December 9, page 1122, were installed.

Canadian Society of Civil Engineers.

At the meeting of the Canadian Society of Civil Engineers, held in Montreal, Que., on January 19, a paper was read by A. O. Austin on The Development of Efficiency in Hig Tension Transmission Insulators.

New York Railroad Club.

The next meeting of the New York Railroad Club will be held on January 20 in New York. H. H. Maxfield, master mechanic of the Pennsylvania Railroad at Trenton, N. J., will read a paper on The General Layout for a Modern Locomotive Repair Plant.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.
American Association of Local Freight Agents' Association.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.
American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and Sept.
American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Sept. 17-19, 1911; St. Louis, Mo.
American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal; annual, January 24-27, Winnipeg, Man.

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, Oct. 9, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday; Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh, Pa.; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Duluth, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 19, Chicago.

INDIANAPOLIS RAILWAY AND MECHANICAL CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21st, 1911, St. Paul, Minn.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; second Wed.

RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month; Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911; Toledo.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

James Bloomingdale has been chosen chairman of the Middle States Freight Association, in place of C. W. Bullen, resigned; office 143 Liberty street, New York City.

The Philadelphia & Reading announces that beginning February 17, single trip one way fares on the Reading lines will be at the rate of 2½ cents a mile. Most or all of these rates at present are 2 cents a mile.

The Interstate Commerce Commission will hold a hearing regarding allowances to tap line railways in St. Louis, Mo., beginning January 23. This will be a continuance of the investigation which was begun with the hearing at New Orleans.

The Western Pacific has made a reduction of 50 cents a ton in the rates on coal in carloads to California from mines in Colorado and Utah. Coal is not cheap in California even with this reduction, the freight rates ranging from $7.35 to $8.35 a ton.

Governor Campbell of Texas renews in his annual message his advocacy of the passage of a 2-cent fare law. Governor Campbell has been regularly trying, every time the legislature has met, to get a 2-cent fare law passed, and regularly has been defeated.

The railway agriculturist causes the fruit of his mental activities to thrive in the most unpromising soil. The San Pedro, Los Angeles & Salt Lake, supposed to lie mostly in a desert, is to run a farmers' instruction train. The Utah College of Agriculture, the University of Nevada and the University of Idaho will co-operate.

The Chicago & Alton has announced that it will put in service on January 22 a fast mail train between Chicago and St. Louis, which will run between these points, a distance of 284 miles, in 6 hours and 15 minutes. This is about 2 hours and 45 minutes less than the schedules of the better passenger trains at present. It will carry no passengers.

Burlington's New Through Service to the South and Southeast.

The Chicago, Burlington & Quincy announces the completion of its new line to Metropolis, Ill., and Paducah, Ky., connection is made at these points with the Nashville, Chattanooga & St. Louis, thus forming a direct line from St. Louis to Metropolis, Paducah, and all points reached by the Nashville, Chattanooga & St. Louis. Trackage rights have been acquired for Burlington trains over the Louisville & Nashville between East St. Louis and Woodlawn, Ill., 69 miles, making a direct freight route to Paducah. Through fast freight trains began running January 10 from St. Louis to Paducah, Nashville, etc., and to points in Georgia. Fast through freight service has been established to all important points in the south.

The Cotton Bill Frauds.

Suits have been entered in court at Decatur, Ala., against the Louisville & Nashville and the Southern Railways by English and German creditors of Knight, Yancey & Co., to recover losses sustained in connection with fraudulent bills of lading for cotton. The plaintiffs are Alexander Eccles & Co., of Liverpool, and Knopp and Fabarius and seven other merchants, of Bremen, Germany. Other English creditors are expected to file similar suits within the next ten days. The total sum for which action will be brought by English creditors is said to be more than $2,000,000, and by Germans about $300,000. The gist of the action is found in the following allegations:

The firm of Knight, Yancey & Co. had been in the habit of obtaining money on drafts secured by spurious bills of lading similar to those upon which the present actions are brought, for the past five years. A month or two after each bill of lading was issued, Knight, Yancey & Co. would buy cotton similar to that called for by the bill and ship it forward under the same marks as those described in the bill of lading. When the cotton arrived

at its destination abroad, it would be delivered upon the surrender of the spurious bill of lading, despite the fact that the spurious bills differed in date and number and in other respects from the manifest accompanying the cotton. It is further alleged that this practice of Knight, Yancey & Co. was connived at by the officers of the railways, and that upon questions arising as to the propriety of a delivery of cotton upon a draft secured by a spurious bill of lading the matter would be referred to the railway concerned, and the railway would direct delivery, thus preventing the discovery of the forgeries and enabling Knight, Yancey & Co. to continue the course of dealing which led to their subsequent failure. It is alleged that more than 400,000 bales have been thus delivered on forged bills, and that when the failure came there were outstanding forged bills of lading for over 50,000 bales of cotton upon which no cotton had ever been delivered. The creditors maintain that this connivance on the part of the railways renders them equally liable with Knight, Yancey & Co. for the loss sustained.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 87, giving a summary of car shortages and surpluses by groups from September 1, 1909 to January 4, 1911, says:

"There was an increase of 48,314 over the surplus shown in our last report, making a total for this report of 110,342 cars. The increase in box car surplus was 22,908 cars, and in coal and gondolas 16,834 cars. The increase was general throughout the country with the exception of group 7, which shows a slightly reduced surplus. Of the groups showing increases, group 9 (Southwestern), shows the least change, the increase in this group being only about 20 per cent.

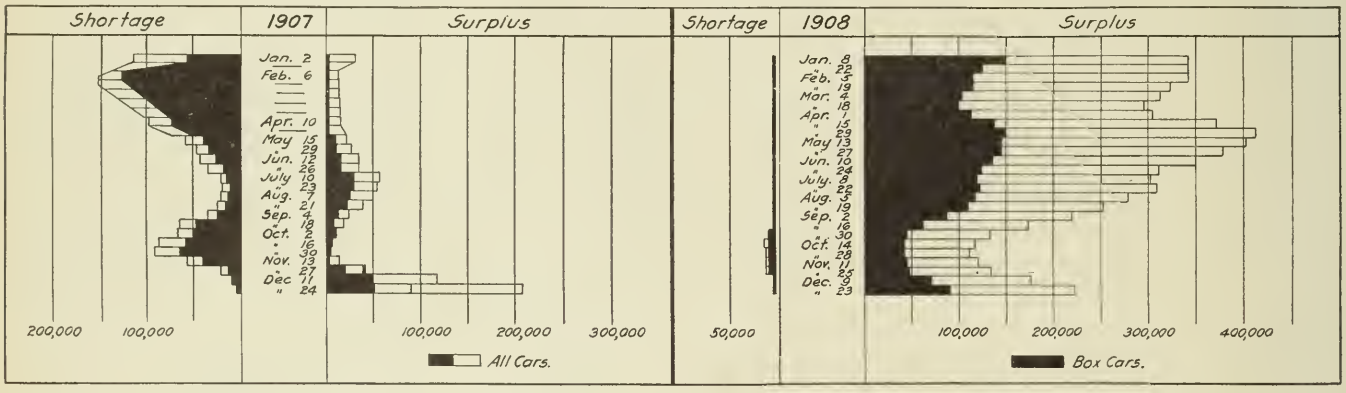
"The shortage was reduced from 10,705 to 3,508, and the coal car shortage reported in our last Bulletin for groups 2 (Eastern), 3 (Middle), and 4 (Middle Atlantic), was practically wiped out. It will be remembered that rather severe weather was experienced at this time last year, which retarded the movement of cars, while with the comparatively mild weather of the past few weeks, cars have moved more freely. It is probable that the increase in surplus over last year may be in a great measure due to the difference in weather conditions."

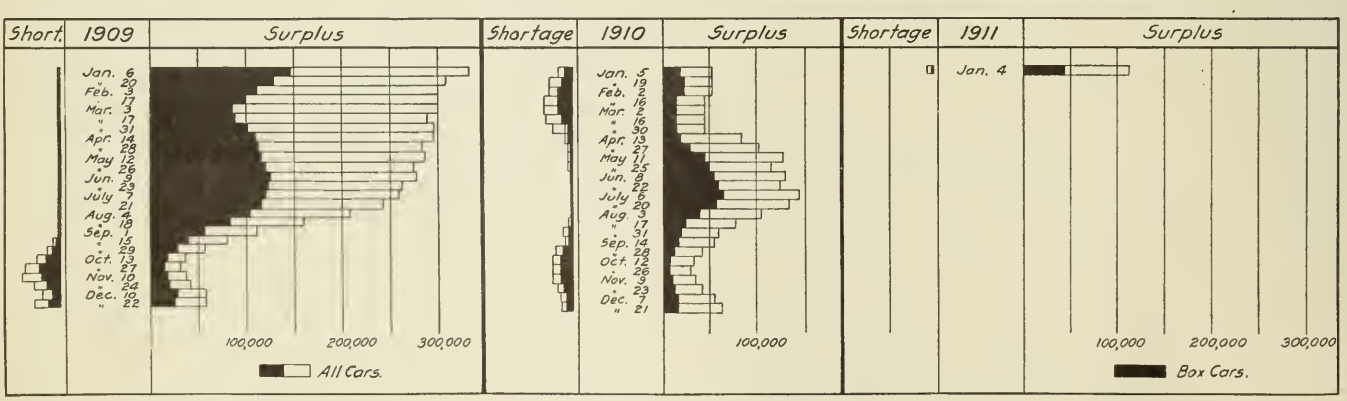
The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts show total surpluses and shortages in 1907, 1908, 1909, 1910 and 1911.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Surpluses: Flat.	Surpluses: Coal, gondola and hopper.	Surpluses: Other kinds.	Surpluses: Total.	Shortages: Box.	Shortages: Flat.	Shortages: Coal, gondola and hopper.	Shortages: Other kinds.	Shortages: Total.
Group *1.—January 4, 1911	8	939	1,874	526	280	3,619	1	0	102	45	148
" 2.— " 4, 1911	24	4,495	267	4,998	4,811	14,571	19	6	1	5	31
" 3.— " 4, 1911	26	4,041	718	16,019	2,819	23,597	0	0	0	481	481
" 4.— " 4, 1911	10	3,146	286	1,298	1,189	5,919	0	64	13	0	77
" 5.— " 4, 1911	17	1,070	276	1,071	540	2,957	991	417	0	13	1,421
" 6.— " 4, 1911	21	8,369	1,366	3,665	4,825	18,225	48	200	44	548	840
" 7.— " 4, 1911	3	357	356	819	469	2,001	0	0	0	0	0
" 8.— " 4, 1911	15	4,936	304	2,691	3,098	11,029	0	47	0	3	50
" 9.— " 4, 1911	12	1,775	142	554	723	3,194	0	0	0	0	0
" 10.— " 4, 1911	20	5,462	2,347	2,790	8,271	18,870	5	0	0	6	11
" 11.— " 4, 1911	4	4,771	690	52	937	6,450	0	253	0	196	449
Total	161	39,361	8,626	34,483	27,962	110,432	1,064	987	160	1,297	3,508

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1910. (SEE ALSO ISSUE JANUARY 13.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$266,248	$84,800	$382,239	$42,412	$93,522	$10,147	$117,607	$10,216	$273,904	$108,335	—$295	$13,805	$94,235	—$15,167
Atlanta, Birmingham & Atlantic	662*	178,813	49,958	244,756	28,678	37,890	14,727	86,097	8,735	176,127	68,629	.....	15,000	53,629	—6,877
Atlantic Coast Line	4,493	2,008,567	589,845	2,786,896	342,301	428,215	41,707	859,495	70,805	1,742,523	1,044,373	.....	95,500	948,873	—148,626
Bangor & Aroostook	627†	176,803	55,127	246,477	42,671	27,025	3,533	78,633	11,100	162,962	83,515	.....	2,525	80,990	—17,437
Bessemer & Lake Erie	204	537,315	22,882	567,615	72,227	142,386	6,070	167,736	8,769	397,188	170,427	.....	6,000	164,427	—245,077
Buffalo, Rochester & Pittsburgh	573	680,456	81,372	783,016	68,478	150,652	10,777	257,370	13,320	500,597	282,419	219	16,000	266,638	—25,400
Central Vermont	411	232,621	80,742	337,686	45,935	53,941	6,387	145,984	8,113	260,360	77,326	—5	10,750	66,571	—13,172
Chicago Great Western	1,489	794,500	229,902	1,107,583	135,283	151,258	46,799	454,940	35,945	824,225	283,358	223	32,822	250,759	—85,618
Chicago, Rock Island & Gulf	471†	245,338	59,567	321,800	28,126	17,541	8,926	93,230	8,896	156,719	165,081	—197	4,613	160,271	—16,812
Chicago, Rock Island & Pacific	7,396	3,925,813	1,544,878	5,787,812	702,914	665,658	157,314	2,193,181	140,129	3,859,196	1,928,616	—15,044	208,250	1,705,322	411,972
Cincinnati, Hamilton & Dayton	1,014‡	591,762	125,793	802,434	50,739	122,559	24,277	373,458	22,486	593,519	208,915	.....	32,723	176,192	—81,523
Delaware & Hudson Co	819§	1,607,650	195,587	1,853,411	137,241	264,687	17,897	596,219	40,496	1,056,540	796,871	—932	49,718	746,220	—140,218
Duluth, South Shore & Atlantic	608	162,855	81,516	257,525	33,592	26,997	9,356	102,098	5,293	177,336	80,189	315	18,000	62,504	124
Evansville & Terre Haute	310	148,670	57,149	225,076	26,524	35,065	5,140	73,449	7,338	147,516	77,560	—649	9,410	67,501	—14,662
Georgia	307	209,825	77,537	306,134	32,622	41,815	10,481	116,053	8,637	209,608	96,526	.....	1,837	94,689	5,650
Grand Rapids & Indiana	587	278,088	124,851	434,593	60,346	75,882	11,858	193,438	14,808	356,332	78,261	290	23,737	54,814	—67,275
Houston & Texas Central	789	437,268	157,397	629,078	88,555	73,022	18,953	243,874	23,173	447,577	181,501	.....	20,042	161,459	—42,965
Long Island	390	295,183	419,390	750,352	75,044	130,889	19,556	388,461	21,043	634,993	115,359	21,664	43,570	93,453	—89,068
Louisville & Nashville	4,591¶	3,679,914	899,656	4,871,172	761,011	766,670	81,062	1,546,216	88,445	3,243,404	1,627,768	2,010	137,800	1,491,978	—191,662
Midland Valley	324	93,242	36,574	136,379	21,317	18,087	2,144	33,030	11,796	86,374	50,005	1,627	6,401	45,231	8,712
New Orleans, Mobile & Chicago	404	123,721	27,159	160,961	18,728	12,995	2,970	46,348	7,556	88,597	72,364	.....	5,448	66,916	15,039
Northern Central	471	916,351	179,395	1,163,122	245,416	231,331	15,711	523,106	23,203	1,038,767	124,355	590	31,232	93,713	—224,576
Pennsylvania *Co.*	1,416	3,436,965	619,031	4,423,693	491,045	858,945	78,046	1,583,442	82,473	3,093,951	1,329,742	—9,264	199,105	1,121,433	—621,412
Pennsylvania *R.R.* Co.	3,971‖	9,900,957	2,731,951	13,535,074	985,233	2,736,343	178,620	4,887,596	330,547	9,118,339	4,416,735	—78,586	417,679	3,920,469	—1,015,416
Pere Marquette	2,337	1,020,144	279,870	1,396,486	198,022	208,430	36,874	595,735	31,953	1,071,014	325,472	—11,996	59,196	254,280	—154,511
Philadelphia, Baltimore & Washington	717	780,099	639,877	1,574,346	192,867	259,668	27,745	634,587	31,784	1,146,650	427,696	.....	48,907	378,789	—10,144
Pittsburgh, Cincinnati, Chic. & St. Louis	1,468	2,320,551	615,107	3,319,068	365,052	648,225	73,695	1,256,905	64,697	2,408,574	910,494	—996	150,443	759,055	—416,531
St. Joseph & Grand Island	319	92,380	34,568	138,491	36,209	20,124	6,863	60,066	6,017	129,279	9,212	—195	6,039	2,978	—10,732
St. Louis & San Francisco	4,732	2,600,728	945,632	3,790,301	652,974	539,665	96,393	1,262,727	113,806	2,665,565	1,124,736	.....	144,592	980,144	159,502
St. Louis, Brownsville & Mexico	501*a*	105,483	46,871	163,682	51,448	10,603	2,314	59,366	7,086	130,817	32,865	.....	4,000	28,865	—12,555
Texas & New Orleans	458	234,600	87,808	342,690	81,326	58,468	7,984	128,166	9,749	285,693	56,997	893	12,182	45,708	—53,564
Vandalia	827	662,000	198,859	954,721	86,090	162,825	27,617	371,136	19,372	667,040	287,681	.....	28,756	258,925	55,144
Virginian	474*b*	292,964	19,834	320,813	33,460	45,162	4,648	88,042	7,451	178,763	142,050	5,445	13,000	134,495	102,797
West Jersey & Seashore	353	159,867	200,573	388,745	63,014	63,160	11,248	207,438	9,432	354,292	34,453	3,989	22,773	15,669	—2,254
Western Maryland	543	481,246	63,254	567,451	71,785	61,793	8,256	209,316	12,645	363,795	203,656	48	19,500	184,204	—
Wheeling & Lake Erie	457	502,880	48,297	584,279	61,198	126,665	7,714	219,396	13,810	428,783	155,496	688	20,842	135,342	—48,515
FIVE MONTHS OF FISCAL YEAR 1911.															
Alabama Great Southern	309	$1,257,257	$486,341	$1,899,124	$228,774	$431,697	$51,151	$567,574	$45,474	$1,324,670	$574,454	—$2,980	$65,659	$505,815	$82,829
Atlanta, Birmingham & Atlantic	662*	812,900	267,338	1,154,345	135,295	193,379	71,910	418,880	43,578	863,042	291,303	.....	55,000	236,303	17,697
Atlantic Coast Line	4,493	8,108,188	2,880,602	11,808,739	1,666,536	1,913,952	216,161	3,952,413	336,987	8,086,049	3,722,690	.....	472,000	3,250,690	—56,703
Bangor & Aroostook	627†	844,227	325,814	1,242,435	214,119	158,320	16,551	371,423	53,751	814,164	428,271	.....	10,575	417,696	—49,949
Bessemer & Lake Erie	204	3,868,119	191,549	4,102,696	422,746	662,556	40,206	1,044,504	39,535	2,209,547	1,893,149	.....	33,000	1,860,149	—549,386
Buffalo, Rochester & Pittsburgh	573	3,464,296	508,595	4,152,863	454,988	734,425	60,107	1,256,007	65,957	2,571,484	1,581,379	363	80,000	1,501,742	—27,905
Central Vermont	411	1,059,044	545,101	1,731,828	247,162	243,081	37,527	715,193	35,114	1,278,077	453,751	3,776	53,116	404,411	—68,640
Chicago Great Western	1,489	3,797,563	1,332,266	5,538,563	669,078	798,902	238,130	2,088,160	177,746	3,972,016	1,566,547	1,791	164,113	1,404,225	—
Chicago, Rock Island & Gulf	471†	867,046	309,485	1,256,783	198,124	87,181	44,118	436,469	40,388	806,280	450,503	—1,587	27,045	421,871	—88,799
Chicago, Rock Island & Pacific	7,396	18,341,963	8,884,682	28,863,989	4,536,268	3,815,759	788,093	10,368,424	705,408	20,213,952	8,650,037	—51,801	1,150,443	7,447,793	—830,905
Cincinnati, Hamilton & Dayton	1,014‡	2,989,214	819,515	4,246,133	337,258	706,984	122,977	1,846,833	110,194	3,124,246	1,121,887	.....	146,114	975,773	—77,895
Delaware & Hudson Co	819§	7,247,620	1,541,701	9,066,226	789,192	1,204,516	119,439	2,908,978	204,101	5,226,226	3,839,999	3,138	218,866	3,624,271	—25,907
Duluth, South Shore & Atlantic	608	935,861	475,324	1,485,194	202,764	147,993	52,431	518,402	37,491	959,081	526,113	8,506	90,000	444,619	19,480
Evansville & Terre Haute	310	781,091	315,888	1,207,313	150,783	158,515	28,278	370,583	32,946	741,105	466,208	—3,868	47,050	415,290	—5,990
Georgia	307	872,569	395,108	1,348,342	188,407	202,084	52,260	530,367	35,507	1,008,625	339,717	.....	10,570	329,147	—25,014
Grand Rapids & Indiana	587	1,273,109	882,176	2,320,858	299,327	352,944	63,240	967,872	74,405	1,757,788	563,070	204	121,720	441,554	—136,347
Houston & Texas Central	789	2,004,740	752,421	2,929,184	356,193	337,234	92,031	1,046,410	107,946	1,939,814	989,370	.....	88,359	901,011	—59,403
Long Island	390	1,350,127	3,232,306	4,789,283	476,291	590,869	96,279	2,021,056	102,924	3,287,421	1,501,862	396,878	217,852	1,680,889	—239,001
Louisville & Nashville	4,591¶	16,815,469	5,028,402	23,173,174	3,864,095	4,013,928	462,718	7,218,955	443,190	16,002,886	7,170,288	3,830	689,000	6,485,118	—1,498,398
Midland Valley	324	350,690	166,883	549,392	100,725	87,597	10,501	153,306	30,686	382,815	166,577	5,761	32,006	140,332	4,898
New Orleans, Mobile & Chicago	404	543,639	143,019	737,812	104,159	57,848	14,999	219,786	38,606	435,398	302,414	.....	21,142	281,272	56,946
Northern Central	471	4,171,516	1,056,215	5,533,391	951,941	993,801	85,639	2,482,058	121,503	4,634,942	898,449	3,952	156,159	746,242	—555,951
Pennsylvania *Co.*	1,416	19,049,732	3,824,391	24,626,460	2,915,176	4,016,585	410,262	8,057,536	418,790	15,818,349	8,808,110	—26,422	864,293	7,917,395	—1,395,590
Pennsylvania *R.R.* Co.	3,971‖	49,492,515	15,011,040	68,785,177	8,332,803	12,327,999	1,003,336	23,877,893	1,653,872	47,195,904	21,589,273	—345,865	2,088,396	19,155,012	—2,533,904
Pere Marquette	2,337	4,623,895	1,944,122	7,112,861	920,194	1,026,009	205,850	2,934,944	165,838	5,252,835	1,860,026	—4,420	296,163	1,559,443	—489,432
Philadelphia, Baltimore & Washington	717	4,327,907	3,319,599	8,406,464	1,260,999	1,322,149	146,958	3,311,455	172,784	6,214,345	2,192,119	.....	244,535	1,947,584	2,761
Pittsburgh, Cincinnati, Chic. & St. Louis	1,468	11,972,418	3,711,409	17,532,622	2,284,378	3,134,496	380,608	6,276,885	326,324	12,402,691	5,129,931	—4,175	679,336	4,446,420	—942,447
St. Joseph & Grand Island	319	503,878	213,823	778,024	181,018	99,556	32,580	320,983	29,918	664,055	113,969	362	27,593	86,738	—78,172
St. Louis & San Francisco	4,732	11,705,839	4,983,249	17,885,527	2,615,126	2,474,481	413,142	6,041,923	488,025	12,032,697	5,852,830	.....	702,280	5,150,550	423,808
St. Louis, Brownsville & Mexico	501*a*	455,266	223,442	734,341	223,557	63,205	11,236	264,303	37,552	599,852	134,489	.....	20,000	114,489	4,316
Texas & New Orleans	458	1,079,748	446,088	1,622,439	309,345	272,101	35,329	601,824	46,690	1,265,289	357,150	2,737	60,910	298,977	—141,753
Vandalia	827	3,178,247	1,097,765	4,713,003	619,033	833,897	140,702	1,804,613	97,858	3,496,103	1,216,900	.....	140,786	1,076,114	—13,303
Virginian	474*b*	1,311,622	419,270	1,471,366	163,152	229,370	27,075	394,097	37,630	851,324	620,042	22,387	66,500	575,929	427,760
West Jersey & Seashore	353	837,182	2,174,645	3,202,010	437,301	352,810	98,036	1,150,925	54,346	2,093,418	1,108,592	—26,821	113,865	967,906	18,601
Western Maryland	543	2,567,698	519,640	3,222,674	421,709	367,444	51,707	1,041,094	62,294	1,944,248	1,278,426	1,059	97,500	1,181,985	—
Wheeling & Lake Erie	457	2,665,250	293,709	3,164,868	389,871	573,535	43,364	1,067,284	67,717	2,141,771	1,023,097	11,820	106,649	928,268	33,389

Mileage operated on November 30, 1909.—* 641 miles; † 530 miles; ‡ 1,036 miles; § 845 miles; ¶ 4,542 miles; ‖ 4,017 miles; *a* 456 miles; *b* 444 miles. —Indicates Deficits, Losses and Decreases.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between Railways of the American Railway Association, in presenting statistical bulletin No. 88, covering car balance and performance for September, 1910, says:

"Attention was called in our August bulletin to the similarity in car performance between that month and the corresponding month in 1907. This similarity is again noted in the September averages. The cars at home averaged 60 per cent., exactly the same as in September, 1907, this item showing a decrease in both years, with the usual increase in the loaded mileage, the latter averaging 71.4 per cent. in September, 1910, as against 70.3 per cent. in August. The increase in 1907 was from 70.8 per cent. to 71.8 per cent.

"The miles per car per day averaged 22, and the ton miles per car per day 375 (active cars 390), as against 24.0 and 354 (active cars 362) in September, 1907. The car loading was somewhat better this year as indicated by an increase in the tons per loaded car from 20.5 to 21.6. Compared with August, 1910, the general performance was improved. The tons per loaded car is the only item failing to show an improvement, this average decreasing from 22.0 in August to 21.6 in September. This slight reduction was more than offset by the increase in the per cent. of loaded mileage and the miles per car per day, producing a fair increase in the ton miles per car per day.

The accompanying table gives car balance and performance in September and the charts on the facing page show car earnings and performance in 1907, 1908, 1909 and 1910.

Car Balance and Performance in September, 1910.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	79,359	701,607	218,614	176,377	162,741	386,667	17,451	136,006	27,456	136,132	103,291	2,145,701
Average number of system cars on line	42,312	408,798	133,342	97,315	85,124	277,391	6,320	78,367	17,105	67,973	71,233	1,285,280
Railway-owned cars: Average foreign on line	40,510	275,272	98,622	55,746	48,218	137,023	12,678	51,396	19,173	60,207	29,617	828,462
Total Railway owned cars on line	82,822	684,070	231,964	153,061	133,342	414,414	18,998	129,763	36,278	128,180	100,850	2,113,742
Excess	3,463	.....	13,350	.....	.....	27,747	1,547	.....	8,822	.....	.....	.....
Per cent. of cars on line to total owned:												
Home	53	58	61	55	52	72	36	57	62	50	69	60
Foreign	51	39	45	32	30	35	73	38	70	44	29	39
All railways	104	97	106	87	82	107	109	95	132	94	98	99
Private cars on line	3,142	38,643	11,386	2,373	4,904	16,830	2,449	7,144	2,550	9,896	2,438	101,755
Total, all cars on line	85,964	722,713	243,350	155,434	138,246	431,244	21,447	136,907	38,828	138,076	103,288	2,215,497
Per cent. of cars in shop	5.22	5.57	8.88	8.71	8.88	6.02	4.28	9.40	5.59	6.73	6.81	6.76
No. of freight engines owned	1,149	10,281	2,928	3,007	2,493	6,183	495	2,565	722	2,555	2,143	34,521
Average cars on line per freight engine owned	75	70	83	52	55	70	43	53	54	54	48	64
Total freight-car mileage	43,580,811	497,539,148	159,607,045	113,923,946	111,946,118	316,761,114	31,745,819	92,797,617	31,164,506	122,474,991	84,708,464	1,606,249,579
Average miles per car per day	16.9	22.9	22.0	24.4	27.0	24.5	49.3	22.6	26.8	29.5	27.3	24.2
Per cent. loaded mileage	74.9	70.0	71.3	69.1	73.4	70.2	72.9	73.2	73.1	73.5	78.0	71.4
Ton-miles of freight, including company freight	479,393,148	8,334,098,911	2,569,785,738	1,849,854,133	1,647,209,076	2,662,808,636	433,835,368	1,355,754,656	396,886,368	1,775,645,247	1,204,961,302	22,710,232,583
Average ton-miles, including company freight:												
Per car-mile	11.0	16.8	16.9	16.2	14.8	14.4	14.3	14.6	12.7	15.2	14.2	15.5
Per loaded car-mile	14.8	23.9	23.7	23.5	19.3	19.6	19.6	20.2	17.4	20.6	18.2	21.6
Per car per day	186	384	372	397	400	350	743	330	341	447	389	375
Gross freight earnings	$5,835,433	$49,723,074	$14,806,930	$11,169,735	$10,883,523	$33,387,560	$3,851,747	$11,483,025	$3,764,173	$18,548,012	$8,468,382	$171,921,593
Average daily earnings: Per car owned	$2.45	$2.36	$2.26	$2.11	$2.23	$2.89	$7.36	$2.81	$4.57	$4.54	$2.73	$2.67
Per railroad car on line	2.35	2.42	2.13	2.43	2.72	2.69	6.76	2.95	3.46	4.82	2.80	2.71
All cars on line	2.26	2.29	2.05	2.40	2.62	2.58	5.99	2.79	3.23	4.48	2.73	2.59

Eastern Rate Hearings.

Walker D. Hines, representing the Delaware & Hudson began the closing argument in behalf of the eastern carriers in the freight rate case before the Interstate Commerce Commission. The eastern case was concluded January 12.

Mr. Hines said that if the carriers had included an unlawful item in making a rate it was within the power of the commission to throw that rate out. If, however, legal basis only had been taken into consideration in making rates, the commission should declare these rates legal. The commission should be broadminded and not technical in reaching its conclusion and should recognize the commercial needs of the country. No maximum of rates should be fixed.

On the subject of the physical valuation of the roads, Mr. Hines spoke of the enhanced value of the properties, through the investments of surplus funds which, in themselves, represented denials to stockholders who should have something to recompense them for those denials. A rate based on physical valuation would inure to the advantage of roads running through the more densely populated sections.

Mr. Hines contended that the carriers had fully shown the necessity for and the reasonableness of the increased rates proposed.

E. D. Robbins, general counsel of the New York, New Haven & Hartford followed. He told of the many improvements under way and in contemplation by the New Haven road involving a total expenditure of $37,000,000. Of this amount $16,000,000 has already been spent in betterments and additions, leaving $21,000,000 still to be laid out. In answer to questions he said that it was proposed to meet this expenditure so far as possible from the operations of the road, only resorting to the issue of new securities in the event that the revenues should not be sufficient to meet the demand.

Mr. Robbins said that it was not true that the traffic manager of the railways in adjusting rates was solely controlled by the desire to raise more money. The prosperity of his company depends upon the prosperity of its territory, and that consideration was always to be taken into account. He instanced a case where a proposed rate, in the opinion of the shipper, would have destroyed a certain industry. If the traffic manager had insisted upon imposing that rate he would have been killing the goose that laid the golden egg.

No rate should be raised beyond the point where commerce would not continue to flow without restriction. "I give it to you as my judgment," he said, "that the limit of the beneficial raise of rates to the railways from the selfish point of view of the railways themselves has been nearly reached, if not actually reached." He said that practically all of the freight business

done by the New Haven road was done at a loss, all of its profit coming from the transportation of passengers.

Hugh L. Bond, Jr., of the Baltimore & Ohio, urged that on the testimony and the record there could be no question that the increases in rates made by the tariffs in controversy were made after the most careful and deliberate consideration of all the circumstances, conditions or factors proper to be considered by the most experienced and skillful men available, with the purpose in view of not only obtaining additional revenue for the carriers but of affecting commercial conditions and the movement of traffic to the least possible degree and so to avoid subjecting the traffic in any class of articles to an oppressive rate. The traffic officers believe that the proposed rates are fair and reasonable to the shippers and as little as the carriers ought reasonably to get at this time.

Mr. Bond said that the credit of the railways, certainly of the Baltimore & Ohio, is in the hands of the commission in these proceedings. The ability of the road to bring and keep its properties up to modern railway standards also depended upon the decision. There was no evidence, he argued, from which the commission could revise the tariffs in question separately, or which would enable the commission to establish a schedule of maximum rates. "Should the commission," he said, "decide that the tariffs in question cannot be made effective, on the ground that any general increase of rates must be unreasonable, then the commission will, at the same time, decide that the Baltimore & Ohio system, and substantially all the roads in the trunk and central traffic territory, must not only stop progressing, but must go backward."

There is no evidence before the commission that any of the rates are unreasonable in themselves, and any conclusion that they are so must be based on the general ground that any general increase of rates at this time is necessarily of itself unreasonable.

Western Rate Hearing.

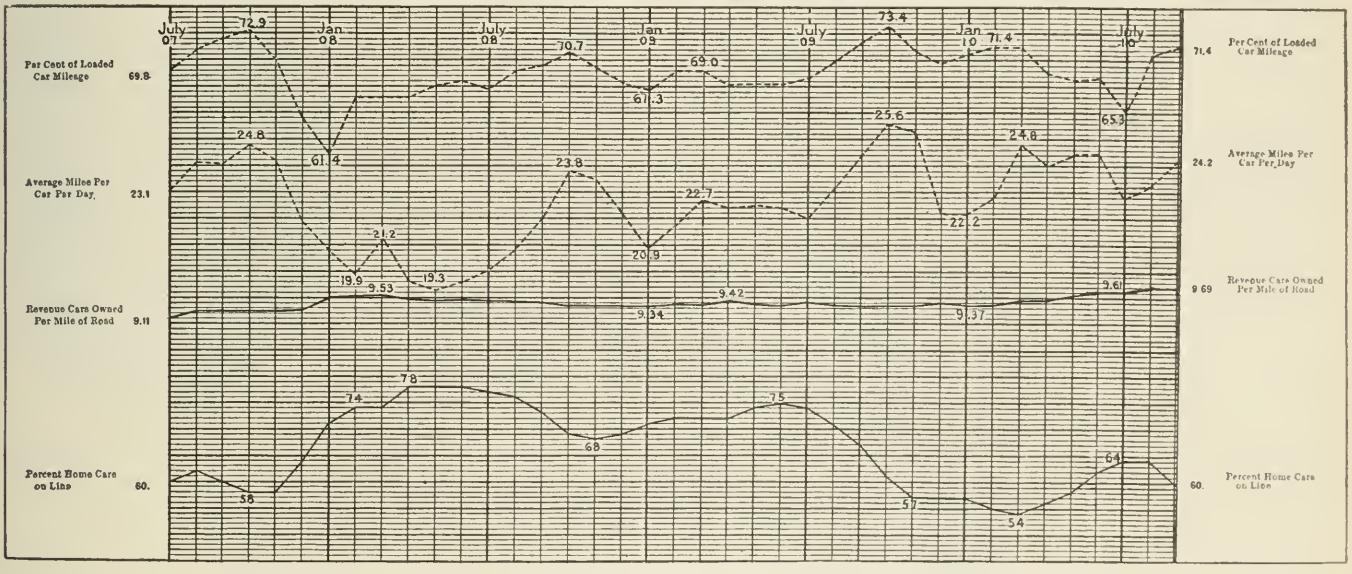
Arguments were submitted to the Interstate Commerce Commission on Monday in the case of the advances in commodity rates proposed by the lines that are in the Western trunk line territory.

In adjusting the time to be allotted to counsel for their arguments it was announced that forty-five minutes would be given to P. H. Morrissey, one of the principal leaders of organized labor, to speak in behalf of the proposed advance in rates.

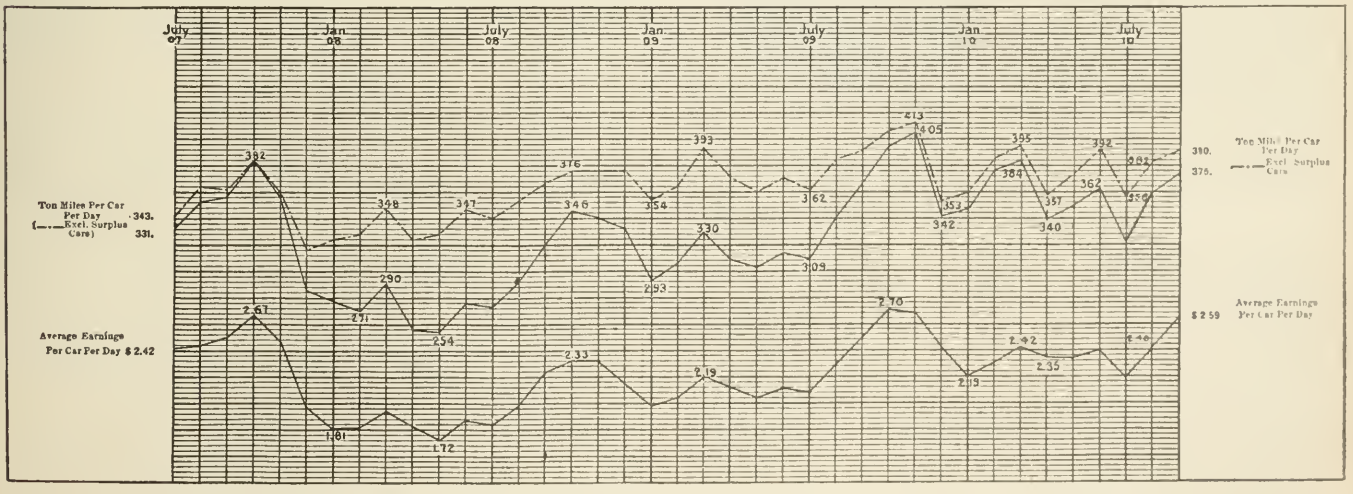
Frank Lyon, of counsel for the commission, said that the carriers frankly state that unless they should be restrained other increases in rates than those involved in these cases would be made where competition would permit. Mr. Lyon said that the increase in the cost to railways of labor during the last ten years had aggregated about thirty per cent.

Interrupting Mr. Lyon, Chester M. Dawes, counsel for the Chicago, Burlington & Quincy, explained that the payroll of that system, of $30,000,000 annually, had been increased $2,700,000 a year by advances in wages.

Burton Hanson, counsel for the Chicago, Milwaukee & St. Paul, pointed out that the valuation of that line was $295,000,000. On that valuation the company was making a return of a little more than five per cent. "My contention is that the rates from



Car Performance in 1907, 1908, 1909 and 1910.



Car Loading and Earnings in 1907, 1908, 1909 and 1910.

which we receive this return are too low," said Mr. Hanson.

"The Supreme Court of the United States has said that this commission is not the general manager of the railways," suggested Edwin H. Hyzer, counsel of the Chicago & Northwestern, "and perhaps it is not, legally, but I am rather inclined to the practical conclusion that this commission is the general manager of the railways, and I think the railways think so, too.

"This commission represents the full police power of the government of the United States on this proposition. That is a tremendous power. That means, to my mind, that we must strip this controversy of the habiliments of law suits. This controversy must cease to be so much a controversy about pocketbooks, as here seems to have been indicated, and I do not much care whether it is the railroad pocketbook or the other fellow's. The fundamental thought of this commission seems to me to be, 'What are the needs of commerce?' We must cease to look at rates apart from commerce as a whole.

"The railways of this country to-day are practically at the feet of this commission, and the welfare and commerce of the country are there also.

"If this commission should undertake to put a valuation upon the railways and then to fit rates that would produce a flat six per cent. return, then, in my judgment, the commerce of this country will die unless the government owns the railways."

W. S. Horton, counsel for the Illinois Central, suggested that the return upon the whole property of the road in 1910 was only 4.48 per cent. This, he maintained, was wholly inadequate.

W. F. Dickinson, of the Chicago, Rock Island & Pacific, said in part:

"An examination of the accounts of this company for a number of years will show that with the payment of a very moderate dividend on its capital stock there never has been sufficient available surplus to warrant the expenditure of any substantial amount in making improvements. The practice of charging improvements and betterments to operating expenses has not been followed by this company for many years. Therefore, those improvements and betterments which have been made have been paid for out of borrowed money and charged to capital account, a process which is always costly unless the credit of the company is such as to warrant investors in paying at least par value for its securities. It goes without saying that the element of credit depends almost wholly upon the ability of the company to have a sufficient balance of income available for dividends to pay liberal dividends and carry a substantial amount to surplus."

Mr. Dickinson then exhibited a table to show the average freight revenue per freight train mile from 1898 to 1910, likewise the average freight operating expenses per freight train mile.

Combining these two sets of figures, the attorney was able to show that the average net freight revenues per freight train mile was 77 cents in 1898, 76 cents in 1900, 63 cents in 1905 and 52 cents in 1910. With the exception of the prosperous year of 1907, when this was 82 cents, this average net return has gradually decreased.

ASK FAIR RETURN ON VALUE.

Concluding he said:

"What we claim in this case and shall claim in all similar cases is the right to an income that will yield a fair return upon the value of the property, and it is upon this right that we base our claim for increased revenue."

Following Gardner, Lathrop, for the Atchison, Topeka & Santa Fe, took up the argument. He said that the western territory is in need of new railway construction and better equipment to take care of the business and give the people a proper service. It is to meet this condition, he continued, that the roads filed the increased rates.

Money is also needed to protect life and property. Many accidents are caused by mistakes of employees, but the greater portion are caused by some defect in the property which could be guarded against by the block signals and safety appliances.

Commissioner Lane wished to know whether if the commission decided to grant the increases it would be necessary to order the rates into effect for a period of two years. Mr. Lathrop thought that it would only be necessary to vacate the proceedings and enter no order whatever, thus leaving the rates liable to complaints from the shippers.

Mr. Morrissey said that he represented 180,000 employees of the railways. He reviewed the petitions sent the commission by the labor organizations, and said that the increases were asked for because the public is now demanding a better service, more expensive cars, more expeditious traffic, etc. All of the argument was of the same general tenor as that of the lawyers preceding.

Mr. Morrissey expressed the opinion that union labor was opposed to the so-called "scientific management" idea, because, under it, men were driven under pressure which was a constant physical drain. The railway employees would not work under the system, he said. If there was to be a million dollars a day saved by the railways through efficiency methods, that money would almost all come out of the pockets of labor.

INTERSTATE COMMERCE COMMISSION.

Ton Mile Rate on Short Roads.

Frank W. Burton v. Unadilla Valley Railway et al. Opinion by Commissioner Lane.

Defendants ordered to establish a through route and joint rate of 16 cents per 100 lbs. on lumber from West Edmeston, N. Y., to New Britain, Conn., unless a separately established rate between New Berlin, N. Y., and New Britain of 13 cents per 100 lbs. is put in.

The per-ton-mile earnings of a small carrier, having only short hauls and light business, may properly exceed the per-ton-mile earnings of stronger lines participating in heavy traffic which moves for considerable distances. (20 I. C. C., 75.)

STATE COMMISSIONS.

A. B. Millar has been appointed secretary of the Pennsylvania State Railroad Commission, and will assume the duties of the office on February 1, succeeding H. S. Calvert, resigned.

The special report of the Indiana Commission relative to the need of the block system, which was sent to the governor a few weeks since, has been sent by the governor to the legislature without comment.

The Indiana Commission has sent to the railways a circular recommending that men repairing cars be provided with special locks so that they can lock switches to prevent disturbance of cars under which they are working.

David Harlowe, of Milwaukee, has been appointed a member of the Wisconsin Railroad Commission, succeeding Professor B. H. Meyer, recently appointed to the Interstate Commerce Commission. Mr. Harlowe will begin his duties on February 1, his term being for four years at a salary of $5,000 per year. Mr. Harlowe has been an active transportation man in Milwaukee for nearly 25 years. He served in the traffic department of the Chicago, Milwaukee & St. Paul for eight years as a young man. For 17 years he has been traffic manager of the Allis-Chalmers Company and its predecessor, the Edward P. Allis Company

COURT NEWS.

The Supreme Court of Georgia has sustained the law of that state, passed two years ago, requiring the use of electric headlights on all locomotives. The decision was in the case of the Atlantic Coast Line.

Judges Warrington, Sanford and Denison in the United States Circuit Court of Appeals at Cincinnati, January 13, rendered a decision sustaining the constitutionality of the act creating the Kentucky railway commission. The case was one brought by the Greenbrier Distilling Company of Chapline, Ky., against the Louisville & Nashville, and involved the reasonableness of the rates of the latter on soft coal from eastern Kentucky. The Kentucky commission ordered the rates reduced, and the road attacked the constitutionality of the law under which it acted, on the ground that it combined executive, legislative and judicial functions in one body, and conflicted with the commerce clause of the federal constitution. Both contentions were overruled.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. U. Wallace has been elected vice-president of the Fort Dodge, Des Moines & Southern, with office at Boone, Iowa.

F. D. Dale has been appointed auditor of the Leavenworth, Kansas & Western, with office at Leavenworth, Kan., succeeding G. T. Crandell, retired.

The officers of the Winston-Salem Southbound, which was recently opened for traffic, are as follows: H. E. Fries, president, Winston-Salem, N. C.; T. M. Emerson, vice-president, Wilmington; H. F. Wilkinson, secretary, Roanoke, Va.; J. F. Post, treasurer, and H. C. Prince, general auditor, both with offices at Wilmington, N. C. Mr. Emerson is also president, Mr. Post, treasurer, and Mr. Prince, comptroller of the Atlantic Coast Line.

George M. Shriver, assistant to president of the Baltimore & Ohio, has been elected second vice-president, with office at Baltimore, Md., succeeding to the executive position which has been vacant since the relinquishment of its duties by Hugh L. Bond, Jr., general counsel of the company. Mr. Shriver entered the service of the Baltimore & Ohio in 1887, as a clerk in the accounting department, leaving that position to go to the United States Express Company, operating over the B. & O. In 1888 he went with Charles F. Mayer, then president of the Consolidation Coal Company, as his secretary, and in that capacity re-entered railway service in the fall of that year when Mr. Mayer became president of the Baltimore & Ohio. Mr. Shriver continued as secretary to the president when John K. Cowen in 1896 succeeded to the office of chief executive, and upon Leonor F. Loree becoming president in 1901 he promoted him to assistant to the president, which position he held at the time of his recent appointment as second vice-president. Mr. Shriver will have charge of the accounting department, and is to perform such other duties as may be assigned him by the president or board of directors.



G. M. Shriver.

Operating Officers.

C. W. Bradley has been appointed inspector of transportation of the Chesapeake & Ohio, with office at Richmond, Va.

E. H. Zeigler has been appointed trainmaster of terminals of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Indianapolis, Ind.

H. J. Schwartz has been appointed a trainmaster of the Illinois Central, with office at Clinton, Ill., succeeding W. S. Williams, promoted.

J. E. Farrell has been appointed a trainmaster of the Chicago & Alton, with office at Roodhouse, Ill., succeeding W. H. Gunzelman, assigned to other duties.

C. J. Balch has been appointed to the new position of assistant general manager of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal.

W. L. Wyman, assistant trainmaster of the Philadelphia & Reading, at Philadelphia, Pa., has resigned to go to the Canadian Pacific, with office at Calgary, Alb.

N. H. Goucher has been appointed superintendent of transportation of the Charlotte Harbor & Northern, with office at Arcadia, Fla., succeeding to the duties of J. M. Kelly, trainmaster.

W. N. Royall, general manager, and E. Borden, general superintendent of transportation of the Atlantic Coast Line, have had their authority extended over the Winston-Salem Southbound, both with offices at Wilmington, N. C.

A. L. Mohler, vice-president and general manager of the Union Pacific at Omaha, Neb., having returned after an absence, has assumed charge of the operation of the road, and Charles Ware, assistant general manager; W. D. Lincoln, assistant general manager, and W. R. Cahill, superintendent of the Nebraska division, will resume the duties of their respective offices.

Orville T. Waring, who has been appointed superintendent of the new Winston-Salem district of the Atlantic Coast Line, with office at Florence, S. C., as previously announced in these columns, graduated as a civil engineer from the University of Pennsylvania in 1902, and in July of that year began railway work in the engineering department of the Baltimore & Ohio. In July of the following year he was appointed assistant division engineer, and in August, 1905, he went to the Atlantic Coast Line as assistant engineer, leaving that company in November, 1906, to go to the Charleston & Western Carolina in the same capacity. He was promoted to assistant superintendent of that road in November, 1907, and the following year returned to the service of the Atlantic Coast Line as roadmaster. From September, 1909, to October of the following year he was acting engineer of roadway and was then appointed assistant engineer, which position he held at the time of his recent appointment as superintendent.

James Allen Kauffman, whose appointment as superintendent of the Tombigbee Valley has been announced in these columns, was born July 14, 1877, at Miamisburg, Ohio, and was educated in the public schools. He started to learn telegraphy in 1894 on the Cincinnati, Hamilton & Dayton, and the following year went to the Illinois Central as a clerk, at Holly Springs, Miss., and was later chief clerk and cashier to the joint agent of the Illinois Central and the Kansas City, Memphis & Birmingham, now a part of the St. Louis & San Francisco. About two years later he was appointed chief clerk, and was then consecutively despatcher and superintendent of the Ohio River & Columbus, at Ripley, Ohio. He was then superintendent, general manager, secretary and a director of the Licking River, at Salt Lick, Ky., and was later appointed general manager of the Lafayette Railroad, at Lafayette, Ga., leaving that company to become consulting and afterwards chief engineer of the Oklahoma Midland Electric. His next position was chief engineer of the Newton & Northwestern, now a part of the Fort Dodge, Des Moines & Southern. In October, 1910, he was appointed chief clerk of the Tombigbee Valley, which position he held at the time of his recent appointment as superintendent.



J. A. Kauffman.

Charles C. Walker, who has been appointed assistant general manager of the Chesapeake & Ohio, with office at Richmond, Va., as previously announced in these columns, was born June 21, 1858, in Albemarle county, Va., and was educated at Oldfield School. He began railway work in 1873, since which time he has been consecutively to 1876, messenger, receiving and delivery freight clerk, brakeman and fireman on the Richmond & Danville, now a part of the Southern Railway, and from 1876 to 1879

he was general operator on the Richmond, York River & Chesapeake, which is also now a part of the Southern Railway. He went to the Chesapeake & Ohio in August, 1879, as a clerk in the claim office, and was subsequently to January 1897, telegraph operator, train despatcher, chief train despatcher, and assistant division superintendent. He was appointed division superintendent at Richmond, Va., in January, 1897, and four years later was made general superintendent of the Eastern division. The following year he was appointed superintendent of transportation, and in May, 1910, he was promoted to general superintendent of transportation, which position he held at the time of his recent appointment as assistant general manager.

F. P. Gutelius, whose appointment as general superintendent of the Eastern division of the Canadian Pacific, with office at Montreal, Que., has been announced in these columns, was born December 21, 1864, at Mifflinburg, Pa. He graduated from Lafayette College as a civil engineer in 1887, and began railway work January 1, 1888, as assistant engineer on the Pennsylvania Lines West of Pittsburgh, and the following year was transferred in the same capacity to the Cleveland & Pittsburgh. From 1890, to June, 1891, he was assistant supervisor in charge of engineering work on the Cleveland & Pittsburgh for the sub-division north of Alliance, with office at Cleveland, Ohio, during which time he made surveys and preliminary plans for the elimination of grade crossings through Newburg, a suburb of Cleveland. He was out of railway work from June, 1891, until November, 1895, when he started the construction of the Trail Creek Tramway in British Columbia, and was later in charge of its operation as general superintendent. He built a 20-mile extension of this line which afterwards became the Columbia & Western, and is now a part of the Canadian Pacific. In September, 1899, he was appointed resident engineer in charge of maintenance of the Canadian Pacific lines in the Kootenay district, B. C., and the following year was made inspecting engineer on maintenance work for the Canadian Pacific system. In June, 1902, he was appointed engineer of maintenance of way, which position he held until the spring of 1906, when he was made assistant chief engineer in charge of all engineering work on the Eastern lines, and he also prepared engineering standards for the entire system. He was appointed general superintendent of the Lake Superior division in September, 1908, which position he held at the time of his recent appointment as general superintendent of the Eastern division.



F. P. Gutelius.

Traffic Officers.

W. B. Wheeler has been appointed general agent of the Rock Island Southern, with office at Pittsburgh, Pa., a new agency.

Frederick C. Lang has been appointed a freight solicitor of the Union Line of the Pennsylvania Lines West of Pittsburgh, in connection with the Chicago agency.

F. A. Acker, traveling freight agent of the Northern Pacific at St. Paul, Minn., has been appointed a traveling freight agent, with office at Kansas City, Mo., a new office.

W. G. Cooper, Jr., has been appointed general freight and passenger agent of the Charlotte Harbor & Northern, with office at Boca Grande, Fla., succeeding E. C. Hoskins.

H. A. Poveleite, general freight agent of the Queen & Crescent at Cincinnati, Ohio, has been appointed a member of the Uniform Classification Committee, with office in Chicago.

M. J. McMahon, assistant general freight and passenger agent of the Buffalo & Susquehanna at Du Bois, Pa., has been appointed traffic manager of the New Orleans Great Northern, with office at New Orleans, La.

F. B. Townsend, coal freight agent of the Minneapolis & St. Louis and the Iowa Central at Chicago, has been appointed an assistant general freight agent, with office at Minneapolis, Minn., and his former office has been abolished.

C. G. Mills has been appointed manager of the Montana Demurrage Bureau and agent of the Western Railway Weighing Association and Inspection Bureau, with office at Butte, Mont., succeeding R. H. Ingle, commissioner, resigned to engage in other business.

A. D. Williamson, traveling freight agent of the Seaboard Air Line, at Live Oak, Fla., has been transferred to Bradentown, in charge of the territory from Turkey creek to Venice, which territory was formerly covered by the Tampa office. W. M. Bullard succeeds Mr. Williamson, with office at Live Oak.

W. J. Craig, passenger traffic manager, and R. A. Brand, freight traffic manager of the Atlantic Coast Line, have had their authority extended over the Winston-Salem Southbound, both with offices at Wilmington, N. C. S. P. Collier, Jr., is general freight and passenger agent of the Winston-Salem Southbound, with office at Winston-Salem.

F. H. Montgomery, traveling agent of the Lackawanna Line at Seattle, Wash., has been appointed traveling freight agent of the New York, Chicago & St. Louis, with office at Buffalo, N. Y., succeeding E. S. Manchester, promoted. E. J. Stoll, traveling freight agent of the New York, Chicago & St. Louis at Portland, Ore., has been appointed commercial agent, with office at Omaha, Neb., succeeding H. F. Curtis, resigned to engage in other business, and James Trumbull succeeds Mr. Stoll.

Engineering & Rolling Stock Officers.

T. S. Abbott, chief engineer of the Coahuila & Zacatecas at Saltillo, Coahuila, Mex., has resigned.

The office of G. S. Bruce, chief engineer of the Charlotte Harbor & Northern, has been transferred from Arcadia, Fla., to Boca Grande.

E. B. Pleasants, chief engineer, and R. E. Smith, general superintendent of motive power of the Atlantic Coast Line, have had their authority extended over the Winston-Salem Southbound, both with offices at Wilmington, N. C.

M. H. Elkin, division engineer of the Lehigh Valley, at Auburn, N. Y., has been transferred to Hazleton, Pa., succeeding F. W. Gilcreast, resigned to go to another company. R. L. Gebhardt succeeds Mr. Elkin, with office at Auburn.

Purchasing Officers.

F. H. Fechtig, purchasing agent of the Atlantic Coast Line, has had his authority extended over the Winston-Salem Southbound, with office at Wilmington, N. C.

OBITUARY.

R. Forrester, consulting engineer of the Denver & Rio Grande, died at Seattle, Wash., on December 30.

Harry D. Annable, assistant foreign freight agent of the Canadian Pacific at New York, died on January 10. Mr. Annable was born in Canada 39 years ago. He had been associated with the Canadian Pacific for several years, having represented the company as general freight agent in London prior to his coming to New York about a year ago.

Edward S. Greenleaf, formerly superintendent of the Jacksonville Southeastern, now part of the Chicago, Burlington & Quincy, died at Jacksonville, Ill., on January 10. Mr. Greenleaf was born in Williamsburg, Me., June 5, 1838, and began railway work in 1855 with the Great Western Railway, now part of the Wabash. In 1866 he was made general freight and ticket agent of the St. Louis, Jacksonville & Chicago, now part of the Alton, and for a number of years after 1870 was superintendent of the Jacksonville, Northwestern & Southeastern and its successor, the Jacksonville Southeastern.

Railway Construction.

New Incorporations, Surveys, Etc.

CANADIAN PACIFIC.—The Kootenay Central, which has been taken over by the Canadian Pacific, is pushing construction work in the Columbia valley, B. C. The plans call for a line from Golden, B. C., following the shore of Lake Windermere, to Fort Steele, 175 miles. The work includes changing the course of Wild Horse creek.

CHEHALIS & COWLITZ.—Incorporated in the state of Washington with $300,000 capital to build from Chehalis southeast to a point on the Cowlitz river, near the Plamondon donation land claim on Cowlitz prairie, 20 miles. Also to build branch lines. H. C. Coffman and G. A. Robinson, Chehalis, are incorporated.

CHICAGO, MILWAUKEE & PUGET SOUND.—A new branch has been opened for business from Warden, Wash., west to Marcellus, 47 miles.

CINCINNATI & NASHVILLE.—This is the new name of the Overton County Railroad, which is to be reorganized. The plans call for building from Livingston, Tenn., northeast via Byrdstown and Monticello, Ky., to Somerset, about 76 miles. Contracts for this work will be let in about four months. The work will be medium heavy, including some rock work and one tunnel. There are to be two steel bridges, also one trestle. The line will carry lumber, coal and merchandise.

CRYSTAL CITY & UVALDE.—This company has opened for business an extension from Crystal City, Texas, to Gardendale, 41 miles.

DELAWARE, LACKAWANNA & WESTERN.—According to press reports, this company is taking up options on 25,000 acres of coal lands in Armstrong county, Pa., and it is thought that the company will build a line into Armstrong county.

DENTON-SLIDELL.—The Denton Chamber of Commerce is back of a project to build a line from Denton, Tex., northwest to Slidell, about 20 miles. A. C. Owsley, Denton, is the principal promotor.

DENVER & RIO GRANDE.—An officer writes regarding the double-tracking work to be carried out between Denver, Colo., and Salt Lake City, Utah, that no definite plans have yet been made to carry out this work, and surveys are not being made. It is possible that the company may construct some double-track during 1911 in locations where the greatest congestion exists, but up to the present time no definite plans have been under consideration.

DULUTH, MISSABE & NORTHERN.—This company has opened for business new branch lines as follows: Silver branch, from Rainey Junction, Minn., to Canadian Junction, 2.6 miles; Woodbridge branch, from Sherwood, to Sharon, 3.9 miles.

GALLATIN VALLEY.—A new branch has been opened for business from Belgrade Junction, Mont., east to Belgrade, five miles.

GREAT NORTHERN.—An officer writes that grading work between Oroville, Wash., and Pateros has been finished. Work has been suspended on the extension to Wenatchee for the present. (December 2, p. 1096.)

GULF, VELASCO & NORTHERN.—An officer writes that contracts will probably be let within 60 days to build from Sealy, Texas, on the Gulf, Colorado & Santa Fe and the Missouri, Kansas & Texas, southeast via Rosenburg, Damon, Columbia and Brazoria to Velasco, on the gulf of Mexico, about 96 miles. The line will carry agricultural products, timber and live stock.

LEHIGH & NEW ENGLAND.—A contract has been given to McArthur Brothers Co., New York, to build an extension from Danielsville, Pa., near Slatington, west to Tamaqua, 32 miles. Construction work is to be started at once. (September 30, p. 599.)

LICKING RIVER.—An extension has been built from Blackwater, Ky., to Arnett, two miles.

MANUFACTURERS' RAILWAY.—An officer writes that construction work has been started to double the trackage capacity of this line, which is wholly within the corporate limits of St. Louis, Mo. No contracts for the work will be let. The improvements include a union freight house, city delivery tracks and a storage yard.

MINNEAPOLIS & RAINY RIVER.—An extension has been opened for business from Bigfork, Minn., to Effie and Kenny, eight miles.

MISSOULA & HAMILTON.—Incorporated in Montana with $500,000 capital, to build from Hamilton, Mont., north to Missoula, with a number of branch lines in Missoula and Ravalli counties. It has not yet been determined whether the company will use steam for the motive power or electric motor cars. Work on the line is to be started early this coming spring. The incorporators include: H. M. Sloan, R. A. O'Hara, Hamilton; F. I. Bennett, I. M. Cobe and L. A. Bushby, Chicago, all of the Bitter Root Valley Irrigation Company.

NASHVILLE-GALLATIN INTERURBAN.—An officer writes that surveys are to be started this month, and it is expected to have all the rights-of-way secured by May 1, so that construction work can be started about the fifteenth of that month. The plans call for a line from Nashville, Tenn., northeast to Gallatin, 30 miles. A contract has been given to the W. K. Palmer Engineering Company, Kansas City, Mo., for the locating survey, including profile, right-of-way map, etc. H. H. Mayberry, Franklin, may be addressed. (January 13, p. 104.)

NORTH COAST.—See Oregon-Washington Railroad & Navigation Company.

NORTH YAKIMA & VALLEY.—The Moxee branch has been opened for business from North Yakima, Wash., to Moxee City, 8.6 miles.

NORTHERN PACIFIC.—According to press reports, this company will spend about $2,000,000 building a 35-mile double-track line between Tacoma, Wash., and Tenino. Surveys for this work were made about a year ago. The improvements to be carried out include piercing a tunnel under Tacoma, near Point Defiance, to be about one-half mile long, and the elimination of the big hill south of Tacoma. The new line will be used jointly by the Northern Pacific, the Great Northern and the Oregon-Washington Railroad & Navigation Company. (October 28, p. 810.)

OREGON ROADS (Electric).—Residents of The Dalles, Ore., are interested in a project to build an electric line from The Dalles to the Tygh valley.

F. M. Swift, Oregon City, Ore., is said to be back of a project to build an electric line through the Molalla territory.

The Lane County Asset Company of Eugene, Ore., has made financial arrangements, it is said, to build an electric line from Eugene to tidewater on Siuslaw Bay. The line is to be extended to Florence, 60 miles, and eventually south to Coos Bay, an additional 75 miles. A site has been secured on the water front for terminals at Siuslaw Bay.

OREGON SHORT LINE.—According to press reports, this company will make improvements to include laying 211 miles of track in Idaho during 1911 as follows: Track to be laid on grade from Caldwell to Homedale, 11.2 miles; extension from Richfield to High Prairie Summit, 67.2 miles; extension from Burley to Kelton Summit, traversing the Raft river project, 60.5 miles; new track from Ashton to Briggs, 37.5 miles; extension from Buhl to Salmon river crossing, 8.6 miles, and extension from Nissa east toward Homedale, 26 miles. At the Boise yards and terminals the platforms are to be extended.

OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY.—Contracts, it is said, will be let in February for building an 80-mile section of the North Coast division, between Spokane, Wash., and a junction with the present main line of the Oregon & Washington.

OVERTON COUNTY RAILROAD.—See Cincinnati & Nashville.

PACIFIC ELECTRIC.—This company has opened its new line between Pomona, Cal., Claremont, and Upland.

PUEBLO & NORTHEASTERN.—An officer writes that contracts will probably be let within 60 days to build from Pueblo, Colo., via Wilson, thence to a connection with the Missouri Pacific and the

Atchison, Topeka & Santa Fe at Nepesta. The work will include putting up two steel bridges. B. H. Tallmadge, of the Pueblo-Rockyford Land Company, is vice-president, Topeka, Kan.

Prineville & Eastern.—Organized in Oregon with $400,000 capital to build from Prineville, Ore., west to a point on the Oregon Trunk, 18 miles. Surveys are nearing completion, and it is expected to begin grading work from Prineville in a short time. T. M. Baldwin, G. M. Cornett, A. J. Noble, W. A. Booth and residents of Prineville are back of the project.

Sanford Traction.—An officer writes that the plans call for a line from Sanford, Fla., south via Celery delta to Orlando, 30 miles, of which 16 miles has track laid and is leased to the company. Work on the rest of the line will be carried out by the company's men. S. O. Chase, president and A. P. Connelly, manager, Sanford.

South Carolina Western.—An extension has been opened for business from McBee, S. C., south to Hartsville, 16 miles.

Southern Pacific.—An officer writes that surveys have been made from Contact, Nev., to Icarus, on the Southern Pacific east of Wells, but it has not yet been decided to build the line.

Southern Railway.—This company will build an additional 10 miles of double track on its main line between Washington, D. C., and Atlanta, Ga. The work has been authorized on a section south of Franklin Junction, Va. The new track will be connected with second track already laid to Whittle which has never been used. When the new work is completed the five miles of single track between Franklin Junction and Sycamore will be operated as a gauntlet under absolute block. No train will be permitted to enter either end of the gauntlet while another is on it. The 28-mile stretch of double track from Montview, Va., to Sycamore will be increased to fifty miles by this addition, and the 12 miles from Montview to Monroe through Lynchburg which is just going into service. The completion of the Lynchburg improvement gives the Southern 239 miles of double track between Washington and Atlanta, which are 648 miles apart, and on completion of the improvement between Franklin Junction and Whittle the total double track will be 249 miles. (January 6, p. 62.)

Tennessee, Alabama & Georgia.—An officer writes that the company expects to begin work early this coming summer on a branch from Harrisburg, Ga., east to Trion, eight miles; also, from Rome to Rockmart, 29 miles. The work includes some heavy cuts and fills, three steel bridges, each 120 ft. long, a 2,500-ft. tunnel shops and terminal buildings are to be built at Chattanooga, Tenn. The principal commodities to be carried will be iron ore, coal and cotton. (December 23, p. 1205.)

Texas Central.—The De Leon branch has been opened for traffic from De Leon, Texas, to Cross Plains, 41 miles.

Tidewater Railroad.—A franchise has been granted by the officials of Birmingham, Ala., and surveys are being made to build from East Lake, southwest via Birmingham to Bessemer, about 25 miles, on which work is to be started soon. The line is eventually to be extended to Tuscaloosa and Gadsden. Morris Brothers, Philadelphia, Pa., are the financial backers of the project; J. M. Dewberry, vice-president, Birmingham.

United Properties Co.—This company, which was recently incorporated in Delaware, it is understood, will build from San Jose, Cal., through the San Joaquin valley to Bakersfield, thence to Los Angeles. It is reported that the Hill interests are back of the project. (Jan. 13, p. 104.)

Vera Cruz & Isthmus.—This company has finished work on a branch line from Rives, Mex., to Cuatotolepan, 13 miles, and from Brisbin to Cerro Colorado, 15 miles.

Virginia & Carolina Southern.—The Elizabethtown branch has been extended from Tarheel, N. C., to Dublin, six miles.

Virginia & Southwestern.—This company has opened for business the section from Moccasin Gap, Va., southeast to Persia Junction, Tenn., 38 miles, where connection is made with the line to Bulls Gap, on the Southern Railway.

Western Pacific.—An officer is quoted as saying that this company will build a line south to San Jose, Cal., within the next few months, and at a later time will build to Los Angeles.

Railway Financial News.

Albany Southern.—The directors of this company have declared an initial dividend of 1½ per cent. on the preferred stock, payable February 1. An officer of the company is quoted as saying that this is a semi-annual dividend, and that the declaration places the stock on a 3 per cent. annual basis.

Boston Railroad Holding Co.—Lee, Higginson & Co., Boston, and Higginson & Co., London, are offering at slightly below par cumulative 4 per cent. preferred stock of the Boston Railroad Holding Co., guaranteed principal and interest by the New York, New Haven & Hartford. Of this preferred stock there is now $20,012,000 outstanding, and after the Holding company has subscribed for its share of the new Boston & Maine stock, there will be $26,422,500 preferred stock outstanding. There is $3,106,500 common stock, of which the New York, New Haven & Hartford owns $3,006,500. The common stock only has voting power. The preferred stock is a first lien on a little over 51 per cent. of the outstanding Boston & Maine stock. The Boston & Maine stock cannot be sold or transferred without authority from the Massachusetts legislature.

Boston & Maine.—See Boston Railroad Holding Co.

Canadian Pacific.—The New Brunswick Southern, for some time leased to the Canadian Pacific, is now to be operated as part of district 1 of the Atlantic division, and the St. Maurice Valley Railway, also leased by the Canadian Pacific, is to be operated as part of district 3 of the Eastern division.

Central New England.—The $1,250,000 first mortgage 5 per cent. bonds of 1899-1919, callable at 105, have been called for payment on February 1.

Chattanooga & Atlanta.—See Tennessee, Alabama & Georgia.

Chattanooga Southern.—See Tennessee, Alabama & Georgia.

Colorado & Southern.—This company has sold to Proctor & Borden, New York, $1,400,000 Colorado & Southern refunding and extension 4½ per cent. bonds. Proctor & Borden are offering these bonds and $1,700,000 of the same issue bought in the open market, making a total of $3,100,000 bonds at a price to yield 4.60 per cent. A letter from President Darius Miller says that the proceeds of the sale of the $1,400,000 bonds, together with the proceeds of the sale of $3,000,000 bonds sold in June, are being used to pay for building a line from Walsenburg, Col., to Pueblo. The company now uses Denver & Rio Grande tracks between Walsenburg and Pueblo.

Delaware & Hudson.—The New York Public Service Commission, Second district, has authorized the Delaware & Hudson to issue $7,000,000 4 per cent. refunding mortgage bonds, to be sold at not less than 95. Of the proceeds of these bonds $4,494,320 is to be used to pay outstanding notes, and the balance is to be used for improvements and additions.

Glasden & Birmingham.—See Tennessee, Alabama & Georgia.

Grand Trunk Pacific.—The minister of railways and canals of Canada has received a telegram from Charles M. Hays, president of the Grand Trunk Pacific Railway, asking that the Grand Trunk Pacific be allowed to submit a proposition to operate the Hudson Bay Railway, which the Government is to build. Mr. Hays also offers to build a line from Saskatoon to the pass, where the Hudson Bay Railway will begin. This will be a counter proposition to the one made recently by the Mackenzie and Mann (Canadian Northern) interests.

Missouri, Kansas & Texas.—At a conference on January 9, representatives of 16 towns on the Texas Central passed resolutions favoring a law which shall permit the Missouri, Kansas & Texas to take over the operation of the Texas Central.

New Brunswick Southern.—See Canadian Pacific.

New York, New Haven & Hartford.—This company has sold $10,000,000 4½ per cent. notes to a Boston syndicate headed by F. S. Moseley & Co. The notes were offered on a 4¼ per cent. basis and quickly sold. They will run until March 1, 1912. Proceeds of the New Haven note sale are presumably for the general corporate purposes. New Haven has $3,350,000 de-

benture notes maturing this year, so that a portion of the money received from the new notes will take care of these maturing obligations.

New York, New Haven & Hartford.—See Boston Railroad Holding Co.

Norfolk Southern.—The directors have declared an initial quarterly dividend of one-half of 1 per cent., payable February 1. This places the stock on a 2 per cent. basis.

Pennsylvania Southern.—See Pittsburgh, Summerville & Clarion.

Pittsburgh, Summerville & Clarion.—*The Commercial & Financial Chronicle* says that the new interests, which several months ago acquired control of this 21-mile line, have leased it to the Pennsylvania Southern, which has $200,000 stock and operates one mile in addition to its leased line.

Seaboard Air Line.—The directors have authorized the sale of $19,000,000 refunding mortgage 4 per cent. bonds to provide cash and to pay for the retirement of $14,651,000 collateral trust 5 per cent. bonds due in May. These bonds are part of $125,000,000 refunding mortgage 4 per cent. bonds provided for by the reorganization plan, none of which having been previously sold. Blair & Co., New York, and associates are to underwrite the bond sale, and it is expected that the sale will net the railway company 80 per cent.

Stockholders are to vote at a special meeting January 30 on the question of authorizing a new mortgage to secure $35,000,000 new 5 per cent. bonds. This mortgage will replace the present mortgage securing $12,000,000 authorized bonds.

St. Maurice Valley.—See Canadian Pacific.

St. Louis & San Francisco.—The $7,000,000 15-20 year 5 per cent. bonds recently offered by Speyer & Co., New York, at 87 to yield 6¼ per cent., have been oversubscribed for.

Tennessee, Alabama & Georgia.—A press despatch from Chattanooga says that the Chattanooga & Atlanta, the Chattanooga Southern and the Glasden & Birmingham are to be merged, and a new company—the Tennessee, Alabama & Georgia—is to take over the operation.

Texas Central.—See Missouri, Kansas & Texas.

Wabash.—James Pollitz, who bought 1,000 shares of Wabash common stock in 1906, and who has been suing the company on various grounds ever since, has been given permission to bring suits against the railway company and against certain of its officers for an accounting of the $10,000,000 Wabash stock issued in 1904 for bonds of the Wabash-Pittsburgh Terminal.

Wabash-Pittsburgh Terminal.—See Wabash.

The chairman of the railways commissioners for the Australian State of Victoria for the past seven years has been an American railway man who has held responsible railway positions in the United States and Canada. He retired from his position on December 1, after a successful management of the government railways of this state which had previously been run at a loss. He was employed to run the government railways on a paying basis and the results achieved during the seven years ended June 30, 1910, show that this was accomplished. The deficit for the seven years ended June 30, 1903, was $9,304,982, while the surplus for the succeeding seven years was $4,558,577, notwithstanding that $3,398,715 was spent in the last seven years for special expenditures and charges in liquidation of extraordinary liabilities, against only $781,706 in the prior seven years. The increased number of passengers carried over the preceding seven years (1896-1903) was 41 per cent. and the increase in number of tons of goods over the same period 32 per cent., and live stock 38 per cent. During 1903-1910 the average train load increased by 40 per cent. over 1896-1903, the average carload by 17 per cent., and the estimated increase of goods and livestock was 61 per cent., while the increase of freight and mixed train mileage run was only 7 per cent. A number of reforms were instituted, and legislation was secured to prevent the scalping of tickets, and other abuses. It is worthy of note that the conditions governing transportation of goods, livestock, etc., and the conveyance of passengers, parcels, etc., have been revised and made uniform throughout Australia.

Late News.

The items in this column were received after the classified departments were closed.

Charles A. Kline has been appointed assistant general passenger agent of the Southern Railway, with office at Washington, D. C.

All trunk line roads are filing passenger tariffs with the Interstate Commerce Commission in strict conformity with Section IV of the law, effective February 17, instead of asking relief under the long and short haul clause. This means that they propose to cut out group ratings. The passenger tariffs being filed represent both increases and reductions, the changes being in all cases only a few cents. Thus the new rate to Pittsburgh from Philadelphia will be $8.75, instead of $8.73 as at present.

Effective February 1, the lines of the Rock Island System will be divided into three operating districts as follows: W. S. Tinsman, general manager of the Chicago, Rock Island & Pacific, at Chicago, has been appointed general manager of the first district, embracing the lines east of the Missouri river, and the line from St. Joseph, Mo., to Horton, Kan. A. E. Sweet, assistant to president, at Chicago, has been appointed general manager, at Topeka, Kan., in charge of the second district, embracing the lines west of the Missouri river (except the line from St. Joseph, Mo., to Horton, Kan.), and north of Caldwell, Kan., including the line from St. Louis, Mo., to Kansas City, and the line extending southwest to Tucumcari, N. Mex. W. M. Whitenton has been apopinted general manager, at Fort Worth, Texas, in charge of the third district, embracing mileage south of Caldwell, Kan., lines south and east of Tucumcari, N. Mex., and the line to Dawson. H. M. Sloan, vice-president, in New York, succeeds Mr. Sweet, and his former office has been abolished.

In the hearing at Washington on the western rate advances, John H. Atwood, representing the shippers' committee of Chicago, followed Mr. Morrissey (whose testimony is given elsewhere in this issue) with an academic discussion as to the proper basis upon which to calculate the fair return to the roads. He concluded that the right thing for the commission to do was to ascertain what has been actually invested and intelligently administered. Attorney Atwood argued that the constitution which confers the power and imposes the duty upon the federal government of establishing and maintaining highways, the relation between the carrier and the government should be that of agent and principal. Therefore, the rate question should be considered from the standpoint whether the roads are performing their duty of transportation as the government would have it done. Referring to the statement made that railway bonds were not readily marketable, Attorney Atwood predicted that if a well-managed road would present its bonds in denominations small enough to be reached by the small investor, say $100 face value, and would offer them for public subscription like government bonds, the issue would be largely oversubscribed. Counsel advised the railways that before they attempted to levy further tribute upon the people, they should cancel their contracts with the express companies, discontinue selling bonds in such a way as to make large profits to a syndicate, sell their stocks so that for every dollar of stock value a dollar will go into their treasuries. With these leaks stopped, their financial condition would be improved. Taking the Chicago & Northwestern, the Atchison, the St. Paul and the Burlington as the dominant transportation factors in the territory under consideration, counsel proceeded to present statistics of their earnings for 1910 to show that they had, after paying expenses, interest, dividends and taxes, then paid large sums for additions and betterments and sinking fund. These latter items, he claimed, could not be fairly deducted from a net operating income and have the remainder fairly declared to be the net. Mr. Atwood continued his argument at the afternoon session, dwelling upon the profits earned by the carriers and declaring that they were now receiving as much as they were entitled to. He said that it was revolting to sound business sense that railway companies should give stock at par to stockholders when it could have been sold 25 or 30 points higher in the open market.

Supply Trade Section.

The Davenport Locomotive Works, Davenport, Iowa, has opened an office at 30 Church street, New York, in charge of H. T. Armstrong.

H. B. Taylor, special designing engineer of the Federal Signal Company, Albany, N. Y., has taken a similar position with the Hall Signal Company, New York, with office at Garwood, N. J.

The Beaumont, Texas, plant of the International Creosoting & Construction Company, Galveston, was recently damaged by fire. The loss, which is estimated at $80,000, is fully covered by insurance.

William Stevenson, for many years with the McGuire-Cummings Manufacturing Co., Chicago, has been appointed special representative of the Indian Refining Co., Cincinnati, Ohio, with headquarters in Chicago.

Grant B. Shipley has resigned his position as engineer of mining and timber preserving machinery of the Allis Chalmers Company, Milwaukee, Wis., and is now president of the Pittsburgh Wood Preserving Company, Pittsburgh, Pa.

The Chicago Car Leasing Company has been incorporated in Maine to make and lease cars of all kinds. The company is authorized to issue $60,000 common and $40,000 preferred stock. The names of the real promoters are not made public.

Frank P. Smith, vice-president of the Hobart-Allfree Company, Chicago, with office at New York, is planning to go into business for himself, handling several accounts in eastern territory on a commission basis. Mr. Smith's field will be particularly locomotive and steam specialties.

The Chicago Pneumatic Tool Company, Chicago, acquired the gasoline hand car business of the Duntley Manufacturing Company, Chicago, on January 1, and will in future make these cars on a large scale. These motor cars are now in use on 83 railways in this country.

W. P. Pressinger has sold his interest in the Keller Manufacturing Company, Philadelphia, Pa., and has resigned his position as vice-president of that company to become manager of the compressor department of the Chicago Pneumatic Tool Company, Chicago, with headquarters in New York.

In a notice published in the *Railway Age Gazette* of January 13, referring to the manufacture of oil headlights by the Dressel Railway Lamp Works, New York, for the Lake Shore & Michigan Southern to comply with the headlight statute in Indiana, the candle power was given, through a typographical error, as 150 instead of 1,500.

Edgar Allen & Company, Ltd., Imperial Steel Works, Sheffield, England, whose principal American office and warehouse is at Chicago, announces that agency arrangements have been made with Roehm & Davison, Detroit, Mich., J. L. Osgood, Buffalo, N. Y., and John J. Greer & Company, Inc., Baltimore, Md. These companies will carry a large stock of Allen's high speed and carbon tool steels.

The Jerguson Manufacturing Company, Boston, Mass., has received orders from the following railways for its new Wiltbonco gage: The Baltimore & Ohio; the Denver, Northwestern & Pacific; the Buffalo, Rochester & Pittsburgh; Oregon-Washington Railroad & Navigation Company; the Norfolk & Western; the Genesee & Wyoming; the Central Vermont; the Missouri Pacific; the Chicago Great Western; the Boston & Maine; the Erie; the Southern, and the Canadian Pacific.

F. K. Shults, until recently connected with the American Steel Foundries as their representative in New York and Eastern territory, has accepted a similar position with the Bettendorf Axle Company, Bettendorf, Iowa, of which company he has been made a vice-president. Mr. Shults has opened an office in room 2040 Grand Central Terminal building, New York City. The office at 30 Church street, room 1021, will remain in charge of G. N. Caleb, vice-president, who has been with the Bettendorf company for the last eight or ten years.

Henry B. Seaman, who, after serving three years as chief engineer of the New York Public Service Commission, First district, resigned that position last September, has opened an office at 165 Broadway, New York, as consulting engineer for railway, bridge and valuation work. Before December, 1907, when he became connected with the Public Service Commission, Mr. Seaman held several prominent engineering positions, including that of bridge engineer of the Erie, and responsible positions in the engineering departments of both the Pennsylvania and the New York, New Haven & Hartford.

The Horace L. Winslow Company, Chicago, recently exceeded its own record for promptness in its start on a large contracting work. The Pere Marquette let the contract for its new shops at Saginaw, Mich., to the Winslow company on Friday, and, in order to hasten matters, agreed to transport a portion of the material in a baggage car, which was loaded on Saturday. On Sunday one of the superintendents of the contracting company with his men was on his way to Saginaw, and on Monday actual work was begun. The work is being pushed to completion and it is expected that the time record of completing the work will in all respects equal the prompt start.

The Dearborn Drug & Chemical Works, Chicago, who has distributed its feed water treatment and lubricants through an agency in the Philippines for the past two years, has decided to open its own branch office and warehouse in Manila. F. O. Smolt, who has been connected with mining propositions since his graduation in chemistry from the University of Illinois in 1891, is now with the Dearborn company, and has gone to Manila to take charge of this work under the supervision of E. C. Brown, manager of the foreign department. Mr. Brown has been investigating steam plant and railway conditions in Japan, China and the Philippines for two years, and has made selling connections at Tokio, Tientsin, Hongkong and Shanghai.

William H. Browne, an electrical engineer, died on January 14 at his home in Brooklyn, N. Y. Mr. Browne was born in Troy, N. Y., in 1849. Coming to New York, he turned his attention to electricity and in 1888 was among the builders of the electric railway in Richmond, Va., one of the earliest electric railways in the United States. He became associated with the Westinghouse interests in New York and was made general manager of the United Electric Light & Power Co. In January, 1902, Mr. Browne became general manager and treasurer of the Stanley Instrument Co., Great Barrington, Mass., where he became identified with William Stanley. Five years later the Stanley works were merged with the General Electric Co., Schenectady, N. Y., and Mr. Browne opened offices in New York as a consulting engineer. Mr. Browne was a member of the American Institute of Electrical Engineers, of the St. Lawrence, Montreal and Catholic clubs, and was past grand master of the Knights of Columbus.

TRADE PUBLICATIONS.

Canadian Pacific.—The industrial department of this company has published a 140-page booklet, giving in tabulated form a full statement of the manufacturing and business opportunities in western Canada.

Protected Metals.—The Asbestos Protected Metal Company, Canton, Mass., has published a well illustrated 35-page booklet on asbestos protected metal, its uses and advantages. This product has been approved by the bureau of buildings of the borough of Manhattan, New York City.

Concrete Post Molds.—The D. & A. Post Mold Company, Three Rivers, Mich., is distributing a 24-page booklet, containing valuable information concerning the casting of concrete fence posts and telegraph and telephone poles. The book includes a number of photographs of post plants now in use on large American railways.

Great Northern.—The passenger department of the Great Northern has published a 38-page booklet describing "The Treasure State," Montana. The cover bears a colored photograph of Montana's exhibit at the 1909 National Corn Exposition in

Omaha, Neb., and the reading pages give the usual amount of information concerning agricultural values in that state.

Rail Clamps.—The Berry Rail Clamp Company, Fond du Lac, Wis., has issued a pamphlet describing its various designs of rail clamps. These devices are designed to prevent the track from creeping; it is claimed that they cannot work loose from the rail and that on curves they serve to counteract the outward pressure of the wheel flanges, thus helping to keep the track in alinement.

Electric Staff System.—The Union Switch & Signal Company, Swissvale, Pa., has published its bulletin No. 51 on the automatic electric staff system, especially adapted to the operation of single track electric railways. This bulletin describes fully the many advantages of this system. It contains 10 pages and is illustrated. Bulletin No. 52, published by the same company, is a reprint of an editorial on the electric train staff published in the *Railway Age Gazette* of December 2, 1910.

RAILWAY STRUCTURES.

BELLVILLE, TEX.—The Gulf, Colorado & Santa Fe, according to local press reports, will build a new brick passenger station at the foot of Main street and will convert the present station into a freight depot.

CLEVELAND, OHIO.—An officer of the Lake Shore & Michigan Southern writes that the Lake avenue subway in the city of Cleveland will be built during 1911. The work consists of the reconstruction of an existing subway now under three tracks and includes removing a double arch carrying three tracks and substituting therefor a steel bridge, spanning a greater width of street and carrying four tracks. No contracts have been let for the work. It is undecided whether the work will be carried out on the Madison street subway in the same city.

CHATTANOOGA, TENN.—See Tennessee, Alabama & Georgia under Railway Construction.

DULUTH, MINN.—The Duluth & Iron Range has let a contract for wrecking its old dock No. 1 preparatory to replacing it with a new steel dock.

EVERETT, WASH.—See Gold Bar, Wash.

GOLD BAR, WASH.—The Great Northern has bought 73 acres of land, it is said, at Gold Bar, as a site for a new station, a shop, roundhouses and storage tracks. It is also understood that the company will increase its yard facilities at Everett.

GUELPH, ONT.—Arrangements are said to have been completed between the city officials and the Grand Trunk for building a new passenger station in Guelph.

LOS ANGELES, CAL.—The Southern Pacific has been denied permission by the United States War Department to construct a direct lift bridge at San Pedro harbor, and an order has been issued that a draw bridge of the bascule type be installed within 12 months, capable of operating in 60 seconds. (December 9, p. 1133.)

NEW YORK.—The new subway station on the Broadway branch of the Interborough Rapid Transit Company, at 191st street, in the borough of Manhattan, is now open for traffic.

PRESQUE ISLE, MICH.—The Lake Superior & Ispheming has requested permission from the city council to build a trestle across Presque Isle drive to carry construction material to the site of the new dock which is to be built at this point. The new ore dock will be located 200 ft. southwest of the present one and parallel with it.

ST. LOUIS, MO.—See Manufacturers' Railway under Railway Construction.

QUINCY, ILL.—The Chicago, Burlington & Quincy is considering a plan for greatly increasing the size of its terminal buildings.

SAN BENITO, TEXAS.—The St. Louis & San Francisco has appropriated $50,000 for a pre-cooling plant to care for the large quantity of truck shipped from this point.

SOMERSET, KY.—The Queen & Crescent is reported to be contemplating extensive shop enlargements.

WILKESBARRE, PA.—Plans are being made, it is said, for a new bridge to be built by the city officials over South street. It is understood that some of the railways entering Wilkesbarre will pay part of the cost of this improvement.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk Pacific is said to have ordered 12 locomotives. This is not confirmed.

The Philadelphia & Reading will build 20 passenger locomotives at its shops in Reading, Pa.

The Illinois Central is preparing specifications on 5 Pacific type, 20 consolidation and 20 mikado locomotives.

The Danish State Railways, Copenhagen, will order 23 locomotives. They are not to be built in Denmark.

The Canadian Pacific, as mentioned in the *Railway Age Gazette* of January 13, has ordered 75 locomotives from the Canadian Locomotive Company and the Montreal Locomotive Works. The specifications for these locomotives are as follows:

Type.	30 *Consolidation.*	1 *Mallet* 0-6-6-0
Simple or compound	Simple	Simple
Weight on drivers	195,000 lbs.	262,000 lbs.
Total weight	220,000 lbs.	262,000 lbs.
Cylinders	24 in. x 32 in.	20 in. x 26 in.
Valves, diameter and kind	12 in. piston	11 in. piston
Diameter of drivers	.....	58 in.
Boiler type	Extended wagon top	Extended wagon top
Working steam pressure	180 lbs.	200 lbs.
Heating surface, tubes	2,631 sq. ft.	2,771 sq. ft.
" " firebox	180 sq. ft.	185 sq. ft.
" " total	2,811 sq. ft.	2,956 sq. ft.
Superheater surface	450 sq. ft.	549 sq. ft.
Equivalent heating surface	3,486 sq. ft.	3,780 sq. ft.
Tubes, number and size	272, 2 in.; 24, 5 in.	18, 2 in.; 167, 2¼ in.; 22, 5¼ in.
Length of tubes between sheets	15 ft. 1⅝ in.	20 ft ⅜ in.
Firebox, type	Radial stayed with cross stays.	Radial stayed with cross stays.
" length inside	103 3/16 in.	120 in.
" width inside	5 ft. 9¼ in.	69⅞ in.
" material and maker	Otis, steel	Otis, steel
Grate area	49 sq. ft.	58 sq. ft.
Tank capacity, water	5,000 gals.	5,000 gals.
Tank capacity, coal	10 tons	12 tons
Axles, main	10 in. x 14 in.	9½ in. x 12 in.
Axles, others	9½ in. x 14 in.	9 in. x 12 in.

Type.	12 *Pacific type.*	10 *Switching* 0-6-0
Simple or compound	Simple	Simple
Weight on drivers	135,000 lbs.	126,000 lbs.
Total weight	215,000 lbs. (for 7) 214,000 lbs. (for 5)	126,000 lbs.
Cylinders	21 in. x 28 in.	18 in. x 26 in.
Valves, diameter and kind	11 in. piston	11 in. piston
Diameter of drivers	75 in. (for 7) 69 in. (for 5)	52 in.
Boiler type	Extended wagon top	Straight top
Working steam pressure	200 lbs.	200 lbs.
Heating surface, tubes	2,777 sq. ft.	1,406 sq. ft.
" " firebox	183 sq. ft.	138 sq. ft.
" " total	2,960 sq. ft.	1,544 sq. ft.
" " superheater	539 sq. ft.	.....
Equivalent heating surface	3,767 sq. ft.	.....
Tubes, number and size	193, 2¼ in.; 22, 5 in.	234
" outside diameter	.....	2 in.
" length between sheets	19 ft. 4⅞ in.	11 ft. 5⅞ in.
Firebox, type	Radial stayed with cross stays.	Radial stayed with cross stays.
" length inside	7 ft. 10⅛ in.	8 ft. ⅜ in.
" width inside	5 ft. 9⅞ in.	3 ft. 6⅝ in.
" material and maker	Otis, steel	Otis, steel
Grate area	45.6 sq. ft.	29 sq. ft.
Tank capacity, water	5,000 gals.	3,500 gals.
Tank capacity, coal	10 tons	4 tons
Axles, main	9½ in. x 12 in.	8½ in. x 10 in.
Axles, others	9 in. x 12 in.	.....

Type.	4 *Mallet* 0-6-6-0	18 *Ten-wheel.*
Simple or compound	Compound	Simple
Weight on drivers	262,000 lbs.	141,000 lbs.
Total weight	262,000 lbs.	190,000 lbs.
Cylinders	34 in. and 23 in. x 26 in.	21 in. x 28 in.
Valves, diam. and kind, H. P.	11 in. piston	11 in. piston
Valves, diam. and kind, L. P.	12 in. piston	.....
Diameter of drivers	58 in.	.....
Boiler type	Extended wagon top	Extended wagon top
Working steam pressure	200 lbs.	180 lbs.
Heating surface, tubes	2,602 sq. ft.	2,238 sq. ft.
" " firebox	180 sq. ft.	180 sq. ft.
" " total	2,782 sq. ft.	2,418 sq. ft.
" " superheater	549 sq. ft.	409 sq. ft.
Equivalent heating surface	3,846 sq. ft.	3,032 sq. ft.
Tubes, number and size	16, 2 in.; 154, 2¼ in.; 22, 5¾ in.	240, 2 in.; 24, 5 in.
Length of tubes between sheets	20 ft. 0⅜ in.	14 ft. 2⅜ in.
Firebox, type	Radial stayed with cross stays.	Radial stayed with cross stays.
" length inside	120 in.	8 ft. 6⅛ in.
" width inside	69⅞ in.	5 ft. 9⅞ in.
" material and maker	Otis, steel	Otis, steel
Grate area	58 sq. ft.	49 sq. ft.
Tank capacity, water	5,000 gals.	5,000 gals.
Tank capacity, coal	12 tons	10 tons
Axles, main	9½ in. x 12 in.	9½ in. x 12 in.
Axles, others	9 in. x 12 in.	9 in. x 12 in.

CAR BUILDING.

The New York, New Haven & Hartford is in the market for 14 sleeping cars.

The Central Railroad of New Jersey is in the market for 250 refrigerator cars.

The Central of Georgia is taking prices on special equipment for 300 freight cars.

The Louisville & Nashville is said to have ordered 32 steel coaches. This is not confirmed.

The Illinois Central will build 100 36-ft., 40-ton, all-wood logging cars at its Burnside shops.

The Great Northern, it is said, has ordered 100 additional freight cars. This is not confirmed.

The New York Central & Hudson River has ordered 20 milk cars for the Merchants Despatch Transportation.

The Northwestern Pacific has ordered 3 baggage cars and 2 combination baggage and passenger cars from the American Car & Foundry Company.

The Pennsylvania has ordered 1,000 hopper coal cars for its eastern lines. Six hundred were ordered from the Cambria Steel Company, 250 from the Pressed Steel Car Company and 150 from the American Car & Foundry Company. This company is in the market for 500 box cars, 300 gondolas and 30 flat cars for its western lines.

IRON AND STEEL.

The Buffalo, Rochester & Pittsburgh has ordered 5,600 tons of 90-lb. rails.

The Great Northern is said to have ordered 3,800 tons of rails from the Illinois Steel Company.

The Delaware & Hudson has ordered 7,500 tons of 90-lb. rails from the Bethlehem Steel Company.

The Pennsylvania has ordered 70,000 tons of rails from the Carnegie Steel Company and the Illinois Steel Company; 63,000 tons from the Cambria Steel Company, and 8,000 tons from the Bethlehem Steel Company.

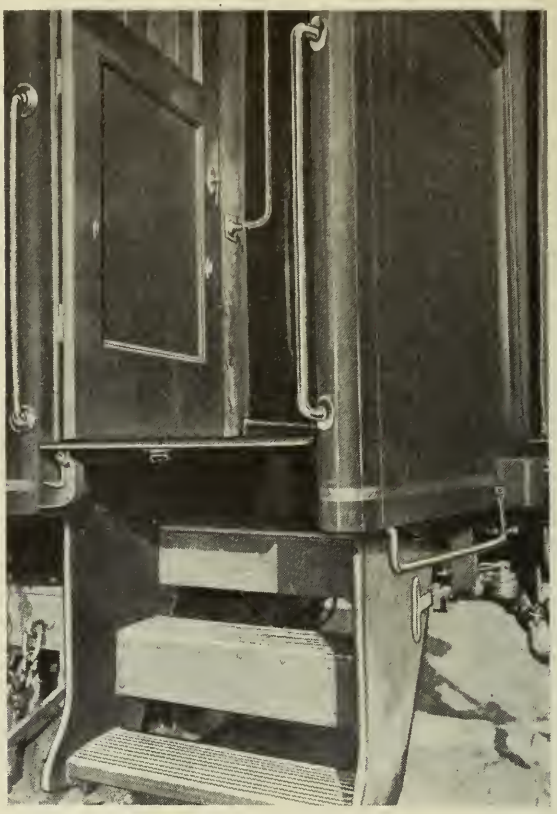
General Conditions in Steel.—At the dinner given to ninety-two steel men at the Waldorf-Astoria, New York, on January 11 by Judge Gary, it was unanimously decided not to make any cut in steel prices. It was thought that there would be enough orders to keep most of the mills busy. In spite of this decision, those who had looked for a downward revision of prices are not discouraged. There has been talk of a general reduction of prices to be made as soon as the prospect for orders improves. No marked improvement is looked for before March.

SIGNALING.

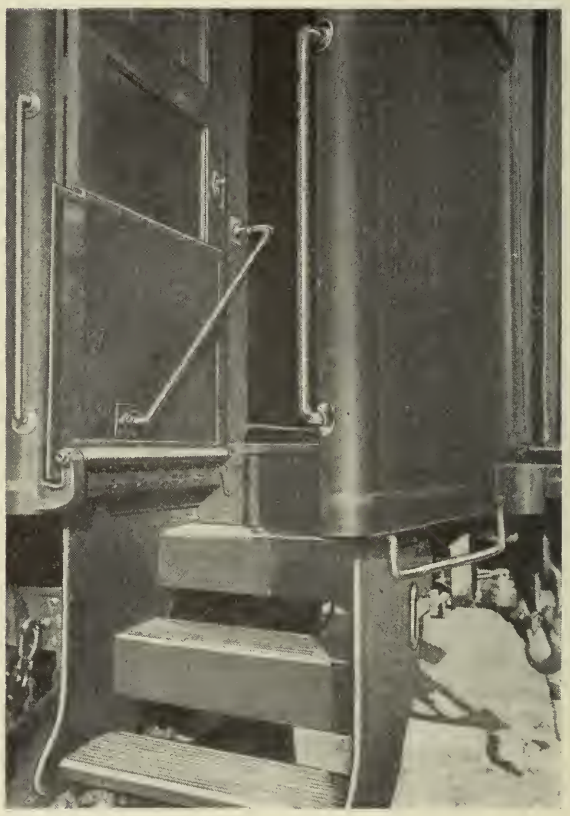
The length of lines block signaled, automatic and manual on the Baltimore & Ohio, is now 1,265 miles, which is 72 miles more than one year ago. The length of road equipped with automatic block signals is 218 miles, an increase of 29 miles. During the present year the B. & O. expects to install automatic signals on the following sections, all double track: Connellsville to Bessemer, 46.8 miles; McKeesport to Laughlin Junction, 11.9 miles; Goehring to New Castle Junction, 15.3 miles.

Vestibule Trap Door.

A metal trap door, arranged for loading and unloading passengers at high station platforms, has been put on the market by the O. M. Edwards Company, Syracuse, N. Y. The top of the door is covered with rubber and has a threshold extending beyond the outside of the vestibule door when it is closed. This threshold is roughened to prevent slipping, and slopes slightly to keep water from running inside the vestibule. The bottom surface of the door is smooth and is easily kept clean. The drop grab handle, as shown, fastens near the hinge, making a convenient arrangement for entering and leaving the car when the drop door is not used. All the adjustments to the door are made from the outside of the car; the adjusting nut in the ratchet bracket being in the corner post, may be easily removed, and the door may be taken from the car in less than half a minute without removing a screw or a bolt. The illustrations show the door in the closed and open positions. It is light and easily handled, and is especially appreciated in stations such as the Pennsylvania and the Grand Central terminals, New York, where passengers are loaded and unloaded at the car floor level.



Vestibule Trap Door; Closed.



Vestibule Trap Door; Open.

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REPRODUCED elsewhere are some statistics prepared by the Interstate Commerce Commission. In the analysis of operating expenses for repairs and renewals it is rather interesting to note that in the case of the Atchison, Topeka & Santa Fe—the road that has given efficiency methods the most thorough tryout—the cost for repairs and renewals per locomotive mile run was on the average 10.19 cents during the five years from 1906-1910, as compared with 9.73 cents on the average in the five years, 1901-1905, and was 10.75 cents in 1910. The expenses per mile run for repairs and renewals for both passenger train cars and freight train cars were higher on the average in the last five years than in the previous five years, and were higher in the case of passenger cars, but not in the case of freight cars, in 1910 than the average for the last five years. This is interesting; but it proves nothing. A comparison of maintenance charges per locomotive or per freight car rather than per locomotive mile or per car mile is in general a better basis on which to compare maintenance charges. The use of car or locomotive mileage gives a misleading impression of great accuracy, while as a matter of fact the expenses for repairs and renewals per unit of equipment comes nearer to being a true criterion of unit maintenance charges.

ILLINOIS is one of the states in which no anti-pass law has been enacted, and a movement has been started for the passage of one at the present session of the legislature. The agitation of the subject has called attention to the fact that some of the Illinois lines are still issuing passes to members of the legislature and that a large majority of the lawmakers have accepted and are using them. Public sentiment regarding the giving of passes, especially to members of legislatures, is perfectly well known. It has found expression not only in numerous state laws but in the Interstate Commerce act. This public sentiment is justified. It has been said in defense of the practice in Illinois that the giving of free transportation to the legislators is merely a courtesy and is not intended to influence their action; that, in fact, it does not influence their action; and that these representatives of the people are so poorly paid by the state that if deprived of free transportation their traveling expenses would be so greatly increased that their labors for the public would involve actual pecuniary loss to them. If passes do influence legislative action, they influence it in an improper way. If they do not, the giving of them amounts to the extension of a courtesy at the expense of the stockholders of the railways which does not benefit the stockholders. If the lawmakers are so ill paid that they must have free transportation to make both ends meet it is the business of the state, not of the railways, to furnish them additional compensation or additional expense money. In Illinois and other states where anti-pass laws have not been enacted the railways ought to make their passage unnecessary by ceasing to give free intra-state transportation to any persons to whom the giving of free interstate transportation is not permitted by the federal law. Where the railways continue to give transportation to persons who have no claim to it, their action affords justification for the passage of anti-pass laws; and in affording this justification the roads arouse a hostile public sentiment which, after the legislative passes have been withdrawn, is apt to cause the legislators to enact all sorts of laws inimical to railways.

NO part of the various activities of a railway corporation are so little understood by the general public as the railway company's relations to its stockholders as partners in the enterprise, and with its bondholders as creditors of the business. Any one of a dozen causes is sufficient to explain this. The subject is highly technical, and discussions of it are likely to quickly take the form of a theoretic or philosophical discussion of something that is quite intangible. Moreover, bankers are notoriously reticent. The proverbial timidity of capital has been so impressed on their minds from their earliest clerkship that reticence has become second nature to them. The commission which has been investigating the subject of the issuance of railway securities and the advisability of more direct government regulation or control of this activity of corporations is composed of men with the broadest possible outlook, and the men who have been called before the commission to discuss the subject of regulation of the issue of securities have been taken from almost every conceivable field that could offer any intelligent suggestion. From the newspaper reports of the hearings it is possible only to get a fair idea of how broad the discussion has been. It is quite possible to see in certain testimony that the witness seldom lost sight of the fact that he had his own axe to grind. On the other

hand, a good part of the discussion has been an expression, frank to an unusual degree, of personal conviction. The general impression of what might well be the conclusion of the commission is summed up by Frank Trumbuss in his discussion before the commission, as follows:

"If you should conclude that you cannot put this subject in a plaster cast because one arm of the body is in Boston and another limb is on the Staked Plains of Texas, I am sure we will get from the report of this commission conclusions which will illuminate the whole subject; and if the mediation of labor differences is better than compulsory arbitration, it may be that your findings will be more serviceable, if not too rigid, if they do not appear to be precise, for that might bring the federal government in conflict with the states."

There has been a very great amount of information placed at the disposal of the public probably for the first time. A part of this information may have always been common knowledge of expert bankers and of the highest financial officers of the larger railway systems, but for the first time the general student gets an opportunity to learn something of the really intimate theories and opinions that have been developed by those who have been largely instrumental in shaping the course of railway development in this country.

THE sale of new stock at par to stockholders when stock is selling above par in the market is one of the questions that has been discussed by various men who have been called before the Hadley commission on the issuance of railway securities, and it is one that permits of discussion separate from the question of the regulation of railway securities. Mr. Trumbull gives a very interesting illustration of what would be the effect of the issue of new stock by a railway company. He says: "A good many people seem to think that when the stock of a railway company is selling at say $150 per share, and a share of new stock is offered at $100, somebody is making a great profit. My thought is that the answer is a very simple sum in arithmetic. You cannot mix one $150 share with one $100 share and come out with two $150 shares." He takes the Pennsylvania's stock issue as an illustration. There was outstanding November 1, 1909, about $320,000,000 stock, with a marked value (at $150 per share) of $480,000,000. There was new stock issued at par amounting to $80,000,000. Adding the assets of the company to the market value of the old stock we get a total of $560,000,000 as the total market value of the new and old stock now outstanding; in other words, all of the partners in the business have contributed $80,000,000 pro rata to their business, and their business is worth $80,000,000 more. It is rather hard to see who got the great bargain, or how a profit was made at the expense of the public. Pennsylvania stock is paying 6 per cent. on *par*.

LIGNITE FUEL FOR LOCOMOTIVES.

RENEWED interest in the use of lignite as a fuel for locomotives has been shown by the changes in practice of the lines in the Northwest. The Chicago, Milwaukee & Puget Sound, the Great Northern and the Northern Pacific are arranging to ship oil 1,300 miles from Bakersfield, Cal., to Tacoma, Wash., and Seattle; the last two mentioned roads have storage tanks for the oil in process of construction at Tacoma, and the oil is to be used on locomotives crossing the Cascades and the Rocky mountains. The Chicago, Milwaukee & Puget Sound is burning oil on locomotives running between Tacoma and Deer Lodge, Mont., but has 75 locomotives equipped with the Brooks spark arrester, so that the semi-lignite coal from its mines at Roundup, Mont., may be used. The Oregon Railroad & Navigation Company used oil to some extent, but lately has demonstrated by tests on a Mikado type locomotive especially designed for the use of lignite, that Washington lignite may be burned safely and economically. As a consequence it will order more freight locomotives of the same type especially designed for burning lignite. The North Western and the Mallet locomotives of the Burlington are using lignite in Wyoming and Colorado. These Mallets, illustrated in the *Railway Age Gazette* of May 13, 1910, have large fireboxes 78 in. x 120 in., a grate area of 65.2 sq. ft., and 5,090 sq. ft. of heating surface. The Oregon Railroad & Navigation Company's Mikado locomotive, which is illustrated in this issue, has a still larger firebox, 7 ft. x 10 ft., providing 70 sq. ft. of grate area and has 495 tubes 20 ft. 6 in. long, giving a tube heating surface of 5,292 sq. ft. Both the Burlington Mallets and the O. R. & N. Mikado have fire-brick arches and very large smokeboxes—100 in. long—so that it is possible to use a large netting area. The numerous experiments with lignite as a locomotive fuel have usually been made with some modification in the draft appliances of the engines keeping the fireboxes and smokeboxes of the ordinary proportions; as a rule, they have not been successful.

Nearly 40 years ago John E. Wootten demonstrated that in order to burn fine, friable fuel on locomotives it was necessary to have a large grate of about 80 sq. ft. area and a mild draft. The theory of the large grate is that the pounds of coal burned per square foot of grate may be small, but the total fuel burned per hour will be large with a corresponding abundant steam production. With a low rate of combustion per square foot of grate and a thin fire the vacuum required is low and the mild blast does not draw large quantities of the light fuel through the tubes. These are the conditions required for burning lignite, and the successful operation of the locomotives referred to above is principally due to their wide fireboxes and large grate areas. However, the brick arch and the long smokebox are also important features. The brick arch is especially useful for burning fine, light fuel like lignite. It increases the length of the flameway, and holds the finely divided fuel that is lifted from the grate in suspension for a longer time, allowing much of it to be burned by the flame, assisted by the radiation from the red hot brick. The brick arch also assists in distributing the draft over the entire grate, thus contributing to more uniform combustion and increasing the efficiency of the furnace. It is evident, therefore, that with the brick arch a large proportion of the sparks which might ordinarily be drawn through the tubes are burned in the firebox and do not reach the tubes. Those which do pass through must be caught, and with a light fuel like lignite a large area of fine netting is required; this is most easily and efficiently arranged in a long smokebox. The mesh of this netting should be about 7 wires per inch, and the diameter of the wire about .045 in.

The friction of the long tubes has some influence in retarding the discharge of sparks. The boiler of the Mikado locomotive has tubes only 2 in. in outside diameter, but 20 ft. 6 in. long. The Burlington Mallet has tubes 16 ft. 6 in. long; an intermediate boiler section 69 in. long without tubes, where a large portion of the sparks must be deposited; and a feed water heater with 406 2½-in. tubes 9 ft. long, which the remaining sparks must traverse before reaching the smokebox. It is obvious that sparks, especially those of a woody nature like lignite, will not have much life in them after traversing the 25½ ft. of tubes with an obstructing compartment between the two sets.

The problem of burning lignite appears to have been solved satisfactorily by the use of locomotives with large fireboxes and long smokeboxes, but it is desirable also to burn lignite on the older locomotives with smaller fireboxes, and it is possible that a brick arch and a long smokebox with some special spark arrester used with such engines may be successful. The Van Horn-Endsley spark arrester, a device for such purpose was recently tested at the locomotive testing laboratory at Purdue University, the results being published in the *Railway Age Gazette* of December 23, 1910. It was applied to a small locomotive of the Chicago & North Western, in which the smokebox was lengthened to 96 in., the rear 5 ft. being fitted with a spiral diaphragm commencing immediately in front of the tube sheet. This directs the gas current around the outer portion of the smokebox, and by the centrifugal action the sparks and cinders are thrown to the smokebox wall, and follow the shell until they drop in the hopper at the bottom. This is such a complete spark arrester that no netting is required, and when

tested at night with Wyoming lignite, running under a heavy load, very few sparks were observed to pass out of the stack.

It is fortunate for the railways operating in the far northwestern territory that large fields of cheap fuel in the form of lignite are found in localities far removed from a good coal supply, and that it is possible to so proportion the boilers of locomotives that they will burn it safely and economically. It is also quite probable that the smaller locomotives may be so modified in their smokebox and draft appliances in such a way that they will use this cheap fuel successfully.

"UNITED WE STAND; DIVIDED WE FALL."

THE Special Committee on Relations of Railway Operation to Legislation has just issued a bulletin (No. 13) in which it discusses the "broad question of the relation of railway operation to legislation and the extent to which the railways can aid themselves in meeting the fair demands of the employees and the public." The tenor of the committee's remarks is that the railways must work together better in future both to remedy and prevent operating conditions which may afford ground, or even pretext, for further unnecessary extensions of government regulation of operating matters, and to make sure, when additional regulation may be desirable or inevitable, that it shall be given a form that will secure the maximum good and cause the minimum harm to both the railways and the public.

This is an exceedingly opportune time for discussion and consideration of this subject. Who would have thought ten years ago, or even six years ago, that before the close of the year 1910 the traffic officers of the railways of the United States would have been deprived entirely of the power to initiate interstate rates? Prior to the passage of the Hepburn act the demand of advocates of government regulation was that the Interstate Commerce Commission be given merely the power, after complaint and investigation, to reduce any specific rate or schedule of rates which it found unreasonable. Almost everyone agreed that the right and power to initiate rates should be left with the officers of the railways. Today, as a result of the legislation of 1906 and 1910, the commission can not only reduce any rate it may find unreasonable, but without any previous complaint and on its own motion, it may prevent for a period of ten months any proposed advance, and if it finds it unreasonable may entirely forbid it. After that the only way the railway can secure the advance is by protracted litigation. The commission is exercising its authority in a wholesale way. The vice-presidents in charge of traffic, in consequence, now have no more power to make rates than a division freight agent had ten years ago. They have less power to advance them. In effect, all that they can do when they want to raise them is to suggest to the commission the question of the legality and expediency of the raise. The consequence is that progress in the entire railway business waits while the commission takes testimony and deliberates.

The dominion of the government over the prices that the railway may receive for its services having now been made practically complete, its attention is being turned to operating questions. At the last session of Congress an act giving the commission authority to prescribe the safety appliances to be used on equipment was passed. Another act to empower it to investigate accidents was passed. Perhaps there is not a great deal in these measures to criticize, just as there was not a great deal in some of the earlier laws for the regulation of rates reasonably to criticize. The advocates of government regulation of the operating side of the railway business now protest that they do not want the government to assume entire control of operation, just as before they said they did not want the government to take entire control of the making of rates. When the railway manager looks back over the history of the regulation of rates, he is not apt to put much confidence in such professions. When he glances over the measures for further regulation of operation, which are pending in the present Congress—including, for example, bills to amend the hours of service law; to fix minimum clearances; to require the substitution of steel and steel underframe passenger equipment for that now in service; to specify the number of men that shall compose a train crew; to require the universal installation of block signals—his lack of confidence in such professions will be confirmed.

Everyone can now see where the railway managers made mistakes in handling the question of regulation of rates; anyone can be wise after the fact. The same craving for greater and greater authority which impelled the Interstate Commerce Commission to seek more and more legislation for the regulation of rates will impel it to seek more and more legislation for the regulation of operation. Suppose that certain conditions in the operating department analogous to, but perhaps far from as bad as, those that obtained in the traffic department continue, and that the railways are equally slow to remedy them. Does it not seem probable that, in these circumstances, there will grow up an overwhelming public sentiment in favor of more and more drastic regulation of operation, as there did for more and more drastic regulation of rates, and if the railway managers do not show more statesmanship in dealing with this sentiment than they did in dealing with the sentiment for regulation of rates, the operating men, in the course of a few years, will find themselves as completely bound hand and foot as the traffic men are now? Ought not the railway managers, therefore, very seriously to consider what course they are going to take in dealing with the question of regulation of operation, and after they have decided what ought to be done, to begin promptly to do it?

The existing laws for the regulation of rates grew out of two conditions. One was a bad condition in the railway business. The railway managers themselves ought to have stopped rebating. But they did not do it. They ought themselves to have abolished other forms of unfair discrimination. They did not do it. The second condition referred to was lack of public intelligence regarding rates. The railway managers, as soon as the propaganda for government rate-making got well under way, ought to have begun and kept up a counter-campaign as wide as the nation to educate their employees and the public regarding rate matters. They did not do it. In the work of correcting the abuses in the traffic department on the one hand, and of educating public sentiment regarding traffic matters on the other, they ought to have worked harmoniously together, each road subordinating its petty, selfish interests for the benefit of all. Everyone knows that they made numerous "gentlemen's agreements," and then went forth and speedily and cheerfully violated them. Most of the managers wanted to keep these agreements, but there were so many who would not be bound by them that rate-cutting and its attendant discriminations could not be stopped except by law. No doubt we should have had some form of regulation of rates, even if the railway managers had worked together consistently and harmoniously to eliminate abuses from the traffic department, but it would have been neither so drastic in form nor so harmful in its results.

Taught by the experience of the past, it would seem that the railway managers ought today to be working harmoniously and energetically together, first, to make railway operating conditions more defensible, and, second, to educate public sentiment regarding the things that ought to be done and the things that ought not to be done, and the reasons why. Are they doing these things as well as they could? Nobody would answer in the affirmative. When, in the past, the American Railway Association has been criticized for having done nothing to stop rebating, it has been answered that it was purely an operating organization and had no authority over traffic. The natural answer to this was that since it was purely an operating organization either its scope should be broadened so that it could

deal with traffic matters, or some other organization of executive officers should be formed which could and would do so. When it is now suggested that at least as to the various proposals for legislation to regulate operation it is peculiarly the American Railway Association's function to do something because it is peculiarly an operating organization, various arguments having more or less plausibility are offered to show that it cannot do so. The consequence is that many such matters have to be handled by committees, representing the railways, it is true, but which do not represent the American Railway Association, and the action of which it can disavow. Now, it may be, as some contend, that the American Railway Association should go on as it has in the past, studying and investigating different operating questions in committee, adopting certain rules of recommended practice, and doing nothing in particular to get the different roads to conform to them; but it does seem to us that the argument in favor of its being made a strong, aggressive organization, which will at once exert a powerful influence to get the different roads to use the best appliances and the best operating methods, and at the same time to prevent legislation and orders of commissions imposing unreasonable burdens and restrictions on them, is overwhelming. Take, for example, what the association did to secure the adoption of uniform demurrage rules. First, its car efficiency committee drafted a code of rules which was reasonably satisfactory to the railways throughout the United States. Then, working harmoniously with representatives of the state commissions and of the Interstate Commerce Commission, as well as with the railways in different sections of the country, the car efficiency committee got the rules adopted as standard practice, not only by the American Railway Association but by the National Association of Railway Commissioners and the Interstate Commerce Commission. The result is that today the uniform code of demurrage rules is in effect practically throughout the entire country.

Take, again, what was done by the general committee on safety appliances in handling the questions arising from the passage last year of the new safety appliance law. This committee did not represent the American Railway Association, but merely the railways which consented to become its constituents; but the work it did seems to be an excellent model for other committees which may or ought to be given the duty of handling questions of public regulation. It conferred with representatives of the railway brotherhoods, with the safety appliance inspectors of the Interstate Commerce Commission and with the commission itself, and as a result of its efforts standards were agreed on for new cars which are reasonably satisfactory to all directly concerned. The committee has yet to handle on behalf of the railways the question of standards of appliances for old freight cars, and there is little doubt that if it does this as well as it has done its other work the results will be satisfactory and valuable.

Surely what was done as to these matters was sane and wise, and if it was why does it not afford a good example of what the association might do and ought to do in regard to a great many other matters? No doubt the uniform code of demurrage rules was better adapted to the needs of the railways and the shippers in some parts of the country than it was in other parts. Its general adoption could only be obtained by subordinating the comparatively unimportant interests of the few to the relatively very important interests of all. There are very few railway managers who would not say that the means used were commendable and that the results are good.

There are numerous other matters, particularly operating details, regarding which the railways by similarly sensible and harmonious action might get similarly satisfactory results. For example: The public has a right to demand and does demand that railway operation in this country be made more safe. This demand, which is expressed in the pending measures already referred to, is going rapidly and steadily to grow stronger. If the railways do not progress faster in the future in making it safe and at the same time take better measures to show the public why they are unable to make it safer and faster, there will in all probability be a big crop of laws, federal and state, requiring larger train crews, three men on an engine, further limitation of the hours of labor, installation of block signals, installation of automatic stops, etc. All railway operating executives know that on many railways a good many accidents are due to the fact that an excessive density of traffic is being handled without the protection of block signals and that on such railways block signals of some kind ought to be installed. They were also practically agreed as to the safety appliances that ought to be used on railway equipment, and the Master Car Builders' Association adopted standards which were based on the experience and the best judgment of its members. If the American Railway Association had taken action resulting in the use of these uniform standards on all railways, it seems highly probable that the safety appliance legislation of last year would not have been passed. But because some of the railways did not individually see fit to do their duty in this matter and the railways as a whole did not put on enough pressure to get them to do it, Congress decided, and with some justice, that there ought to be legislation on the subject. It is well known that not only are many lines of pretty dense traffic not protected by block signals, but that there is a great lack of uniformity in the rules under which those having block signals are operated. There are cases where three different railways operating under trackage rights over the same tracks are all running their trains under different rules as to signaling. The dangers connected with such lack of uniformity are well known.

Which are the railways going to do—correct the situation themselves, or wait until Congress compels them to do it? If Congress passes legislation on this subject it is almost certain, in view of past experience, to contain unreasonable provisions which will impose unnecessary expense on the railways and do the public no good.

Railway managers know that the great majority of accidents are due to carelessness or recklessness on the part of employees, resulting in disregard or violation of the rules of the companies. They can point to the fact that the American Railway Association has developed and adopted a code of train rules which would prevent most accidents if only the rules were properly enforced and obeyed. But can they satisfy the public—or themselves—that they are all exhausting their resources in efforts to stop these infractions of the rules? Can they satisfy themselves that they are doing all they can to secure the co-operation of employees and the public in stopping them?

The different railways of the country operate under widely different conditions. Their financial resources differ greatly. These disparities make the question of what matters properly may be and best can be handled by associated, and what by individual, action a hard one to decide. Naturally, too, the officers of many railways, regardless of these differences of physical and financial conditions, wish to manage the affairs of their own roads in their own way. And it would be easy to carry standardization of apparatus and of practice to an extreme, for progress always begins with some man or group of men insisting that this or that thing should be done differently from what it has been done in the past by the great majority, and proving their faith by works. But the question whether particular things shall be done by individual or associated action should always be decided in the light of a full recognition of the fact that government regulation is here; that it has come to stay; that it is more apt to increase than to diminish; and that for that reason a policy may be wrong which, but for it, would be right.

On the occasion of the signing of the Declaration of Independence Benjamin Franklin remarked to his fellow signers, "We must all hang together, or assuredly we shall all hang separately." Largely because the railways of the United States have not hung together at times when they should have,

the public has for some years past been hanging them separately.

There is an old story about an aged father who, when about to die, called his numerous able-bodied sons about him and challenged either of them to break a bundle of sticks which he handed them. Each tried it and failed. The old gentleman then untied the bundle and, sick and feeble though he was, easily broke each of the sticks over his knee. The moral of this, as it applies to the railway business, as it is now conducted in this country, surely requires no pointing.

AUTOMATIC STOPS.

THE Block Signal Board, whose annual report, slightly abridged, appears in this and last week's issues, says that during the past year there has been some progress in automatic stops. A committee of the Railway Signal Association said the same thing at Richmond last October. Some progress has been made in Germany, as was shown in a paper which was noticed in our issue of January 13, page 89.

The Germans, like the English, are satisfied with a cab signal, and do not trouble themselves about automatic stops; but that is not an important difference at the present stage of the development of the art, as the principal thing to be done is to find the best means of producing, by roadside power, a small movement on a moving vehicle. This much settled, the question, of what use shall be made of that movement is not likely to present serious mechanical difficulties.

The progress here noticed is mostly invisible to the physical eye. Railway men and signal makers have done some thinking, but they still leave the main questions untouched and do not build anything. The Washington Water Power Company, however, has made actual progress, putting automatic stops in use on its interurban electric line; and the Erie seems to have adopted the Harrington stop for a short section of one of its lines; that is to say, the Harrington installation seems now to be treated as permanent instead of experimental.

What does this progress, real or imaginary, amount to? The railways, as represented in the Railway Signal Association, continue to demand perfection. They know, of course, that the conditions under which they labor are such that they will never get it. The demand for perfection is not wholly unreasonable, for a pretty close approach to perfect safety is possible without either automatic stops or cab signals, and it would seem wasteful to adopt any radical change which did not produce a marked improvement. The activity of the Block Signal Board is due to the fact that the inventors keep on bringing out new schemes; but the immediate desideratum is the development of the details of the schemes already known. This maladjustment is inevitable, for the men with schemes have unlimited time on their hands, but no railway, while the railways, which have the facilities for development, seem, for the most part, contented to wait. This apparent hesitation is not strange, for the adoption of automatic stops on a large road would bring in new responsibilities. The stop would save lives and property only rarely, yet would have to be kept at the highest efficiency constantly. The Interboro Rapid Transit Company runs trains past automatic stop apparatus thousands of times daily, but the total number of times that the safety of trains has depended on it during the six years that the lines have been in operation is exceedingly small. On the ordinary steam railway, doing a miscellaneous business, the problem what danger spots should have automatic stops and what should not could never be settled except arbitrarily, and that would be a perpetual open question.

As has been the case with many other questions in railway management, this one seems likely to depend for its settlement largely on the element of time. When theories are obscure, elusive or confusing, everybody waits to learn from experience —the experience of some one else. But in this question, unlike many others, there is not much experience to draw from. Even the simpler improvement, the block system, has made progress rather haltingly, and often apparently because of expected economy rather than as a safety measure, pure and simple. Automatic stops might be used on 500 miles of road for five years without proving the superiority of the system over a simple block system *reinforced by the same amount of money and thought* that is spent on the automatic stops. In this paucity of experience-lessons progress is likely to be made by "fits and starts." The Washington Water Power Company had an easy problem, compared with that of the large roads, and so it was practicable there to take action. The manager of the Pennsylvania Lines, in encouraging Gray-Thurber, is putting himself in position to be ready, in case automatic stops shall suddenly be called for by the public imperatively, while yet he is spending little money, and is not committing himself. And some sudden demand, real or imaginary, intelligent or unintelligent, is the thing most to be expected. Our worst two recent collisions (Nevada, Ohio, December 24, and Batavia, N. Y., January 13) occurred on lines where the public expects the very best service and conditions. At Batavia the engineman at fault is said to have had a perfect record for many years. If the best railways have collisions of trains which are controlled by the best men, the public, when convinced of this, will demand a change, with *or without* reason. That is to say, the reasons for continuing to do without automatic stops may have any amount of logic supporting them, but exasperation at the absence of any rational explanation of the disastrous results of present conditions will outweigh logic.

The public, however, is not without some logic on its side. The Block Signal Board says that the block system is not managed with maximum efficiency. The practice of the railways comes pretty near confirming this statement, by its universal dependence on the flagman. The sounding of the locomotive whistle to send out or call in the rear flagman is heard by passengers everywhere, on the best roads, day and night. This whistling would be an annoyance under any circumstances, but it is doubly so when it is considered that it is a constant advertisement of the fact that the block system is not depended on completely.

As long as the block system, as usually managed, is thus admittedly in need of improvement, it is not strange that legislators and people generally look with favor on the propositions of the inventors. They offer to reinforce the block system by mechanical or electrical devices which are at least theoretically effective, whereas the flagging system is not only a bit of unscientific patch work, but is so glaringly defective that its defects are seen and understood by every person who travels.

On the whole, therefore, it is quite possible that those observers who think that some progress has been made in 1910 have correct vision.

NEW BOOKS.

Mechanical World Pocket Diary and Year-Book for 1911. A Collection of Engineering Notes, Rules, Tables and Data. Cloth, 3⅞ in. x 6 in., 300 pages of text and blank pages for diary and memoranda. Emmott & Company, 20 Bedford street, London.

This pocket book has been issued annually for 24 years, and with each succeeding year it has been steadily improved in quality and amount of data. This year 32 pages have been added, and by revision and condensation space has been afforded for the introduction of a large amount of new matter. Included in it are lengthy sections relating to cutting tools for standard machine tools and special sections dealing with milling cutters and twist drills. Another new section deals with high speed steel and useful data on annealing, hardening and tempering it. The gas engine claims more attention, and the portion relating to boilers and steam fittings has been brought up-to-date. The number of illustrations has also been increased about 50 per cent., and although the book deals rather with British practice than with American, it will be found convenient for ready reference in many particulars.

Letters to the Editor.

DEAN RAYMOND ON RAILWAY RATES AND PROFITS.

Iowa City, Iowa, January 10, 1911.

To the Editor of the Railway Age Gazette:

The claims made by the Illinois Manufacturers' Association in its brief submitted to the Interstate Commerce Commission as they appear in the public press provoke me to ask some questions and to make some suggestions.

Has it ever been clearly determined that an individual or a corporation doing business under a public franchise, and, if you please, performing one of the functions of the state, is entitled to earn no profits on the business that it does?

If this theory should ever become the accepted theory on which the regulations of rates is to be based, will there be any further performance of the functions of the state by individual persons or corporations?

What inducement would there be for any individual or collection of individuals to undertake the risk of a commercial enterprise, or, even if no risk is involved, to undertake the effort of a commercial enterprise, if thereby nothing is to be gained but savings bank interest on capital actually invested?

Physical valuation has generally been assumed to mean cost of reproduction of plant at the time of the valuation, less the estimated depreciation at that time; and various methods have been suggested for determining the cost of reproduction of the several items of the plant. I think that no method adopted has ignored the value of the real property at the time of the valuation, but that all have included the appreciation or depreciation of this real property that has occurred between the time of purchase by the corporation concerned and the time of valuation. Is this method which includes appreciation of real property an entirely wrong one, and is it a just theory that an individual or a corporation performing the functions of the state and purchasing property for such performance is not entitled to the same unearned increment that another individual or corporation that is not engaged in performing a function of the state is entitled to?

Just what is that part of the assets of a carrier given to it by the public? Two items occur to me: (1) The use of the public streets for a right of way; and (2) franchise. Whether or not the carrier may be entitled to capitalize the ground value of the public street as a right of way may be open to question. And I agree that it would be improper to capitalize the value of the franchise since the franchise has value altogether too uncertain to warrant an attempt to capitalize it, and further because to get at a basis for rate regulation such valuation is wholly unnecessary.

That a carrier is not entitled to capitalize the value of its road as a going concern for a basis for rate making must be patent to anyone because this value depends upon rates now in force, which rates may be in question.

How does it occur that the source of the money invested in the property has anything to do with the value of the property? The Illinois Manufacturers' Association seems to hold that a carrier is not entitled to earn as much on money put back into its property from earnings as it is entitled to earn on other capital. Without knowing the reason for this distinction, I presume that it lies in the fact that money so earned may have been earned by charging unreasonable rates, but would not this fact have to be proved? Possibly another argument is that this money is the public's money which, it may be assumed, is given to the company through payments for service for the purpose of making the property more serviceable. But this argument does not appeal to me as one having great force, because this money has been earned by conduct of the business of manufacturing transportation, which is a separate and distinct proposition from ownership of a highway. Some years ago in the columns of the *Railroad Gazette* I called attention to the fact that reasonableness of rates as a whole must not be judged by capital invested but by the magnitude of the business done and that the reasonableness of individual rates must be determined by what the traffic will bear. In a recent discussion of a paper on valuation presented to the American Society of Civil Engineers I took the ground that a valuation for rate making could not be a valuation of the physical property nor a valuation of the property as a going concern, and that, indeed, no valuation properly measured reasonableness of rates; but that the reasonableness of rates as a whole, *if the government wishes to regulate this item*, should be determined as follows:

Rates as a whole should be such as to return a reasonable investment interest rate on the physical valuation plus a reasonable business profit rate on the business done. This second item may be determined by adding a proper percentage of operating expenses, which must include not only the ordinary cost of services but the necessary sinking funds or their equivalent in maintenance expense to maintain the property in a condition for efficient service, including betterments which may be paid for out of earnings.

It seems to me that only a part of a railway enterprise is the function of the state,—namely, the provision of a highway, which by the peculiarities of the case cannot be operated as a toll road (even though it is in part so operated), but must be operated by a single concern. The property might be rented to an operating corporation by the owning corporation, as is in fact sometimes done, at some maximum rate prescribed by law, just as toll rates are prescribed, except that, if convenient, the rate would be a guaranteed interest rate rather than specific charges for a variety of traffic units. If this were done, would there be anyone who should say that the operating company manufacturing transportation for sale is not as much entitled to a business man's profit as in any member of the Illinois Manufacturers' Association who makes some other commodity than transportation?

It might be claimed, indeed, that such an operating company should not be limited at all in its earnings, being permitted to charge whatever transportation rates it might see fit or be able to exact; but there is certainly a general feeling growing, if it has not already matured, that even such a company doing an interstate business possesses a partial monopoly and is serving the people in such a way as to make it amenable to public regulation not only in the matter of safety, adequacy, and efficiency of service, but also in the matter of its charges.

I am quite firmly convinced that if rates are based on what the traffic will bear, when that expression is properly defined and is understood to mean what the economists call the monopoly price, not more than a reasonable business man's profit will result, and that indeed rates so fixed are what may be called economic rates. But, if the people as a whole after due consideration determine that this is not so and that a business man's profit should be limited to, say, 15 per cent. when the business conducted is of such a semi-public nature as that of common carriers, then if, after rates have been fixed at what the traffic will bear, there should result a greater return than the allowed business man's profit a horizontal reduction in all rates would seem to be a proper course. But on the other hand, if in the attempt to fix rates at what the traffic will bear, rates as a whole have given less than the allowed business man's profit, then it would seem proper that a horizontal increase in rates should be made.

The essential points that I wish to make are:

1. That taken as a whole, the property and the business together, no court and no individual can ever determine what reasonable rates are by attempting to say that they shall be any particular percentage of any particular valuation of the property.

2. That two things, the investment in physical property and the conduct of the business, must be kept distinct and separate.

3. That a reasonable minimum return must include an invest-

ment interest on the physical value of the property, including unearned increments and a fair business profit on the business done.

4. That if individual rates are finally correctly fixed at the monopoly price, no more than a proper business man's profit will result even if that profit be very large.

5. That, if, however, in return for the privilege of doing this semi-public business, government assumes to say that the profit rate shall be limited, then it must be limited as indicated in point No. 3.

Since formulating the foregoing, I have read the first installment of Mr. Acworth's studies in your issue of January 6, and am thereby encouraged to believe that the statements of this letter are not far from correct.

WILLIAM G. RAYMOND.

STUDIES IN RAILWAY ECONOMICS.

BY W. M. ACWORTH.

IV.

In the previous article I endeavored to show that reductions of rates that will pay the railway undertaking sooner or later are at least as likely to be made under private management as under state ownership. Whether reductions that will never pay directly ought to be made at all is a question so difficult that I am unable to formulate any catagorical answer, even in my own mind. I think I can conceive circumstances in which they ought to be made, but I am clear they are not circumstances which will normally arise, and I am quite clear that in a democratic state at all events the reductions that are most likely to be made under state ownership are not of a class that ought to be made at all. When the state owns the railways, the state is absolutely compelled half year by half year, or quarter by quarter to pay the interest to the uttermost farthing on the railway debt, whether the railway undertaking has earned that interest or not. In other words, if reductions deplete the net revenue below the minimum point, the balance has to be found out of the general taxation of the country. Now the inhabitants of a country obtain the benefit of railway service in quite unequal degree. To the trader and the wholesale manufacturer railway rates are of first class importance. They hardly affect at all the poorer class of the population; they affect very little the farmers and manufacturers who sell their products in local markets; so that a railway deficit taxes the whole population for the benefit of one class.

But there is more than this. Reduction of rates are seldom of general application. They are granted for the benefit of a particular trade or a particular locality, and, therefore, the case is often not merely the taxation of the many for the benefit of the few, but actually the taxation of the whole country for the benefit of one locality; or the taxation of one set of traders for the benefit of others, possibly less vocal, but by no means certainly necessitous or less meritorious. On the whole, my conclusion is that, though theoretically a reduction of rates at the expense of general taxation might under certain circumstances be justifiable, the power to reduce is so much more likely to be abused than to be used rightly that it would be in the interest of the country, at least in a democratic state, that there should be what the Americans call constitutional limitations, preventing any reduction of rates, which even temporarily reduced the net revenue of the state railway undertaking, below the sum necessary to meet the full interest on the railway debt.

If the contentions urged above have any force, we are shut down to the conclusion that, so far at least as the operation of existing railways is concerned, no advantage can be gained from nationalization. I am somewhat surprised to find that Sir George Gibb in the very interesting railway paper read by him not long since before the Royal Economic Society declares that, while there is a good deal to be said for the state taking over existing railways, there is no justification for the state building railways at the outset. For myself, I should have come to the precisely opposite conclusion. That Belgium was justified in adopting a policy of state construction when the only capital otherwise available was foreign capital objectionable on political grounds, I quite believe. That Australia had to have a railway somehow, and that state railways were better than the alleged alternative, no railway at all, I quite understand. I can appreciate that the disadvantages were considerable; that the railways would probably have been built cheaper; that they would have been laid out with a more single eye to the economic development of the country, had they been built by private capitalists at their own expense and risk, seems to be highly probable; but I cannot see that the game would have been worth the candle. But to say that when a country is equipped with all the railways that it practically needs, when the money has been found with no risk to the state, it is desirable to transfer them from private to state ownership, when the disadvantages of the transfer are certain and the gains—to put it mildly—problematical, this passes my comprehension.

It must of course be admitted that, if the aims of private management and the aims of public management are essentially divergent, if private ownership implies a policy inconsistent with the best development of all the resources of the state, private ownership must go. But does private ownership imply any such policy? Is there any real difference between the policy that we may expect to be pursued by a normally enlightened railway company and the policy that ought to be pursued by the state? I have given above reasons for thinking that state operation is not likely to be more economical, and that in the matter of rate reduction the private undertaking is at least as likely as the state to make all the reductions in rates that ought to be made, while the state is much more likely to make reductions that ought not to be made. But the state, we are assured, can tap new sources of revenue. We used to hear much from chambers of commerce and similar bodies about the avoidance of "waste of competition." Of late years the private companies of America have done a good deal independently of the state to reduce this waste. More recently the private companies of Great Britain have followed their example. If I am not mistaken, the complaints as to the waste of competition, both in the United States and in England, are already becoming less vocal as traders, and others are gradually discovering that elimination of waste means in practice the withdrawal of advantages which possibly they ought never to have had, but which from long enjoyment they have come to regard as naturally and rightly belonging to them. Recent history has shown how exceedingly difficult it is even for private companies to take back that which, whether rightly or wrongly, they have once conceded. For the state—once more let me mention that I am speaking of a democratic state only—to take back a concession would be, I believe, as a matter of practical politics, out of the question; and, if justice was found to demand an equality of conditions, the only possibility for the state would be not to level down, but to level up, and the final result would be simply disastrous.

We are told further that substantial economies are to be affected by unification of management. In a railway journal this hardly needs discussion. Practical railway men know how very unimportant compared to the total expenditure, are the heads of expenditure under which alone economies are even theoretically possible. Students of railway history know how far the anticipated results of state purchase have corresponded with the actual subsequent facts. The public men of Switzerland have by now been sadly disillusioned; and even the French deputies seem already aghast at the result of the recent purchase of the Western railway, which was carried through by a purely political vote in spite of the protests, not only of all the chambers of commerce in the districts primarily affected, but actually of

the great majority of the parliamentary representatives of those districts.*

One advantage, however, must be conceded to the state as compared with private companies. The English railway companies know to their cost that for the last 16 years it has been almost impossible for them to raise rates. The American companies are having the same lesson taught them even more drastically at the present moment. Governments have proved again and again their ability to raise rates and let the will avouch the deed. Half the state railway systems of Europe have made important increases in rates within the last few years: Russia, Austria, Hungary, Denmark, even Switzerland quite recently, while Prussia, in spite of the fact that its railways are already called upon to pay a very large portion of the general expenses of the government, has in the last year or two put a very heavy tax on railway passenger tickets. I am far from saying that these increases are not justified. I am persuaded personally that a great many short-distance rates in England and a great many long-distance rates in America, a great many car-load rates in America and a great many small consignment rates in England, are too low. I only desire to point out here that, when laymen write glowing treatises on the advantages of nationalization, they do not usually put the greater facility with which the state can increase rates in the forefront.

So far, we have been dealing with the relative advantages of state and private ownership and, as will be seen, the decision in my judgment must be that private ownership should in the interest be maintained. But private ownership can only continue to exist, if private management not only conforms to the interest of the community as a whole, but can succeed in impressing on the community the belief that it does so conform. We shall, therefore, have to consider how best the private undertaking can be kept in touch with public opinion, and how in the last resort public opinion can dominate private management and cure its abberrations.

(To be continued.)

*If there ever was a case in which we were entitled to look for economy out of concentration of administration, it was when the eight London Water Companies were bought up by a public authority. Yet the representative of the Metropolitan Board confessed to a Parliamentary Committee in the Session of 1907 that the actual *administration* expenses were more under the one Board than they had been under the eight Companies.

DEMURRAGE COLLECTIONS IN CALIFORNIA AND ELSEWHERE.

E. E. Mote, manager of the Pacific Car Demurrage Bureau, San Francisco, has issued his seventeenth monthly report on the working of the law of California, under which $6 a day is collected on cars detained by consignees; and in connection with the figures for his own state he makes some interesting comments on the working of the code of demurrage rules which was recently endorsed by the Interstate Commerce Commission. The following is the substance of the introductory portion of Mr. Mote's report:

November, 1910, was the seventeenth full calendar month of the operation of a $6 demurrage rate on state traffic in California and a $1 rate on interstate traffic in the same state and on all traffic in other territory. Of cars subject to the $6 rate reported in November by California agencies, 1.04 per cent. were held in excess of the free time, against 6.29 per cent. subject to the $1 rate in the same state, and 5.88 per cent. in other territory. The average delay to $6 cars after the expiration of the free time was 1.88 days per car; to $1 cars in California 3.02 days per car, and in territory outside of California, 4.76 days per car. The results obtained in November are merely a repetition of those for the preceding sixteen months in showing that in proportion to the number of cars subject to each rate there were from five to six times as many $1 cars held in excess of the free time as of $6 cars.

Many inquiries having been made as to results from the application of the National Demurrage Code which has now been generally adopted in territory outside that of this bureau, we submit below a statement made from the monthly reports of fourteen other bureaus, all of which we believe put into operation the National Code on or before September 1, 1910, comparing the uncollected demurrage outstanding at the close of that month with the same month of 1909 (before their adoption of the National Code). There is probably no other single feature of demurrage regulations that so clearly reflects their efficiency as the proportion of demurrage charges that is actually collected.

In the bureaus named, the increases in uncollected, ranging from 11 to 268 per cent., an average of 81 per cent. in September, 1910, over the corresponding month of the previous year, are little short of startling, considering that the increases in the total amounts charged and collected were but 24 and 29 per cent., respectively.

Before the preparation of this statement it was assumed that because of the "average plan" of the National Code (which provides that no charge shall be taken into account until the end of the calendar month, and then only when the "debits" exceed the "credits") the uncollected charges would be greatly reduced; but since it appears that the uncollected has increased in spite of the "average plan," it follows clearly that some other causes are responsible for this state of things.

Our own theory is that these increases in uncollected are largely due to the "weather interference" and "bunching" clauses of Rule 8, of the National Code. Section 1 makes it possible to defer or avoid payment by the mere claim of the consignee that because of the weather he was unable to employ men or teams to load or unload, or that in process of removal to or from the cars the freight would be seriously injured. In the language of E. E. Clark, Interstate Commerce Commissioner, "Who is to say that the inclemency of the weather was or was not such as to entitle the consignee to exemption?" "How can any person decide that question and keep free from charges of discrimination?"

If the consignee secures possession of his freight and then refuses to pay demurrage on the plea, however unreasonable, of weather interference, what is the carrier going to do about it?

Section 2, of Rule 8, also makes it possible to defer or avoid the payment of demurrage upon the mere claim of "bunching" by the consignee, and it being utterly impossible to determine the question in ninety-nine cases out of one hundred within the free time, the consignee having possession of the freight, has as with the weather rule "nine points of the law in his favor," and may and, as we are reliably informed, generally does tell the carrier to "whistle for the money."

If these unsatisfactory results are possible under the supervision of demurrage managers with experienced and well-trained forces, it is safe to say that the conditions must be much worse in such sections of the country as have abolished demurrage bureaus leaving the supervision of the work with the individual road; although as to this we have no means of securing accurate information.

UNCOLLECTED DEMURRAGE AT CLOSE OF SEPTEMBER.

Name of Bureau.	Uncollected 1909.	Uncollected 1910.	Increase Amount.	Increase Per Cent.
Baltimore & Wash..	$2,182	$4,145	$1,963	90
Central (St. Louis)..	10,027	20,966	10,939	109
Chicago	95,698	174,337	78,639	82
Illinois & Iowa.....	29,073	69,136	40,063	137
Intermountain	5,360	9,184	3,834	71
Mo. Valley, Ks. City	27,453	52,766	25,313	92
Montana	8,133	12,999	4,866	60
No. East Penna.....	10,977	12,169	1,192	11
Pac. No. West.....	4,301	15,829	11,528	268
Pittsburg	47,106	69,975	22,869	48
Va. & West Va.....	2,821	5,095	2,274	80
Western (Omaha)...	21,540	39,615	18,075	84
Western N. Y.....	52,380	80,893	28,513	54
Wisconsin	31,949	65,398	33,449	105
Total	$349,000	$632,517	$283,517	81
			Decrease.	
Pacific	$9,584	$5,409	$4,175	43

PAUL MORTON.

Paul Morton, for years prominent in railway service, from July 1, 1904, to July 1, 1905, secretary of the navy in the cabinet of President Roosevelt, and since 1905 president of the Equitable Life Assurance Society, died in New York on January 19.

Commenting on Mr. Morton's death, ex-President Roosevelt said: "To him, more than any one man, we owed the information that enabled the government definitely to break up the practice of giving rebates by the railways, and this service was one which he alone among the railway men was willing, at small cost to himself, to render to the public; and for it he is entitled to the grateful remembrance of all men who deem it of prime importance to see the law justly and rightly enforced."

These statements of Mr. Roosevelt are characteristically exaggerated. They imply that Mr. Morton was the only railway man who was willing effectively to co-operate with the government in stopping rebating. The Roosevelt administration and other administrations have received the earnest co-operation of other railway men in abating this and other railway evils. But it probably is true that Mr. Morton does deserve credit for having done more than any other railway executive to bring about the cessation of rebating. When he became vice-president in charge of traffic of the Atchison, Topeka & Santa Fe in 1896 he felt strongly that the time had come when the railways must co-operate with each other and with the public authorities in ending the pernicious practice; both because its suppression was necessary to conserve railway revenues and because its continuance was bound to get the railways into serious trouble with the public. Along with other railway officers he held many conferences with public officials both before and after the passage of the Elkins act, with a view to bringing about some arrangement under which rebating might be stopped. It was the irony of fate that after he had become a cabinet officer, Judson Harmon of Ohio and Frederick N. Judson of St. Louis, attorneys appointed by the government to investigate alleged unlawful discrimination by the Santa Fe in favor of the Colorado Fuel & Iron Company, should have made a report indicating that rebates had been paid and holding Mr. Morton responsible. As is well known, Mr. Roosevelt refused to allow criminal proceedings to be instituted.

That Mr. Morton should have labored to bring about the cessation of rebating and that he should have been, as the public believes, at the same time authorizing the giving of rebates, may seem to the public a remarkable inconsistency. As a matter of fact, it is questionable whether any infraction of law was involved in the relations between the Santa Fe and the Colorado Fuel & Iron Company. But whatever may have been the facts about this case, Mr. Morton himself would have been the last to deny that while advocating suppression of rebates he was authorizing their giving. For, like numerous other railway men, he was the victim of the conditions of his time. A great majority of railway managers wanted to stop rebating. But there were some who were not so anxious to do so, and competitions repeatedly forced those who did want to stop them to continue them.

Mr. Morton's rise in the business world was very rapid. He was but 39 years old when, on the election of E. P. Ripley as president of the Santa Fe in 1896, he was brought by Mr. Ripley to the road as third vice-president. The Atchison had only recently emerged from a receivership. Under Mr. Ripley's administration it has been raised from a bankrupt property in decrepit physical condition to one of the great railways of the world. Mr. Morton was in the road's service during the eight years of Mr. Ripley's administration when the important work of putting the road on its feet was being done, and to his diplomacy in dealing with the public along its lines and the ability with which he guided its traffic department was in large measure due its rapid increase in prosperity. He was a railway diplomatist of a high order. Years before most railway executives began to take the public into their confidence, it was his custom when riding over the line to see and talk freely with all newspaper men that asked to see him. The consequence was that he was exceedingly popular in almost every newspaper office along the lines of the Santa Fe, and that this helped to popularize the Santa Fe itself goes without saying. His relations with business men and politicians along the line were equally friendly. He was a loyal friend to all who deserved his friendship, which largely accounts for the fact that he had loyal friends.



Paul Morton.

Mr. Morton was born at Detroit, Mich., May 22, 1857. He was a son of J. Sterling Morton, who subsequently, while a citizen of Nebraska, was made Secretary of Agriculture of the United States by President Cleveland. He began railway work in December, 1872, as a clerk in the land office of the Burlington & Missouri River at Burlington, Iowa. He continued with this road and its successor, the Chicago, Burlington & Quincy, until February, 1890, having been made assistant general freight agent when he was but 21 years old. Four years later he was made first assistant general freight agent. He was next made general passenger agent. He was appointed general freight agent in 1888, and in February, 1890, when but 33 became president of the Colorado Fuel & Coal Company, the Southern Iowa Railway and the Illinois Western Railway. He was elected third vice-president of the Atchison, Topeka & Santa Fe in January, 1896, and from February, 1898, to July, 1904, was second vice-president, when he became a member of Mr. Roosevelt's cabinet. From July, 1905, until the time of his death he was president and chairman of the Equitable Life Assurance Society of the United States.

THE INTERSTATE COMMERCE COMMISSION'S EXHIBIT OF OPERATING STATISTICS.

The accompanying table showing an analysis of the operating statistics of the New York Central & Hudson River was prepared under the direction of the Interstate Commerce Commission in connection with its inquiry into advances in rates. The other tables show an analysis of operating expenses for repairs and renewals and an analysis of freight service operating statistics of the roads that were selected by the Interstate Commerce Commission. The exhibits prepared by the Interstate Commerce Commission are, of course, as complete for all roads as that shown here for the New York Central & Hudson River, and the figures shown herewith for the other railways are simply abstracts of the complete Interstate Commerce Commission figures.

New York Central & Hudson River.

§ G. Analysis of operating expenses for rails, ties, and bridges and culverts.

Year Ended June 30—	Number of miles operated exclusive of trackage rights		Total number of train miles	Rails. New rails laid during the year				Rails. Expense of renewals of rails			Ties. New ties laid during the year				Ties. Expense of renewals of ties			Bridges and culverts. Expense of renewals and repairs	
						Per mile main track.	Per train mile						Per mile main track.	Per train mile					
	Miles of road	Miles of main track.		Number of tons.	Total cost.	Tons.	Cost.	Tons.	Cost.	Total.	Per mile main track.	Per train mile.	Number of ties.	Total cost.	Number of ties	Cost.	Number of ties.	Cost.	Total.	Per mile main track	Per mile	Total.	Per train mile.
									Cents.			Cents.						Cents.			Cents		Cents
Ten-year average, 1901-1910	3,256	6,205	45,588,551	46,868 6	$1,333,752	9.0	$258	0.00103	2.93	$681,700	$131	1 50	1,623,625	$979,247	312	$188	0.036	2.15	$1,199,709	$230	2 63	$770,304	1.69
Five-year average, 1906-1910	3,326	5,401	47,709,762	52,286.4	1,470,983	9.7	272	.00110	3.09	777,549	144	1 63	1,741,176	1,149,392	322	213	.037	2 41	1,369,937	254	2 87	772,751	1.62
1901-1905	3,186	6 008	43,467,340	41,450.8	1,196,521	8.3	239	.00095	2.75	585,850	117	1.35	1,506,073	809,103	301	162	.035	1.68	1,029,481	206	2.37	768,038	1.77
As reported for 1910	3,326	5,521	50,846,139	64,543.5	1,830,454	11.7	332	.00128	3.62	837,988	152	1 66	2,124,870	1,391,681	385	252	.042	2 75	1,647,812	298	3.26	610,727	1.21
1909	3,325	5,460	46,140,040	44,188.5	1,249,009	8.1	229	.00096	2.71	805,295	147	1.75	1,619,356	1,146,504	297	210	.035	2.48	1,509,201	276	3.27	355,282	.77
1908	3,326	5,437	47,875,401	58,990 6	1,655,872	10.9	305	.00123	3.46	598,992	94	1.06	2,067,797	1,500,393	380	276	.043	3.13	1,599,537	294	3.34	390,578	.82
1907	3,326	5,394	47,865,164	51,983.0	1,453,965	9.8	274	.00109	3.04	597,396	113	1.25	1,509,638	929,168	284	175	.032	1.94	1,015,361	191	2.12	857,758	1.79
1906	3,327	5,284	46,122,064	41,726.0	1,165,016	7.9	221	.00090	2.53	1,137,892	215	2.47	1,384,214	779,312	262	147	.030	1.69	1,077,973	204	2.34	1,649,408	3.58
1905	3,327	5,278	44,993,077	51,817.9	1,464,633	9.8	278	.00115	3.26	793,906	150	1.78	1,737,979	980,824	329	187	.039	2.19	1,235,587	234	2.75	1,227,054	2.73
1904	3,291	5,188	44,661,812	44,590.2	1,256,775	8.6	242	.00100	2.81	711,288	137	1.59	1,102,723	645,093	213	124	.025	1.44	1,055,314	203	2.36	749,704	1.66
1903	3,270	5,137	46,487,989	33,208.8	935,824	6.5	182	.00071	2.01	505,885	98	1.09	1,714,155	911,930	334	177	.037	1.96	1,102,986	215	2.37	743,210	1.60
1902	3,212	5,055	44,708,092	34,950 4	970,922	6.9	192	.00078	2.17	511,616	101	1.14	1,641,148	807,445	325	160	.037	1.81	913,477	181	2.04	688,386	1.54
1901	2,829	4,384	38,485,731	42,686.7	1,354,449	9.7	309	.00117	3.71	406,557	93	1.11	1,334,360	694,223	304	158	.037	1.90	840,041	192	2.30	440,835	1.21

§ H. Analysis of operating expenses for repairs and renewals.

Year Ended June 30—	Locomotives. Number of locomotive miles.	Locomotives. Total expense.	Locomotives. Per mile run.	Passenger-train cars. Number of car miles.	Passenger-train cars. Total expense.	Passenger-train cars. Per mile run.	Freight-train cars. Number of car miles.	Freight-train cars. Total expense.	Freight-train cars. Per mile run.
			Cents.			Cents.			Cents.
Ten-year average, 1901-1910	65,340,690	$4,484,905	6.86	133,672,050	$1,562,056	1.17	724,632,347	$4,790,238	0.66
Five-year average, 1906-1910	68,122,538	5,328,365	7.62	144,713,348	1,769,568	1.18	780,713,647	6,205,334	.79
1901-1905	62,558,541	3,641,446	5.62	122,630,752	1,414,693	1.15	668,551,046	3,375,142	.51
As reported for 1910	71,258,113	5,503,763	7.72	154,800,025	1,765,832	1 14	818,268,884	7,384,248	.90
1909	64,484,545	4,856,912	7.53	143,171,591	1,561,391	1.09	765,067,042	7,529,561	.98
1908	68,155,951	5,323,590	7.81	138,628,981	1,586,799	1.19	753,397,150	4,700,094	.62
1907	70,264,940	5,328,012	8.43	146,531,681	1,992,294	1.36	786,083,096	5,927,395	.75
1906	66,450,641	5,034,546	7.58	140,434,483	1,571,315	1.12	780,852,063	5,488,372	.70
1905	65,159,648	4,726,155	7.25	135,447,744	1,180,409	.87	710,955,940	3,637,916	.51
1904	64,724,648	4,630,610	8.61	131,076,915	1,364,194	1.04	688,514,240	4,757,908	.69
1903	65,585,110	3,643,533	5.56	127,534,787	1,671,158	1.31	716,062,106	4,073,919	.57
1902	64,629,528	3,608,972	5.58	123,333,063	1,491,995	1.21	636,686,542	2,646,614	.42
1901	52,693,773	2,597,960	4 93	95,758,250	1,365,261	1.43	590,536,404	1,759,335	.30

§ I. Analysis of specified operating expenses for conducting transportation.

Year Ended June 30—	Total number of revenue train miles.	Fuel for locomotives. Total expense	Fuel for locomotives. Per train mile.	Train service. Total expense.	Train service. Per train mile	Station service. Total expense	Station service. Per train mile.	Loss and damage. Total expense	Loss and damage. Per train mile
			Cents.		Cents.		Cents		Cents
Ten-year average, 1901-1910	42,990,023	$6,125,289	14.25	$3,613,773	8 41	$4,005,155	9.32	$792,290	1.84
Five-year average, 1906-1910	45,604,615	7,312,897	16 04	4,076,215	8 94	4,558,945	10 24	1,120,103	2 46
1901-1905	40,375,431	4,937,680	12.23	3,151,332	7 81	3,341,365	8 28	464,477	1.15
As reported for 1910	48,047,594	7,668,997	15.96	4,257,721	8 86	5,265,011	10.96	1,043,767	2.17
1909	44,351,412	6,875,192	15.50	3,773,481	8.51	4,731,751	10.72	1,272,881	2 87
1908	45,473,243	8,129,982	17 88	4,317,362	9 49	4,926,576	10 84	1,440,471	3.19
1907	45,786,902	7,773,705	16 98	4,375,558	9.56	4,462,663	9.75	1,007,467	2 20
1906	44,363,925	6,116,611	13.79	3,656,973	8.24	3,936,726	8.87	827,928	1 87
1905	42,679,594	5,761,337	13.50	3,548,217	8.31	3,675,122	8.61	638,433	1 50
1904	41,940,205	5,749,157	13.71	3,577,756	8.53	3,633,421	8.66	549,479	1 31
1903	41,957,984	5,078,814	12.10	3,390,316	8.08	3,609,084	8.60	477,421	1.14
1902	41,404,856	4,635,877	11.20	2,991,335	7.23	3,327,809	8 04	348,299	.84
1901	33,894,537	3,463,213	10.22	2,249,034	6.64	2,461,390	7.26	308,752	.91

§ J. Analysis of relation of maintenance accts. to expense of conducting transportation.

Year Ended June 30—	Revenue ton miles per mile of road	Revenue passenger miles per mile of road	Train miles (all classes) per mile of road	Ratio of M. of W and S. to conducting transportation.	Ratio of M. of E to conducting transportation.
				Per ct.	Per ct
Ten-year average, 1901-1910	2,237,447	444,232	13,164	35.15	38 45
Five-year average, 1906-1910	2,415,783	488,765	13,304	32.30	40.28
1901-1905	2,059 111	401,698	13,014	34.28	36 01
As reported for 1910	2,548,051	517,688	14,068	34.17	42 54
1909	2,293,914	474,153	12,863	30.67	44 04
1908	2,332,232	478,933	13,343	31.10	33.40
1907	2,508,407	498,744	13,337	30.01	40.27
1906	2,396,293	464,309	12,883	35.96	41.93
1905	2,153,138	429,228	12,617	35.97	38.95
1904	1,997,659	417,108	12,797	32.90	37.03
1903	2,163,000	408,046	13,681	35.92	37.34
1902	1,939,620	431,748	13,408	33.17	35.75
1901	2,042,306	322,362	12,586	32.97	32.95

§ K. Analysis of freight service operating statistics.

Year Ended June 30—	Average number of miles of road operated, including trackage rights	Number of freight and mixed train miles.	Freight and mixed train miles per mile of road.	Average number of loaded freight cars per train mile	Average number of tons of revenue freight. Per train load	Average number of tons. Per loaded car	Average number of tons of revenue freight hauled over each mile of road	Average number of miles hauled	Total number of locomotives in service June 30	Total tractive power on June 30	Average tractive power per locomotive on June 30	Number of locomotives assigned to freight service June 30.	Total number of freight cars in service June 30	Total capacity of freight cars in service June 30.	Average capacity of freight cars in service June 30	Freight car capacity per locomotive assigned to freight service June 30	Number of freight cars per locomotive assigned to freight service June 30
										Tons.	Tons.			Tons.	Tons.	Tons.	
Ten-year average, 1901-1910	3,463	20,033,376	5,785	24.09	385.59	16.00	2,237,447	187.50	1,044	a 26,538	a 13.6	1,039	64,699	a 2,075,402	a 32.1	a 1,997	62.3
Five-year average, 1906-1910	3,586	21,118,783	5,890	24.44	408.38	16.72	2,415,783	197.29	2,194	31,388	14.3	1,173	67,662	2,271,732	33.6	1,937	57.7
1901-1905	3,340	18,947,968	5,673	23.73	362.80	15.29	2,059,111	177.71	1,694	b 20,475	b 12.1	904	61,735	b 1,829,090	b 29.6	b 2,024	68.3
As reported for 1910	3,588	22,035,655	5,141	24.94	413.10	16.56	2,548,051	195.17	2,323	34,751	15.0	1,224	69,713	2,494,095	35.8	2,038	57.0
1909	3,587	20,281,317	5,654	24.65	404.00	16.39	2,293,914	200.36	2,317	34,456	14.9	1,240	65,479	2,247,995	34.3	1,813	52.8
1908	3,588	20,906,267	5,827	23.09	398.54	17.26	2,332,252	198.48	2,205	32,180	14.6	1,202	67,976	2,281,315	33.8	1,898	56.5
1907	3,589	21,554,326	6,006	24.59	415.93	16.92	2,508,407	195.01	2,150	29,749	13.8	1,108	68,971	2,251,352	32.6	1,926	59.0
1906	3,580	20,818,352	6,814	24.95	410.29	16.45	2,390,293	197.44	1,974	25,893	13.1	1,032	66,180	2,083,905	31.5	2,019	64.1
1905	3,566	20,051,249	5,623	23.67	381.32	16.11	2,153,138	192.42	1,850	22,669	12.3	1,007	63,957	1,935,775	30.3	1,922	63.5
1904	3,490	19,344,900	5,543	23.38	358.69	15.23	1,997,690	190.73	1,773	20,350	11.5	927	63,699	1,882,935	29.6	2,031	68.7
1903	3,423	20,029,833	5,851	23.68	367.79	15.53	2,163,000	193.45	1,763	20,420	11.6	936	62,777	1,804,730	28.7	1,928	67.1
1902	3,320	18,759,920	5,650	23.09	341.55	14.79	1,939,620	190.58	1,729	19,462	10.7	928	61,125	1,696,500	27.8	1,828	65.9
1901	2,899	16,553,937	5,710	24.64	364.66	14.60	2,042,106	161.39	1,358	.....	.....	722	57,116	.....	.....	.....	79.1

§ L. Analysis of operating revenues.

Year Ended June 30—	Freight service. Per train mile	Freight service. Per ton of revenue freight	Freight service. Per ton mile of revenue freight	Passenger service. Per train mile	Passenger service. Per revenue passenger.	Passenger service. Per revenue passenger mile.
	Cents.	Cents	Cents	Cents.	Cents.	Cents
Ten-year average, 1901-1910	242.008	117.566	0.627	132.821	58 335	1.747
Five-year average, 1906-1910	255.277	123 137	.624	141.802	61.577	1.739
1901-1905	228.739	111.996	.629	123.840	55.092	1.755
As reported for 1910	258.087	121.930	.625	143.246	63.403	1.740
1909	250 458	124.214	.620	143.399	62.729	1.743
1908	243 341	121.185	.611	139.107	63.466	1.725
1907	267.244	124.949	.641	144.273	60.925	1.741
1906	257.255	123.408	.625	138.983	57.363	1.747
1905	243.731	122.573	.638	130.490	55.587	1.719
1904	238.997	126.720	.664	126.994	56.273	1.761
1903	233.945	122.621	.634	127.518	54.627	1.773
1902	216.737	95.195	.632	121.835	54.640	1.723
1901	210.285	92.769	.575	112.373	54.335	1.799

§ M. Analysis of passenger service operating statistics.

Year Ended June 30—	Average number of miles of road operated, including trackage rights.	Number of passenger and mixed train miles	Passenger and mixed train miles per mile of road	Average number of passengers per passenger and mixed train mile.	Average number of passengers per train.	Average number of revenue passengers carried over each mile of road.	Average number of miles carried.	Number of locomotives assigned to passenger service June 30.	Total number of passenger-train cars in service June 30.	Number of passenger-train cars per locomotive assigned to passenger service June 30
Ten-year average 1901-1910	3,462 88	23,172,399	6,691 66	5.76	462	444,232	33.41	572	2,141	3.74
Five-year average 1906-1910	3,586.31	24,604,239	6,860 60	5.88	65	486,765	35.41	630	2,275	3.61
1901-1905	3,339.46	21,740,559	6,310 20	5.63	58	401,698	31.41	514	2,007	3.90
As reported for 1910	3,587.72	26,031,355	7,255 68	5.94	66	517,686	38.43	686	2,376	3.46
1909	3,587.08	24,108,026	6,720 79	5.94	65	474,153	35.99	656	2,392	3.65
1908	3,587.72	24,628,950	6,864 79	5.63	64	478,933	36 80	630	2,302	3.65
1907	3,588.82	24,457,469	6,814 90	6.99	67	498,744	34.98	599	2,190	3.62
1906	3,580.20	23,795,395	6,646 39	5.90	64	464,309	32 83	578	2,137	3.70
1905	3,566 18	22,843,685	6,405 68	5.93	62	429,228	32 33	627	2,123	4 03
1904	3,490 26	22,893,758	6,559 33	5.73	59	417,108	31.95	550	2,151	3.91
1903	3,422 66	22,246,133	6,499 66	5.73	59	408,046	30 92	547	2,098	3.84
1902	3,319.55	23,025,048	6,936 20	5.36	59	431,748	31 72	531	2,074	3.91
1901	2,898.67	17,694,173	6,104 24	5.41	52	322,362	30 21	416	1,589	3 82

a Nine-year average, years ended June 30 -1902-1910.

b Four-year average, years ended June 30, 1902-1905.

Interstate Commerce Commission,
Washington, December 1, 1910.

ANALYSIS OF OPERATING EXPENSE FOR REPAIRS AND RENEWALS.

	Atchison, Topeka & Santa Fe Ry. Co.			Baltimore & Ohio R. R. Co.			Boston & Maine Railroad.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Locomotives:									
Number of locomotive miles.	30,000,884	41,478,545	46,793,687	53,607,986	60,372,196	64,316,068	28,206,778	30,952,129	31,299,152
Total expense	$2,919,540	$4,228,008	$5,030,451	$3,741,664	$4,639,959	$5,927,282	$1,389,932	$1,732,168	$1,924,776
Per mile run (cents)	9.73	10.19	10.75	6.98	7.69	9.22	4.93	5.60	6.15
Passenger-train cars:									
Number of car miles	59,868,351	95,564,695	107,425,420	65,107,790	76,459,424	82,503,178	47,509,630	54,867,127	57,538,932
Total expense	$491,862	$933,179	$1,315,789	$641,763	$833,659	$811,769	$780,233	$825,179	$793,188
Per mile run (cents)	.82	.98	1.23	.99	1.09	.98	1.64	1.50	1.38
Freight-train cars:									
Number of car miles	351,355,878	471,360,205	559,847,411	591,758,860	724,852,343	797,259,545	176,697,521	211,671,760	223,563,374
Total expense	$2,165,691	$3,780,605	$3,967,510	$3,203,412	$5,626,746	$6,280,839	$1,039,337	$1,229,953	$1,483,956
Per mile run (cents)	.62	.80	.71	.54	.78	.79	.59	.58	.66

	Central Railroad Co. of New Jersey.			Chicago & Alton Railroad Co.			Chicago & Northwestern Ry. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906 1910.	1910.
Locomotives:									
Number of locomotive miles.	11,268,772	12,547,872	12,671,240	7,803,447	8,538,416	9,163,109	45,733,019	51,036,868	55,523,343
Total expense	$745,186	$1,017,167	$1,082,554	$490,083	$662,228	$766,698	$1,984,713	$2,886,200	$3,496,800
Per mile run (cents)	6.61	8.11	8.54	6.28	7.76	8.37	4.34	5.65	6.30
Passenger-train cars:									
Number of car miles	15,161,821	17,442,291	17,507,129	14,334,428	17,316,634	19,007,366	69,747,714	88,188,276	97,683,216
Total expense	$200,293	$223,300	$208,845	$153,728	$138,263	$144,512	$553,516	$637,377	$816,144
Per mile run (cents)	1.32	1.28	1.19	1.07	.80	.77	.79	.72	.84
Freight-train cars:									
Number of car miles	110,945,351	130,313,335	131,143,989	82,528,173	100,115,874	104,930,166	386,017,416	486,797,506	528,531,270
Total expense	$774,975	$1,216,259	$1,409,552	$346,120	$404,725	$316,676	$1,916,232	$3,306,161	$2,706,848
Per mile run (cents)	.70	.93	1.07	.42	.40	.30	.50	.68	.51

	Chicago, Burlington & Quincy R. R. Co.			Chicago, Milwaukee & St. Paul Ry. Co.			Chicago, Rock Island & Pacific Ry. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Locomotives:									
Number of locomotive miles.	42,925,764	46,556,136	51,710,638	38,601,255	44,233,294	47,349,806	26,836,060	38,172,307	42,393,600
Total expense	$2,912,116	$4,215,403	$3,954,307	$1,337,638	$2,376,735	$2,831,230	$1,667,337	$3,135,125	$3,506,057
Per mile run (cents)	6.79	9.07	7.65	3.46	5.37	5.98	6.21	8.21	8.27
Passenger-train cars:									
Number of car miles	72,681,270	93,720,282	109,789,231	52,406,996	70,786,929	77,547,500	49,455,824	80,947,112	90,947,010
Total expense	$697,373	$866,996	$833,633	$562,010	$652,088	$630,500	$420,328	$682,734	$767,472
Per mile run (cents)	.96	.93	.76	1.07	.92	.81	.85	.84	.84
Freight-train cars:									
Number of car miles	453,490,037	571,438,711	637,163,521	417,200,346	483,517,544	497,100,460	261,485,974	372,670,659	418,236,167
Total expense	$3,539,658	$5,402,923	$4,925,473	$1,940,672	$3,216,054	$2,980,075	$1,290,256	$2,434,545	$2,902,382
Per mile run (cents)	.78	.95	.77	.47	.67	.60	.49	.65	.69

	Delaware, Lackawanna & Western R. R. Co.			Erie Railroad Co.			Lehigh Valley Railroad Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Locomotives:									
Number of locomotive miles.	22,301,150	21,692,097	19,698,159	29,162,865	29,333,982	29,807,613	19,318,212	21,435,686	21,906,365
Total expense	$946,466	$1,191,598	$1,330,922	$2,726,541	$3,640,888	$3,148,687	$2,004,018	$2,314,724	$1,967,135
Per mile run (cents)	4.24	5.49	6.76	9.35	12.41	10.56	10.37	10.80	8.98
Passenger-train cars:									
Number of car miles	30,900,362	36,055,452	36,882,902	39,124,734	47,962,682	52,290,223	20,275,826	23,300,687	24,345,811
Total expense	$364,811	$496,786	$547,482	$554,275	$564,920	$668,407	$339,888	$313,804	$263,522
Per mile run (cents)	1.18	1.38	1.48	1.42	1.18	1.28	1.68	1.35	1.08
Freight-train cars:									
Number of car miles	191,776,172	236,438,966	249,156,416	373,528,604	378,160,217	380,952,625	283,540,906	309,829,215	308,461,307
Total expense	$1,107,352	$1,462,206	$1,489,294	$1,859,714	$2,892,362	$2,892,640	$1,965,988	$2,342,399	$2,442,539
Per mile run (cents)	.58	.62	.60	.50	.77	.76	.69	.76	.79

	Minneapolis & St. Louis Railroad Co.			New York, New Haven & Hartford R. R. Co.			Pennsylvania Railroad Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Locomotives:									
Number of locomotive miles.	2,075,057	2,794,385	3,362,691	29,422,626	30,976,816	29,637,868	77,907,700	92,958,644	94,960,634
Total expense	$116,428	$178,440	$231,262	$1,729,366	$2,293,954	$2,351,653	$6,013,259	$9,075,853	$9,549,701
Per mile run (cents)	5.62	6.40	6.88	5.88	7.41	7.93	7.72	9.76	10.05
Passenger-train cars:									
Number of car miles	4,531,373	5,313,512	5,870,295	63,449,546	71,140,826	73,015,820	108,896,192	136,635,306	143,295,025
Total expense	$35,704	$52,821	$63,588	$1,032,113	$1,068,363	$983,074	$1,824,145	$2,075,064	$1,966,142
Per mile run (cents)	.79	.99	1.08	1.63	1.51	1.35	1.67	1.52	1.37
Freight-train cars:									
Number of car miles	16,960,643	21,753,876	25,005,364	186,973,851	200,153,004	210,448,114	950,983,640	1,134,748,418	1,189,337,685
Total expense	$121,666	$205,820	$198,607	$1,022,819	$1,218,461	$1,382,576	$8,295,460	$10,799,823	$10,562,966
Per mile run (cents)	.72	.95	.80	.55	.61	.66	.87	.95	.89

	Philadelphia & Reading Ry. Co.			Toledo, St. Louis & Western R. R.			Wabash Railroad Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Locomotives:									
Number of locomotive miles.	26,378,016	26,904,425	26,196,000	3,448,719	3,207,624	2,815,241	20,466,047	20,976,828	20,987,147
Total expense	$1,760,351	$2,695,979	$2,823,160	$175,463	$220,832	$238,443	$1,279,575	1,601,537	1,851,900
Per mile run (cents)	6.70	10.02	10.78	5.09	6.88	8.47	6.25	7.63	8.82
Passenger-train cars:									
Number of car miles	25,097,753	27,157,664	28,350,462	3,472,258	3,332,487	3,170,631	37,882,386	37,908,700	37,455,473
Total expense	$353,660	$640,809	$1,049,074	$30,185	$27,023	$23,106	$450,846	339,574	331,863
Per mile run (cents)	1.41	2.36	3.70	.87	.81	.73	1.19	.90	.89
Freight-train cars:									
Number of car miles	.....	*a* 291,690,357	307,251,277	40,478,959	48,188,456	44,382,071	189,689,161	254,239,999	271,658,389
Total expense	$1,885,657	$3,524,144	$4,083,925	$162,966	$155,043	$202,475	$1,107,894	$1,404,972	$1,407,647
Per mile run (cents)	.....	*a* 1.21	1.33	.40	.32	.23	.58	.55	.52

a Three-year average, years ended June 30, 1908-1910.

ANALYSIS OF FREIGHT SERVICE OPERATING STATISTICS.

	Atchison, Topeka & Santa Fe Ry. Co.			Baltimore & Ohio R. R. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	5,803	7,163	7,459	3,678	4,096	4,434
Number of freight and mixed train miles	13,161,108	17,408,378	18,947,388	20,281,145	24,969,169	27,152,441
Freight and mixed train miles per mile of road	2,268	2,431	2,540	5,514	6,089	6,124
Average number of loaded freight cars per train mile	18.92	22.22	20.87	19.47	18.94	19.34
Average number of tons of revenue freight:						
Per train load	261.18	306.34	298.39	399.32	425.12	442.86
Per loaded car	13.00	14.97	14.30	20.51	22.45	22.90
Average number of tons of revenue freight hauled over each mile of road	594,094	749,619	757,977	2,207,898	2,591,372	2,711,666
Average number of miles hauled	320.58	371.89	353.11	196.54	193.81	191.48
Total number of locomotives in service June 30	1,121	1,545	1,596	1,579	1,897	2,055
Total tractive power on June 30 (tons)	*b* 14,586	23,233	24,518	*b* 22,438	29,321	32,125
Average tractive power per locomotive on June 30 (tons)	*b* 12.1	15.0	15.4	*b* 14.3	15.5	15.7
Number of locomotives assigned to freight service June 30	765	869	866	1,055	1,348	1,475
Total number of freight cars in service June 30	31,876	42,369	44,584	71,497	79,690	83,693
Total capacity of freight cars in service June 30 (tons)	*b* 862,316	1,253,818	1,392,300	*b* 2,349,657	2,899,295	3,149,792
Average capacity of freight cars in service June 30 (tons)	*b* 25.6	29.5	31.2	*b* 32.9	36.4	37.7
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 1,055	1,444	1,608	*b* 2,227	2,151	2,135
Number of freight cars per locomotive assigned to freight service June 30	41.7	48.8	51.5	67.8	59.4	56.9

b Four-year average, years ended June 30, 1902-1905.

	Boston & Maine R. R.			Central R. R. Co. of New Jersey.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	2,275	2,261	2,243	688	668	669
Number of freight and mixed train miles	8,250,351	9,347,021	9,487,146	3,307,591	4,007,991	4,130,504
Freight and mixed train miles per mile of road	3,627	4,134	4,230	4,815	6,002	6,174
Average number of loaded freight cars per train mile	16.67	16.45	17.15	20.28	19.38	19.06
Average number of tons of revenue freight:						
Per train load	205.13	234.03	247.33	470.11	511.18	517.36
Per loaded car	12.32	14.22	14.42	23.15	26.40	27.15
Average number of tons of revenue freight hauled over each mile of road	750,191	975,068	1,046,212	2,276,868	3,068,051	3,192,394
Average number of miles hauled	89.34	100.35	102.84	79.52	75.68	72.39
Total number of locomotives in service June 30	987	1,079	1,119	438	481	477
Total tractive power on June 30 (tons)	*b* 8,489	10,513	*c* 11,458	*b* 4,479	5,865	5,923
Average tractive power per locomotive on June 30 (tons)	8.6	9.7	*c* 10.3	*b* 10.2	12.1	12.4
Number of locomotives assigned to freight service June 30	378	416	446	254	258	253
Total number of freight cars in service June 30	17,281	22,376	24,746	18,828	20,795	21,968
Total capacity of freight cars in service June 30 (tons)	*b* 382,274	599,504	722,200	*b* 578,344	726,336	816,445
Average capacity of freight cars in service June 30 (tons)	22.1	26.8	29.2	*b* 30.7	34.9	37.1
Freight car capacity per loco. assigned to freight service June 30 (tons)	1,011	1,441	1,619	*b* 2,277	2,815	3,227
Number of freight cars per locomotive assigned to freight service June 30	45.7	53.8	55.5	74.1	80.6	86.8

b Four-year average, years ended June 30, 1902-1905. *c* Data for 1,109 locomotives.

	Chicago & Alton R. R. Co.			Chicago & Northwestern Ry. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	917	986	998	6,520	7,575	7,629
Number of freight and mixed train miles	2,986,001	3,267,301	3,558,625	15,863,489	19,311,616	21,336,510
Freight and mixed train miles per mile of road	3,257	3,314	3,566	2,454	2,549	2,799
Average number of loaded freight cars per train mile	18.41	19.73	19.28	17.19	17.40	16.81
Average number of tons of revenue freight:						
Per train load	330.07	399.32	383.07	255.17	267.96	260.71
Per loaded car	17.91	20.24	19.86	14.85	15.41	15.51
Average number of tons of revenue freight hauled over each mile of road	1,077,248	1,322,609	1,365,832	627,003	682,599	729,094
Average number of miles hauled	178.81	163.47	160.15	140.06	147.26	141.40
Total number of locomotives in service June 30	213	256	271	1,196	1,437	1,520
Total tractive power on June 30 (tons)	*b* 2,640	3,551	4,027	*b* 11,154	15,154	17,185
Average tractive power per locomotive on June 30 (tons)	*b* 12.4	13.9	14.8	9.3	10.5	11.3
Number of locomotives assigned to freight service June 30	108	136	151	717	855	859
Total number of freight cars in service June 30	9,705	11,116	12,084	47,136	58,189	62,639
Total capacity of freight cars in service June 30 (tons)	*b* 305,016	416,872	479,748	*b* 1,340,610	*b* 1,847,874	2,100,770
Average capacity of freight cars in service June 30 (tons)	*b* 31.5	37.5	39.7	28.4	31.7	33.5
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 2,825	3,065	3,177	1,870	2,161	2,445
Number of freight cars per locomotive assigned to freight service June 30	89.9	81.7	80.0	65.7	68.0	72.9

b Four-year average, years ended June 30, 1902-1905.

	Chicago, Burlington & Quincy R. R. Co.			Chicago, Milwaukee & St. Paul Ry. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	8,177	8,899	9,023	6,854	7,396	7,512
Number of freight and mixed train miles	17,771,185	17,770,500	19,501,367	16,200,772	18,339,985	19,321,529
Freight and mixed train miles per mile of road	2,181	1,997	2,161	2,364	2,478	2,572
Average number of loaded freight cars per train mile	18.16	22.38	22.44	18.24	18.64	18.13
Average number of tons of revenue freight:						
Per train load	261.73	383.48	381.26	242.91	274.62	275.58
Per loaded car	14.30	17.14	16.99	13.31	14.74	15.20
Average number of tons of revenue freight hauled over each mile of road	561,154	765,699	824,016	574,010	680,733	709,161
Average number of miles hauled	*b* 249.87	270.78	266.80	190.37	181.13	173.52
Total number of locomotives in service June 30	1,253	1,605	1,673	975	1,106	1,199
Total tractive power on June 30 (tons)	*b* 12,596	18,893	20,273	*b* 8,355	10,977	12,840
Average tractive power per locomotive on June 30 (tons)	*b* 10.1	11.8	12.1	*b* 8.6	9.9	10.7
Number of locomotives assigned to freight service June 30	737	888	857	609	703	782
Total number of freight cars in service June 30	45,238	48,903	49,881	39,980	44,591	44,868
Total capacity of freight cars in service June 30 (tons)	*b* 1,162,235	1,487,408	1,673,925	*b* 1,057,821	1,375,093	1,422,491
Average capacity of freight cars in service June 30 (tons)	*b* 25.7	30.4	33.6	*b* 26.5	30.8	31.6
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 1,577	1,676	1,953	*b* 1,737	1,956	1,819
Number of freight cars per locomotive assigned to freight service June 30	61.4	55.0	58.2	65.6	63.4	57.4

b Four-year average, years ended June 30, 1902-1905.

	Chicago, Rock Island & Pacific Ry. Co.			Delaware, Lackawanna & Western R. R. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	5,170	7,177	7,400	802	861	930
Number of freight and mixed train miles	11,634,848	14,982,248	16,683,695	6,208,496	6,935,072	6,742,112
Freight and mixed train miles per mile of road	2,307	2,088	2,255	7,743	8,055	7,249
Average number of loaded freight cars per train mile	15.52	17.28	17.19	20.92	22.72	24.36
Average number of tons of revenue freight:						
Per train load	201.72	258.16	257.83	403.86	492.56	545.14
Per loaded car	12.98	14.94	15.00	19.27	21.68	22.38
Average number of tons of revenue freight hauled over each mile of road	460,245	538,815	581,272	3,136,030	3,925,998	3,951,580
Average number of miles hauled	230.83	236.62	229.58	162.75	172.61	170.13
Total number of locomotives in service June 30	902	1,348	1,430	638	704	755
Total tractive power on June 30 (tons)	*b* 9,862	16,976	19,413	*b* 7,839	8,922	10,146
Average tractive power per locomotive on June 30 (tons)	*b* 10.9	12.6	13.5	*b* 12.3	12.7	13.4
Number of locomotives assigned to freight service June 30	517	737	781	392	413	444
Total number of freight cars in service June 30	25,003	37,166	37,375	25,019	26,384	27,690
Total capacity of freight cars in service June 30 (tons)	*b* 742,110	1,195,027	1,295,115	*b* 697,462	845,581	904,290
Average capacity of freight cars in service June 30 (tons)	*b* 29.7	32.1	34.6	*b* 27.8	32.0	32.6
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 1,435	1,622	1,648	*b* 1,779	2,047	2,037
Number of freight cars per locomotive assigned to freight service June 30	48.4	50.4	47.8	63.8	63.8	62.3

b Four-year average, years ended June 30, 1902-1905.

	Erie Railroad Co.			Lehigh Valley R. R. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	1,884	1,921	1,961	1,391	1,441	1,440
Number of freight and mixed train miles	11,203,592	11,224,403	11,079,544	7,784,566	8,845,150	8,839,384
Freight and mixed train miles per mile of road	5,947	5,845	5,649	5,598	6,137	6,138
Average number of loaded freight cars per train mile	22.86	23.63	24.46	24.35	23.47	23.66
Average number of tons of revenue freight:						
Per train load	396.77	471.36	500.23	479.08	521.11	535.85
Per loaded car	17.35	19.93	20.32	19.67	22.24	22.65
Average number of tons of revenue freight hauled over each mile of road	2,359,724	2,749,978	2,808,448	2,683,091	3,197,398	3,288,705
Average number of miles hauled	151.55	150.38	146.34	183.15	174.31	174.26
Total number of locomotives in service June 30	1,128	1,372	1,398	752	860	874
Total tractive power on June 30 (tons)	*b* 13,304	19,097	20,052	*b* 8,967	11,557	12,127
Average tractive power per locomotive on June 30 (tons)	*b* 11.7	13.9	14.3	*b* 11.9	13.4	13.9
Number of locomotives assigned to freight service June 30	597	706	745	433	484	492
Total number of freight cars in service June 30	50,762	51,018	48,350	35,095	41,651	44,125
Total capacity of freight cars in service June 30 (tons)	*b* 1,430,127	1,818,263	1,809,900	*b* 1,039,650	1,427,608	1,603,127
Average capacity of freight cars in service June 30 (tons)	*b* 28.1	35.6	37.4	*b* 29.6	34.3	36.3
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 2,446	2,576	2,429	*b* 2,771	2,939	3,258
Number of freight cars per locomotive assigned to freight service June 30	72.7	85.0	64.8	81.1	86.1	89.7

b Four-year average, years ended June 30, 1902-1905.

	Minneapolis & St. Louis R. R. Co.			New York, New Haven & Hartford R. R. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	656	945	1,027	2,037	2,051	2,043
Number of freight and mixed train miles	731,274	1,026,037	1,212,635	7,219,077	7,528,091	7,246,504
Freight and mixed train miles per mile of road	1,115	1,086	1,181	3,544	3,671	3,547
Average number of loaded freight cars per train mile	18.81	16.17	15.26	19.25	18.52	20.01
Average number of tons of revenue freight:						
Per train load	255.00	250.06	266.80	215.07	256.07	293.20
Per loaded car	13.55	15.53	17.48	11.20	13.80	14.65
Average number of tons of revenue freight hauled over each mile of road	285,485	271,940	315,008	762,103	939,813	1,057,560
Average number of miles hauled	101.77	101.32	107.62	89.35	93.09	93.44
Total number of locomotives in service June 30	82	96	103	1,017	1,199	*c* 1,220
Total tractive power on June 30 (tons)	*b* 720	908	1,100	*b* 10,158	12,990	*d* 13,393
Average tractive power per locomotive on June 30 (tons)	*b* 8.8	9.5	10.7	*b* 10.0	10.8	10.9
Number of locomotives assigned to freight service June 30	41	50	50	333	444	453
Total number of freight cars in service June 30	2,952	3,998	4,385	14,474	27,752	35,716
Total capacity of freight cars in service June 30 (tons)	*b* 72,997	109,704	126,100	*b* 395,561	863,117	1,141,733
Average capacity of freight cars in service June 30 (tons)	*b* 24.7	27.5	28.8	*b* 27.3	31.1	31.9
Freight car capacity per loco. assigned to freight service June 30 (tons)	*b* 1,780	2,194	2,522	*b* 1,188	1,944	2,520
Number of freight cars per locomotive assigned to freight service June 30	72.1	80.0	87.7	43.5	62.5	78.6

b Four-year average, years ended June 30, 1902-1905. *c* Includes 44 electric locomotives unassigned as regards freight or passenger service. *d* Tractive power of 1,176 locomotives; no tractive power reported for 44 electric locomotives.

	Pennsylvania R. R. Co.			Philadelphia & Reading Ry. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	3,828	3,983	3,971	1,008	1,010	1,022
Number of freight and mixed train miles	27,400,235	32,660,488	31,422,531	10,235,955	9,883,958	9,647,409
Freight and mixed train miles per mile of road	7,158	8,200	7,913	10,155	9,786	9,439
Average number of loaded freight cars per train mile	22.27	23.23	24.14	.....	*a* 19.42	19.86
Average number of tons of revenue freight:						
Per train load	508.57	586.85	649.41	312.47	433.12	477.49
Per loaded car	22.87	25.44	26.90	.....	*a* 23.86	24.04
Average number of tons of revenue freight hauled over each mile of road	3,637,091	4,782,232	5,139,379	3,147,560	4,210,122	4,506,980
Average number of miles hauled	148.55	167.81	168.43	91.86	94.44	97.12
Total number of locomotives in service June 30	2,564	3,431	*c* 3,439	907	1,017	1,032
Total tractive power on June 30 (tons)	*b* 35,877	53,616	*d* 55,117	*e* 10,608	13,162	13,527
Average tractive power per locomotive on June 30 (tons)	14.0	15.6	16.0	*e* 11.7	12.9	13.1
Number of locomotives assigned to freight service June 30	1,644	2,304	2,349	519	604	628
Total number of freight cars in service June 30	108,880	136,388	143,917	37,617	41,906	40,971
Total capacity of freight cars in service June 30 (tons)	*b* 4,025,609	5,712,274	5,803,486	*b* 1,095,533	1,310,274	1,398,089
Average capacity of freight cars in service June 30 (tons)	37.0	41.9	40.3	*b* 29.1	31.3	34.1
Freight car capacity per loco. assigned to freight service June 30 (tons)	2,449	2,479	2,470	*b* 2,110	2,170	2,226
Number of freight cars per locomotive assigned to freight service June 30	66.2	59.2	61.3	72.5	69.4	65.2

a Three-year average, years ended June 30, 1908-1910. *b* Four-year average, years ended June 30, 1902-1905. *c* Includes 2 electrics. *d* Tractive power of 3,437 locomotives. *e* Three-year average, years ended June 30, 1903-1905.

	Toledo, St. Louis & Western R. R.			Wabash R. R. Co.		
	1901-1905.	1906-1910.	1910.	1901-1905.	1906-1910.	1910.
Average number of miles of road operated, including trackage rights	451	451	451	2,463	2,515	2,515
Number of freight and mixed train miles	1,503,765	1,375,120	1,287,399	7,306,402	8,766,831	9,429,662
Freight and mixed train miles per mile of road	3,334	3,049	2,855	2,966	3,486	3,749
Average number of loaded freight cars per train mile	18.50	24.46	24.98	18.59	19.92	19.81
Average number of tons of revenue freight:						
Per train load	285.39	455.19	481.31	291.03	354.67	352.70
Per loaded car	15.41	18.59	19.26	15.66	17.81	17.81
Average number of tons of revenue freight hauled over each mile of road	956,563	1,379,187	1,374,787	863,271	1,236,452	1,322,598
Average number of miles hauled	215.20	196.40	191.22	228.57	241.47	237.51
Total number of locomotives in service June 30	86	97	94	504	620	658
Total tractive power on June 30 (tons)	*b* 910	1,295	1,273	*b* 4,893	7,025	7,825
Average tractive power per locomotive on June 30 (tons)	10.6	13.3	13.5	9.7	11.3	11.9
Number of locomotives assigned to freight service June 30	57	64	61	268	364	396
Total number of freight cars in service June 30	3,044	3,427	3,273	16,939	21,647	22,206
Total capacity of freight cars in service June 30 (tons)	*b* 79,199	105,307	105,000	*b* 533,693	742,298	796,910
Average capacity of freight cars in service June 30 (tons)	26.0	30.7	32.1	31.5	34.3	35.9
Freight car capacity per loco. assigned to freight service June 30 (tons)	1,390	1,646	1,721	1,991	2,039	2,012
Number of freight cars per locomotive assigned to freight service June 30	53.4	53.6	53.7	63.2	59.5	56.1

b Four-year average, years ended June 30, 1902-1905.

THE SUPPLY DEPARTMENT.*

BY H. C. PEARCE.

General Storekeeper, Southern Pacific Company.

IV.

REQUISITIONS AND ORDERS.

We have now the organization and facilities, and are prepared to do business.

Form of Regular Requisitions.

Each person having authority to order material should be required to make out a requisition on the form provided, and in the way instructed, and obtain the approvals prescribed. The form of requisition shown herewith contains only essentials, with ample room to describe what is wanted, and nothing except what is wanted. Instructions regarding the use of this requisition may be changed from time to time, but generally speaking the substance of these instructions is that the person making a requisition must state correctly and technically the thing he wants. In the case of requisitions for material regularly required, they must conform to the standards, as shown by the standard lists.

For the purpose of further identification, and to prevent mistakes, each item on the standard list should be indicated by an item number. This number indicates, not only the number of the item but the section in the storehouse in which it is located. Thus, 13-1 indicates that the item described is located in section 13, and is item 1 on the list. The list is arranged alphabetically and in sections, and also shows the technical description. They also should be required to show the actual amount on hand and amount due; and, in the case of stock requisitions, the average previous months' consumption. This information, together with complete shipping instructions, forms practically all the essential information that is required.

Form of Special Requisitions.

Special requisitions must be prepared to cover all special materials, tools, etc., which are not carried in stock, and are not shown on the standard lists, as indicated above. These requisitions, in addition to giving complete description of what is wanted, must indicate why it is wanted, and its approximate value, and be approved by the head of the department, with full explanation as to why it is required.

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File No.....
Section No.....

REQUISITION FOR MATERIAL. *NO.....*

.....190....

TO..... AT.....

Please ship the following material to

.....

Approved.. ..... Approved..... At.....

Title..... Title.....

On Hand and On Order.	Average Monthly Consumption.	Additional Wanted.	Description of Material.	Purpose.	Leave Blank. For Accounting Purposes.

Form of Requisition for Material.

Form of Stationery Requisitions.

There is a separate requisition made for stationery, owing to the character of this material. Form numbers answer for item numbers, and, besides, stationery is usually ordered on basis of three months' supply. That is to say, the system is divided up in such a way that requisitions are made on the basis of each three months. This saves much unnecessary time in shipment, and has been found practical and profitable. A sample requisition is shown herewith. Only one form of requisition is necessary, of two different sizes, half and full sheets.

Form of Shop Orders.

A form of shop order is shown. It is used by the local shops in drawing material from the storehouses at all points. This order is made out usually by the shop foremen of the different shops, and can be made out in his own way, for the reason that he has not the time to study the standard lists, drawings and schedule references. Besides, the connections between the user and the material is such that all this information can be procured in another way, as will be explained later. At the shops, where the delivery system is installed, the order is telephoned to the section, and delivery made by messengers, who in turn take receipt when the material is delivered, and deliver the order back to the section storekeeper, who in turn puts on the technical description and item reference from his stock books. In cases where the shop delivery system is not in use, and the men go to the counters and get the material, the counter foreman and section foreman in the storehouse enter the correct description on the tickets in the same way, so that when the tickets go into the office for accounting purposes, the description is technically correct and identified in the same manner as the requisitions.

Regular Requisitions; Method of Handling.

The requisitions, after being properly approved, are forwarded to the division store, they are identified by a number and registered, and show the date received, original number, file number, brief description of what it is for, and what was done with it. They are then checked against the available material, as shown on the stock lists, and notations made after such items as can be supplied from outside points. They are then arranged according to section and delivered to each section storekeeper, who first checks the column "Amount Due" to see that the back-orders which he has for this material agree with the amount which they show is due. For example, if their requisitions should show that they want one dozen hand saws with none due, and the section storekeeper found he held a back-

Form 2081. C. S.

Sheet No.....
File No.....

STATIONERY REQUISITION No......

TO STATIONER: .....19....

The following supplies are required at.....for the.....ending.....19.....

Approved: *Approved:*

....

[TITLE]..... [TITLE]..... [TITLE].....

INSTRUCTIONS.

1. Requisitions should be made on dates designated by proper official and should cover sufficient stationery to last until stock ordered on next requisition is received.
2. Requisitions should be written in copying ink or indelible pencil and an impression copy taken by the maker.
3. The "Number on Hand" at time of making requisition must be shown in the column provided for that purpose.
4. Blanks bearing form numbers must be listed in numerical order, followed by Miscellaneous Supplies.
5. DO NOT INTERLINE ON THIS BLANK. Use one line for each article.
6. When material called for by requisition is received, it should be checked with the impression copy, and any discrepancies noted thereon.

Form.	DESCRIPTION.	Number on Hand.	Number Required.	Value.	Remarks.

Form of Stationery Requisition.

order for one dozen, he would cancel the item, making notation to the effect after same that there was a dozen due that they did not know about. All duplications are discovered in this way. He then checks the descriptions against his stock books to see that the material is properly described and itemized, and at the same time compares the quantity ordered with his stock books, or what he is using himself of this class of material. If it shows extravagance, or is excessive, he makes notation after the item to this effect. In fact, the section storekeeper in the division store censors every item on a requisition for stock for the division, and is in effect general storekeeper of that division for his particular section. In the same way the section storekeeper of the general store censors all requisitions from the division stores for stock, and is general storekeeper of his particular section for the system.

His next move is to make a cross at the left of such items as he has in stock and provided for. The messenger then comes around and picks up the requisitions so marked, and then takes them back to the storekeeper, who personally goes over notations made by the section storekeepers, and makes such changes as he may desire, and indicates after the items on the requisitions which have not already been provided for, what action shall be taken. For example, one item he will mark "Purchase," another

in his possession before the material is received. These invoices are usually made in triplicate, one copy going to the consignee, one to the maker of the requisition (usually the superintendent), and the other remaining on file. The shipping notice, or manifest number and date, is then entered on the original requisition, and the requisitions filed numerically by divisions. The unfilled items on the requisitions are drawn off onto back-orders, and when these back-orders are filled they are handled in the same way, and attached to the original requisition, so that the original requisition in the storekeeper's office shows at all times its exact status, and can be located instantly by reference to the number or date.

Special Requisitions; Method of Handling.

Special requisitions when received at the division store are merely registered in the same way as regular requisitions, and forwarded to the general storekeeper, who obtains any additional approvals which may be necessary, and prepares at once a purchase requisition to cover, sending a copy of same to the division storekeeper so that he may be in position to advise division officers what action has been taken. In this way these requisitions are delayed no longer than is necessary to get the necessary approvals and time to check against what may be available

Form 4218 C. S.

ORDER ON STOREKEEPER

.....191....

Charge Acct. No..... *Shop No.....*

To be used for..... *Store No.....*

.....

.....

TO STOREKEEPER:

Please deliver to bearer the following material:

Class.	Articles.	Material Released.		Material Issued.		
		Kind.	Quantity.	Quantity.	Price.	Amount.

This blank to be used by the M. P. & C. Dept. in drawing material from the Store Department.

If for repairs to Locomotives, it must show whether for "Shop" or "Running" Repairs. If for repairs to Cars, separate requisitions must be made for each subdivision of each account. Issues must be shown in "Material Issued" column, and Scrap or serviceable material released, in "Material Released" column. Under "Material Released" show whether second-hand or scrap; if the latter, show the kind of metal. Issues must be priced and extended by Store Clerks:

.....

.....

(TITLE)

Form of Order on Storekeeper.

"Shop," meaning in the first instance it will be bought, and in the second it will be made in the shops.

The requisitions are then turned over to the requisition clerk, who first draws off transfer requisitions for such items as can be supplied from outside points where it is not needed; second, he makes requisitions on the purchasing agent for such items as it is necessary to purchase; third, makes store orders on the different shops for such material as must be made or repaired in the shops, indicating after these items the action taken, i. e., the order numbers and dates. The requisitions are then sent to the section storekeepers, and the preparation for shipment commences at once. Several different sections will thus be working on the same requisition at the same time.

As soon as the material is ready for shipment, the shipping foreman, who has already made arrangements for the necessary cars to load, is notified. The requisitions are taken up by him, the material checked into the cars and turned over to the agent, who is also located (in case of the general store) in the store for billing. The number and date of the waybill, car number, etc., is indicated on the requisition and turned over to the manifest clerk, who immediately makes the invoice from the original requisition, and mails it out. This work at the large stores is done at night, so that in all instances the consignee has a manifest

or can be supplied. They pass through the division stores and general store to prevent anything being bought which may be on hand or can be made applicable.

Stationery Requisitions; Method of Handling.

Stationery requisitions are prepared by the agents, approved by the superintendents, and, in the case of general officers, approved by the heads of the departments, and sent directly to the stationery storekeeper, who handles them in the same way as other requisitions.

Shop Orders; Method of Handling.

Shop orders are checked over every night by the section storekeepers to see that the description and item references are technically correct, and delivered to the material clerk, where they are abstracted to their proper classes and charged to the proper operating accounts.

Store Orders; Method of Handling.

Store orders for shop work to be done in the shops are made by the storekeeper of the shop under whose direction the material is to be made, and sent to the local mechanical official or shop superintendent, as may be directed, for approval. These

orders are all numbered and made in duplicate. Whatever material is necessary to do the work is ordered by him, and charged to his order, as well as the labor. When the article is completed the storekeeper, or store delivery foreman, is notified, takes the material away, and gives receipt for it, which is authority for the shop clerk to prepare bill for the value of same.

Purchase Requisitions; Method of Handling.

Requisitions are made on the purchasing agent *only after every other resource has been exhausted.* All purchase requisitions are made at the general store, and if for stock are based on the general stock books, which show the technical description of the material required with such schedule, drawings, pattern, and other references as may be necessary. This record also shows the quantities which have been purchased during the year or years, amount on hand and amount due. From this information the storekeeper determines the quantities necessary for him to provide, taking into consideration his personal knowledge of any changed or unusual conditions. The requisition is then prepared, checked again by the general stock clerk against the general stock books to be sure it is correct in every detail, certified to by him, approved by the division storekeeper and general storekeeper and forwarded to the purchasing agent for execution.

In the case of special requisitions the method of procedure is the same, except that all such requisitions are made in the office of the general storekeeper, and after the necessary approvals have been obtained from the heads of departments, and when necessary from the general manager or chief executive officer.

The purchasing agent upon receiving these requisitions, will, if covered by contract or agreement, indicate at once the proper contract reference. If the item or items are not covered by such agreement, requests for bids should be sent out immediately, stating the time the bids close. When such bids are received they are tabulated and the purchasing agent decides, and indicates by a circle the bid accepted. It is attached to the requisition and sent to the order clerk, from which orders are made in triplicate, one copy going to the seller, and the other to the storekeeper, and the other being filed with the requisition. The storekeeper upon receiving this copy checks it against the requisition and calls the purchasing agent's attention at once to any changes or errors which may have been detected. It is then sent to the section storekeeper, who will receive the goods, and it is attached to his duplicate copy of the requisition from which to check the specifications when the material is received.

RECEIPT AND INSPECTION.

Purchase Bills.

Purchase bills or invoices are supposed to be made by the seller on the dates the material is shipped, and sent in triplicate to the purchasing agent. These bills in all cases give reference to the orders and requisition numbers, and are first checked by the purchasing agents against the copy of the order to see that they agree in the matter of price, routing, etc., the triplicate being retained in his office, and the original and duplicate forwarded to the storekeeper. The storekeeper enters it against the item on the requisition record book, that is, he gives the date shipped, name of the shipper, amount of the invoice, routing, etc. As soon as the material is received and entered against the requisition record he checks them again for receipt of the material, and certifies to receipt of the material, giving reference to the date and book upon which it is entered, retains the duplicate for his file, and returns the original to the auditor for voucher. The purpose of the first check is an advance notice that the material has been shipped so it will not be necessary to trace for information already possessed.

Freight Bills.

The freight bills are prepared by the agents at the points where the goods are received, and forwarded by him with the goods in triplicate, one portion being receipted for by the storekeeper when he receives the goods. These are matched against the receiving records by the dates, waybill and car references, and checked against the copy of the purchasing agent's order to see that the routing is in accordance with same, any notations regarding the freight rates, etc., entered and after being checked regarding extensions, etc., they are attached to the purchase bill, and deductions made from the face of the purchase bill for any freight charges which may have been assumed in accordance with the terms of purchase. The duplicate remains on file with the duplicate purchase bill in the storekeeper's office, and the original is returned with the original purchase bill as voucher for the deduction to the auditor. It is the business of the storekeeper not only to check additions, extensions, etc., but to see that the correct rate is applied as well.

Receiving Freight.

No freight should be taken from the cars without the waybills. Storekeepers should insist on getting the waybills or freight bills before a piece of material is removed from the cars. This is one of the first precautions that should be taken to prevent mixups and trouble. The waybills being received, they are placed in the hands of a receiving foreman, who arranges them on a clip, and when the cars are set personally supervises the unsealing of the cars, indicating their condition, seal record, etc. He then as closely as possible inspects the exterior appearance of everything that is checked out, checking off the pieces on the waybill, that is—bundles, boxes, or however they may be grouped, and indicates their condition if there is anything apparently wrong with them. He delivers these bundles, packages, etc., to the respective section storekeepers, and, together with the signed waybills, turns them over to the section storekeeper for detailed checking.

The section storekeeper is equipped with what is known as hip pocket freight received book. It is a book about 8½ x 3½, ¾ of an inch thick, so it can be conveniently carried in the hip pocket. The idea of this book is that it makes a permanent record, and is big enough so it can be permanently filed. It is the original record of the material as it was received, and is made so as to be carried in the hip pocket so that the man who checks and puts away the freight has both hands free. A loose check is constantly being mislaid, with the result that the receiving books are usually nothing more than abstracts from memorandum slips, and the like, and are not reliable. In this book are first entered: Date, car number, initial, waybill number, details—thus: 1 bundle, 1 box, 1 package.

The boxes, packages, etc., are then unpacked and laid out in the section. If there is a packing list with it, it is compared first with the copy of the order, and then with the material. If there is not it is compared with the order, the identification marks, order number, etc., usually appearing on the box or on the package. If there is a discrepancy, it is called to the attention of the store foreman to witness the inspection and check. He then enumerates the material in detail after having verified it as above, gives its exact condition, if it appears in bad order the apparent causes, and is the man on the ground who actually knows what is received. He has to aid him in this check: First, his stock book; second, copy of the requisition; third, copy of the order; fourth, the check list, if there is one in the package.

The material is then put away in its proper place, and the book is called for daily by the freight received record clerk, where it is entered up in detail against the requisition, from which the purchase bills and freight bills are checked. The men carry two books, one for the odd and one for the even days, so that they always have their freight received book with them, and at the same time the office is not delayed in keeping up their record of freight received. This is always done daily. In receiving freight in storehouses, the most important detail is to have it carefully inspected, checked, marked and put

away, so that it can be located instantly for delivery or shipment. The importance or this will be shown later.

Inspection.

The inspection of material by storekeepers is a feature which has never been appreciated or understood. It is the most practical and useful inspection there is. A great deal of material is bought in accordance with specifications, and most large railroads have an inspection bureau in charge of an engineer of tests, whose duty it is to see that the material conforms to the specifications. Usually this inspection is made at the mills or factories where the material is made, so as to save the expense of freight to point of delivery. Where it is all subject to inspection at point of receipt, the order so specifies and the storekeeper makes request on the engineer of tests to have the material inspected, receives his certificate and files it with the duplicate purchase bill. When material is inspected at factories or mills, the inspector's certificate is attached to the original purchase bill, and reaches the storekeeper through the regular channel in the same way. This is only one inspection and applies to but a small portion of the material used by a railway.

The other inspection is necessarily made by the storekeeper, and an organization so systematized that there is a specialist in charge of each class of material, a man who knows the actual use to which it is applied, and is in touch with its use every day and with the men who use it on the ground, is the man to inspect this material. Upon him we must depend, not only for the company's getting the weight and quantity it is charged with, but also for its getting an article which is best suited for the purpose for which it is used. He has not only his knowledge of the use of the material, and similar kinds on his shelves, but in many instances he is provided with samples with which to compare, and it is remarkable the things which are discovered every day in a well organized general store on a railway where practical inspection is carried out to its full usefulness.

With our large railways buying enormous quantities of material, practically on the basis of price, the company must protect its purchasing agent by inspection. The buyer is not in position to know what the article is that he is purchasing. He must depend as much on the storekeeper for seeing that he gets what he intends to buy as that he gets the quantity and weight bought, and this work can only be done by the storekeeper.

Thus we have a man who actually orders the material, receives it, inspects it, puts it away on the shelves, and delivers it or puts it up for shipment with his own hands.

Direct Shipments.

A great deal has been said on this subject. It offers a favorite criticism from those who are not familiar with the details of the supply department. Like many other so-called economics, at first blush it would appear to be more economical to have material shipped directly to the work from the manufacturers, mills, etc., and naturally jobbers and other business houses encourage this among railway officers and purchasing agents. Their claim is that it saves the company carrying the stock, saves handling, back-hauls, etc. All of these claims are more or less fictitious and unsound.

First and most important, it is absolutely impossible to check and inspect material that goes directly, any statement to the contrary notwithstanding. Of course, it may have been inspected at the mill by our inspectors, but in more cases it has not, or it may be changed after it was inspected. So far as the check is concerned, the men that get the material out on the road for the work are interested only in their work, and not in a careful inspection and check of what they get. The chances are they do not check it until weeks afterwards, until they get the bill, and by that time it is used up, or gone somewhere else.

Secondly, there is no necessity for carrying the material in stock just because it is passed through the storehouse. In fact it should not be done. If it is special material, that is, material that is not ordinarily carried in stock, or more of it than is ordinarily carried in stock, and is ordered only for some particular work, it goes through the storehouse, is inspected, checked and forwarded to its destination. Nine times out of ten, if less than a carload, it can be put in with other material going the same direction and make a carload; or, if it is a carload, it can be rebilled to destination, so that there is no unnecessary car haulage.

So far as saving back-haul is concerned, it is another so-called economy that is greatly exaggerated. There is hardly ever a train that has not empty cars in it.

Of course, it is not intended that this plan should be followed out entirely. It would be ridiculous to do that. Lumber, bridge material, steel bridges, large shipments of all kinds and nature will, of course, be inspected at point of shipment, loaded and shipped directly to the work. I am speaking of the general run of stock or special materials that are used on a railway. Generally speaking, it should all pass through the storehouse, where it can be properly inspected and checked by an organization trained and paid for that work.

Unloading of Cars.

Probably no more important work falls upon a thorough supply organization than the prompt and economical release of equipment. Car unloading has been shamefully handled on our railways in the past for many reasons:

First—Imperfect and uncertain switching service.

Second—Lack of necessary help to do the work.

Third—Lack of the proper organization to see that it is done.

Switching must be done as promptly and as accurately for the company as for the individual, and the storekeeper must be in position to demand proper switching service.

The system of having laborers in other departments unload cars is wrong and should not be permitted, except at points where there is not sufficient work to keep the necessary number of men busy all the time handling company material. At all other points storekeepers should have sufficient men to promptly unload and release the cars. His organization must be such that he may know the exact time every car is received in the yard, arrange to get the waybills, have the car spotted at its proper place and track, men ready to release the car, and have it promptly reported as an empty, or assigned for reloading.

A daily record of this kind will work wonders in releasing equipment, and will save enormous sums of money by making equipment available when it is needed. There is no excuse for company material remaining under load longer than twenty-four hours, under any well organized supply system.

FILLING REQUISITIONS AND PRICING.

We have now received our stock and are ready to fill requisitions; or, in other words, we have arrived at the point where we are in shape to carry out the real purpose of the entire organization.

The handling of requisitions has been explained in considerable detail in previous chapters, but for the benefit of the men actually doing this work, it will be proper to more carefully review this important feature.

To start with, we must assume that the organization has been perfected to an extent whereby requisitions will come to the section storekeepers accurately prepared, but if they do not the section storekeepers by means of their organization, that is, their stock books with everything technically described and numbered, are in a position to correct them, and they should do so at once. The requisitions are laid out in each section for filling, and the material packed and plainly marked, giving reference to the requisition number and date, and laid out together with the requisition in the aisles ready for the shipping crews to pick up when the cars are placed for loading. A bulletin is issued each day in the larger stores, showing cars that will be loaded, and where they are spotted. Placards are also put on the cars to prevent mistakes.

The shipping crews pass through the different aisles, the foreman takes the requisitions and checks the material against them, they are loaded into the car in proper station order, the car number entered on the requisition, and the bills delivered to the agent. In the larger stores, the storekeeper is also the agent. At the smaller stores, a shipping notice is prepared and delivered to the agent, from which the billing is prepared.

It is the further duty of the store foreman to see that these cars actually get out of the yard, and report every morning to the storekeeper any cars which are not pulled out. This for the reason that it must be borne in mind that the storekeeper is responsible for seeing that the material is actually delivered where it is wanted, and it serves no good purpose for him to have a receipt for the billing, it is his business to see that it gets there.

The requisition, together with the waybill number and date, and car number, is then delivered to the requisition clerk in the storekeeper's office, who enters the date it was shipped, checks it off, and turns it over to the invoice clerk, who prepares a shipping notice or manifest and invoice at one writing. One copy goes to the consignee, another copy to the maker of the requisition, and the third copy is the invoice, which is afterward priced, extended, and goes to the department having charge of the accounts, usually the division superintendent. The first two copies are identical with the invoice, and made at the same writing, and are, therefore, an invoice in every respect, except price and extension, which cannot be made until later, owing to a good deal of material being made or repaired in the shops, the prices for which are not worked up until the end of the month, or for other reasons.

The purpose of this is to place in the hands of both the maker of the requisition and the consignee a bill for the material before the material arrives. At the larger stores this work is done at night, that is, where there is sufficient to do to keep one man busy it is best to have it done at night so that in all cases these advices will be in the hands of the men who receive the material before the material can get there.

The original requisition is then filed numerically by divisions, and shows, on its face, car number and date of shipment, waybill number and date, invoice number and date, and forms the original record, from which all information is given. Anyone inquiring about this requisition only has to give the number, when every detail regarding its handling is apparent on its face.

Any back orders, that is, items which are not on hand, or were not ready for shipment at that time, are abstracted therefrom, and will, when filled, pass through the same channel and be attached to the original, so that there are two places the requisition may be found, either on file in the storekeeper's office, arranged numerically under its proper division, or in the section storekeeper's station in its proper division.

The most important feature to bear in mind in the handling of requisitions is promptness. This cannot be too earnestly impressed on all concerned. The great fault of our storekeepers is the useless routine and delay in handling their requisitions.

Pricing.

There is no more important work than pricing, and it is something which has never been given the attention it should have been. Prices must, of course, be accurate, but they must also be in shape so they can be gotten at. There is more guessing done on account of prices being hard to obtain than for any other one reason. Another cause of erroneous pricing, and often ridiculous pricing, is that the price clerk is not able to identify the description on the requisition with the description in his price book, and the system which has been outlined has had this point always in view. For this reason the stock books are all written up at one time, which insures the same description appearing at every point on the system. Requisitions and shop tickets are checked against the stock books and the proper descriptions inscribed thereon. Requisitions for material are made up from the stock books, so that the same description appears on the requisitions. The purchase bills are checked against the requisitions, and the descriptions on the purchase bills changed to agree with the descriptions on the requisitions, so that the duplicate purchase bill in the storekeeper's office, from which the prices are taken, bears exactly the same description as that on the requisition and shop tickets. Besides the price books are revised every year in the same way as the stock books, further insuring the same descriptions appearing in every transaction. Therefore, when the price clerk gets his requisitions and shop tickets, he has the correct description before him, and can identify it instantly with its correct price.

The most satisfactory price book is loose leaf, plain book without any printing on it. It is ruled up in such a way that it will show only the year and the requisition number, thus:

1909. 444.

Item 1—Adzes, R. R., 5 inches wide .....doz. $5.50

meaning that this price obtained for requisition 444. The reason for putting in the year is that we change the numbers of our requisitions yearly, commencing with 1, and the reason for putting in the number of the requisition is that by turning to this requisition you can locate the entire transaction, e. g.,

Number and date of requisition,
Description of material ordered,
Date it was received,
How it was received,
From whom it was received,
Point of delivery,
Actual cost, including freight,

and this entry can be made, in the smallest possible space, with the least number of marks of the pen. Giving the consignee's name and address, and all that sort of thing, only makes your price book bulky and destroys its usefulness.

The reason why I prefer loose leaf price books to cards is that they are more permanent, and not so likely to get mislaid and lost as cards, and for the further reason that six or seven price books can be written up at the same time with carbons on the typewriter on good bond paper, thus insuring the same description in each one, and the location of the item in the same place.

Store orders are handled in exactly the same way. The prices are simply taken from the store orders, and reference given to the store order number, indicated by "S. O."

The same persons should do all the pricing. They should make a business of doing pricing and nothing else. In this way they become accurate and quick. No set rules regarding changing of prices can be carried out, good judgment simply must be used. The most satisfactory plan, I believe is to have yearly prices, that is, to make up the prices once a year and maintain these prices during the year with certain exceptions, the loss or profit owing to fluctuation in prices being applied to the proper accounts at the end of the year by the auditor. In this way every division is treated the same, with result that the operating expenses are not influenced in any way by different prices on different divisions or districts. After all figures are only of use for comparative purposes.

This, of course, simplifies the price book very much, it only being necessary to write up the price book once a year, as explained above, the prices remaining the same for everything on hand at that time during the year.

The next installment will take up assembling, marking, loading, manufacturing, repair work, shop deliveries and accounting.

(*To be continued.*)

The minister of public works of Argentina has approved the plans, specifications, and description presented by the Santa Fe Railway Company for the construction of a branch line starting at Reconquista and extending northward for a distance of 25 miles.

MIKADO LOCOMOTIVE FOR BURNING LIGNITE; OREGON RAILROAD & NAVIGATION COMPANY.

The railways in the Northwest, near Puget Sound and Portland, Ore., are at such a distance from a good coal supply that some of them are arranging to use oil from Bakersfield, Cal., a distance of 1,086 miles from Portland. The Oregon Railroad & Navigation Company (now the Oregon-Washington Railroad & Navigation Company) has used oil on some locomotives but it now uses Cumberland coal from Kemmerer, Wyo., 40 miles west of Granger, Wyo., and 904 miles from Portland. There are lignite mines at Centralia, Wash., on the line of the Oregon-Washington, 96 miles north of Portland. To test this lignite in locomotive service the Oregon Railroad & Navigation Company had the simple Mikado type locomotive, which is here illustrated, built by the Baldwin Locomotive Works. It was especially designed for burning lignite coal. The cylinders are 23¾ in. x 30 in., the driving wheels 57 in., and the weight on drivers is 204,450 lbs. The principal features of the locomotive which are intended to adapt it for the use of lignite fuel are the large boiler, the large firebox, a brick arch supported on tubes, and a long smokebox extending 66 in. in front of the exhaust nozzle, with a total length of 100 in. The boiler is 82 in. in diameter, with 495 two-inch tubes 20 ft. 6 in. long, providing a tube heating surface of 5,292 sq. ft., the firebox is 7 ft. wide and 10 ft. long, giving a grate area of 70 sq. ft. The draft rigging and spark arrester are shown in the detail drawing. A large area of netting, 7 x 7 mesh, No. 17 wire, is provided, which is fixed horizontally on the center line of the smokebox and is more than 7 ft. square, the exact size being 85 in. x 85 in. There is also a netting basket down to the exhaust nozzle, a vertical netting at the upper part of the front half of the smokebox, and a baffle plate of the usual design and proportions. The principal dimensions and data of the locomotive are given on the accompanying table:

General Data.

Type	2-8-2
Service	Freight
Fuel	Lignite
Tractive effort	45,500 lbs.
Weight in working order	263,100 lbs.
Weight on drivers	204,450 lbs.
Weight of engine and tender in working order	425,000 lbs.
Wheel base, driving	16 ft.
Wheel base, total	34 ft. 8 in.
Wheel base, engine and tender	64 ft. 7 in.

Ratios.

Total weight ÷ tractive effort	5.78
Weight on drivers ÷ tractive effort	4.50
Tractive effort × diameter drivers ÷ heating surface	466.00
Total heating surface ÷ grate area	79.50
Firebox heating surface ÷ total heating surface, per cent.	4.23
Weight on drivers ÷ total heating surface	36.80
Total weight ÷ total heating surface	47.30
Volume both cylinders, cu. ft.	15.40
Total heating surface ÷ vol. cylinders	361.00
Grate area ÷ vol. cylinders	4.55

Cylinders.

Kind	Simple
Diameter	23¾ in.
Stroke	30 in.

Valves.

Kind	Bal.-Piston

Wheels.

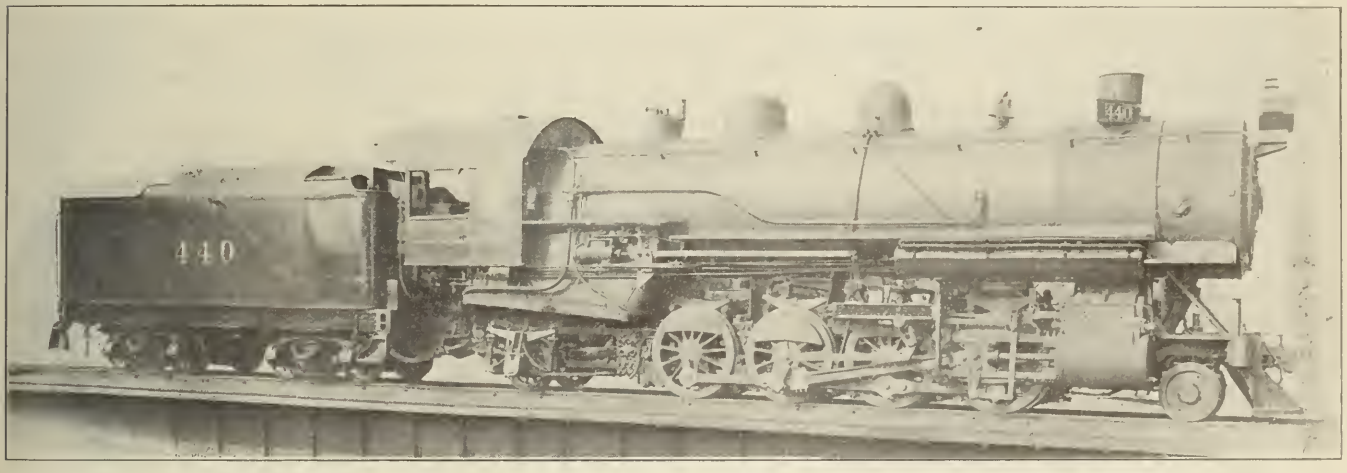
Driving, diameter over tire	57 in.
Driving journals, main, diameter and length	10¼ in. x 12 in.
Driving journals, others, diameter and length	9 in. x 12 in.
Engine truck, diameter	30½ in.
Engine truck, journals	6 in. x 10 in.
Trailing truck, diameter	36 in.
Trailing truck, journals	8 in. x 14 in.

Boiler.

Style	Straight
Working pressure	180 lbs.
Outside diameter of first ring	82 in.
Firebox, width and length	84 in. x 120 in.
Firebox, tube sheet, thickness	½ in.
Firebox water space	5 in.
Tubes, number and diameter	495—2 in.
Tubes, length	20 ft. 6 in.
Heating surface, tubes and firebox	5,527 sq. ft.
Heating surface, firebox	235 sq. ft.
Heating surface, firebrick tubes	32 sq. ft.
Heating surface, total	5,559 sq. ft.
Grate area	70 sq. ft.

Tender.

Tank, style	Water bottom
Journals	6 in. x 11 in.
Water capacity	9,000 gals.
Coal capacity	10 tons

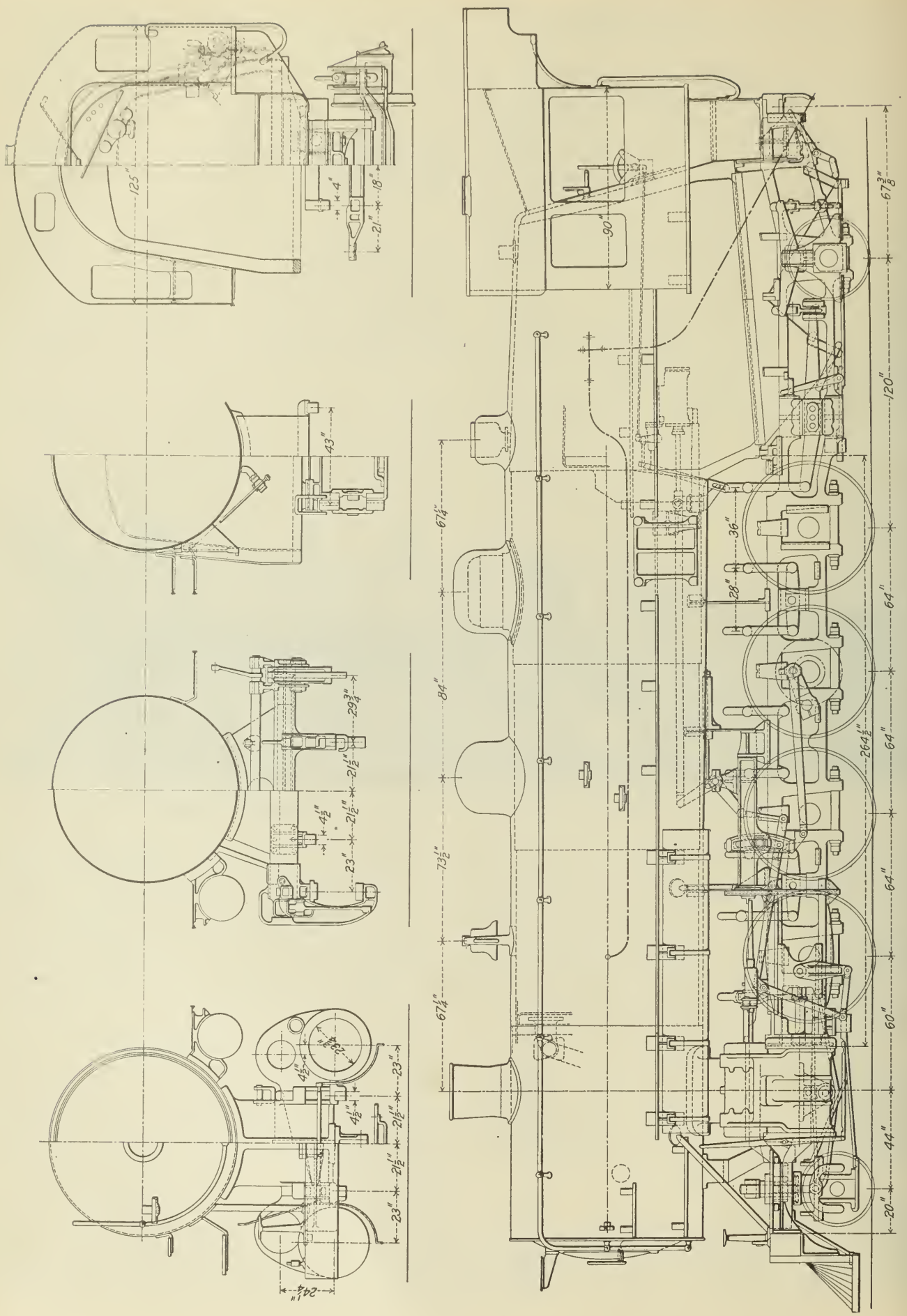


Mikado Lignite Burning Locomotive; Oregon Railroad & Navigation Company.

The freight locomotives used on the Oregon Railroad & Navigation Company are the standard consolidation type of the Harriman Lines, and their principal dimensions are: Cylinders 22 in. x 30 in.; drivers 57 in.; boiler 80 in. diameter; tubes 15 ft. long; tube heating surface 3,236 sq. ft.; firebox 66 in. x 108 in.; grate area 49.5 sq. ft.; and weight on drivers 187,000 lbs. The advantage of the Mikado type over the consolidation is that the large firebox is entirely back of the drivers and has a depth in front of 87¼ in. as compared with 74 in.; the tubes are 20 ft. 6 in. long as compared with 15 ft.; the smokebox is 100 in. long as compared with 74 in. The Mikado also has a fire-brick arch which is not provided in the consolidation engine.

SERVICE TESTS OF LIGNITE AND CUMBERLAND COALS.

From September 25 to October 7, 1910, tests were made by the Oregon Railroad & Navigation Company with the Mikado engine No. 440 burning Hannaford creek lignite from Centralia, Wash., and with the consolidation engine No. 379 burning Cumberland coal from Kemmerer, Wyo. The Cumberland coal has a heat value of about 10,000 B. T. U. per lb., and the lignite 8,900 B. T. U. per lb. The tests were made under the direction of F. W. Mahl, assistant to the director of maintenance and operation of the Union Pacific and Southern Pacific systems. The line selected for the test was that running east from Portland between Albina, Ore., and the Dalles, 88 miles in length. It is comparatively level with a few grades 26 ft. to the mile and a maximum of 53



Mikado Locomotive for Burning Lignite; Oregon Railroad & Navigation Company.

ft. to the mile 4½ miles east of East Portland, where a pusher engine was used with all test trains.

The figures shown are the average of three round trips with each locomotive under ordinary service and operating conditions, the coal and water having been carefully weighed and measured. A number of special observations were made to determine the amount of live sparks discharged from the stack. The consolidation engine burning Cumberland coal threw more live sparks than the Mikado. They were larger and not entirely consumed on reaching the ground, while those from the lignite coal were quickly burned out. In addition to its demonstration of the possibility of burning lignite on large locomotives without danger of fire risk, the tests show that the cost of lignite for a given service is about 17 per cent. less than for Cumberland coal. The cost of fuel per 1,000 ton-miles is 28.137 cents for the consolidation engine and 23.305 cents for the Mikado. These figures do not include the cost of hauling the fuel, which if taken into account, would be of further advantage to the lignite, as it requires a haul of only 96 miles to Portland, while the Cumberland coal is mined at a distance of 904 miles from that place. The results of the tests are given in detail in the table below:

Number of locomotive	440	379
Type of locomotive	*Mikado*	*Consolidation*
Total time on road between terminals	15 h. 32 m.	16 h. 59 m.
Time lost standing	4 h. 46 m.	5 h. 29 m.
Actual running time	10 h. 46 m.	11 h. 30 m.
Average running speed, deducting stops, m. p h.	16.4	15.3
Number of stops made	19.33	16.66
Pounds of water evaporated	294,808	282,270
Pounds of coal burned on road	62,427	53,067
Apparent evaporation, pounds of water per pound of coal	4.73	5.32
Evaporation from and at 212 deg., pounds of water per pound of coal	5.77	6.48
Distance run—miles	176.6	176.6
Number of loaded cars in train	87.66	87.
Number of empty cars in train	6.	2.33
Total number of cars in train	93.66	89.33
Weight of train in tons	4,444	4,013
Ton-mileage	392,405	354,857
Pounds of coal per 1,000 ton miles	159.08	149.665
Cost of coal per 1,000 ton miles in cents	23.305	28.137

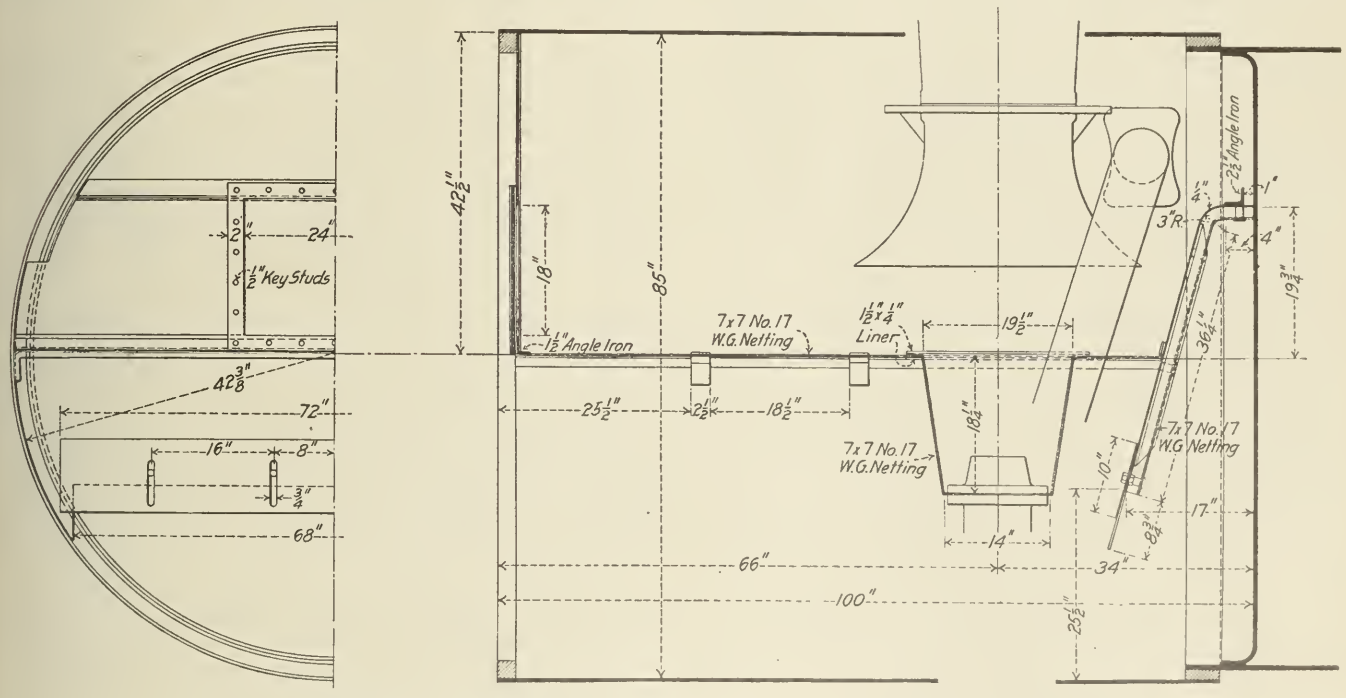
The Mikado locomotive gave such satisfaction that future new freight equipment will be made similar to it.

A consular report says that immigration into Paraguay is small, but growing confidence, together with the opening up of a fine section of the country adjacent to Argentina, by railway communication, affords an encouraging outlook.

BLOCK SIGNAL AND TRAIN CONTROL BOARD.

The principal features of the third annual report of the Block Signal and Train Control Board of the Interstate Commerce Commission, were noticed in the *Railway Age Gazette* of January 20, page 117. Below we give that part of the report dealing with automatic air-brake hose connections and additional information concerning automatic train stops.

Connectors.—Two automatic hose connectors have been held to possess merit. Automatic hose connectors are now used regularly, but only to a limited extent, and their use still seems to be regarded as experimental. One of the main reasons for failure of the railroads to adopt hose connectors, so far as the board can determine, seems to be the failure of manufacturers and designers of connectors to agree upon the specific form of connector contour that will fulfill the requirements of the situation. As was indicated by Mr. Willis C. Squire, in a comprehensive paper on the subject of automatic connectors for freight and passenger train cars, which was read before the Western Railway Club on September 20, 1910, the conditions of operation that have to be met in the use of an automatic connector can best be obtained by a combination of the most practicable features and methods of support, contact, and registration now embodied in several of the types of connectors that have been in service for some time past. Mr. Squire states as his opinion that—



Smokebox Arrangement of Mikado Locomotive for Burning Lignite.

"This combination is possible, is desirable, and will be accomplished when the connector manufacturers finally get together to decide upon standard form and features for manufacturing automatic connectors for freight train and passenger train service. When this condition of affairs is an accomplished fact, refinements of designs and elimination of unnecessary parts and the simplification of the entire mechanical problem will be possible."

In response to a request from the board, the Long Island Railroad Company has furnished the following information:

"As far as this company is concerned, the history of automatic hose connectors is as follows: In November, 1902, 4 engines and 20 cars were equipped experimentally with the Westinghouse automatic air and steam couplers. These were of the side-port type, the couplers being held together by long bent springs at the side.

"In the fall of 1903 all passenger locomotives and passenger cars were equipped with this automatic coupler. From the beginning a great deal of difficulty was experienced in keeping the couplers tight. It was found very hard to locate the hose terminals properly and to get a length of hose which, if moved in one direction, would not kink or would not be pulled in two when moved in the opposite direction. The spring arms holding the coupler heads were found very difficult to keep at the proper tension, and screw jacks were provided to set these springs down occasionally. It was found that the gaskets became displaced and had to be replaced with considerable frequency. This is a very annoying feature, because, when trains were found in the train sheds with the gaskets leaking, they had to be cut in two to replace the same on account of the construction of the coupler.

"It was desired to increase the train-line pressure from 70 to 110 pounds on our passenger trains about 1908, on account of the introduction of the high-speed brake. It was found utterly impossible to do this with the original style of automatic connector, as the springs would not hold the pressure. The Westinghouse Automatic Air and Steam Coupler Company then redesigned their connector so as to permit the use of a coil spring which was adjustable, so that a constant tension could be maintained. Therefore, in May, 1909, a complete new outfit of automatic connectors was purchased and installed on all of our passenger equipment. This resulted in greatly decreasing the trouble from leakage, but it was then developed that the automatic connectors damaged the hose somewhat when cars curved and a large increase was found in the number of burst hose.

"At the present time the latest type of automatic heads are running on our passenger-train cars and locomotives with reasonable success. We find, however, that the leakage is much greater than with hand couplers and are of the opinion that there is no saving whatever in the cost of the hose. We are also doubtful as to whether the time saved by automatic connectors justifies their expense in view of the fact that serious delays occur whenever it is necessary to change a gasket after a train is made up.

"We consider the use of these connectors still in the experimental stage and are not fully prepared to recommend them for general use."

The Chicago & Alton advises the board that two of its trains were equipped with automatic connectors some years ago, but that considerable trouble has been experienced on account of leakage, and the company is not contemplating any additional equipment.

The mechanical officers of the New York Central lines report that they have tested a number of different designs of connectors, but that as yet none has been found that will operate successfully under heavy traffic conditions.

AUTOMATIC STOPS—PLANS PRESENTED.

(1) Charles E. Duffie, Omaha, Nebr. Approved for test February 22, 1908. This is a cab signal and train stop making use of intermittent contact rails. It will be tried on the Union Pacific about 40 miles west of Omaha on the main line.

(2) A. L. Bower, Boyertown, Pa. Approved for test July 20, 1908. This is a cab signal and automatic train stop, requiring short sections of insulated track rails and the insulation either of a truck from the remainder of the locomotive or of the locomotive from the tender. The installation has not been completed, and the board is not aware of any present activity on the part of the inventor looking toward that end.

(3) G. W. Jayne, Washington, D. C. Plans tentatively approved July 20, 1908. A cab signal and train stop making use of Hertzian waves, a "wireless" system; also another system working by induction.

(4) Perry-Prentice Electric Company, Chicago, Ill. Approved for test July 20, 1908. This is a Hertzian wave or wireless cab signal and automatic stop system. It has been installed on the Chicago Suburban Railroad (electric) and examined by the board. This installation was not considered suitable for a conclusive test. The board has been advised, under date of November 8, 1910, by the Perry-Prentice Company that lack of capital alone has prevented making an installation for test.*

(5) P. J. Simmen, Los Angeles, Cal. Approved for test July 29, 1908. This is a controlled manual block and automatic train stop system employing intermittent contact rails. This system, without automatic stop, was installed and used on the Toronto & York Radial (electric) Railway, and was inspected by members of the board. No installation has as yet been offered in which the automatic stop was used, and the installation on the Toronto & York Radial Railway does not approximate service conditions on steam roads closely enough to warrant the board in conducting a test of that installation. Mr. Simmen advises, in reply to a recent inquiry, that lack of capital has prevented him from providing such an installation as the board would consider satisfactory for test purposes. He estimates that an installation suitable for test by the board would cost from $15,000 to $25,000, because in order to demonstrate the remote control principle which is a prominent feature of his system it would be necessary to equip an entire division of some road. He advises the board that he has been in negotiation with the Pennsylvania Railroad Company for permission to make an installation on its Bedford division about 70 miles in length. These negotiations have not yet been successful for the reason, as Mr. Simmen states, that he and the officers of the road have not been able to come to a satisfactory conclusion on the matter of terms covering the cost, which it is stated will be about $12,600 at a minimum.

(6) Railway Electric Signal Company, New York, N. Y. Approved for test July 29, 1908. This is an automatic stop and cab signal of the intermittent contact rail type employing alternating current.

(7) H. D. Patterson, New York, N. Y. Approved for test October 1, 1908. This is a cab signal and train stop system in which electrical devices located along the roadway act inductively to produce effects upon apparatus located on the train or engine. In reply to an inquiry, Mr. Patterson states that he is now preparing for an installation suitable for examination by the board on one of the elevated lines of New York City. He also states that lack of capital has delayed the work of development.

(8) Rowell-Potter Safety Stop Company, Chicago, Ill. Approved for test October 12, 1908. This is a ground mechanical trip automatic train stop and automatic block system combined. It was tested by the board during the winter and spring of 1908-9, and reported on in the second annual report. The board has no information of any working installation of this system having been made.

(9) H. J. Warthen, Washington, D. C. Approved for test November 2, 1908. This is an intermittent contact rail cab signal and automatic train stop. The device is now being installed on the Buffalo, Rochester & Pittsburg, near Rochester, N. Y., for purposes of test.

(10) A. H. Fox, New York, N. Y. Plans tentatively approved May 27, 1909. This is an automatic train stop of the magnetic or inductive type, depending for its operation on the nonmagnetic property of manganese steel rails. The inventor was encouraged to develop his system further, and now informs the board that he has secured the use of tracks on the Putnam division of the New York Central, and proposes to make an installation for the purpose of testing the operation of his device with a view to securing definite data regarding particular features; and that as soon as these data have been obtained he will be prepared to offer the board an installation for test purposes.

(11) Gray-Thurber Automatic Train Control & Signal Company, Pittsburg, Pa. Approved for test October 21, 1909. This is a cab signal and train stop requiring short sections of insulated track rails, and the insulation either of a truck from the

* This was tried on the Canadian Pacific, Dec. 8, as reported in the *Railway Age Gazette*, Dec. 16, page 1158.

remainder of the locomotive or of the locomotive from the tender. This device is now being installed on the Lake Shore & Michigan Southern, near Cleveland, for purposes of test.

(12) S. H. Harrington, New York, N. Y. Approved for test September 15, 1909. This is an overhead mechanical trip automatic train stop. It was tested by the board on the Erie Railroad during the winter of 1909-10. (See Appendix D for results of test.)

(13) Darwin G. Jones, Atlanta, Ga. Approved for test December 22, 1909. This is an intermittent contact rail cab signal and automatic train stop.

(14) Electrical Automatic Railroad Safety Signal Company, New York, N. Y. Approved for test May 28, 1910. This is called the Lacroix cab signal and automatic stop; it is an intermittent contact rail system. This device was installed and exhibited on the Erie Railroad, near Nutley, N. J., and has been examined by a member of the board. Plans of an installation which is now being made on the Staten Island Rapid Transit Railway have been filed with the board, and it is expected that this installation will be ready for official test during the coming winter.

(15) Ross Engineering Company, Chicago, Ill. Approved for test July 22, 1910. This is a cab signal and automatic stop, requiring short sections of insulated track rails at indication points, and the insulation of one truck from the remainder of the engine or of the locomotive from the tender. The board is not aware of any action yet taken looking toward an installation for test purposes, but is informed by the proprietors that the General Railway Signal Company, of Rochester, N. Y., is developing the Ross apparatus and intends to make an installation to test the merits of the system.

(16) Railway Automatic Safety Appliance Company, Wilmington, Del. Approved for test September 21, 1910. This is a mechanical trip automatic train stop in which the trips are of intermediate height, or about the level of the buffer beam on the locomotive pilot. The board is informed by the proprietors of this device that arrangements have been made with the Pere Marquette to make an installation for official test purposes and that work upon this installation is now in progress; it is expected to be completed, ready for inspection, about the middle of December.

In addition to these purely automatic stop devices, the board has approved for test the following cab signal devices, to which an automatic train stop can be attached, if desired:

(17) E. F. Clement, Philadelphia, Pa. Approved for test February 22, 1908. This is a cab signal system designed to repeat in the engine cab the indications of fixed signals along the roadway, making use of short sections of insulated track rails and a truck insulated from the remainder of the locomotive, or the locomotive insulated from the tender.

(18) Railway Audible Signal Company (Limited), London, England. Approved for test February 5, 1910. This is an audible cab signal requiring short sections of contact rail. The apparatus is electrically operated in connection with fixed signals. In operation, when the signals are clear, the contact rail is charged, causing a proceed indication to be displayed in the cab; when the signals are at stop, the circuit to the contact rail is broken, causing an audible danger indication to be given in the cab. The apparatus is in use on the Great Western Railway of England, and records of its service were given in the board's last annual report, page 22. The company states that it is now negotiating for an installation in this country for purposes of test.

Only two devices have been tested by the Board, the Rowell-Potter and the Harrington. Concerning the Rowell-Potter the board said:

> As regards the system as a whole, the board concludes that if the faults mentioned (in the report) were remedied, and it sees no reason why they should not be substantially overcome, and if the apparatus were well inspected and maintained, the system would be safe and reliable, and its use would tend materially to promote safety of operation on a railroad using it. As to its economy, there is insufficient data to form a conclusion of any real value.

Concerning the Harrington the board said:

> The system, with reasonable inspection and maintenance, would be safe and reliable and its use would tend materially to promote safety of operation on a railroad using it.

PENNSYLVANIA STATE RAILROAD COMMISSION.

The Pennsylvania State Railroad Commission in its annual report to the governor, tells of its activities during the past year under the following heads: Pittsburgh Trolley Situation; Locomotive Boiler Inspection; Philadelphia Trolley Situation; Improved Service on the Philadelphia & Reading; Investigation of Telephone Rates; Accidents; Recommendations. For the inspection of boilers the commission has adopted rules similar to those of New York, recently noticed in the *Railway Age Gazette* (January 20, page 120). The Philadelphia trolley situation is being investigated by Ford, Bacon & Davis, a work which has been going on for several months. A report is expected soon. The passenger service of the Reading was investigated by order of the Senate, and considerable improvement has been accomplished. The commission renews its recommendation for a law to prevent trespassing, the legislature having neglected the recommendations heretofore presented on that subject.

The act creating the commission does not specifically designate what shall be the force and effect of a recommendation by the commission, and it is recommended that this weakness of the law be corrected. The decisions of the commission ought at least to be treated at prima facie sound when brought before a court or other tribunal. All of the recommendations hitherto made by the commission have been complied with except in two cases; one where the Baltimore & Ohio was ordered to change its local passenger fares, and the other where all lines were required to check baggage through for passengers holding adequate transportation, even if in two or more separate tickets. The Pennsylvania refused to comply with this last recommendation. The Baltimore & Ohio, to meet the competition of the Pittsburg & Lake Erie, charges between Pittsburgh and Connellsville, 2 cents a mile; but from stations in this territory to other points on its road it charges 3 cents a mile. This discrimination the commission desired to have corrected.

The commission is having made two new maps of the state: one primarily to show the railways, and the other the trolley lines.

FOREIGN RAILWAY NOTES.

The definite surveys and estimates for the proposed extensions of the Baturite Railway, Brazil, and of the Victoria-Diamantina Railway have recently been approved. The extension of the Baturite Railway will be a little over 18 miles long, from Iguatu to Cedro, while the Victoria-Diamantina will extend 161 miles over the section between Itabira and Matto Dentro and the line to Santa Anna dos Ferros.

A contract has been let for the connection of the West of Minas Railway in Brazil with the Goyaz Railway. Specifications provide for payment on unit basis. Name of contractor may be had on inquiry from the Bureau of Manufactures, Washington, D. C. Plans have been approved to extend the Goyaz Railway 159 miles, from Ipamery to Antas, and another extension from Perdicao to Palestina, to cost $2,100,000.

The Chilean government has outlined extensive public improvements for 1911, covering railway building, harbor improvements, waterworks, sewer systems, etc. The estimates for new work on the 35 railways under construction by the government amount to $10,194,450 United States gold for the year, with $1,080,578 for surveys for new lines, condemning right of way, etc., and $365,000 for new rolling stock to be used on the new lines under construction, to say nothing of the new equipment needed for the old lines.

TRAIN ACCIDENTS IN DECEMBER.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of December, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
2.	Toledo & O. C.	Glouster.	rc.	F. & P.	0	5
5.	A., T. & S. F.	Victorville.	bc.	P. & F.	0	3
6.	N. Y. C.	Ogdensburg.	xc.	P. & F.	0	2
13.	Bessemer & L. E.	Rockdale	rc.	F. & F.	1	2
*21.	Penn.	Chicago.	xc.	P. & F.	1	10
22.	N. Y., N. H.	N. Gro'dale.	rc.	F. & F.	2	1
*22.	Penn. (See derailments.)	Millstone J.	rc.	F. & F.	..	..
†24.	Penn.	Nevada, O.	xc.	P. & P.	6	6
25.	Boston & M.	Somerville.	xc.	P. & F.	1	0
27.	Chic. & Alton	Farber, Mo.	rc.	P. & F.	3	0
27.	Balt. & Ohio	Mercer's, W. Va.	bc.	F. & F.	4	2
27.	Chic. G. W.	Stockton.	bc.	F. & F.	3	0

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	Kil'd.	Inj'd.
2.	Missouri Pac.	Knobnoster.	b. rail.	P.	0	15
3.	Carolina, C. & O.	Clinchport.	acc. obst.	F.	3	3
4.	St. Louis & S. F.	Brookf'd Junc.	ms.	P.	0	5
5.	N. Y., N. H. & H.	Hilliard.	unx.	F.	0	2
9.	Norfolk & W.	Batavia.	exc. speed.	F.	0	2
14.	A., T. & S. F.	Davis, Okl.	b. rail.	P.	1	31
22.	Penn.	Millstone J.	acc. obst.	P.	3	4
24.	Norfolk & Western	Crum, W. Va.	unx.	P.	4	15
27.	N. Y. C.	Weehawken.	d. switch.	F.	1	1
29.	Louisv. & N.	Ben Hur.	unx.	F.	2	0
30.	San Antonio & A. P.	Pettus.	d. switch.	P.	1	6
31.	Texas & Pac.	Mesquite.	b. rail.	P.	0	10

In the collision at Millstone Junction, N. J., about two o'clock on the morning of December 22, three trains were involved. A westbound freight which was at a standstill, waiting for a clear signal into the next block section, was run into at the rear by a following freight, which had been run past one caution and one stop signal. In this collision the flagman of the standing train, who was in the caboose, was killed. A part of the wreck fell across the adjacent main track and was run into by a westbound passenger train which came along about one minute after the collision. The passenger engine was derailed. By the double wreck all four main tracks were blocked for about four hours, and one engineman, one fireman and one flagman were killed.

The collision at Nevada, Ohio, on the 24th, was between eastbound passenger train 48 and westbound passenger train 15. The latter was running on the eastbound track, and when it was struck was within a short distance of the point at which it was to cross back to the westbound track. Two passengers, two baggagemen, the engineman of the eastbound train and a man riding with him to learn the road, were killed. Six passengers and four employees were injured. The eastbound train ran past a caution signal two miles west of the crossover, a red signal one mile distant and two red signals at the tower; and collided with the westbound train 2,000 ft. east of the tower.

The collision at Mercers, W. Va., on the 27th is reported to have been due to a mistake in handling despatcher's orders.

The derailment near Crum, W. Va., on the 24th, occurred at the west end of Tunnel No. 6. Four mail clerks were killed, and eight passengers, two clerks, two express messengers, one news agent and two employees were slightly injured. The cause of the derailment is not known, as the track was badly torn up, but it is thought that something derailed the engine. The mail car struck the west portal of the tunnel, after it had been derailed and was badly damaged, as was also the express car next to it.

An otherwise unimportant derailment in the yard of the Grand Central Terminal of the New York Central in New York City on the 19th ruptured one of the pipes used for supplying cars with Pintsch gas, and the escaping gas, some 20 or 30 minutes after the derailment, having accumulated in an open space beneath a large building—the sub-station of the power system—and becoming ignited, exploded, destroying the building and killing 13 persons.

Of the half dozen electric car accidents reported in the newspapers as occurring in the United States in the month of December, two, one on the 7th and one on the 24th, both occuring in Cincinnati, were reported as being attended with fatal results. On the 7th a car was struck by a train of the Baltimore & Ohio at a crossing and the motorman was fatally injured; and on the 24th a rear collision of street cars resulted in the fatal injury of two persons.

In a butting collision on the Grand Trunk near St. Hyacinthe, P. Q., December 10, between a light engine and a freight, four trainmen were killed. The road at this point is double track, and according to the reports, the collision was caused by the light engine running on the wrong track.

DOUBLE TRACK RAILWAYS IN MINNESOTA.

The railway map of Minnesota, given herewith, is printed for the purpose of showing all sections of railways in the state on which there are two or more main tracks. All of the railways which are shown in heavy lines on the diagram are double-track railways, except the one small piece of three-track lines, as noted.

There are in this state two prominent examples of situations where two companies, each owning a single-track line, have put the lines together, under a single superintendent, to be operated as a double-track railway, namely, the Northern Pacific and the Great Northern, from a point near Minneapolis to East St. Cloud, about 60 miles, and the lines of the Chicago, Milwaukee & St. Paul and the Chicago, Burlington & Quincy for 20 miles south of St. Paul.

The termini of the double-track sections are given in the table below:

MINNESOTA.

	No. Tracks.	No. Miles.
Chicago, Burlington & Quincy.		
Point Douglas-St. Paul (with C., M. & St. P.*)	2	20
Chicago Great Western.		
W. St. Paul-S. St. Paul	2	4
Chicago, Milwaukee & St. Paul.		
River Jct.-Richmond	2	10
Wabasha-Hastings	2	50
St. Paul-Minneapolis	2	10
C., St. P., M. & O.		
St. Paul-Northline, Wis	2	23
Northern Pacific.		
St. Paul-Minneapolis	2	10
St. Paul-White Bear	2	11
W. Duluth Jct.-Duluth	2	6
In Duluth	2	1
In St. Paul	2	2
In Minneapolis	2	9
Staples-Moorhead (including 1.6 miles three-track)	2	107
Great Northern.		
State Line-Brookston	2	33
St. Paul-Sauk Rapids	2	77
Minneapolis-Wayzata	2	14
Duluth & Iron Range.		
Two Harbors-Eveleth	2	73
Duluth, Missabe & Northern.		
Duluth-Wolf	2	68
Sherwood-Hibbing	2	10

* Two single track railways operated as one double-track. In some places the two tracks are a mile or more apart.

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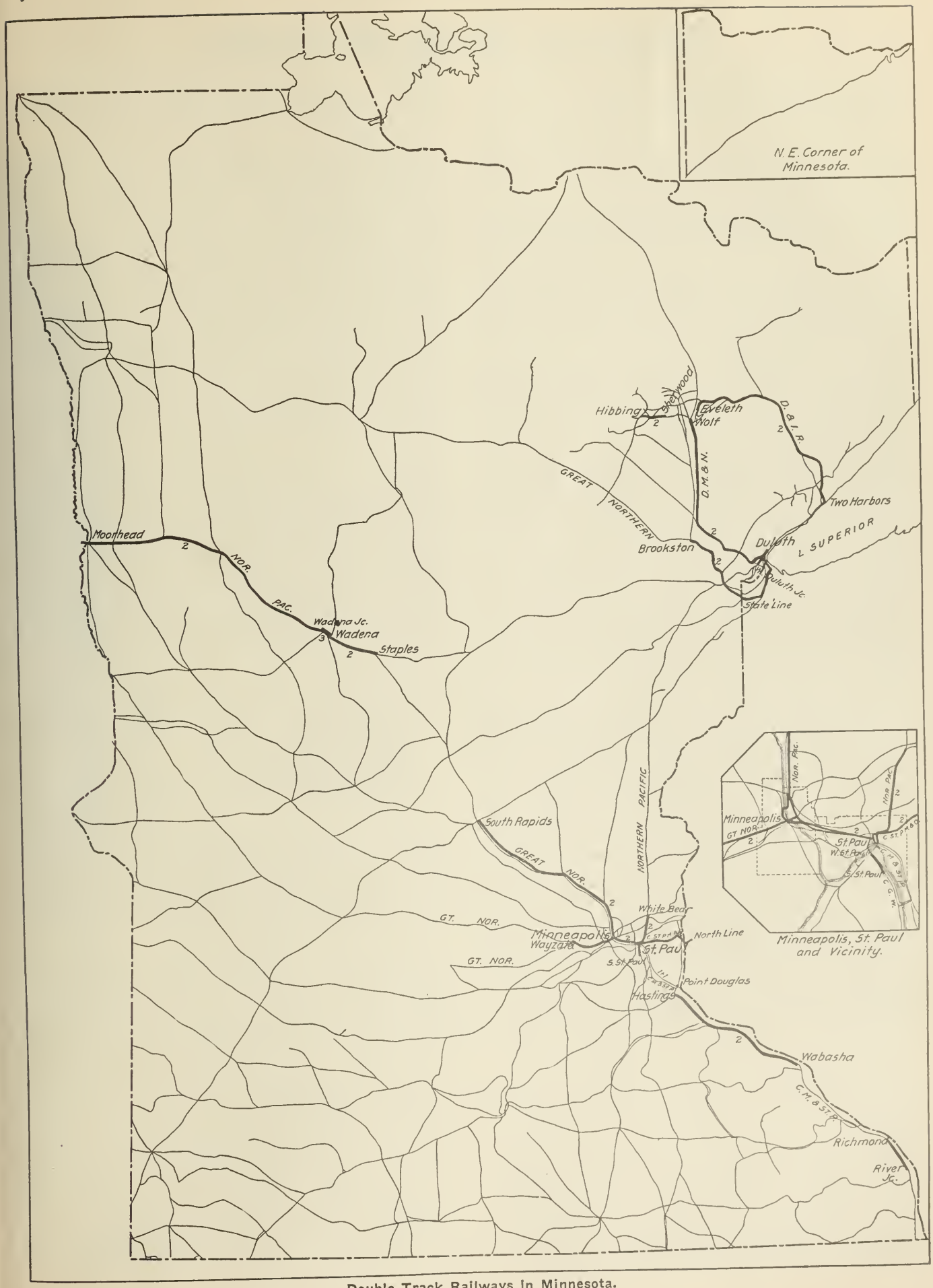
[1] Abbreviations and marks used in Accident List:

rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.



Double Track Railways in Minnesota.

General News Section.

The Boston, Cape Cod & New York Canal Co. has made a mortgage to secure $6,000,000 50-year 5 per cent. notes, under which $1,420,000 bonds are to be issued at once.

The Hartford & New York Transportation Company is to increase its fleet by the addition of two steamers for service between New York and Boston, and one to run between New York and Portland, Me.

The Mayor of Pittsburgh, Pa., has prepared bills which he will present to the Pennsylvania legislature, providing for the establishment of a public utilities commission for Pennsylvania similar to the public service commissions of New York state.

The Cincinnati, Hamilton & Dayton has finished its new yard at Toledo. It has capacity for 3,000 cars, as follows: receiving, 800 cars; classification, 850; holding, 550; storage, 250; outbound, 350; repair, 150; and caboose, 50. The yards have gravity tracks and are about four miles long.

The state of New Jersey has a commission which has been appointed to see about building a ship canal across the state, connecting the Raritan and Delaware rivers. This commission has just organized, with David Baird, of Camden, president, and F. W. Donnelly, of Trenton, secretary.

The Northern Central is preparing to beautify the grounds around its stations throughout the line from Baltimore to Harrisburg this summer. Elaborate schemes of the landscape gardeners are already being carried out at some of the stations. The most extensive work is that at Harrisburg Junction, just across the Susquehanna river from Harrisburg.

Between Mourmelon and Bethany, France, on January 22 a Farman aeroplane was flown 18 miles and back, at good speed, carrying four persons.

From a press despatch dated Berlin, January 23, it appears that experimental flights have been made there with a dirigible balloon 378 ft. long, capable of carrying 50 passengers. This airship, if it proves satisfactory, is to be bought for the use of the German army. It has four motors of 125 h. p. each, and six propellers.

The Pennsylvania Railroad is now running a Good Roads Educational train and proposes to send it all over the state. This will be the first time any eastern railway has run such a train. The Pennsylvania State College, the roads department of the National government and the State Highway Department of Pennsylvania will co-operate. The train consists of four cars, one fitted up with a lantern for the illustrations of the lectures, and another to be used for exhibits showing models of several types of roads, such as earth, sand-clay, gravel, macadam, and telford. Two platform cars will carry samples of road building machinery.

A meeting of a large number of officers and passenger representatives of the Pennsylvania Lines West of Pittsburgh was held in Chicago last week. Its purpose was to discuss plans for increasing business, handling it more economically and establishing better relations between the railways and the public. The meeting was presided over by Samuel Moody, passenger traffic manager of the Pennsylvania Lines West. It was attended also by J. R. Wood, passenger traffic manager of the Pennsylvania Railroad. Besides the passenger officers and representatives, some of the executive officers, including J. J. Turner, second vice-president, and G. L. Peck, general manager, of the Lines West, were present.

A little booklet describing investment securities has been published by N. W. Halsey & Co., New York. Under the title "The Most Satisfactory Bonds," the banking house shows by graphic illustration the comparative trend of the bond market for a period of years of railway, municipal and corporation bonds. Benefits to the investor resulting from the supervision of commissions are analyzed and discussed; and methods employed by banking houses in determining the safety issues which they contemplate purchasing are described. Among these are the analyses of reports to determine whether wages paid and the prices of the commodities sold conform to prevailing standards; the validity and duration of franchises; the character of the community served; the physical condition of the property—whether the equipment is well maintained or has become obsolete; the character and ability of the company's management, and the appraisal of the physical value of the property.

The Lake Shore & Michigan Southern now uses telephones throughout its main lines, Buffalo to Chicago. The circuits are as follows: Buffalo to Erie, 88 miles, 21 telephone stations; Erie to Cleveland, 95 miles, 25 stations; Buffalo to Erie (message circuit), 88 miles, 21 stations; Cleveland to Toledo, Sandusky division, 110 miles, 37 stations; Cleveland to Toledo, Norwalk division, 116 miles, 35 stations; Toledo to Elkhart, Air Line Division, 133 miles, 44 stations; Toledo to Elkhart, Old Line Division, 143 miles, 35 stations; Elkhart to Chicago, 101 miles, 33 stations. A telephone despatching circuit is to be strung from Elkhart to Grand Rapids. The message and train despatching telephone circuits of this road at present form one of the most complete and extended railway telephone equipments now in use. The apparatus consists of Western Electric telephones and selectors, and a few details of the equipment are of the special design of Mr. Ryder, general superintendent of telegraph of the New York Central lines, who is one of the pioneers in the use of the telephone on railways.

Washington to New York in 3 Hours and 55½ Minutes.

A special train of an engine and two cars, which was run to carry J. P. Morgan from Washington to New York over the Pennsylvania Railroad, last Monday, made the trip of 226.8 miles in 3 hours, 55 minutes and 30 seconds, or at the rate of 57.8 miles an hour. This is about 8½ minutes less than the time taken by the special train from Jersey City to Washington over the Central of New Jersey, the Reading and the B. & O. on December 16. The Pennsylvania train stopped at West Philadelphia 4 minutes to change engines, and at Manhattan Transfer 3 minutes to change from steam to electric power. The following is the record as published:

	A. M.	Miles.
Left Washington	11:12	....
Left Bowie	11:31	15.3
	P. M.	
Left Baltimore	12:02	40.0
Left Havre de Grace	12:39	75.0
Left Wilmington	1:12	108.5
Arrived West Philadelphia	1:42	136,3
Left West Philadelphia	1:46	.....
Left Trenton	2:16	168.8
Left Millstone Junction	2:34	192.6
Left Perth Amboy Junction	2:44	205.5
Left Newark	2:53	216.8
Arrived at New York	3:07½	226.8

It will be seen that the speed over the New York division, West Philadelphia to New York, 90.5 miles averaged 67 miles an hour. The time over this division, including the stop for changing engines (81½ minutes) is only 2½ minutes greater than that of a fast run which was made from Philadelphia to Jersey City, March 24, 1902, and the distance to the New York terminal is 2.3 miles more than to the Jersey terminal.

Strike on the Southern Pacific of Mexico.

Forty-eight engineers and 29 firemen, employed on the Southern Pacific of Mexico and the Sonora Railway, and belonging to the Brotherhood of Locomotive Engineers, went on strike on January 17. The strike followed several conferences between E. Corrigan, representing the Brotherhood, and officers of these railways. The employees demanded both increases in wages and recognition of the Brotherhood. The officers refused both demands. Their refusal to recognize the Brotherhood was based mainly on the fact that it is a United States organization which is not recognized by the laws of the Republic of Mexico, and therefore a railway doing business in Mexico could not legally enter into a contract with them. The demands for increases in pay ranged from 36 to 50 per cent. The lines were never completely tied up. Daylight passenger service has been maintained and some freight business has been moved. On January 21, 23 per cent. of the trains of the company were moving. Some of the employees who quit work are Mexicans, but most of them are Americans. It is probable that the places of all will

be filled by Mexicans. It is rather significant of the attitude of the Mexican government that the representatives of the Brotherhood who are conducting the strike, thought it expedient to return to the United States and direct it from this side of the line. The government has entirely refused to recognize the Brotherhood on the National Railways of Mexico.

New York Central and the Proposed B. R. & E.

W. S. Kallman, assistant freight traffic manager of the New York Central Lines, was called to the stand at the opening of the final hearing on the second application for a certificate of convenience and necessity for the proposed Buffalo, Rochester & Eastern between Buffalo and Troy, and gave testimony based on statistics of his road and from other sources. The total tonnage of freight carried by the New York Central to or originating at all points on or parallel with the proposed B. R. & E., and also between those points, amounted to 5,739,769 in 1909. If the new two track line of 300 miles could secure this entire traffic, it would still be nearly 2,500,000 tons short of the 8,000,000 tons which its promoters have testified they must secure in order to pay its operating expenses and interest charges. Careful analysis of these tables showed that the B. R. & E. could not obtain over 500,000 tons of this entire freight traffic, he said, while the most liberal estimates could not allow them over 850,000 tons. These estimates could be quadrupled, the witness believed, without establishing for the proposed road its ability to operate with any profit.

Syracuse and Schenectady freight traffic must be dropped from consideration in these tables, Mr. Kallman said, because the promoters of the proposed road had not declared in their testimony any intention of building branch lines to either of these important cities. North Tonawanda traffic also could not be claimed by the B. R. & E., because it would have no direct track connection with any railway at East Buffalo. At Rochester, Oneida, Utica and Troy only from 10 per cent. to 20 per cent. of the freight business of his road could possibly be secured by the new line, the witness asserted, as the New York Central was now in sharp competition for it with the Pennsylvania, Erie, Lehigh, B. R. & P., Lackawanna, N. Y., O. & W. and the D. & H. at these points. Superior stations, team track facilities and the large number of industries connected by private sidings at all these centers would go to prove this estimate liberal. Practically no part of the east bound freight destined to points on the Boston & Albany could be obtained by the B. R. & E., he pointed out, as the New York Central system lines had been able to secure such traffic in competition with the Erie, Lehigh, Lackawanna, Pennsylvania, Grand Trunk and Canadian Pacific and their western connections via the Boston & Maine and New Haven roads.

Almost none of the 2,614,236 tons received at the Niagara frontier in 1909 from the Lake Shore, Michigan Central and N. Y. C. & St. L. could be secured by the proposed road. Some 2,600 station freight agents and 450 officers and traveling freight agents were constantly soliciting freight business for the Central lines in 29 states throughout this country as well as in Canada. Mr. Kallman did not believe a railway of only 300 miles, with admittedly no eastern or western traffic relations, could get any appreciable amount of the business secured by the New York Central system with its 13,000 miles of track and its half century of established service. At Buffalo, Black Rock, Rochester, Syracuse, Utica, Schenectady and Troy, the Central has public team tracks with a capacity of from 102 to 641 cars, while its private sidings will hold from 522 to 3,335 freight cars at these points.

Assuming that the B. R. & E. had secured the entire tonnage received by the N. Y. C. & H. R. and West Shore from connecting lines at the Niagara frontier in 1909 destined to all points on and parallel with its lines and to New England points, Mr. Kallman testified, it would still lack 1,140,000 tons of the 4,000,000 which it admitted it must get of this class of traffic to operate with any profit. Though the B. R. & E. promoters testified that they must count on at least 1,000,000 tons of local freight each year, he estimated from the traffic records that the new road could not obtain a local tonnage of over 100,000. Less than 400,000 tons of west bound freight was all that the B. R. & E. could expect to receive, even if it deprived the Central of any participation in this class of traffic from the Boston & Maine and New Haven roads, he testified—a figure of 100,000 tons below that which the B. R. & E. witnesses had claimed as necessary to operate that road. In order to fulfil a similar claim by the promoters of the new road that they must get 2,500,000 tons of miscellaneous freight, the B. R. & E. must get all such tonnage away from the Central and an equal amount from other trunk lines to come within 500,000 tons of its figure, witness showed.

Only 17,500 of the tonnage of ex-lake grain traffic forwarded from Buffalo via the Central and West Shore in 1909 could be obtained by the B. R. & E., Mr. Kallman showed by the records. As to the iron ore traffic from the lakes which had been claimed by the new road, he showed that no such freight was carried by the Central lines to any point in this state except Charlotte, which is located so that all such traffic must be unavailable for the B. R. & E.

A. H. Smith, vice-president and general manager of the N. Y. C. & H. R. showed that to pay 5 per cent. interest on the money invested in it, the new road must earn a gross income of not less than $20,000,000 each year. Its gross earnings per mile would have to be from $50,000 to $70,000, or greater than those of 140 of the leading and oldest railways in the country over 200 miles in length. None of these roads had to compete with a parallel line of six tracks, running through substantially the same territory and not over five or six miles from it, he testified —a condition that it would be hard to find anywhere in the country. When compared with these old established roads the large gross earnings required by the proposed B. R. & E. to pay interest charges and operating expenses, he considered, showed the expectations of its promoters to be preposterous from the point of view of a railway expert.

Taking a few of the roads having the largest earning powers, Mr. Smith cited the large percentage of coal and ore carried by them—66.6 per cent. by the D. & H., 65.7 per cent. by the Pennsylvania, 63.9 per cent. by the D. L. & W., 78.1 per cent. by the P. & L. E., 66.6 per cent. by the P. &. R., and 60.4 per cent. by the Lehigh. The B. R. & E. could not carry much, if any, coal, he testified, as it would have no line extending into the coal regions. Over 12,000,000 tons of freight would have to be carried by the new road, in the opinion of the witness, in order to pay expenses. An average tonnage per mile of over 40,000 would thus have to be carried. The futility of such an expectation was shown by the figures for 1909 which showed an average tonnage per mile of 11,380 for the Central, 16,290 for the Erie, 8,910 for the B. & M., 17,240 for the Lehigh, 21,120 for the D. & H., 21,350 for the Lackawanna and 10,500 for the N. Y. O. & W. The capitalization per mile of the new road would have to be between $285,000 and $400,000, the witness testified, which exceeded that of 16 of the best railways in the United States.

General tie-up on the Boston & Albany and Boston & Maine, which backed up freight on the Central line through the inability of the New England roads to take it, was the fundamental cause of the delays in service in 1907. Temporary insufficiency of cars and engines and large improvements in progress along the line he assigned as other reasons. At present the facilities of the B. & A. have been so improved by the Central that it is taking twice as many cars per day as it could in 1907. On January 1, 1910, 2,305 locomotives, 2,453 passenger cars, 65,838 freight cars and 3,670 company service cars were in service on the N. Y. C. & H. R., the witness testified, while improvements and extensions of terminals have helped to make the service given in 1908, 1909 and 1910 high class in every respect, as a matter of general knowledge. At Buffalo there had been no congestion of freight since 1907.

The trackage capacity of the system was at present unlimited, Mr. Smith said, and some of its divisions, such as the Hudson, handle as high as 125 trains per track per day, while the Mohawk and Western divisions are capable of handling more than double the tonnage now handled over them, provided the freight is taken away when delivered. The West Shore can be expected to handle with its two tracks half of what the main line could. Altogether the system could thus handle with its present equipment three times the tonnage it now moves.

The capital which it is proposed to spend on the B. R. & E., in benefiting connections beyond the state in either direction would be far more wisely spent, in his judgment, Mr. Smith testified, by developing lateral and tributary lines to open up more of the valleys and fertile regions of this state, thus helping

in a direct way the people who are asked to create the enterprise. He believed that there were times when a state could afford to be reasonably selfish in such a matter, especially when it had an assured means for reasonably regulating existing properties. As a competitor with the Central in carrying freight from Buffalo to Albany or Troy, he declared the B. R. & E. could never succeed because it would not have the same facilities, the same density, the same experience, nor as favorable location and water level grades.

Railway Securities Commission at Chicago.

The Hadley commission on regulation of railway securities conducted hearings at Chicago this week. The first to appear before it was Henry C. Adams, statistician of the Interstate Commerce Commission. Professor Adams declared that government control over the issuance of stocks and bonds is inextricably bound up with control of rates. Mr. Adams said in part:

"There are three parties interested in the stock and bond transactions of the carriers. The first comprises the stockholders, whose desire is for a high valuation of investment by which returns may be gaged. The second is the railway management, which is interested in maintaining the credit of the road that new capital may be available whenever needed. The third is the public, and the public, which furnishes the capital, has an equity in the railway properties just as much as either of the two others. It should know at all times just what the cash investment in the railways actually is in order that it may be able to determine what its own equity is." He believed that the basis of railway return should be the cost of original construction and of permanent improvements.

Marvin Hughitt, chairman of the Chicago & North Western, said that it is manifest that after a time either the states or the nation will have to yield in the matter of regulation of railways. It is to be hoped that as between the federal power and the state power the corporations will not be subjected to any more embarrassment than they are now laboring under.

"Obviously one authority to create and one to administer and govern would be less hazardous and more convenient, but how far the public advantage would be served by the concentration in the federal authority of all these jurisdictions exercised by the several states I have grave doubts.

"Personally I am much impressed with the necessity of proceeding in this matter with as much freedom from prejudice and haste as is consistent, because the states have rights that they would cling to tenaciously. It would free the corporation managers and directors from a great deal of labor to go to one authority for everything, but to act precipitately in this matter of federal control would be to place the corporation in a perilous situation and cause measureless harm to property values and investments.

"It would also bring to a stop, as I view the matter, all further enlargement of railway facilities until the questions are fought out between the constitutional lawyers and the federal authorities in the courts. All this, of course, is to be avoided. I doubt the advantage to the public to have the federal government go much further than it has gone in the control of the railways. Of all the difficulties that could happen to us nothing could be worse than to be left in the situation where we must obey or attempt to obey two jurisdictions; that would put the corporations in contempt of one or the other."

Mr. Hughitt said that he did not think the railways have ever oppressed the people of the country, either by stock and bond issues or by reason of the rates they have charged, and referred to the heavy reduction in rates that have taken place in the last 40 years. He said that the pioneer age of railways is passed and predicted that no more trunk lines will be built and that future progress in railway construction will be intensive rather than extensive.

F. A. Delano, president of the Wabash, favored federal rather than state regulation of securities if the effect of federal regulation shall be to exclude state regulation. He thought that the limit to which it would be safe to go would be some stiffening up of the law in respect to the responsibility of directors for the issuance of additional capital, and, perhaps, the requirements of a sworn statement as to the funds raised and their disposition. Legislation which would cover general principles is much to be preferred to legislation which attempts to prescribe detail methods. He contended that it would be utterly impracticable to limit the issuance of capital stock at par for money or property of equivalent value. The prices at which securities can be sold depends on credit and credit depends on a multitude of conditions. The older railways no longer have first or second mortgage bonds to sell and most depend on "junior" securities. Some must raise capital by selling stock. No road can sell its stock at par or better unless it has extremely good credit; that is, in addition to earning a dividend it must earn a safe surplus. He defended the practice of issuing new stock at par to stockholders when old stock is selling above par. Whether or not this should be done is a question of judgment and expediency for the directors. He contended that if there was a relation between capitalization and rates it was the opposite of what was generally assumed. Railways differ very greatly in original cost of construction, in cost to replace and in value, and they all have to make the same rates. With respect to the capitalization of betterments, additions and extensions charged in the past to income, but which might be charged to capital, he said that this practice is bad, not so much because it hurts the general public as because it opens the door to trickery on the part of directors and may mislead investors. The law might properly limit any going back and capitalizing of such expenditures for a period of, say, two years previous unless such expenditures are clearly indicated in the accounts as suspense items. With respect to valuation he said that the action of the railways (defending themselves against rate reductions), seeking to show that if the reductions were made their property would be confiscated, is no reason for deciding that their rates should be based on the cost of reproducing the properties. Railway officers oppose valuation not because they think it will show the properties are overcapitalized, but because they do not think it is the proper basis for the regulation of rates.

Efficient Switch Lamps.

That a switch light should be large enough to be very quickly noticed from the most convenient distance, goes without saying; and it is equally well known that many lamps fall very far short of this standard, because of bad adjustment or defective maintenance. To correct faults of this kind the Southern Pacific has lately adopted the following rule:

"It is highly important that switch stands and lamp forks be so adjusted as to properly focus the switch light to give the maximum benefit to approaching trains. Roadmasters must, in their personal monthly inspection of switches, investigate this matter closely and by frequent inspection after dark see that the proper results are secured. Cases of switch lights located on or adjacent to sharp curves where a special focusing of the light may be required to give best results will be each made a subject of special study and roadmasters will receive instructions from division engineer."

The North Western Button.

The committees on safety of the Chicago & Northwestern have been heretofore noticed in the *Railway Age Gazette*. From a statement in the "North Western" (magazine), it appears that the members of these committees when traveling over the road on their inspection trips wear badges, in the shape of buttons, a picture of one of which is shown herewith. The letters on the button are made in gold, and are on a background of green and red enamel. There is now a safety committee on each division of the road, and they make regular tours throughout the lines of the division for the correction of undesirable conditions, where correction is practicable, and for the making of reports on more serious matters.



The Mason Laboratory at Yale.

The Mason Laboratory of Mechanical Engineering, for the Sheffield Scientific School, Yale University, which is now under construction, is to be 85 ft. wide on Hillhouse avenue and will extend 200 ft. back to Temple street, though the full width of the building extends only about two-thirds as far back. This building, with its equipment, will cost $200,000, and is the gift of George G. and William S. Mason, of the class of 1888. They

have also given $50,000 for its endowment. It is to be ready for use next autumn. The building is three stories high above the basement; and the testing machines, steam engines, electric generators and gas engines are to be on the first floor. The lecture room and small laboratories are on the second floor, and the third floor is to be used for research and for a mechanical technology exhibit. This will not be a museum but an exhibition of such modern machines as are of particular interest to students, to be brought to the school, and probably in most cases to be exhibited temporarily.

Twenty-fifth Year of International Railway Congress.

The International Railway Congress Association was established in 1885, and Mr. Weissenbruch, general secretary, prints in the *Bulletin* for January a historical review of its work during the quarter century. At the first session (in Brussels in 1885) the Congress represented 19 governments, 131 railway systems and 31,000 miles; and the number of delegates present was 289. At the eighth session, in Berne, Switzerland, last year, the number of governments represented was 48, railway systems 420, and mileage of railways 359,858; and the number of delegates present was 799. An abstract of the principal topics which have been discussed by Congress and the conclusions thereon fills 100 pages of the *Bulletin*. As to the function and usefulness of the association, Mr. Weissenbruch says:

It has been said in the daily press that the conclusions adopted at the general meetings have too often been general expressions in which the general public would vainly look for definite and precise solutions. These conclusions are necessary for starting the discussions, but they must be drafted in such a way as to make it possible for them to be adopted without too much opposition at the general meetings where the delegates who have specially studied them are relatively few in number. Every step in advance is in its origin the work of a minority; it must raise some doubts in a meeting where the majority has not yet recognized its necessity. But what does it matter? At the same time while the meeting formulates its impersonal opinion, each of the managers or engineers present at the meeting forms or modifies his personal opinion. His attention is drawn to the question. When he reaches home, he studies it again. He is much assisted both by the documents he brings home with him as well as by the relations of friendship or of mutual esteem which he has formed at the periodical meetings of the Congress. It is thus by no means one of the least results of the Congress Association that it forms, for railway men, a stimulus which takes them away from their daily routine. How much useful work may thus result from intelligent and better directed zeal!

Wood Preservers' Association.

The seventh annual meeting of the Wood Preservers' Association, held at the Auditorium Hotel, Chicago, closed January 19. The papers presented at this meeting were abstracted in the *Railway Age Gazette* of last week. At the closing business session the following officers were elected: President, John T. Logan, president of the National Lumber & Creosoting Company, Texarkana, Texas; first vice-president, Andrew Gibson, superintendent of treating plants of the Northern Pacific, Paradise, Mont.; second vice-president, R. J. Calder, secretary-treasurer of the International Creosoting & Construction Company, Galveston, Texas; third vice-president, D. Burkhalter, supervisor of creosoting plants of the Buffalo, Rochester & Pittsburgh, Bradford, Pa.; secretary-treasurer, F. J. Angier, timber treating engineer of the Kettle River Company, Chicago.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

AMERICAN ASSOCIATION OF LOCAL FREIGHT AGENTS' ASSOCIATION.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and Sept.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York; Jan. 27, New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 17, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911; St. Louis, Mo.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, Oct. 9, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday; Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh, Pa.; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 19, Chicago.

INDIANAPOLIS RAILWAY AND MECHANICAL CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21st, 1911, St. Paul, Minn.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; second Wed.

RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month; Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Sat.; annual, May 6, 1911, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Southern Railway has established a branch office of its land and industrial departments at Harrisburg, Pa.

The Baltimore & Ohio last week ran an agricultural educational train over its lines in eastern Ohio, between Wheeling and New Concord, and between Zanesville and Marietta. The lecturing was in charge of Prof. A. B. Graham, of the Ohio State University.

Beginning on February 1 the Burlington will run an express and passenger train from Chicago to St. Paul, Minn., daily in 10 hours and 15 minutes, which is 2 hours and 30 minutes less time than is now taken by any other train on the Burlington. This road, in connection with the Great Northern and the Northern Pacific, will reduce the time of express (parcels) from New York to Seattle, Wash., by 24 hours.

The ten principal express companies, at a conference held in New York last week, agreed to make reductions in the rates for the transportation of shipments of merchandise which have to be carried over the lines of two or more companies; the object being to make the tariffs as simple as they would be if there were but one company doing business throughout all the lines of these ten companies throughout the United States and Canada.

The movement of freight over the Panama Railroad has increased so much that an extension of terminal facilities is needed. In the month of November the westbound movement was 26,513 tons—about one-quarter larger than in the same month of 1909, while the eastbound movement, 22,734 tons, was almost double the movement of the previous year. It is said that the increase is due to improved steamship service from the Isthmus to New York and San Francisco.

The Pennsylvania will run an agricultural instruction train in New Jersey January 31-February 3. Former experiments of this kind in New Jersey have been so successful that the time of the trip is now increased from three days to four, and the train will have an additional car, to contain exhibits to be used by the lecturers for illustrations. There will be with the train eight professors and other representatives of the New Jersey State Agricultural College.

Bates & Chesebrough, who recently established the California-Atlantic Steamship Company, have announced a rate of 40 cents per 100 lbs. on lumber moving from Portland, Ore., to New York, via Panama. The announcement was made in a letter by J. W. Chapman, traffic manager of this company to the Oregon & Washington Manufacturers' Association. He said that the first ship to sail from Portland with a cargo of lumber will leave there on February 15.

The New York State superintendent of public works reports that the canals of the state carried last year 3,073,412 tons of freight, which is slightly less than the total for the preceding year. More than two-thirds of this freight was "way"; the through freight amounting only to 494,208 tons eastward and 310,972 tons westward. During the past season more than 2,000 permits were issued for the use of pleasure craft on the canals, and the superintendent recommends that laws be passed to regulate this traffic. With the enlarged canal it will be necessary, or at least, very desirable, to have charts of the canal system, for a large part of the new canal will consist of open lock and river navigation where the channel will be tortuous and of varying width and depth.

Local Tickets on the B. & A.

The letter printed in our issue of January 13, page 74, in which it was said that local tickets on the Boston & Albany are not accepted in a direction opposite to that which appears from a reading of the ticket, has brought out an answer from an officer of the road which says that while this rule was in effect for a few months, the acceptance of local first class tickets in either direction has been universal throughout the company's lines since July 15 last.

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

Barr Chemical Works v. Philadelphia & Reading et al. Opinion by Chairman Clements:

1. The fifth class import rate of 27 cents per 100 lbs. applied to the shipment of glue stock from Boston to Chicago found unreasonable to the extent that it exceeded the sixth class domestic rate of 24 cents per 100 lbs. The rate on this article should not exceed for the future the rate simultaneously in effect on "fleshings, tanner's or slaughter-house offal, and wet hide trimmings, carload," between the same points. Reparation awarded. (20 I. C. C. 77.)

Further Class Rate Suspensions.

Recently the commission directed the suspension until March 1 of certain class rates from New Orleans to points in Mississippi, Helena, Arkansas and Memphis, Tenn., filed by the Yazoo & Mississippi Valley and the Illinois Central. An order has been issued further suspending them until September 1.

Minimum Car Load Rule.

William K. Noble v. Baltimore & Ohio Railroad Company, et al. Opinion by Commissioner Prouty:

Tariff of defendants should have provided that when a car of the capacity ordered by the shipper could not be promptly furnished and a car of a different capacity was furnished, such car might be used upon the basis of the minimum fixed for the car which was ordered. Such a rule should be established by defendants for the future. Reparation awarded because of failure of defendants to establish and apply the above rule. (20 I. C. C. 72).

The Commission Will Bring Indictments for Unlawful Overcharge.

National Refrigerator & Butcher Supply Company v. Illinois Central Railroad Company et al. Opinion by Commissioner Lane:

On March 20, 1908, the complainant shipped one box of hardware, weighing 220 pounds, from Cleveland, Ohio, to Memphis, Tenn., over the lines of the Baltimore & Ohio, the Baltimore & Ohio Southwestern, and the Illinois Central railways, upon which there was charged and collected the amount of $2.44, based upon a rate of $1.09 per 100 pounds. But the lawfully published rate, as admitted by the defendants, was 70 cents per 100 lbs., and reparation is awarded in the amount of 88 cents, with interest thereon from March 20, 1908.

Complaints of the character herein considered should never be brought before this commission. There should be no necessity for appealing to governmental authority to award damages for plain overcharges. It is the plain duty of the carriers to collect no more than the published rate; to do otherwise is a crime for which indictment will lie and for which there is serious punishment provided in the law against both the carrier and its agent. When there is a contest between the shipper and carrier as to the lawful rate applicable, arising out of an obscure tariff, there may properly be appeal to this commission to give construction to the schedules. But there is but one count of such character involved herein. The others are based upon admitted deviations from the tariff rates. If by inadvertence the wrong rate had been applied, the carrier should have hastened, upon the application of the shipper, to remedy its mistake, and this no more for its own protection against prosecution under the law than out of a desire to do justice to its patrons. It is not too strong a statement of the fact to say that certain carriers seem at times willfully bent upon withholding for as long a period as may possible moneys to which they are not entitled. The commission has a mass of correspondence carrying such complaints. The law expressly makes it illegal for a carrier to exact more than the lawful rate, and the commission will regard it as its duty henceforward to enforce this provision by indictment in cases where the carrier appears willfully to have required payment of an illegal amount or refuses to make restitution immediately on its attention being called to its improper and unlawful action. (20 I. C. C., 64).

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1910. (SEE ALSO ISSUES JANUARY 13 AND 20.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,546*	$5,624,893	$1,885,624	$8,102,900	$1,191,322	$1,192,573	$142,369	$2,255,221	$168,074	$4,949,559	$3,153,341	.....	$197,712	$2,955,629	$266,278
Central New England	277	237,837	24,969	276,752	58,195	22,942	2,643	68,834	2,978	155,592	121,160	.....	9,000	112,160	—23,985
Chicago & Alton	1,025†	864,463	322,718	1,275,040	223,596	264,236	38,270	490,250	34,814	1,051,175	223,865	—$2,877	35,000	185,988	—243,542
Chicago & Erie	269	314,087	70,192	423,514	51,180	87,576	18,096	195,321	9,886	362,059	61,455	.....	11,387	50,068	—46,894
Chicago, Burlington & Quincy	9,091‡	5,599,206	1,816,435	8,050,976	846,576	1,368,030	114,815	2,612,515	180,181	5,122,117	2,928,859	—10,090	250,454	2,668,315	402,956
Chicago, Indiana & Southern	329	315,989	21,162	347,517	47,130	62,109	9,708	119,212	9,074	247,233	100,284	—154	13,575	86,555	—16,748
Chicago, Milwaukee & Puget Sound	1,865§	1,346,493	113,588	1,492,268	82,938	157,860	31,643	470,642	14,891	757,974	734,294	813	37,833	697,274	105,782
Chicago, Milwaukee & St. Paul	7,511	4,144,523	1,092,934	5,762,846	784,346	841,873	103,767	2,603,049	88,490	4,421,525	1,341,321	—849	216,041	1,124,431	—763,890
Chicago, St. Paul, Minneapolis & Omaha.	1,744	1,055,240	378,760	1,527,211	128,046	165,670	25,556	577,876	29,583	926,731	600,480	—1,254	60,034	539,192	1,853
Cumberland Valley	162	207,451	50,794	269,694	37,997	50,297	3,777	85,924	5,930	183,925	85,769	153	5,993	79,929	—23,227
Delaware, Lackawanna & Western	930	2,373,788	586,575	3,146,620	326,460	432,053	55,287	950,958	53,653	1,818,411	1,328,209	35,868	138,650	1,225,427	—298,243
Duluth & Iron Range	188¶	381,341	30,515	419,142	65,726	57,500	298	112,772	8,718	245,014	174,128	—1,780	16,889	155,459	—310,076
Duluth, Missabe & Northern	293	433,596	41,157	481,476	84,672	78,321	1,664	124,063	13,067	301,787	179,689	—1,936	20,514	157,239	—588,691
El Paso & Southwestern Co	901‖	519,675	88,225	638,591	76,797	81,398	9,914	167,581	23,369	359,059	279,532	—857	19,360	259,315	—2,534
Elgin, Joliet & Eastern	808a	651,964	3	688,669	74,278	130,640	4,178	209,709	13,309	432,114	256,555	.....	15,400	241,155	—60,640
Erie	1,959	3,104,721	721,350	4,114,631	489,626	691,132	92,511	1,363,412	82,309	2,718,990	1,395,641	21,212	120,631	1,296,222	—284,695
Florida East Coast	583	161,238	76,250	264,164	42,922	40,436	4,240	88,323	8,034	183,955	80,209	.....	13,731	66,478	28,511
Fort Worth & Denver City	454	368,671	139,928	529,691	39,261	72,701	4,907	158,418	15,253	290,540	239,151	—1,261	10,000	227,890	19,506
Georgia Southern & Florida	395	118,756	65,052	209,587	25,984	38,779	5,853	75,243	9,368	155,227	54,360	.....	12,255	42,105	—10,472
Grand Trunk Western	347	326,881	154,917	518,565	50,662	77,168	16,648	235,887	15,808	396,173	122,392	—1,148	31,697	89,547	—28,054
Maine Central	932	486,910	214,388	745,686	113,602	114,515	8,107	282,778	22,462	541,464	204,222	1,775	35,879	170,118	—59,099
Minneapolis, St. Paul & Sault Ste. Marie.	3,572b	1,409,369	413,793	1,946,984	167,227	278,183	41,276	701,689	42,228	1,230,603	716,381	9,823	104,651	621,553	—383,859
New York, Chicago & St. Louis	561	762,997	120,531	920,577	93,659	130,843	48,582	377,148	15,305	665,537	255,040	—1,984	34,500	218,556	—104,422
New York, Philadelphia & Norfolk	112	221,331	31,280	272,785	25,673	44,688	3,796	107,658	11,524	193,339	79,446	.....	10,000	69,446	—8,548
New York, Susquehanna & Wester	152	163,676	52,199	244,021	25,936	22,202	1,129	90,588	4,178	144,034	99,987	2,294	11,771	90,510	19,249
Norfolk & Western	1,951	2,553,899	318,185	2,967,714	340,856	613,161	45,443	889,388	58,046	1,946,894	1,020,820	—1,443	93,000	926,377	—282,485
Norfolk Southern	602	165,341	56,631	238,334	24,016	27,076	4,207	75,067	14,992	145,358	92,976	—1,021	5,900	86,055	—
Northern Pacific	6,019c	4,156,080	1,432,154	5,972,746	481,235	643,064	75,457	1,915,301	77,416	3,192,473	2,780,273	25,965	328,501	2,477,737	—183,986
Northwestern Pacific	376	127,864	115,184	264,558	59,626	43,323	2,278	108,996	8,930	223,153	41,405	.....	10,500	30,905	—22,000
Peoria & Eastern	351	215,166	55,165	292,887	39,791	55,171	5,183	130,655	5,719	236,519	56,368	.....	10,000	46,368	—22,498
Pittsburgh & Lake Erie	191	1,205,964	124,844	1,371,686	190,005	127,945	14,463	341,509	23,583	697,505	674,181	—457	25,200	648,524	—339,711
Rutland	468	177,785	88,495	300,528	48,101	41,619	5,404	115,701	5,950	216,775	83,753	.....	11,053	72,700	—2,855
San Antonio & Aransas Pass	724	258,169	103,479	384,431	89,129	49,558	5,050	134,734	9,662	288,133	96,298	.....	10,000	86,298	—39,399
Toledo, St. Louis & Western	451	288,191	35,126	342,796	44,746	50,755	11,057	113,833	8,759	230,150	112,646	.....	13,900	98,746	—39,580
Trinity & Brazos Valley	463	198,246	31,286	250,657	31,811	32,013	7,885	95,024	12,972	179,705	70,952	.....	3,500	67,452	11,233
Wabash	2,515	1,820,487	578,036	2,585,197	303,568	413,610	75,330	1,021,089	65,489	1,879,086	706,111	—3,436	76,676	625,999	—141,798
FIVE MONTHS OF FISCAL YEAR 1911.															
Atchison, Topeka & Santa Fe	7,546*	$25,388,823	$9,567,838	$37,889,815	$5,470,192	$5,486,999	$702,237	$10,614,973	$773,427	$23,047,829	$14,841,986	.....	$1,228,444	$13,613,542	$521,544
Central New England	277	1,105,285	167,225	1,339,153	303,988	110,909	10,252	383,530	14,672	823,351	515,802	.....	45,000	470,802	—60,034
Chicago & Alton	1,025†	4,091,959	1,989,532	6,527,253	963,672	1,035,413	190,344	2,338,108	171,663	4,698,600	1,828,653	—$10,276	179,606	1,638,777	—792,882
Chicago & Erie	269	1,673,288	376,582	2,227,059	283,479	464,370	99,999	936,953	47,724	1,832,525	394,534	.....	56,488	338,046	—32,333
Chicago, Burlington & Quincy	9,091‡	26,771,485	10,836,420	40,810,246	5,982,016	6,247,551	687,979	12,447,885	914,857	26,280,288	14,529,958	—25,591	1,252,304	13,252,063	2,266,141
Chicago, Indiana & Southern	329	1,277,929	135,708	1,454,104	225,872	284,132	47,480	568,854	45,021	1,171,359	282,745	1,762	67,875	216,632	126,169
Chicago, Milwaukee & Puget Sound	1,865§	5,501,766	631,900	6,287,381	304,407	591,318	152,605	2,087,785	58,745	3,194,860	3,092,521	18,344	189,166	2,921,699	—
Chicago, Milwaukee & St. Paul	7,511	20,819,780	6,732,679	30,115,152	4,373,050	3,904,569	540,567	12,056,526	430,198	21,304,910	8,810,242	115,681	1,080,204	7,845,719	—1,680,227
Chicago, St. Paul, Minneapolis & Omaha.	1,744	4,891,334	2,163,605	7,515,061	970,216	831,556	121,989	2,613,860	141,774	4,679,395	2,835,666	—3,880	294,777	2,537,009	341,503
Cumberland Valley	162	1,019,097	304,120	1,384,768	163,589	186,960	23,019	410,715	29,263	813,546	571,222	1,466	28,889	543,798	—1,097
Delaware, Lackawanna & Wester	930	11,082,608	3,469,733	15,501,443	2,033,239	2,120,355	308,633	4,430,375	276,600	9,169,202	6,332,241	99,486	673,250	5,758,477	—1,224,107
Duluth & Iron Range	188¶	4,762,124	128,469	4,936,070	489,121	326,888	2,481	783,531	45,706	1,647,727	3,288,343	17,255	199,051	3,106,548	—1,211,061
Duluth, Missabe & Northern	293	7,099,138	209,672	7,346,959	503,959	513,245	8,508	962,617	59,788	2,048,117	5,298,842	51,835	297,920	5,052,756	—1,249,498
El Paso & Southwestern Co	901‖	2,452,038	404,523	3,009,652	393,632	393,709	52,730	817,752	111,871	1,769,694	1,239,958	—3,288	96,800	1,139,870	—6,707
Elgin, Joliet & Eastern	808a	3,439,594	40	3,648,958	527,120	705,339	20,819	1,088,035	67,222	2,408,535	1,240,423	.....	77,000	1,163,423	—531,527
Erie	1,959	15,620,543	4,291,690	21,390,153	2,745,178	3,532,849	513,288	6,584,837	398,639	13,774,791	7,615,362	75,008	568,941	6,971,413	193,689
Florida East Coast	583	586,243	339,004	1,063,566	219,173	198,072	22,278	419,542	40,487	899,553	164,013	.....	68,656	95,357	40,486
Fort Worth & Denver City	454	1,541,840	783,695	2,428,386	236,705	352,341	31,127	770,244	71,640	1,412,057	1,016,329	—6,984	50,000	959,344	—29,483
Georgia Southern & Florida	395	542,529	331,082	998,841	111,407	196,839	30,223	366,243	45,496	750,208	248,633	.....	49,383	199,250	—22,816
Grand Trunk Western	347	1,417,650	905,361	2,502,150	301,686	384,599	88,899	1,042,595	63,219	1,880,998	621,152	5,617	158,486	457,048	—221,593
Maine Central	932	2,256,568	1,548,025	4,048,652	749,962	523,405	39,051	1,418,023	108,566	2,839,007	1,209,645	15,280	179,737	1,045,188	—286,539
Minneapolis, St. Paul & Sault Ste. Marie	3,572b	6,972,770	2,365,338	9,947,059	1,027,542	1,291,043	207,551	3,334,083	201,673	6,061,892	3,885,167	92,822	556,414	3,421,575	—1,449,929
New York, Chicago & St. Louis	561	3,859,246	766,159	4,797,553	549,976	638,598	259,617	1,855,137	80,053	3,383,381	1,414,172	—7,151	172,506	1,234,521	—319,983
New York, Philadelphia & Norfolk	112	1,207,498	194,852	1,509,005	163,433	247,078	24,279	554,506	54,820	1,044,116	464,889	.....	39,200	425,689	60,771
New York, Susquehanna & Western	152	818,258	289,283	1,241,302	170,437	114,114	10,604	445,349	22,946	763,450	477,852	9,093	58,401	410,358	63,084
Norfolk & Western	1,951	13,120,350	1,924,021	15,559,089	1,847,753	2,834,825	240,823	4,477,183	298,905	9,699,489	5,859,600	4,652	465,000	5,389,948	298,775
Norfolk Southern	602	741,690	346,561	1,178,374	138,283	138,882	24,571	355,675	67,997	725,408	452,966	3,469	30,300	426,135	—
Northern Pacific	6,019c	20,866,870	8,611,077	31,464,703	4,251,740	3,399,594	446,496	9,477,459	405,908	17,981,197	13,483,506	251,879	1,539,328	12,196,057	—3,083,303
Northwestern Pacific	376	710,434	828,569	1,649,530	260,472	203,830	13,879	543,871	44,662	1,066,714	582,816	.....	52,500	530,316	13,567
Peoria & Eastern	351	1,169,129	328,992	1,610,211	219,231	255,725	32,322	619,608	28,346	1,155,232	454,979	.....	50,000	404,979	43,370
Pittsburgh & Lake Erie	191	6,723,536	747,731	7,676,945	936,830	675,613	70,300	1,684,984	117,820	3,485,547	4,191,398	1,556	137,000	4,057,842	646,814
Rutland	468	840,056	578,130	1,599,218	241,788	209,366	35,678	557,974	32,794	1,077,600	521,618	.....	55,241	466,377	4,722
San Antonio & Aransas Pass	724	1,410,538	514,676	2,029,553	303,238	241,128	24,562	632,608	46,834	1,248,370	781,183	.....	46,000	735,183	124,028
Toledo, St. Louis & Western	451	1,344,016	218,444	1,663,174	231,033	208,837	44,704	547,066	49,172	1,080,812	582,362	.....	69,500	512,862	80,637
Trinity & Brazos Valley	463	716,466	172,868	930,408	168,950	167,781	39,807	410,254	52,306	839,098	91,310	.....	17,500	73,810	11,085
Wabash	2,515	8,766,837	3,576,433	13,273,647	1,495,919	1,981,441	396,221	4,814,710	335,844	9,024,135	4,249,512	—4,695	373,678	3,871,139	—128,965

Mileage operated on November 30, 1909—* 7,459 miles; † 998 miles; ‡ 9,021 miles, § 1,400 miles; ¶ 168 miles; ‖ 867 miles. *a* 770 miles; *b* 3,425 miles; *c* 5,691 miles; — indicates Deficits, Losses and Decreases.

STATE COMMISSIONS.

William O. Seymour, chairman of the Connecticut State Railroad Commission, and a member of that body for the past 20 years, died suddenly on Tuesday at his home in Ridgefield.

The Louisiana railway commission has issued an order for a general hearing on the proposed reduction in express rates. The rates proposed by the commission run from 35 cents per 100 lbs. of merchandise for 20 miles or less to $2 per 100 lbs. for merchandise for over 350 miles.

The United States circuit court having issued a temporary injunction restraining the Louisiana railway commission from enforcing its order in the case of J. W. Thompson & Co. v. the Texas & Pacific et al., reported previously in these columns, the commission has ordered all lines not specifically enjoined from putting into effect rates on sand and gravel prescribed by the commission to comply with the order, protecting the rates named therein on all shipments of sand and gravel, carloads, between points in the state.

California: Discrimination Against Los Angeles in Favor of San Francisco.

California Associated Jobbers of Los Angeles v. Southern Pacific et al. Jobbers' and Manufacturers' Association of Stockton and Traffic Bureau of the Merchants' Exchange of San Francisco interveners.

The complaint is that rates from Los Angeles to towns in the San Joaquin valley are unduly high as compared with rates into the valley from San Francisco. The commission finds that rates, for instance, from Los Angeles to Bakersfield, a distance of 168 miles, are from 50 to 73 per cent. higher than rates from San Francisco to Berenda, a distance of 168 miles. The commission, therefore, orders a reduction in the rates from Los Angeles to points in the San Joaquin valley north of Bakersfield. The commission holds that in this case it is not fair to base a rate on the cost of service on a particular part of the line, and that therefore the fact that it is more expensive to operate from Los Angeles over the Tehachapi mountains into the valley than it is to run trains from San Francisco, on a nearly level road, into the valley, is not a valid reason for higher rates from Los Angeles than from San Francisco.

Commissioner Loveland dissenting:

With the finding of the majority opinion that the Los Angeles-San Joaquin valley rates are high as compared with rates from other competitive coast points, I most earnestly dissent. In my judgment the comparison of rates into the San Joaquin valley on a mileage basis should be between Stockton and Los Angeles, because water competition controls the rate from San Francisco to Stockton; in other words, for 78 miles from San Francisco toward the valley Stockton is entitled, as compared with San Francisco, to the advantages of being 78 miles nearer to the valley points than is San Francisco, and San Francisco is entitled to enjoy just that differential over Stockton that water competition and other competitive conditions will give her. In my judgment this commission has no authority in law to order railways to charge rates which will turn the business over to competing water carriers. I do not agree with my associates that the much heavier cost of service over the two mountain ranges should be ignored and Los Angeles given an advantage over Sacramento and Stockton on a broad mileage basis.

COURT NEWS.

The New York State Court of Appeals in a decision handed down last Tuesday, denies the authority of the New York State Public Service Commission, First district, over matters of public health. These are within the province of the New York City Board of Health. This decision reverses the lower courts, which had confirmed an order of the public service commission abating an alleged nuisance in the yard of the New York, New Haven & Hartford at 131st street, New York.

On October 2 last the railway from Melipilla, Chile, to San Antonio was formally opened, in the presence of the vice-president of the republic.

Railway Officers.

Executive, Financial and Legal Officers.

R. G. Shorter has been appointed auditor of the Marietta, Columbus & Cleveland, with office at Marietta, Ohio, succeeding Hudson Campbell, acting auditor.

W. H. Fulton, superintendent and purchasing agent of the Stewartstown Railroad, has been elected vice-president, and will also retain his duties as superintendent, with office at Stewartstown, Pa.

F. D. Dale has been made a representative of the accounting department of the Union Pacific at Leavenworth, Kan., in connection with matters pertaining to business of the Leavenworth, Kansas & Western. This corrects an item which appeared in our issue of January 20.

Hoyt King, formerly land commissioner of the Sanitary District in Chicago, has been elected vice-president and general manager of the Chicago Transfer & Clearing Company, succeeding James T. Maher, resigned, to go to the Great Northern at St. Paul, Minn.

Joseph F. Titus, for the last four years assistant to J. T. Harahan, former president of the Illinois Central, has resigned to become assistant treasurer of the Berkshire Life Insurance Company, and the duties of his former office will be assumed mainly by M. P. Blauvelt, comptroller.

A. R. Zoelsmann has been appointed auditor of the Chester, Perryville & Ste. Genevieve, the Cape Girardeau & Thebes Bridge Terminal, the Cape Girardeau & Chester and the Saline Valley, with office at Cape Girardeau, Mo., succeeding R. H. Schultz, appointed general superintendent.

M. B. Van Zandt, assistant treasurer and assistant secretary of the Chicago, St. Paul, Minneapolis & Omaha and the Chicago & North Western, has been appointed treasurer of both these companies, with office at New York, succeeding R. H. Williams, who has been retired on account of ill health. A. S. Pierce succeeds Mr. Van Zandt, with office at New York.

The office of Roberts Walker, chairman of the executive committee and general counsel of the Chicago, Rock Island & Pacific, and president of the Rock Island Company, has been transferred from New York to Chicago. G. T. Boggs, vice-president, assistant secretary and assistant treasurer of the Chicago, Rock Island & Pacific, and vice-president, secretary and treasurer of the Rock Island Company, at New York, has resigned, effective February 1, and J. J. Quinlan, assistant secretary and assistant treasurer of the Chicago, Rock Island & Pacific, and vice-president, assistant secretary and assistant treasurer of the Rock Island Company, in addition to his other duties, succeeds Mr. Boggs as secretary and treasurer of the Rock Island Company, with office at New York.

William J. Dickinson, who was elected second vice-president of the Louisville & Nashville, with office at New York, as previously announced in these columns, was born in 1852 in England. He was educated in the public schools and began railway work in September, 1882, with the Louisville & Nashville, and was in the continuous service of that company for 23 years. He held various clerical positions in the office of the auditor of receipts until 1891, and then for a short time he was a traveling auditor. In December, 1891, he was appointed assistant auditor of receipts, and was promoted to auditor of receipts in July, of the following year, remaining in that position for over five years. He was then consecutively freight claim agent for two years, chief clerk in the traffic department two years, comptroller for four months, and then third vice-president in charge of traffic for four years. Mr. Dickinson was out of railway service from 1905 to 1910.

Operating Officers.

J. C. Hagerty, superintendent of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, has had his office transferred to Seymour, Ind., effective within six weeks.

H. E. Allen, superintendent of the Chicago, Rock Island & Gulf at Amarillo, Texas, has been appointed superintendent of the Trinity & Brazos Valley, with office at Teague, Texas, suc-

ceeding J. Munday, resigned to accept service with another company.

C. J. Balch has been appointed to the new position of assistant to general manager of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal. Through a typographical error it was stated in our issue of January 20, that Mr. Balch had been appointed assistant general manager.

W. J. Stoneburner, superintendent of the Missouri, Kansas & Texas at Denison, Texas, has been appointed superintendent, with office at Greenville, Texas, succeeding R. J. Sullivan, resigned to accept service with another company. J. Munday, superintendent of the Trinity & Brazos Valley at Teague, Texas, succeeds Mr. Stoneburner.

R. H. Schultz, auditor and general freight and passenger agent of the Chester, Perryville & Ste. Genevieve, the Cape Girardeau & Chester, the Cape Girardeau & Thebes Bridge Terminal and the Saline Valley at Cape Girardeau, Mo., has been appointed general superintendent, with office at Cape Girardeau, in charge of matters relating to traffic and operation.

H. M. Gain has been appointed passenger trainmaster of the Eastern division of the Grand Trunk, with office at Montreal, Que.; S. L. Trusler, assistant trainmaster, at Hamilton, Ont., has been appointed passenger trainmaster of the Middle division, with office at Toronto, Ont., and H. W. Matthews has been appointed passenger trainmaster of the Western division, with office at Detroit, Mich.

Harvey Hansford Morris, whose appointment as superintendent of the Huntington division of the Chesapeake & Ohio, with office at Huntington, W. Va., has been announced in these columns, was born April 11, 1873, at Coalburg, and was educated in the common schools. He began railway work February 7, 1890, with the Chesapeake & Ohio as a telegraph operator, and in October, 1898, he was promoted to train despatcher, at Hinton. He remained in that position until June, 1904, when he was made trainmaster of the Guyandotte Valley branch, and in November, 1907, he was promoted to trainmaster of the Kanawha coal district, with headquarters at Handley, which position he held at the time of his recent appointment as superintendent.

William Herbert Johnson, whose appointment as assistant superintendent of the Winston-Salem district of the Atlantic Coast Line, with office at Florence, S. C., has been announced in these columns, was born October 26, 1871, at Charlestown, W. Va., and was educated in the public schools. He began railway work in March, 1889, as telegraph operator on the Shenandoah Valley, now a part of the Norfolk & Western, and in August of the same year he went to the Norfolk & Western, and was promoted to train despatcher in June, 1891. In February, 1898, he went to the Illinois Central as a train despatcher at McComb City, Miss., and in January, 1899, returned to the service of the Norfolk & Western, as train despatcher. He was promoted in 1902 to assistant chief despatcher, becoming chief despatcher in April, 1905, on the Radford division, and in February, 1907, he was appointed assistant trainmaster of the Norfolk division. He left the service of the Norfolk & Western to become superintendent of construction on the Winston-Salem Southbound, and when this new line was opened for operation he was appointed assistant superintendent of the Atlantic Coast Line.

Traffic Officers.

C. D. Le Grande has been appointed general agent of the Norfolk Southern, with office at Richmond, Va.

G. W. Schelke has been appointed a traveling passenger agent of the Illinois Central, with office at Evansville, Ind.

A. D. Beals has been appointed a traveling freight agent of the Chicago Great Western, with office at Red Wing, Minn.

B. A. Hamilton has been appointed agent in charge of freight traffic for the new agency of the Northern Pacific at Cleveland, Ohio.

A. A. Reinhardt has been appointed traveling freight agent of the Toledo, St. Louis & Western and the Chicago & Alton, with office at New Orleans, La.

E. B. Erwin has been appointed general agent of the San Pedro, Los Angeles & Salt Lake, with office at Denver, Colo., succeeding C. E. Hooper, resigned.

Clarence L. Williams has been appointed a general agent, passenger department of the Canadian Pacific, with office at Pittsburgh, Pa. effective February 1.

W. F. Murray, chief clerk to the general freight agent of the Missouri, Kansas & Texas at Dallas, Tex., has been appointed general agent of the St. Louis Southwestern, with office at Tyler, Tex.

D. W. Calloway, traveling freight agent of the Trinity & Brazos Valley at Fort Worth, Tex., has resigned to accept a position with the New York-Galveston steamship line of the Southern Pacific Company.

H. C. McFadden, president and general manager of the Fitzgerald, Ocilla & Broxton, has been appointed general freight agent of the Georgia & Florida, succeeding T. B. Akridge, with office at Augusta, Ga., effective February 1.

F. F. Barkow, traveling freight agent of the Ann Arbor Railroad, has been appointed a commercial agent, with office at Milwaukee, Wis., succeeding C. S. May, resigned. R. J. Wilda succeeds Mr. Barkow, with office at Menominee, Mich.

J. H. Hackett has been appointed agent of the Erie Despatch, at Akron, Ohio, succeeding D. B. Aungst, commercial agent, assigned to other duties, and the office of commercial agent has been abolished. J. A. Lloyd has been appointed agent, at Salt Lake City, Utah, succeeding F. T. Vincent, deceased.

J. W. White, commercial agent of the Missouri, Kansas & Texas at Denison, Tex., has been appointed commercial agent, with office at Fort Worth, Tex., succeeding F. G. Abbey, who has been appointed chief clerk to the general freight agent. Henry W. Landman, soliciting freight agent at Kansas City, Mo., succeeds Mr. White.

Edward D. Lappin has been appointed a traveling freight agent of the Seaboard Air Line, with office at Kansas City, Mo., succeeding S. C. Bates, resigned to become manager of the Traffic Bureau of Springfield, Mo. W. H. Drew has been appointed a soliciting freight agent, with office at Tampa, Fla., succeeding L. Barwick, resigned.

Incident to the re-districting of the Rock Island Lines, which was announced in the *Railway Age Gazette* of January 20, page 145, W. J. Leahy, general passenger agent of the Chicago, Rock Island & Pacific at Chicago, will have jurisdiction over the First district, with office at Chicago. J. A. Stewart, assistant general passenger agent at Chicago, has been appointed general passenger agent, with jurisdiction over the Second district (except the city of St. Louis, Mo.) at Topeka, Kan. George H. Lee, general passenger agent at St. Louis, will have jurisdiction over the Third district and the city of St. Louis, with office at St. Louis.

Warren K. Cundiff, whose appointment as assistant general passenger agent of the Union Pacific, with office at Omaha, Neb., has been announced in these columns, was born October 19, 1868, at St. Joseph, Mo. He received his education in the public schools, and began railway work in 1886 with the St. Joseph & Grand Island, and remained with that road until June, 1902, during which time it had been merged with and then separated from the Union Pacific. In September, 1906, he went with the Union Pacific at Omaha as a rate clerk, and he was soon promoted to traveling passenger agent, and then to chief rate clerk. His next office was chief clerk, from which position he was recently promoted to assistant general passenger agent, with office at Omaha.

Ralph S. Stubbs, whose appointment as general eastern freight agent of the Southern Pacific and general freight agent of the Atlantic Steamship Lines of that company, with office in New York City, has been announced in these columns, was born February 3, 1882, at Ashland, Ohio. He graduated from the University of Nevada in 1901, and began railway work in 1902 as a clerk with the Armour Car Lines at Chicago. A year later he was appointed general eastern agent of the Continental Fruit Express in Chicago, and in 1905 was made foreign freight agent of the Southern Pacific in New York City. His next position was general freight and passenger agent of the Arizona Eastern and assistant general freight and passenger agent of the Southern Pacific at Tucson, Ariz., to which he was appointed in April, 1909, and from which he was recently promoted as above.

W. F. Paton, whose appointment as general passenger agent of the National Railways of Mexico, with office at Mexico City, has been announced in these columns, was born June 17, 1870. He received his education in the public schools of New York City, and began railway work in 1887 as a stenographer in the purchasing department of the Mexican National Railroad, now part of the National Railways, in New York City. He was transferred to the traffic department in the following year, and he was contracting freight agent for eight years from 1889. He was then made general eastern agent, and from 1904 to 1908 he was general eastern agent for the National Lines of Mexico at New York. His next office was general agent at Cincinnati, Ohio, for the National Railways of Mexico, and in April, 1909, he was appointed assistant general passenger agent, with office at Mexico City. He was appointed general passenger agent of the National Railways of Mexico, the Interoceanic Railway of Mexico, the Vera Cruz & Isthmus and the Pan-American on January 1, 1911.



W. F. Paton.

Engineering and Rolling Stock Officers.

W. J. Hoskin, shop master mechanic of the Chicago & Alton at Bloomington, Ill., has been appointed road master mechanic on the Northern and Southern divisions. A. G. McLellan, formerly with the Grand Trunk at Battle Creek, Mich., succeeds Mr. Hoskin.

F. W. Gilcreast, whose resignation as division engineer of the Lehigh Valley, at Hazleton, Pa., has been announced in these columns, has been appointed chief engineer of the Lehigh & New England, in charge of the Tamaqua extension, with office at Mauch Chunk.

Frank T. Slayton, whose appointment as superintendent of motive power of the Virginian Railway, with office at Princeton, W. Va., has been announced in these columns, was born March 31, 1862, at Iowa Falls, Iowa. He was educated in the common schools and began railway work in December, 1881 in the shops of the Canadian Pacific, at Winnipeg, Man. The following year he became a fireman on the Burlington, Cedar Rapids & Northern, now a part of the Chicago, Rock Island & Pacific. He remained in this position until September, 1886, since which time he has been consecutively to July, 1900, engineer, trainmaster and division master mechanic on the Minnesota & Northwestern, now a part of the Chicago Great Western. In July, 1900 he was appointed master mechanic of the St. Joseph & Grand Island, and was later promoted to superintendent, which position he held at the time of his recent appointment as superintendent of motive power of the Virginian Railway.



F. T. Slayton.

Purchasing Officers.

George H. Robinson has been appointed general storekeeper of the Oregon Short Line and the Southern Pacific Company lines east of Sparks, with office at Pocatello, Idaho, succeeding F. W. Taylor, resigned to accept service with another company.

OBITUARY.

Robert Dudgeon, commissioner of the Pacific Northwest Demurrage Bureau, with office at Seattle, Wash., died in Seattle on January 14.

William D. Knott, purchasing agent of the Atlanta, Birmingham & Atlantic, at Atlanta, Ga., who was recently granted leave of absence on account of ill health, died January 18, at Atlanta.

Henry Wentworth Brown, auditor for the receivers of the Metropolitan Street Railway Company, and president of the Transportation Equipment Company, died January 19 in New York, at the age of 34 years.

George Parsons Sweeley, master mechanic at the Allegheny shops of the Pennsylvania Lines West of Pittsburgh, died at his home in Allegheny, Pa., January 10. Mr. Sweeley was born in Montoursville, July 13, 1856, and was educated in the common schools. He began railway work in the Renovo shops of the Pennsylvania in April, 1875, and was later made shop foreman. In 1888 he was appointed general foreman of the shops of the Pittsburgh, Cincinnati, Chicago & St. Louis. In March, 1893, he was appointed master mechanic of the Pittsburgh, Fort Wayne & Chicago, and in 1896 he went as matser mechanic to the Cleveland & Pittsburgh division, at Wellsville. He was appointed master mechanic of the Allegheny shops in 1900, which position he held at the time of his death. Mr. Sweeley was a member of the American Railway Master Mechanics' Association, the Master Car Builders' Association and the Pittsburgh Railway Club.

John Edward Schwitzer, chief engineer of the Canadian Pacific, died at the Royal Victoria hospital, Montreal, on January 23. Mr. Schwitzer was born April 19, 1870, at Ottawa, Ont., and graduated with the degree of B.A.Sc. in civil engineering from McGill University, Montreal, in 1891. He began railway work in 1888 as a rodman on the Lake Temiscamingue Colonization Railway, now a part of the Canadian Pacific. From January, 1892, to December, 1896, he was engaged in engineering work on various railways, and from December, 1896, to July, 1899, he was in private practice as a civil engineer and land surveyor, at Rat Portage, Ont., and was later town engineer at that place. In July, 1899, he was appointed assistant engineer of the Canadian Pacific, in charge of terminal improvements at Rat Portage, and the following year was appointed assistant engineer of maintenance of way at Winnipeg, Man. He was promoted to resident engineer of District No. 2, in 1901, and in April, 1903, was appointed a division engineer of the Central division, at Winnipeg. In August, 1905, he was appointed principal assistant engineer of the Western lines, and was later assistant chief engineer, which position he held at the time of his appointment on the first of the present month as chief engineer. He was taken sick with pneumonia almost immediately on his arrival in Montreal, and never assumed the duties of his new office.

FOREIGN RAILWAY NOTES.

The Chilean government has authorized David Battle, in behalf of the Aguas Blancas Railroad Company, to construct two branch lines: One from kilometro 62 on the main line to the nitrate beds of Remiendo No. 2; and the other from Oficina Valparaiso to Pampa Loreto.

A proposal has been made by the Madeira-Mamore Railway Company, Brazil, to the Bolivian government for the construction of a branch railway 17 miles long from the Madeira-Mamore line across the river Mamore, near the Cachuela Esperança. The proposal has been accepted, with some modifications. This proposed branch, together with the main line of the Madeira-Mamore Railway, will overcome the last barrier in the way of transportation for the immense territory drained by the Beni and Mamore, with their larger navigable tributaries in Bolivia, to the west and south.

Railway Construction.

New Incorporations, Surveys, Etc.

American Central Railway.—According to press reports, actual construction work will be started on a section from Vernon, Tex., south, by April 1. The projected route from Vernon, northwest, is via Olustee, Okla., and Mangum, to Miami, Tex. Considerable construction work was carried out near Mangum, Okla., several months ago. The Central Construction Co., Mobeetie, Tex., has the contract. W. E. McClintock, chief engineer, Mobeetie.

Aransas Terminal.—An officer writes that work is being carried out by the company's men on the line from Aransas Pass, Texas, southeasterly along the channel of the Aransas Pass Channel & Dock Company to deep water, on the east side of Harbor island. Grading is about 60 per cent. finished. Track has been laid on 3,000 ft., and drawbridges are on the ground, ready for erection. The work includes a trestle about three-quarters of a mile long. E. O. Burton, president, Gibbs building, San Antonio; C. S. Corrigan, chief engineer, Box 183, Aransas Pass. (August 5, p. 262.)

Athens & Southeastern.—An officer writes that this company has laid track on eight miles between Athens, La., and Fords. The line was built to haul lumber and general merchandise, and may eventually be extended east to Arcadia, seven miles. R. H. Swartz, president, St. Louis, Mo.: J. E. Kennedy, general manager, Athens, La.

Atlantic, Okeechobee & Gulf.—Organized in Florida with $1,000,000 capital, and offices at 818 Audubon building, New Orleans, La., which will be transferred in March to Tampa, Fla. The company plans to build from a point near Tampa, southeast through the counties of Hillsboro, Polk, De Soto, Lee, Palm Beach and Dade to a point near Miami, with a branch from near Fort Meyers, northeast to Melbourne, in Brevard county; also a branch from Fort Myers, north through the counties of Lee, De Soto, Manatee and Hillsboro to Tampa, and another branch from Bassenger, north to St. Cloud. H. C. Farriot, president; R. H. Riley, W. Graham and A. H. West, vice-presidents; D. A. Simmons, secretary; W. H. Milton, treasurer, and F. B. McGarry, general counsel, H. M. McElroy, chief engineer. F. P. Bell may be addressed at New Orleans, La.

Baltimore & Ohio.—An officer writes that track laying has been finished on the following improvements: Second track from Benton Ferry, W. Va., to Gaston Junction, three miles; Valley Falls to Powell, three miles, and on the bridge over the Monongahela river.

Canadian Pacific.—An officer is quoted as saying that this company will lay about 500 miles of track in the western part of Canada during the summer of 1911. This includes the completion of the double track between Winnipeg, Man., and Brandon, and considerable double tracking work near Moose Jaw, Sask. Through the mountain section the road is to be ballasted with rock, and, in addition, the bridges are to be strengthened to carry heavier rolling stock. A number of new steel bridges will be built, and a number of branch lines, each from 20 to 40 miles long, are to be constructed.

Carolina Traction.—According to press reports, this company will let contracts at once to build from Winston-Salem, N. C., north to Ruralhall, thence northeast to Lawsonville, and then northwest to Floyd, Va., with a branch west to Danbury, N. C., in all 130 miles. H. P. McKnight, Southern Pines, is the principal promoter.

Chicago, Rock Island & Pacific.—An officer writes regarding the report that an extension is to be built from Des Moines, Iowa, to a connection with the Kansas City line at Allerton, Wayne county, that the company has made surveys, but no authority has yet been given for carrying out the construction work.

Colorado & Southern.—Grading work is now under way on the Colorado Railroad, from Dixon, Colo., to Cheyenne, Wyo., 32 miles. It is said that this work is being carried out by the following contractors: Eggleston Matthews, Gilbert Brothers, Lafferty & Allen, E. C. Caldwell, Dooling Brothers, Owens Brothers, P. Fitzgerald and Crook & Hoffman. The work has been divided into short sections, as much of the construction work is heavy and the contracts call for completion of the work within five months. Kilpatrick Brothers, Denver, Colo., are the general contractors. (January 6, p. 62.)

Colorado Railroad.—See Colorado & Southern.

Grant Railroad.—This company has been granted a certificate of public convenience and necessity in Wisconsin, to build from Woodman, Wis., on the Prairie du Chien division of the Chicago, Milwaukee & St. Paul, south about 11 miles to Mount Hope, thence southwest six miles to Patch Grove, and then continuing southeast about five miles to Bloomington, all in Grant county. The company has located the line and financial arrangements are being made to carry out the work. The line will carry live stock, dairy products, farm produce, timber and coal. William Leighton, president, Mount Hope; S. C. Scott, chief engineer, Galena, Ill. W. E. Howe, Bascobel, Wis., is interested.

Houston & Texas Central.—According to press reports, heavier rail is being laid on the section between Austin, Texas, and Hempstead.

Hudson Bay, Peace River & Pacific.—Application will be made by this company for incorporation, in Canada, to build from Nelson, on Hudson Bay, north to Fort Churchill, thence west via Fort Vermillion, Alb., on Peace river, Fort St. John, B. C., Laurier Pass, and along Nass river to the Pacific ocean, thence to Port Simpson. A branch is also to be built south to Edmonton, Alb. It is understood that the project will receive government subsidies in cash and lands.

Joliet & Lake Mankan Colonization Railway.—This company has made application in Canada to build from a point near Joliet, Que., south to Montreal, about 45 miles. The names of the promoters are not given.

Maine Roads.—A bill is to be introduced in the Maine legislature, asking for a charter to build from Brewster, Me., on the Penobscot river opposite Bangor, connecting with the Maine Central, thence easterly about 20 miles, and then northeasterly via Bancroft, on the Maine Central, to Houlton, on the Bangor & Aroostook. A. L. Lumbert, Houlton, is interested.

Midland Continental.—According to press reports, plans are being made to complete the construction of this line from Pembina, N. D., southwest to Edgeley, about 212 miles. Grading work was finished last year on the first 50 miles between Edgeley, on the Chicago, Milwaukee & St. Paul, and Jamestown, on the Northern Pacific, and some bridge work was carried out on this section. F. K. Bull, president, Racine, Wis. (December 30, p. 1281).

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes regarding the reports that an extension is to be built from Ambrose, N. D., to Plentywood, Mont., that the company does not contemplate building such an extension at the present time.

National Railways of Mexico.—Grading work is nearing completion on a branch of the Vera Cruz & Isthmus, from Rives, Vera Cruz, Mex., north to San Andres, Tuxtla, 47 miles. McGavock & Barrow are the contractors. A temporary bridge is being constructed over the San Juan river. Another branch is being constructed from Brisbin, Vera Cruz, north to Cosamaloapan, about 40 miles. Track laying is already under way on the first section of 20 miles.

Nevada-California-Oregon.—An officer writes that contracts will be let within 30 days to build an extension of 40 miles north of Alturas, Cal. This will include six miles of rock work. (December 9, p. 1130.)

North Carolina Roads (Electric).—Plans are being made to build an electric line from Charlotte, N. C., southwest to Piedmont, S. C., with a number of branch lines. J. B. Duke, B. N. Duke and W. S. Lee, Durham, N. C., are back of the project.

Nueces River Valley.—An officer is quoted as saying that construction work is to be started within 90 days, from Eagle

Pass, Tex., east. The plans call for a line from Eagle Pass, east to Beeville, about 180 miles. The line is eventually to be extended to the gulf of Mexico. W. A. Frisby, president; G. A. Hull, consulting engineer, Beeville. (November 11, p. 941).

Oakland & Bay Shore (Electric).—Incorporated in California with $500,000 capital, to build an extension of the Oakland & Antioch, near Oakland, Cal.; also to build a branch to Martinez. R. H. Miller, A. J. Krutmeyer and J. R. Selby are incorporators.

Oklahoma Roads.—A bill is now under consideration to authorize the state of Oklahoma to build a line from the northwest corner of the state to the southeast section, about 425 miles. The bill will provide for a $10,000,000 bond issue, to be decided by a special election.

Pacific Great Western.—Organized in Oregon to build from Eugene, Ore., west to Mapleton, on the Suislaw river, about 60 miles. The work will include piercing a 1,100-ft. tunnel. Surveys have already been made. R. B. Hunt, J. Ayers, Eugene, and F. M. De Neffe, Portland, are incorporators.

Pecos Valley Southern.—This company has about finished grading work, and track laying is to be started at once on the extension from Balmorhea, Texas, south to Phantom lake, six miles. Negotiations are under way for continuing the extension to Alpine. (December 30, p. 1281.)

Pennsylvania Railroad.—This company has opened for traffic a new inbound, also an outbound track over the Schuylkill river to West Philadelphia station, Pa., increasing the running tracks over the Schuylkill river from four to six tracks. The improvements to the Broad street station approach include the widening of the bridge over the Schuylkill river to provide for an additional inbound and outbound track to the upper level of West Philadelphia station, also a new 70-ft. turntable, and a new passenger storage yard between Twentieth and Twenty-third streets, large enough to accommodate about 50 steel cars, or about nine suburban trains. To relieve the congestion in the Philadelphia yards the blind stub tracks at the southern end of the passenger yard in West Philadelphia have been connected up with the inbound Philadelphia, Baltimore & Washington track, giving outlets from this yard at the north and south ends. To widen the main line bridge to carry two additional tracks the present bridge abutments were extended on each side. The new tracks are carried on trusses wholly separate from the old structure. The opening of the two tracks and the completion in the near future of the storage yard east of the Schuylkill river will do much to relieve congestion on the approach to Broad street station. This improvement, which is preliminary to such other improvements as may be suggested by the committee recently appointed, will cost about $750,000.

Quebec & Great Northern.—Application will be made for a charter in Canada, to build from Port Arthur, Ont., east to New Liskead, thence northeasterly to Maniwaki. A line is to be built northerly from Maniwaki to the Grand Trunk Pacific, and another line from the Grand Trunk Pacific via the Coulange river to Ottawa.

R. & T. Cement Railway (Electric).—An officer writes that this company was incorporated in Maine in 1908. The plans call for building a line near Rockland, Me., to be used by the New England Portland Cement Company, connecting the quarries and works of the company with the water front. The line will be between three and five miles long. Surveys have been made, but contracts are not yet let. Alfred S. Black and Edward B. McAllister, Rockland, are interested.

Southern Railway & Navigation Company.—An officer writes that this company is building from Natchez, Miss., southwest via Vidalia, La., and Morville to Monterey, on the Black river. Track has been laid on seven or eight miles. The line is being built to carry lumber, cotton, rice and agricultural products. D. K. Jeffris, president, Chicago. (See Louisiana Roads, January 13, p. 104.)

Velasco, Rosenberg & Northern.—Plans are being made to build a line through Brazoria county, Texas, west of Columbia. C. S. Edwards, West Columbia, associated with residents of Brazoria, is back of the project.

Vera Cruz & Isthmus.—See National Railways of Mexico.

Railway Financial News.

Central of Georgia.—In accordance with the suit recently decided in favor of the second and third preference income bondholders, arrangements have been made for the payment of the balance due to make the full interest of 5 per cent. on the second preference Central of Georgia income bonds, and the total 5 per cent. due on the third preference income bonds for the year 1907. From these payments are deducted the expenses of the protective committee which brought the suits.

Chicago, Milwaukee & St. Paul.—*The Commercial & Financial Chronicle* of January 21 contains the following: "The rumor that $50,000,000 new bonds will shortly be offered for sale is generally discredited, but it appears probable that later in the year the company will raise from $10,000,000 to $15,000,000 new capital by the sale of bonds or otherwise, in order to finance the purchase of new rolling stock and pay for the completion of construction work on certain of its branch lines.

Cumberland Railway & Coal.—Stockholders are to vote February 15 on the question of making a mortgage to secure an issue of $3,000,000 bonds.

Fonda, Johnstown and Gloversville.—The New York Public Service Commission, second district, has authorized this company to issue $380,000 first consolidated mortgage, 4½ per cent. 50-year bonds, at not less than 85, and the proceeds to be used for the payment of indebtedness to the amount of $185,130, and for other co-operate purposes.

Illinois Central Bond Sale.—This company has sold to Kuhn, Loeb & Co., $2,740,000 first and refunding 4 per cent. bonds. The bonds are part of an issue of $120,000,000 authorized in 1908, of which $20,000,000 are now outstanding. Of the total, $61,766,000 are reserved for refunding. Up to June 30 last, the Illinois Central has advanced about $3,000,000 to subsidiary companies, partly to enable those companies to pay their unearned interest. Presumably the Illinois Central is reinbursing its treasury for such advances.

Kansas City Viaduct & Terminal.—The period from July 1, 1909, to January 1, 1911, during which the interest coupons on the first mortgage bonds were paid through the issue of income bonds, having expired, a protective committee has been formed as follows: R. C. Storey, chairman; Benjamin Graham, William C. Lane, R. Walter Levy and Lawrence E. Sands, with William G. Dooley as secretary, 25 Broad street, New York.

Kentucky & Indiana Terminal.—The £1,031,000 ($5,155,000) first mortgage 4½ per cent. bonds of 1911-1961 recently offered in London were oversubscribed for. The bonds are guaranteed principle and interest by the B. & O., the C. I. & L. and the Southern Railway. From the proceeds of this sale the $1,000,000 Kentucky & Indiana Bridge & Railroad first mortgage bonds, due March 11, 1911, are to be refunded. The K. & I. Bridge & Railroad $1,069,000 first consolidated mortgage 4 per cent. bonds due 1950 have been bought in and cancelled.

Missouri, Kansas & Texas.—Stuyvesant Fish, formerly president of the Illinois Central, has been elected a director of the Missouri, Kansas & Texas.

New York Central & Hudson River.—The *Boston News Bureau* says: "There are good reasons for the belief that the Central's forthcoming financing will take the form of an issue of terminal bonds secured by a mortgage on the New York terminal. It is understood that the amount of bonds to be issued is $50,000,000, and that they will bear 4½ per cent. interest."

New York, New Haven & Hartford.—An additional block of $10,000,000 one-year 4½ per cent. notes has been sold by the New Haven. This makes $22,000,000 one-year notes which the company sold during the last year, the company having sold $10,000,000 to F. S. Mosley & Co., Boston, as noted in these columns last week, and on Wednesday of last week sold $2,000,000 to a Boston banking house. It is said that the company received par for the notes.

NORFOLK SOUTHERN.—Stockholders are to vote at a special meeting January 30 on the question of authorizing a new mortgage to secure $35,000,000 new 5 per cent. bonds. This mortgage will replace the present mortgage, securing $12,000,000 authorized bonds. Last week through a typographical error, this paragraph was placed under the caption of Seaboard Air Line.

PHILADELPHIA & READING.—See Reading Company.

PITTSBURGH & SHAWMUT.—F. J. Lisman & Co., New York, are offering a block of the first mortgage 5 per cent. sinking fund bonds of the Pittsburgh & Shawmut at 94½. Of the authorized $12,000,000 bonds, $4,000,000 are outstanding. The road forms a southern extension of the Pittsburgh, Shawmut & Northern. The Pittsburgh, Shawmut & Northern proper has been operated by a receiver for about five years, and a letter from F. S. Smith, the receiver, says that the bulk of its securities is owned by a few important interests who meantime have furnished the money for the large body of coal lands and part of the capital for the construction of the Pittsburgh extension. They have not proceeded with foreclosing the mortgage, being desirous of upbuilding the property and developing the traffic of the Pittsburgh extension before formulating a reorganization plan.

PITTSBURGH, SHAWMUT & NORTHERN.—See Pittsburgh & Shawmut.

READING COMPANY.—This company has made arrangements to sell to J. P. Morgan & Co., New York, and Drexel & Co., Philadelphia, $20,000,000 general mortgage 4 per cent. bonds to pay for the retirement of $18,811,000 Philadelphia & Reading Railway consolidated mortgage 7 per cent. bonds due in June.

SEABOARD AIR LINE.—Through a typographical error, the paragraph referring to a stockholders' meeting of the Norfolk Southern was placed last week under the caption of Seaboard Air Line.

ST. LOUIS SOUTHWESTERN.—The company has sold to William Salomon & Co., and Rhoades & Co., New York, $1,620,000 equipment 5 per cent. notes. The notes were all promptly resold by the bankers.

SOUTHERN PACIFIC.—If nothing happens to change the present status of affairs with the Southern Pacific before June 30, the Southern Pacific first refunding 4 per cent. bonds, due 1955, will on that date become legal investments for savings banks in New York. The law requires that bonds to be legal investments for savings banks in New York must be issued by a company that has paid dividends of at least 4 per cent. on all stock for five years previous to the date of the bonds becoming legal investments to have shown gross earnings for those five years of five times or more the fixed charges; and that the bonds be a first or refunding mortgage with certain qualifications on 75 per cent. of railway owned.

WABASH-PITTSBURGH TERMINAL.—Under the direction of the Chaplin protective committee, the receivers of this company have brought suit against the Wabash Railroad to establish a stockholders' liability against the Wabash Railroad as owner of $10,000,000 Terminal company stock. Complainants say that the Wabash Railroad is liable as the original subscriber to $10,000,000 stock of the Terminal company which the Pittsburgh-Toledo syndicate took from the Terminal company and later turned over to the Wabash, the syndicate receiving in return $10,000,000 par value of the Wabash Railroad stock. This the syndicate sold, but none of the proceeds of this sale, it is said, has ever been paid to the Wabash-Pittsburgh Terminal. See Wabash Railroad.

WABASH RAILROAD.—The *Wall Street Journal* says that the Wabash Railroad will have to make further arrangements for taking care of the Wheeling & Lake Erie $8,000,000 notes which were purchased by a syndicate for the Wabash under an agreement by which the Wabash was to take up these notes at 6 per cent. interest. This agreement has about expired, and further arrangements will have to be made in the near future. The liability, including interest, now amounts to about $9,380,000. See Wabash-Pittsburgh Terminal.

WHEELING & LAKE ERIE.—See Wabash Railroad.

Late News.

The items in this column were received after the classified departments were closed.

W. I. Converse has been appointed superintendent of the Deering Southwestern, with office at Deering, Mo.

The Missouri Pacific is said to have ordered 1,000 refrigerator cars and 1,000 steel hopper cars from the American Car & Foundry Company.

The Western Maryland has ordered 10,000 tons of rails from the Bethlehem Steel Company and 2,000 tons from the Pennsylvania Steel Company. The Chicago, Milwaukee & St. Paul is in the market for 8,000 tons of rails.

The Missouri Pacific has established a package car service from Boston, Mass., to the Pacific coast via the Boston & Maine, New York Central & Hudson River, Lake Shore & Michigan Southern and the Cleveland, Cincinnati, Chicago & St. Louis to East St. Louis, thence via Missouri Pacific affiliated lines.

P. A. Auer, general passenger and ticket agent of the Chicago, Rock Island & Gulf, at Fort Worth, Texas, has been appointed assistant general passenger agent of the Rock Island Lines, with office at Chicago. George S. Pentecost, assistant general passenger agent of the Chicago, Rock Island & Pacific, at Kansas City, Mo., succeeds Mr. Auer, with office at Fort Worth, Texas, and his former position has been abolished.

The reductions in sleeping car rates, which have been under consideration for several months, have been announced by the Pullman Company to go into effect February 1. The tariffs filed provide that where the lower berth rate is $1.50 the upper berths will be $1.25, and where the lower berth rate is more than $1.50 the upper berths will be 20 per cent. less. The minimum rate for lower berths will be $1.50, and that of upper berths $1.25.

The $22,000,000 one-year 4½ per cent. notes issued by the New York, New Haven & Hartford, as noted on page 184, will be held to the amount of about $11,000,000 to meet obligations maturing before February 1, 1912. The remaining $11,000,000 is to be put out at interest and used at the discretion of the board of directors as occasion may call. The main payment before February 1, 1912, will be $6,700,000 five-year notes, which mature during January, 1912.

Representatives of the railways and brotherhoods and inspectors of the Interstate Commerce Commission have agreed on the following recommendations to the commission for extension of time to enable carriers to comply with provisions of the safety appliances law for equipment in service April 14, 1910. Carriers will not be required to change the brake staffs from the left to the right side of steel or steel underframe cars with platform end sills or change the end ladders on such cars except when these appliances are renewed. Carriers to be given five years from July 1, 1911, to change the location of the brake staffs on all other cars, and also to comply with the other brake specifications on all cars. That carries be not required to make changes or get additional end ladder clearance on cars that have ten or more inches end ladder clearance within 30 inches of the side of the car until the car is shopped for work amounting practically to rebuilding the body of the car. That carriers be granted five years after July 1, 1911, to change cars having less than 10 in. end ladder clearance within 30 in. of the side of the car to comply with the standard. That an extension of five years after July 1, 1911, be given for changing all other appliance on freight cars provided that where the following appliances are within three inches of the required location no change will be required: All hand holds except end holds under the sills, ladders, sill steps and brake staffs. That an extension of three years from July 1, 1911, be granted to change passenger cars; one year from July 1, 1911, to change switching locomotives, and two years from that date to change all other locomotives. The committee also agreed on numerous changes in the standards.

Supply Trade Section.

The Hicks Locomotive & Car Works plant, Chicago Heights, Ill., valued at $750,000, will be sold at Chicago on February 21 by William McInnes, receiver.

The McKeen Motor Car Company, Omaha, Neb., has delivered two 70-ft. all-steel gasolene motor cars to the Southern Pacific. This makes a total of ninety-nine 200-h.p. motor cars built by this company.

W. G. Tawse, road foreman of engines of the Chicago & Eastern Illinois, has resigned that position and is now with the Locomotive Superheater Company, New York, with office at Chicago.

The Crawford Locomotive & Car Company, Streator, Ill., has received an order from the Atchison, Topeka & Santa Fe for two dynamometer cars. The cars will be of steel construction, 51 ft. 3 in. long and 9 ft. 10⅜ in. wide.

The Western Electric Company, Chicago, recently opened three new branch houses: one in Buffalo, N. Y., another in Portland, Ore., and a third in Milwaukee, Wis., giving it 23 branch houses in different parts of the United States.

Thomas L. Mount has been appointed eastern sales agent of the Consolidated Railway Electric Lighting & Equipment Company, New York, with office in New York. L. J. Kennedy has been made western sales agent, with office at Chicago.

Joseph T. Ryerson & Sons, Chicago, at the annual meeting of directors, held January 23, elected the following officers: President, Clyde M. Carr; vice-president and treasurer, Joseph T. Ryerson; secretary, Gilbert H. Pearsall; chairman of the board, Edward L. Ryerson.

F. J. Bingham, who has been a general sales agent of the Union Fibre Company, Chicago, resigned January 15, to become general sales agent of the Northern Insulating Company, St. Paul, Minn., with headquarters in the Steger building, Chicago. The company will make a full line of refrigerator car lining and cold storage insulations.

Thomas H. Garland, general agent of the refrigerator service of the Chicago, Burlington & Quincy, resigned December 31, 1910, to become a vice-president of Burton W. Mudge & Co., Chicago. In his new position Mr. Garland will devote his time to the development and manufacture of the various devices designed and patented by him, which are now in general use. Mr. Garland has been in charge of the perishable freight traffic on the Burlington since February, 1900, when that road established a special department to devise ways and means for the proper care of perishable freight. He arranged a systematic refrigerator car service to and from all stations on the line for the transportation of dairy freight, fruits and vegetables in less than carload lots. In developing this service his attention was called to the necessity of better ventilation of refrigerator cars to carry off the heat and gases generated by the fruits and vegetables. For this purpose he designed a special ventilator which is now in use, not only on refrigerator cars, but also on passenger equipment on many large railways.



Thomas H. Garland.

S. R. Fuller, Jr., who has been sales agent in the New York office of the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., since April, 1910, has been made district manager in charge of the Chicago office of that company. George L. L. Davis, assistant to the vice-president, has been made third vice-president. Mr. Davis will remain in charge of the St. Louis sales office.

James A. Farrell, who is to be the new president of the United States Steel Corporation, was born in New Haven, Conn., in 1863. He started work with the New Haven Wire Company, New Haven, at the age of 16, and was promoted from time to time through various departments of that company, until at the age of 25 he went to Pittsburgh, Pa., as assistant superintendent of the Oliver Wire Company, later becoming superintendent. Four years afterward he took part in the organization of the Pittsburgh Wire Company, was made general manager, and built the plant of this company at Braddock, Pa. The unusual success of the Pittsburgh Wire Company against the competition of that period was no doubt a factor in Mr. Farrell's becoming manager of export sales of the American Steel & Wire Company, Cleveland, Ohio, when that company absorbed the Pittsburgh Wire Company. The large increase in the exports of the American Steel & Wire Company led to Mr. Farrell's being given supervision over the export sales of all of the other manufacturing companies of the United States Steel Corporation, and to the formation in the latter part of 1903 of the United States Steel Products Export Company, New York, of which he became president. The name of this company was changed in 1910 to United States Steel Products Company. Mr. Farrell is widely known in foreign countries, and was the chairman of the committee on foreign relations of the American Iron & Steel Institute during the meetings in October, 1910, which were attended by a large number of foreign steel men. Mr. Farrell's paper on Foreign Relations, read at the meeting, has already been published and translated into several languages. The United States Steel Products Company has been successful in selling the products of the manufacturing companies of the United States Steel Corporation abroad. The exports, which prior to the formation of the company were spasmodic and unsystematic, ranging from several thousand tons to several hundred thousand tons per year, have increased until in 1910 they amounted to more than 1,400,000 tons. Mr. Farrell will be formally elected at the meeting of the board of directors on January 31.



James A. Farrell.

Alson Ellis Clark, president of the Wadsworth-Howland Company, Chicago, died Sunday, January 15, at his home in Chicago. He was born at Barre, Vt., in 1838, and served during the Civil war in the 45th Massachusetts regiment. He came to Chicago in 1865 and became a member of the firm of Hoagland & Clark, commission merchants. He gave up the commission business in 1889 and went abroad for two years. On his return to Chicago he became president of the Wadsworth-Howland Company, the position he held up to his death.

The Vulcan Iron Works, Wilkesbarre, Pa., has received the following orders for locomotives: four switching locomotives for the Keokuk & Hamilton Water Power Company, Keokuk, Iowa; one locomotive for Wade, Clower & Wade, Haines City, Fla.; one mine locomotive for the Booth-Bowen Coal & Coke Company, Freeman, W. Va.; one ten-wheel logging locomotive

for the Roanoke Railway & Lumber Company, Norfolk, Va.; one mogul locomotive for the Kentwood & Eastern Railway, Kentwood, La.; one six-wheel switching locomotive for the Erie City Iron Works, Erie City, Pa.; one locomotive for the Northwestern States Portland Cement Company, Mason City, Iowa; one locomotive for the Alpha Portland Cement Company, Easton, Pa., and one locomotive for the S. B. Martin Company, Fiborn Quarry, Mich.

TRADE PUBLICATIONS.

Cranes.—The Whiting Foundry Equipment Company, Harvey, Ill., is distributing its crane catalog No. 82, which in addition to the usual catalog descriptions includes good photographs of up-to-date crane installations.

Valve Gear.—The Pilliod Company, New York, has published a 20-page illustrated catalog on the Baker locomotive valve gear, pointing out clearly and concisely the most important facts about its construction and operation.

Electric Drive.—The General Electric Company, Schenectady, N. Y., has published bulletin No. 4785, on electric drive in wood working plants, illustrating and describing electric motors driving wood boring machines, drills, planes, etc.

Southern Pacific.—The Southern Pacific traffic department has issued a booklet describing the agricultural possibilities and climatic advantages of the territory surrounding Hermosillo, Mexico. The booklet is well illustrated with photographs and contains excellent maps.

Shovels.—The Hussey-Binns Shovel Company, Pittsburgh, Pa., has issued a set of specifications for shovels, spades and scoops, with illustrations to show the method of casting ingots for shovels and the successive steps in rolling them into the finished blade. A blueprint giving all dimensions of the standard track shovel is included with the specifications.

Signals.—The General Railway Signal Company, Rochester, N. Y., has published bulletin No. 115-A on the model 2-A signal to supplement sections 1, 2 and 5 of its catalog. The bulletin contains 20 pages, is illustrated with excellent photographs and gives detailed information on the construction and operation of these signals. During the first year of their manufacture 2,869 of these signals were sold.

Railway Equipment Primer.—Bruce Crandall, who wrote the Bettendorf Bears, is the author of a new book, the Railway Equipment Primer. In it he not only gives the merits of the Creco brake beam, made by the Chicago Railway Equipment Company, Chicago, but also summarizes the railway situation facetiously, but effectively. The politician, who "runs" the railways, spelling the word "R-U-I-N" is a character who will especially make a hit with railway officers.

Rail Inspection.—Robert W. Hunt & Co., Chicago, have published a booklet describing their system of rail inspection. This booklet contains 25 pages and includes specifications for high T-rails and girder rails recommended by the committee on way matters of the American Street and Interurban Railway Engineering Association at Atlantic City last June, and also the Lorain Steel Company specifications which are used with slight modifications by the Pennsylvania Steel Company. The firm wants to call attention to a typographical error on page 6, section 4, which was discovered after the publication of the pamphlet. This paragraph relates to chemical composition, and the proper limits for the carbon content should be .60 to .75 instead of the limits shown in the pamphlet.

RAILWAY STRUCTURES.

ABERDEEN, S. D.—The division headquarters, local freight houses and passenger station of the Chicago, Milwaukee & St. Paul were burned January 23. Press despatches give the loss as $100,000.

BOSTON, MASS.—An officer of the Boston & Maine writes that the company is looking for a site for the proposed new mechanical department shops, plans for which are being prepared by the engineering force. Land, however, has not yet been bought. It is understood that the shops will be located at a point within 25 miles of Boston.

BROOKLYN JUNCTION, W. VA.—An officer of the Baltimore & Ohio writes that the company has under consideration the question of building a new bridge over Fish creek, at Brooklyn Junction.

CARROLL, TEXAS.—The Texas & Pacific has prepared plans for a brick freight depot to replace the wooden structure recently burned.

FULLERTON, CAL.—The Atchison, Topeka & Santa Fe Coast Lines will enlarge its station at Fullerton.

GALVESTON, TEXAS.—The Atchison, Topeka & Santa Fe budget for the Gulf lines includes the following improvements for the Galveston division: Track changes in Galveston yards, $15,000; 16-stall brick and concrete engine house, $40,000; standard sand house, $1,750; machine and blacksmith shop, $8,000; standard 85-ft. turntable, $7,500; oil and storehouse, $17,000.

GREENBURG, IND.—The coal dock of the Cleveland, Cincinnati, Chicago & St. Louis, was burned January 20, together with the new interlocking tower near it. The loss is estimated at $40,000, most of which is covered by insurance.

GRIDLEY, CAL.—The Northern Electric will build a station at Gridley, to cost $10,000.

GUELPH, ONT.—An officer of the Grand Trunk writes that arrangements have been made for the construction of the new passenger station at Guelph. The improvements include a subway at Neeve street. (January 20, p. 147.)

HOQUIAM, WASH.—The Northern Pacific will build a large wharf and warehouses on the tide flats at Hoquiam, to cost $10,000.

HOUSTON, TEXAS.—The International & Great Northern has let a contract to C. G. Patton, Houston, Texas, for building wharves and warehouses on the company's property below the turning basis. The wharves will be 400 ft. long, and the warehouses 50 ft. x 500 ft.

JOPLIN, MO.—The St. Louis & San Francisco, according to local press report, will build a nine-story office building and passenger station at Sixth and Main streets. The land necessary for the new building has been secured, and the plans prepared.

LAREDO, TEXAS.—The International & Great Northern and the Texas-Mexican will build a joint passenger station. The cost is estimated at $25,000.

LOS ANGELES, CAL.—The Los Angeles Railway Company is said to have under consideration the question of building a passenger station at Twelfth and Main streets, Los Angeles.

MARSHALLTOWN, IOWA.—The Iowa Central roundhouse was burned January 15, 12 engines being damaged.

REGINA, SASK.—The Railway Commission of Canada has approved the plans of the city officials of Regina, for a subway to be constructed under the railway tracks, at Broad street.

SAN ANSELMO, CAL.—The Northwestern Pacific will build a passenger station at San Anselmo, to cost $7,500.

SAN FRANCISCO, CAL.—A permit has been given to the Western Pacific to build a bridge over its tracks on Mississippi street, San Francisco.

SOMERVILLE, TEXAS.—The Gulf, Colorado & Santa Fe has let the contract for building a brick machine shop and boiler room, 92 ft. x 56 ft., work to begin within ten days.

ST. CLAIR, PA.—An officer of the Philadelphia & Reading writes that work is now under way by Edward L. Seeds, Philadelphia, Pa., putting up a concrete, steel and wooden coaling station to be 33 ft. x 910 ft. and 60 ft. high; also for constructing ash pits at the St. Clair yard.

TACOMA, WASH.—The Chicago, Milwaukee & Puget Sound will build the passenger station on Pacific avenue, Tacoma, to cost $250,000. (September 23, p. 562.)

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chinese Government is in the market for from 20 to 30 locomotives.

The Grand Trunk has ordered 12 consolidation locomotives from the American Locomotive Company.

The Long Island has ordered four ten-wheel locomotives from the American Locomotive Company. The cylinders will be 21 in. x 26 in., the diameter of the driving wheels will be 60½ in., and the total weight will be 174,000 lbs.

The Algoma Central & Hudson Bay has ordered 10 superheater consolidation locomotives from the Montreal Locomotive Works. The cylinders will be 22½ in. x 28 in., the diameter of the driving wheels will be 56 in. and the total weight will be 194,000 lbs.

The Chesapeake & Ohio has ordered eight Pacific type locomotives and two eight-wheel coupled superheater passenger locomotives from the American Locomotive Company. The cylinders of the Pacific type will be 22 in. x 28 in., the diameter of the driving wheels will be 72 in., and the total weight will be 215,000 lbs. The cylinders of the eight-wheel coupled locomotives will be 29 in. x 28 in., the diameter of the driving wheels will be 62 in., and the total weight will be 325,000 lbs.

CAR BUILDING.

The Kanawha & Michigan has withdrawn its inquiries for coal cars.

The Lehigh & New England is in the market for 500 hopper cars and 300 box cars.

The Chicago, Indianapolis & Louisville is in the market for 400 freight cars.

The American Refrigerator Transit Company, St. Louis, Mo., is taking prices on 1,000 refrigerator cars.

The Chicago, Burlington & Quincy is taking prices on 500 thirty-ton steel underframe refrigerator cars.

The Barrett Manufacturing Company, Chicago, is in the market for from 50 to 75 fifty-ton tank cars and three 30-ton tank cars.

The Tennessee Packing & Stockyards Company, Nashville, Tenn., is said to have ordered 25 refrigerator cars. This is not confirmed.

The Chesapeake & Ohio has ordered 25 coaches from the Pullman Company. This company is also in the market for five 60-ft. steel postal cars.

The Chicago Railway Company, mentioned in the *Railway Age Gazette* of December 2 as being in the market for 215 passenger cars, will build this equipment at its shops.

The Pennsylvania has ordered for its western lines 500 gondolas from the American Car & Foundry Company, and 300 box cars and 30 flat cars from the Pressed Steel Car Company.

The El Paso & Southwestern, mentioned in the *Railway Age Gazette* of September 9 as being in the market for three baggage cars, two postal cars, two chair cars and four coaches, has ordered this equipment from the Pullman Company.

IRON AND STEEL.

The Boston & Maine is in the market for 30,000 tons of rails.

The Baltimore & Ohio is in the market for 15,000 tons of rails.

The Nevada-California-Oregon has ordered 3,000 tons of rails.

The Western Maryland has ordered 9,875 tons of rails from the Carnegie Steel Company.

The Lehigh Valley has ordered 20,000 tons of rails from the Bethlehem Steel Corporation.

The Chicago, Milwaukee & Puget Sound is said to have ordered 9,000 tons of 85-lb. rails.

The Chesapeake & Ohio has ordered 3,000 tons of rails from the Pennsylvania Steel Company.

The Buenos Aires Central has ordered 1,000 tons of rails from the Tennessee Coal & Iron Company.

The Nashville, Chattanooga & St. Louis has ordered 2,000 tons of rails from the Tennessee Coal & Iron Company.

The Memphis Union Station Company has ordered 630 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Norfolk & Western has ordered 3,500 tons of steel from the Virginia Bridge & Iron Company and the Phoenix Bridge Company.

The Southern has ordered 22,400 tons of rails from the Tennessee Coal & Iron Company, and 3,000 tons of rails from the Maryland Steel Company.

The New York Central Lines have ordered 176,750 tons of rails to meet the requirements for maintenance of the properties this year. This order has been assigned among the several steel companies as follows: United States Steel Corporation, 87,500 tons; Lackawanna Steel Co., 81,250 tons, and Bethlehem Steel Co., 8,000 tons. Of the total order, 82,750 tons are for the lines east of Buffalo, N. Y., and 94,000 tons for the lines west. The rails will be divided among the various roads as follows: New York Central & Hudson River, 65,000 tons; Boston & Albany, 15,000; Rutland, 2,750; Michigan Central, 15,000; Lake Shore & Michigan Southern, 22,500; Cleveland, Cincinnati & St. Louis, 12,000; Peoria & Eastern, 3,500; Cincinnati Northern, 3,500; Chicago, Indiana & Southern, 6,000; Indiana Harbor Belt, 2,500; Lake Erie & Western, 5,500; Toledo & Ohio Central, 6,000; Pittsburgh & Lake Erie, 17,500. The specifications call for a large tonnage of open-hearth rails, and a considerable quantity of ferro-titanium rails, with a higher percentage of ferro-titanium in them than heretofore, will also be used.

General Conditions in Steel.—The decision of the steel men to maintain the official prices has induced several railways to place the orders which they had been withholding in the hope of getting lower prices. The orders during the past week have been large and everything seems to point toward a general improvement in the industry. The prices of wire have been raised, but that product is entirely separate and there is no danger of an increase in other prices at present. It is now known that a reduction in prices could only come with a corresponding reduction in wages, and that is not likely.

FOREIGN RAILWAY NOTES.

At a recent meeting of the North-Eastern Ural Railway Company, the question was discussed as to the construction of new lines of railway in Russia. The proposed lines would run from Taboriansk to Ekaterinburg via Turinsk and Irbit, and also from the Alapayevsk iron works to Bogdanovich via the Egorshinsk mines. The total length of line would be 309 miles and the cost of construction is estimated at about $14,630,000.

A new section of the Madeira-Mamore Railway, Brazil, extending for 40 miles from the Jacy Parana to kilometro 152, has been formally opened to traffic. A trip is now made daily over the operated section of the line from Porto Velho to kilometro 152 in about 12 hours. Rubber loaded on cars at the present terminus at kilometro 152, in the morning can be transshipped from the cars to ocean steamers at Porto Velho on the evening of the same day, and thence carried direct, without further handling, to the United States or Europe.

The press of Montevideo announces that the government of Uruguay has received and is studying a proposal to build a standard gage railway starting from Montevideo, or some other point on the Uruguay river, and traversing the republic as far as the Cuareim river, the northwestern border of Brazil. The concession would also include powers to expropriate for purposes of agricultural colonization, up to 24,711 acres of land in the vicinity of each station, the stations not being more than 9 miles apart, and also to construct ports, wharves, depots, elevators, etc., on the Uruguay river.

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An extensive reorganization of the Rock Island Lines was put in effect on February 1. Under the new organization there will be a marked decentralization of management. The lines have been divided into three districts, and, whereas the old organization was departmental, the new organization is frankly divisional. The following official memorandum both gives the reasons for the change and describes its nature:

"The principal reason for the change in organization was the desire to furnish better service to the public. The first requirement is a decentralization of authority heretofore held in Chicago. On each of the three districts the general manager will be supreme on all matters local to his district and, with co-ordinate officers in the freight and passenger departments, will keep in touch with and meet service conditions promptly by frequent conferences. In the operating department, both the general superintendents and division superintendents will have on their staff the mechanical and engineering district or division representatives. The plan is a divisional one wherein the superintendent is responsible for all operations on his territory, but the organization of the general superintendent's force differs from that of most roads having divisional organization. He will have a superintendent of motive power and an engineer of maintenance of way reporting directly to him on all operating matters, and in this way the control of each general manager's district is centralized in the general superintendent, who will be responsible only to his immediate superior, the general manager. For purposes of maintaining uniform practice and standard methods, the mechanical and engineering district representatives will be advised by the system officers."

Further details of the reorganization are given in our news columns. It is an interesting example of the tendency of the managements of large railway systems to recognize the dangers of excessive centralization of authority and the desirability of giving divisional and district officers the staffs and the authority necessary to enable them satisfactorily to handle all matters pertaining chiefly to their own divisions or districts.

Some weeks ago President Mellen of the New York, New Haven & Hartford in an unofficial letter suggested a court of commerce in Connecticut as a substitute for the proposed new public utilities commission in that state. The bill embodying that idea and, presumptively, fathered by the New Haven company, has now been introduced in the lower house of the state legislature. Its force of statement of the jurisdiction of the new tribunal is so unique as to be worth exact reprint.

Section 5. It shall be the duty of all persons to abstain from all acts unreasonably endangering the public health or safety. It shall be the duty of all employers to adopt reasonable measures to prevent injuries from the conditions of their employment to the health and safety of their employees. It shall be the duty of all railway companies, water companies, telegraph companies, telephone companies, and express companies, and of all other corporations, associations, partnerships and persons, who also serve the public, to render to the public such proper and adequate service, including the provision of reasonable facilities therefor, as shall be reasonable and just and reasonably compensated under the then existing conditions that shall actually exist; and it shall be the duty of all who supply or serve the public to refrain from extortionate, unjust and unreasonable rates, charges and prices for the commodities supplied and services rendered to the public.

The construction and functions of the court are also novel in many respects. An additional superior court judge, besides the existing eleven in the state, is to be created. Then any one of the twelve is to be appointed by the Connecticut chief justice to be a court of commerce for a year, that is to have all the power of an ordinary judge of the court and more, for he can regulate procedure and suspend the rules of evidence; he can employ an expert adviser or advisers; he may appoint a committee of investigation; and he may enter any order, decree or judgment which he thinks fit as calculated to carry out the intentions and spirit of the law. Any individual or party may bring a case before the judge without the intervention or initiative of an attorney should they prefer to do so. Appeal is given from the court to the supreme court of the state under the ordinary appellate form of procedure—but only on questions of law, not of fact.

The novelty, not to say radical originality, of the single headed court is obvious. Its jurisdiction would reach out broadly to public hygiene and include "all" employers of labor, whether corporations or otherwise—matters hitherto voted beyond the purview of public service commissions. Whether its powers would extend to finance and capitalization is not clear, but presumptively they would, as any one of the judges might hold the theory that capitalization bore on rates and forbid, for

example, a new issue of stock. The court, apparently, would not possess initiative and would take up a case only on complaint, which in one sense would leave the corporations considerable freedom of action but might, in another sense, subject them to purely vexatious procedure. Seemingly it would be a kind of court of redress, yet with powers which extend beyond mere redress and into positive judgments relating to public equity, necessity and convenience, in the largest meanings of those terms. The fate of the measure will be watched with interest in a state where the question of a strong public utility commission has now for four years been an active issue in politics, with the platforms of both parties in the last political campaign indorsing it, and an outcome just possible is the creation of the court as a quick appellate tribunal annexed to such a commission. Meanwhile an antecedent fact may be emphasized. Connecticut has had for forty years or more a railway commission with plenty of law behind it, but wretchedly weak in personnel, policy and action. Had its composition and character been the reverse, would we now be hearing of commerce courts and of public utilities as a topical question in state politics?

THE post office appropriation bill, which is now being discussed in Congress, has a clause (page 20, H. R. 31, 539), which, if adopted, will require the universal use of steel mail cars by July 1, 1916. A provision in the bill requires the post office department at once to adopt specifications for steel cars, to which all new mail cars must conform, and there is a further proviso that, from the date of the passage of the bill, the government must refuse to pay rental for any wooden mail car which is run ahead of a steel car in any train. That is to say, if there were steel passenger cars in a train, the mail car, if not of steel, would have to be put at the rear of the train. As the larger railways have long been in the habit of giving the post office department about everything that it wanted, it is not unlikely that this demand will have to be complied with—though to do so will entail a heavy expenditure. Most of those mail cars which will not in the ordinary course be retired within five years are costly vehicles, and cannot be altered to be used for other purposes except at a large loss. The troublesome part of the proposal, however, is that which is designed to stop the mixing of steel and wooden cars in the same train. Many roads, even of those which do not own steel cars, would feel the effect of this, for the Pullman Company has a good many steel sleeping cars, which run over other roads than the Pennsylvania, and which it may at any time wish to send over an unusual route. To run a single steel sleeper at the rear of a long train would incur the penalty of this proposed law. By and by the practice of running mail and baggage cars at the rear of trains, now quite common in a limited territory, may have to be made universal. To think of every train being run with a blind end car at the rear—like a mole being dragged by the tail! Thus the real poetry of railroading will be one step nearer its final extinction. And the brand furnished by Mr. Brandeis and that ilk can never take its place.

EIGHT years ago E. W. Winter came to the Brooklyn Rapid Transit to put it on its feet. Since leaving the presidency of the Northern Pacific in 1897 he had been active in various enterprises, because there had been greater need for his services than what he would admit to be his own need for a rest. He had for two years been a confidential adviser for the directors of the Brooklyn Rapid Transit, and when they realized that they needed him in active charge he took the office. Though it was expected that the work he would have to do would only take about six months, he really "enlisted for six months or the war," and he has seen it through. He resigned last week, taking advantage of a time when his work of reorganization is finished and the company is ready to go ahead with a policy of extension which he can leave in the hands of his fellow officers. Though he does not expect to retire from railway work permanently, he has no definite plans aside from the enjoyment of several months of the leisure he has earned. At the end of 1902 the Brooklyn Rapid Transit was almost hopelessly run down; track, cars, credit—almost everything was in the same shape, and the company was barely earning a surplus. The new president asked the directors for more and more money, and somehow they raised it. In the seven years which followed, $40,000,000 was spent on permanent improvements. Some $35,000,000 bonds were sold under par, with a loss of $6,500,000 in discount, of which all but $1,000,000 has been made up by earnings. Mr. Winter, so far as he could, got all earnings put back into the property and opposed dividend payments; the stock is now paying 5 per cent. However, his biggest work was not the physical rehabilitation of the property but its moral rehabilitation, and raising it to the plane of good repute in the eyes of the public. In 1903 the management was under a unanimous fire of public condemnation. The people were more than simply suspicious of the new regime. Over and over again the B. R. T. had been taken in hand by new managements promising all the service the public could ask, but each house-cleaning brought in seven devils worse than the first. Winning the respect and trust of the public, rather than the bringing about the physical development of the system, is what has taken years. Mr. Winter succeeded by giving the road's patrons good service, raising the standard of the employees and taking care of them, and, in the face of attack and abuse, convincing the citizens of his integrity and fidelity to trust.

OUR esteemed contemporary, the *St. Louis Globe Democrat*, commenting on a recent editorial reference in this paper (January 6, 1911, page 1) to the rapid growth of the commerce of St. Louis during 1910 in spite of the so-called "bridge arbitrary" of which some of its business men greatly complain, assures us this growth was entirely because St. Louis has a very strong constitution, and not because its freight rate adjustment is favorable. There is no doubt that St. Louis has a very good constitution. Its business men are able and enterprising. But our contemporary greatly exaggerates the disadvantages in freight rates that they had to overcome. As has been shown in this paper before, the total amount in the form of the so-called arbitrary on coal that the shippers of St. Louis pay to the Terminal Railroad Association each year is only about one-fifth of one per cent. of the annual value of their manufactured products. Surely, for a city having, as our contemporary says, a most robust constitution, a burden of one-fifth of one per cent. cannot be so very heavy. Furthermore, as we have pointed out before, the imposition of this very slight burden is entirely justified by the conditions under which coal is transported from points in Illinois to points in St. Louis. To offset the very slight disadvantage, growing out of its geographical location, of which St. Louis complains, it has many and great advantages. It has one of the most efficiently managed terminal railway systems in the world. Its competitors complain that it has large advantages in through railway rates. Chicago, for example, asserts that the rates from St. Louis to the Southwest, and also to St. Paul, are too low as compared with those from Chicago. Indianapolis complains that the rates from St. Louis are too low as compared with those from Indianapolis to almost all points of the compass. Galveston complains that the rates from St. Louis to Oklahoma, Kansas, Arkansas, etc., are too low as compared with those from Galveston. The cities on the Pacific coast complain that the rates from St. Louis to the intermountain territory are too low as compared with those from the coast. According to its competitors, St. Louis is one of the most favorably situated cities in respect to freight rates in the United States. Now, the Terminal Railroad Association is owned by the trunk lines that enter St. Louis. Therefore, the trunk lines, which, in effect, have made the rates charged by the Terminal Association, have also made the very favorable rates which St. Louis enjoys to all parts of the country. Does it not appeal to the sense of fairness

of the *Globe-Democrat* that when it discusses the rate adjustment of St. Louis it should consider it as a whole? It is the entire adjustment that affects the city's commerce. The *Globe-Democrat* says that the business men of St. Louis do not propose to "stand" the disadvantages under which, it asserts, they labor. There are other cities which say that they do not propose to stand the disadvantage under which they labor as compared with St. Louis. The jobbers at Denver and on the Missouri river are finding, as a result of their successful litigation about the class rates from the Atlantic seaboard, that rate readjustments are not jug-handle affairs; for they are in a fair way to lose by the Interstate Commerce Commission's principle, that a through rate should ordinarily be the sum of the local rates, two dollars for every dollar that they may gain by it. Probably the disinterested and public-spirited real estate men of St. Louis will never agree that the Terminal Railroad Association should be given the ordinances it needs to develop its facilities. If it should be they would not get a chance to sell as much real estate for railway purposes as they would if all the eastern railways were forced to establish terminals in St. Louis. But we are sure that if the *Globe-Democrat* will give due consideration to all the rate advantages and disadvantages of its city, it will conclude that St. Louis will be very much wiser to bear with such small rate evils, real or imaginary, as it now has, rather than to fly to others of which it knows not.

CANADIAN RECIPROCITY AS AFFECTING NEW ENGLAND.

FREDERIC BASTIOT, the French economist, used to state a principle of political economy somewhat in these words: "All men, women and children are consumers. They must, at the very lowest terms of consumption, eat to live. But all men, women and children are not producers. And only a small part of the producers are such under a system of bounties, direct or indirect, of governments. Therefore, as a very broad generalization, the consumer's interest represents the greater good to the greater number." This postulate which may almost be called an axiom of Bastiot, can by an easy shift be applied to the railway interest thus: Consumption is the larger and more vital interest. It creates demand which production must and will necessarily meet. The gap between the two is spanned by trade, and transportation is a prime factor in trade. Trade must have its common carrier. Therefore any bar of trade is against the carrier's interest.

This general dictum may be specifically applied to a region like New England. The six New England states, constituting together but one small corner of the nation, are, along with their geography, highly concentric. They have a dense population, very largely focused in some eighty cities, not to mention many congested factory towns; and they have one controlling industry, manufacturing, which in a very great degree makes them industrially homogeneous, though within the bounds of manufacturing the products are infinitely heterogeneous. Moreover, most of the New England factories are old; they are the beneficiaries of the latest mechanical devices of the inventive Yankee race; whether it is machine work or hand work they are highly organized; and the cost of labor and cost of material are almost the only varying elements of their efficiency in competition. As related to the railways, the vast factory interests of New England consume low class freight and turn out high rate freight. They take in raw iron, copper, steel, wool and cotton. They send out iron, copper and brass machinery and hardware, large and small, and the manufactured textiles. And they send not merely to the rest of the country but to transatlantic markets. Their business is intensive and assertive, constantly craving an expanded market; and more than ever needing the wider mart, now that, seeking either nearness to the market or to the raw material, the competing cotton factory is springing up in the South and mechanical industries in the Central West.

As New England is geographically and industrially consolidated, so is the system of railways, now almost exclusively under the New Haven company's ownership or control. But the outlying northern part of the New Haven system is represented by the Boston & Maine, whose lines, including those of the leased Maine Central, reach the Grand Trunk and the Canadian Pacific at seven or eight points. Bearing on the character of the Boston & Maine traffic as affected by the proposed reciprocity treaty with Canada, its classification of freight business last year is suggestive:

Commodities.	Tons.
Products of agriculture	2,979,023
Products of animals	1,044,721
Products of mines	5,966,008
Products of forests	3,334,577
Manufactures	4,659,081
Miscellaneous	4,832,118
Total	22,815,528

The detailed analysis of the large groups of railway freight on the connecting system between New England and Canada brings out some striking facts in favor of the reciprocity schedules.

Out of the first group (products of agriculture, 2,979,023 tons) only three, hay, potatoes and vegetables can possibly mean injury to the farmer under the reciprocity plan, and of these hay has the natural vantage of bulky material in nearness to the New England markets; and the great potato crop of Aroostook county, Maine, has the additional vantage of prolific soil and wholesale cultivation by machinery. The three products named are less than one-third of the Boston & Maine "agricultural" freight, the rest—grain, flour, cotton, etc.—coming from outside New England. These exotics, under any tariff, must for the most part enter New England by rail either over the Boston & Albany or by the New Haven system, including the Boston & Maine.

The second group (1,044,721 tons, products of animals) includes live stock, dressed meats, other packing house products, poultry, game, fish, wool, hides and leather. A mere glance at these commodities will show how largely they are extraneous to New England. Fish, with game and poultry, formed together but 66,936 tons; and the protests of Gloucester against reciprocity and free fish is more than countered by the acclaim of reciprocity by the fish merchants; also the census figures show how Gloucester gained 70 per cent. in population under the old Canadian reciprocity treaty and has fallen from 28,211 to 24,398 during the last 15 years.

The third group (products of mines, 5,966,008 tons) consisting of coal, ore and stone, is so obviously unrelated in the main to New England industry as to require no comment, except to call special attention to the benefit of cheaper coal to the railways under the reduced duty on the coal from the mines of the Canadian maritime provinces. Incidentally, attention may be called to the $8,608,066 extended last year for coal by the New Haven-Boston & Maine system for locomotives alone.

The fourth group (products of the forests, 3,334,577 tons) has as its major item lumber, 2,644,853 tons. Is a reduced duty on Canada lumber as against the extending forests of Maine a thing for railway lament?

The fifth and sixth groups, manufactures and miscellaneous, may practically be treated together as factory products, the advantage for which, as a whole, of the expanded Canadian markets admit of no argument adverse to the railways and every argument in their favor. Together they represent 9,491,199 tons, or approximately 42 per cent. of the Boston & Maine freight business, and of far greater percentage in its total freight receipts, owing to higher classification.

In a general summary the returns show that out of the Boston & Maine total freight traffic of 22,815,528 tons, a tonnage, exclusive of lumber, of not more than about 6 per cent. can by any stretch of fancy or fear be affected unfavorably by the new reciprocity bill, and affected, at most, only by a moderate fraction of that tonnage.

The New Haven system in southern New England, with its

dense population, has no such classification of freight business by commodities as has the Boston & Maine. But with some minor variants it would undoubtedly give similar returns. The conclusion is irresistible that the interests of the New England railways, along with the other transportation interests of that region, lie on the side of the reciprocity bill. That conclusion may for the moment be based on the nature of the railway traffic alone. But it does not negative a closing allusion to the values of general enlargement of trade, the stimulus to business of cheaper commodities, the comforts of lower prices of food for the laborer and those multiplied benefits of the many which contrast with the profits of the few.

PREVENTING COLLISIONS BY STATUTE.

THE question of what shall be done to prevent collisions is now squarely before the legislature of Indiana, and it will be interesting to see what the law-makers do with it. None of the bills appear to have been the result of any serious study of the situation. One proposes to give the railway commission discretion to enforce its orders requiring the installation of block signals; and there is a confusing variety of other measures.

Indiana has been more active in this matter than any other state. A law was passed in 1907 making the use of the block system compulsory, but it had numerous defects. No authority was designated to decide what should be accepted as a satisfactory block system; roads of small income were excepted, and electric roads were specifically exempted. The railway commissioners made earnest efforts to have the law enforced in its proper spirit, but the railways blocked the commission's wheels wherever possible. Last autumn there were several bad butting collisions on interurban roads—one on the Fort Wayne & Wabash Valley, killing 41 passengers—and the commission made a special report to the governor, which report is now before the legislature. The interurban roads are in some respects even more dangerous than the steam roads, and the fact that the block system law does not apply to them does not alter this fact.

If there is any virtue in legislation on this subject, here is an opportunity to demonstrate the fact. A beginning has been made (in the passage of the law of 1907) and the thing to do now is to perfect what has been begun. Block signaling, if regulated by law, ought to be under the control of the federal government for the sake of uniformity; but as long as Congress neglects to act, state legislatures have a good right to act. A legislator who imitates the do-nothing policy of Congress only stultifies himself.

There is no denying the difficulty of the problem. The Indiana commission told the governor, in substance, that the trolley roads ought to have the block system, but that they were so poor that the expenditure which would be necessary for its adoption would bankrupt them. The commission, however, weakened its position by not boldly taking a positive stand for "safety first, speed afterward." The commissioners saw that the block system was the thing needed, yet wasted much valuable ammunition in the discussion of partial remedies. They seem to have ignored the plain lesson of experience, that the block system is the only rational remedy for collisions, and that the time interval system, however much it is bolstered up, will still be so faulty as to be immeasurably inferior to the block system. Improvement, without the block system, is not entirely out of the question, but at best there would be many serious dangers still untouched. The perplexing question of what to do when the block system is seen to be necessary and the only alternative is a serious diminution of the speed of trains, while yet there is no money in the treasury to establish the block system, is one for the railway company, primarily; and the commission, on its part, would have done well to stick more closely to the single main point, the safeguarding of the passengers' lives. It is not bound to settle all the railways' troubles.

It is a pity that the commission could not have made a more vigorous report to the legislature. A perfect report does not insure wise legislative action, it is true; but with a ringing declaration of what ought to be done the commissioners could then, with clear consciences, leave the responsibility with the legislature. We have not the space for the whole of the report, but we give below* its main paragraph, in the commissioners' own language. The commission takes a level-headed view of the situation, but leaves too much to the "wisdom" of the legislature. The subject is so involved that it is to be feared that the legislature—like innumerable other legislatures in similar situations in the past—will fail to take effective action. Legislatures are not likely to have much wisdom on block signaling.

And the wisdom of the commissioners is unsatisfactory. Clear-sighted as they are in nearly everything that they say, they leave the subject suspended in the air. The recommendations for better men and better discipline are excellent, are in the right direction, and are needed, but these improvements *will not prevent collisions;* not unless the teaching of many years of past experience is false. That second paragraph of the recommendation to the company is all right for a preliminary order or recommendation, but if it is to truly embody the rightful demands of the people of Indiana (or of any state) it needs to be backed up by a declaration that *the block system and nothing less* will be accepted as a preventive measure. And the legislators cannot be expected to make such a declaration until they have been suitably informed by the commission.

An esteemed correspondent who lives in Indiana has written to inform us that in some of our comments in the past we have done the commissioners a grave injustice by calling them a political commission, and he takes up the cudgels in their defense. He says that there are as many Democrats as Republicans among the commission's employees, and that the commissioners themselves are non-partisan, and in this matter of safety they have done the best that could be done under laws which give the board very limited powers. Assuming that we did use the term here cited—we have not found it in our recent files—we referred not so much to the doings of the board as to its origin. As in nearly every other state, the commissioners, selected by or in accordance with the spirit of a governor and a legislature whose

* "Conclusions as to the cause of these accidents are not difficult; the recommendation of a practical and efficient remedy for such accidents under subsisting conditions of interurban organization, operation and revenues is the most difficult work ever required of this commission. It is clear to us that these operating conditions are incompatible with safety, and we so report; and that fatal accidents must continue to occur unless there are radical changes and betterments: that on the one hand, the public demand, and have the right to demand a much higher degree of safety than these lines now afford, and this proper factor of safety can be secured only by the expenditure of larger amounts of money than is now used in the employment of competent, trained, experienced men, and the installation of adequate safety devices, and by holding to criminal responsibility who ever by flagrant neglect causes these fatalities; on the other hand, it is equally clear that if this is done, as it ought to be, that there will be little or nothing left, passing all questions of dividends on stock, to pay interest on the bonds of some of these companies."

Acting under the law providing for such cases, the commission sent to the Fort Wayne & Wabash Valley Traction Company a list of recommendations for improvements, the substance of which was as follows:

1. (a) That said company shall secure and employ better railroad men for motormen and conductors, taking such steps as are necessary to secure capable and fit men, and to keep them in their service; (b) that applicants for positions as motormen or conductors should not be employed until their former records have been carefully considered; (c) that all motormen hereafter employed shall have at least one year's experience in train service, this qualification being no greater than the law of the state requires for flagmen of passenger trains on steam railways; (d) that no other duties be assigned to motormen than the operation of their cars, and that they shall not be required to do the work, or assist in doing the work of baggagemen or expressmen; (e) that separate compartments shall be provided for motormen, so that their exclusive attention may be given to operating their cars, and so that they may not be diverted by the conversation of passengers or other persons; (f) that when a trailer or an additional car is attached to the motor car, a third man shall be put on to assist and work under the direction of the conductor.

2. That said company proceed to install block signals on its interurban railway, and to this end that within sixty days, it shall report, and submit to this commission plans and blue prints of some adequate block system, the same to be hereafter installed and operated as soon as practically possible.

3. That said company shall enforce the double order system of despatching on its lines; and that hereafter no exception under any circumstances shall be made to this rule. Delays are better than accidents.

4. That although trainmen should operate by rules and time-cards and orders, and signals when installed, said company shall proceed to eliminate obstructions to sight at curves, where sight is badly obstructed. And until this is done, said company is directed to post slow speed signals at said curves, and to reduce speed of cars at such places to a limit of not exceeding fifteen miles per hour.

5. That division superintendents and trainmasters should not be burdened with other duties than those pertaining to train operation.

6. The train despatchers should not be required to handle interlocking plants or to perform other duties than those pertaining to the despatching of trains.

very breath is politics, can hardly be expected to get out of that atmosphere. A bi-partisan commission, impartial as between different parties, is often weakened by politics as much as though it were partisan, and the term "political" would apply to it the same as the other. Even in New York, Governor Hughes, who was looked up to by the whole country as an ideal officer who would act wisely in matters of this kind, in appointing ten commissioners, selected only two who were experts in railway matters. We are free to admit that the Indiana commissioners have done as well as they knew how to do; what we complain of is that they did not take expert advice in regard to the collision disgrace *and do as well as anybody knew how to do.* It is quite possible that the advice which they took was sound, but that they lacked the courage to adopt it, and present a correspondingly vigorous declaration to the legislature. But a situation of that kind only emphasizes our point the more forcibly; for to give sound advice to a legislature a railway commissioner not only must have public spirit and general knowledge, but, in addition to these, that special knowledge of railway conditions which, in many critical matters, comes only from training and experience in close contact with railway conditions. In other words, a railway expert is needed. It is out of the question to expect even the best citizens, non-railroaders, to qualify as capable commissioners in one year; nor in three years, except under favoring circumstances.

THE "LEAGUE FOR PUBLIC SAFETY" AND RAILWAY ACCIDENTS

"LEAGUE for Public Safety" is the name of a concern, having headquarters in Chicago, which is inquired about by a correspondent whose letter we print in another column. This "league" devotes itself principally to the promotion of an automatic train stop; and as schemes for the introduction of one device or another under this general head seem to be increasingly common, we have taken some pains to make inquiry, on the lines suggested by our correspondent. The particular apparatus offered in this case may or may not have merit in itself—some devices possessing a good deal of worth have fallen into the hands of discreditable persons—but as the Chicago concern represents a type of men which has annoyed railway officers throughout the country, it may deserve a word.

Clyde Alison Mann was formerly the secretary of this "league." He tells us that the present secretary is E. P. Bryant. Mr. Mann, however, is still "very much interested" in its work and expects to see the "league" very active during the present year. He admits that he has been active both in the "league" and in the organization of the Railway Safety Equipment Company, but protests that no unfavorable conclusion is warranted from his simultaneous connection with the league and with the automatic stop concern. He says that as soon as he can get the league "on its feet" he intends to withdraw from it and give his services entirely to the Railway Safety Equipment Company. The device being promoted by this company consists of a hinged lever depending from the engine or tender, and a trip which in the stop position presents a curved upper surface to the roller in the lower end of the lever. The upward movement given the roller by its passing over the curved surface of the trip causes a service application of the brakes. The device has not been tested by any railway officers or the engineers of any state commission, so far as can be learned, nor is it included among those schemes that are considered by the Block Signal and Train Control Board to possess merit warranting their further development.

The claim made by the "league" in the circular quoted by our correspondent that the Block Signal Board is overwhelmed with work and can make little headway, has no substance. The board has had to deal with a great many devices which do not deserve consideration; but so far as concerns those which have merit, the board has complained rather of delay on the part of the proprietors. Automatic stops which are worth testing have been tested as fast as they were presented in accordance with the rule laid down by Congress.

The general subject of automatic stops was considered in an editorial in our last issue, page 153. The problems connected with it are beset with difficulties. The theory is attractive, but in its practical application the superintendent and the signal engineer have to deal with refinements of mechanical and electrical practice, and of discipline, which can be only imperfectly measured and compared. Whether to try to improve the safety of trains by the simple methods which have proved so successful in England; or to assume that English discipline is impossible in this country and try to make mechanical devices take the place of men, is a question which two railway managers might decide in opposite ways, and yet neither of the two be able to prove the other wrong. The most common error is the assumption that the mechanical (or electrical) substitute for brains will be perfect. It is almost certain *not* to be perfect.

The problem being thus obscure, the rational-minded inventor or railway manager will handle it constantly with caution. As the Block Signal and Train Control Board has said, there is an unlimited field for the improvement of the personnel as well as the *materiel* of American railways. Muckraking circulars concerning railway accidents almost invariably prove to have their origin in schemes for private profit, rather than in a desire to promote the welfare of the public. With such a purpose, the promoter always aims to get something done by the railway companies, which are supposed to have fat treasuries. If purely disinterested, why not look at some of the faults of the men? Unfortunately, these can be cured only by the slow processes of education, and there can be no patent on any magic formula. The railway companies have sins enough to answer for, and we are not offering apologies for them; but there would be a more even balance in the discussion if the employees were oftener called to account for their delinquencies. It often has been pointed out that a large majority of accidents on American railways is due, not to shortcomings of plant or rules of operation, but to the failure of employees to obey the rules. The railways of Great Britain do not have automatic stops, and very few automatic block signals, yet have records of a high degree of safety. That their accident record is better than that of American railways is mainly due to two elements: the universal use of the space interval, and the fact that British employees implicity obey the rules; and they do this because English trainmen and station men have been so long used strictly to obeying rules and orders that it has become second nature. Moreover, the laws designed to punish men who carelessly or recklessly disregard their duty, are better enforced than here. In spite of the fact that these things are well known to railway men and that they repeatedly have been given publicity, most of the denunciation of American railway accidents, and practically all the legislation regarding them, are directed against the railway corporations, and extremely few of them against the employees. But agitations conducted in this way do not and will not prevent accidents. As the Block Signal Board points out, "nowhere in the world have appliances for safeguarding railway transportation been so highly developed as in this country, notwithstanding which nowhere in the world is there a greater proportionate number of accidents of the kind which such advance in the art should prevent."

What is most desirable is better co-operation between the railway managements and the employees to stop accidents. The Chicago & North Western, through its "safety committees," consisting of both officers and men, is making an effort to secure such co-operation, the results of which will be studied with lively interest by railway officers throughout the country. Unless effective co-operation can be generally brought about, we shall require the sort of discipline on our railways to which the masters of steamships are subjected by the United States government. The other day a locomotive engineman on a railway in Idaho ran past two signals which were set against him, disregarded the frantic hand signals of the trainmen on another train, and ran into their caboose, killing the roadmaster, who happened to be on it. When this sort of thing happens on a railway and the superintendent attempts to administer proper discipline, he is

waited on by protesting committees of employees, who very likely will threaten a strike if the management insists on executing exemplary punishment. On the other hand, if the master of a steamship runs past signals he is likely to have his license summarily taken away. A case in point is that of Captain Alfred Croskey and Fourth Officer Henry J. Allen of the steamship *Northwestern*, which was stranded on San Juan island on the Pacific coast on December 2 last. Although Captain Croskey had been on duty continuously over 16 hours, inspectors of the United States government suspended his license for one year, saying that they were "of the opinion that Captain Croskey was guilty of negligence on this occasion in turning the command of the ship over even temporarily to an officer who is not recognized as a skilful pilot in those waters." They also suspended the license of Fourth Officer Allen for three months, holding that, although he had had no experience in the waters in question, he was not relieved from the responsibility of keeping a good lookout and doing his best to navigate his ship safely, and that his failure to ascertain by taking cross bearings of the lights that his position was dangerous was highly censurable. The conductor and engineman of a train are its master and first officer. They are paid high wages because they plead the weight of their responsibilities. It is to be feared there are many of them, and of other employees, who will never fully live up to their responsibilities until they are dealt with in the same firm way by public sentiment and by the government as are the officers of steamships; and there is precisely the same reason for so dealing with them as there is for so dealing with the officers of steamships.

Before the government will so deal with them, it will be necessary to educate public opinion to a point where it will require the government to do it. How this work of education shall be done is a hard problem. The Harriman Lines began some years ago to carry on the work of public education by giving wide publicity to the facts about their accidents. In the year 1903-1904 the number of accidents on the Union Pacific was 20 for 1,000,000 locomotive miles, and in the last half of 1910 it was but 4 for 1,000,000 locomotive miles. In 1903-1904 there were 29.5 accidents for 1,000,000 locomotive miles on the Pacific system of the Southern Pacific and in the last half of 1910 there were but 10.5. It is certain that this marked reduction in accidents was not brought about entirely by publicity, for meantime the plants and operating methods of the Union Pacific and the Southern Pacific were greatly improved. But it seems quite probable that it was largely brought about by publicity. And it is absolutely certain that the work of public education, which is one of the prerequisites to the substantial reduction of accidents, is not only not furthered, but is to a large extent rendered impossible, by the reckless denunciations of irresponsible writers the sole purpose of some of whom seems to be to get their hands into the railway companies' treasuries.

NEW BOOKS.

Mechanical World Electrical Pocket Book for 1911. Cloth, 3⅞ x 6 in., 180 pages of text and blank pages for diary and memoranda for the year. Price, 6d. Emmott & Company, 20 Bedford street, London.

The electrical pocket book published by the *Mechanical World* of London has been revised and so condensed that it affords space for a large number of new tables relating to current density, temperature rise, illumination, depreciation allowance and many others. The notes on accumulators have been rewritten and extended and a new section on liquid starters has been introduced. In general, the book has been thoroughly revised and contains many new illustrations.

Employers' Liability and Workmen's Compensation. Bureau of Labor, Department of Commerce & Labor, Washington, D. C.

Bulletin No. 90 of the Bureau of Labor is devoted largely to the subjects of employers' liability and workmen's compensation. There is a history of federal and state legislation, and the work of federal and state commissions appointed to inquire into the subject; action taken by employers and associations of employers and workmen, and the laws recently enacted by the state of New York; the results of a recent conference in Chicago of state commissioners; a summary of the important features of workmen's compensation systems at present in force in 26 countries, and the cost of employers' liability and workmen's compensation insurance in the United States and various other countries.

Proceedings of the International Railroad Master Blacksmiths Association. 258 pages, 6 in. x 9 in. Secretary, A. L. Woodworth, C. H. & D. R. R., Lima, Ohio.

The eighteenth annual convention of this association was held at Detroit, Mich., August, 16, 17 and 18, 1910. Among the more important subjects considered were tools and formers; frogs, crossings and switches; treatment of high-speed steel; frame making and repairing; the use of scrap; piecework; oxy-acetylene welding; spring making and repairing. An account of this convention appeared in the *Railway Age Gazette* of September 2, 1910. The book is neatly arranged and contains a large number of illustrations of tools and handy devices. The executive committee met October 23, 1910, and selected Toledo as the place for holding the next convention.

Letters to the Editor.

THE "LEAGUE FOR PUBLIC SAFETY."

To the Editor of the Railway Age Gazette:

For some time railway managers and the press in all parts of the country have been receiving circulars sent out by the "League for Public Safety," 339 Rand-McNally Building, Chicago. The "League" in these circulars has dealt with the subject of railway accidents. It has given statistics about them in gruesome detail, lamented their continuance in many Jeremiads, and criticized railway managements for inadequate appreciation of the needs of the situation. In its bulletin number two hundred forty-six, dated January 14, 1911, for example, it says, "Railway managements fail to realize that the reduction of wreck damage and loss will pay for *protective equipment* in from one to ten years. *Absolute protection* will pay for itself in a few years."

Who are the men who are thus giving their time and spending their money to promote the safety of transportation on our railways? Who is C. A. Mann? It is said that the same office which is occupied by the "League for Public Safety," and from which it sends its literature, is also occupied by the Railway Safety Equipment Company, which recently was organized, under the laws of Illinois. This company was formed to promote the sale of the Collord-Rohe automatic stop, a device intended, as its name implies, to bring trains automatically to a stop when there is danger ahead.

In one of the circulars of the "League" which was sent to numerous general managers of railways it says:

"The Train Control Board of the Interstate Commerce Commission is overwhelmed with devices, good, bad and indifferent, designed to accomplish this purpose (to add the automatic stop feature to block signals), and, consequently, can make little headway. Therefore, the appalling casualty record requires that any practical solution of the Board's chief problem be presented to you as very important to the public and the railways. *We have made independent investigation, and beg to forward herewith for your engineers, data concerning the 'Collord-Rohe' equipment, which tested very successfully. We understand it is inexpensive, simple, absolute, can be used in connection with track circuits or manually and by steam or electric roads. Public welfare, we are convinced, will be served by an investigation of the merits of claims made for the Collord-Rohe patents.*"

Many railway officers would be glad to know what, if any, backing is really possessed by such "leagues" as this. If they are able by their sometimes plausible statements to influence legislators and others, their true character should be known. On the other hand, if they are mere money getters, such as are referred to by the Block Signal Board in its annual report as "scarcely less than fraudulent" (*Railway Age Gazette*, January 20, page 119, bottom of first column), they ought to be exposed. C. W. S.

DEVELOPMENT OF THE WESTERN MARYLAND.

BY GEORGE L. FOWLER.

Associate Editor, *Railway Age Gazette.*

The Western Maryland is building an extension from Cumberland, Md., northwesterly for about 87 miles, across the Allegheny mountains to Connellsville, Pa. The way is hard and rough, yet all pains have been taken in the location and construction of the extension to make it a low grade mountain line fully up to the most modern railway work. It is evident that there must be some very good reasons for such an undertaking, and it is the object of this article to set forth these reasons.

As it stands today, the Western Maryland represents the consolidation of two comparatively small roads with a link that was built to connect them. While it forms a part of east and west and of north and south lines, it is a small part, and is not considered as an element of great moment in through traffic. The two roads forming the basis of its present mileage are the old Western Maryland, running from Baltimore west to Cherry Run, with a loop around by Hanover, having a spur to York and a branch from Edgemont on the main line north to Shippensburg, where there is a connection with the Philadelphia & Reading; also a low grade cut off line from Hagerstown to Zumbro on the line from Edgemont to Shippensburg, making a low grade connection via Hagerstown, with the Philadelphia & Reading at Shippensburg. The second road is the West Virginia Central & Pittsburgh, running from Cumberland southwesterly to Elkins, Durbin and Belington, W. Va., and tapping the coal measures in the northeastern portion of that state When these two roads had been brought under one management there was a gap of about 56 miles between them. The West Virginia Central & Pittsburgh originated a large portion of the coal traffic which after being hauled to Cumberland was there delivered to the Baltimore & Ohio to be taken to Cherry Run, whence it went over the western Maryland to tidewater or was sent north for New York or New England delivery. Under these conditions the originating road had only a partial participation in its own traffic and the first step taken in the development was to build the Cumberland connection from Cherry Run to Cumberland, and thus make a through route from the West Virginia coal fields to tidewater. It was a heavy piece of construction, costing about $117,000 a mile, but the results have justified the outlay.

While a discussion of these West Virginia coal fields belongs more properly to the industrial department of the road, it is well to mention them here because they have heretofore furnished the main body of the road's traffic. The entire coal movement at present is about 7,000,000 tons annually and is growing rapidly. The coal originated on the line comes from the Georges Creek, Potomac and Kanawha fields. The location of these fields is shown on the map.

But a few miles from the Huttonsville terminus the famous New River coal field will be reached. Up to this time its development has been discouraged owing to the enormous quantity of coal available at nearer points to market. A demand for this superior quality of coal is causing attention to be paid to this field and an early development may be expected. An average analysis of the New River coal as mined for local use near Elkins, may be taken as:

Moisture	.35 per cent.
Volatile matter	29.03 " "
Fixed carbon	65.87 " "
Ash	4.75 " "
Sulphur	0.828 " "

from which a coke of the following analysis can be made:

Moisture	.52 per cent.
Volatile matter	.54 " "
Fixed carbon	92.01 " "
Ash	6.93 " "
Sulphur	.52 " "
Phosphorus	.029 " "

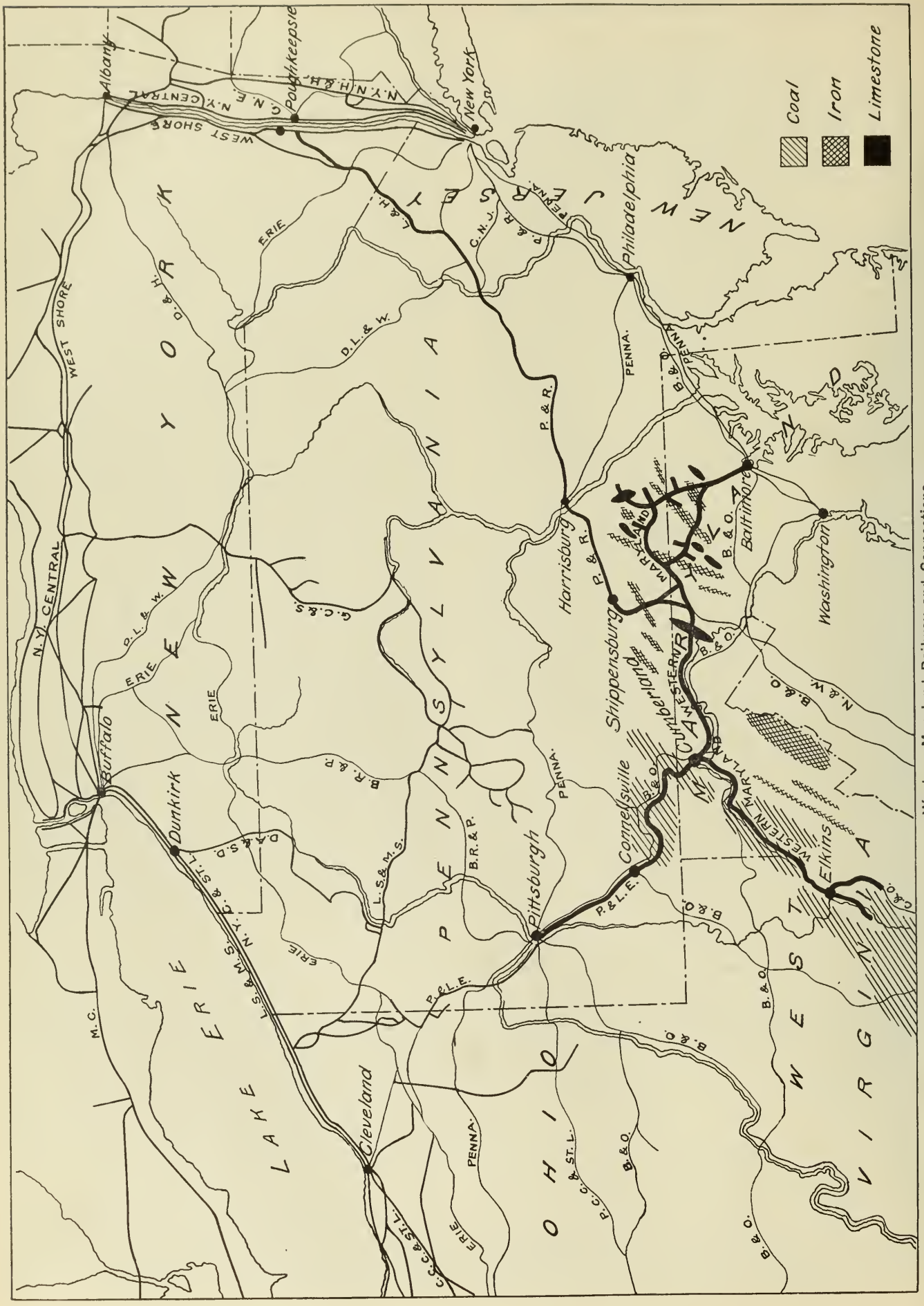
The coals of the Upper Potomac basin run higher in ash and lower in volatile matter. For example those of the Kittanning seam carry from 7.5 to 8 per cent. ash, about 22 per cent. volatile matter and 69 per cent. fixed carbon with about 1 per cent. sulphur and .017 per cent. phosphorus. The Freeport coals present about the same analyses. The Georges Creek coal is nearly worked out and the estimates are that it will be exhausted and the operations abandoned in five or six years more. The Kanawha coals that are on the line have approximately the same analysis as the New River. The veins run from 3 ft. to 6 ft. thick, with occasional rises to as high as 23 ft., the latter being a limited area of the Georges Creek or Pittsburg Dam. But this last is very exceptional and these thick veins are nearly exhausted. But in addition to the fields which are already being worked there are other and adjacent properties that have not yet been tapped and which contain hundreds of millions of tons which the future development of this region will bring to the surface. Among these fields is that of the Freeport and Kittanning measures, lying along the Casselman and Youghiogheny rivers, which has not yet been sufficiently explored to determine its possibilities either in quantity or quality, but of which the indications are that it will be valuable in both. It is known to be a coking coal. It is rather high in volatile matter and ash, and must be washed before shipping, but is, nevertheless, a thoroughly marketable article and is found in seams of from 3 ft. to 7 ft. thick. In the years that it has occupied the Youghiogheny valley, the Baltimore & Ohio has made no attempt to cross the river and secure this product. It involved considerable expense in the way of bridges and spans, so that it has been neglected. The estimated traffic that can be secured from operations to be developed in these fields is placed by the Western Maryland officials at 1,000,000 tons a year, with a probability of 1,000,000,000 tons existing and available with modern methods of mining and prices.

At present the output of the mines controlled by the company is about 12,000 tons a day, to which 6,000 tons must be added for those of the independent operators, with a steady and healthy growth on the part of each, which will insure a good traffic to the road for years to come.

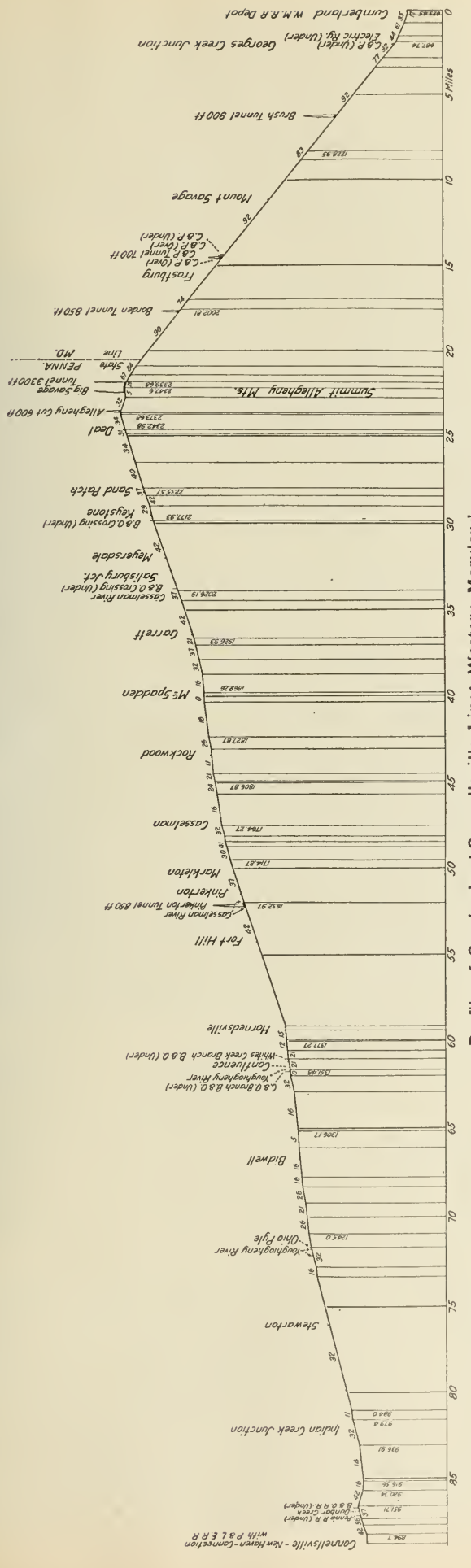
Returning to the development under consideration, even with the Cumberland connection from Cherry Run there was no through connection. It will be remembered that several years ago, it was expected that the Western Maryland would be the eastern outlet of the Wabash. This did not work out, however, and after the reorganization of the company, a year ago, traffic arrangements were made with the New York Central Lines west of Pittsburgh, with the result that, with the Pittsburgh & Lake Erie between Connellsville and Pittsburgh, it only remained to build a line from Cumberland to Connellsville to secure the shortest line between Baltimore and Pittsburgh, and to throw open the rails of the Western Maryland to through East and West traffic, and put it in the position of a competitor for trunk line business.

The details of the construction of this line are of sufficient interest to warrant a separate consideration, and this will be given, from an engineering standpoint, in the next issue of this paper. Suffice it to say, here, that the immediate problem was to build a low-grade line across the Allegheny mountains, through a rough country, and secure a location that would bring operating expenses down to a minimum, and, while not sparing expenses at a cost to this future efficiency, make a line that would put the minimum burden of fixed charges on the road. The estimated cost was put at about $13,000,000. Contrary to the usual method of financing it was found to be possible to secure the funds and build the line on the proceeds of stock only, so that, when built, it will stand clear of indebtedness and not add a cent to fixed charges.

This tells a double story. It speaks for the skill and standing of the men who negotiated it and for the confidence of investors in the desirability of the connection and of its probable value to the road. As it stands, then, the total funded debt of the main and leased lines imposes a fixed annual interest charge of about $1,275,000. Under present conditions the total gross



Western Maryland Railway and Connections.



Profile of Cumberland-Connellsville Line; Western Maryland.

annual revenue is about $7,500,000, and it is estimated that this annual revenue will rise to $12,000,000 after the connection is opened for traffic, and that, to repeat, without an increase of fixed charges.

Now, what is the warrant for such an estimate? First, distance. The route over the Western Maryland and the Pittsburgh & Lake Erie to Pittsburgh offers the following advantages as compared with competitive routes:

Baltimore	to	Pittsburgh	via	Western Maryland.....	317 miles
"	"	"	"	Pennsylvania	329 "
"	"	"	"	Baltimore & Ohio.....	327 "
"	"	Cleveland	"	Western Maryland.....	449 "
"	"	"	"	Pennsylvania	468 "
"	"	"	"	Baltimore & Ohio.....	497 "
"	"	Toledo	"	Western Maryland.....	562 "
"	"	"	"	Pennsylvania	589 "
"	"	"	"	Baltimore & Ohio.....	642 "
"	"	Chicago	"	Western Maryland.....	806 "
"	"	"	"	Pennsylvania	798 "
"	"	"	"	Baltimore & Ohio.....	813 "

The distance from Pittsburgh and Chicago to New York will also be less by this new route than by the Baltimore & Ohio. It is argued, then, that with a lower mileage the chances for traffic are at least as good as over competitive lines.

Of course, without suitable traffic arrangements, the extension of the road across the Alleghenies and down into Connellsville would mean little more than a bid for some of the traffic that originates in the great coke district. But, as a matter of fact, it is not this that is sought for, it is considered that this will probably continue to follow its present routes, and that reliance must be placed on getting access to the great Pittsburgh district which the New York Central terminal facilities will enable it to do. The Pittsburgh connection will throw open the whole field tapped by these northern and western connections, and it will depend, to a large extent, on the facilities offered by the tidewater terminals as to how much can be induced to move that way. Meanwhile an outlet to the West will be formed for the high grade West Virginia coals that will furnish an increasing amount of originating traffic when the line is in operation.

The new extension, therefore, will not only open a short line to the seaboard, but one that will have ample terminal facilities at each end, and present the minimum of adverse grade to eastbound traffic. As it stands, the profile of the Cumberland-Connellsville extension is the easiest against eastbound traffic of any of the northern lines crossing the Alleghenies. It presents a smooth, almost uniform rise from Connellsville to the summit of the Alleghenies, as well as on the drop down the eastern slope. The maximum grade against eastbound traffic will be 42 ft. to the mile, while that of the Pennsylvania is 79 ft., and the Baltimore & Ohio 53 to 62 ft. This will involve some pusher service, to be sure, which will be discussed in a later issue.

After leaving Cumberland, eastbound, the line runs over an undulating profile, on which the maximum grade against eastbound traffic is 0.3 per cent. for 74 miles to Williamsport, Md. From here it rises on a 1 per cent. grade into Hagerstown (about six miles) and then for 17 miles, to the summit, the rise is by undulating profile, the maximum grades being 1.5 per cent. On this part of the line the Mallet compound locomotive has been introduced for pusher service, with very satisfactory and economical results; one Mallet, with 320,000 lbs. on the driving wheels taking the place of two consolidation locomotives each having 180,000 lbs. on the driving wheels. At Highfield the road divides, one part reaching Emory Grove, 20 miles out of Baltimore, by way of Gettysburg and Hanover, and the other by the more direct southern route. By the latter the distance to Emory Grove is 50 miles, whereas it is 74 miles by the northern route. But as the grades against eastbound traffic are less, on the northern route all of the loaded trains are sent that way, while the empties are hauled back over the shorter line. This affords the facilities of a double track over this portion of the route, an operation similar in every respect to that of the Norfolk & Western from Naugatuck to Kenova, as described in the *Railroad Gazette* of October 2, 1903.

Aside from the through line traffic that is expected from the

western connections, the road runs through a country that is comparatively rich in mineral resources and capable of contributing a considerable originating traffic.

For the first 20 miles out of Baltimore it passes through a rich agricultural section which is being developed along the lines of its natural resources as well as for suburban residence. This section passed, it strikes through a limestone region where the rocks possess valuable properties both for cement making and for furnace flux; and closely associated with these are extensive beds of brown hematite iron ore that have been worked in the past and which probably have a future before them, as they are available and have been used in open hearth work, but which are rather too high in phosphorus to be suitable for the bessemer process. These beds of ore lie not only along the east slope of the Blue Ridge, but extend well down towards Baltimore.

Analysis shows that these ores run from 46 to 48 per cent. of iron, with occasional rises to 55 and even 60 per cent., and that they carry from .67 to .94 per cent. of phosphorus and about .025 of sulphur. Then along the summit of the Blue Ridge there is a line of magnetic ore that has been worked.

These resources are cited, not because it is the expectation of the officers of the road that they will be opened in the near future, but merely to indicate the geologic character of the country through which it passes.

The limestone, however, is a different proposition, and the quarries of that material are being vigorously worked. Analysis shows it to be of a high quality; for example, that at Thomasville shows

Carbonate of lime, $Ca\ Co_3$	97.5	to	98.	per cent.
Silica, $Si\ O_2$	.25	"	.01	"
Iron oxide, $Fe_2\ O_3$	.02	"	.03	"

This is, to be sure, a banner quarry, but the quarry at Wakefield gives from 91.54 to 96 per cent. carbonate of lime, and that at Union Bridge from 94.1 to 97.14 per cent. At the latter place, nature seems to have done her best, for close beside the limestone there are shales especially well suited for cement manufacture, and a mill to utilize the two resources, thus lying together, is in course of construction. At Cotoctin there is a bed of high-grade dolomite that will analyze about 54 per cent. carbonate of lime and from 42 to 48 per cent. carbonate of magnesia. These beds of limestone and ore are also shown on the map.

Further to the west, in the neighborhood of Cumberland, the road passes through a rich and fertile fruit district from which great developments are expected within the next few years.

The situation may, therefore, be summed up as follows: The Western Maryland at present forms a short link in a route from New England to the south by way of the Poughkeepsie bridge and the Philadelphia & Reading, between which and the Norfolk & Western and Chesapeake & Ohio it forms a connection. Of itself it runs from Baltimore to York, Shippensburg and Cumberland, and thence down to Elkins and Durban in West Virginia. It traverses a territory rich in minerals and natural resources, but not yet fully developed, and originates the greater part of its traffic at the present time. On its western extension, running southwest from Cumberland, in addition to reaching the New River coals it taps a lumber district that will cut, in places, 100,000 ft. to the acre, and from which it obtains an extensive traffic. So much for its present resources.

Connellsville is an important originating and shipping point, but is not sufficiently so to warrant the construction of a line through a rather rough country to secure a share of that originating traffic, especially as it must parallel another trunk line for nearly the whole distance in order to get it. We, therefore, come to the real reason for the construction of the extension, which is to make it a connecting link between this eastern road and western connections, so that the combination may add another to the east and west trunk lines. That it will succeed, and will be able to contribute its share to the traffic that will follow, as an originating road, is evidently an opinion held by those who financed the undertaking.

TWO STUDIES OF RAILWAY CAPITALIZATION.

Frank Trumbull's discussion before the Hadley Commission has been revised and printed, as has also a comprehensive letter to the commission written by W. H. Williams, of the Delaware & Hudson. Both discussions naturally deserve the closest study as the expressions of opinion of experts, but this conventional expression is very far from conveying any adequate idea of the breadth and frank intimacy of the two papers. There are certain striking points brought out in the two discussions that make it possible to discuss them aside from a critical review of the whole discussion.

In the first place, there are definitions of capitalization in the two papers that are so searching, and so far from the usual loose definitions that one hears, that any one who is going to make a study of the subject of railway capitalization should at least have them clearly in mind. Mr. Trumbull says: "The technical definition of capitalization applies to the debit side of the account as well as to the credit side; that is to say, property may be capitalized by adding it to assets, even though no capital liabilities be incurred for it; but people ordinarily understand the word 'capitalization' to mean 'to issue capital for either bonds or stock.'" Mr. Williams said: "Stated in another way, the book assets (or capitalization) of a corporation represent capital; the liabilities (including securities) denote ownership and relative equities of the several classes of owners." Readers of the *Railway Age Gazette* may remember that Professor Ripley, in a series of articles on Railway Capitalization in these columns, made a distinction between capital and capitalization. He used the word "capital" to designate the assets, and "capitalization" to designate the liabilities—in this case securities. It will be noted that neither Mr. Williams nor Mr. Trumbull agrees with this distinction. Taking capital to be synonymous with capitalization and to mean book value of the property, both Mr. Trumbull and Mr. Williams discussed the relation of capitalization to rates; and, in company with those who have made the most careful studies of the subject, come to the conclusion that the effect of capitalization on particular rates is nil, and both Mr. Trumbull and Mr. Williams come to the conclusion that as a matter of fact the total capitalization of all railways in the country bears no relation to the aggregate freight rates. Mr. Trumbull's argument is possibly less dogmatic—certainly less sweeping; but both arguments are based on a thorough knowledge and experience of the method by which railway enterprises are financed.

Mr. Trumbull gives the following striking illustration of inverting the income account of the Chesapeake & Ohio for the fiscal year ended June 30, 1910. Instead of deducting operating charges first, he sets up, first:

The interest on the debt, which was for the year	$5,570,000
Dividends of 4¼ per cent. were paid on the capital stock	2,669,000
So that security holders received, as compensation for what he calls "readiness to serve the public,"	8,239,000
Gross revenue was	32,398,000
Setting aside first the	8,239,000
just mentioned, which it seems the operating company is entitled to for "readiness to serve," the company has	24,159,000
With which to pay operating charges of	20,538,000
Leaving the profit on the service at, which is equivalent to 5.77 per cent. earned, but not paid, on the stock.	3,621,000

Mr. Trumbull's argument is that, as a whole, the railways are entitled to a minimum of 6 per cent. for *readiness to serve the public;* that is, readiness to serve instantly 92 millions of people; and that they should earn twice that in order to afford a margin of security for investors against periodical depressions and panics. An analysis of the capitalization and net earnings of all the railways in the country, as reported to the Interstate Commerce Commission, show, of course, that the railways have never anywhere near earned this rate of return; but, as Mr. Trumbull says: "Notwithstanding all of these illustrations, there is a certain demand that for the railways of this country we shall set a stake somewhere and that from that time on there shall be no

"watered" stock. There are naturally some practical difficulties. For example, I believe in some states there is provision that the debt of a railway company shall not exceed its capital stock, and if there should be a prohibition of the sale of capital stock at less than par some companies would doubtless be perplexed. Again, there should be no question about the right of holders of convertible bonds, if they have purchased them heretofore at less than par, to exchange them for stock at par. If every share of stock purchased hereafter must represent one hundred dollars in money or property, I think it not probable that any important new development could be accomplished by independent enterprise. We might do away with watered stock and have in place of it 'arid' stock, and arid stock might not 'make the desert rejoice and blossom as the rose.' For anyone who has actually been engaged in business knows that the simple placing of a dollar of actual value behind each dollar of certificate does not necessarily make a *profitable* investment. The mere act of exchanging one hundred one-dollar bills for a hundred-dollar bill, although a transaction of unblemished integrity, is not in itself exhilarating. Allowance must be made for virgin territory, for all the vicissitudes of business and for human nature, and if an investor thinks that he will get a smaller average return of income *and profit* from railway investment than from other things, he will inevitably discriminate against railway stocks. Money, like its human owners, will go where it has the best prospective reward, and the most liberty. And in this connection it is difficult to see how private capital can be kept interested in railway stocks if it can make more in agriculture or mining or manufacturing or merchandising."

Mr. Williams has two quite separate arguments to prove his point. Taking first the simpler and less far reaching argument, he expresses the opinion that the business of railways may properly be divided in two quite distinct categories: one, the ownership of a public highway or turnpike and the optional furnishing of vehicles for the transportation of goods and passengers; and the other quite distinct business of actual transportation of goods and passengers over this semi-public highway. He says: "In other words, the owner of the turnpike is entitled to not less than the legal interest on the value thereof, and at the same time the hackman taking passengers over the turnpike is entitled to a reasonable reward for the services rendered by him, and this reward will depend on efficiency, and that return is never limited to the amount of his expenses plus a fair daily wage." Taking Interstate Commerce Commission figures, Mr. Williams shows that net earnings failed to equal 6 per cent. on the cost of the property by over $176,000,000, for 1908, for instance, leaving, consequently, nothing whatever to pay for service rendered.

As a matter of fact, Mr. Williams' arguments would appear to make this discussion of purely academic interest. All these questions are more or less dependent on the determination of the relation, if any, existing between:

1. The cost price of material in place.
2 The par value of securities issued and outstanding, and
3. The present value (sometimes called "fair value") of the property.

After showing that the cost of the property to the present owners has little, if anything, to do with the original cost of the rails, labor, equipment, etc., because in nearly every case of existing railway companies, except a few of the smaller ones, the present railway company's outstanding securities represent reorganizations following receiverships, or, to a large extent, the purchases of properties of other companies and the subsequent merger or consolidation with the purchasing company. In view of these facts it is plain that there is no fixed necessary or common relation between the "cost of material in place" and the "cost of the property to the present holders thereof."

"The aggregate par value of securities is controlled by (a) the 'cost of the property to the present holders thereof,' and (b) by the rate at which they will be accepted in payment therefor by the sellers, or at which they can be sold for the cash needed to pay the purchase price. It may be concluded, therefore, that there is not, nor can there be, any definite and fixed relation between any two of the three items.

"Property without the right of use has no value. Value begins with use and increases as use increases. It is dependent upon the *right* of use, and is controlled by the *extent* of use. The value of a railway, therefore, is not constant, and may be subject to frequent and to violent fluctuations.

"The present value of the property is its value in use, and so cannot be fixed by the aggregate par value of securities issued and outstanding, or by the original cost of material in place, nor would the fact be otherwise were stock and bonds to be issued at par (with neither a discount nor a premium) and were all additions and betterments and all extensions paid for by the issue at par of capital securities. The part value of securities issued is the consequence of past transactions and so cannot be controlled by so temporary and fluctuating a fact as 'present value,' but these transactions are too remote from original cost to have been controlled thereby and 'the cost price of material in place,' being antecedent to both of the other facts, could, of course, be controlled by neither. The suggestion that value in use can be increased or diminished by issuing or declining to issue new securities in any amount needs only to be stated in order that its absurdity shall be recognized."

As we understand Mr. Williams' argument, the money value of the material, labor, equipment, etc., that is originally put into the building of a railway is the building company's guess at the value of that railway. If the value in use does not approximate the original guess as to its value, the company will go through a reorganization in which securities will be issued not against the original cost, but against the revised *guess* as to the value of the railway, and it would be as absurd to say the guess affected the value—that is, the earning power—and ability to charge high or low rates, etc., as to say that a man's guess as to whether a coin was placed heads up or down would in any way affect the coin itself.

It might be argued that if the total amount of securities issued, with the consequent interest requirements, cannot affect rates, why then should an increase in the operating expenses change economic conditions so that roads can charge higher freight rates? The answer to this argument is that, first, the amount of capitalization of each railway was the guess of a different set of men, and these guesses, like bids for an issue of bonds, are competitive guesses, so that if a mistake is made in one case it may be to the direct advantage of some other company; in other words, if a man, or company of men, built a railway through a territory which cannot support that railway, either owing to competitive conditions or to lack of traffic, they are the ones who have to suffer, and the burden is not shared by a company owning a railway in an entirely different part of the country. On the other hand, an increase in operating expenses extends over the whole country. It may not affect different roads to an equal amount, but it affects all; it is as if the government owned all the railways and should decide that they were all to perform some extra service which would raise the cost of operating railways, which would raise the cost to either the traveling public or the tax payer, and this higher cost would become effective automatically. A general increase in operating expenses does not bring with it quite automatically an opportunity to earn more, but the railway's contention is that this adjustment must eventually take place. Fixed charges and wages to labor are both expenses, but the fixed charges are controlled by competitive conditions as among the railways themselves, while a change in the cost of labor effects all the railways and is conditioned by something entirely outside.

In a Government Loan Bill, recently passed in Victoria, Australia, for the construction of new railways, a proviso is inserted, giving a minimum wage of $2 a day to all men engaged in railway construction.

STUDIES IN RAILWAY ECONOMICS.

BY W. M. ACWORTH.

V.

At this stage I desire to interpolate one remark. The arguments of the foregoing articles have been addressed to the ordinary plain man, who has no prepossessions for or against state ownership in the abstract, who regards the question of state or private ownership as a practical question, to be decided one way or another on the facts and evidence. To those who on abstract grounds believe in the socialization of all the means of production and distribution as the only fit scheme for the governance of the universe I have nothing to say. I am not writing, nor am I competent to write, a treatise on socialism.

To proceed: it may be noted that so far we have only considered the question from the point of view of the public, regarded as a whole. Now, the interests of the public and of the individuals composing it are by no means identical. It may well be in the interest of the whole community—I do not discuss whether it is—that the railways should carry agricultural produce at a loss, in order to keep agriculture, the backbone of the nation's strength, in a prosperous condition. But it is certainly not in the interest of the community that the railways should carry Messrs. A. B.'s manufactures at a loss in order to increase Messrs. A. B.'s profit from $100,000 to $150,000 per annum. Yet we can hardly blame Messrs. A. B. if this point is not as transparently clear to them as to others. In fact the classic instance of the Berwick fish merchants, who wrote to the board of trade during the rates inquiry in 1889: "What we want is to have our fish carried at half present rates; we do not care a ——— whether it pays the railway or not," is, except perhaps in strength of language, quite fairly typical of the attitude of the average trader where his own business interests are involved. And, further—for the average man is, in spite of the common belief to the contrary, anything but a reasoning animal—I do not doubt that the demand of the Berwick fish merchant had at least the tacit sympathy of the Berwick grocer and the Berwick butcher, even though it is perfectly obvious that the fish merchant's demand was anti-social, and that, if he got his rates down regardless of whether it paid the railway company or not, the rates charged to the grocer and the butcher would at least have tended to go up. I am not speaking the language of paradox, but of sober conviction when I say that, though of course low rates as a whole are in the public interest, the demands of particular trades and particular localities—still more, of course, of particular individuals or firms—for specially reduced rates are quite likely to be as much against the interest of the public as against the interest of the railway.

On the other hand, though I believe particular and sectional demands are very often such as should not be conceded, even apart from consideration of the pecuniary sacrifice to the railway involved, there must be cases, few in percentage of the whole, but large in aggregate number, which have justice on their side. And it is evident that, having regard to the relative size of a normal railway and a normal private undertaking and the impersonal organization and inaccessibility of the actual railway management, the trader may fail to receive the well-weighed and even-handed justice that he is entitled to expect; or, what is even more important, may not believe that he has received it even when the facts are otherwise.

The trader is entitled to claim at the hands of the railway company, *positively,* (a), reasonable rates, and (b) reasonable facilities, and, *negatively,* that none of his competitors shall be given undue preference over him. This sounds simple enough. The difficulty begins when we start to decide what is a reasonable rate, what is a reasonable facility, and what is undue preference. Let me set up to be shot at my own definition of a reasonable rate: "A reasonable rate is a rate which an expert manager would fix, or, as the case may be, would maintain, having carefully considered all the relevant circumstances, and being actuated solely by judicial and avowable motives." The definition needs explanation and justification. In the first place, it is clear that it may be reasonable to maintain a rate already in existence where it would not be reasonable to introduce it *de novo.* To deprive a man of something that he has long possessed is a much greater hardship to him than it is to another man to refuse him something which he has never had. In other words, one of the relevant circumstances which the manager ought to take into careful consideration is "the acquired situation." How much importance he ought to attach to it is a matter of judgment, having regard to all the circumstances of the acquired situation. Further, there are two parties to the rate, the railway that receives, and the trader who pays; and a rate to be reasonable requires to be reasonable from the point of view of the railway which receives just as much as from that of the trader who pays. One would have thought that to state this was only to enunciate a truism, were it not that experience shows the contrary. I remember twenty years ago the leading counsel for the traders in the board of trade inquiry as to maximum rates laying down as a self-evident proposition that a rate which stops the traffic cannot be a reasonable rate. And within the last few months an American authority, writing not as attacking, but in defence of the railways, made this admission in the columns of the *Railway Age Gazette.* And yet any such position is absolutely untenable. It is surely obvious that the nearer the rate approaches zero, the greater will be the volume of the traffic carried. It is nothing but the railway rate that prevents coal from Scranton or Pittsburgh being sold in San Francisco. But will anyone say that its sale is stopped by unreasonably high rates? If the highest rate that the trader can afford to pay is still lower than the lowest rate the railway can afford to take, traffic is impossible; and either no rate is quoted at all, or, if nominally entered in the tariff, it remains a mere paper rate. I think, therefore, we can fix as a minimum point below which a rate ceases to be reasonable, the point at which the out-of-pocket expenses of operation exceed the total receipts from the traffic.

But this minimum to the railway will, as has been said, be above the maximum that the customer can pay in every case where it exceeds the difference between the production price at the point of origin of the commodity to be transported, and its selling price at the point of destination. It is true that not long since an English millionaire bought a field of old pasture and transported the soil in train loads to improve his garden fifty miles off; but the transaction was hardly of a commercial nature, and is not typical. It is between what I may call respectively the railway minimum and the traders' maximum that business is to be done, and that reasonable rates have to be fixed on every commodity, varying from coal and iron ore on which the quantum of the rate is all important, to articles such as ostrich feathers, where the highest rate that anybody ever in practice charged, or thought of charging, is so trifling in relation to the value of the article that it makes no impression on the selling price. It is, I think, a convenient phrase to describe that portion of the total potential traffic that lies between the two above mentioned points as *viable* traffic. As to how the rates on this traffic are to be so fixed as to be reasonable I have little to add to what I have already said elsewhere. But we may just note that the railway minimum is not a fixed quantity, but varies according to the nature and circumstances and conditions of the traffic in each case. A ton-mile rate, amply reasonable for coal from Pittsburgh to the seaboard, would leave the railway badly out of pocket, if applied to miscellaneous consignments for short distances of high class freight. But assuming the manager to have ascertained, with such accuracy as he can, the out of pocket* cost to him of doing each class of business, and to have supplemented his positive facts with the best estimate his expert skill enables him to make, one portion of the reasonable rate chargeable on each class of business has been accounted for. But out of pocket costs are only a minor part of the total expenses of running the railway. The general expenses of the undertaking,

*See Note at end of Article.

the government and local taxes, the interest and dividend on the capital involved, all have to be provided; and reasonable rates are such rates as, on the one hand, are fairly adjusted *inter se,* and, on the other hand, are sufficient among them to supply the income needed for these latter purposes. A fair adjustment means, in other words, an adjustment on the basis of "what the traffic can bear," a phrase I do not discuss, because I have already discussed it at great length elsewhere.*

But one point more must be added. There is no fixed or abstract standard of reasonableness; the thing is merely a matter of comparison. When a man says that a rate is unreasonably high, he merely means that it is higher than other rates that he believes to be fairly comparable. The same man who declares that a penny a mile is an unreasonably high rate per ton mile for the railway carriage of coal, would be ready to admit that a sixpence a mile was reasonably low for cartage. And circumstances are so infinitely diverse that it is possible for disinterested experts, and still more for interested non-experts, to argue indefinitely whether the comparisons are fairly made, having regard to all the circumstances and conditions. So we come back to the position that the best man to fix a reasonable rate is the most expert, the most knowledgable, and most judicially minded person available. In other words, not an outsider, but an ideal railway manager.

Just one word should be said on the last clause of the definition, "A reasonable rate is a rate fixed by an expert manager—actuated solely by judicial and avowable motives." I have already given reasons for considering that the manager is naturally in a position of a judicial kind—that his tendency is to act as an impartial arbitrator between conflicting interests. Human nature, being what it is, we may expect each trader to desire that he himself shall pay somewhat less than his fair share of the total expenses of the railways, and therefore, that the converging pressure will keep the railway manager in a condition of stable equilibrium. Moreover, the manager's interest from the railway point of view is to stimulate traffic, and if he charges any class of traffic a rate beyond that which it can reasonably afford to pay he discourages traffic. Of course, there have been in the past, and will be in the future, managers who act from dishonest and unavowable motives. That is only to say that it is human to err. Whether the private manager, who concedes an unreasonably low rate to a manufacturing company, of which he is a shareholder, in order to fill his own pockets, is more or less dishonest than a minister of railways, who gives a similar concession to the trade of a town or district, in order to secure its support in a hotly contested election, is a matter we need not here discuss.†

*Elements of Railway Economics, Chapters VIII and IX.

†An English minister not long since announced in the constituency that he was contesting a large reduction of duty on an article in which the constituency was largely and directly interested. His opponents said, and no doubt believed, that the announcement had helped, and was made for the purpose of helping the minister's election prospects.

NOTE.—"Out of pocket cost" is, of course, not a precise, but an indefinite phrase. It may mean the cost of carrying the average ton, which is possibly quite high. It may mean the cost of carrying the extra ton, which is probably so small as to be negligible. In practice it is probably used to mean something between the two extremes, tending towards the lower limit in cases where it is desirable to encourage new traffic capable of great expansion.

There is another reason why "out of pocket cost" is an indefinite phrase, in the fact that the cost varies with the volume of the traffic, and the volume of the traffic depends on the rate. A figure for "out of pocket cost," accurate on the assumption that the volume of traffic was x, would clearly be wrong, if the volume turned out to be 4x, or x/2.

"Interest and dividend" is also an indeterminate phrase. In the case of state railways, for instance, Australia professes to take as the proper standard such a sum as covers, but no more than covers, the actual interest on railway loans, with no allowance, on the one hand, for recoupment of the accumulated deficit of early years, or, on the other hand, for a sinking fund to provide for the future. Prussia takes as a standard, not professedly but in fact, the largest sum that can—without raising too pronounced an opposition—be extracted from the pockets of the railway customers in relief of the general taxation of the state. Again, on private railways it is evident that the standard must vary according to the status of the undertaking. Investors in the common stock of an old established and prosperous railway can hardly claim as high a return as would be reasonable for those who put their money into a pioneer line which may never pay a dividend at all, and certainly will not do so at the outset. But then, again, if the old established company has made it a policy over a series of years to keep down dividends and improve its property out of revenue, a dividend of 6 per cent. on the normal capital may really only be a dividend of 3 per cent. on the actual capital put into the road by the shareholders.

THE SUPPLY DEPARTMENT.‡

BY H. C. PEARCE.
General Storekeeper, Southern Pacific Company.

V.

ASSEMBLING, MARKING AND LOADING.

Assembling of Material.

This is undoubtedly the hardest and most important matter with which our supply departments have to deal. There are so many things entering into it that it is hard to lay down any iron clad or fixed rules, but it is recognized as being necessary to have material for a job all go at once. Instead it is the rule to ship everything just as soon as you have it. There are many reasons for this. First, under the theory that it saves handling, etc., a great deal of material for a job is ordered directly, which may come at any time and all times. Second, if it comes through the store, the storekeeper is anxious to reduce his stock, he wants to load it out and get rid of it, and get credit for it. Third, it is the easiest way to handle it, and everybody wants to do everything the easiest way.

The result at the other end is different. A man is going to start a building. The first thing he will probably receive is the shingles, a latch or lock. By the time he gets his foundation material and lumber, the hardware is stolen or used somewhere else. When he gets the building pretty well along, and everything ready, he will find he has not his doors or windows, and he will probably have to shut down the job and move his gangs to another point. Another feature—the material comes dribbling along; first there will be a car of cement, a car of brick, and then a car of rough lumber, some hardware, plumbing, etc. Then he will have to send a gang of men a considerable distance to unload it and take care of it. This is another feature of direct shipments which is always overlooked when being discussed, and one of the reasons why it is not practical to make direct shipments, even of lumber, generally speaking.

So that the proposition which confronts a supply organization is to move material for a job altogether. In order to do that you have to assemble it at certain points, usually at the materials yards. The most practical plan the writer has found, and one which is working out fairly well, is—first, the makers of the requisitions must state on them if they desire any part of the material shipped before it is all complete. All other requisitions will be construed as meaning that nothing is to be shipped until everything else is ready, the reason for this being that invariably when a requisition is made, and before it has time to get the necessary approvals, to say nothing of assembling and shipping the material, the makers commence telephoning to ship this, that and the other thing, and in this way by getting a part of the material on hand they use it as a lever to force greater efforts for delivery of the balance by claiming that the men are on the ground, the loss in time, etc. This, of course, is not right, and is a false position, and it is the first thing that has to be stopped, for there is no excuse for men being sent to a job until the material is there or they have knowledge that it will be there by the time the men are.

So unless a requisition comes in with a notation for some particular item or items that are to be shipped on a given date, it will be held until it is all ready. The storekeeper, on receiving this requisition, will check it up, as described above, lay aside and mark such material as he has on hand to apply upon it, making provision for the balance to be assembled in the same way, and when it is all received and ready for shipment he will notify the maker of the requisition that the material is loaded, giving the numbers of the cars and will go forward on a certain train. Or, in the absence of any such notice, the shipping notice itself will be notice to the maker of the requisition that the material on his requisition for such and such work is on the way and is complete. It is then for him to have the necessary men there to receive it, take care of it, and then go on with the

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work. Of course, there are many details that enter into this transaction that do not make it easy. For example, it is frequently desirable to furnish the foundation material and the rough lumber. Then we should follow along with the mill work, finishing up with the hardware, plumbing, etc. This should be done in the case of large work. The storekeeper will simply have to keep in touch with the job and keep the material going to the work as needed, but for all small work the plan can be carried out intact, as above.

In order to do this, however, it is necessary to have a well equipped and arranged yard, plenty of room for assembling, and if possible such distributing yards should be located close to the industries and shops, so that the shop work can be assembled. This is generally the class of work which causes the most delay and trouble, but supply departments will do well to concentrate their efforts toward organizing along these general lines with this general purpose in view, but they can never do it so long as the idea of direct shipments, low cost and low stock is considered the unit of efficiency.

Marking and Loading.

The greatest care must be exercised in marking and loading material. There is no reason why a railway store should not load and mark its material as well as any first-class manufacturing or jobbing house, and a good organization will do it. In addition to careful packing and marking the address, the requisition number must always be noted, and the date of shipment. The reason for this is to enable the storekeeper and inspectors to tell, when material is found out on the line, the date it was actually shipped there. This has been found by practice to be useful, and leads to much good. This is particularly applicable to frogs and track material where the marking is put on with white lead.

The arranging of freight in cars for transfer to division stores is a very important matter, and by being handled properly can very greatly decrease the cost of doing work. For example, bolts of different sizes should always be separated. If they are loaded in barrels, throw in a few sheets of paper between each size. Pipe fittings the same way, in fact everything should be marked in the car, even though it be a carload for one point, so that the receiver of the material can take it out and put it in his racks or shelves in the least possible time. The material can be arranged in this way in cars just as quickly as it can a wrong way. By furnishing an advice of shipment which will reach the consignee before the material does, the man receiving has a guide to what is in the car, and the material is in order to check and put away.

The full importance of loading, marking and invoicing material from railway stores has never been appreciated, and has in the past caused much criticism, investigation, and needless delay as well as expense. Here is where the organization of the general store comes in. It is the pivot around which all other operations revolve, and without it no thorough or economical store system can be maintained.

Probably more freight is lost by imperfect marking and description than in any other way. Not only should the package be carefully marked with the address and requisition number, but wherever possible the material itself should be marked. For example the frogs should have the angle and weight of section marked on them, as well as the party to whom it is consigned. All other material of the same character should be treated in the same way.

MANUFACTURING, REPAIR WORK AND SHOP DELIVERIES.

Industries and Shop Work.

Probably no more important aid to the supply department could be given than to have such manufacturing industries as the planing, rolling mills, and foundries in charge of and under the direction of the general storekeeper, and why should not this be done? He of all officers is most interested, because he is the man who is looked to for furnishing material, and the full effectiveness, economy and usefulness of these industries cannot be obtained unless it is understood they are the manufacturing plants for the railway and not for any particular individual or department. He is in position to know how much to make, and how much not to make. The idea of making up a lot of stuff just because it can be done cheap, and for the purpose of keeping the men at work is a ridiculous and vicious policy, yet it is one that has always been offered as an excuse for making up material that is not wanted, and in many cases it has been considered a satisfactory explanation. The real economy of manufacturing by railways is the fact that they are able to get just what they want when they want it, and not be obliged to keep a lot of stuff they do not need. In no other way can the general storekeeper carry out the policy of providing material when it is wanted, and assembling it, unless he has absolute control of the industries which are furnishing it. He is the one who should say what work shall have preference.

Of course, in our railway shops where a great deal of our work is done, repair made, etc., it is done in connection with maintenance of equipment, and on store orders from the storekeeper. This is all right, but it must be understood that this work must be done with promptness when it is wanted and in the quantities wanted. Shops that take the position that they are only run for repairing engines and cars cannot possibly be of assistance to the supply department in furnishing material. It must be clearly understood that the shops are run for the benefit of the railway.

There is probably no branch of the service that needs a more careful and thorough investigation than the manufacturing in our shops. It should be clearly and distinctly understood that the supply department is responsible for the stock, and that the shops should give it as good service wherever possible as would be received from an outside manufacturer. Where the conditions are practical such facilities should be under the direct supervision of the supply department.

The storekeeper should have such an organization as will permit him to be in perfect touch with the work going on at the shops each day; checking up the orders, delivering the raw material, taking away the finished products, etc. He will find this will overcome some of the delay and complaints regarding shop made materials and repairs.

Delivery by supply cars has been fully explained in another chapter, but it will do no harm to say that these cars are the connecting link between the storehouse and the users of material, and should be utilized to their fullest extent. These cars are in charge of store men, who actually deliver the material to the work and are in position to know that only what is wanted is delivered, and bring in everything that is on hand that is not wanted or can be spared. These cars, in addition to covering the division on monthly schedule, and distributing supplies for all ordinary maintenance and operation, to agents, trackmen, signal supervisors, plumbers, etc., should utilize the balance of the month in distributing supplies to local storehouses, roundhouses, car repair stations, etc., thus doing away with the cost of handling through the freighthouses, and incidentally delay and loss of shipments. They are transfer stores, and. as stated, are of unlimited aid to the economical operation of the division.

Their great value consists in the fact that they are able to actually deliver to the work just what is wanted when it is wanted, and where it is wanted, and pick up and bring in everything that is not wanted without opportunity for loss or delay, and render an accurate accounting for the same at the lowest possible cost for movement or handling.

Shop Deliveries.

The delivery of material to our shops is a matter which requires the most careful organization and supervision. It has been the practice on most railways for the men to call and get their material at the storehouse and supply depots. In order

to facilitate this many sub-stores have been established at convenient locations. In the absence of the shop delivery system, which has been described, this is the most practical thing to do. The objection to the sub-stores is that it necessarily means a very considerable duplication of stock, and you are never exactly sure that the thing wanted is in that particular place. Besides, it divides up your forces so that the full benefits of a concentrated organization are not obtainable.

The plan which the writer considers the best from every standpoint is the system of delivery by the supply department to the work. This is carried on in this way: To start with the material in the storehouse is all arranged in sections, that is, material of the same general character being grouped together in charge of a storekeeper, who does nothing but maintain this stock and deliver it. In each of these sections is a telephone which bears the same number as the section. In each shop there are several stations with telephones arranged conveniently, with cards tacked up, which show where the material is located. If a special item is required reference can be made to an indexed book arranged alphabetically, which shows the section each individual item is located in.

For example, the man engaged on air brake work wants something in his line. He calls up the storekeeper of Section 7, who has charge of this class of material, and tells him what he wants in his own way. Both these men are practical men, they are engaged every day in this work, and they can talk the matter over if necessary between themselves on the telephone. He tells him what he wants and goes away about his work. The section storekeeper takes this down on a sharp order, puts up what is wanted, rings the button for the delivery boy, a number of which are stationed at the foreman's desk the same as bell boys in a hotel. The boy takes the ticket and the material and delivers it to the man, who receipts for it. He brings the ticket back and delivers it to the storekeeper, who puts the time called on the ticket, time delivered, and puts it in his box. Thus you have the same system established that obtains in any of our large department stores.

The reason for the manual system is that these men may find when they make the delivery that it is not just what is wanted, they find out on the ground just what is wanted, and go back and make the exchange. Then again they are constantly in touch with the men that are doing the work, and can anticipate their needs. In other words, they are the connecting link between the storehouse and the job. This is of inestimable value to the supply department and to the company, for the reason that it keeps the mechanics at their work all the time, and it necessitates only the carrying of just what is wanted for the particular work at the time. It has been found by experience that each delivery can be made in an average of five minutes.

A full description of this system was presented to the Railway Storekeepers' Association by the writer in 1907, and it is appended hereto for more detail information, but the idea is simply this: Any system that permits high priced mechanics and their helpers to go any distance from their work and hold a post mortem, as it were, regarding materials is wrong, and should not be permitted, and there is absolutely no reason, if a proper organization is maintained, why a man cannot get what he wants delivered to him. There is no way that this can be done except by the man who is actually engaged in the work being in shape to connect personally with the man who has the material. This also cuts out the transferring and handling of these matters through the foreman, and gives him more time to attend to other work, which is of more importance. The expense of actually doing the work cannot be anywhere near as much, because the mechanics and their helpers will go for the material, and, if it is heavy, they will get someone else to bring it down for them.

Finally—the full purpose is to provide what is wanted when it is wanted as economically as possible, and that this can be done by an organization maintained and trained in this work, whose unit of efficiency is its ability to do this work successfully, more economically and better than any other department whose unit of efficiency is something else, is so apparent that it needs no discussion. The facts are that today, notwithstanding constant statements to the contrary, the service of our railway stores is probably 100 or more per cent. better than it ever was when departments were maintaining their own stocks, and is being done with at least 100 per cent. less money invested in material. But that it can be greatly improved there is no question, as the full value of prompt and efficient service is not yet fully understood or appreciated. The very criticism which the store system receives from other departments will eventually bring about the most efficient organization that can be devised.

ACCOUNTING.

No attempt will be made to go into the details of the accounting for material and supplies used. This matter is entirely in the hands of the accounting department, and varies with the various railways and policies of the owners and executives. The only matter relating to accounts with which we will deal is that which pertains entirely to the storekeeper's responsibility, and to the extent to which it applies to the economical operation of the department.

There is no question but what all the detail of accounting should be done by the division storekeepers on the ground. No other system is practical, for the reason that these men are the only ones that are in position to actually transcribe the results of operations from day to day.

The writer is strongly of the opinion that daily accounting is as preferable to monthly accounting as monthly accounting is to yearly. Or, in other words, for the purpose of knowing more accurately just what is going on, a system of daily accounting or estimates should be installed at each of the division stores of the property, whereby the division storekeeperes may know every day approximately how much business has been done, and what it has cost to do it. This information should be wired to the general storekeeper each night, and tabulated by him. This is done more to keep control of the material and the cost of doing the work than for any other one thing. This system is being followed on some of the large railways with excellent results. It does not cost any more to do in this way, and I do not believe as much.

The trouble with our accounting in the past has been that it has been too ancient. Current accounting is the greatest possible aid to the executive, and the only way he can keep control of, and familiar with his business. It does not do him any good to know what has happened 60 days, or a year before, he wants to know now. In fact the best accounting would be accounting which would tell him what was going to happen instead of what has happened. I think accounting ought to anticipate results as well as record them. So it is apparent that the successful storekeeper must be able to anticipate his transactions. Just how far in detail this can be done profitably is a question which the accounting department will have to decide.

Stock Books.

The stock book may not come directly under the head of accounting, yet it is really the basis of all supply department accounting and the most important record in it. The stock book is a register of everything that is on hand at a specific time. First, and of most importance, it is a technical description of the article, and it should be identified by a number. The book is arranged in columns by months and shows:

Average monthly consumption previous year,
Amount on hand first of each month,
Amount ordered during that month,
Amount on hand succeeding month, etc.

This book is in general use all over the country, and has been for a great many years.

These books should be prepared every year, and written up

CLASSIFIED STATEMENT OF MATERIAL ON HAND.....1910—BASED ON DISBURSEMENTS FOR EIGHT MONTHS ENDING AUGUST 31ST.

Class No.	Classification.	1st Division.		2nd Division.		3rd Division.		4th Division.		5th Division.		6th Division.		7th Division.		TOTAL.		Class No.
		Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	Stock on Hand.	Day's Supply.	
1	Air Brake Material																	1
2	Axles, Car																	2
3	Axles, Locomotive																	3
4	Bearings, Journal (Car and Tender)																	4
5	Bolts, Rivets, Nuts, etc																	5
6	Car Furnishings, Fixtures, etc																	6
7	Castings, Rough Brass																	7
8	Castings, Rough Iron and Steel																	8
9	Couplers and Parts																	9
10	Fence Posts and Fence Wire																	10
11	Forgings																	11
12	Frogs																	12
13	Fuel																	13
14	Glass																	14
15	Hardware (Shelf)																	15
16	Hose																	16
17	Ice																	17
17½	Interlocking and Signal Material																	17½
18	Iron—Bar and Sheet																	18
19	Lamps and Lighting Material																	19
20	Locomotive Parts—Finished																	20
21	Lumber and Timber																	21
22	Material in Course of Manufacturing																	22
23	Metals																	23
24	Miscellaneous																	24
25	Oil—Car																	25
26	Oil—Engine																	26
27	Oil—Headlight																	27
28	Oil—Miscellaneous																	28
29	Oil—Signal																	29
30	Oil—Valve																	30
31	Paints																	31
32	Piles and Stock Yard Posts																	32
33	Pipe and Fittings—Cast																	33
34	Pipe—Wrot., and Fittings																	34
35	Rail—Iron, Second-hand																	35
36	Rail—Steel, New																	36
37	Rail—Steel, Second-hand																	37
38	Rail—Steel, Scrap																	38
39	Rail Fastenings																	39
40	Scrap, not Including Rail																	40
41	Springs—Car and Locomotive																	41
42	Stationery																	42
43	Steel—Bar and Sheet																	43
44	Switches and Fixtures																	44
45	Tie Plates, Brace Chairs, etc																	45
46	Ties—Cross																	46
47	Tires																	47
48	Tools																	48
49	Trucks, Brake Beams, etc																	49
50	Tubes																	50
51	Waste																	51
52	Wheels—Car																	52
53	Wheels—Locomotive																	53
54	Steamship Equipment																	54
55	Spare Machinery																	55
	TOTAL																	
	Less Rail, Scrap, Ties and Trucks																	
	Previous Month																	

Office of General Storekeeper.

Form for Statement of Material on Hand.
Actual form measures 13 *in.* x 17 *in.*

at the same time. This for the reason that the descriptions must be uniform, and for the further reason that the same item should appear in the same place in the book at each store on the railway.

It may be said that it is not necessary to write up items that are not carried at certain places. This can be answered by the statement that the stock book is really the catalog of the railway, and answers every purpose of a jobber's catalog, except the illustrations. So that the storekeeper that has a stock book is in position to order whatever may be called for at any time. There is no necessity for his carrying an article in stock just because he has it listed. The disadvantages of having these items is the bulk of the book, but this is more than offset by its usefulness.

After the stock books are all written up and delivered to the storekeepers, they must arrange their stocks to agree with the stock book, mark it exactly the same, and have it run in order. This for the reason that everything should be concentrated to save time and convenience in taking stock, which has to be done every month. The average monthly consumption is deduced from the previous year's business, and serves as a guide for future orders. It must not be used arbitrarily, but is an indication and a very valuable one.

A monthly inventory must be made, but it should be borne in mind that this stock-taking is for the purpose of ascertaining the sufficiency of the stock on hand, and is not intended to cover the value. It is usually carried on by two men, the section storekeeper and his helper, but if he has no helper the two section storekeepers join for stock-taking purposes. One man calls off the number of pieces on hand, the other man enters the amount with a hard pencil in the on-hand column. This stock can be taken just as rapidly as one man can make figures in his book. At the same time that he checks the amount on hand he should enter in the order column the additional amount he thinks he will require. This for the reason that the stock appears differently when actually seen than it does as an entry in a book. You might have fifty of an article shown in a stock book, and it might look like a great many, but if you were looking at the material itself, and knew by practical experience how many were being used, you would get an entirely different impression. Hence, it is important to put down at the time, in pencil, how many additional should be ordered, although it may be changed afterwards.

After this is done there should be brought forward and placed directly over the amount on hand the amount due; e.g., $\frac{24}{44}$ meaning that there are 44 on hand and 24 due on previous requisitions. The section storekeeper should look over carefully what he has ordered, taking into consideration the back-orders which he holds, the detailed information which he has regarding the conditions of the work going on, time of year, kind of deliveries he is receiving, and according to his best judgment enter in the amount that he thinks he ought to have of each item in his section. The book should then go to the storekeeper, who, in company with his store foreman, should go over the items thus ordered, making any changes which his further knowledge of conditions may warrant, and the requisition is then prepared accordingly.

It will be seen by this that an actual inventory of stock is taken every 30 days, consequently it is being constantly checked for errors and revised, with result that practically a current inventory is maintained. Constant inventories are the most important factor connected with the control of stock.

Receiving Records.

This is the second most important record, and is a diary of the entire transaction, from the time a requisition is made until it is completed, and the invoice or purchase bill passed for payment. It must start first with either a transcription of the requisition or a carbon copy of it. It has been found economical and desirable to make two forms of the requisition or receiving record and prepare them at one writing on a typewriter with a carbon. In addition this form will have columns to show—

Date received,
How received,
Amount received and the seller,
Point of delivery,
Routing,
Number,
Date,
Amount of invoice or purchase bill,
Amount of freight charges, if any,

and a column of remarks in which is entered the condition of the shipment, and a memorandum of the date the item was hurried. This book is of great value for tracing purposes.

The first information to be entered is the number of the order placed by the purchasing agent, the name of the seller, point of shipment, routing, etc. The purpose of checking this order against the requisition record first is to check the description with the description on the requisition, to note and correct errors in placing the order, if any are made. Besides it gives additional information of when and with whom the requisition was placed for tracing. The next information entered is the advice of shipment, either in the form of a shipping notice, bill of lading, or purchase bill. Herein is noted the date of shipment, what was shipped, from whom, checked against point of delivery and specifications.

The next entry is taken from the hip pocket "freight received book," which is the original receiving record, kept by the section storekeeper, in which is entered daily the material received in their respective sections. This entry (as explained in another chapter) gives reference to the date, car number and initial, waybill reference, how packed (boxes, bundles, crates, etc.), and the detailed checking of what they contain entered by the section storekeeper, who unpacks the material and puts it away. The contents of these books are transferred to the requisition or "freight received record," against each respective requisition, showing quantities received, date received, and how received. Thus it will be noted every particular item is identified. The next information is the purchase bill, which is checked against the receipt of material as regards quantities, descriptions, test reports, point of shipment, routing, and the amount and number of the purchase bill or invoice, and the freight charges. The proper certification is then made on the face of the original as to the receipt of the material, giving reference to the page in the receiving record, where it is to be found; thus having a complete history of the transaction from the time it originated until it closed, a most valuable permanent record thus can be obtained.

This book, in addition to being an accurate record of every requisition made and all material received, also serves the purpose of identifying each particular shipment, and each specific item. The book also shows everything that is outstanding, that is, obligations in the way of unfilled requisitions; is used entirely for tracing, and becomes without question the most valuable and useful record in a railway store. Its primary purpose is to make an absolutely complete record of everything ordered and everything received.

Issues.

The issues are all authorized, either by approved requisitions or shop orders, and covered, either by departmental invoices or direct charges to operating accounts. Department invoices are drawn to cover all materials issued on approved requisitions, and are simply a bill against the department making the requisition. These are usually prepared monthly from the daily manifests, which are made directly from the original requisitions, and sent to the head of the department, where they are checked against the receipted manifests, and if found correct approved for entry in that month's accounts. Shop charges, that is, material issued directly to the shops for work being done there, is usually charged direct to the operating accounts from the shop tickets, and the tickets either retained on file or submitted with the detail charges to the shop superintendent or master mechanic monthly. Transfers between stores are handled the same way as

Classified Statement of Material Received, Issued, and on Hand,

Department _____ Store _____ Division. Month of _____ 19__

Class No.	CLASSIFICATION	Unit of Quantity	ON HAND FROM LAST MONTH		RECEIVED DURING THE MONTH				TOTAL TO ACCOUNT FOR		ISSUED DURING THE MONTH										ON HAND AT CLOSE OF MONTH		Class No.
					Purchased		Transfers				Charged Out		Transfers to Other Depts		Transfers to Other Stores		Sales		Total				
			Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
1	Air Brake Material																						1
2	Axles—Car	Lbs.																					2
3	Axles—Locomotive	Lbs.																					3
4	Bearings—Journal (Car and Tender)	Lbs.																					4
5	Bolts, Rivets, Nuts, etc.																						5
6	Car Fastenings, Trimmings and Fittings																						6
7	Castings—Rough Brass	Lbs.																					7
8	Castings—Rough Iron and Steel	Lbs.																					8
8½	Commissary Stock																						8½
9	Coolers and Parts																						9
10	Fence Posts and Fence Wire																						10
11	Forgings	Lbs.																					11
12	Frogs	No.																					12
13	Fuel	Net Tons																					13
14	Glass																						14
15	Hardware (shelf)																						15
16	Hose	Ft.																					16
17	Ice	Net Tons																					17
17½	Interlocking and Signal Material																						17½
18	Iron—Bar and Sheet	Lbs.																					18
19	Lamps and Lighting Material																						19
20	Locomotive parts—Finished																						20
21	Lumber and Timber	Feet																					21
22	Material in Course of Manufacture																						22
23	Metals	Lbs.																					23
24	Miscellaneous																						24
25	Oil—Car	Gal.																					25
26	Oil—Engine	Gal.																					26
27	Oil—Headlight	Gal.																					27
28	Oil—Miscellaneous																						28
29	Oil—Signal	Gal.																					29
30	Oil—Valve	Gal.																					30
31	Paints																						31
32	Piles and Stock Yard Posts	Lin. Feet																					32
33	Pipe and Fittings—Cast																						33
34	Pipe—Wrought, and Fittings																						34
35	Rail—Iron, second-hand	Gross Tons																					35
36	Rail—Steel, new	Gross Tons																					36
37	Rail—Steel, second-hand	Gross Tons																					37
38	Rail—Steel, scrap	Gross Tons																					38
39	Rail Fastenings	Lbs.																					39
40	Scrap, not including Rail	Net Tons																					40
41	Springs—Car and Locomotive	Lbs.																					41
42	Stationery																						42
43	Steel—Bar and Sheet	Lbs.																					43
44	Switches and Fixtures																						44
45	Tie Plates, Brace Chairs, etc.																						45
46	Ties—Cross	No.																					46
47	Tires	Lbs.																					47
48	Tools																						48
49	Trucks, Brake Beams, & Passed Steel Car Fittings																						49
50	Tubes	Feet																					50
51	Waste	Lbs.																					51
52	Wheels—Car	No.																					52
53	Wheels—Locomotive	No.																					53
54	Steamship Equipment																						54
55	Spare Machinery																						55
	TOTAL																						

I hereby certify that the above is a correct statement of the material received, issued, and on hand, belonging to this Department and under my charge _____ 19__

_____

_____

Dated: _____ 19__

Form for Material Received, Issued and on Hand.

transfers to other departments, i.e., by departmental invoices. The storekeeper depends fully on the requisition for his authority for the issue of material, and any material issued without a requisition or an order is unaccounted for. Many other schemes of attempting to balance up special items, etc., have been put into effect and carried on to a certain extent, but they are impractical, and the only way to see that credit is received for everything that is issued is to have sufficient help to see that nothing is taken without a requisition.

Classification.

The classification of material is for the purpose of keeping track by classes of how much is used of each class, and is for the primary purpose of enabling the officers to have an intelligent idea of what the amount of material, in dollars and cents, of various classes is on hand as soon after the close of the month as possible. This record is of primary importance to the storekeeper and general storekeeper, and for the purpose of controling stock is probably of the greatest value.

In order, however, to obtain full benefit from this statement it must be intelligently classified, that is to say, it must be divided into sufficient classes so as to indicate clearly what it is intended to show, not generalize. At the same time, no more classes should be permitted than is absolutely necessary. With the exception of the one column, Class 24, miscellaneous, shown herewith, I consider it an entirely practical classification, and the best one the writer has seen. A miscellaneous class should be eliminated from any classification. After all, the real value of a classification is not so much the name and number of the class as it is to maintain the same thing all the time. All figures of a statistical nature are of little value except for comparative purposes.

The classification is arrived at briefly by abstracting, from the purchase bills, department invoices, and other charges to stock which constitute receipts or debits. The manifests, invoices against other departments, bills collectible and shop tickets are abstracted in the same way, and represent issues or credits. The results thus obtained are shown on a statement entitled Classified Statement of Material Received, Issued, and on Hand, and shows the amount on hand the previous month, received during the month, total to account for, amount charged out, transfers to other departments, transfers to other stores, sales, the difference being the balance on hand to carry forward to the succeeding month.

A statement of this kind is made up by each division store and from it is compiled the Classified Statement of Stock on Hand, which is the ultimate purpose of this statement, so far as the storekeeper is concerned, and forms the most concise and clear analysis of the condition of the stock of any statement produced. It can, of course, be sub-divided as finely as may be desired, but it is believed from 75 to 90 classes will segregate any stock as much as necessary.

The Classified Statement of Material Received, Issued and on Hand also serves the purpose of a balance sheet, in fact this is its primary use. The original goes to the auditor for this purpose, and is corrected by him; but the general storekeeper makes use of this same form for the purpose of obtaining as quickly as possible, after the close of the month, the actual condition of the stock.

Pay Rolls.

The pay roll is always a matter of grave importance, and one that must be watched closely during the month. The writer has found the system of daily accounting (carrying the disbursements down daily) to be of great assistance in controling the cost of operation, in cost per thousand dollars, or percentage of cost based on disbursements. While this is not by any means a fair criterion or representation of what is being done, still it forms the best unit of measure that the writer knows of. It is based on disbursements, it might be based on receipts; in fact it probably should be based on both, and generally is, but the purpose is to know how much it costs to handle every thousand dollars' worth of material in and out. Values enter largely into this, as well as the manner in which the work is done, but it is assumed, and known by all practical men, that statistics of this character have little value except to the general storekeeper himself in comparing his own results with previous results, and one division with another, with full knowledge of the conditions which govern. Comparisons with other roads and other methods, doing their business on a different basis in a different way, are of little or no value, and do not represent anything in particular; but where an officer maintains the same system of comparisons, year in and year out, in a short time he has a valuable guide, which is the most that can be said of a statement of this character.

The above may be said to embrace practically all the essential accounting, so far as the supply department is concerned. There are innumerable statistics and other valuable data prepared, connected with the buying, distribution and accounting for supplies, but my purpose has been simply to call attention to the vital factors which are absolutely necessary, and of direct and positive assistance to the supply department in maintaining what is wanted, accounting for it and controling it.

The final installment will deal with buying under contracts or agreements, how to install the plan, and weakness and strength of supply department organizations.

(*To be concluded.*)

STATISTICS OF EXPRESS COMPANIES FOR A YEAR.

The Interstate Commerce Commission has issued an abstract of statistics of express companies in the United States for the year ending June 30, 1909, made up from its first annual report on this subject. A uniform system of operating accounts was prescribed July 1, 1908. The report covers the operations of the 13 important companies. The service rendered by express companies consists in collecting shipments intrusted to their care at points of origin, in safeguarding such shipments in transit, and in delivering them to consignees at destinations. Transportation proper is furnished by railway and other carriers, and the expense of such transportation is included in the operating expenses of those carriers. In addition to the service referred to, express companies do custom house brokerage, the order and commission business, and issue money orders, traveler's cheques, etc. The service performed by an express company touches the service of the post office and banks on the one side, and the freight service of railways on the other. Competition among express companies seems to exert very little influence upon express rates.

There is no recognized unit of service for the express business corresponding to the ton-mile, and selection was made of the "piece handled" as the unit best suited for statistical purposes, and the companies were required to render special statements showing the number and weight of pieces handled (exclusive of money and valuables) and the amount of revenue accruing therefrom during the months of April, August and December, 1909. The average revenue per piece and per pound was lowest in August and highest in December, with April about a mean between the other two. The figures contained in the summary compiled from the special statements on traffic movement show that the average revenue per piece received by express companies for the three months named was 50.49 cents, the average revenue per pound was 1.54 cents, and the average weight per piece was 32.80 pounds. Pieces weighing 100 pounds or less represented 95.01 per cent. of the total number, 74.06 per cent. of the total weight, and 83.69 per cent. of the total revenue.

Figures compiled from the statements rendered by 11 companies for the months of April, August and December, 1909, show an average revenue of 50.64 cents per piece. Of this amount 24.07 cents was paid to railways and other carriers for express privileges, 20.52 cents was paid for operating expenses, and 0.33 cents for taxes, this leaves an average operating in-

come to the express companies of 5.72 cents per piece handled.

The total mileage on June 30, 1909, covered in the operations of the 13 companies, was 260,507 miles, excluding ocean mileage and mileage in foreign countries, except Canada and Mexico. Of this total, the express mileage on steam roads was 238.961 miles; on electric lines, 6,414 miles; on steamboat lines, 14,138 miles, and on stage lines, 993 miles. The company which operated the greatest mileage was Wells Fargo & Co. with 65,698 miles, followed by the American Express Company with 48,224 miles, the Adams Express Company with 34,360 miles, and the Southern Express Company with 33,181 miles. The two companies operating the smallest mileage were by the National Express Company with 1,714 miles, and the Globe Express Company with 1,899 miles. All the large companies operate in many states, and with the exception of six states, all the states are served by more than one express company.

The cost of real property used in operations by the express companies on June 30, 1909, was $14,932,169, and the cost of equipment, $7,381,405, making a total of the book value of property and equipment for the 13 companies of $22,313,575.

The income account shows gross receipts from operations amounting to $132,599,190, from which there were deducted payments for express privileges amounting to $64,032,126, leaving as operating revenues $68,567,064, the amount with which the operating expenses should be compared. The operating expenses for the year covered by the report were $56,273,055, and the net operating revenue $12,294,008. The figures show that the express companies operated on a basis of 82 per cent. of operating revenues. A relatively small amount of property is necessary for the transaction of the express business and considerable expense is incurred for services that require practically no equipment. The operating ratios of the companies varied from 47 per cent. for the Great Northern to 92 per cent. for the United States Express Co.

After the deduction of taxes, $906,519, from net operating revenue there remained $11,387,489, to which was added $5,232,467, representing principally income from securities owned. After the deduction of interest, $1,047,280, and miscellaneous items, $190,122, there remained a net income of $15,382,553, out of which dividends amounting to $4,326,939 were declared. In addition, there were $2,223,089 dividends declared out of surplus.

The combined general balance-sheet statement shows that the total assets of the 13 companies were $186,221,380. The most significant fact shown by this statement is that the record value of the property used in operation by the express companies is but 12 per cent. of the total assets. The total investment as shown by the value of real property and equipment is but 25 per cent. of the capital liability as represented by the capital stock and funded debt reported. It is evident that the amount of capital stock of these companies bears no relation to the amount invested in the conduct of the express business.

Express companies hold $4,662,658 of the stock of express companies; they hold $20,471,942 of the stock of railway companies, and railway companies hold $14,124,000 of the stock of express companies.

The report contains a brief outline of the history, organization, and capitalization of the 13 companies. The names of the directors of these companies are given and the official relations of certain directors with other transportation agencies are shown as of June 30, 1909. An appendix contains tables illustrating the working of the scale of graduated charges by showing the average returns from shipments of given weights at certain base rates per 100 lbs., and there is an analysis of the application of the single, double and triple graduates to shipments taking selected rates. The changes made in rules and in the classification of commodities shipped by express which affect the charges on the shipments, 1909, are set forth, compared with 1896.

INCREASES OF EARNINGS AND EXPENSES OF EASTERN RAILWAYS FOR FIVE MONTHS.

The following figures have been compiled by the Bureau of Railway Economics to show the increases in earnings and expenses on 22 eastern railways during the five months ended November 30, 1910. They are particularly interesting because of their bearing on charges that the railways recently have been padding their expenses to influence the decision of the Interstate Commerce Commission in the rate advance cases. If such padding had been done it would naturally show in the statistics in the form of excessive increases in the maintenance of way and equipment accounts. It will be noted, however, that the increases in these accounts have been comparatively small, while they have been very large in the conducting transportation account, where the effect of the advances in wages would be most evident. While the *percentages* of increase in the traffic and general accounts have been large, the *absolute* increases have been relatively small, and are of less significance. Probably these increases are largely due to the expenses involved in handling the rate advance cases and similar matters.

The estimate of the increase in wages ($13,015,745) is based on the percentages of increases that actually have been made during 1910 to the various classes of employees.

INCREASES IN EXPENSES FOR FIVE MONTHS ENDING NOVEMBER 30, 1910, OVER SAME PERIOD IN 1909.

		Operating Revenues.	Maint. of Way.	Maint. of Equip.	Traffic.	Transp.	General.	Total.	Net operating Revenue.	Taxes.	
1.	Baltimore & Ohio	$2,111,350	$181,591	$638,617	$130,646	$2,448,667	$121,161	$3,520,682	d $1,409,332	$126,390	1
2.	Pennsylvania Railroad	905,170	259,727	199,650	131,338	2,753,694	170,095	3,514,504	d 2,609,334	.....	2
3.	Pennsylvania Company	872,921	125,930	531,868	68,199	1,328,103	60,670	2,114,770	d 1,241,849	140,903	3
4.	P., C., C. & St. L.	1,005,195	45,181	416,500	55,232	1,254,736	38,865	1,810,514	d 805,319	137,092	4
5.	Vandalia	568,047	d 1,142	136,837	18,958	400,051	5,448	560,152	7,895	21,199	5
6.	G. R. & I.	100,633	46,650	19,784	7,826	139,261	7,597	221,118	d 120,485	16,747	6
7.	N. Y. C. & H. R.	1,873,540	614,846	429,660	4,186	1,786,807	295,720	3,131,219	d 1,257,679	45,296	7
8.	L. S. & M. S.	716,327	872,874	456,179	42,307	1,365,998	93,445	2,830,803	d 2,114,476	114,783	8
9.	Michigan Central	649,874	365,931	319,612	57,150	974,141	46,211	1,763,045	d 1,113,171	55,450	9
10.	C., C., C. & St. L.	781,598	418,729	357,859	50,737	1,146,843	59,012	2,033,180	d 1,251,582	40,000	10
11.	L. E. & W.	72,715	47,018	53,839	24,056	116,135	10,773	251,821	d 179,106	2,959	11
12.	Erie	1,136,441	237,985	76,542	66,185	421,736	d 6,576	795,872	340,569	46,804	12
13.	Lehigh Valley	465,419	43,462	78,729	56,949	658,567	24,467	862,174	d 396,755	d 7,200	13
14.	D., L. & W.	11,667	457,373	159,980	43,992	482,630	4,705	1,148,680	d 1,137,013	20,750	14
15.	Chesapeake & Ohio	434,869	196,466	14,815	5,270	531,917	63,441	811,909	d 377,040	46,250	15
16.	Norfolk & Western	1,015,731	358,648	385,887	20,961	498,218	9,527	1,273,236	d 257,505	45,000	16
17.	Boston & Maine	681,391	182,104	277,880	17,864	936,654	57,549	1,472,051	d 790,660	30,287	17
18.	N. Y., N. H. & H.	1,200,869	270,555	237,441	11,111	724,839	110,783	1,354,729	d 153,860	42,000	18
19.	N. Y., C. & St. L.	351,153	169,648	185,238	19,811	273,812	12,775	661,284	d 310,131	7,500	19
20.	C., H. & D.	11,351	d 250,862	21,220	17,384	312,833	d 28,276	7..299	d 60,948	16,948	20
21.	Pere Marquette	172,213	d 31,767	134,948	41,267	422,526	24,617	591,591	d 419,378	58,212	21
22.	Wabash	688,746	d 37,025	335,388	10,461	456,035	14,879	779,738	d 90,992	.....	22
	Total increase	$15,827,220	$4,573,917	$5,468,473	$901,890	$19,434,203	$1.196,888	$31,575,371	d $15,748,151	$1,007,370	
	Total 1909 figure for same period	$395,518,436	$48,720,603	$60,487,419	$7,609,552	$124,345,080	$7,669,325	$248,831,979	$146,686,457	$13,711,603	
	Per cent. of increase	4.0	9.4	9.0	11.9	15.6	15.6	12.7	d 10.7	7.4	

NOTE.—Wage increase estimated at $13,015,745. d = Decrease.

The section of the Buenos Ayres Midland Railway from Rica to Carline was constructed at a record speed for Argentina; working out at about three-quarters of a mile a day.

Shop Section.

THE car department competition, previously announced, will close February 15. The conditions are such that the competition is open to all of our car department readers, the only requirement being that the articles submitted must relate to some subject or subjects of interest or importance to foremen in the car department. For instance, the article might discuss such topics as the best way of making a certain kind of repairs or the best material to be used for a given service. The efficiency of a shop or repair yard may often be improved by changing the method of organization or of handling the equipment. If you have accomplished results in this way, tell us how you did it. There are great possibilities in the car repair yards for the use of reclaimed or second-hand material. The introduction of all-steel and steel underframe equipment has made it necessary to provide new tools and facilities on many roads, and exact information as to how different classes of this work are handled will be appreciated by many of our readers. The passenger car repair shop and its auxiliaries cover a wide range of work, including several trades, and very little has been published along the lines of shop operation and shop practice for this class of work; we should like to have several articles relating to it. The maintenance and cleaning of passenger equipment also offers an attractive field for good articles. The article may be made just as long or short as you think best in order to tell your story clearly. The best paper will be awarded a prize of $35, and the second best a prize of $20. Papers which are not awarded prizes but are accepted for publication will be paid for at our regular space rates.

REMEMBER the engine house kink competition which is to close March 15. The engine house is "the neck of the bottle," controlling the time that locomotives must be held out of service, and it is necessary that the work be done properly and with the greatest possible despatch. All engine houses have good kinks, although in many cases the men have become so accustomed to their use that they may not realize their importance. A first prize of $35 will be awarded for the best collection of two kinks, and a second prize of $20 for the second best. More than two kinks my be submitted, allowing the judges to base the decision on what they consider to be the best two in each collection. Kinks accepted for publication but not awarded a prize will be paid for at our regular rates.

A COMPETITION on the instruction of workmen and apprentices will be held, closing April 15. This subject presents great possibilities, for every foreman is confronted with the problem of properly instructing and developing his men to do better and more efficient work and also to recruit the ranks by apprenticeship. Concerning the latter subject, important developments have taken place within the past few years. Modern apprenticeship systems, differing vitally from the old methods and including complete and careful instruction in both theory and practice, have been installed on a number of railways. The instructors and the men in charge of this work are confronted with many problems. What are these problems, and how have you overcome them? How is it possible to get the best results in handling apprentices on a small road or in a small shop, where it is impossible to provide the elaborate courses and facilities for instruction which are common in the apprentice schools at the larger shops? What does the apprentice boy think of his future and of the apprenticeship system? If you have a bright lad in your shops, encourage him to send in an article telling what he thinks of his opportunities in the railway shop and how he feels about the efforts which are being made in his behalf. The subject, as outlined above, also covers an even more important field, that of the instruction of workmen who have not had the advantages of a good apprenticeship course and whose efficiency can be greatly increased by proper instruction. We are more or less accustomed to hear of the title of "shop demonstrator," although it was an unknown term in railway shops ten years ago. What results are we getting from these demonstrators, and how do they carry on their work? Have not the results been sufficient to warrant using them more extensively? Then there are the handy men or laborers who constitute quite a large proportion of the shop force, and many of whom are ambitious and capable of filling much better positions if they can be properly developed and trained. What are you doing to develop these men, and what results have you obtained? The article should contain from 500 to 1,500 words. A prize of $35 will be given for the best article and $20 for the second best. Articles not awarded prizes, but which are accepted for publication will be paid at our regular rates.

M. H. WESTBROOK, of the Grand Trunk at Battle Creek, Mich., was awarded the first prize of $50 in the shop kink competition which closed January 15, and R. G. Bennett, motive power inspector at the South Pittsburgh shops of the Pennsylvania Railroad, Pittsburgh, Pa., was awarded the second prize of $25. The competition was a particularly successful one and the judges had great difficulty in selecting the winners. There were 16 other contestants, as follows: Frank J. Borer, foreman air brake department, passenger car shops, Central Railroad of New Jersey, Elizabeth, N. J.; R. E. Brown, machine foreman, Atlantic Coast Line, Waycross, Ga.; H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa.; W. H. Fetner, master mechanic, Central of Georgia, Macon, Ga.; T. E. Freeman, general foreman, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa; John V. Le Compte, foreman, Baltimore & Ohio, Garrett, Ind.; C. C. Leech, foreman, Pennsylvania Railroad, Buffalo, N. Y.; Charles Maier, engine house foreman, West Jersey & Seashore, Atlantic City, N. J.; "Old Railroader"; A. G. Pancost, draftsman, Elkhart, Ind.; William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; Theodore Rowe, general foreman, Great Northern, Jackson street shops, St. Paul, Minn.; P. F. Smith, chief draftsman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; William H. Wolfgang, draftsman, Wheeling & Lake Erie, Toledo, Ohio; H. C. Wilson, foreman tool room, Southern Railway, Spencer, N. C. Space only permits the reproduction of three of these collections, all of which are exceptionally large, in this number. The collections as a whole were exceptionally good, and all of them will be used, the remaining ones appearing in future issues.

THE paper on The Apprentice System as Seen by One of the Apprentices, written by Richard Keefe, an apprentice on the New York Central & Hudson River at Oswego, N. Y., and reproduced on another page in connection with the abstract of the proceedings of the fourth annual apprentice instructors' conference of the New York Central Lines, should appeal to those who are interested in the education of apprentices in railway shops. No foreman or instructor can really be successful in this work unless he can place himself in the boy's position and see things from his viewpoint.

ONE of the speakers at the New York Central's Lines' apprentice instructors' conference emphasized the importance of educating the apprentices and workmen to the necessity of making the proper use of safety guards and such other measures and regulations as are provided to protect the workers from in-

jury. After all the conservation of human energy and life is of far more importance than the conservation of material or other resources. The United States Steel Corporation has done splendid work in safeguarding its employees against injury and takes a justifiable pride in it. The Industrial Safety Association has recently established a museum of safety in the Engineering Societies' building, New York, which contains a large number of safety devices. Valuable as such devices are, their effect may often be lost due to misuse unless the employees are educated to a realization of their importance.

SCIENTIFIC MANAGEMENT.

THE editorial on scientific management and the article on The Mistakes of the Efficiency Men, which appeared in the *Railway Age Gazette* of January 6, have brought forth considerable comment, and three representative letters which we have received concerning them are published in another part of this issue. W. J. Harahan, vice-president of the Erie Railroad, has summed the matter up simply and in a common sense manner. L. H. Turner, superintendent of motive power of the Pittsburgh & Lake Erie, explains why the cost of maintaining freight cars on his road is so low and why it cannot be used as a standard for other roads to work to. C. J. Morrison, consulting engineer of New York, who was identified with Mr. Emerson's work on the Santa Fe for several years, takes up the cudgels in Mr. Emerson's cause, and his arguments are replied to by "One Who Has Worked With Them." The value and effectiveness of scientific time studies cannot be questioned, and it is unfortunate that the art of making them was not developed during the early days of piece work, or is not appreciated by many who are trying to establish piece work today. The making of these time studies is, however, of just as great importance in a day-work shop as in one where the men are paid by piece work or on a bonus system. To get the best results it is necessary for those in charge to know exactly what each piece of work is costing and to analyze the various operations scientifically to make sure that the work is being done in a proper manner and at the lowest cost. In shops where piece work prices have been established in a haphazard manner, time studies should be made to check these prices and to intelligently revise them. If by making these studies the men can be shown that they are wasting time and effort in doing the work, no difficulty will be found in adjusting the prices to the mutual advantage of both parties.

Mr. Morrison has presented certain figures concerning the operations of the mechanical department on the Santa Fe which apparently show that a considerable saving was made in 1906 and 1907, due to the application of Mr. Emerson's methods. It is difficult to draw any general conclusions from such figures unless all the facts surrounding the case are fully known. With no intent to question the correctness of Mr. Morrison's figures or his conclusions, but rather to emphasize the necessity of analyzing such figures carefully by taking into consideration the various factors which may effect them, the following data has been taken from statistics specially prepared for the Interstate Commerce Commission in order that comparisons may be made extending over the past ten years. The number of new locomotives for each year is taken from the annual reports of the railway.

Year ending June 30.	Number of locomotive miles.	Cost per mile run—cents.	New locomotives.
1901.....	25,404,000	7.36	52
1902.....	25,408,000	8.70	207
1903.....	32,151,000	8.17	75
1904.....	32,485,000	10.88	156
1905.....	34,555,000	12.60	31
1906.....	38,302,000	9.67	192
1907.....	41,648,000	9.29	128
1908.....	41,005,000	11.52	81
1909.....	39,642,000	9.61	...
1910.....	46,793,000	10.75	54

It must be admitted that the cost per mile run is not the best figure to make comparisons with, but unfortunately the ton-mile statistics are not available in the special data which has been prepared for the Interstate Commerce Commission. The cost of locomotive repairs per train-mile undoubtedly increases as the locomotives grow larger and their capacities increase. Mr. Emerson went with the Santa Fe in February, 1904. The strike which took place on that road beginning in May, 1904, was one of the worst that has ever occurred on any railway in this country. It is quite generally admitted that for a year or two from the time such a strike commences the cost of repairs and renewals to locomotives is necessarily much higher than for the preceding or succeeding years. Examining the cost per mile beginning with 1901, it will be seen that it does not vary greatly for the first three years. Beginning with the year ending June 30, 1904, the cost jumps from 8.17 cents for the preceding year to 10.88. As the strike did not commence until May, 1904, it might appear that it had been anticipated, and that more money had been expended for the fiscal year ending June 30, 1904, than might otherwise have been done. In 1905 the cost of repairs per locomotive mile jumped to 12.60, an abnormally high figure considering the previous record. The strike lasted practically only about a year, although it was not officially called off until a much later time.

During the strike a large amount of finished locomotive parts had been ordered, and at its close a considerable portion of these were in stock, which would naturally reduce the cost of repairs for the period immediately following. In 1906 and 1907 we find the cost per mile falling back to 9.67 and 9.29, respectively. Compared to the years 1901, 1902 and 1903 this figure would seem to be quite reasonable, for undoubtedly the size of the locomotives and their capacity had increased, at the same time increasing the cost of maintenance per mile run.

Another factor must also be taken into consideration. For the first year, and in many cases for the first two years after new equipment is received on a road it will cost only about one-half as much to maintain it as it does after that period. A study of the column showing the new locomotives added each year indicates that for the years 1902, 1904, 1906 and 1907 a large number of new locomotives were purchased, and if these were received in the early part of these fiscal years the tendency would be to reduce the cost of repairs per locomotive mile for those years. However, this may not have held true for the reason that the balanced compounds which were purchased in large numbers during this period gave considerable trouble when they were first placed in service.

It seems quite possible, therefore, that Mr. Emerson's methods should not be given the entire credit, if any credit at all, for the apparent good showing made for the years 1906 and 1907. It is no secret that during Mr. Emerson's entire stay on the Santa Fe he encountered strong opposition in several quarters, and immediately after he left the road the expenses in the motive power department increased greatly, due to a reaction, which under the conditions might naturally have been expected. In 1909 the cost fell to 9.61, but increased in 1910 to 10.75, or to very nearly what it had been for the fiscal year ending June 30, 1904. Just what caused the increase during the past year does not appear.

This rough study, which is incomplete, has been made not to controvert Mr. Morrison's conclusions, but to indicate that it is not safe to compare statistics of this kind unless all the facts in the case are known and allowance is made for those features which might have an appreciable effect on them. There are other important factors which should be checked such as the amounts charged off for depreciation and renewals each year, etc.

There is hardly a mechanical department in the country that has not made an apparently splendid showing for some one year by reclaiming material that had been charged out to it but which was lying idle, either being misplaced or forgotten, or because of the stock being carried in too large quantities. The effect of cutting this stock down is to make a good showing in

the operating expense for the year, but it is simply due to the extravagance of former years and in the following year when new material must be purchased, the maintenance expense goes back up. An important part of the betterment work on the Santa Fe was the careful study of this problem and the reclaiming of large amounts of material, which undoubtedly helped to make the good showing during 1906 and 1907. However, it should not have been necessary to retain an efficiency engineer to do this.

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Mr. Emerson has taken us to task for the statement in the editorial on scientific management in our issue of January 6 that "Mr. Emerson was given a fair trial in the mechanical department on the Santa Fe (three years), and claims to have saved the road $5,000,000 in that time." Charles B. Going, editor of the *Engineering Magazine,* preceded Mr. Emerson on the stand and prepared the way for his testimony, and one of the last things he said before Mr. Emerson was called was that a report had been made by the mechanical officials to the operating vice-president of the Santa Fe which showed that based on a tractive power unit, the savings due to the introduction of Mr. Emerson's methods for the three years had been calculated to be in excess of $5,000,000. Mr. Emerson did not correct this statement, and we assumed that it met with his approval.

Mr. Emerson also wishes to have another fact emphasized which may best be done by quoting as follows from the lecture he delivered at Harvard University. "Mr. Emerson had neither official position nor executive authority. He investigated, planned and then advised. He taught the underlying principles, showed the methods of research. Executive orders were issued and the work required was undertaken by the regular shop officials and force. Outside of his own office assistants, the specialists he selected and recommended were appointed by the regular officials and owed obedience to them. If important orders were necessary they were issued by the superintendent of motive power or by Mr. Kendrick, vice-president. Because the plans were new, untried, and because of the great interests at stake involving safety to life, full control was retained throughout by the regular officials."

MECHANICAL ARTICLES DURING JANUARY.

THE following articles of interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of January 6:

The Screw Reverse Gear. The reverse gear as used on locomotives in this country does not permit an easy and accurate adjustment of the cut-off, especially on the larger locomotives, and it might be well to consider the use of the screw reverse gear, which is extensively and successfully used abroad.—January 13, page 72.

The Use of Bridges in Exhaust Nozzles. W. E. Johnston explains why the exhaust nozzle with a bridge sometimes gives better results with the inside stack.—January 13, page 73.

The Effect of High Temperature on Locomotive Cylinders and Valves. It does not seem wise to use superheat of 550 deg. Fahr. on old locomotives with flat slide valves and ordinary design of cylinders. Special attention should be given to the design of these parts for locomotives using highly superheated steam—600 to 650 deg. Fahr.—January 20, page 110.

Test of Simple Atlantic Type Locomotive on the Testing Plant at Altoona. This locomotive was to have been tested at the St. Louis Exposition in 1904, but has since been tested at Altoona. Its performance is compared with that of the compound Atlantic type passenger locomotive which was tested at St. Louis.—January 20, page 125.

Federal Boiler Inspection Bill. The substance of this bill, which has passed the Senate and is now in the House Committee, is given.—January 20, page 126.

Lignite Fuel for Locomotives. The roads in the Northwest have given this subject considerable attention during the past few years with the view of taking advantage of large lignite deposits in that section. thus obviating the hauling of coal for long distances.—January 27, page 150.

Mikado Locomotive for Burning Lignite; Oregon Railroad & Navigation Co. This locomotive was especially designed for burning lignite coal, and has given splendid results. Its performance burning lignite is compared with that of a consolidation locomotive burning Cumberland coal.—January 27, page 167.

The Supply Department. The series of articles on this subject by H. C. Pearce, general storekeeper, Southern Pacific, which was started in the issue of January 6, has been continued during the month.—January 13, page 85; January 20, page 112 and January 27, page 161.

STANDARDIZATION OF CHILLED IRON CAR WHEELS.

THE paper on The Standardization of Chilled Iron Car Wheels with Reference to Service Conditions, which was read by a representative of the Griffin Wheel Company at the January meeting of the Western Railway Club, presents a new phase of the chilled wheel question which is so important that we publish a liberal abstract of it in this issue. The subject is one which evidently deserves further attention from the wheel committee of the M. C. B. Association, as the paper seems to show that there are some classes of service to which the standard weight M. C. B. wheels are not suitable, and some further standardization in detail should be adopted for the weight of wheels for refrigerator and furniture cars, tenders and passenger cars.

In addition to the gross load on eight wheels the braking power should be considered, and an additional thickness should be added to the plate to take care of the stresses due to the heating of the wheel when the brakes are applied. The thickness of the tread should also be increased for this reason. The whole question of wheel design is therefore involved in the problem of adapting the cast wheel to the more severe conditions which are found in some classes of service. To assist in this work the Association of Manufacturers of Chilled Car Wheels has prepared a number of tables which show the thicknesses of plate and tread and the weights of wheels for various gross loads and total braking power. These tables are included in the paper. Unfortunately, they are not accompanied by an explanation of the manner in which the wheel proportions were arrived at, though we are asked to accept them with the same confidence as the tables which apply to the strength of beams, channels and other rolled steel sections. A rational theory for the design of car wheels must involve a consideration of a combination of stresses which are difficult to measure, and as they have not been exactly measured wheel design cannot be considered as having an exact basis. It is surprising to find that the lateral stresses due to the blow on the flange are not mentioned in the paper, but they are probably assumed to be proportional in some way to the gross load acting under velocities due to normal running speeds.

The tables of cast iron wheel proportions, as prepared by the wheel makers, should, therefore, be regarded as a tentative presentation of our present knowledge of the subject rather than exact or final figures which will bear rigid analysis. They are the result of a careful study of records relating to the life and service of a large number of wheels, and as such can be accepted as the best available guide for present practice.

With increased loads and speeds heavier braking is required, and the stresses due to the heat generated by severe brake shoe applications are greater than ever. The proper design of the cast wheel is, therefore, becoming more important. Considering the amount of money involved, in addition to the question of safety there is no more important subject for the M. C. B. Association to investigate than the design and composition and the method of manufacture of the chilled cast wheel. These questions have been left largely with the wheel makers, but there should be a fuller co-operation of the railways, not only in this development, but in the further standardization of wheel application with reference to the character of the car and the kind of service.

It is claimed that the cast iron wheel is so safe that if properly made and applied in accordance with the rules proposed there would not be one broken wheel in one million. The manufacturers are so confident of this that they have no hesitation in recommending chilled wheels for all classes of railway service, and they see no indication of the limit of its capacity having been approached. In adapting wheels of various weights to particular services, the paper proposes that the 675-lb. wheel be abandoned and the 725-lb. wheel can be used under both 80,000-lb. and 100,000-lb. cars, because in many cases there is little difference in the requirements of these two classes and bet-

ter service would be secured for the 80,000-lb. class. The 700-lb. wheel is recommended for refrigerator, furniture and other heavy cars of the 60,000-lb. class and also for the 70,000-lb. class. The 625-lb. wheel should be used for other ordinary 60,000-lb. and less capacity cars. The arguments for this change, as presented in the paper, appear to be reasonable, and the suggestion relating to more rigid rules concerning wheel application are worthy of the careful attention of all who are interested in car service and maintenance.

The paper may be regarded as a statement of the position of the wheel manufacturer as to the cast iron wheel. It reiterates what has been repeatedly stated in these columns, that the cast iron wheel is capable of being improved and made more suitable for the work that it has to do, but it puts the greatest stress on the advisability of adding to the weight and skims over with the barest of allusions to the possibility of improving the metal. It is on this last point that especial emphasis has been put by railway officials. It is a timely appeal from the manufacturers for consideration, especially in view of the inroads that are being made in their field by the steel wheel. It is undoubtedly quite sincere in its statements, and while we may be disposed to accept it with considerable hesitation, we can attribute to the enthusiasm of the author the closing statement to the effect that the cast iron wheel makers can furnish "the safest wheel made of any material." This in view of our almost total ignorance of the actual stresses to which a car wheel is subjected is putting it rather strong.

Letters to the Editor.

SCIENTIFIC MANAGEMENT.

New York, January 14, 1911.

To the Editor of the Railway Age Gazette:

I have read the editorial on scientific management in the *Railway Age Gazette* of January 6, and think it is in line with the conditions. The trouble with the efficiency exponent seems to be that he thinks he can lay down certain hard and fast rules, and that all events can then be made to fit in with the carrying out of such a proposition; that he can calculate to a theoretical nicety the results as they must occur, largely irrespective of business conditions. It seems to be his idea that because the railways do not handle their business along such lines that they are not carrying out the proper business principles. I believe someone has shown that if the amount which it is claimed could be saved—one million dollars per day—was accomplished, it would be necessary to wipe out a very large part of the expenses of the mechanical department, in which department a large part of the saving was evidently to be made. The saving would necessarily have to be largely in labor because as a general proposition railways buy as much material as they can from outside manufacturers under competitive conditions.

There is no question but that the railways require scientific management to the fullest extent, and, to my mind, the most effective way to bring about scientific management is in the predetermination of expenses so far as it is possible to do so, and, it is possible to do so to a very great extent. In the predetermination of expenses it is, of course, essential that all the conditions surrounding the business shall be carefully considered, and that line of action adopted which means the greatest good to the railway as a whole, considering both its prospective revenue and expenses. The offhand manner in which some efficiency men have announced that they could make a saving of large amounts without the knowledge of the conditions affecting the property that they seek to improve, has, it seems to me, militated against them. No railway man will venture an opinion as to whether another railway is being operated more or less economically because he knows the varying conditions surrounding the operation of different roads are so necessary of explanation, before a full understanding may be had. There is no question but that the efficiency man has done good, as everybody else does good who enunciates any idea of improvement to a sufficient extent to impress other people. I believe that stern necessity has done more than anything else to absolutely require efficient operation. There are some railways on which it is so essential that it becomes an absolute necessity. The example in the results produced forces other roads to adopt measures accomplishing the same thing. In any event the competent operating railway officer must be cognizant of the necessity for proper management, and be capable of devising the necessary means for it, otherwise he does not deserve to be designated as competent.

W. J. Harahan,
Vice-President, Erie Railroad.

Pittsburgh, Pa., January 20, 1911.

To the Editor of The Railway Age Gazette:

The editorial on scientific management in the *Railway Age Gazette* of January 6, mentions the cost of maintenance of freight cars on the Pittsburgh & Lake Erie, as referred to by Harrington Emerson before the Interstate Commerce Commission. The commission is made up of able, earnest, and just men, who are prompted by one thought only, to do justice to all concerned, and ascertain, if possible, everything bearing on the case which will enable them to deal impartially with the question before them. Mr. Emerson in referring to the Pittsburgh & Lake Erie, either ignorantly or intentionally misled the commission. He knew, or should have known, that there is no road in this country that has better facilities for the maintenance of its equipment, and that very few, if any, have as good; he should also have known and stated that the average age of freight cars owned by the Pittsburgh & Lake Erie is six years and eight months, which tends to produce a low cost of maintenance. Moreover about 73 per cent. of this equipment is of all steel construction.

The writer's remarks before the Railway Club of Pittsburgh made no reference whatever to the operation of the Pittsburgh & Lake Erie, but treated the subject from the standpoint of the average conditions which prevail throughout the country. Men who have a general knowledge of the railway situation are familiar with the fact that the Pittsburgh & Lake Erie is distinctive and peculiar in many respects, and that it cannot fairly be used as a standard of comparison. Much capital seems to be made of the fact that the writer was not informed as to the cost of repairs on his own road. The Pittsburgh & Lake Erie computes the cost of car repairs on the cost per mile run, not on the cost per car per year. Freight rates are based on the cost per ton per mile hauled; why should not car repairs be based on the cost per mile? During 1909 the average mileage per day for the freight cars operated by the Pittsburgh & Lake Erie was 12.47 miles, while the average for the country, as nearly as can be learned, was about 22 miles. This was due to the nature of the business and the short haul which makes a correspondingly high terminal delay that cannot be avoided. Had the cars on the Pittsburgh & Lake Erie made the average mileage, the cost per car for maintenance would have been increased $23.57, or to a total of $54.58 per car per year, or $0.068 per car mile. The conditions on the Pittsburgh & Lake Erie are therefore unusual, and it should not be used as a basis for deciding matters for the other lines.

Mr. Emerson should confine himself to general conditions, and not select special and isolated cases to be used as a guide for others who are not so fortunately situated, and in consequence cannot reach the high standard of efficiency that comes so easily in special cases. He should also realize that in giving testimony before a tribunal of able and just men, any attempt upon his part to present only such results as are obtained under the most ideal conditions, or the failure to mention any facts which would throw a greater light upon the subject, is regarded as an attempt to mislead or give a wrong impression, and is, in a manner, a distortion of the truth.

Mr. Benjamin Baker, in his article in the *Review of Reviews*

of January, 1911, under the heading of Efficiency, Freight Rates, and Tariff Revision, refers to the work of the writer as a "humorous situation." With the highest regard for the opinions of Mr. Baker on subjects with which he is conversant, and with no desire to say unkind things, we are impelled to believe that Mr. Baker could in no other way have advertised his incompetency to deal with the subject in so plain a manner as he did by writing the article mentioned above. His lack of knowledge of the intricacies of railway work could not have been better illustrated, and his regretful expressions that all railway men are not expert accountants, and mechanical and civil engineers, best indicates his lack of knowledge of the men who are managing the great railway systems of this country. The traffic departments are to be congratulated on being exempt from any attack by Mr. Baker. It cannot be denied that they are an able body of men, and it is safe to say that 95 per cent. of the best traffic men of the country obtained their educations in the public schools, and learned the details of their work commencing as bill clerks, and climbing step by step to the positions they are holding today. As an evidence of the eternal fitness of things, it is a truthful statement that railway presidents and general managers in this country are receiving salaries ranging from $15,000 to $50,000 per year, although nine out of ten of them were never educated in any special line, but have a broad and general education, which they have obtained, not through the universities, but in their long journey from the lowest positions on the road to the high ones which they now occupy. Civil and mechanical engineers and expert accountants are a necessity, and railways could not be operated without them. They are especially valuable in their own particular line, but in most cases have not had an opportunity to become proficient in the varied forms of work pertaining to railway operation to anywhere near the same degree as the man who has absorbed his knowledge through contact with the actual conditions. The reference to the situation that has existed in the past on the Pennsylvania and Illinois Central has no connection, and cannot be applied to the case in question, and were Mr. Baker permitted to enjoy the acquaintanceship of 90 per cent. of the railway men of this country who hold important positions, he would be greatly surprised at their ability in handling figures and computing costs.

The gentlemen who gave testimony before the Interstate Commerce Commission are among the highest types of manufacturers, and undoubtedly were sincere and well meaning in their statements. It is safe to say that none of them have had actual experience in the supervision of railway repair shops, but their work has been largely, if not wholly, confined to the manufacture of one or more standard articles, in the making of which certain men and certain machines were constantly employed in the production of standard parts. It is the easiest matter in the world to increase the output of a manufacturing plant by the introduction of the newest and most improved methods and machine tools, high speed steel, and sufficient power to drive the machines to their utmost capacity. In the average railway shop there is a constant change of the work and readjustment of the machines. Often these changes take place many times during the day. It is a condition that operates against a large output, but at the same time is one that cannot be avoided, and which must be met. Undoubtedly if the witnesses were to change from their present businesses and enter the field of locomotive and car repairs, they would in a short time beg the privilege of correcting the testimony given before the Interstate Commerce Commission.

L. H. TURNER,
Superintendent Motive Power, Pittsburgh & Lake Erie.

New York, January 17, 1911.

To the Editor of the Railway Age Gazette:

In your issue of January 6, 1911, appears a severe criticism of efficiency engineers. The spot light is turned on their mistakes, and special attention is paid to the extravagant statements and claims made by them. The criticism is supposedly written by "One Who Has Worked With Them." After reading the article the question immediately arose—did the writer work with them or simply along side of them? The nature of the criticism leads one to believe that it was *along side of* rather than *with*. Had he worked with them he would have known with how much care and thought the statements are prepared and would also realize that statements which may appear extravagant to the uninitiated are really sound.

The efficiency engineer determines what can be done with a shop or organization in the same way that an assayer determines the value of a mine. If the plant is a large one the engineer will take several assistants, each of whom will make assays or observations of work in which he has specialized. For example, in a large plant examined by Mr. Emerson, one man observed machine tool operations, another foundry operations, a third power, belting, lighting, abrasive wheels, etc., a fourth the routing of the work, trucking, etc., while Mr. Emerson studied the organization and the accounts. Various inefficiencies were noted such as a planer overrunning the stroke 50 per cent., belts too light and too loose to drive the tools to their maximum capacity, chipping by hand instead of using air hammers, no standard tools but each machinist going to the forge to direct the making of his tools, work poorly routed thus causing excessive trucking, poor discipline, no adequate records, no standards of operations, etc. These assays were all summed up and the plant found to be 40 per cent. efficient. In order to be conservative the saving to be made was based on an efficiency of 60 per cent., and an attainable efficiency of 90 per cent. All statements were made with the same care and conservatism, yet many were called extravagant or visionary. Mr. Emerson has always showed the honesty of his convictions by offering to undertake contracts on a contingent fee. On one railway where an offer was made to reduce the cost of maintaining locomotives 25 per cent., the reply was made that it could not be done and that if it could be done the road would do it itself. A comparison of some of the accounts from this road with those from another road operating in the same territory and under practically the same conditions will immediately show that the statement was not extravagant.

	A. R. R.	B. R. R.
Per cent. operating expenses to gross earnings	77	58
Miles per locomotive	20,500	30,500
Miles per passenger locomotive	28,000	34,000
Miles per freight locomotive	18,000	24,500
Per cent. maintenance equipment to gross earnings	22.4	15.2
Cost of maintaining equipment per locomotive mile	$0.34	$0.245
Cost of maintaining equipment per 1,000 ton miles	$1.95	$1.50
Per cent. maintenance of locomotives to gross earnings	11.37	3.9
Cost of maintaining locomotives per locomotive mile	$0.172	$0.064
Cost of maintaining locomotives per locomotive	$3,500.00	$1,950.00
Cost of fuel per locomotive mile	$0.13	$0.098
Per cent. of revenue tons of freight per loaded car to average capacity	28.5	35.0

The figures reveal other inefficiencies than the high cost of maintaining locomotives.

The criticism seems to consider that the only deterioration on a railway is physical, and therefore a deterioration of 50 per cent. is unreasonable. Consider engines, roadway, cars and crews 100 per cent. efficient, but the cars loaded only to 25 per cent. of their capacity and the despatchers only 50 per cent. efficient, what will be the efficiency of the road? It is not at all uncommon to see solid trains of empty cars going in both directions. For a train to run six hours and stand eight hours in making a division of 100 miles is so common as to be more nearly the rule than the exception. On the last trip which I made on a freight train we stood in the yard for three hours after the time called for starting. On one great transcontinental road (not the Santa Fe) every siding on one 115 mile division is several feet lower than the main line, and the tonnage of the locomotives is determined by what they can pull out of the sidings, not by what they can pull over the division. Examples of railway inefficiencies are so numerous as to make Mr. Emerson's figures appear conservative to one who has studied the conditions.

The editorial in the same issue must have been written with the idea of drawing comment. While, of course, all believe

that no railway official would spend a cent of the company's money except according to his best judgment, still his judgment may be bad for lack of adequate records, competent counsel, and standards. Shops have been built and equipped which impose enormous and unwarranted burden charges on operations. These mistakes are probably due to lack of adequate records and competent counsel. The records are so kept on most railways that the actual cost of any particular article cannot be determined and no one knows whether it is cheaper to buy or to manufacture it.

Mr. Emerson will frankly admit that many of the ideas which he used came from other roads. In fact, while in the employ of the Santa Fe, I made a trip to nine of the leading railway shops to pick up ideas for improvements. Many of the ideas that I brought back are still in use at Topeka. One of the duties of an efficiency engineer is to keep his eyes open for ideas so that he may not have to laboriously work out problems that have already been solved.

The editor must have failed to see the saving on the Santa Fe by looking at the annual reports. The totals do not show it for the reason that the money saved in the mechanical department was spent by others. A little inside history will also explain some things.

During the entire three years Mr. Emerson was with the Santa Fe he was opposed by the superintendent of motive power, who was bitterly antagonistic to the efficiency work. Bearing these facts in mind examine a few of the figures which are taken from statistics prepared by order of the Interstate Commerce Commission for use in its investigation in regard to freight rate advances.

	1904.	1905.	1906.	1907.	1908.	1909.	1910.
Total operating revenue	$54,714,717	$58,802,410	$67,119,993	$75,792,605	$75,574,382	$76,770,668	$86,971,313
Ratio total operating expense (not including taxes) to total operating revenue	60.01	64.50	59.46	60.36	63.49	59.11	64.32
Maintenance of equipment	$7,884,280	$9,331,124	$9,088,085	$9,752,564	$11,786,218	$11,427,226	$12,884,898
Ratio maintenance of equipment to total operating revenue	14.41	15.87	13.54	12.87	15.60	14.89	14.82
Operating expense for repairs and renewals per locomotive mile	10.88c.	12.60c.	9.67c.	9.29c.	11.52c.	9.61c.	10.75c.
Operating expense for repairs and renewals per passenger-train car mile	.78c.	1.23c.	.77c.	.89c.	.90c.	1.05c.	1.23c.
Operating expense for repairs and renewals per freight-train car mile	.63c.	.66c.	.73c.	1.00c.	.75c.	.88c.	.71c.
Fuel for locomotives	$3,968,841	$3,722,231	$4,090,362	$4,484,293	$4,716,497	$4,615,688	$6,210,987
Fuel for locomotives per train mile	16.01c	14.20c.	14.16c.	14.58c.	15.33c.	15.34c.	18.06c.
Ratio of maintenance of equipment to conducting transportation	48.71	54.20	47.91	44.36	50.01	51.29	47.56

The figures not only show that a saving was made during the fiscal years 1906 and 1907 when Mr. Emerson was allowed to install efficiency methods, but also that most of the saving was lost the following year when he left the road and those opposed to the work endeavored to discredit it by increasing expenses.

As Mr. Emerson did more work at Topeka than at any other point, statistics from the Topeka shops are interesting.

Cost of Repairs to Locomotives at Topeka Shops.

	1905.	1906.	1907.	1908.	1909.
Labor	$977.81	$797.52	$817.44	$1,015.00	$1,070.00
Material	779.53	647.18	829.62	1,025.00	1,000.00
Number of locomotives	342	350	357	275	...
Average days in shop	32	26	27	38	38

There were 22½ per cent. more general and heavy repairs in 1907 than 1906. Here again is seen the rise in 1908 and 1909. A system account which illustrates the work on the Santa Fe is that known as the tool account.

Maintenance of Shop Machinery and Tools.

	Fiscal years ending June 30.			
	1905.	1906.	1907.	1908.
Percentage to gross earnings	0.71	0.47	0.34	0.32
Cost per 1,000 locomotive miles	$12.00	$8.20	$6.16	$5.80
Cost per 1,000 revenue ton miles	$0.101	$0.0615	$0.042	$0.041
Percentage to maint. of equipment	4.45	3.45	2.65	2.00
Percentage to maint. of locomotives	9.6	9.4	6.8	5.0
Cost per locomotive	$334.68	$225.03	$176.35	$157.11

In this case there was no loss in efficiency in 1908 as the tool account was still in the hands of the man who had handled it during the three previous years.

Railway accounts are exceedingly difficult to analyze and interpret. Comparisons between different roads are not only hard to make but are dangerous in the hands of the inexperienced. Expenditures which would be economical on one road would be wasteful on another. I hope to present in the near future an exhaustive analysis of railway accounts and believe that it will justify many of the statements of the efficiency engineers.

C. J. MORRISON.

52 East 19th street.

[Editor's Note.—Mr. Morrison is a graduate of Cornell University, served two or three years as a special apprentice in the mechanical department of the Northern Pacific and was on the Santa Fe during the time that Mr. Emerson was connected with that road and was on his staff. Since leaving the Santa Fe in 1909 he has been engaged as a consulting engineer in New York.]

"One Who Has Worked with Them" wishes to have it understood that the mistakes credited by him to the efficiency men have come to his attention either directly or on the best of authority during a number of years close work with them and those who were following their leadership. During a large part of that period he defended them against similar charges of extravagance in statement and other criticisms, even as Mr. Morrison now comes to their rescue.

No question was raised in the article to which Mr. Morrison takes exception, with reference to the accuracy of the information secured by the efficiency men through investigations, or assays as he calls them, of conditions existing in specific shops or on certain railways. This question was not considered, and it may be taken for granted for the purpose of this discussion, that such data are usually as nearly accurate as may be expected under the circumstances. It may be said in passing, however, that many things may either escape the notice of "experts" in their examination of a shop or of a railway property, or may be hidden, if there are reasons from the standpoint of the men on the ground why this should be done. It was clearly stated in the article to which Mr. Morrison refers that in most cases the extravagant claims are "possible of proof." This, however, does not make them any the less extravagant. The writer did assert that claims even though based on facts are often either unwarranted or unnecessary—in either case, that under certain conditions they are better left unsaid. Such claims are general, and as the executive heads of our large industrial corporations and railways are necessarily unfamiliar with every detail of the business which they direct, it is only general statements and conclusions that come to their attention. And when these are carelessly made, or are such as not to appeal to the good sense of the average officer, they usually fail to receive the consideration to which they are entitled. It is because the efficiency engineers have lacked tact and good judgment in approaching men in authority that they have not gained their confidence.

It is not to be wondered at that railways do not readily agree to turn over their properties to efficiency engineers who promise to make radical reductions in cost on a contingent fee, even when there is no good reason for doubting that these results can be accomplished. From the standpoint of the efficiency engineer the experiment would doubtless prove a success. Costs could be reduced for a certain length of time, one year, two years, perhaps three years, and his profits would grow apace. But when all the possible savings have been made and the contractor has reaped the benefits, the railway awakens to find that its equipment is in poor condition, its roadbed not up to standard, its labor discontented, and the operation of its road generally demoralized. Then the real payment for the "economy" is begun; the percentage paid to the efficiency engineer is only

a small part of the cost. Such a road has no one but itself to blame, for in giving carte blanche to a theorist to do as he pleases with its property it should be prepared for the consequences which follow, as the night follows the day. Was not the offer made by Mr. Emerson, to which Mr. Morrison refers, to reduce the cost of maintaining locomotives 25 per cent., in itself an extravagant and unnecessary statement to make? And did it not spoil whatever chance of success he might otherwise have had?

Without appearing to question the correctness of the statistics cited for "A" and "B" roads, it may be doubted if the two roads were being operated under the same conditions. It is neither necessary to defend the high costs in respect to "B" nor wise to commend the low costs in respect to "A" without more complete information concerning them. A good record may speedily change to a poor one, and the positions of the two may be altered. Granting, however, that the instances cited are fair, it does not appear that "A" made a good showing because of the adoption of a so-called efficiency system, nor does it follow that "B" could have attained to "A's" record had the efficiency man been called in. The claim has not been made by the writer that certain roads are not inefficient. We agree with Mr. Morrison that there is room for much improvement on many of them; we disagree, however, as to what physician should be called in to treat the patient.

As to deterioration on a road other than physical, this also is recognized. No attempt was made to mention all the factors, out of consideration to the efficiency men. Had they all been considered, the conclusion would have been even more to their disadvantage. It may be said, however, that it is seriously to be doubted if a combination of 100 per cent. engines, crews, roadway and cars with but 25 per cent, car loading and 50 per cent. despatching exists. A railway manager who gets 100 per cent. from the first hour would assurely not be contented with 25 and 50 per cent. from the last two. The poor operating results referred to on a certain road due to delayed trains, sidings being too low, etc., are unfortunately only too common. Railways are looking for relief from the conditions that now make them unavoidable. Their enumeration, however, in connection with this discussion has no bearing upon the question under consideration.

"ONE WHO HAS WORKED WITH THEM."

NEW BOOKS.

Rules and Formulae Relating to Boiler Inspection and Design. Endorsed, adopted and published by the International Master Boiler Makers' Association. Office of the secretary, 95 Liberty street, New York. 65 pages; 3¾ in. by 5¾ in.; flexible linen; price $1.00.

There is a growing need for a good pocket manual relating to that portion of the boiler design which is of especial interest to inspectors and those engaged in the maintenance and repair of boilers, and the present volume is the first attempt to meet this need. There is little, if any, original matter, and the rules and suggestions were selected from various authorities, by a committee of the above association. A special study was made of the staying of flat surfaces by screw stays with riveted heads. This subject is fully covered and the approximate rule of D. K. Clark is given preference. The first 15 pages are devoted to instructions in regard to general inspection of boilers, covering the subject fully and in good shape. The other portion of the book, relating to rules and formulae, is not so satisfactory, because there are no drawings. The rules in regard to the efficiency of riveted joints, reinforced rings, etc., are apt to be confused unless they are accompanied by a sketch showing exactly what is meant by the different dimensions. The book would be materially improved in another edition if it were more fully illustrated. On account of the large amount of inspection of boilers now required by state laws, it is desirable that uniform rules which are authoritative be compiled in good shape and made into a convenient handbook.

INCREASING THE OUTPUT OF A LOCOMOTIVE REPAIR SHOP.*

BY H. HOLDER.
General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.

The following methods have helped materially to increase the output of our shop about 30 per cent.; this, with working hours reduced and a small increase in the number of machine tools and men. To increase the output of a locomotive repair shop, it is necessary to take a general and impartial view of the entire situation. Each department should then be analyzed in detail. Of course, it is possible for a shop to reach the limit of its capacity beyond which it is impossible to go, owing to insufficient buildings, etc., but it is not intended to deal with that problem.

If, after carefully studying the problem and conferring with the heads of all departments, it is evident that the shop is not working to its capacity, the first step is to find which department is lagging. As the erecting shop starts and completes the work, it is the proper place to begin the investigation, as it has to depend on others for the material with which to work. If the work is furnished by the machine and smith shops before it can be used, and this finished work lies waiting for erecting men, is it the fault of the men, the foreman, or the method of doing the work? If the men are idling or killing time the trouble is with the foreman, and he should rectify it. Our experience has been that if the material is furnished the erecting shop the men will hustle to get it out of the way and up to the next man. On the other hand, if the men are working hard and keeping busy, is it the lack of tools that is holding the work back, and if so, what tools are needed—shop kinks, handy tools, or pneumatic tools? If the former, get busy and make some, as most of them may be made easily and quickly. If pneumatic tools are needed, get in a request for them without delay. If the necessary tools are in service, could the work not be handled quicker if more of it was specialized, such as link and motion work, shoes and wedges, cab mountings, engine trucks, driving boxes, brake work, valve and steam-chest work, rods, guides, etc.? From experience we have found by specializing these different classes of work that much more can be accomplished with fewer men. If all the work is specialized as far as practicable, it is then only a question of a few more men, but on the other hand if the erecting men are continually waiting for work, and have not enough to keep them busy, look to the machine side next.

Is the machine work in general being held back, or is it one or two special jobs such as the pistons and cross-heads, air-pumps, lubricators and injectors, rods, driving boxes, drill-press work, lathe work or planer work? If it is one or more of these special jobs, it is easily located and remedied. If it is the general work, is the trouble with the foreman, the tools or the want of jigs and special tools and kinks? Are some of the machines swamped with work, while others are scantily supplied? Is the work handled to the best advantage by the machines to which it is given, or could it be handled better by others. Then look to the foreman to rectify it. If this is properly handled are the tools equipped with high-speed steel, and operated at the proper speeds and feeds? Our own experience has been, that even old-style planers can be run at three times their original speed and by making special tool holders for high-speed steel; the feed can be increased in the same proportion and do better work than before.

Is the stock of finished material kept up? If not, the work will surely fall behind, for if the stock runs out and a machine has to stop, and be changed to make one or two small pieces which should be made by the hundred instead of singly, the output of that machine will be retarded 50 per cent. or 75 per cent.

The machines should be grouped to handle the different classes of work to the best advantage without too much trucking. The

*Submitted in the competition which closed December 15, 1910.

piston and cross-head machines should be near where the bench work is done. The machines doing driving box work should be close together, including the babbiting of hub faces, pressing in the brasses, machining the outside of the brasses, fitting boxes and boring.

Are the machines supplied with rough material from the smith shop, storehouse and foundry in ample time for machining and delivering it to the erecting shop in time for completion of the engine on schedule time? If not, does the hand-forged work from the smith shop cause the delay, and if so, could not dies be made for forging the pieces in quantity under a steam hammer or in a forging machine? If forging machines are not kept busy from Monday to Saturday, could not dies be made to do much of the work now done by hand?

It may be that work is delayed and material left in the fire to soak, while waiting for a helper from another fire, or for a chance to get the use of the steam hammer. One or two more helpers, or one more hammer would help the situation wonderfully.

The boiler work should always be ahead of the erecting work two or three days, for if not, it will surely hold the engine back and retard the output. If behind time it should be given special attention at once, so that as soon as the engine is wheeled the ash-pan can be put up, and the engine be ready for steam in 8 to 10 hours. If this cannot be done because of ash pan work interfering with the erecting men in the pit, owing to engines having underhung springs, etc., it would pay if the shop is large enough to have one ash-pan crew work nights. With the boiler work, front end, and ash pans out of the way, engines can be turned out of the shop from two to three days sooner than otherwise. In our own shop, under these circumstances, we have wheeled an engine at 7 a. m., and have had it on the road under steam at 3 p. m.

Last, but not least, does the store keep in stock the material most needed, and supply it quickly? If not, what is the reason? Is the storekeeper informed as to the shop's needs, or is he expected to guess at them? A lot of material may be in stock that was usable years before, but is now out of date. The storekeeper is not aware of it, and his old stock should be used wherever possible, even at a loss, for the sake of getting rid of it, thereby getting it off his hands and making room for more up-to-date and useful material. He should be told what is wanted and be given an idea of the quantity desired. He should also be aided in reducing the stock by combining several different sizes of the parts (where the difference is slight) into one, and thereby keep 12 pieces of one size in stock, instead of 48 pieces of 12 sizes. This is better for the shop, as well as for the store, for it gives a much larger stock, as far as the shop is concerned, but a much smaller stock in the store. This may be done with axles, piston rods, crank pins, sheet steel, and innumerable castings of iron, brass and steel. This will put the proper kind of stock where it can be delivered almost at a moment's notice, which every foreman knows to be a great advantage. Where it is necessary to wait from two days to four weeks to get the rough material, the finished article must necessarily be held back.

Just a word as to the foremen. Are they all working in harmony as they should, and in good natured rivalry to keep their own department ahead of the others? If not, they should mend their ways at once, and all work together for the good of the whole. The foreman must set a right example for his men, for few workmen will go beyond the pace set for them by their leader. If he goes about his work with a "What we don't do today we can do to morrow," kind of an air, the workmen will do likewise. He should be able to read human nature and to get the best results he must keep the good-will of all those under him. Be one with the men and still above them, and treat everyone fair and square, without partiality. A live, wide-awake, up-to-date foreman, will see that as soon as the work is handed to him, it is started on at once and forwarded to the next department as quickly as possible.

ELECTRIFICATION OF THE SHOPS OF THE WABASH RAILROAD.

Many of the older and smaller railway repair shops are still operated at a large expense for power transmitted by shafting from steam engines. In some cases this involves the maintenance of two or three boiler plants and engines, with firemen and engineers at each plant. At other old repair shops new power plants have been built at a large expense and the machinery entirely changed for the electric drive. The large cost of the electric drive where a new power plant is contemplated has often prevented the desired improvement, but that it is possible to make considerable improvement at a moderate cost is shown by the practice of the Wabash. The new car shops of this road at Decatur, Ill., were provided with an electric power plant which has additional capacity sufficient for the locomotive terminal some distance away. At Moberly, Mo., several small boilers and engines at the shops and the pump house were replaced at comparatively small expense by one station with a 150-k.w. generator for shop tools, light and pumping. A description of the installation was published in the *Railway Age Gazette,* November 20, 1908. A similar installation has been made at the Wabash shops at Fort Wayne, Ind., and Springfield, Ill.

At Springfield the power is furnished by outside parties and is delivered at 2,300 volts. It is transformed by Westinghouse oil type transformers to 440 volts for power purposes and 110 volts for lighting. Westinghouse oil type circuit breakers are used at the switchboard on both the power and lighting circuit, and in addition there are three-pole, single throw, no arc, fused knife switches protecting each circuit. All wiring is in conduits. The main machine shop and the erecting shop have six motors as follows: Two 35-h.p., one 25-h.p., one 20-h.p., and one 15-h.p. driving the machine tools and one 25-h.p. motor on the drop table. The tools in the machine shop annex are driven by a single 20-h.p. motor. A 7½-h.p. motor is used for driving the carpenter shop and a 20-h.p. motor in the boiler and blacksmith shop. For furnishing blast for the boiler and smith shops a 35-h.p. motor is used direct connected to a 12-in. fan. All motors, with the exception of the one operating the drop table are of the three-phase 440 volt, 60 cycle, a.c., induction or squirrel cage type. The drop table motor is a slip ring type with a reversible controller which furnishes variable speed from 850 to 1,140 r.p.m.

Power is furnished by the Springfield Heat, Light & Power Company, which brought the power wires to a convenient point in the shop yard and installed a transformer at its own expense. The aggregate power of the ten motors is 177½-h.p., and the cost of the installation was as follows: Ten motors, $2,838; pulleys and belts, $264.54; switches, $70.55; conduit and wire, $332.64; switchboard, $82.59; sundries, $163.49; labor, $350; total, $4,101.81. The estimated cost of the transformer furnished by the power company was $350.

LARGE LOCOMOTIVE MILEAGE.

The *Santa Fe Employees' Magazine* for January, 1911, publishes the following record for engine No. 1415, a 4-cylinder balanced compound, which was received from the Baldwin Locomotive Works in April, 1906, and went into service on May 1 of that year on the first district of the Albuquerque division. On October 22, 1910, four years and five months later, the engine was sent to the shop for the first general repairs after making 241,335 miles. The boiler record was equally good, as during the period no tubes were removed. The engine was in charge of the same engineer and fireman while making this extraordinary record, which is without precedent on the Santa Fe. It was in service in a district of treated water, and before the treating plants were put in it was only possible to obtain from 30,000 to 40,000 miles between tube renewals.

Shop Kinks.

FIRST PRIZE.

BY M. H. WESTBROOK.

Grand Trunk, Battle Creek, Mich.

APPLICATION OF FLEXIBLE STAYBOLTS.

A device for applying flexible staybolts is shown in Figs. 1 and 2. It consists of a sleeve A which screws on the socket B. The

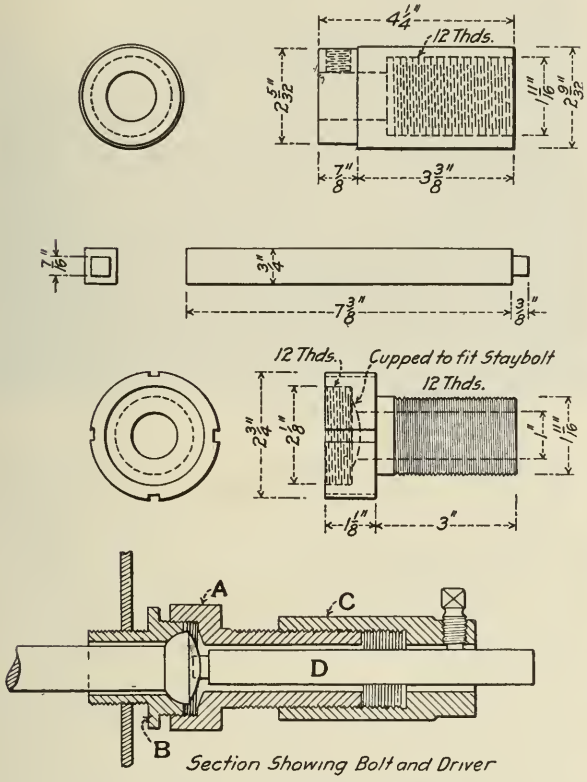


Fig. 1—Driver for Flexible Staybolts.

sleeve C is threaded to the same pitch as the staybolts and holds the end of the square steel driver D in the square recess in the head of the staybolt. The driver D is revolved by a small crank

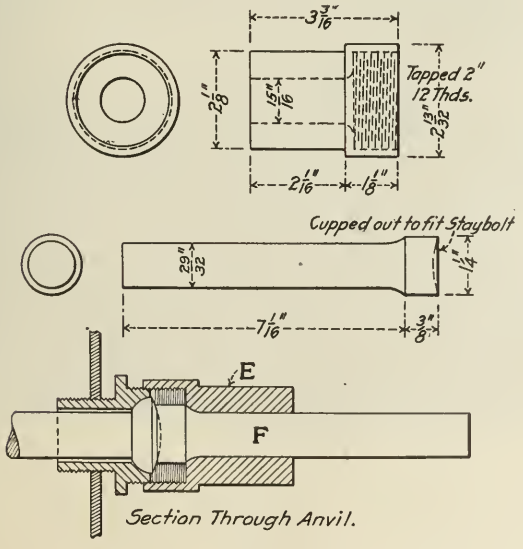


Fig. 2—Anvil for Applying Flexible Staybolts.

which is not shown, making the application of the staybolt a comparatively easy job. After it has been screwed into place, sleeve E, Fig. 2, with anvil F, is applied to hold the head of the bolt while it is being riveted over on the other end.

BORING TOOLS FOR AIR PUMP CYLINDERS AND STEAM CHESTS.

A method of boring air pump cylinders which saves taking them apart, as is sometimes necessary when they are bored out

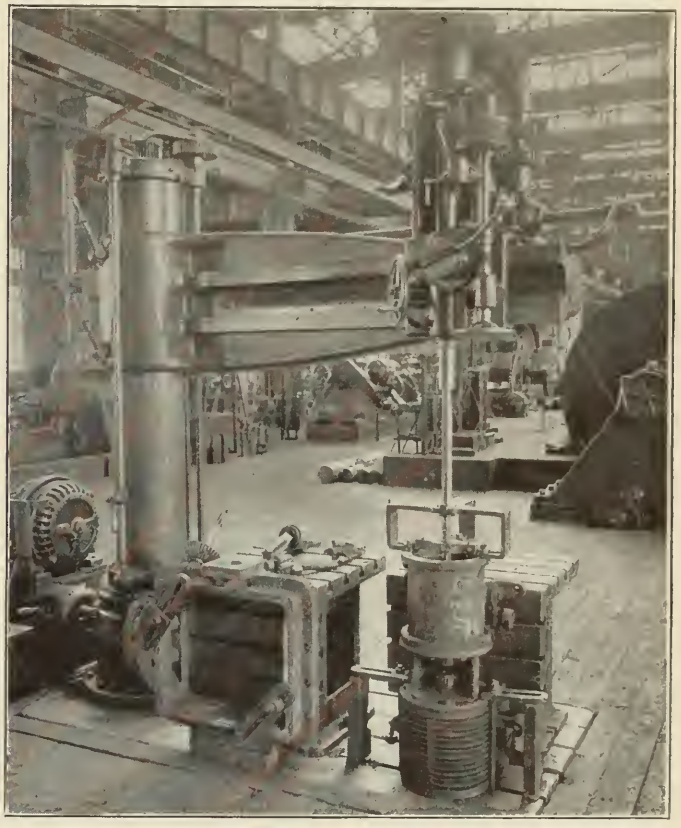


Fig. 3—Tools for Boring Air Pump Cylinders and Steam Chests.

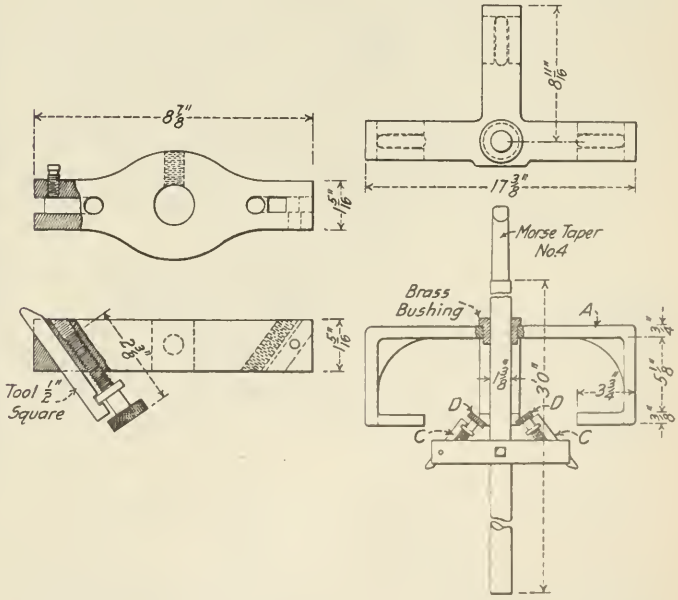


Fig. 4—Boring Tool for Air Pump.

in a lathe or boring mil, is shown in Figs. 3 and 4. It insures a bore perfectly true with the cylinder head bore, as reference

to the drawing will show. The guide bracket A is bolted to the cylinder casting after the spindle has been centered. The tools C are adjusted by the screws D. The boring bar is made with a standard Morse taper shank and is driven by a universal drill.

To the left of the air pump in Fig 3 is shown a steam chest which is ready for boring. It was formerly the practice to cast the steam chest with this hole cored and to finish it on a

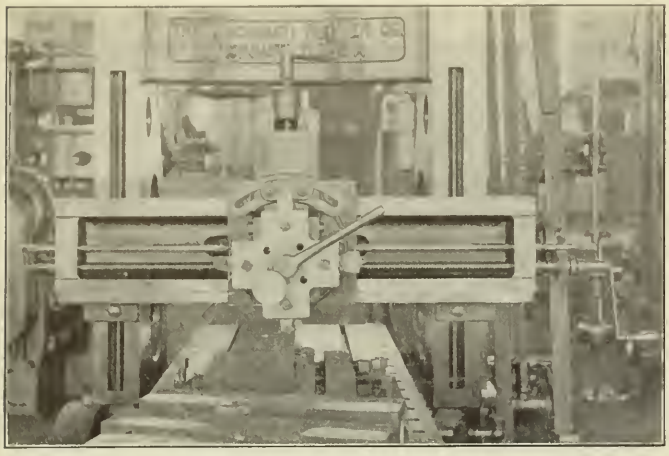


Fig. 5—Turret Tool Head Applied to a Small Planer.

horizontal boring mill, but considerable time was often lost, due to the core having been placed off the center or because of the holes being filled with sand. By making the part solid and using special high speed steel counterboring tools and drills, one of these can be finished in a few minutes.

TURRET TOOL HEAD FOR SMALL PLANER.

The application of an inexpensive turret tool head to a small planer is shown in Figs. 5 and 6. It was primarily made to reduce the time of planing shoes and wedges, there being three tools for each shoe. However, it has since proven adaptable to the general run of work and is a good time and labor saving device. The tool head is bolted to the clapper E and turns on the pin B; it is centered by the pin C and is clamped in position by the hand nut D.

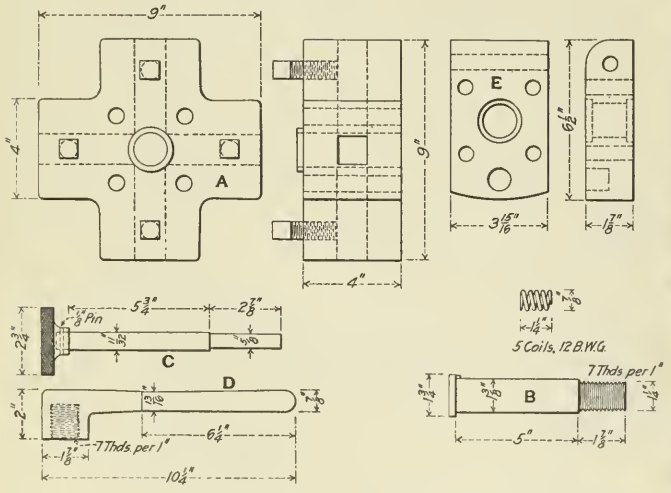


Fig. 6—Details of Turret Tool Head for Planer.

MILLING SHOES AND WEDGES.

A quick and cheap method of machining the inside and outside of shoes or wedges at the same time is shown in Fig. 7, the machine being shown set up for wedges. They are bolted to the cast steel jigs by ¾-in. countersunk head bolts, the nut being placed on the under side of the jig. One bolt is sufficient for each wedge as the ends are securely blocked. The holes can generally be drilled in a place where they may later be used for holding the wedge to the frame jaws. The wedges are blocked up on one end to give the required taper.

SHARPENING MILLING CUTTERS ON THEIR ARBORS.

A method of sharpening milling cutters while on their arbors is shown in Fig. 8. A portable adjustable head carries an emery



Fig. 7—Milling Shoes and Wedges.

wheel which is driven by a belt from an air motor arranged on a suitable frame. This method is considered an improvement over grinding them in the usual way in the tool room, as frequently after severe duty the arbors become slightly sprung, which results in two or three teeth having to do most of the work. In many ways this method has proven superior to the general practice. The portable grinder has been found useful for other purposes.

MULTIPLE PARTING TOOL FOR PISTON RINGS.

A multiple parting tool used on boring mills for making piston packing rings is shown in Fig. 9. A tool is made for each width of ring used, as it takes time to change the spacing blocks for the rings of various widths. When properly adjusted, these tools are used to part the rings to the correct width and no

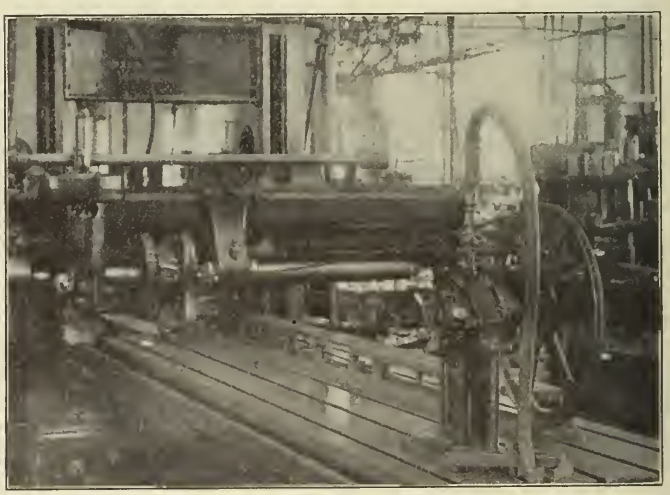


Fig. 8—Sharpening Milling Cutters in Place on Their Arbors.

facing-up is necessary after they are cut off. The drawing shows the tool in detail.

PLANING BABBITTED TRUCK BRASSES.

A tool for planing babbitted bearings of engine truck brasses is shown in Fig. 10, two strokes of the planer or shaper being

sufficient in most cases to make a good bearing. The tool is a disk of a diameter to suit the brasses, 5/8 in. thick, and made of tool steel. It fits the head of a Morton draw cut shaper, but the shank may be made to suit any machine. When dull the cutter may be revolved one-third of the way around, which gives a

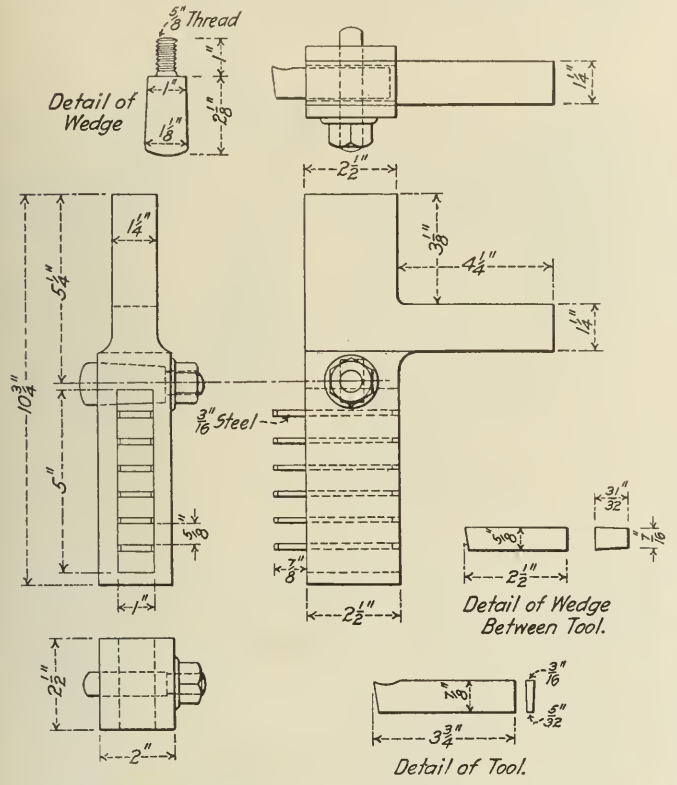


Fig. 9—Multiple Parting Tool for Piston Rings.

new cutting surface; it thus has three cutting surfaces which may be used before resharpening.

SOCKET FOR TAPER REAMERS.

A socket for holding taper reamers is shown in Fig. 11, group A. This has proven of value in reaming main rod ends and straps. The absence of the positive rigidity, found in the solid socket and spindle, allows the holes to be reamed faster and with less breakages.

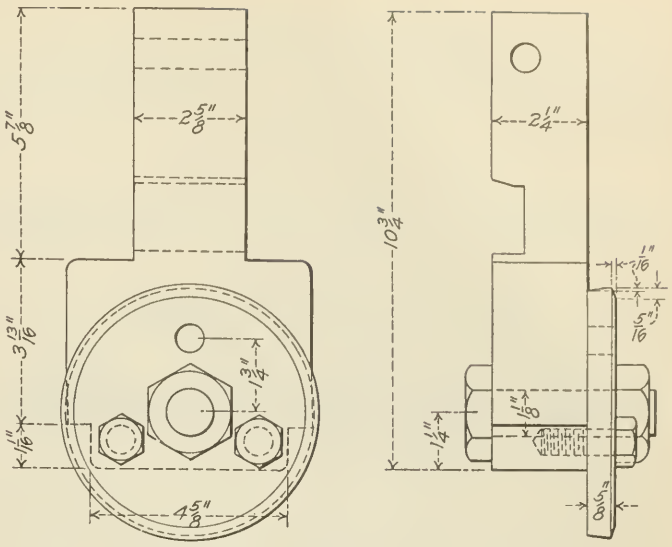


Fig. 10—Tool for Planing Babbitted Truck Brasses.

CENTER GRINDER.

A pneumatic grinder for lathe centers is shown at E and G in Fig. 11, and in Fig. 12. It is made from a rotary air motor

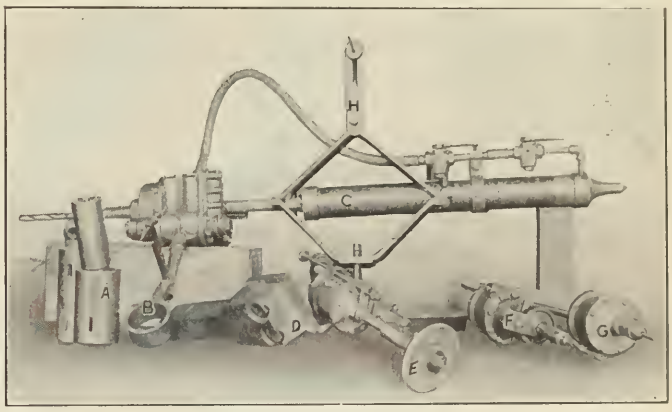


Fig. 11—Miscellaneous Tools and Handy Devices.

originally designed for drilling 3/16 in. tell-tale holes in staybolts. It is small and may easily be held in place in the ordinary lathe tool holder.

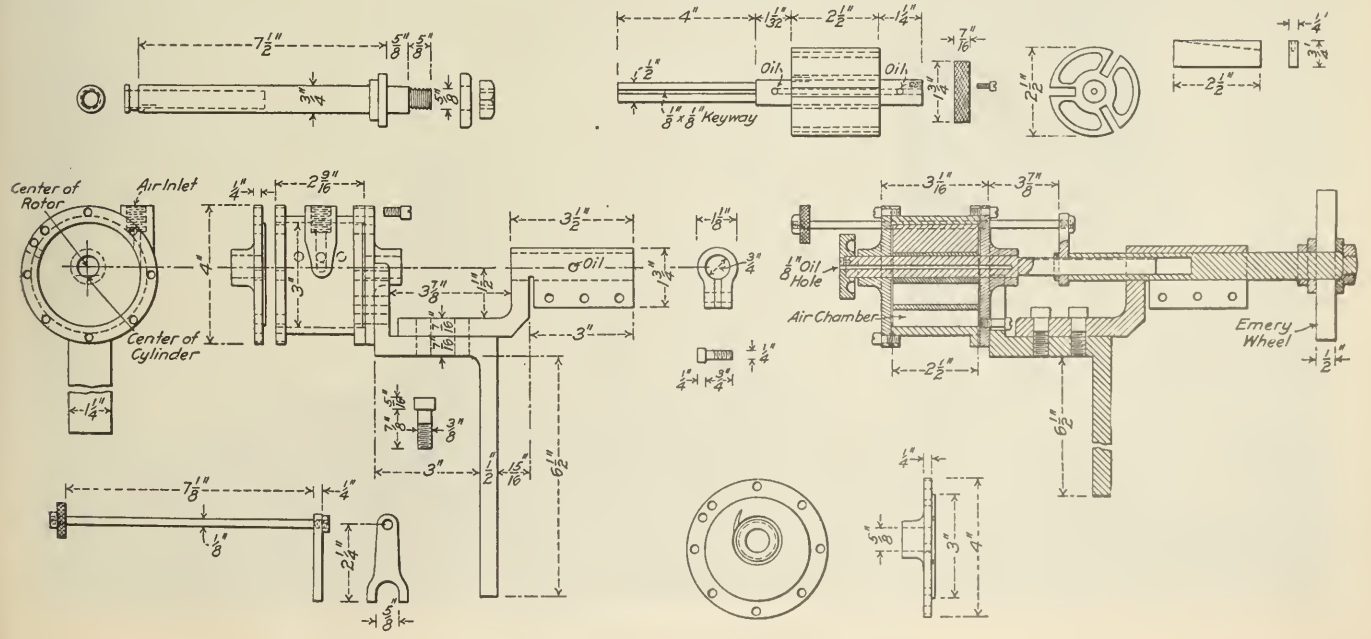


Fig. 12—Details of Lathe Center Grinder.

QUARTERING MACHINE GAGE.

A quartering machine gage, B, is shown in Fig. 11. It is slipped over the spindle and used to true up the crank pin preparatory to boring out the opposite wheel for a new crank pin.

PNEUMATIC FEED FOR AIR MOTORS.

A pneumatic feed, C, for air motors is shown in Fig. 11, and in detail in Fig. 13. It has many uses and is especially adaptable

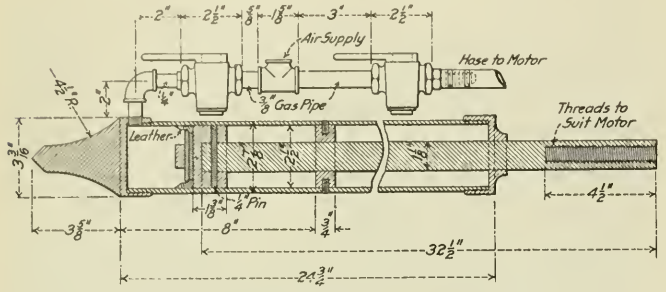


Fig. 13—Pneumatic Feed for Air Motor.

in drilling and tapping driving and truck wheel hubs for hub liners, and in drilling into the heads of tire retaining ring rivets preparatory to removing the ring and replacing the tire. The pressure on the piston gives a constant feeding pressure to the motor.

PLANING BABBITTED CROSSHEAD SHOES.

A tool for planing babbitted crosshead shoes in one cut is shown at D in Fig. 11. It has been made to cut better by having the cutting edges beveled back slightly.

PNEUMATIC BREAST DRILL.

By adding a set of gears to the motor described above, as shown in Fig. 14, a breast drill F in Fig. 11, may be made that will drill holes up to 9/16 in. in diameter.

QUARTERING INDICATOR.

The quartering indicator, H in Fig. 11, has proven valuable when pressing axles into driving wheels that have the crank pins already in.

REAMERS.

Several reamers and shanks are shown in group J, Fig. 15, which illustrate an idea of standardizing the holes in special

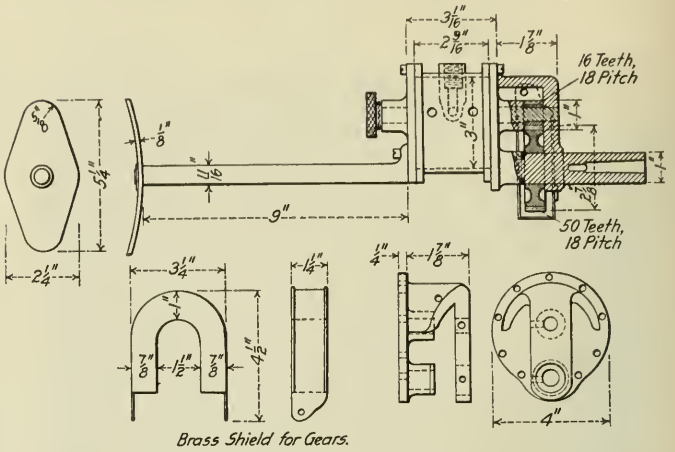


Fig. 14—Pneumatic Breast Drill.

reamers so that spindles or shanks may be made to fit into the various styles of machines that may have occasion to use these reamers.

The reamer on the right of group K, Fig. 15, has been found to be an improvement over the other two as the flutes are not as near together and there is more room for the chips to free themselves and work out of the hole. Under heavy tests this reamer has not broken a flute.

LATHE TOOLS FOR BRASS WORK.

An economical design of lathe tools for brass work is shown in group O, Fig. 15. Each tool has a seat for the set screw located by a jig so that it will fit the shank properly and run true

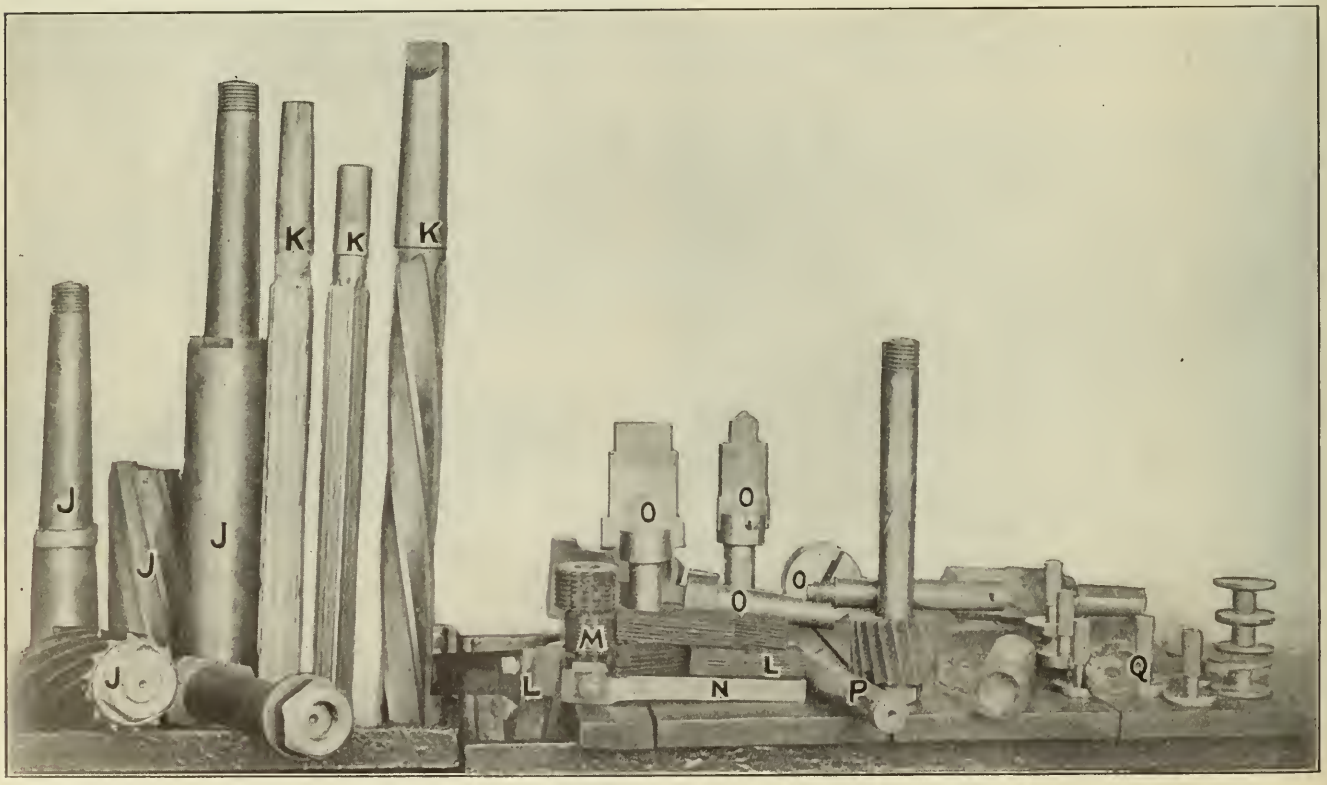


Fig. 15—Miscellaneous Tools and Gages.

with the spindle of the lathe. This is much cheaper and more satisfactory than the solid tools used in some shops.

THREADING TOOL.

A threading tool is shown at N, Fig. 15, and in detail in Fig. 16. It is only necessary to grind the top face to keep it sharp. It is milled by the cutters M, which in turn are made by feeding the chaser L into the cutter in the lathe forming a series of

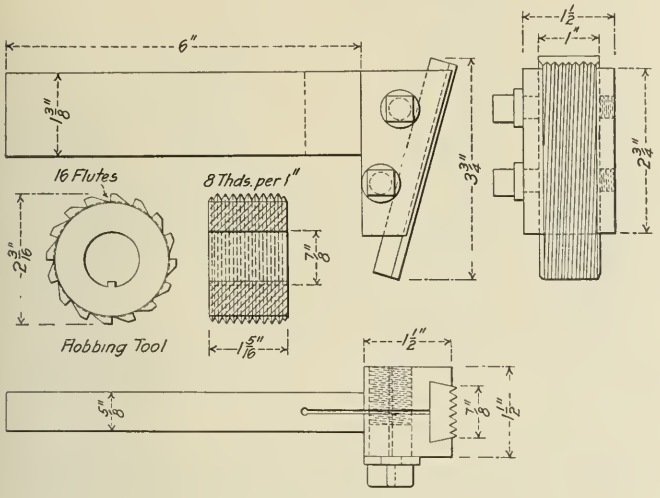


Fig. 16—Threading Tool.

angular grooves of the desired pitch and depth. The cutter N, shown set in the holder, has threaded 14,000 mud plugs and used up 1¼ in. of the cutter.

AIR PUMP GAGES.

A set of piston and ring gages for air pumps and piston packing rings are shown in group Q, Fig. 15. The gages in each set vary by 1/32 in.

SECOND PRIZE.

BY R. G. BENNETT.

Motive Power Inspector, Pennsylvania Railroad, South Pittsburgh Shops, Pittsburgh, Pa.

STEEL CAR REPAIR JACK.

The steel car repair jack shown in Fig. 17 has proved valuable as a time and labor saver in the repair of steel cars. It is built of a number of channels, so arranged as to act as guides and supports for screw jacks which may be used on either the side or top members of the frame. The columns are spaced about 8 ft. apart; they are imbedded in concrete piers, which are 5 ft. deep, and are braced at the top by angle irons and channels. The screw jacks each consist of two bronze nuts which are clamped to the channels by bolts so that it is possible to adjust them to any height. Through these nuts is passed a steel jack screw, outside diameter 2¼ in., with two threads per inch (square threads); on the end of jack screw is a swivel iron head. The damaged car is placed in the structure and the bulged side sheets or underframe, after being heated with a burner, may be jacked back into their proper places and held there until cooled. Eye bolts are placed at the base of the columns so that the cars may be chained to the rail when it is necessary to do so.

BABBITT FURNACE.

The furnace shown in Fig. 18 is used for melting babbitt from the faces of driving boxes and other locomotive parts

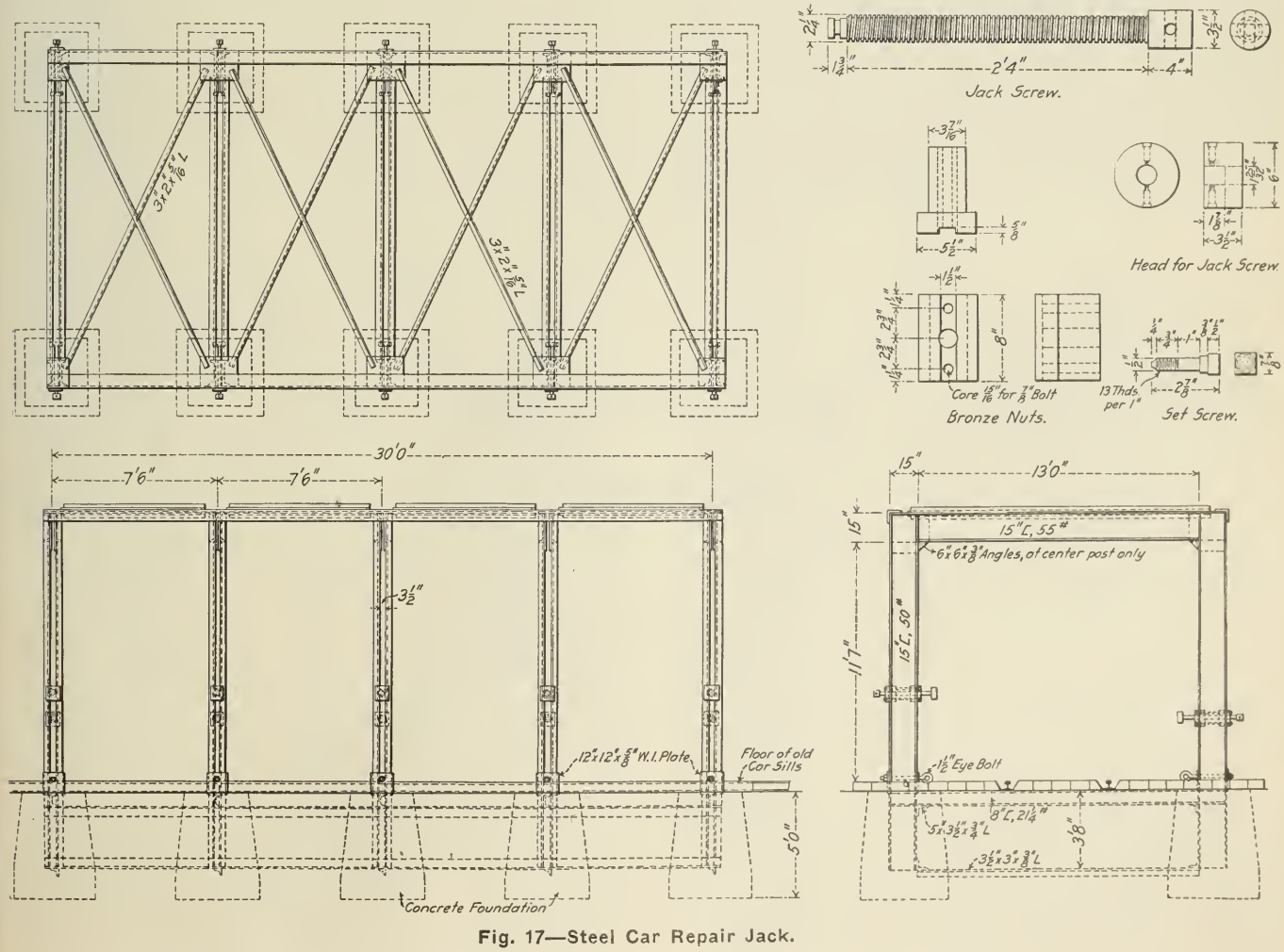


Fig. 17—Steel Car Repair Jack.

that are brought into the shop for repairs. The parts may be hoisted by a wall crane into the cast iron ladle, under which is an 8-in. Good Luck burner. Gas is supplied to the burner through a ⅜-in. pipe and air through a ½-in. pipe. The furnace is a sheet iron box lined with fire brick and having a door on one side. This device does away with the machining or chipping off the old babbitt from the box, and the melted babbitt thus obtained may be used again.

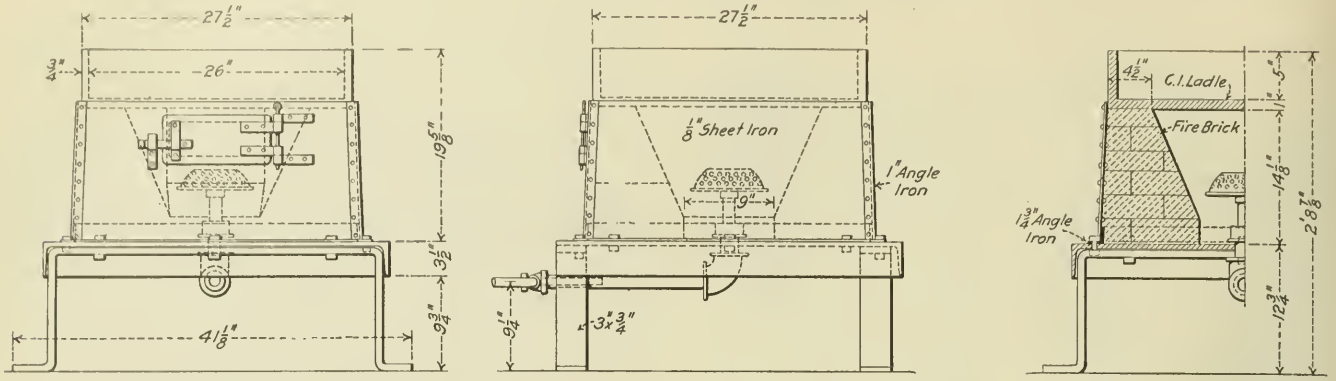


Fig. 18—Babbitt Furnace.

BABBITTING THE FACES OF DRIVING BOXES.

The babbitting jig shown in Fig. 19 affords an easy means for babbitting the faces of driving boxes to any desired thickness. To apply the jig, first fasten the cross piece A to the box by passing the cellar bolts through the holes provided; then force the jig into the top of the journal bearing by means of the screw B. The cover plate C will then extend over the face of the box and may be adjusted by the screw F to give the required thickness of babbitt. The clamp D holds this in a rigid position. The babbitt is poured through the tap holes in the plate and is prevented from flowing away by a gum band E, which extends around the outside of the cover plate, together with a little clay packed around the outside of the gum band. This device has lightened the work on the boring machine on which it was formerly necessary to face off the excess metal.

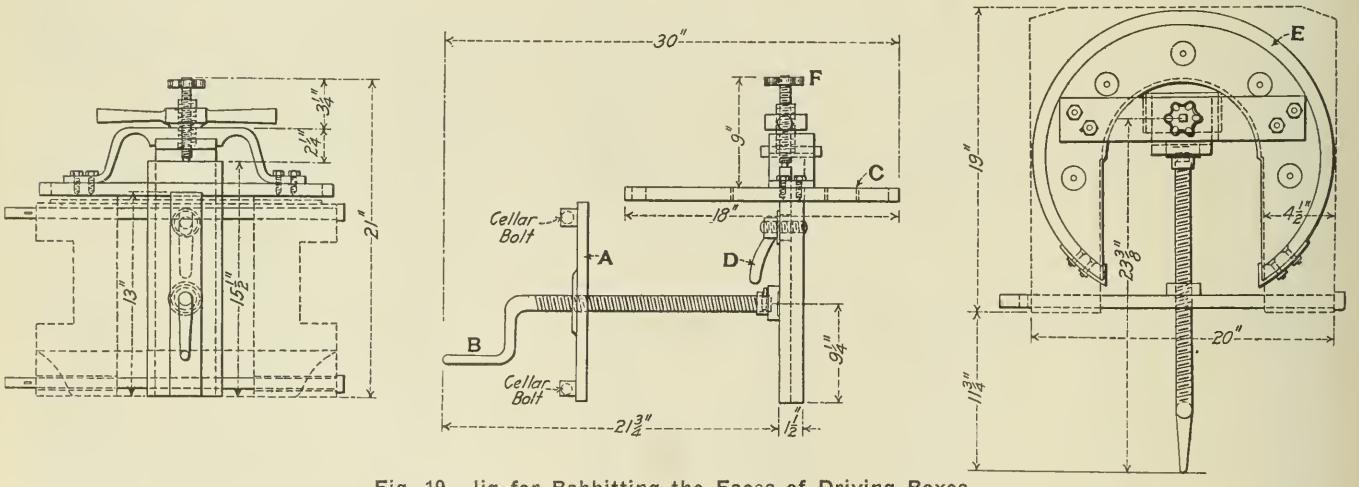


Fig. 19—Jig for Babbitting the Faces of Driving Boxes.

BOLT SHEARING MACHINE.

A serviceable device for a car repair yard is the bolt shearing machine shown in Fig. 20. It consists of a long lever E, pivoted at G, with a knife blade F inserted in it. The lever is operated by a 10-in. air brake cylinder. A piece of iron D, notched to receive ¾-in., ⅞-in. or 1-in. bolts, is bolted to the crosspiece; when air is supplied to the cylinder the knife will shear the bolt. The whole mechanism is mounted in a wooden frame support and any car repairer can operate the machine, thus relieving the blacksmith shop of many small jobs.

COLD SAW FOR LOCOMOTIVE FRAMES.

A convenient device for sawing a locomotive frame in order to insert a piece for a new weld is shown in Fig. 21. It consists of a portable rail saw, as manufactured by the Vandyck Churchill Company, so arranged that it may be operated by an air motor connected to shaft A, and fed by hand or automatically by the pawl and feed mechanism shown in the illustration. Two adjustable legs support one end of the machine while the other end is clamped to the locomotive frame.

STRIPPING MACHINE FOR TORN HOSE.

A device for cutting the clamp bolt and removing the fitting from one end of a torn air brake hose is shown in Fig. 22. By means of an 8-in. air brake cylinder and a system of levers, the operator, by pressing a foot-valve, may cut the clamp bolt with the knife A at the left of the machine. After removing the clamp lay the end with the fitting on top of the jaws and again press the foot-valve. The plunger B will force the piece down through the jaws tearing the hose from the fitting. The knife A is driven by a cam attached to the frame of the machine. This machine has been found to be a valuable addition to an air brake hose department.

TRIP HAMMER FOR SHEARING YOKES FROM COUPLERS.

A simple device for shearing yokes from couplers is shown in Figs. 23 and 24. The machine consists of a cast steel hammer, weighing 1,570 lbs., which may be raised to any desired height by means of an 8-in. air cylinder; it is tripped by a tripping attachment coming in contact with a ¾-in. rod which is passed through two eye bolts fastened to the guides of the hammer.

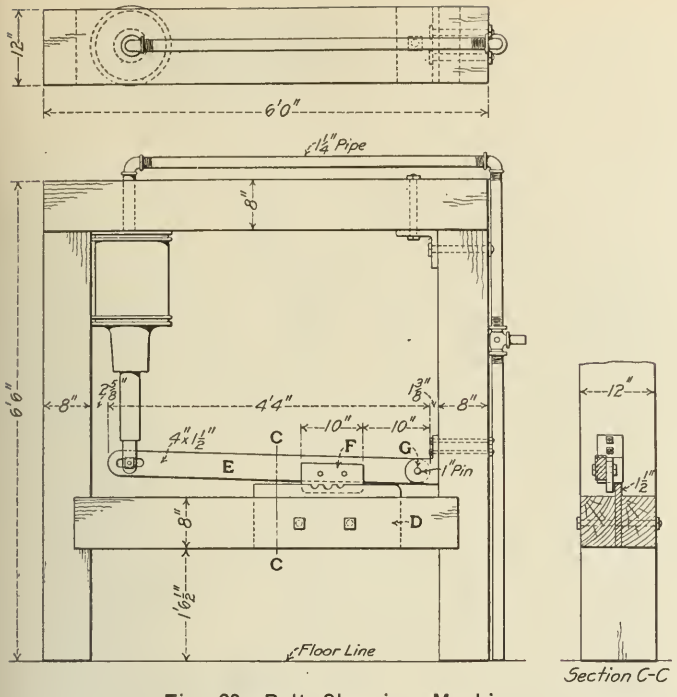


Fig. 20—Bolt Shearing Machine.

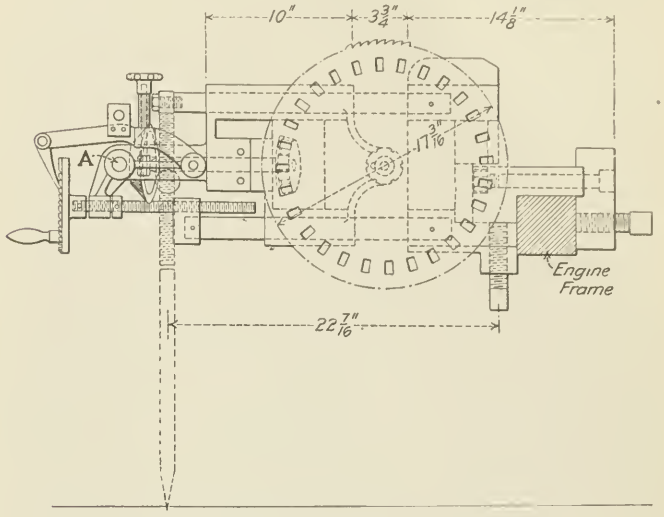


Fig. 21—Locomotive Frame Cold Saw.

The movable block and spring near the top of the guides absorbs the shock of the tripping device as it flies up after releasing the hammer. The drop of the hammer is regulated to 9 ft. in summer and 8 ft. in winter. One blow shears the yoke from the coupler; occasionally a malleable iron coupler is damaged, but never a cast iron one. The time and labor saved by this machine however, compensates for any loss of this kind. The machine may be operated by one man stationed at the cylinder, who, by operating the rod connecting the air cocks A and B, and opening and closing the valve C in the exhaust pipe, may raise and lower the hammer at will. To operate the hammer move the connecting rod to close the valve A and open the valve B, thus admitting air at the top of the cylinder. When the hammer is tripped, move the connecting rod in the opposite direction, which opens valve A and closes valve B at the same time. A hole drilled in the side of valve B permits the upper part of the cylinder to drain, thus relieving the pressure ahead of the piston. Exhaust valve C is used to exhaust the air from the cylinder

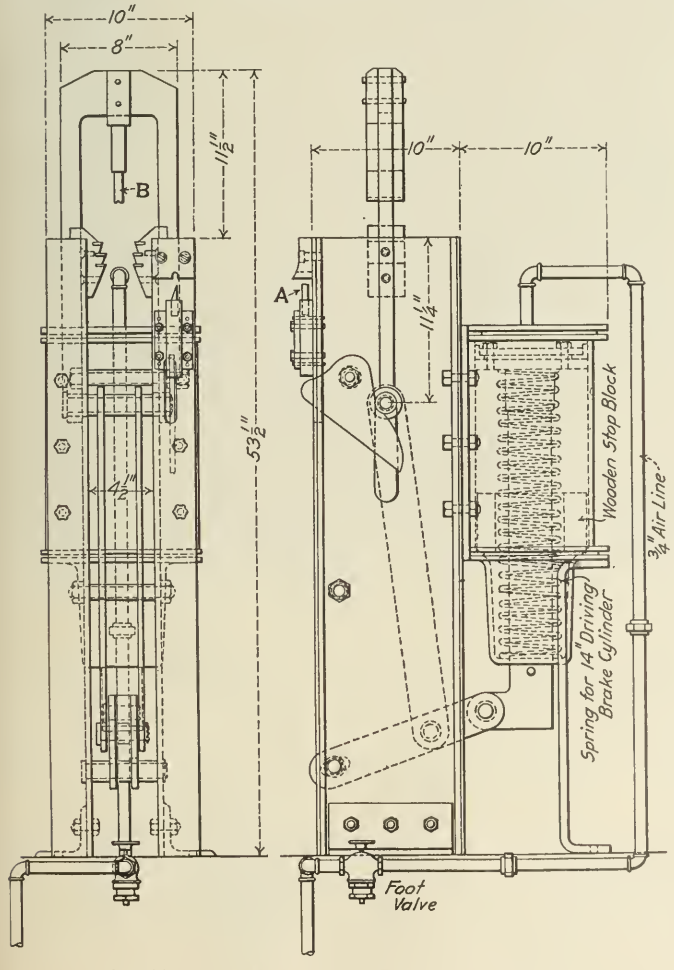


Fig. 22—Stripping Machine for Torn Hose.

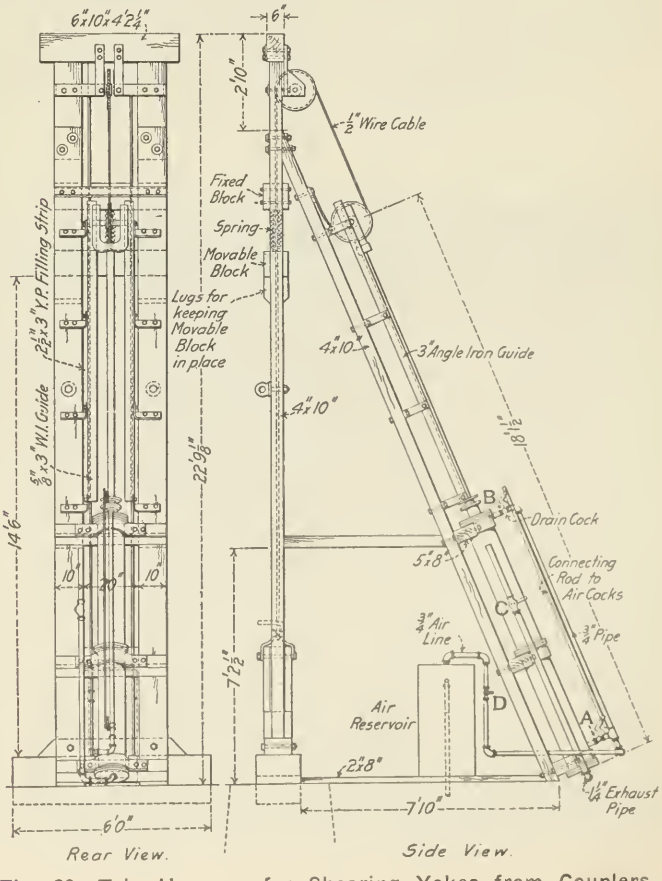


Fig. 23—Trip Hammer for Shearing Yokes from Couplers.

after the piston is moved to the starting position. It is closed when lifting the hammer, to give the required dash-pot action. Air is taken from an air reservoir through the valve D, which should be closed when the machine is out of use. Air is used from the shop line at about 100 lbs. pressure.

Fig. 24 shows a partial front elevation of the lower part and base of the apparatus including the blocks and spring on which the yoke with its coupler is placed for shearing. Before placing the coupler and yoke in the apparatus the hammer is raised slightly and is then lowered until it rests on a movable arm which may be swung under it. The workmen are thus protected from the accidental falling of the weight while they are placing or removing couplers in or out of the device. When air is admitted to the cylinder and the hammer is raised the arm is automatically swung out of the way. This device was first seen at the shops of the Union Railroad.

HOSE STRIPPING MACHINE.

A compact arrangement for stripping the fittings from air brake hose is shown in Fig. 25. The machine is operated by the foot valve B, which admits air to an 8-in. by 12-in. air brake cylinder. The piston rod has fastened to its upper end a forked member C, which when air is admitted to the cylinder rises. In the first operation this end C, forces the knife A over, cutting the clamp bolts so that the clamps may be removed. The piston is then allowed to return to its normal position. In the second operation the forked end when rising, closes the movable clamps F which work on the guides H. The inside faces of these clamps are fitted with checkered plates so as to firmly grasp the hose. Each clamp also has two studs G, at the ends of which are coil springs for the purpose of drawing the clamps back after the air pressure has been released. The links J and K, and the

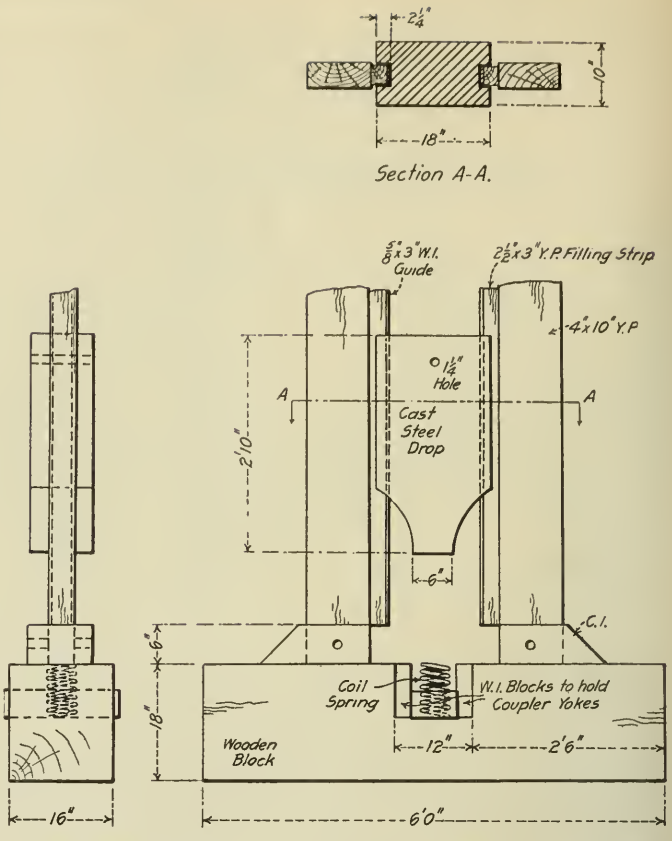


Fig. 24—Base of Device for Removing Yokes from Couplers.

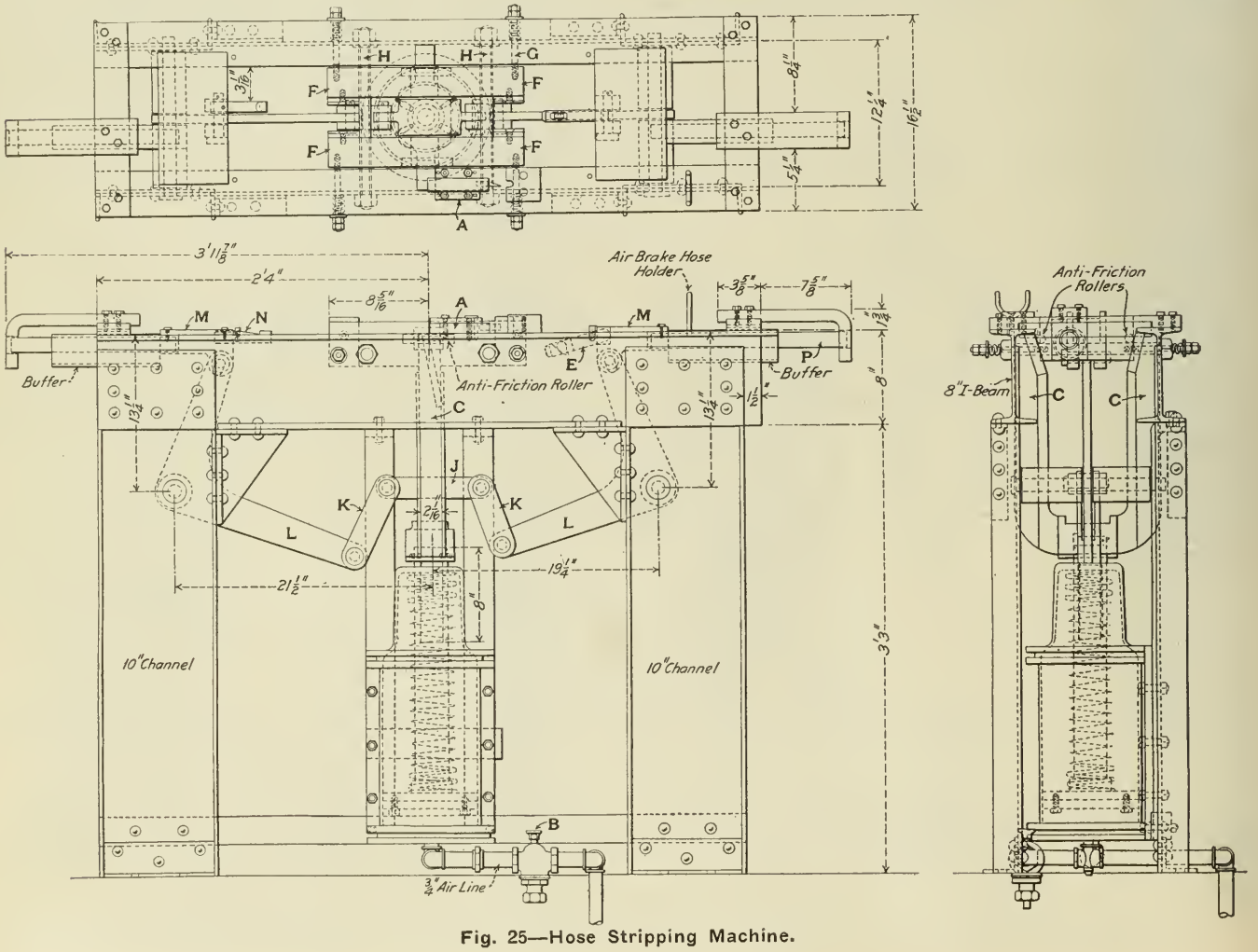


Fig. 25—Hose Stripping Machine.

bell cranks L operate the stripping blocks M. To one of these blocks is attached fitting N to catch the hose coupling, and to the other fitting E to catch the nipple end of the hose. These stripping blocks move along the top face of the machine, using the inside flanges of the I beams which form the bed of the machine as guides. At the end of each stripping block is a rod P which holds a piece of air hose that acts as a buffer and takes up the horizontal shock when the hose is stripped. There is a heavy coil spring in the cylinder to absorb the vertical shock at the moment the stripping takes place. When operating the machine the workman, after removing the clamps, places the hose so that the fittings catch in their respective holding devices. He then operates the foot valve, admitting air and raising the piston. The clamps grasp the hose and the fittings are drawn from it; they drop into a chute and fall to the floor. The foot valve is then released, exhausting the air from the cylinder and allowing the hose to be taken from the machine. This machine does not require skilled labor.

BY P. F. SMITH.

Chief Draftsman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.

Credit is also due to Thomas Marshall, Master Mechanic; Henry Holder, General Foreman; James Findlay, Machine Shop Foreman and James Lynch, Blacksmith Shop Foreman.

ROCKER BOX BORING BAR.

A simple bar for boring rocker boxes without removing them from the locomotive is shown in Fig. 26. It consists of a piece

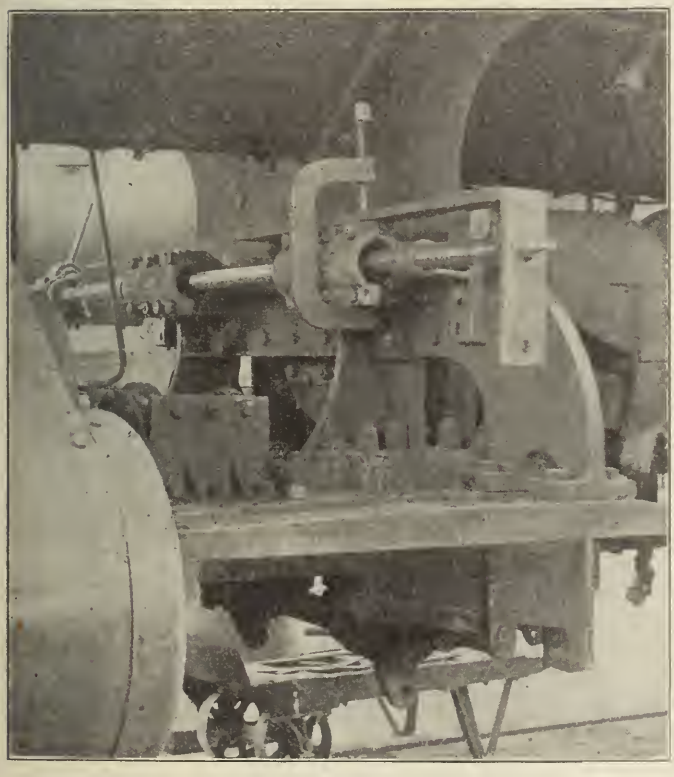


Fig. 26—Rocker Box Boring Bar.

of hollow tubing, with a taper shank fastened in one end to take the air motor. Brackets or bearings to support the bar are bolted to the guide yoke, and an L-shaped brace is clamped to one of the rocker boxes to support the feed screw at the end of the shaft opposite the motor. The feed may be operated either by hand or by fastening a wrench to the square end of the feed screw to hold it stationary.

ECCENTRIC MANDREL.

An eccentric mandrel for a lathe is shown in Fig. 27 and 28. It consists of a cast iron slotted base, which is bolted to the face plate of the lathe. The bar on which the eccentric fits is held in place on the base by a large nut. This bar may be adjusted for different throws of eccentric by the long screw which



Fig. 27—Eccentric Mandrel.

passes through the base. As shown in the photograph, the bar has four slots in which tapered wedges fit. These are grooved near the outer ends to engage the collar of the large nut, the turning of which adjusts the wedges for the different sizes of axle fits. There is an adjustable dog on the base of the mandrel which engages the inside fillet on the center rib of the large half of the eccentric and holds it rigidly in place. Different sets of wedges to cover a wide range of axle fits are shown in the photograph. A gage for measuring the different eccentric throws is also shown resting on the mandrel.

BORING PISTON VALVE CHAMBERS.

A simple and efficient device for boring piston valve chambers is shown in Figs. 29 and 30. It consists of heads with tapered



Fig. 29—Application of Device for Boring Piston Valve Chambers.

shoulders on the inner faces to fit the counterbores of the steam chest. This, together with the holes which fit over the steam chest cover studs, make it self entering. The heads are fitted

MOLDING PACKING RINGS.

The machine for molding packing rings, shown in Fig. 31 consists of a 3-in. air cylinder which is controlled by a three-way

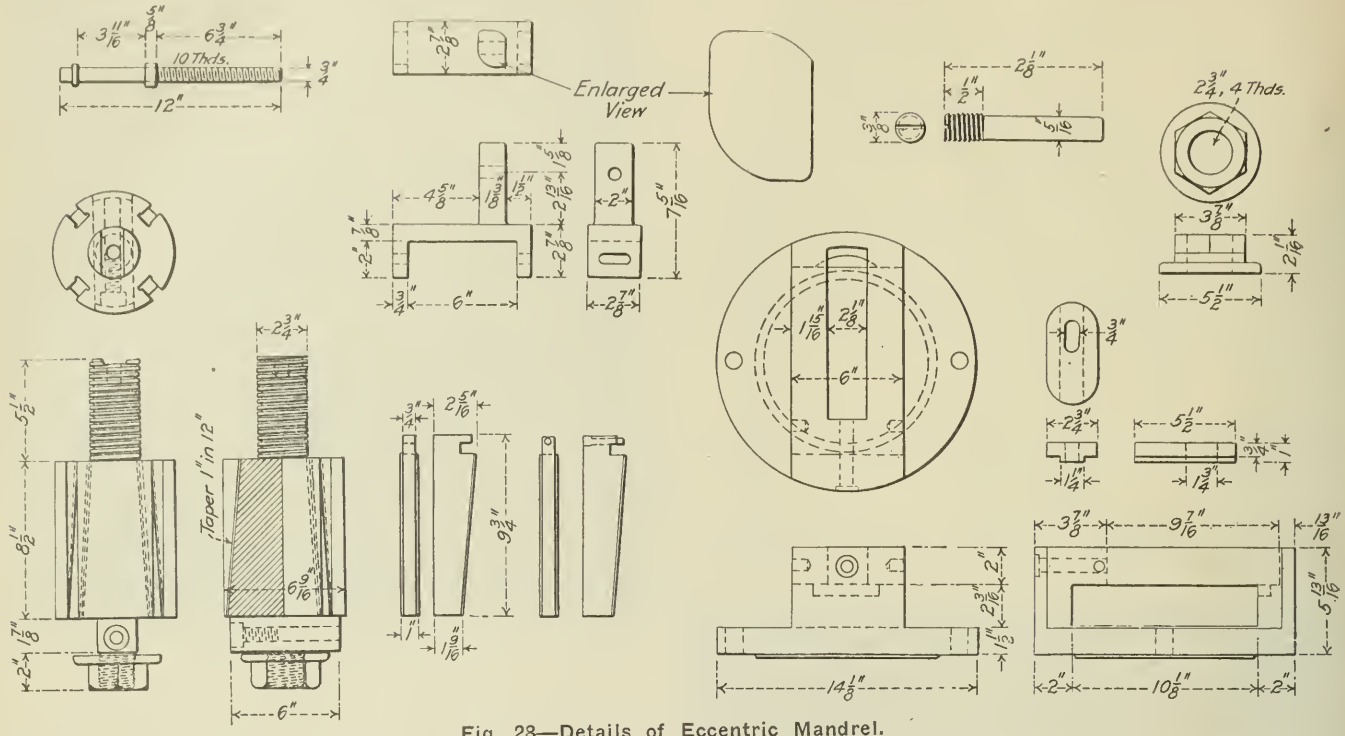


Fig. 28—Details of Eccentric Mandrel.

with bushings at their outer ends in which the boring bar fits; collars are so placed as to prevent the boring bar from moving endways. At the front end of the bar and clearly shown in the photograph is a worm gear which meshes with a worm. An air motor fits on the taper shank on this worm. The feed

cock. The cylinder is bolted to a frame constructed of angle iron; a yoke at the end of the piston rod is attached to the female former, the male die being fastened to the frame. The rings when removed from the mold are finished except that it is necessary to clip off and file down the lug formed by the gate

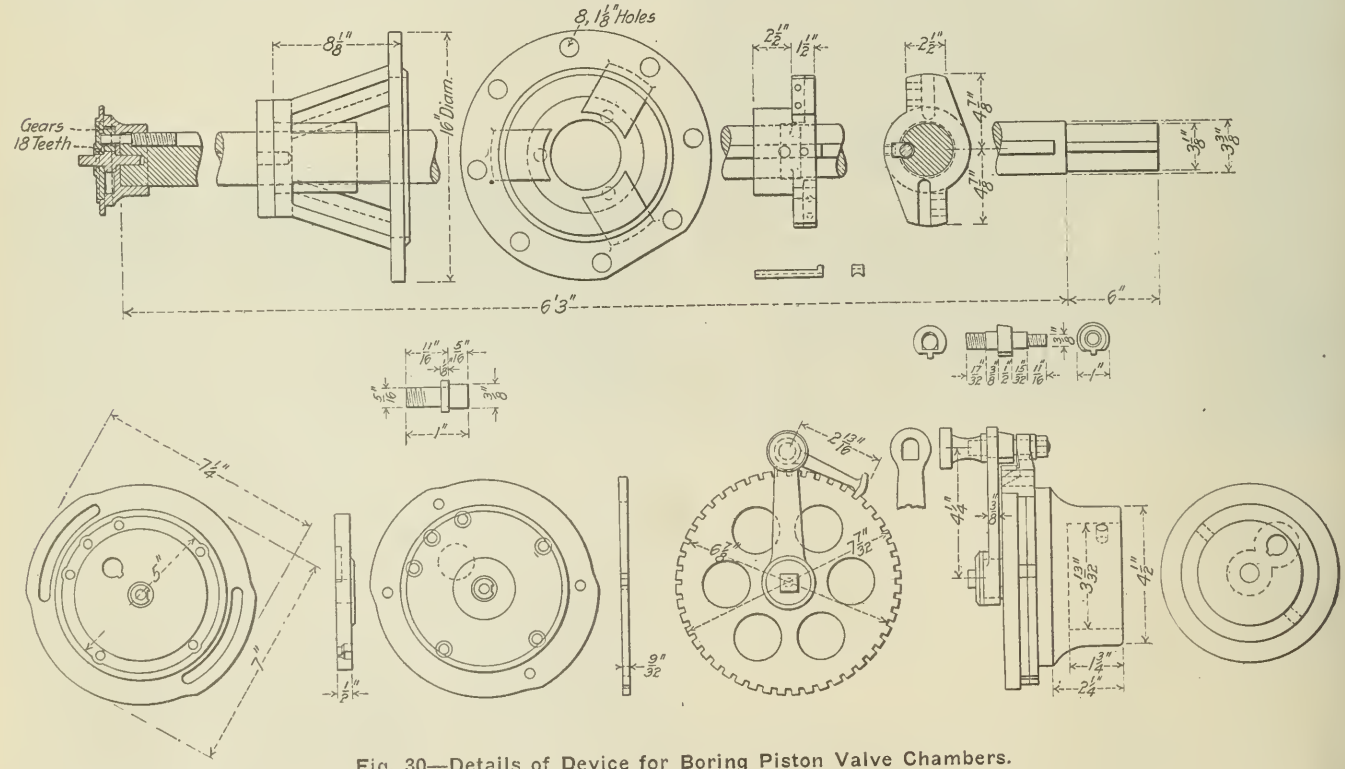


Fig. 30—Details of Device for Boring Piston Valve Chambers.

mechanism is placed at the other end of the boring bar and may be regulated to give either a fine or a coarse feed. Different heads are provided for the different size valve chambers.

for pouring. Finished packing rings are shown at the left. The outfit is equipped with a complete set of dies for the different sizes of piston, valve and air pump packing. The photograph

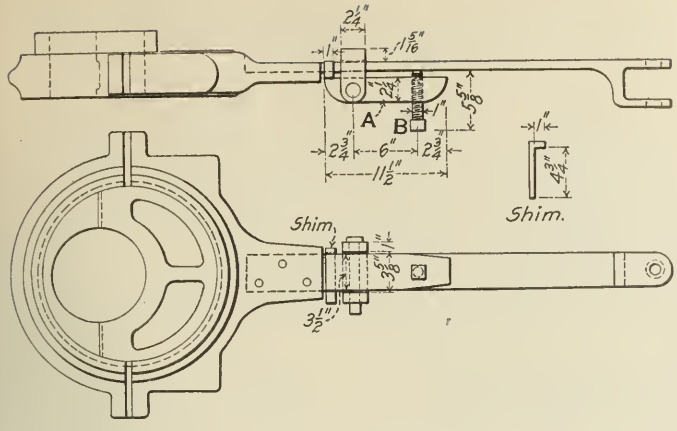


Fig. 32—Device for Bending Eccentric Blades.

shows the device tilted on one side to better illustrate its construction and operation.

BENDING ECCENTRIC BLADES.

It is often necessary to adjust eccentric blades after they have been bolted to the eccentric strap. The device for bending the blades shown in Fig. 32 is light and may be easily applied to either side of the blade. A number of shims to suit the different blades should be carried in stock. After the device has been adjusted by putting the 1-in. pin through the strap and the bar A, the blade may easily be bent to any position by turning the screw B.

CHUCK FOR HOLDING BOLT HEADS.

A chuck for holding the heads of bolts, which is much more convenient than the dogs or drivers that are ordinarily used, is shown in Fig. 33. The two parts of the clamp are each held at one end by a ⅝-in. stud bolt. In order to adjust the distance between them, they swing around these bolts and may be clamped in any desired position by tightening the square head stud bolts at the other end.

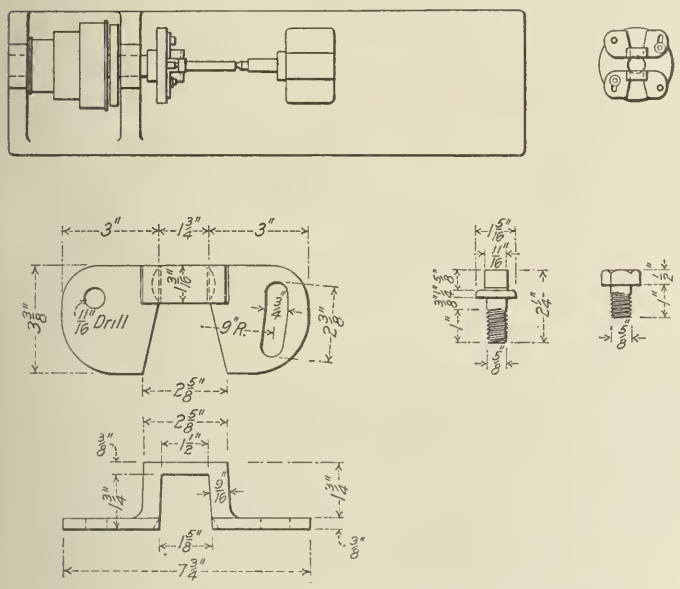


Fig. 33—Adjustable Chuck for Holding Bolt Heads.

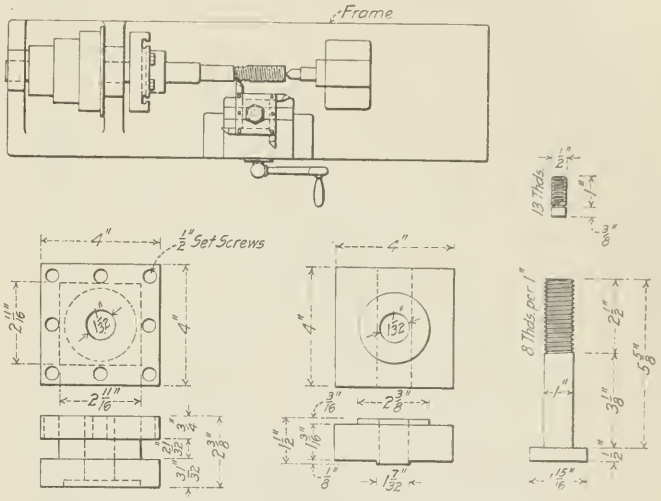


Fig. 34—Turret Tool Holder for Lathe.

LATHE TURRET TOOL HOLDER.

A simple lathe turret tool holder, to carry four tools, which may easily be constructed is shown in Fig. 34. Each tool is held securely in position by two ½-in. set screws, and the turret head is clamped to the carriage of the lathe by tightening the nut on the 1-in. bolt about which it revolves.

PISTON PACKING RING MANDREL.

The piston packing ring mandrel, Fig. 35, consists of a cast iron bell-shaped cone on a threaded spindle which is held

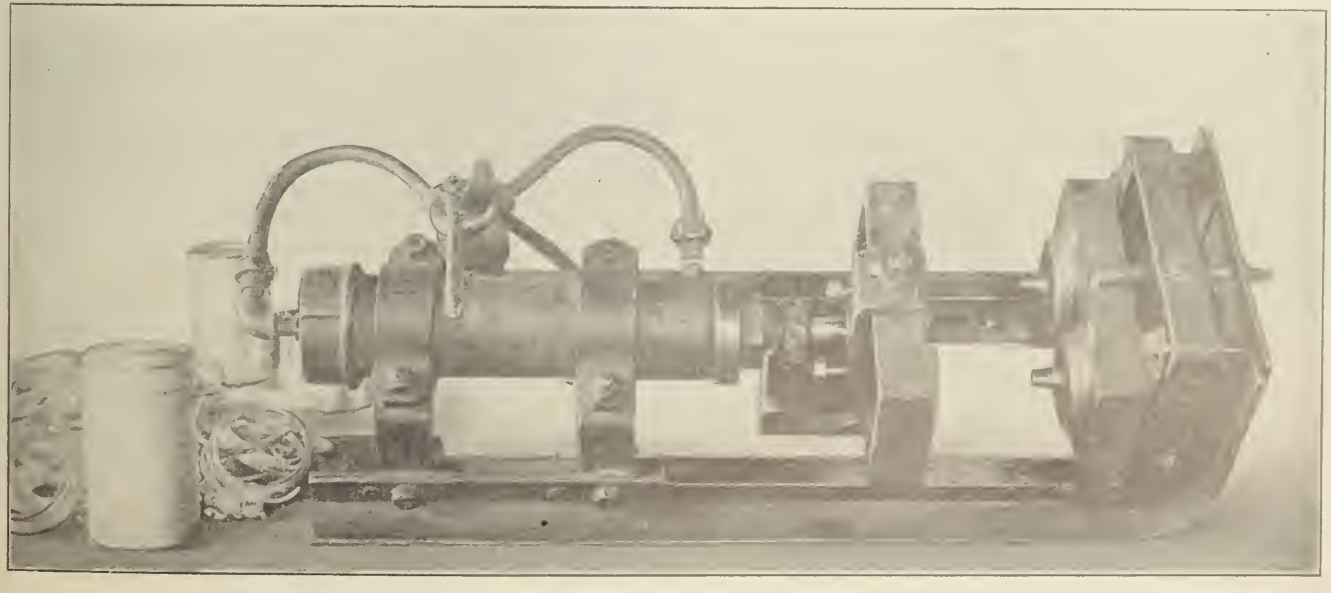


Fig. 31—Machine for Molding Packing Rings.

between the lathe centers. On the same spindle is pressed the flat casting, on which the slotted dogs with tapered ends to fit the taper on the cone are bolted. By turning the nut shown just in front of the bell-shaped cone, the dogs are forced outward from the center and engage the inside of the packing ring, as shown. A driver, which is bolted to the face plate, engages

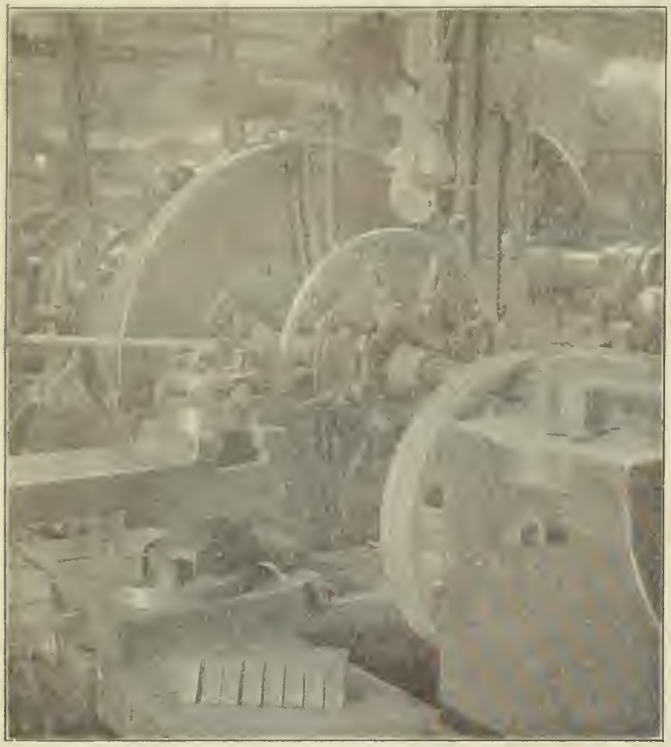


Fig. 35—Application of Piston Packing Ring Mandrel.

a dog on the spindle, thus driving the mandrel. Several unfinished rings are shown hanging on the tail stock center, and just back of the mandrel is an iron hook on which the finished rings may be hung. On the carriage in the foreground is shown an extra set of dogs for use on packing rings of larger sizes, which do not come within the limits of the dogs shown on the mandrel.

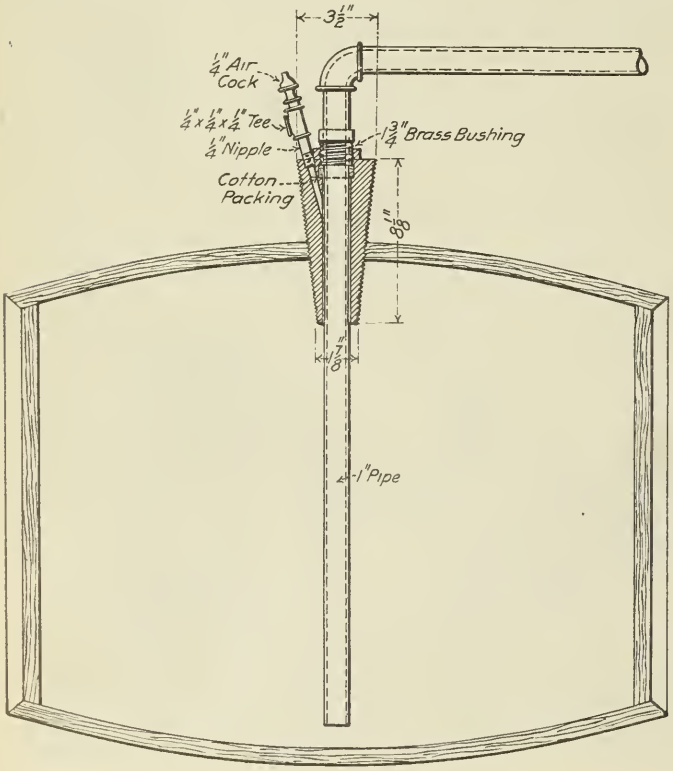


Fig. 36—Device for Emptying Barrels by Compressed Air.

DEVICE FOR EMPTYING BARRELS.

The device for emptying barrels by air pressure, which is shown in Fig. 36, is easily constructed and affords a rapid and cleanly method of transferring oil from barrels to storage tanks. The brass plug is screwed in the bung hole and the 1-in. pipe through which the oil is forced from the barrel fits snugly in the bushing which screws into the plug; the cotton packing makes a tight joint between the plug and the pipe. Compressed air enters through the ¼-in. air cock and nipple and passes down through a groove between the pipe and the brass plug, thus forcing the oil from the barrel.

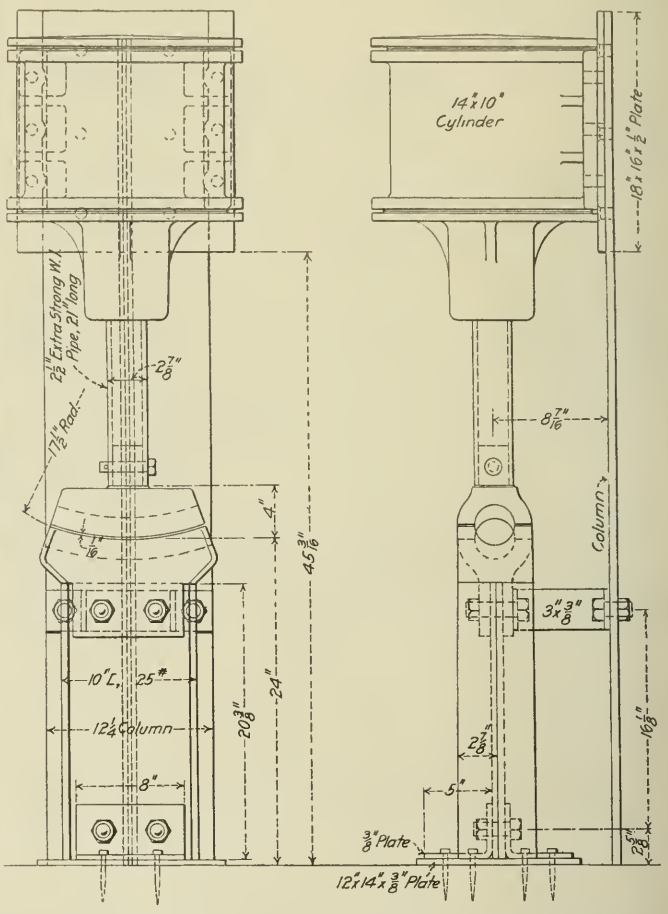


Fig. 37—Press for Forming Locomotive Arch Tubes.

ARCH TUBE FORMER.

A device for forming locomotive arch tubes to the proper shape is located in the boiler shop near an oil furnace in which they are heated. The power is supplied by a 14-in. x 10-in. driver brake cylinder, the air being controlled by a foot valve. The construction of the press and of the formers is clearly shown in Figs. 37 and 38.

DOUBLE BABBITT FURNACE.

A double furnace for melting two kinds of babbitt is shown in Fig. 39. The bases and the fire pots were taken from two old engine house stoves. Crude oil is used and each stove has a separate burner. The crucibles may be lifted in and out of the tops of the furnaces by means of the lugs. An extra crucible is shown in the foreground.

FORGING SMOKE ARCH BRACES.

The dies for forging both ends of a smoke arch brace under a steam hammer are shown in Fig. 40. The bottom foot of the

brace is first blocked out, as shown at the extreme right; it is then reheated and finished to the proper shape by the dies shown

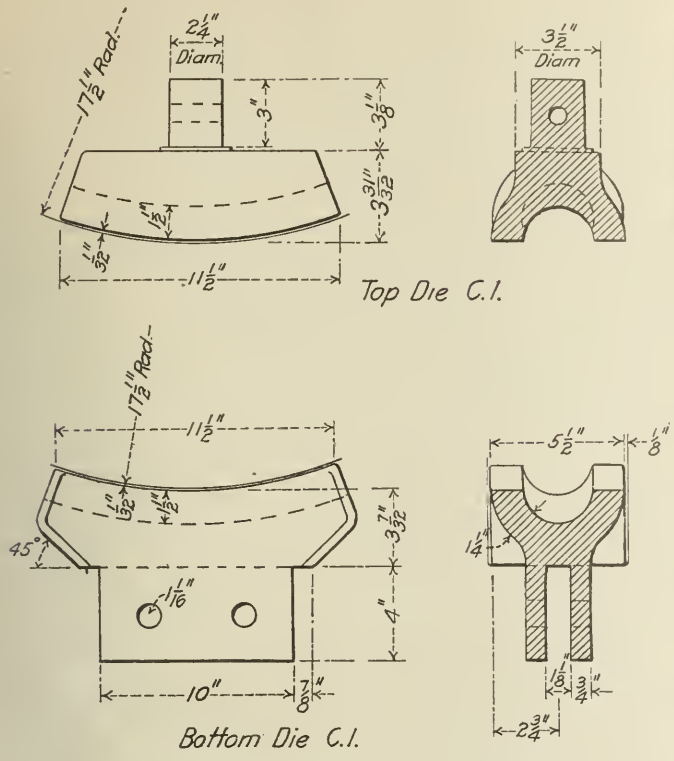


Fig. 38—Dies for Forming Arch Tubes.

at the left. The pad for the smoke arch at the other end of the brace is blocked out in the form of a ball, as shown near the center of the photograph, and is then reheated and formed to the



Fig. 39—Double Furnace for Melting Babbitt.

proper shape under the steam hammer in the large round die. The disk tool with the handle is then used to offset the pad and complete it.

FORGING COUPLER CARRIER IRONS.

The tools for forging the two members of an ordinary coupler carrier iron under a steam hammer are shown in Fig. 41. The stock for the bottom member is first bent, as shown by the piece in the foreground in the center. It is then placed on the female former at the left and the block is driven down into place. The former has steel inserts at its outer top edges, and by placing the two strips on the ends of the iron, as shown, it may be cut off to the proper length by one blow of the hammer. The top member is formed by the dies shown at the right. Both the top and the bottom members of the support are finished at one heat. A set of these ready for drilling and application are shown near the center between the two sets of dies.



Fig. 40—Formers for Forging Smoke Arch Braces Under a Steam Hammer.

FORGING ROD STRAPS.

Dies for forging rod straps are shown in Fig. 42. The strap is first blocked out in the ordinary manner and is then reheated

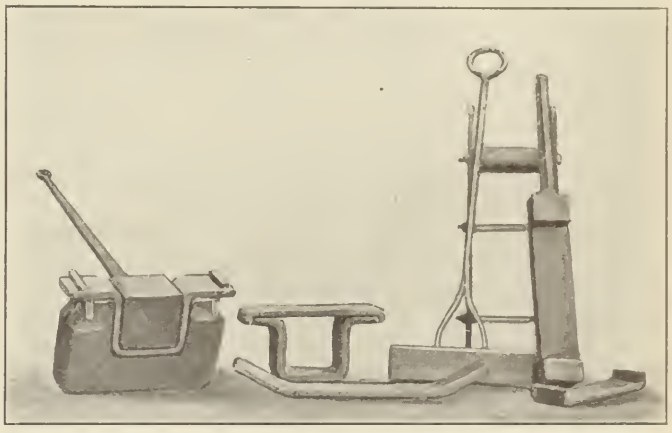


Fig. 41—Tools for Forging Coupler Carrier Irons Under a Steam Hammer.

and bent in the block shown to the left in the photograph. After both bends have been made the block for straightening and forming the inside of the strap is inserted; the clamp is

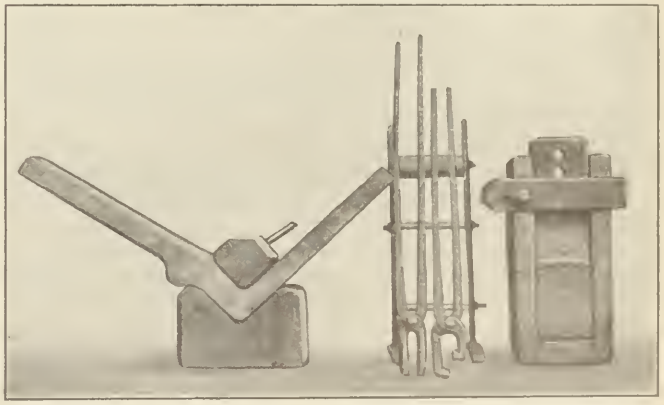


Fig. 42—Tools for Forging Rod Straps Under a Steam Hammer.

then put on and the block is driven down into place. The various tools for handling the strap in the different stages of its construction are shown near the middle of the photograph.

A bill has been introduced in the British Parliament to authorize the absorption of the Manchester & Milford Railway Company by the Great Western Railway Company.

THE MISTAKES OF THE EFFICIENCY MEN.

BY ONE WHO HAS WORKED WITH THEM.

II.

THEORY VS. PRACTICE.

The most common mistake of efficiency engineers, as pointed out in the previous article,* is their exaggerated statements and claims. Other mistakes, equally inexcusable, have been made and, unfortunately, are being repeated. Among these is the failure of many of their theories when brought to the test of practical application. Scientific management should, and does when correctly interpreted, include more than the visionary theories of a school of propagandists, many of whom seem to have no conception of the difficulties to be encountered in any serious effort to apply the principles of efficiency to railway operation. These principles do not alter, however theories concerning them may change. But as in the case of exaggerated and unwarranted statements, the chief harm comes through the obscuring of actual conditions. Not a few railway managers have lost confidence in the principles of scientific management because they have been incorrectly interpreted.

A theory of the efficiency men, widely quoted and commented on, has been used as the cornerstone of the structure reared as a defense against the alleged attacks of the railways on what have been assumed to be the inalienable rights of the shipper. They say that labor employed by railways averages about 70 per cent. efficiency and that 40 per cent. of the materials and supplies used are wasted; in other words, that waste is the rule and economy the exception. Further, that as it has been possible to increase the general efficiency of certain manufacturing plants to 100 per cent., this result is also attainable in railway operation. It is asserted that the avoidable losses to railways through the inefficiency of labor, including station men, train crews, clerks, shopmen, trackmen, etc., amount to $240,000,000 a year, and that the loss due to wasted fuel and supplies amounts to $78,000,000. It is necessary to consider here only one class of labor, as what may be said of it applies with equal force to all others. The largest single item is that of shopmen whose efficiency is alleged to be 70 per cent. This statement is intended to apply to the average of all railways in this country, for while on some roads the efficiency is greater, on others it is correspondingly less. An efficiency materially in excess of 70 per cent., however, has apparently not been credited to the larger and more truly representative systems, since they employ the greater part of the total.

The above mentioned theory assumes three things, none of which the efficiency men have proved: First, that the average efficiency is but 70 per cent.; second, that, if it is, the ideal of 100 per cent. can be realized, and third, that this will represent a net gain. These will be considered in the order named.

How is the efficiency of a workman arrived at? The theory is that 100 per cent. represents the amount of work an average man can perform in a given time. In order to determine accurately the times required for the innumerable operations of a locomotive repair shop, a study of the conditions surrounding each operation must be made and supported by actual demonstrations under normal conditions. When properly done such investigations are invaluable to shop managers and in the piecework shops particularly are a necessary part of the system for determining correct prices. In the most successful shops foremen or assistant foremen make these investigations and the results are not unsatisfactory as a whole, although the means used may not be strictly scientific. In the haste to "make a record" (for an efficiency engineer does not hesitate to promise almost immediate results) in introducing an efficiency system, time studies are made, often with the assistance of a stop watch, by inexperienced men of little tact—students and others equally incapable. Under such conditions it is not surprising that insufficient allowance is made for the failings of the average workman and the varying condition of the equipment. As a consequence 100 per cent. efficiency in actual practice is generally what an unusually capable workman can accomplish in a given time under ideal conditions. This is not an assumption or a theory on the part of the writer, who is well aware of the almost marvelous results that have been obtained in certain specific operations, such as bricklaying, carrying pig iron and others, and of the possibilities in this respect that lie before us in other directions. It is borne out by the evidence of scores of shop superintendents who have seen the experiment tried. And when the practical men who are close to the workmen and understand exactly how performance differs from promise, and practice from theory, give overwhelming evidence of these conditions their testimony cannot be ignored. After all the proof of the pudding is in the eating. But whether the efficiency of shop men is 70 per cent. or 80 per cent., more or less, the real weakness of the theory lies elsewhere.

Where has it been shown to be a practical possibility to increase the productiveness of shopmen from 70 to 100 per cent., that is, to obtain 43 per cent. greater output over their original efficiency, *and to maintain it?* Single instances may be cited, it is true, but they prove nothing. Evidence of this kind is interesting, but usually misleading. These instances in many cases are of men with more than the average intelligence and with uncommon ability to improve conditions by devising new methods and facilities. They do not by any means represent average men under normal conditions. Experienced managers always recognize the exceptional workman; they are the leaders of their class of whom there are only too few. The efficiency men seldom fail, however, to single them out as representing the possibilities of all men, and it is not an unusual occurrence for superintendents and foremen to be misled, by the evidence that John Brown and Tom Jones have increased their output from 70 to 100 per cent., into thinking that such results may be expected of all the men in their shop.

It follows from the assumption that because the efficiency of shopmen is but 70 per cent. (as alleged) there is an actual waste of 30 per cent., and conversely that an increase in their efficiency to 100 per cent. will represent an actual saving of 30 per cent. In other words that this saving can be effected *without cost.* This theory falls by its own weight and is not in accordance with the schemes for determining wages which the efficiency men have evolved. Yet it is used as evidence before the Interstate Commerce Commission. In actual practice, what does it cost to increase the efficiency of a workman from 70 to 100 per cent.? The hourly rate is guaranteed whatever the output. Assume that a man whose efficiency is 70 per cent. turns out seven pieces of a certain part in a day and that his wages are $3.50. Then the cost per piece is 50 cents. If he increases his efficiency to 100 per cent. his output will be 10 pieces and his earnings (according to the Emerson scheme of day rate and bonus) $3.50 plus 20 per cent. bonus, or $4.20, making the cost per piece 42 cents; a saving of 8 cents or 16 per cent. To this cost, however, should be added the expense of the greater organization required in maintaining such a system, which varies in certain shops but is conservatively 10 per cent. of the pay roll of the workmen. In many shops it is more than this. This amounts to 4.2 cents and makes the cost per piece 46.2 cents. The net saving is therefore, 3.8 cents, or less than 8 per cent. In this calculation nothing has been included to cover the cost of improved facilities which usually precede any marked increase in the efficiency, nor any part of the increased day rate of the workman which is usually granted as an additional incentive to increase his efficiency. Some things can be secured for nothing, but not labor. As the manufacturer aims to obtain the highest price for his product, so labor sells the fruit of its toil in the highest market. The shopman knows when his output has increased, and he demands the increased

* The first article considered the extravagant statements and claims made by efficiency engineers and appeared in the *Railway Age Gazette* of January 6, 1911.

wages which are justly his due. And no system can ultimately prevail, either in industrial plants or in railway shops, which will make men's minds or hands work more rapidly or more effectively, without paying the price—perhaps not always in the same ratio, but practically so. And in many instances to the chagrin of the efficiency men and with great financial loss to the employers, the results have been that after rates have been increased and a bonus given to insure to the employer a larger output, the men have finally succeeded in "beating the system." Then the output falls while rates remain the same. Thus it happens that often in the end not only is there no net gain in production, but costs have materially increased and the last state is worse than the first. No system has yet succeeded when the men affected by it are not in sympathy with its general principles. The first important step—gaining their confidence—cannot be done by rule.

That an average efficiency of 100 per cent. (as determined by the efficiency men) can be secured and maintained in a representative railway shop and that one standard should be accepted for all, no practical railway man will believe. Such a result requires ideal conditions with respect to buildings, equipment and other facilities and more important, and most improbable, with respect to all other men in the shop. Men cannot long be worked like machines. Such conditions may exist in certain industrial plants although it is seriously to be doubted. But the work done in a railway shop cannot be fairly compared with that in an industry where stock parts are made under conditions which do not change from day to day and by workmen who, each performing but a simple operation, are to all practical purposes parts of the machinery of the plant.

There is another theory abroad that has been widely advertised. It is that railway managers are unable through force of circumstances to bring about needed economies in railway operation, and that the application of the principles of so-called scientific management alone can insure relief from these conditions. This ignores the fact that long before the efficiency men appeared on the scene results had been obtained that have been adopted by them as standard. In order to support this theory evidence should be given to prove that what was before and is now impossible through the application of methods familiar to all successful railway managers has been accomplished by the efficiency system. The facts, however, disprove the theory. In a recent article on Saving by Scientific Management, a leading efficiency engineer states that the attainable standards for the average of all railways in this country in the maintenance of equipment are: Freight car repairs, per year, $35; passenger car repairs, per year, $500, locomotives, $0.06 per mile; and in support of the claim, certain railways are cited as having maintained their equipment during a specified time within these figures. Low maintenance costs have been secured on many of the representative roads, and to the extent to which motive power officials have the genius for organization and the capacity for handling men these results have become permanent. Low costs have also been secured on other roads, but for one or more of a variety of reasons have been but temporary in their character. If the efficiency men have been able to show on any railway greater *permanent* economies in operation than have been effected elsewhere without their assistance it has not come to our notice. It has already been pointed out in the *Railway Age Gazette* that the standards that were used on the only representative railway where the efficiency engineer has been given a trial were borrowed from roads where an efficiency system as such was unknown. If scientific management has gone further and made certain spectacular reductions in costs, it is safe to say that either conditions were woefully bad, the reductions have not been maintained, or the service has suffered. There is a difference between low costs and poor service and reasonable costs and good service. Inasmuch as the low costs cited from time to time by efficiency engineers have not been the result of their efforts, it is unfair to claim that only by means of scientific management can they be reproduced elsewhere. The fallacy lies in the assumption that a practical railway manager is unscientific.

Destructive criticism, that which destroys for the sake of destroying is common. It is easy to be an iconoclast. Constructive criticism, that which tears down a structure only to replace it by a better, is rare. Efficiency men gain nothing by refusing to recognize the means by which economies are usually effected in railway operation and by claiming for their systems results that can be secured by more direct and less theoretical methods.

One of the most successful of the pioneers in betterment work who has spent years in an effort to establish it in manufacturing plants and on railways has stated that he is successful only as he enters upon his work with an open mind, ready to labor side by side with the men who carry the load. There is a large and growing field for such a man. And railway managers will always welcome any efficiency engineer who has profited by the mistakes of his fraternity. The principles of scientific management are not new. Theories concerning them have to a large extent obscured their nature. But there are many, and their number is increasing, who recognize that successful railway operation is made up of a multiplicity of steps each carefully planned and carried out; that the problem is to control the parts in order that the whole may be controlled. This is scientific management.

THE USE AND MISUSE OF THE SCRAP PILE.

BY A SMITH SHOP FOREMAN.

A prominent railway officer has been quoted as saying "A railway's profit is in the scrap pile." In all probability he really meant that there was lots of money to be made or saved from scrap material, if it was properly handled. The truth of this is apparent after one has given the matter careful consideration. The scrap pile has often appeared to me to be the easiest place about a railway to waste or to save money. To save money, it is necessary for the master mechanic, or shop superintendent to have the earnest support of the general foreman and the foremen of the various departments in the effort to use all serviceable material that can be found in the scrap. All departments contribute to the scrap pile, but the principle contributors are the machine shop, boiler shop, blacksmith shop, coach and car shops, and the repair yards. If these departments were to contribute only such articles as are really scrap, the waste would not be so great; but various articles are thrown in the scrap pile that are in reality not scrap, but are often, either as raw material or articles ready for application, just as good as new.

Machine Shop.—Usually the machine shop foremen will take good care of scrap brass, babbit, tin and copper, knowing these to be high priced metals and alloys, but the same foremen will often neglect to pay sufficient attention to the waste of such articles as nuts, washers and bolts. When the price of these is taken into consideration—hexagon nuts 5½ cents per pound, square nuts 4½ cents per pound, and cut washers 3 cents per pound—and the fact that a small amount of this material is required to weigh a pound, it is easy to understand that a few of these pieces carelessly wasted each day will amount to quite an item at the end of a month, and to a considerable item at the end of the year. It is difficult to estimate accurately the loss occasioned by the careless handling of bolts, owing to the fact that some roads buy them and others make them.

Another serious and inexcusable loss that often occurs in the machine shop is caused by the misplacing of brass fittings, castings and forgings when an engine is being stripped for a general overhauling, thus causing the needless expense of providing new pieces in order to complete the repairs and return the engine to service. Again, there is sometimes a big loss occasioned by the careless handling of high price tool steel; for instance, after heavy tools for turning tires, etc., have become too short

for the tool post of heavy machines it is too often the case that they are carelessly laid aside and eventually lost when they should have been turned in to the foreman, or left with the tool smith to be drawn out into smaller tools for other machines. This loss is not likely to occur every day, but when we consider the price of a good grade of high speed steel, once a month is too often to have it occur when it could be so easily prevented.

Boiler Shop.—The principal loss in the boiler shop is occasioned by the careless and extravagant use of bolts, stay-bolts, nuts, washers and rivets, and the careless cutting and scrapping of sheet iron and steel—i. e., by cutting a whole sheet of steel to get a small piece when probably there are a number of pieces in the scrap pile that would serve the same purpose as well, if they were kept in order so that they could be found when wanted. This can easily be done by having a scrap bin built in sections close to the boiler shop, having several smaller sections for serviceable sheet iron or steel, and one large section for strictly scrap material. The number of sections reserved for serviceable material, would of course be regulated by the different sizes of sheet metal carried in stock; but it would not be necessary to have a separate bin for each size. The idea is so old and simple that the only problem connected with it is to school the foremen and the men to use it to the best advantage.

Car Department.—The loss caused by the improper handling of scrap material in the coach and car shop and on the repair tracks is pretty nearly the same and does not differ much from the machine shop, except in the scrapping of brake beams, car castings and forgings that are serviceable, or that could be made serviceable with just a little labor that would be inexpensive compared with the price of new forgings or equipment. With the hearty co-operation of the foremen with the general foreman and master mechanic, the waste can be reduced to such a degree as to become unworthy of comment. Probably the best way to eliminate the loss occasioned by the careless handling of bolts, nuts, washers and rivets, is to have bins built in sections, having a section properly marked or stencilled for each size nut, washer or rivet. A separate rack or bins should be built for bolts. The combined efforts of the shop foremen and the foreman of the scrap gang would soon convert these bins into a second hand store-house, and whenever the articles wanted could be found in these bins, not only would the cost be saved but the time consumed in hunting someone authorized to write an order on the store, and in going and coming from the store-house would be saved. There is nothing new in the method I suggest, but I am convinced that it is one that is not practiced enough, nor to the extent that it might be.

The cutting and rethreading of the longer broken bolts to be used in shorter lengths is practiced almost universally, but in a number of cases it is not practiced to the extent that a strict sense of economy would warrant or justify, and consequently the very results aimed at are not obtained. The car department uses all sizes of bolts from ⅜ in. to 1½ in., and if a strict system of keeping the repair tracks cleared of old bolts and keeping them in order to be used over to the best advantage is maintained, the storekeeper will be aided materially in reducing his monthly requisition for bolts.

Blacksmith Shop.—There is probably no department connected with the railway repair shop that can use scrap material so advantageously as the blacksmith shop. That is, if the scrap is kept in order so that it will not cost more to find it than it would to use new material. Yet there are cases where the scrap pile is so utterly disregarded by the smith foreman and his men, that they seldom resort to it except when the material wanted can not be found in the new material in stock. These conditions could and should be reversed, so that the smith will only use new material when serviceable material can not be conveniently found in the scrap pile. There is no great difficulty in inaugurating and maintaining a system of keeping scrap to be utilized in this way. The smith shop will require a scrap bin built in not less than five sections. Four of these should be used for serviceable lengths of material to be divided as follows: A bin for such shapes of iron as are not used extensively, one for round iron, one for flat iron, and one for open hearth steel; the fifth bin should be used for material that is strictly scrap. While this is an old and simple method of handling scrap, it is one that a great number of shops do not make use of, notwithstanding the fact that it means dollars and cents to the company. Old axles are used almost everywhere by the smith in making heavy forgings and for drawing short pieces of standard sizes of iron which cannot be found in stock for immediate use. But the same smith foreman will often neglect to use to advantage such scrap pieces as arch bars, sill plates, truss rods and draft rods, and many other pieces removed from old equipment, which are ordinarily sold as scrap. If the cost of loading it at the shops and of transportation is deducted from the price received for it, the net receipts from the sale will not amount to much. When we consider that tons of this material could have been used in place of new material and that the average price of the new material is about one dollar and seventy cents per hundred pounds, it is easy to undertsand that this sort of scrap can and should be handled more wisely.

Track Department.—The roadway department also disposes of a great deal of scrap. The principle extravagance indulged in by this department is the purchasing of new tools and equipment to take the place of old ones, and the improper disposition made of the old tools. Such tools as claw bars, spike mauls, track wrenches, picks, and track gages are often scrapped or misplaced by careless handling. The tools mentioned can also become so worn as to be entirely unserviceable and yet be thoroughly repaired at a cost far below the cost of new ones. With the exception of the track gages all of these tools can be neatly and quickly repaired in the smith shop. Another economy in the roadway department that is thoroughly practical is the repairing of frogs, switches and switch rigging. A frog can become so worn as to be dangerous and yet be repaired thoroughly at a small cost, while the purchasing of new frogs regardless of their size or description is very expensive. All of this work can be done safely, neatly, and quickly in the smith shop, with the exception of drilling holes and planing a rail that is tapered to a feather edge.

The problem of handling scrap material in a large modern railway shop calls for sober thought and the organization of a scrap gang headed by a man of intelligence; in addition to being intelligent, he should have fairly good mechanical ideas in order to reasonably determine what to save and what to scrap, as good material scrapped is money thrown away, and unserviceable scrap material kept on hand is money lying idle. The old adage that runs something like this: "Keep a thing seven years, and if in that time you find no need for it, keep it another seven years," might do very well for the farm, but not for the large railway shop where the scrap pile is so important from more than one point of view.

FIXING PENCIL LINES.

The *Revue de Mecanique* gives the following rules for fixing pencil lines on drawings that are not to be inked in, rules that will apply equally well on work done with hard or soft pencils. The first method is to rub the drawing with a piece of wax like that used in the manufacture of phonographic rolls. This produces a kind of varnish which protects the lines against rubbing and insures their preservation. Paper as well as tracing cloth can be protected in this manner.

Another method is to heat the paper slightly before using it, then spread a solution of warm alcohol and bleached colophone rapidly over the surface so as to thoroughly wet it, after which it is to be dried in warm air. The pencil works very easily on the surface of paper so prepared. In order to fix the lines, it is merely necessary to reheat the paper slightly for a few moments. The lines are thus covered with a thin coating of transparent varnish which preserves them in a condition of perfect clearness.

APPRENTICE INSTRUCTORS' CONFERENCE; NEW YORK CENTRAL LINES.

The fourth annual conference of the apprentice instructors of the New York Central Lines took place at the Grand Central station in New York, January 27, 1911. The conference had a peculiar significance, as a number of apprentices have been graduated during the past few months who were enrolled after the new apprentice system was inaugurated. All of the apprentice instructors from the ten shops on the system where apprentice schools are maintained were present. The meeting was conducted by C. W. Cross, supervisor of apprentices, assisted by Henry Gardner, assistant supervisor of apprentices. Others present were: J. F. Deems, general superintendent motive power of the New York Central Lines; F. E. McCormack, division superintendent of the New York Central & Hudson River; W. L. Davis, apprentice instructor of the Atchison, Topeka & Santa Fe, Topeka, Kan.; W. B. Russell, director of the Franklin Union, Boston, Mass., and formerly assistant supervisor of apprentices on the New York Central Lines; F. W. Brazier, superintendent of rolling stock of the New York Central & Hudson River; E. B. Katte, chief engineer electric traction; Fred H. Colvin, managing editor, *American Machinist,* and R. V. Wright, of the *Railway Age Gazette.* The names of the apprentice instructors follow:

Name.	Title.	Road.	Address.
A. L. Devine	Drawing Instructor	N.Y.C.&H.R.R.	West Albany, N. Y.
Chas. Pfister	Asst. Dr. Instructor	"	" " "
Elmer Knapp	Asst. Dr. Instructor	"	" " "
G. Kuch, Jr.	Shop Instructor	"	" " "
H. S. Rauch	Drawing Instructor	"	Oswego, N. Y.
W. F. Black	Shop Instructor	"	" "
F. Deyot, Jr.	Drawing Instructor	"	East Buffalo, N. Y.
F. Deyot, Sr.	Shop Instructor	"	" " " "
G. Kuch, Sr.	Drawing Instructor	"	Depew, N. Y.
Joseph Latt	Shop Instructor	"	" "
A. A. Schafer	Drawing Instructor	L. S. & M. S. Ry.	Collinwood, Ohio.
H. J. Cooley	Shop Instructor	"	" "
C. A. Towsley	Drawing Instructor	"	Elkhart, Ind.
M. T. Nichols	Shop Instructor	"	" "
J. L. McTaggert	Drawing Instructor	Mich. Central	St. Thomas, Ont.
R. W. Middleton	Shop Instructor	"	" " "
C. P. Wilkinson	Drawing Iustructor	"	Jackson, Mich.
Robert Cook	Shop Instructor	"	" "
A. W. Martin	Drawing Instructor	Big Four R. R.	Beech Grove, Ind.
John Buehler	Shop Instructor	"	" " "
Howard Ihrig	Drawing Instructor	P. & L. E. R. R.	McKees Rocks, Pa.
Frank E. Cooper	Shop Instructor	"	" " "

The program opened with the reading of an address on The New Apprenticeship, prepared by G. M. Basford, assistant to the president, American Locomotive Company. It is as follows:

THE NEW APPRENTICESHIP.

Twenty years ago an apprentice boy entered a railway shop "down east." He was indentured and began his service with happy anticipation of the pleasure of learning the trade of machinist as many have done more recently. He worked six months "snagging" castings, gave up hope and quit. No one in the shop paid the slightest attention to him. No one thought of teaching him anything. He could not induce the foreman to put him on any other work and he became discouraged. He would have been given other work in due time and probably would have become a workman forming one member of the vast army of those who have learned trades according to this method. Shops today are full of such workmen and people say that apprenticeship is a failure. That kind of apprenticeship is, of course, a failure. It is worse. It is a crime. The company robbed the boy, not of money, for his pay envelope was not tampered with or his pocket picked, but he was promised an opportunity to learn a trade and was robbed of that in order that he should be used as cheap help. That, however, was not apprenticeship as we know it.

The following paragraph appears in the prospectus of the New York Electrical School and is an example of remarks frequently made concerning apprenticeship which are true of much that passed for apprenticeship in the past: "The apprenticeship system under which young men formerly learned a profession or trade is a thing of the past. At its best, it was a crude way of imparting knowledge, long drawn-out and tiresome alike to teacher and pupil, discouraging many of them before they had an opportunity of testing the system fairly."

This audience, however, represents a great movement, which is already national in its scope, dedicated to the proposition that the new apprenticeship is the only way to prepare young men for mechanical pursuits. Those who are in position to understand the results already attained are sure that we are right and that in the long run general acknowledgement of success will be accorded. If we carry out the work on its present lines we can not fail and it will be surprising if we cannot improve on them.

Do you realize that the new apprenticeship contains two elements which the old never had? The first of these is the individual attention of shop instructors who are competent mechanics and who have nothing else to do. The second is mental development in school coincident with the shop development. Do you realize the advantage which you as instructors enjoy over the teachers in public schools and even over college professors? Your pupils have not only selected their callings, but they are actually following them and they are holding their own and making their way among men earning their own living. This brings about an ideal relation between pupil and teacher, which does not exist in any other field of educational work. Other educators work with pupils who must make places for themselves after and because of the education. You educate workers in their work. There is a vast difference in these conditions which is not understood by school men and others who argue that the trades should be taught in schools.

The advantage which you enjoy over other teachers brings also a corresponding responsibility, for you must introduce methods specially adapted to the character of your problem. You are closer to your pupils than are any other teachers. This is the chief reason why you cannot use ordinary methods and ordinary text books. This is one reason why you need to be better teachers than seem to suffice for other conditions and other methods. Because you know very definitely what the boys need and because they use their knowledge as soon as it is given them you stand in the best possible position as educators. This fact should in itself be an inspiration in the shop and in the classroom. For example, consider the teacher of algebra in a public school. He teaches a subject without having the remotest idea of just how the pupil will be called upon to use it. The teacher's work is indefinite, unreal, separated from life, and is like a shot in the air. On the other hand, you educate a boy in laying out a boiler sheet knowing that he will use the knowledge in order to hold his own in the shop. Is there not a vast difference between the two cases? It makes little difference how algebra is taught. It is, however, of the utmost importance that the boy should be taught the best way, the New York Central way, to lay out that boiler sheet, and he should know why it is the best way. He should also know that the slightest defect in this work involves trouble, delay, unnecessary expense and increased difficulty in the steps in the work which are to follow.

In the school room, because you know very definitely what the boys need, you are in position to educate them to think, which is an object difficult to attain in the indefinite work of the public school. It is certainly a privilege to teach under such favorable conditions, but you need to be the best teachers in the world because you are responsible for preparing the American workman for his work. Remember that it will be easy to measure the results of your work and that they are sure to be measured.

In a movement such as that in which you are engaged it is of the first importance to know in the most definite way what you are trying to accomplish. If you have never attempted to define the object of apprenticeship and cover the ground that you desire to cover in a few words you probably do not realize the difficulty of doing so. The Commission on Industrial and Technical Education, reporting to the State of Massachusetts in 1906, stated the object of industrial education in the following words: "The Commission was told at almost every hearing that in many industries the processes of manufacture and construction are made

more difficult and more expensive by a lack of skilled workmen. This lack is not chiefly a want of manual dexterity, though such a want is common, but a want of what may be called industrial intelligence. By this is meant mental power to see beyond the task which occupies the hands for the moment to the operations which have preceded and to those which will follow it—power to take in the whole process, knowledge of materials, ideas of cost, ideas of organization, business sense and a conscience which recognizes obligations."

It is difficult to conceive of a better statement than this of the object of the group of men here assembled. This comprehends the training of the hand and the training of the mind of the workmen of the future. The closing words concerning "a conscience which recognizes obligations" reveal a field of effort to which I specially desire to call your attention.

You are dealing with boys in the most impressionable age of their lives. They are at the age when the influences of home, of the church and of the public schools are likely to be weak or altogether wanting. The boys are perhaps away from home, but if at home they are drifting rapidly toward manhood and are forming the habits of their lives as to thought as well as in the occupation of their hands. They are about to establish their ideals and select companions whose influence is likely to last throughout their lives. In short, they are embyro citizens beginning to realize the independence which comes from earning their own living. At this stage you are thrown in contact with them more closely than is any other human influence. You may impress them with your own personality, your own ideas, outlook and hopes, you may bring before them standards which they will adopt. You may not do any of these things. Your influence depends very largely on your own personality, your knowledge of boys and boyhood and your ability to acquire close proximity to their lives. Perhaps you may not realize the importance of this contact, but it seems reasonable to expect that if you can get upon such close footing with them that they will trust you with their troubles, ask your advice and take you into their confidence, you will be able to mold their future to a very large extent. Do you appreciate your responsibilities in this direction?

Nothing is to be feared from the influence of any man skilled with his hands and developed in his mind for independent thought and action, but much is to be feared from a large class of workmen skilled or unskilled who allow others to think for them and who are morally weak in that they will not act with the courage of their own convictions. It seems to me that the greatest problem before the instructor of apprentices today lies in that part of the work which has to do with conscience and citizenship, and that in this direction lies the greatest opportunity for apprenticeship development. In this lies your greatest responsibility. If you do not realize it you fail to accomplish the greatest of all the objects lying before you.

A great deal may be accomplished through apprentice organizations, debating clubs, athletic teams and other influences which tend to develop individual initiative in connection with the team work idea. Boys need to manage something to develop self government in order to realize that the world has a right to expect them to take their places in the human organization of life in general and in order that they may become self-reliant units in that organization.

Summing up I would like to lay before you three facts: You are working under ideal conditions as to the relationship between instructor and pupil. This relationship renders it possible for you to exert most powerful influences over the character and the future of your students. The most vital object of this whole movement is to produce men, American workmen, skilled, resourceful, honorable men, men prepared and inclined to fulfill their obligations.

CONSERVATION OF WORKMEN.

F. H. Colvin, managing editor of the *American Machinist,* spoke as follows on the above subject: "You are doing good work in teaching the boys the fundamentals of mechanics and shop mathematics and in training them for the production of good work at a reasonably rapid rate. Increasing the output of any machine by using improved methods rather than depending entirely on increased manual effort is true conservation of the capital invested. In a like manner the conservation of the workman is equally important in the broad economical view of his relation to manufacturing and to the community.

"Nearly all the states are paying considerable attention to the problem of compensation for injured workmen, and there is no doubt that we will follow in the footsteps of the older countries in this respect. This question is unfortunately usually discussed in the attitude of antagonism by both sides, instead of from a standpoint of mutual interest. Under the guidance of your instructors, or even a special instructor who can cover other points of a similar nature at your various schools, who has a real personal interest in the boys and their welfare, and who commands their confidence, the proper relation between employer and employed can be made clear and helpful to both.

"One of the difficulties with all large corporations is that of instilling workmen with the idea of individual responsibility, both to the company and to their fellow employees. An instructor of this kind could do much toward pointing out this individual responsibility in the way of properly caring for machines and tools, so that they would not be a source of danger to themselves or others. He could make clear the penalties of taking chances with a belt which needed lacing or cementing, of unnecessarily going into dangerous places, and many other points which are responsible for more injuries than any of us realize.

"It is not solely a question of compensation, but one of economic loss to the individual and to the community. Even if the injured workman receives full wages, there is a distinct loss in the production of that shop, and this indirectly is shared by him as an individual number of the community, and to every man in the shop, whether he or they realize it or not. Everything which is destroyed represents cost to some one. A nut or washer shied at a dog and not recovered is a distinct loss, just as is the destruction of a man's usefulness through unnecessary accidents. Guards must be used to be of value. The time will come when failure to use them may mean dismissal, as the responsibility cannot all be placed on one side. There is no question that the economic and political future of this country depends largely upon the intelligence of its workmen, and anything that we can do that will aid in the formation of a broad foundation cannot fail to be a lasting benefit to ourselves and to our various communities.

"Any reduction in the number of accidents is a distinct gain from any point of view, and there is no question but that education can help in this direction as well as any other. It is very often less a matter of carelessness than of a recognition of individual responsibility. Whether this work should be done in your classroom or at special meetings is a matter of detail. It is even possible that much of the work can be done by the shop instructors, who have practical examples constantly before them."

J. F. Deems, general superintendent motive power, under whose direction the new apprentice system was inaugurated said: "I have watched with a great deal of interest the work that you men have been doing; not only watched it from the reports sent in and investigations that I have made in going over the road, but by making inquiries from others outside of railway work who have investigated your work. I congratulate you on what you have done and what you are doing. It was not an easy task when you took it up. You had very little to guide you in the work, and you have accomplished much more than I hoped for in the length of time that you have been at it."

F. W. Brazier, superintendent rolling stock, drew particular attention to the necessity of the instructors cultivating executive ability, and stated that in order to make a success of his work as the head of a department he had to have every one with him, even to the office boy. He also spoke strongly against the use

of cigarettes and said that he would not promote a man in his department who used them.

E. B. Katte, in an inspiring talk, emphasized the necessity of "learning men." Education is a good thing, but a man to exert a strong influence on those about him, either when working with them or directing them, must really know and understand the men and their characteristics.

C. W. Cross, supervisor of apprentices, spoke in part as follows: "It is gratifying to know that there are now at least twelve railways in the United States where a systematic course of apprentice instruction is being pursued with marked success. Skilled instructors are leading the young mechanics through graduated courses to a thorough knowledge of their calling and the results are so far most encouraging. The important element of natural selection is markedly active in many of the shops. Under proper instructions it is speedily recognized whether the young man has made the proper choice of a calling or not. The unfitted are weeded out and directed to other fields. The moral and intellectual tone of the student apprentice is elevated. Life becomes sweeter and higher and nobler when the difficulties of a calling are illumined by intelligent and kindly instruction. The burden of labor lies lightly on the shoulders of the studious youth who can call the gathered wisdom of a proficient instructor to his aid. To this is added another important factor—that the amount of work or output of the apprentice shows a marked increase where there is an instructor. Hence the apprentices under the new system are being better paid with the result that instead of being a burden on their parents or guardians during their apprenticeship, the young mechanics are self supporting from the beginning, and when they graduate they have the proud consciousness of knowing that they are fitted to take part in the world's work without fear or favor.

"On March 1, 1906, the apprenticeship department was created and a few weeks later the work was well started at nine of the shops. We have completed the cycle of the work and the graduates now turned out have had the full four years course of training. The courses of study have been revised and improved and specialized to fit the several trades in a manner that has met with the approval of all interested persons. The graduates are used to good advantage in the service and as a proof of the efficiency of the training system, when graduates are re-employed as mechanics at the completion of the apprenticeship they are given a generous rating, and in many cases the maximum rate in the trade in which they are re-employed."

W. B. Russell expressed appreciation at the fact that in two or three instances boys who were apprentices when he gave up the work a year and a half ago had successfully completed their courses and had developed so rapidly as to have been made apprentice instructors or assistants.

In presenting his annual statistical report Henry Gardner, assistant supervisor of apprentices, stated that on July 1, 1910, 617 apprentices were enrolled, which is an increase of 62 over the previous year. Fewer apprentices were discharged during the year, showing that more attention had been paid to weeding out the unsuitable and unruly boys during the six months probationary period. In addition to very complete statistics, a large number of specially good jobs which had been done by apprentices while working in the shop drafting room or in the shop were mentioned. The report might indicate that too many high grade men were being turned out in proportion to the number of mechanics who would be content to remain in the shops for an indefinite period. Mr. Gardner stated, however, that it must be understood that many of the instances mentioned in his report were unusual and that no mention had been made of the fact that capable mechanics were being turned out who would remain in the shop and be a credit to it, because it was understood that this condition did prevail and the unusual incidents were referred to to show the extent to which an ambitious boy might develop under the new apprenticeship system. In the discussion the question came up as to whether it was advisable to attempt to raise the standard of the apprentices too high. Mr. Rauch, of Oswego, had gone on record at a conference two or three years ago with the statement that he would very much prefer to have apprentices from the seventh or eighth grade of the public schools to those who had partially or entirely completed a high school course. Observations at Oswego had compelled him to change his mind, and he is now willing to take all of the high school boys he can get. Of 17 apprentices graduated at Oswego, of whom about 25 per cent. were high school boys, only two had left the service.

Mr. Davis, of the Santa Fe, stated that the high school boys developed far more rapidly and did better work, but that they did not remain in the service. For instance, at Topeka about one boy in every 25 comes from the high school. Of 25 apprentices graduated at that shop last year, 23 were still in service at Topeka, and the other two were with the company at other points on the system. At Fort Madison, where a large percentage of the boys are from the high school, seven had been graduated in the same time and all had left the service.

Mr. Martin, of Beech Grove, reported that 25 per cent. of the apprentices at that shop had attended high school, but that in four years only one of the graduates had left the service. Mr. Russell, however, called attention to the fact that the high school training at Indianapolis was such that better results along these lines might be expected than at other places. Mr. Cross was emphatic in the statement that the apprentices on the New York Central Lines were not all stars by any means.

PRIZES FOR EXCELLENCE.

In discussing the question as to whether it was advisable to give prizes to a few apprentices for good work or to try to advance a large number of apprentices moderately, H. S. Rauch, of Oswego, said: "Assume that the company agrees to reward each apprentice who passes through his course with a standing of 90 per cent., and otherwise completes his apprenticeship in a manner satisfactory to his superior officers. This reward to be in the form of a check for $100, which to the average apprentice would look like a fortune. I certainly believe that it would be an incentive for all to work harder to gain the goal. But would this prize stimulate a desire for knowledge for the sake of knowledge itself; would it be instrumental in the creation of a good healthy love of work? Would we not be placing a temptation before the boys to get this 'average of 90 per cent.' regardless of how they got it? It is true that the instructor is in a position to discover dishonesty of this character, but what would be done when the discovery was made; would we bar the apprentice from further competition for the prize or would we discharge him? In either event the effect would be demoralizing. Then how about the slow, plodding, hard working young man who does not grasp things as quickly as some of his fellows but who retains and puts to good use all that he does learn due to the fact that he had to work so hard to learn it. This type of young man would become discouraged when he realized that his averages were not up to the standard and felt that however hard he might work there was little chance of his winning.

"Let us look at the other side—at the boy to whom nature has apparently been most kind; everything comes to him without much effort, he concentrates his mind for a few moments and has mastered the subject. This boy is a natural prize winner, but he wins prizes for the sake of their possession and not for any benefit which he might derive from the study which gives him the right to possess them. He becomes haughty, imbued with a feeling that he is far superior to the slow kindly classmate at his side, and again our purpose is defeated, for instead of producing harmony and co-operation we have produced only discord and discontent.

"Let us imbue the future mechanic with the idea of attaching himself permanently to the organization, not by holding out to him a prize that might be his downfall, but a prize that will inspire confidence in all alike, be they bright or dull, by giving

him a living wage that will spur him on to a good healthy love of work."

Discussion.—The general opinion seemed to be that this would be a most unwise provision to make. Some boys are good in the shop and poor in the school room, and vice versa. It would be extremely difficult to decide how to award the prizes fairly, and it is doubtful if any good object would be attained. Prize winners do not always make the best workmen or employees. Mr. Davis stated that on the Santa Fe each graduate is given $75 at the completion of his course if his work is satisfactory. If he remains with the company for six months he is given $75 more.

RESULTS OF MODERN APPRENTICESHIP.

F. Deyot, Sr., of East Buffalo, spoke of the advantage that the modern apprentice has for acquiring a complete knowledge of his trade in a comparatively short period. The great advance in shop practice which has taken place within recent years has made the life of the mechanic of the old school one of continuous study to keep up with the times. The discussion of this subject brought out the fact that care should be taken not to carry the apprentices too much, but to urge them to take responsibility and to develop self confidence, so that when a boy leaves the apprentice department he will be fully prepared to stand on his own merits and to take such responsibilities as may be placed on him.

COURSE FOR ELECTRICAL APPRENTICES.

C. A. Towsley, of Elkhart, Ind., outlined a complete course for electrical apprentices. The increased use of electricity in connection with shop equipment and operation, and car lighting has made it imperative to provide such a course, as there are now a number of electrical apprentices on the system. It was also suggested that a part of this course, at least the fundamental principles, could be added to some of the other courses to good advantage. In the machine shop, for instance, electric drives are now being used to a considerable extent, and it is believed that the cost of maintenance of the motors and controllers could be reduced considerably by educating the mechanics in the care and operation of this equipment, at least to a slight extent. Mr. Russell said that the results obtained in Boston have been such as to demonstrate that the only way of successfully instructing the practical mechanic in these matters was by the use of electrical apparatus in the laboratory, with a minimum amount of lecture or class room work. As a proper laboratory equipment would be too expensive to install at any one shop, he suggested the advisability of equipping an instruction car with such apparatus, which might be used for all the shops on the system. Mr. Katte mentioned some talks which had been arranged for the instruction of the electrical employees at the railway Y. M. C. A. in New York. As far as could be seen, these talks did not accomplish any great practical results. The theories of electricity are most difficult to understand, but electric apparatus is comparatively simple in construction.

LABORATORY WORK.

E. Kennedy, of Depew, and W. F. Black, of Oswego, presented papers describing the methods of instruction in laboratory work. To show how interested the boys were in this work Mr. Kennedy said: "We had a class which came to the shop one Sunday and trammed an engine on the erecting floor to satisfy themselves that they could do the actual work after learning the job from the wooden model. It is good policy to take the same class of boys two or three months later and let them go over the same work on the models to see if they have retained what was taught them and to renew their interest.

"As to the value of a new classroom course for machinists based on shop practice, opinions may differ. Give a boy a mechanical magazine with no cuts or illustrations, and another magazine containing several illustrations and see which one will interest him most. Invariably it will be the one with the pictures, probably from the fact that in combining the cut and the accompanying explanation, he can more readily see what the author means. For example, explain to an apprentice how to find the speed of a pulley or any job of that sort, and nine times out of ten, he will forget it the next day; but give him a picture of the pulleys and their sizes together with the question, formulae and answer all on the same sheet, and it becomes interesting. You have captured the boy's attention. This is one of the ways to make a new machinists' classroom course based on shop practice most beneficial; put in plenty of pictures. The regular home and classroom problems for general use are all that can be desired in their line, but to fill the wants of the machinist apprentices a new course pertaining to shop work entirely is really necessary."

Mr. Black said: "In the laboratory at Oswego we have a set of models used for the purpose of instructing the apprentices in the art of laying out from blue prints. These models are of wood and are copied after spring rigging and driver brake parts; the method of instruction is to give the apprentice the model covered with paper, together with a blue print from the standard files, showing the part he is to lay out; then he proceeds along the same lines that he would in the shop. After he has completed this task the work is checked up by the instructor and if not found O. K. must be done again. We have found this instruction invaluable to apprentices who are to be placed where laying out is to be done.

"We have found that any instruction which we are able to give in the laboratory during the last half hour of the session has been productive of flattering results in the shop. This is due to several reasons; the boy's mind is not distracted by the noise and the hustle of the shop and he realizes that he is being paid by the hour while receiving instruction and is more apt to concentrate his mind upon the work in hand than he would if he was working piece work, where time means money."

WALSCHAERT VALVE GEAR.

Benjamin Frey, of St. Thomas, said: "It is important to take into consideration the relation between the time the classroom instruction is given and the time the apprentice takes up this branch of his trade in the shop. I do not think that we should wait until the boy is in the valve setting gang before we begin to teach him the principles of valve motion in the school room. By a little co-operation between drawing and shop instructors, the boy should gain a fair general knowledge of the mechanism and know what is meant by the terms valve travel, lap, lead, cut-off, etc., before he takes up valve setting in the shop. He should also know how to read the markings on the valve stem and keep track of them in an intelligent manner. He will then be able to grasp this end of his trade more readily in the shop, generally increasing the respect of some of the journeymen who are not always desirous of telling all they know about this particular work.

"In order to make a success of teaching valve motion in the classroom it is necessary to have a model which is adjustable; one with such adjustments as will produce practically the same conditions in valve setting as are found in actual practice. This will not only require less of the instructor's time in explanation, but will tend to stimulate the interest and enthusiasm of the apprentice. When two boys are prepared to take up valve setting in the classroom, the model is thrown out of adjustment and they proceed to set the valves. All operations and adjustments should be made by the boys. The duty of the instructor should only be to give advice here and there as the boys require it. After the valves have been set the model is again thrown out of adjustment, but in a manner to produce different conditions than found in the previous setting. Under these new conditions the boys again proceed to set the valves. In performing the work they should, of course, exchange their duties, so that each may gain all the points possible from the work. In this way the model is continually thrown out of adjustment and reset by the boys until one of them is able to set the valves under practically every condition without assistance from the instructor. We then

appoint this boy to teach the other until he has mastered the subject well enough to take the place of the first boy. We then consider the first boy O. K. as far as the classroom instruction goes, and then allow the second boy to teach a third. Later the third boy will teach a fourth and so on in the order that the boys take up the work in the shop. The instructing boy should, of course, ask the instructor at any time about any point he desires to have explained. By this method more of the instructor's time can be devoted to the other class work, and the boys are at the same time kept interested by competition to become the head or instructing boy.

"We allow the entire class session to those boys who are using the model for valve setting as it is almost impossible to make any headway in teaching this subject during a shorter period, and the boys who are following in another class will not break into the partially completed work of the first set of boys."

Mr. Cook, Sr., of Depew, has made a practice of giving the apprentices an actual demonstration of valve setting in the shop with good results. Mr. Martin, of Beech Grove, has found it advisable to have the boys work on the Walschaert model in the school room a week or two before they go on this work in the shop.

THE BACKWARD BOY.

F. E. Cooper, of McKees Rocks, said: "Few boys are good in both the shop and the school. When a boy is found to be slow in school his case should be given careful consideration. He may have been turned against the school by older journeymen who have not had an opportunity to get much education and therefore are a little prejudiced. He may have been told that the school work will not hold his job for him. When a boy gets that idea in his head he should be given a sensible talk by both the shop and drawing instructors. If that fails try to interest him in the school work by giving him work in the shop that will correspond somewhat to the work in the school. This may be done by giving him a blue print and telling him to perform the necessary operations on a machine or having him lay off a piece of work without giving him any instructions or allowing him to receive any; then if he gets stuck and cannot go ahead he will feel ashamed of himself and you can give him a good sensible talk as to why the school is a great help in learning the trade. After this the boy will usually begin to take a greater interest in the school work as well as that in the shop.

"It requires a great deal of patience to bring around a boy who is slow in the shop. If a boy is slow on a job and cannot get it out in the specified time, the instructor should prove to him that it can be done in the time set and show him where he loses time. If the boy is slow but willing, we should not turn him down unless his case is hopeless; sometimes by letting the slow boy follow a good one on the machines he begins to see that he is slow and picks up. The instructor should study the boy's nature; some boys you can coax along, while with others you have to use a little force."

Discussion.—It pays to take pains to develop the backward or slow boy, and when he has been developed he usually makes a first-class mechanic and remains in the service. In not a few instances boys have been found who cannot make a good showing in the school room, but who are splendid mechanics. The only way in which a dull boy can be developed is by patient and painstaking effort on the part of the instructor, but it is well worth the effort.

LOYAL AND SATISFIED APPRENTICES.

A. W. Martin, of Beech Grove, said: "A long step toward the accomplishment of this is to maintain constant interest in the work by making every feature of the course attractive and by the shifting of tasks as frequently as possible without upsetting the shop schedule or lowering the shop efficiency. Let the boy fill the place of a mechanic in his absence and try to make him feel that the company is endeavoring to make him a good citizen and mechanic, as well as to increase the output in as economical a manner as possible.

"I have experienced but very little trouble in keeping the boys satisfied and interested in their work. However, I must admit that there are cases where they become indifferent. Then I try to make a special effort to find out what the boy is most interested in. When I think he is far enough advanced in his regular course to branch off on special work, I allow him to do so for a short period. Doing this stimulates a better feeling in the boy toward his studies and often brings him to a point where he can see the importance of carefully observing every little detail in his instruction papers; when he returns to his regular course he goes at it with renewed interest. Changes of this kind are undoubtedly beneficial to the boys in many ways."

Discussion.—Instructors should remember that boys watch closely and try to follow those men with whom they come in contact, whose personalities appeal to them. It is important, therefore, that the instructors watch themselves carefully that they may set a proper example for the boys, and not only that but that they make an effort to get the foremen and the men with whom the boys come in contact to do the same. Examples were cited of boys who had been discouraged. A little effort on the part of the instructor could locate just what influence was working on the boy, and steps could be taken to overcome it. If it was found that one of the workmen in the shop was carelessly talking to him in such a way as to discourage him, the difficulty could easily be corrected by getting the man off to one side and talking the matter over with him.

The moral effect of having the foremen and mechanical officers visit the school room is very great, and this practice should be encouraged. Mr. Davis spoke of officers of the Santa Fe, including the vice-president, Mr. Kendrick, stopping off at the schools whenever they found opportunity and giving the boys a talk. The boys should be encouraged in athletic sports, and wherever possible the foreman and the shop superintendent should try to attend the games. Much may be accomplished in encouraging the boys by having the instructor give the shop superintendent a memorandum of those who have made specially good records or who need encouragement. The shop superintendent can then at his first opportunity look the boy up and personally commend him, or if he needs encouragement, I give it to him. The boys forget that the shop superintendent or general foreman is the "old man" and feel more kindly toward him when they find him waving his hat in the air and rooting at a baseball or football game. The foreman should be urged to attend the apprentice club meetings or any of the social affairs of the apprentices and to mix up with them.

MONTHLY REPORT FOR PARENTS.

Mr. Kuch, Sr., told of the good that had been accomplished by sending monthly report cards to the parents of the apprentices showing the progress which they were making. The next month the dull boys and the sluggards made an earnest endeavor to raise their marks for their standing had been criticised by their parents. A number of acknowledgments were received from the parents, showing their appreciation of the efforts being made in behalf of their boys by the company.

Discussion.—The concensus of opinion was that a simple report, which could be sent home to the parents each month, indicating the standing of the apprentice in his school and shop work, would be productive of good results. It was suggested that the first report be sent through the mails with a letter asking for the coöperation of the parent and explaining the report fully.

RECORDS.

G. Kuch, Jr., of West Albany, made some suggestions concerning a simple form of record card which would show the attendance and punctuality of each apprentice and also how his time had been put in each day. In discussing this report several of the instructors were emphatic in saying that lateness should not be tolerated.

CAR BUILDER APPRENTICES.

Mr. Shafer, of Collinwood, in speaking of the car builder apprentice said: "The question of keeping the car builder apprentice thoroughly interested in his trade for a period of four years is a problem not easy to solve. We are continually being brought face to face with the fact that the apprentice, and also the prospective apprentice, is inclined to believe that car building is not and will not be a desirable vocation to follow. Journeymen of this trade do much toward hindering the progress of the apprentice and cause him to lose interest in his work by telling him that car building is nothing more nor less than menial labor which can be performed by the most unskilled workman. Another point is the wages paid to the car builder. Because some other trades command higher wages, they are believed to be greatly superior. We must bring the car builder apprentice to a point of view where he can see that his trade is of some importance and that we are giving courses of study which pertain strictly to car building." Mr. Shafer outlined a course of study for such apprentices.

Discussion.—At present there are about 62 car department apprentices on the New York Central Lines. F. Deyot, Sr., of East Buffalo, stated that they had considerable difficulty in securing apprentices, as freight car work only was handled at the East Buffalo shops. The work of the school at that point was described in the *Railway Age Gazette* of August 5, page 231. A complete car builder's course of study is in preparation.

APPRENTICE EDUCATION FROM THE STANDPOINT OF ONE OF THEM.

Richard Keefe, one of the apprentices at Oswego, has the faculty of expressing himself in a most original and readable manner, as may be seen from the following paper which was read at the conference.

"One morning on going to the shop from the classroom, a few minutes after nine, the foreman put me on a job with a first-class mechanic whose first salute to me was: 'The railway is losing money on you fellows.' I took this to be a morning grouch and let it past. After a while he lifted his head from a paper he was making faces over and said: 'Say, can you make this out? Dumbed if I can and I've been at it all morning.' He held out a blue-print but I didn't jump to take it; then with a little less acid in his tone he said: 'I generally make these out at home but last night the kid was sick, and I couldn't think." The sick kiddy was too much for me so I took the blue print and had no difficulty in reading it. This ability to read blue prints is an important side of apprentice education, but just as important is the ability to meet an emergency, or to have confidence in an undertaking and the willingness to be led, all of which are felt rather than seen and are the direct result of our training.

"Every mechanic expects the apprentice to 'hop' to his music; every apprentice knows the mechanic will 'kick' to his tune, for the mechanic has no time for the 'greeny.' The only man who understands apprentice language is the 'angel,' which is slang for shop instructor, but it is no miss to call him such, for without him the greeny would never grow, but would be at a standstill half his time. Sometimes we wish the angel was twins, even triplets would no more than meet the demand. Of course the mechanic is not greatly to blame, as under the present system, 'time is money.' Piecework is not a good school for the apprentice to become an expert workman in, he catches the spirit of rush and hustle that is round about him, and soon is satisfied if his work just does, without any desire to improve it; he may make more pay and often does if work is plenty, but he loses sight of the main object of work which is perfection.

"The rate paid a first year apprentice is out of proportion to his needs; even a first yearer must eat like a man and dress as a man in order to work like a man; he looks like a man and feels like a man until he puts his hand in his pocket. The apprentice who clothes himself, buys tools, carries some protection, pays apprentice club dues, church and shop collections, is obliged to pay his nearest relatives for board, washing and mending in 'promissory notes' (no time of payment specified), must be blind on the girl side of the road and put the curb on a growing sociability. All this hurts; it might be called, 'apprentice cramp'; it squeezes the region of the short rib and produces imperfect vision. A dime looks the size of a car wheel and it makes as many revolutions in his pocket as one going a mile a minute before it disappears into spend-land. I might go further and say it leads to defective hearing, for the jingle of small coin is so sweet to the ear that many a fellow adds keys, nails and tool checks to swell the sound so that in time he becomes tone deaf to the ring of real money. Apprentice cramp is a disease that carries off many of the first yearers and deters many other desirable fellows from becoming apprentices. Another trouble is the discovery that physically he is not adapted to the trade he has started, yet rather than start another at first year rate he drops out. This is a loss to the railway as well as to the boy and it's up to them to remedy it. The high school boy of today is more inclined to mechanics than ever before if the rate paid was more proportional to his wants.

"The classroom is the smoothing iron that rubs out all the wrinkles of discontent, for the apprentice looks forward to these hours with pleasure. 'Up to the college,' has almost the ring of 'come on to the ball game,' and the class instructor is regarded as a 'dad' by all the boys. Even the fellow who went in with a sneer goes out with a thank you. Next to the school is the club; here the apprentice spreads his wings for his first flight in oratory, here he gets used to hearing his own voice and gets over the scare of the sound of it, here he also sharpens up his wits for defense or his tongue for attack and here he talks railway, reads railway and grows to be a railroader.

"The great disadvantage of apprentices in the railway shops is the uncertainty of keeping the job. We are at the mercy of every foreman and we have no court of appeals. In many cases the class instructor stands our friend, but he is outside of the shop and cannot be expected to be judge and jury. The question we ask ourselves oftenest is, what is the railway going to do with us? If the road does not want us, we have practically wasted our time. Take for example the apprentice who has served a couple of years at the machinist trade; his knowledge won't count for much outside the railway shop if he is fired and yet it is of great value in the shop if it sees fit to use him. Take the carpenter apprentice who can do anything from building a cab to laying track, lagging a boiler or wiring a shop. Of what use will this be to him if the road does not want him and he has to seek work with a house builder? The railway is big enough to be a life work for the most ambitious if promotion was arranged so that the apprentice would know where he stood as he went along.

"In summing up I must not forget those little keys that open up the world to the apprentice and are the one thing he does not outgrow (they appeal even to the grey-beard), namely, the passes. These serve to educate him as well as school or club, and most of all they make him feel that he is an investment and an investment in the biggest thing in the world, the railway."

RAILWAY AGE GAZETTE DINNER.

The apprentice instructors were the guests of the *Railway Age Gazette* at a dinner at the Engineers' Club on Friday evening, January 27. Following are the more important points which were brought out in the impromptu after-dinner talks:

Mr. Davis, of the Santa Fe, mentioned the encouragement which was given to the apprentice movement on the Santa Fe by the higher officials. He said: "I notice that when our president, Mr. Ripley, speaks before any of the railway associations he usually manages to slip in a word or two about the apprentice department. When Mr. Kendrick, the vice-president, goes over the line he does not visit all the places, but invariably, and especially if he has company on his car, he visits the apprentice schools." The apprentice instructors are always ready to give the boys advice, when they come to them, and do so in a painstaking and truthful manner, thus gaining the confidence of the boy. An apprentice if found smoking cigarettes is discharged.

Mr. Rauch, of Oswego, emphasized the necessity of setting a good example. Every young man between the ages of 16 and

22 has an ideal which he is trying to follow. The instructor should give the boy the same kind of advice that he would give to his own sons. Never tell an apprentice you will do something that you are not absolutely sure you can do; in that way you will gain his confidence and respect.

Mr. Schafer, of Collinwood, who was only graduated from the apprentice ranks a comparatively short time ago, said that many of the boys wished to know just what the possibilities for advancement were in railway service. His answer was: "It is up to you; if you can make good and deliver the goods there is a better job waiting for you."

Mr. Gardner, the assistant supervisor of apprentices, quoted Martin Gower, formerly supervisor of apprentices on the Canadian Pacific, as saying that in order to be successful, a man must have a good character, common sense and an education. Of the three, education is the least important, and the instructors should strive to develop and impove the other two.

Mr. Cooley, the shop instructor at Collinwood, spoke of the value of the practical shop training that is carried on at the same time as the school work. He told of a college man who came into the shop and did not understand how to perform a comparatively simple operation. After it had been explained to him he said: "I wish I had worked in a shop and learned the trade before I went to college, for then I would have known what I was studying about."

Mr. Vauclain, of the Baldwin Locomotive Works, made an address, and among other things said: "My own instruction dates back, like yours, to my mother and then to my father, and then to the other fellows, and it will be surprising for you to know that I have working for me today, as an engineer, one of the first outside instructors that I ever had. Before I reached the dignity of pantaloons, when I was a mere child, this man used to carry me around on his shoulders and tell me all about the different parts of a locomotive; he would take me with him on the locomotive, and I would ride through the tunnel with him and would get ballyhoo from my mother when I came home and a smile from my father; this man still instructs me. There is hardly a week goes by that he does not come in and say that there is something that I will have to do if I want to make our locomotives more satisfactory to our customers. He is 87 years old and is listened to with the most considerate attention, and his advice is generally good. Now, why is this? It is because the boy—and I am still a boy so far as that man is concerned—has learned to have confidence in his instructor. If all of you gentlemen here who are instructors succeed in obtaining the confidence of your pupils, your apprentices, you will be sure to be successful with them. It is only when a pupil fails to have confidence in his teacher that the teacher has a difficult time in instructing.

"The boys in your shops are picking their instructors. They are not necessarily selecting a man appointed by the company to instruct them, but if he is the right kind of a man his instruction will survive, because the boys will all cling to it and he will be successful. A man cannot remain as an instructor for any number of years unless he has the boys behind him taking him as their standard. The whole system becomes standardized."

C. W. Cross, supervisor of apprentices, emphasized the importance of the instructor studying the boys carefully and striving to exert a strong moral influence over them.

ALUMINUM IN CAR CONSTRUCTION.

The *Zeitschrift des Vereines Deutscher Ingenieures* calls attention, in a recent issue, to twelve cars that have been put in service on the Zurich tramways, in which all of the metallic portions of the body are made of aluminum. In addition to its lightness, the metal has a further advantage, in that when it is cleaned with a sand blast, simple painting suffices to protect it. Varnishing, which is needed on steel plates, is thus dispensed with, and the loss of time and the large expense in applying it are saved.

STANDARDIZATION OF CHILLED IRON CAR WHEELS WITH REFERENCE TO SERVICE CONDITIONS.*

The object of this paper is to establish the simple laws which determine the proper relation of the chilled iron wheel to service conditions, and necessarily the conclusions are based on the long experience and complete records of the Griffin Wheel Company, covering the performance of ten million wheels.

The economy in the chilled wheel, as compared with other parts of the car for increasing capacities, is shown in the following table:

Capacity of car	20,000	40,000	60,000	80,000	100,000
Per cent. of increase	...	100	200	300	400
Average weight of car, lbs.	18,000	24,000	30,000	36,000	42,000
Per cent. of increase	...	33	66	100	133
Weight of heavy cars, lbs.	18,000	40,000	48,000	56,000	64,000
Per cent. of increase	...	122	166	211	255
Weight of wheel. lbs.	525	550	625	675	725
Per cent. of increase	...	5	19	29	38
Weight of axle, lbs.	350	450	550	730	870
Per cent. of increase	...	29	57	109	149
Weight of body of car, lbs.	12,400	17,800	23,000	27,900	32,900
Per cent. of increase	...	43	86	125	165

The economy of wheels in service is even greater than shown, because it is only since 1909 that the M. C. B. standard wheels were of the weight shown for 60,000-lb., 80,000-lb. and 100,000-lb. capacity cars. The 600-lb., 650-lb. and 700-lb. wheels for these classes of cars represent the majority of wheels now in service. The comparison of relative increases in weight for the increasing capacities is shown on the chart (Fig. 1). The wheel from the lightest to the heaviest capacity cars shows an increase in weight of only 38 per cent., while the axle has increased in weight 149 per cent., and the weight of the car, exclusive of wheels and axles, has increased 165 per cent. The rails on which the wheels operate have increased 100 per cent. Whether or not the weight of the chilled iron wheel has kept pace with the increasing service demands is determined by the record of wheel performance in each class of service and it will be shown that with 95 per cent. of the total equipment the performance of the chilled iron wheel is eminently satisfactory.

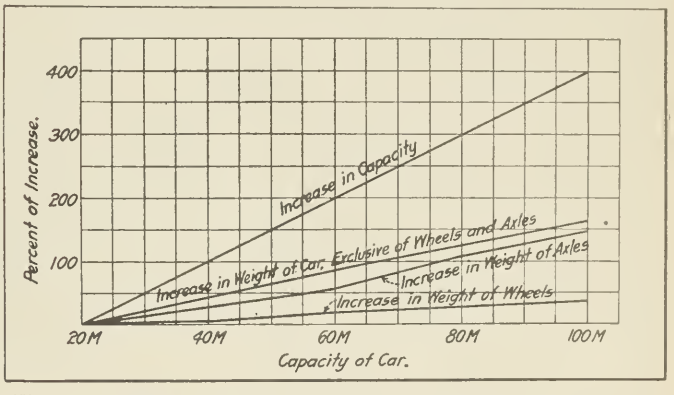


Fig. 1—Increase in Weight of Various Parts of Freight Cars.

The performance of wheels under modern heavy freight cars has been remarkable when we consider the rapidity with which these cars came into service, giving no time for experimental work as far as the wheels were concerned. In fact, the cars have not yet been in service long enough to obtain the records of the best wheels. The wheel removals each year contain some of the original wheels placed under the first 100,000-lb. capacity cars that were built. The best evidence we have of the performance of the chilled iron wheel under 80,000-lb. and 100,000-lb. capacity cars is from our replacement records of wheels which failed to make their guarantee, comprising all of the wheels manufactured during the years 1905, 1906 and 1907, the time limit for the guarantee having just about expired. This

*Abstract of a paper read at the January, 1911, meeting of the Western Railway Club by a representative of the Griffin Wheel Company.

list contains 1,020,463 wheels as follows, manufactured by Griffin Wheel Company:

	650 lb.		700 lb.	
	Total.	Replaced.	Total.	Replaced.
1905	173,286	1,250	59,949	709
1906	278,815	3,183	166,220	2,547
1907	198,356	1,295	143,837	834
Total	650,457	5,728	370,006	4,090
Per cent.	.....	.88	.....	1.10

These percentages of replacement represent all wheels which failed to make the guarantee for worn tread, shell out, cracked plate, seams, broken flange, broken in pieces and defective castings. Wheels weighing less than 600 lbs. reached their maximum in 1892 and have been on the decline ever since.

The years of maximum production were in 1906 and 1907, with a falling off in the following years, which would indicate that railway equipment was placed in a better average condition during the years 1906 and 1907, and a large percentage of the wheels manufactured in those years are still in service.

During the year 1909 the M. C. B. Association recommended as standard three weights of chilled iron wheels, viz., the 625-lb. for cars of 60,000-lb. capacity; the 675-lb. for cars of 80,000-lb. capacity, and the 725-lb. for cars of 100,000-lb. capacity. The performance of these wheels is practically perfect when operating under conditions which can reasonably be interpreted as conforming to those of the three classes of cars. It would naturally be supposed that the equipment of all railways would be divided into three classes so that all items of service relating to the wheel should be proportionate to the 625-lb., 675-lb. and 725-lb. wheel. While this is true of 90 per cent. to 95 per cent. of the equipment, there has been a tendency of late in certain sections to increase the percentage of brake pressure to the light weight of the car, and in the case of refrigerator cars and heavy furniture cars of light capacity, the weight of the car allows a higher braking power in total than corresponds with its capacity. It is of extreme importance that the capacity of the wheel should correspond with the intensity of the braking power of the car.

It is doubtful if one wheel in a million would break in service if applied to such cars as we may reasonably infer are specified in the M. C. B. recommendations for each capacity. It is therefore important that the recommendations be closely studied and followed—they are as follows:

Master Car Builders' Recommended Weights of Chilled Iron Car Wheels.

Weight of wheel	625 lbs.	675 lbs.	725 lbs.
Axle capacity	22,000 lbs.	31,000 lbs.	38,000 lbs.
Gross load	88,000 lbs.	124,000 lbs.	152,000 lbs.
Deduct car capacity	60,000 lbs.	88,000 lbs.	110,000 lbs.
Weight of car	28,000 lbs.	36,000 lbs.	42,000 lbs.
Brake pressure at 70 per cent.	19,600 lbs.	25,200 lbs.	29,400 lbs.

Note.—80,000-lb. and 100,000-lb. capacity cars calculated at 10 per cent. excess load.

Summary.

	Gross Load.	Brake Pressure.
625-lb. wheel designed for	88,000 lbs.	19,600 lbs.
675-lb. wheel designed for	124,000 lbs.	25,200 lbs.
725-lb. wheel designed for	152,000 lbs.	29,400 lbs.

The brake pressure under the majority of equipment is 70 per cent. of the light load of the car, and using this as standard we may determine the brake pressure corresponding to each wheel. Heat is developed through brake friction; therefore, the brake pressure when continuously applied represents the rate at which heat is being developed, other things being equal, and therefore, brake pressures should be proportional to that part of the wheel which resists the temperature stresses—the plate.

Relation of Brake Pressure to Stresses in the Wheel.

The question arises just how to determine the relation of the wheel to the brake pressure. As stated above, we assume that the conditions as laid down by the M. C. B. Association are entirely satisfactory, and by considering the braking strength of the plate to vary as the square of its thickness, and its strength in tension when resisting temperature stresses to vary directly as its thickness, Table No. 1 was prepared for and published by the Association of Manufacturers of Chilled Car Wheels.

Table No. 1.

Thickness of Plates Required in Cast Iron Wheels to which Brakes Are Applied.

Maximum Gross Load on 8 Wheels.	Thickness of Plates Required in Each Wheel to Safely Carry the Load.	Total Braking Power of Car.	Thickness of Plate to Be Added to Take Care of Temperature Stresses.	Required Thickness of Tread.
Pounds.	Inches.	Pounds.	Inches.	Inches.
40,000	.36	12,500	.16	....
50,000	.41	15,000	.19	....
60,000	.45	17,500	.22	1.50
70,000	.48	20,000	.25	....
80,000	.52	22,500	.28	1.62
90,000	.55	25,000	.31	....
100,000	.58	27,500	.34	1.75
110,000	.60	30,000	.37	....
120,000	.63	32,500	.41	1.87
130,000	.65	35,000	.44	....
140,000	.68	37,500	.47	2.00
150,000	.71	40,000	.50	....
160,000	.73	42,500	.53	2.12
170,000	.75	45,000	.55	....
180,000	.77	47,500	.59	2.25
190,000	.79	50,000	.62	....
200,000	.81	52,500	.66	2.37
210,000	.84	55,000	.69	....
220,000	.86	57,500	.72	2.50
230,000	.87	60,000	.75	....
240,000	.89	62,500	.78	....
250,000	.91	65,000	.81	2.50

Table No. 2.

Weights of Various Diameters of Wheels with Different Thicknesses of Plates.

Thickness of Plates in Inches.	Weight of Wheels. 36 in. Diam.	33 in. Diam.	30 in. Diam.	28 in. Diam.	26 in. Diam.	24 in. Diam.
.62	640	550	480	440	390	350
.68	665	575	500	455	405	360
.75	690	600	525	470	420	375
.81	715	625	550	485	435	390
.87	740	650	575	500	450	405
.93	770	675	600	520	465	420
1.00	800	700	620	540	480	435
1.06	830	725	640	560	495	450
1.12	860	750	660	580	510	460
1.18	890	775	680	600	525	470
1.25	920	800	700	620	540	...
1.31	950	825	720	640	...	...
1.37	980	850	740	660	...	...
1.43	1010	875	760	...	...	...
1.50	1040	900	...	...	...	...

Table No. 1 divides the required thickness of the plate required in a wheel for ordinary railway service in two parts:

1.—That required to carry the load.

2.—That required to resist temperature stresses as represented by brake pressure.

The sum of these quantities gives the required thickness of the plate in the wheel.

Table No. 2 has also been prepared for the Association of Manufacturers of Chilled Car Wheels to show the approximate weight of a wheel for all usual diameters when the thickness of plate is specified. With these two tables at hand it requires but a moment to decide whether any wheel harmonizes with the service conditions. The method of using the table is as follows:

Example.—What wheel should be used under a refrigerator car having a gross load of 90,000 lbs. and braking pressure of 37,500 lbs.? Referring to Table No. 1 we have the following:

Thickness of plate corresponding to gross load of 90,000 lbs. .55 in.
Thickness to be added on account of 37,500-lb. brake pressure. .47 in.

Total thickness of plate.....1.02 in.
Referring to Table No. 2, weight of wheel is.....700 lbs.

Table No. 1 is for use only when considering cars in miscellaneous service, that is, where cars of all classes are coupled together in one train; the application of this rule is simply to produce a distribution of retarding force to each wheel in proportion to its size. When the trains are made up of the same kind of cars and operated on heavy grades, another principle applies. In this case the wheels are all alike and the braking power uniform on all cars, hence the rate at which heat is produced is determined solely by average gross load and the rate of grade. In this case it is entirely immaterial how brake pressures are calculated, for it is self-evident that sufficient braking power for each car must be used to offset the gravity effect of the average gross load per car, and no more or no less. To take care of this situation Table No. 3 has been prepared.

This table shows how the weight of the wheel should vary with operating conditions and is intended as a guide for choos-

ing the proper standard wheel to suit any operating condition. From the experience gained in observing the performance of trains made up of fully loaded cars of one kind and operated on 4 per cent. grades, such as often occurs in mining districts, the maximum safe operating conditions for wheels have been established and are shown in Table No. 3.

Table No. 3.

Effect of Gross Load and Grade on Wheel Design.

	1%	2%	3%	4%
Gross Load 75 tons.				
Thickness plate, in inches, to carry load	.71	.71	.71	.71
Additional thickness for grade	.15	.30	.45	.60
Total thickness	.86	1.01	1.16	1.31
Weight of wheel, lbs	646	706	766	825
Gross Load 60 tons.				
Thickness plate, in inches, to carry load	.63	.63	.63	.63
Additional thickness for grade	.12	.24	.36	.48
Total thickness	.75	.87	.99	1.11
Weight of wheel, lbs	600	650	700	750
Gross Load 50 tons.				
Thickness plate, in inches, to carry load	.58	.58	.58	.58
Additional thickness for grade	.10	.20	.30	.40
Total thickness	.68	.78	.88	.98
Weight of wheel, lbs	575	612	654	692
Gross Load 40 tons.				
Thickness plate, in inches, to carry load	.52	.52	.52	.52
Additional thickness for grade	.08	.16	.24	.32
Total thickness	.60	.68	.76	.84
Weight of wheel, lbs.	550	575	604	637

Use of Tables.—These tables furnish a ready means of examining any operating condition of freight cars and freight engine tenders to determine whether the wheels are properly standardized. The tables represent the maximum safe combination of load and braking power that are safe for chilled iron wheels. The safe operating stress for the wheel is governed by the properties of metal of which the wheel is composed. Operating conditions of load, grade and brakage are fixed by the railway. The obvious responsibility of those having charge of standardization of wheels is to harmonize the wheel to the maximum conditions under which it must operate. Tables No. 1 and No. 3 are to be used exactly as tables for the strength of I-beams, channels, angles, etc.

Graphic Chart.—As a further aid in choosing wheels for various conditions, a chart has been prepared (Fig. 2) which extends beyond the limit of present freight cars. The object of this chart is to show in what classes of equipment brake pressures are likely to be in excess of safe wheel practice. Fortunately the cars at present under which the wheels are not properly standardized are comparatively few, and the remedy is easily applied.

The vast majority of wheels are properly standardized and the improper standards exist in a very small percentage of cars. This is all the more reason why these errors should be corrected. The total percentage of refrigerator cars is only 1.36 per cent.,

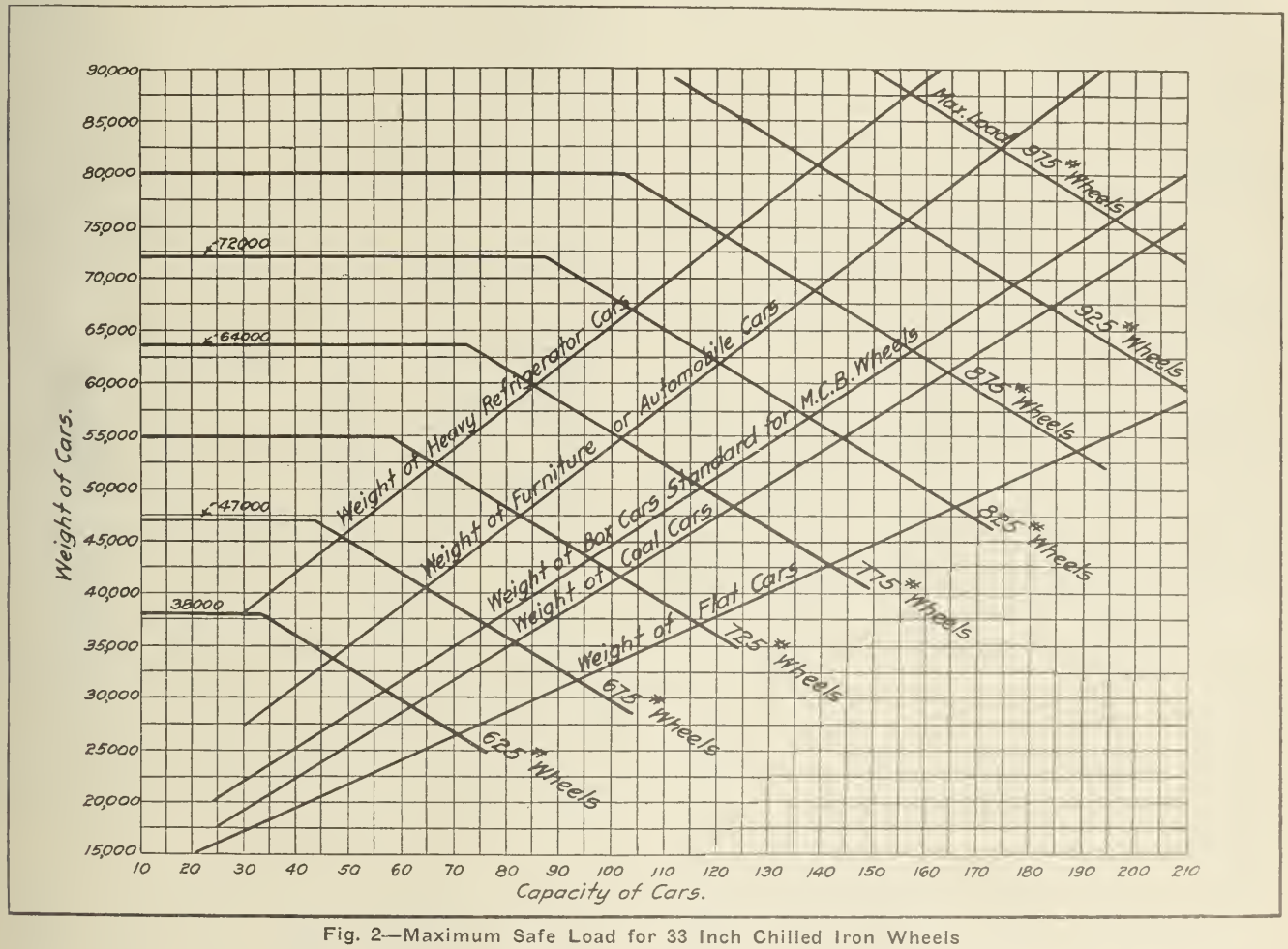


Fig. 2—Maximum Safe Load for 33 Inch Chilled Iron Wheels

Based on the Gross Load and the Temperature Stresses for Miscellaneous Equipment on Grades not Exceeding 3 Per Cent.

and there is probably about the same percentage of furniture cars. There are several ways in which corrections can be made. The recent tendency is to obliterate the different classes of cars by building a few cars of the smallest capacity, having largest brake pressure, thus placing these cars, as far as the wheel requirements are concerned, in the heavy class, and a wheel should be made to take care of all such non-standard cars.

Wheel for Heavy Brake Pressure and Small Load.

This wheel would be the 625-lb. wheel with 75 lbs. added to the plates; in other words, what is needed is a heavy wheel with small center core size. The result of such a standard would be the practical elimination of wheel troubles in the important class of cars handling perishable freight where it is important that delays should not occur. If it should be impractical to have a standard wheel for refrigerator and heavy furniture

cars, then the alternative is to have but one wheel for all classes of cars. This would be far more expensive, as it would be necessary to increase the weights on 95 per cent. of the 60,000-lb. class of cars because 5 per cent. of this class require heavy wheels. It is not practical to use the present standard 675-lb. wheel for refrigerator cars for in the first place making the core size smaller would add at least ten pounds to the hub and the weight would then be 685 lbs. It becomes necessary, if the 675-lb. standard is maintained, to take ten pounds of metal from the plates. The tread of the 675-lb. wheel is much heavier than required for the gross load carried by refrigerator cars, hence the final result would be but a slight improvement over the 625-lb. wheel.

Another solution is to abandon the present 675-lb. wheel and use the 725-lb. under both 80,000 and 100,000-lb. cars, because in many cases there is no difference to speak of in these two classes, and better service would be secured in the 80,000-lb. class. The standards would be:

725-lb. wheel for 80,000-lb. and 100,000-lb. capacity cars.

700-lb. for refrigerator, furniture, and other heavy cars of the 60,000-lb. capacity class, and also for 70,000-lb. capacity cars.

625-lb. for ordinary 60,000-lb. and less capacity cars, and the lighter refrigerator cars.

This would be the best solution, as it would take care of all cars of the 80,000-lb. class which have a braking power in excess of that of the average 80,000-lb. class, such as refrigerator cars, furniture cars, etc. The 725-lb. wheel is correct for most 100,000-lb. capacity service. There are a few cases, however, of dairy products cars and special cars of very heavy weight which would require special consideration.

ENGINE TENDER WHEELS.

It is the custom with most railways to purchase the three weights of M. C. B. wheels and use them indiscriminately in freight, engine and passenger service, the only item considered being the weight of the wheel and size of journal. Fairly good results have followed from this practice on roads where brakes are seldom applied to prevent too high an acceleration of speed on descending grades, but on heavy grades where the conditions imposed on the wheel are greater than those ordinarily encountered in freight service for the same weight of wheel, special consideration is required. This subject has been given careful consideration during the last two or three years and designs have been developed which answer every service requirement.

In making up the designs for wheels in service under engine tenders the same relation to service conditions are followed as shown in Table No. 1, which is based upon the M. C. B. recommendations for freight service. The difference between engine tender service for a given gross load and freight service for an equal load is that the weight of the tender when empty is much greater than that of a freight car; because the tender is always partially loaded, the braking power is made at a higher percentage than is common in freight service, so that the temperature stresses in tender wheels are very much greater than in any of the cars in the same train; for example:

Let us assume a tender having a capacity of 8,000 gal., using an axle with 5½ in. x 10 in. journals. The items relating to the wheel problem are as follows:

Weight loaded	150,000 lbs.
Weight empty	56,000 lbs.
Brake pressure at 90 per cent	50,400 lbs.

It will be noted that as far as the load is concerned an axle of the same dimensions used under 100,000-lb. capacity cars is sufficient and it is assumed by a good many roads that, therefore, the 725-lb. M. C. B. wheel is equally as satisfactory as in freight service. This conclusion may be approximately true on roads where there are no grades of sufficient consequence to call for continuous operation of brakes, but on roads having steep grades requiring brake action to control the speed of the train it can readily be seen that the condition is very different from that of wheels under freight cars.

It was shown that the 725-lb. wheel is designed for cars having approximately 30,000-lb. brake pressure. The problem resolves itself to the following:

Engine tender, braking power	50,000 lbs.
725-lb. wheel designed for braking power	30,000 lbs.
Excess braking power	20,000 lbs.
From Table No. 2, 725-lb. wheel has plate thickness.	1.06 in.
From Table No. 1, excess metal required for 20,000-lb. braking power	.25 in.
Thickness of plate required for tender wheel	1.31 in.
From Table No. 2 weight of 33-in. wheel, plate thickness 1.31 in.	825 lbs.

This shows that to obtain the same factor of safety under an engine tender having a gross load of 150,000 lbs., as in freight service, that an 825-lb. wheel is required. Wheels of this character will produce the best results.

Another reason why wheels for tender service require a larger section of metal in the plate is that many engines are equipped with straight air brakes which are used independently on the engine. Therefore it is possible to use the brakes on the tender wheels with greater frequency, or with greater intensity, than on the entire train. Also on account of the short wheel base and the high center of gravity of the load, there is more swaying and greater shifting of the load from one wheel to another than in ordinary service. This coupled with the desire to give a higher factor of safety in engine service demands a wheel in which all parts are proportioned to the stresses which are known to apply to the wheel.

Table No. 5.

Weight of Engine Tender Wheels.

Capacity, Gals.	Weight of Tank.	Total Load.	Thickness of Plates in Inches.	Weight of Wheels.	Size of Journal.
3,000	21,000	60,000	.68	600	3¾ x 7
4,000	28,000	80,000	.75	600	4¼ x 8
5,000	35,000	100,000	.87	650	4¼ x 8
6,000	42,000	120,000	1.00	700	5 x 9
7,000	49,000	140,000	1.12	750	5 x 9
8,000	56,000	160,000	1.25	800	5½ x 10
9,000	63,000	180,000	1.37	830	5½ x 10
10,000	70,000	200,000	1.50	860	6½ x 12

Weight of Engine Truck Wheels.

Diameter.	For Less Than 6,000 Pounds Pressure.	For 6,000 to 12,000 Pounds Pressure.	For 12,000 to 16,000 Pounds Pressure.
24 ins.	410 lbs.	450 lbs.	480 lbs.
26 "	460 "	500 "	535 "
28 "	510 "	560 "	600 "
30 "	575 "	635 "	680 "
33 "	650 "	735 "	800 "

Table No. 5 shows in general the weights of wheels which should be used in engine tender and engine truck service.

PASSENGER SERVICE.

A great many pasenger cars are equipped with our chilled iron wheels and no failure has been reported in years in regular passenger service.

Table No. 6.

Weight of Passenger Car Wheels.

Capacity.	Weight of Car.	Total Load.	Thickness of Plates in Inches.	Weight of Wheels.	Size of Journal.
8 Whl. Trk.	20,000	35,000	.68	600	3¾ x 7
8 " "	30,000	45,000	.68	600	3¾ x 7
8 " "	40,000	55,000	.81	625	3¾ x 7
8 " "	50,000	65,000	.93	675	3¾ x 7
8 " "	60,000	80,000	1.06	725	3¾ x 7
8 " "	70,000	90,000	1.18	775	3¾ x 7
8 " "	80,000	100,000	1.31	815	4¼ x 8
12 " "	80,000	100,000	1.00	700	4¼ x 8
8 " "	90,000	110,000	1.43	845	4¼ x 8
12 " "	90,000	110,000	1.06	725	4¼ x 8
8 " "	100,000	120,000	1.56	875	5 x 9
12 " "	100,000	120,000	1.12	750	4¼ x 8
12 " "	120,000	140,000	1.31	815	4¼ x 8
12 " "	140,000	160,000	1.43	845	4¼ x 8

The weight of wheels for passenger service is shown in Table No. 6. This is based largely on Table No. 1, although it is self-evident that the factors for passenger service are different than those for freight service in that the tonnage to be controlled by the brakes is less, and therefore, for continuous application of the brakes less braking power is required. However, as passenger trains require special factors of safety, the wheels should not be lighter than shown in Table No. 3 for 4 per cent. grades. Chilled iron wheels were used under the first Pullman coaches,

but as the coaches grew heavier the service became too severe for the then existing designs of chilled iron wheels, viz., 650 lbs. for 36-in. wheels, and inasmuch as there was no heavier design for the chilled iron wheel at that time, a change was made to the heavy steel-tired type of wheel. The service on passenger cars is not nearly so severe as in heavy freight and engine service, and therefore the chilled iron wheel, if of proper weight, is eminently adapted to this traffic as indicated by the large number of cars equipped with them in constant service year after year with no wheel failures.

SELECTION OF WHEELS FOR ENGINE AND PASSENGER SERVICE.

It is almost self-evident that wheels should not be purchased as freight wheels and used indiscriminately in engine and passenger service, for the reason that the operating stresses in the wheel are not the same in both cases. The process of selection is thoroughly recognized in all materials entering into the construction of passenger equipment and should be extended to the wheels, which are the most important part of the structure.

Large sums of money are spent to procure safety in other directions, while practically nothing is allowed the chilled iron wheel maker for producing the best that can be made for this service. Where it is known that wheels are ordered for passenger and engine service, special selection can be made in the foundry of the taps from which they are poured, special treatment in annealing and special tests after the manufacture has been completed can be applied.

The same rules apply here as in the manufacture of any other article. There is an opportunity for selecting from the mill run of any product in order to secure the most select for any special service. Also during the last two years considerable progress has been made in the use of alloys which can be shown to definitely improve not only the wearing quality but the stability of the wheel from structural failure. It is evident that where expensive alloys are used and where special manufacturing consideration is given to a lot of wheels that there must be an increase in the manufacturing cost. This, however, is very slight in most cases, and is returned to the railway in the way of extra service, extra guarantees, etc.

SAFETY.

The question of safety in the use of chilled iron wheels is often discussed. Safety is a relative term and whether one type of wheel is more safe than another depends on a careful record showing percentages of failures. The results in service show that no type of wheel is entitled to the distinction of being "absolutely safe" and when we begin to apply the percentage of failures, often the wheels that are supposed to be the most safe are compelled to relinquish this claim to some other type. Where the rules laid down in this article are followed, there will not be one broken wheel in one million in the chilled iron class. The study of the metallurgy of the chilled iron wheel shows the metal to be ideal for the purpose for which it is used, that is, the maximum amount of service and reliability at the least cost.

Considering the present misapplication of wheels in the case of cars of heavy braking power, as compared with their capacity, and in the adaptability of chilled iron to produce the best and at the same time the cheapest material for wheel manufacture, and on account of the reliability of the wheel when the relation of the metal to the stresses which it must safely carry is considered, we have no hesitancy in recommending the chilled iron wheel for all classes of railway service which now exist, and we see no indication of having reached the limit; in fact on account of the absence of ductility in the metal of the tread it is better suited than any other material for highly concentrated loads. For special cases, such as crane and turn-table service, where 100,000 lbs. are carried per wheel, we have no hesitancy in furnishing standard designs of chilled iron wheel.

From tests we have made, we are positive that if allowed a reasonable advance to permit greater care in manufacture and closer inspection on lines which are not now covered by standard inspection rules, and if the wheels are ordered specially for each class of service, as outlined in this paper, we can furnish not only the most economical, but the safest wheel made of any material, and guaranteed to stand any service that the strongest car or rail can carry, for any capacity or in any service, and that the proportionate ratio of comparative safety and wear will increase in proportion with the load.

INCREASING SHOP OUTPUT.*

SECOND PRIZE.

W. G. REYER.
General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

Last May we started an effort to increase the shop output. The first move was to speed up the stationary engines, increasing the speed of the line shaft from 125 to 160 r. p. m. By using a heavier tool steel and forcing the cut on the wheel lathe, which was not of the latest type, the output has been increased from three and a half to five pairs of driving wheels in 10 hours. By increasing the feed on the planer and improving the device for clamping driving boxes, we have been enabled to reduce the time for replaning the shoe and wedge fit on two boxes from one hour to 20 minutes when ¾ in. or ⅞ in. of stock is removed, and after being laid off on the engine has been decreased from one hour to 20 minutes when ¾ in. or ⅞ in. of stock is removed, or 12 minutes when ¼ in. stock is to be removed. This is accomplished by the use of the chuck shown in Fig. 1. It consists of a bed plate C with three T-slots, the central one being used by the two T-bolts which hold the guide bar A in position. This guide bar is the same size as the frame jaw, so that the shoe and wedge fit over it snugly. There are two dogs D on each side of

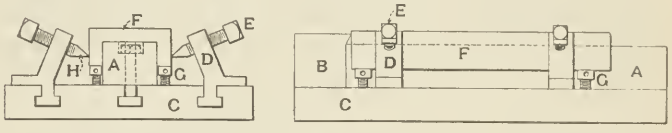


Fig. 1—Chuck for Planing Shoes and Wedges.

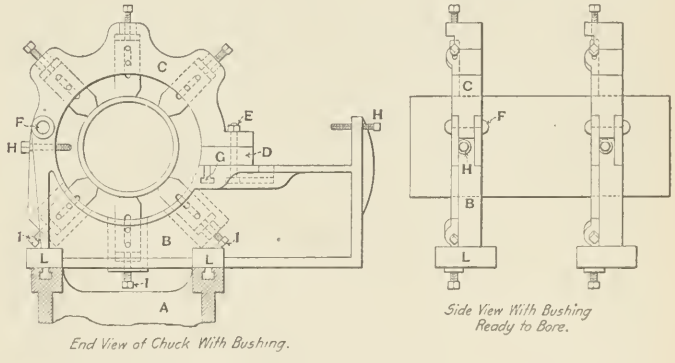


Fig. 2—Chuck for Boring Cylinders or Cylinder Bushings.

A and near its ends; the steel screws E which pass through the dogs are balled out at the ends to take the center points H, which hold the shoe firmly in position. The block B is made of tool steel, the top of it coming in contact with the shoe, as shown. The shoe is set on the guide A and may be adjusted by turning the roundhead screws G; the heads of these screws have six 5/16-in. holes and are turned by means of a pin 7 in. long, made of hard steel wire, tapered at one end to enter the holes easily. By means of this device it is possible to adjust a shoe or wedge in from one and a half to two minutes and to hold them securely under any feed or depth of cut.

*This article was submitted in the competition which closed December 15, 1910, and was awarded the second prize of $20.

By using a square nose tool and taking a coarser feed and heavier cut we have been able to reduce the time for finishing strap rod brasses from 3½ to 1½ hours for the smaller sizes, and from 5½ or six hours to 2½ hours for the larger ones. We used to turn our driving box brasses on a lathe, requiring 30 minutes. They were then laid off and fitted in to be planed, requiring 25 minutes, and about 25 minutes more for planing. This work is now done on a draw cut shaper, and the brasses are finished and ready to apply to the driving box in about 30 minutes for the smaller sizes and 45 minutes for the larger ones. It formerly required 12 hours to bore an 18-in. cylinder, this time being measured from the time the cylinder was taken off the floor until it was returned. This is now being done in nine hours, and the time will be reduced still more when the chuck shown in Fig. 2 has been installed. A is a section of the bed of the cylinder boring machine, and B is the base of the chuck, which may be used either for a cylinder bushing or a cylinder casting. The method of chucking one of the bushings is clearly shown in the illustration. To use this chuck with a cylinder it is necessary to remove the part C by taking out the bolt E and removing the block D and the pin F. The cylinder may then be placed on the base and adjusted to the proper position by manipulating the screws I and H. The casting may be securely clamped in position by means of two cross bars, one at each end of the cylinder, one end of the bars being held by eye bolts which fit on the pins F, and the other by T-bolts, which fit in slots G. The lugs L are bolted to the base of the machine by two bolts each.

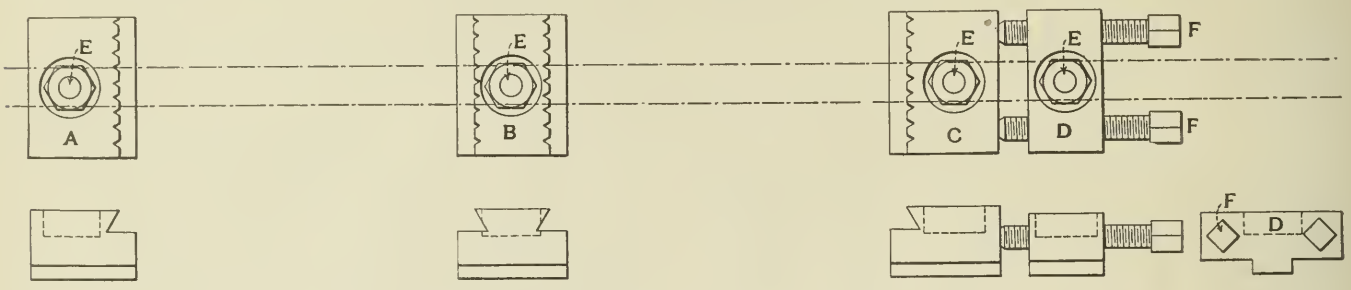


Fig. 3—Chuck for Milling Shoes and Wedges.

By using heavier tools and coarser feeds we have reduced the time for turning rod bushings on the lathe from one-half hour to 15 minutes. In the lathe it is the coarser feed and not the speed that counts. Formerly we turned our cylinder packing, of Stevenson style, on a lathe. By doing this on a boring mill we have been able to cut the time in half, turning out 30 rings in 10 hours. However, we are now installing Dunbar packing and are able to finish 10 rings in 10 hours.

We finish all shoes and wedges on a milling machine, machining both the inside and outside at one operation. One man will finish 40 of these in 10 hours. The chuck for milling shoes and wedges is shown in Fig. 3. The blocks A, B, C and D are made of cast steel and have tongues which fit in the grooves in the table of the milling machine. The blocks are held in place by the bolts E. The shoes are placed between the upper parts of the blocks and these are then forced tightly against the ends of the shoes by screwing up the set screws F in the tail block D. The shoes are milled at the top and sides in one operation. By changing the clamping device and forcing the cut for boring out driving boxes, we have been able to decrease the average time of boring these boxes and facing the hubs for from 6-in. to 9-in. journals from 1½ hours to 50 minutes. Five-inch strap rod brasses, which we formerly bored and faced on a lathe, requiring about 1½ hours, we are now able to finish on the boring mill in one hour. Formerly it was the practice to have two men on double-head bolt cutters. One man now attends to both heads, and we have increased the speeds for a ½-in. bolt from 122 to 200 r. p. m.; for a ⅝-in. bolt from 74 to 180 r. p. m.; for a ¾-in. bolt, 70 to 150 r. p. m., and for ⅞-in. and 1-in. bolts, 68 to 122 r. p. m. We also use high speed steel dies. One man has turned a thread for 2½ inches on ⅞-in. bolts at the rate of 160 in 30 minutes. Note that we are cutting the 1-in. bolts at the same rate formerly used for ½-in. bolts.

ERECTING SHOP.

The erecting shop was so crowded that we did not have adequate space to assemble brake work, spring rigging, pistons, crossheads and rocker boxes. Two pits were closed and used for this work, leaving 13 working pits. We were not using specialists on all work except steam pipe and brake rigging. One machinist and two apprentices remove all steam chests, fit all valve yokes, lay off new valve rods, fit new valves and valve strips and rings, face all valves and apply steam chests. One machinist and one apprentice do all the guide work. One machinist, an apprentice and a helper attend to the crossheads, pistons, cylinder packing and glands. Two handy men and one helper overhaul and apply all brake rigging and spring rigging, reaming all holes necessary for this work. Two machinists and two apprentices attend to the eccentrics and eccentric straps, apply the link motion and set the valves. One machinist and one apprentice remove, overhaul and apply the reverse levers and quadrants. One machinist and one helper face all frame jaws and apply the binders. One machinist and one apprentice lay off all shoes and wedges, fit up new ones and apply liners to the old ones. Three handy men and three helpers do the work on steam pipes, dry pipe, stand pipe and throttle rigging. One machinist is employed for cab work. A foreman and 12 helpers deliver all material, and when not engaged in this work, clean the shop. Each man in the erecting shop has a work box on a two-wheel truck, thus saving considerable time. Air hammers have been installed for doing all chipping.

We cast the brass on the shoe and wedge fits of both steel and cast iron driving boxes and also on the hubs. The boxes are not heated before the brass is poured. The arrangement for preparing the driving boxes for pouring the brass is shown in Fig. 4. The block D is placed in the box and the ring E, which forms the hub liner and which is 1 in. wide, ⅜ in. thick and of a diameter to suit the box, is placed in position, the block D projecting ½ in. above it, as shown in the illustration. The crown of the box is dove-tailed to hold the brass securely, the grooves H H crossing in the center and extending to within ¼ in. of the flange. Strips G are then clamped at the ends and the joints are luted with clay or asbestos. Attention is directed to our method of reclaning old driving boxes. Before we started applying the brass liners on the shoe and wedge fit we would scrap the box when it had been planed down to a certain limit. Now we plane the box to the limit and then pour a brass liner on it and use it again. This refers to cast iron boxes. The practice of casting liners on the steel driving boxes instead of riveting saves about $1.50 in labor on each box. We are welding our broken frames with crude oil without removing them from the engine.

We have a meeting of all of the foremen once a week, at which they are expected to report progress on the work in their departments for engines which are in the erecting shop and to state when they will be able to complete the work on each one of them. We then set a time at which each engine must be

turned out of the shop. If the foremen are short of facilities, or any other department is holding them up, they report it.

BOILER SHOP.

It formerly required about 170 hours to apply a back flue sheet and a side sheet to one of our consolidation locomotives. We have reduced this to 88 hours by handling the work in the following manner: A boiler maker and helper start to remove the flues, this work being completed in about six hours. Two drills are then started on the outside and a man begins to cut off the rivets on the flange and mud ring. An operator with an oxy-acetylene torch cuts the seams. The staybolts are broken down in the throat and by this time the drilling of the staybolts has been finished. The flue sheet is then knocked out and we start to drive the bolts back. A turn-buckle is applied which helps to pull the bolts loose. This part of the job is accomplished in about 14 hours. The sheets are then laid off, punched and placed in the boiler. The flue sheet is marked off, after which it goes to the punch. We then start riveting on the side sheet, beginning at the mud ring and working up the flange and across the seams. This is ordinarily completed in from eight to 10 hours. The flue sheet is then applied and riveted in place. All rivets are driven with a long stroke hammer. The stay-bolt taps are then started and the bolts are applied, the chipping and calking being done in the meantime. The boiler is ordinarily ready for the flues 88

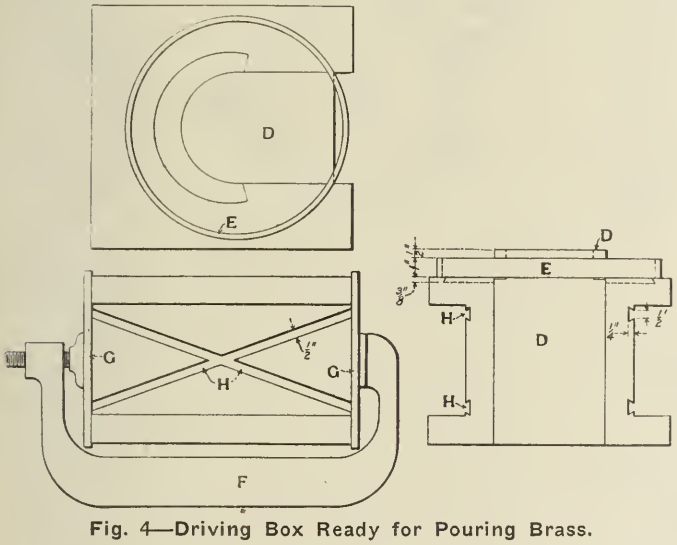


Fig. 4—Driving Box Ready for Pouring Brass.

hours after the work is started. During the month of November, 1910, we turned out 18 engines from the erecting shop.

APPRENTICES.

We have installed an apprentice school, having 48 apprentices, divided into six classes. Each class attends school for 2 hours in the early morning, from 6:50 to 8:50, and again from 12:20 to 2:20 P. M. once a week. This arrangement of time allows each class to get one morning turn and one afternoon turn during the week. They are taught mechanical drawing, arithmetic and spelling, and show a great deal of interest and are already showing ability and progress.

FOREIGN RAILWAY NOTES.

According to the German press, it was resolved at a recent meeting of the principal storekeepers of Russian railways, that steps be taken to procure the repeal of the order prohibiting the use of foreign material. It was pointed out that in spite of the existing regulations, foreign material is imported. Hence the railway authorities have to pay a heavy price to the agents for material, which could be procured directly at much less cost. Among other things it was proposed that the import duties should be reduced.

HOW TO GET THE MOST WORK FROM MEN AND MACHINES.*

BY C. J. CROWLEY.

Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.

This is a problem that all shop managers are striving to solve. I find that when you have men working on one class of work they become experts and can do much more work in a given time than mechanics, no matter how good, can do in the same time if they are not accustomed to the work. In equipping a shop it is best to have two or more machines exactly alike, set side by side. Of course, you can not do this with all machines, but where it is possible it should be done. The advantage is that you can arrange the work to always have a mechanic available for any job that is needed. If a mechanic is sick or is taking a vacation you do not have to assign a man to work that he is not accustomed to. When it is advisable to make attachments or jigs, it is only necessary to make one as it can be used on either machine. When two or more mechanics are working on the same work they naturally talk it over, and it also establishes a sort of rivalry between them which means better work and more of it. It is an advantage in working in apprentices, as they always have an experienced mechanic near by to instruct them. The apprentice learns much more quickly and the company is the gainer.

When an apprentice is working on a machine, let him know its condition, and tell him that you would like to have it in as good or better shape when he is ready to leave it. You will thus turn out mechanics that are always trying to better conditions, and instead of letting their tools run down they will improve them. Work that requires a skilled mechanic should be separated as much as possible from that which can be done by an apprentice or a handy man.

Parts of engines should be put through the machine shop in as large quantities as possible, as it is much cheaper and increases the output. Avoid as many changes of work on machines as possible, as the time lost in making them lessens the output of the machine. When an engine is in the shop for repairs have a date or the time when it is expected out; then the mechanics working on certain parts will know just when each part is needed, and will try to have the work done promptly so they will not be blamed for the delay.

Templates should be used for laying out work and for drilling, thus securing greater uniformity and a larger output than when holes are layed out separately. The use of high speed steel has increased the output of machine tools 100 per cent. over the old carbon steel. High speed drills are being used more each year, but when large holes have to be drilled or reamed, they are rather expensive. Free cutting reamers with soft steel bodies and high speed cutters are cheap and do the work as well as high priced drills and at about one-third the cost. With reamers of this kind you can increase the output at least 100 per cent over the carbon steel reamer, and the holes are more uniform than those made by a drill.

During the past few years the tendency of tool builders making tools for railway shops has been to make heavy, powerful, complicated machines. In a few cases the powerful machines are all right, but in many instances these machines are running about 75 per cent. of the time on work that does not need much power or an extra heavy machine. As the heavy, powerful machines are usually clumsy, nothing is gained by their use. What railway shops need is a heavy, powerful, hollow spindle turret lathe that will take old axles and rough out crank pins, crosshead pins and rod knuckle pins, etc., cheaper than the cost of forging. These pins can then be finished on any ordinary lathe much cheaper than the forged pins.

In most old shops lathes, planers and drills are in fair shape,

*Submitted in the competition which closed December 15, 1910.

but have not the belt pulling power to compete with modern machines. Wider belts can often be used to advantage on them On a machine having a four-step cone a two or three-step cone can be made to fill the space, increasing the power which can be transmitted greatly.

All castings and forgings should be watched to determine if they have a surplus of stock or require unnecessary work.

To get the best results, either in the building of new engines or in repair work, three or more men should work on the same class of work. In the smaller shops these men will have several different jobs to do. When an engine is in the shop for repairs part of the men can do the stripping while the others are assembling the work on other engines. When it is necessary to break in a new man it is much easier when he has three or more men who are capable instructing him.

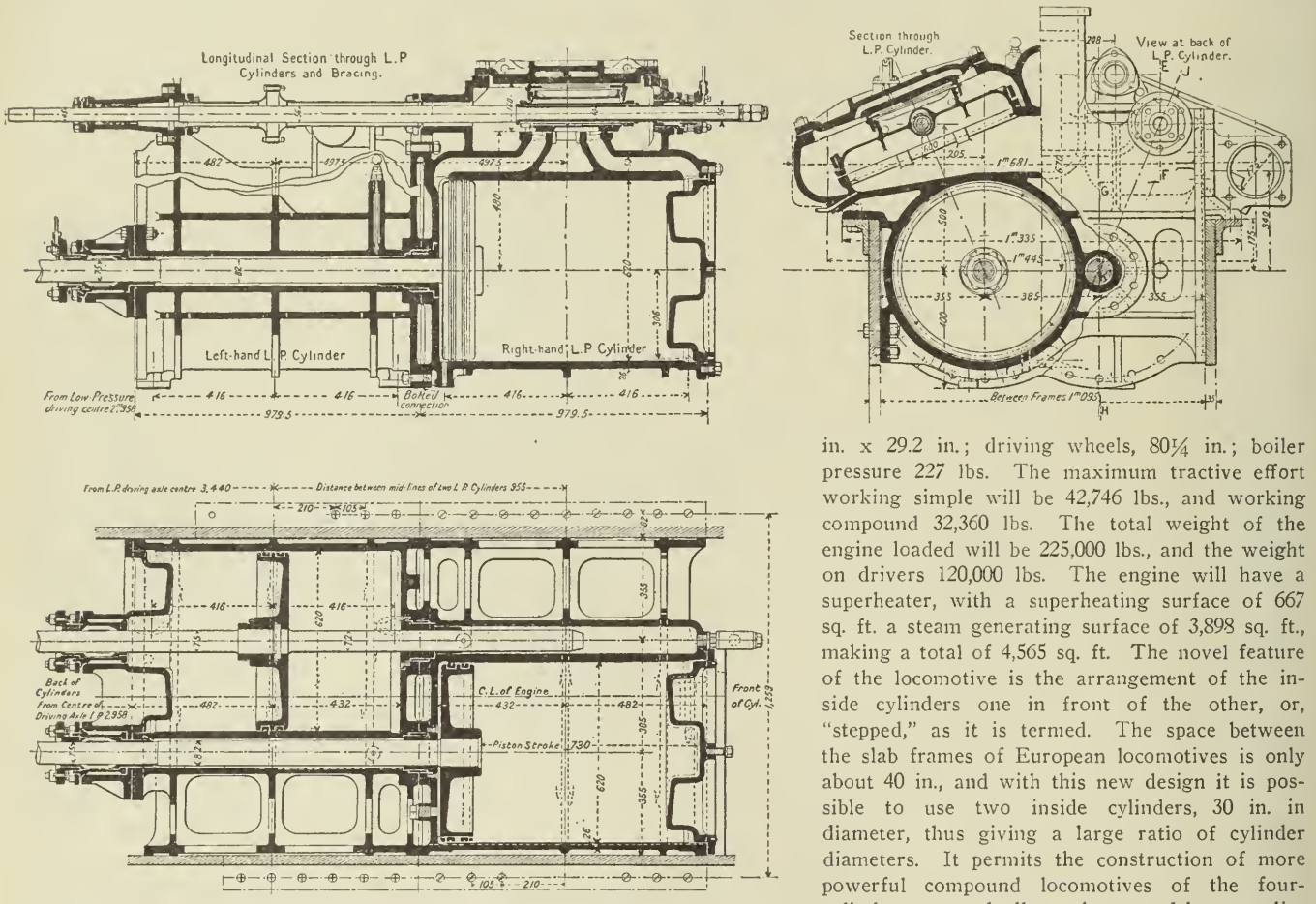
A system of accounting should be established by all railways for different classes of repairs, such as air brakes, boiler shell, boiler trimmings, driving boxes, driving wheels, etc., such that it will be an easy matter for one road to compare its work with another. When the cost of a certain class of work is high, as compared to other roads, an investigation should be made to determine the cause. The mechanics would be more careful and not put in too much unnecessary time on their work. They should be taught to do good work where it is necessary and to cut out all unnecessary work. The mechanic of today is not the man that can do a good job, but the man that knows when a job is "good enough."

The Trans-Andean Railway, connecting Valparaiso, Chile, and Buenos Aires, Argentina, ascends the Andes 7,615 ft. within a distance of 46 miles from Los Andes to the summit, or an average of about 166 ft. to the mile.

STEPPED CYLINDER ARRANGEMENT FOR BALTIC TYPE LOCOMOTIVE.

The demand for more powerful locomotives for the Nord express, running between Paris, Brussels, Cologne and Berlin, together with the desire to use four-cylinder compound locomotives having slab frames and limited lateral clearance, has led to the ingenious design for the inside cylinders which is here illustrated. This design is used in the new Baltic type locomotive, 4-6-4, which is now building at the shops of the Northern Railways of France. It will be the most powerful passenger locomotive in Europe and is expected to develop 2,000 h.p. The specifications require it to haul 441 tons of train at an average speed of 75 miles an hour on a level, or at 60 miles per hour on ½ per cent. grades.

The dimensions of the compound cylinder will be approximately: High pressure, 17¼ in. x 25¼ in.; low pressure, 24.8 in. x 29.2 in.; driving wheels, 80¼ in.; boiler pressure 227 lbs. The maximum tractive effort working simple will be 42,746 lbs., and working compound 32,360 lbs. The total weight of the engine loaded will be 225,000 lbs., and the weight on drivers 120,000 lbs. The engine will have a superheater, with a superheating surface of 667 sq. ft. a steam generating surface of 3,898 sq. ft., making a total of 4,565 sq. ft. The novel feature of the locomotive is the arrangement of the inside cylinders one in front of the other, or, "stepped," as it is termed. The space between the slab frames of European locomotives is only about 40 in., and with this new design it is possible to use two inside cylinders, 30 in. in diameter, thus giving a large ratio of cylinder diameters. It permits the construction of more powerful compound locomotives of the four-cylinder type and allows the use of larger cylinders, which is regarded as desirable for superheated steam. The main rods are of equal length, so that there will be no tilting action due to the offset cylinders, as far as the rods are concerned. This new locomotive will be tested in competition with one which is being built at Creusot, having the same proportions but fitted with a water tube boiler built on the Temple system of steam generation as employed in the French navy. We are indebted to *The Engineer*, London, for the illustration of the new cylinder design.



Arrangement of Cylinders on the Baltic Type Locomotive for the Northern Railway of France.

The first train composed of all steel rolling stock to operate on an English railway of standard gage, made a trip on the Metropolitan District Railway on January 3. It is expected that within two months 52 all steel cars will be in service on this line. These trains will be composed of alternate motor and trailer cars, and will be equipped with the Westinghouse quick action air brake.

General News Section.

A. J. Davidson has been appointed commissioner of the Pacific Northwest Demurrage Bureau, Seattle, Wash., in place of R. Dudgeon, deceased.

At Douzy, France, January 26 Roger Sommer, flying in a biplane at a height of 100 ft., carried six passengers to Romilly and back.

Mayor Gaynor, of New York City, is having prepared a bill, to be presented to the legislature, to provide for the construction of a freight railway along the west side of Manhattan Island, in accordance with the plans which have been proposed by Dock Commissioner Tomkins.

The Chesapeake & Ohio has ordered telephone equipment for its lines through from Fortress Monroe to Cincinnati, nearly 1,000 miles. Since last March the telegraph has been supplanted for train dispatching over four of the most important divisions of this road, and the telephone system is now complete from Richmond to Cincinnati by the James river route. The equipment is furnished by the Western Electric Company.

The State of Maine must be added to the list of states, already somewhat long, in which it is proposed to greatly enlarge the powers of the state authorities over railways. A bill has been drawn for the establishment of a Public Utilities Commission of five members and it is said that United States Senator Johnson is one of its authors. A joint caucus of the democrats (who are now in the majority in the legislature) has declared in favor of the bill. Massachusetts is also agitating the subject.

A robber who held up the passengers in a train of the Colorado Southern, near Pueblo, last Friday, in broad daylight, and who secured $117 in money, together with some jewelry, was caught a few minutes after he leaped from the train. Special Agent McCafferty, of the Denver & Rio Grande, who happened to be on the train, and who was informed that the robber was at work in the rear coach, followed him in jumping off the rear platform, and succeeded in shooting the thief through the right wrist, thus compelling him to drop his pistol.

J. A. D. McCurdy, who on Monday last in a biplane attempted to fly from Key West, Fla., to Havana, Cuba, succeeded in flying about 96 miles and almost reached land, but was compelled to alight on the water because of the accidental loss of a part of his lubricating oil. He was picked up by vessels of the navy which were watching for him. He succeeded, however, in making the longest flight in America, the longest over-sea flight anywhere, and the first sea flight out of sight of land. He was in the air two hours and eight minutes.

The annual report of the insurance department of the Pennsylvania Railroad system shows that the company's losses by fire in 1910 were $280,097, as compared to $402,615 in 1909—a reduction of almost a third. In the past few years the road has redoubled its efforts to prevent fires. Many employees have been trained in fire fighting, and there are organization of firemen in every station, roundhouse and shop. Many yard locomotives have been equipped with pumps for fire fighting. In 1910 379 fires on company property were extinguished with the company's fire apparatus and by the company's own employes, with only a loss of about $18,000. The Railroad Insurance Department is to issue a circular to employes calling attention to the number of fires occurring from preventable causes. There were 1,009 fires on the system last year, and the loss from them was only $280,097, an exceedingly small loss, as the value of the property on which they occurred was more than $250,000,000. Thirty-six fires entailing a loss of $17,000 started on adjacent property. Sixteen fires, with a loss of $16,750, were of incendiary origin.

Railway Accidents in Pennsylvania.

The statistics of persons killed and injured on the railways of Pennsylvania, as tabulated by the railway commission of that state, are of interest by reason of the arrangement of the classes of employees, which is different from that found in most statistical reports. We quote as follows:

During the year 1910 there were 1,364 persons killed and 14,083 injured on the steam and street railways of Pennsylvania. On the steam railways 1,117 lost their lives; on the street railways, 187. The roll of injured shows that 9,967 were hurt on the steam railways. Trespassers were the most frequent victims, 587 being killed. The statistics of employees show the following:

	Killed.	Injured.
Section men and work train employees	120	1,352
Brakemen	112	2,490
Firemen	33	964
Conductors	31	578
Flagmen	21	213
Repairmen and inspectors	21	168
Track walkers	18	27
Yard crews	16	341
Engineers	10	528
Crossing watchmen	5	14
Carpenters	4	126
Freight handlers	3	580
Baggagemen	2	75
Car cleaners	1	83
Miscellaneous	40	469
Total	437	8,008

Of the total fatalities (1,177), 44 were killed in collisions, 85 at grade crossings, 28 by derailment; . . . struck by overhead or side obstruction, 17; repairing track or roadbed, 4; handling freight or baggage, 3; coupling or uncoupling cars, 15; falling from locomotive or cars, 111; jumping on or off locomotives or cars, 77; struck by locomotives or cars, 728; miscellaneous, 46.

It will be observed that though the total number of section men and work-train employees killed was 120, the number killed in repairing track was only 4; indicating apparently that the greater part of the 120 fatalities happened when the victims were not actually at work.

Earnings of United States Steel Corporation.

The statement of the United States Steel Corporation for the quarter ended December 31, was far below expectations in earnings, which were reported as $25,990,978. This was at the rate of approximately $104,000,000 a year, a figure barely in excess of dividend requirements at the rate of 7 per cent. on the preferred and 5 per cent. on the common, and other annual deductions. Surplus net income for the quarter, after all deductions, including sinking funds, depreciation and dividends, was only $408,032, or at the rate of approximately $1,600,000 a year. The annual dividend requirements on common stock of the corporation amount to approximately $25,000,000. From the foregoing figures it is evident that the earnings for the last quarter of 1910 were only a shade in excess of common dividend requirements. The total earnings of $25,990,978 for the quarter ended December 31 compare with earnings of $40,982,746 in the last quarter of 1909; $26,246,674 in the last quarter of 1908. The net earnings in the fourth quarter of 1910 were lower than in any previous quarter since the organization of the corporation, with the exception of 1903 and 1904. Earnings by months from October to December, inclusive, reflect the depressed condition of the steel industry in that quarter. For example, earnings in October aggregated a total of $10,512,000; November, $8,228,000 and December, $7,249,000. The unfilled orders on hand at the close of December 31, 1910, amounted to 2,674,757 tons as compared with 5,927,031 tons on hand, December 31, 1909. After the meeting Judge Gary gave out the following statement: Thomas Morrison, of Pittsburgh, tendered his resignation as a member of the board of directors, thereby creating a vacancy and in his place we elected James A. Farrell. Also we accepted the resignation of W. E. Corey as president and elected to succeed him Mr. Farrell.

Proposed Improvements at Boston.

The Joint Board of Metropolitan Affairs, including the Railroad, Harbor, and Public Land, Boston Transit and Metropolitan Park Commissions, reporting to the Massachusetts Legislature, recommends a tunnel between the North and South terminal stations (as proposed by the New Haven road), the construction of a new highway over the proposed tunnel, development of the East Boston flats, larger piers, and better railway and steamship

terminal facilities in South Boston, a large number of improvements in the metropolitan district, and various improvements in the Charles River basin. In its recommendations regarding a tunnel between the terminal stations the report says that the cost of taking 158 estates, which fall in the line of the proposed highway, will total $9,885,750. The report declares against recommending legislation for the electrification of steam railways; but a strong minority, including the railroad commissioners and George G. Crocker, former railroad commissioner are said to have been in favor of taking action looking to compulsory electrification.

World's Production of Steel.

The following tables were compiled by the British Board of Trade to show what part each country took in the world's output of steel in 1909:

Country.	Total production 1909. Tons.	Per head. Tons.
United States	23,955,000	0.27
Germany	11,856,000	0.18
United Kingdom	6,610,000	0.15
France	3,020,000	0.08
Russia	†	†
Austria-Hungary	1,909,000	0.038
Belgium	1,606,000	0.22
Canada	685,000*	0.10*
Sweden	308,000*	0.06*
Spain	223,000*	0.011*

* Provisional figures. † Figures not yet available.

United States.

Description of steel produced, in thousands of tons.	1907.	1908.	1909.
Open hearth:			
Acid	1,270	696	1,077
Basic	10,279	7,140	13,417
Total	11,549	7,836	14,494
Bessemer:			
Acid	11,668	6,117	9,331
Basic	.....	.....	.....
Total	11,668	6,117	9,331
Other sorts	146†	70†	130†
Total output	23,363	14,023	23,955

† Chiefly crucible steel.

Germany.

Description of steel produced, in thousands of tons.	1907.	1908.	1909.
Open hearth:			
Acid	209	145	225
Basic	3,975	3,792	3,782
Total	4,184	3,937	4,007
Bessemer:			
Acid	381	368	149
Basic	7,097	6,406	7,397
Total	7,478	6,774	7,546
Other sorts	208*	296*	303
Total output	11,870	11,007	11,856

*Steel castings, also crucible and electric steel in 1908.

United Kingdom.

Description of steel produced, in thousands of tons.	1907.	1908.	1909.
Open hearth:			
Acid	3,385	2,579	2,763
Basic	1,278	1,238	1,385
Total	4,663	3,817	4,148
Bessemer:			
Acid	1,280	907	1,111
Basic	579	572	622
Total	1,859	1,479	1,733
Other sorts	.....	45	729‡
Total output	6,522	5,341	6,610

‡ Mild steel.

The Commerce Court.

The senate on Tuesday last confirmed Messrs. Hunt, Archbald, Mack and Carland, as judges of the Commerce Court. This long delay on the part of the senate has been due to the fact that opposition was made in the committee against Judge Hunt, on the ground, it is said, that senators had found fault with some of his decisions as judge in Montana, but there was no opposition when the vote came to be taken in the senate. Judge Knapp was confirmed before the holiday recess, so the court can now organize.

Railway Securities Commission at Chicago.

The Hadley commission on the regulation of the issuance of railway securities finished its hearing in Chicago late last week. George M. Reynolds, president of the Continental and Commercial National Bank of Chicago, favored federal rather than state regulation of securities. He said responsibility for successful railway enterprise should be borne by the investor, but he should have the advantage of enforced publicity of railway affairs. Railway undertakings, because of their beneficial influence on the sections they serve, should be given some latitude for increasing by good management their earnings above the general level, but less latitude than they have had in the past. The reasonableness of railway rates should be measured by some standard other than return on capitalization. Railways should share seasons of depression as well as of prosperity with other concerns. Railway securities are becoming more widely distributed in the West than ever before, Mr. Reynolds said, and if the West continues to be as prosperous in the next 25 years as it has been in the past 25 years, its people will participate as largely in the prosperity of the railways as those of the East. He did not think that railway securities will be popularized by limiting the roads to any given financial return. He thought it would be a difficult thing to regulate the prices at which railway securities should be sold, as the price at which they are acceptable to the public depends on supply and demand. Moreover, usually a railway built through a section which needs a railway cannot sell its securities at par, and, nevertheless, it contributes more to the section than is represented by the difference between the par value of the securities and the cash actually paid in for them. Many railway difficulties would be solved if the government would restrict the building of new lines to territory where they are needed, but this might be taken by the investing public as a guarantee of the soundness of enterprises which were approved of, and the government should not put itself in the position of giving any such guarantee.

Rufus C. Dawes, president of the Union Gas & Electric Company, defended the issuance of so-called "watered" stock as a necessary means to promoting many enterprises. Speaking of public utility corporations in general, Mr. Dawes said that he thought the government was justified in restricting their earnings to a fair return on the value of the property, but that he did not think the government should interfere to determine how the fair return should be divided between the capitalists participating in the enterprise. He used this illustration: Suppose the cash investment in a property is $75,000. The return on this at 6 per cent. would be $4,500. Suppose $50,000 of the investment is represented by bonds drawing 4 per cent., or $2,000 a year; $25,000 by preferred stock, paid for, like the bonds, at their par value; and $25,000 represented by common stock, issued as a bonus to the persons without money but possessing brains who are relied on to make the business successful. It would be said that $25,000 of this capitalization was watered. But Mr. Dawes pointed out that 4 per cent. on the bonds, 5 per cent. on the preferred stock and 5 per cent. on the common stock would total just $4,500 a year, or 6 per cent. on the actual cash investment of $75,000. The public, therefore, in the charges which it paid, would be allowing the investors and promoters only an average return of 6 per cent. on the actual investment, and he could not see that the public had any particular interest in the fact that some of the investors voluntarily accepted only 4 per cent. on their cash investment and others got 5 per cent. on no investment at all except ability. Mr. Dawes said: "I think the abolition of unpaid stock would impede the organization of corporations and impair the efficiency of their operations. I think it would also withdraw an opportunity heretofore held out to ambitious and enterprising men without money.

"If the duty of warning the public purchasers of stocks appears paramount, and it is believed their interest would be protected by such action, stock could be issued to an amount equal to the cash paid in and the companies permitted to issue additional stock without designating money value, but conferring on the possessor a fractional interest in the equity above the stock having a designated money value.

"This would perhaps clarify the situation. It would certainly fix the attention of purchasers to the essential interest purchased—namely, a proportionate part of the whole.

"Since the government exercises the power of regulation, and

since the government cannot guarantee earnings, the government must not interfere more than is necessary in the manner by which capital is attracted to enterprises.

"If it interferes in a manner to check the flow of capital to railway investment the cost of operation will increase and the power of regulation will not suffice to prevent the rise of freight rates."

John J. Mitchell, president of the Illinois Trust & Savings Bank, and a director in four railways, favored federal rather than state regulation of securities. He opposed forbidding roads to sell their stock below par, because the amount securities will bring is a matter of the credit of the road, the value of the security and the rate of interest.

Burton Hanson, general solicitor of the Chicago, Milwaukee & St. Paul, favored federal regulation of securities and said he was not sure but what it was entirely practicable. He said that if the issuance of securities by interstate carriers comes within the right to regulate interstate commerce he thought Congress could exercise that power to the exclusion of the states.

John H. Roemer, a member of the Wisconsin railway commission, declared in favor of federal in preference to state regulation of both railway securities and railway rates. He said that Wisconsin would not let states' rights interfere with federal regulation.

Charles G. Dawes, president of the Central Trust Company of Illinois, favored federal regulation, but opposed regulation which would prevent securities from being issued for less than par. He insisted that capitalization had actually nothing to do with the fixing of rates. He said:

"Watered stock is not only not necessarily unfair between stockholders but is often essential to the complete fulfillment of fair arrangements between them. This device, harmless and often necessary in itself, has, through its association with efforts of corporations and individuals to dispose of stocks at fictitious prices, come to be widely condemned. So immensely large is the volume of watered stock in this country, issued alike by large and small corporations, that it would seem even to a prejudiced observer that it must subserve at least some good uses, because if it were wholly wrong it would be inconceivable that business men should so generally sanction it. Stock in the modern corporation represents not only ownership, but the location of control. Varying values in corporation assets are reflected in the selling or market price of the stock. Dishonest men may and do to some extent use watered stock to create impressions of values which do not exist, but the abolishment of watered stock would not materially hinder them.

"The proposed laws to reform corporations should not interfere with capitalization except to prevent fraud, and fraud is not inherently involved in watered stock. They should recognize that appraisement of property through stock issues does not mean realization on them. It is not the water in the stock that causes the chief trouble among the unwary investors. It is the water in the price they pay for it."

John Moody, of New York, said that "capitalizing American prosperity had put the railways between the devil and the deep sea." If a fundamentally sound system of financial management were adopted forthwith it would make necessary an immediate charge of higher freight rates if dividend payments were not to be impaired. He said the roads are inflating capitalization on a basis of present earning power, and if they continue to do this they will be "up against it" in the course of a few years. While the Interstate Commerce Commission prescribes excellent methods for keeping accounts, providing for the setting aside of a depreciation account for the constant renewal of wornout property, it does not have the power to force the roads actually to set aside such a fund. As a result, the roads generally are not paying much attention to the requirement. The tendency is to buy equipment with new capital and this unnecessarily increases capitalization. He said that if the Interstate Commerce Commission did not insist on full compliance with the requirement for putting aside adequate renewal sums out of earnings and the expenditure of sufficient funds from earnings for proper maintenance, the strong roads would pay less dividends, the weaker roads would be financially embarrassed and some probably would be driven into bankruptcy.

W. D. Williams, a member of the Texas railway commission, opposed federal regulation of railway securities. The states, he said, are in a better position to regulate the railways than the national government. Mr. Williams was confident watering of stock is harmful to railways and the public, but he is opposed to the federal government preventing it.

The discussions contributed by Frank Trumbull, of the Chesapeake & Ohio, and W. H. Williams, of the Delaware & Hudson, are given elsewhere in this issue.

Proposed Railway Legislation in Illinois.

The text of the bill for the amendment of the Illinois railway commission act, which has the backing of Governor Deneen, has been made public. The bill gives the railway commission jurisdiction over all common carriers and the term "common carrier" is made to include railways, express companies, steamship lines, private car lines, sleeping car companies, fast freight lines and all other persons or corporations engaged in operating any agency for public use in the conveyance of persons or property. The term "transportation" is made to include not only the actual act of transportation but all services performed in connection with it, such as refrigerators, storage, etc. The commission is given substantially the same jurisdiction over state business that the Interstate Commerce Commission has over interstate business, and, in addition, the regulation of security issues is provided for by the following provision:

"Sec. 14. No increase in the capital stock or the bonded indebtedness or any fixed indebtedness by any common carrier shall be created without application first being made to said commission. Upon said application being made the commission may employ competent experts to investigate the character, cost and valuation of the property of such common carrier and its present indebtedness and liabilities and the necessity for the proposed increase of capital stock or bonded indebtedness or other liability, and after such investigation shall determine whether or not such stock shall be issued or such bonded debt or other liability be created.

Quebec Bridge Loss $7,154,987.

The total cost of the wreck of the Quebec Bridge was disclosed in Parliament, at Ottawa this week. The cost of the wreck to date was stated by the Minister of Railways to be $7,154,987, but he estimates that the value of the unused steel on hand is $300,000. He said also that a number of bids for the new bridge had been submitted, but that it was not in the public interest to disclose them at present. There is a difference of opinion existing among the members of the new bridge commission, who have agreed to submit their differences to M. J. Butler, of the Dominion Steel Corporation, and W. H. Hodge, of New York.

The Railway Appliances Association.

A supplementary list of exhibitors at the exhibition of railway appliances to be given by the Railway Appliances Association during the week of the convention of the American Railway Engineering and Maintenance of Way Association, March 20 to 24, in addition to the list published in the *Railway Age Gazette* of December 16, page 1158, is given below. The available space is almost entirely reserved, but a few good locations are still vacant on the balcony. A working model of the Brennan monorail system will be in daily operation on a cable over the balcony, and it is expected that this will prove one of the most novel and interesting features of the exhibit. The exhibition this year will be larger and will contain more interesting features than any held in previous years.

American Railway Steel Tie Co., Altoona, Pa.
Burroughs Railway Nut Lock Co., Decatur, Ga.
Ceresit Waterproofing Co., Chicago.
Chicago Pneumatic Tool Co., Chicago.
Philip Carey Company, Cincinnati, Ohio.
W. P. Collins & Co., Chicago.
Concrete Form & Engine Co., Detroit, Mich.
Conley Frog & Switch Co., Memphis, Tenn.
Continuous Rail & Safety Switch Co., St. Louis, Mo.
Detroit Steel Products Co., Detroit, Mich.
Engineering News, New York.
Heath & Milligan Manufacturing Co., Chicago.
C. W. Hunt Company, West New Brighton, N. Y.
Iowa Gate Company, Cedar Falls, Iowa.
O. N. Kelly, Salt Lake City, Utah.
Nachod Signal Co., Philadelphia, Pa.
National Roofing Co., Tonawanda, N. Y.
Standard Scale & Supply Co., Pittsburgh, Pa.
Sterling Varnish Co., Pittsburgh, Pa.
Strauss Bascule Bridge Co., Chicago.
Waughn Rail Support Co., St. Louis, Mo.
Weir & Craig Manufacturing Co., Chicago.
Western Electric Company, Chicago.
Whyte Railway Signal Co., Toronto, Ont.

Canadian Railway Club.

The ninth annual dinner of the Canadian Railway Club was held at the Windsor Hotel, Montreal, Que., Friday evening, January 27, with an attendance of about 150. The toast "The Railways" was responded to by D. Crombie, assistant to the vice president of the Grand Trunk, who replied to various criticisms of the railways. In Montreal, however, the relations between the railways and the public are amicable, the press being in touch with the railway managements. Other speakers were C. J. Phillips, H. H. Vaughan, Dean Adams, of the McGill University; E. M. Tewkesbury, and G. Pearsall. From the business men present the expressions concerning the business outlook for the present year were decidedly hopeful.

Air Brake Association.

The eighteenth annual convention of the Air Brake Association will be held at the Auditorium Hotel, Chicago, May 23 to 26, 1911. W. S. Bartholomew, 1545 Railway Exchange building, Chicago, is general chairman of the committee on arrangements. The following subjects will be discussed: Air Brake Instruction, Rating; Brake Cylinders and Connections; Adequate Braking Power for Freight Cars; Cost of Maintenance of Locomotive Brakes; Running Triple Valves Without Lubricant; Fibre Stresses in Brake Gear Parts; PC Equipment, lecture illustrated by stereopticon views; Steel Pipe *versus* Iron Pipe Recommended Practice; Topical Subjects; Friction of New and Worn Brake Shoes on New and Worn Cast Wheels; Breaking-in-two of Trains.

The Canadian Society of Civil Engineers.

At the meeting of the general section of the Canadian Society of Civil Engineers, held on February 2, at Montreal, Que., a paper on Aesthetics in Bridge Design, was read by the author, Prof. C. R. Young, A.M. Can. Soc. C.E., of the University of Toronto.

American Society of Mechanical Engineers.

At the next meeting of the American Society of Mechanical Engineers, to be held February 14, in New York, John Calder, manager of the Remington Typewriter Works, Ilion, N. Y., will present a paper on The Prevention of Industrial Accidents.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911; St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo., 3d Friday in Month; Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911; Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The managers of the New York Produce Exchange have taken action looking to the establishment of a freight bureau, at the head of which will be a traffic expert.

The Railroad Commission of Nevada has complained to the Interstate Commerce Commission that the railways of that state refuse to obey a finding of the state commission, handed down last August, reducing freight rates.

The Cartens Packing Company, of Tacoma and Seattle, has complained to the Interstate Commerce Commission, asking for a reduction of 50 per cent. in the rates on live cattle from points in Colorado, Wyoming, Montana, Utah, Idaho and Oregon. The present rates are alleged to give unreasonable advantage to shippers in Chicago, Kansas City and Omaha.

The Indiana Manufacturers' & Shippers' Association has complained to the Indiana railway commission about the increases in coal rates which became effective on December 1 and December 19. Its petition names several towns and cities which, it is alleged, are injured, and sets out that the old rate of 60 cents a ton to points in the gas belt was satisfactory, but alleges that the new rate of 65 cents is unjust.

The Land and Industrial Department of the Southern Railway reports increased production of alfalfa in widely separated districts. In Washington county, Mississippi, a field of 28 acres seeded in the fall of 1909 produced 168.8 tons at a cost of $593. Estimating this hay to be worth $15 a ton in the barn, the profit was $1,940 on the 28 acres, the hay costing only $3.47 per ton. Reports from the Delta show that about 50 farmers are now growing alfalfa with success. At Newport in east Tennessee, five tons an acre has been reported, and the price is $22 a ton.

F. C. Donald, commissioner of the Central Traffic Association, has denied in an interview that the roads belonging to this association have refused to sell tickets to Europe by the vessels of independent steamship companies. Mr. Donald says that it has been the practice for years for railways to pay a 10 per cent. commission to steamship companies which sell railway tickets to immigrants. The agents always are instructed to see that passengers exercise their own judgment in selecting the railway over which to travel. All that the railways have done is to refuse to deal with any except responsible persons.

The Pullman Company put into effect general reductions in sleeping car rates on February 1. The reductions, as previously announced in this paper, range from 25 cents to $1 on lower berths for a considerable proportion of all the long-distance runs, and make the rates for upper berths 20 per cent. lower than for lower berths, on all routes. Some of the rates for lower berths are $1.75, $2.25, etc., instead of being all in even half-dollars as heretofore. Rates for upper berths in tourist cars are reduced 20 per cent. as compared with lowers, which are not changed; minimum upper berth rate $1.

The railway commissions of Michigan, Indiana and Ohio have joined in a petition to the Interstate Commerce Commission asking that the roads in the official classification territory be required to add one or more classes to the six now in use in the classification of freight, and that said classes be so proportioned and arranged that the rates applicable on commodities named in the lowest class shall not exceed 10 per cent. of the first class. The petition says that by reason of the great variance in the weight, bulk and value of the commodities the six classes now in use are inadequate and insufficient, and that many cheap and heavy commodities are entitled to be carried at a less charge than the sixth class rates.

Officers of the Union Pacific and the Atchison, Topeka & Santa Fe talked on railway rates to a meeting of about 300 business men of Denver in that city on January 25. Among the speakers were J. A. Munroe, freight traffic manager of the Union Pacific; E. L. Copeland, secretary and treasurer of the Santa Fe, and J. R. Koontz, general freight agent of the Santa Fe. W. W. Hall, president of the Denver branch of the American Railway Employees' & Investors' Association, also spoke. Mr. Munroe and Mr. Koontz were subjected to a fire of questions, some of them being from George J. Kindel, the well known Denver rate champion. According to the reports in the Denver newspapers, Mr. Kindel met his match and more when he tackled these two experienced traffic officers.

The Maine Steamship Company has filed a certificate of increase in capital stock from $350,000 to $2,150,000, and announces that the company will acquire the steamers Bunker Hill, Massachusetts and Old Colony, which boats will take the place of the Harvard and Yale on the run between New York and Boston. The Maine Steamship Company is controlled by the New York, New Haven & Hartford. The three boats are being overhauled so as to carry passengers, and will be ready for service June 1. The outside line between New York and Boston will be operated under the name of the Maine Steamship Co.—Metropolitan Line. The New York and Portland run will be operated by the Maine Steampship Co.—Portland Line. The Metropolitan Steamship Company will lose its identity as a passenger line as its operations in the future will be confined to carrying freight.

New York and Montreal Wheat Exports.

Hon. Charles A Prouty, Interstate Commerce Commissioner, took testimony in New York City this week on the complaint of the New York Produce Exchange concerning freight rates on grain from Lake Erie to New York City. The grain men declare that the export trade of New York has been largely diverted to Montreal, and it is charged that the tariffs of the railways to New York discriminate against grain coming from Minnesota and other western states by lake, in favor of grain coming from Canada. In the summer of 1903 the rate on wheat from Buffalo was raised from 4 cents a bushel to 5 cents, and since that time Montreal has been getting the lion's share. Last year the rate from Buffalo on wheat for domestic points was 6.5 cents a bushel, and for export, 5.5 cents; while on Canadian grain, brought through in bond, for export, it was 4 cents. In spite of this, Montreal got 75 per cent. of all the wheat exported from the United States to transatlantic ports. The following figures were presented:

Wheat Exports During Season of Navigation 1906-1910.
(United States and Canadian Government Figures.)

	(Bushels) Exported from New York		
Year.	Produced in U. S.	Produced in Canada.	Total.
1906	10,454,682	2,237,019	12,691,701
1907	15,252,783	2,622,917	17,875,700
1908	13,902,028	2,309,890	16,211,918
1909	7,411,214	1,836,699	9,247,913
1910	1,303,696	4,732,725	6,036,421

	(Bushels) Exported from Montreal				Aver. rate per bu., Buffalo to N. Y.
Year.	Produced in U. S.	*Per cent.	Produced in Canada.	Total.	
1906	949,155	8.3	12,893,431	13,842,586	4.58
1907	4,774,267	23.8	13,347,742	18,122,009	5.5
1908	10,908,195	43.9	19,553,152	30,461,347	5.5
1909	10,731,498	59.1	14,300,137	25,031,635	5.1
1910	3,882,885	74.9	16,537,149	20,420,034	5.5

*Percentage via Montreal of the total of United States wheat exported from the two ports.

It was said that vessels from New York now ballast with water, where formerly they carried grain.

A representative of the International Mercantile Marine Company said that in 1909 the steamers of his company did not carry any grain to Europe; and lately, because of the falling off in the exports of wheat and cattle, two steamers had been withdrawn from the New York service, while several had been added to the Montreal line. The Hamburg-American line also showed that the amount of grain carried by it to Hamburg in 1910 was only 60 per cent. of the amount carried in 1909.

Traffic Club of Chicago.

The annual dinner of the Traffic Club of Chicago took place at the La Salle Hotel on Wednesday evening, January 26. Judge Peter S. Grosscup, of the United States Circuit Court, an honorary member of the club, was toastmaster, and speeches were made by J. Adam Bede, formerly a congressman from Minnesota, and Charles F. Moore, of New York. Neither of the speeches dealt very specifically with railway matters, being of a facetious nature. Judge Grosscup commented, in introducing one of the speakers, on the inconsistency between the Interstate Commerce act and the Sherman act. He said that on one page of the

statute books the Interstate Commerce act says that railways must not discriminate, but that when the railway man turns over a leaf to the next page he finds a provision which says that for railways to agree to prevent discrimination is criminal conspiracy. The dinner was attended by about 500 persons.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways, in presenting statistical bulletin No. 87A, giving a summary of car shortages and surpluses by groups from September 29, 1909, to January 18, 1911, says:

"The surplus totals 122,297 cars, an increase during the two weeks of 11,865 cars.

"The increase in surplus coal cars is 11,310, while the box car surplus decreased 832 cars, the latter due chiefly to the increased demand for this class in groups 6 (Northwestern), 10 (Pacific), and 11 (Canadian). In the latter group, a surplus of 4,771 cars reported two weeks ago has been almost entirely wiped out.

"The shortage shows a slight reduction, although there are some increases in the box car shortage in Groups 6 (Northwestern) and 11 (Canadian)."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report, the charts show total surpluses and shortages in 1907, 1908, 1909, 1910 and 1911.

INTERSTATE COMMERCE COMMISSION.

One of the Western lines recently wrote to the Interstate Commerce Commission that it desired to insert a clause in its tariffs providing that "employees of private cars (owned or chartered by the parties using them) namely, cooks and porters in service (not private service), will be regarded as train employees and carried free." The commission replied that the provision proposed is not considered by the commission to be legal; that the servants which the act permits to be carried free are only such as are fairly to be included in the word "family," and that other private servants cannot be brought within the provisions of the act by being regarded as train employees when such is not in fact the case.

Reparation Awarded.

Barrett Mfg. Co. v. C., M. & St. P. Opinion by Chairman Clements.

Rate of 70 cents minimum carload 30,000 lbs., on mixed carload shipments of building and roofing paper, saturated felt, etc., found unreasonable to the extent it exceeded 63 cents, minimum weight 40,000 lbs. Reparation awarded. (20 I. C. C., 79.)

Ephrata Not Discriminated Against.

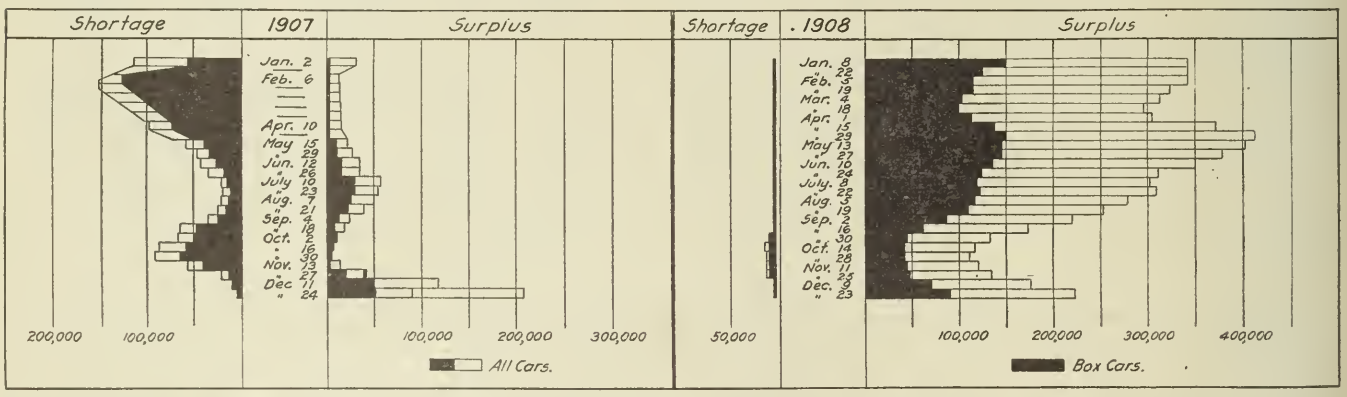
American Cigar Co. v. P. & R.

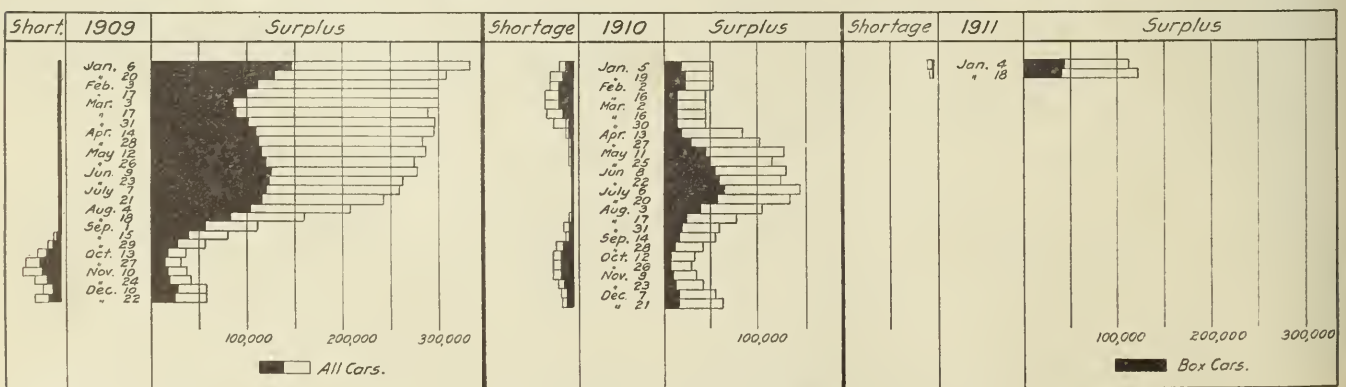
Existence of commodity rate of 21 cents on tobacco in carloads,

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—January 18, 1911	8	379	1,539	1,770	165	3,853	2	0	0	90	92
" 2.— " 18, 1911	22	7,422	666	8,960	6,544	23,592	0	0	25	14	39
" 3.— " 18, 1911	24	6,465	1,270	21,089	3,469	32,293	0	125	0	368	493
" 4.— " 18, 1911	10	3,110	286	672	1,413	5,481	0	50	328	0	378
" 5.— " 18, 1911	17	1,986	549	1,423	656	4,614	0	75	0	0	75
" 6.— " 18, 1911	21	6,634	1,345	4,508	4,738	17,225	395	6	10	150	561
" 7.— " 18, 1911	3	208	274	1,083	539	2,104	45	0	0	2	47
" 8.— " 18, 1911	15	4,056	358	3,229	2,538	10,181	4	0	0	2	6
" 9.— " 18, 1911	11	3,417	357	543	858	5,175	0	0	0	0	0
" 10.— " 18, 1911	19	4,821	2,466	2,494	7,486	17,267	5	0	0	43	48
" 11.— " 18, 1911	4	31	252	22	207	512	264	253	0	221	738
Total	154	38,529	9,362	45,793	28,613	122,297	715	509	363	890	2,477

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1910. (SEE ALSO ISSUES JANUARY 13, 20 AND 27.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$103,180	$44,814	$159,036	$22,011	$31,028	$3,200	$53,313	$4,308	$113,860	$45,176	—$346	$5,290	$39,540	—$20,059
Ann Arbor	301	128,747	38,341	178,585	23,843	19,076	3,471	56,202	6,570	109,162	69,423	1,395	14,265	56,553	16,752
Arizona Eastern	347*	88,758	33,534	131,475	24,057	12,662	1,877	40,159	3,273	82,028	49,447	.....	6,944	42,503	—36,624
Atlantic City	166	66,076	42,347	113,857	25,795	15,061	1,915	68,688	785	112,245	1,612	—3,120	7,000	—8,507	9,050
Carolina, Clinchfield & Ohio	237	136,588	10,604	150,453	15,394	19,510	5,424	32,548	7,472	80,348	70,105	.....	5,500	64,605	38,958
Carolina, Clinchfield & Ohio of S. C.	18	7,058	1,613	8,898	460	36	923	2,451	410	4,280	4,618	.....	200	4,418	—
Charleston & Western Carolina	340	139,892	34,802	182,071	30,654	23,332	3,301	56,959	4,131	118,377	63,694	.....	4,475	59,219	14,936
Chesapeake & Ohio of Indiana	284	105,205	20,619	132,326	35,988	23,839	5,895	72,378	4,875	142,976	—10,650	.....	3,790	—14,440	—
Chicago & North Western	7,734†	4,603,075	1,528,911	6,728,749	826,689	778,002	94,104	2,746,665	132,454	4,577,914	2,150,835	—8,267	287,000	1,855,568	30,163
Chicago, Peoria & St. Louis	255	126,656	23,834	159,192	21,121	33,090	7,212	78,078	5,955	145,456	13,736	.....	4,500	9,236	—26,513
Cincinnati Northern	248	93,061	14,600	112,921	14,270	17,130	3,960	43,913	2,837	82,110	30,811	.....	4,500	26,311	12,151
Cleveland, Akron & Columbus	212	182,252	44,954	241,703	43,584	35,470	2,693	78,685	3,384	163,816	77,887	.....	13,000	64,887	6,900
Colorado Midland	338	151,245	24,324	195,472	23,991	42,943	5,501	84,021	5,674	162,130	33,342	—777	8,500	24,065	—55,748
Detroit, Grand Haven & Milwaukee	190	109,456	38,470	173,320	18,666	24,157	5,460	80,781	3,928	132,992	40,328	—39	3,009	37,280	—22,176
Detroit, Toledo & Ironton	441	137,547	13,045	164,315	33,540	25,898	2,637	89,030	5,673	156,778	7,537	—1	6,712	824	—1,274
Hocking Valley	350	562,513	69,254	675,078	117,737	98,920	8,982	211,206	13,554	449,499	225,579	.....	29,725	195,854	—62,968
International & Great Northern	1,159	633,527	194,426	878,036	115,305	125,280	20,405	333,130	21,597	615,717	262,319	—99	22,000	240,220	26,858
Iowa Central	559	255,956	41,801	311,694	35,983	48,834	6,305	128,371	8,711	228,204	83,490	.....	9,794	73,696	—12,330
Kanawha & Michigan	175	228,543	27,069	261,078	27,833	52,173	2,047	74,809	6,927	163,789	97,289	—31	7,800	89,458	10,170
Kansas City, Mexico & Orient	740	139,548	37,348	186,812	36,477	33,079	8,478	76,817	7,481	162,352	24,480	.....	2,705	21,775	—4,720
Lehigh Valley	1,432	2,829,133	324,399	3,271,262	317,324	529,031	76,631	1,066,182	60,348	2,049,516	1,221,746	—7,419	94,600	1,119,727	—252,698
Louisiana Ry. & Nav. Co.	350	130,832	21,376	166,442	29,904	18,061	5,838	67,214	6,850	127,867	38,575	.....	4,400	34,175	17,846
Louisiana Western	207	119,990	54,897	185,096	18,094	24,163	5,774	55,328	7,803	111,162	73,934	159	6,077	68,016	—4,303
Minneapolis & St. Louis	1,027	322,676	89,281	439,635	56,222	54,961	8,230	185,691	13,605	318,709	120,926	—79	21,428	99,419	—59,823
Missouri, Kansas & Texas	1,737	1,198,493	418,577	1,707,224	197,516	233,835	35,522	522,682	41,427	1,030,982	676,242	—1,357	34,500	640,385	—
Missouri, Kansas & Texas of Texas	1,348	755,342	339,207	1,154,549	131,859	66,073	21,825	491,970	38,040	749,767	404,782	2,183	22,500	384,465	202,784
Missouri Pacific	3,920‡	1,514,905	364,811	2,098,464	367,809	370,071	56,808	990,409	67,951	1,853,049	245,415	—3,045	83,500	158,870	—316,469
Morgan's La. & Texas R. R. & S. S. Co.	348	455,263	90,431	582,401	52,508	49,422	10,200	177,823	13,810	303,763	278,638	—4,819	17,756	256,063	7,779
New Orleans & North Eastern	196	257,575	46,565	323,568	31,905	57,694	8,195	114,843	11,403	224,040	99,528	32	9,750	89,810	—7,422
Oregon & Washington	244§	82,679	69,366	157,560	13,030	6,560	12,758	65,960	3,680	101,988	55,572	—1,447	3,300	50,825	51,769
St. Louis, Iron Mtn. & Southern	3,316¶	1,963,322	482,324	2,642,675	349,831	345,151	58,401	805,664	74,213	1,633,260	1,009,415	—2,601	78,916	927,898	—41,595
Santa Fe, Prescott & Phoenix	364‖	107,568	39,828	155,271	22,698	14,758	2,453	46,358	5,915	92,182	63,089	.....	100	62,989	—2,251
Spokane, Portland & Seattle	433	200,205	76,483	307,726	38,030	17,949	4,277	104,347	9,831	174,434	133,292	—1,324	38,500	93,468	40,056
Tennessee Central	294	92,793	27,282	126,777	21,633	14,780	4,917	41,127	8,108	90,565	36,212	.....	3,980	32,232	—9,378
Toledo & Ohio Central	444	415,324	50,534	491,528	63,315	61,924	5,671	157,044	8,681	296,635	194,893	.....	18,548	176,345	14,453
Vicksburg, Shreveport & Pacific	171	80,457	45,109	137,660	19,688	20,939	3,255	38,545	4,314	86,741	50,919	—233	4,675	46,011	12,462
FIVE MONTHS OF FISCAL YEAR 1911.															
Alabama & Vicksburg	143	$482,803	$215,957	$753,210	$97,455	$123,661	$18,664	$251,269	$25,753	$516,802	$236,408	—$258	$22,850	$213,300	$14,702
Ann Arbor	301	543,898	241,805	839,656	117,852	96,169	20,096	275,204	32,525	541,846	297,810	12,388	71,326	238,872	19,017
Arizona Eastern	347*	474,765	164,200	688,261	125,466	63,013	9,554	194,743	21,048	413,824	274,437	.....	28,044	246,393	—36,128
Atlantic City	166	338,746	712,481	1,099,611	125,955	56,870	17,543	476,112	7,442	683,922	415,689	—27,101	35,000	353,588	64,437
Carolina, Clinchfield & Ohio	237	541,378	77,624	640,479	62,167	91,617	26,735	136,915	39,919	357,353	283,126	.....	27,500	255,626	132,500
Carolina, Clinchfield & Ohio of S. C.	18	27,800	7,335	36,600	2,920	259	4,570	11,282	2,578	21,609	14,991	.....	1,000	13,991	—
Charleston & Western Carolina	340	547,128	160,716	744,469	142,468	103,576	16,388	243,862	19,268	525,562	215,907	.....	22,375	193,532	46,228
Chesapeake & Ohio of Indiana	284	507,354	148,103	690,012	159,815	109,403	32,851	326,694	23,510	652,273	37,739	.....	18,950	18,789	—
Chicago & North Western	7,735†	22,568,294	9,027,396	34,479,078	5,261,063	3,871,425	552,101	13,203,887	668,969	23,557,445	10,921,633	2,379	1,335,000	9,589,012	—842,865
Chicago, Peoria & St. Louis	255	610,010	153,132	801,174	122,801	154,415	35,601	338,608	28,268	679,693	121,481	.....	22,500	98,981	—62,502
Cincinnati Northern	248	456,273	112,652	597,368	89,702	121,120	17,874	215,030	14,980	458,706	138,662	.....	22,500	116,162	—28,471
Cleveland, Akron & Columbus	212	874,535	271,456	1,217,791	236,701	182,998	15,641	384,129	18,851	838,320	379,471	.....	42,000	337,431	57,613
Colorado Midland	338	680,739	170,441	953,634	127,685	193,592	27,509	387,107	28,141	764,034	189,600	—1,217	42,500	145,883	—94,947
Detroit, Grand Haven & Milwaukee	190	461,492	277,158	858,135	138,515	100,919	30,830	392,386	21,278	683,928	174,207	—59	15,045	159,103	—82,798
Detroit, Toledo & Ironton	441	752,116	81,306	899,834	158,585	157,838	14,631	433,586	27,724	792,364	107,470	—74	33,560	73,836	—2,141
Hocking Valley	350	2,961,017	414,783	3,621,048	451,513	505,319	45,316	1,054,855	76,645	2,133,648	1,487,400	.....	149,685	1,337,715	—1,282
International & Great Northern	1,159	3,016,033	928,659	4,197,873	600,471	576,499	96,107	1,537,338	106,369	2,916,784	1,281,089	—1,288	108,000	1,171,801	389,442
Iowa Central	559	1,173,307	261,053	1,500,181	190,864	270,202	36,273	587,509	44,940	1,129,788	370,393	.....	48,927	321,466	—51,916
Kanawha & Michigan	175	1,253,072	161,386	1,443,086	159,042	248,365	12,353	375,392	31,994	827,146	615,940	—70	40,036	575,834	198,152
Kansas City, Mexico & Orient	740	588,863	208,218	841,584	161,794	170,821	37,945	375,834	38,930	785,324	56,260	.....	22,572	33,688	—72,797
Lehigh Valley	1,432	12,922,320	2,206,157	15,680,343	1,674,213	2,563,671	434,876	4,871,333	314,148	9,858,241	5,822,102	—119,395	465,800	5,236,907	—563,995
Louisiana Ry. & Nav. Co.	350	541,444	102,736	712,971	132,395	85,462	24,690	286,095	30,219	558,861	154,110	.....	22,000	132,110	41,791
Louisiana Western	207	552,775	261,348	854,088	81,612	127,356	30,452	247,053	36,386	522,858	331,230	1,443	30,385	302,288	—35,205
Minneapolis & St. Louis	1,027	1,618,094	600,900	2,365,077	271,190	284,181	56,609	878,599	69,537	1,560,116	804,961	—195	102,718	702,048	—115,300
Missouri, Kansas & Texas	1,737	5,132,092	2,094,440	7,690,120	1,092,506	1,127,463	181,080	2,475,810	220,550	5,097,410	2,592,710	—55	274,626	2,318,029	—
Missouri, Kansas & Texas of Texas	1,348	3,156,535	1,662,301	5,095,853	774,949	311,378	115,854	2,120,811	170,136	3,493,128	1,602,725	—2,733	112,500	1,487,492	243,600
Missouri Pacific	3,920‡	8,070,423	2,205,900	11,387,477	1,835,613	1,809,542	308,631	4,768,769	351,369	9,073,924	2,313,553	—11,423	417,500	1,884,630	—
Morgan's La. & Texas R. R. & S. S. Co.	348	1,486,140	480,233	2,084,567	288,133	252,633	54,321	721,468	66,583	1,383,138	701,429	—12,294	88,780	600,355	—11,855
New Orleans & North Eastern	196	1,113,704	260,019	1,463,204	144,528	224,317	46,059	511,160	53,821	979,885	483,319	—219	42,750	440,350	18,820
Oregon & Washington	244§	405,178	381,967	821,416	66,635	26,245	50,992	331,123	19,714	494,709	326,707	—5,588	16,500	304,619	305,869
St. Louis, Iron Mtn. & Southern	3,316¶	8,354,739	2,556,508	11,848,025	1,870,884	1,673,942	285,497	4,078,834	378,174	8,287,331	3,560,694	—13,190	392,580	3,154,924	—536,918
Santa Fe, Prescott & Phoenix	364‖	471,777	183,020	700,536	124,003	64,623	13,273	221,997	27,352	451,248	249,288	.....	501	248,787	—21,960
Spokane, Portland & Seattle	433	1,566,635	444,541	2,118,617	230,356	134,530	19,337	551,785	47,861	983,869	1,134,748	—2,723	159,100	972,925	493,833
Tennessee Central	294	429,496	178,334	645,182	92,005	59,409	24,936	188,082	39,954	404,386	240,796	.....	19,900	220,896	9,393
Toledo & Ohio Central	444	2,025,458	315,025	2,477,408	316,896	309,024	33,488	742,281	40,916	1,442,605	1,034,803	.....	81,263	953,540	243,363
Vicksburg, Shreveport & Pacific	171	389,536	209,970	646,328	89,075	110,041	17,543	190,624	22,188	429,472	216,856	—77	30,175	186,604	36,177

Mileage operated on November 30, 1909.—* 308 miles; † 7,638 miles; 660 miles; ‡ 3,881 miles; § 6 miles; ¶ 2,610 miles; ‖ 257 miles; — indicates Deficits, Losses and Decreases.

Lancaster, Pa., to Richmond, Va., did not result in undue discrimination against Ephrata, Pa., from which point class rate of 24 cents was in force. Overcharge found, and to be refunded without order. (20 I. C. C., 81.)

Ties Must Be Carried As Cheaply As Lumber.

Fullerton Powell Hardwood Lumber Company v. Virginia & Southwestern.

Rate charged on a carload shipment of cross-ties from Harvey, Va., to Muskegon, Mich., found to be unjust and unreasonable in so far as it exceeded the rate contemporaneously in effect between said points on lumber. (20 I. C. C., 86.)

"Midnight Tariffs."

Du Pont, etc., v. Depue & Northern.

Certain commodity rates, subsequent to the shipments herein involved, were made effective by defendant for one month only. Such reduced rates were effective via competing lines at time of shipments, but for limited time only. No proof presented as to reasonableness of rate. Reparation denied and complaint dismissed. (20 I. C. C., 83.)

Refusal to Establish Through Route.

Iola Portland Cement Company v. M. K. & T.

Although complainant knew of an existing through route and joint rate over the Atchison, Topeka & Santa Fe and Fort Worth & Rio Grande, it nevertheless routed shipments over the Missouri, Kansas & Texas and the Fort Worth & Rio Grande, the applicable published rates being a higher combination of intermediate rates; *Held,* That complainant is not entitled to reparation and that prayer for establishment of through route and joint rate over the Missouri, Kansas & Texas and Fort Worth & Rio Grande, upon supposition that such action is a necessary corollary to an award of reparation, should be denied. (20 I. C. C. 91.)

Fourth Section Not Violated.

Nebraska Material Company v. C. B. & Q.

Rate of 12 cents on common brick from Mound Valley, Kan., to Tecumseh, Neb., not found to have been unreasonable or unjustly discriminatory as compared with the rate of 8 cents to Lincoln, Neb., a point 48 miles more distant and on the same line. Tecumseh is a local station on the Chicago, Burlington & Quincy, about 48 miles southeast of Lincoln. The shipments moved over the St. Louis & San Francisco to Kansas City, thence to destination over the Burlington. Traffic carried from Mound Valley to Lincoln over this route passes through Tecumseh. The 8-cent rate to Lincoln was cancelled by defendants on January 4, leaving in force to those points a through rate of 11 cents made up of the combination of intermediate rates. The 12-cent rate to Tecumseh was legally effective at the date of these shipments, and is still in force. Defendants assert that the rate to Tecumseh is reasonable, and that the maintenance of a rate to Tecumseh higher than the rate to Lincoln and the other points mentioned was not prohibited by the fourth section of the act as it existed prior to June 18, 1910, because competitive conditions rendered transportation to the latter points substantially dissimilar from carriage to Tecumseh.

It appears that the Missouri Pacific Railway Company has lines reaching from points in the so-called Kansas gas belt, in the vicinity of Mound City, to Lincoln, which do not pass through Tecumseh. On January 1, 1907, that company reduced to 8 cents its rate on brick from the Kansas gas belt points to Lincoln. To obtain a share of the traffic the defendants made the same rates as the Missouri Pacific to competitive points such as Lincoln and Omaha, but they did not apply those rates to intermediate points on their lines. Nebraska City and Plattsmouth were given Omaha rates because they are junction points of the Burlington and the Missouri Pacific. Defendants say that they cancelled the 8-cent rate because it was unreasonably low for the service rendered and was considered unremunerative. Our conclusion is that th competitive conditions existing in respect of the transportation to Lincoln, Omaha, Plattsmouth, and Nebraska City were such that the maintenance of a higher rate to Tecumseh was not a violation of the fourth section of the act as interpreted by the courts previous to its recent amendment. Complaint dismissed. It must be understood that our decision in this case is without prejudice to any investigation which may be made under the present requirements of the fouth section. (20 I. C. C. 89.)

Action on Long and Short Haul Law Postponed.

An order has been issued by the commission to the effect that the long-and-short-haul clause of the revised law will not become effective until the commission has had an opportunity to pass on the merits of applications made by the carriers for relief. The order provides that the carrier may file with the commission such changes in their rates as may be necessary in the ordinary course of their business, "continuing under the present basis or adjustment higher rates or fares at intermediate points and through rates or fares higher than the combinations of intermediate rates or fares, provided that in so doing, the discrimination against intermediate points is not made greater than that in existence on August 17, 1910, except when a longer line or route reduces rates or fares to the more distant point for the purpose of meeting by a direct haul a reduction that has been made by the short line." Such rates and fares are subject to correction if they conflict with any of the provisions of the act.

STATE COMMISSIONS.

The Corporation Commission of Virginia held hearings last week on the petition of the Richmond, Fredericksburg & Potomac for authority to raise passenger fares from 2 cents a mile to 3 cents.

The New York State Public Service Commission, Second District, has received notice from the New York Central in the nature of a demurrer as to the complaint of Hon. Thomas M. Osborne as to the charge for taking care of parcels at parcel rooms in the passenger stations of the company. The company raises the question that the charge for the checking of parcels is not made for the transportation of passengers or property or for any service rendered in connection therewith; that the service is not within the duties owed by the defendant to the public, and is not within its profession as a common carrier. The service is voluntary, and is available to any person without respect to his having been or his intention to become a passenger. A hearing is demanded on the question of the jurisdiction of the commission.

FOREIGN RAILWAY NOTES.

It is proposed to construct a railway connecting the Nigerian tin fields in the province of Bauchi, Nigeria, Africa, with the Baro-Kano line.

The Buenos Aires Great Southern, with 3,038 miles of line, is now the largest Argentine railway, exceeding the Buenos Aires and Pacific with its 3,028 miles.

The Buenos Aires Western Railroad Company, Argentina, has been authorized to construct and operate a branch line, 49 miles long, to connect the La Zanja station with that of Meridiano V.

Messrs. Gibbs & Co. have secured from the Chilean government a concession for the construction and operation, during 50 years, of a railway from Caleta de Chucumata to Oficina Alianza, a distance of nearly 55 miles.

The department of public works of Brazil has signed a contract with Messrs. J. de Oliveira Fernandes and Humberto Saboya de Albuquerque for the construction of the section of the West of Minas Railway, between Henrique Galvao and kilometro 48 on the Goyaz Railway. By the terms of the contract the line must be completed within 18 months.

Work will shortly be commenced on the great engineering project of joining Ceylon with the mainland of Asia. The first step on the Indian side will be to build a viaduct about a mile long to carry the railway to the island of Rameswaram. The railway will be continued 22 miles across the island to the nearest point to Ceylon. From thence there will be a steam ferry to Ceylon. The remaining part of the route will be provided by an extension of the Ceylon railway system.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Osgood H. Dowell has been elected assistant counsel of the Eastern Railroad Association.

E. W. Winter, president of the Brooklyn Rapid Transit, has resigned. See editorial columns.

George W. Martin has been elected vice-president of the Pittsburgh & Susquehanna, with office at Philadelphia, Pa.

J. Welch has been appointed auditor of the Chicago, Milwaukee & Puget Sound and the Tacoma Eastern, with office at Chicago.

James I. Whallon has been appointed assistant auditor of the Lake Erie & Western, the Fort Wayne, Cincinnati & Louisville and the Northern Ohio, with office at Indianapolis, Ind., succeeding J. P. Hart, assigned to other duties.

J. F. Titus having resigned as assistant to the president of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, W. L. Tarbet, tax commissioner of the Illinois Central, has been appointed land and tax commissioner of the three roads, with office at Chicago, reporting to the general attorney. The custody of deeds, records, contracts, title papers and other documents has been transferred from the tax commissioner to the assistant secretary, who will report to the comptroller. E. P. Skene, land commissioner of the Illinois Central, has been appointed assistant land and tax commissioner of the three roads, with office at Chicago.

Operating Officers.

W. J. Little has been appointed passenger trainmaster of the Northern division of the Grand Trunk, with office at Allandale, Ont.

Otto Holstein, chief despatcher of the Central Railway of Peru, at Lima, Peru, has been appointed also trainmaster, with office at Lima.

N. E. Bailey has been appointed superintendent of the United Verde & Pacific, with office at Jerome, Ariz., succeeding H. I. Russell, resigned.

T. W. Rowder has been appointed an assistant superintendent of the St. Joseph & Grand Island, with office at St. Joseph, Mo., succeeding C. E. Hedrix, appointed superintendent.

Henry W. Thornton, superintendent of the Erie & Ashtabula division of the Pennsylvania Lines West, at New Castle, Pa., has been appointed to the new position of assistant general superintendent of the Long Island Railroad, with office at Long Island City, N. Y.

H. S. Monehan has been appointed trainmaster of the First and Second districts, First division, of the Denver & Rio Grande, with office at Pueblo, Colo., succeeding R. T. McGraw, promoted, and J. Flynn has been appointed trainmaster of the Third and Fourth districts, First division, with office at Walsenburg, succeeding P. D. Sheehan, resigned.

E. H. Coapman, vice-president and general manager of the Southern Railway, at Washington, D. C., has been appointed also general manager of the Virginia & Southwestern. G. W. Taylor, general superintendent of transportation of the Southern Railway, at Washington, and G. R. Loyall, general superintendent at Knoxville, Tenn., have had their authority extended over the Virginia & Southwestern.

The reorganization of the Rock Island Lines into three districts is referred to editorially elsewhere in this issue. Incident to the reorganization, which was announced in the *Railway Age Gazette* of January 20, page 145, C. W. Jones, general superintendent of the Central district of the Chicago, Rock Island & Pacific at Davenport, Iowa, has been appointed general superintendent of the First district, with office at Davenport. J. B. Smalley, general superintendent of the Southwestern district at Topeka, Kan., has been appointed general superintendent of the Second district, with office at Topeka; and T. H. Beacom, general superintendent of the Southern district at El Reno, Okla., has been appointed general superintendent of the Third district, with office at El Reno. F. J. Easley, superintendent of the Missouri division at Trenton, Mo., has been appointed superintendent of the Illinois division, with office at Rock Island, Ill., succeeding H. P. Greenough. Mr. Greenough has been appointed superintendent of the El Paso division, with office at Dalhart, Texas, succeeding H. L. Reed, who succeeds Mr. Easley at Trenton, Mo. M. J. Kennelly, superintendent of the Louisiana division, has been appointed superintendent of the St. Louis division, with office at Eldon, Mo., succeeding G. Davis, who succeeds Mr. Kennelly on the St. Louis division. C. L. Ruppert, trainmaster on the Missouri division, has been appointed superintendent of the Amarillo division of the Chicago, Rock Island & Gulf, with office at Amarillo, Texas, succeeding H. E. Allen, resigned to accept service with another company.

Traffic Officers.

John L. Sullivan, traveling freight agent of the Chicago Great Western, at Fort Dodge, Iowa, has been transferred to Des Moines, Iowa.

W. D. Wright has been appointed district passenger agent of the New York Central Lines, with office at Williamsport, Pa., succeeding Frank Halloran, deceased.

W. W. Broughton, general traffic manager of the Great Northern, with office at St. Paul, Minn., has resigned to become vice-president of the Pittsburgh Coal Company, effective March 1.

Augustin Miranda has been appointed an assistant general freight and passenger agent of the Sonora Railway and the Southern Pacific of Mexico, with office in Mexico City, a new position.

R. J. Carmichael, district passenger agent of the Illinois Central at Chicago, has been appointed a division passenger agent, with office at Chicago, a new position, and his former office is abolished.

G. G. McKay, city ticket agent of the Canadian Pacific at Detroit, Mich., has been appointed a traveling passenger agent, with offices at St. Louis, Mo., succeeding Thomas J. Wall, appointed city passenger agent at Chicago.

J. P. Fresenius has been appointed a traveling freight agent of the St. Louis & San Francisco, the Chicago & Eastern Illinois, the Evansville & Terre Haute and the New Orleans, Texas & Mexico, with office at New Orleans, La.

S. D. Barlow has been appointed general freight agent of the Western Transit and the Rutland Transit Companies, with office at Buffalo, N. Y., and the positions of general westbound agent and special agent have been abolished.

H. G. Locke, traveling passenger agent of the Chicago Great Western at Boston, Mass., has been appointed a traveling passenger and freight agent, with office at Boston. J. H. Ranney also has been appointed a traveling passenger and freight agent, with office at Boston.

William E. Farris, assistant general freight and passenger agent of the Buffalo & Susquehanna Railroad and the Buffalo & Susquehanna Railway, at Du Bois, Pa., has been appointed general freight and passenger agent, with office at Buffalo, N. Y., and his former position has been abolished.

Warren P. Cameron, traveling freight solicitor in connection with the Sioux City, Iowa, agency of the Union Line Pennsylvania, has been appointed traveling freight solicitor in connection with the agency at St. Paul, Minn., succeeding F. C. Lang, transferred. Edward G. Pankau succeeds Mr. Cameron.

Ira E. Whyte, district passenger agent of the Central Railroad of New Jersey, at Asbury Park, N. J., has been appointed general baggage agent, with office at New York, succeeding F. B. Greenawalt, resigned. C. J. Gummersbach succeeds Mr. Whyte,

and G. D. Ginder has been appointed district passenger agent, with office at Scranton, Pa.

J. H. McCue, manager of the Virginia & Southwestern, has been appointed general agent of the Southern Railway and the Virginia & Southwestern, with office at Bristol, Tenn.-Va. He will have charge of all matters relating to traffic, and to the industrial and agricultural development of the territory traversed by the lines of the Virginia & Southwestern.

G. W. Benus, commercial agent of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern at Pittsburgh, Pa., has been appointed commercial agent, with office at Cincinnati, Ohio, succeeding J. B. Clancey, deceased. J. G. Hill, commercial agent at Indianapolis, Ind., succeeds Mr. Benus, and S. A. Williams, traveling freight agent at Birmingham, Ala., succeeds Mr. Hill.

Alexander Tinling, general agent of the Northern Pacific, at Seattle, Wash., has been appointed general freight agent, with office at St. Paul, Minn. N. H. Kennedy, general agent at Spokane, Wash., succeeds Mr. Tinling. J. O. Dalzell, assistant land commissioner, at St. Paul, Minn., succeeds Mr. Kennedy. E. A. McKenna, general agent, at Wallace, Idaho, has been appointed general agent, at Aberdeen, Wash., succeeding H. M. Williams, resigned. C. M. Grubbs succeeds Mr. McKenna.

A. E. Mann, traveling freight agent of the Louisville & Nashville in New York City, has been appointed a commercial agent, with office at Cleveland, Ohio. E. A. Fall, soliciting agent at Birmingham, Ala., succeeds Mr. Mann, and Maurice P. Davis succeeds Mr. Fall. W. C. Dillard, soliciting agent at Mobile, Ala., has been appointed a traveling freight agent, with office at Houston, Tex., and George C. Willings succeeds Mr. Dillard. C. F. Stith has been appointed a traveling freight agent, with office at Oklahoma City, Okla.

Incident to the re-districting of the Rock Island Lines, which was announced in the *Railway Age Gazette* of January 20, page 145, H. A. Snyder, general freight agent of the Chicago, Rock Island & Pacific, at Chicago, will have jurisdiction over the first district, with office at Chicago; F. J. Shubert, assistant general freight agent, at Kansas City, Mo., has been appointed general freight agent, with jurisdiction over the second district, with office at Kansas City, and H. W. Morrison, assistant freight traffic manager, at Little Rock, Ark., will have jurisdiction over the third district, with office at Little Rock.

H. C. McFadden, who has been appointed general freight agent of the Georgia & Florida, with office at Augusta, Ga., as previously announced in these columns, was born in 1867, at Mount Vernon, Ohio. He began railway work in 1885 as a clerk in the general freight and passenger department of the Cincinnati, Van Wert & Michigan, now a part of the Cincinnati Northern, at Van Wert, Ohio. In 1889 he was appointed a rate clerk in the passenger department of the Savannah, Florida & Western, now a part of the Atlantic Coast Line, at Savannah, Ga., and was promoted to chief clerk and then assistant general passenger agent. He left the service of that company in 1901. His next position was general freight and passenger agent of the Atlanta, Birmingham & Atlantic, from which he resigned in April, 1907, to become president and general manager of the Fitzgerald, Ocilla & Broxton, which position he now leaves to become general freight agent of the Georgia & Florida.

George M. Kridler, whose appointment as assistant general freight agent of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, has been announced in these columns, was born March 3, 1873, at Marlboro, Ohio. He received his education at Hudson, Ohio, and began railway work in December, 1890, with the Pennsylvania Company at Hudson, as a clerk in the local freight office. He was afterward transferred to Steubenville, Ohio, and later to Wellsville, Ohio, and in 1893 went to Cleveland, Ohio, where he was connected first with the Empire fast freight line, and then with the Red Line, until October, 1897. He was then made chief clerk to the commercial agent of the Lake Shore at Cleveland, and a year later was appointed contracting agent. In May, 1901, he was promoted to commercial agent, and he was transferred to Pittsburgh, Pa., as general agent in June, 1906. His next promotion was to division freight agent at Youngstown, Ohio, in September, 1910, which position he resigned January 1, 1911, to become assistant general freight agent at Cleveland.

Engineering and Rolling Stock Officers.

Willard Doud, shop engineer of the Chicago, Burlington & Quincy, at Lincoln, Neb., has resigned.

A. Stewart, general superintendent of motive power and equipment of the Southern Railway, and D. W. Lum, chief engineer maintenance of way, have had their authority extended over the Virginia & Southwestern, both with offices at Washington, D. C.

Frank W. Gilcreast, whose appointment as chief engineer of the Lehigh & New England, with office at Mauch Chunk, Pa., has been announced in these columns, was born April 2, 1858, at Woburn, Mass. He was educated at Tufts College, receiving the degree of C. E. in 1878, and began railway work in August, 1880, in the engineering department of the New York & New England, now a part of the New York, New Haven & Hartford. In January of the following year he went to the New York, Chicago & St. Louis, and the following June was appointed resident engineer. In September, 1882, he was appointed resident engineer of the Buffalo, Rochester & Pittsburgh, and the following year was made division engineer. He remained in this position until June, 1884, when the company went into the hands of a receiver. From May, 1885, to August, 1889, he was engineer for Brown, Howard & Co., on the New York Aqueduct. He returned to railway work in August, 1889, as resident engineer of the Schuylkill & Lehigh Valley, now a part of the Lehigh Valley, and in January, 1893, he was promoted to division engineer in charge of maintenance of way on the Mahanoy & Hazleton division, which position he held at the time of his recent appointment as chief engineer of the Lehigh & New England, in charge of the Tamaqua extension.

The reorganization of the Rock Island Lines into three districts is referred to editorially elsewhere in this issue. Incident to the reorganization, which was announced in the *Railway Age Gazette* of January 20, page 145, W. J. Tollerton, assistant general superintendent of motive power of the Chicago, Rock Island & Pacific at Chicago, has been appointed assistant general superintendent of motive power of all Rock Island Lines, with office in Chicago. F. W. Williams, superintendent of motive power of the Northern district at Cedar Rapids, Iowa, has been appointed master mechanic of the Cedar Rapids, the Minnesota and the Dakota divisions, with office at Cedar Rapids. T. W. McCarthy, master mechanic at Cedar Rapids, has been appointed master mechanic of the Kansas division, with office at Horton, Kan. H. J. Osborne has been appointed master mechanic of the Des Moines Valley division, with office at Valley Junction, Iowa. Frank W. Thompson has been appointed division engineer of the Iowa division, with office at Des Moines, Iowa. W. L. Hope has been appointed division engineer of the Illinois division, with office at Rock Island, Ill. Roy Johnson, district engineer at Cedar Rapids, has been appointed division engineer of the Missouri division, with office at Trenton, Mo. L. J. Hughes has been appointed division engineer of the El Paso division, with office at Dalhart, Tex. L. D. Harper has been appointed division engineer of the Kansas division, with office at Herington, Kan. H. M. Stone, district engineer at Topeka, Kan., has been appointed division engineer of the Arkansas division, with office at Little Rock, Ark. T. W. Fatherson has been appointed division engineer of the Indian Territory division, with office at El Reno, Okla. C. A. Richards has been appointed division engineer of the Oklahoma division, with office at Haileyville, Okla. J. M. McChord has been appointed a night roundhouse foreman at Rock Island, Ill., succeeding W. F. Negus. W. H. Peterson, principal assistant engineer at Chicago, has been appointed engineer maintenance of way of the First district, with office at Davenport, Iowa; J. M. Brown, district engineer at Davenport, has been appointed engineer maintenance of way of the Second district, with office at Topeka, Kan., and A. B. Warner, district engineer at El Reno, Okla., has been appointed engineer maintenance of way of the Third district, with office at El Reno. J. B. Kilpatrick, superintendent of motive power at Chicago, has been appointed superintendent of motive power of the First district, with office at Davenport, Iowa; S. W. Mullinix, superintendent of motive power at Horton, Kan., has been appointed superintendent of motive power of the Second district, with office at Topeka, and C. M. Taylor, superintendent of motive power at Shawnee, Okla., has been appointed superintendent of motive power of the Third district, with office at Shawnee.

OBITUARY.

M. L. Newton, consulting engineer of the Waterloo, Cedar Falls & Northern, with office at Waterloo, Iowa, died in that city on January 25.

J. B. Clancey, commercial agent of the Cincinnati, New Orleans & Texas Pacific, with office at Cincinnati, Ohio, died at Cincinnati on January 23.

James Fulton Elder, for many years superintendent of air brakes on the Pennsylvania Railroad, and the inventor of valuable improvements, died at his home in Philadelphia, Pa., January 30, at the age of 75 years. He entered the employ of the Pennsylvania Railroad at Altoona in 1856 and was a pioneer in air-brake development, having had charge of that work on the Pennsylvania throughout the years of the introduction of power brakes.

Col. Edward L. Russell, vice-president and general counsel of the Mobile & Ohio, died at the Raleigh Hotel, Washington, D. C., on January 28, from pneumonia. He was born in Franklin county, Alabama, in August, 1845, and entered the railway service in 1876 as general solicitor of the Mobile & Ohio. In March, 1897, he was elected first vice-president, and in February, 1898, he was made president, but in March, 1901, when the Southern Railway came into control, Samuel Spencer was elected president, Mr. Russell continuing at the head of the legal department as general counsel. Since October, 1904, he has also been vice-president.

James G. Taylor, formerly auditor and assistant treasurer of the Burlington & Missouri River, now part of the Chicago, Burlington & Quincy, at Omaha, Neb., died in New York City on January 23. Mr. Taylor was born in Albany county, New York, and was educated at Trinity Church school at Watervliet, N. Y. He began railway work in 1870 as a clerk with the Burlington & Missouri River, and was promoted consecutively to cashier, paymaster and assistant treasurer. He was also for a time assistant secretary of the Chicago, Burlington & Quincy. He left the Burlington in 1903, and has since made his home in New York City.

Erastus Clark, jr., formerly for many years general freight agent of the New York Central & Hudson River, died January 30 at the home of his son in New York City. He was born in Buffalo in 1826, and began railway work with the Buffalo & Rochester. He was freight agent in 1852, at the time the New York Central came into control and he was then appointed freight agent of the western division of the New York Central and several years later was made general freight agent of the entire system. Mr. Clark remained in that position until 1895, when he retired, but for several years thereafter he was retained by the company in an advisory capacity.

Joseph W. Reinhart, formerly president of the Atchison, Topeka & Sante Fe, and recently president of the Inter-City Viaduct and Terminal Company and the Inter-City Viaduct Freight Railway Company of Kansas City, Mo., died in Kansas City on January 27. Mr. Reinhart was born September 17, 1851, at Pittsburgh, Pa., and was educated at the Western University of Pennsylvania. He began railway work in 1869 as a clerk for the division superintendent of the Allegheny Valley, now part of the Pennsylvania Railroad, and for five years from 1875, he was superintendent of transportation of the same road. He was then made auditor of the Richmond & Allegheny, and three years later was appointed general auditor of the New York, West Shore & Buffalo. He became general auditor of the Atchison, Topeka & Sante Fe and auxiliary lines in 1888, and the following year was elected fourth vice-president and general auditor of that road; he also formulated and executed a plan for the financial reorganization of the Atchison Company, and was elected first vice-president and general auditor in 1890. From March, 1893, to September, 1894, he was president of the Atchison, Topeka & Sante Fe, the Gulf, Colorado & Sante Fe, the St. Louis & San Francisco, the St. Louis, Kansas City & Colorado, the Atlantic & Pacific, the Colorado Midland, the Wichita & Western, the Southern California, the New Mexico & Arizona, and the Sonora Railway, Ltd., and from December, 1893, to September, 1894, he was receiver also of these companies. From 1893 to 1894, he was chief expert of the United States Government under the Fifty-third Congress in reorganization of executive departments. On leaving the Sante Fe he became a special railway and corporation expert, and since 1909 has been interested in the railway projects in Kansas City mentioned above.

Railway Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—According to press reports, this company is planning to rebuild the lines in eastern Texas between Port Bolivar, Texas, and Longview, to reduce the grades. This work is to be carried out in connection with the expected large tonnage of ore from Cass county, to which point the Port Bolivar Iron Ore Railway is now being built from Longview, about 30 miles. The terminal and port facilities at Port Bolivar are also to be enlarged. It is said that the company has under consideration the question of extending its lines east to New Orleans, La., as well as building an extension from Longview, Texas, north, to connect with its Oklahoma lines.

Atlantic, Northern & Southern.—According to press reports, this line, which was built by residents of western Iowa, has completed work on the extension from Atlantic, Iowa, south to Villisca, 38 miles. (September 30, p. 598.)

Bangor & Aroostook.—This company has asked for an extension of time to March 1, 1918, in which to finish work on the Allegash extension from West Seboois, Me., north to St. Francis, 157 miles. The survey which has just been filed shows that the route from West Seboois is between Jo Mary and Twin lakes, south of Sourdnabunk lake, across the outlet of Chesuncook lake and east of Chamberlain lake, thence near the east bank of the Allegash river to St. Francis. It is understood that construction work will be started this year if the location is approved.

Black Lick & Yellow Creek.—A contract has been given to A. L. Anderson & Bro., Altoona, Pa., railway contractors, for building 20 miles of railway in Indiana county, Pa. The new line will be a feeder to the New York Central and will extend through rich coal fields, connecting several mining operations. The contract is worth about $250,000, and the work is to be completed this summer.

Boston & Maine.—The petition of this company to the Vermont legislature to build new tracks between Brattleboro, Vt., and South Vernon, paralleling the tracks of the Central Vermont, has been amended in the senate so as to give the Central Vermont certain rights over any tracks which the Boston & Maine might build. The request of the Boston & Maine to exercise the right of eminent domain to take land in Brattleboro was refused. (April 15, p. 1014.)

Buckhannon & Northern.—An officer writes that bids have been received for building 30 miles of line from the Pennsylvania—West Virginia state line, up the west side of the Monongahela river to Rivesville, Marion county, W. Va. The company expects to let the contract early in February. (Dec. 30, p. 1281.)

Butte, Anaconda & Pacific.—Announcement is made that this company is planning to build an extension from Anaconda, Mont., to the Cable and Georgetown mining sections.

California Roads.—Financial arrangements are said to be made for building from Bella Vista, Cal., to Afterthought mine, at Ingot, 15 miles. T. H. Adams, Indianapolis, Ind., and G. L. Porter, Union City, Tenn., are said to be interested.

Canadian Pacific.—Authority has been given this company by the Railroad Commissioners of Canada to build a branch from Guelph Junction, Ont., on the main line, to a point near Hamilton, about 20 miles.

Central Vermont.—See Boston & Maine.

Chicago, Weatherford & Brazos Valley.—An officer writes that grading work is now being carried out by the Mitchell-Pigg Construction Company, Weatherford, Texas, on the line between Bridgeport, Wise county, and Gainesville. Grading has been finished on 22 miles. Track laying has not yet been started. Contracts were let recently for the ties, bridge and building material for the first section of 10 miles. Maximum grades will be 1 per cent., and maximum curvature 4 deg. L. M. Kirkes, president; F. B. Truax, chief engineer, Weatherford. (November 4, p. 886.)

Colorado Roads.—Plans are being made to build from Dillon, Colo., on the Denver & Rio Grande and the Colorado & Southern,

northwest to Kremmling, on the Denver, Northwestern & Pacific, about 40 miles. P. F. Reinhardt, formerly of Steamboat Springs, now of Missoula, Mont., is said to be interested.

Detroit, Bay City & Western.—An officer writes that an extension is to be built from Caro, Tuscola county, Mich., to Wilmot, 11.5 miles.

Great Northern.—J. J. Hill, chairman, is quoted as saying that construction work is to be started at once on the Midland of Manitoba, building a line from Winnipeg, Man., south to the Hill lines in North Dakota. The plans call for a line from Winnipeg, south to the international boundary, with a branch from Winnipeg, west via Brandon and Elkhorn; also a branch from Morden, northwest to a point near Rathwell, thence northwest to a point on the first mentioned line running westerly from Winnipeg.

Harriman Lines.—Announcement has been made by R. S. Lovett, president of the Union Pacific and Southern Pacific, that improvements are to be carried out during the next five years, including the double-tracking of the Union and Southern Pacific from the Missouri river to the Pacific coast, at a cost of $75,000,000. Plans for the construction of a number of extensions and new lines, to connect with the Union Pacific and Southern Pacific in the West and Northwest, which for some time have been under consideration have also been approved.

Hudson & Manhattan.—An officer is quoted as saying that construction work will be started before May 1 on the proposed extension to the Grand Central Station, New York City. (Dec. 2, p. 1097.)

Kansas, Oklahoma & Panama.—This company, which was organized last year to build from Liberal, Kan., to a point in Oklahoma, has amended its charter. The company has a capital of $1,000,000 and office at Oklahoma City, Okla. The plans call for building from Beaver, Okla., southeast to Frederick, near the Red river, thence into Texas, with a branch from Elk City, in Beckham county, Okla., east to Oklahoma City, in all, about 325 miles. The estimated cost of construction is $30,000 a mile. The directors include: J. J. Winton, R. M. Ruffin, F. A. Mosher, A. H. Syncox and J. E. Dumarr. (May 27, p. 1324.)

Knox County Central.—Application has been made in Maine for a charter to build from Friendship, Me., north via Waldoboro, Union, Hope, Lincolnville, Searsmont and Belmont, to Belfast. C. W. Stackpole, W. F. Curran and H. J. Chapman, Bangor; J. Wyman, Millbridge; F. S. Walls, Vinal Haven, and C. M Coleman, Lincolnville, are interested

La Crosse & Southeastern.—This company is making surveys for an extension from Viroqua, Wis., to Retreat, about 35 miles. A. E. Rau is engineer in charge of preliminary work, Sparta.

Lincoln County (Electric).—An extension of two years has been asked for by this company to build from Damariscotta, Me., southwest to Booth Bay Harbor.

Monongahela Railroad.—See Pittsburgh & Lake Erie.

New York Connecting.—This company, which was organized by the Pennsylvania Railroad and the New York, New Haven & Hartford, to build a line through the boroughs of Brooklyn and Queens, New York City, and over the East river on a bridge to a connection with the New York, New Haven & Hartford, at Port Morris, on the Harlem river, started work on the line in August, 1910, and on the foundations for the bridge over the East river on December 30. The plans and estimates for the important parts of the railway and bridge structures are still in the hands of the engineers, and the contracts have not yet been let.

New York, New Haven & Hartford.—The new tunnel through Sylvan hill, just west of Terryville, Conn., was opened January 28 for traffic. With the opening of this tunnel the work of double-tracking and shortening the line of the old Highland division between Waterbury and Bristol is about finished. As soon as some slight changes are made to the line east of Bristol, there will be a double-track between Waterbury and Fairfield.

Northern Electric.—An officer writes that although the necessary franchises and rights-of-way have been secured for an extension from Chico, Cal., to Redbluffs, no time has been set for carrying out the work.

North Carolina Traction.—An officer writes that a contract has been let to the Propst Contracting Company, Charlotte, N. C., to build from Winston-Salem, north to Ruralhall, thence northeast to Lawsonville, and then northwest to Floyd, Va. The work includes one 600-ft. steel bridge and several trestles. Maximum grades will be 2 per cent. and maximum curvature 12 deg. A. M. Clarke, president and H. P. MacKnight, chief engineer, Southern Pines, N. C. (See Carolina Traction, January 27, p. 183.)

Oregon Electric.—See United Railways Company (Electric).

Pennsylvania Railroad.—This company has asked permission from the authorities of the city of Rahway, N. J., to elevate its tracks and to lay additional tracks through the city. In order to provide underground crossings for highway traffic the railway company asks that changes be made in the location and grades of certain streets and that part of some streets be vacated for the railway company's use.

Pittsburgh & Lake Erie.—According to press reports, bids have been received for building an extension of the Monongahela Railroad, from Martin, Pa., south to Rivesville, W. Va., 30 miles, where connection is to be made with the Baltimore & Ohio.

Work is to be started soon, it is said, on a nine-mile connecting line between Fayette, Pa., and Dickerson Run.

Portland & Southeastern.—An officer writes regarding the reports that an extension is to be built from Albritton, Ark., to Delhi, La., about 40 miles, that the company has been making plans for this new line, but that nothing definite has yet been decided.

Port Bolivar Iron Ore.—See Atchison, Topeka & Santa Fe.

Sacramento Short Line (Electric).—This company has been incorporated in California with $10,000,000 capital, to build an electric line from Oakland, Cal., northeast to Sacramento, and to other points in Sacramento valley. Some of the incorporators are identified with the United Properties Company, and include B. M. Aikens, Gavin McNab, R. P. Henshall, L. Elkins, G. W. Mordecai and F. L. Stewart.

San Francisco, Oakland & San Jose (Electric).—This company, it is said, will build 98 miles of line into Sacramento, Cal., to connect with the Northern Electric.

St. Paul, Sioux City & South Dakota.—According to press reports, this line will be built east via Canova, S. D., Clarno and Madison, thence northeast to Marshall, Minn. C. A. McGee, Winfred, S. D., representing eastern capitalists, is said to be interested.

Texas Roads.—Residents of San Antonio, Texas, are back of a project to build a line from that place to a point in the Rio Grande valley near Brownsville. A company is to be organized with a capital of $500,000, and the promoters expect to secure a large amount of money in bonuses from residents along the proposed route. G. West, J. J. Stevens, F. L. Hillyer, G. C. Vaughan, C. A. Zilker and W. Cassin, are interested.

United Properties Company.—See Sacramento Short Line.

United Railways Company (Electric).—According to press reports, this line, which is controlled by the Hill interests, is to be extended from its present terminus to Tillamook, Wash. It is expected that the work will not be finished until 1912. The Oregon Electric, which is also a Hill line, is to be built from Salem, Ore., to Eugene, about 75 miles. Surveys have been made and it is expected to start the work soon.

Utah & Grand Canyon.—This company, which was incorporated last year to build from Lund, Utah, south to St. George, 85 miles; also, from Marysvale, south to Panguitch, 55 miles, will start construction work as soon as contracts can be let. F. A. Dudley, president, Niagara Falls, N. Y.; V. E. Huntsacker, Salt Lake City, Utah, is a director. (December 16, p. 1167.)

Waldo Electric.—An extension of two years has been asked for by this company to build from Belfast, Me., south to Camden.

Winter Harbor & Eastern.—An extension of two years has been asked for by this company to build a line from Winter Harbor, Me., north to Cherryfield.

Railway Financial News.

Buffalo, Rochester & Pittsburgh.—A semi-annual dividend of 2½ per cent. on the common stock has been declared, payable February 15. The yearly rate for the last two and a half years has been 4 per cent.

Chicago, Rock Island & Pacific.—James McLean, of Phelps, Dodge & Co. has been made a director.

Kansas City Southern.—This company has sold to Ladenburg, Thalman & Co., $5,000,000 refunding and improvement mortgage 5 per cent. bonds of 1950, being part of an authorized issue of $21,000,000, of which $10,000,000 was issued in July, 1909. The proceeds are to be used for terminal improvements, reduction of grades, additional equipment and track improvements.

New York, Ontario & Western.—The New York Public Service Commission, Second district, has been asked to authorize the issue of $2,702,000 4 per cent. general mortgage bonds, to reimburse the company for expenditures already made and to pay for 12 locomotives now under construction. In its petition the company says that between February 1, 1907 (the date of the last issue of general mortgage bonds), and December 1, 1910, it has spent $2,751,443 for the acquisition of property, extensions and improvements. With the new issue, this would make $6,650,000 outstanding of the $12,000,000 authorized under the mortgage.

Ohio Electric Railway.—This company has sold $6,000,000 6 per cent. notes through Drexel & Co., of Philadelphia, and has sold about $4,000,000 stock.

Reading Company.—J. P. Morgan & Co., New York, and Drexel & Co., Philadelphia, are offering at 97 and interest the unsold balance of the new $18,811,000 general mortgage 4 per cent. bonds. (January 27, page 185.)

Southern Pacific.—Negotiations are being carried on with French bankers for placing a large block (perhaps $50,000,000) of bonds in Paris. See Railway Construction.

Spokane, Portland & Seattle.—The capital stock is to be increased from $25,000,000 to $62,500,000, and the company is to become the holding company for the Hill properties in Oregon and Washington outside of the Great Northern and the Northern Pacific.

Wheeling & Lake Erie.—The syndicate headed by Kuhn, Loeb & Co., which holds the $8,000,000 5 per cent. notes of this company, has agreed to extend the notes from February 1. (January 27, page 185.)

FOREIGN RAILWAY NOTES.

It is said that during 1911 work will be commenced on 1,800 miles of new railways in Russia.

The Chilean government has granted to Gibbs & Co., of Valparaiso, a concession to construct a private railway from Chucumata to the rich nitrate fields of the interior.

On November 21, 1910, the birthday of the president of Guatemala, the works of the Guatemalan section of the Pan American Railroad were formally inaugurated. The construction of this section, about 38 miles long, is in charge of the Guatemala Central Railway, and its completion is expected within 18 months.

The Minas section of the Bahia-Minas Railway, Brazil, extending from Aymore station to Theophilo Ottoni, a distance of 146 miles, has been purchased by a group of capitalists, who are authorized to use the power of the waterfalls which are found within a distance of 5 miles of the line, for the future electrification of the road.

Messrs. Amandio Fidencio Lampert and Pedro A. Gonçalves de Carvalho have obtained a concession from the Brazilian government for the construction of 63 miles of railway in the Valley of the Cahy river, extending from the Port of S. Joao de Montenegro to the boundary of the district of Caxias, in the state of Rio Grande do Sul.

Late News.

The items in this column were received after the classified departments were closed.

B. R. Moore has been appointed superintendent of motive power of the Duluth & Iron Range, with office at Two Harbors, Minn., succeeding H. S. Bryan, deceased.

F. W. Taylor, general storekeeper of the Oregon Short Line, at Pocatello, Idaho, has been appointed purchasing agent of the Pacific Electric, with office at Los Angeles, Cal.

Local trains on the Hudson division of the New York Central are now operated with electric motive power from New York City to Hastings, four miles beyond Yonkers.

J. H. Rosenstock, trainmaster of the Delaware & Hudson, at Carbondale, Pa., has been appointed superintendent of the Susquehanna division, with office at Albany, N. Y., succeeding D. F. Wait, assigned to other duties.

Winfield A. Huppuch, chairman of the New York Democratic State Committee, has been offered by the governor the appointment to the Public Service Commission, Second district, in place of N. Carlisle, of Watertown, whose term has expired.

The New York, New Haven & Hartford, it is said, will place orders shortly for 30,000 tons of rails. The Chicago, Rock Island & Pacific is said to have ordered 10,000 tons of rails. The Grand Trunk, it is said, will place orders immediately for 61,000 tons of 80-lb. rails.

Proposed advanced rates on fruits and vegetables from Chicago and Milwaukee to various destinations over the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern railways, which were to have gone into effect on February 1, have been ordered suspended until June 1.

Seven cases have been filed in the Federal District Court at Chicago against the Chicago & Alton; Chicago & Eastern Illinois; Illinois Central; Chicago & North Western; Chicago, Milwaukee & St. Paul, and the Belt Line, to recover penalties for violating the safety appliance law.

J. P. Cummings, division superintendent of the Chicago, Burlington & Quincy, at Beardstown, Ill., has been transferred to Ottumwa, Iowa, succeeding W. F. Thiehoff, who succeeds Mr. Cummings at Beardstown, Ill. The Beardstown division has been taken out of the Illinois district and put in the Missouri district, and the Centerville division has been taken out of the Missouri district and put in the Iowa district.

By an explosion of dynamite near the station of the Central of New Jersey at Communipaw (Jersey City), N. J., on Wednesday of this week, 25 or more persons were killed and property of the railway company was damaged to the extent of $200,000. It is roughly estimated that other property losses will amount to several hundred thousand dollars; hundreds of windows having been broken in the lower part of New York City, more than a mile from the explosion. The dynamite was being unloaded from a freight car on the end of pier No. 7 and was being carried into the hold of a lighter. This lighter and another vessel, with the crews of both, were so completely destroyed that none of the bodies of the men were found. A car of cement next to the car in which the explosion occurred was also destroyed, but a third car containing dynamite withstood the shock so well that its contents did not blow up, though great numbers of the sticks of dynamite were scattered about the floor of the pier. About 40 freight cars were wrecked or badly damaged. Every window in the passenger station was blown out and scores of passengers on two ferry boats lying at the slips were injured by flying splinters and glass. The force of the explosion was felt 40 miles away, north, south and east. A man in a tugboat, which was nearly a mile away from the scene of the explosion was blown out of the pilot house into the water and fatally injured. Many of the tallest buildings in the lower part of Manhattan were jarred, and in some cases, according to the stories of the occupants, they "rocked," and walls were cracked in some of them. It is conjectured that the explosion of the dynamite was caused by the explosion of a boiler of the lighter. It is said that the explosives were to be delivered for use at places in Manhattan.

Supply Trade Section.

Edwin S. Woods & Co., Chicago, have moved to larger quarters in the Monadnock building, suite 1252-54.

The Clark Car Company, Pittsburgh, Pa., has moved its offices from the Frick annex to the Henry W. Oliver building.

The Baldwin Locomotive Works, Philadelphia, Pa., has moved its St. Louis, Mo., offices from the Security building to the Wright building.

The General Railway Signal Co., Rochester, N. Y., has moved its New York offices from the Night and Day Bank building to the Liberty tower.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Ann Arbor Railroad for five 70-ft. motor cars, delivery to be made within four months.

Harold Kirschberg has resigned his position of illuminating engineer of the Pennsylvania Railroad, and is now with the Heany Lamp Company, New York, and its associated companies.

R. W. Bailey, chief sales agent in the Philadelphia district for the American Bridge Company, New York, has been made general sales manager of that company, succeeding J. A. Huston, resigned.

The Joseph Dixon Crucible Co., Jersey City., N. J., during the year 1910, supplied graphite and graphite lubricants to 210 different steam railways, increasing its business with the steam roads 53 per cent.

E. S. Taylor, who has been in the sales department of the Pullman Company, Chicago, has become associated with the Forsyth Brothers Co., Chicago. Mr. Taylor's headquarters will be in Chicago for the present.

The White Enamel Refrigerator Company, St. Paul, Minn., has opened an office on the main floor of the Steger building, Chicago, where it has on exhibition a full line of refrigerators using the Bohn siphon system.

The Indianapolis Switch & Frog Company, Springfield, Ohio, has opened a sales office in the Balboa building, San Francisco, Cal. S. I. Wailes will be in charge as coast representative. This is the sixth branch office of the company.

At the regular quarterly meeting of the board of directors of the Pressed Steel Car Company, Pittsburgh, Pa., held January 25, O. C. Gayley was made a director to fill the vacancy caused by the recent death of one of the members of the board.

Edward Blake, Jr., manager of sales and director of the Wells Brothers Co., Greenfield, Mass., has left that company to become manager of the Canadian Tap & Die Company, Ltd., Galt, Ont., of which he has been treasurer since its organization in 1905, and in which he has obtained a controlling interest.

The National Car Coupler Company, Attica, Ind., has opened a sales office in the McCormick building, Chicago, in charge of W. A. Ruth, general sales agent. The company reports much improvement in late orders for small steel castings, and now has enough orders booked to keep its plant busy for three months.

The Buckeye Steel Castings Company, Columbus, Ohio, has bought 85 acres of land at Indiana Harbor, Ind., bordering on the canal and reached by the Pennsylvania, the Baltimore & Ohio and the Indiana Harbor Belt railways. The company does not expect to build a plant in the immediate future, as has been reported, but when conditions are favorable the erection of such a plant will be undertaken.

The Electrical Testing Laboratories, New York, have installed at Eightieth street and East End avenue, additional apparatus for testing materials of construction. This includes tension and compression machines up to 200,000 lbs. capacity, a torsional testing machine of 230,000 in.-lbs. capacity, and an equipment for testing cement and concrete. This equipment is at the service of engineers, builders and the public in general.

The directors of the Crucible Steel Company of America, Pittsburgh, Pa., have perfected arrangements for the formation of the Pittsburgh Crucible Steel Company, and purchased 423 acres of the property of the Midland Steel Company, Midland, Pa., on the Ohio river, below Beaver, including the plant the company put up only a few years ago. Included in this purchase also are 1,800 acres of coal lands on the opposite side of the Ohio, and 130 acres of limestone near Newcastle. It is the intention to improve this property with plants sufficient to produce the requirements of the company in the way of the highest grades of open-hearth steel. The formation of the new company, the purchase from the Midland, and the improvements to be made will mean an expenditure of $7,500,000.

Clyde Mitchell Carr, who recently was elected president of Joseph T. Ryerson & Son, Chicago, succeeding Edward L. Ryerson as announced in the *Railway Age Gazette* of January 27, was born in Illinois, July 7, 1869. He prepared for Princeton University at the Lake Forest Academy, and was later a student in Northwestern University for two years. In addition to his connection with Joseph T. Ryerson & Son, Mr. Carr is a director of the Chicago Great Western Railroad and is also very active in Chicago civic societies, being a trustee of the Art Institute, of the Orchestral Association, the Chicago Bureau of Public Efficiency, the Chicago City Plan Commission and of Forest University. Mr. Carr is also interested in the American Iron and Steel Institute, of which he is an active member.



Clyde M. Carr

George E. Pratt, who has been in charge of sales of the Crawford Locomotive & Car Company, Streator, Ill., has been made railway representative of the Kennicott Co., Chicago Heights, Ill., with office in the Corn Exchange Bank building, Chicago. Mr. Pratt will be in charge of sales for the new railway department of the Kennicott Co., which will make steel under frames for freight and passenger equipment and complete tank cars. The company's plant at Chicago Heights is being enlarged and new machinery and tools are being installed to care for this new line.

TRADE PUBLICATIONS.

Drills and Lathes.—Joseph T. Ryerson & Son, Chicago, have issued two new circulars describing the Rockwell drill press and the Rockwell lathe.

Ingot Iron.—The American Rolling Mill Co., Middletown, Ohio, has published a 25-page booklet on American ingot iron, telling the story of the development of this product and the results of the various tests to which it has been submitted.

Telephones.—The Western Electric Co., Chicago, has devoted bulletin No. 117 to central battery telephone sets and accessories, for standard requirements. Descriptions and photographs give full information on the various types and ringing systems.

Electrical Apparatus.—Fairbanks, Morse & Co., Chicago, have published, in bulletin No. 25, a catechism on direct current apparatus. The questions and answers give definitions of electrical terms and describe the construction and uses of the electrical apparatus made by that company.

Block Signaling.—The General Railway Signal Co., Rochester, N. Y., in bulletin No. 115-B, describes the installation of the block system on the electric railway of the Washington Water

Power Company, Spokane, Wash. This was described in the *Railway Age Gazette* of December 16.

Denver & Rio Grande.—The annual review number of the Railroad Red Book, a monthly publication issued by the Denver & Rio Grande, contains 103 original articles on agricultural, mining and industrial subjects, prepared by a number of the most prominent authorities in the West.

Building Materials.—F. W. Bird & Son, East Walpole, Mass., has published a 25-page booklet on the Bird Neponset products for building purposes, describing these products and their method of manufacture. Photographs of the most prominent buildings in which these products are used are included.

Pile Drivers.—The Browning Engineering Company, Cleveland, Ohio, has published a catalog on Browning pile drivers. These machines consist of self-propelling cars, carrying pile drivers for driving piles at various angles and in any position, either close to the car or up to about 30 ft. from it. The catalog is illustrated and the descriptions are clear and concise.

The Southern Railway.—This company has published separate booklets on Alabama, Mississippi, Georgia and North Carolina. These illustrated and comprehensive little booklets should prove a valuable source of information to prospective home seekers, manufacturers and investors in those states. Detailed descriptions are included of the growth and development, the climate and soil, the agricultural and mining resources, the many industries and their centers. All this information could only have been compiled after an enormous amount of labor; the publishers should be well satisfied with the result.

RAILWAY STRUCTURES.

Brawley, Cal.—The Southern Pacific is enlarging its freight house at Brawley.

Buffalo, N. Y.—Negotiations are pending with the Erie Railroad for the elimination of grade crossings in Buffalo at eleven street crossings. The improvements proposed are to be made on the Erie from Walden avenue in the east end of the city, northwest to Military Road. At five of the crossings, from Delavan avenue to Delaware avenue, inclusive, except Main street, negotiations will be taken up for similar work on the Delaware, Lackawanna & Western, which parallels the Erie tracks. From a point near Walden avenue to north of Delavan avenue, the Erie tracks are to be raised from 9 ft. to 13 ft. on 1.5 miles, then depressed for about two miles to a point west of Main street, the maximum depression being 32 ft. through a rock cut, reducing the grade from 1.33 to 0.3 per cent. From a point east of Colvin street, westerly 3.5 miles, the tracks will be raised a maximum of about 8 ft.; at Military Road similar work is also planned to be carried out on the New York Central.

Charleston, S. C.—The Carolina, Clinchfield & Ohio has made application to the Harbor Commission, it is said, for a permit to erect coal piers on the company's property at Cooper River.

Council Bluffs, Iowa.—The Union Pacific will begin work at once on its new shops to replace the old ones in the transfer yards. The new building will be 100 ft. x 30 ft., and will include carpenter and lathe shops.

Fairmont, W. Va.—The Baltimore & Ohio has asked the War Department for permission to build the double-track bridge over the Monongahela river at Gaston Junction, near Fairmont. It is expected that the work will be started soon.

Harrisburg, Pa.—An ordinance has been presented to the city council of Harrisburg authorizing the construction of a steel bridge over the Philadelphia & Reading tracks at 13th street. The question of building a bridge at this place has been under consideration for a long time.

High Bridge, Ky.—The work of replacing the Queen & Crescent bridge over the gorge of the Kentucky river at High Bridge, with a structure 31 feet higher, on the same foundations as the old bridge, and without interfering with traffic, is nearing completion. This bridge is one of the highest railway bridges in the world. The increased height of the new bridge will give a much better grade at this point and its great strength will allow the use of heavier locomotives. The new bridge is to carry double tracks, and like the old bridge, was erected on the cantilever principle. It is of steel throughout on stone piers, 1,230 ft. long, with the track level 308 ft. above low water mark. About 6,900 tons of steel have been put in place, leaving some 142 tons yet to be placed, the greater part of which cannot be put in its permanent position until after the removal of the old bridge. The principal work remaining to be done consists of riveting. It is expected that riveting will be completed by March 1. The new approaches, consisting largely of high embankments on either side of the bridge, made necessary by the increased height of the structure, are about completed.

Hutchinson, Kan.—The Atchison, Topeka & Santa Fe has prepared plans for extensive yards and a new repair shop and round house. It is expected that work will begin early in the spring.

Laramie, Wyo.—The Union Pacific has begun work on a 30-stall roundhouse to be built at an estimated cost of $450,000.

Los Angeles, Cal.—The Los Angeles Pacific is planning to construct a subway through Los Angeles for its Venice and Santa Monica lines. The estimated cost of the improvement is $10,000,000.

Marquette, Mich.—The Lake Superior & Ishpeming is to erect, this spring, a large, iron ore dock, at Marquette. It will be of reinforced concrete, 1,200 ft. long, 54 ft. wide, and 75 ft. high. Its capacity will be 200 pockets, with an aggregate storage of 47,000 tons. Groups of six spouts each, for loading into vessels, will be operated by electric motor. The cost of the dock will be $1,200,000.

Matamoros, Mex.—Plans have been made by the National Railways of Mexico, it is said, for putting up new passenger stations at Matamoros and at Nuevo Laredo; also for replacing a number of the existing bridges on the San Luis Potosi—Tampico division, with steel structures. Work is now under way on the bridge over the Rio Grande between Nuevo Laredo and Laredo, Texas. The new bridge is being built to carry heavier rolling stock than the present structure.

Nelson, Ill.—According to local press reports, the Chicago & North Western has applied for a government permit to bridge the Illinois river.

Ottawa, Ont.—The Canadian Northern has completed arrangements for a terminal in the city of Ottawa, it is said. At present the Canadian Northern terminal is on the outskirts of the city.

Peoria, Ill.—The Peoria & Pekin Union has completed plans for enlarging its East Peoria yards by the laying of 33 miles of track. Eighty-pound steel will be used.

Port Arthur, Texas.—The Southern Pacific has announced that it will build a $20,000 passenger station in the near future.

Portland, Me.—The Portland Union Station Company has asked permission to increase its capital stock and to secure property by the right of eminent domain, for increasing its terminal facilities in Portland.

Racine, Wis.—The power house and terminals at Racine, Wis., of the Milwaukee Light, Heat & Traction Company, Milwaukee, are being enlarged under the direction of Charles J. Davidson, Milwaukee, chief engineer. Two 125-k.w. low pressure units, made by the General Electric Company, Schenectady, N. Y., and one 1,500-h.p. turbine and equipment from the Union Electric Light & Power Company, St. Louis, Mo., are being installed.

San Diego, Cal.—The Atchison, Topeka & Santa Fe has been given a permit to build a new warehouse on its wharf at San Diego.

San Luis Potosi, Mex.—The National Railways of Mexico is building an addition to the combined freight and passenger station, also making additions to its shops at San Luis Potosi. The company has under consideration the question of putting up a new storehouse.

Terrell, Texas.—The Texas & Pacific has ordered material for a new freight house to replace the one recently burned. Construction work will begin in February, and it is hoped to have the building ready for service by June.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Missouri Pacific is said to be in the market for 75 locomotives.

The Chicago, Indianapolis & Louisville is taking prices for three Pacific and seven consolidation locomotives.

E. F. & G. E. Fauquier, Ottawa, Ont., have ordered two ten-wheel freight locomotives from the Montreal Locomotive Works, Ltd. The cylinders of these locomotives will be 18 in. x 24 in. The diameter of the driving wheels will be 50 in., and the total weight will be 109,000 lbs.

Cavacchi & Pagano, Baker Lake, New Brunswick, have ordered one ten-wheel freight locomotive from the Montreal Locomotive Works, Ltd. The cylinders will be 18 in. x 24 in. The diameter of the driving wheels will be 50 in., and the total weight will be 109,000 lbs.

O'Brien, Fowler & McDougal, Ottawa, Ont., have ordered seven mogul locomotives from the Montreal Locomotive Works, Ltd. The cylinders of these locomotives will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight will be 130,000 lbs.

O'Brien-McDougal & O'Gorman, Ottawa, Ont., have ordered two mogul locomotives and three ten-wheel freight locomotives from the Montreal Locomotive Works, Ltd. The cylinders of the mogul locomotives will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in. and the total weight will be 130,000 lbs. The cylinders of the ten-wheel locomotives will be 18 in. x 24 in., the diameter of the driving wheels will be 50 in. and the total weight will be 109,000 lbs.

The Harriman Lines, mentioned in the *Railway Age Gazette* of December 30 as intending to build 196 locomotives, have definitely placed this order with the Baldwin Locomotive Works. The order will include 101 mikado freight locomotives, 10 mikado passenger locomotives, 8 consolidation locomotives, 12 consolidation Mallets, 12 mogul Mallets, 6 ten-wheel locomotives, 2 Pacific type locomotives, 5 American locomotives and 40 six-wheel switching locomotives. Some of the mikado locomotives will burn lignite fuel as described in the *Railway Age Gazette* of January 27, pages 150 and 167.

CAR BUILDING.

The Louisville & Nashville has ordered 100 Rodger ballast cars.

The Spokane, Portland & Seattle is in the market for 25 all wood passenger cars.

Boston & Maine has ordered 12 passenger cars from the Laconia Car Company.

The Berwind Lumber Company, Pittsburgh, Pa., is in the market for 10 40-ton flat cars.

The Louisiana Railway & Navigation Company has ordered four chair cars. This item is not confirmed.

The Kanawha & Michigan is said to be in the market for passenger and baggage cars. This item is not confirmed.

The New York, New Haven & Hartford has ordered 14 sleeping cars from the Barney & Smith Car Company.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 35 caboose cars from the American Car & Foundry Company.

The National Railways of Mexico have ordered 200 flat cars and 100 tank cars from the American Car & Foundry Company.

The Minneapolis, St. Paul & Sault Ste. Marie is said to be in the market for passenger equipment. This item is not confirmed.

The Hawley Lines, mentioned in the *Railway Age Gazette* of October 28 as being in the market for 8,000 freight cars, have withdrawn their inquiries for this equipment.

The Argentine Government has ordered 29 baggage cars from the American Car & Foundry Company. This is a part of the recent large order for cars placed by the Argentine government.

The Chesapeake & Ohio, reported in the *Railway Age Gazette* of December 21 as in the market for 200 flat cars, has ordered this equipment from the American Car & Foundry Company.

The Chilean Government is taking bids on 20 box cars, 20 coal cars, 20 flat cars, 3 powder cars, 25 metal cars, 3 first-class coaches, 3 second-class coaches and 3 baggage cars. Bids will be opened March 25 in the office of the Direccion General de Obras Publicas, Santiago, Chile.

IRON AND STEEL.

The Delaware, Lackawanna & Western is in the market for 18,000 tons of rails.

The Norfolk & Western has ordered 12,000 tons of steel from the American Bridge Company.

The Northern Electric has ordered 1,300 tons of bridge steel from the American Bridge Company.

The Chicago, Rock Island & Pacific has ordered 10,000 tons of rails from the Illinois Steel Company.

The Lake Superior & Ishpeming has ordered 5,900 tons of structural steel for an ore dock from the Wisconsin Bridge Company.

The St. Louis & San Francisco has ordered 1,000 tons of bridge steel for a draw span at Pocahontas, Ark., from the American Bridge Company.

The Isthman Canal Commission will receive bids until March 24 for miscellaneous supplies, including steel cross ties, bolts and nuts, tie clips, rail bonds, steel conductor rails, frogs, switches, etc.

The Chicago, Burlington & Quincy has ordered 30,000 tons of rails as follows: 10,000 tons from the Illinois Steel Company, 10,000 from the Colorado Fuel and Iron Company, and 10,000 from the Lackawanna Steel Company.

The Chicago & North Western has ordered 5,000 tons of bridge steel, divided as follows: 2,000 tons from the Pennsylvania Steel Company; 2,000 tons from the McClintic-Marshall Construction Company, and 1,000 tons from the American Bridge Company.

The New York Central Lines have ordered 41,500 tons of titanium bessemer rails for 1911, and have specified the use of 1 per cent. of the 10 per cent. titanium alloy (or equivalent titanium) which will therefore require more than 400 tons of the 10 per cent. alloy. The strength of the titanium content may be increased to 15 per cent., thus requiring a proportionately smaller quantity of alloy.

General Conditions in Steel.—The improvement in the steel industry since the first of January has been very encouraging, but whether this improvement is permanent or temporary remains to be seen. Orders booked by the United States Steel Corporation during January were more than a third larger than those of either December or November, and the percentage of operations has considerably increased.

FOREIGN RAILWAY NOTES.

Final plans have been accepted for the extension of a branch of the Central of Brazil Railway, connecting G. Portella with Vassouras on the Spaucahy Railway; also a short line to Itacurussa: A central branch to Monte Claros, 37 miles long will be built at a cost of $800,000, and 21 miles of main line north from Lafayette will be changed to broad gage.

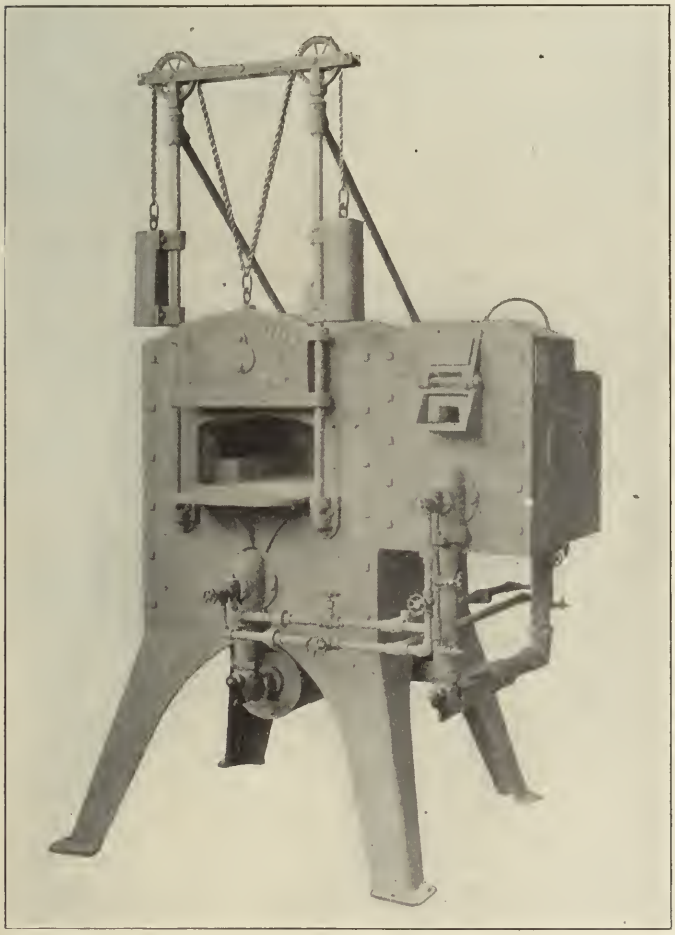
The construction of the railway line from Dean Funes, Argentina, to Laguna Paiva, a distance of 250 miles, was completed last October. This new line is of considerable importance to the development of many agricultural regions, as it extends from the coast of Santa Fe Province to Dean Funes, a town on the northernmost section of the Province of Cordoba.

Shop Equipment.

Frankfort Furnaces for Natural Gas or Oil Fuel.

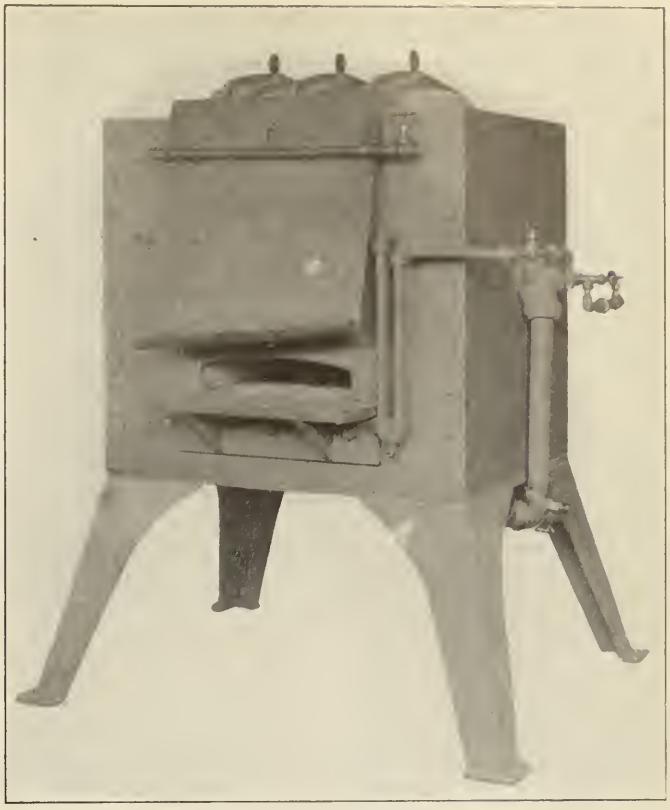
The Strong, Carlisle & Hammond Company, Cleveland, Ohio, has issued a catalog describing oil and gas furnaces which it has developed for a variety of purposes. Several of these which are specially designed for use in railway shops are here illustrated.

The No. 110 Frankfort rivet furnace has four ovens, each oven being entirely separate from the others and having its own burners and hopper. The rivets pass down an incline from the hopper to the oven so that the surplus heat may be utilized to preheat them. The control of the temperature is such that with reasonable attention to the air and gas valves over-heating may be prevented. The good combustion in the combustion chamber reduces scale or oxidation of the rivet. For natural gas there are three burners to each oven. The ovens are 20 in. wide by 24 in. deep by 15 in. high, with an entrance 20 in. by 7 in.; the floor space for the whole furnace is 65 in. by 135 in.



No. 5A—Frankfort Furnace.

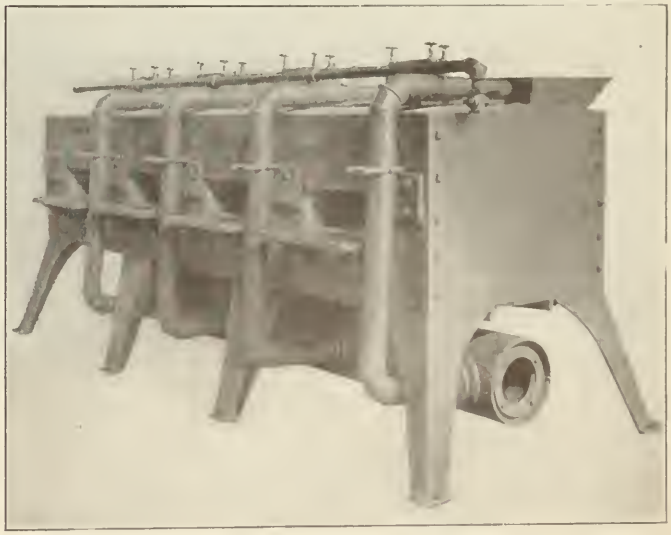
The No. 38 Frankfort forging furnace was designed for high temperatures and continuous service. The arch is made in sections, and any section may be replaced while the furnace is in full operation; the old arch clamp is refilled with brick at some convenient time. The walls of iron, mineral wool and brick reduce the heat radiation, all surplus heat being vented through ports in the roof. The front is equipped with a water shield which allows the workman to stand close to the entrance. When so ordered the furnace may be built with an air pipe which runs along the bottom of the entrance and drives the heat up behind the water shield. The oven floor slants to the center and all slag drains off through a hole in the back. The illustration shows the H. W. S. oil burner in which the oil is atomized by steam, which is superheated in the furnace walls. With slight changes in the burner the oil can be atomized by compressed air or air at 1 lb. per sq. in. The burner is large



No. 38—Frankfort Forging Furnace.

enough to heat the furnace in a short time. The oven is 24 in. wide by 12 in. deep by 18 in. high, the entrance 18 in. wide by 4 in. high, and the floor space 46 in. by 61 in. The No. 38 is an efficient furnace and will heat the material quickly and evenly.

The 5A Frankfort combination furnace is equipped for oil fuel, and is designed for tool room work, but may be used for a variety of purposes, such as annealing, case-hardening, tempering and dressing tools, and melting babbitt or other soft metals. It is adaptable for general use in the shop or factory, and although it has sufficient capacity for large work, the smallest article may be treated with economy and thoroughness. The furnace heats quickly and maintains its temperature with precision. A high or low temperature may be secured, which makes it valuable for treating high-speed steel. Owing to its unique construction, the furnace is free from oxidizing gases and direct contact with the flame is avoided. Combustion takes place under the heating oven, and a clean intense heat enters

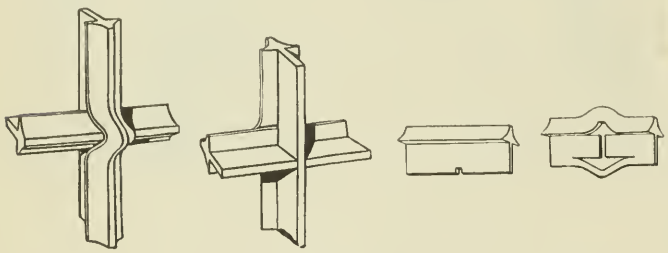


No. 110—Frankfort Rivet Furnace.

the working chamber or oven. The two ovens and melting pots are served by separate burners, working independently of each other. The small oven is intended for dressing tools and treating small articles made from high-speed steel, such as cutters, dies, taps, reamers, milling tools, drills, etc. The pot will hold about 75 lbs. of lead or babbitt and any desired temperature may be secured. The blower is mounted on brackets in the rear, which economizes in space. The principal dimensions are: entrance, large, 14 in. by 8 in.; heating chamber, 18 in. wide by 18 in. long by 11 in. high; entrance, small, 4½ in. by 3 in.; heating chamber, 4 in. wide by 6 in. long by 3½ in. high. The total height to the top of furnace is 48 in.; and the floor space is 62 in. by 53 in. The large oven has five natural gas burners or one oil burner, and the small oven, one oil or natural gas burner.

Detroit Fenestra Window Sash.

One of the conspicuous improvements in shop and factory building construction in recent years is the use of solid steel Fenestra window sash. These solid steel sash are made of rolled sections; both the horizontal and vertical members are of the same shape and area, except the frame bars, which are of a molded channel section. The muntins are connected at their intersection by the Fenestra joint, on which the efficiency depends. A small cross slot is made in the vertical bar, just wide enough



The Fenestra Joint.

to allow the flange of the horizontal bar to pass through. The molded portion is then pressed out so as to fold closely around the corresponding part of the horizontal bar. The joint is so arranged that less than 20 per cent. of the material is removed and still the bars are locked. This constitutes its chief advantage over mitre joints, where at least 50 per cent. of the material is removed, with consequent weakening of the sash. A



Interior View of a Shop Equipped With Fenestra Window Sash.

detail illustrating how the Fenestra joint is made and locked is shown herewith. A special connection is employed as a protection against corrosion at the wall; but no frames proper, sash weights, or heavy mullions are used. As the mullion bars are only 3-16 in. thick, there is very little obstruction to the light.

The standard sizes of sash are for 10 in. by 16 in. or 12 in. by 18 in. glass, and they are made up in various multiples of these sizes, both as to height and width.

One of the first large installations of Fenestra windows in railway shops was in that of the New York Central at West Albany, N. Y. More recent installations are in the new shops of the Duluth, Missabe & Northern at Proctor, Minn.; in the Missouri, Kansas & Texas freight station at St. Louis, Mo.; in the shops of the St. Louis Southwestern at Tyler, Tex.; in some of the later roundhouses built by the Pennsylvania Rail-



Exterior View of a Shop Equipped with Fenestra Window Sash.

road; in the new power house at the Chicago & North Western station, and in the large additions to the shops of the same company at Forty-fifth avenue. Illustrations of the interior and exterior of these shops are here given; it will be seen that Fenestra sash is used not only in the side walls but also in the saw-tooth roof, providing specially good illumination.

The American rights for the manufacture of this type of window are owned by the Detroit Steel Products Company, Detroit, Mich., and they have built a large factory at that place for its manufacture.

Jessop's Ark High Speed Tool Steel.

High speed steel since its introduction has revolutionized methods of shop operation and machine design. The steel which can endure longest under stress of deep cuts, coarse feeds and high speeds—the elements governing maximum output—is the steel that will be sought for high speed work. The question of endurance is most vital, especially when it concerns a forming tool or milling cutter, the contour of which must be preserved; the cost of material while often expensive, is of secondary importance when compared with the cost of labor on the finished tools. In all cases the value of tool steel as a factor in reducing shop expense, will be found in the time it remains in service without going to the tool dresser or grinder.

Jessop's Ark high speed steel is one that has proved its value for lathe tools, planer tools, boring tools, drilling, milling cutters, solid reamers, inserted teeth for milling cutters, threading dies, blanking and cutting dies, forming tools, planer knives for wood tools, inserted tooth saws, and other purposes in high speed work. In railway shops, where hard steel tires are a difficult proposition to cope with, whether driving wheels or car wheels, Jessop's Ark high speed steel has established a record on a modern high powered electrically driven wheel lathe, of making cuts ½ in. deep (1 in. reduction), with ½ in. feed at a speed of 17 ft. per min. The least number of tires turned under the above conditions was thirteen, with one grinding of the tool. Good results have also recently been attained in car wheel work by turning 50 wheels with one grinding of the tools. These wheels were 32 in. in diameter and very hard. The speed was 13 ft. per min., the cut ⅜ in. deep or ¾ in. reduction, and a feed of 3/16 in. Its efficiency on chrome-nickel and treated nickel steels, makes Jessop's Ark high speed steel an expense reducer in any plant. Wm. Jessop & Sons were established in Sheffield, England, in 1774, and have always kept to the forefront in point of progress. The headquarters of this company in this country is at 91 John street, New York.

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ON February 1 E. T. Howson became a member of the editorial staff of the *Railway Age Gazette*, with direct supervision over the maintenance of way department. Mr. Howson comes to us from the Chicago, Burlington & Quincy, where he has been engaged in engineering work for about five years. He received his engineering education at the University of Wisconsin, and while a student there was editor of the *Wisconsin Engineer*, which is published by the students in the engineering college. He graduated in 1906 and was assistant engineer on reconstruction on the Burlington in southern Illinois for a year. He was then in maintenance work in both office and field for two years. His last service with the Burlington was as division engineer of the La Crosse division in charge of important terminal and double track work as well as maintenance of way. He will make his headquarters at our Chicago office.

THE writer of the articles on The Mistakes of the Efficiency Men, who is so severely criticised in a communication in this issue, was engaged to prepare the series of articles not because he was opposed to the principles of scientific management, for he is not, but because of his intimate practical contact with efficiency engineers and also his previous extensive experience in effecting economies in railway service. He has no intention of quarreling with the correctness of the principles of efficiency. He believes in them and his criticisms of the efficiency engineer, which are based on actual experience, must therefore carry all the more weight. A few managers of industrial plants have realized the force of the principles of scientific management and have retained efficiency engineers, sometimes with splendid results when the work was carried on under the supervision of a good, practical manager, but often with poor results when a close check was not kept on the engineer. In some instances the efficiency engineer has had untrained and inexperienced young men as his staff. Probably he realized more fully than anybody else the handicap he was laboring under, but where could he find the right kind of men to do this work? They must be carefully trained and developed, and it takes time to do this. The practical shop demonstrator or foreman with a plentiful supply of common sense is far more apt to make a correct schedule than most of these inexperienced young men, and, after all, the most important factor in making schedules for railway repair work is common sense and good judgment. There is a great difference between such work and the manufacturing of new material, even though the underlying principles governing their performance are the same. The bonus system may accomplish good results; so does piecework when properly handled. One of the most efficient railway shops in this country is operated on the day work plan. The main thing is to have a system such that the management will know exactly what a fair day's work should be and that the men will be given an incentive in some form or other to put forth their best efforts as concerns both quality and quantity of output. If these things are accomplished the method of payment is immaterial. Conditions at one shop may demand one system, while those at another may require a radically different treatment. The prominence which has been given the subject of scientific management means much to the railways, not because it has focused attention on the efficiency engineers who have formulated its principles, but because of the effect which must result from a realization of its possibilities on the part of the army of railway officers and foremen who are studying it. It is, however, important that they profit by the mistakes of the efficiency engineers.

THE government accident bulletin which is reprinted in this issue is the first one under the new law, which brings all accidents into the quarterly records, including highway crossing cases, trespassers, employees off duty, etc. The classification has been modified in some respects. For those classes of accidents in which the public takes the most interest comparisons can be made the same as in the past, but in the final totals comparison with former periods is practically out of the question, for these, besides being greatly increased by the addition of the new classes mentioned, are also decreased by the omission of "industrial accidents," which the commission has decreed shall no longer be called railway accidents. In table No. 1, however, the industrials are shown at the bottom, so that after all the only important difference produced by their exclusion is that the railways (as appears from the circular of instructions) are relieved from the duty of reporting their causes and circumstances in detail. But the present record is appalling, in whatever way one looks at it. The only reason that we are not really appalled is that we have become hardened. This, indeed, is largely inevitable, for no mind can bear the burden of even one branch of the sorrows of 80 millions of people. Moreover, the railways are not the only subjects of reflections of this kind. The records of accidents in mines, or at sea, furnish similar suggestions. The annual report of the coroner of New York City, recently issued, contains a lot of striking facts which will serve to modify quite materially the views of anyone who thinks that the car of Juggernaut runs only on standard gage railways. In the notes on causes of

prominent train accidents this bulletin presents a notable list, no less than six bad disasters having happened in the quarter under review. The collision (No. 20) which occurred at Durand, Mich., in August, is described quite fully; and the facts, as here given, expose the mischievous character of the official and unofficial comments, evidently ignorant or prejudiced, which were so freely published in the Michigan newspapers at the time of the coroner's investigation. Concerning the other notable accidents the facts given in the bulletin add little to what has been published already. These others, so far as we can identify them are: Ignacio, California (August), No. 22; Middletown, Ohio (July), No. 24; Fort Wayne & W. V. Electric (September), No. 25; Dellvale (Clayton), Kan., derailment No. 9; Analomink, Pa. (August), derailment No. 23. Perhaps the most interesting collision case is that numbered 3; disclosing a combination of three negligent telegraphers and a controlled-manual block-signal apparatus that was not used.

SOME FACTS ABOUT MAIL PAY.

THE committee on railway mail pay, Julius Kruttschnitt, chairman, has made an interesting study of the complicated and confusing subject with which it has to deal, and we give in another column an abstract of a pamphlet which has been issued showing some of the results. This is a real "report of progress," for it has been difficult heretofore to get much definite useful information on this subject. But on the question of how the railways' claims shall be impressed on the postmaster general or Congress there does not appear to have been much progress. On this point the committee does not enlighten us. The "small roads," which means those—not always extremely small in mileage—that carry a very small quantity of mail, presented their case to the House post office committee in a pamphlet last month, but we do not learn that there is any hope of action by Congress at the present session.

The general situation is extremely illogical, and has been so for years. Like the two cent charge for letters or the one cent a pound for newspapers, the rate paid the railways is admittedly based on the crudest possible averages. On letters weighing a fourth of an ounce, or on a charge for disseminating knowledge for the general public welfare, the injustice inseparable from a crude basis is not burdensome, but an injustice which mounts up to the value of thousands of ton miles, as this does in the cases of many railways, cannot so easily be put aside as negligible. Space for assorting letters is properly chargeable for, as space, because it cannot be used to carry lading, and for the government to pay for a 50 ft. car while compelling the railway to furnish for nothing a 35 ft. car (where a longer one is not needed) has no rational basis except on the theory that might makes right. In their second request—for relief from carrying the mail from stations to post offices—the railways are illogical, for this burden bears just as heavily in proportion on the large roads as on the smaller ones. But it is a condition, not a theory, that confronts them; and their position, we understand, is that the smaller roads in many cases actually sustain important losses on this service, while the larger roads, carrying several times as much mail, can absorb the loss with more show of reason. To ask that the prices for transportation be readjusted as often as there is a material change in the quantity of mail carried (third request) is so reasonable that the point needs no argument.

So far as we can learn, the only answer that is made to the railways' claim of unreasonableness in details, is that as a whole, the railways receive more than they ought to receive. Even so, there is no reason for continuing inequitable rates when a basis which is equitable can be found. Two wrongs do not make a right. It looks as though the postmaster general, through successive administrations, had simply aimed to reduce the railways' total compensation—which he looks upon as a public spirited purpose—in any way that is possible and that is technically within the law. Where a 60 ft. car makes a 300-mile run the department makes no bones of deciding that for a part of the run, say 50 or 100 miles, a length of only 50 ft. is needed and only that length will be paid for; a decision that could be justified only on the assumption that it would be economical to devide such a run and use for it two separate cars. Such a narrow minded policy should be beneath the dignity of a department of the government. If the railways are being paid too much the fair way to reduce the prices is to vote a reduction openly in Congress.

But there is no evidence, after all, that the railways receive too much. It must be that some roads make a good profit on mail carrying, for we see them every now and then racing with each other to see which can find most favor with the post office department; but taking the railway system of the country as a whole, the committee shows that the railways receive for the mails less per linear foot of car space than is received for passengers; and no reasonable person has ever claimed that the passenger service is excessively profitable. On the contrary, it is conducted at a loss on many thousands of miles of road, and its continuance is justified only on the ground that the public must have the service and is able to reimburse the railways, wholly or partly, by furnishing loads for freight trains. A few roads in thickly settled districts have made money on passengers, and it is true that in some cases a reduction of fares has increased the net receipts; but the fact remains that almost everywhere the freight service has to bear a part of the cost of maintaining the passenger service. There is no good reason why this burden should be increased for the benefit of the mail service. Each service should bear its own burdens, as nearly as practicable.

Unless the facts which are set forth by this committee can be impeached it would appear that the railways have made out a pretty good case.

THE LOCOMOTIVE BOILER INSPECTION LEGISLATION.

THE federal locomotive boiler inspection bill, which passed the Senate on January 10 and the house on February 7, is very different from the earlier measures introduced in Congress dealing with this subject. For example, Bill H. R. 9786, which was presented at the first session of the sixty-first Congress, prescribed specifically various devices with which locomotive boilers must be equipped; provided that each should withstand a hydrostatic test in the ratio of 150 lbs. to the square inch to 100 lbs. to the square inch of the working steam power allowed; and made other detailed requirements regarding boiler construction and operation. It provided that the secretary of commerce and labor should, in such manner and under such rules as might be prescribed by him, once in every three months, at least, order a careful inspection of each boiler, and authorized any inspector who was not satisfied that a boiler was safe to compel the locomotive to be taken out of service. In other words, it arbitrarily fixed the standards, put the entire duty of inspection in the first instance on the government, and left the railway managers with almost no discretion to determine how boilers should be constructed or equipped, or how or when they should be inspected. Bill S. 6702, as it was originally introduced at the second session of the sixty-first Congress, contained substantially similar, but very much more elaborate and detailed, provisions, and its adoption would have required the employment by the government of 300 inspectors.

On the other hand, the bill which has now been passed by both houses (S. 6707) does not prescribe in detail how boilers shall be built and equipped, but merely forbids the railways to use locomotives unless the boilers and the appurtenances thereof are in proper condition and safe to operate, and unless they shall be inspected from time to time in accordance with the provisions of the act. Inspections are to be made by the railways according to rules and instructions to be prepared in the first instance by themselves, but which shall be subject to approval and modifi-

cation by the Interstate Commerce Commission, which may itself prepare rules and instructions for any road that fails to prepare and file them with the commission. There are to be appointed one chief inspector and two assistant chief inspectors, and the country is to be divided into 50 districts, in each of which there shall be one inspector who shall be in the classified service and be appointed through the civil service commission. The railways are required to file with the inspector of the district in which a locomotive is operated a sworn report of each inspection and a sworn statement as to the repairs made of defects disclosed by the inspection. A district inspector may order any locomotive out of service if he finds its boiler or apparatus pertaining thereto not in serviceable condition; but the railway may appeal at once from his order to the chief inspector and from the chief inspector to the Interstate Commerce Commission. Pending the appeal the orders of the inspector must be obeyed. In case of accident resulting from failure of a locomotive boiler or its appurtenances causing serious injury or death, the railway shall make a report to the chief inspector, the accident shall be investigated by a government official, and the results of the investigation shall be made public in such manner as the Interstate Commerce Commission may deem proper.

It will be seen that this measure puts the responsibility, in the first instance, for seeing that boilers are properly made and inspected where it belongs—that is, on the railway. The government will not attempt to supersede the railway management in the performance of a duty properly belonging to the latter, but will merely exercise supervision to see that the railway management performs its duty. Under any of the earlier bills there would have been duplication of inspection, the function being performed by both the railways and the government. Under the later measure there will be little or no more duplication than is necessary if the government is to make sure that the railway is complying with the requirements of the law. The results will be better than would have been obtained by the enactment of one of the earlier measures: and the securing of them probably will cost both the government and the railways less.

That arbitrary and unwise legislation has been prevented and that a fairly satisfactory law has been enacted are due mainly to the fact that the railways, while vigorously opposing the earlier bills, did not oppose all legislation on the subject, as they often have done when measures for the regulation of other matters were pending, but merely insisted that any legislation that might be passed should be fair and wise, and tendered the services of their experts to aid in drafting a good bill. Representatives of the Special Committee on Relations of Railway Operation to Legislation held several conferences with representatives of the Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and Enginemen, the Order of Railway Conductors and the Brotherhood of Railroad Trainmen. These conferences led to the various points of difference between the representatives of the employees and the representatives of the railways being settled or compromised with the result that the measure finally passed went to Congress with the endorsement of H. E. Wills, the legislative agent of the brotherhoods, and F. O. Melcher, the chairman of the Special Committee on Relations of Railway Operation to Legislation.

Public men often have complained that when bills affecting railways have been pending before state legislatures or Congress, the roads have sent to appear before the committees to which the measures were referred their legislative agents, usually attorneys, who had no authority to suggest any modifications in them but could merely oppose them. It has been said that if the railways would send to the state and the national capitals responsible officers possessing practical knowledge of the matters involved, and authority to say what modifications in the proposed measures would be acceptable to the railways, fewer arbitrary and harmful measures would be passed. The experience with the boiler inspection legislation shows that there has been ground for these criticisms of the policy often followed by the railways. The same thing may be said of the results of the conferences between representatives of the railways, representatives of the employees, and the safety appliance inspectors of the Interstate Commerce Commission regarding recommendations to be made for modifications of the standards prescribed by the commission for safety appliances on new cars and for extensions of the time within which the roads must put these appliances on old equipment. In both cases the roads have gained by a policy of firm but conciliatory negotiations more than in any case in recent years they have gained by a policy of mere opposition.

NEW BOOKS.

Metal Statistics. 208 pages, 3½ in. x 6 in. Cloth. American Metal Market Co., New York.

The 1911 edition of this work contains a better selection of statistical information relating to the metal and iron and steel trades than any of the previous issues. The figures are presented in such a clear and concise form that it is very convenient for reference. The statistics cover the production, consumption and price movements of all metal and iron and steel products for a series of years. Unusual care has been taken to include only such figures as have been proved reliable. The iron and steel section has been entirely revised under the supervision of B. E. V. Luty, Pittsburgh, Pa., and several new features of original character have been introduced, including composite pig iron and composite finished steel. Among the various copper statistics is a table showing the total production of this metal from 1800 through 1910, which sets forth graphically the tremendous strides that have been made in this country within the last ten years particularly.

Self Taught Mechanical Drawing and Elementary Machine Design. By F. L. Sylvester, M.E., with additions by Erik Oberg. 320 pages; 5 in. x 7⅜ in.; cloth. The Norman W. Henley Publishing Company, New York. Price, $2.00.

In this elementary treatise the aim of the author has been to adapt the work to the requirements of the practical mechanic and young draftsman, and to present the subject in such a simple manner that it may be easily studied without a teacher. The first part contains simple lessons in mechanical drawing, followed by easy lessons in mathematics, pertaining to the problems in machine design that are presented later. The last part treats of strength of materials and the elements of machine design. The chief merit of the book is the consistent level maintained throughout. In none of the parts relating to mechanics, mathematics or strength of materials is a technical education necessary to understand the formulae presented, and the capacity of the shop apprentice who has not had this advantage is constantly kept in view. The book is likely to prove useful to many young apprentices who are not technical graduates and have not attended manual training schools.

Elements of Electricity for Technical Students. By W. H. Timbie, instructor in industrial electricity, Pratt Institute. 556 pages; 5¼ in. x 7¾ in.; cloth. John Wiley & Sons, New York. Price, $2.00.

The author has had an extensive teaching experience on this subject and the book is based on lecture notes used for several years in the classes of applied and industrial electricity at the Pratt Institute of Brooklyn, N. Y. These notes have given good results in preparing the students for more advanced study as well as for practical work. The chief merits of the book are: First, it contains an adequate amount of information concerning electrical laws in shape for immediate use. Second, it applies the information to existing conditions and not to abstract them. Third, it gives such a drill in practical problems that an additional amount of profitable information is obtained, and it develops in the student a capacity for applying what he has learned, the large number of diagrams aiding materially in providing exact and clean-cut conceptions of the problems. Fourth, the book presents only those facts and principles that the technical student needs to know, history and general theory being omitted. The text is an adequate treatment of a few funda-

mental ideas rather than a profuse treatment of many; yet it constitutes a well-rounded course for the man who is to receive no further electrical education. A knowledge of common school arithmetic and the simplest algebra is required to study the book satisfactorily. It is especially adapted for use in the short practical courses given in trade, industrial and technical high schools, but at the same time would afford sufficient preparation for the theory and practice of electricity as taught in colleges and universities.

Letters to the Editor.

NICKEL AND CHROME ALLOYS FOR CHILLED IRON CAR WHEELS.

Pittsburgh, Pa., February 2, 1911.

To the Editor of the Railway Age Gazette:

The best steel used for wearing surfaces in automobiles has nickel and chrome in it, the nickel to give increased tensile strength and toughness of surface, and the chrome to give hardness of surface. The necessity of an alloy of some kind for chilled car wheels is evident from the fact that all known kinds of pig iron and scrap have been used without success in the endeavor to make an improved chilled iron car wheel. Such makers as the Pennsylvania Railroad and the Norfolk & Western would not be seeking a better car wheel mixture, if the present mixtures were good enough.

Nickel and chrome are the least expensive and best known alloys on the market. They are the only ones that meet the difficulty of increased combined carbon in a remelted chilled car wheel. This is the troublesome element in the present mixture, and must be recognized and regulated if an improved chilled car wheel is to be made. The chemical, mechanical and service tests showing that these alloys will remedy all this difficulty and enable chill wheel foundries to continue their present foundry practice, and the railways to buy a reliable, inexpensive car wheel, as they have heretofore been doing, have all been made by the actual use of such wheels under 50-ton steel cars for nearly two years; these cars run 60,000 miles in that time, or equal to seven years of ordinary freight car mileage.

Two special mechanical tests have also been made with the following results: Under hydraulic flange pressure the nickelized car wheel gave way under 90,000 lbs. A standard chilled iron car wheel flange gave way at 54,000 lbs., showing 66 per cent. in favor of the nickelized wheel. Under the drop flange test, introduced by the Lobdell Car Wheel Company, consisting of a weight of 21 lbs. dropped 14 ft., the nickelized wheel flange stood 37 blows, while standard chill wheels on the same test block broke at an average of 12 blows, showing an advantage of over 300 per cent. in favor of the nickelized wheel. It is believed that the ordinary chilled car wheel flange will not stand 5 blows. These tests are of special interest when it is remembered that the weak point in the ordinary chilled car wheel is the flange. The rolled and forged steel wheels have been introduced, notwithstanding their acknowledged deficiency in wearing qualities and expensive re-turning, solely because they are stronger in the flange than the ordinary chilled wheel. The above tests show that the use of nickel removes this difficulty, and that a stronger flange can be obtained at one-third the cost of a steel wheel on the basis of cost per 1,000 miles. This drop flange test, although it has not yet been adopted by the M. C. B. Association, will commend itself to all engineers of tests. The action of the falling weight on the inside of the flange gives a shock similar to that which the flange is subjected to in service.

The tests described show 300 per cent. advantage in strength of flange of the nickelized chilled car wheel over the ordinary car wheel. The steel wheel makers claim an advantage in this respect of 500 per cent., but if 300 per cent. is sufficient, as proven by the use of the nickelized wheels on 50-ton steel cars making a mileage of 60,000, why pay three times as much for an unnecessary advantage? To give a humorous illustration, suppose a man wanted his nose lengthened ¼ in. and found a surgeon that would do the job for $1,000. Would he be likely to prefer a surgeon who told him that he would not put on less than ¾ in., but would do it for $3,000. The patient might object that the extra half inch was very unnecessary, and very expensive.

Where the surface of the tread is made tougher by the addition of nickel and harder by the addition of chrome an increase in mileage follows as a matter of course. From actual results in the use of alloys, a guarantee of 80,000 to 90,000 miles can be given at an expense of one-third the steel wheel, and 30 per cent. less than the cost of the present ordinary chilled wheel on the basis of cost per 1,000 miles.

Robert C. Totten.

SCIENTIFIC MANAGEMENT.

Port Chester, N. Y., February 5, 1911.

To the Editor of the Railway Age Gazette:

It is inconceivable that the writer of The Mistakes of Efficiency Men, in your issue of February 3, page 230, could ever have worked "with them," for he shows such a lamentable ignorance of their fundamental principles. Ordinarily such writers may be left to hang themselves, but as scientific management is now on the tapis and is so imperfectly understood in many quarters I feel impelled to criticise most of the article. Will the writer kindly give an instance which justifies his saying, "Failure of many of their theories when brought to the test of practical application"? The principles of scientific management are based on truisms and must be as true in practice as in theory; when failure occurs it will inevitably be found that it is caused by a violation of principle and not through fault of principle.

For a writer who claims to have "worked with them" to ask how the efficiency of a workman is arrived at, and then to go on and give an entirely erroneous account of how it is done is to say the least surprising. Cursory observation readily detects lost time in any operation; the operator stops to talk, to go on an errand, to look for material, etc. It is easy to see that waste motions are being made, that the speed is slow and to locate innumerable causes that restrict output, so that when he says: "Time studies are made, often with the assistance of a stop watch, by inexperienced men of little tact—students and others equally incapable," he writes himself down as one wholly misconceiving the situation. A trained observer, though he may know little about the particular operation which he is observing, can readily detect the wastes and keep account of them, the stop watch being merely an assistance in fixing the time; when this is done it is only the beginning of the making of a schedule upon which the efficiency shall be calculated. The fixing of that schedule must be the work of a person expert in the particular line in which the observation has been made and in which every consideration is given to the conditions surrounding the operation.

He also says that "men cannot be worked like machines," and this is where efficiency engineers maintain a strong position. Their object is not to increase the effort of the men, but on the other hand to decrease it, mixing a little brain with it to produce a greater output. The operator who has to run after the foreman for a job, for material, or for other things, has to work harder to turn out a satisfactory day's work. It is the object of the efficiency engineer to make the work easier for the operator. Take an actual illustration; an observer noticed that a machine was held up quite a time while two men laboriously put into place a heavy roll of paper; he studied out a plan whereby a new roll was ready to drop into the place of the preceding

one as soon as it was empty; this increased the output and diminished the effort of the employe. It is an inexcusable error to maintain that efficiency engineers study to drive men to exhaustive effort; on the contrary they aim at assisting the men to secure greater output with diminished effort.

The trouble with the present system lies almost wholly with the management and not with the men; this is why scientific management is so effective. One of the tenets of scientific management is "immediate, reliable and adequate records." These are almost wholly lacking in railway service. Managers would be astonished could they but know the true facts as to their operations, but the reports, not records, which come to them do not give them. Were such records available it would be found that the estimates made by the efficiency engineers were much too low.

Again the writer exhibits his ignorance when he says: "It is not an unusual occurrence for superintendents and foremen to be misled, by the evidence that John Brown and Tom Jones have increased their output from 70 to 100 per cent., into thinkink that such results may be expected of all the men in their shop." If he had worked with efficiency engineers he should know that often a man of exceptional ability, the uncommon man, will attain an efficiency of 200 per cent. and keep it up day in and day out. When it is said that a concern or any part of it can be made 100 per cent. efficient, it means that the average of all the men will be that, or in other words, that the output is equal to that which would be produced if every man worked to an even 100 per cent. efficiency, a condition that will probably never occur. There will always be men of high and men of low efficiency. The fault with the present system is that high and low get the same rewards, which is neither just nor economical. The schedule always being made for the average man enables the uncommon man to realize much above the 100 per cent., and he should receive his reward in way of a bonus.

It would be interesting if the writer would name any efficiency engineer who ever contended that scientific management could be had without cost. It is one of their cardinal principles that to secure efficiency the cost of supervision must be increased and that the efficient man should receive more money. But the writer goes on to say that ultimately the men will beat the system; how this can be is past comprehension; if the operative delivers the output he gets his reward. How he is to get the reward without delivering the goods is not explained and would defy explanation.

Again, it is said that railways are different from other establishments. This is the old, old story: "That plan is excellent for so-and-so, but it would not work with me." All enterprises are alike in their fundamentals and the same underlying principles apply to all.

The writer refers to testimony taken before the Interstate Commerce Commission as to costs on some roads, but no efficiency engineer of any standing would claim that those costs were schedule costs. It might well be that roads with low costs were as inefficient as those with high costs, the low cost being the result of exceptional favoring conditions. Only an exhaustive study and trial can determine the schedule in any particular case, for any particular road or any particular establishment.

The writer ends his article with these excellent sentences: "Successful railway operation is made up of a multiplicity of steps each carefully planned and carried out; that the problem is to control the parts in order that the whole may be controlled." These sentences are the alpha and omega of scientific management, but no one with a modicum of actual experience in connection with railway operation will hold for a moment that those steps are either planned or controlled. The methods in vogue have grown up like "Topsy," without co-ordination between parts and there is constant friction between departments and divisions. Each road has its heredity, which controls its system; each head of departments has his idiosyncracies resulting from his environment and the experience of the American Railway Association is sufficient proof that this heredity and environment are the most serious obstacles to placing the railway business on a scientific basis.

The writer says: "An efficiency engineer does not hesitate to promise almost immediate results." This is rank slander of the profession; perhaps the writer can name a single instance, but it is greatly to be doubted. It is a fact, however, that in anticipation of the taking hold of an efficiency task the men brace up and make a spurt to show that they are not so black as painted, but lacking systematic management it is something that cannot be continued.

As the real work of the efficiency engineer does not begin until he comes up against the "rutty" ways of the management, it follows that no immediate permanent results can be looked for or promised, and no one knows this better than the efficiency engineer. I appeal for fair play and the discussion of this question on fair grounds, with illustrative instances instead of a wholesale denouncement with misleading and erroneous statements of fact.

F. LINCOLN HUTCHINS.

THE CREDIT FOR THE ABOLITION OF SECRET REBATES.

January 31, 1911.

To the Editor of the Railway Age Gazette:

In your issue of January 27 you quote ex-President Roosevelt on Paul Morton's death:

> "To him, more than any one man, we owed the information that enabled the government definitely to break up the practice of giving rebates by the railways, and this service was one which he alone among the railway men was willing, at no small cost to himself, to render to the public; and for it he is entitled to the grateful remembrance of all men who deem it of prime importance to see the law justly and rightly enforced."

As you say "these statements of Mr. Roosevelt are characteristically exaggerated." They are more; they depict Mr. Morton in the role of a common informer, which certainly he never was. Railway men have gone to jail rather than take up that position.

But, further, Mr. Morton, deserving as he was, deserves no credit for bringing about the cessation of rebating.

The Interstate Commerce Commission was organized in 1887. For twelve years they made no earnest effort to abolish rebating, and the reason is plain—the commercial community, the railway traffic men, and apparently the commission itself, credited the growth of business, the stimulation of enterprise and the equilibrium of industrial conditions to the universal and ancient practice of rebating. The application of the wholesale principle and the handling of the railway as primarily a concern of its stockholders, worked out in practices analogous to and considered to be as legitimate as protective tariffs, bounties, land grants, exemptions from taxation, and other well-known forms of encouraging industry.

Into this situation entered A. J. Cassatt when he returned to the service of the Pennsylvania Railroad in 1899 as its president. With the great resources at his command, interests sufficient to give a voice in the management were purchased in the Baltimore & Ohio, the Chesapeake & Ohio and the Norfolk & Western. The co-operation of the New York Central Lines was secured. It was then announced that rebates would no longer be accorded to any shipper, no matter how important. The results were attained through peaceful methods, and were beneficial not only to the transportation companies but to the industrial and commercial interests.

To prevent the resort to secret discrimination, even during a period of commercial depression, the railways concerned in the movement were largely instrumental in formulating and urging the enactment of the Elkins laws, in 1903.

It is easy to be wise after the event, and it is not surprising that the ass appears as the claimant of the lion's skin. The plain truth is that Mr. Roosevelt's discoveries in the matter of rebates were about as novel as his discovery of the ten commandments.

F.

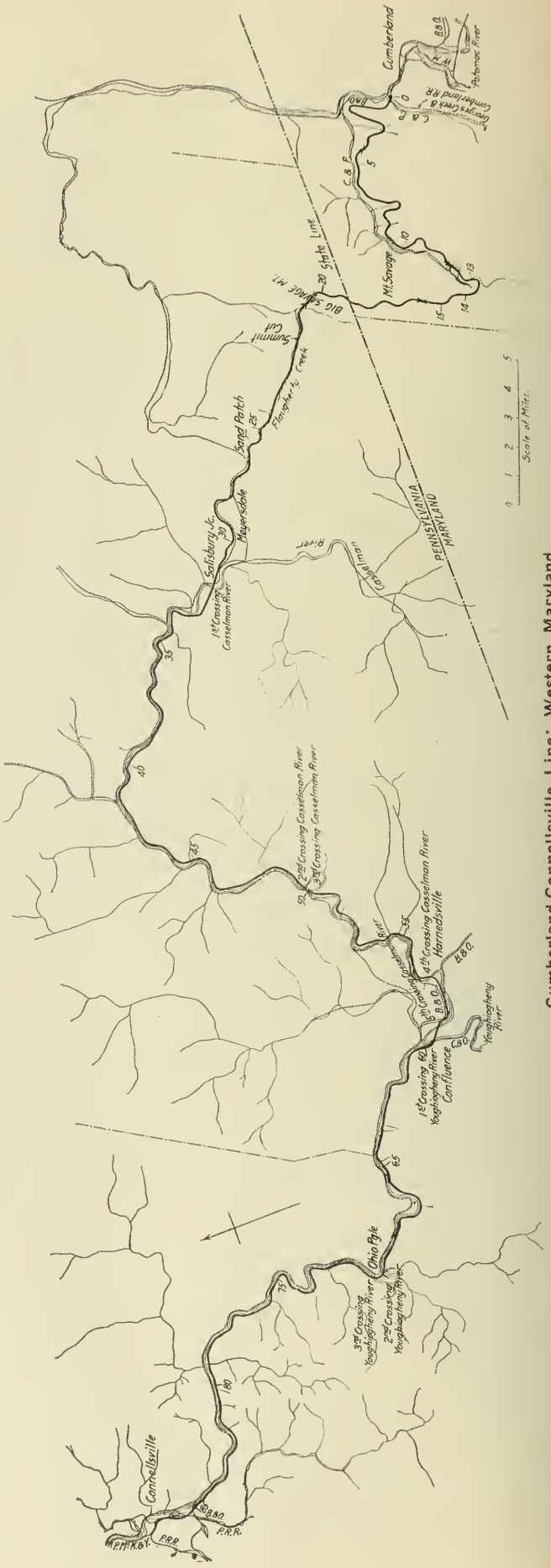
CUMBERLAND-CONNELLSVILLE CONNECTION OF THE WESTERN MARYLAND.

BY GEORGE L. FOWLER.
Associate Editor, *Railway Age Gazette.*

The reasons for the construction of the connecting link between Cumberland, Md., and Connellsville, Pa., for the Western Maryland having been found to be sufficient to warrant undertaking the work, it remained to solve the engineering problems presented, along the lines of modern railway construction and operation. In accordance with these, economy of operation is the matter of prime importance and, in order that the greatest possible advantages may be obtained, the cost of survey, location and construction, must necessarily rise far above what would have been considered permissible a few years ago, even through so rough a country as that in which this new line is located. The first problem, therefore, in this work was to secure a line of as low a grade as possible, especially in the matter of grades adverse to the eastbound or heavy traffic. This was to be done on what is mountain work for the whole distance. As measured on the map the air line distance from Cumberland to Connellsville is about 50 miles. Between them lie the Allegheny mountains. The general statement may be made that this range of mountains rises gradually from the West until it reaches an average summit level which is that of a large rolling tableland, and that, then, there is a rapid drop on the eastern slope which is quite abrupt and presents a rather steep face for its whole length, extending down through Pennsylvania, Maryland and Virginia. The result of this general configuation of the mountains is that, on all railway lines crossing them, the adverse eastbound grades are much lighter than the westbound. In other words, the rails ascend from the West by a long, comparatively low grade, and then, the summit being passed, drop down on the eastern slope at a rather rapid rate. This grade is comparative only, for in every case there are points where it is found to be necessary to install a pusher service. Of course the lower this grade the lower the cost of operation.

The progress in the art of railway construction has been such that locations are now adopted that would have been out of the question a few years ago. Hence, when the location of the connection of the Western Maryland was under consideration, the point that was pushed to the front was to obtain the lowest possible ruling grade against eastbound traffic over the Allegheny mountains. Up to that time the grades for the several roads that make the passage are for the Pennsylvania 79 ft. per mile; Baltimore & Ohio, 53 to 63 ft. per mile; Chesapeake & Ohio, 30 ft. per mile; Norfolk & Western, 53 ft. per mile. In the case of the Western Maryland the location adopted has maximum grades of 42 ft. per mile, compensation being made for curvature. These occur at two points and have a length of about ten miles at each place, though the pusher service will be longer, as they are flanked at each end by grades 30 ft. or more. In fact, judging from the profile it would appear that the pusher service might well extend from Harnedsville to the summit, a distance of about 35 miles. On the east slope, or against the westbound traffic the grades run from 61 ft. to 92 ft. to the mile, or from 1.15 to 1.74 per cent., and over a distance of about 22.5 miles. This grade starts one mile west of Cumberland, and is persistently heavy until the summit of the mountains is reached, and the whole crossing of the range proper is accomplished in something less than 40 miles, though the eastbound climbing starts well west of this point at Connellsville.

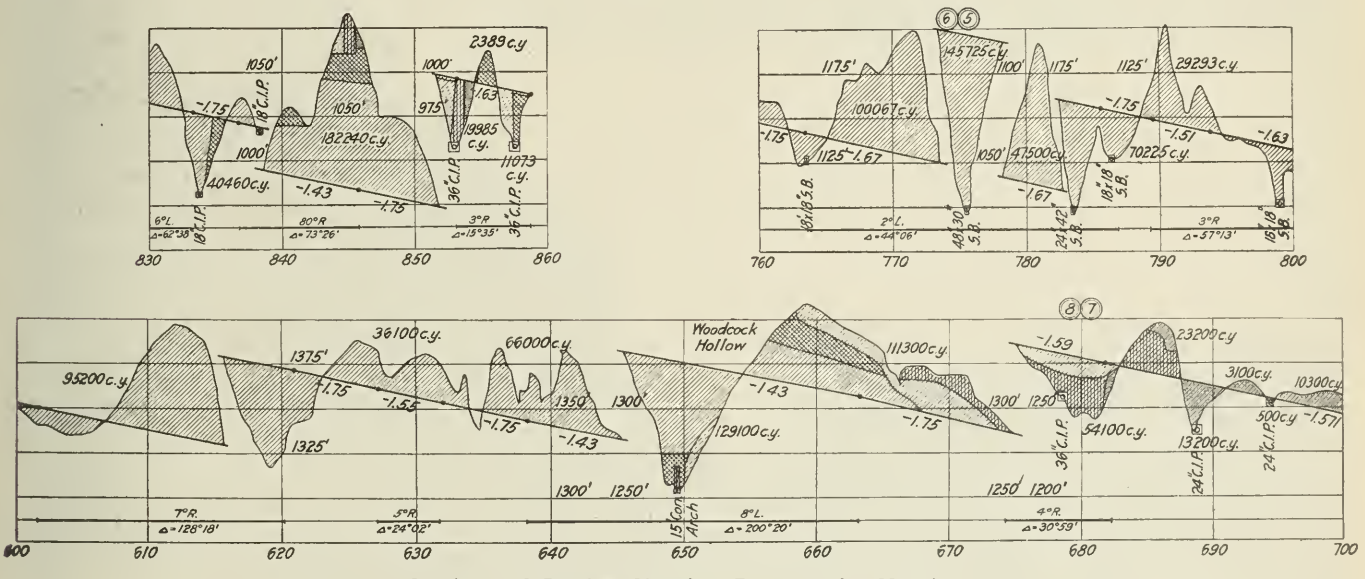
A proper appreciation of this location can only be obtained by a careful consideration of the topography of the country. The map showing the alignment will indicate at once that it was rough and cut with numerous minor ridges around or through which the road had to be carried. For example, the air line distance from Cumberland to the summit cut is 9 miles; by the selected route it is about 23.5 miles. In spite of the steep grades and the oxbows in the line, the country is not as rugged as it is on the



Cumberland-Connellsville Line; Western Maryland.

west slope of the mountain, where the line follows the winding water courses. The country is an open farming land, rich and well cultivated, easy to work as far as the actual removal of material is concerned, but involving some heavy work. In fact this condition obtains from the very start at Cumberland, where at the Narrows, the road lays in the face of a bluff that had to be blown away in order to make a shelf on which to place it.

On this east slope of the mountains the rock formations are, for the most part, of sandstone and shale which have been distorted by terrestrial upheavals until the strata are frequently vertical, and as the work is followed these strata will be found at almost every possible angle. At Cumberland Narrows, where the work begins, the formation is not hard but resembles that found along the Norfolk & Western in West Virginia. It is not, however, a difficult rock to work. Towards the west the rocks become harder, especially the sandstone, until on the west slope of the mountains, there are stones of this character that are exceedingly hard, even upon the surface, where they have been exposed to the action of the water and the elements. This is especially noticeable in the tunnel work. Like most of the rocks south of the Pennsylvania or New York lines, the surface is disintegrated to varying depths and has become seamy and



Sections of Profile, Showing Progress by Months.

ample, where two large bridges over the Youghiogheny are to be built, requiring in their piers and abutments about 13,450 cu. yds. of concrete, the stone has been obtained by blasting out the rock forming the bed of the river, and similarly easy conditions prevail all along the line. Again, while the rock is hard and will probably be self-sustaining through a greater part of the tunnel work, where it has been subjected to atmospheric action, it is somewhat disintegrated so that it is easily shot and then handled with a steam shovel in cuts. The practice in this particular, is, even where no rock is encountered, to drill holes from 12 ft. to 16 ft. in depth and shoot them with dynamite, which so shatters the rock and soil that the steam shovel can easily handle the loosened material.

The method of cut excavation is the usual one of starting the shovel in on a level of from 14 ft. to 20 ft. below the highest point in the profile, cutting out to the slope stakes, then dropping down to a correspondingly lower level and repeating the process until the grade line is reached. In the meantime the earth is drilled for shooting where it is necessary, with a light well-drilling equipment, and the material is carried to the dump in contractor's cars hauled by light locomotives. For the fills, the usual temporary trestle is used, and in a few instances this is carried up to a considerable height, 80 ft. in one case. Owing to the rough contour of the ground, these material lines frequently require considerable grading for their location, and in the deep Allegheny cut at the summit, a series of switchbacks have been put in in order to get down to grade. Here the amount of material to be removed is about 144,000 cu. yds. At first it was the intention to build a tunnel at this point, but it was afterwards decided, owing to the character of the ground and cover, to make a cut through the summit at a depth of about 80 ft.

unreliable, but contrary to the conditions found further south the rock along this line becomes very hard at comparatively shallow depths. For the most part this hard rock is a red sandstone. Occasionally it is flanked by a hard gray sandstone, which sometimes requires timbering, but which often stands alone and will need no support, though it is the intention to insure all of the tunnels against a cave-in by lining with concrete. These sandstones are those associated with the coal measures and usually lying below the latter. Associated with them, too, all along the line, is a formation whch is popularly called a fire clay by the contractors, because it contains a greater or less percentage of that substance. As a matter of fact it is a sort of conglomerate, containing some sand and limestones and shale, and having the physical characteristics of the latter more fully developed than that of any of its other ingredients. This fireclay formation is worthless for manufacturing purposes, though as noted elsewhere, a great deal of this material of a high grade is found along the line, that is used in the making of first-class brick.

This peculiarity of the rocks to remain hard below the surface and even on it at many points has been of great economic value in the execution of the work, since it has enabled the contractor to obtain a hard stone suitable for concrete work immediately on the ground in almost every instance. At Ohiopyle, for ex-

A few points in the profile of the line between Cumberland and the summit are selected for illustration in order to show the general character of the work. In this the hatched sections represent the work to be done. The double cross hatching and dotted lines, that completed on December 1, 1910. As usual in such cases, an effort has been made, which is usually successful, to have the cuts and fills balance within the limits of the free haul of 1,000 ft. Some of the work is exceptionally heavy as between stations 650 to 660 where there is a fill of 129,100 cu. yds., and a cut of 111,300 cu. yds. At station 585 again there is a fill of 126,200 cu. yds., while the heaviest cut on the east slope, known as the Tit cut, contains 182,240 cu. yds., and just west of it at station 775 there is a fill of 145,725 cu. yds., which has a depth over the base of its culvert of 101 ft. All along the line

there are cuts whose contents range from 30,000 to 60,000 cu. yds., and a reproduction of the profile would be merely a multiple repetition of just such work.

With a location such as that outlined, and the work being pushed with an almost feverish haste, the difficulty of operating at many points of attack from the start will be readily appreciated. Add to this the fact that, in order to meet the requirements as to speed and economy of construction, it has been necessary to use steam shovels of large capacity, the work of preparation is still further enhanced. The greater part of the work is being done by shovels weighing from 80 tons to 90 tons, and where the heavy machines of a few years ago, weighing 50 or 60 tons, are in use, they are regarded as toys and useful only in the smaller of the excavations and lighter materials. Take the case of the Tit cut for example. The shovel with its equipment of rails, cars and locomotives had to be hauled over the roads and through the fields from Cumberland to a distance of about 1.3 miles, and that, too, so as to reach an elevation 360 ft. above the point of departure. Or again in the case of the Allegheny summit cut. The shovel had to be carried over an ordinary country road that was not remarkably good, from Sand Patch on the Baltimore & Ohio Railroad to the summit of the mountain, a distance of about five miles and involving an actual change of elevation of about 175 ft., though, owing to the rolling character of the road the distance through which the machine was lifted was much greater. So all along the line the shovels have been brought in to the work over what must have been obstacles of great magnitude, and in spite of the difficulties that would have seemed insurmountable. Of course the distance, barring unevenness of the ground presents merely a repetition of the work required in moving the shovel up to its work in a cut or a haulback for a fresh start. The shovel moves itself, but its rails and ties must be laid for it and carried to the front for every movement. This is cited, not as a matter of special engineering significance, but as indicative of the vigor with which this work is being pushed.

In the cuts much of the material moved is of a stiff heavy clay, that shovels easily, and stands well on the slope, usually at an angle of one to one. But when dumped into the fill, it flows some, and consequently is apt to put considerable pressure upon the lower ends of the bents of the temporary trestle. For this reason care is exercised that they are not pushed out of place by the pressure of the earth, and the material is distributed well out over the whole length of the fill, thus building the whole up at once, instead of starting in at one end and working out to the other, according to the practice prevalent in the old horse and cart days.



Heavy Cut Work; Western Maryland.

In making these fills it is estimated that there will be a 10 per cent. settlement, so that a corresponding allowance is made in the heights to which they are raised. This allowance is simply indicated to the contractor, as all stakes are set and marked to the true grade. But as the 10 per cent. excess is easily calculated there is no difficulty about it.

As for the height of the fills and the material used to form



Work in Tit Cut.

them, it might be expected that, in many instances it would be cheaper to put in a viaduct. It is, however, the policy to avoid viaducts wherever it is possible to do so, with the result that there is but one upon the road. This is a short distance west of Meyersdale, and will be handled in detail later. Other than this every hollow that could not be spanned with a short bridge has been filled over a concrete arch or a cast iron pipe of sufficient area to carry off the maximum flow of water that could be delivered by the contributing water shed above.

As for the amount of material to be moved; on the first division, and a little beyond, to or from Cumberland to the Mt. Savage tunnel near the summit, the total excavation is 2,500,000 cu. yds., and the estimated amount of fill practically the same, as there is no waste or borrow.

The method of tunnel driving is the same as that used elsewhere in the United States. The heading is driven along the top and the full width of the tunnel, after which the bench will be removed, a small steam shovel being worked for handling the material into the cars. Where timbering is necessary the excavation is carried down to the spring line of the arch, where the ends of the beams are footed, and from which they are carried up as shown in the diagram. These timbers are usually 12 in. square and are spaced 4 ft. between centers, though it has often happened that the pressure is so great as to spring them



Slip at Owl Hill Cut; Western Maryland.

when in this position, so that intermediate bents have had to be placed.

The drilling is, of course, done with air in the usual manner, and with the usual outside plant for compressing. Because of the speed with which this work is being done, these plants are very complete and often in duplicate, to avoid the danger of a



West Portal of Pinkerton Tunnel; Western Maryland.

shutdown. At the Big Savage tunnel for example, the boilers and compressors are housed in substantial temporary buildings. The plant consists of two compound compressors with 22¼ in. and 14¼ in. by 21 in. air cylinders, and 20 in. by 21 in. steam cylinders. They have each a capacity of compressing 1,250 cu. ft. of free air to 100 lbs. pressure per minute. There are three return tubular boilers each 6 ft. in diameter by 16 ft. long carrying a steam pressure of 100 lbs. For lighting there is a 9 in. by 8 in. vertical engine driving a 25 k. w. dynamo. This plant furnishes the light and air for both headings of the tunnel. The completed tunnel will have a length of about 3,300 ft. The air is carried over the top of the mountain to the east end of the tunnel in a 6 in. main and then into the face and the drills.

In the summit tunnel the rate of advance runs about 9 ft. a day for each heading, when everything is working well. This tunnel will be the determining factor in the completion of the connection.

As in the other tunnels the rock at this point is a sandstone, gray at the portals, but soon changing to red. At the west opening, which may be taken as typical of others as well as the east end, there were 195 ft. timbered and 120 ft. not timbered. The heading is now in the hard red sandstone above alluded to, and it is expected that this will hold to the meeting. The roof is fairly dry. Of course there is some water, but not enough to cause trouble, and as the tunnel has a crown at the center, the natural drainage will take care of all of the water that may come down. As for the formations encountered at Big Savage, the east heading first passed through a hard sandstone for 50 ft., followed by 40 ft. of fireclay. Then came 40 ft. of the fireclay conglomerate mentioned in which there was considerable sandstone, then 180 ft. of hard sandstone and slate. slate.

At the west end there was at first about 50 ft. of soft, friable sandstone and shale followed by 250 ft. of hard gray sandstone with occasional strata of slate; then 100 ft. of conglomerate and beyond the hard red sandstone. The general dip of the strata is about 26 deg., with a strike nearly parallel to the line of the tunnel.

In driving the heading, which is to the full width of the tunnel the drills are brought up against the face in the usual manner, and are kept there. After blowing down, if there are any projections that extend within the limits that should be cleared, they are cared for by the use of hand drills. The drill used for this purpose is one working on the same principle as an air hammer, and is held in place by the operator. With this holes from 10 in. to 16 in. in depth can be quickly drilled and the small parts removed without necessitating the placing and bracing of a large drill.

All of the tunnels on the line are being built for a double track with the exception of the Big Savage which will be for single track. The excavation, timbering and concreting will all be done in accordance with the standard sections that are shown in the engraving. It is the intention to line all tunnels with concrete from end to end whether the roof needs timbering or other support or not. Therefore, where timbering is not required, the section of excavation will be somewhat decreased, but still will be enough larger than the finished section to allow for the concrete lining. As to how this will work out in practice is indicated by the description of the rock formation in connection with the tunnels.

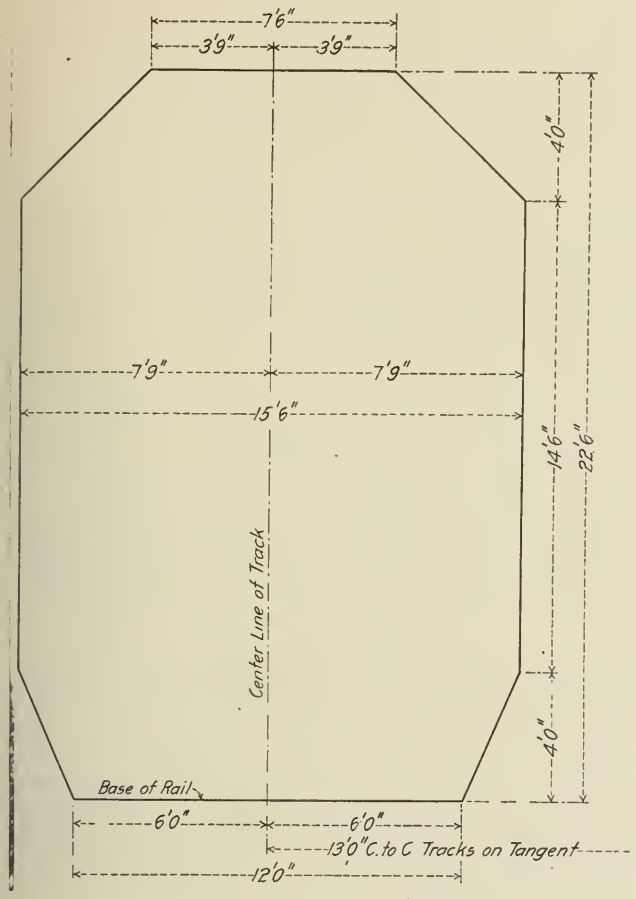
The timbering that is put in for the support of the roof during the progress of the excavation, will be the permanent timbering used, and is shown in the line engravings of the standard sections as well as in the reproductions of the photographs of the tunnel portals. It is formed of 12. by 12 in. timbers footed at the spring of the arch, in seven pieces for the double track and five for the single-track tunnels. The roof itself is carried on spalls packed in over 3 in. legging on the outside of the



Temporary Trestle for High Fill.

timbers. Then, when the excavation is completed the timbering will be buried in the concrete. The concrete will be carried straight up to the arch segments and lagging, and, in the case of the side walls up to the plumb ports and lagging. Where

the lagging is omitted, the concrete is to extend back to the rock, unless the breakage behind the plumb posts shall exceed 3 in., in which case that space will be dry-packed. Weep holes will be left



Standard Clearance Diagram.

in the concrete every 100 ft., unless conditions require a different arrangement.

Refuge niches 2 ft. 6 in. wide, with arched tops will be located every 200 ft. and staggered.

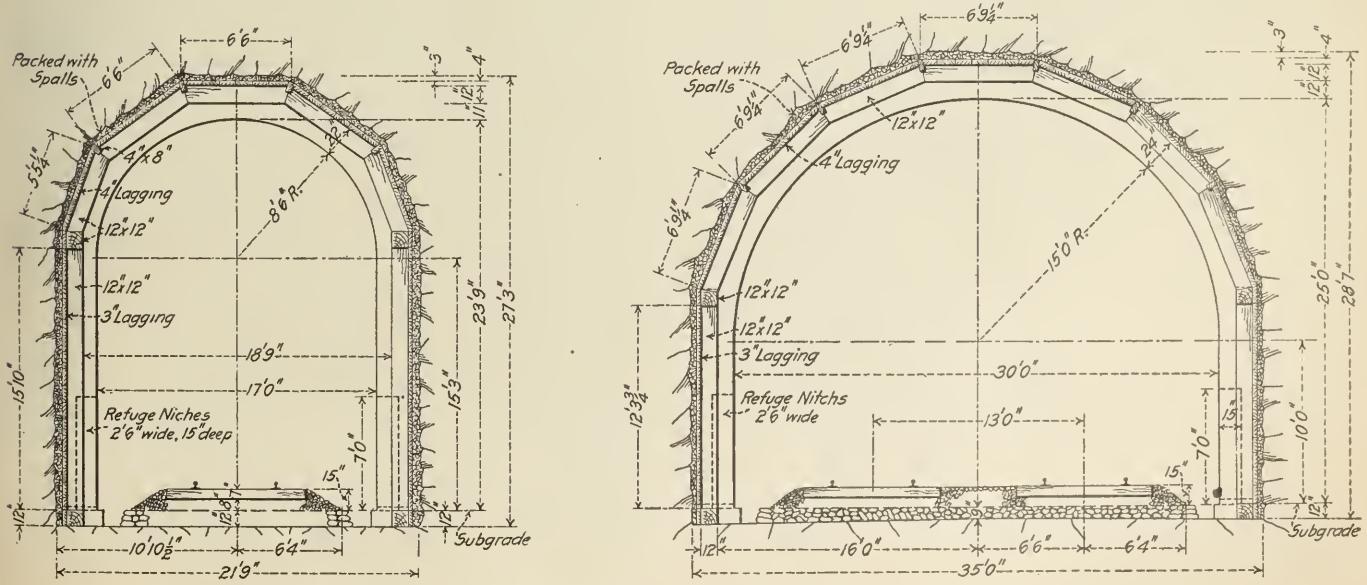
These are the requirements for the standard sections, which may be changed in detail at the discretion of the engineer. This includes such matters as the omission of the mud sills and the like. As will be seen from the engravings, the width of the tunnels for single track is 17 ft., and for double track 30 ft., with respective heights of 22 ft. 6 in. and 23 ft. 9 in. respectively above the top of the cross tie.

Boring of the several tunnels is progressing rapidly. The Pinkerton tunnel, 825 ft. long has been completely bored through. The east and west headings were connected within the past week. The Brush tunnel, 872 ft. long has also been opened up for its entire length. The Big Savage tunnel has been bored for 1,474 ft., while in the Borden tunnel 400 ft. of the 850 ft. have already been excavated. Work is being prosecuted in night and day shifts. Track laying is expected to commence by the first of April.

After passing the Big Savage tunnel, the line continues to rise to the Allegheny cut about 23.5 miles from Cumberland. It then starts down on a grade of 34 ft. to the mile, increasing at times to 42 ft. to the mile as a maximum, and dropping as low as 16 ft. until Harnedsville is reached. During the early part of the descent, the line passes over a rolling country and follows a small stream (Flaugherty Creek) nearly to Meyersdale, just below which place it reaches the banks of the Casselman river. From this point on it is close to the banks of that stream or of the Youghiogheny, into which it empties down to Connellsville.

Shortly after leaving Meyersdale the topography changes; the valley narrows, the hills on either side become steep and rocky, and the stream flows through a narrow gully with almost precipitous sides. This does not necessarily involve heavy work of construction, but it is very rough and a great deal of it is rock work. The country has the same rough contour as most of the rest of the valley or hollow land along the streams on the western slope of the Alleghenies. The location is on side hill for nearly the whole distance from Confluence to Connellsville and all of the distance from Ohiopyle down. In one or two cases where bluffs rise directly from the bed of the stream they will have to be blown away, and a shelf built for the reception of the road. This is simple, straight work, and is the same as that of the Baltimore & Ohio along the opposite bank of the stream, or of the Lehigh Valley or Central of New Jersey down the Lehigh river. So that, when the roughness of the country is considered, the skill with which the line was located is shown by the almost perfect smoothness of the profile as it rises on either side from Cumberland and Connellsville to the summit of the Alleghenies.

Although the general character of the work is the same along the river, each short section is apt to present problems and sometimes serious problems of its own. For example, at Owls Hill, a short distance east of Confluence, the line was originally laid



Single and Double-Track Tunnels; Western Maryland.

out to skirt the foot of a high wooded bluff. From examinations that had been made it appeared to be a case of comparatively easy shovel work. But after the work had been started and the toe of the slope cut away, the whole side of the mountain started to slip. It was, then, found that the underlying rock had a steep slope and that the earth had nothing to hold it. The first indication of a slip came at night and it was only by prompt effort that the contractor saved his shovel from being buried. Then, for several days, the shovel was pulled back out of the way each night, until it became evident that to build the road on the original location it would be necessary to remove the whole mountain, when the alignment was thrown out and away from the toe of the bluff and room left for any slip that may occur. It will be seen, from the engraving, how the rock is stripped and the earth has come down.

A subsequent article will take up the bridges and culverts.

THE SUPPLY DEPARTMENT.*

BY H. C. PEARCE.

General Storekeeper, Southern Pacific Company.

VI.

BUYING UNDER CONTRACTS OR AGREEMENTS.

The plan of purchasing under contracts or agreements directly from manufacturers for the purpose of maintaining standards and obtaining uniform material and uniform deliveries is one which was developed by W. V. S. Thorne, director of purchases for the Harriman Lines, and is most ably and thoroughly outlined in detail in a paper read by him before the New York Railroad Club, May, 1908. This paper should be studied carefully by every executive officer, as well as officers of the supply department. Its principles are based on the necessity of establishing and maintaining standards, and buying what is most suitable for the purpose desired at the lowest cost, fully protected by complete specifications and thorough inspection.

The first is brought about by regular meetings of experts who use the material, and who should know the exact purpose which it serves and what is best adapted for that purpose. For example, in the matter of equipment, locomotives, cars, etc., the expert representatives of this department meet at stated periods. If it be on maintenance of way matters, the chief engineers or engineers of maintenance of way are called together in the same manner.

Certain specific equipments will be submitted at this meeting, freely discussed, and finally a vote taken as to adoption for use of some one of them. Detailed specifications and drawings will then be prepared of the article adopted, and it will bear the same number as the drawing, and is designated common standard. Any future changes in designs and specifications will be covered by supplement or revised drawings and will always carry the same number.

In this way the drawings and specifications are placed in the hands of the different manufacturers, and the most satisfactory as regards price, deliveries, etc., is accepted, and an agreement made for the necessary supply. The manufacturer is thus able to figure accurately just what it will cost to produce this particular article; his market is assured and he can arrange his facilities and plant so as to produce it at the lowest possible cost. The railway company on the other hand is assured of getting exactly what it buys, and it can be arranged so that they will get uniform and specific deliveries.

These contracts and agrements are usually based on the market price of raw material, and are subject to change within a reasonable length of time, which is indicated in the agreement, so it is perfectly fair for both parties. This agreement, in addition to specifying the price at which the article shall be delivered at a given point, should also specify the number of days that they agree to make shipment from the date of the order, with a penalty clause for failure to do so. Under this arrangement the purchasing agent is in position to place the order the day he receives it, the descriptions, drawing references, price and deliveries already having been arranged for. The manufacturer has the drawings, schedules and full detailed knowledge of what is required, and the day the order is received he is in position to either make shipment or prepare the material for this purpose.

The material is inspected on the ground by this company's inspector to see that it conforms to the specifications and drawings, a certified copy of such acceptance is attached to the purchase bill covering the shipment, which goes directly to the purchasing agent, who is thus in position to check the prices and deliveries according to the terms of the agreement.

No more fair, simple and thorough system could be evolved, and it carries with it uniformity promptness and the lowest possible cost to the railway company.

HOW TO INSTALL PLAN WITHOUT DISORGANIZATION.

This plan can be installed under any system without inconvenience or expense. First, make a rough sketch of your facilities, your storehouse, platforms, material yards and other storage, and lay it off into sections. Have in mind grouping it for economical handling, irrespective of where the material is located at the present time. Indicate on this sketch the section number, general description of the material it will contain and the location of the section storekeepers' headquarters. Have signs put up over these sections with the section number. Build a small station for the section storekeeper, large enough to contain his stock books, requisitions, catalogues and other data. Prepare a card which will show the sectional arrangement of the material, somewhat like the accompanying list. Tack this up at section headquarters, inside and out. Prepare an indexed list of the material to be carried in each section, arranged alphabetically, which will show the section where it is located. Distribute these lists and cards to each division and local storekeeper, superintendent, division engineer and all other officers who have authority to make requisitions for material and instruct them to make their requisitions from a certain date by sections, a separate requisition for each section.

SECTIONAL ARRANGEMENT OF MATERIAL IN STOREHOUSES.

Section.	*Description of Material.*
1.	Maintenance of way material, steam shovel parts, hand car, motor car and velocipede parts.
2.	Bolts, nuts, rivets, lag screws, washers, etc.
3.	Sheet iron, brass, copper, zinc, lead, engine bars, springs, tubing, chain, wire rope, jack screws.
4.	Boiler and fire-box steel, steel tank ends, flues, pipe, bar iron, bar steel, piston rods.
5.	Boiler lagging, pipe covering, nails, carbide, shovels, rope, building paper, wire staples, handles, etc.
6.	Finished and rough brass, pig metals, etc. (except journal bearings).
7.	Air brakes, lubricators, injectors, automatic sanders, steam heat equipment, Pintsch and acetylene gas material, electric headlight parts.
8.	Car trimmings and fixtures, shelf and building hardware, small tools, metal piston and valve stem packing.
9.	Water service material, pipe fittings, globe, angle and gate valves, etc.
10.	Upholstering material, etc.
11.	Glass, brushes, painters' supplies, paints in packages.
12.	Belting, hose, packing, rubber and leather goods.
13.	Station and train supplies, lamps, lanterns, chairs, glassware, tinware, etc.
14.	Castings (rough iron and steel), except car castings.
15.	Car castings and forgings, journal bearings, bolsters, brake beams, car trucks, car bolts, couplers and parts, train chains, stoves and parts.
16.	Wheels and axles (mounted and unmounted), tires, centers, front ends, cylinders, etc.
17.	Lumber, all kinds (rough and finished).
18.	Fire clay, brick, cement, coke, charcoal, smithing and Blossburg coal.
19.	Oils, waste, grease, varnishes, candles, etc.
20.	Signal, telegraph, telephone, interlocking and electrical material.
21.	Scrap, all kinds.

Then go through your organization and select from your warehousemen and stock clerks, a man for each section. You always have men in every organization who are particularly familiar with certain classes of material. For example, one man will be familiar with track material, he should be assigned to this section, another with locomotive castings, another with car castings and forgings, another with hardware, etc., and still another who looks after air brake material, lubricators, injectors, etc., aiming always to have a man assigned to the section with which

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he is most familiar. His instructions will be to take entire charge of this section of material, *no matter where it is located.* He will then naturally concentrate his material into his section and arrange it so it will be most convenient for him to handle it. Only in this way can he control it, and be entirely responsible for it. This can be done gradually as the plan develops and will in no way interfere with the regular operations. It will be found that the men themselves will be more anxious than anyone else to get the material they are in charge of and responsible for directly under their own supervision.

Naturally the requisitions will be made from the stock books, in sections, and the orders on the purchasing agent and the purchase bills will follow in sequence. In fact the whole plan will develop out of this arrangement. The purpose of signs is to identify the grouping of the material with certain numbers. It will only be a short time when if you ask where a certain man is, they will answer by giving the section number. The next step will be to install the telephone system, a telephone in each section. This enables the officers and foremen to get in instant communication with each section storekeeper, and from this the shop delivery system will develop, as described in another chapter.

The same arrangement will apply to scrap docks, lumber yards, oil houses and other outside points where supplies are handled. After the plan is installed the general store the division stores will follow as a matter of course. With the sectional organization once installed, details can be worked out to as fine a point as desired and to suit any general plan, and it can be done without disorganization or extra expense.

WEAKNESS AND STRENGTH.

The weaknesses of the present supply department are: first, the officer who is usually held responsible for providing material and the money invested in it really has no control over the buying of it. Strange as it may seem, the general plan is to have him subordinate to the purchasing agent. On what theory this is based the writer is unable to conceive. It is certain that the man who is responsible for the money invested in material must also be responsible for the buying. In no other way can the desired results be obtained, and it is surprising to the writer that, with the great advances that have been made in the last few years in railway economics, this point has been lost sight of, and that the real purpose of the organization, i.e., furnishing only what is wanted when it is wanted with the lowest permanent investment, can never be obtained until the buyer is under the direction of the officer who is responsible for the investment. On properties where the amount of material used does not warrant an organization of this kind there should be a supply agent who would be responsible for both the buying and distribution. On larger systems, however, unquestionably the proper organization is an officer in charge of both purchases and distribution, with a sub-head to do the buying and another to maintain the stock and have charge of the distribution.

The second trouble is lack of proper organization and system; and a man with the necessary rank and detailed knowledge and training to effect it and carry it on. One of the first and most important facts to take into consideration is the danger of more material being provided than is necessary, and lack of proper interest in seeing to it that everything possible is made available. This should be one of the first and most important duties of the chief supply officer, and it is necessary that he should have such rank as will enable him to get the full benefits of his organization. Without a proper organization, manned by competent help, nothing of any great value can be maintained. The strength of an organization depends very largely upon its head and its personnel, and the men in it must have the same rank, opportunities and remuneration as those in other departments. It is not technical knowledge that is needed, but good business training and industry. Our organizations have been severely handicapped, and will be for some years, for lack of trained help. It has been recruited largely from men transferred from other work, principally in and around the shops. Younger men coming up, as soon as they could get something better to do, got transferred, with the result that there is today a smaller percentage of trained men capable of handling supplies than in any other department on a railway. But they are increasing rapidly, and it is only a matter of a few years when there will be plenty of trained men to take up the work. There has never been any systematic method of apprenticeship and promotion. There is no question but that this can be done, and will furnish great strength to the organization.

Another weak point in most organizations is the failure to grasp the importance of prompt action and its relation to stock and stock investment. Their efforts have been devoted more to obstructing than taking action. Their idea was that by delay and obstruction some other arrangement would be made, and the material would not be needed at all. For that reason departments that had work to do did not have confidence in getting what they wanted, and consequently laid in large stocks and made provision, simply because they knew by experience they never could get anything when they wanted it. This led to enormous losses in the way of material deteriorating and becoming obsolete.

The first essential towards a competent organization is the prompt handling of requisitions. Until stocks are in such shape that requirements may be filled, and the organization is in such shape as to promptly do so, they are impotent, and serve no good purpose. Lack of facilities hampers operations very considerably, but with a proper organization this can be largely overcome. The advantage of facilities is chiefly for proper protection of material from the weather and to reduce the cost of handling.

The accounting in our stores has generally been well presented, in fact it has received first consideration. In many organizations more money has been expended in keeping the accounts than in caring for, handling and distributing the material. Yet in many cases the accounts are worthless, because they are on an unsound foundation. Inventories have been taken in offices without any knowledge of the material, what it was, or the condition it was in. While reports and records neatly kept may look well written up on a typewriter, they may be found to be absolutely worthless, and unless they are based on actual inventories and have been compiled by practical men on the ground, they are not worth the paper they are written on.

The delivery of material is another source of weakness. It is the usual practice to send it in local freight, and we all know what it is to move company material in this city. The supply cars solve the problem so far as ordinary maintenance and operation are concerned. That is, where each division has a set of cars it covers a great many local deliveries, but still we have a great volume of material that will always move on local freights in the regular way, and this will always have to be watched and delays carefully guarded against.

The strength of the organization consists:

First—In the fact that there is a strong, growing demand for it, made necessary by concentration and system, the enormous amount of actual money that is required to furnish materials for large railways or industrial corporations, and the fact that executives recognize that this work can only be properly and economically done by men whose every-day work it is; and as they commence to realize what an organization of this kind can do towards reducing expenditures for material and supplies, maintaining standards, facilitating the work, as well as protecting the company against extravagance and loss, the importance of the department will be greatly enhanced. Our owners and executives are bound to appreciate sooner or later that a supply department should be for the purpose of decreasing its purchases and not increasing them.

Second—It is being equipped with strong young men who are ambitious and workers; men who have learned the value of close application to detail, and who have become accustomed

to devoting their entire efforts to the work at hand. These men will all develop and always carry with them a complete and well founded knowledge of details and facts as they exist in practice.

Third—The training they have received in the past, and the reorganization that is going on at present, is all along the line of greater economy and efficiency. This will lead not only to better results for their employers, but it offers employees a training and molds their character in a manner which will last through their entire lives.

MALLET LOCOMOTIVE WITH ARTICULATED BOILER REBUILT FROM OLD POWER.

BY M. H. HAIG.

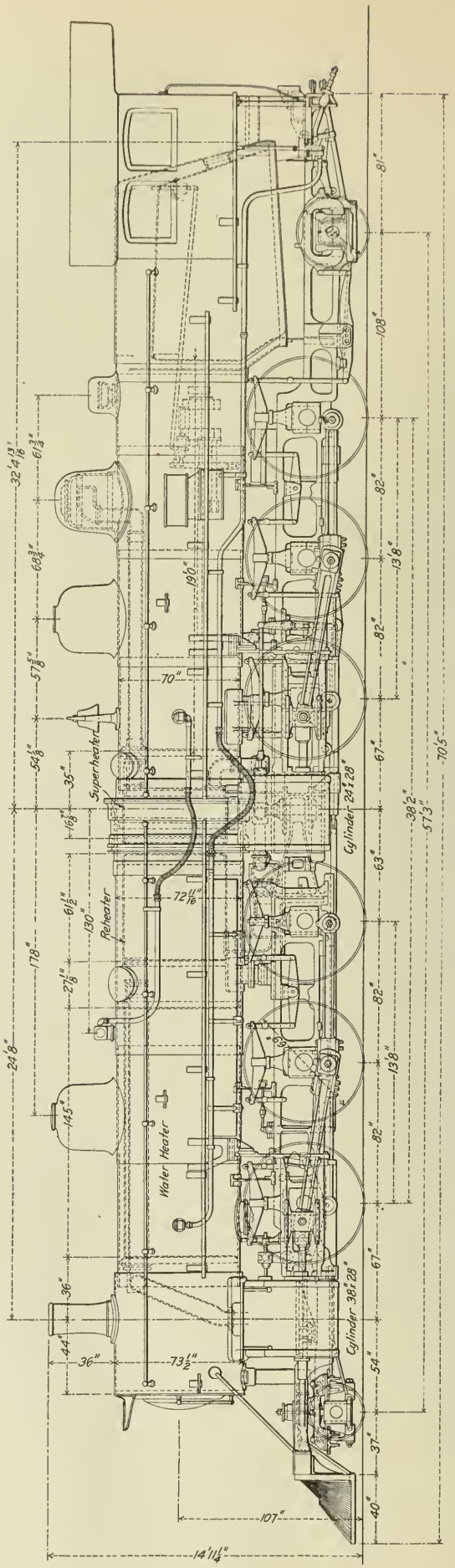
Mechanical Engineer, Atchison, Topeka & Santa Fe.

The demand for larger power units, due to traffic conditions, raises a question as to the disposition of the older and smaller locomotives. New locomotives are often introduced in large numbers, leaving the older and smaller ones for use on branch lines, or to be scrapped or sold. The Mallet principle of locomotive design not only provides a power unit of large capacity easily controlled by the usual crew, but is further peculiarly adapted to the disposition of the old power. By combining two locomotives, each of which were formerly mounted on a single set of drivers into one Mallet locomotive mounted on two sets of drivers, or by adding a new front section to an existing locomotive, the old power is absorbed and larger power is provided without causing a surplus of old power to be disposed of at a loss. This principle possesses still further merit in that the larger power thus obtained is served by existing standard repair parts.

The Atchison, Topeka and Santa Fe has recently converted two Prairie type freight locomotives into a single Mallet locomotive. It was designed in the office of the mechanical engineer and was built in the company's shops at Topeka, Kan., Experience in its construction and careful investigation into the assignment of power affected by the introduction of Mallet locomotives have demonstrated that the conversion of the old locomotives is more satisfactory and more economical than combining two existing locomotives into a single Mallet. Combining two locomotives depletes the total of locomotives in service, whereas, the addition of a front section increases the capacity of each locomotive converted without affecting the number and the older power is well disposed of. The cost of a new front section is considerably less than that of a complete locomotive. Therefore, adding a front section to an existing locomotive is more economical than combining two existing locomotives. As a result of this experience 14 locomotives are being converted to the Mallet type by the addition of front sections, the work of conversion being done at the company's shops.

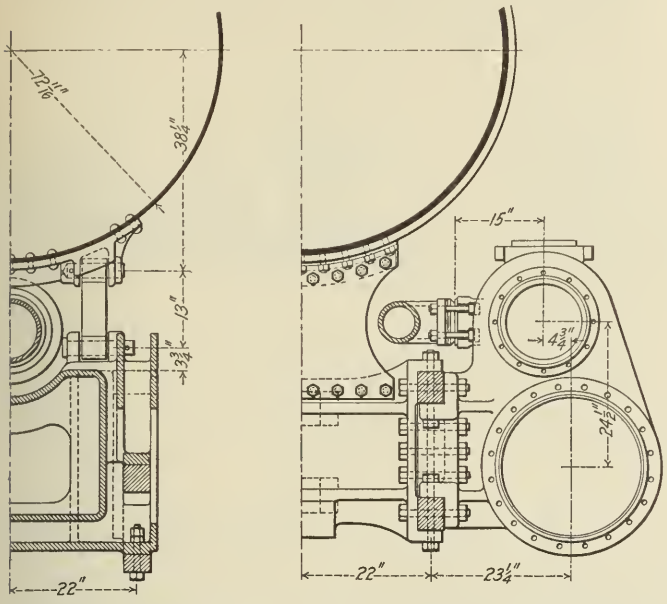
The experimental Mallet locomotive rebuilt from two existing locomotives is in service and possesses several features of interest. The locomotives selected for rebuilding were two made by the Baldwin Locomotive Works, equipped with Vauclain compound cylinders, and needing new cylinders and general repairs. In the construction of the Mallet locomotive the old frames, wheels, boxes, valve motion, machinery, etc., were used. The old firebox and boiler were mounted on the rear section of the locomotive and new cylinders 24 in. and 38 in. in diameter, respectively, were mounted on the rear and forward sections.

The greater steam capacity to meet the requirements of the single larger locomotive was provided by the addition of a feed water heater, a superheater for the high pressure cylinders, and a re-heater for the low pressure cylinders. The superheater and re-heater are of the Jacobs type and include two drums containing a number of fire tubes. The hot gases pass through the tubes and the steam passes through the drums around the tubes, being directed over the surfaces of the tubes in thin streams by baffle plates properly arranged. The superheater is in the

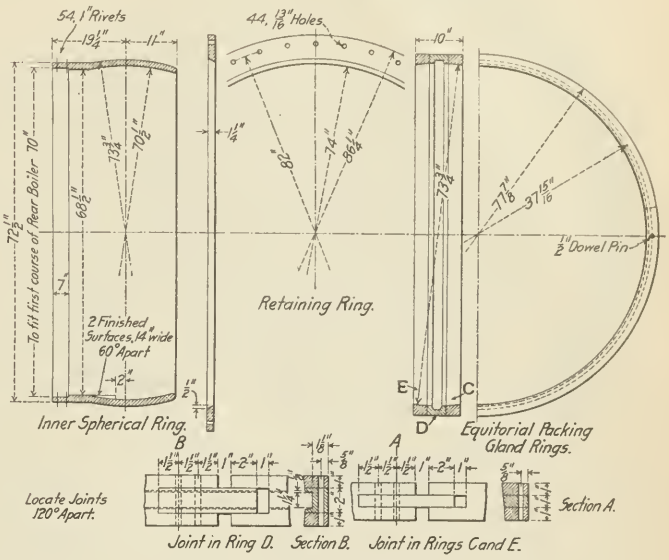


Mallet Locomotive with Articulated Boiler, Rebuilt from Old Power; Atchison, Topeka & Santa Fe.

rear section of the boiler in the part constituting the smokebox of the old boiler. The re-heater is in the forward boiler section, just back of the feed water heater. Between the superheater and the front flue sheet of the boiler is a working space 23 in. long for working on the flue ends. Access to this space is provided by a manhole in the boiler sheet. A similar working space 27⅛ in. long is arranged between the re-heater and the back flue sheet of the feed water heater.

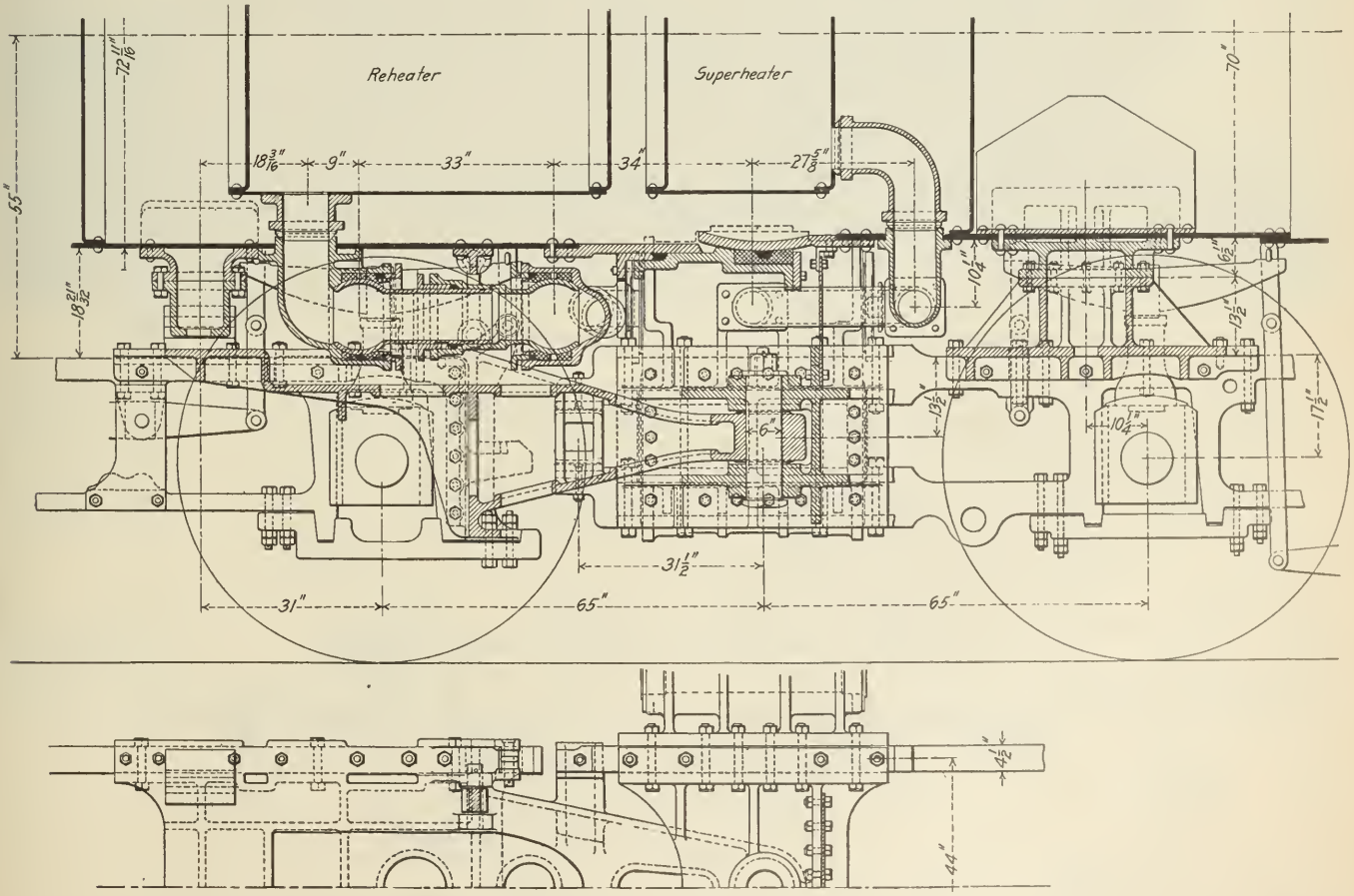


Partial Sections on either side of the Pivot Connection.



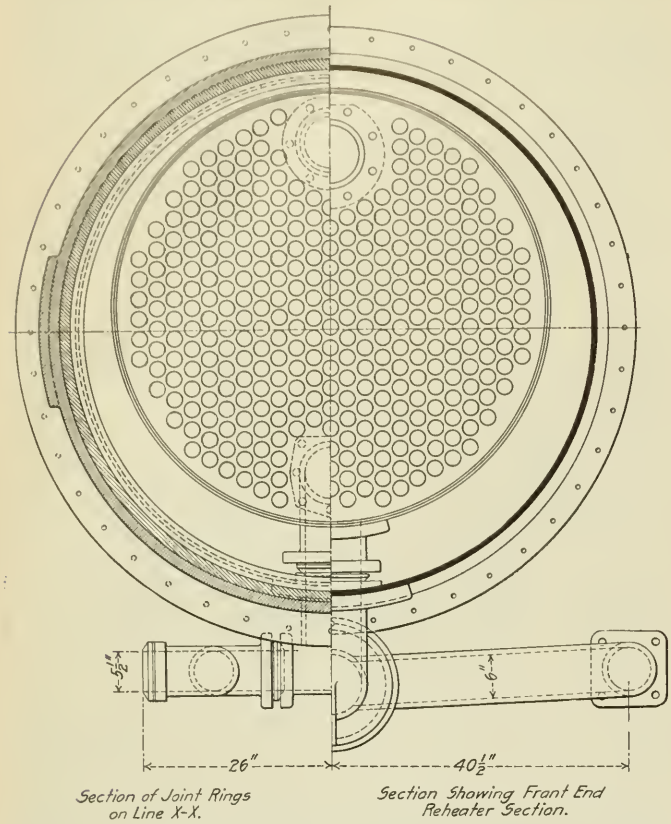
Details of Flexible Boiler Joint.

The superheaters were described on page 814 of the *Railway Age Gazette* for October 29, 1909. The superheater drum is 28⅞ in. long by 60 in. in diameter. It contains 324 flues 2¼ in. in diameter, the flues and drum providing a heating surface of 484.6 sq. ft. The re-heater is 61⅞ in. long by 60 in. in diameter and contains 336 flues, 2¼ in. in diameter, providing a total heating surface of 1,063 sq. ft. The ends of the flues in both the superheater and the re-heater are welded by the autogenous process. The feed water heater is of the usual form applied to a number of Mallet locomotives. It contains 303 flues 2¼ in. in diameter and 12 ft. 1 in. long, providing a heating surface of 2,216.54 sq. ft. The total heating surface of the firebox, boiler flues, superheater, re-heater and feed water heater is 7,507 sq. ft.

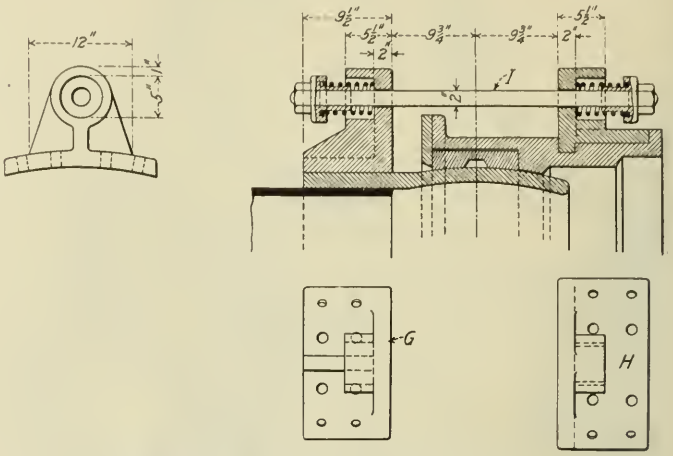


Pivot Connection for Mallet Locomotive.

The unique feature of the locomotive is the flexible joint permitting the articulation of the boiler. It was designated and patented by W. J. Leighty, a draftsman engaged in special work under the direct supervision of H. W. Jacobs, assistant superintendent of motive power, and permits the forward section of the boiler to move contiguously with the forward wheel section. The locomotive has been in service several months and the performance of the joint has proved satisfactory. By providing an articulated joint in the boiler and by supporting the boiler rigidly on the forward frames, the clearance limits of its front end are materially reduced. The method of supporting the boiler is also more satisfactory than with the rigid boiler that swings independently of the forward frames. The arrangement of the steam pipes and connections is much less complicated than with the rigid boiler.

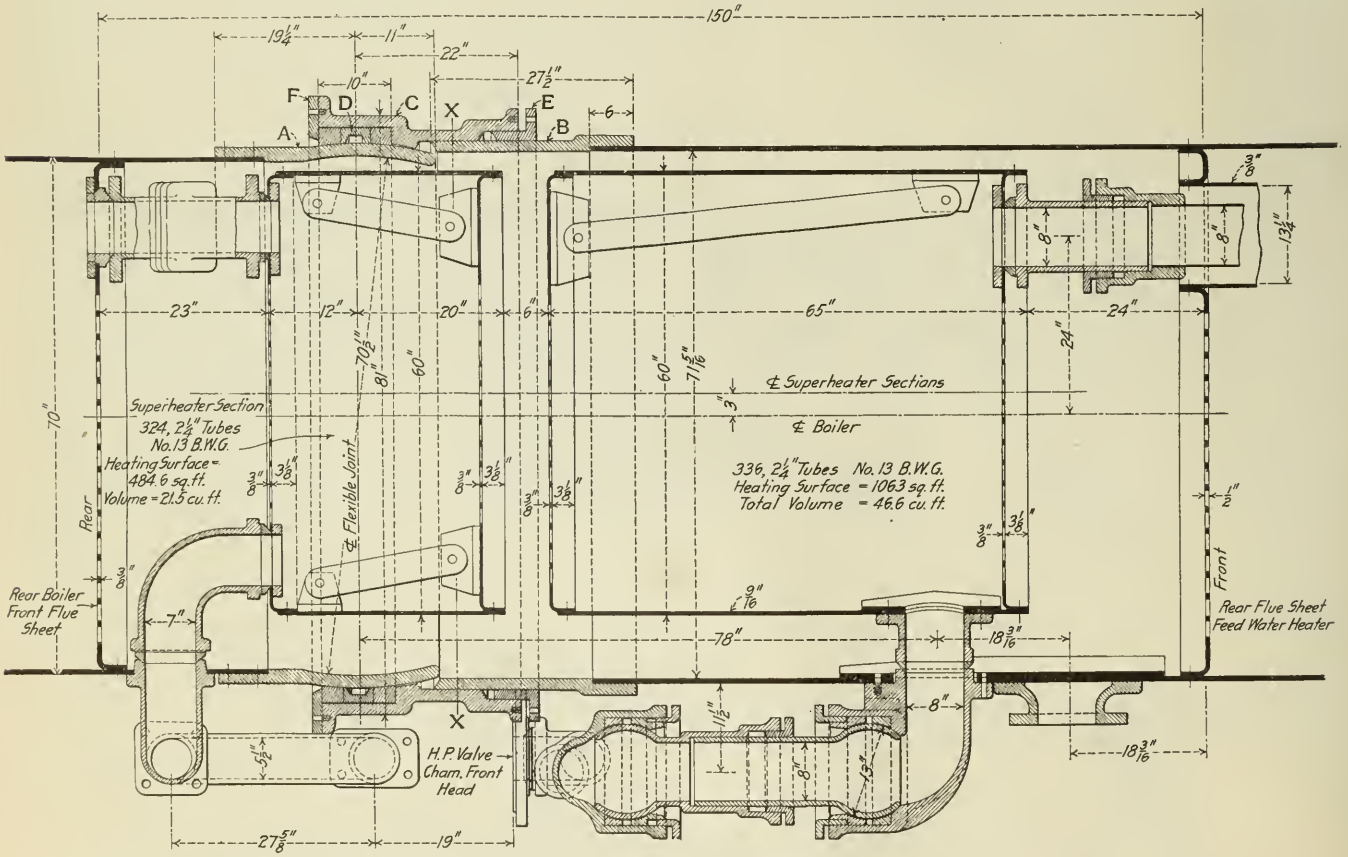


Sections Through Boiler Showing Arrangement of Superheater and Reheater Tubes.



Centering Device on Flexible Boiler.

The flexible boiler joint consists of the following principal parts which are shown assembled in one of the illustrations: Spherical ring A; sleeve B; casing C; packing rings D; packing gland E and retaining ring F. The spherical ring and sleeve are made of cast steel and are riveted to first course of the front



Superheater, Reheater and Flexible Joint of Articulated Boiler; Atchison, Topeka & Santa Fe.

and back sections of the boiler, respectively. The casing C is fitted over the sleeve of the rear boiler section but is not secured rigidly, being packed by the gland E which is adjusted by means of studs. The casing slides over the spherical ring, being packed by the rings D, which are held in place by retaining ring F. The retaining ring is bolted to the casing. Details of the packing gland rings are also shown in one of the drawings. They are turned to fit the radius of the spherical ring and are joined in such a manner as to allow flexibility when rounding curves.

To insure the joint returning to its proper position when the locomotive enters a tangent after rounding a curve, the two sections are tied together on the horizontal center line of the boiler by two rods, each working in connection with two coil springs which provide the necessary flexibility. They are 4 in. outside diameter and of ½ in. material. The details of the rods, springs, spring pockets, etc., are shown. The spring pockets G and H are bolted at opposite sides of the joint. Disconnecting the joint is easily accomplished when it is necessary to uncouple the two sections of the locomotive. All connections binding the boiler shells of the two sections are released by removing the rods I and by loosening the packing rings around the joint.

The Ragonnet reversing gear is used for controlling the valve motion. The general dimensions of the Mallet locomotive, together with the principal dimensions of the two locomotives converted, are given in the accompanying table. The tractive effort of a single Prairie type locomotive of the class from which the two were selected for conversion is 34,700 lbs. The tractive effort of the Mallet locomotive estimated by the usual formula is 68,000 lbs.

General Data.

	Prairie	Mallet
Type	Prairie	Mallet
Service	Freight	Freight
Fuel	Bit. coal	Bit. coal
Tractive effort	34,700 lbs.	68,000 lbs.
Weight in working order	210,190 lbs.	358,250 lbs.
Weight on drivers	141,690 lbs.	290,000 lbs.
Weight of engine and tender in working order	322,800 lbs.	527,950 lbs.
Wheel base, rigid	13 ft. 8 in.	13 ft. 8 in.
Wheel base, total	32 ft. 2 in.	57 ft. 3 in.
Wheel base, engine and tender	57 ft. 8¾ in.	90 ft. 1 in.

Ratios.

Total weight ÷ tractive effort	6.0	5.2
Weight on drivers ÷ tractive effort	4.08	4.26
Tractive effort × diameter drivers ÷ heating surface	643	625
Total heating surface ÷ grate area	69.44	139.00
Firebox heating surface ÷ total heating surface, per cent	5.21	2.6
Weight on drivers ÷ total heating surf.	37.9	38.63
Total weight ÷ total heating surface	56.00	47.70
Vol. equivalent simple cylinders, cu. ft.	11.48	20.66
Total heating surface ÷ vol. cylinders	325.6	369.2
Grate area ÷ vol. cylinders	4.7	2.6

Cylinders.

Kind	Vauclain Comp.	Compound
Diameter	17 in. and 28 in.	24 in. and 38 in.
Stroke	28 in.	28 in.

Valves.

Kind	Piston	Bal. piston
Diameter	15 in.	{ H. P., 13 in. { L. P., 16 in.

Wheels.

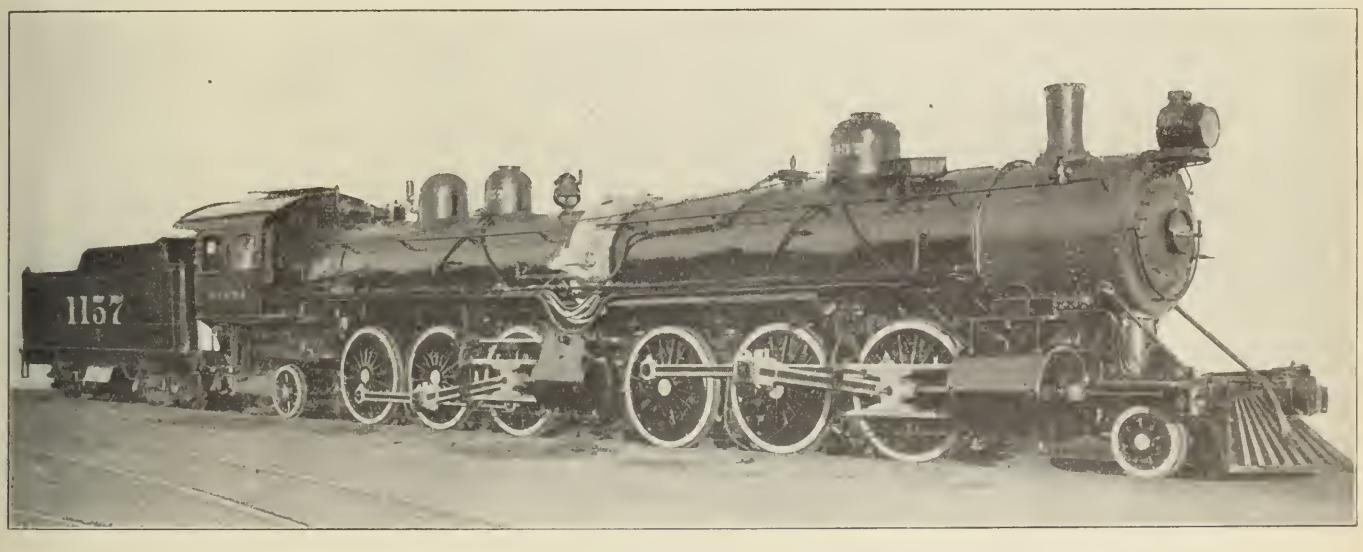
Driving, diameter over tire	69 in.	69 in.
Driving, thickness of tire	3½ in.	3½ in.
Driving, journals, main, diameter	10 in. x 12 in.	10 in. x 12 in.
Driving, journals, others, diameter	9 in. x 12 in.	9 in. x 12 in.
Engine truck, diameter	31¼ in.	31¼ in.
Engine truck, journals	6½ in. x 12 in.	6½ in. x 12 in.
Trailing truck, diameter	40 in.	40 in.
Trailing truck, journals	8 in. x 14 in.	8 in. x 14 in.

Boiler.

Style	Straight	Straight
Working pressure	220 lbs.	220 lbs.
Outside diameter of first ring	70 in.	70 in.
Firebox, width and length	97 in. x 117⅜ in.	97 in. x 117⅜ in.
Firebox plates, thickness	⅜ in and 9/16 in.	⅜ in. and 9/16 in.
Firebox, water space	4½ in. and 4 in.	4½ in. and 4 in.
Tubes, number and diameter	318—2¼ in.	318—2¼ in.
Tubes, length	18 ft. 11 in.	18 ft. 11 in.
Heating surface, tubes	3,546 sq. ft.	3,546 sq. ft.
Heating surface, firebox	195 sq. ft.	195 sq. ft.
Heating surface, total	3,741 sq. ft.	7,507 sq. ft.
Heating surface, feed water heater	.....	2,216 sq. ft.
Grate area	54 sq. ft.	54 sq. ft.

Tender.

Wheels, diameter	34¼ in.	34¼ in.
Journals	5½ in. x 10 in.	5½ in. x 10 in.
Water capacity	6,000 gals.	9,000 gals.
Coal capacity	10 tons	12 tons



Mallet Locomotive with Articulated Boiler, Rebuilt from Old Power; Atchison, Topeka & Santa Fe.

The Santa Fe recently purchased a number of locomotives of the same general dimensions and capacity as the Mallet locomotive converted in its own shops. All of these are equipped with Jacobs-Shupert fireboxes and with the exception of two, with rigid boilers. Of the two flexible boilers, one is articulated by a double ball joint applied by the Baldwin Locomotive Works and somewhat similar in design to the Leighty joint described; the other is provided with the Vauclain bellows type joint. All of these locomotives are in service in the Pan Handle district of Texas. The locomotives with articulated boilers have been placed in service among the others without special care or supervision. After they have been in service a sufficient length of time to justify a conclusion as to the merits of the several boiler arrangements, sufficient data should be available by which to determine the most desirable boiler for future Mallet locomotives.

On December 4, 1910, the railway from Ligua, Chile, to Papudo north of Valparaiso was opened to traffic. The road is 17 miles long, with a gage of 39.37 inches, and connects the port of Papudo with the Longitudinal Railway at Ligua. The cost of construction was $23,553 per mile.

ACCIDENT BULLETIN NO. 37.

The Interstate Commerce Commission has issued Accident Bulletin No. 37, containing the record of railway accidents in the United States during the three months ending September 30, 1910. The number of persons killed in train accidents was 321, and of injured 3,892. Accidents of other kinds, including those sustained by employees while at work, by passengers in getting on or off cars, by travelers at highway crossings, by persons doing business at stations, etc., by trespassers, and others, bring up the total number of casualties, excluding "industrial accidents," to 22,238 (2,948 killed and 19,380 injured). The casualties are classified in Table No. 1, given below, which includes some details taken from Table 1B, not here shown[1]. Supplementing the statement of railway accidents proper, the commission gives the following record of—

Industrial accidents to employees.

	Killed.	Injured.
While working on tracks or bridges	40	5,545
At stations, freight houses, engine houses, coaling stations, water stations, etc., where no moving railway car or engine is involved	21	4,654
In and around shops	15	9,028
On boats and wharves	35	283
At other places	21	1,492
Total	132	21,002

NOTE.—Accidents occurring in connection with railway operation or distinctively railway work are shown in the double-column table. "Industrial" accidents are those occurring to employees of the railway on railway premises in which movements of cars or engines are not involved.

Adding the casualties to employees in industrial accidents to the figures given in the larger table, the total number of employees killed, including those not on duty, is 1,080, and injured, 33,642; and this makes the total number of persons killed, all classes, 3,080, and injured, 40,382.

The totals of the items in Table 1 are swelled by the inclusion of classes of casualties not heretofore shown in the quarterly bulletins, as already explained, but the lists of casualties are also very large in those items which are made up on the same basis as under the former law, as will be seen by reference to Table 1A, below. In the first, third, and fourth items of that table the increases over the corresponding quarter of 1909 are very large. Except in the first item, it is possible that the increases are in part due to the adoption of more careful methods of keeping records by the railways, consequent on the change in the law, though there is no conclusive evidence of this. In Table 2A, giving causes in detail, the record of passengers killed in train accidents (63 in Table 1) is further swelled by the inclusion of 2 disastrous collisions on electric railways in which 40 persons were killed. Table 2A contains 8 collisions, in which 95 persons were killed, and 125 were injured, and 1 derailment in which 14 were killed and 22 injured. In the corresponding quarter of the preceding year the five most serious accidents caused 47 deaths.

[1] This bulletin is the first one issued under the revised accident law. In previous quarterly bulletins the records have included only collisions, derailments, casualties to passengers, and casualties to employees on duty. The class termed "Industrial accidents," as found in the present bulletin, includes a large part of those injuries to employees, fatal and nonfatal, which in former bulletins have been included under "other causes," in Table No. 1. This item in the present and future tables, therefore, will not be comparable with the same item in bulletins 1 to 36, inclusive.

TABLE NO. 1A.—*Comparison of principal items with last bulletin and with one year back.*

	Bulletin 37.	Bulletin 36.	Bulletin 33.
1. Passengers killed in train accidents	63	12	56
2. Passengers killed, all causes	135	55	104
3. Employees (on duty) killed in train accidents	209	125	137
4. Employees (on duty) killed in coupling	56	45	38
5. Employees (on duty) killed, all causes	869	711	748
6. Total, passengers and employees (items 2 and 5, above)	1,004	766	852
7. Other persons killed (including trespassers, nontrespassers, and employees not on duty), all causes	1,944	...	...
8. Employees killed in industrial accidents	132	...	...

TABLE NO. 2.—*Collisions and derailments.*

	Number.	Loss.	Killed.	Injured.
Collisions, rear	301	$342,368	27	413
Collisions, butting	184	424,846	85	831
Collisions, train separating	97	33,833	5	46
Collisions, miscellaneous	805	401,600	39	669
Total	1,387	$1,202,647	156	1,959
Derailments due to defects of roadway, etc.	290	$173,875	10	276
Derailments due to defect of equipment	796	713,309	30	242
Derailments due to negligence of trainmen, signalmen, etc.	112	134,365	16	193
Derailments due to unforeseen obstruction of track, etc.	93	161,287	49	210
Derailments due to malicious obstruction of track, etc.	35	36,526	5	51
Derailments due to miscellaneous causes	417	449,492	37	421
Total	1,743	$1,668,854	147	1,393
Total collisions and derailments	3,130	$2,871,501	303	3,352
Total for same quarter of 1909	2,751	2,316,014	180	3,341
1908	2,567	1,950,408	176	2,729
1907	4,279	3,605,696	309	4,534

In the larger double column table will be found the usual list of class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest.

Collision No. 2, occurring about 4 a. m., was caused by a northbound freight running 4 miles past the station at which it should have met a south-bound freight. The conductor of the northbound train had tried to get the dispatcher to give him an order

TABLE NO. 1.—*Casualties to passengers, employees, and other persons.*

	Passengers.		Employees on duty.		Employees not on duty.		Other persons not trespassing.		Trespassers.		Total persons.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collisions	47	1,014	85	817	2	86	1	27	21	15	156	1,959
Derailments	15	816	110	514	4	6	..	22	18	35	147	1,393
Accidents to trains, cars, or engines, except collisions, derailments, and boiler explosions	1	39	5	165	...	2	1	17	2	9	9	232
Bursting of, or defects in locomotive boilers or boiler attachments	...	2	9	305	...	...	...	...	...	1	9	308
Total train accidents	63	1,871	209	1,801	6	94	2	66	41	60	321	3,892
Accidents to roadway or bridges not causing derailment, such as fires, floods, landslides, explosions, etc.	...	2	...	6	...	...	1	3	...	...	1	11
Coupling or uncoupling cars (does not include accidents with air or steam hose)	...	...	56	722	...	...	...	...	...	...	56	722
While doing other work about trains (not in shops or engine houses) or while attending switches	...	1	45	4,833	...	3	...	7	...	...	45	4,844
Coming in contact, while riding on cars, with overhead bridges, tunnels, or any signal apparatus, or any fixed structure above or at the side of the track	4	14	25	443	...	1	1	3	13	33	43	494
Falling from cars or engines	22	102	103	1,397	3	18	4	20	111	199	243	1,736
Getting on or off cars or engines	25	687	42	1,843	11	88	4	47	145	481	227	3,146
Other accidents on or around trains not here named	1	988	8	241	...	21	2	122	5	74	16	1,446
Being struck or run over by engine or car at stations or yards	14	25	183	361	22	24	37	96	251	303	507	809
Being struck or run over by engine or car at highway grade crossings	...	...	6	16	5	1	267	598	35	31	313	646
Being struck or run over by engine or car at other places	3	2	172	138	30	21	27	35	874	385	1,106	581
Other causes	3	130	20	347	2	41	8	394	37	141	70	1,053
Total, other than train accidents	72	1,951	660	10,347	73	218	351	1,325	1,471	1,647	2,627	15,488
Grand total	135	3,822	869	12,148	79	312	353	1,391	1,512	1,707	2,948	19,380

to run to D, but did not succeed; but the name of this place—D—appears to have stuck in his mind, and in reading his order to the engineman he read that name into it, though the order plainly read E; and E was the station that the train ran past. The report says that the engineman repeated the order to the conductor, but nevertheless the error went undetected. A brakeman of the train had seen the order and had read it correctly, but he was asleep in the caboose when certain south-bound trains were met, and when his train left E he assumed that all south-bound trains, for which his train should wait, had passed.

Collision No. 3, occurring at 6:27 p. m., was due to mistakes and confusion in the delivering of meeting orders on the part of telegraphers, to lack of care on the part of the conductor and engineman of a train, and to failure to carry out manual block signal rules. The trains involved were No. 6, running eastward from A to B, C. D. E, and F, and No. 1, running in the opposite direction, both regular passenger trains. The dispatcher, finding that train No. 1 was a little late, sent order No. 22, requiring these trains to meet at C. This order was sent to the eastbound train at A and to the westbound at F; and it was also sent to C,

TABLE NO. 2A.—*CAUSES OF 43 PROMINENT TRAIN ACCIDENTS.*

[Note.—R stands for rear collision; B, butting collision; M, miscellaneous collisions; D, derailment; P, passenger train; F, freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars and roadway.	Reference to record.	Cause.
1	M	F. and F.	2	1	$2,072	11	Freight train ran into side of work train. Despatcher had allowed work train on main track until 10:30 p. m., without sending a copy of the order to other trains. There was only one train in the vicinity and the despatcher assumed it would be impossible for this train to reach the work train by 10:30.
2	B	F. and F.	1	1	3,300	49	North-bound train ran past meeting point. (See note in text.)
3	B	P. and P.	2	29	3,550	86	Confusion of meeting orders and failure in block working. (See note in text.)
4	B	P. and F.	0	93	3,625	12	Motorman of north-bound electric work car ran past a meeting point fixed by despatcher's order. (See note in text.)
5	B	F. and F.	0	3	4,400	54	Despatcher, 27 years old, with three years' experience, issued "lap orders." His conduct in connection with these orders is characterized in the report as gross negligence.
6	R	P. and P.	2	38	4,800	42	Passenger train entered station at excessive speed. Two passengers killed.
7	B	F. and F.	0	0	5,030	8	Operator in receiving order omitted four words. He claims that the words must have been cut off by the sticking of the relay, but another operator at the same time received the same order correctly.
8	B	F. and F.	4	3	6,461	94	False clear block signal given by signalman who was intoxicated. (See note in text.)
9	B	P. and F.	0	22	6,481	89	Failure to deliver meeting order. (See note in text.)
10	B	F. and F.	2	5	7,650	52	Agent accepted hold order after train had passed; was confused as to fourth and fifth sections of a freight, and made wrong entries on block sheet.
11	M	P. and F.	1	14	8,000	10	Coal cars ran away from mine. (See note in text.)
12	B	P. and P.	2	20	8,430	88	Error in meeting order. Operator of 10 years' experience wrote "east" in place of "west," but according to despatcher repeated the order correctly. Conductor and engineman at fault for accepting order, as it bore internal evidence of irregularity.
13	B	P. and F.	0	9	8,950	45	West-bound freight failed to clear east-bound 5 minutes, as required by rule; east-bound ran past train-order signal.
14	B	F. and F.	0	6	10,776	84	North-bound train encroached on time of south-bound. South-bound also left station a little ahead of time; dense fog prevailed. (See note in text.)
15	R	F. and F.	1	1	12,000	81	Brakeman, who was killed, failed to properly protect train by flag; occurred in fog at 1 a. m.; train moving slowly.
16	B	P. and P.	2	82	13,200	87	Misplaced switch at crossover.
17	R	P. and F.	0	2	15,000	80	Excessive speed under permissive block signal.
18	R	F. and F.	0	2	16,792	44	Fast freight train ran too fast under caution signal and disregarded distant signal at entrance of next block section.
19	B	F. and F.	1	4	17,319	7	Conductor misread name of station in meeting order. Engineman killed. There were two names in the body of the order and the conductor seems to have confused them.
20	R	P. and P.	9	17	18,000	41	Disrgard of red light by engineman of passenger train. (See note in text.)
21	B	F. and F.	4	8	18,000	51	Operator of two years' experience and two months in the service at this office, accepted an order after train had passed. This collision occurred at 2:20 a. m. The operator disappeared next morning.
22	B	P. and F.	12	24	18,871	46	Conductor and engineman of west-bound work train waiting for two east-bound passenger trains started out after only one of the trains had passed. (See note in text.)
23	B	F. and F.	6	5	19,175	47	Operator failed to deliver order. (See note in text.)
24	B	P. and F.	20	39	27,758	3	Failure to deliver telegraphic order. (See note in text.)
25	B	P. and P.	34	11	7.000	99	South-bound extra car (on electric railway) encroached on time of north-bound regular car. (See note in text.)
26	B	P. and P.	6	18	.....	100	South-bound extra passenger car encroached on time of regular north-bound car. (Electric Railway.)
	Total	.....	111	457	$266,640	...	

DERAILMENTS.

1	D	P.	0	7	$2.200	16	False clear night signal at derailing switch. Red glass had been broken and light showed white. Cause of breakage of glass undiscovered.
2	D	P.	0	7	2,675	24	Unknown. (See note in text.)
3	D	P.	0	0	3,285	107	Loose tire on wheel of tourist sleeping car.
4	D	F.	0	0	5,202	116	Train of 43 empty cars running through a sag; the rear part of train pushed the cars together and forced one of them off the track.
5	D	P.	3	40	5,700	123	Unexplained. Speed 60 to 65 miles an hour. The tender was the first vehicle to jump the track.
6	D	F.	0	1	6,600	103	Cars ran off end of track on trestle, because brake chain became knotted.
7	D	P.	0	25	7,461	114	Switch thrown immediately in front of fast train by apprentice signal man, without instructions. Signal man was engaged at telephone. Train derailed by running at high speed through crossover.
8	D	F.	0	3	10.360	102	Fault in brake rigging of rear driving wheel. Wreck partly destroyed by fire due to spontaneous combustion.
9	D	P.	14	22	10,500	115	Washout 12:25 a. m. (See note in text.)
10	D	F.	0	0	10,700	20	Broken wheel; seam in flange.
11	D	P.	0	15	12,124	14	Broken angle bar.
12	D	P.	3	35	12,147	32	Accidental obstruction. (See note in text.)
13	D	P.	0	6	13,700	67	Misplaced switch. Switch had been left wrong by employee of bridge and building department. Engineman and fireman held not blameworthy.
14	D	F.	1	1	14,510	69	Improper handling of air brakes approaching crossing on descending grade of 1 per cent. Engine ran off at derailing switch.
15	D	F.	0	0	14,699	68	Accidental obstruction (steel brake beam lying on track).
16	D	P.	0	5	15,000	36	Excessive speed on sharp curve; 11 p. m. Engineman of 19 years' experience.
17	D	P.	2	6	15,290	111	Explosion of locomotive boiler. Fire box failed by weakness due to excessive heat, caused by low water. Engineman and fireman killed.
18	D	P.	2	3	15,700	15	Bridge weakened by fire. Engineman and fireman killed. Train approached bridge over curved line and conductor saw fire and applied brakes, but too late. Cause of fire unknown.
19	D	P.	2	8	16,450	39	Excessive speed (estimated 70 miles an hour) over curve of 10 degrees. Engineman and fireman killed.
20	D	P.	4	36	21,500	28	Misplaced switch. Primary responsibility rests on conductor and brakeman of freight train which had used the switch a short time before, but the engineman and fireman of the passenger train, who were killed, are held to have been partly responsible, as the switch could have been seen in season for slackening speed.
21	D	F.	0	1	21,800	22	Tires of driving wheels of engine slipped and caused rails to spread. (See note in text.)
22	D	F.	0	0	28,307	76	Excessive speed with ore cars suitable to be run only at low speed.
23	D	F.	2	2	31,700	78	Runaway on steep grade. (See note in text.)
	Total	.....	33	223	$297,610	...	
Total collisions and derailments		...	144	680	$564,250	...	

the station where the trains were to meet. Subsequently, finding that No. 1 was losing time, the dispatcher determined to change the meeting point to D, one station farther east, and prepared order 27 to that effect. This order was sent to B for No. 6 and to E for No. 1. The operators at C and D did not answer promptly. As soon as this order was sent, and before it was repeated, the operator at E reported that No. 1 was coming, and the dispatcher then decided to leave in force the original order; so he told the operator at E and operator W at B to destroy order No. 27. This proceeding was proper, as the order had not been repeated. Operator W at B says that he did not understand the dispatcher; and he did not destroy the order. He had written on it, prematurely, the word "complete," which word, when accompanied by a notation of the time, makes an order valid for use. He then became engaged in other duties (selling tickets) and forgot about this unfinished order. At this time the night operator, S, came on duty and he (S), without consulting the day operator, delivered this unfinished order to train No. 6. He saw that the order bore the word "complete," but failed to notice that it lacked the time indorsement, which was an essential element. The conductor, engineman, fireman, and one brakeman of train No. 6 also accepted and read the order, not noticing this irregularity; and train No. 6 then proceeded from B. On arrival at C this train should have received a copy of the original order No. 22, fixing the meeting point at C (copies of meeting orders being regularly sent to operators at meeting points), but the operator at this station neglected to deliver this copy, and instead gave the conductor and engineman a clearance card, showing that he had no orders for that train and that the block section (C to D), which the train was to enter, was clear. He claims to have told the conductor by word of mouth that the clearance card would be valid only after the arrival of the westbound train, but this is not substantiated; and besides, oral instructions contrary to written orders are forbidden. Under the block-signal rules this clearance card could not be given until after receipt of word from D that the block section was clear and would be kept clear for train No. 6, nor should the card be used at all unless there were some good reason for not clearing the signal. Moreover, this operator but a few minutes before, as required by the rules, had promised D that he would hold all eastbound trains for the arrival of train No. 1. On this clearance card train No. 6 left C, and the collision occurred about 1 mile east of that place. Both of the men at B and the one at C had been in the employ of this company for several years, and all three were regarded as efficient operators.

The block-signal system in use on this line is the "Controlled manual," but there is no track circuit control, and the rules permit a clearance card to be given under certain conditions without putting the signal in the position to give a "proceed" indication. A card was thus given in this case, but without any reason or excuse. In consequence of the use of the same outdoor fixed signal for the two functions of a block signal and a train-order signal there is a complication in the rules concerning the use of a clearance card as a substitute for the giving of a proceed indication by the fixed signal, but it does not appear that this conduced to the commission of the error in this particular case.

Collision No. 4, which occurred on an electric road, was due to disobedience of a meeting order by both the conductor and the motorman of a northbound work train. Each of these men had received a copy of the order about 30 minutes before the collision, and it appears that both of them fully understood it. Neither had any other order in his possession at the time. The report says: "The motorman states that he was writing out certain freight bills and asked the conductor twice whether the southbound car had passed, and was assured that it had. The conductor states that he supposed the motorman would attend to the orders while he (the conductor) was looking around the cars, his attention being taken by some wires that were loose."

Collision No. 8, occurring at 3:30 a. m., was due to a false clear block signal. The signalman, disqualified by being under the influence of intoxicating liquor, gave a clear signal to a southbound extra train to enter a section already occupied by a northbound regular train. There was a dense fog at the time so that neither engineman had a view of the opposing train in season to slacken his speed. According to the rules the signalman at this point should give a clear signal only after receiving word from the train dispatcher. This signalman had been in the employ of the company as an extra man for about three months. His mental condition after the collision was such that no explanation could be had of his error. He was arrested and held for the grand jury on a criminal charge, but the result of the trial is not yet reported.

Collision No. 9, between a southbound passenger train and a northbound freight, was due to the failure of an operator to deliver an order to the southbound train. This train was to meet the northbound at H, and the order for it was sent to the operator at that point. The train made its regular stop there to meet a northbound passenger train and to take water, but as it approached the station the engineman sounded the regular whistle signal, indicating that he desired a clear train-order signal, and the operator, forgetting the order on his table, at once changed the signal to the "proceed" position. The operator is held negligent for not having reported to the dispatcher that the train was approaching the station, and also for neglecting to use the "tell-tale" device, an arrangement for covering the lever of the signal in such a way as to remind an operator of the presence of an order in his office in case he should inadvertently attempt to change the signal when it ought to be left in the "stop" position. After the train had left, he discovered the order lying on his teilegraph table and immediately notified the dispatcher; but it was then too late to stop the northbound train. Up to the time of this accident this operator's record had been good. He had been at H two years and had had four years' experience in all.

Collision No. 11 was due to the presence on the main line of five coal cars, which had escaped control at a mine about a mile away from the railway, and had run to the main track before the men in charge could stop them. These cars had run away because of carelessness of men at the loading point in pushing a loaded car against four others which were standing on a grade with the wheels blocked, but with blocks not large enough to withstand the shock which they were given by the moving car. There is a derailing switch below the mines, which ordinarily would have thrown these cars off the track, but it had been closed a few minutes before by a switching crew, to facilitate their switching movements, and the runaway cars came along just as the engine had cleared the running track. There is no derail near the main line of the railway, the reason given for not having one at this point being that because of the presence of buildings close to the track there is no suitable place for a derail. The statement of the railway company says that, to provide against a collision of this kind in the future, it is proposed to install two derailing switches, so connected with each other that when one of them is closed, ahead of the switching engine, another one, in the rear of the engine, must at the same time be open.

Collision No. 14, between northbound and southbound freight trains, occurred about 6 a. m., in a dense fog. The northbound train had reached a point about 3,000 feet short of a switch, at a passing station, where it should have cleared the southbound train. The southbound train appears to have been a few minutes ahead of time. The evidence as to the precise time is conflicting, but the main responsibility is thrown upon the northbound train, as it was running in violation of the rule which required it to reach the meeting point and be clear of the main track before the leaving time of the southbound train.

Collision No. 20, killing 9 persons and injuring 17, occurred about 10:43 o'clock in the evening and resulted in the wreck of a sleeping car, which took fire from the locomotive that crushed it, and was completely destroyed. This sleeping car was the rear car in a passenger train which had been stopped for the purpose of making slight repairs, and it was run into by a following passenger train, after having been stopped about 25

minutes. The report says that the flagman of the standing train went back promptly a distance of about 2,400 ft., to a highway crossing and there placed a torpedo on the rails; and that there was a clear view from the standing train back for 2 miles to the station at D, the switch lights of which were plainly visible. The engineman of the second train appears to have taken no action toward stopping until after he passed over the torpedo, and even then the brakes appear not to have been applied with full force. The brakeman who went back with the red light and torpedoes says that he watched the approaching train from the time it started from D, and that he continued to give the stop-signal motion with his lantern until he was obliged to step off the track to avoid being run over. The train passed him at high speed. The conductor of the standing train saw the motions of the brakeman's lantern and heard the explosion of the torpedo. The sleeping car conductor was on the ground at the rear of the train, and he also saw the stop signals given and heard the explosion of the torpedo. The porter of the sleeping car also watched the brakeman and gives similar testimony. He says that he was sure that the brakeman went as far as the road crossing, because he saw the light of the brakeman's lantern reflected from the whitewashed wing fence of the crossing.

The engineman of the second train declares that he did not see the red tail lights of the standing train. He says that on hearing the torpedo he made a service application of the brakes. After the collision he went back to see if he could find the remains of the torpedo, using in his search a tail lamp which he found in the rubbish of the wreck. This tail lamp was afterwards picked up by a road foreman of locomotives and proved to be the one which was on the left-hand side of the rear of the car of the standing train.

The conductor of the second train heard the explosion of the torpedo and says that the air brakes were immediately applied, but only slightly; and that after application, and before the collision, they were released. The baggage man and the train porter in the baggage car of this train heard the explosion of the torpedo and spoke about it. This baggage man, who was entering on his record the pieces of baggage which he had just taken into his car, walked to the end of the car after hearing the explosion, and returned to the center and remarked to the porter that it was strange the engineer did not stop; all of this before the collision occurred.

The rear flagman of the second train did not hear the explosion of the torpedo, but he saw the flagman of the leading train standing at the side of the track as his (the second) train passed him. Immediately after the collision he went back to protect his own train and at the road crossing found the brakeman of the standing train.

The leading train had left its rear car at D and at the inquest held by the coroner testimony was offered to the effect that the tail lights (markers) were not transferred from this car to the car ahead, but besides the circumstantial evidence already noted, the report says that a trainmaster of the road was at D that night and that he noticed particularly that the markers were in place and brightly burning when the train departed.

The engineman of the second train was first employed by this company in 1881. He was dismissed in 1885 and was re-employed 4 months later. Nine years later he was out of the service temporarily by reason of a strike. In the 19 years since 1881 his record shows 20 suspensions or reprimands.

The conductor of the standing train was first employed by this road in 1894. Four years later he was dismissed for negligence but was re-employed within a month. Eleven months later he was dismissed again, and was re-employed on July 19 of the present year, or a little over one month prior to the accident. During the 11 years that he was out of the service he was employed on other roads, most of the time as freight and passenger conductor and as yardmaster, but during the past two years he was a farmer.

The brakeman or flagman of this train had been in the service 24 days. He is 23 years old, and his last work before coming to the railway was as a carpenter; but he had had railway experience as a fireman, baggageman, and clerk, aggregating 18 months. He was employed this year by an experienced trainmaster and, according to the report, he not only was found to possess the proper knowledge and intelligence to perform the duties of a passenger brakeman, but also is held by the superintendent to have done, in this particular case, all that could be expected of him.

Collision No. 22 was between a westbound extra freight train and an eastbound regular passenger train. It occurred on a curve where neither of the enginemen had more than a few seconds' view of the opposing train before striking it; and 12 passengers were killed and 18 injured. The tender of the engine of the passenger train penetrated the baggage car and the rear end of the baggage car penetrated the smoking car, and nearly all of the victims were in the smoking car. The extra freight train, after receiving orders to run from A to B, was moved some distance away from the station to the west end of a sidetrack, there to await the arrival of two regular eastbound passenger trains, the first one of which was 25 minutes late. After this first passenger train arrived and passed, the extra was started out; and it ran about 2 miles before the collision occurred. The conductor of the extra train states that he "entirely overlooked" the second train. The engineman sustained a fractured skull, and was so seriously injured that at the time the report was made he was not able to make any statement concerning his relation to the wrong movement of the train.

Collision No. 23 was due to failure of a telegrapher to stop a train for which he held an order. This operator was 20 years of age and had been in the service of the railway three months. Previous to this he had had eight months' experience on another road. In sending the order the despatcher gave the usual signal on the wire and the operator responded with the letters "RD," indicating that he had displayed the red (stop) signal; and afterward the despatcher again asked him if the signal was displayed and the operator replied in the affirmative. But after the accident he offered the explanation that the signal, when released by him, did not move to the stop position. The superintendent doubts the truth of this statement, adding that he has never known of a signal of this kind to fail in that way.

Collision No. 24, in which 20 persons were killed and 39 injured, was between a southbound passenger train and a northbound freight train. The passenger train was running at high speed. The cause was the failure to deliver meeting orders. The freight train was running northward from A to B, C, D, etc. An order had been sent to its conductor at A to the effect that the passenger train would wait at C until a certain hour. The despatcher intended to send the same order to the passenger train at D, but "through oversight" failed to send it in season Discovering this error, he then tried to send word to B to hold the freight there, but he did not succeed in doing this until after the freight had passed B, and the collision occurred between B and C. This despatcher was 32 years of age, and had been in the service of the road seven years; his habits and character were "excellent," and his service "very satisfactory." Of the victims of this accident, nine (six killed and three injured) were trespassers, riding on the front end of the front car of the passenger train. It is supposed that these trespassers had boarded the train at its last stop, though no one saw them get on.

Collision No. 25, in which 34 passengers were killed and seven passengers and four employees were injured, occurred on an electric interurban railway and was between a southbound car running as an extra train and a northbound car running as a regular train. The southbound, which should have kept clear of the time of the northbound, ran past the sidetrack at which it should have waited and also past the next sidetrack; and the

collision occurred at a point on a curve where neither motorman had more than a short distance in which to see the opposing car. The collision occurred about noon. All of the persons killed were on the northbound car, which was completely wrecked. The southbound car carried no passengers. The motorman running the southbound car, who is principally at fault, had acted as motorman of the northbound regular train for 60 days previous to this collision, and he had been employed on this division of the road about six months, previous to which he was a motorman on city street railway lines. The report says that no statement has been secured from this motorman and that he is confined in an asylum. He is 35 years old. The conductor of this car, who is equally responsible with the motorman, is 23 years old. He was first employed as conductor on this line about 11 months previous to the collision, but had resigned and was out of the service until about one month before the collision.

Derailment No. 2 was that of a train running about 50 miles an hour, and the first vehicle to leave the track was the tender. All of the cars in the train were derailed, but the injuries to persons were not severe. The officers of the road were unable to reach any positive conclusion as to the cause of this derailment, but they found a probable cause in the extremely tight coupling between the engine and the tender and to the fact the buffer plate on the engine was worn to a depth of about one-half inch, and the buffer plate of the tender was also worn some. The report says: "Although there were no marks to show that the buffer plate on the engine had tended to raise the tender, it is possible that it acted that way." The accident occurred on a curve of 3 deg. 3 min.; superelevation of outer rail 8 in.

Derailment No. 9, which occurred in the middle of the night, was due to a washout caused by a cloudburst. The very unusual volume of water was held back by the embankment of the railway until it flowed over the top and crossed the tracks, and then a length of track about 350 ft. long was washed out, and, for a length of about 20 ft. the earth was washed away to a depth of 7 ft. Of the 14 persons killed, nine were passengers, three were trainmen, one was an employee not on duty, and one was a trespasser. The report says that this cloudburst was a most extraordinary occurrence. Two residents of the neighborhood, who have lived there for 30 years, says that 7 in. of water fell in about 30 minutes. At the next station east of the point of trouble very little rain fell, while at the next station west, although there was a hard rain, it was not such as to cause alarm. A number of highway bridges were washed away.

Derailment No. 12, in which the engineman, fireman, and baggageman were killed, was due to the displacement of a door on a freight car by the shifting of the goods within the car; this door, falling from the car in an eastbound train, lodged on the rails of the westbound track, and it was struck by a passenger train running at high speed. The engine and baggage car were overturned, and four other cars were derailed. This accident occurred about 3 o'clock a. m. The first wheels to jump the track were the trailing wheels of the engine. All the rest of the train remained on the track for over a mile.

Derailment No. 21 was caused by a freight train becoming uncontrollable on a descending grade because of improper handling of air brakes by the engineman. By long-continued application of the brakes on the driving wheels of the engine the tires on these wheels became so hot that they slipped laterally on the wheel centers, and as a result they produced abnormal side pressure on the rails, forcing one rail out of place and derailing the engine and a number of cars. This accident occurred at 2 o'clock in the morning, and the trainmen had been on duty 10 hours and 10 minutes. The testimony concerning the conduct of the engineman in regard to the handling of the air brakes is not clear, but it appears that after finding that the speed of the train was not slackening properly he took a stick (to use as a lever) and went back over the cars to set hand brakes; and all the time that he was away from the engine the driving-wheel brakes, worked by "straight" air, remained set. The engine was in good condition and the air brakes had been working properly, and at the commencement of the descent there was a sufficient supply of air. The brakemen were held blameworthy for not setting hand brakes. These men claim that they did not hear the brake signal which was given by the engine whistle. The conductor, who was in the caboose making out reports, was held blameworthy for not noticing that the train had passed a certain place where it was usual to stop for the purpose of cooling the wheels.

Derailment No. 23 was caused by a freight train becoming uncontrollable on a descending grade of 78 ft. per mile because of improper management of the air brakes. This derailment occurred about 2 a. m. The train consisted of an engine, 62 cars, and a caboose. In consequence of the excessive speed the twenty-third car in the train was derailed at a sharp curve, and, with 33 cars next behind it, was piled up in a very bad wreck. The whole mass took fire and was burned up. The origin of the fire is unknown, but it is conjectured that it started in a car loaded with oil cake. The engine, with 22 cars, ran a half-mile farther and was derailed and wrecked at a frog because of the looseness of the tires of the driving wheels, which had become heated by the brakes being kept set for too long a time. It is estimated that the speed of the train rose to 55 miles an hour or higher. The engineman was killed, and the precise nature of the trouble with the air brakes can not be made out. So far as can be discovered the engineman had applied and released the brakes too frequently to admit of recharging the auxiliary cylinders. The testimony of the surviving members of the crew indicates that he did not apply the air brakes until some time after giving the whistle signal for the application of the hand brakes.

The engineman was 66 years old and the company gives him a good record. The air-brake apparatus was connected for operation on all the cars of the train but one. The conductor had noticed the excessive reduction of the air pressure as shown on the air-brake gage in his caboose, but when he finally opened the conductor's valve it was too late for this to have any effect on the wheels.

The bulletin contains the usual tables showing details of accidents to employees in coupling and uncoupling cars; nature of injuries in these accidents, and detail causes of accidents in which men fell from cars, engines, etc.

ACCIDENTS ON ELECTRIC RAILWAYS.

Table No. 1E shows casualties on electric railways in train accidents as follows: 41 passengers and 5 employees killed; 422 passengers, 44 employees, and two others persons injured; in other accidents, 7 passengers, 14 employees, and 79 other persons killed, and 365 passengers, 70 employees, and 167 other persons injured This makes a total of 146 persons killed, and 1,070 injured. Adding to this the industrial accidents, the grand total is 148 killed, and 1,150 injured. The collisions on the electric railways numbered 61; damage to cars, etc., $30,780; derailments 17, damage $5,555.

FOREIGN RAILWAY NOTES.

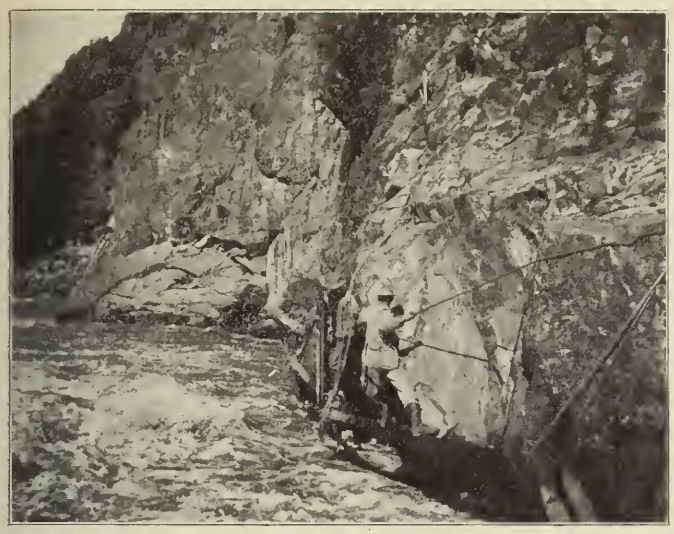
The Chilean government has set aside $522,139 United States gold for the construction of 30 miles of railway connecting Cajon and Llaima.

The railway commissioner of South Australia has given orders for the construction of a truck to be run on one rail for experimenting with the monorailway as applied to conditions in South Australia, where the necessity of cheap construction in sparsely populated districts is very great. If the experiment is successful, the government intends to build some small lines as feeders to main lines, at a probable cost of about $2,500 per mile, including rolling stock.

DIFFICULT LOCATION WORK IN GORE'S CANYON.

BY J. J. ARGO.
Locating Engineer, Laramie, Hahn's Peak & Pacific Ry.

The writer was sent out as locating engineer for the Denver, Northwestern & Pacific, when this road was under construction, to locate a line through Gore's canyon of the Grand river in



Instrument Man Going Up the Canyon on Foot-Logs.

Middle Park, Colo. The railway company had had a long fight for the right-of-way through the canyon, and, as the case had just been decided in its favor by the secretary of the interior, its plans required that the final location be made at once.

Gore's canyon is a deep, narrow gorge, about six miles long. For a considerable part of the distance it is what is commonly termed a box canyon; that is, the walls rise directly from the water's edge. The Grand river, a narrow stream from 100 to 200 ft. wide, flows through the canyon over a bed of large boulders and has a fall of about 2 ft. in 100. The amount of water is comparatively small, except during the months that the melting snow from the main range of the Rockies raises it from 10 to 30 ft. It then completely fills the bed of the stream between the canyon walls. The canyon was almost inaccessible at all times, although it was possible when the water was low, or when the river was frozen in the winter, to get through, with a good deal of difficulty. During the high water season it was impassable, and it was during this period that the location had to be made. The sides of the canyon are in some places ragged granite bluffs rising to a height of 3,000 ft., and in other places they are coarse slide rock standing at about the angle of a rock dump. Through this slide rock run the small streams which cut the sides of the canyon. It is possible to walk or climb over the slide rock, but the bluffs cannot be scaled except by artificial means.

We were able to work over the bluffs by the use of swinging ropes from above, as it is nearly always possible for a skilful climber to find enough points from which such ropes can be hung, by making his way up the cliffs, usually at the ends where they adjoin the slides, and taking advantage of the ledges and



Placing Foot-Logs on Face of Cliff.

crevices. Then an active man, by holding to these ropes, can scramble over an almost perpendicular cliff. An instrument man, with his instrument strapped on his back and a rope around his body safely securing him in case he should slip, can go almost anywhere and set up his instrument in seemingly impossible places. By this means a preliminary or angle line was run, and 10-ft. contours obtained, from which we were able to make up our map and projected location. It was possible to get over any of the bluffs in this way, but it was tedious, and when we were working a short distance from the mouth of the canyon a whole day would be spent in getting to and from work.

It was necessary to devise some means of getting to the interior of the canyon in a shorter time, but it seemed at first almost impossible. The opposite side of the canyon was equally inaccessible, so that it could not be used for triangulation. No boats of any kind could be used in the swift and treacherous stream. It was possible to climb up the slides out of the canyon



Cliff With Foot-Logs in Place and Slide Rock in Background.

in some places, but owing to the height of the canyon this took up too much time. We finally adopted the expedient (which was original with me, though it may have been used by others under similar conditions), of swinging foot logs along the face of the bluffs over the river, by means of wire rope attached to steel pins fastened in the rock. It was no easy matter to do this with hastily improvised means and limited time, and putting up these foot logs was the most strenuous work of the survey. Our method of placing the logs was as follows: Pine logs from 6 in. to 10 in. in diameter and about 16 ft. long, which grew on the rock slides of the canyon, were cut and taken down to the river bank, steel rope, ⅝ in. in diameter was fastened to each end of the log. We used pins of drilled steel about 16 in. long, sharpened with a flat point, for supports. These were driven into crevices in the rock in most cases, or, when this was not possible, holes were drilled for them. Beginning at the up-stream end of the bluff, a pin was located at as near the proper height as possible, a log was floated down the river to its position, and the upper end of the log raised to the proper height and swung by the rope from the pin. A rope was then dropped from the top of the bluff and attached to the lower end of the foot log, allowing men located above to hold the lower end of the log at the same height as the upper end, while a man walked out on the log and put in the steel pin from which to swing the lower end of the log. Then another log was floated down, its upper end attached to the same pin to which the lower end of the first had been fastened and its lower end raised by the rope from above while a man went out on it and fastened another of the pins in the bluff. After the logs had been placed for a short distance by this method, the whole party handling the logs would be working on these shaky supports, and the swift current made it very difficult to handle the logs in that situation. Sometimes the current was so strong that in floating down the logs we would lose log, rope and all. Sometimes the steel pins, apparently solid, would drop out. This danger was provided against by putting in a large number, and by binding the ends of the logs together solidly. The ropes swung from the top of the cliff continually started loose rock which dropped all around us, and one or two instruments were smashed by such rocks. One of the party dropped into the river from one of the foot logs, but was a good swimmer and managed to get away from the swift current into an angle of the bluffs and get out safely. There were no serious accidents during the work.

After we had all of the inaccessible bluffs strung with foot logs, the work of setting stakes was arduous but interesting. The canyon, while exceedingly rugged, has a comparatively straight course, and the alinement of the road through it is nearly all good, with only four short tunnels.

The Chilean and Argentine governments have agreed on a plan to connect the two republics by another railway some 400 miles north of the present Transandean Railway between Valparaiso, Chile, and Buenos Aires, Argentina. It is proposed to have this line of the same gage all the way, thus avoiding the transfer of freight, as is the case via the present Transandean line. Such a line would open up some rich mineral country on the Chilean side, as well as rich mineral and agricultural lands on the Argentine side. This line would require a tunnel of only 1,640 feet to pierce the Andes at the point selected, and only about 36 miles of road is needed to connect it with the Longitudinal Railway now building and the port of Caldera, Chile, which would bring the farms of Argentina much nearer the nitrate fields of Chile than the present route. The Argentine government has made the appropriations for that portion of the road, and from the sentiment in Chile there seems no doubt but that Chile will be ready to connect as soon as a tunnel can be completed through the Andes. The Chilean section would open up a country now occupied by 30,000 people, which number would be greatly increased, since that part of the country is rich in minerals.

INEQUITABLE MAIL-PAY RATES.

The Committee on Railway Mail Pay, Julius Kruttschnitt, chairman, has issued a pamphlet containing the facts and arguments which it proposes to present to the government in asking: (1) that the postmaster general be authorized to allow the railways compensation for space in apartment cars [an apartment is a space less than a whole car, used for assorting mail]; (2) that the "short line" railways be not required to carry the mail from stations to post offices (as is required under the present law, in case the post office is within 80 rods of the station); and (3) that the weighing of the mails, to fix a basis for the price, shall be made every year instead of once in four years. The pamphlet opens with brief historical notes. As late as 1842 only three-quarters of the railway mileage of the country was utilized for mail service. The present tariff of the rates of pay, based on weight, combined with additional rates based on space, was originally adopted in 1873, but has been modified. In 1876 Congress ordered a reduction of 10 per cent., and in 1878 a further reduction of 5 per cent. Then in 1907 there was a further reduction of 5 per cent. on the heavier routes. This refers to the rates (based on weight) for transportation. The rates of pay for post office cars (space) separate from the transportation, which were established by the law of 1873, were reduced in July, 1907, on all cars 45 ft. long or longer. In 1907 the postmaster general reduced the transportation pay about 12 per cent. by ordering that when mails were weighed the average weight per day should be ascertained by dividing the gross weight by the whole number of days included in the weighing period, thus including Sundays, which theretofore had been excluded.

The volume of mail handled by the post offices in 1910 was so much larger than that of 1907 that the increase in revenue was $40,543,652, and during the same period the increase in expenses amounted to $39,737,936; but none of this increase went to the railways. On the contrary, they received $352,760 less in 1910 than in 1907. For the year ending June 30, 1910, the total amount received by the railways for transportation of mails was about $44,000,000, and for railway postal cars about $5,000,000, or a total of about $49,000,000; whereas the city and rural delivery services cost $68,500,000. The information lately gathered by the post office department concerning the cost and revenue of railway mail service shows that on the railways reporting (77 per cent. of the railway mileage of the country), the railways received from the express companies 19 per cent. more and for passengers 37 per cent. more per car foot mile than is received for carrying the mail. While the mail has occupied 9.32 per cent. of the space in trains, as measured by car foot miles, it produced only 7.08 per cent. of the revenue. The express companies, occupying 10.67 per cent. of the cars, pay 9.66 per cent. of the train revenue.

The railways carry postal clerks free, not only when on duty but to and from their homes, and the inspectors, etc., of the post office department ride free. In case of accident, the company must settle with these men the same as with a passenger, but the express companies do not require this. The government pays for 1,400 railway post office cars, but there are 3,800 parts of cars, fitted up with the same conveniences, for which no space rate payment is made. No allowance is made for the frequency of trains nor for speed. It is estimated that the weight of mail increases at the rate of 6 per cent. per year, yet the railways cannot have the price readjusted oftener than once in four years.

The pamphlet contains a list of the roads which organized the committee on railway mail pay; and the members of the committee are the following: J. Kruttschnitt, Union and Southern Pacific Systems; Ralph Peters, Long Island; Chas. A. Wickersham, Western of Alabama; W. W. Baldwin, Chicago, Burlington & Quincy; Frank Barr, Boston & Maine; W. W. Atterbury, Pennsylvania; C. E. Schaff, New York Central; C. R. Gray, St. Louis & San Francisco.

THE EXISTING RAILWAY SITUATION.*

BY H. U. MUDGE.

President, Chicago, Rock Island & Pacific.

The weak point in the railway situation is that the railways do not agree. One railway company, by its action, may reduce any rate to all competitive points. It requires uniform and concerted action to increase a single rate. It will be seen, therefore, how difficult it is to make any rate increases, and it was only in the face of the most urgent necessity that action was taken looking to some increases in freight rates.

The occurrences leading up to the present railway conditions are about as follows:

In 1907 there was a large increase in the rates of wages paid all railway employees, followed by a severe decline in business. It seemed at the time necessary to either restore the wages to the old basis or increase the transportation rates. The railway companies were told by the authorities in Washington that to decrease wages at that time would only accentuate the panic and were told by the shippers that this, of all others, was not a time to increase freight rates. It was in vain that many of the railway managers explained that with the ever increasing cost of labor and material and the constant increase in cost of operation through state and federal requirements, such as the Nine Hour Law for telegraph operators, Self-cleaning Ash Pan Law, Employers' Liability Law, Safety Appliance Laws, the Electric Head Light Laws in several of the states. Full Crew bills in various states and many other things, that an increase in rates was inevitable, if not now, then some time later; if not under private ownership, then under national ownership after the roads had been driven to the wall.

However, the roads pulled through this panic without reducing wages or increasing freight rates, but by reducing expenditures for maintenance of way, structures and equipment, i. e., taking it out of the property. Business conditions improved and the roads began to put back some of the money withheld, but in the fall of 1909, before they were anywhere near caught up, the labor organizations began to clamor for another large increase in wages. This was denied by the general managers on the ground that the time was not yet right for another general increase. In the first case, that of the switchmen in the northwest, arbitration was offered by the roads but declined by the men, and a strike ensued. Organizations in other sections followed and arbitration was resorted to with the decision in every case that the men were entitled to substantial increases because of the increased cost of living. Practically all of the railway labor organizations have received increases in wages, except two, and those are now under consideration. That of the engineers is now being voted upon by the men as to whether they will accept the 9½ per cent. increase offered by the managers, or whether they will strike or take other means to endeavor to enforce their demands. [Since this was written the raises, amounting to 10 per cent. or more, has been given the two organizations referred to, the engineers and conductors.]

During all this time there have been many rate hearings and decisions covering adjustments between communities, such as the Spokane, Missouri River, and Texas Cattle rate cases, in all of which the revenues of the roads were, or will be, materially reduced, if the decisions stand as rendered. There have been also important reductions in intrastate freight and passenger rates by the various legislatures and state commissions, some of which have been overruled by the courts, and others are still being contested.

Someone must eventually foot the bill. The officers of the railways believed that some portion of their added cost of living should be offset by slight increases in freight rates on commodities on which the freight rate is almost infinitesimal as compared with the price of the article transported, and which freight rate increase, if added to the price, would make no noticeable difference in its cost to the consumer. They felt that with the general downward revision of the average rates, caused by these numerous decisions, they must initiate some slight increases in order to partially offset this general downward tendency.

The railways have placed this matter fairly before the Interstate Commerce Commission. Insofar as the western roads are concerned, the amount of the increase asked for would not nearly cover the increases in wages made during the present year, and I doubt if it would equal the amount of reductions made by the decisions above referred to, but the outcome is awaited by the railway managers and by the investing public with a good deal of concern.

During all of the discussion and agitation attending the enactment of the Hepburn Law and the Mann-Elkins Law, there were many far-seeing railway men who thought that the additional authority conferred upon the commission would be beneficial to the country and to the railways, and there were other men, whose views were entitled to equal consideration, who felt that to place the life and liberty of so much capital absolutely under the control of a commission that might be swayed by political considerations was, to say the least, a dangerous experiment and almost sure to result in disaster. It seems, therefore, that the outcome of the present controversy is looked upon by men holding both these views as having a much greater importance than the mere question of the increase in the revenue involved.

The states through which the Rock Island operates have, for the most part, been favored with excellent crops and we expect to be quite busy for the next three months in moving them. There does not appear to be a tendency toward business expansion at the present time. While there are those who are willing to branch out, the bankers and capitalists do not seem disposed to furnish money for these undertakings in views of the present conditions, i. e., there seems to be a tendency to lay low until the atmosphere clears up a bit.

The railways made quite heavy expenditures last year for rails and equipment, and so far as I can learn, their expenditures on these accounts for the next ten or twelve months will be very light. If I am correct, the rail mills and car and engine manufacturers will find themselves short of orders in the near future. This, of course, will throw a considerable number of men out of employment and will affect the lumber, fuel and steel markets, and it seems to me must, of necessity, make things very quiet for a time. My personal opinion is, therefore, that we are in for a period of non-expansion and that the length and severity will depend largely upon the trend of public opinion with reference to the rights of the railways.

This western country is a country of wonderful resources and it is only because of this that we have survived the terrific onslaught made on large capital. I am, by temperament, an optimist. I believe in the West, and I believe in the western people. I believe that they mean to be fair and will be fair when they have time to learn the facts and the effect of this continual hammering of the real industries of the country by the so-called politicians. The railways can adapt themselves to almost any condition, if the condition is stable.

The railways have made wonderful strides in the matter of efficiency and the unit costs of transportations, but they have not been able to offset the heavy increases in wages, cost of material and cost of government regulation of operating matters, and at the same time the serious reductions in rates by government and state regulations. They can make still further reductions in unit costs through better efficiency, better tools and machinery, revision of grades, additional double tracks and in various other ways, but, for the most part, these economies must be preceded by heavy initial expenditures. Practically all of the industrial plants that have effected large economies have first replaced their plants with modern ones and have been permitted to charge sufficient prices to enable them to recoup themselves for these expenditures. This they are able to do by a beneficent government by means of a high protective tariff. The railways are

*This was written for the press by Mr. Mudge in response to several requests for an expression regarding his views on the existing railway situation.

not asking for a bonus of this kind. They are merely asking to be allowed an even break. They are willing to pay their employees more than twice as much as is paid in other countries and they are willing to furnish transportation at less than one-half the charges made in other countries, and they only ask that they be allowed to charge a sufficient tariff to enable them to secure money to do what the public requires, viz., furnish a safe and efficient service and still allow a sufficient return to capital to make the investment an attractive one, which it is not at the present time.

THE REPAIR TRACK AND ITS RELATIONS TO TRAFFIC.

BY F. F. B.

The repair tracks are the bane of the yard-masters' life Usually they are a miscellaneous collection of stub tracks, assembled bit by bit, as the demand for space increases, in most inconvenient portions of the yard; and their inconvenience is a constant cause of friction between the repair track foreman and the aforesaid official. But in the proper conduct of repair track work there is more that affects the prosperity of the road than appears upon the surface.

At many division points, a switch engine and crew are regularly assigned to the repair tracks, but usually do not earn half the cost. The repair track foreman generally maintains that he cannot get along without the engine, but systematizing the work, from the yard up, often brings better results without it. A check on a certain system at several division points in competitive territory the past year disclosed the following conditions:—Instances of as high as fourteen days' detention on commercial freight, one to three days' delay on the part of the yard-master getting a car placed on repair track; three days' delay in repairs, or, perhaps five or six awaiting transfer, delay in getting car out after repairs had been made, and another, an inexcusable delay, in moving a car out of the yard.

The term "dead freight" (lumber, coal, etc.), is misleading. The consignee of this particular car may be losing money on a contract, or a plant may be compelled to close down for lack of fuel, and if he be located in competitive territory, he is going to the X, Y & Q road and his business will be lost. In times past, he might have been placated by a pass, or a rebate, and enticed back, but that day is past, and the only lever that is left now is *service*. That only will retain the old patrons and get new ones.

Consider, first, location and arrangement. At most points, especially in Western territory, there should be at least six tracks, of capacity suitable to the amount of repair work; one for east or north-bound loads, one for west or south-bound loads, one for system empties, one for foreign empties, one for heavy repairs, and one for the storage and cleaning of refrigerators or other special service cars. Many roads having a heavy fruit trade store their surplus refrigerators at the division points, and have them all overhauled and repaired before the season commences. All of these tracks should be accessible from both ends, except that stub tracks may be used for heavy repairs if necessary. The foreman should have wheels located at ends of certain tracks, so that cars requiring new wheels may be properly placed when set in.

It is a bad policy to have repair tracks lead off the main line, as it is not practicable to place, or switch a string of "chain-ups," cars off center, etc., near the time of main line trains. Car inspectors in yard should mark cars "heavy," "for transfer," or "for wheels," as the case may be, so that cars may be properly placed at one handling. Repair tracks should be pulled at the close of the day's business, or before if they are ready; or when a portion of them are ready. During the night, after each incoming train has been switched, take the bad orders to the repair track, each crew to set and space cars handled by it. Do not "sluff" the bad orders off all night, and take a chance on being able to get them placed before the day crews come on. The chance may be lost; and besides the track they are occupying in the yard may be needed. Place all merchandise and perishable loads "first out," so they can be grabbed and started on their way as soon as repaired.

The repair track foreman is to be responsible, of course, for the protection of his men, and of contents of cars undergoing repairs. Furnish him with a list of all loaded box cars and contents, and require him to advise the yard-master as soon as repairs have been completed on perishable or time freight. During the day, if a track is completed, or a portion of it, it should be pulled and again filled. Have a car checker or some other competent person take a check of the tracks at the close of the day. The switch crew should not be sent to pull tracks and allowed to take out everything with the "bad order" mark off. Note on the list any cars that are jacked up. Company material should not be transferred, when possible to divert, neither should commercial coal if company coal of same quality can be substituted.

The section foreman usually has to furnish men for transferring lading of bad orders, and he is apt to delay unless followed up. If necessary to transfer a load of heavy timber, bridge steel or machinery with the crane car, it should be done immediately, as the wrecker may be ordered out at any moment, to be gone a day or more. A good order car should never be placed on the repair track, because it came into the yard with a bad order chained to it. The yard master should forward loads received from the repair track in preference to all other loads except perishable and merchandise. A good result can be obtained by a comparison of the average delay in yard to repair cars at the different division points, eliminating heavy repairs if deemed advisable. In this manner it is possible to trace delays, from the "on hand" reports which should show location of car each day, and then if the delay is the result of a lack of energy, discipline can be administered.

ELECTRIFICATION OF RAILWAYS IN GERMANY.

Largely for military reasons, little has been done up to the present time toward the introduction of electric-motor power on the Prussian railways. On electric roads the trains do not possess the independence of steam locomotives. The electric car is dependent on a power house and a set of electric wires, and injury to either of these may suffice to delay mobilization or supplying of troops for weeks. For the first experiments with electric-motor power on a large scale, the line from Magdeburg to Leipzig with its continuation, Leipzig to Halle, has been selected—entirely an interior line which does not lead to the frontier. Electric cars will be introduced on the first stretch from Dessau to Bitterfeld during 1911. The so-called "one-phase reversed current" will be used. Very successful experiments with this current have been made on local trains in the neighborhood of Berlin and Hamburg. On account of lack of water power in Prussia the necessary electricity will have to be generated by steam. The power house has been built by the General Electric Company, Schenectady, N. Y., in the neighborhood of Bitterfeld, where a plentiful supply of cheap lignite is obtainable. The power house is the property of the General Electric Company, which contracts to supply the necessary current to the government. The wires will carry 10,000 volts. Two kinds of electric locomotives will be used. Locomotives for passenger trains, weighing about 70 tons, have 1,000-h.p. and a speed of about 80 miles an hour. Freight locomotives have 600 to 800-h.p., and a speed of about 37 miles an hour. The most interesting feature of the locomotives is that, instead of transmitting power from the motor to the axles by means of cog wheels as heretofore, this is done by cranks and rods as in steam engines. The motor is situated rather high in the body of the locomotive, recent experience tending to show that a high center of gravity steadies the locomotive. The wires are hung as follows: Poles are 82 yards apart; the poles are connected by a heavy cable from which the electric wire is suspended by means of running knots at intervals of 6.5 yards. With the exception of locomotives the present rolling stock will be used without change.

General News Section.

At Pau, France, February 2, Martin, the French aviator, in a monoplane, flew for five minutes carrying seven passengers.

The Southern Pacific, dealing with a strike of enginemen and firemen on its lines in Mexico, has filled the vacancies by the appointment of Mexicans.

On the Canadian Pacific lectures are being given to large classes of employees on first aid to the injured. Classes have been formed on each of the six divisions of the road.

Flying above the circular track at Issy-Les-Molineaux, France, February 3, Mr. Say, competing for a prize, made a distance of 63 kilometers in 32 minutes, which is at the rate of about 73 miles an hour.

The Gulf, Colorado & Santa Fe has made a trackage contract with the St. Louis Southwestern for the use of the latter's track between McGregor, Texas, and Waco and the G. C. & S. F. will shortly run regular trains into Waco.

The French State Railways have ordered 50 ten-wheel passenger locomotives from the North British Locomotive Company, Glasgow, Scotland. This is believed to be the first locomotive order that France has placed in the British Isles for almost 30 years.

The Chicago & Western Indiana has ordered, from the Western Electric Company, telephone equipment for two circuits throughout the lines of its own road and of the Belt Railway of Chicago, with a total of 55 stations. There will be a message circuit paralleling the train despatcher's circuits throughout.

The United States government has brought suit at New York for $5,000 against the steamboat City of Lowell, owned by the New England Navigation Company, which, it is charged, was loaded with 1,800 persons last August on a voyage from New York to Poughkeepsie to witness the boat races; the number of passengers allowed by law being 800.

Justice of the Peace Edward A. Ransom, Jr., of Jersey City, N. J., on February 2 issued warrants for the arrest of eight men in connection with the explosion of dynamite at a dock of the Central of New Jersey in Jersey City February 1, when 24 or more persons were killed and over 150 injured. The persons thus charged with responsibility are the general freight agent of the road; the local freight agent; the dock master; a checker; the owner of the lighter; and the manager, the assistant manager, and the superintendent of transportation of the powder company.

For changing from steam to electric or electric to steam engines at Manhattan Transfer, near New York City, the Pennsylvania allows each train four minutes, and a record has been made up showing that, of the 108 trains that have to be changed daily, from 92 to 99 per cent. accomplish the process in less than the allotted time. On one day all of the trains went through with perfect records. The quickest time in which the exchange has been made, thus far, was 1 minute and 30 seconds. In warm weather when steam couplings do not freeze, a reduction may be made in the time allowed.

A bill has been introduced in the Arkansas senate to abolish the railway commission. The Little Rock correspondent of the St. Louis *Globe-Democrat* says that when the bill was first introduced it was considered a joke, but recent developments have convinced everyone connected with the state government that it is quite likely to be passed by the senate. The judiciary committee to which it was referred has decided, with only one dissenting vote, to recommend it for passage, and what action the house will take in reference to it is admitted to be in doubt. It is stated that if the bill is passed the governor will veto it.

The so-called "Chipperfield" commission of the Illinois legislature has made a report charging that a large amount of land held by public service corporations and other concerns on water fronts in the state of Illinois has been improperly acquired. The commission expresses the opinion that of the 265 acres of lake front in Chicago, from Fifty-first street to the Chicago river, which the Illinois Central occupies, it has legal title only to a few small tracts. Similar charges are made against the Chicago Dock & Canal Company, the Wiggins Ferry Company of East St. Louis, the Lincoln Park commissioners and various other concerns. The recommendation is made that the attorney general proceed to test the rights of all persons and concerns holding lands, the title to which is in question, and that $50,000 be appropriated by the legislature to defray the expense of litigation.

The explosion of gas which occurred at the Grand Central Terminal, New York City, December 19, causing the death of ten persons and damage to many buildings, was inquired into last week by a coroner's jury, but after six hours' deliberation the jury was unable to agree, and handed in two verdicts. Nine of the jurors, including the foreman, found that the accident was unavoidable, but a minority of three said it was due to the negligence of the company or companies in charge of the terminal. Albert Seagroatt, the motorman in charge of the engine attached to the cars which broke the gas pipe, had been arrested on the day of the accident but was set free after the action of the jury became known. Mr. Seagroatt was dismissed from the service of the road on January 17. His statement, as reported by the newspapers, was to the effect that he knew of no damage to the gas pipe until a long time after the cars ran over the bumping post. The rails were slippery on the morning of the accident, and there was no sand available on his engine.

We referred editorially last week (*Railway Age Gazette*, February 3, page 190) to the requirements of the pending post office appropriation bill, regarding the use of steel mail cars. The bill then referred to (H. R., 31, 539) has been passed by the house, but the senate committee has accepted certain recommendations from the post office department for its modification, which, it seems probable, will be adopted by Congress. Under the bill as it is proposed by the senate committee to amend it. it is provided that after July 1, 1911, no pay shall be allowed for the use of any wooden full railway post office car unless constructed substantially in accordance with the most improved plans and specifications of the post office department for such type of cars, nor for any wooden full post office car run in any train between adjoining steel cars or between the engine and steel car adjoining, and that hereafter, additional equipment accepted for this service shall be of steel construction or with steel underframe, if used in a train with a majority of cars of like construction. It is provided further, that after July 1, 1916, the postmaster-general shall not approve or allow to be used or pay for the use of any full post office car not constructed of steel or other non-combustible material or with steel underframe; if such post office car is used in a train in which a majority of the cars are of steel or steel underframe construction. It will be noted that the clause as here proposed, does not limit construction to steel, but permits the use of other non-combustible material. Furthermore, under the original bill, the postmaster-general was not allowed to exercise any discretion whatever in administering the law, while under the present proposition, the postmaster-general may, on the application of any railway, and for good cause shown after hearing, extend the time for compliance by such railway with the foregoing provisions. The bill as passed by the house, would not have permitted the acceptance of any additional wooden cars, while the bill as it is proposed to amend it would, it would seem, bar the use of wooden cars only in trains in which a majority of the cars are of steel construction.

Some Absurdities of Railway Regulation.

Howard Elliott, president of the Northern Pacific, in an address before the Minnesota Federation of Commercial Clubs, at St. Paul, Minn., on January 26, used the following illustration to show up the absurdities in some recent legislation for the regulation of railways.

Let us suppose that some men are engaged in the business of hauling freight of all kinds from the river front in St. Paul to the higher parts of the city. The owners and chief managers are doing the best they can to deliver coal, merchandise and other

freight promptly and cheaply, though every pound must be hauled with difficulty over slippery streets and up heavy grades.

Suddenly, however, a large number of men appear and begin to tell the owners and managers how to run their business. None of these men have any financial interest in the business of transporting merchandise by wagon, and few of them have any practical knowledge of it. One man says, "I have been looking at your wagons and their beds are not the right height from the ground, and you must change them. I notice also that the steps are put on wrong and the buckles of your harness are not of the right character. You must fix these things." Another man says, "The lanterns your teamsters carry are not suitable. You must buy a much more expensive kind and see that they are carried whether they are needed or not." Another says, "You must not use a certain lead horse any more because he is not suited to the business." Another says, "I noticed that you were carrying a calf on one of your wagons. In such cases you must get your wagon from the river front to destination within one hour, and it must be moved at a speed of not less than ten miles an hour." Another says, "In our part of the city your wagons must not move faster than four miles an hour, and you must stop them at every street crossing." Another says, "The city authorities have decided that you must reduce all your charges 25 per cent." And still another says, "I represent a committee that has decided that your sheds and barns are not of the right type and you must tear them down and build new ones."

Meanwhile some of the stablemen and others have come to the managers and owners saying that they have decided not to do any more work unless their pay is increased 25 per cent.

Naturally the owners and their managers are somewhat confused and discouraged at all this interference, and are tempted to say, as the fiddler did in the mining camp, "Please do not shoot, for I am doing the best I can." Now, all this sounds rather ridiculous when it is applied to the man hauling coal and merchandise in the city, but it is exactly what is going on all the time in the United States today in relation to the railways, only there is much more of it because the federal government and all of the states are making rules and regulations about the kind of equipment to be used, the character of locomotive headlight, the kind of boiler in the engine, the speed of livestock trains, the speed of trains in cities, the rates to be charged, the kind of buildings to be put up—and the labor unions are at the same time making demands for increases in pay.

Hudson River Bridge Studies.

The New York and New Jersey Interstate Commission, in its fourth report, just issued, says that a center pier for a bridge over the Hudson is out of the question, and that if ever a bridge is built across the North River at New York it will have to be a single span bridge. This commission (on the part of New York) which consists of McDougall Hawkes, E. W. Bloomingdale, A. J. Shamberg, George R. Dyer and Kingsley L. Martin, serving without compensation, was appointed in 1907 and reports annually to the New York Legislature. Test borings have been made opposite West 179th street and West 110th street, respectively. The commission favored a two-span bridge at the 179th street or 110th street location, but the borings proved that there is no satisfactory foundation for a bridge pier in the center of the river. As there is a width of about 2,800 feet between the established pier head lines along the entire length where a bridge is contemplated the commission was advised by its engineer, Henry W. Hodge, that the construction of such a bridge will cost about the same at any of the proposed sites; and the commission now believes that a bridge located in the West 57th-59th street district will best meet interstate traffic requirements. This opinion is unanimously concurred in by the New Jersey Commission.

On the question of a bridge as against a tunnel for vehicular traffic the report sets forth the reasons for a bridge against any tunnel system.

"Most people," the commissioners say, "have in mind the tunnels now built for railway transportation, which are giving satisfactory and efficient service, but it must be remembered that a tunnel for vehicular traffic is a very different proposition. The railway tunnel does not come to the surface, since the passengers descend to it by stairways and elevators, but vehicles must enter a tunnel by an incline, on which the grades should not exceed 3 per cent. if any heavy hauling is to be considered, and these inclined approaches make the total length of structure very much longer than the actual river tunnel. This would make necessary a total length of over two miles.

"A powerful plant would be necessary, ready at all times to take care of a heavy rainfall, which might at any time rush in through the long open cuts at either end.

"The ventilation of such a tunnel would be very difficult, as it would be a more serious problem than for a railway tunnel where the trains practically fit the entire bore and thus change the air with each passage. A tunnel would also require a considerable lighting plant, and, finally, not less than six tubes would, in the engineer's opinion, be required to match the capacity of a bridge having four lines of subway or trolley tracks and a driveway wide enough for four lines of vehicles, besides two sidewalks.

"According to the engineers the cost of tunnels of equal capacity would be about the same as a bridge.

"For these reasons, as well as for the general reason that vehicular traffic in the open is in every way more desirable than an artificially lighted, ventilated and drained tunnel, the commission is of the opinion that tunnels cannot from any point of view serve the purpose."

It is estimated that a bridge 2,800 ft. long would cost $21,000,000.

Proposed Steamship Docks at Montauk.

The Long Island Railroad has bought at Montauk, L. I., a tract of land 160 acres in extent, which, with 60 acres already owned, affords a site for a railway terminal on a deep water front; and plans have been made for piers 1,000 ft. long and 125 ft. wide, a size that will accommodate the largest ocean steamers. Montauk is the eastern terminus of the Montauk division of the Long Island road, and the present action seems to be part of a general purpose to provide at this place an ocean terminal which will enable steamers from Europe to put their passengers and mails into New York City much earlier than is now possible. Montauk is 118 miles east of New York, a distance which can be traversed by passenger and mail trains in two hours and a half; while the steamships, by landing at Montauk, not only will shorten their voyage by the distance named, but also will avoid the inconvenience and delays which are encountered in New York Bay and in getting to their docks. It is understood that the officers of the Long Island road have recently been in consultation with government officers at Washington concerning those features of the proposed improvement which would require action or consent of the government, and it is given out that the road intends to provide itself with an ocean terminus as soon as it shall be needed; but nothing is said as to when work will be begun on the docks, and the steamship companies will not say that as yet they have decided to send boats to the new terminal. Within a few months the White Star Line will have in service one of its new vessels about 100 ft. longer than the Mauretania, and there is at present no dock in New York long enough to accommodate such a monster. Application has been made for authority to lengthen the Chelsea piers, on the North river, and until some decision is reached on this point the steamship companies apparently will remain non-committal. A representative of the Long Island road says that the White Star, the Cunard and the Scandinavian steamship lines have inspected the proposed location and have favored the proposed improvement.

Chicago Subways.

Bion J. Arnold, chief subway engineer of Chicago, submitted two plans for subway systems to the mayor and local transportation committee of the city council on Monday, February 6. The first plan contemplates a comprehensive system of two level subways eventually reaching all parts of the city, but to be constructed in five steps as the demands warrant. The first step will provide relief for the congestion of surface cars in the downtown district by the construction of a subway a little more than 2 miles in length. The second and third steps will include the construction of a 4-track subway through the loop district for the accommodation of the elevated railways. The fourth step is for the connection of all the steam railway terminals by subways, while the fifth step provides for extensions into the outlying parts of the city.

The second plan is designed exclusively for the relief of the present congestion of surface cars in the business district.

The total estimated cost of the first plan is $54,450,000, but expenditures of $2,500,000 to $3,000,000 will be all that is necessary to start with the first step. The estimated cost of the second plan is between $4,500,000 and $4,750,000, with an additional outlay of $2,950,000 for the necessary connections for universal through routing.

Mr. Arnold recommends the first plan because of the necessity of starting with but a small investment but providing for expansion as the demands warrant, although the second plan is so arranged that it will not conflict with the construction of the first plan at a later date. There will be no grade crossings, and there will be high speed, straight line operations. Engineer Arnold recommended the use of reinforced concrete, with steel construction where the stations occur, as the cheapest and best.

Passage of Boiler Inspection Bill.

The lower house of Congress on Tuesday of this week passed the bill providing for federal supervision of the inspection of locomotive boilers, which passed the Senate on January 10. This bill provides for a chief inspector, two assistant inspectors and 50 district inspectors, with authority similar to that now exercised by the Public Service Commission in the state of New York. The substance of its provisions was given in the *Railway Age Gazette* of January 20, page 126. See editorial columns.

Degrees Conferred at Lincoln.

The University of Nebraska has conferred the degree of Doctor of Engineering on three engineers of prominence, one each in bridge design, electricity and mechanics. They are J. A. L. Waddell, senior member of the firm of Waddell & Harrington, Kansas City; Bion J. Arnold of Chicago; and Mortimer E. Cooley, dean of the Engineering Schools of the University of Michigan.

Mr. Acworth's Observations.

W. M. Acworth, of London, who has been in this country for the last two months and who has been to Texas and other western states, spoke as follows on his departure for home last week:

"The principal defect of American railway management lies in the centralization of administrative power in headquarters in Chicago and New York. This, while tending, doubtless, to efficiency and economy, is responsible in some degree for the present strained relations between the railways and the public. Matters that arise in Kansas, in Texas, in the far South, in the far West and need prompt adjustment have to be referred to officers a thousand miles or two thousand miles away, and the citizen thinks he is dealing with a machine.

"In those important sections of your country the large railway system should have real executive officers with the largest possible discretion to deal with local questions on the spot. The ranking officers of your railways should every now and then visit the different communities along their lines and cultivate the personal acquaintance of their citizens.

"The skeletons in the railway cupboard have all been buried, and the roads would do well to open their cupboards and let the public see how sweet and clean they are.

"In actual economy of railway operation the Americans are first in the world. Why do the newspapers give so much space to criticism of railway efficiency? In the number of tons per car and cars per train, in the fullest utilization of locomotives, in obtaining the greatest measure of result for each unit of expenditure, they are not equalled by the railways of any other nation.

"The investors of Europe and even your own Wall Street seem hardly to grasp the enormous amount of money that must be spent upon your railways to keep pace with your growing traffic. If your traffic doubles every ten years, as it substantially does, you will need not perhaps to double your facilities every ten years, but to increase them at least 50 per cent. The eleven hundred millions per year specified by Mr. Hill as necessary for this purpose is none too much. The inhabitants of your Western and Southern states, your people in general, must understand that this capital cannot be obtained in their own communities.

"Texas and Oklahoma have no money to spare for railway building. They want it all for their own local business. Even the East cannot find all the money required. This money in large measure must for a long time to come be raised abroad; and investors in other lines will not be willing to subscribe it so long as there is a continuance of the harassing conditions which tend to impair the revenues of your railways, to hamper their administration and to retard their development. If the railways of the United States could reach a time when state legislators ceased from troubling and state commissioners were at rest it would be good for the railways and still better for the citizens of the United States.

"No one would say that American farmers are more efficient than those of France and England or that your government is more efficient than the government of Prussia. Your railways have reached a higher standard in international comparison than your farmers or your government, and under greater difficulties, for in England and on the continent employment with a railway company is a prize and every man hopes to remain in the service of the same company throughout his life. He is, therefore, obviously more amenable to discipline than the shifting, and often even foreign force employed on your railways."

Railways in Southern Asia.

In their more far-reaching connections and results, the railway enterprises of South China are even more important than those of North China. The work now being done or likely to be done in the general railway development of this portion of the Chinese Empire is under the control of French and British interests, the French by reason of the railway connections to be made with Indo-China through the Province of Yunnan, and the British through the connections possible by way of Burma. French and British interests have the surrounding country so well under control in the way of railway construction that when concessions are granted foreigners for the construction of lines in Chinese territory, they will, perforce, go to those controlling the connections to be made. What part these railways are to have in the development of Asia can readily be understood after reading the following article from the National Review, a Chinese-British publication: Yunnan, which is about half the area of France, but with only about one-eighth of France's population, owes its present-day prominence to its geographical position in relation to the spread of railways in southeastern Asia. The northwestern boundary of Yunnan touches Tibet, thence it goes south and fringes Assam, Burma, Siam and Tongking. Across Yunnan are the shortest land routes between the British and French Indies and China. The route from Canton to Calcutta, via Yunnan, is 1,600 miles, compared with 4,000 miles by sea through the Straits of Malacca. To take a longer view, the Yunnan lines will form an important section on the great trunk railway now assuming shape across southern Asia, which will link Canton with the European system at Constantinople, and with that of Africa at Cairo. Of this great trunk railway, fully 5,000 miles in length, about 3,500 miles are either already in operation or under construction; and the greater part of the remainder of the distance has been surveyed and projected. The main line of this route, as at present existing, runs from Karachi, on the Arabian Sea, across northern India to Assam. From that point it forks into two branches, both of which impinge upon Yunnan. The more northerly branch reaches Sadiya, on the border where Tibet, China, and Burma meet, at the point where the Brahmaputra, descending from the heights of Tibet, turns sharply in its course to roll onward through the plains of Bengal. This Sadiya branch is meantime of importance because of the coal fields to which it gives access, and its continuance into Yunnan would create a connection between the Brahmaputra and the upper navigable waters of China's great river, the Yangtze Kiang—from which Sadiya is less than 400 miles distant—but the other branch referred to is more likely to form the main route through Yunnan to the east. It leaves the existing line about 150 miles north of Mandalay and runs to Bhamo on the Chinese frontier. From Bhamo, or from Kun-lon, on the same frontier, to which a third branch runs from Mandalay, the British government has the right to extend the lines through Yunnan and to the Yangtze Kiang. The only railway actually tapping the province of Yun-

nan, across which all the immensely important connections noted must be made, is the French line, opened to traffic on April 1 last, from Haiphong on the Gulf of Tonkin to Hanoi, thence to Lao Kai on the Chinese frontier and on to Yunnan-fu, the capital of the province, a distance of about 450 miles from the starting point. Yunnan-fu is likely to be the junction point for all of the lines across south Asia. *Consular Report.*

American Institute of Consulting Engineers.

At the annual meeting of the American Institute of Consulting Engineers, held on January 17 in New York, the following officers were elected for the ensuing year: President, Alfred P. Boller; vice-president, Gustav Lindenthal; secretary and treasurer, Eugene W. Stearn, 103 Park avenue, New York. The members of the council are as follows: For the term expiring January, 1912, Gustav Lindenthal, New York; Ralph Modjeski, Chicago; and John F. Wallace, New York. For the term expiring January, 1913, General T. A. Bingham, New York; Rudolph Hering, New York; and C. O. Mailloux, New York. For the term expiring January, 1914, Alfred P. Boller, New York; J. F. Greiner, Baltimore, Md.; and C. C. Schneider, Philadelphia, Pa. The following standing committees were appointed: Committee on admissions, Gustav Lindenthal, chairman; C. O. Mailloux; Rudolph Hering; J. E. Greiner and R. P. Bolton. Committee on professional practice and ethics, John F. Wallace, chairman; H. W. Hodge, L. B. Stillwell, F. A. Molitor, G. F. Swain and W. J. Wilgus. Committee on legislation, Gen. T. A. Bingham, chairman; S. O. Miller and S. Whinery.

The institute is the outgrowth of a local association of consulting engineers, organized in New York in 1905, now expanded into one of national scope. At a meeting held last December, the constitution was amended and the name, originally the Association of Consulting Engineers, was changed to the present one. The main object of the institute is to promote the business interests of the consulting engineer by advocating a code of ethics, professional practice and schedule of charges, by acting in pertinent legislative matters, and by urging the separation of the contractor from the designing engineer. The membership is limited to those actively engaged in the independent practice of the profession of engineering, in any of its branches, as consulting engineers, and who are not engaged in contracting.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911; St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo., 3d Friday in Month; Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911; Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Missouri house has passed a bill to prohibit railways from charging a higher passenger rate per mile between any stations on their lines than they charge between competitive points.

A bill has been introduced in the New York legislature to empower the public service commissions to suspend tariffs, a power similar to that exercised by the Interstate Commerce Commission.

The state railway commission of Florida has complained to the Interstate Commerce Commission against the rates on fruits and vegetables charged by the Seaboard Air Line from points in Florida to places in other states.

The Agriculturist of the Lehigh Valley Railroad, assisted by other agriculturists from the New York State Experiment Station and Cornell College, last Wednesday, at Burdett, near the east shore of Seneca Lake, gave a lecture to the fruit growers of New York state. Similar talks are to be given at other places along the line.

The order of the California State Railroad Commission, made December 24, reducing freight rates from Los Angeles to the San Joaquin valley, goes into effect February 15; the petition of San Francisco merchants for a reopening of the case having been denied last week. The order applies to all classes of freight, and following are examples of the reductions on the highest and lowest classes (class 1 and class E); to Bakersfield, 71 cents to 67 and 22.5 cents to 17; to Visalia, 79 to 71 and 29 to 19; to Fresno 80 to 79 and 30 to 21.

The Transcontinental Passenger Association lines have decided to make reduced rates for the convention of the National Educational Association, which will be held in San Francisco, July 8 to 14. It is probable the fare from Chicago will be $62.50 for the round trip. A reduced rate will also be made for conventions in other California cities, the probable rate for other conventions being $72.50. A one-way rate of $33 from Chicago and $32 from St. Louis to the Pacific coast, effective March 10 to April 10, will be made.

Traffic Manager Langdon of the Long Island Railroad has issued a pamphlet showing the number of buildings put up on Long Island during the last calender year, part of a record which he has kept for the past six years. The total for 1910 is 8,517, which is 848 more than were built in the year 1909. The present record includes 7,068 dwellings, 803 stores, 42 factories and 604 miscellaneous buildings. The records are gathered by the local agents and other representatives of the company, and the list shows the number in about 150 places. It has been found that the gross receipts of the railway increase at the rate of $100 a year for each new building. For example, the number of buildings put up in six years has been 37,086. The earnings six years ago were $7,824,000. Adding to this $3,708,600, we have $11,552,600, which is only about $62,000 less than the actual gross receipts for 1910.

Special Examiner Burchmore of the Interstate Commerce Commission took testimony at Chicago last week in the case involving the action of the railways in cancelling certain L. C. L. commodity rates between Illinois and Wisconsin points. The witnesses who testified for the railways were F. P. Eyman, assistant freight traffic manager of the North Western; H. A. Pierpont, general freight agent of the St. Paul; M. A. Patterson, assistant general freight agent of the Rock Island, and F. S. Hollands, assistant general freight agent of the Chicago Great Western. It was shown that the rates in question had originally been established to enable industries located in the interior to ship into Chicago and Milwaukee for redistribution; that they are anomalous; that they are all for short hauls, the average being about 50 miles, and that increased terminal costs have made the handling of traffic much more expensive than when the rates were made. It was insisted that the advances would not hurt anybody, as the industries that pay the rates have grown strong enough to stand the advances.

Arthur Hale at Cincinnati Traffic Club.

In an address before the Traffic Club of Cincinnati on February 6, Arthur Hale, general agent of the American Railway Association, said, in part, that while the advantages of co-operation had been illustrated ever since two men had acted together with a common aim, he felt that the traffic clubs were the last and probably the most important indications of the advantages of co-operation, involving as they did the largest business elements in the country—the shippers and the transportation companies. He was therefore glad to see the number of traffic clubs increase. He felt that every traffic club had had a large part in every recent improvement in understanding, such improvement being made more and more essential by the progress of the law in the regulation of transportation companies and of shippers.

The traffic clubs of the country have helped in one marked advance, viz., the increase of car efficiency of the railways in the last four years. In the fall of 1906 there was the most serious car shortage of which we know. We have no accurate record of how serious that car shortage was, nor how serious had been the prior car shortages; but it was certain that such a car shortage would never occur again, and *that* on account of co-operation between the railways and the shipping public.

After Mr. Brandeis' arraignment of the railways he could hardly hope that anyone could think that any action of theirs was scientific. Even if it was not scientific he felt that Mr. Brandeis would agree that it was beneficial. Whether scientific or not, the result of the action, which he felt was joint action on the part of the railways and the shipping public, was when in the fall of 1910 more freight was moved than four years before, there was no serious car shortage, although the two years preceding had been years of very hard times for the railways.

The reason that there was no serious car shortage last fall was because there were more cars and better cars furnished by the railways, and these cars were loaded more fully and handled more promptly by the shipping public. He had no doubt that the traffic clubs of the country in bringing the shipping public and the railways together had contributed to this result, but that there were more definite causes than this and causes which the traffic clubs had undoubtedly done their best to foster. . . . During the car shortages of the fall of 1906 the railways had taken such steps that since that time they have always known exactly what the shortage and surpluses are, and furthermore they have shared that knowledge with the shippers and given them due notice whenever anything like a car shortage seemed imminent. In addition, the railways have used the experience which these car shortage statements recorded and have increased their equipment as they thought would be necessary to meet impending emergencies, and although the emergencies had exceeded those of 1906 and 1907 they had been successfully met. On the other hand, the public, working through the State and Interstate Commissions, and through the demurrage rules, had succeeded in reducing the detention of cars by shippers and consignees, and in thus doing had borne its part in the great reform.

Traffic Club of New York.

The Traffic Club of New York held its fifth annual dinner last Saturday evening at the Waldorf-Astoria, with about 600 members and guests present. The speakers were: Judge Thomas J. Freeman, receiver and general manager of the International & Great Northern; William A. Glasgow, Jr., a Philadelphia lawyer, and J. Adam Bede, of Minnesota, formerly member of Congress. Governor John A. Dix, of New York, had been invited, but was unable to be present and sent a telegram expressing his regrets. He said in part: "I have an interest in all that pertains to transportation. Emerson [R. W., not H.—Ed.] said that there was 'meanness in traffic,' I presume that he had reference to freight rates, or possibly to obtaining a satisfactory rate in moving the commodities for which he was responsible. Every producer of a commodity lives in the hope that rates will be reduced, but that imposes on the producer the responsibility of giving to the traffic manager a greater [volume of] product. You thus work with those who create, and you aid in the development of communities by serving them best and receiving from them in return their best. I trust that you will live forever. . . ."

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting

statistical bulletin No. 90 covering car balance and performance for October, 1910, says:

"The averages reported in the bulletin reflect a typical October performance, which indicates conditions strikingly similar to those existing in October, 1907. Following is a comparison of the principal averages for the past four years.

	October, 1910.	October, 1909.	October, 1908.	October, 1907.
Gross revenue per mile of road	$1,092	$1,100	$1,002	$1,104
Per. cent. home cars on line	57	61	69	58
Average miles per day	24.8	25.6	23.8	24.8
Per cent. loaded mileage	71.6	73.4	70.7	72.9
Ton miles per car per day	376	379	346	382
Average daily earnings all cars on line	2.66	2.70	2.33	2.67

"It will be noted that miles per car per day averaged the same in both 1907 and 1910, while there is but one point difference in the per cent. of home cars on line, and the average daily earnings per car on line.

"Compared with September averages, the performance shows an improvement in all items excepting tonnage per car and per loaded car, which decreased from—

	Tons per Car.	Tons per Ld. Car.
September, 1910	15.5	and 21.6 to
October, 1910	15.4	" 21.5

"The ton miles per car per day, however, increased from 375 to 376, reflecting the increased daily mileage of cars. The daily earnings per car on line increased from $2.59 to $2.66." The accompanying table gives car balance and performance in October, and the charts on the facing page show car earnings and performance in 1907, 1908, 1909 and 1910.

Car Balance and Performance in October, 1910.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and S. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	79,892	703,815	218,533	177,409	159,867	388,439	17,405	128,436	27,505	139,040	104,211	2,144,552
Average number of system cars on line	39,504	387,740	124,471	93,160	78,586	264,212	6,016	68,420	16,187	65,715	69,593	1,213,604
Railway-owned cars: Average foreign on line	45,646	297,087	100,738	63,089	57,865	164,879	14,640	61,000	22,804	64,585	33,539	925,872
Total Railway-owned cars on line	85,150	684,827	225,209	156,249	136,451	429,091	20,656	129,420	38,991	130,300	103,132	2,139,476
Excess	5,258	.....	6,676	.....	.....	40,652	3,251	984	11,486	.....	.....	.....
Per cent. of cars on line to total owned:												
Home	49	55	57	53	49	68	35	53	59	47	67	57
Foreign	57	42	46	35	36	42	84	47	92	47	32	43
All railways	106	97	103	88	85	110	119	100	141	94	99	100
Private cars on line	3,277	39,881	12,000	2,554	5,896	17,912	2,663	8,876	2,953	9,988	2,324	108,324
Total, all cars on line	88,427	724,708	237,209	158,803	142,347	447,003	23,319	138,296	41,944	140,288	105,456	2,247,800
Per cent. of cars in shop	5.03	5.29	8.46	7.32	8.87	5.23	4.16	8.54	5.36	5.86	7.14	6.23
No. of freight engines owned	1,155	10,320	2,940	3,018	2,450	6,270	495	2,573	716	2,577	2,156	34,670
Average cars on line per freight engine owned	77	70	81	53	58	71	47	54	59	54	49	65
Total freight-car mileage	45,926,858	538,213,522	163,636,100	120,718,759	118,261,495	343,697,771	33,094,277	9,177,726	36,691,746	133,411,731	100,630,048	1,725,260,033
Average miles per car per day	16.8	24.0	22.3	24.5	26.8	24.7	45.8	22.6	28.2	30.7	30.8	24.8
Per cent. loaded mileage	71.9	69.6	71.3	69.6	74.5	73.4	74.2	71.5	63.6	73.3	76.4	71.6
Ton-miles of freight, including company freight	532,443,277	8,452,205,433	2,609,809,035	1,957,713,496	1,743,566,004	2,943,870,195	472,105,517	1,310,090,335	307,724,479	1,965,678,737	1,469,502,129	23,764,708,587
Average ton-miles, including company freight:												
Per car-mile	11.6	16.6	16.7	16.2	14.8	14.2	14.9	14.3	11.4	14.9	14.6	15.4
Per loaded car-mile	16.1	23.8	23.2	23.3	18.7	19.7	20.1	19.5	15.9	20.4	19.1	21.5
Per car per day	194	400	374	398	399	298	720	323	325	459	450	376
Gross freight earnings	$6,250,633	$52,630,337	$15,104,067	$12,302,546	$11,992,896	$36,016,823	$4,089,044	$12,199,653	$4,406,812	$20,137,408	$10,239,663	$185,369,882
Average daily earnings: Per car owned	$2.53	$2.41	$2.22	$2.24	$2.42	$2.99	$7.58	$3.06	$5.17	$4.67	$3.17	$2.79
Per railway car on line	2.37	2.48	2.16	2.54	2.84	2.71	6.39	3.04	3.65	4.99	3.20	2.79
All cars on line	2.28	2.34	2.05	2.91	2.72	2.60	5.65	2.85	3.39	4.63	3.13	2.66

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June first, certain tariffs naming increased rates on rice and rice products, filed by the agent of the Southern Pacific and the Mallory Steamship Company. Sixty-four other carriers are named as defendants.

Refusal to Order Through Rate.

Edison Portland Cement Company v. D. L. & W. Opinion by Commissioner Prouty:

The commission is unable to declare defendants guilty of negligence in not having established through routes for Portland cement from New Village, N. J., to Williamstown and Enosburg Falls, Vt. The road finally succeeded in establishing joint rates, and we cannot say that it was guilty of negligence in not having been able to bring about this arrangement at the time of the movement in question. (20 I. C. C. 95.)

Beckman Lumber Company v. Illinois Central.

Proportional rate of 11 cents on lumber, Winfield, Ala., to Thebes, Ill., restricted in its application to shipments destined beyond Thebes, held inapplicable when the only destination indicated on the bill of lading was Thebes proper. Combination rate of 23½ cents assessed for the movement of a car of lumber as from point of origin to Thebes proper found unreasonable and lower rate prescribed for future. Reparation awarded. (20 I. C. C. 98.)

Rates on Cream Reduced.

R. E. Cobb et al. v. Northern Pacific et al. Opinion by Commissioner Prouty:

Complainants are engaged in the operation of creameries at Minneapolis and St. Paul and using the centralizer method. The commission orders the adoption of the distance rates prescribed in the *Beatrice case* (15 I. C. C. Rep., 109) over the lines of the defendants between interstate points within a distance of 510 miles from St. Paul. It is highly desirable that there should be uniformity in all this territory when that can be attained without any sacrifice of justice. There ought always to be harmony between state and interstate transportation by rail; but under the circumstances of this case this commission feels that it can not deny the prayer of complainants. These centralizers are engaged in the manufacture of butter at St. Paul, in the course of which they draw their supplies from points without the state of Minnesota, and they also sell their product at points without that state. The very purpose of this commission is to see that persons requiring interstate transportation shall be accorded

just and reasonable charges for that service; and it has no right to respect the policy of the state of Minnesota nor of the state of North Dakota if they interfere with the application of a just and reasonable transportation charge for this interstate service. These states have made rates to favor the local creameries. (20 I. C. C. 100.)

STATE COMMISSIONS.

The Iowa Commission has been reorganized with Nathaniel S. Ketchum as chairman.

C. M. Larson, real estate engineer of the Chicago & Alton at Chicago, has been appointed principal assistant engineer of the Wisconsin railway commission.

The South Dakota railway commission has issued an order requiring the railways to put intrastate class rates west of the Missouri river, except in the Black Hills, on the same basis that is now in effect east of the Missouri river. This will involve a substantial reduction.

W. M. Barrow, formerly secretary of the Louisiana railway commission, has been appointed assistant attorney-general of Louisiana. His office will be at Baton Rouge, and one of his duties will be to assist shippers in the preparation and presentation of cases before the commission.

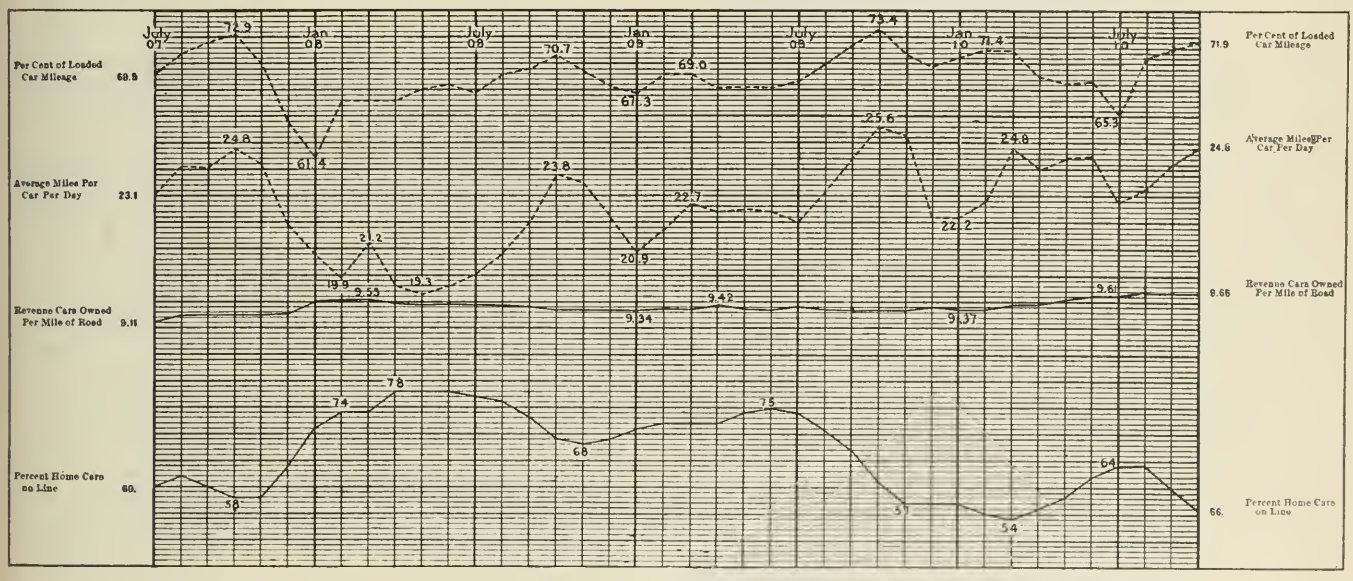
Prof. Milton J. Brecht, superintendent of public schools of Lancaster county, has been appointed by the governor of Pennsylvania a member of the state railway commission, succeeding John Y. Boyd. The term is five years. Prof. Brecht has been a school teacher and politician all his life, and is 56 years old. He has twice been a candidate for Congress, but has not been active in politics for the past six years.

COURT NEWS.

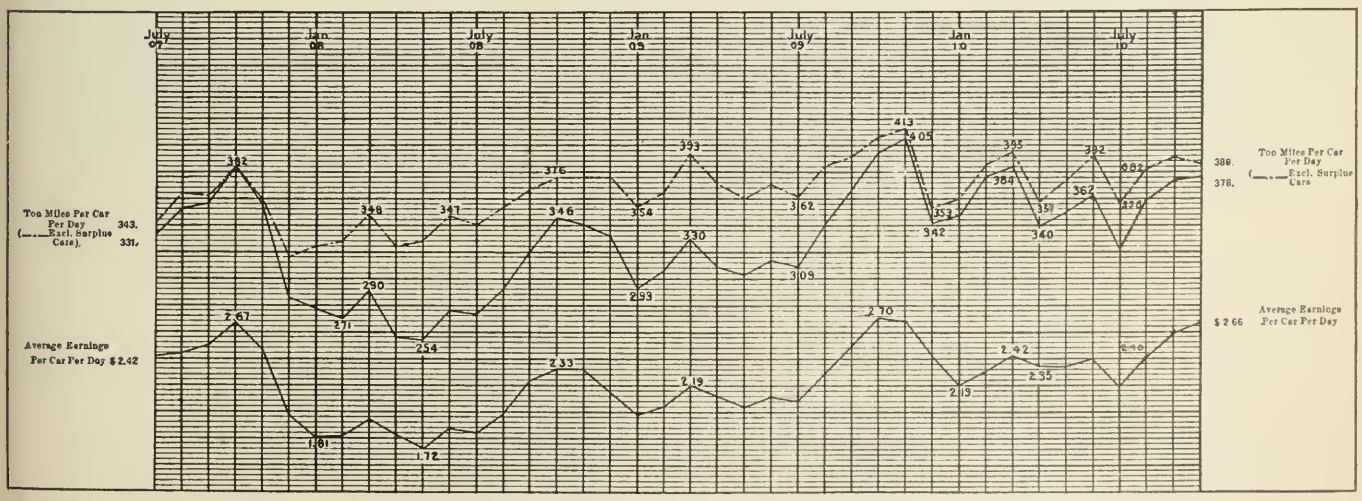
Judge McPherson of the United States district court at Des Moines, Iowa, has enjoined the Iowa railway commission from reducing rates on soft lumber and nut coal.

In the federal court at New Orleans, February 2, the Texas & Pacific was fined $100 each on five counts of an indictment charging the collection of illegal rates for storage. Counsel for the road said that the practice declared illegal was common on all of the roads in the territory affected and that the suit against the Texas & Pacific was a test case.

The federal court at Portland, Ore., has refused to restrain the Oregon railway commission from enforcing an order requiring reductions in class rates between Portland and southern Oregon points, and the reduced rates went into effect on January 27. Judge Wolverton, who rendered the opinion, held that it did not appear that the railway will necessarily be deprived of its property or of a fair remuneration on its investment.



Car Performance in 1907, 1908, 1909 and 1910.



Car Loading and Earnings in 1907, 1908, 1909 and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) compared with last year
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,546	$5,144,593	$1,953,582	$7,724,954	$1,142,086	$1,334,355	$166,118	$2,308,510	$156,044	$5,107,113	$2,617,841	.....	$188,374	$2,429,467	$1,081,550
Atlantic Coast Line	4,494	2,118,298	775,475	3,114,244	341,960	422,721	52,464	933,677	74,302	1,825,124	1,289,120	.....	95,500	1,193,620	—4,446
Bangor & Aroostook	627*	197,170	45,865	256,068	45,428	24,696	3,242	84,499	11,184	169,049	87,019	.....	2,525	84,494	9,493
Boston & Maine	2,243	2,097,812	1,137,170	3,528,563	420,955	569,390	38,583	2,089,529	106,495	3,224,952	303,611	—$1,665	182,270	119,676	—357,323
Buffalo, Rochester & Pittsburgh	573	681,197	85,003	784,377	58,700	151,756	10,408	261,717	13,800	496,381	287,996	162	16,000	272,158	—23,210
Central of Georgia	1,915	811,601	347,275	1,277,289	144,111	172,819	32,587	395,503	65,127	810,147	467,142	6,369	50,797	422,714	29,958
Chesapeake & Ohio	1,939	1,980,494	432,420	2,547,795	214,753	479,660	44,579	836,759	60,566	1,636,317	911,478	2,534	76,750	837,262	—98,364
Chicago & North Western	7,744†	3,980,753	1,518,763	6,100,729	665,987	821,213	93,974	2,780,670	148,051	4,509,895	1,590,834	—8,837	285,000	1,296,997	620,820
Chicago, Burlington & Quincy	9,091‡	4,991,040	1,832,015	7,451,014	692,307	1,275,419	126,160	2,596,125	182,816	4,872,827	2,578,187	—16,638	250,454	2,311,095	954,303
Chicago, Rock Island & Pacific	7,396	3,678,131	1,655,435	5,658,995	602,097	715,910	153,258	2,257,943	126,734	3,855,938	1,803,057	—10,974	209,877	1,582,206	889,586
Chicago, St. Paul, Minneapolis & Omaha	1,744	901,734	369,656	1,373,620	116,400	185,032	23,594	565,418	29,845	920,289	453,331	—2,741	57,558	393,032	139,709
Cincinnati, Hamilton & Dayton	1,015	551,602	126,268	758,752	32,917	138,731	24,631	378,445	21,506	596,230	162,522	.....	32,723	129,799	351
Delaware, Lackawanna & Western	930	2,254,573	600,091	3,033,375	199,016	426,063	53,748	976,191	68,783	1,723,801	1,309,574	26,584	133,775	1,202,383	—132,469
Denver & Rio Grande	2,553	1,539,726	349,263	1,979,470	169,515	350,739	45,283	724,856	51,885	1,342,278	637,192	—8,899	70,000	558,293	155,556
Erie	1,959	2,876,904	703,207	3,893,342	387,736	619,846	93,904	1,419,341	76,848	2,597,675	1,295,667	—6,444	120,631	1,168,597	63,246
Galveston, Harrisburg & San Antonio	1,338	710,145	243,435	1,001,461	109,557	143,307	26,371	369,094	28,150	676,479	324,982	672	35,049	290,605	51,508
Grand Rapids & Indiana	587	259,202	116,867	405,112	52,848	77,893	13,357	199,378	15,081	358,557	46,555	—68	23,683	22,804	—84,575
Great Northern	7,274§	3,238,207	1,033,741	4,658,245	379,868	618,134	72,598	1,482,195	93,892	2,646,687	2,646,558	2,346	248,669	1,764,235	979,514
Lehigh Valley	1,433	2,604,633	331,202	3,033,692	287,377	564,860	77,075	1,095,634	74,959	2,099,905	933,787	—27,145	94,600	812,047	253,650
Louisville & Nashville	4,591¶	3,427,482	1,025,944	4,771,675	657,633	767,732	100,223	1,575,637	96,870	3,198,095	1,573,580	12,335	137,800	1,448,115	—177,121
Maine Central	932	432,901	195,503	678,469	79,706	121,555	7,618	306,200	46,815	561,894	116,575	—1,238	35,869	79,468	—58,199
Mobile & Ohio	1,114	731,140	146,859	1,014,338	106,732	174,345	30,994	340,897	34,310	687,278	327,060	—1,010	25,460	300,590	40,859
New York, New Haven & Hartford	2,041	2,491,385	2,049,547	5,032,911	539,910	635,673	31,094	2,216,164	153,853	3,576,694	1,456,217	125,728	320,000	1,261,945	—194,996
New York, Ontario & Western	546	620,613	85,515	734,168	80,354	121,924	11,631	329,527	22,120	565,556	168,612	—2,091	17,500	149,021	—23,672
Norfolk & Western	1,952	2,441,454	356,702	2,935,532	307,192	573,514	58,751	951,513	63,036	1,954,006	981,526	—866	165,000	815,660	—182,354
Northern Pacific	6,018‖	3,364,732	1,292,576	5,013,847	475,789	696,762	83,188	1,851,155	84,609	3,191,503	1,822,344	118,821	250,692	1,690,473	664,886
Pennsylvania R. R.	3,982	9,458,332	2,652,709	13,123,248	1,856,948	2,764,182	206,844	5,376,875	371,299	10,576,148	2,547,100	—154,846	417,679	1,974,575	1,881,990
Pennsylvania Co.	1,416	2,725,855	674,054	3,776,570	406,277	765,801	76,912	1,609,042	90,782	2,948,814	827,756	—7,107	198,892	621,757	—358,169
Pere Marquette	2,337	982,088	303,620	1,403,323	185,992	205,870	35,179	638,685	32,451	1,098,177	305,146	10,404	59,200	256,349	—122,091
Pittsburgh, Cincinnati, Chic. & St. Louis	1,468	2,294,269	677,551	3,340,080	469,930	628,340	68,616	1,361,272	68,225	2,596,383	743,697	—700	149,824	593,173	—336,022
Seaboard Air Line	3,029*a*	1,274,231	453,935	1,914,955	226,653	255,801	66,618	640,645	56,600	1,246,317	668,638	—251	65,000	603,387	33,448
Southern Ry.	7,038	3,518,178	1,506,796	5,433,221	653,171	780,299	137,101	1,805,084	165,240	3,540,895	1,892,326	1,953	201,208	1,693,071	113,438
Union Pacific	3,473*b*	2,889,787	874,859	4,136,990	307,833	535,926	70,648	1,133,932	111,919	2,160,258	1,976,732	—8,450	196,495	1,771,787	312,780

SIX MONTHS OF FISCAL YEAR 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) compared with last year
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,546	$30,533,416	$11,521,420	$45,614,769	$6,612,277	$6,821,355	$868,354	$12,923,484	$929,471	$28,154,941	$17,459,828	.....	$1,416,819	$16,043,009	$1,229,699
Atlantic Coast Line	4,494	10,226,486	3,656,078	14,922,984	2,008,496	2,336,674	268,624	4,886,090	411,289	9,911,173	5,011,811	.....	567,500	4,444,311	—60,949
Bangor & Aroostook	627*	1,041,397	371,679	1,498,504	259,548	183,016	19,794	455,921	64,935	983,214	515,290	.....	13,100	502,190	—40,456
Boston & Maine	2,243	13,104,531	8,675,200	23,529,782	3,213,047	2,938,200	269,372	10,531,980	546,518	17,499,117	6,030,665	$28,477	1,065,253	4,993,889	—1,200,200
Buffalo, Rochester & Pittsburgh	573	4,145,493	593,598	4,937,240	513,687	886,181	70,516	1,517,724	79,757	3,067,865	1,869,375	524	96,000	1,773,899	—4,694
Central of Georgia	1,915	4,309,220	1,879,345	6,763,783	928,940	1,069,180	197,909	2,059,129	255,504	4,510,662	2,253,121	40,640	277,862	2,015,899	—5,261
Chesapeake & Ohio	1,939	12,575,220	2,891,041	16,131,929	1,896,764	2,962,004	269,023	4,684,651	357,966	10,170,408	5,961,521	—10,015	460,500	5,491,006	—528,907
Chicago & North Western	7,744†	26,549,947	10,546,159	40,579,807	5,927,051	4,692,638	645,076	15,984,557	817,019	28,067,341	12,512,466	—6,457	1,620,000	10,886,009	—222,045
Chicago, Burlington & Quincy	9,091‡	31,762,526	12,668,435	48,261,260	6,674,323	7,522,970	814,139	15,044,010	1,097,673	31,153,115	17,108,145	—42,230	1,502,758	15,563,158	3,220,448
Chicago, Rock Island & Pacific	7,396	22,020,095	10,540,117	34,522,984	5,138,361	4,531,669	941,351	12,626,367	832,142	24,069,890	10,453,094	—62,776	1,360,319	9,029,999	58,680
Chicago, St. Paul, Minneapolis & Omaha	1,744	5,793,068	2,533,261	8,888,682	1,086,617	1,016,589	145,582	3,179,278	171,619	5,599,685	3,288,997	—6,622	352,334	2,930,041	481,212
Cincinnati, Hamilton & Dayton	1,015	3,540,816	945,783	5,004,885	370,174	845,715	147,609	2,225,278	131,700	3,720,476	1,284,409	.....	178,837	1,105,572	—77,545
Delaware, Lackawanna & Western	930	13,371,180	4,069,824	18,534,818	2,232,255	2,546,418	362,381	5,406,566	345,383	10,893,003	7,641,815	126,070	807,024	6,960,861	—1,356,576
Denver & Rio Grande	2,553	9,462,483	2,964,842	12,981,717	1,591,744	2,109,349	297,426	4,271,003	290,956	8,560,478	4,421,239	—7,402	420,000	3,993,837	170,237
Erie	1,959	18,497,447	4,994,897	25,283,496	3,132,915	4,152,695	607,192	8,004,178	475,486	16,372,466	8,911,030	—81,453	689,572	8,140,005	242,452
Galveston, Harrisburg & San Antonio	1,338	4,091,557	1,367,540	5,740,402	737,591	854,113	154,605	2,028,915	168,723	3,943,947	1,796,455	—18,237	181,049	1,597,168	41,503
Grand Rapids & Indiana	587	1,532,312	999,044	2,725,971	352,175	430,837	76,596	1,167,251	89,486	2,116,345	609,626	136	145,404	464,358	—220,923
Great Northern	7,274§	25,039,930	7,472,944	34,823,596	4,717,446	3,907,979	511,162	9,369,994	575,499	19,082,080	15,741,516	142,958	1,694,262	14,190,212	—568,577
Lehigh Valley	1,433	15,526,953	2,537,358	18,714,035	1,961,591	3,128,530	511,952	5,966,967	309,106	11,958,146	6,755,889	—146,540	560,400	6,048,949	—817,645
Louisville & Nashville	4,591¶	20,242,952	6,054,346	27,944,849	4,521,729	4,781,660	562,940	8,794,592	540,060	19,200,981	8,743,868	16,166	826,800	7,933,234	—1,675,519
Maine Central	932	2,689,469	1,743,528	4,727,121	829,667	644,961	46,669	1,724,224	155,380	3,400,901	1,326,220	14,042	215,606	1,124,656	—344,739
Mobile & Ohio	1,114	4,049,611	756,625	5,566,616	652,751	942,423	197,775	1,895,311	196,720	3,884,980	1,681,636	—10,247	149,180	1,522,229	32,055
New York, New Haven & Hartford	2,041	15,497,811	14,024,246	32,365,221	3,760,555	3,594,044	177,578	12,244,783	866,819	20,643,779	11,721,442	746,072	1,912,000	10,555,514	—383,993
New York, Ontario & Western	546	3,725,401	1,060,065	4,977,400	599,903	227,320	71,985	1,821,738	106,387	3,327,333	1,650,067	—24,618	105,000	1,520,149	177,181
Norfolk & Western	1,952	15,561,804	2,280,723	18,494,621	2,154,945	3,408,339	299,574	5,428,696	361,941	11,653,495	6,841,126	—5,518	630,000	6,205,608	—479,129
Northern Pacific	6,018‖	24,231,602	9,903,653	36,478,551	4,727,530	4,096,356	529,684	11,328,615	490,516	21,172,701	15,305,850	370,700	1,790,020	13,886,530	—2,418,416
Pennsylvania R. R.	3,982	58,950,847	17,663,749	81,908,425	10,189,752	15,092,182	1,210,180	29,254,768	2,025,171	57,772,053	24,136,372	—500,711	2,506,075	21,129,586	—4,415,894
Pennsylvania Co.	1,416	21,775,588	4,498,445	28,403,030	3,321,453	4,782,386	487,175	9,666,578	509,571	18,767,163	9,635,867	—33,529	1,063,185	8,539,153	—1,753,759
Pere Marquette	2,337	5,605,983	2,247,742	8,516,184	1,106,186	1,231,879	241,028	3,573,629	198,290	6,351,012	2,165,172	5,984	355,363	1,815,793	—611,523
Pittsburgh, Cincinnati, Chic. & St. Louis	1,468	14,266,688	4,388,961	20,872,702	2,754,308	3,762,835	449,224	7,638,158	394,550	14,999,075	5,873,627	—4,875	829,159	5,039,593	—1,278,469
Seaboard Air Line	3,029*a*	6,939,886	2,312,494	10,303,263	1,432,526	1,397,744	362,883	3,460,497	299,022	6,952,672	3,356,591	—7,803	390,000	2,952,788	69,978
Southern Ry.	7,038	20,161,631	8,618,166	31,099,356	3,842,786	4,962,770	782,919	10,109,837	866,067	20,564,379	10,534,977	9,501	1,086,202	9,458,276	294,277
Union Pacific	3,473*b*	20,764,111	6,087,357	29,043,602	2,844,945	3,086,882	609,998	7,074,407	656,754	14,272,986	14,770,616	—14,739	942,395	13,813,482	—426,863

Mileage operated on December 31, 1909—* 546 miles; † 7,638 miles; ‡ 9,021 miles; § 7,100 miles; ¶ 4,542 miles; ‖ 5,838 miles; a 2,997 miles; b 3,384 miles; — indicates Deficits, Losses and Decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

T. S. Williams, vice-president of the Brooklyn Rapid Transit, has been elected president, succeeding E. W. Winter, resigned.

George W. Peterson has been appointed a general attorney of the Chicago, St. Paul, Minneapolis & Omaha, with office at St. Paul, Minn.

Charles D. Warren, president of the Traders' Bank of Toronto, Can., has been elected president of the New Orleans, Fort Jackson & Grand Isle, succeeding A. Kennedy.

Mark W. Potter, chairman of the board of the Carolina, Clinchfield & Ohio, with office at New York, has been elected president, succeeding George L. Carter, resigned.

D. H. Dunham has been appointed assistant attorney of the Chicago & North Western, with office at Omaha, Neb., succeeding C. C. Wright, promoted to general solicitor at Chicago.

The officers of the Kettle River Valley are as follows: James J. Warren, president, Vancouver, B. C.; F. M. Holland, vice-president, Toronto, Ont.; C. B. Gordon, secretary and treasurer, Vancouver, B. C., and O. E. Fisher, auditor and general freight and passenger agent, with office at Republic, Wash.

H. E. Graham, superintendent and general freight agent of the Pittsburgh, Allegheny & McKee's Rocks, at Pittsburgh, Pa., has been elected vice-president and manager; A. G. Davis has been appointed secretary and auditor, and F. M. Garland has been appointed treasurer, all with offices at McKee's Rocks.

E. F. Blomeyer has been elected vice-president and general manager of the Tennessee, Alabama & Georgia (formerly the Chattanooga Southern), with office at Chattanooga, Tenn. I. M. Dittenhoefer has been appointed general solicitor, with office at New York, and Coleman & Frierson, general counsel, with office at Chattanooga, Tenn.

Operating Officers.

F. Demuth has been appointed superintendent of the Grand Forks division of the Kettle River Valley, with office at Grand Forks, B. C.

Abner Bernard has been appointed trainmaster of freight terminals of the Illinois Central, with office at Fordham, Ill., succeeding Daniel J. Higgins, assigned to other duties.

W. J. Tally has been appointed superintendent of transportation of the Raleigh & Southport, with office at Raleigh, N. C., succeeding T. F. Wilson, who has resigned to go to another company.

W. M. Wardrop, trainmaster of the Pennsylvania Lines West at New Castle, Pa., has been appointed superintendent of the Western division, with office at Fort Wayne, Ind., succeeding J. B. McKim, assigned to other duties.

J. S. Stevens, superintendent of telegraph of the Chesapeake & Ohio, at Richmond, Va., having been granted leave of absence on account of ill health, C. W. Bradley has been appointed acting superintendent of telegraph, with office at Richmond.

Theodore Ensel, superintendent of the Pere Marquette, at Grand Rapids, Mich., has been appointed superintendent of telegraph, with office at Detroit, succeeding W. K. Tasker. J. S. Pyeatt. superintendent at Detroit, succeeds Mr. Ensel, and W. K. Tasker succeeds Mr. Pyeatt.

C. A. Morgan, assistant trainmaster of the Delaware & Hudson, at Carbondale, Pa., has been appointed trainmaster, succeeding J. H. Rosenstock, promoted. J. J. Rounds, day chief despatcher, at Carbondale, succeeds Mr. Morgan. E. G. Knapp, night chief despatcher, at Carbondale, succeeds Mr. Rounds, and P. F. Kilker succeeds Mr. Knapp.

A. Q. Campbell, assistant engineer of the Oregon Short Line at Ogden, Utah, has been appointed an assistant superintendent on the Idaho division, with office at Pocatello, Idaho, succeeding W. S. Harer, resigned. C. F. Smith has been appointed an assistant superintendent on the Idaho division, with office at Nampa, Idaho, succeeding T. W. Rickard, assigned to other duties.

In the absence of J. P. O'Brien, general manager of the Oregon-Washington Railroad & Navigation Company at Portland, Ore., M. J. Buckley, assistant general manager, will be in charge of operation of the road. J. D. Stack, also assistant general manager at Portland, will assume the duties devolving on Mr. Buckley, and L. R. Fields, superintendent at Portland, with the title of acting assistant general manager, will temporarily succeed Mr. Stack.

Ira A. McCormack has been appointed assistant general superintendent of the Eastern district of the New York Central & Hudson River, with office at New York. Mr. McCormack was born in 1859, and began railway work in 1872 as a telegraph operator on the Pittsburg & Connellsville, now a part of the Baltimore & Ohio, and the following year he went to the Pittsburgh, Fort Wayne & Chicago, now a part of the Pennsylvania Railroad, where he remained for 13 years as brakeman, conductor, freight and ticket agent and yardmaster. His next position was yardmaster on the West Shore, and in 1888 he was promoted to trainmaster. Three years later he went to the Pittsburgh & Lake Erie as trainmaster, at Pittsburgh, but soon after took a similar position on the New York Central. He then went to Chicago to install automatic signals on the Chicago & North Western and the Illinois Central, and was later trainmaster on the Lake Shore & Michigan Southern. In 1895 he was appointed general superintendent of the Brooklyn Rapid Transit, and in 1899 was elected vice-president of the Syracuse Rapid Transit, leaving that position to become general manager of the Cleveland Electric Street Railway. He returned to the New York Central in 1902, as assistant manager of the Grand Central station and was promoted to the position of manager of the Grand Central station and Harlem Line, which title was changed in 1905 to general superintendent of the electric division. He held this position until 1907. At the time of his recent appointment, Mr. McCormack was a special agent in the transportation department of the New York Central, at New York.



Ira A. McCormack.

Traffic Officers.

J. F. McDoel, commercial agent of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., has retired.

C. H. George has been appointed general freight agent of the Pittsburgh, Allegheny & McKee's Rocks, with office at McKee's Rocks, Pa.

M. W. Ratchford has been elected manager of the Illinois and Iowa Demurrage Bureau, with office at Peoria, Ill., succeeding Ashley J. Elliott, deceased.

Reed Finley, soliciting freight agent of the St. Louis & San Francisco at Dallas, Texas, has been appointed agent of the Mallory Line, with office at Waco, Texas.

R. M. Chastian has been appointed a commercial agent of the St. Louis, Iron Mountain & Southern, with office at Texarkana, Ark., succeeding Fred Van Fossen, resigned.

C. W. Jones, city passenger agent of the Chicago, Rock Island & Pacific at Kansas City, Mo., has been appointed general agent in the passenger department, with office at Kansas City.

J. G. Pullinger, agent of the Western Transit Company, at St. Louis, Mo., has been appointed also agent of the Rutland

Transit Company, with office at St. Louis, succeeding A. A. Poland, resigned.

J. Y. Calahan, general agent of the New York, Chicago & St. Louis, at Chicago, has been appointed an assistant general passenger agent, with office at Chicago, a new position, and his former office has been abolished.

F. D. Hurst has been appointed general agent of the Lake Erie & Western, the Northern Ohio and the Fort Wayne, Cincinnati & Louisville, with office at Pittsburgh, Pa., succeeding B. J. Torbron, promoted.

R. F. Atwood, commercial agent of the Rock Island Lines at St. Joseph, Mo., has been appointed commercial agent, with office at Kansas City, Mo., succeeding Fred Smith, promoted to assistant general freight agent.

A. J. Davidson, formerly president of the St. Louis & San Francisco, has been appointed commissioner of the Pacific Northwest Demurrage Bureau, with office at Seattle, Wash., succeeding Robert Dodgeon, deceased.

E. W. Clapp has been appointed assistant general freight and passenger agent of the Southern Pacific lines in Arizona and New Mexico, also general freight and passenger agent of the Arizona Eastern, with office at Tucson, Ariz., succeeding R. S. Stubbs, assigned to other duties.

H. G. Brewer, soliciting freight agent of the Trinity & Brazos Valley at Waxahachie, Texas, has been appointed a traveling freight agent, with office at Fort Worth, Texas, succeeding D. W. Calloway, resigned to accept service with another company. J. J. Mullane succeeds Mr. Brewer. George Dirmeyer has been appointed a traveling freight agent, with office at Dallas, Texas, succeeding H. S. Fry, resigned to go with the Texas City Steamship Company.

P. A. Auer, whose appointment as assistant general passenger agent of the Rock Island Lines, with office in Chicago, was announced in the *Railway Age Gazette* of January 27, page 185, began railway work in 1887 with the Chicago, Rock Island & Pacific in Chicago as city depot ticket agent. He held this position for twelve years and was then made traveling passenger agent, with office at New York. In 1902 he was promoted to division passenger agent at Pittsburgh, Pa., and two years later was appointed general passenger agent of the Chicago, Rock Island & Gulf, with office at Fort Worth, Texas, from which office he has just been promoted.

William E. Farris, whose appointment as general freight and passenger agent of the Buffalo & Susquehanna, with office at Buffalo, N. Y., has been announced in these columns, was born November 22, 1870, at Sandborn, Ind. He was educated in the common schools, and began railway work August 1, 1891, as a telegraph operator and agent on the Evansville & Terre Haute. Mr. Farris remained in the service of this company at various places until April, 1905, when he was appointed agent in charge of the Evansville & Terre Haute and the Chicago & Eastern Illinois terminals at Terre Haute, Ind. He resigned from that position December 31, 1910, to become assistant general freight and passenger agent of the Buffalo & Susquehanna, which position he held for one month, until his appointment as general freight and passenger agent.

G. S. Pentecost, whose appointment as general passenger agent of the Chicago, Rock Island & Gulf, with office at Fort Worth, Texas, was announced in the *Railway Age Gazette* of January 27, page 185, was born October 12, 1872, at Mt. Vernon, Ind. He graduated from the high school in 1891, and began railway work in 1898 with the Chicago Terminal Transfer Company. He was next a ticket seller at the Grand Central depot, Chicago, and in January, 1902, was made passenger agent of the Chicago, Rock Island & Pacific at Chicago; in August of the same year he was made traveling passenger agent, with office at Fort Worth. He was then promoted consecutively to passenger agent at El Paso, Texas; district passenger agent at Pittsburgh, Pa.; division passenger agent at Omaha, Neb., and assistant general passenger agent at Kansas City, from which last office he has just been promoted.

Engineering and Rolling Stock Officers.

A. McCulloch has been appointed chief engineer of the Kettle River Valley, with office at Merritt, B. C.

V. W. Ellet has been appointed a general foreman of the Rock Island Lines, with office at Rock Island, Ill., succeeding J. E. Loy, assigned to other duties.

G. S. Hunter has been oppointed a master mechanic of the Missouri, Oklahoma & Gulf, with office at Muskogee, Okla., succeeding J. F. Grealy, resigned.

J. K. Howard, assistant engineer maintenance of way of the Ann Arbor Railroad, at Owosso, Mich., has been appointed engineer maintenance of way, with office at Owosso, succeeding G. R. Endert, resigned. J. P. Ramsey succeeds Mr. Howard, with office at Owosso.

C. W. Dieman has been appointed master mechanic of the Green Bay & Western, the Kewaunee, Green Bay & Western, the Ahnapee & Western and the Iola & Northern, with office at Green Bay, Wis., succeeding W. P. Raidler, resigned to engage in other business.

G. L. Lambeth, master mechanic of the St. Louis division of the Mobile & Ohio, at Jackson, Tenn., has been appointed master mechanic of the Mobile division, with office at Whistler, Ala., succeeding E. G. Brooks, assigned to other duties. W. Q. Daugherty succeeds Mr. Lambeth.

F. O. Walsh, master mechanic of the Atlanta & West Point and the Western Railway of Alabama, at Montgomery, Ala., has been appointed mechanical assistant to the general manager of the Brazil Railroad Company, in charge of the mechanical department, with office at Sao Paula, Brazil, S. A.

William P. Carroll, terminal foreman of the New York Central & Hudson River, at Buffalo, N. Y., has been appointed master mechanic, with office at Rochester, succeeding F. M. Steele, resigned. J. J. Cunningham, terminal foreman at Gardenville, succeeds Mr. Carroll, and Arthur Dale succeeds Mr. Cunningham.

J. W. Marden, superintendent of the car department of the Boston & Maine, at Boston, Mass., has resigned, and that position has been abolished. E. T. Millar, general foreman of the car department, at Concord, N. H., has been appointed general car inspector, with office at Boston, Mass., succeeding F. S. Sanborn, assigned to other duties.

Purchasing Officers.

John H. Guess, formerly general purchasing agent of the National Railways of Mexico, has been appointed assistant general purchasing agent of the Grand Trunk, with office at Montreal, Que.

C. A. Roth, storekeeper of the Chicago, Burlington & Quincy at Galesburg, Ill., has been appointed a storekeeper at Havelock, Neb. J. L. Feemster, storekeeper at St. Joseph, Mo., succeeds Mr. Roth at Galesburg, and J. A. Allen, general foreman at Aurora, Ill., succeeds Mr. Feemster. J. E. Matthews, chief lumber inspector at Chicago, has been appointed Pacific coast lumber agent, with office at Seattle, Wash., and J. F. Rothschild, storekeeper at Hannibal, Mo., succeeds Mr. Matthews. J. H. Ellis, storekeeper at Lincoln, Neb., succeeds Mr. Rothschild.

OBITUARY.

A. C. Harvey, for the past 15 years district passenger agent of the Great Northern at Philadelphia, Pa., died on February 2, at the home of his son in East Orange, N. J. Mr. Harvey was born at Granville, N. Y., and began railway work in 1863 as a clerk in the passenger department of the Pussumpsic Railway. For 12 years he was traveling freight and passenger agent of the Union Pacific and then he was with the Chicago, Milwaukee & St. Paul two years, before going to the Great Northern.

Henry T. Griffin, assistant general passenger agent of the Chicago, Milwaukee & St. Paul, died February 2, at Chicago. Mr. Griffin was born November 7, 1848, and began railway work in 1868 as a clerk in the accounting department of the Chicago, Milwaukee & St. Paul. He was later a clerk in the general passenger department and was then promoted to chief clerk of the same department. He was appointed assistant general passenger agent in November, 1900. Mr. Griffin was a brother-in-law of Sir Thomas G. Shaughnessy, president of the Canadian Pacific and his son, J. H. Griffin, is general agent of the Canadian Pacific in San Francisco, Cal.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona, Mexico and Gulf of California.—Surveys have been made and contracts for building the line will be let soon. The proposed route is from Sasco, Ariz., southwest to Port Lobos, Sonora, Mex., on the gulf of California. Plans are being made to improve the harbor at Port Lobos to establish extensive port and terminal facilities there. E. H. Parker, chief engineer. (August 5, p. 262.)

Arkansas Roads.—According to press reports, the Board of Trade of Little Rock, Ark., and G. H. Cravens, formerly chief engineer of the Memphis, Dallas & Gulf, at Nashville, are back of a project to consolidate a number of existing lumber roads between Little Rock and De Queen, which are 146 miles apart. About 63 miles of new line will have to be built to complete the line between these two places. G. R. Brown is secretary of the Board of Trade, Little Rock.

Atchison, Topeka & Santa Fe.—The Sunset Western, it is said, has grading work under way on an extension from Fellows, Cal., north for about two miles.

Atlantic, Quebec & Western.—This road has been extended from Newport, Que., northeast to Grand River, 17 miles.

Aurora, Elgin & Chicago (Electric).—The lines of this company are to be extended from Yorkville, Ill., west via Plano and Sandwich to Somonauk, and may eventually be extended to Mendota, 66 miles from Aurora.

Badger Railway & Light Co.—Surveys have been made and rights-of-way secured for a line between Whitewater, Wis., and Lake Geneva, 22 miles. The company will do the work with its own men. G. Pickhard, chief engineer, 710 Majestic building, Milwaukee.

Belleville & Western.—Incorporated in Illinois, with office at Belleville, Ill., to build from Belleville to a point in Section 9, Township 1, South Range 9, west, in St. Clair county. J. Adami, Centerville; J. D. Vogt, R. W. Hofsommer, P. J. Gundlach and B. A. Gundlach, all of Belleville, are incorporators.

British Columbia & Dawson.—A bill has been passed in the Canadian House of Commons, it is said, incorporating this company with a capital of $10,000,000. The incorporators include: B. Brooks, of the Western Union Telegraph Company, New York; J. W. Kendrick, vice-president of the Atchison, Topeka & Santa Fe, Chicago; W. C. Pratt, A. C. Sullivan, E. C. Harris and C. G. Young, New York, and J. O. Clifford, Chicago.

Cumberland Valley.—An officer writes that this company will complete within a few months revision work on the main line for two tracks between Carlisle, Pa., and Greason, 4.84 miles. Five public grade crossings will be abolished. Second track is also being laid from Greason to Newville, 5.26 miles, which it is expected will be finished by the end of this year. All the work is being carried out by the company's men.

Greenville & Knoxville.—This company is planning to make a mortgage to secure funds for building from the present terminus at Riverview, S. C., northwest to Knoxville, Tenn., about 100 miles.

Greenville, Sparatanburg & Anderson (Electric).—See Piedmont & Northern (Electric).

Hudson & Manhattan.—The New York Public Service Commission, First district, has extended the time to June 15, 1913, in which to complete the Ninth street extension of the subway system, from Sixth avenue to Fourth avenue, in the Borough of Manhattan. The work was to have been finished by June, 1911, but has been delayed, pending the adoption of the tri-borough or other system of new subways.

Kanawha, Glen Jean & Eastern.—A new branch has been opened for business from Sugar Creek Junction, W. Va., to Pax, six miles.

Indianapolis, Nashville & Southern Traction.—An officer writes that this company has been incorporated in Indiana with $150,000 capital, to build from Indianapolis, Ind., south via Bloomington, Bedford, Mitchell and Paoli to Evansville, about 170 miles. The company will do the grading work with its own men. There will be two trestles, one of 1,600 ft., and another of 800 ft., and a 1,000-ft. tunnel. J. A. Johnston, president, and J. A. Shafer, chief engineer, Indianapolis.

La Crosse & Southeastern.—An officer writes that contracts will be let this coming spring to build an extension from Viroqua, Wis., south via Libertypole, thence southwest to Fargo, then west to West Superior, and continuing south to Retreat, 19 miles. Contracts will also be let for work on eight miles between Wilton and Ontario, including 14 pile bridges. The maximum grades will be 2 per cent. and maximum curvature 6 degrees. Bids will be received by A. E. Rau, engineer, Sparta.

Lida Valley.—According to press reports, surveys are to be started at once for the line from Cuprite, Nev., to a point near Hornsilver, 15 miles, thence west to Lida. Surveys will be continued into the Bishop country. A. D. Goodenow, general manager, and S. W. Connolly is in charge of the survey. (December 23, p. 1204.)

Louisiana & Arkansas.—An officer writes that permanent location has been made for an extension from Jena, La., east to Natchez, Miss., 50 miles, but it has not yet been determined when the line will be built. (January 6, p. 62.)

Memphis, Paris & Gulf.—An officer writes that this company has located the line from Murfreesboro, Ark., east to Pine Bluff, 166 miles. A contract has been given to the Ware Construction Company, St. Louis, Mo., to build the line and subcontracts are now being let. The work is to be finished within 12 months. J. H. Allen, chief engineer, Pine Bluff, Ark.

Mexican Roads.—A concession has been given to the Hudson Consolidated, Ltd., an English syndicate, of which Joseph Brailsford, London, England, is chairman, to build about 470 miles of railway through southern Mexico. It is said the government will grant a subsidy of $5,000,000 gold in aid of the project. Surveys are now being made.

C. Carbonneau, representing the Franco-Espano Bank of Paris and Madrid, which is financing the proposed line to be built by a French syndicate between Comacho, Zacatecas, Mex., and Mazapil, with branch lines to mining camps and other points in the state of Zacatecas, is arranging to start work on the line. Surveys were made some time ago. The main line and branches will total about 300 miles.

Morgan's, Louisiana & Texas.—The new line from Lafayette, La., northeast to Baton Rouge, 57.4 miles, has been opened for business.

Montgomery & Chattanooga.—Incorporated in Alabama with $50,000 capital, to build from Montgomery, Ala., northeast to Anniston, about 95 miles. The company proposes to first build the 50-mile section from Montgomery to Alexander City, at a cost of $750,000. Benjamin Russell, president, First National Bank, Alexander City.

Mount Sterling Short Line.—Judge H. Clay McKee and O. G. Wales, Toledo, Ohio, are back of a project to build a line either to Paris, Ky., Carlisle or Cynthiana.

Nazas Valley & Pacific.—This company has been organized in Mexico to build a line from Tepehuanes, to Guanacevi, about 62 miles, and a branch will probably be built to Inde, 33 miles. The interest on the bonds of the company is guaranteed by the state of Durango for a period of 25 years. The permanent survey will probably be finished about April 1, and the company hopes that the Sierra Madre mountains will be crossed on a 2 per cent. grade. J. T. Odell, president, New York; J. F. Wallace, vice-president, and A. D. Meloy, secretary.

New York, Ontario & Western.—This company expects to finish this coming fall the double-track work now under way on the Scranton branch, between Scranton, Pa., and Cadosia, N. Y., 54 miles. There remains about 25 miles yet to be double-tracked.

Norfolk & Western.—A new branch has been opened for business on the Radford division from Salem, Va., to Crusher, 10 miles.

North Carolina Roads.—According to press reports, the Whiting Lumber Company has bought a large amount of timber

lands and will build a line from Topton, N. C., north to Robbinsville, 12 miles. It is proposed to eventually extend the line from Robbinsville, northwest along the Cheoah river.

Northern Pacific.—According to press reports, the Sunnyside branch is to be extended from Grand View, Wash., east to Gibbon, on the main line, about 12 miles.

Oklahoma Roads.—Residents of Ardmore, Okla., will give a bonus of $100,000 to secure the building of a new line through that place. The projected route is from Lawton, southeast via Duncan and Ardmore, to Sherman, Texas, and the line is to be built within 18 months. The Development Company, Philadelphia, Pa., is back of the project.

Panama-David Railroad.—It is expected that the Panama assembly will ratify the contract between the Panama government and the Balboa & Pacific Estates, Ltd., of London, England, to build a line from the city of Panama, west to David, about 300 miles. (See Panama Railroad, January 6, p. 62.)

Parral & Durango.—This road has been extended from Mesa de Sandia, Mex., southward to a point about one-half mile beyond Paraje Seco.

Pennsylvania Roads (Electric).—According to press reports, plans are being made by residents of Philadelphia, Pa., to build an electric line from Slatington, Pa., northwest to a connection with the Carbon Transit Company at Lehighton, 12 miles. It is said that the work includes putting up a large bridge at Lehigh gap over the Lehigh river, the Lehigh canal and the railway tracks.

Piedmont & Northern (Electric).—Incorporated in South Carolina with $5,000,000 capital. It is understood that the company will take over the rights and property of the Greenville, Spartanburg & Anderson, which was organized to build an electric line between Anderson, S. C., and Spartanburg, about 65 miles, with a number of branch lines. The incorporators include: J. B. Duke, Somerville, N. J., and B. N. Duke, New York. (See North Carolina Roads, January 23, p. 183.)

Pittsburgh & Great Lakes Connecting.—Financial arrangements are said to be made to build from Ellwood City, Lawrence county, Pa., northeast to Raymilton, in Venango county, 40 miles. The work will include piercing a tunnel near Jacksonville. It is the intention of the company only to build the first 33 miles from Ellwood City to Grove City at the present time. The estimated cost of the work is $100,000 a mile. The offices of the company are at Pittsburgh. J. R. Snyder, president, and J. A. Allen, chief engineer.

San Luis Southern.—Trains are now being operated between Blanca, Colo., and Jaroso, 31.38 miles.

St. Louis, Brownsville & Mexico.—The charter of this company has been amended in Texas, permitting the construction of an extension from Buckeye, in Matagorda county, Mex., to Collegeport, 16 miles. This extension has been projected for some time.

Southern Railway.—An officer writes that the company proposes to double-track the line from Franklin Junction, Va., southerly to the northern terminus of the present double-track at Galveston, 1.4 miles. The contract has been given to Stewart Brothers & Jones, Rockhill, S. C.

Southern Railway & Navigation Company.—Train service has been extended from Morville, La., to Jeffris, 1.5 miles.

Sunset Western.—See Atchison, Topeka & Santa Fe.

Texas Roads.—Residents of Bryan, Texas, are back of a project to build from Smitana, on the International & Great Northern, at a point six miles from Bryan, through the Brazos river bottom, about 26 miles. Arrangements have been made for trackage rights over a short section of the International & Great Northern. W. E. Saunders, Bryan, is interested.

Virginia & Carolina Southern.—The Elizabethtown branch has been extended from Dublin, N. C., to Elizabethtown, eight miles.

The Chilean government has appropriated money for the construction on the railway from Valparaiso to Casa Blanca, a small place about 40 miles to the southeast.

Railway Financial News.

Atlantic, Northern & Southern.—This road, which runs from Kimballton, Iowa, south to Villisca, 55 miles, has been put in the hands of a receiver on the application of creditors to the amount of $100,000. The road, the southerly 38 miles of which was opened to traffic a few weeks ago, was built by farmers living along the line.

Baltimore & Ohio.—It is understood that this company is negotiating for the purchase of the Coal & Coke Railway, which runs from Charleston, W. Va., to Leiter, 166 miles, with 24 miles of branches. The company also owns 100,000 acres of coal lands. It has $18,881,800 stock and $4,031,000 bonds outstanding.

Carolina, Clinchfield & Ohio.—The new directors have been elected: Thomas F. Ryan, Frank A. Vanderlip, John S. Dennis, C. Ledyard Blair, Edward D. Adams, W. K. Whigham and Robert C. Ream.

Coal & Coke.—See Baltimore & Ohio.

Gulf, Colorado & Santa Fe.—This company has arranged for trackage rights over the St. Louis Southwestern's tracks from McGregor, Texas, on the Santa Fe, east to Waco, 20 miles.

Holyoke & Westfield.—See New York, New Haven & Hartford.

Hudson Companies.—See Hudson & Manhattan.

Hudson & Manhattan.—Holders of the $10,000,000 6 per cent. notes of the Hudson Companies (the holding company for the Hudson & Manhattan), due October 15, 1911, have been given the privilege of extending them until October 15, 1913. The new notes will be secured by the same collateral as the old ones, consisting of $1,500 Hudson & Manhattan first mortgage 4½ per cent. bonds of 1957 for each $1,000 note. The notes are convertible into bonds at 85 during 1911, 87½ in 1912, and 90 in 1913. A cash payment of 1½ per cent. on each note will be made to holders accepting the offer.

New York, New Haven & Hartford.—The Holyoke & Westfield, whose road from Holyoke, Mass., to Westfield, 10 miles, is leased to the New York, New Haven and Hartford, has asked the Massachusetts Railroad Commission for permission to issue $200,000 4½ per cent. 40-year bonds, dated April 1, 1911, to refund the same amount of first mortgage 4 per cent. bonds due on that date.

New York, Ontario & Western.—The $2,702,000 general mortgage 4 per cent. bonds of 1955 have been sold to White, Weld & Company, New York (February 3, page 259).

Oklahoma Railway (Electric).—A meeting of the stockholders has been called for February 24 to authorize an increase in capital stock from $3,000,000 to $15,000,000, of which $5,000,000 will be preferred; and to authorize $12,000,000 bonds. According to the *Commercial & Financial Chronicle*, the new capital is to be authorized in order eventually to build a number of interurban lines.

Oregon Electric.—White, Weld & Co., New York, are offering at par and interest a block of first mortgage gold 5 per cent. bonds of 1908, of which $10,000,000 were authorized and $2,000,000 are outstanding. The company operates 70 miles of road, including the line from Salem, Ore., to Portland, and all of its common stock is owned by the Hill interests.

Pittsburgh, Shawmut & Northern.—William Salomon & Co., New York, and Rhoades & Co., New York, are offering at 97.84 and interest $875,000 5-year receivers' certificates, dated March 1, 1911. They are issued to refund receivers' certificates due March 1.

St. Louis Southwestern.—See Gulf, Colorado & Santa Fe.

Tennessee, Alabama & Georgia.—Under this name the Chattanooga Southern has been consolidated with the projected Chattanooga & Atlanta, and the Gadsden & Birmingham. When construction is finished, the company will have a through line from Chattanooga, Tenn., to Atlanta, Ga., via the Seaboard Air Line from Rockmart, Ga. *The Commercial & Financial Chronicle* says that the authorized capital stock of the new company will be $2,350,000 common and $750,000 preferred. A

mortgage securing an issue of $5,000,000 first mortgage 5 per cent. 50-year bonds, dated February 1, 1911, has been made to the Empire Trust Company of New York. (December 23, p. 1206.)

Wabash-Pittsburg Terminal.—The Guaranty Trust Company and Sutro Brothers & Co., have jointly bought $1,000,000 receivers' certificates issued to pay for 1,000 steel cars, which are about to be ordered. This issue is part of $2,000,000 previously authorized, and the remaining $1,000,000 may be issued for buying more cars when necessary.

Wheeling & Lake Erie.—The $8,000,000 5 per cent. notes held by the syndicate headed by Kuhn, Loeb & Company, have been extended for 18 months by an agreement between the railway and the syndicate.

Winston-Salem Southbound.—The Union Trust Company, Pittsburgh, Pa., is offering at 95½ a block of first mortgage 50-year 4 per cent. bonds, dated July 1, 1910, being part of an authorized issue of $5,000,000, all of which is outstanding. The bonds are secured on 89 miles of road from Winston-Salem, N. C., to Wadesboro, and are guaranteed, principal and interest, jointly and severally, by the Norfolk & Western and the Atlantic Coast Line, each of which owns half the capital stock. This stock is also deposited as security.

FOREIGN RAILWAY NOTES.

At the beginning of this year there were 63 organizations in the German Railway Union, having in the aggregate 67,128 miles of railway, the Prussian State Railway leading, with 23,418 miles, while one other German road has less than 4 miles. Austria had 12,664 miles in the Union; Hungary, 11,388; besides 1,995 belonging to Austria and Hungary jointly. The other lines are chiefly in Holland and Roumania, and one in Russia. The mileage increased 1,138 miles during last year. In the last ten years it has increased 10,131 miles, or nearly 15 per cent.

A member of the Italian Parliament, Prof. Ancona, of the Milan Polytechnic, has published some figures which indicate that Italy is not making money very fast by its railways. The report of the railway department indicated a profit of $7,400,000 in the last year reported, but this critic says that this was because certain expenses incurred by the railway had by law been made chargeable to the general treasury, and that the actual profits for the last four years have been $8,600,000, $7,400,000, $3,200,000 and $860,000, respectively. The state's investment in these railways, it should be remembered, is about $1,000,000,000.

The Portuguese railway employees won their recent strike and obtained the following concessions from the companies: The lowest wages will be increased about 20 cents a day; all the employees will receive a yearly vacation of 20 days, during which time they will receive full pay; a nine-hour day rule will be rigidly kept; the amounts of the pensions will be revised; all employees will be given passes and the period of the strike will be regarded as vacation, the strikers receiving full pay. At first all of the demands of the strikers were refused, but the companies offered a 10 per cent. wage increase. This was rejected as unsatisfactory. Work was taken up on January 15 and express trains were to be run a day or two later.

Passenger rates on Belgian railway lines per mile are about 3 cents first class, 2 cents second class, and 1 cent third class. In Germany the average passenger rates are 2.7 cents, 1.7, and 1 cent, respectively, and in France, 3.1, 2.3, and 1.5 cents, respectively. In Russia rates are somewhat lower, but this advantage in the cost of travel is offset by the slowness and fewer conveniences of traveling. Italian rates are somewhat higher, but the highest in Europe are those of England, ranging from 4 cents to 5.8 cents per mile first class, to 3.7 cents per mile second class, and 1.9 to 2.9 cents third class. In Belgium the comparatively cheap mode of transportation offered through cheap commutation tickets, "abonnements," unquestionably stimulates travel, and probably causes the large volume of passenger traffic on the lines of this country. These tickets can be purchased for periods of 5 and 15 days, 12, 9, 6, and 3 months, and during the period for which the ticket is issued the holder has the right to travel at any time, on any train that suits his convenience, without regard to the distance traveled, within Belgian territory.

Late News.

The items in this column were received after the classified departments were closed.

The Brinson Railway has ordered 50 sixty-ton box cars from the American Car & Foundry Company.

E. T. Stotesbury has been elected a director of the Lehigh & Hudson River, succeeding the late J. Rogers Maxwell.

Archibald T. Banning has been elected secretary of the Duluth, Missabe & Northern, succeeding E. B. Ryan, Jr., resigned.

Charles H. Markham, president of the Illinois Central, with office at Chicago, has been elected also president of the Central of Georgia and the Ocean Steamship Company of Savannah, succeeding Major J. F. Hanson, deceased.

C. A. How, supply agent of the Missouri Pacific, at St. Louis, Mo., has been appointed general purchasing agent, with office at St. Louis, succeeding S. F. Pryor, resigned to become vice-president of the Simmons Hardware Company.

The directors of the Boston & Maine have approved the action recently taken for the eventual construction of a line for the Boston & Maine on the New Hampshire side of the Connecticut river, extending about 11 miles north of Hinsdale, N. H.

The Arizona & New Mexico has filed notice of an increase in its capital stock from $1,500,000 to $2,300,000; the additional sum is to be used for extensions and betterments. The line now extends from Lordsburg, Grant county, N. Mex., to Clifton, Ariz.

Major Melville W. De Wolf, vice-president of the Erie Railroad, died February 8, in New York City, at the age of 77 years, from heart failure brought on by an attack of asthma. He began railway work in 1873 as agent of the Erie & Pacific Dispatch, at New York. In May, 1893, he was appointed general eastern freight agent of the Erie Railroad, and on June 1, 1908, he was appointed special agent. In November of the same year he was made a vice-president of that company, which office he held at the time of his death.

Congressman Macon, of Arkansas, has introduced a bill providing that it shall be unlawful for any company, corporation, organization, or association engaged in interstate or foreign commerce to use the mails, telegraph or telephone lines, or the railways within the jurisdiction of the United States for purposes of interstate or foreign commerce without first having filed with the Interstate Commerce Commission an affidavit duly subscribed and sworn to by the chief agent or officer thereof, clearly setting forth that the aggregate value represented in and by the stocks, bonds, or other securities of the company does not exceed the aggregate physical value of the property and the reasonable value of the business, privilege, or franchise that the said stocks, bonds, or other securities were issued to represent.

The Commerce Court was organized at Washington on Wednesday, in the conference room of the Court of Custom Appeal, Martin A. Knapp, presiding judge, acting as chairman. The other members of the court, John E. Carland, Robert W. Archbald, William H. Hunt and Julian W. Mack, were all present. The court will open for business at noon on Wednesday, February 15, at which time cases now pending in other courts that properly are to be adjudicated before the new court will be automatically transferred. The following officers were appointed: Clerk, G. F. Snyder, salary, $4,000; deputy clerk, W. S. Hinman, salary, $2,500; marshal, F. J. Starek, salary, $3,000; deputy marshal, J. L. Murphy, salary, $2,500. Mr. Snyder was secretary to Senator Elkins and is clerk of the State Committee on Interstate Commerce. He is a lawyer and is well known among railway officers. Mr. Hinman has been attached to the confidential clerical staff of the White House for many years. Mr. Starek is connected with the internal revenue bureau, having for a long time served as chief clerk. Mr. Murphy is chief of a division of the Interstate Commerce Commission.

Supply Trade Section.

The Detroit United Railway Company has ordered 60 two-motor 70 h.p. car equipments from the General Electric Company, Schenectady, N. Y.

The W. K. Kenly Company, Chicago, announces the appointment of the Railway Signal Company of Canada, Ltd., Montreal, Que., as general agents for Canada.

Edward Beers, secretary of the Commercial Acetylene Company, New York, left on February 3 for an extended trip in Canada. The company has an office and charging station at Toronto, Ont.

George Moses, eastern and southern representative for James B. Sipe & Co., Pittsburgh, Pa., died in Pittsburgh, January 15. Mr. Moses was for a number of years actively engaged in railway work, and previous to 1907 held a responsible position in the office of Alexander Stewart, general superintendent of motive power of the Southern Railway.

A. C. Moore, district manager of the Safety Car Heating & Lighting Company, New York, with headquarters in Chicago, was on February 1 made general manager, in charge of the commercial interests of the company, with headquarters in New York. Mr. Moore is succeeded in Chicago by J. G. Van Winkle as general agent in charge of the northwestern district.

The Pennsylvania Railway Motor Company has been incorporated in Pennsylvania by J. A. Viele, Frank M. Knapp, O. W. Ensworth and R. W. Brown. The company will make cars, engines, boilers, machinery, etc. It is capitalized at $200,000. The Viele motor car will be the principal product of this company and, when complete, the plant will have a capacity of one of these cars per month. These cars will be similar to the one Mr. Viele has been working on for many months, and which is understood to have undergone several tests on the Pennsylvania Railroad tracks. Work will be begun on the plant immediately.

The Linde Air Products Company, Buffalo, N. Y., has increased its capital from $500,000 to $1,000,000. The company has purchased sites at South Elizabeth, N. J., and North Trafford, Pa., and is proceeding at once with the erection of two large factories. It is anticipated that these two new plants will be completed and in operation by next June. Contracts have been let for the buildings and for such equipment as the company does not make at its Buffalo shops. The company already has two plants in operation—one in Buffalo and one in East Chicago—but has found that it needs these additional oxygen plants.

Eugene P. Thomas, assistant to former president James A. Farrell of the United States Steel Products Company, New York, has been elected president of this company to fill the vacancy caused by Mr. Farrell's election to the presidency of the United States Steel Corporation. Mr. Thomas has had a wide experience in the export branch of the steel trade, having been in London from 1899 to 1903, as foreign representative of the Lorain Steel Company, Philadelphia, Pa., the American Steel & Wire Company, Cleveland, Ohio, and the Illinois Steel Company, Chicago. When these companies were taken over by the United States Steel Corporation, Mr. Thomas came to New York to take charge of a department of the United States Steel Products Company.

John I. Beggs, president of the Milwaukee Electric Railway & Light Company was elected president of the St. Louis Car Company, St. Louis, Mo., at the recent annual meeting. This was the first annual meeting of the corporation since its reorganization by Mr. Beggs. The directors elected are: John I. Beggs, Robert McCullough, Richard McCullough, George J. Kobusch and Warnes S. McCall. The officers are: President, John I. Beggs; chairman of the board of directors, George J. Kobusch; secretary and treasurer, J. M. Taylor. Edwin Missner, chief clerk of the Milwaukee Electric Railway & Light Company at Milwaukee, has been appointed assistant to the president. The company has paid off all indebtedness and has now a working capital of $400,000.

Annual Baseball Game at the Atlantic City Convention.

Charles A. Knill, chairman of the baseball committee of the Railway Supply Manufacturers' Association is already making plans for the annual game at Atlantic City, N. J., during the conventions of the Master Mechanics' and the Master Car Builders' Associations. In orer to give aspirants for places on the teams an opportunity to find out if they can qualify, the following eligibility rules have been framed:

(1) Each team to be composed of 12 men in uniform, eight railway supply men and four railway men.

(2) Supply men must be in the sales departments of their companies, or call on railways or car companies to solicit business.

(3) No one who is employed in a shop alone will be allowed to play.

(4) No one is to be allowed to play who comes to Atlantic City for the baseball game alone. Each player must be in attendance as a representative of a supply company and registered as such.

(5) Railway men to play must be members of either the M. M. or M. C. B. association. Employees in shops cannot play.

(6) Members' names and occupations, and the names of the supply concerns or railways with which they are connected must be submitted to J. Will Johnson, chairman of the entertainment committee, at least one month before the game.

(7) If for any reason a change in team is necessary, names shall be submitted and passed on by the sub-chairman of the baseball committee as well as by Mr. Johnson.

(8) No player shall be eligible who has not been employed as salesman for at least one year by a railway supply company, or who has not been a member of the M. M. or M. C. B. association for at least one year.

All players who can meet these requirements are requested to write soon to either Harry B. Hammond, Pressed Steel Car Company, Pittsburgh, Pa., who will captain the western team, or F. M. Nellis, 53 State street, Boston, Mass., who will captain the eastern team, so as to give them time to select their teams. Pittsburgh, Pa., will be in western territory and Buffalo, N. Y., in eastern.

TRADE PUBLICATIONS.

Rock Drill Accessories.—The Ingersoll-Rand Company, New York, in bulletin 9003, describes and illustrates its rock drill accessories.

Finished Steel.—The Carnegie Steel Company, Pittsburgh, Pa., has published Stock List No. 6 of the Waverly warehouses, Newark, N. J., giving all the various products on hand and the code words for use in telegraphic orders.

Interlocking Machines.—The General Railway Signal Company, Rochester, N. Y., has published a catalog on model 2 electric interlocking machines. This catalog contains over 50 pages, is illustrated and gives diagrams and full information on this line.

Cranes.—The Northern Engineering Works, Detroit, Mich., has devoted its catalog No. 25 to photographs and brief descriptions of all the various types of Northern cranes. Appended to each description is a note giving the number of the catalog which is devoted to that particular design.

Electrical Fittings and Generators.—The Sprague Electric Company, New York, has published catalog No. 436, giving a full list of electrical fittings and accessories. Illustrations and prices are included. Bulletin No. 111 of this company illustrates the various types of electric generators and gives a long list of the plants in which they are installed.

Train Despatching.—The United States Electric Company, New York, has published Bulletin No. 501 on Gill selectors for telephone train despatching, describing the development of the selective calling system particularly in its application to railway telephony, and explaining fully the functions and service of the Gill selector and the answer-back.

Missouri Pacific.—"Under Sapphire Skies in San Antonio" gives the prospective traveler a good idea of the attractions of this old Texas City and other points reached by the Missouri Pacific—Iron Mountain route. Another booklet by the same passenger department describes Hot Springs, Ark., as "The Natural Wonderland Set Apart by the Nation for the Health and Pleasure of the People."

Western Pacific.—"Where's Where and How to Get There," is the title of the latest ticket agents' manual of the Western Pacific. A large map and details of connections give the information suggested in the title. Another booklet issued by the road is called "Seeing the Western Pacific." Taking the important towns in order from Salt Lake City, Utah, to San Francisco, Cal., this publication briefly outlines the interesting facts regarding each community.

Electric Railways and Air Brakes.—Bulletin No. 4808 of the General Electric Company, Schenectady, N. Y., is a reprint of an article on the Washington, Baltimore & Annapolis 1200-volt direct current railway, which appeared in the *General Electric Review.* It is illustrated with photographs and diagrams, and gives detailed information on this inter-urban line. Bulletin No. 4798 illustrates and describes General Electric straight air brake equipments for electric railways.

Safety Valves.—The Crosby Steam Gage & Valve Company, Boston, Mass., has published two catalogues on locomotive pop safety valves; one giving the construction of their standard type open and muffled valves, and the other giving a report on tests of 3 in. and 3½ in. valves as submitted by Prof. F. E. Miller, of the Massachusetts Institute of Technology. These tests were made as complete as possible. The results give data that is interesting and instructive from an engineering standpoint, especially that obtained from the valves with the inner edge of the main discharge slightly rounded.

Generators, Alternators and Air Compressors.—Bulletin No. 4804 of the General Electric Company, Schenectady, N. Y., is devoted to direct connected generating sets, which are used for both power and lighting in isolated plants and also as exciters for alternating current generators in central station work. Bulletin No. 4685 describes belt-driven alternators. These alternators are of the revolving field type and range in capacity from 30 to 550 k.w. Photographs, dimension diagrams and descriptions give full information on this line. Bulletin No. 4810 illustrates and describes portable and stationary air compressor sets. The portable air compressors are mounted on three-wheel trucks, which can easily be moved from one place to another, and were designed for use where the installation of a system of piping is not feasible.

RAILWAY STRUCTURES.

Centralia, Wash.—The Northern Pacific will begin work in the spring on a large roundhouse and repair shops. The yard trackage will also be increased.

Eagle Lake, Texas.—The Gulf, Colorado & Santa Fe will build a brick combination passenger station and freight house for which bids will be taken at once. The building is to cost between $8,000 and $10,000.

Evansville, Ind.—The Louisville & Nashville will build track repair shops at a cost of $140,000.

Ft. Wayne, Ind.—The Wabash has prepared plans for a new passenger station, but they will have to be reconsidered on account of the refusal of the city to vacate the necessary ground.

Galveston, Texas.—The Atchison, Topeka & Santa Fe has included in its 1911 budget the following improvements for Galveston and vicinity: A new 16-stall brick and concrete engine house, to cost $40,000, and a quantity of machine tools for equipping this engine house; extensive yard improvements and the moving of a number of the yard buildings.

Gas City, Ind.—The Pennsylvania Lines West are revising the plans for a one and one-half story brick passenger station to be built at a cost of about $15,000.

Grand Island, Neb.—The Chicago, Burlington & Quincy has completed plans for a new passenger station between Fifth and Seventh streets, and the city council has voted to vacate the necessary property.

Huguenot, N. Y.—The New York Public Service Commission, First district, has ordered the elimination of grade crossings on the Staten Island Rapid Transit in Amboy road, near Huguenot avenue, Staten Island.

Jamestown, N. Y.—The New York Public Service Commission, Second district, has ordered the elimination of three grade crossings on the Erie Railroad at Jamestown, at a cost of $560,000. The railway company is to pay one-half, the city one-quarter and the state one-quarter of the cost.

Kalamazoo, Mich.—The Michigan Central has let a contract to H. L. Vanderhoist, Kalamazoo, for building its new freight house, which is to cost about $28,000.

Minot, N D.—The Minneapolis, St. Paul & Sault Ste. Marie expects to begin work in the spring on a passenger station to cost about $100,000. It will be located between Main and Reishus streets.

Mobile, Ala.—Plans have been made for the construction of a new passenger and freight station, it is said, by the New Orleans, Mobile & Chicago, at Mobile, on which work is to be started soon. The station is to be built on the block bounded by Royal, St. Emanuel, Charleston and Augusta streets. The company proposes to lay double tracks from Tennessee street to the new terminal, which will be in the business center of the town.

Moline, Ill.—The Chicago, Burlington & Quincy, has prepared plans for a new passenger station, but is holding the plans in abeyance during negotiations between the Burlington, the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & St. Paul and the Davenport, Rock Island & Northwestern for building a union station.

Montalvo, Cal.—Recent rains have damaged the concrete piers of the Southern Pacific steel bridge over the Santa Clara river near Montalvo.

New Haven, Conn.—According to press reports, revised plans have been made for the new union station in New Haven, and work on the structure will be started soon. (December 23, p. 1208.)

Omaha, Neb.—Fire in the yards of the Chicago, St. Paul, Minneapolis & Omaha on February 1 destroyed a storehouse containing a quantity of locomotive supplies. The oil house, coal chute and yard office were also damaged.

Peoria, Ill.—The Illinois Traction System plans to build a one-story brick freight house 63 ft. x 130 ft.

Port Mann, Ore.—The Canadian Northern has begun work on the town site of its new Pacific terminal to be known as Port Mann. A tract of 4,000 acres, having a water front of 2½ miles, has been surveyed and a large force of men is engaged in the preliminary work of leveling the site and building the company's car shops and foundries.

Sherman, Texas.—The Houston & Texas Central will extend its yard mileage, and the building of an emergency car shop is contemplated.

St. John, N. B.—The Canadian Pacific is planning to build terminals on land recently bought at the head of the harbor. The company expects to put two steamers on the Bay of Fundy instead of the one now there, and the new terminals are intended to care for the increased traffic.

The Dalles, Ore.—The Oregon-Washington Railroad & Navigation Company has prepared plans for a $30,000 passenger station, but its location has not been decided on.

Tulsa, Okla.—The St. Louis & San Francisco has agreed with the city on the details of a plan for building a subway at an estimated cost of $100,000.

Vancouver, Wash.—The Spokane, Portland & Seattle is contemplating building elevators and docks to cost about $2,000,000 at a point 3½ miles below the city.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Wheeling & Lake Erie is in the market for 4 Mallet locomotives.

The Brompton Pulp & Paper Co., Sherbrooke, Que., has ordered 1 Forney type locomotive from the Montreal Locomotive Works. The cylinders will be 14 in. x 22 in., and the total weight in working order will be 50,000 lbs.

The Florida East Coast has ordered 5 Pacific type locomotives from the American Locomotive Company. The cylinders will be 20 in. x 26 in., the diameter of the driving wheels will be 68 in. and the total weight in working order will be 196,000 lbs.

The Hocking Valley has ordered 10 consolidation locomotives from the American Locomotive Company. The cylinders will be 23 in. x 30 in., the diameter of the driving wheels will be 57 in. and the total weight in working order will be 237,000 lbs.

The Pittsburg, Summerville & Clarion has ordered 1 consolidation locomotive from the American Locomotive Company. The cylinders will be 20 in. x 26 in., the diameter of the driving wheels will be 57 in. and the total weight in working order will be 162,000 lbs.

The Marion & Rye Valley, Marion, Va., has ordered 1 consolidation locomotive from the American Locomotive Company. The cylinders will be 21 in. x 24 in., the diameter of the driving wheels will be 46 in., and the total weight in working order will be 142,000 lbs.

The Texas City Transportation Company, Texas City, Texas, has ordered 1 mogul locomotive from the American Locomotive Company. The cylinders will be 17 in. x 24 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 94,000 lbs.

The Pennsylvania, it is said, will build the frames and the running gear of 20 2,000-h.p. electric locomotives at its Juniata shops. The brakes and the motor equipment for these locomotives will be made by the Westinghouse Electric and Manufacturing Company. This is not confirmed.

The Kanawha & Michigan has ordered 8 consolidation locomotives and 2 six-wheel switching locomotives from the American Locomotive Company. The cylinders of the consolidation locomotives will be 23 in. x 30 in., the diameter of the driving wheels will be 57 in. and the total weight in working order will be 237,000 lbs. The cylinders of the switching locomotives will be 20 in. x 26 in., the diameter of the driving wheels will be 50 in. and the total weight in working order will be 130,000 lbs.

The Harriman Lines have ordered 196 locomotives from the Baldwin Locomotive Works, as mentioned in the *Railway Age Gazette* of February 3. The locomotives will be apportioned as follows: Union Pacific, 30 mikado freight, 10 mikado passenger, 10 switch; Oregon Short Line, 15 mikado freight; Central Pacific, 6 mikado freight, 6 consolidation, 6 switch, 12 Mallet consolidation, 12 Mallet mogul, 2 eight-wheel passenger; Southern Pacific, 3 eight-wheel passenger, 6 switch; Oregon & California, 10 mikado freight, 2 switch; Oregon-Washington Railroad & Navigation, 40 mikado freight, 10 switch, 2 Pacific; Galveston, Harrisburg & San Antonio, 6 ten-wheel passenger, 2 switch; Morgan's Louisiana & Texas, 2 switch; Texas & New Orleans, 2 switch; Arizona Eastern, 2 consolidation. Of this number, the following locomotives will be lignite burners: 80 of the mikado freight; all of the mikado passenger; and all of the Pacific. The lignite burners will be equipped with 9,000-gal. rectangular tenders, having a coal capacity 5 tons greater than the standard tender, as it has been found that the capacity of the standard tender is not great enough where lignite is burned. Two extra tenders are included in the order for the Southern Pacific of Mexico. These will have a capacity of 7,000 gal., and will be of the cylindrical type. All of the Mallets have semi-cylindrical tenders with a capacity of 10,000 gal. of water and 3,200 gal. of oil. The following dimensions are for all the locomotives in the respective classes: mikado freight, drivers, 57 in., cylinders 23¾ in. x 30 in., weight on drivers 195,000 lbs.; consolidation, all dimensions conform to Harriman Lines standard: mikado passenger, drivers, 63 in., cylinders, 26 in. x 28 in., weight on drivers, 210,000 lbs.; Mallet consolidation (2-8-8-2), drivers, 57 in.; cylinders, 26 in. and 40 in. x 30 in., weight on drivers, 394,000 lbs.; Mallet mogul (2-6-6-2), drivers, 63 in., cylinders, 25 in., and 38 in. x 28 in., weight on drivers, 320,000 lbs.; ten-wheel passenger drivers, 63 in., cylinders, 22 in. x 28 in., weight on drivers, 160,000 lbs.; Pacific, drivers, 77 in., cylinders, 25 in. x 28 in., weight on drivers, 170,000 lbs.; eight-wheel passenger, drivers, 73 in., cylinders, 20 in. x 26 in., weight on drivers 100,000 lbs.; switch, all dimensions conform to Harriman Lines standards. Delivery on these locomotives is to begin April 1.

CAR BUILDING.

The Wheeling & Lake Erie is in the market for 500 flat cars.

The Lehigh Valley is said to have ordered 15 milk cars. This is not confirmed.

The Great Northern has ordered 75 tank cars from the Pressed Steel Car Company.

The Lehigh & Hudson has ordered 6 flat cars from the Standard Steel Car Company.

The Atlanta & West Point has ordered 100 flat cars from the American Car & Foundry Company.

The Wabash-Pittsburg Terminal will place an order shortly for 1,000 70-ton steel hopper coal cars.

The Minnesota, Dakota & Western, International Falls, Minn., is taking prices on from 50 to 60 41-ft. 40-ton flat cars.

The Pennsylvania will build at its Altoona shops, 1,000 gondola cars, 50 suburban passenger cars, 9 dining cars and 7 postal cars.

The Buffalo, Rochester & Pittsburgh, mentioned in the *Railway Age Gazette* of December 9 as preparing specifications on from 1,500 to 2,000 freight cars, is said to have withdrawn these inquiries.

The Central of Georgia, mentioned in the *Railway Age Gazette* of January 20 as intending to build 300 freight cars, is said to have ordered 250 car frames from the Standard Steel Car Company. This is not confirmed.

The New York Central Lines, it is said, are building 35 steel mail cars at their shops. Fifty more will be built as soon as the capacity of the shops will permit. This is not confirmed.

The Pittsburg & Shawmut has ordered 1,500 fifty-ton twin-hopper all-steel coal cars, 500 fifty-ton steel gondola coal cars, 50 forty-ton steel flat cars, 50 thirty-ton steel underframe box cars, and 15 caboose cars. The American Car & Foundry Company will build the hopper cars, the box cars and the caboose cars, and the Pressed Steel Car Company will build the gondola cars and the flat cars.

IRON AND STEEL.

Isthmian Canal Commission will receive bids until February 16, on miscellaneous supplies, including reinforcement steel bars, manganese castings, ingot copper, steam whistles, etc. Circular No. 621-A.

The New York, New Haven & Hartford and the Boston & Maine have ordered 61,000 tons of rails as follows: 15,000 tons from the Lackawanna Steel Company; 15,000 from Bethlehem Steel Company, and 31,000 from the Pennsylvania Steel Company.

General Conditions in Steel.—Recent bookings have been in excess of the actual rate of production, a condition which the trade has not seen for almost a year. As a result, the output will be increased to 70 per cent. of the capacity as against 45 per cent. in operation during the last week in January. The steady increase in the buying momentum has finally put a stop to all talk of prospective price reductions. Fear is expressed among some conservatives that the improvement is only temporary, but the rail orders already placed, assure the mills a larger total tonnage for the first half of 1911 than was shown for the last half of 1910.

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TWO statements in the editorial on scientific management and the article on the mistakes of the efficiency men in our issue of February 3 seem to have disturbed the efficiency men. One of these engineers is especially indignant because it was stated that it should not be necessary to retain an efficiency engineer to reclaim good material from the scrap pile and to cut down surplus stock. To prove his point he cites the great difficulty that the betterment engineers had in 1904 in getting the mechanical department officers of the Santa Fe to realize the importance of this feature and the reluctance with which they undertook to push it. Right here is where the efficiency engineers make a serious mistake. In too many instances they base their conclusions on conditions on the railways from three to ten years ago when they or some of their associates were in closer touch with the railways. They assume that the roads have made no progress since that time. While there are undoubtedly still places where serviceable material is wasted by not being reclaimed from the scrap pile, conditions have been wonderfully improved during the past few years and it is safe to say that railway officers and foremen generally are keenly awake to the importance of this matter. Why it should be necessary, under such circumstances, to retain an efficiency engineer to supervise this work is incomprehensible. It will always be possible to find examples of waste of this sort, for where a railway stretches over a thousand miles or more of territory, instead of occupying a city block or two, as does a manufacturing establishment, there will be a critical point in the prosecution of this work beyond which it will be impossible to go without spending more than it is possible to save by the additional effort. The other point that was criticized is the statement that: "An efficiency engineer does not hesitate to promise almost immediate results." This is fully replied to by "One Who has Worked with Them" in this issue, as are also the other questions and criticisms suggested by F. Lincoln Hutchins in our issue of February 10. The communication on scientific management from the master mechanic in Colorado, which appears in this issue, is well worth reading. He is no theorist, but has made good as a successful railway shop manager; and in commenting on the betterment work he speaks from actual experience.

WE publish elsewhere a letter from a lawyer at Topeka, Kan., A. A. Graham, in which the writer takes the novel position that the public should limit the wages and salaries paid by public service corporations as well as of their charges and profits. Mr. Graham's plan for limiting the *outgo* of such corporations is apt to prove more attractive to their owners than to their employees, and as the employees have great voting power, his scheme, however novel and interesting, is not apt to find the same favor with those who pass regulating laws as have schemes for limiting their *income*. Mr. Graham takes the ground that while the government should fix the *maximum* return public service corporations should receive, it should in no case guarantee a minimum. Like most persons, including many lawyers, he reads the decisions of the Supreme Court of the United States upside down, and writes as if it has held that a fair return is the *most* that those performing a public service may be allowed to have, whereas what it has held is that this is the *least* they are entitled to receive. He basis his theory of limitation of profits on the principle of public regulation of the rate of interest. But the return that the stockholders—the owners—of a railway receive is not *interest;* it is *commercial profit.* The owners of a railway are not lenders of money; they are borrowers and investors; they *borrow* from the bondholders; and they *invest* their own capital in stock, taking all the risks taken by investors in any other line of enterprise. Even in other lines where the chief business done is that of loaning money the government does not restrict profits. Banks loan money; and the government limits the rate of interest they may charge; but it does not restrict the date of commercial profit they may receive. A savings bank, for example, borrows money from depositors—who are analogous to the railway's bondholders—paying them 3 per cent.; and it then loans this money and that invested by its own stockholders on commercial paper at 5 or 6 per cent. It may, in this way, earn on the capital put into the enterprise by its stockholders 8, 10, 25, even 50 per cent., and nobody complains that its profits are excessive and ought to be reduced, despite the fact that banks have been subject to government regulation from time immemorial, and often have been conducted by governments themselves. Mr. Graham also strongly controverts the position that has been taken in these columns, that if the government can and shall fix the *maximum* return that may be received by railways it shall guarantee this also as a *minimum*. He says: "All this, if practicable, would be very nice, because individual responsibility would no longer cause anxiety. The individual could live in the happy assurance that, whatever his motives and efforts, the government would guarantee him an income." All of which entirely misses the real point at issue. What the railways ask is not that the government shall guarantee them a return, but either (1) that it shall allow them freely so to fix their rates as to make sure that, so

long as the rates are reasonable—that is, are such that the traffic can move freely—they will surely be able to earn as substantial profits as other business concerns in both fat and lean years; *or* (2) that, if the government is going to limit their profits as it does not limit those of other business concerns, it shall guarantee that the "fair return" which it fixes as their maximum shall also be their minimum. Railway men would prefer the adoption of the former alternative. They recognize the fact that the adoption of the latter would be destructive of railway enterprise. But they also recognize the fact that a policy which fixed a low maximum return for railways but no minimum return would not only destroy railway enterprise but would entirely repel new capital from the transportation business.

ONE of the banes of the railway business has been organizations and concerns formed to serve as self-constituted intermediaries between the roads and their patrons for the purpose of making a profit out of brokerage in freight rates. They were more common and prosperous in the days of rebating than they have been recently, but that they still bob up is shown by an announcement filed by a Texas "Fast freight" corporation with the Interstate Commerce Commission on December 26. Its announcement stated that its purpose was "to own or lease and operate refrigerator and other cars for the transportation of freight and to rent or lease said cars to railway companies or others; to contract for the use or hire of said cars for the transportation of perishable and other freight; to solicit, handle and route such perishable freight; to own, handle and control letters patent and inventions;" and, in general, "to act as agent, trustee, broker, or in any other fiduciary capacity." Its intention more particularly was "to solicit and route interstate freight traffic to and from the states of Texas and Oklahoma and the Republic of Mexico, keeping in close touch with the traffic in the territory described by becoming thoroughly informed in advance of the movement that it may be directed along the paths of least resistance." The real milk in the cocoanut was disclosed by a provision in its tariff that "when refrigerator or other equipment owned or controlled by (this company) is furnished to railway companies in transporting such interstate traffic, the same will be subject to a charge of 12½ per cent. of the gross earnings on such traffic, in addition to the regular or customary mileage or per diem charges allowed by the transportation companies for the use of private equipment." When the traffic was handled by the railway companies in cars other than those owned or controlled by this intermediary, it was to be subject to a charge of 2½ per cent. of the gross earnings from it. Water transportation companies handling business solicited by the agency in question were to be charged 5 per cent. of their gross earnings on business between Atlantic ports and United States gulf ports and 8 per cent. on business between Atlantic ports and Mexican gulf ports. It is pretty well known that most railways spend a good deal of money in maintaining soliciting staffs whose work it is to get business for them. Just what long-felt want such a concern as this would fill is not evident, but it is evident that if it were allowed to share, as it proposed to, in the gross earnings of the railways, the door would be opened wide for rebating. The railways could not control the disposition of the 12½ per cent. commissions it had decided it would take, and, judging by past experience, sooner or later part of them would have filtered into the pockets of the shippers whose business the brokerage company secured. We understand the Interstate Commerce Commission has ordered the tariff withdrawn and that the promoters have been informed that their proposed methods of business are illegal, and that if they should persist in their plans they would be subject to prosecution. Such schemes as this seem but thinly disguised efforts to evade that portion of the Interstate Commerce law which provides that any person, corporation or company who shall obtain or attempt to obtain the transportation of property at less than the regular rates, or who shall obtain or attempt to obtain any allowance, refund, or payment for damage or otherwise in connection with or growing out of the transportation of or agreement to transport such property, whether with or without the consent or connivance of the carrier, whereby the compensation of such carrier for such transportation, either before or after payment, shall in fact be made less than the regular rate then established and in force on the line of transportation, shall be deemed guilty of fraud. The incident illustrates why it is so hard to prevent a revival of rebating; and the apparent nipping of the scheme in the bud illustrates how government regulation often works to the advantage of the railways as well as to that of honest shippers.

FEDERAL BOILER INSPECTION.

IN the *Railway Age Gazette* of February 10 we gave a resumé of the principal points of the new federal locomotive boiler inspection law. In our issue of June 17, 1910, we criticised the bill that was then before Congress, on the ground of its general worthlessness and failure to meet any sort of reasonably practical demands. It was fought so vigorously by the railway representatives, and its supporters apparently knew so little of what was needed or of what boiler inspection really meant, that they followed the advice of one railway officer and struck out the whole bill from start to finish, substituting the one that has just been passed.

The supporters of the original bill have learned something in the course of the hearings in which they have assisted and the flagrant violations of common sense found in the first bill have disappeared, but the new one will be almost entirely dependent upon the good sense of the inspector general as to whether it develops into a mere opportunity to give places to worthy election helpers or does raise the general condition of locomotive boilers on roads where they might otherwise be neglected. In short, the law will have the value that is given it. As framed, many things can be read into or out of it. For example, section 2 requires that no locomotive boiler shall be used in interstate commerce, unless it is "well made, of good and suitable material," with "all pipes and tubes exposed to heat of proper dimensions," and that "the spaces between and around all tubes shall be sufficient." It is well that the lawmakers did not attempt to fill these specifications, but if the inspector general can draw up a specification that will fit every kind of service with every kind of water, through the whole wide range of steam pressures that are used, he will have ability that will hardly be content to work for the salary offered. The saving clause is in section 5, which practically allows each carrier to formulate its own rules for boiler inspection, subject to the approval of the Interstate Commerce Commission.

The law is tentative; it prescribes no specific regulations for boiler inspection (which was wise) nor does it lay down any line of work or conduct for the individual inspectors, which may be wise or not according to the man who has charge of the matter. If the office of inspector general is filled by a man who is familiar with locomotive work and its requirements, who is an engineer and a railway man, he may be able to develop a system of inspection checking that will have the same value in raising the standard that the regulations of New York, Pennsylvania and Ohio have had in these states. He will, however, be handicapped by the impossibility of coming into close personal touch with his men and of knowing whether their reports are based on actual observations or are merely the perfunctory bulletins from a man who is making a sinecure of his office.

If, however, the inspector general is a politician whose knowledge of his work is based on the law as it is handed to him to administer, then the whole thing could easily become a farce.

Locomotive boiler inspection differs from that of every other kind of boiler inspection in that it is a sort of continuous performance, where repairs are being constantly made and where defects and failures are constantly occurring. We know almost nothing of the stresses to which the firebox is subjected, so that

unending watchfulness, rather than calculations, are needed to insure safety. The value of the New York state inspection lies in the fact that no attempt is made to do more than check the work done by the railways in their own best practice, and its efficiency is due to the regulations having been drawn by a practical railway man, who was thoroughly familiar with the design and operation of locomotive boilers and knew the limitations of any regulations that might be issued.

To those who opposed the federal bill, it appears of doubtful value, regardless of the wisdom with which it may have been drawn or may be administered; because, at its very best, it can do no more than duplicate the work of the state commissions, and duplication of work, even by the government, does not appeal to most men in this day and generation.

CHICAGO ASSOCIATION OF COMMERCE.

A REFERENCE was made in the *Railway Age Gazette* of January 13, 1911, page 71, to the fact that while the railways entering Chicago belong to the Chicago Association of Commerce and contribute to its support, this association has become one of the most active organizations in the country in carrying on agitation and litigation against them. The *Chicago Daily News,* in an editorial in its issue of February 6, after quoting from the editorial in the *Railway Age Gazette* said:

"The Chicago Association of Commerce has done well to admit all legitimate business interests to membership. It has shown that the presence of railway men among its members does not deter it from exercising proper activity in endeavoring to protect the general public from excessive freight rates. If railway men were to withdraw from the organization on that account the action would be an admission that they had expected the association to swerve from its duty as champion of the broad public welfare to retain their continued support."

We are not aware of any plan on the part of the railways or any one of them to withdraw from the association. We are far from saying that they ought to do so. But we have been unable for a long time to see what advantage they derive from their memberships. The association, as we already have said, is composed of and derives its funds from both shippers and railways. It employs a traffic director of experience and ability, and it would seem that, in these circumstances, his proper function should be to mediate between these interests. There was a time a few years ago when he did so, and with success. Lately, however, the traffic committee and the traffic director of the association have used all of their energy and all of their ability in carrying on litigation and agitation against the railways. Numerous newspaper interviews—often extreme in tone—have emanated from them, whose sole intent and effect have been to increase public prejudice against the railways. The *News* says that the activity of the association has been properly directed to "protecting the general public from excessive freight rates." Rates are the compensation that the railways belonging to the association receive for the services that they render. Prices are the compensation that the shippers belonging to the association receive for the goods that they sell. The shippers belonging to the Chicago Association of Commerce have made many times greater advances in their prices within the last ten years than the railways have made or have proposed in their rates. If it is in the interest of the public for the association to exert itself to prevent the railways that belong to it from raising their rates, why would it not have been in the interest of the public for the association to have exerted itself to prevent the shippers that belong to it from excessively raising their prices? Did anyone ever hear of it doing so? Did anyone ever hear of it showing its vaunted spirit of co-operation by even exerting itself to restrain the shippers that belong to it from raising the prices that they charge the railways that belong to it? Again, the *News* says, "There is no good reason why the railways, as one of the most powerful of the special interests, should expect to be assigned a different role than that assigned to other elements in society." It is precisely because the Chicago Association of Commerce has assigned to the railways a different role from other elements that many railway men think its policy grossly unfair. We said, in commenting on the activities of the association in a previous issue that the role it has thus far assigned to the railways is that of the goat—one with which the railways can hardly be expected to be greatly pleased.

Some of the witnesses for the association in the recent hearings regarding advances in freight rates before the Interstate Commerce Commission called attention to certain rates enjoyed by large industrial concerns which are very much lower in proportion than those made on the commodities of most shippers. Some of the rates referred to are unfairly discriminatory. If the association is disposed to be fair in dealing with its railway members, why has it merely referred to these rates as an argument against advances in other rates instead of as an argument in favor of advances in the particular rates that are unfairly low? It could serve the interests of the general public a great deal better by exposing and attacking unfair discriminations, of which some of its own members are the recipients, and the railways and small shippers in general are the victims, than it ever has or ever will by agitating against general advances in rates. The only way that many unfair discriminations can ever be corrected is by legislation authorizing and requiring the Interstate Commerce Commission to raise rates that are unfairly low. The association has often exerted itself to prevent advances and to secure reductions in rates. Is it fair enough also to advocate legislation to empower the Interstate Commerce Commission to raise rates that are too low?

The *Railway Age Gazette* would like exceedingly to see better co-operation between the railways and the shippers, both outside and inside the Chicago Association of Commerce and all other similar organizations. But it never expects to see it until such organizations not only accept the railways as members, but, after accepting them as members and taking their money, give them a square deal.

THE COLLISION PROBLEM IN INDIANA

THE Railroad Commission of Indiana has issued a circular (No. 71), addressed to all the interurban lines of the state, calling for the adoption of better means for the "prevention of accidents." The terms of this circular are nearly the same as those of the circular issued sometime since, addressed to a single company, the Fort Wayne & Wabash Valley, which was noticed in the *Railway Age Gazette* of February 3, page 192. The clause requiring motormen to have had a year's experience in train service, allows the suspension of this rule if, in the judgment of the manager of the road, it is deemed best to employ a man without that amount of experience; but if a manager takes advantage of this permission he must report the fact to the commission within sixty days, and the commission may then veto his action, and require him to dismiss the motorman. The requirement to use block signals calls for their installation within such reasonable time as may be agreed upon by the commission and "the committee composed of interurban officers and the expert of the commission." The commission's representative is to make a further and final report on February 24, which is expected to throw light on what method or methods of block signaling ought to be used by the interurban roads.

Evidently the commissioners are making an earnest effort to do as well as they can under the present imperfect law. The extent to which the railways will carry out these recommendations remains to be seen. As yet the legislature has done nothing to strengthen the weak and uncertain powers of the commission; but in the closing paragraph of the present order the document is said to be issued by virtue of the authority conferred by the legislature and "in accordance with the agreements made between this commission and the committees representing the interurban companies." And at a legislative committee hearing last week one of the representatives of the interurban roads said that they were not opposing a block signal law.

At this last legislative hearing the committee had to devote its attention mainly to the objections of railway men and of its

own members to details of the proposed law. The main purpose of the bill under discussion appears to be to strengthen the block system law of 1907, but there is no agreement as to how to do this. The steam railways propose that the law shall require such a block system as is approved by the American Railway Association. In view of the differences of opinion in that association as to some of the rules for block signaling, as shown by the blank spaces and alternative rules which appear in the association's code, and of the long time it takes to secure agreement among the members on disputed questions, the adoption of this proposition probably would mean long delay. Those things in which the association has aided the law makers—such, for example, as the height of draw bars or the rules for transporting gunpowder—were exceedingly simple compared with a code of rules for block signaling. Again, the interurban people object strongly to having the rules for their conduct drawn up by the steam railway men. In view of these differences of opinion, and of the differences of conditions on different railways, which are more serious; in view also of the obstacles always encountered in regulating such details by statute, the obvious duty of the legislature is to frame its law with as few details as possible. The main clause of the Esch bill, now before Congress, is simplicity itself. Like the law of Great Britain, it requires the railways to adopt "the block system." Mr. Esch's definition is as follows:

> The term "block system" shall be taken to mean the methods and rules by which the man or men in charge of every train, when ordered, or signaled, or permitted to proceed from any point, may be informed and assured that the track on which the train is to proceed has been cleared of all other trains for a definite distance and will continue clear for an unlimited time; the methods and rules to be such as to protect a train on a single-track railroad, moving in a given direction, from any train that may be coming toward it, moving in the opposite direction.

Here is the main point; what more does Indiana want?

We have received a number of criticisms of what we said in our article of February 3 about what is going on in Indiana. One writer calls attention to the fact that Indiana, in spite of its faults, has made better actual progress toward block signaling than has any other state administration; this being so, why hold the commission up to so high a standard? The answer is simple; because there is, practically, but one standard. At least there is only one for an advisory commission, whatever may be said about the liberty of a railway company or a legislature to deal in compromises. The dividing line between the block system and all other methods of safeguarding trains against collision is so radical that there is no half-way position. The railways of the country are discrediting the block system already by their attempts to splice it with other safeguards, and intelligent state commissions have a duty to hold up a rigid standard.

Another criticism is that the standard which we demand is not only high, but impossible; automatic block signals cost $1,500 to $2,500 a mile and positively cannot be afforded. But we did not demand automatic signals. That is an assumption or misconception on the part of our critic. The manual block system under certain circumstances is cheaper. The simple, old-fashioned staff is available. The continuous track circuit is a great safety device, but it is not absolutely essential for the prevention of the kind of collisions that Indiana has suffered from. Again, it is possible for a line which imposes low-speed rules for all cars at all stations and side tracks, to install automatic signals, at a cost considerably less than has heretofore been deemed the minimum for reliable signals. By using "light" signals, having no moving parts, the cost of the signal itself may be reduced, probably, two thirds. This does not mean that the *system* will cost only a third of former prices, for the track circuits, relays, etc., are the same with both styles; but the saving in the signal is an important item, and the saving is further increased by the low cost of maintenance and care, in the case of the "light" signals.

With simplicity in its law and intelligence in its administration, Indiana can cure its 1907 law of its weaknesses in short order; and the apparent readiness of the interurban lines to submit to a law should make the task of the legislature comparatively easy.

Letters to the Editor.

SCIENTIFIC MANAGEMENT.

Colorado, February 9, 1911.

To the Editor of the Railway Age Gazette:

In connection with the very interesting series of letters and editorials on scientific management recently published in the *Railway Age Gazette,* allow me to suggest that you reprint letters published in the July 10 and July 17, 1908, issues, including a letter from Harrington Emerson. The fact was brought out that the Santa Fe was purchasing from private concerns large quantities of finished material, such as cylinders, driving boxes, shoes and wedges and similar material, which is ordinarily made in railway shops. Mr. Emerson was obliged to admit that this was true, and that it was done because the Santa Fe could purchase from private concerns cheaper than it could produce the finished material in its own shops. The fact that an outside concern could stand the cost of manufacture, meet depreciation, insurance, taxes, and incidental expenses, and sell to the Santa Fe at a profit, at a price lower than the railway's cost of manufacture would seem to effectually dispose of any claims ever made as to the remarkable results obtained through the introduction of efficiency methods.

Mr. Emerson in his Harvard address, from which you quote in your editorial of February 3, states that he and his associates were employed simply in an advisory capacity and had no authority. This statement needs some attention. Mr. Emerson and his assistants were supreme as to shop methods; they had the matter of repairs to locomotives in their own hands. They had this power without any responsibility for any results other than the cost of repairs. They had no responsibility for engine failures or for the unsatisfactory performance of locomotives in service. The master mechanics and foremen who were responsible for the service rendered by the locomotives carried this responsibility without having full control of shop and roundhouse methods, and the result of such a condition of divided responsibility can be imagined.

Mr. Morrison, in the letter published in the *Railway Age Gazette* of February 3, states as inside history that the efficiency campaign met with strong opposition from the company officers. This is no doubt true, and it was a logical result of divided responsibility, as outlined above, and also of the attitude assumed by the men who were employed to install scientific methods in the shops and roundhouses. These men were not selected because of their long experience in positions where executive and mechanical ability were required. Their attitude toward the master mechanics and foremen—who were responsible for results—was such as to antagonize nearly every man in the service.

Mr. Morrison states that money saved in the mechanical department of the Santa Fe was spent by others. By what department was it spent? Was there no check on expenditures by departments, other than the mechanical, on that railway?

Many men of experience believe the efficiency campaign on the Santa Fe was poorly conceived and handled, was a monumental failure, and that instead of saving the company five million dollars in three years it cost the road a great deal of money, the amount of which no man can ever ascertain. It is believed by many that because of that experiment the Santa Fe made a record for engine failures and generally demoralized service that will stand as a record for some time to come.

Too much stress is laid on the cost of locomotive maintenance per mile or per locomotive. In the annual reports published in the *Railway Age Gazette* for the year 1910 the Union Pacific shows the highest cost of power maintenance, $3,500 per engine. The Union Pacific also shows, as it has for years, the lowest operating ratio of any road in the country. Is there any connection between these two facts?

The question of true economy is deep, broad and long. The

statement that a certain road maintains its power at a certain figure per mile for a certain year or term of years is of no value whatever unless all the conditions are known and taken into account.

MASTER MECHANIC.

Arkansas, February 9, 1911.

To the Editor of the Railway Age Gazette:

The recent discussion in your columns concerning efficiency men and their methods has been very interesting to all railway officers. In this age, when political pressure on the railways involves decreases in revenue on the one hand and increases in operating expenses and taxes on the other, extraordinary efforts must be made to make each dollar expended go as far as possible; and few will deny that this is precisely what has been, and still is, being done. The efficiency engineer in the expenditure of this hypothetical dollar seems to hold the opinion that it should be based on a theoretical practice; while the railway officer contends for practicable theory. It is generally admitted that theory perfects practice; and it might with equal propriety be said, that, conversely, practice perfects theory. Each is interdependent—neither independent of the other. We might say by way of illustration that practice is the body—tangible, visible, concrete—while theory is the soul—intangible, subtle, abstract. The efficiency engineer defies revolution for the sake of evolution; the practical man wants evolution of the safe and sane type. Efficiency did not spring full armed from the Jove of Brandeis—it is as old as history itself. Ever since the publication of the decalogue, the efficiency engineers of theology have been making heroic endeavors to get 100 per cent. moral efficiency out of the race, but mankind is still composed of men and the millenium has not yet been definitely announced. The efficiency engineer with the assurance of youth, the exhiliaration of A Great Idea, and an abundant confidence in himself, has sometimes rashly and hastily introduced the human factor into his efficiency equation as a constant, instead of a variable of the *n*th degree. Herein lay the cause of the failure to solve such equation. This explains why "The best laid plans of mice and men gang aft agley."

The practical psychology of the problem seems to have been considered a negligible factor by the efficiency engineer. A man who knows men may ordinarily learn or acquire methods and attain a reasonably large measure of success; while one who is chock full of methods—scientific and otherwise—but who does not understand the handling of the genus homo, is almost sure to fail. The solution of the problems, therefore seems to the writer to be this: Let the practical man acquire efficiency methods, and let the efficiency engineer acquire the knack of handling men—*"cette main de fer, dans un gant de velours."*

GENERAL SUPERINTENDENT.

New York, February 14, 1911.

To the Editor of the Railway Age Gazette:

If the correspondent who criticizes in your issue of February 10, the article on The Mistakes of the Efficiency Men, which appeared in the preceding number, had read that article more carefully, he would have written in a calmer spirit. Most of his objections are due to his failure to interpret the statements he criticizes in the light of their relation to the subject matter immediately under consideration. He also labors under the misapprehension that a criticism of a plan of action, or of a theory concerning a principle, is a criticism of the principle itself. One Who has Worked with Them was careful to state clearly at the outset that the principles of scientific management are grounded and rooted in truth, and specifically said, "These principles do not alter, however, theories concerning them may change." It is in their interpretation and application that mistakes have been made. And because of this, scientific management has not been given the place to which it is entitled in the great field of industrial economics.

Your correspondent says that scientific management is imperfectly understood. Unquestionably, this is true. The pity is that the efficiency men themselves appear to resent any effort that may be made to determine the cause of this misunderstanding. If after a decade or more of effort these fundamental principles are still so imperfectly understood, what is the reason? Certainly not because the efficiency men have had no opportunity to interpret and apply them. Is it not in great part due to the fact that in so many cases they have failed to consider the problem in its relation both to theory and practice, and have disregarded the conscientious opinions of successful railway and industrial managers?

An instance is requested of the failure of the theories of the efficiency men when brought to the test of practical application. At least one has been specifically mentioned in the columns of the *Railway Age Gazette*. This is not the place, however, to give a list of such failures. If your correspondent is as close to the efficiency men as may be judged from the manner in which he champions their cause, he need not go far in seeking the information he requests. Let him ask the efficiency men; they know. That such failures are due to a violation of principles, as your correspondent suggests, does not change the situation. The question is who violated them and why was it done? Perhaps the efficiency men can answer this question also.

That in many instances time studies have been made by inexperienced men and that frequent mistakes have resulted is a matter of common knowledge in shops where any extensive attempt has been made to determine the times required for their almost innumerable operations. Has your correspondent ever compared the time studies made by different men at different times for the same operation? He says, "A trained observer, though he may know little about the particular operation which he is observing, can readily detect the wastes and keep account of them." This statement is subject to certain qualifications. Much depends on whether or not the observer has been properly trained. An observer who can determine the lost motion in a simple operation like piling pig iron may easily be misled in observing the time required on a difficult machine job. Practical men usually take issue with efficiency engineers on this question, and with good reason. There has been so much of the student variety of "scientific knowledge" presented to the men who know much of practical results, but little of theory, that it is not surprising that it receives scant consideration—less, undoubtedly, in many cases, than it deserves.

That young and inexperienced men have often been used for this purpose is perhaps not wholly due to the impatience of the efficiency engineers to "show results," and their desire to keep the overhead charges down. It is partly due to the fact that time—a longer time than many of them think—is required to produce men of sufficient experience and of good judgment whose findings can be accepted without question. Time studies when properly made, are invaluable to the shop manager, and no one recognizes this more clearly than the writer.

To decrease the effort of the workman and at the same time materially to increase the output is a worthy object. Nor is it to be doubted that when the ideal has been reached this is the result. That unnecessary motions should be omitted, that materials should be brought to the workman as they are needed, when practicable, that successive tasks should be planned, etc., is, of course, recognized by everyone familiar with the situation. The mistake is often made, however, of urging men to greater effort with the promise of greater reward, without a proper alignment of the other forces which affect him. In many shops the majority of the workmen believe that any system that aims to increase their output materially, necessarily tends to make them but wheels in the great machinery of industry. And the statement made in the article of February 3 will bear repeating: "No system has yet succeeded when the men affected by it are not in sympathy with its general principles. The first important step—gaining their confidence—cannot be done by rule."

The statement that superintendents and foremen are often

misled by the evidence that certain workmen have reached a high efficiency, into believing that all men in the shop may reach this efficiency need not have mentioned any particular percentage. Such percentages are relative; they might be 100 or 110 or 120. The fact is that men whose efficiency is very much higher than the average are not uncommonly cited as examples of the possibilities of the average of all men in the shop, and that as a result of inaccurate information, incorrect time studies, or other conditions that have not been properly taken into account, such data are often fictitious.

No statement was made in the article on The Mistakes of the Efficiency Men that "scientific management could be had without cost." The statement was made, however, that if shopmen are but 70 per cent. efficient, and that this means an *actual waste* of 30 per cent., as claimed by an eminent efficiency engineer, conversely it follows that an increase in their efficiency to 100 per cent., in order to represent an *actual gain* of 30 per cent., would necessarily have to be made without cost. In the articles written by, and in the interviews with certain efficiency engineers, little, if anything, has been said of the *cost* of increasing the efficiency of railways from 70 to 100 per cent. If, in order to save $5 a man spent $4, what was the initial loss or waste, $5 or $1? And assuming that it is true that because of inefficiency railways waste $1,000,000 a day, if it costs $800,000 to overcome this loss, what is the net gain, $1,000,000 or $200,000? No one realizes more than the efficiency engineers themselves what it costs to increase the net gain by the methods they pursue. And it is not an uncommon occurrence for efficiency schemes to fail, if for no other reason, because the expense is prohibitive.

There are many ways of "beating the system." Increases in rates may be demanded, allowances for delays or other contingencies may be secured, workmen are often encouraged to organize and thus present a solid front of opposition to certain features, if not to the system itself. The result is that the increase in output is often offset by increased costs. And once an advantage of this kind has been gained by the men, it is not given up without a struggle. This explains why spectacular results are usually but temporary.

If the statistics given on various occasions by certain efficiency engineers and used as evidence before the Interstate Commerce Commission have not been for the purpose of proving that other railways should secure equally good results, what was the purpose? The following is quoted in this connection from an article on Saving by Scientific Management, recently published: "A number of well known railways . . . have realized standards on a large scale *which we are wholly justified in considering realizable by the generality of railways in this country.*" (The italics are ours.) Before this statement was written did the efficiency engineer apply to a sufficient number of railways to warrant his general conclusion, the test recommended by your correspondent, viz., "an exhaustive study and trial to determine the schedule in any particular case for any particular road?"

As to efficiency engineers promising almost immediate results. If your correspondent will turn to the first page of the first of a series of articles on The Twelve Principles of Efficiency in the June, 1910, issue of *The Engineering Magazine,* he will immediately see a case in point. In this instance it was promised that the output of a certain plant could be increased 60 per cent. without increasing either the force or the equipment, and without increasing the pay roll more than 10 per cent., and that these results could be secured *within 6 months.* If this is not a promise of "almost immediate results," we do not know the meaning of the term. To secure such results in a much longer period than six months would be considered remarkable. Again, if almost immediate results are not often promised why, in the agitation against the railways because of their proposed increases in rates, was it not stated that the alleged enormous wastes in railway operation could be secured only gradually and within a period of years or whatever period might be considered reasonable? The argument of the railways has been that the need for increased rates is a *present* need. The public has been given to understand that the economies promised through scientific management, as interpreted by the efficiency engineers, were early possibilities and that both present and future needs of the railways would thus be provided for.

In conclusion, let it be said that the article to which your correspondent takes exception was not on the mistakes of efficiency principles but of efficiency men. Its purpose was to point out to the efficiency engineers and to railway and industrial managers, that while certain efficiency men have made many and serious mistakes, three facts should not be forgotten: (1) That the principles of scientific management are sound; (2) that their correct interpretation and practical application make for successful operation, and (3) that these principles should not be confounded with theories concerning them which are often incorrect.

ONE WHO HAS WORKED WITH THEM.

"THE 'LEAGUE FOR PUBLIC SAFETY' AND RAILWAY ACCIDENTS."

CLYDE ALISON MANN.

341 Rand McNally Building, Chicago.

CHICAGO, February 8, 1911.

To the Editors,
Railway Age Gazette:

Gentlemen:

I observe in your issue of February 3, on page 193 and 194, that the *Railway Age Gazette* has made a mis-statement as follows: "This League for Public Safety devotes itself principally to the promotion of an automatic train stop." This I will ask the *Railway Age Gazette* to retract for the reason that it is not true.

Again, your third sentence was as follows: "The particular apparatus offered in this case may or may not have merit in itself—some devices possessing a good deal of worth have fallen into the hands of discreditable persons—but as the Chicago concern represents a type of men which has annoyed railway officers throughout the country, it may deserve a word."

The innuendo conveyed is obvious, and you will find that my reputation in Chicago and elsewhere is good, as you will find by inquiry of a list of representative men whose names I shall be pleased to give you. The effect and intent of the sentence was to slander and discredit myself, and also the League for Public Safety.

I have stated that you mis-state the purpose of the League, and in confirmation will be pleased to show you the bulletins of the League, as issued, the perusal of which will show you that you shot wide of the mark, and that, to the contrary, the League devotes itself principally to the promotion of public knowledge and desire for anti-trespass laws and to the enlistment of employes in the work of safety by the two approved methods, as given in bulletin 248, (1) pensions for employees; (2) the committee of safety plan.

Also the League will call public attention to the fact that safeguarding train operation is one of the greatest economies that can be practised, one which will increase the earnings in sums much greater than the cost of installation of full automatic block signal equipment.

I beg to quote from bulletin 249 which was the last and therefore the most pertinent one to be used:

"Saving lives of thousands by reducing the casualties of railway operations can be accomplished—must be accomplished. In the United States we kill and injure per million of passengers fully ten times as many persons, men, women and children, as in England.

"About half of those persons killed and injured in railway accidents in the United States were making a thoroughfare of dangerous ground—some railway right-of-way. In most states no laws prohibit trespass—children and others who do not know the hazard may go into that danger and do, and are killed because no one is empowered to stop them. In this, railways are not to blame.

"Again, there is no systematized effort a-foot to arouse railway employees as a whole to the greater care and obedience. That this is needed is shown by the results of doing it and the experience of every railway official. The plan of 'committees of safety' on each division, made up of men from the track, roundhouse, train and supervising forces, is a proven success. In the United States Steel plants the plan is said to have cut casualties in two. The men get a feeling of shared responsibility. The

pension system is also advocated to keep men from shifting from job to job.

"Greater obedience must start in the homes.

"Signal safeguards must be more generally adopted. Only 65 per cent. of the steam railway and practically none of the electric interurban mileage is protected. The investments are found to be repaid in one to five years by the saving of wreck losses."

If there is anything inimical to public benefit in those words, please advise me. I also regard the efforts that have been made, which has resulted in a large amount of newspaper publication, to be highly beneficial to the railways themselves. And some of the officials recognize that fact.

I trust the *Railway Age Gazette* will do so.

Yours truly,

CLYDE A. MANN.

(Mr. Mann has sent us the above letter, demanding a retraction of certain statements made in the editorial published in our issue of February 3, page 193, entitled as above. Mr. Mann's letter was accompanied by one from his lawyers, in which also a retraction is *demanded*. We gladly publish Mr. Mann's letter.

It will be observed that he complains of the following language used by us:

"The League for Public Safety devotes itself principally to the promotion of an automatic train stop;"

and says:

"On the contrary, the League devotes itself principally to the promotion of public knowledge." . . .

It will be observed that he also complains in his letter of an "obvious innuendo" which he considers might be justly attributed to other portions of our editorial quoted by him. We have no criticism to make of Mr. Mann or his methods, except in-so-far as he has attempted to use the so-called "League" (ostensibly a philanthropic movement for public good), to promote the sale of his own device.

We submit there is no "innuendo" that could be justly drawn from the language used in our previous editorial. Our criticism of the use of this "League" for private gain is plain and we emphatically disclaim any other meaning or motive.

It is the duty and purpose of the *Railway Age Gazette* to give the public the facts about matters of this kind as far as we are able to obtain them. The men who are engaged in pushing the work of the "League" may be men of the highest character, but when they attack railway officials in the manner this "League" has done, ostensibly from *Room 339*, and one of the active managers of the "League" conducts, ostensibly in *Room 341*, a corporation for pecuniary profit (Rooms 339 and 341 being part of the same office) and the "League" in its Bulletin No. 245 (January 5, 1911) announces to railway managers:

"We have made independent investigation and beg to forward herewith for your engineers, data concerning . . . (the device sold by the company), which tested very successfully. . . . Public welfare, we are convinced, will be served by an investigation of the merits of claims made for . . . (it). . . . Will you kindly advise what you decide to do toward consideration of the above data we are sending?"—

Then we consider that they act in a manner "discreditable" in the highest degree and that men, under such circumstances, should not be permitted to conduct a "League for Public Safety." It is just such conduct as this that destroys and discredits much work which otherwise would be for public good.

Our editorial utterances were based on the following facts:

First. The "League for Public Safety" has been sending out numerous bulletins regarding railway accidents, and in some of these has criticised railway managers for not recognizing the need of what the "League" calls "absolute protective equipment."

Second. Mr. Mann has been active in and had control of the work of the "League" and until very recently was its secretary. He told us so himself.

Third. Mr. Mann also informs us the "Railway Safety Equipment Company" was organized recently under the laws of Illinois to promote the sale of an automatic stop.

Fourth. Mr. Mann also informs us that he is active in the affairs of the Railway Safety Equipment Company, that as soon as he has the "League for Public Safety" on its feet, he intends to devote himself exclusively to the business of the company.

Fifth. The "League for Public Safety" and the "Railway Safety Equipment Company" *occupy the same suite of rooms* in the same building, and *use a common entrance, No. 339*, or rather did so at the time of the writing of the editorial published on February 3, 1911.

A reading of the past bulletins of the "League," more especially those of recent issues, will disclose a well defined campaign of education for the use of "automatic stops," and a criticism of all other methods and the final assurance of the existence of the necessary device. It may be the "League" has not "principally devoted itself to the promotion of an automatic stop," but in view of the identity of the parties in interest, it looks very much to us as if it was "principally" the point desired to be attained.

If in our previous editorial we were not explicit enough, and thereby unwittingly injured anyone, we regret it and trust this fully explains the situation.—Editor.)

"DECREASING EFFICIENCY" OF ORGANIZED RAILWAY LABOR.

To the Editor of the Railway Age Gazette:

I have noticed several articles in the last three months in the *Railway Age Gazette*, in which this subject has been slightly discussed. Assuming that there is a decrease there must be reasons.

In a recent issue railway operators were asked as to the increase or decrease on their individual lines. About six officers, out of all that answered, stated that their relations with the men were satisfactory, and also, pleasant. This, in itself demonstrates, that the trouble is a local one, and not general, as so many are prone to believe. Those six men must represent several different localities. And if the trouble be a local one, it can be remedied if the parties concerned will apply themselves to find out where it lies and then take concerted action to eradicate the conditions that led up to it. But it will need persistent, consistent application by both parties concerned, otherwise, the result will be only failure.

How is it that six men report favorably? One of the most vital things necessary to successful operation is discipline. But it may be maintained in more ways than one. A close acquaintance with the men is very necessary if we are to have a knowledge of the right kind to administer and the quantity may be somewhat regulated by this knowledge. There are many men who care little about their identity on the division or road they they are working on. At the same time, there are a good many men who feel as if they would like to be regarded as something more than a mere unit or a cog in a great transportation wheel. I know of but a bare half dozen lines where officers are and have been for some time, taking the pains to get acquainted with the men. But here on these half dozen lines the officers are in real earnest and the men know it.

Now, these officers are not doing this through any hazy idea of common humanity. They have a well defined idea, with plenty of reason back of it. They are after economical results through the application of each employee in a loyal, energetic and willing manner. And they are getting it; at least in a great measure. As soon as the men were convinced that the officers were in real earnest they commenced to take an interest themselves; perhaps only a few at first but the great majority after the officers had persisted for a while. And the results were and still are well worth the effort no matter how long it takes in accomplishment.

As soon as the individual employee was made to feel that he was something more than a mere unit, that his identity was not lost, that some one was taking a kindly interest in him, at least a part of the time, then as a rule he was not slow to respond. But how did it make for discipline? Almost invariably it tended toward bettering the feelings of the employees toward the employer. With a set of employees feeling more kindly, more active and more careful in the performance of their respective duties, it can easily be seen how and which way discipline would be affected. This, in turn, paves the way for more intelligent efforts by all concerned. Of course, as there are here

and there railway officers who are not money earners for anybody, except themselves, there are also men who did not profit or learn by the new order of things. If it is seen that they are of bad spirit permanently, they ought to be weeded out; or let the organization to which they belong try at taking a hand in causing them to mend or alter their ways. And I believe most of the railway labor organizations can be depended on for some help.

Now I do not mean by an acquaintance with or taking an interest in the men, that the higher officers should know the men; for on the large systems it is impossible. But, is it impossible that a division superintendent or division master mechanic or any of the minor officers, is it impossible that they shall know them well enough to speak when met on the work, or off of it?

A man employed by a railway company who is never spoken to by his superintendent or M. M. except when called into the office to get raked over the coals or get a smart dose of discipline, is not very likely to entertain any exceptional amount of kindly interest in the property; and if he feels that way, it is plain to be seen what kind of service he will give as a rule.

If a man can't give good whole-hearted service it is better for both him and the property that he be in some other place. I know some roads where if a man is known to drink or frequent saloons he is immediately discharged without being given another chance. I am glad to say I also know of several first class lines where it is different. Upon finding out that a man is drinking, they call him into the office and, privately, the superintendent has a talk with him. In that talk, that superintendent makes up his mind as to whether he can cure his man or not. If he is satisfied that he cannot, he either discharges him or else takes him out of the danger zone of the operating department to some minor position where he has not much responsibility. But these officers invariably cure their men. How is it they have such good luck? Because they know their men and have known them for a long time. On these lines that I mention, they have the smartest of officers in every way. They hire these men soon after they leave school and they make the job so good that there is no inducement for the men to go elsewhere. So here you have a man for a life-time, so to speak, and in that length of time, you do some training. If he does not develop in one department, you can perhaps switch him to some other class of work more suitable to his talents, while still young; and if he shows incompetence or inability to qualify in the business of railroading, you can get rid of him while he is still young. And you are doing him no injustice by doing so. And after the man is fairly started, he stays with these lines I have mentioned because his environments are such that he desires to stay.

The owners, through their directors and officers, encourage such institutions as the Y. M. C. A., and also the building of club-houses, reading rooms and instruction rooms. Sometimes, the officers have heart to heart talks with the men about their work. Also you will probably find a few instructors on the premises who are specialists in their respective lines. A man has to be either incompetent or a pretty serious offender if he ever is discharged. They made him and they are not yet through. He will be more finished later on and perhaps some day, they may need him for an official position. So they try to keep them and hire as few outsiders as possible, because the man they have got is familiar with local conditions and the experienced outsider would have all of that to learn. And the atmospheres of no two railways are exactly alike. Speaking from the employees' point of view, I positively know of several local divisions and lodges of railway labor organizations that have gone on record and passed resolutions to expel any member seen or known to frequent saloons or to do any drinking. And this resolution is being enforced. The move will soon become a general one, I am sure.

In some places and with some men, I regret to say you may enforce rule G until you have fired every drinking man you have got, and still it will crop up again in spite of the severe discipline. But, let the organization to which he belongs, threaten in downright earnest to expel him, unless he stops using liquor and it generally has an immediate effect. If you discharge him for violation of Rule G, he will still manage to get a job. But if he is expelled then he is without protection of any kind; and he realizes what that means. It is regrettable that the men and the officers are so far apart as is the case on the majority of our large roads. And I believe that both sides are equally to blame.

Of late years apparently great strides are being made in training employees, especially those who come in contact with the public; towards being more courteous in their dealings and associations with the public. If true courtesy between officers and men were not only practiced but insisted on, I rather believe that this would serve as a factor in bringing about better and closer relations between the men and their superiors, which in turn, would lead to a better understanding of what each needed and wanted. On the whole, the result would probably be a great deal of good.

So, taken on the whole, I believe, if both officers and men would work toward effecting a better understanding of what might be done to improve present relations, and having found out, apply themselves earnestly and conscientiously to the problem, we should have true, economical operation of our railways.

Let us hope that the future bears promise of better things.

LOCOMOTIVE ENGINEER.

REGULATION OF RAILWAY RATES, PROFITS AND WAGES.

Topeka, Kans., January 23, 1911.

To the Editor of the Railway Age Gazette:

The people, to speak popularly, or the government, to use the legal term, have a direct interest in, and control over, the rate of charges of all public service corporations or general utilities concerns, operating under franchises granted by the municipal, the state or the federal government, on the ground that such institutions are in fact in the exercise of a portion of the governmental prerogative and the enterprise is for the general benefit.

As a fundamental principle, this has never been doubted, although, in practice, corporations, like individuals, sometimes forget who made them; but in both cases consciousness is usually restored at the end of a bitter experience.

The existence, on the part of the people, of the fundamental right of control being conceded, we have left only the question of the exercise of this control, a question of such immense proportion as to have been the source of almost all our industrial difficulties, in the solution of which the writer does not claim to have discovered a new formula, or a panacea for all our industrial ills, but believes he can offer a method which will at least have the merit of uniformity and the support of tradition.

To say that the rate of charge by a public service corporation should be "reasonable" is exhausting all the learning on the question in a single word, but still leaves the mind in utter ignorance as to what constitutes the "reasonable"; and, as every one claims the right to formulate his own definition for this important word, we must pass to a more restricted field of inquiry.

We had better say that rates should be remunerative, should cover operating expenses, maintenance, repairs and betterments, as well as a fair return on the capital invested.

At first sight, all these elements would seem easy of determination except the fairness of the income, a question likely to be viewed altogether in the light of interest. On this, however, all governments have laws designating a legal rate of interest and a rate which cannot be exceeded except as usurious; and the taking of usury has been a crime ever since the organization of society.

We should, therefore, not be required to further pursue inquiry as to what constitutes a reasonable income on capital, at least, in the most general sense. The question has been raised, that, if the government may limit the income of a public service corporation to a legal rate of interest on the capital invested, or, what

is perhaps more equitable, the physical value of the property, should not the government guarantee such income?

A question seriously asked, especially when backed by an aphorism such as is usually brought to bear in the present case, that it is a poor rule which does not work both ways, requires a serious answer.

The governmental power to limit does not imply an obligation to guarantee. The contrary notion is founded on an altogether mistaken idea of the nature, function and object of a public service corporation, operating under a franchise. The government grants to an association of individuals, operating as a body called a corporation, the right to use a portion of the sovereign prerogative for a certain purpose within prescribed limits as a means whereby the investors may employ their private capital for the purpose of gain. In a most important sense, this grant is much in the nature of a lease, where rights rather than promises are given and granted for a certain fixed period, the government often reserving a certain portion of the income from the enterprise; and, where this is not done, the corporation is in possession rent free. If, now, carrying out our analogy, the landlord should guarantee a certain income to his tenant, provided he limited him to a certain number of tillable acres, prohibiting him from plowing up the ancient meadow, or such like, then, on principle, also, we could well say, in like manner, that the government, having prescribed a limit for the operations of the corporation, should guarantee a reasonable income.

All this, if practicable, would be very nice, because individual responsibility would no longer cause that anxiety, now such a distressing burden on the human mind. All personal responsibility and all anxiety would then be transferred to the government; the individual could live in the happy assurance, that whatever his motives and efforts, the government would guarantee him an income; and we would thus have established a system leading us beyond the Utopia of even the most visionary socialist. Under such a system, what business or calling would not be organized into a public service corporation, that the government might, although limiting, still guarantee the income? Whence would the government acquire the resource, necessary to provide for this guarantee, is a conundrum, not a question, and, therefore, needs neither answer nor explanation.

Nature has given to man certain talents, to some one, to some ten, to employ for gain, but never guarantees an increase; and human experience always has shown and always will show more losses than gains.

Clearly the right of the government to limit the charges of public service corporations to a legal or reasonable rate of income cannot be doubted; and the corporations have a fundamental and incontestable right to make such charges as, under proper management and operation, will cover such income. The guarantee proposed would not only be without consideration to the government, but unnecessary also, because, in the very nature of the case, the corporations are permitted to make such charges for their public services as well, under proper management, provide for a reasonable, and, in the case supposed, a legal rate of income. Superficially, if we adhere to the law on the subject, all difficulties now seem disposed of; but not so, because the greatest of all industrial difficulties is embraced under the head of operating expenses in the item of wages.

If, now, all other elements going to make up the reasonableness of a charge are conceded as fundamental or regulated by a statute, why, in reason, should rates of wages be any exception?

My contention is thus clearly seen to be, that, as the rate of charge by a public service corporation is under governmental control, and a legal and permissible rate of interest established by law as representing a reasonable income on capital, the question of wages, in order to harmonize with our already established principles, must, if not established by statute, be subject to judicial determination.

On first impression, the establishment by law of a price at which a man may contract his personal services seems inconsistent with the principles of a free government, and would, in any event, be distasteful to the do-as-you-please spirit of American liberty. In like manner for like reasons we revolt against the intervention of a court to determine the rate of wages, because an encroachment upon the personal liberty of contract. In the private dealings of men with one another, all these objections against statutory or judicial control or intervention in the matter of wages are well founded; but, in respect to public service corporations, the case is otherwise. A man in the employ of a public service corporation is, in a most important sense, in the employ of the government, because, as above stated, such corporation is in the exercise of a governmental function, a part of the supreme prerogative.

Taking as an example those purely governmental offices and employments, no one ever objected to accepting the presidency of the United States, the governorship of a state or enlisting in the army because the compensation is regulated by law and subject to change.

In like manner, if the scale of wages to be paid by a public service corporation from the laborers on up to the president was regulated by law and subject to change, objections on the part of employes as to the amount of their pay would be as little heard of as in purely governmental employments, and labor troubles would cease to be an anxiety to the management and a distress to the employes.

To particularize, if a railway company, by its charter, were required to pay 25 cents per hour to its laborers, 40 cents per hour to the foreman over them and not to exceed $20,000 per year to the president, would not these positions be filled with willing and contented employes, and are not such rates, under present conditions, reasonable as a matter of fact and fair to the public ultimately charged with their payment? On this basis and in this manner, a reasonable and fair scale of wages could be established by law subject to change on a change of conditions, the total amount of wages thus paid to be computed as operating expenses, and covered by the rate of charges made by the corporation for services rendered. To the payment of such charges the public would not object.

Now, take the other method, the determining of a reasonable scale of wages as a judicial act by a court, we encounter all that uncertainty, all that setting aside, retrials, appeals, reversals and overrulings which always have and always will characterize our judicial proceedings because of errors committed and because our judges are so very human.

Our courts, however, come after the law, and we must have them for the determination of questions of law as well as of fact; and, where such questions publicly arise, the courts are the proper tribunals for their determination. The question of what constitutes a fair and reasonable rate of charge by a public service corporation is now one of mixed fact and law for our courts, and the writer sees no good reason, nor in fact any reason, why questions touching the reasonableness of the scale of wages to be paid by such corporations should not also be within the jurisdiction of our courts under proper regulations for determination. This would be the establishment of that uniformity in the settlement of difficulties, mentioned at the beginning of this article, and is supported by the tradition that our courts are the proper tribunals for settling all disputes of a public nature. Under such a control, exorbitant salaries to high officials would cease to be a public robbery and the laborer would always be worthy of his hire.

This would be introducing the methods of civilization in the settlement of those disputes where the general public has a direct interest. Present conditions, as between labor and capital, are now a matter of warfare, measured only by the ability of one to attack and the endurance of the other to stand a siege. Warfare, as a method for settling disputes between nations, has almost, we may hope, been replaced by a civilized one, an international court of arbitration. The savage warfare still waged by capital and labor upon each other must soon cease also, and be replaced by the methods of civilization. The laws and the courts furnish the means and the methods; and, in the very nature of governments, there can be no other.

A. A. GRAHAM.

BRIDGE WORK ON THE WESTERN MARYLAND EXTENSION.

BY GEORGE L. FOWLER.
Associate Editor, *Railway Age Gazette.*

In passing over the Cumberland-Connellsville extension of the Western Maryland, even as it stands today, with work of all descriptions in progress, the impression made is that of thoroughness and excellence. The grading is being done for double track to east end of Big Savage tunnel, a distance of 20 miles, and for single track from there to Connellsville; but all bridge abutments, piers and the single viaduct are planned to carry a double track. The standard width of fill is 16 ft., with a scope of 1.50 to 1. The cuts are excavated to a width of 18 ft. at grade and are to be trimmed to a slope of 1 to 1. In places the shovel cuts to a steeper slope and the earth stands well in a majority of cases, but the final slope will be about that given except in solid rock cuts.



Twenty-Five-Foot Concrete Arch.

In this use of fills across the deep hollows that come down from the mountains, the water opening at the bottom is a cast iron pipe or a concrete arch, according to the area of watershed to be provided for. The pipes vary from 12 in. to 48 in. in diameter and are usually laid out at a rather sharp angle, frequently following the natural slope of the ground which may rise to 30 degrees or more.

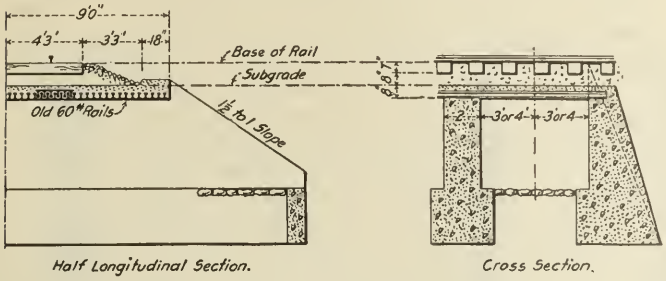
Where concrete arches are used the work is of the highest order. The art of concrete work has made such rapid advances during the past few years that we have become accustomed to a high grade of work and finish, but it is rarely that one finds concrete arches erected as these have been, in the wilds of the mountains and away from the habitations of men, that shows the same uniform excellence which characterizes all of the work on the Western Maryland extension. Not only have the forms been erected in the most substantial manner, but the lumber used has been of a high grade and has been so smooth, well fitted and treated, that even when first removed there is almost no evidence of grain marking which is of such common occurrence. In addition to this the surfaces are invariably straight and true, while the color is usually uniform and free from all efflorescence. After the removal of the forms, those surfaces that are exposed to view are rubbed down and washed so that, when finished, they will present an appearance that would do credit to any park work, whether it is located in a town or on the slope of an unfrequented mountain. An idea of this general appearance is shown in the reproduction of some of the photographs.

To secure this excellence careful specifications for the cement and concrete have been drawn. These require that the cement shall be tested in accordance with the standards of the American Society for Testing Materials and that Portland cement be used. A 1-2.5-5 mixture is used for all bridge piers, the arch ring of culverts of 10 ft. span or more, and the coping and back walls above the coping of abutments. It is also used for tunnel arching or reinforced work above foundations. The proportions are varied for other classes of work to a 1-3-6 mixture, which is generally used for all parts of culverts under 10 ft. span, inside walls and footings of culverts over 10 ft. span, in bridge abutments below coping, in retaining walls and tunnel side walls.

In addition to this the company has an inspector constantly on the ground who watches every operation and sees to it that proper methods are followed in the work. Ordinarily the concrete is put in very wet, so wet that it flows readily down beneath the forms used in the wings of abutments and the cover of an arch. Then it is thoroughly spaded until there can be no doubt that it has filled the forms and is up against the surfaces at every point, leaving no voids. Then, when the forms are removed, no holes and cavities are to be found that will require filling and patching.

As cold weather comes on the contractors will be allowed to use a moderate amount of salt, about one quart to ten bags of cement, to prevent freezing. This will cause a slight efflorescence, but it will be easily washed away. One contractor, at

least, will not take advantage of this. His method is to mix his concrete hot and cover it carefully at night with straw and canvas. In order to secure a hot mixture at the minimum of expense, he uses cold water but turns the exhaust pipe from his



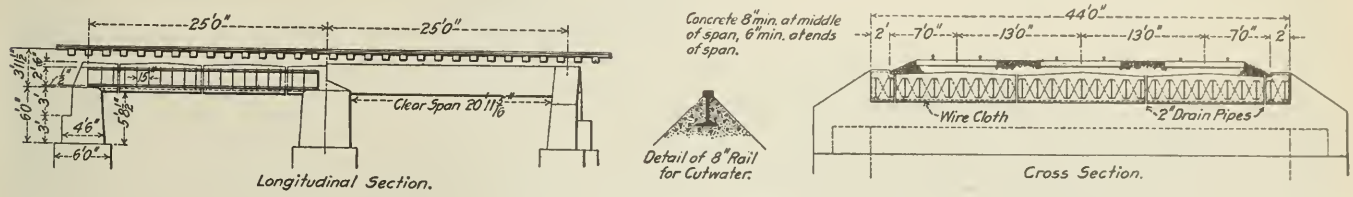
Rail Top Culvert.

engine into his mixer, which thus condenses the steam and rises to a high temperature. With the exhaust pipe swung on an elbow, it is an easy matter to swing it out of the way when filling or emptying. The same contractor also protects his upper surfaces by freezing. At the end of a day's run, the upper surface of a piece of work is flooded with an inch or so of water. Should this freeze in the night and set on the concrete, it is simply necessary to scrape off the ice and a small amount of the top surface of the concrete in the morning and go on. But these are merely side issues in the general consideration of the subject as indicative of local practices.

Closely associated with the concrete work and dependent upon it for stability are the bridges. Whenever it has been possible, and that is nearly everywhere, the plate girder of the deck type is used. Occasionally, in order to obtain necessary head room, a through or a half through bridge is used. The second general feature that has been insisted upon in all constructions has been that the ends of the bridges shall be square with the track, so that the two wheels on an axle shall always leave and enter the structure at the same time. If there is any skewing to be done it is with the abutments and not with the girders. Those who have had experience in the maintenance of bridge approaches and are familiar with the lurch given to a car as one wheel leaves the structure a perceptible interval before the other, will appreciate the advantages of this arrangement, which will prevent that trouble and will be shown in detail, in the description of some of the bridges that is to follow. The plate girder type was adopted because of its simplicity, both in construction and repairs, its ease of erection, accessibility and adaptability to the location of this particular road.

In many places the concrete is ready for the reception of the steel, but that part of the work will not be commenced until the grading is about ready for the rails, when it will be pushed rapidly. Meanwhile the concrete will have weeks in which to season.

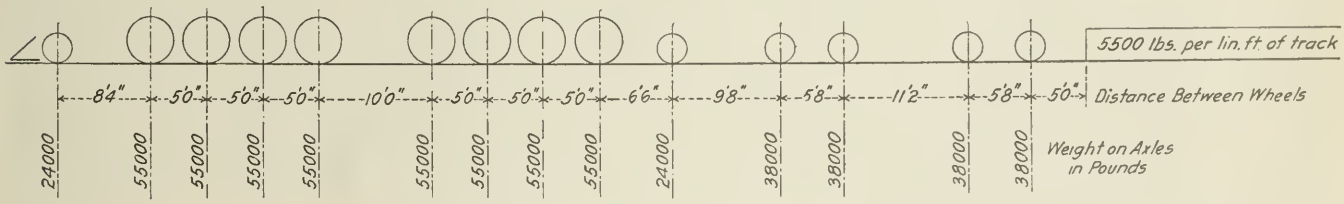
The bridges along the new line are, for the most part, of the plate-girder type, although there will be a few of the through truss construction. In arranging for and designing these structures a few fundamental desirables have been laid down and adhered to as far as possible. The deck plate-girder bridge was adopted for use wherever it is practicable, because of its ease of erection and the simplicity of its construction and floor arrangement. It is, of course, modified into the half-through and through types wherever clearances and head room require, but, for most cases, the deck plate can be used. This applies to structures of considerable span, rising, in one case to 122 ft. For the support of these girders, concrete piers and abutments are employed and the viaduct or steel construction has been avoided as far as possible. There is one long viaduct on the line.



Solid Floor, I-Beam Bridge.

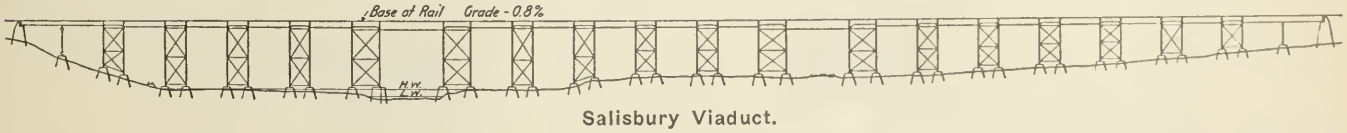
Finally the bridge has been regarded as an incident to the railway and not a principal feature. The road has, therefore, been located where it was most desirable to have it, and the bridges have been designed and built to fit the place and meet the requirements of their own particular locations.

While the plate girder may be regarded as the standard for moderate spans, the short spans are carried on solid floors, formed of I-beams embedded in concrete. One such bridge for two 25 ft. spans is shown in the engraving as arranged for a three-track roadway. It consists of a flooring of 24 in. I beams, spaced 1 ft. 6⅜ in. between centers and resting on a concrete abutment and pier. The whole is embedded in concrete, and, in calculating the stresses to be sustained, it has not been considered that any load at all will be put upon the concrete. It is regarded merely as a casing to protect the steel. The only point to be considered, then, so far as the concrete is concerned is whether or no it will crack and permit water to percolate down to and corrode the steel.



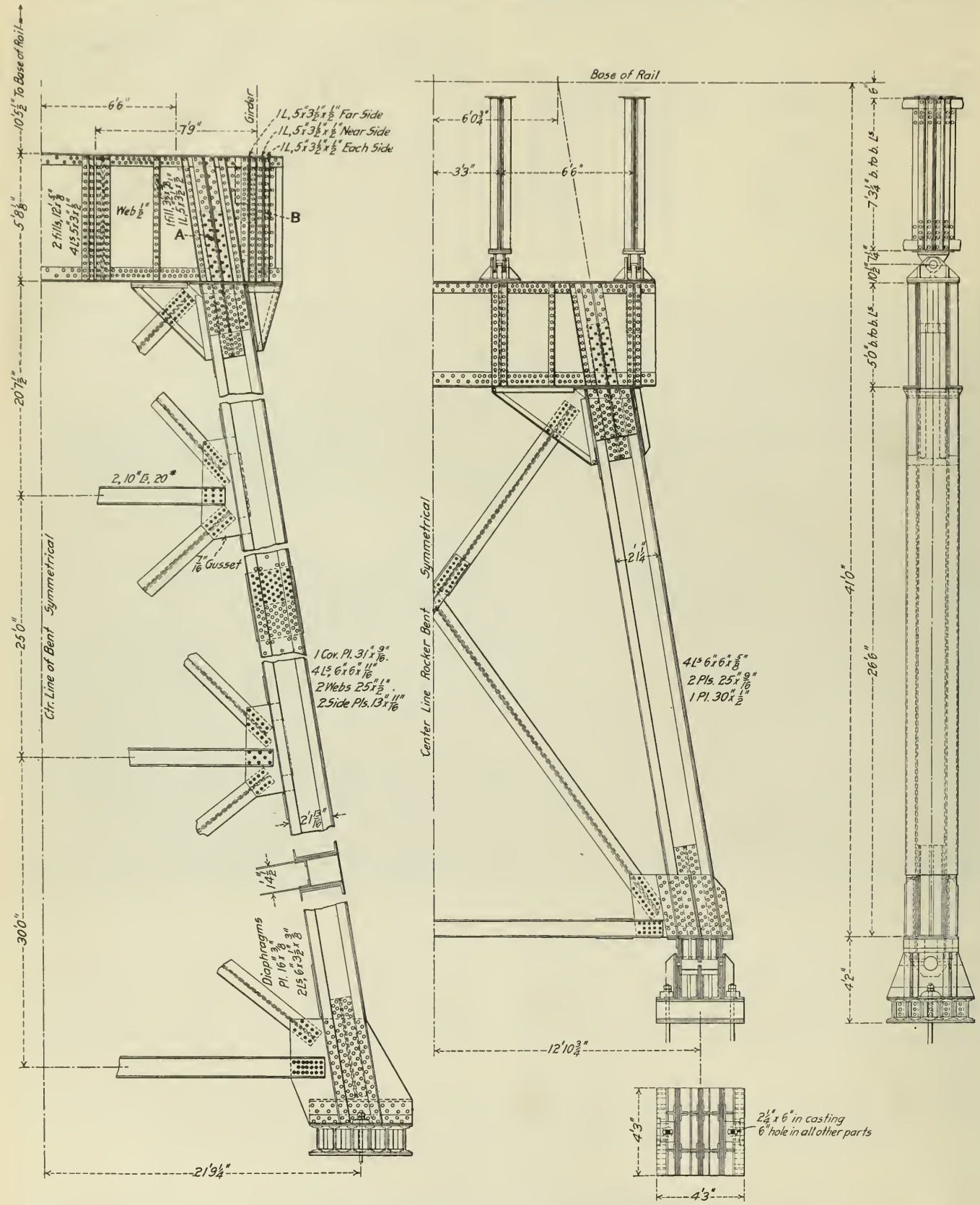
Typical Loading; Mallet Engine and Tender.

It will be noticed from the engravings that the upper surface of the concrete is crowned, both longitudinally and transversely for drainage, and that, at each of the pockets so formed, there is a 2-in. drain pipe carried down through the floor to permit



Salisbury Viaduct.

the water to flow away. Along each side the concrete is raised to form a coping to prevent the toe of the ballast from spreading and prevent it straggling off into the stream. The same thing is done at the sides of the abutments. The I beams are tied together by the diagonals shown in the engraving and the whole is strengthened by a wire cloth set in 2 in. below the bottom of the beams. This cloth is made with a 3 in. by 8 in. mesh, of Nos. 8 and 10 wire with the No. 8 wire parallel to the beams. The ballast is placed directly on the concrete as shown.



Fixed and Rocker Bents; Salisbury Viaduct.

A detail of the cut-water of the pier is shown, in which an 8 in. T-rail is embedded for the protection of the concrete. This

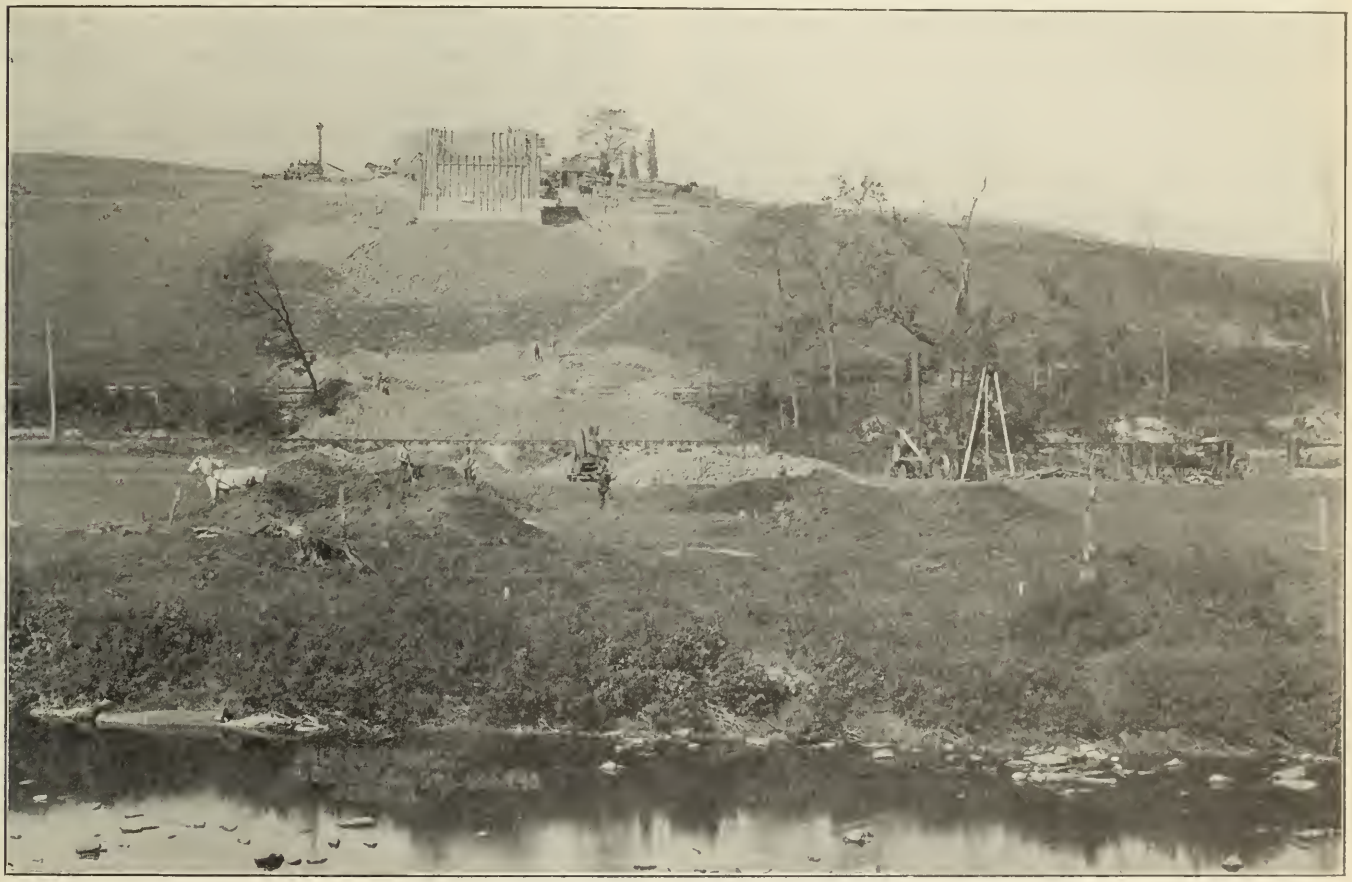
is the construction followed in all of the piers for the other bridges, with the exception that, on some of the heavier work a 9-in. rail is used.

Where the beams rest upon the concrete a seat is formed by the insertion of a ½ in. by 12 in. plate, and a joint is made between the concrete of the abutment and that of the superstructure by the insertion of three thicknesses of building paper. Five thicknesses of building paper are also used for making a joint between the spans.

The beams are not painted but all scale and rust are thoroughly removed by chipping and brushing before they are placed. And, finally, the top surface is plastered with a 1 to 2 mortar.

This construction is used on short span work up to 25 ft. Beyond this a plate girder is used.

For culverts a similar construction is put in, except that rails are used instead of I beams. This is an old construction, but one is shown as illustrative of the Western Maryland practice.



Site of Salisbury Viaduct.

In these rail culverts, which are used up to 8 ft. spans, the rails are set head up close together in a single tier the whole length of the culvert, except beneath the rails. Here a second interlocking and inverted tier, of about 6 rails is inserted as shown. The rails are thoroughly grouted and the concrete laid over them. The concrete is laid with the same form of coping to catch the toe of the ballast as in the case of the I beam bridges. This construction leaves the flanges of the rails exposed, but protects them from the washing through of dirt or ballast that occurred in the original design of these rail culverts, where there was no concrete or other protection and the materials of the ballast were laid directly on the rails. This type of culvert is used only where a restricted headroom or area will not permit the use of an arch or a pipe culvert, and in every case care is taken to have the rails thoroughly cleaned before they are embedded in the concrete.

In the case of the bridges of long span, as the plate-girder deck type is used wherever it is possible, a discussion of the details would become a mere repetition of general design varied, of course, in each individual case by local conditions.

For the loading of the bridges the Mallet locomotive has supplanted the old consolidations of the Cooper schedules. For typical loading a 2-8-8-2 Mallet is used, carrying 24,000 lbs. on each pair of truck wheels, and 55,000 lbs. on each pair of drivers, which are spaced 5 ft. between centers. The tender to weigh 38,000 lbs. for each axle, and this to be followed by a load of 5,500 lbs. per lineal foot of track as shown on the diagram. This takes the place of two 177.5 ton consolidation locomotives, followed by 5,000 lbs. per foot of track of the old specifications.

The longest bridge structure on the road is at Salisbury Junction, where there is to be a viaduct 1,908 ft. long over the steel work. It crosses a sloping meadow land, through which the Casselman river flows, and along which the Baltimore & Ohio R. R. runs, both of which are crossed. The maximum height above high water is 101.3 ft. The towers and intermediate spans are 30 ft. and 60 ft., respectively, except at the river and railroad crossings, where they are 40 ft. and 90 ft. There is a hinged bent at each end to carry the end girders of 50 ft. lengths. The design of this bent is shown in the engraving to consist of two legs, each formed of two 25 in. and one 30 in. plates, held in the shape of a U or open girder by four 6 in. angles. The shoes are of cast steel with 4¼ in. pins, and are held to an I beam grillage set in the piers by anchor bolts.

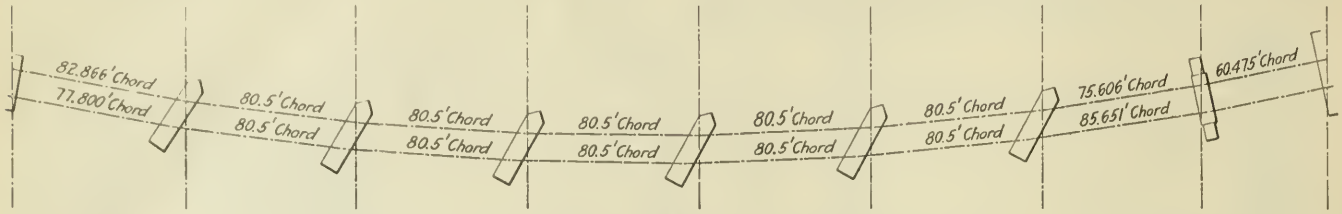
The rigid bents have legs of the same general form and are composed of a 31 in. by 9-16 in. cover plate, four angles, and four 25 in. by ½ in. web plates. An interesting detail will be found in the cap, to hold which a diaphragm plate A is riveted to the leg, and left standing for the field rivetting. In order that these rivets may be easily accessible the diaphragm of the longitudinal girder is cut off at *B*, leaving a space for the rivetters.

In following the valley of the Casselman and Youghiogheny, where the new line parallells the Baltimore & Ohio for nearly 60 miles, it is often necessary to cross the latter road. In places the angle of the crossing is quite acute, necessitating long and peculiarly arranged girders. One such case occurs at station 2069, near Confluence. At this point the angle of crossing is about 24°. The arrangement of piers is shown in the engraving. Three main girders are used where center lines are indicated as *A*, *B* and *C* on the foundation plan. It will be seen that there are three long girders, two of which have a span of 87 ft. 6 in., and one of 80 ft. 6 in. to carry the line over the tracks. And then, in order to avoid skew abutments, each of the long girders is supplemented by shorter ones; those at the sides having two short ones at one end each, and the center one having one at each end; thus leaving the ends of the steel work square with the rails.

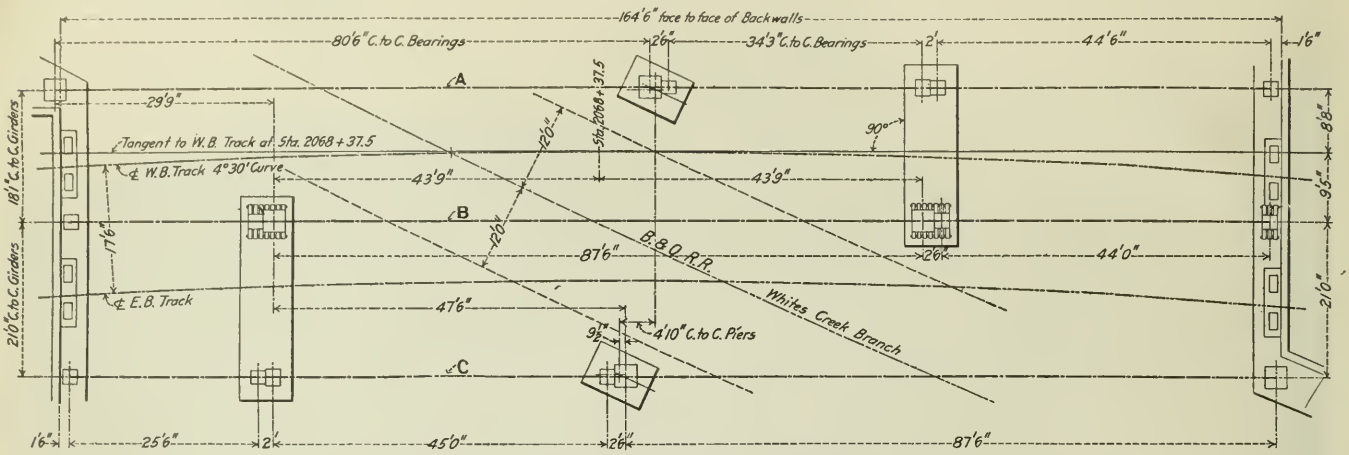
In the case of the bridge at the upper crossing of the Youghiogheny at Ohiopyle, the line runs on a 4 degree curve for the whole length of 561 ft., in which there are seven spans. In order to take advantage of the duplication of work it was necessary to make the main girders of a uniform length. This was done by setting all of the piers parallel to each other and thus varying the skew with the line of the bridge from point to point. In this way five of the seven spans were identical.

In this case, as in that of the lower bridge at the same place, where concrete piers 100 ft. high have been built, an excellent foundation was found in the hard red sandstone forming the river's bed, and which it was only necessary to excavate for a short distance and level in order to secure a proper footing.

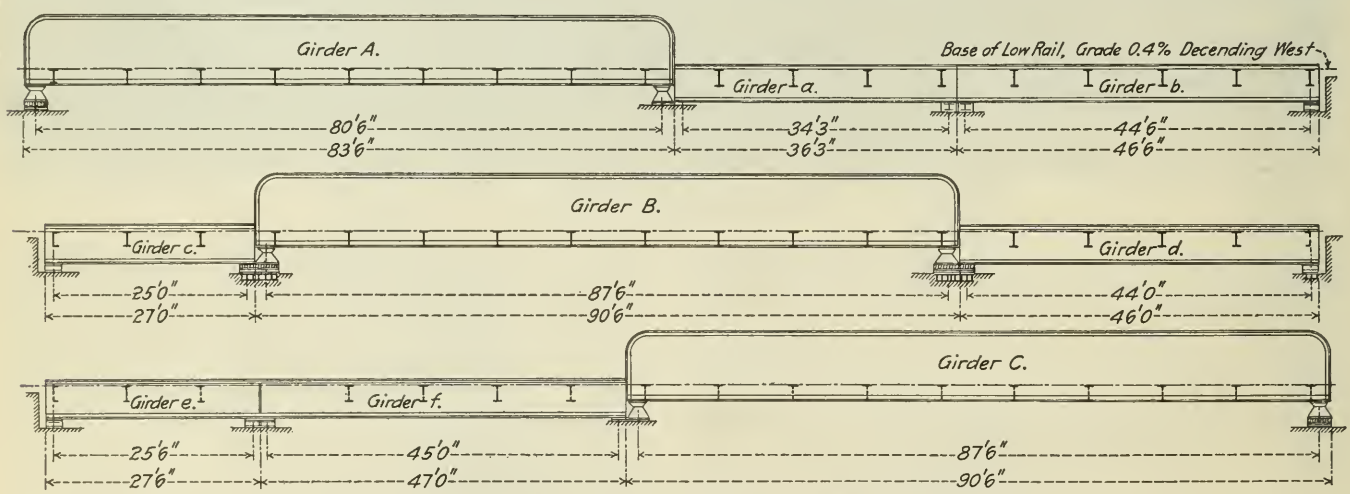
One detail that obtains in the foundations of all of the bridges which is worthy of note is the arrangement of the anchor bolts. Owing to the difficulty of having them properly located in the field they have been set so as to be adjustable through a rather wider range than is usual. The method followed is shown in the engraving. The bolts are held at their lower ends by the usual grillage, but, instead of being confined by the concrete they are carried up through a conical casing of sheet metal, which flares out to a diameter of 9 in. at the top. After the concrete has hardened the bolts have a freedom of motion in all directions, limited only by the casing. Then the foot of



Bridge Piers for Second Crossing of Youghiogheny River.

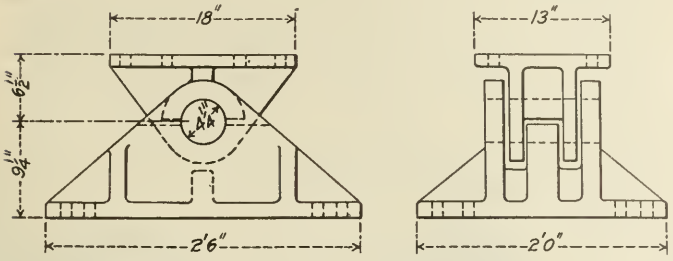


Foundation for Bridge Over Baltimore & Ohio Tracks.



Elevations of Girders; Bridge Over Baltimore & Ohio Tracks.

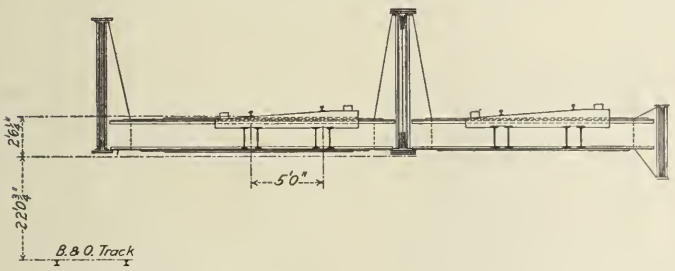
the bend or the bridge seat has a slotted hole measuring 2¼ in. by 6 in. in it, as shown in the engraving of the hinge bend of the Salisbury viaduct. This permits of a lateral adjustment, while the washer is slotted in the other direction in the same manner so that the bolt can be moved 2 in. in any direction; or, in other words, there is a freedom of motion of 4 in. to allow for any inaccuracies that may occur in the setting of the



Cast Steel Shoe for Rocker Bent.

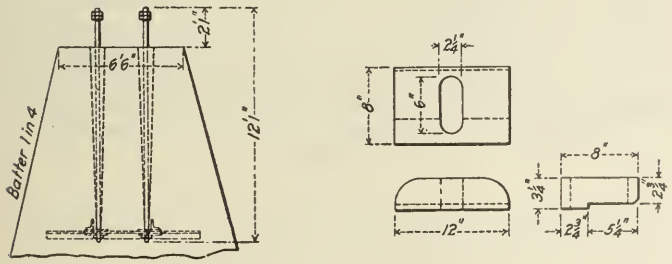
bolts. After they have been sprung into their proper position, the hole about them is grouted and they are rigidly fixed.

The construction of the line is being done under the administration of B. F. Bush, president, who has had large experience in heavy railway construction in the west and northwest, and



Cross Section of Bridge Over Baltimore & Ohio Tracks.

A. Robertson, vice-president and general manager, whose jurisdiction extends over the construction. The execution of the work is under the immediate charge of H. R. Pratt, the chief engineer of the company, who is responsible for the whole work, the character of which is indicated by these details and outline of the general engineering features, which will thus be seen to be



Anchor Bolts and Cast Steel Cap.

that of a high-class modern railway construction, such as has only become possible in recent years because of the advances that have been made in methods of work, and which would have been out of the question a generation ago. The Carter Construction Company, Chicago, John B. Carter, president, has the contract for the entire line. A. W. Jones is the chief engineer of the Carter Construction Company.

For 15 years the Russians have had an establishment in the Crimea for preserving ties by soaking them in sea-water. At present some 300,000 ties yearly are so treated. The ties are soaked three or four months, each absorbing from 9 to 11 lbs. of salt. They are said to do best in hot and dry districts, where they last about two years longer than untreated ties—not nearly so long as creosoted ties; but the process is much cheaper.

LOCOMOTIVE SMOKE IN CHICAGO.*

BY PAUL P. BIRD.

Chicago is the greatest railway center and one of the largest manufacturing centers in the world. Soft coal from Illinois and Indiana is used, but this coal is difficult to burn without making smoke and dirt. For years it has been an open question as to how much of the total smoke of Chicago was made by locomotives. It is often stated by railway officials that the railways make a very small proportion of the total smoke, and that from a standpoint of smoke prevention the electrification of railway terminals is unwarranted. During the last few months the department of smoke inspection of Chicago has made an investigation to determine the proportion of the total smoke made by the railways. The result of this study may be summarized as follows:

SUMMARY OF CONCLUSIONS.

Although the locomotives use only 18½ per cent. of the total coal, they make 43 per cent. of the total smoke and over one-half of the total dirt.

The locomotives consume within the city limits 5,600 tons of soft coal daily, or about 1,850,000 tons annually.

According to the Ringlemann system of judging the density or blackness of smoke, the average density of locomotive smoke in Chicago is 23 per cent.

Because smoke from locomotives carries with it large quantities of sparks and cinders, such smoke is a greater dirt producer than smoke from stationary plants.

Although locomotives make 43 per cent. of the total smoke, because of the character of the smoke they produce over one-half of the the total dirt traceable to smoke.

The lowest average density of smoke produced by any one road is about 10 per cent. This figure probably represents as low an average as can be maintained with steam locomotives using soft coal.

If all locomotives in Chicago maintained an average smoke density as low as 10 per cent., the locomotive smoke would still form 29 per cent. of the total smoke and probably produce over one-third of the dirt.

Locomotives in the neighboring towns outside of Chicago make an average smoke density of about 41 per cent., showing that the anti-smoke campaign in the city has already reduced the smoke nearly one-half.

Approximately 10 per cent. of all coal fired in a locomotive firebox is discharged from the stack in the form of cinders. Within the city limits of Chicago about 560 tons (14 carloads) of cinders from locomotive smoke-stacks are dropped every day.

There are about 2,200 miles of railway track in the city limits. At all times there are about 1,400 different locomotives working in the city, and during a week as many as 3,740 different locomotives are in Chicago.

CLASSES OF SMOKE MAKERS.

In making a study of the different ways in which the total smoke of Chicago is made, the smoke makers of the city have been grouped into seven different classes, as follows:

Central District.—This class includes all stationary boiler plants in the district bounded by Chicago avenue, Twenty-second street, Halsted street, and Lake Michigan, and is composed chiefly of office buildings, hotels, wholesale and warehouse buildings, factories, etc.

Miscellaneous Power Plants.—This includes all stationary high pressure boiler plants except those in the central district. In this group are placed factories, mills, manufacturing buildings, electrical power plants, packing houses, breweries, gas manufacturing plants, pumping stations, school houses, hotels, hospitals, laundries, etc.

Flat Buildings.—This includes all low pressure steam-heating plants in flat or apartment buildings, family hotels, etc. No

* Abstract of a paper read at a meeting of the Western Society of Engineers, Chicago, February 15, 1911.

private residences or buildings having three or less flats are included.

Domestic Heating.—This includes all private residences, cottages, two and three flat buildings, etc., which use soft coal, principally in stoves.

Special Furnaces.—These include all special furnaces used in various manufacturing processes other than steam boiler furnaces, such as heating and melting furnaces in steel plants, terra cotta plants, malleable iron plants, forge shops, enameling plants, annealing ovens, baking ovens, china kilns, etc.

Locomotives.—This includes all steam-railway locomotives used in the city limits.

Boats.—This includes all steam vessels used in the city limits, such as tugs, passenger, freight, excursion and canal boats, pile drivers, dredges, etc.

COAL CONSUMPTION.

The smoke department estimates that 10,000,000 tons of bituminous coal are consumed in Chicago annually. This figure may be taken for the year 1910 and includes semi-bituminous or Pocahontas coal. From 1893 to 1906 a record was kept of all coal shipped into Chicago and all coal shipped away. It showed that in 1906 the consumption was about 8,000,000 tons. A curve drawn through the points obtained by plotting this record for the thirteen years between 1893 and 1906 shows that a gain of 2,000,000 tons from 1906 to 1910 is consistent and probable. A check on this total figure of 10,000,000 tons has been obtained by accounting for its use by the different consumers of soft coal.

Central District.—This class is estimated to use 1,500,000 tons of soft coal annually. This figure has been obtained by making a careful census of the boilers and by considering figures obtained from coal dealers. It is estimated that 1,125,000 tons of Illinois and Indiana coal are used in this district and about 375,000 tons of semi-bituminous coal. This semi-bituminous coal is used in the low pressure plants.

Miscellaneous Power Plants.—The coal used by the plants in this class has been obtained by making the following computation: The records of the boiler department and smoke department show that there are about 7,000 high pressure boilers in the city and that the average rated boiler horse power is about 143. A study of the load conditions in hundreds of plants shows that the average load is about 75 per cent. of the installed boiler capacity. With these figures the following computation is made:

Number of high pressure boilers in the city	7,000
Average rated horsepower per boiler	143
Total capacity in horsepower of high pressure boilers	1,000,000
Average load, per cent. of rating	75 per cent.
Number of days per year that average plant is in operation	300
Number of hours per day that average plant is in operation	10
Average pounds of coal used per boiler horsepower per hour	5
Then it follows that the	
Total tons of coal used per year in all stationary high pressure boiler plants is	5,625,000

According to the classification of plants, this 5,625,000 tons is the annual coal consumption of the low pressure plants and the high pressure plants. The high pressure plants have been estimated to use 1,125,000 tons annually, which leave 4,500,000 tons of coal as the annual consumption of the miscellaneous power plants.

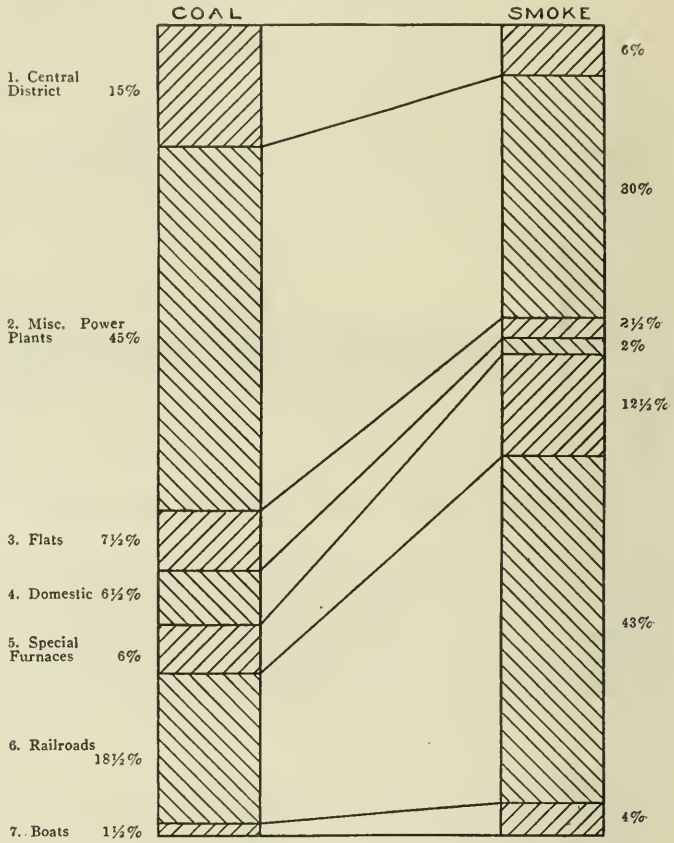
Flat Buildings.—These plants are estimated to use 750,000 tons of coal per year, most of which is Pocohontas coal. This figure has been obtained by getting the number of such buildings in Chicago and estimating the average coal consumption per building. There are probably from 1,000,000 to 1,200,000 tons of semi-bituminous coal used in Chicago annually.

Domestic Heating.—The coal used for domestic heating is difficult to estimate, and 650,000 tons of soft coal annually is as close a figure as is obtainable. This has been arrived at by getting figures from coal dealers and by estimating the number of consumers.

Special Furnaces.—These are estimated to burn 600,000 tons of coal per year. This is based on figures obtained from a number of the largest consumers.

Locomotives.—The coal used by locomotives has been accurately estimated. The smoke department wrote to all the railways asking for estimates of coal burned by locomotives in the city limits. The returns show a total of 5,601 tons. This is the average for week days. Assuming that the Sunday consumption is one-third of the week day consumption, and that the other holidays in the year do not affect the average, it follows that the annual coal consumption of steam locomotives in the city limits is 1,850,000 tons.

Boats.—These are estimated to use 150,000 tons per year. This figure has been obtained by getting estimates from most of the companies operating vessels in the rivers.



Percentages of Total Smoke and Total Coal Burned in Chicago.

The division of the 10,000,000 tons is therefore as follows:

Consumer.	Annual Consumption. Tons.	Per cent.
Central district	1,500,000	15.0
Miscellaneous power plants	4,500,000	45.0
Flats	750,000	7.5
Domestic	650,000	6.5
Special furnaces	600,000	6.0
Locomotives	1,850,000	18.5
Boats	150,000	1.5
	10,000,000	100.0

DENSITY OF SMOKE.

Knowing the coal consumption of these different classes of plants, it requires a knowledge of the average density of smoke made by each class to arrive at the percentage of the total smoke made by each. For this purpose the department has used the Ringlemann method of estimating the relative blackness or density of smoke. This system was invented by Prof. Ringlemann, of Paris, and is in general use throughout the world. The U. S.

Geological Survey has adopted it as a standard. The Ringlemann method of judging smoke is clearly explained in the transactions of the American Society of Mechanical Engineers, Volume XXI, December, 1899. Using this method of computing the percentage of density, the smoke department has arrived at the following results:

SMOKE DENSITY BY RINGLEMANN CHART METHOD.

Consumer.	Percentage of Density.
Central district	3.75
Miscellaneous power plants	6.5
Flats	3.0
Domestic	3.0
Special furnaces	20.0
Locomotives	22.3
Boats	25.0

that the cleanest place was at the Illinois Central tracks and Van Buren street, where the average density was 10.5 per cent. Locomotives of the Wisconsin Central occupy the first place with an average density of smoke of 10.76 per cent. The Chicago Junction Railway occupies the lowest position in the list with an average of nearly 42 per cent. The average percentage of locomotive smoke density in the two months' investigation is 22.3 per cent.

DIVISION OF TOTAL SMOKE.

Knowing the amount of coal burned in the city by each of the seven classes of consumers and the average density of the smoke made by each class it is an easy matter to compute the total amount of smoke made by each class. As far as known this is the first attempt ever made to sub-divide the total smoke of a

No	RAILROAD COMPANY TRUNK LINES	MILES OF TRACK IN CITY LIMITS			LOCOMOTIVES									COAL					
					AVERAGE NUMBER IN CHICAGO AT ONE TIME			TOTAL NUMBER OF DIFFERENT LOCO'S IN CHICAGO DAILY			TOTAL NUMBER OF DIFFERENT LOCO'S IN CHICAGO WEEKLY			TONS PUT ON ENGINES IN CHICAGO DAILY			TONS BURNED WITH IN CITY LIMITS DAILY		
		MAIN	SIDE	TOTAL	PASS.	FREIGHT	TOTAL	PASS.	FREIGHT	TOTAL	PASS	FREIGHT	TOTAL	PASS	FREIGHT	TOTAL	PASS	FREIGHT	TOTAL
1	A. T. & SANTA FE R.Y. CO.	13.28	43.82	57.10	10	24	34	10	24	34	19	35	54	52	158	210	25	75	100
2	BALTIMORE & OHIO R.R.	16.14	25.67	41.81	5	20	25	10	32	42	10	32	42	65	195	260	19	56	75
3	CHICAGO & WESTERN INDIANA R.R.	50.32	99.71	150.03	3	—	3	3	—	3	3	—	3	90	55	85	30	55	85
4	CHICAGO & ALTON R.R.	14.22	32.60	46.82	5	19	24	10	23	33	10	29	39	85	232	317	9	134	143
5	CHICAGO BURLINGTON & QUINCY R.R.	11.34	80.17	91.51	20	73	93	41	73	114	59	100	159	150	300	450	50	215	265
6	C & O R.R.CO. OF IND. FORMERLY C.C.&L.	—	—	—	2	3	5	2	3	5	2	3	5	12	21	33	1	6	7
7	CHICAGO & EASTERN ILLINOIS R.R.	—	—	—	8	12	20	12	13	25	12	13	25	19	58	77	24	52	76
8	CHICAGO GREAT WESTERN R.R.	—	16.01	16.01	4	12	16	5	20	25	5	20	25	32	100	132	15	48	63
9	CHICAGO INDIANAPOLIS & L'VILLE R.Y.	—	—	—	4	3	7	6	5	11	6	5	11	—	8	8	4	10	14
10	CHICAGO IND. & SOUTHERN R.R. CO	—	—	—	2	2	4	3	4	7	3	4	7	18	32	50	1	8	9
11	CHICAGO MILWAUKEE & ST PAUL R.Y.	54.66	103.01	157.67	18	76	94	34	96	130	56	145	201	172	598	770	49	457	506
12	CHICAGO & NORTHWESTERN RAILWAY	66.89	234.34	303.23	135	188	323	135	188	323	135	188	323	500	1500	2000	264	786	1050
13	CHICAGO ROCK ISLAND & PACIFIC R.Y.	35.94	76.99	112.93	17	17	34	33	27	60	222	166	388	52	158	210	88	118	206
14	ERIE RAIL ROAD	—	—	—	4	9	13	6	14	20	11	34	45	43	70	113	11	73	84
15	GRAND TRUNK RAILWAY SYSTEM	17.04	26.25	43.29	4	16	20	8	25	33	8	25	33	53	137	190	20	60	80
16	ILLINOIS CENTRAL RAIL ROAD	143.00	167.63	310.63	67	81	148	70	106	176	70	106	176	502	400	902	300	200	500
17	LAKE SHORE & MICH. SOUTHERN R.Y.	11.42	73.85	85.27	22	43	65	26	48	74	181	324	505	180	383	563	78	231	309
18	MICHIGAN CENTRAL RAIL ROAD	7.58	42.60	50.18	5	18	23	15	20	35	15	20	35	44	131	175	22	68	90
19	NEW YORK CHICAGO & ST LOUIS R.R.	8.70	29.51	38.21	4	22	26	6	25	31	6	25	31	35	112	147	10	55	65
20	PENNSYLVANIA RAILROAD CO	89.72	164.19	253.91	19	126	145	35	153	188	245	1071	1316	80	567	647	80	567	647
21	PERE MARQUETTE RAILROAD	—	—	—	5	4	9	8	2	10	52	3	55	30	20	50	10	20	30
22	WABASH RAILROAD	9.84	28.68	38.52	3	18	21	10	18	28	10	30	40	60	140	200	15	75	90
23	MINN. ST.P & S. STE M RY LESSEE OF W.C	—	—	—	6	9	15	6	9	15	6	9	15	—	6	6	13	39	52
	BELT OR TRANSFER RAILROADS																		
1	B & O CHICAGO TERMINAL RR	33.93	50.77	84.70	2	23	25	2	23	25	2	23	25	19	57	76	25	75	100
2	BELT RAILWAY OF CHICAGO	32.24	66.36	98.60	—	82	82	—	82	82	—	82	82	—	425	425	—	425	425
3	CHICAGO JUNCTION RAILWAY	5.80	4.20	10.00	—	37	37	—	37	37	—	37	37	—	296	296	—	296	296
4	CHICAGO RIVER & INDIANA R.R.	—	—	—	—	4	4	—	4	4	—	4	4	—	32	32	—	32	32
5	CHICAGO UNION TRANFER RY	—	—	—	—	1	1	—	1	1	—	1	1	—	—	—	—	2	2
6	CHICAGO WEST PULLMAN SOUTHERN RR	—	—	10.00	—	10	10	—	10	10	—	10	10	—	40	40	—	40	40
7	CHICAGO & CALUMET RIVER R.R.	2.19	.10	2.29	—	2	2	—	2	2	—	2	2	—	6	6	—	6	6
8	ELGIN JOLIET & EASTERN R.Y.	3.52	15.73	19.25	—	45	45	—	45	45	—	45	45	—	121	121	—	121	121
9	INDIANA HARBOR BELT R.R.	10.25	—	10.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	ILLINOIS NORTHERN RAILWAY	12.25	—	12.25	—	5	5	—	5	5	—	5	5	—	24	24	—	24	24
11	MANUFACTURER'S JUNCTION R.Y.	—	1.16	1.16	—	3	3	—	3	3	—	3	3	—	9	9	—	9	9
12	UNION STOCK YARDS	17.31	129.37	146.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	TOTAL	669.58	1512.72	2192.30	374	1007	1381	496	1140	1636	1148	2593	3741	2223	6391	8624	1463	4438	5601

Miles of Railway Track, Number of Locomotives and Amount of Coal Burned by Them Within the City Limits of Chicago.

An important part of the investigation of the density of smoke in Chicago has been a study of the smoke made by locomotives. During October and November, 1910, a special observer spent his entire time on the rights of way of the railways in the city limits. During these two months he made over 11,000 separate observations and watched the locomotives of 30 different railways. The observer was assigned each day to a certain point on the right of way of some road, often at a junction of two or more roads, his instructions being to watch every locomotive coming within his sight, and to record in his memorandum book the number of minutes during which he watched the engine and his estimate of the density of the smoke in accordance with the Ringlemann charts. It is probably unnecessary to say that this work was done with absolute impartiality and that no effort was made to watch the engines of one road more than another. The results show that the dirtiest place in Chicago was at Fifty-fifth street and the Chicago & Western Indiana tracks. This point is also at the south end of the Erie yards. The average density observed was 45.4 per cent. Similarly, the list shows city among the various classes of plants responsible for its production. The work has been done carefully and accurately, and it is felt that the results obtained are very nearly correct.

Consumer.	Annual coal consumption. Tons.	Annual coal consumption. Per cent.	Smoke. Percentage of density.	Smoke. Percentage of total smoke. As figured.	Smoke. Percentage of total smoke. Round numbers.
Central district	1,500,000	15.	3.75	5.85	6
Misc. power plants	4,500,000	45.	6.5	30.45	30
Flats	750,000	7.5	3.0	2.34	2½
Domestic	650,000	6.5	3.0	2.06	2
Special furnaces	600,000	6.	20.0	12.5	12½
Locomotives	1,850,000	18.5	22.3	42.9	43
Boats	150,000	1.5	25.0	3.9	4

OUT OF TOWN OBSERVATIONS.

During the month of December, 1910, the same observer who had worked in Chicago on the investigation of locomotive smoke was sent to eight different towns outside the city limits to make similar observations. The density of smoke averaged 41 per

cent. This is probably a fair figure for the performance of a locomotive using Illinois or Indiana coal with no particular attention paid to preventing smoke. Streator, Ill., had the smokiest locomotives, 361 observations averaging 51 per cent. smoke density. This indicates the results of the anti-smoke campaign in Chicago. It shows that outside of the city, where no effort is made to prevent it, the smoke is nearly twice as dense as in Chicago. This is true of the stationary plants as well as the railways. If the citizens of Chicago will compare their city with other cities in the middle west they will find that, plant for plant, locomotive for locomotive, chimney for chimney, Chicago is the cleanest of all.

CHARACTER OF LOCOMOTIVE SMOKE.

Locomotive smoke carries with it quantities of sparks and cinders, while in stationary plants relatively little of such material is thrown out. This is because of inherent features in the design that are unavoidable. On a locomotive there is so little room available that the grate surface of the boiler is necessarily small and consequently a powerful draft is necessary to do the required work. This draft is obtained by discharging the exhaust steam from the engine cylinders up the stack. Because of this strong draft great quantities of fine coal and ash is drawn out of the firebox with the smoke, which in turn are discharged from the stack in the form of cinders. From 8 to 18 per cent. of all bituminous coal put into locomotive fireboxes escapes from the stack in this manner. In Chicago about 5,600 tons of coal are burned in locomotives each day. Assuming that 10 per cent. of the coal leaves the stack in the form of cinders, it means that 560 tons of cinders are thrown into the air and dropped on the city of Chicago every day. This is equal to about 14 carloads. On the other hand, in stationary plants where there is plenty of room for a larger grate surface and where the coal is burned with a lower draft and with tall chimneys, but few cinders are carried out with the smoke. Therefore the smoke from locomotives on account of carrying with it sparks and cinders is far more objectionable than the smoke from stationary plants, and as it is discharged into the atmosphere at no great distance from the ground and is trailed over long courses, it is safe to say that from the standpoint of a nuisance the steam locomotive is the worst offender of all. The investigation shows that the locomotives of Chicago make about 43 per cent. of the total smoke. Considering its character, the conclusion seems warranted that steam locomotives produce over one-half of the dirt traceable to smoke.

POSSIBILITIES OF LOCOMOTIVE SMOKE PREVENTION.

The lowest percentage of smoke density made by the locomotives of any railway was 10.7 per cent. Probably 10 per cent. is as low an average as can be maintained with steam locomotives using soft coal. Therefore the very best condition that can be hoped for in Chicago is to have all locomotives average 10 per cent. density, which would mean that the locomotive smoke would still be 29 per cent. of the total, and probably be responsible for over one-third of the dirt. The modern steam locomotive is such a highly developed machine that it is extremely unlikely that any change will ever be made in its construction which will produce better results than this. A further reduction of the smoke made by locomotives can only be brought about by change of fuel. The possible fuels besides the local soft coals are semi-bituminous coal, anthracite coal, coke and oil. A considerable amount of semi-bituminous or Pocahontas coal is now being burned by some of the railways in Chicago, and although it makes less smoke than Illinois coal under the same conditions, its use by no means guarantees the entire elimination of smoke. Probably the universal use of semi-bituminous coal would not succeed in reducing the average density of smoke below a point that is considered possible with Illinois coal. The general use of anthracite coal or of coke for locomotives would eliminate smoke, but the other nuisances due to steam locomotives would not be diminished. If coke were used there would be an increase in the quantity of sparks and cinders discharged from the stacks. In either case the volume of furnace gases and their effect in vitiating the atmosphere would not be reduced. Fuel oil makes smoke unless carefully handled, and the smoke that is made is more objectionable than the smoke from soft coal. It is probable that if all locomotives in the city burned oil, the smoke and gases would form more of a nuisance than the soft coal smoke of today. The general use of any specially selected fuel would greatly increase the cost of fuel to the railways, and the practical difficulties involved would make it a very difficult thing to bring about. The locomotive fireboxes would have to be changed if coke or hard coal were used. In order to ensure that all locomotives operating in the city limits used the same fuel, all the engines on an entire division would have to be thus equipped, which of course would greatly increase the cost of operation.

ELECTRIFICATION.

The study that has been made indicates clearly that electrification offers the only final and satisfactory solution of the locomotive smoke problem. The use of special fuel for preventing smoke on steam locomotives is only a makeshift and will not satisfy the public.

A NEW RAILWAY LAW IN CALIFORNIA.

The California legislature has passed the Eshleman railway bill, drafted by Railroad Commissioner Eshleman, Governor Johnson, Senator Stetson, Attorney-General Webb, Assemblyman Gogswell, railway commissioners Loveland and Gordon and W. R. Wheeler and Seth Mann, of Merchants' Exchange Traffic Bureau, San Francisco. The bill became a law February 15. The important sections of the law are as follows:

Sections 1 to 5.—Provide for organization of the commission as it now exists, adding an attorney at $5,000 a year; to give to the commission and persons in its official employ the right of free transportation in California when on official business; provide for meetings to be held monthly at San Francisco and such other places and times as may be necessary.

Section 6.—Provides for contempt proceedings to enforce the commission's orders.

Section 7.—Provides for the issuance of process by the commission to compel attendance of witnesses and production of books and papers.

Section 16.—Empowers the commission to establish rates for the transportation of freight and passengers; to prescribe rules and regulations for demurrage; for services in connection with transportation; for the classification of freight; to establish through rates; prescribe joint rates and the division of rates or fares on joint rates; prescribe the construction and maintenance of tracks to connecting lines; and the regulation of crossings.

Section 17.—Provides for a record of rates established by the commissioners; rules as to admissibility of evidence; that railways shall be given 20 days' notice of proposed action by the commission upon any rate.

Section 18.—Provides that within 30 days after the act goes into effect railway companies shall file tariffs, and that the commission shall, within 60 days thereafter, establish or suspend the same unless the commission shall assign any such rates for investigation, giving the companies concerned notice and opportunity to be heard; that companies shall be provided with tariffs affecting them; companies are required to have tariffs printed and posted.

Section 19.—Provides that rates shall remain in effect until changed by the commission; on the first day of July, 1912, and annually thereafter, companies may file proposed changes of schedules, which shall be acted upon by the commission as upon an original filing of rates; if the commission has investigated any such within six months it need not have a hearing; intervention is allowed on a showing of interest in the subject matter

of any investigation; a hearing need not be held in case of any rate approved by the commission.

Section 20.—Any one commissioner may take testimony in any case, which shall be transcribed and submitted for the consideration of the entire commission.

Section 21.—Provides for physical valuation of railway property.

Section 22.—The commission may investigate books and records of companies and compel the production of evidence.

Section 23.—Commission is to enforce the provisions of the act to recover penalties; to correct abuses; and to investigate charges of discrimination; defines discrimination and declares that any discrimination in the nature of a violation of the order of the commission shall be contempt; in addition to penalty for contempt, fine of $5,000 for each offense on the part of the company and $1,000 or imprisonment not exceeding one year on the part of any officer or agent.

Section 24.—Commission may establish penalties for failure of officers of a company to comply with orders or to return blanks properly filled out.

Section 26.—Commission may provide intrastate rate laws and provide for emergency rates.

Section 29.—Commission on its own initiative may investigate unreasonableness of discriminatory rates.

Section 32.—Provides penalty for failure to obey order of commission; not less than $500 nor more than $2,000.

Section 37.—Forbids free transportation except in certain cases; newspapers to be permitted to exchange advertising for transportation.

Section 41.—Provides various penalties; prohibits rebates and other offenses, and fixes jurisdiction of courts with relation thereto.

Section 48.—Allows a period of three years for commencing action under the act.

Section 49.—Provides an appropriation of $100,000 to carry out the purpose of the act.

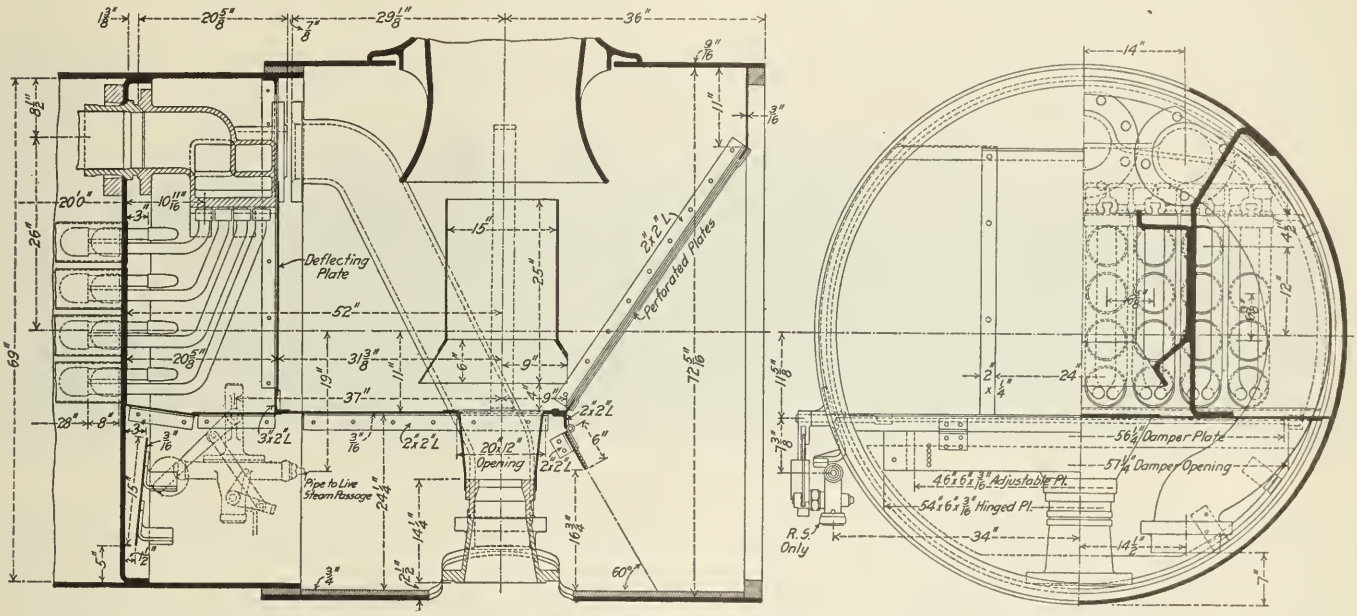
Section 52.—The act shall go into effect at once.

The Wright act is repealed. This embodied the maximum clause, under which maximum rates were established, leaving the railway the privilege of charging less than the tariff. The new law provides for absolute rates.

PACIFIC TYPE SUPERHEATER LOCOMOTIVE; CHICAGO & NORTH WESTERN.

Last July the Chicago & North Western received five Pacific type locomotives from the American Locomotive Company equipped with the Locomotive Superheater company's type A superheater. These were part of an order of 20 Pacific type locomotives, the other 15 not being equipped with superheaters. They were of the same general design as the 25 Pacific type locomotives received in January, 1910, the only difference being in the boilers and cylinders of the superheater locomotive; the boilers were modified to allow the application of the superheater, and the cylinders were increased from 23 in. to 25 in. in diameter. The boilers of both superheater and non-superheater engines were designed for 200 lbs. pressure, but the non-superheater locomotive is using 190 lbs. and the superheater locomotive 175 lbs.

The type A superheater, better known as the Schmidt, is shown in the accompanying drawing. Its new classification is the trade name given it by the Locomotive Superheater company. It is of the top header, double loop type, designed to give an average temperature of 600 deg. The return bend is only 24 in. from the firebox end of the flues, which is somewhat nearer than is



Superheater as Applied to Pacific Type Locomotive; Chicago & North Western.

customary in American practice, and gives a higher degree of superheat. The superheater elements are made of 1½-in. outside diameter seamless steel tubes. They are connected at the firebox end by cast steel U-bends, and are bent up at the smokebox end to fit in the headers. These tubes are inserted in four rows of 5 in. flues near the top of the boiler. The design is such that the steam is made to pass through all the superheater tubes simultaneously on its way from the boiler to the cylinders. A superheating surface of 691 sq. ft. is provided, which is 21 per cent. of the total heating surface and 23 per cent. of the tube heating surface. The main features of this type of superheater are its interchangeability and accessibility. Each individual superheater element may be removed and examined without disconnecting the whole arrangement.

The locomotives have given satisfactory service and the officials of the Chicago & North Western report that they use considerably less coal and water than locomotives of the same class using saturated steam. Records show that the superheater locomotives burn about one ton less coal per 100 miles than the saturated steam engines. On the run from Chicago to Elroy, a distance of 217 miles, about four tons of coal are saved per round

trip. One water stop is also omitted as the locomotives run a greater distance with the same amount of water.

It is stated that during two months one of the engineers running these engines never pulled into Elroy late. In one instance his train was 35 minutes late at Madison but arrived at Elroy on time, making up the 35 minutes in 70 miles. This performance is the more interesting in view of the fact that on this particular section the saturated steam locomotives have never been able to make up any time. In view of the satisfactory service of these engines, superheaters of the same type were specified for 30 out of an order of 50 consolidation locomotives now being delivered to this railway by the American Locomotive Company. The general dimensions of the Pacific type locomotives are as follows:

General Data.

Type	Pacific
Service	Passenger
Fuel	Bit. coal
Tractive effort	37,620
Weight in working order	250,500 lbs.
Weight on drivers	154,500 lbs.
Weight of engine and tender in working order	408,400 lbs.
Wheel base, driving	13 ft. 6 in.
Wheel base, total	34 ft 7 in.
Wheel base, engine and tender	66 ft. 10½ in.

Ratios.

Total weight ÷ tractive effort	6.65
Weight on drivers ÷ tractive effort	4.11
Tractive effort × diameter drivers ÷ heating surface	849.
*Tractive effort × diameter drivers ÷ equivalent heating surface	646.
Total heating surface ÷ grate area	62.8
*Equivalent total heating surface ÷ grate area	82.5
Firebox heating surface ÷ total heating surface, per cent.	6.28
*Firebox heating surface ÷ equivalent total heating surface, per cent.	4.79
Weight on drivers ÷ total heating surface	46.4
*Weight on drivers ÷ equivalent total heating surface	35.4
Total weight ÷ total heating surface	75.3
*Total weight ÷ equivalent total heating surface	57.3
Volume both cylinders, cu. ft	15.90
Total heating surface ÷ volume cylinders	209.5
*Equivalent total heating surface ÷ volume cylinders	275.0
Grate area ÷ volume cylinders	3.0

Cylinders.

Kind	Simple
Diameter	25 in.
Stroke	28 in.

Valves.

Kind	Piston
Diameter	14 in.
Travel	6 in.
Steam lap	1 1/16 in.
Exhaust lap	3/16 in.
Lead, forward gear	¼ in.

Wheels.

Driving, diameter over tire	75 in.
Driving, thickness of tire	3½ in.
Driving, journals, main, diameter	10½ in. x 12 in.
Driving, journals, others, diameter	9½ in. x 12 in.
Engine truck, diameter	37¼ in.
Engine truck, journals	6 in. x 12 in.
Trailing truck, diameter	49 in.
Trailing truck, journals	8 in. x 14 in.

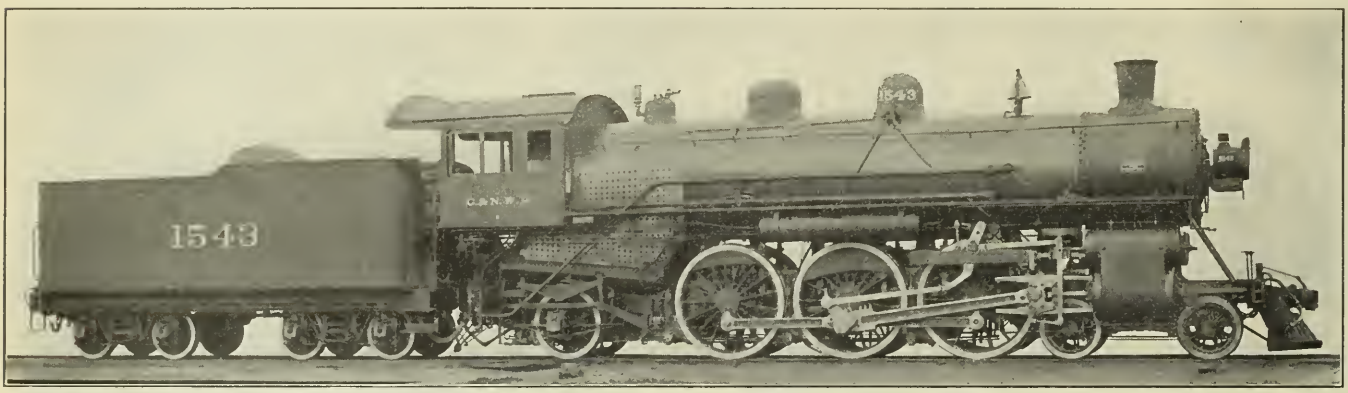
Boiler.

Style	Ext. wagon top
Working pressure	190 lbs.
Outside diameter of first ring	70 5/16 in.
Firebox, width and length	70¼ in. x 108⅛ in.
Firebox, plates, thickness	⅜ in. and ½ in.
Firebox, water space	4½ in.
Tubes, number and diameter	212—2 in.
Tubes, length	20 ft.
Heating surface, tubes	3,092 sq. ft.
Heating surface, firebox	209 sq. ft.
Heating surface, arch tubes	27 sq. ft.
Heating surface, total	3,328 sq. ft.
Superheating surface	691 sq. ft.
*Total equivalent heating surface	4,365 sq. ft.
Grate area	53 sq. ft.
Center boiler, above rail	9 ft. 8 in.
Top smokestack, above rail	15 ft. 4 in.

Tender.

Tank, style	U shape
Wheels, diameter	37¼ in.
Journals	5½ in. x 10 in.
Water capacity	8,275 gal.
Coal capacity	12 tons

*Equivalent total heating service equals the total heating surface (3,328 sq. ft.) plus 1½ times the superheating surface.



Pacific Type Locomotive With Superheater; Chicago & North Western.

FOREIGN RAILWAY NOTES.

The number of miles of government railways in operation in Trinidad is 81.5, the cost of construction of which was $4,553,048. The total receipts of all lines for the year ended June 30, 1910, were $517,094, and the expenditures, excluding interest on bonds, $311,127.

The construction work on the Amoy-Changchow railway in China, which was discontinued some months ago owing to lack of funds, is still at a standstill. The recent offer by Chinese-Penang capitalists to buy the line, paying 50 per cent. of the entire outlay to present stockholders, was refused. It is expected that the reorganization of the company will be effected early in 1911.

The projected direct railway between Valencia, Spain, and Madrid has now been advanced to the final stage by the publication of a royal order accepting one of the two plans and specifications submitted for approval to the Department of Public Works, so that this railway, to be constructed under government subsidy, is now a certainty. The plans accepted, subject to certain modifications, are those of Don Jose Carbonell, Madrid, with an estimated total cost of construction and equipment of about $9,406,000. With the opening of this railway, Valencia will become the undisputed seaport of Madrid, from which it will be separated by only 230 miles of rail. The other ports of the Peninsula are all far more unfavorably situated with regard to the capital, Corunna being 516 miles by rail from Madrid, Vigo 511, Cadiz 439, and Barcelona 426. It is intended to commence work on the new road simultaneously on five sections and inaugurate it in 1914. The 55 miles of railway already constructed between Valencia and Utiel will be used as the first section on the Valencia side, if negotiations with the company now operating it lead to acceptable terms, but if not an independent line will be constructed over this section without state subsidy, which is only granted on new railways between localities where no railway communication exists. The government subsidy is about $10,800 per mile, with an additional $2,700 per mile in the form of an advance returnable in yearly installments from the profits of the line from the second year after its inauguration.

General News Section.

The lower house of the South Carolina legislature has passed the senate resolution directing the Attorney General to drop the merger case against the Southern Railway. This was a test vote and ends the legislation.

During the calendar year 1910, the Union Pacific System, the Southern Pacific Company, and the Southern Pacific Lines in Mexico, having a mileage of 17,960 miles, carried 49,492,150 passengers, without killing one. The total passenger mileage was about three billion.

The House Committee on Interstate and Foreign Commerce has been holding hearings on the proposition to provide for the physical valuation of railways. Representatives Madden and Lenroot spoke in favor of the measure. Railway men were present to oppose the bill. Members of the committee say that there will be no legislation on this subject at this session.

It is announced in the Texas newspapers, that the Texas State Railroad will be sold, if the state can find a buyer. It was operated at a loss of $12,000 last year. It was originally intended to extend the road several hundred miles, but this idea was long since abandoned. It runs from Rust to Palestine, a distance of 31½ miles, and is operated in connection with the state penitentiary.

Former Governor C. N. Haskell of Oklahoma has written a letter advocating the elimination of that provision of the state constitution which prohibits railways built in Oklahoma from being sold to an interstate line. He says that the best interests of the state will be served by the building of railways where they are needed, and "that as soon as they are completed the other railway lines will lease and operate them to the good of the state."

The Chicago, Burlington & Quincy is experimenting with an attachment to be applied to the common track drills for removing nuts from track bolts. The drill and bits are removed and a wrench substituted in their place. After the nuts have been loosened with a common track wrench they can be removed and replaced with this attachment much quicker than can be done by hand in the usual way. It is especially convenient in putting on nut locks. While but a few tests have been made, the results obtained so far have been satisfactory.

On page 146 of the *Railway Age Gazette,* January 20, there was an announcement that a number of 1500 candle power headlights were to be furnished the Lake Shore & Michigan Southern, in order to comply with the Indiana headlight order. The statement should have been followed by an explanation that the order of the Indiana commission is too indefinite to be obeyed understandingly by any intelligent headlight man, because it must refer to a reflected light, and the candle power of a reflected light varies with the distance from the reflector and the position in regard to the axis of the reflector at which the light is measured. Hence the statement that a 1500 candle power light is to be furnished is utterly meaningless or misleading unless the point of measurement is also given. In this case it happens to be that the measurement will be made at a distance of 350 ft. ahead of the glass, and for 3 ft. outside the rails, and represents 1,500 equivalent candle power at 330 ft. This is not a high power headlight, as might be inferred from the bare statement in the news item, and is not so brilliant as to be dazzling; but it is one that should give a somewhat better illumination than the oil headlight in common use.

Governor Colquitt's Views.

A despatch from Galveston, Texas, to the St. Louis *Globe-Democrat* says: "Governor Colquitt, who came from the railway commission to the executive mansion, believes there is entirely too much anti-railway legislation on the statute books of Texas, and he protests against any more new laws on this line. He says Texas owes much to the railways for development of its resources and establishment of enterprises and reminds the legislature that the railways are ready and willing to do more, if permitted to earn reasonable interest on their investments.

"The new governor declares that the railway laws to be adopted, if any new ones are to be passed by this legislature, must be favorable to the railways, or they will be vetoed. He says, however, there is no need of any new laws, and some of the laws presumed to be safeguarding the public against the railways might be repealed and Texas would be better off. He says he firmly advocates regulation of the railways, but not confiscation."

Disastrous Collision on Western of France.

A press despatch of February 14 reports a collision on the Western of France, near Courville, in which ten or more persons were killed and a large number injured. It is said that two express trains simultaneously ran into a freight train which was moving from the main track to a siding. The wreck took fire and was partly consumed.

Tungsten, Titanium, and Tantalum.

The world's production of tungsten for 1909 was larger than in 1908, and was possibly equal to that of 1907, according to Geological Survey publications. The estimated output for 1909 was 5,289 short tons of concentrates containing 60 per cent. of tungsten trioxide, compared with 3,898 tons in 1908 and 6,062 in 1907. In very few of the returns, however, is the percentage indicated, and this is necessary in comparing figures. It is probable that most of the exported ore is richer than 60 per cent. in tungsten trioxide, and that the figures are therefore low. The principal sources of the 1909 production were: United States, 1,619 tons; Argentina, 900 tons; Australia, 1,200 tons; Bolivia, 168 tons; Germany, 106 tons; Portugal, 609 tons, and the United Kingdom, 421 tons. The volume of the tungsten ore produced in the United States during 1909 was $614,370, compared with $229,955 in 1908 and $890,048 in 1907. With the recovery of the American steel trade during 1909 prices rose above those of 1908 and ranged from $5 to $9 per unit for tungsten ores, the average price being $6 to $6.50 per unit. So far as known, titanium oxide deposits at Roseland, Va., are the largest in the world. The use of titanium in making steel rails increased considerably during 1909 and its use in arc-light electrodes is also growing. No production of molybdenum or uranium minerals and only a small output of a tantalum mineral is known to have been made in the United States during 1909. The use of molybdenum in steel has not increased much. Tantalum incandescent electric lamps have such strong competition in tungsten lamps that the demand for tantalum minerals seems rather to have decreased than grown. The tantalum used in this country in 1909 was imported from Germany.

New Haven's Boston Improvements.

The New York, New Haven and Hartford desires to acquire the Boston, Revere Beach & Lynn (narrow gage), and has submitted to the Massachusetts legislature a bill designed to give the necessary authority. At the hearing before the committee, T. E. Byrnes, vice-president of the road, said: "The New York, New Haven & Hartford proposes to build and equip a double-track tunnel under Boston harbor, connecting the East Boston branch of the Boston & Maine and the Revere Beach road with the South Station, using the lower level of the station; and to connect with the main line of the New Haven at a point between the tracks of the South Terminal Company and the Back Bay station. It is proposed to equip and operate by electricity at least two tracks of the New Haven road from Readville to the tunnel; also the tracks through the tunnel, and two additional tracks from the tunnel to Lynn and the tracks of the R. B. & L. from the tunnel to Lynn. It is also proposed to four-track the main line of the Boston & Maine beyond Lynn to Beverly, building a four-track tunnel through the city of Salem; and

as soon as the grade crossings on the line are eliminated and the Salem tunnel completed to operate by electricity at least as far as Beverly. The tunnel will cost about $12,000,000, while the other work outlined will amount to nearly as much."

The road asks permission to charge an additional fare through the tunnel. The completion of the proposed improvements would permit trains to be sent through from points south to points north of Boston, without change and make Boston for the first time a way station.

A Chicago Railway Commission.

The city council of Chicago has adopted resolutions authorizing the mayor to appoint a railway terminal commission. The resolutions say that the entire railway passenger and freight terminal situation of the city demands thorough and intelligent investigation. The commission will probably consist of 15 members, the majority of whom will be members of the city council. The mayor is to be a member of the commission, ex-officio.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held on February 17. Frederick H. Milliner, Omaha, Neb., experimental electrician of the Union Pacific will present a paper on The Application of the Wireless Telegraph as an Aid in the Operation of Railways. It will be illustrated by a large number of lantern slides.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on February 15, a paper by E. D. Hardy, M. Am. Soc. C. E., on Water Purification Plant, Washington, D. C., Results of Operation, was presented for discussion.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911; St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court. Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo., 3d Friday in Month; Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911; Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The next meeting of the Transcontinental Passenger Association will be held at Salt Lake City, Utah, beginning June 14.

It is announced that the Harriman Lines will spend $1,250,000 for advertising during the present year, which is much larger than the sum spent last year.

An arrangement has been made by the Western Pacific and the Southern Pacific under which through tickets may be sold by each to all points on the lines of the other which are not also on the lines of the originating road.

The Grand Trunk has announced that it will make the same tourist rates from Chicago to eastern points this summer as have been made by the Central Passenger Association Lines for the last two years. These rates have been on the basis of a fare and a third plus $1.50 for the round trip. It was proposed to advance the rates to a fare and a half.

The management of the Pennsylvania Lines West of Pittsburgh has issued a half dozen pamphlets for the benefit of farmers, each pamphlet dealing with one of the following six subjects: Wheat, corn, oats, alfalfa, orchards and soil fertility. These pamphlets are made pocket size and have been prepared in co-operation with the faculty of the Ohio State University.

The Secretary of War has notified the Pacific Mail Steamship Company of cancellation of its contract with the Panama Railroad Co., by which rates on through freight are to be divided on the basis of 70 per cent. for transportation from San Francisco to Panama and 30 per cent. from Panama to New York. Mr. Dickinson declares that this division is inequitable. The contract is revocable upon 90 days' notice.

The railways running East from Chicago have asked the Interstate Commerce Commission for authority to postpone for sixty days the effective date of the new milling-in-transit rules, drawn up several months ago to comply with views of the commission as to alterations necessary to secure greater protection against violation of tariffs. The new rules were to go into effect, February 15, but objections were raised by the Chicago Board of Trade.

Senator Logan of Polk County, Arkansas, has introduced in the state legislature, a bill to increase the taxes of all the railways in the state. This is proposed on the ground that the roads have secured injunctions against the enforcement of the passenger and freight rates fixed by statutes and by the railway commission, and in their pleadings have represented that the value of their properties is so great that they are unable on the rates fixed by state authorities to earn a fair return.

The Pennsylvania Railroad has in the city of Philadelphia 56 separate and distinct freight stations, claimed to be the largest number of freight stations maintained by any road in any city. The area of the city being 128 sq. miles, there is an average of one station to about 2½ miles. The company has just made a new wall map showing the locations of the stations and of the lines by which they are connected to the main lines of the road; and also giving information about scales, electric cranes and other facilities. The traffic officers of the road rank Philadelphia as "the leading manufacturing center of the world."

The railways are offering no opposition whatever to the proposed legislation to limit the issuance of free passes in Illinois, but, nevertheless, the bills for this purpose are not making much progress. The legislators show a very much stronger disinclination to give up the passes than the railways show to having their issuance prohibited. Three propositions have been offered: One is to follow the lines of the Interstate Commerce Law; another is to prohibit the issuance of any passes at all to anybody, the obvious purpose being to so load down the bill that it will be killed; the third is to exempt so many classes of persons that the bill will be valueless. It is obvious that the bill easily could be passed if only it provided that the legislators might be allowed to keep their passes.

The suit in the federal court at New Orleans, in which the Texas & Pacific was fined $500 for the collection of illegal storage charges, as noticed in our last issue, page 297, is notable as being the first one ever prosecuted in the courts under the Interstate Commerce act for collecting more than the published rates. Mr. Marble, attorney of the Interstate Commerce Commission, informs us that all previous prosecutions for departures from published rates have been based on cases where the amount collected was too small; not too large. The present suit arose in connection with shipments of hay from Arkansas to New Orleans in 1907 and 1908. Owing to congestion in the yards at New Orleans, the cars were held back at Westwego; but the consignees were notified that the hay was ready for delivery, and demurrage was charged. As this charge was for detention of cars at a point other than the destination, it was held that the carrier had collected an amount greater than its published charges for transportation to destination; and on the facts as thus stated, the Interstate Commerce Commission prosecuted the road. As stated last week, the railways claim that the practice here condemned was common among all of the roads in that territory and that the collection was not made without first consulting the legal department.

Chicago Traffic Club.

At the meeting of the Chicago Traffic Club on Tuesday of this week, the principal speaker was Walter E. McCormack, formerly an attorney of the Interstate Commerce Commission. Mr. McCormack holds that the Federal Government has the necessary power to regulate the railways, to the absolute exclusion of regulations made by the individual states. He declared that the present situation, under which the railways are subject constantly to conflicting jurisdiction, as between state and federal authorities, is intolerable.

C. M. & P. S. Through Trains.

The Chicago, Milwaukee & St. Paul announces that regular through passenger trains to and from the Pacific coast over the Chicago, Milwaukee & Puget Sound will begin running May 28. Trains composed wholly of steel cars will be put on, to run daily between Chicago and Seattle. One of the trains will be called the Olympian and the other the Columbian.

Freight Rates to Colorado.

The new and increased freight rates from the Atlantic seaboard to Colorado points filed last month by the rail and water differential lines operating from New York through the south Atlantic ports, did not go into effect, revised tariffs having been filed February 9, to go into effect February 13. The higher rates were made because of the withdrawal of concurrences in the through rate with these roads by the Colorado roads. The Colorado lines aimed to reduce the differentials in force over the lines operating through the south Atlantic ports. These lines enjoyed the same differential as those operating through the Gulf. The Atlantic lines expected the commission to suspend the new rates pending an investigation, but the commission would not interfere.

Because of the commission's refusal to suspend the withdrawal of concurrences (which were filed by the Colorado lines January 13), the lines operating through the south Atlantic ports finally decided on the tariffs filed February 9, which maintain the old rates, as noted below.

These lines are the Cumberland Gap Despatch, the Kanawha Despatch, the Seaboard Air Line and the Savannah fast freight lines. They will have to make their rates into Colorado on the Mississippi river combination plus local rates from the river into Colorado. They made persistent effort to have the withdrawal of these concurrences suspended by the commission but without effect. The commission refused to order the Colorado lines to do business with the Atlantic port lines, as other routes are still open, and the withdrawal of concurrence merely limits the choice of routes. Determined not to be shut out the Atlantic lines appealed to the commission for permission to file new through rates no higher than those in effect before the withdrawal of the concurrences. New proportional rates being made to the Mississippi river which, added to the local rates from the river into Colorado, will maintain rates on the old basis. The commission granted this permission, and the Atlantic lines have

filed the new through rates. These rates will have been filed only four days prior to their effective date. The commission acquiesced in this plan. The originating lines will now have to carry freight to the Mississippi river at from five to six cents per 100 lbs. less than under the old division.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways, in presenting statistical bulletin No. 89, giving a summary of car shortages and surpluses by groups from October 13, 1909, to February 1, 1911, says:

"The total surplus reported is 156,355 cars, an increase of 34,058 since our last bulletin. This increase is made up almost entirely of coal and miscellaneous cars, which increased 25,442 and 5,431 respectively. Of the increase in coal car surplus over 80 per cent. is on the roads in groups 2 (Eastern), and 3 (Middle). The increase in miscellaneous cars is principally in coke cars, group 2 (Eastern), and stock cars, group 10 (Pacific). Box cars show an increase of only 1,657, the largest item in this class being in group 11 (Canadian), where the increase is 2,357.

"This report shows 104,755 more surplus cars than were reported for the corresponding date in 1910. In making comparisons with last year, however, consideration should be given to the fact that there has been an increase of approximately 100,000 in the total cars owned, and also that the weather conditions during the past month have been much more favorable to railway operations than a year ago."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report, and the charts show total surpluses and shortages in 1907, 1908, 1909, 1910 and 1911.

INTERSTATE COMMERCE COMMISSION.

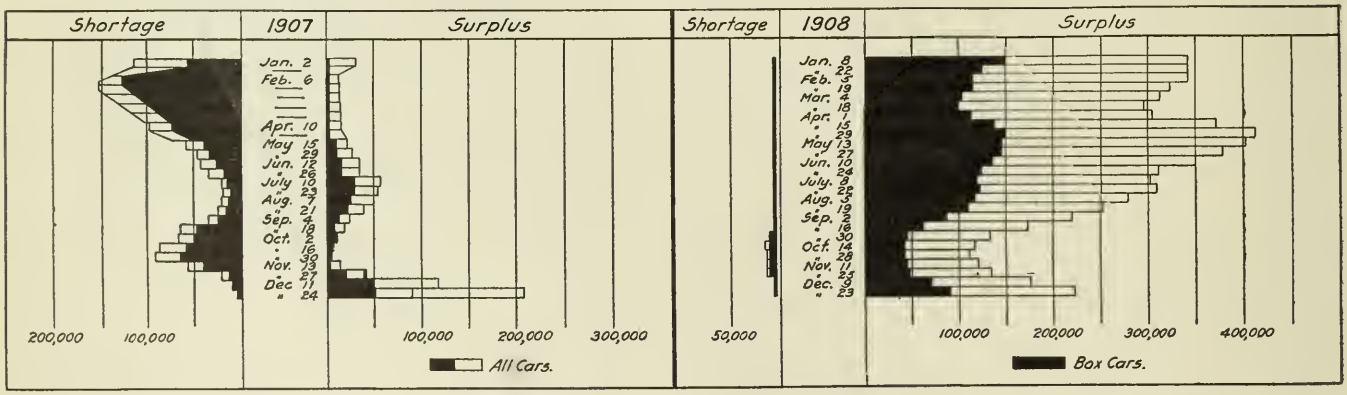
The commission has ordered a further suspension until July 1 of the proposed advances in rates on grain, grain products, etc., in the so-called South Dakota case. These are the rates from Chicago, Peoria, St. Paul and other points to points in South Dakota. The commission previously suspended them until March 1, but finds that the hearing cannot be concluded by that time.

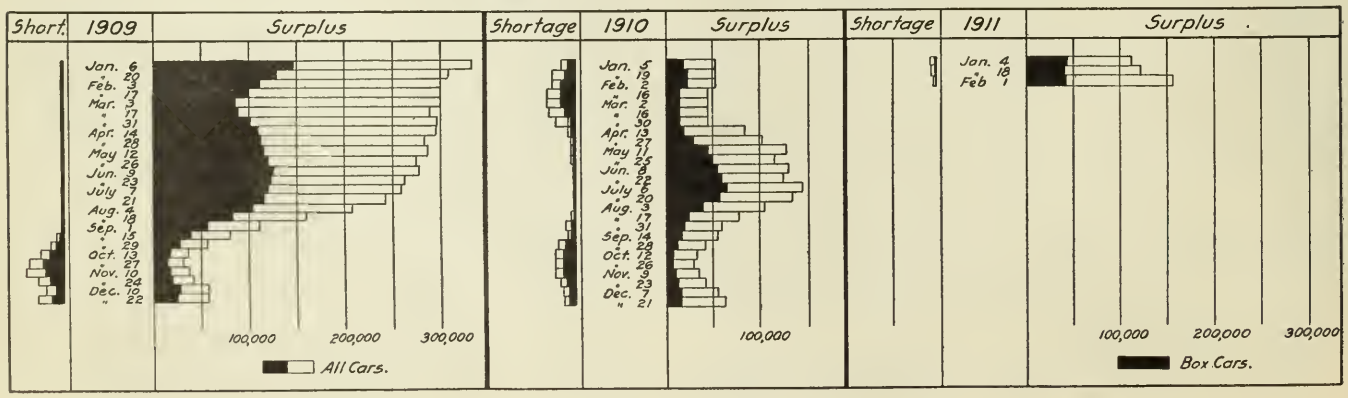
The commission has suspended the tariffs filed on behalf of the Louisville & Nashville to take effect February 10; also, until July 1, proposed advances in rates on cement over the Atchison, Topeka & Santa Fe filed to take effect March 1. New tariffs naming changes in tap line allowances filed to take effect February 23 by the Chicago & Eastern Illinois, the Evansville & Terre Haute and the Evansville & Indianapolis have been suspended until May 1.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—February 1, 1911	8	138	1,517	3,181	188	5,024	0	0	0	25	25
" 2.— " 1, 1911	24	5,574	575	16,988	7,813	30,950	2	0	0	25	27
" 3.— " 1, 1911	24	5,756	1,181	34,787	3,963	45,687	0	140	0	519	659
" 4.— " 1, 1911	10	4,693	89	1,498	1,795	8,075	0	134	0	0	134
" 5.— " 1, 1911	17	1,443	301	2,686	823	5,253	90	50	0	0	140
" 6.— " 1, 1911	21	6,980	1,576	4,493	4,929	17,978	78	8	12	150	248
" 7.— " 1, 1911	3	364	96	640	771	1,871	0	0	0	0	0
" 8.— " 1, 1911	15	4,359	591	4,008	2,469	11,427	0	0	0	4	4
" 9.— " 1, 1911	13	2,831	549	421	853	4,654	0	4	1	10	15
" 10.— " 1, 1911	21	5,660	3,539	2,516	9,618	21,333	5	0	0	30	35
" 11.— " 1, 1911	4	2,388	876	17	822	4,103	0	0	0	0	0
Total	160	40,186	10,890	71,235	34,044	156,355	175	336	13	763	1,287

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1910. (SEE ALSO ISSUE FEBRUARY 10.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Baltimore & Ohio	4,439*	$5,221,156	$1,174,751	$6,841,826	$671,909	$1,362,666	$163,373	$2,958,350	$157,586	$5,313,884	$1,527,942	—$11,984	$244,643	$1,271,315	—$373,907
Central of New Jersey	631†	1,646,295	356,993	2,096,803	195,332	306,488	29,748	636,505	40,016	1,208,089	888,714	—16,387	104,170	768,157	11,419
Chicago & Alton	1,025‡	831,239	351,770	1,268,056	171,168	232,530	38,850	491,748	37,016	971,312	296,744	—2,041	35,000	259,703	34,383
Chicago & Eastern Illinois	965	939,471	182,494	1,182,289	83,479	195,535	21,528	460,470	34,710	795,722	386,567	—474	9,229	376,864	82,555
Chicago Great Western	1,489	738,250	230,074	1,046,171	74,984	156,650	44,511	445,336	36,690	758,171	288,000	—120	32,823	255,057	100,247
Chicago, Milwaukee & Puget Sound	1,865§	1,062,835	126,602	1,226,119	66,960	143,456	20,735	428,925	13,775	673,851	552,268	—643	37,833	513,792	141,529
Chicago, Milwaukee & St. Paul	7,511	3,787,623	1,103,335	5,407,238	541,526	855,145	114,523	2,588,495	97,611	4,197,300	1,209,938	2,260	222,798	989,400	527,842
Cleveland, Cincinnati, Chic. & St. Louis	1,982	1,826,388	644,242	2,749,037	291,685	483,510	77,145	1,195,335	59,369	2,107,044	641,993	—7,737	83,548	550,708	64,058
Colorado & Southern	1,181¶	695,139	108,091	853,492	78,322	147,389	10,059	248,556	24,254	508,580	344,912	—1,848	24,700	318,364	68,555
Delaware & Hudson Co.	819‖	1,437,807	200,487	1,695,839	81,408	233,141	22,755	637,705	34,683	1,009,692	686,147	355	66,014	620,488	—197,297
Elgin, Joliet & Eastern	808*a*	588,862	7	620,823	51,541	141,165	3,895	234,743	43,728	475,072	145,751	.....	15,400	130,351	—46,474
El Paso & Southwestern Co	901*b*	534,958	81,358	643,304	81,473	93,562	10,594	191,341	24,530	401,500	241,804	—4,456	12,300	225,048	32,572
Gulf, Colorado & Santa Fe	1,518	951,057	296,647	1,331,051	190,498	184,858	26,653	453,163	30,871	886,043	445,008	.....	35,412	409,596	231,188
Illinois Central	4,550	3,648,831	1,133,969	5,386,795	429,213	968,019	119,783	1,935,655	106,806	3,559,476	1,827,319	858	223,000	1,605,177	565,787
Kansas City Southern	827	643,382	155,786	903,105	88,776	110,360	32,777	315,651	32,710	580,274	322,831	.....	29,476	293,355	41,693
Lake Erie & Western	886	390,674	72,363	488,291	67,006	94,129	13,645	190,670	13,296	378,746	109,545	.....	19,091	90,454	—52,202
Lake Shore & Michigan Southern	1,663	2,683,662	906,442	4,104,336	740,897	700,293	110,008	1,589,890	86,859	3,227,947	876,389	—4,983	170,399	701,007	—563,019
Michigan Central	1,803*c*	1,689,312	560,270	2,577,490	279,732	365,988	73,692	1,141,584	52,770	1,913,766	663,724	—4,621	166,570	492,533	—90,990
Missouri, Kansas & Texas	1,737	977,969	451,052	1,514,479	163,599	198,154	37,064	540,195	38,887	977,899	536,580	1,055	71,892	465,743	—
Missouri, Kansas & Texas of Texas	1,348	646,260	364,708	1,067,210	145,543	72,979	21,472	503,801	41,406	785,201	282,009	—672	22,102	259,229	61,314
Nashville, Chattanooga & St. Louis	1,230	743,852	251,267	1,064,643	148,168	199,458	36,685	376,450	24,445	785,206	279,437	—15	22,287	257,135	19,669
New York Central & Hudson River	3,588	5,002,278	2,388,198	8,387,012	1,143,151	1,716,418	223,865	3,454,607	211,840	6,749,881	1,637,131	23,551	404,284	1,256,398	—780,178
Oregon & Washington	244*d*	59,273	50,581	114,309	9,308	5,464	10,016	49,129	3,786	77,703	36,606	—146	2,448	34,012	34,391
Oregon R. R. & Nav. Co	1,490*d*	678,476	243,535	981,292	108,608	83,063	25,934	383,377	33,254	634,236	347,056	—4,362	91,914	250,780	—61,635
Oregon Short Line	1,618*e*	1,231,467	374,572	1,721,081	195,016	206,124	20,609	414,108	48,995	884,852	836,229	—2,470	120,160	713,599	29,160
Oregon-Washington R. R. & Nav. Co	1,569*f*	257,755	103,175	383,208	41,547	30,954	12,560	151,190	13,001	249,252	133,956	—1,496	32,982	99,478	—
Philadelphia & Reading	1,022	3,165,715	584,382	3,901,208	235,097	703,593	37,897	1,321,658	63,935	2,362,180	1,539,028	26,294	84,228	1,481,094	—62,672
Philadelphia, Baltimore & Washington	717	723,983	646,947	1,552,675	227,459	255,035	33,914	692,552	42,102	1,251,062	301,613	.....	48,907	252,706	—86,646
St. Louis & San Francisco	4,732	2,381,440	1,035,042	3,679,842	565,465	476,675	93,605	1,335,216	122,603	2,593,564	1,086,278	.....	146,750	939,528	78,760
St. Louis Southwestern	769	571,529	149,401	750,524	78,807	105,442	32,292	174,366	23,716	414,623	335,901	709	20,700	315,910	75,222
St. Louis Southwestern of Texas	703	298,351	97,655	417,455	100,203	66,285	12,280	172,988	17,386	369,142	48,313	—146	14,059	34,108	51,858
Southern Pacific Co	6,187*g*	4,383,498	2,557,159	7,453,371	985,467	960,719	190,370	2,098,086	248,679	4,483,321	2,970,050	68,418	275,054	2,763,414	—165,554
Texas & Pacific	1,884	1,209,681	423,536	1,763,168	137,834	243,055	22,526	666,357	40,746	1,110,518	652,650	1,476	93,144	560,982	—41,250
Vandalia	827	634,714	200,147	939,442	150,297	162,613	27,307	384,872	20,096	745,185	194,257	.....	28,774	165,483	—5,603
Wabash	2,514	1,829,240	582,077	2,597,621	334,556	438,165	76,585	1,076,257	84,439	2,010,002	587,619	—2,530	76,676	508,413	—27,545
Yazoo & Mississippi Valley	1,372	870,889	359,010	1,291,268	121,185	120,640	15,357	335,245	25,074	617,501	673,767	—32	33,000	640,735	272,487
SIX MONTHS OF FISCAL YEAR 1911.															
Baltimore & Ohio	4,439*	$35,790,375	$8,465,822	$46,996,377	$5,832,228	$8,615,211	$1,054,590	$17,191,853	$937,058	$33,630,940	$13,365,437	—$14,713	$1,318,865	$12,031,859	—$1,639,975
Central of New Jersey	631†	9,143,417	2,542,656	12,283,061	1,343,761	1,890,261	191,538	3,543,293	233,532	7,202,385	5,080,676	124,234	584,657	4,620,253	—338,037
Chicago & Alton	1,025‡	4,923,199	2,341,302	7,795,309	1,134,240	1,267,943	229,195	2,829,856	208,678	5,669,912	2,125,397	—12,317	214,600	1,898,480	—758,499
Chicago & Eastern Illinois	965	5,083,675	1,123,099	6,589,948	648,688	1,169,893	145,160	2,327,581	196,225	4,487,547	2,102,401	—8,900	167,129	1,926,372	—5,169
Chicago Great Western	1,489	4,535,813	1,562,340	6,584,734	744,061	955,552	282,641	2,533,497	214,436	4,730,187	1,854,548	1,671	196,936	1,659,283	—
Chicago, Milwaukee & Puget Sound	1,865§	6,564,601	758,502	7,513,501	371,367	734,773	173,341	2,516,710	72,520	3,868,711	3,644,790	17,701	227,000	3,435,491	—
Chicago, Milwaukee & St. Paul	7,511	24,607,403	7,836,014	35,522,390	4,914,576	4,759,714	655,090	14,645,021	527,809	25,502,209	10,020,180	117,941	1,303,002	8,835,119	—1,152,385
Cleveland, Cincinnati, Chic. & St. Louis	1,982	10,460,925	4,355,139	16,241,736	2,203,131	2,770,685	528,571	6,690,120	342,139	12,534,646	3,707,090	—46,414	493,548	3,167,128	—1,244,362
Colorado & Southern	1,181¶	4,012,708	916,801	5,187,557	627,323	983,483	70,200	1,601,770	134,203	3,416,979	1,770,578	—7,262	148,200	1,615,116	—19,278
Delaware & Hudson Co	819‖	8,685,427	1,742,188	10,762,065	870,600	1,437,657	142,194	3,546,683	238,784	6,235,918	4,526,147	3,492	284,880	4,244,759	—223,205
Elgin, Joliet & Eastern	808*a*	4,028,456	48	4,269,781	578,661	846,503	24,715	1,322,778	110,950	2,883,607	1,386,174	.....	92,400	1,293,774	—578,002
El Paso & Southwestern Co	901*b*	2,986,996	485,881	3,652,956	475,106	487,271	63,324	1,009,093	136,400	2,171,194	1,481,762	—7,744	109,101	1,364,917	—
Gulf, Colorado & Santa Fe	1,518	4,666,996	1,719,055	6,802,495	1,112,798	945,526	147,184	2,400,354	189,440	4,795,302	2,007,193	.....	197,038	1,810,155	282,549
Illinois Central	4,550	20,905,135	6,839,462	31,394,419	4,103,102	6,386,431	674,634	10,394,747	625,820	22,184,734	9,209,685	—33,533	1,246,591	7,929,561	2,058,280
Kansas City Southern	827	3,905,555	878,231	5,311,608	541,500	663,139	162,655	1,745,330	172,646	3,285,270	2,026,338	.....	176,858	1,849,480	394,929
Lake Erie & Western	886	2,269,997	513,879	2,942,445	476,120	541,443	100,838	1,085,356	73,253	2,277,009	665,435	.....	113,762	551,673	—234,266
Lake Shore & Michigan Southern	1,663	16,600,179	6,204,592	25,707,082	4,431,480	3,972,345	643,520	8,798,352	474,835	18,320,532	7,386,550	—28,285	910,182	6,448,083	—2,784,563
Michigan Central	1,803*c*	9,862,812	4,235,687	15,707,412	2,356,301	2,216,237	468,790	6,256,464	295,652	11,593,444	4,113,968	—23,826	695,020	3,395,122	—1,267,625
Missouri, Kansas & Texas	1,737	6,110,061	2,545,492	9,204,599	1,256,105	1,325,617	218,144	3,016,005	259,438	6,075,309	3,129,290	1,001	346,519	2,783,772	—
Missouri, Kansas & Texas of Texas	1,348	3,802,795	2,027,010	6,163,064	920,493	384,357	137,327	2,624,612	211,541	4,278,330	1,884,734	—3,410	134,602	1,746,722	304,913
Nashville, Chattanooga & St. Louis	1,230	4,118,393	1,505,381	5,988,109	885,415	1,126,327	211,573	2,126,245	149,128	4,498,689	1,489,420	—2,826	133,722	1,352,872	—61,539
New York Central & Hudson River	3,588	29,914,096	16,988,217	52,441,586	7,440,441	8,682,796	1,294,710	19,168,460	1,323,138	37,909,545	14,532,041	17,509	2,401,496	12,148,054	—2,231,352
Oregon & Washington	244*d*	464,451	432,548	935,725	75,942	31,705	61,008	380,252	23,500	572,412	363,313	—5,734	18,948	338,631	340,261
Oregon R. R. & Nav. Co	1,490*d*	5,372,148	2,210,619	8,075,948	1,082,408	731,587	180,369	2,722,572	199,795	4,916,731	3,159,217	—917	388,049	2,770,250	—704,381
Oregon Short Line	1,618*e*	7,958,208	2,750,048	11,348,353	1,513,575	1,122,096	175,307	2,632,352	265,829	5,709,159	5,639,194	—4,664	430,021	5,204,509	—737,493
Oregon-Washington R. R. & Nav. Co	1,569*f*	257,756	103,175	383,208	41,546	30,954	12,560	151,190	13,001	249,252	133,956	—1,496	32,982	99,478	—
Philadelphia & Reading	1,022	17,715,782	3,715,556	22,410,826	2,020,755	4,117,982	262,466	7,083,822	398,816	13,883,841	8,526,985	121,630	505,060	8,143,554	200,325
Philadelphia, Baltimore & Washington	717	5,051,889	3,966,546	9,959,139	1,488,458	1,577,183	180,872	4,004,007	214,887	7,465,407	2,493,732	.....	293,442	2,200,290	83,885
St. Louis & San Francisco	4,732	14,087,279	6,018,291	21,565,370	3,180,591	2,951,157	506,746	7,377,139	610,628	14,626,262	6,939,108	.....	849,030	6,090,078	502,568
St. Louis Southwestern	769	3,153,520	752,082	4,076,963	433,594	630,516	165,913	1,001,637	130,809	2,362,469	1,714,494	4,217	115,366	1,594,911	24,430
St. Louis Southwestern of Texas	703	1,666,496	579,828	2,379,738	546,231	421,997	64,616	970,796	97,054	2,100,693	279,044	—1,328	55,726	221,990	73,119
Southern Pacific Co.	6,187*g*	29,075,037	16,704,007	48,970,148	5,906,882	6,044,893	989,390	12,604,169	1,373,852	26,919,186	22,050,962	295,602	1,650,323	20,696,241	—1,731,326
Texas & Pacific	1,884	6,075,719	2,236,483	8,945,129	992,432	1,589,208	128,252	3,359,065	215,781	6,284,738	2,660,391	—12,148	343,348	2,304,895	—275,042
Vandalia	827	3,812,961	1,297,913	5,652,446	769,331	996,510	168,009	2,189,485	117,954	4,241,289	1,411,157	.....	169,560	1,241,597	—18,906
Wabash	2,514	10,596,077	4,158,511	15,871,269	1,830,476	2,419,605	472,806	5,890,967	420,284	11,034,138	4,837,131	—7,225	450,354	4,379,552	—156,460
Yazoo & Mississippi Valley	1,372	3,846,326	1,448,267	5,626,885	1,077,927	826,947	89,909	1,674,568	139,982	3,809,333	1,817,552	—3,061	197,942	1,616,549	635,123

Mileage operated on December 31, 1909.—* 4,460 miles; † 668 miles; ‡ 998 miles; § 1,400 miles; ¶ 1,248 miles; *a* 770 miles; *b* 867 miles; *c* 1,746 miles; *e* 1,509 miles; *g* 6,061 miles.

‖ 1910 figures exclude operations of Cooperstown & Charlotte Valley R. R.

d Merged, midnight December 23, 1909, into the Oregon-Washington R. R. & Nav. Co.

f Began operation on December 24, 1909, as a consolidation of Oregon & Washington R. R. and Oregon R. R. & Nav. Co.

Tariff to Penalize Shipper for Poor Marking Is Illegal.

C. H. Algert Company v. Denver & Rio Grande. Opinion by Chairman Clements:

The rule of the Western Classification providing that L. C. L. shipments consisting of separate packages shall be rated one class higher when each package, or piece is not plainly and indelibly marked with the name of consignee and the name of the station, and state is unreasonable. Reparation awarded. The higher rate on packages not properly marked was in the nature of a penalty. Such a rule would result in discrimination, in that the higher rate would be applied in some cases and the lower in others, due to the fact that there could be no uniformity in the determination by the various agents of the question of fact as to whether or not particular packages were properly marked. All questions of this nature ought to be settled before the goods are accepted. (20 I. C. C. 93.)

STATE COMMISSIONS.

The Texas railway commission has cited the Texarkana & Fort Smith, which is the Texas corporation of the Kansas City Southern, to appear before it and show cause why $10,000 a mile of its securities should not be cancelled and its charter forfeited on the ground that it has issued stocks and bonds exceeding by that amount the valuation placed on its property by the commission.

COURT NEWS.

The Oklahoma Supreme Court has decided that the corporation commission has power to order the railways to build union stations at junction points. The decision was rendered in a case brought by the Missouri, Oklahoma & Gulf to restrain the commission from enforcing an order requiring the construction of a station at Durant.

The United States circuit court of appeals at Cincinnati, February 7, upheld the fine of $100 that had been imposed by the federal court in Tennessee against the Louisville & Nashville under the federal safety appliance law. The railway claimed that as the defective car was used only in intrastate commerce, the federal law did not apply to it. The circuit court of appeals overruled this contention.

Judge Gibbons of the circuit court of Cook county, Illinois, has overruled the demurrer of the defendants in the suit brought by the Illinois Central against Frank B. Harriman, former general manager of the road, and other officers for an accounting in connection with the alleged frauds against the railway in the matter of car repairs. This means, of course, that the Illinois Central has stated a good cause of action and that the cases must go to trial.

The supreme court of New Hampshire has decided in favor of the state in its suit to declare illegal certain advances in freight rates made several years ago by the Boston & Maine, on three of its leased lines, in violation of the terms of the laws under which the leases were authorized. The roads in question are: Portsmouth, Great Falls & Conway, 73 miles, Portsmouth to the White Mountains; Dover & Winnepesaukee, Dover to Alton Bay, 29 miles; Wolefboro Railroad; Wolfeboro Junction to Wolfeboro, 12 miles. The laws authorizing the Boston & Maine to acquire control of these roads were passed in 1883, 1889 and 1892; and they stipulated that there should be no increase in the rates then in force, either passenger or freight. The suit was begun by the attorney general in the lower court in 1908 and it was there decided against the road; and the present decision, made on appeal, confirms the earlier opinion. This suit is the same concerning which president Mellen, soon after he took the presidency of the Boston & Maine, said that he would comply with the law as interpreted by the supreme court. He added, however, that it was against public policy to have different rates on different small divisions of the Boston & Maine, and said that he should ask the legislature to permit increases in the rates. This application to the legislature has already been made.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

James A. Blair, Jr., has been elected president of the Macon, Dublin & Savannah, with office at New York, succeeding Homer Loring.

C. D. Meneely, secretary and treasurer of the Brooklyn Rapid Transit, has been elected vice-president and treasurer and a member of the board. J. H. Bennington succeeds Mr. Meneely as secretary.

R. V. Taylor, general manager of the Mobile & Ohio, at Mobile, Ala., has been elected vice-president and general manager, and S. R. Prince, assistant general counsel, at Mobile, has been appointed general counsel, succeeding E. L. Russell, deceased, who was vice-president and general counsel.

R. V. Fletcher has been appointed general attorney of the Illinois Central and the Yazoo & Mississippi Valley, with office at Chicago. George A. Dupuy has been appointed special attorney of the Illinois Central, with office at Chicago. A. P. Humburg has been appointed commerce attorney and E. W. McGrew has been appointed attorney, both with offices at Chicago.

R. V. Fletcher, who has been appointed general attorney of the Illinois Central and the Yazoo & Mississippi Valley, with office at Chicago, was born in Grant County, Ky., September 27, 1869, and received his preparatory education at a private high school in Williamstown, Ky. He removed to Mississippi in 1893, where he taught in a high school and at the same time pursued a post graduate course in the University of Mississippi. He was admitted to the bar in 1899; was engaged in private practice for a number of years, was elected attorney general of Mississippi in November, 1907, and a year later was appointed a judge of the state supreme court. For the past two years he has been a member of the firm of Flowers, Fletcher & Whitfield, attorneys in Mississippi for the New Orleans, Mobile & Chicago Railroad and the Postal Telegraph-Cable Company.

Operating Officers.

R. L. Logan, superintendent of telegraph of the Kansas City Southern, at Kansas City, Mo., has had his authority extended over the Arkansas Western.

William H. Whalen, superintendent of the Tucson division of the Southern Pacific, has been appointed superintendent of the Los Angeles division, with office at Los Angeles, Cal., succeeding W. H. Averell, resigned. Mr. Whalen was born in 1861, in Auburn, N. Y. He was educated at the high school of the Valparaiso Normal School, Indiana, and afterwards took some courses of the Scranton (Pa.) Correspondence School. Mr. Whalen began railway work November 3, 1882, on the Chicago & North Western, working as a boiler maker for about two years. He was, consecutively, locomotive fireman, engineman and roundhouseman at Chicago. On January 1, 1900, he was made master mechanic at Baraboo, Wis., and on May 1, 1901, he was transferred to the operating department and made assistant superintendent at Oshkosh, Wis. In October, 1902, he was made superintendent of the Iowa division,



William H. Whalen.

where he remained until April 1, 1908, when he was appointed superintendent of the North Wisconsin division. In July of the same year he was made superintendent at Dunsmuir, Cal., and was later made superintendent of the Tucson division.

T. A. Shea, trainmaster of the Missouri Pacific at Little Rock, Ark., has been appointed superintendent, with office at Aurora, Mo., succeeding J. W. Daniels, resigned.

E. B. Fisher, general superintendent of the Missouri, Oklahoma & Gulf, with office at Muskogee, Okla., has resigned, and, effective February 15, that office has been abolished. I. H. Luke, general manager at Muskogee, will assume the duties heretofore performed by Mr. Fisher.

W. H. Whalen, superintendent of the Tucson division of the Southern Pacific at Tucson, Ariz., has been appointed superintendent of the Los Angeles division, with office at Los Angeles, Cal., succeeding W. H. Averell, resigned. J. H. Dyer, superintendent of the Shasta division, at Dunsmuir, succeeds Mr. Whalen; and J. W. Metcalf, assistant superintendent at San Joaquin, succeeds Mr. Dyer.

S. B. Robertson, engineer of the Indianapolis division of the Pennsylvania Lines West, at Columbus, Ohio, has been appointed superintendent of the Erie & Ashtabula division, with office at New Castle, Pa., succeeding Henry W. Thornton, resigned to accept service with another company. F. J. Perry, assistant trainmaster at New Castle, has been appointed trainmaster of the Erie & Ashtabula division, with office at New Castle, succeeding W. M. Wardrop, promoted.

Traffic Officers.

L. F. Curtis has been appointed immigration commissioner of the Nevada-California-Oregon Railway.

T. L. Jennings has been appointed a traveling freight agent of the Alabama Great Southern, with office at Birmingham, Ala., succeeding S. A. Williams, transferred.

W. W. Keith, general agent of the Tonopah & Tidewater at Goldfield, Nev., has been appointed assistant to the traffic manager, with office at Oakland, Cal.

W. A. Kellord has been appointed general baggage agent of the Missouri, Kansas & Texas, with office at Denison, Tex., succeeding George H. Bower, resigned.

A. Traynor, general baggage agent of the Union Pacific at Council Bluffs, Iowa, has had his jurisdiction extended over the Oregon Short Line, effective February 1.

L. Richardson has been appointed district passenger and freight agent of the Southern Pacific, with office at Oakland, Cal., succeeding C. M. Burkhalter, resigned to go to another company.

George F. Hobart has been appointed traveling freight agent of the Tennessee, Alabama & Georgia (formerly the Chattanooga Southern), with office at Birmingham, Ala., succeeding J. C. Fraser, resigned.

Samuel G. Hatch, general passenger agent of the Illinois Central and the Indianapolis Southern, at Chicago, has been appointed passenger traffic manager of those roads and the Yazoo & Mississippi Valley, with office at Chicago, succeeding Albert H. Hanson, retired.

A. W. Lefeber, auditor and purchasing agent of the Midland Valley, at Muskogee, Okla., has been appointed also traffic manager, a new position. Eugene Mock has been appointed general freight and passenger agent, with office at Muskogee, succeeding J. O. Hamilton, resigned, effective March 1.

R. P. Hurley has been appointed a commercial agent of the Lake Shore & Michigan Southern and the New York Central Fast Freight Lines, with office at Toledo, Ohio. M. W. Siebert has been appointed dairy agent, and E. L. Adams, G. W. Winters, J. H. Hunter and W. H. Amsden have been appointed traveling freight agents, all with offices at Toledo.

Engineering and Rolling Stock Officers.

John Roberts has been appointed signal engineer of the New York, Westchester & Boston, with office at New York.

T. M. Hutson has been appointed supervisor of track, district No. 1, of the Louisiana & Arkansas, with office at Stamps, Ark.

A. Bernard, supervisor of bridges and buildings of the Illinois Central at Durant, Miss., has had his headquarters changed to Water Valley, Miss.

J. B. Emery has been appointed master mechanic of the Texarkana & Fort Smith, with office at Texarkana, Tex., succeeding E. Gilroy, resigned.

T. M. Price, assistant master mechanic of the Detroit, Toledo & Ironton at Jackson, Ohio, has been appointed general foreman, with office at Jackson, succeeding H. F. Martyre, resigned.

M. Weber has been appointed master mechanic of the Albuquerque division of the Atchison, Topeka & Santa Fe Coast Lines, with office at Winslow, Ariz., succeeding William Daze, assigned to other duties.

Willard Doud, shop engineer of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed shop engineer of the Illinois Central, with office at Chicago. He will give particular attention to planning improvements in power plants and other features of the shops which come especially under the mechanical department.

The following officers of the Kansas City Southern have had their authority extended over the Arkansas Western: C. E. Johnson, chief engineer, at Kansas City, Mo.; J. W. Small, superintendent of machinery, at Pittsburg, Kan.; J. J. Taylor, general foreman of bridges and buildings, at Texarkana, Tex.; and P. Gratton, general roadmaster, at Kansas City, Mo.

F. H. Watts, engineer of the Logansport division of the Pennsylvania Lines West, at Logansport, Ind., has been appointed engineer of the Indianapolis division, with office at Columbus, Ohio, succeeding S. B. Robertson, promoted. E. B. Taylor, Jr., division engineer of the Cincinnati & Muskingum Valley, at Zanesville, succeeds Mr. Watts, with office at Logansport, Ind., and E. F. McCrea, assistant engineer of the Pittsburgh division of the Pennsylvania Lines West, at Pittsburgh, Pa., succeeds Mr. Taylor.

The positions of the following assistant engineers on the Kansas City Southern have been abolished: J. W. Heylmun and G. S. Russell, at Kansas City, Mo.; W. H. Bush, Pittsburg, Kan., and O. P. Allee, Siloam Springs, Ark. A. Leckie has been appointed division engineer at Pittsburg, Kan., in charge of all engineering work previously handled by the above abolished offices. The positions of assistant engineers H. De W. Smith, at Texarkana, Tex., and R. H. Gaines, Mansfield, La., are abolished. R. H. Gaines has been appointed division engineer at Texarkana, Tex., in charge of all engineering work previously handled by these two offices. He has also been made chief engineer of the Texarkana & Fort Smith. The position of H. De W. Smith, resident engineer of the Texarkana & Fort Smith, at Texarkana, has been abolished. A. F. Rust, resident engineer of the Kansas City Southern, at Kansas City, Mo., has been appointed a consulting engineer, and his former position has been abolished. M. A. Box, roadmaster, has been appointed general roadmaster of the Southern division of the Kansas City Southern and the Texarkana & Fort Smith, with office at Texarkana, Tex., succeeding John Gratton, resigned.

Purchasing Officers.

R. G. Lowry has been appointed general storekeeper of the Kansas City Southern, with office at Pittsburg, Kan., succeeding C. V. Twyman, resigned.

OBITUARY.

W. J. McWain, signal engineer of the Pere Marquette, died last week at his home in Detroit, Mich.

John E. Payne, president of the Erie & Western Transportation Company, a subsidiary of the Pennsylvania Railroad, which operates steamer lines on the Great Lakes, died at his home in Philadelphia, Pa., February 13. He was 68 years old.

Railway Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—The Manitoulin & North Shore will issue bonds, part of the proceeds of which are to be used for extensions to complete the line from Sudbury, Ont., in the district of Nipissing, to Little Current, on the island of Manitoulin, about 80 miles. (December 23, p. 1204.)

According to press reports, a contract has recently been given to J. D. MacArthur, Winnipeg, Man., for building 75 miles.

Canadian Northern Ontario.—The railway commissioners of Canada have authorized the building of the line from near Hawkesbury, Ont., towards Montreal, Que., also, the construction of a bridge over Riviere des Milles Isles, between Two Mountains and Laval counties, at Mile 37.9 from Hawkesbury.

Central Canada Railway & Power Company.—Application has been made in Manitoba for permission to build from Winnipeg, Man., or St. Boniface, northwesterly to the Winnipeg river in townships 17, 18 or 19, thence to the northern boundary of Manitoba, with branch lines to a point on Lake Winnipeg. Fisher, Wilson, Battram & Hamilton, Winnipeg, are the solicitors.

Charles City Western.—An officer writes that this company, which now has a line from Charles City, Iowa, to Marble Rock, 17 miles, will probably build an extension from Charles City north to Elma or to Riceville.

Colorado & Southern.—Plans are said to have been made by this company and the Colorado Midland to build jointly a line down the valley of the Blue river in Colorado, from Dillon, which is 32 miles from Leadville, to Kremmling, on the Denver, Northwestern & Pacific.

Colorado Midland.—See Colorado & Southern.

Copper River & Northwestern.—This road is now in operation from tidewater at Cordova, Alaska, to Chitina, 131 miles. The company has finished work on a total of 166 miles and expects to have the line in operation to Kennecott, about 200 miles, early in May. Several snow sheds have been erected to protect the line from drifting snow, and at another point the track has been raised several feet above the level of the plain to prevent heavy drifts. The company has been successful in maintaining its winter schedule.

Denver, Northwestern & Pacific.—A bill has been introduced in the Colorado legislature to provide for the construction by the State of the Continental Divide tunnel on the D., N. & P.

Dominion Development Railway.—Incorporation has been asked for by this company in Canada to build from the mouth of the Naas river on the Portland canal, easterly along the Naas and Omenica rivers to Peace river, thence along that river and through Alberta, Saskatchewan and the northwest territory to Fort Churchill or Port Nelson, or both, but not running south of the 55th parallel in Alberta and Saskatchewan. A. T. Thompson, Ottawa, Ont., is the solicitor.

Gulf, Sabine & Red River.—This company will build a four-mile extension of its lumber road in Calcasieu parish, La.

Kansas City Southern.—The proceeds of a proposed issue of bonds are to be used for extensions and improvements, including the laying of 25 per cent. of the 788 miles of main line with 85-lb. rail; the reduction of grades; ballasting the road; improvement of bridges, etc. (January 6, p. 62.)

Maine Central.—An application has been filed with the Railroad Commissioners of Maine for permission to build from a point about half way between Cumberland Junction, Me., and Yarmouth Junction, to Mile 18 on the main line from Portland towards Lewiston. The new track will be six miles long and will replace seven miles of the existing line over which there is the heavy Walnut Hill grade. On account of this heavy grade between Portland and the cities and towns on the middle and upper Androscoggin rivers, freight is now sent by a longer route via Brunswick and Crowley and Leeds Junction.

Manitoulin & North Shore.—See Algoma Central & Hudson Bay.

Natchez, Columbia & Mobile.—An officer writes that surveys are now being made for a branch south to a point near Sartinville, Miss., about eight miles. The work is to be carried out by the company's men. An extension is also projected north to a point near Monticello, 12 miles. Surveys are being made. (September 17, p. 521.)

North Coast.—See Oregon—Washington Railroad & Navigation Company.

Northern Illinois Electric.—An officer writes that this company has given a contract to Burns & Co., Chicago, to build from De Kalb, Ill., west via Rochelle and Newburg to West Bradford. The company now has five miles of line in operation.

Oklahoma Railway (Electric).—This company is said to be making plans to build a number of extensions from Oklahoma City, Okla., to include one south to Norman and another north to Guthrie.

Oregon Short Line.—An officer writes that the company has been authorized to lay track on the grade from Caldwell, Idaho, toward Homedale, about 11 miles; also, to build a line from Ashton to Driggs, about 37.5 miles. Grading for this line is now under way by the Utah Construction Company, Ogden, Utah. (January 20, p. 143.)

Oregon-Washington Railroad & Navigation Company.—According to press reports, contracts have been given by the North Coast for grading work on 103 miles between Spokane, Wash., and Ayer. The work will include grading a section of eight miles through Palouse canyon west of Cheney, where the estimated cost is about $175,000 a mile. Near Ayer a large bridge will be built. It is understood that contracts for the bridge work are to be let soon.

Pacific & Idaho Northern.—Work on the extension from Evergreen, Idaho, northeast to Meadows, 16 miles, has been finished and the line is now open for business. The company will further extend the line north through Long valley, and it is probable that the line will eventually be extended along the Little Salmon river towards Grangeville.

Peoples Railway.—Application has been made in Canada for permission to build lines in western Ontario to Arthur, Meaford, Owen Sound, Sarnia, Port Dover, Waterford, Hamilton, Otterville, Stratford, Goderich and a number of other places. Pringle & Guthrie, Ottawa, are the solicitors.

Quebec & Saguenay.—Bids will be received up to March 2 by J. F. Guay, Morin building, Quebec, Que., for building about 56 miles of railway, from Cap Tourmente, Que., northeast to Murray Bay wharf. The work will be let in sections of 10 miles. This line is to be built from the northern terminus of the Quebec Railway, Light & Power Company, and arrangements may be made with that company to operate the line when built.

Quebec Railway, Light & Power Company.—See Quebec & Saguenay.

Richmond, Magog & Stanstead.—This company, organized with a capital of $1,000,000, has been granted permission to build from a point near the town of Richmond, Que., south through the counties of Richmond, Sherbrooke and Stanstead, about 50 miles. The line is to be completed before June, 1917. The office of the company will be at Sherbrooke.

St. Louis Southwestern.—This company is said to have finished work on the extension from Gatesville, Texas, to Hamilton, about 25 miles, and the line is to be opened for operation this month. Work is well under way on a further extension from Hamilton to Comanche, 25 miles, and it is planned to continue the line eventually to either Abilene or Sweetwater, about 100 miles from Hamilton.

Toronto Suburban.—This company has asked permission to build an extension from a point on the authorized line to Guelph, Ont., to Milton, also to extend the Guelph line to Berlin, Preston, Hespeler, Galt and Hamilton, and for an extension of time for the construction of the previously authorized line.

Vashon Island Railway.—Organized in the state of Washington to build a line to extend the entire length of Vashon Island. The estimated cost of the work is $125,000. C. Schaefer, W. J. Gordon and J. Reid, Vashon, Wash., are interested.

Railway Financial News.

Atchison, Topeka & Santa Fe.—A syndicate of American and foreign bankers, headed by Eugene Meyer, Jr., & Company, New York, have bought from the original underwriting syndicate, which was headed by J. P. Morgan & Co., the National City bank and the First National bank, New York, the unsold portion (about $20,000,000) of the $43,686,000 4 per cent. convertible bonds issued in March, 1910.

Baltimore & Ohio.—An issue of $10,000,000 4½ per cent. notes, due June 1, 1913, has been sold to Speyer & Company and Kuhn, Loeb & Company, New York. This is part of an authorized issue of $50,000,000, of which $40,000,000 was sold last May. The new notes are issued to provide funds to retire $10,000,000 notes maturing March 10, 1911.

Boston, Revere Beach & Lynn.—See Boston & Maine.

Boston & Maine.—A bill is to be introduced in the Massachusetts legislature authorizing the acquisition of the Boston, Revere Beach & Lynn by the Boston & Maine and the necessary construction to make connections between the B. R. B. & L. and the B. & M. See item on page 327.

Chicago Heights Terminal Transfer.—This company, which operates 38 miles of road in and near Chicago Heights, Ill., has made a mortgage to the Northern Trust Company, Chicago, to secure an issue of $1,000,000 twenty-year 6 per cent. bonds.

Detroit United.—A quarterly dividend of 1¼ per cent. on the $12,500,000 stock has been declared. The last dividend (August, 1907), was 1¼ per cent. quarterly.

Fitzgerald, Ocilla & Broxton.—See Ocilla Southern.

Georgia & Florida.—It is said that the Georgia & Florida has bought, or is negotiating for, the Savannah, Augusta & Northern, which runs from Statesboro, Ga., to Garfield, 25 miles; and the Savannah & Statesboro, 33 miles long from Statesboro to Cuyler, which is on the Seaboard Air Line about 20 miles west of Savannah. The S. A. & N. has been building an extension from Garfield to Stevens Crossing, connecting with the Georgia & Florida.

Grand Trunk.—A dividend of one-half of 1 per cent. on the $35,000,000 (about) third preference stock has been declared. The last dividend on this stock was the 3 per cent. paid in April, 1908, out of earnings for the calendar year 1907.

Kansas City, Mexico & Orient.—According to the *Commercial & Financial Chronicle,* negotiations are believed to be under way for placing in Europe between $8,000,000 and $10,000,000 first mortgage fifty-year 4 per cent. bonds.

New York Central & Hudson River.—An issue of $30,000,000 three-year 4½ per cent. notes has been authorized, the proceeds to be used in continuing the Grand Central Terminal and electric zone improvements at New York, providing third and fourth tracks on the Hudson division, new passenger and freight facilities at Utica, N. Y., and Rochester, and other extensions and improvements. It is announced that this issue covers all requirements for 1911. It is expected that the majority of the notes will be sold abroad.

Ocilla Southern.—This company has leased from the Fitzgerald, Ocilla & Broxton its lines from Barnes, Ga., to Fitzgerald, 6 miles, and from Ocilla to Irwinville, 10 miles. The line from Ocilla to Broxton, 25 miles, will continue to be operated by the F. O. & B.

Philadelphia & Reading.—See Reading Company.

Reading Company.—An issue of $25,000,000 capital stock of the Philadelphia & Reading Railway has been authorized. The stock is to be issued to the Reading Company to reimburse it for the payment of $2,545,000 prior mortgage 4 per cent. bonds due and paid last July, $18,811,000 consolidated mortgages due June 1, 1911, also other liens and obligations of the railway company which have been or will hereafter be paid by the Reading Company.

Savannah & Statesboro.—See Georgia & Florida.

Savannah, Augusta & Northern.—See Georgia & Florida.

Southern Pacific.—An issue of $50,000,000 collateral trust 4 per cent. bonds of the Central Pacific has been authorized. Negotiations are under way for the sale of these securities in Paris.

Late News.

The items in this column were received after the classified departments were closed.

The Peoria & Pekin Union has ordered 2,000 tons of rails from the Illinois Steel Company. The Delaware & Hudson will place an order shortly for 4,000 tons of fabricated steel.

The Buckhannon & Northern has given a contract to the Patterson, Moran & Luck Co., Fitzsimmons building, Pittsburgh, Pa., for building a 30-mile section from the Pennsylvania-West Virginia state line to Rivesville, W. Va.

The Wrightsville & Tenille has ordered 1 ten-wheel locomotive from the Baldwin Locomotive Works. The cylinders will be 18 in. x 26 in., the diameter of the driving wheels will be 57 in., and the total weight in working order will be 128,500 lbs.

A contract has been given by the Florida East Coast to the Kissimmee Valley Construction Company, of which W. H. Coachman is president, Jacksonville, Fla., to build from Maytown, Fla., to Lake Okeechobee, 130 miles; also, a branch from Whittier to Bassenger, 30 miles.

Difficulties in the formulation of the orders to be issued in the eastern and western freight rate cases, and continued efforts to bring about unanimous decisions, have led the Interstate Commerce Commission to abandon its effort to render its opinions in these cases this week. Further conferences have been postponed until February 20, and arguments in comparatively unimportant cases, which had been set for that date, have been postponed until further notice.

The court of commerce formally opened for business Wednesday, Chief Justice Knapp presiding. Six cases have been transferred to the commerce court from the circuit court to date. The first two on the docket are the case of the Southern Pacific and the Santa Fe against the Interstate Commerce Commission, transferred from the Kansas circuit court, First division, and the Santa Fe, the Southern Pacific and the San Pedro, Los Angeles & Salt Lake against the commission, transferred from the same court. These are the Los Angeles and San Francisco switching cases. It was announced by a representative of the commission, that that body was prepared to postpone until May 1, or even later, the effective date of its order in these switching cases, in order to enable the court to determine the issues involved.

A conference was held on Wednesday between representatives of the Goulds and banking interests, after which George J. Gould said that there was and will be no controversy between the controlling interests in Missouri Pacific. It had long been his intention, known to Mr. Rockefeller and Kuhn, Loeb & Co., to retire from the presidency of the company, as soon as the corporation could obtain the services of the best equipped railway man to take his place. The offer of his position was made some time ago to a well-known railway man, who was unable to avail himself of it. Ever since, various men have been under consideration and discussion, and it is hoped that a selection will be made in the very near future. Stock owned and represented by the interests referred to will be voted at the annual election for the following directors: George J. Gould, Fred T. Gates, Cornelius Vanderbilt, E. T. Jeffrey, Paul M. Warburg, of Kuhn, Loeb & Co., Edwin Gould, Edgar L. Marston, of Blair & Co., Kingdon Gould, E. T. Adams, representative in this country of the Deutsche bank; J. J. Slocum, W. K. Bixby, O. L. Garrison, and a vacancy left for the president to be selected, who is to reside in St. Louis. Mr. Gould will become chairman of the board of directors. The foregoing statement means that control of the property hereafter rests with Kuhn, Loeb & Co., the Deutsche bank, and Blair & Co. The property is to be thoroughly rehabilitated, Kuhn, Loeb & Co. financing the improvements. The outstanding stock of the Missouri Pacific is about 830,000 shares. Of these the Gould interests are supposed to hold between 360,000 and 400,000 shares; Kuhn, Loeb interests, from 100,000 to 125,000 shares, and the Rockefeller interests from 75,000 to 125,000 shares.

Supply Trade Section.

The Asbestos Protected Metal Company, Canton, Mass., has opened a branch office at 613 Fisher building, Chicago, under the management of Wilmot W. Burritt.

The Detroit Steel Products Company, Detroit, Mich., will have an exhibit of Detroit-Fenestra windows in space 277 at the Chicago Cement Show, February 17 to 23.

The Pawling & Harnischfeger Company, Milwaukee, Wis., has opened a branch office at 533 Baronne street, New Orleans, La., under the management of T. W. Waddell.

Prof. John S. Leake has resigned his position in the Manual Training School, Louisville, Ky., and is now with the Pneumatic Jack Company, Louisville, with office in Louisville.

The Walls Frogless Switch & Manufacturing Company has been incorporated in Colorado to manufacture an invention of J. W. Walls, Pueblo, Colo. The incorporators are: J. W. Walls, M. C. Johnson and J. M. Luqueer.

The American Manufacturers' Export Association, with office at 1 Madison avenue, New York, has been formed to promote foreign trade. Henry T. Wills, secretary of the National Tariff Commission Association, has been made secretary of the new organization.

The David Lupton's Sons Company, Philadelphia, Pa., has opened an office in the Peoples Gas building, Chicago. This office will be in charge of R. A. Sanborn, who has resigned his position as division engineer for the board of supervising engineers of Chicago. Mr. Sanborn's experience in building construction will be an advantage to him in advising on the construction necessary in fitting Lupton products.

The United States Metal Products Company, a consolidation of the John W. Rapp Company, New York, and the J. F. Blanchard Company, New York, has been incorporated in Massachusetts with $6,000,000 common and $2,000,000 7 per cent. cumulative preferred stock authorized. Of the common, $5,000,000 has been issued, and of the preferred, $1,500,000. The company makes metal doors, window frames, interior trim, etc.

The Ideal Concrete Machinery Company, South Bend, Ind., has opened a Chicago office at 1075 Old Colony building, in charge of H. I. Purcell. This company makes the Ideal proportioning and continuous mixer, fence post and building block molds and automatic machinery of various types. The Lake Shore & Michigan Southern is now using this company's concrete blocks for bridges and signal towers. The Union Pacific is using the blocks for many of its station buildings, and other roads are using them for various purposes.

The Jones & Laughlin Steel Company, Pittsburgh, Pa., is dismantling furnace No. 3 of the Eliza group and will immediately build another blast furnace there, to cost about $1,500,000. This company is now spending about $4,000,000 in the erection of furnaces at Aliquippa, all of which will be in service by May 1. The Pittsburgh mills of this company are now operating at about 80 per cent. of their capacity, while the mills at Aliquippa are operating at their full capacity. About $25,000,000 is to be spent on the plants at Aliquippa, entirely for new undertakings.

The Concrete Form & Engine Company, Detroit, Mich., has been organized to combine the Collapsible Steel Form Company, Detroit, and the Belle Isle Motor Company, Detroit. The company will make collapsible steel forms for concrete culverts, conduits and sewers, general concrete and road-making machinery and Belle Isle gasolene engines for railway velocipedes and power cars. The officers of the company are: W. B. Gregory, president; Harry W. Frost, vice-president; W. W. Kenyon, vice-president; W. C. Shanafelt, vice-president and general manager; L. K. Rumsey, secretary and treasurer, and W. D. Waugh, assistant general manager.

The Chicago Pneumatic Tool Company, Chicago, has issued its ninth annual report. Although business conditions were scarcely favorable, the net earnings and the volume of business secured during the year were greater than in any previous year in the history of the company. Nearly all the plants were operated at their full capacity and substantial improvements were made, especially in the plant at Detroit, Mich., where a further addition is now under construction. All the foreign subsidiary companies are self-supporting and are steadily increasing their earnings. The manufacture of light motor trucks begun last year, promises to add substantially to the future profits of the company. The total profits for the year were $1,054,809. Dividends amounted to $257,951, and the balance carried to profit and loss was $436,975, making the total surplus $1,509,149.

TRADE PUBLICATIONS.

Southern Railway.—This company has published an interesting booklet on the cultivation of alfalfa in the southeast. This is a new product of the South, but the booklet shows with what success it is being grown there and what its cultivation has done for some western states. The booklet also points out the most favorable districts for its growth and shows how profitable its cultivation is.

Portland Cement.—The Atlas Portland Cement Company, New York, has devoted a 12-page booklet to the advantages of its new product, Stainless Atlas-White Portland Cement. It is claimed that this new cement is just as strong as Atlas Portland cement, both in tension and compression, and that it combines the extra advantages of being pure white and stainless. Some interesting results of tests are also included.

Window Sash.—The Detroit Steel Products Co., Detroit, Mich., is distributing a 36-page booklet giving full information on its Detroit-Fenestra window sash. The dimensions and details furnished are sufficient to enable all plans to be drawn for the use of this product and its fittings. In addition to the detail drawings the book contains a number of photographs showing the applicability of steel sash to railway shops, roundhouses, power houses, pumping stations, and various industrial buildings.

RAILWAY STRUCTURES.

Ayer, Wash.—See Oregon—Washington Railroad & Navigation Company under Railway Construction.

Cambridge, Kan.—The Atchison, Topeka & Santa Fe has made appropriations for the following new work for 1911: Cambridge, extension to water facilities, $4,300; similar work at Augusta, Kan., $2,500; coaling plant at Newton, Kan., $3,200; yard tracks at Brownwood, Texas, $8,700; pumping plant at Gallup, N. Mex., $5,000; increased water facilities and an addition to the boiler house at Albuquerque, N. Mex., $10,600; improvements to roundhouse at Clovis, N. Mex., $48,000.

Charleston, S. C.—An officer of the Carolina, Clinchfield & Ohio writes regarding the reports that the company will put up large steel piers near Charleston, that plans have been made for some time for putting up coal piers at Charleston, over which the Clinchfield coal is to be shipped. The work has not been undertaken, awaiting the authority of the Interstate Commerce Commission to put into effect an export rate similar to that now in effect at Chesapeake Bay points, and which, as the law now stands, is prohibited under the long and short haul clause.

Coeur d'Alene, Idaho.—Announcement is made that a union passenger station is to be put up at Coeur d'Alene.

Colorado Springs, Colo.—The Atchison, Topeka & Santa Fe expects to begin work on a new passenger station during the coming year. The project of building a union station is opposed by the railways and has apparently been dropped.

Dallas, Texas.—After a conference of railway officers and local business men a statement has been issued that a new union station will be built by the Gulf, Colorado & Santa Fe, the Missouri, Kansas & Texas, the Texas & Pacific, the St. Louis & San Francisco, the Chicago, Rock Island & Gulf, the Trinity & Brazos Valley, the St. Louis Southwestern, the Houston & Texas Central, and the Texas & New Orleans.

Hibbing, Minn.—The Great Northern is preparing plans for a passenger station and freight depot to cost about $12,000.

Kansas City, Kan.—An order of the state railway commission, which has been upheld by the supreme court, makes Kansas City, Kan., a terminal point. In accordance with this ruling, it will be necessary for many of the roads entering the city to build new terminals. Some of this work has already begun.

Monterey, Mex.—Fire in the roundhouse of the National Railways of Mexico damaged 16 locomotives, with an estimated loss of $75,000.

New Haven, Conn.—According to press reports, revised plans for a new passenger station to be built in New Haven by the New York, New Haven & Hartford have been approved by the directors' committee, and it is expected that the work will be started soon. The new station is to be built on the site between the office building and the present station fronting on Union avenue, and extending from Portsea to State street. It is said that the improvements will cost between $1,250,000 and $1,500,000.

Ottawa, Ont.—An officer of the Grand Trunk writes regarding the reports that extensive shop improvements are to be made at Ottawa East,, that this work has not yet been definitely decided upon.

Portland, Ore.—The Ogden-Washington Railroad & Navigation Company has given a contract to the American Bridge Company, Seattle, Wash., for the new bridge at Portland. The contract is said to be worth about $1,000,000.

Quebec, Que.—The experts employed by the Canadian government to make recommendations concerning the new Quebec bridge, to replace the structure which was wrecked some years ago, are said to have reported in favor of the tender submitted by the St. Lawrence Bridge Company, which is composed of the Dominion Bridge Company, and the Canadian Bridge Company, and the contract will probably be given by the government as recommended. The value of the contract will be about $13,000,000, or $400,000 more than the tender sent in by the British Empire Bridge Company, which was based on the official design. The St. Lawrence Bridge Company prepared its own tender. Phelps Johnson, of the Dominion Bridge Company, assisted by Mr. Douggan, prepared a design of his own, and it is understood the experts consider this design superior to the official one. The St. Lawrence Bridge Company, if it secures the award, will probably spent about $2,000,000 putting up new shops and for machinery. It will probably take six years to complete the bridge. Although it seems from this statement that the government has rejected the lowest bid, it is said that the government by adopting the new design will save over $1,000,000.

Temiskaming, Ont.—The Canadian parliament has been asked to vote $50,000 towards the construction of a bridge to connect the provinces of Ontario and Quebec near Temiskaming.

FOREIGN RAILWAY NOTES.

The railway in Haiti from Grand Riviere to Port Haitien, about 15 miles, which has been allowed to run down, is to be reconstructed and extended to Port au Prince by an American company.

Work on the Chilean Longitudinal Railway is progressing north of Valparaiso. The tunnel near La Gurupa was recently completed and opened to traffic, together with 12 miles of new road to the north.

The commission appointed about a year ago to study the question of electrifying the government railway between Valparaiso, Chile, and Santiago has made a favorable report, and the matter is now before congress for its approval.

The Italian government has recently granted a concession for the construction of the Italian section of the Locarno-Domodossola railway, which is soon to be built. The concession of the Swiss government has already been obtained and the canton of Tessin has made a donation of $200,000. The new line will connect the Simplon and St. Gothard railways, and is therefore of great importance.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Bessemer & Lake Erie is said to have ordered 35 freight and passenger locomotives. This is not yet confirmed.

The Roaring Fork has ordered 1 consolidation locomotive from the Baldwin Locomotive Works. The cylinders will be 21 in. x 26 in., the diameter of the driving wheels will be 50 in. and the total weight in working order will be 150,000 lbs.

CAR BUILDING.

The Ann Arbor is in the market for 110 forty-ton freight cars.

The Delaware, Lackawanna & Western is in the market for 12 milk cars.

The New York, Westchester & Boston is in the market for 60 passenger cars.

The Louisville & Nashville is building 3 all-steel passenger cars at its shops.

The Vandalia is said to be in the market for 50 flat cars. This is not yet confirmed.

The Scranton Railway Company has ordered 10 pay-as-you-enter cars from the Cincinnati Car Company.

The Central Pennsylvania Traction Company, Harrisburg, Pa., has ordered 6 pay-within cars from the J. G. Brill Company, Philadelphia, Pa.

The Louisiana Railway & Navigation Company has bought 2 second hand chair cars instead of 4 as mentioned in an unconfirmed item in the *Railway Age Gazette* of February 3.

The Alton, Jacksonville & Peoria (electric) mentioned in the *Railway Age Gazette* of November 18 as taking prices on 6 motor cars, has ordered 5 motor cars from the American Car Company.

IRON AND STEEL.

The Bangor & Aroostook is in the market for 13,000 tons of rails.

The Chicago, Milwaukee & St. Paul is in the market for 60,000 tons of rails.

The Norfolk & Western has ordered 2,000 tons of structural steel from the McClintic-Marshall Construction Company.

The Chicago, Burlington & Quincy has ordered 2,500 tons of structural steel for bridge work from the Pennsylvania Steel Company.

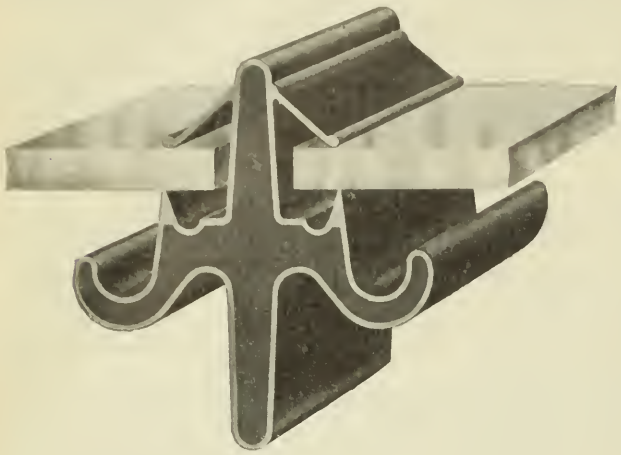
The Louisville & Nashville has ordered 3,000 tons of structural steel from the Cambria Steel Company for a viaduct at Louisville, Ky.

The Chicago City Railways, mentioned in the *Railway Age Gazette* of January 13 as being in the market for 15,000 tons of rails, has placed this order with the Pennsylvania Steel Company and the Lorain Steel Company.

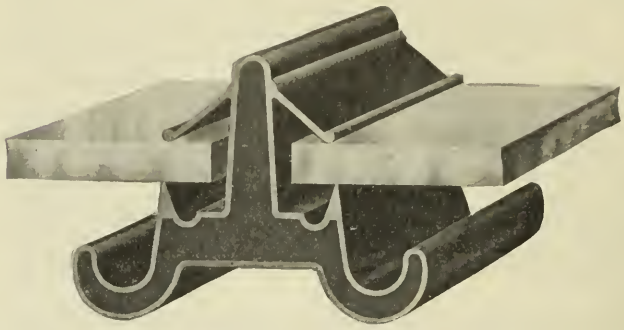
General Conditions in Steel.—Although the underlying conditions of the steel trade are more firm than for the last several months, it is scarcely probable that there will be any pronounced buying movement in the near future. Many of the recent large orders have been merely the vital requirements for the first half of the year. The industry is now operating at 60 per cent. capacity, and steel men feel that if an average of 70 per cent. can be maintained throughout the year they will be well satisfied. The unfilled tonnage statement of the United States Steel Corporation for January showed an increase of 436,000 tons over the December statement. This was a great surprise in Pittsburgh, only a 200,000 ton increase being expected.

The Kinnear Glazing Bar for Skylights.

The Kinnear Manufacturing Company, Columbus, Ohio, whose principal products are rolling doors, shutters and partitions, has recently developed a system for glazing skylights that is different from any used heretofore in this country. The principal feature of this system is the lead-covered bar,



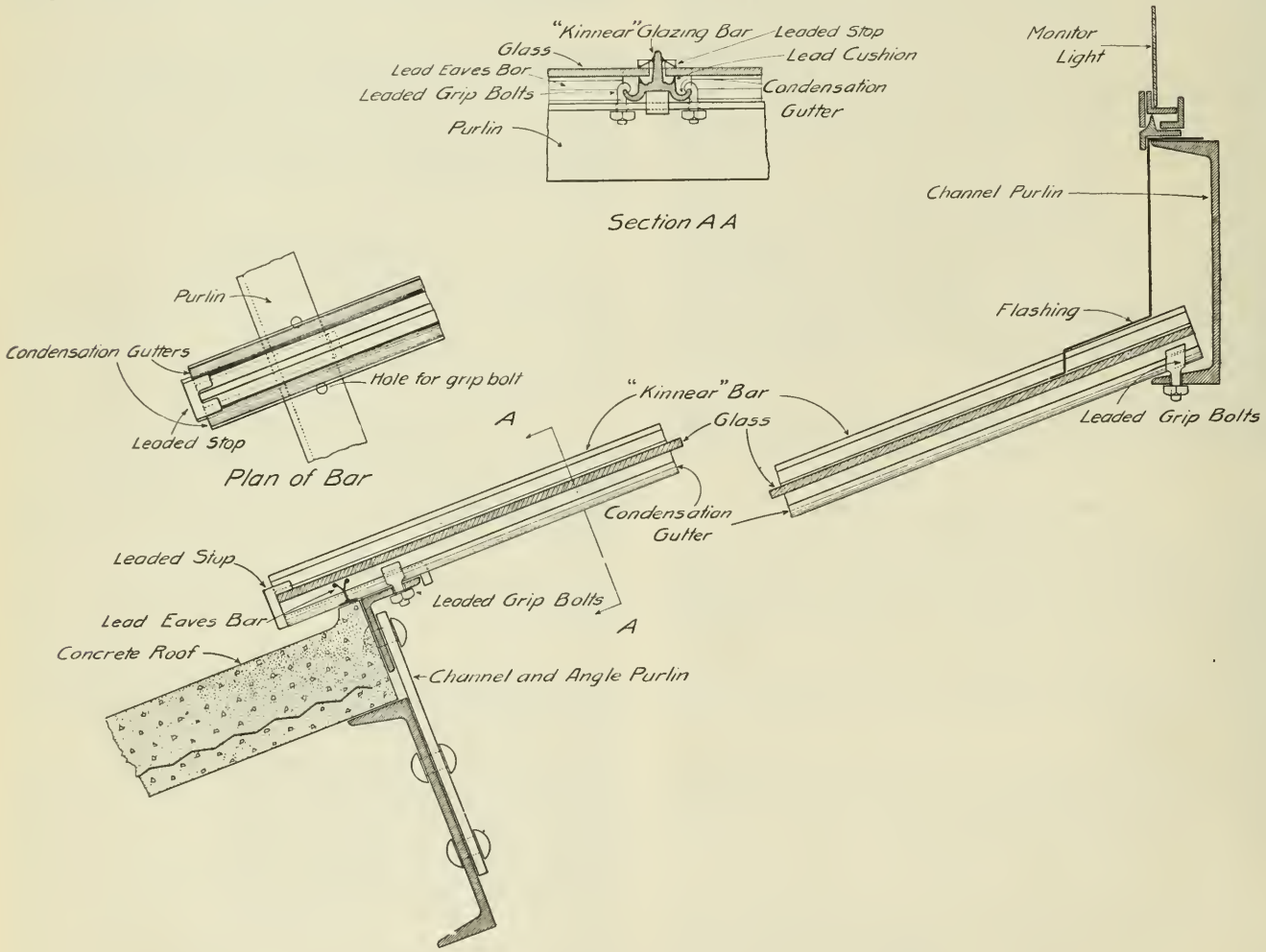
Kinnear Glazing Bar for Spans up to 12 ft.



Kinnear Glazing Bar for Spans up to 8 ft.

the lead being rolled on and not pierced for any connection. The full size sections shown, indicate the shape of the bar and the thickness of the lead covering. The bar is made of a medium grade of steel, and is enclosed in a seamless lead envelope of ample thickness, the ends being hermetically sealed. The lead covering is to prevent corrosion, and experience with similar bars in England, shows that it has been effectual in this respect for a period of 20 years. The chemical action due to atmospheric conditions results in a slight tarnish, caused by the formation of an oxide or carbonate of lead, either of which are insoluble and form a protection against further corrosion. The lead-covered bar is, therefore, especially useful for roundhouses, mills, train sheds and factories, where the skylights are exposed to sulphurous gases or other corroding agents.

It will be seen that the glass is laid on the sharp edge of lead, which is formed when rolling it on the bar. This edge is crushed to a uniform bearing when the lead sheath on top is pressed down, and the glass is held firmly in position between them. The curved flanges at the bottom form a gutter which carries away the condensation. The bar as



Section thru Light taken parallel to Truss

Kinnear Glazing Bar for Continuous Skylights.

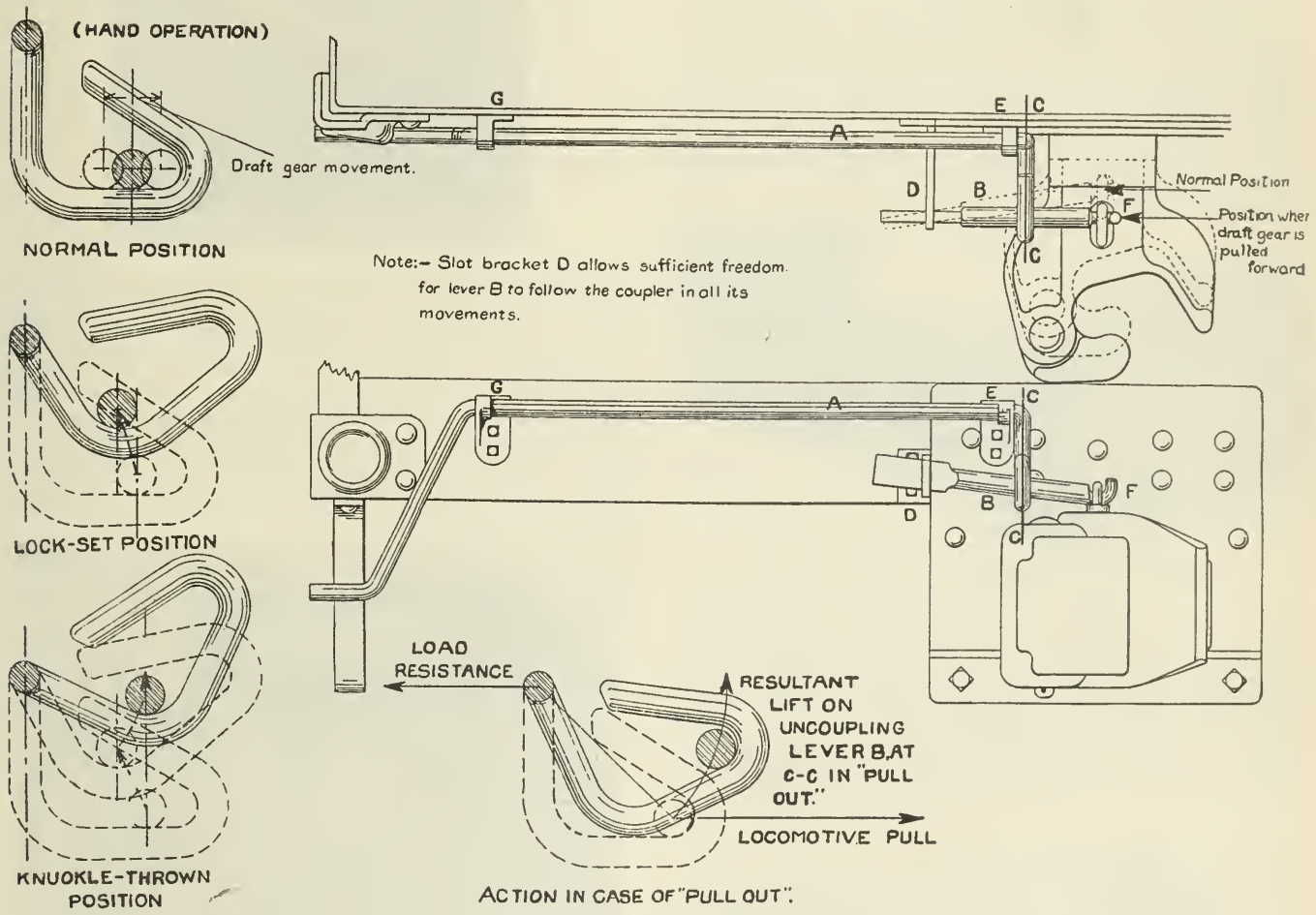
applied to a continuous skylight in modern fireproof building construction is also shown. The Y-shaped lead eaves bar is used as a wind stop. Next to it is the leaded grip bolt, which clasps the gutter and secures the bar to the purlin. A leaded stop is fitted over the end of the bar and extends inward with a lap over the purlin. Screws, rivets and bolts are avoided in the fastenings, and no putty or felt is used for packing. Expansion is provided for by proper clearance at the side and top of the glass and no breakage should occur from that cause. Where glass is laid in two lengths, a galvanized iron support is provided, which also has a lead covering to prevent leakage. Glass broken by accident is easily repaired by lifting the lead sheathing at the top of the bar. The installation is so simple that it may be applied by ordinary mechanics; the cost of maintenance is low, as no paint or putty is required.

Duplex Uncoupler and Automatic Release.

The device here illustrated has been specified on a large number of cars and its merits are being widely recognized. The illustrations relate to two distinct functions; it is from its dual capacity that it gets its name, Duplex. These are, first, the function of an uncoupler (hand operation) and second, of an automatic release. Regarding the former, all the links, clevises, etc., are omitted in the construction, doing away with one of the troublesome features of the old style pin-lifter. It will be noted also that a backward lift is exerted on the coupler lock, this being necessary in many couplers now on the market in order that the lower end of the coupler lock may be forced forward and rest on the lower wall of the coupler, where it obtains its lock-set. Again, as the illustration shows, the leverage on the knuckle increases as the operation of throwing the knuckle continues. This is a substantial advantage because it will have a tendency to do away with the practice commonly followed among trainmen, of lifting the lock to the lock-set position with the left hand rotating the operating lever, while they continue the operation by pulling the knuckle open with the right hand. This is dangerous, and it is argued that if sufficient leverage was provided, whereby the line of least resistance was by way of the operating lever, it would cease.

Considering the other function of this device, that of automatically unlocking the coupler in "pull-outs" so that it may be held up off the track, we come to an entirely different operation of the Duplex parts. In hand operation the power in unlocking the coupler is applied at the handle of the operating rod; in the automatic unlocking the power is applied at the extreme opposite end of the device, viz., at the connection between the coupler lock and the uncoupling apparatus. While in all former efforts to automatically release couplers the release mechanism has been that of jointing the coupler lock and employing the upper side of the arc, the Duplex, as will be noted, causes the arc movement of the coupler lock (in space) corresponding to the forwardly moving drawbar and upward in sufficient height to permit the coupler to unlock; this by a mechanism of the uncoupling apparatus employing the lower rather than the upper side of the arc (see diagram). Care is taken in the application to maintain the line of lift of the coupler lock within the vertical plane of the coupler axis so that while the arc motion as described prevents any backward binding of the lock in the drawbar, there will also be no side binding to prevent its free upward movement.

The particular advantage of the Duplex for automatic releasing is that in making the original application a close adjustment can be provided without danger of disabling the device, and any change in the position of the coupler, such for instance as is commonly known as a "floating draft gear," would only result in the Duplex adjusting itself to the changed condition. The advantage of an adjustment which brings the release mechanism into action instantly in case of a "pull-out" is that the lock is lifted before the coupler travels to where the coupler liners engage the end sill or carrier iron, when, of course, train tension is resumed and the lock could not be lifted with a



Views Showing the Application and Operation of the Duplex Uncoupler and Automatic Release.

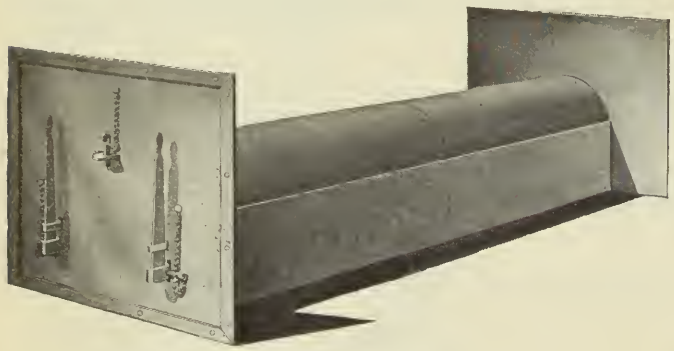
crowbar. Another advantage is that when once the car is equipped with the Duplex, means of automatic release are provided for the car continuously regardless of interchange of couplers, some of which embody release mechanisms while others do not.

The particular fact to which the manufacturers call attention is the economy of parts, each part being employed in both operations (hand and automatic) and that the total number of parts is less than ordinarily applied in the pin-lifter type of uncoupling apparatus.

The National Railway Devices Company, Old Colony Building, Chicago, Ill., which manufactures this device, is about to send out pamphletis which will cover its operation in detail and show some applications made during the year 1910. It has also installed at its main office apparatus for making demonstrations by air pressure, and for this purpose has assembled all the current types of M. C. B. couplers. All interested are invited to witness these tests; the company offers to make demonstrations also by actual applications to the cars of any railway that may desire it.

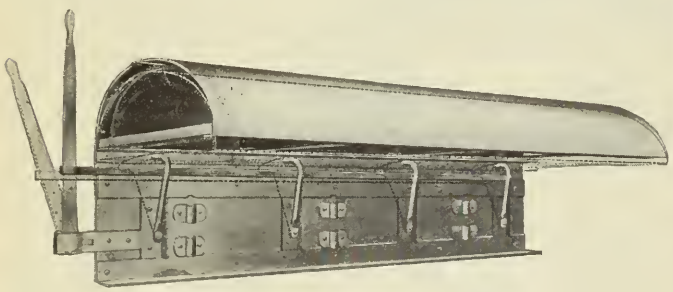
Collapsible Steel Forms.

The Concrete Form & Engine Company, of Detroit, Mich., successor to the Collapsible Steel Form Company and the Belle Isle Motor Company, of Detroit, manufactures collapsible steel forms. concrete machinery, and small marine and general utility engines. The working parts of the collapsible steel form made by this company are very simple; the form is light and easily handled, yet it is strong and comparatively indestructible. It is used principally in the construction of concrete conduits, sewers, small bridges, tunnels, etc.



Collapsible Steel Form for Concrete Conduits.

The forms are made in three pieces—the top, which is semicircular, and the two side plates. The top and one side plate are shown in the illustrations. The top is located between the two side plates and is held in position by arms so attached to these plates that they may be swung down by the lever. The supports of the top thus being lowered cause it to drop away from the concrete so that it may easily be removed. The side plates are held in position by working braces, so that when locked they are



Top and One Side Plate; Collapsible Steel Form.

immovable. The end plates which are fastened to the top and side plates by keys, are also easily removed. By the use of two side plates and extra standard size tops it is possible to build almost any size of culvert required in the average wagon roadway. The Concrete Form & Engine company will exhibit their complete line at the Chicago Cement Show, February 16 to 23, 1911, in booth No. 195 on the main floor of the Coliseum.

Hauck Oil Fuel Burners.

An oil burner that has proven serviceable in locomotive and car shops is manufactured by the Hauck Manufacturing Company, 140 Cedar street, New York City. These burners are light and simple in construction, making it possible for an ordinary workman to handle them easily. They are especially useful on work that would be inconvenient to take to the furnace, since the heater may be arranged to heat most any part of a locomotive or car in place. These burners are started with a match and a piece of paper, giving a flame comparatively



Straightening a Piston Rod With a Hauck Oil Burner.

short, but powerful. A cheap grade of fuel oil may be used economically, and there is no danger from an explosion. The accompanying illustrations show the application of the burner for straightening piston rods and steel car frames. The piston rod shown was bent three inches from the piston head, and after being heated four or five minutes by this burner, it was easily straightened; the total time required was only ten minutes. In repairing steel cars these burners prove to be of special value, as the time and labor spent in removing the damaged



Hauck Oil Burner Used for Steel Car Repairs.

part from the car to repair it in a coal fire would be in excess of the time spent by heating it, in place, with this burner. These burners are also valuable for bending pipes of large diameters; brazing; heating locomotive frames for welding; setting up corners on mud-rings; flanging or off-setting thick shells and for other things where it would be more convenient to bring the heat to the object to be repaired.

Electric trains are expected to run between London, England, and Brighton within three years.

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THE paper presented to the New York Railroad Club last Friday night on Wireless Telegraphy in Railroad Work must be regarded as a report if not exactly of progress, at least of a commencement. For the past four years the Union Pacific has kept the author of the paper, Dr. Frederick H. Millener, busy as an experimental electrician investigating the possibilities of adapting wireless telegraphy to railway service. The first attempt was to devise a cab signal that would indicate the position of the road signals, but it was found that, while it was quite feasible to design an apparatus that would work, it has, thus far, been impossible to design one that would work with the reliability that is required for that kind of service. The fact was brought out, too, that for short distance transmission the wireless installations would be more expensive than the wires, but for distances of more than 100 miles the reverse is true. The investigations have not been fruitless, for it is the intention of the Union Pacific to build two or more stations in order that there may be a certainty of maintaining communications when the wires are down. This is a condition that has to be met frequently on the plains, where the distances are not only very great, but severe storms are apt to cause wire troubles. In the discussion, some data was given regarding the conditions of the static earth charges in the region where sparks across 2½-in. and 3-in. air gaps can frequently be obtained from earth discharges alone. It is these discharges, due to surcharges from a, perhaps, distant thunderstorm that cause the disabling of the signals, and it is in the avoidance of such things as this that one of the chief difficulties will be found in the use of the wireless along the lines of a railway. There was nothing stated to show that any practical railway work had, as yet been done with wireless, but merely that, to put it conservatively, attempts were being made to make a beginning.

THE conflict of the New York, New Haven & Hartford with the Grand Trunk, which opened last spring when the Grand Trunk secured a Rhode Island charter and permission to extend to Providence, has passed through a new legislative stage in Vermont, where a petition of the New Haven—or, more strictly speaking, the Boston & Maine—has fallen between the upper and lower houses. The New Haven wanted Vermont's permission to parallel in that state, on the west side of the Connecticut river, some 10 miles of the Vermont Central, the Grand Trunk's New England outlet. The lower house of the state voted affirmatively by a great majority; the senate by an emphatic majority killed the measure by amendment. As an outcome, the New Haven says it will shift to the other side of the river, build the 10 miles northward to Brattleboro under the New Hampshire general railway law and cut out the 10 mile link on which it is dependent. There is in northern Vermont a similar link of the Vermont Central, 14 miles long, between Windsor and White River Junction, which must also be similarly eliminated to give the New Haven its through northward line which it intends to double track throughout. With two links out, the Grand Trunk is compelled to build 50 miles between Windsor and Brattleboro. This "battle of the parallels" is one phase of the campaign. Another is the reported plan of diverting from the Grand Trunk to the Canadian Pacific the large annual traffic now supplied to the Grand Trunk by the Boston & Maine. And now comes the counter stroke of the New Haven, which, by securing half-control of the Rutland system along with the New York Central, invades Canada, and by traffic rights reaches Montreal. The next stage is not unlikely to be a movement by the Grand Trunk in Rhode Island to obtain legislative sanction for the use of the New Haven's terminal plants at Providence, which, the owning corporation asserts, are already fully worked.

A FEW weeks ago a railway officer with large interests on the Pacific slope was quoted as explaining the anti-railway sentiment of the people by his theory that the railway corporations had not "entered politics" enough. His idea, with its implication, was that the railway corporations had indulged overmuch their policy of aloofness; that they had stood too persistently on their dignity; had in too great degree ignored legislatures and commissions; and that the ultimate remedy was greater political activity at state capitals and more direct appeals to the voting constituencies. The advice had a strange sound and is historically hardly convincing. How often has the tongue of the anti-railway orator impugned the corporations for their political activities; told us how they have in the past "owned" legislatures and elected legislators; how in states like Kansas in the West, California on the Pacific coast, and Connecticut, Rhode Island and New Hampshire in the East, they were politically dominant: and how, party-wise, they followed the aphorism of Jay Gould, who was "a Democrat in a Democratic county, a Republican in a Republican county, and in every county an Erie man!" In the processes which led up to the anti-corporation sentiment, beginning a few years ago, were not the political forces overworked and the economic forces too much ignored? And is not the effective appeal now to economic facts the final remedy? Certainly the leading causes—high finance, the insurance scandals, evasions of the law in

rates—which brought on the popular reaction, were non-political. And ultimately must not the situation work itself out through the play, not of politics, but of the economic energies expressed in such terms as rates more just, labor less aggressive, railway law crystallized into more definite statutes, and commissions elevated in their personnel? Along those reformative lines, rather than political ones, railway "activity" can never run too fast or too far.

NEW YORK STATE BOILER INSPECTION.

IN the *Railroad Gazette* of September 13, 1907, and the *Railway Age Gazette* of June 17, 1910, we commented on the locomotive boiler inspection law of New York state and that proposed by the federal government, respectively. In regard to the former, the position taken was that the regulations proposed and since put in operation by the New York Public Service Commission, Second district, were simply an embodiment in legal form of those in force on railways whose standard of boiler maintenance was what it ought to be. The enforcement of the rules has shown that, as a general rule, the railways have little cause for complaint. Officers who were in a position to keep their boiler maintenance up to a high point may regard the law as a useless and constant outflow of certificates of inspection, or but one more addition to the many pin-prick annoyances to which they are subjected; while those whose idea of boiler maintenance were closely allied to neglect may possibly think the requirements so much fol-de-rol, but of these there are probably very few. The rules were drawn along the lines of first-class work, and certainly first-class work should be done. Granted, then, that the majority of managers and superintendents of motive power are agreed as to the desirability of high grade boiler maintenance, it is somewhat surprising to find that the commission is of the opinion that its supervision has served as a very decided preventative of that class of accident which is usually divorced from management or roundhouse responsibility and put on the shoulders of the careless runner.

Whether the position is a sound one or not, there certainly has been a marked falling off in the number of boiler accidents since the state regulations have been in force. In their last report we have the following list:

	1909.	1908.
Pocket flue blew out	0	1
Arch tube burst	0	1
Plugs and studs blew out: nuts stripped	0	4
Burst flue	0	1
Flue pulled out	1	1
Low water	4	11
Broken staybolts	1	0

It is acknowledged by the commission that this may be a mere coincidence, but it is urged, at the same time, in explanation of the falling off of low water accidents, that before the present regulations were put in force there were many that were due to the engineman being deceived as to the height of the water, because of defective fittings, and they emphasize the statement by referring to cases of low water that were undoubtedly the result of such defects. For instance, on one occasion an engineman maintained that the water was high because he had tried the gage cock and the issuing water had spattered and burned his wrist. Investigation showed that the drip was clogged and filled with water, and that the steam had thrown it out so that he was deceived. In another case the bottom opening of the water glass had become stopped, causing a false indication. It is because the law requires close attention to these minor details that the chances for such a deception are lessened; and, with this, low water failures are made fewer.

It is not that the state inspector or his assistant can personally inspect any large number of the 7,000 locomotive boilers of the state, but because they are apt to put in an appearance unexpectedly in out-of-the-way places that the moral effect is good and inspectors who might otherwise be slack in the performance of their duties are keyed up to doing careful and efficient work.

The state inspection must necessarily be far from complete because it is not the policy to put the railways to inconvenience, but it is made as thorough as circumstances will permit. Staybolts are examined for leaks and for plugged holes; the injectors are tested to see that they are in proper working condition; the water glass and gage cocks are examined to make sure that they are clean; the registration of the steam gage and the opening of the safety valves are checked, and so on. Sometimes such an inspection develops startling conditions, as when a nest of 41 broken staybolts was found in a boiler, or a score were found plugged because they leaked. All of this has a healthy influence on the railway inspectors.

Occasionally an inspector is so imbued with loyalty to his railway that he neglects that strict adherence to the truth which a statement under oath would imply, and it has been found to be necessary to have a few transferred to other duties. In some cases incompetent men were at work who were really unable to detect defects.

As we have said before, the state inspection would be a superfluity if all railway inspectors did their whole duty at all times and every railway management insisted on a high grade of maintenance. But this condition seems to be rare, and it is especially lacking on the small roads where the officers are inexperienced in railway affairs and ignorant of things mechanical. They do not realize the danger of neglect, and will take hair-raising chances, as in a case where a boiler was found to be at work with the shell corroded to a thickness of barely one-sixteenth of an inch.

It is in this service as a check that the value of the work of the New York commission is to be found. It is an independent authority that cannot be hampered by the desire of the superior officers to make a showing, and it has been of great assistance to the mechanical department, in some cases, where the financial control was inclined to cut down expenses to a point very close to the danger limit. There is the authority to issue an order, but so smoothly have things been carried on that it has only been found necessary to issue one; requests and suggestions have served in every other case. That the regulations have been suited to the work to be done, and have been satisfactory to the railways and the commission, seems to be borne out not only by the smoothness and the lack of friction with which they have been administered, but also by the fact that they have been adopted verbatim by the commissions of Ohio and Pennsylvania, and have been put in force in Canada.

The gist of the situation is this: the rules set up no new conditions; they did not require that the railways should do any other thing than live up to their own professions of faith in their daily practice. They did not interfere with the regular routine of shop and roundhouse work, but merely required that that routine should be regularly and systematically followed. The inspections of the state employees are not to take the place of the railways' men, but simply to serve as a check to hold those men up to concert pitch.

Of course the rules are not perfect. No one claims that they are. Nothing of this sort can be of universal application and value any more than any other attempted panacea. A rule that would require washing out at 30 day intervals in the Adirondacks may be unnecessary, while when applied to boilers coming in from Ohio and Pennsylvania prove quite insufficient to meet the necessities of the case. The common sense of the commission and the railways allow for local conditions, and expects that the boilers in bad water districts will receive the extra attention that they demand.

It would seem, then, that this sort of inspection, or rather this checking of railway inspection, is of value, and of greater advantage, possibly, to the railways than to the public, while the burden on the latter is limited to the salaries and traveling expenses of two men. If, then, this law has been so satisfactorily administered in a state, why would it not be of equal value in the hands of the federal government?

THE FUTURE OF THE MISSOURI PACIFIC.

GEORGE J. GOULD'S retirement from the presidency to the chairmanship of the Missouri Pacific is understood to mark the termination of his active management of the property. The change was due to the feeling of others who were largely interested in the property, principally Kuhn, Loeb and their associates, that its affairs were not being well conducted. The Missouri Pacific runs through a rich territory in Missouri, Kansas and Nebraska. It has great potentialities. But its possibilities have not been adequately developed in recent years. In physical condition and in financial results it has lagged behind not only other roads equally well situated but others far less favorably situated. Between 1880 and 1891 it paid dividends ranging from 1½ to 7 per cent. It suspended dividend payments in 1891, but renewed them in 1901, paying 5 per cent. until 1908. In the latter year it declared a dividend in stock, and it has paid none since. Its earnings and operating expenses show why it has thus fallen behind. It may, perhaps, be fairly compared with a group of roads composed of the Southern Pacific, the Santa Fe, the Rock Island, the St. Louis & San Francisco, the Missouri, Kansas & Texas, the Kansas City Southern and the Denver & Rio Grande.

The average gross earnings per mile of these roads, including in the group the Missouri Pacific itself, in the five years ended June 30, 1905, were $7,097, and in the five years ended June 30, 1910, they were $8,738, the amount for the second five-year period being 23 per cent. more than for the first five-year period. The average gross earnings of the Missouri Pacific itself in the first period were $6,578 and in the second period $7,222, an increase of but 10 per cent. This was the smallest increase shown by any road in the group. The average net earnings per mile of the group in the first five years were $2,444, and in the second period $2,924, an increase of 20 per cent. Every road in the group showed an increase except the Missouri Pacific, whose net earnings were $2,257 in the first period, and were $2,141 in the second period, a decrease of 5 per cent.

The expenditures per mile for maintenance of way and structures by the group during the first five years were $990, and during the second five-year period $1,169. Those of the Missouri Pacific were $865 and $1,001, respectively. The expenditures per mile of the group for maintenance of equipment during the first period were $854 and during the second period $1,182. Those of the Missouri Pacific were $750 and $984, respectively. This is one way of saying that the road has been under a management which has retained completely the authority, but has not been near enough to the property to exercise this authority judiciously. The result has been that the Missouri Pacific is today in bad physical condition; its operating force is not strongly organized; and the traffic department, with a natural right to get a large share of the business in a highly competitive territory, has been unable to make a fair bid for the business that properly belongs to it.

The Missouri Pacific itself does not own an absolute majority of the stock of any of the other so-called Gould roads, with the exception of the St. Louis, Iron Mountain & Southern; and in speaking of the Missouri Pacific throughout these comments we mean Missouri Pacific and St. Louis, Iron Mountain & Southern. The Missouri Pacific owns 45.5 per cent. of the Denver & Rio Grande common stock outstanding and 17.7 per cent. of the Denver & Rio Grande preferred. The preferred and common stock have equal voting power, and there is a total of $38,000,000 common and $49,779,800 preferred outstanding. The Missouri Pacific owns 5 per cent. of the outstanding Wabash preferred, and the Iron Mountain owns an additional 20 per cent., making a total of 25 per cent. The Iron Mountain owns slightly over 5 per cent. of Wabash common. The common and preferred have equal voting rights, and there is $38,189,200 preferred and $53,189,300 common. In addition to this, the Missouri Pacific owns a considerable interest in Texas & Pacific and holds in its treasury $23,668,000 T. & P. second income bonds. In the present state of legislation in Texas, however, these T. & P. bonds are not a quick asset. It will be seen that, regardless of the holdings of the Gould estate, the Missouri Pacific owns a sufficient portion of stock of the D. & R. G., its western connection, and the Wabash, its eastern connection, to have a large, if not controlling, voice in the affairs of the two roads.

Within the past fiscal year the Missouri Pacific and the Iron Mountain were reorganized and a new comprehensive mortgage was placed on the Missouri Pacific. This first and refunding mortgage authorizes the issue of $175,000,000 bonds, of which $29,806,000 are now outstanding. This leaves a large margin for the future issue of bonds, but this margin is needed. It will require the expenditure of a great many millions of dollars to put the property in the physical condition which its geographical location and traffic possibilities warrant. The Goulds have been skillful financiers, if not successful operating officers, and the financial reorganization that they carried out last year has put the company in a position to take advantage of strong backing by bankers; this backing is now supplied by the interest that Kuhn, Loeb & Co., of New York, and the Deutsches Bank, of Berlin, have taken. The extent of the resources of these bankers and the quality of their courage and foresight has been shown by Kuhn, Loeb & Company's relations with the Union Pacific; in fact, it is a fairly accurate comparison to contrast the Union Pacific, at the time E. H. Harriman took hold of it, with the Missouri Pacific today. With ample funds for improvement and an able operating officer, who shall live and work on and with the property, the Missouri Pacific has at least as great possibilities as had the Union Pacific.

INSTITUTIONAL RAILWAY BOND INVESTMENT.

THE institutional investment has long been recognized as one of the major factors, if not *the* major factor, in the absorption of securities, including those of the railways. As compared with individual and trustee investment it, of course, cannot be accurately measured. But it has an absolutely important significance in two directions: It represents, in the first place, investment which as a whole may be fairly regarded as conservative and, in the case of bonds, held usually to maturity; secondly, it absorbs, generally, securities in large blocks as distinguished from the smaller marketings of the individual. Beginning at the top with the mutual savings banks, the typical big savings institutions of our eastern states, the trend and variations of institutional investment as set forth in the recent report of the comptroller of the currency became informative. The returns from 1909 are as of April 28 for holdings; those from 1910 as of June 30. But the difference in the date is not material, as it would be, for example, in the case of railway earnings.

The returns show a decrease during the 14 months of holdings of railway bonds by all banking institutions—national, state, mutual savings, stock savings, private banks and trust companies—from $1,551,160,520 to $1,455,100,000, or somewhat more than 6 per cent. But the great loss is in the national banks ($43,825,242) and in the trust companies ($49,904,241), while the ultra conservative institutions, the mutual savings banks, actually increase their holdings of railway bonds from $743,425,893 to $747,800,000. The increase is small, and contrasts somewhat strikingly with a gain of about 6 per cent. in the railway bond holdings of the same class of banks in 1909 as compared with the previous year in the ratio of railway investments to total resources. But, on the other hand, the gain, small as it is, contrasts impressively with a drop in 1910 as compared with 1909 of $42,499,502 in the savings bank holdings of state, county and municipal bonds, which are even more conservative than those of the railways. Taking banking institutions of all classes, railway bonds shows a decrease of between 6 and 7 per cent. as stated; state, county and municipal bonds, a decrease somewhat less than 5 per cent.; and public service corporation bonds, excluding

steam railways, but including street railways, show an increase of about 5 per cent.

The clear inference from the figures is that the socalled "municipal" investment of banking institutions is drifting backward in spite of the high security this because the rate of interest return still remains low in spite of the notable increase during the last year, that steam railway securities are more than holding their own in absolute figures, but not holding their former increment; and that the new drift of banking investment is toward the minor and localized public service corporations. If this last form of banking investment could be analyzed more closely and sub-divided it would probably be found that the street railways are at the front. Many of them have passed their tentative stage and state banking commissions are opening them more and more to savings bank investment, for example in Massachusetts. They are still expanding prosperously in such regions as Texas and the Pacific states. Finally, as a closing and cogent argument for the investor, they make a higher interest return, partly because market for these securities is narrower and more localized, although, through eastern agencies, it is now beginning to expand. The early investment prejudice against tractions is obviously diminishing, and they are competing more and more in the investment market with steam railway as well as municipal bonds of the class held by the banks.

If that competition were due to natural economic conditions further comment would be called for. But it is in fact due much to artificial conditions.

Outside of the steam companies other public service corporations—light, power, water, street railway and the rest—are many of them subject to the supervision of state commissions. But many of them are not; and very few of them—almost none outside of street railways—are of an interstate character bringing them under federal regulation. Their relation to public necessity and convenience is intensive, to be sure. But, as a rule, they are small corporations, a fact that gives them a certain immunity, from a state commission. The steam railway is not only a big target in itself, but the victim of a double barrelled gun. State and interstate commission equally assail it, local and federal authority claim, except in the case of the smaller intrastate lines, jurisdiction over it. That is the point where an inequity reflects itself in the railway bond and to the advantage of competitors—still more so in railway stocks. The most conservative, municipal bonds excepted, of our institutional investments carries thus a double load in the investment rivalries of the market, as though compulsory rates and higher cost of supplies and increased wages were not enough. The same power that diminishes net earnings encourages financial competition.

There is yet another aspect of institutional investment states, counties, cities, towns and school districts must borrow money like the railways. The federal return shows that the holdings of their bonds by the banks are falling off fast, and it is a familiar fact that when a municipality does borrow now it must be at an interest rate increased something like a quarter of one per cent., as compared with three or four years ago. Does it ever occur to the average citizen that the hue and cry against the railways and the public procedure that have forced the railway bond's interest return up have forced up by its competition the municipal bond interest rate too? There's food for thought in that suggestion for the taxpayer and municipal financiers when they consider the marketing nowadays of a new loan for a public improvement.

NEW BOOKS.

Freight Train Resistance. Its Relation to Average Car Weight. By Edward C. Schmidt, professor of railway engineering. Bulletin No. 43, University of Illinois, Engineering Experiment Station, Urbana, Ill. Paper, 5¾ in. x 9 in., 152 pages; 52 illustrations; 60 tables.

The principal figures and conclusions in this bulletin were presented in a paper read at the May, 1910, meeting of the American Society of Mechanical Engineers, Atlantic City, N. J., and at the 1910 convention of the American Railway Master Mechanics' Association. The bulletin contains the full details of each test, including tables and diagrams, making a complete record of a most exhaustive investigation of freight train resistance with relation to the weight of cars. The conclusions differ from those of other investigators in this field, principally in showing the greater resistance per ton for light cars, and a greater increase in resistance of any train, with speed, than has been found by the test departments of some of the larger railways.

Heat. By J. Gordon Ogden, Ph.D. 116 pages; 4¾ in. x 6¾ in. Popular Mechanics Company, Chicago. Price, 25 cents.

In this little volume the subject of heat is treated much after the manner in which "familiar science" has been taught in the public schools. It describes the effect of heat on bodies and is illustrated with views of simple laboratory apparatus. There are no tables and little that would give one a working knowledge of the subject of heat. While it is interesting reading for a young student, it is of little use as a text book.

Letters to the Editor.

THE EFFICIENCY ENGINEER.

Pittsburgh, Pa., February 14, 1911.

To the Editor of the Railway Age Gazette:

Your articles and contributions about the efficiency engineer are enough to arouse the enthusiasm of a young and progressive engineer like myself. The older engineers had to blaze a way for themselves, but we young and actively engaged men find many examples and much information at our hands. While the able writers, in your current number, evidently have this subject thoroughly at their fingers' ends, as it were, there are many of us still groping for help to better work.

What strikes the writer is that he is not acquainted with a single efficiency engineer. While to confess this is a humiliation, yet it is the truth. The writers in your journal on both sides of the question seem to know their haunts and their works, and it would be invaluable information to many of us, college bred or self educated, or whatever we may be, striving for help to render more and better service, to know all about the efficiency engineers, and primarily to know: (1) Their names and addresses; (2) their specialty and their training; (3) the work they have performed and are performing, with exact particulars, dates and results, so that one may judge of the reality of the efficiency engineer.

It will not suffice to give the names of skilled observers, employed to check time and to work at special lines under directions. No works, no railway, is without such observers: such men often make valuable suggestions, but we seek the able, competent efficiency engineers directing and using such observers and employing all other known methods to increase efficiency in order to get better results. That they are many and able, and that they must be all around us doing their good work, perhaps without great desire for publicity, there can be no room for doubt.

It must be that such men, working and always accomplishing, obtain a great reward for themselves: it must be that the better known they become the greater will be their reward. The reward, let it be money or fame, is what, after all, we seek. These men then will only too gladly let themselves and their works be known. It will be most interesting to see plainly published in your valuable paper, exact particulars, without any "glittering generalities.

We beg then that regardless of the side of the question taken by your able contributors and writers, that they shall tell us who are the "efficiency engineers" and of their works, especially as indicated above.

ENGINEER.

BATON ROUGE CUT-OFF; SOUTHERN PACIFIC.

In the operation of the Southern Pacific properties there has long been apparent a necessity for a line to avoid the detour of certain traffic through New Orleans. In 1885 the late C. P. Huntington proposed to build a line from Lafayette, La., to Baton Rouge, but his associates did not concur, and the project was abandoned. In 1902 the late E. H. Harriman became interested in the idea and surveys were then made under the direction of G. W. Boshcke. In 1905 the construction of the road was authorized, and on January 1, 1906, the grading was begun. The line was opened for operation January 15, 1911.

The saving in mileage by this short line will be considerable. The drawing shows the situation. From Lafayette to New Orleans is 145 miles. From New Orleans to Baton Rouge is 90 miles. By the short line, the distance from Lafayette to Baton Rouge is 57 miles, a saving of 178 miles on the route from Lafayette to Memphis. The Baton Rouge, Hammond & Eastern affords a direct connection with the main line of the Illinois Central at Hammond. The distance from Lafayette to Hammond via Baton Rouge is 102½ miles, and via New Orleans is 198 miles, a saving of 95½ miles. A connection with the Queen & Crescent system by use of the New Orleans Great Northern from Covington is a possibility. The distance from Slidell to Lafayette via New Orleans is 181 miles; via Baton Rouge it is 154 miles, a saving of 27 miles. This new line will thus be an important factor in the transportation problems not only of this locality but also of transcontinental service.

Some features of the construction were uncommon. As indicated on the map, the direction of the line is squarely across the general trend of the drainage of the territory through which it passes. The principal waterway crossed is the Atchafalya river. This river is an effluent of the Mississippi, and during certain flood stages it serves as an outlet for probably one-fifth of the water of the Mississippi as well as for the water of the Red river. From the junction of the Atchafalaya and the Mississippi to the jetties at Southwest Pass is 315 miles. From the said junction to the Gulf of Mexico at the mouth of the Atchafalaya is only 150 miles, hence the flood waters of the Mississippi and Red rivers pass with considerable velocity through this short outlet to the sea. The basin is perhaps an original sea marsh through which the Red river has pushed its way, building up its banks and gradually raising the surface of the marsh with the sedimentation incident to annual freshets. The general elevation of this basin is about five feet above sea level. The bottom of the Atchafalaya is 45 ft. below sea level. The banks of the river are about eight feet higher than the general level of the basin. This basin varies from six to seventeen miles in width. To get a direct line it was necessary to cross this basin along the line of its greatest width. During flood periods in the Mississippi river, the waters flow out of the main Atchafalaya channel and gradually fill this immense basin to a depth of about 8 ft. These waters generally begin to rise in January and the flood period extends to September, so that there are normally only three months in the year when the ground surface is visible. Even when the surface is not flooded the ground is saturated and soggy. This condition made it impracticable to use the usual methods in constructing the roadbed. As the entire country was flooded, the working force, as well as all materials for the work and supplies for the men, had to be transported by steamboats from Morgan City. The hull of an old ocean steamship was converted into a quarter boat and towed through a network of lakes, bays and bayous to the right of way, in order to afford accommodations to the engineers and working forces.



Pile Drivers at Work on Trestle; Southern Pacific.

In building the roadbed, three methods were pursued. In the western section the line was first cleared for a width of 25 ft. During the progress of this work the floods came on, and the trees were then cut about 10 ft. above the ground. The next step was to build a temporary trestle westward from Bay Poulet. Meantime the road had been graded and track laid through the highlands on the west end of the line, and a pile driver was started at the western limit of the swamp, working toward the force which was working in the swamp. The photographs give a fair idea of the appearance of the work at this



Right of Way Cleared for Pile Driver.



Temporary Trestle, Ready for Dirt Train; Southern Pacific.

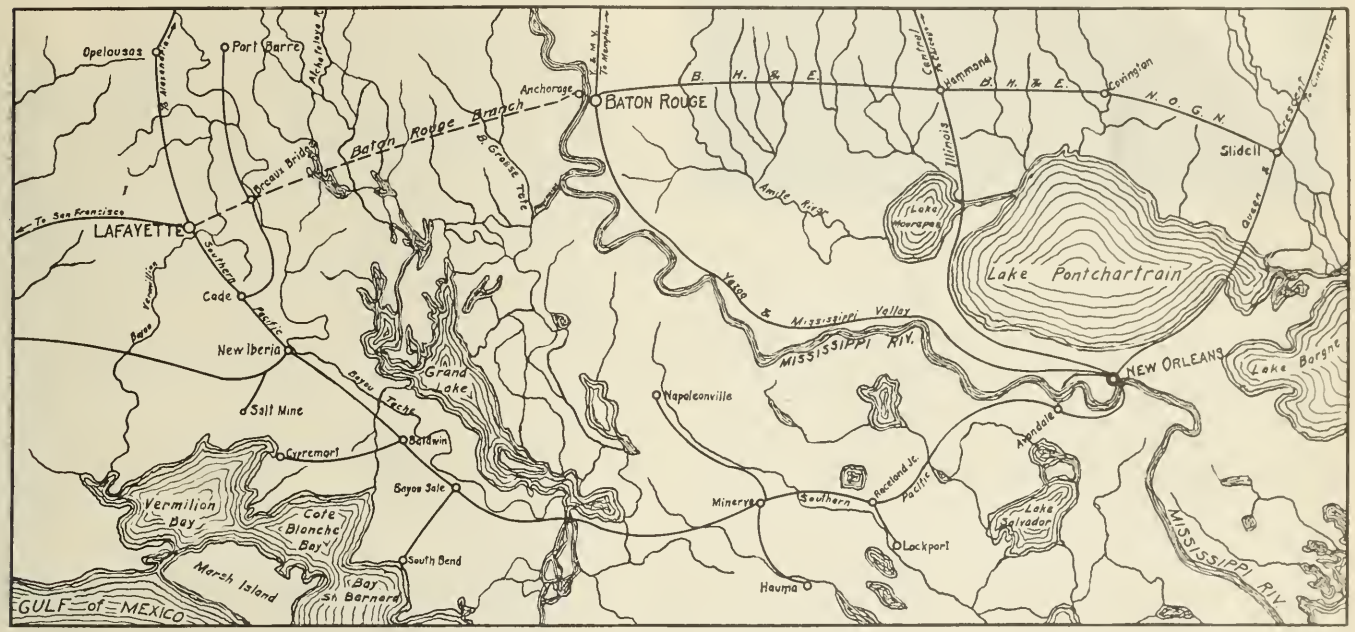
time. As the material had to be handled from behind, a pile driver was constructed with the machinery on an elevated deck and with a dolley track passing under this on a lower deck. On this dolley track material cars were operated. This is shown in the photographs. These pile drivers each completed about 100 ft. of trestle per day. In crossing the streams which run through the swamp, permanent trestles and bridges were constructed. All timber used in permanent work was first treated with dead oil of coal tar at the company's works at Houston, Tex.

When the forces met, completing this trestle, earth was hauled in ballast cars from the company's pits, on Bayou Vermillion, an average distance of 15 miles, and dumped into the water until the trestle was entirely filled and the permanent roadbed thus formed. The dirt having been unloaded from a height of about 7 ft. into water 6 to 8 ft. deep, the material was thoroughly compacted. It required about 350,000 cubic yards of earth to complete this section. When the waters receded, Bermuda grass was planted on the embankment slopes, and by the time the floods came again, the embankment was in good condition to resist washing. Three years have elapsed and the roadbed is solid and retains its original cross section.

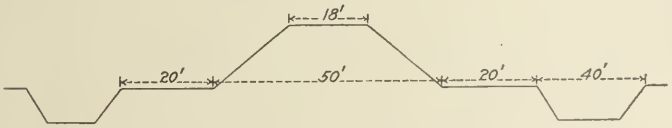
The heavy cost of constructing the temporary trestle caused the engineers to seek other methods of building the remaining roadbed through the swamp. During the progress of the above mentioned work, large forces were placed on the east edge of the swamp, and when the floods subsided the base of the roadbed was built with wheelbarrows. This was carried to a height of 3 to 5 ft. in order to get as much of the work above high water level as possible during the low water period. Track was laid on this incomplete roadbed and earth hauled from pits acquired on the Bayou Grosse Tete ridge and unloaded with plow and cable. The track was raised 12 in. at a lift and this dirt placed under ties and tamped with shovels. This was gradually carried "seaward" from the high ground and three miles of roadbed thus completed. In this section about 125,000 cubic yards were placed. This method was economical but, as the base could be built only in short periods of low water, and as the number of men who were willing to live and work in the swamp under the trying conditions was limited, too much time would have been required to have used this method in the remainder of the swamp section.

There apparently remained one course, and that was to use the swamp material. To this end a contract was let to the Gulf Dredging Company for the construction of the remaining eight miles by dredge boats. Three dredges were employed on the work. In order to obtain as wide a base, or berme, as possible for the embankment, booms were constructed of extra length: The general cross-section of the work is shown by the accompanying sketch. Where possible to do so all the material was taken from one side. These dredge boats were brought from the vicinity of New Orleans. The engineers, fearing future trouble if the regimen of the Atchafalaya was disturbed, would not permit the banks of that stream (which form the rim of the basin) to be cut, hence the dredge boats had to be brought through the bayous and lakes to the right of way. It was necessary to remove the timber in the bayous by use of dynamite, and for long distances the dredges had to dig channels in which to push their way through the lagoons.

The work of these dredge boats was arduous and slow. It having been impossible in clearing the right of way to cut the trees close to the ground, the dredges encountered large stumps and roots and, though skilfully handled, there were several cases of sinking and partial capsizing. These three dredges, working night and day, were a year in building the roadbed through these eight miles. As the roadbed built by dredges was dressed by hand with pick and shovel and appeared very well, it was hoped that the troublesome part of the construction was over, but such was not the case. Even before track was laid the embankment began to assume irregular shapes through settlement and subsidence. In some sections it gave way laterally from the center; in others it split along lines roughly parallel with the center line, one-half the roadbed retaining its finished grade elevation and the other sinking as much as three or four feet. One of the photographs illustrates this condition. It was first thought that the berme was sloughing into the canals, but investigation disproved this. The irregularities were caused by the subsidence of the original surface and by settlement of the embankment. The track was laid on the unsettled portions of the roadbed, and alinement being adjusted thereto. Although



Baton Rouge Cut-Off; Southern Pacific.



Cross Section of Roadbed Where Dredge Was Used.

the track laid from the west joined that from the east on September 1, 1910, nearly five months of steady work with a large force of men, and several trains were required to finally shape up the roadbed and track so as to render operation practicable. About 1,000,000 cubic yards of material were required to build the embankments on the 16 miles through this swamp and the



Settlement of Part of Roadbed.

permanent bridging required is about 1,000 lineal feet per mile of road.

A recital of the facts relating to this construction does not convey any idea of the difficulties that encompassed it. The country afforded no supplies except cat fish. Transportation was practicable by use of steam boats in the rivers and by small craft in the flood period. When the waters subsided it was not practicable to convey any supplies along the right of way. The dense growth of timber, brush and vines prevented free circulation of air, and during the summer months, which, in this latitude, extend from April to November, the temperature combined with the humidity made any sort of exertion unusu-



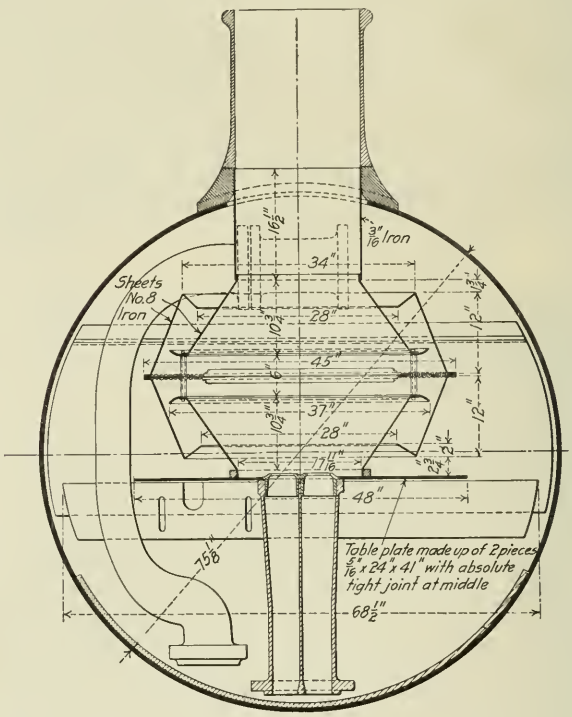
Dredge Making Fill; Southern Pacific.

ally tiresome. Mosquitoes and other insects were present in countless numbers and made the most of their unusual opportunity. The absence of communication with the outside world created a condition of isolation and loneliness that was depressing. It was a difficult matter to keep men on the work. The greatest care was necessary to see that the men were provided with pure drinking water and plain, wholesome food, well prepared. Notwithstanding the idea that prevails that alcohol is necessary to kill malaria, the use of intoxicants was discouraged and, as far as possible, prevented. This not only resulted in conserving the strength of the men, but it prevented the brawls and discontent which a free use of liquor on such work as this always causes. In spite of their unfavorable surroundings, the general health of the forces was excellent. There was not a death from natural causes on the work during the entire five years of its progress. Two cases of accidental drowning and one of homicide made up the fatalities in the swamp work. It is believed that in very few instances has a work of this magnitude been conducted under similar conditions with less sacrifice of human health and life.

We are indebted for this description and illustrations to Thornwell Fay, vice-president and general manager, Morgan's Louisiana & Texas Railroad. The construction of the line was under the direct charge of E. B. Cushing, Mem. Am. Soc. C. E.

BROOKS SPARK ARRESTER.

The Chicago, Milwaukee & Puget Sound has equipped about 75 locomotives with the Brooks spark arrester, and the results have been such that additional engines are being fitted with the device as fast as opportunity affords. The Pacific and Prairie type locomotives in this territory have large fireboxes of about 50 sq. ft. grate area, with brick arches supported on tubes, and rocker grates in sections 10 in. wide, with air openings 9-16 in.



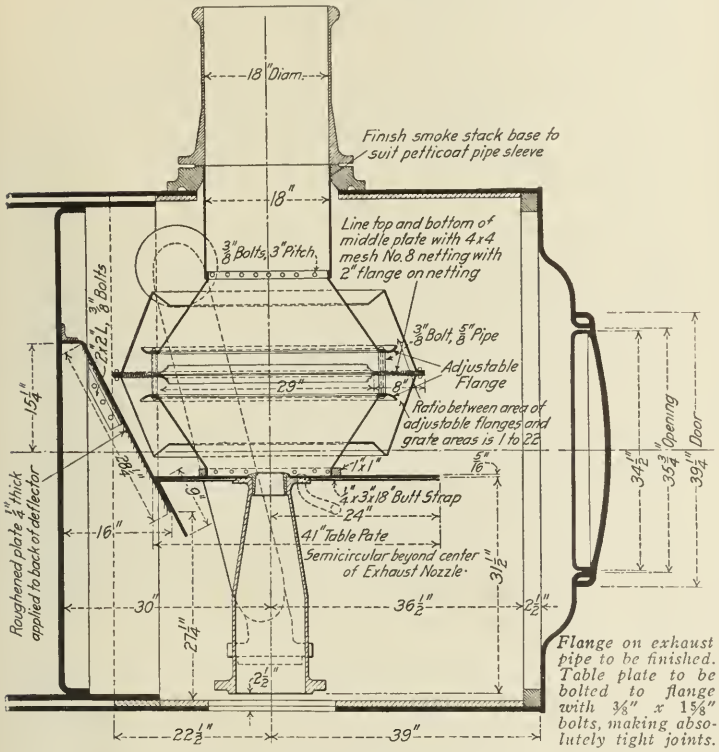
The Brooks Spark Arrester as Applied to Chicago, Milwaukee & Puget Sound Locomotives.

to 11-16 in. wide. The largest boilers have 19-ft. tubes and smoke boxes 78 in. long. The coal used is a semi-lignite obtained from the company's mines at Roundup, Mont., the analysis of which indicates that it is much superior to straight lignite, and compares favorably with the other Western bituminous coals. The chemical composition of the Roundup semi-lignite is: Moisture, 7.83 per cent.; volatile combustible, 32.66; fixed carbon, 53.63; ash, 5.88; sulphur, 0.22. The heat value is 12,771 B. T. U. per pound. In locomotive tests this coal has evaporated 5.6 lbs of water per pound of fuel, and the weight of ash was 7 to 10 per cent.

The Brooks spark arrester can be better understood by an inspection of the drawing than by any description. It appears to be an inverted and concealed diamond stack, with an ingenious array of baffle plates which are arranged to catch the sparks and

allow the gases to escape. The straight stack proper is 18 in. in diameter and 40 in. long with less than one-half of it extending into the smokebox. Two sets of diamond-shaped baffle plates or cones are on the lower end, just above the center line of the smokebox. Between the outer plates is an annular plate 8 in. wide, lined top and bottom with 4 × 4 × No. 8 netting, which breaks up the sparks. The inner portions of the diamond plates have their edges 3 in. from the central plate, and their outer circumference is fitted with an adjustable curved flange.

The usual baffle plate in front of the tubes has a wide flare and the inner surface is roughened, acting as the initial spark breaker.



The Brooks Spark Arrester as Applied to Chicago, Milwaukee & Puget Sound Locomotives.

There is also a horizontal table plate bolted to the top of the exhaust nozzle which serves to close the lower end of the inner diamond and to deflect the sparks so they will not directly enter the lower opening of the outer diamond. The principle of this spark arrester appears to be a modification of some of the older forms of diamond stack, the deflectors being within the smokebox; while the gases have a circuitous route there is no netting to obstruct their passage.

FOREIGN RAILWAY NOTES.

On December 5, 1910, the first section, 39 miles long, of the Chinese part of the Canton-Kowloon Railway was opened to traffic. It extends to Sin-chuen. The British section of the road, 22½ miles long, was opened to traffic on October 1, 1910.

Russian newspapers tell marvelous tales of the difficulties encountered in building the Amur Railway. It is said that the weather is so severe that earthwork is possible only during less than three months of the year. The valley consists of a mixture of boulders and elastic clay, which at no great depth remains frozen the year round, and must be thawed out artificially to be excavated. Then when it is thawed, it will sustain no considerable weight. Further, for long distances, no water is to be had. It should be remembered that the course of the Amur for hundreds of miles before it reaches the sea is northward, the consequence of which is that its lower course is dammed by ice after the main part of the river is open, which causes great floods.

WORK OF SAFETY COMMITTEES ON THE CHICAGO & NORTH WESTERN.

The *Railway Age Gazette* has already referred (September 2, 1910, page 391) to the movement on the Chicago & North Western to secure effective co-operation between officers and employees to reduce accidents. Employees' safety committees have been organized on all the divisions and in the various shops and division safety committees composed of division officers also have been formed. The employees' committees investigate conditions that may cause accidents and make recommendations to the division safety committees for their removal. There is also a central safety committee, to which the reports and recommendations of the division committees go. R. C. Richards, general claim agent, is its chairman, and the other members are: S. G. Strickland, general superintendent; S. M. Braden, general superintendent; G. W. Dailey, division superintendent; H. T. Bentley, assistant superintendent of motive power; G. B. Shrand, trainmaster Chicago terminals; C. H. Osborn, assistant superintendent car department; W. J. Towne, engineer maintenance of way; H. E. Dickenson, division superintendent; W. E. Dunham, supervisor motive power and machinery, and E. E. Nash. The committees that have now been formed have a total membership, including officers and employees, of about 350.

The method of work followed has been for the division safety committees and employees' safety committee to make inspection trips over the divisions at frequent intervals. They are usually accompanied by Mr. Richards. A special train is provided, and the party, which usually contains 15 to 20 people, ordinarily rides in the superintendent's business car. The members observe the condition of track, structures and equipment as they go along, and make frequent stops for more careful inspection of stations, shops and yards. The committee is often accompanied by division officers not belonging to it; for instance, by road foremen of engines, bridge foremen, etc. Sub-committees are appointed to investigate different matters. For instance, one sub-committee is assigned to inspect track; another roundhouses; another equipment; another to see if operating rules are being disregarded by such conduct as going between moving cars, failure to set cars so as to keep side tracks clear, etc. In the appointment of these sub-committees, on which one or more of the division officers sometimes serve, a point is made of not selecting men to investigate things they are concerned with in their daily work. A track man, for example, is not put on a track committee or a shop man on a shop committee. The track man is put on the shop committee and the shop man on the track committee. The idea is that employees are more apt to notice shortcomings of plants or methods that they do not come in contact with constantly.

An inspection trip over a division takes from one to four days. When it requires more than a day the committee men usually sleep on the car. At the end of the trip a dinner at a hotel is arranged for, at which all sit down together. The sub-committees then make their reports to the full committee, and the matters they bring up are discussed and necessary action taken.

The names of members of the employees' safety committee are posted on the bulletin boards in the roundhouses, shops and other places where the men congregate, and employees are asked to make whatever suggestions and complaints occur to them to the committeemen. The members of the committees wear a special button, which was illustrated in the *Railway Age Gazette* of January 27, page 176.

The central safety committee has recommended that the employees on committees be rotated, the term of office to be not less than six months nor more than 12. At first employees were a little loathe to serve on the committees and hesitated to freely criticize at meetings with their superior officers. The officers, however, have received all suggestions and criticisms in such good spirit that employees are getting ambitious to serve

on the committees, and their members are losing all reluctance about making suggestions and criticisms. It is being found that the employees' committees constitute a very important intermediary between the management and employees in general, because an employee will report matters to a fellow employee on one of the committees that he would not think of reporting directly to an officer.

The work of the safety committees has brought out numerous suggestions for changes in plants and operating methods, which the central committee has recommended to the general officers; and many of the suggestions made have been favorably acted on. The following are some examples: One division committee recommended that side curtains in engine cabs be placed inside the gangway, and experiments are being made to see to what extent this can be done. It has been found that numerous accidents occur in the uncoupling of hose, and it has been recommended that the management consider the advisability of annuling the rule requiring men to go between cars to uncouple air hose on freight cars and in future permit the hose to be uncoupled by the action of the cars in parting. The attention of the central committee was called by several division committees to the inadequate lighting of various roundhouses, engine houses and coal sheds, and the central committee referred the matter to the management, calling particular attention to the conditions at certain places. It was found that at a good many places the poor lighting was due to the fact that the windows had not been kept properly cleaned, and where this was the case immediate action was taken. The inadequate lighting tended to prevent the employees from working as rapidly as they otherwise could and also rendered their work less safe. Some other recommendations that have been received from division committees and favorably acted on by the central safety committee are, that investigation be made to see if it is not practicable to put another hand rail in vestibule cars to make it safer and easier for passengers to get on and off; that instructions be given to employees of the car department to remove to a safer distance drawbars and other things taken from cars; that the motive power department be asked to make arrangements to overcome complaints about blow-off pipes; that action be taken to reduce the number of accidents to trespassers and to bring the matter before the different state legislatures for action; that the general purchasing agent, the general storekeeper and the engineer of tests be requested to investigate thoroughly the quality of oil being purchased and used; that the general managers take some action which will cause private industries to unload their material far enough from tracks to prevent accidents and that certain of the departments of the road be asked to do likewise; that the engineers of maintenance be requested as soon as turntables require re-covering to increase the width of the platforms and cause all planking between the rails on turntables to be removed, and railings to be provided at the sides. Referring to the condition of the tracks and premises of private industries to which employees of the road are obliged to go in the switching cars, one of the division committees recommended that each industry holding a lease be required to build bins for the reception of its materials at least 6½ ft. from the nearest rail, and be not allowed to unload any material, such as coal, sand, gravel, crushed stone, etc., except in such bins. The central safety committee heartily concurred in this recommendation, but suggested that the distance limit for such structures should be 6 ft. Another recommendation from one of the division committees on which the central safety committee acted favorably was that more care be taken in inspecting cedar ties. It was found that a great many have hollow or shaky hearts; that where tie plates are used they are put in the center of ties, and that in spiking the tie to the plate it is found that there is often a shell of but one or two inches of soft timber to hold the spike.

The foregoing are merely examples of recommendations which have come up to the management as a result of its causing the officers and employees to take co-operative action for the purpose of reducing accidents. It has been said very often that a large majority of accidents is due to the carelessness or recklessness of employees. The experience of the North Western shows that a good many such accidents may be prevented by arousing the interest of the employees, and it is highly probable that the management of any other railway which should set on foot a similarly thorough-going investigation—from the employees' standpoint as well as from the management's standpoint—would find at least as many shortcomings of employees and of plant as have been found on the North Western. It would also find probably just as many examples of carelessness about proper lighting of buildings, handling of materials, etc.

It will be noted that most of the recommendations relate to conditions obtaining practically on the entire system. Faulty conditions on a particular division which can be remedied by the co-operation of employees and officers on that division are dealt with by the division committees themselves. Meetings of the division committees as well as of the central safety committee are held every month.

One of the very good results has been to bring officers and employees into closer and more harmonious relations than could possibly exist without such meetings—meetings always having a definite and workable purpose. In fact, practically all the officers and employees in the operating department are being organized into a single body having for its purpose the promotion of safety.

The North Western's management is not missing any chance to remind officers and employees of their duty in respect to the promotion of safety. One of the novel plans that have been adopted on the recommendation of the central safety committee is that of pasting slips regarding the matter of safety on the pay checks of employees and certain officers. The following slips are to be pasted on the checks of assistant superintendents, division engineers, trainmasters, train despatchers, agents, yard masters, roadmasters, conductors, engineers, signal men and foremen of all classes, inspectors of all classes, including engine and car inspectors:

> You are responsible for the safety of others as well as yourself.

> Exercise of care to prevent accidents is a duty which you owe to yourself and your fellow employees.

The following are to be put on the checks of brakemen, firemen, switchmen, switch tenders, gatemen, flagmen and telegraph operators:

> In case of doubt, adopt the safe course. Speed must always give way to safety.

> Remember that it is better to cause delay than it is to cause an accident.

The following are to be put on the checks of clerks, helpers and laborers of all classes of stations:

> Remember that it takes less time to learn to do a thing right than it does to explain why you did it wrong.

The following are to be put on the checks of track men, car and engine repairers and carpenters, and all other employees:

> In twelve months 153 men were injured by stepping on nails projecting from boards and cleats taken from cars and thrown on the ground close to the track. Why not pile the boards and cleats six feet from the rails with the nails down and save such injuries? If you don't do this, you may be the next victim.

A banner will be given at the end of each six months to the division which during that period has made the best record in keeping down accidents. In conferring the banner consideration will be given to the density of traffic and all other factors that tend to affect to the total number of accidents.

The managing officers believe that already they can see where substantial results have been secured. There has been a marked reduction of personal injuries since the movement was started, as compared with last year. Of course, only when statistics of accidents for a year or more since the safety movement was started can be compared with statistics for a similar previous period can an accurate judgment be formed.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of January, 1911. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Cause of Accident.	Kind of train.	Kil'd.	Inj'd.
*6.	Atchison, T. & S. F.	Mulvane.	rc.	P. & F.	2	0
†7.	M., Kan. & Tex.	Abbott.	rc.	P. & P.	2	6
13.	N. Y. C.	Batavia.	rc.	P. & P.	6	10
18.	N. Y. C.	Oneida.	xc.	F. & F.	3	0
24.	N. Y. C.	Furness.	bc.	P. & F.	0	2
*25.	Boston & M.	Boston.	xc.	F. & F.	2	0
27.	Grand Trunk	Muskegon.	rc.	F. & F.	1	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	Kil'd.	Inj'd.
9.	Del., Lack. & W.	Harrison.	careless running.	F.	1	0
13.	Gt. Northern	Priest River.	exc. speed	F.	2	0
18.	N. Y. C.	Wende.	boiler.	F.	3	0

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of train.	Kil'd.	Inj'd.
2.	Chic., R. I. & P.	Topeka.	wind.	P.	0	0

In the rear collision of passenger trains at Batavia, N. Y., on the 13th, six passengers were killed and ten or more were injured. Westbound train No. 23, running at 30 or 40 miles an hour, crashed into the rear of train No. 49, which was standing at the station and the rear car of No. 49, a sleeping car, was completely wrecked. The wreck took fire and some of the victims were severely burned; others were scalded by steam escaping from the boiler of the wrecked locomotive. It is said that train No. 23 had run past four automatic signals set against it. This collision was reported in the *Railway Age Gazette* of January 20.

In a collision reported as occurring near Paintsville, Ky., on the night of January 1, six persons riding on the pilot of the locomotive were killed. The road where this occurred is known as the "Millers Creek Railroad," and appears not to be a common carrier. It is operated or controlled by the Consolidation Coal Company. The collision was between a passenger train and three cars which had broken loose from a freight train and were standing on the main track. Four of the killed are classed as passengers and two as trainmen.

Of the electric car accidents reported in the newspapers as occurring in the month of January, we find only one case in which there was a fatal injury. This was a rear collision in Brooklyn, N. Y., on the 2d.

In a rear collision on the Grand Trunk of Canada, at Collins Bay, on the 23d, an engineman and a fireman were killed. A press despatch from South Africa on the 5th reported the derailment of an excursion train near Cathcart, Cape Colony, in which 15 persons were killed and 40 injured.

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collision——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

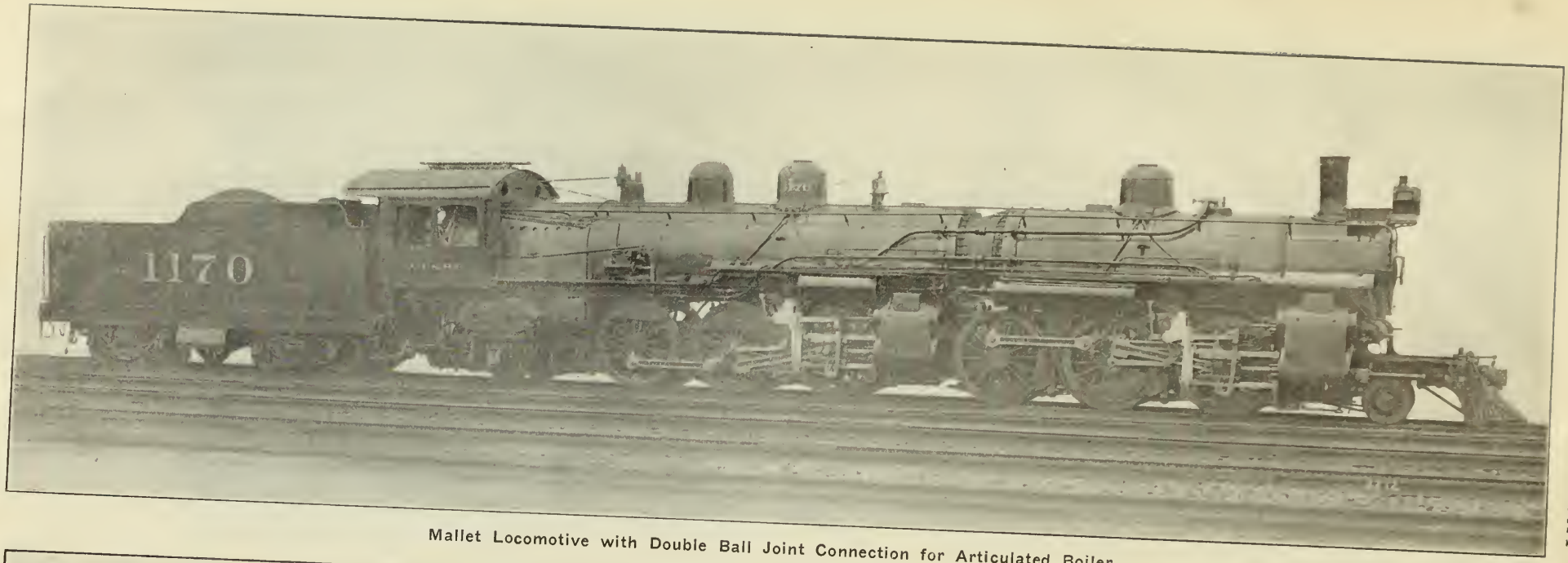
MALLET LOCOMOTIVES ON THE SANTA FE.

Mallet articulated locomotives were first put in service on the Atchison, Topeka & Santa Fe in the fall of 1909, when the Baldwin Locomotive Works delivered four to that road, which far exceeded in weight and capacity any other locomotives that

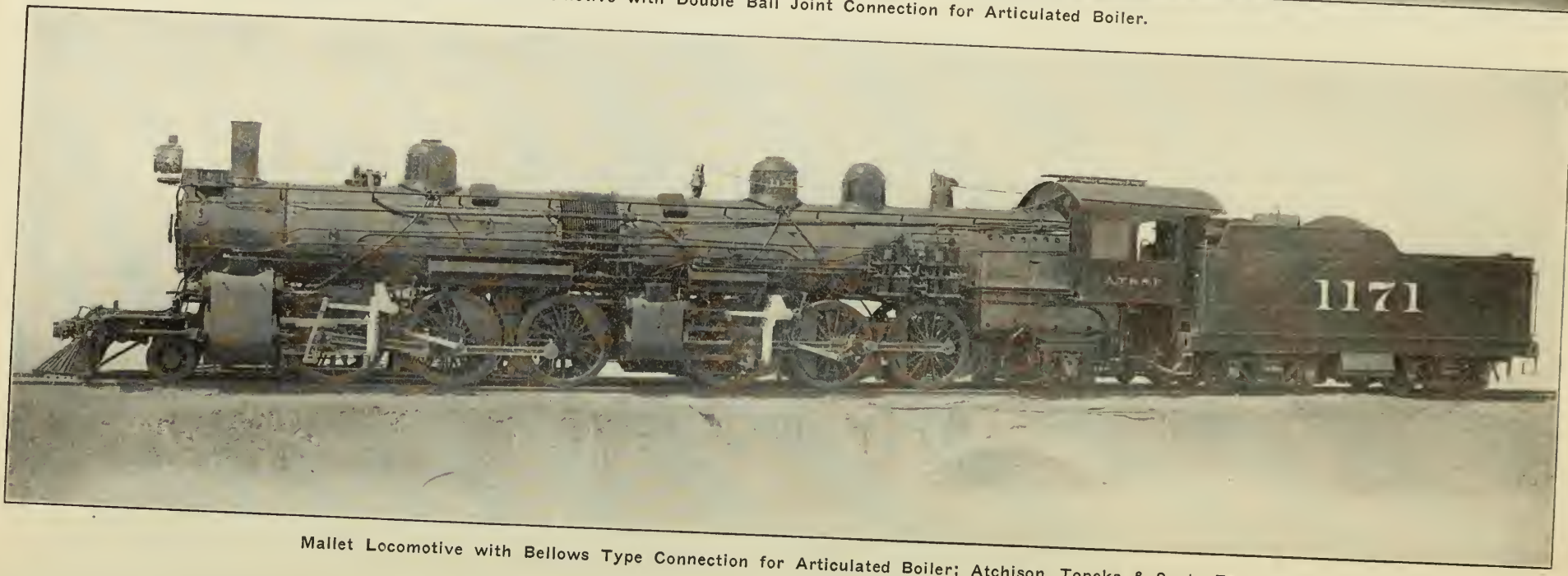


Mallet Locomotive with an Articulated Boiler on a Curve.

were used at that time. Two were for freight service with a 2-8-8-2 wheel arrangement and two for passenger service with a 4-4-6-2 wheel arrangement. Their performance has been watched closely, and a number of improvements have been made in forty Mallets, recently built for the Santa Fe by the Baldwin Locomotive works. These have a 2-6-6-2 wheel arrangement, and their

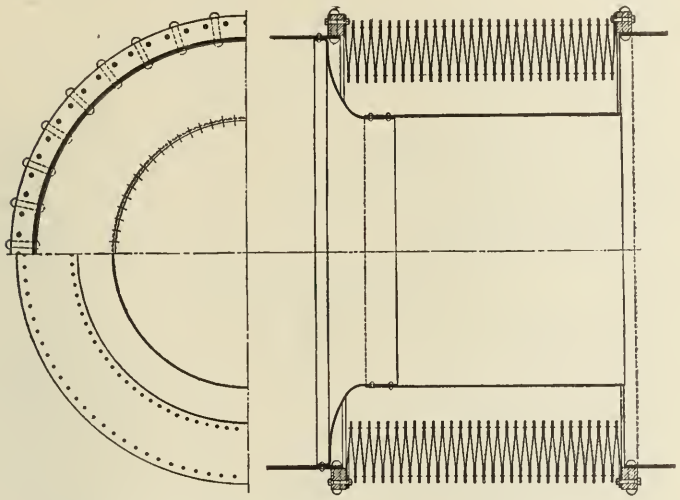


Mallet Locomotive with Double Ball Joint Connection for Articulated Boiler.



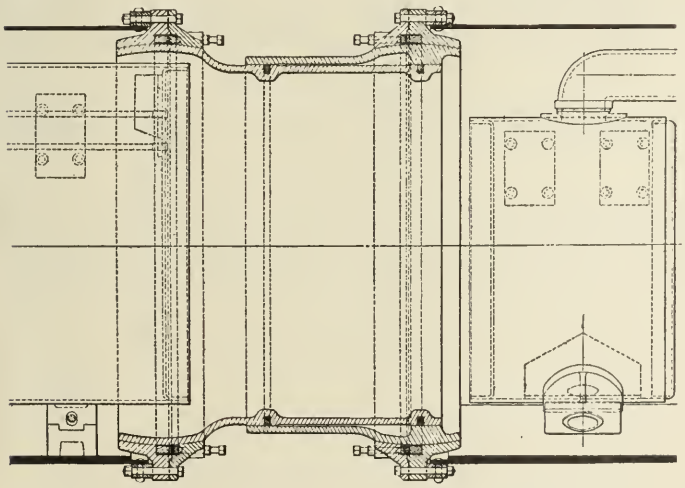
Mallet Locomotive with Bellows Type Connection for Articulated Boiler; Atchison, Topeka & Santa Fe.

general design is based on the Prairie type locomotive for fast freight service. They are used on the Belen cut-off, where the maximum grade is .6 per cent., and although they are rated to haul 2,200 tons, cars and lading, they have actually handled 2,700 tons, maintaining a speed of 15 miles per hour on this grade. Their maximum tractive effort working compound is 61,500 lbs. The special feature in the design of these locomotives is the boilers, two of them being equipped with flexible boilers, while the others have rigid boilers of the separable type.



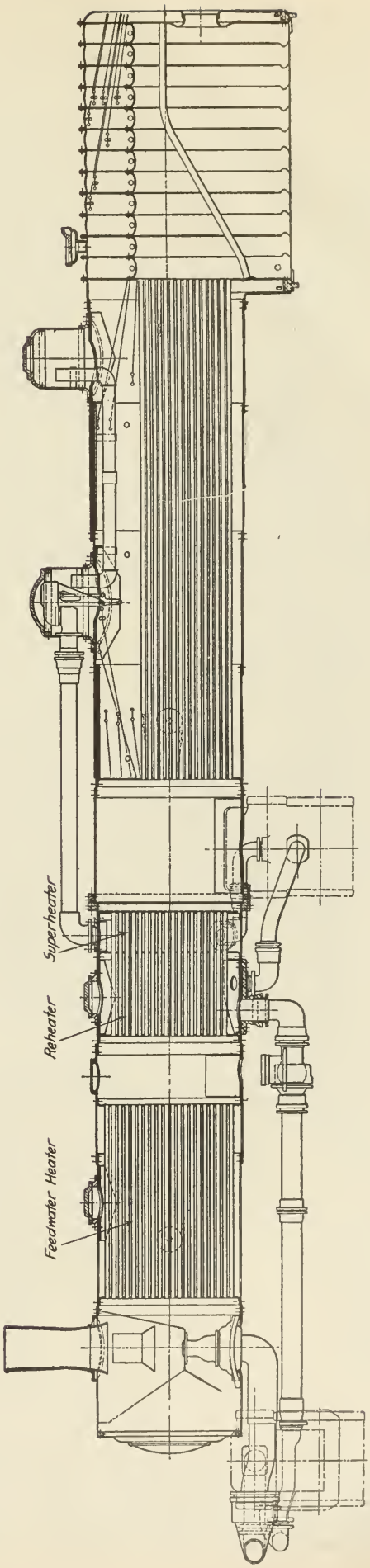
Bellows Type Connection for Articulated Boiler.

The rigid boiler is provided with a separable joint dividing it into two distinct sections. The front section contains the smokebox, feed water heater, combustion chamber, reheater and superheater. The rear, or main boiler section has a combustion chamber in its forward end. The superheater and re-heater are placed adjacent to each other, and are separated by an intermediate tube sheet, and one set of tubes traversing both heaters. The steam piping is so arranged that all joints are placed outside the boiler shell, where they are accessible. Experience on the



Double Ball Joint Connection for Articulated Boiler.

Santa Fe has proved the desirability of drawing the steam for the cylinders from a point as near the firebox as possible, and in order to avoid the use of a long external dry pipe two domes are used on the rear boiler section; these are connected by two internal pipes each 5 in. in diameter. The upper part of the forward dome contains the throttle valve, and is cut off from a direct connection with the boiler by a horizontal plate. The steam on entering the rear dome passes through a netting which assists in catching the suspended water, and is then conveyed through the two 5-in. pipes to the forward dome, where it enters



Rigid Boiler with Separable Joint; Atchison, Topeka & Santa Fe.

the throttle valve, which is so arranged that it only takes steam through the top. The dry pipe leading to the forward section and superheater passes along the top center line of the boiler on the outside.

The two flexible boilers embody decided innovations in locomotive construction in their design. An articulated boiler with a single ball joint, as designed at Topeka, was described in the article by M. H. Haig, mechanical engineer of the Santa Fe, in the *Railway Age Gazette* of February 10, 1911, page 278. In one of the Baldwin designs the principle is somewhat the same, except that there are two ball joints, one on each section of the boiler, with long overlapping sleeves and packing rings near the edge. A detail of this design is here illustrated. The ball joints are kept tight by rings of soft metallic packing, which may be adjusted by set screws. The two boiler sections may thus move in any direction relative to one another, full provision being made for expansion and contraction. The other flexible joint shown is that designed by Mr. Vauclain, of the Baldwin Locomotive Works, and is called the Bellows type connection. This joint consists of 60 rings, of high carbon steel, No. 14 gage thick, 10 in. wide and 75½ in. outside diameter. They are made with a set, so that when placed adjacent to each other they form a series of V-shaped joints. The adjacent rings are riveted together at the inside and bolted at the outside; the whole flexible connection is bolted in place between the front and rear sections. The products of combustion traverse this connection through a cylindrical flue 44 in. in diameter, which is riveted to the rear boiler section and prevents cinders from lodging in the crevices between the connecting rings.

It is, of course, necessary in these engines with flexible boilers to place flexible joints in all pipes which pass the articulated connection in the boiler. This, however, introduces no important complication. The steam piping is simplified, as no flexible joints are required in the exhaust connection between the low pressure cylinder and the smokebox. There is also a distinct advantage in the avoidance of sliding supports under the forward boiler section, and the stability of the locomotive on curves is not impaired by the lateral displacement of the boiler on the front frames, which necessarily occurs in a Mallet locomotive as usually built. Both the high and low pressure pistons are packed with cast iron rings sprung in. The high pressure piston head, 24 in. in diameter, is made of cast iron in one piece. The body of the low pressure piston is made of cast steel, and a cast iron bearing ring measuring 8 in. in width at the bottom is bolted to it. Tire flange oilers are applied to the leading driving wheels of the front group, which should prove of value in reducing flange wear, as the road has curves of 16 deg. on sidings and 10 deg. on the main line.

Record No. 69, recently issued by the Baldwin Locomotive Works, and from which this article was compiled, gives a more detailed account of the locomotives. Following are the principal dimensions and ratios:

General Data.

Type	Mallet
Service	Freight
Fuel	Soft coal
Tractive effort	61,500 lbs.
Weight in working order	392,300 lbs.
Weight on drivers	317,300 lbs.
Weight of engine and tender in working order	562,000 lbs.
Wheel base, driving	37 ft. 10 in.
Wheel base, rigid	13 ft. 8 in.
Wheel base, total	56 ft. 5 in.
Wheel base, engine and tender	89 ft. 3 in.

Ratios.

Total weight ÷ tractive effort	6.38
Weight on drivers ÷ tractive effort	5.15
Tractive effort × diam. drivers ÷ total heating surface†.	771
Tractive effort × diam. drivers ÷ total equivalent heating surface*	657
Total heating surface† ÷ grate area	105
Total equivalent heating surface* ÷ grate area	123
Firebox heating surface ÷ total heating surface,† per cent.	3.64
Firebox heating surface ÷ total equivalent heating surface,* per cent	3.10

Ratios.

Weight on drivers ÷ total heating surface†	57.6
Weight on drivers ÷ total equivalent heating surface*	49.1
Total weight ÷ total heating surface†	71.3
Total weight ÷ total equivalent heating surface*	60.8
Volume equivalent simple cylinders, cu. ft.	20.60
Total heating surface† ÷ vol. cylinders	267.5
Total equivalent heating surface* ÷ vol. cylinders	313.5
Grate area ÷ vol. cylinders	2.55

Cylinders.

Kind	Compound
Diameter	24 in. and 38 in.
Stroke	28 in.

Valves.

Kind	Bal. piston

Wheels.

Driving, diameter over tire	69 in.
Driving, thickness of tire	3½ in.
Driving, journals, main, diameter	10 in. x 12 in.
Driving, journals, others, diameter	9 in. x 12 in.
Engine truck, diameter	31¼ in.
Engine truck, journals	6½ in. x 12 in.
Trailing truck, diameter	40 in.
Trailing truck, journals	8 in. x 14 in.

Boiler.

Style	Straight
Working pressure	220 lbs.
Outside diameter of first ring	70 in.
Firebox, width and length	63¼ in. x 119⅝ in.
Firebox, plates, thickness	{ 5/16 in., ⅜ in., and 9/16 in.
Firebox, water space	5 in. and 5¼ in.
Tubes, number and diameter	294—2¼ in.
Tubes, length	19 ft. 7 in.
Heating surface, tubes	3,376 sq. ft.
Heating surface, firebox	200 sq. ft.
Heating surface, firebrick tubes	34 sq. ft.
Heating surface, feed-water heater	1,893 sq. ft.
Heating surface, total, including feed-water heater	5,503 sq. ft.
Heating surface, reheater	650 sq. ft.
Heating surface, superheater	300 sq. ft.
Heating surface, total equivalent	6,453 sq. ft.
Grate area	52.5 sq. ft.

Tender.

Tank, style	Water bottom
Wheels, diameter	34¼ in.
Journals	5½ in. x 10 in.
Water capacity	9,000 gals.
Coal capacity	12 tons

†Total heating surface includes feed-water heating surface.

*Total equivalent heating surface equals total heating surface plus reheating and superheating surface.

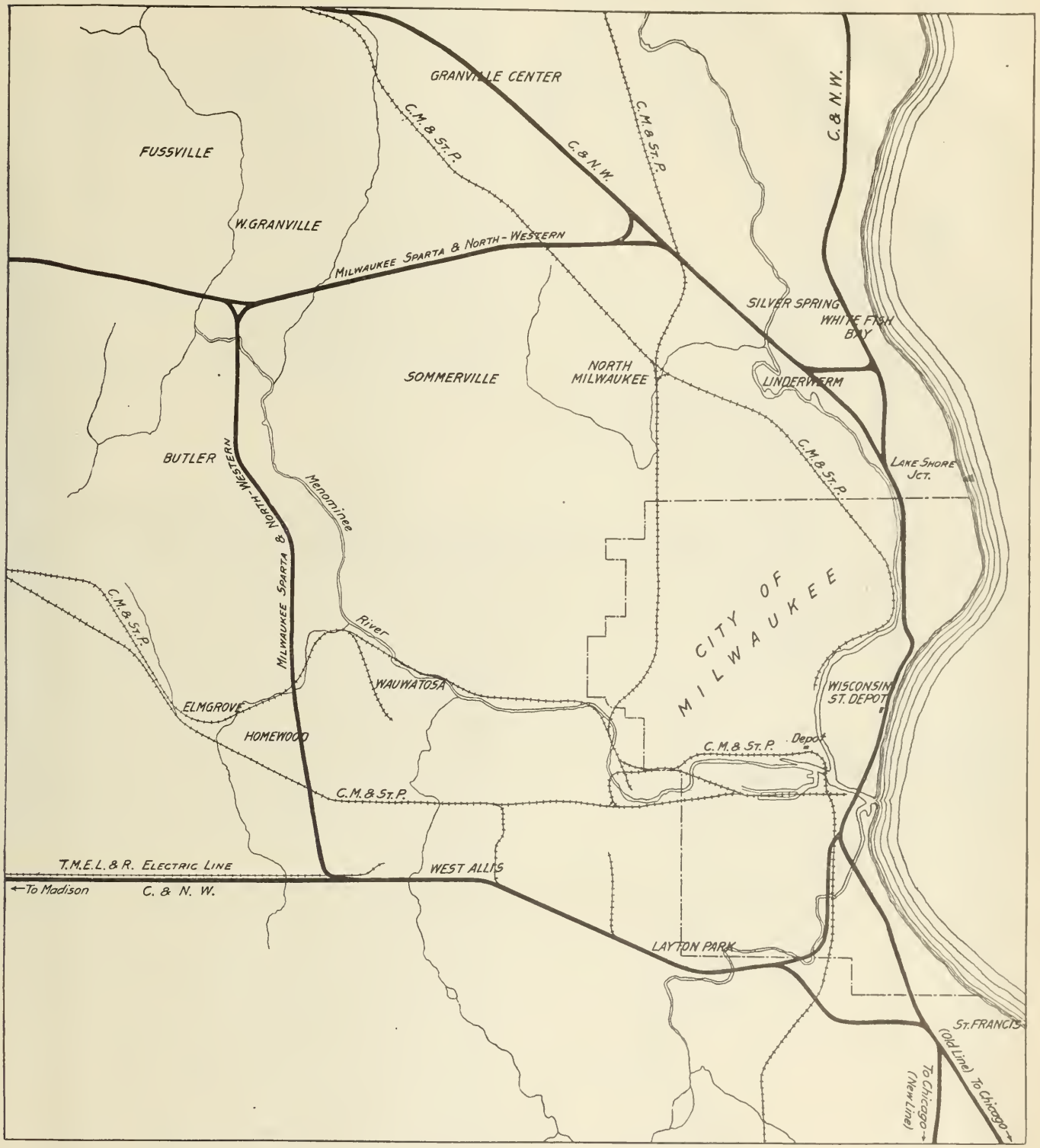
BELT LINES OF THE CHICAGO & NORTH WESTERN AT CHICAGO AND MILWAUKEE.

There has been much discussion by railway officers in recent years of the need for belt lines outside of the congested parts of large cities, over which through traffic originating at and destined to points other than these large cities themselves could be routed. The Chicago & North Western is one road whose management has not only been talking about this needed improvement, but has been making it. The North Western has been building outer belt lines at both Chicago and Milwaukee.

Its Des Plaines Valley Railway intersects, above Northfield, Ill., the two double track lines of the North Western running from Chicago to Milwaukee. From Northfield, as shown by one of the accompanying maps, it runs southwest to Des Plaines, Ill., where it intersects the Wisconsin division of the North Western. Southwest of Des Plaines it turns directly south and runs to a connection with the Galena division at Proviso, Ill. The line is 12 miles from the congested part of Chicago and is 22 miles long. At Proviso the yards have been enlarged, large engine houses have been built, cooling plants have been erected, etc. At this point the Des Plaines Valley connects with the Indiana Harbor Belt, and here the switching of through cars in connection with the making up of trains will be done, which heretofore has been done in the city. This will give the North

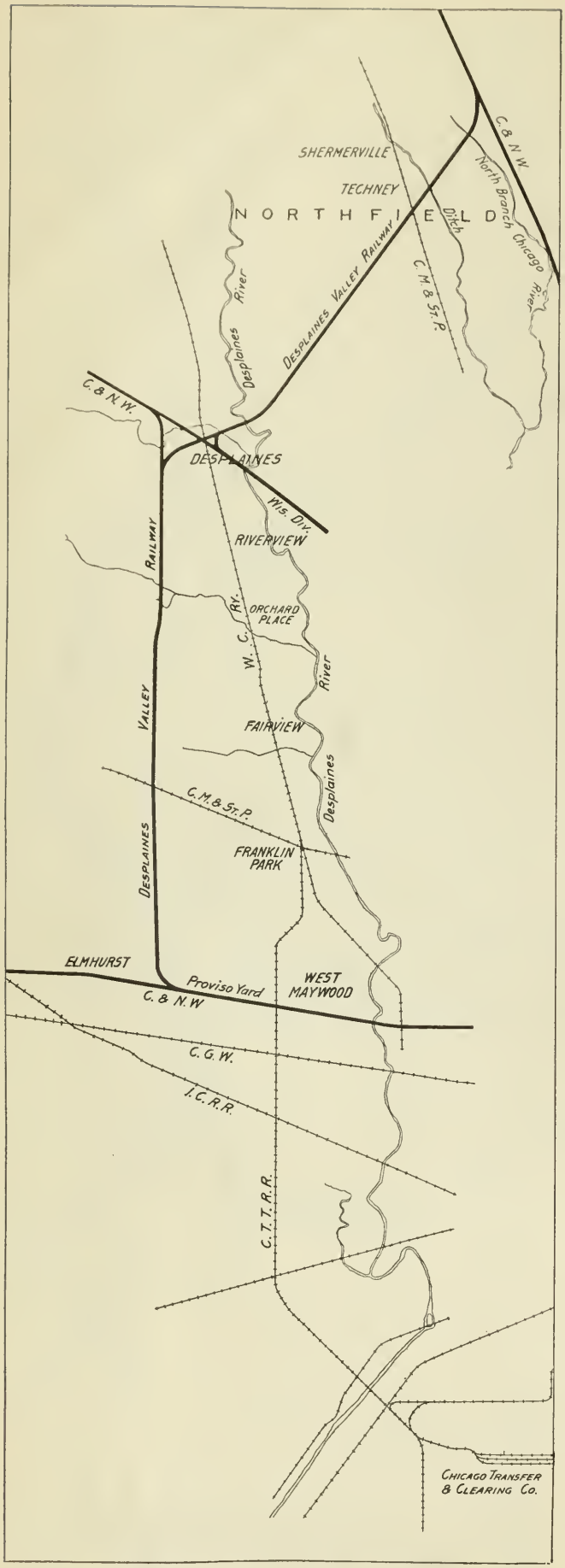
Western an opportunity to exchange with other roads via the Indiana Harbor line, in addition to using the facilities now afforded by the Belt Railway, and with the constant increase in business it will probably mean additional traffic for both the belt lines mentioned; and will also result satisfactorily from the standpoint of time required to effect transfers. Besides expediting the handling of existing traffic, the new line will open up an extensive territory where facilities can be provided for the location of new industries which will afford additional traffic.

In addition to the large terminal facilities which the construction of the Des Plaines Valley Railway will give the North Western for handling freight traffic at Chicago, a further enlargement of facilities will result from the construction of its new passenger terminals in that city and the use of the tracks now employed in passenger service for the handling of freight business.



Chicago & North Western Lines Around Milwaukee.

The other map herewith shows both the old lines of the Chicago & North Western through Milwaukee and its new belt line, the Milwaukee, Sparta & Northwestern. Formerly through traffic was routed through the city from Lake Shore Junction as far around as West Allis, all the business, both local and



Des Plaines Valley Line of the Chicago & North Western.

through, passing through a narrow throat in the city along the lake front. Now all business originating at and destined to points beyond Milwaukee will be moved via the Milwaukee, Sparta & Northwestern, which will eliminate the congestion incidental to the mixture of local and through traffic and make it practicable both to better serve the industries already located on the North Western and to open up a large territory suitable to industrial development.

The Milwaukee, Sparta & Northwestern is a new low grade line from Lindwerm, Wis., about eight miles north of Milwaukee, to Sparta, Wis., a distance of about 169 miles, exclusive of the belt connections around Milwaukee shown on the map. The new line connects with the Chicago, St. Paul, Minneapolis & Omaha at Wyeville, and gives the North Western an opportunity to handle its heavy tonnage for the Twin Cities and Duluth, and connecting traffic for the Omaha line over a direct low grade road, which will enable engines to pull larger units without sacrificing time. This line, in connection with the Milwaukee belt, will also provide the North Western with means to run some of its through passenger trains to Duluth and the Twin Cities through Milwaukee. It now has direct connections from Milwaukee to Lake Superior and Minnesota by its Waukesha and Madison lines, but the new road will be more direct.

The construction of these belt lines is in line with the policy which Marvin Hughitt, chairman of the Chicago & North Western, has pursued of developing home industries.

THE GENEALOGY OF THE NEW HAVEN.

[WITH AN INSET.]

The New York & New Haven Railroad, the base on which the New York, New Haven & Hartford system was built up, was chartered in 1844, but not fully opened until five years later, after much difficulty in raising its original capital of $2,500,000. The basic line from New Haven to a junction with the Harlem tracks was then, as now, about 64 miles. Its beginnings, of course, were meager. There were no night trains on the line and but two freight trains per day; yet it paid dividends almost from the first from earnings that then had better been used in improvements. Ere long it suffered two costly calamities. One was the famous "Schuyler fraud"—the issue of spurious shares for nearly $2,000,000 by Robert Schuyler, president and stock transfer agent of the corporation. The story of that dramatic crime with its rich harvest of litigation and which the company did not outlive for 14 years will be found on page 317 of the *Railroad Gazette* of April 29, 1904. The other calamity was the Norwalk drawbridge disaster, May 6, 1853, in which 46 persons lost their lives.

It is a striking fact that the present system has been built up during two decades and under two presidents—C. P. Clark and C. S. Mellen—the earlier history of the road being ultra-conservative. Not until 1872, or 23 years after its opening, did it take in the New Haven, Hartford & Springfield line, the natural extension into Massachusetts. The important acquisition under intermediate presidents, G. W. Watrous and J. M. Hall, who for a brief time succeeded President Clark, were the New Haven & Northampton; the old Shore Line between New Haven and New London; and the more important New York & New England, reaching from the Hudson river to Boston—a line of checkered and sensational history. But under President Clark consolidation went on by leaps and bounds. It included the Housatonic group; the Naugatuck; the Boston Air Line; the large Old Colony and the New York, Providence & Boston, with their several allied Sound boat lines; the beginnings of trolley purchase; and along with these the development of the Harlem terminal and the four-tracking of the main line between New Haven and New York.

Big and swift as were President Clark's mergers he has been surpassed in the development of the system by his successor,

THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY

CONSTITUENT AND LEASED PROPERTIES OPERATED DIRECTLY.

COMPANIES CONSOLIDATED.

Name of Company.	Date Consolidated
THE NEW YORK & NEW HAVEN R. R. CO. } THE HARTFORD & NEW HAVEN R. R. CO. }	Aug. 6, 1872
The latter has been consolidated with	
The Hartford & Springfield R. R.	in 1847.
The Branch Co.	" 1850.
The Middletown R. R. Co.	" 1850.
Middletown Extension R. R. Co.	" 1861.
New Britain & Middletown R. R. Co.	" 1868.
Windsor Locks & Suffield R. R. Co.	" 1871.
THE STAMFORD & NEW CANAAN R. R. CO. Successor of New Canaan R. R. Co.	Oct. 1, 1890
THE HARTFORD & CONNECTICUT VALLEY R. R. CO. Successor to Connecticut Valley R. R. Co.	Dec. 21, 1892
NEW YORK, PROVIDENCE & BOSTON R. R. CO.	Feb. 13, 1893
THE COMPANY FOR ERECTING AND SUPPORTING A TOLL BRIDGE FROM NEW HAVEN TO EAST HAVEN	Oct. 18, 1895
THE UNION WHARF CO. IN NEW HAVEN AND THE CONTRACTORS TO REBUILD AND SUPPORT UNION WHARF AND PIER IN NEW HAVEN	Oct. 18, 1895
SHORE LINE RAILWAY CO. Successor in 1864 to The New Haven, New London & Stonington R. R. Co., which was formed in 1856 by a merger of New Haven & New London R. R. Co. with New London & Stonington R. R. Co.	Mar. 18, 1897
THE HOUSATONIC R. R. CO.	Mar. 26, 1898
SHELFAUG, LITCHFIELD & NORTHERN R. R. CO. Successor of Shepaug Valley R. R. Co. and Shepaug R. R. Co.	July 9, 1898
DANBURY & NORWALK R. R. CO.	Oct. 26, 1905
PROVIDENCE & SPRINGFIELD R. R. CO. Successor in 1872 to Woonasquatucket R. R. Co.	Oct. 30, 1905
NEW HAVEN & DERBY R. R. CO.	Nov. 3, 1905
RHODE ISLAND & MASS. R. R. CO. (R. I. Div.) Incorporated under name of Rhode Island Mining R. R. Co.	Nov. 3, 1905
WOONSOCKET & PASCOAG R. R. CO.	Nov. 3, 1905
THE MIDDLETOWN, MERIDEN & WATERBURY R. R. CO. Formerly The Meriden & Cromwell R. R. Co. and The Meriden & Waterbury R. R. Co. Consolidated in 1887 under the name of The Meriden, Waterbury & Conn. River R. R. Co. Sold under foreclosure and came into the possession of the M. M. & W. R. R. Co. in 1898.	Nov. 3, 1905
THE ROCKVILLE R. R. CO.	Nov. 6, 1905
COLCHESTER RY. CO.	Dec. 16, 1905
THE NAUGATUCK R. R. CO. Foreclosed. The Watertown & Waterbury R. R. Co. in 1893.	Jan. 31, 1906
THE PROVIDENCE TERMINAL CO. Incorporated as New York, Providence & Boston & Old Colony R. R. Terminal Co.	Dec. 29, 1906
BOSTON & NEW YORK AIR LINE R. R. CO. Successor of New Haven, Middletown & Willimantic R. R. Co.	Jan. 30, 1907
PAWTUXET VALLEY R. R. CO.	Feb. 5, 1907
THE MANUFACTURERS R. R. CO. Successor to The Manufacturers St. Ry. Co. of New Haven.	Apr. 30, 1907
THE NEW ENGLAND R. R. CO. Successor in 1895 to the New York & New England R. R. Co.	Apr. 1, 1908

Note.—On May 31, 1907, The Consolidated Ry. Co., organized Aug. 31, 1901, and The New York, New Haven & Hartford R. R. Co., merged under the name The New York, New Haven & Hartford R. R. Co.

PROPERTIES LEASED.

Name of Company.	Terms of Lease.	Stock owned by N.Y.N.H.&H.	% Owned
*Berkshire R. R. Co.	99 yrs. from Apr. 1, 1893..	$556,100.00	79.2
Boston & Providence R. R. Corp.	99 yrs. from Apr. 1, 1888..	217,800.00	5.4
The Harlem River & Port Chester R. R. Co.	99 yrs. from Oct. 1, 1873..	1,000,000.00	100
Holyoke & Westfield R. R. Co.	‡Perpetual from June 1, 1907	20,000.00	7.7
‡Milford, Franklin & Providence R. R. Co.	Expired Apr. 1, 1907.....	100,000.00	100
‡Milford & Woonsocket R. R. Co.	Expired Apr. 1, 1907.....	148,600.00	100
*New Haven & Northampton Co.	99 yrs. from Apr. 1, 1887..	2,460,000.00	100
Norwich & Worcester R. R. Co.	100 yrs. from Feb. 1, 1869.	69,200.00	2.3
Old Colony R. R. Co.	99 yrs. from Mar. 1, 1893..	7,749,400.00	35
Providence, Warren & Bristol R. R. Co.	95 yrs. 9 mos. from July 1, 1891	500.00	0.3
Providence & Worcester R. R.	99 yrs. from July 1, 1892..	311,800.00	8.9
*Rhode Island & Mass. R. R. (in Mass.)	Operated without lease...	100,000.00	100
Plymouth & Middleboro R. R. Co.	99 yrs. from Dec. 1, 1892..	.....	..
Chatham R. R. Co.	To June 30, 1910, and thereafter until terminated by either party by 10 days' written notice	.....	..

* Merged in October, 1910.
‡ Merger proposed this year.
† In perpetuity to New Haven & Northampton Co.

DIRECT CAPITAL OBLIGATIONS.

Name	Rate %	Character	Date Maturity.	Total Outstanding. $121,878,150 00	In N.Y.N.H.&H. Treasury, or in Reserve Funds.	Owned by Subsidiary Companies. $17,442,500 00
Capital stock (par $100)						
Outstanding receipts for installments paid on subscriptions to 446,449 shares				$22,139,325.00	$123,625.00	$2,844,650.00
BONDS.						
N. Y. N. H. & H. R. R. Co., H. R. & P. C.	4	1st mtg.	May 1, 1954	$15,000,000.00		
N. Y., Prov. & Boston R. R. Co.	4	Gold mtg.	Apr. 1, 1942	1,000,000.00	$201,000.00	
Housatonic R. R. Co.	5	Consol. mtg.	Nov. 1, 1937	2,939,000.00		
Danbury & Norwalk R. R. Co.	6	Consol. mtg.	July 1, 1920	100,000.00		
" " "	5	Consol. mtg.	July 1, 1920	400,000.00		
" " "	5	Cons. mtg.	Apr. 1, 1925	150,000.00		
" " "	4	1st ref. mtg.	June 1, 1955	500,000.00		
Woonsocket & Pascoag R. R. Co.	5	1st mtg.	Oct. 1, 1910	100,000.00		
New Haven & Derby R. R. Co.	5	Consol. mtg.	May 1, 1918	575,000.00	1,000.00	
Providence & Springfield R. R. Co.	5	1st mtg.	July 1, 1917	750,000.00		
Naugatuck R. R. Co.	4	1st mtg.	May 1, 1954	2,500,000.00	1,000.00	
Boston & N. Y. Air Line R. R. Co.	4	1st mtg.	Aug. 1, 1955	3,777,800.00		
Providence Terminal Co.	4	1st mtg.	Mar. 1, 1956	4,000,000.00		
Pawtuxet Valley R. R. Co.	4	1st mtg.	Apr. 1, 1925	160,000.00		
New England R. R. Co.	4	Consol. mtg.	July 1, 1945	10,000,000.00		
" " "	5	Consol. mtg.	July 1, 1945	7,500,000.00		
Roxbury Central Wharf	5	1st mtg. gold notes	Sept. 1, 1912	200,000.00		
Worcester & Conn. Eastern Ry. Co.	4½	1st mtg.	Jan. 1, 1942	1,992,000.00	38,000.00	$40,000.00
Worcester Ave. R. R. Co.	5	1st mtg.	Nov. 1, 1917	500,000.00		
New Haven St. Ry. Co.	5	1st mtg.	Sept. 1, 1913	600,000.00		
" " "	5	Consol. mtg.	June 1, 1914	250,000.00		
New Haven & Centerville St. Ry. Co.	5	1st mtg.	Sept. 1, 1913	263,000.00		
Meriden Horse R. R. Co.	5	1st mtg.	Oct. 1, 1911	150,000.00		
" " "	5	Consol. mtg.	Jan. 1, 1924	415,000.00		
Norwich St. Ry. Co.	5	1st mtg.	Oct. 2, 1923	350,000.00		
Montville St. Ry. Co.	5	1st mtg.	May 1, 1920	250,000.00		
New London St. Ry. Co.	5	1st mtg.	Oct. 2, 1923	150,000.00		
Middletown Horse R. R. Co.	5	1st mtg.	Dec. 1, 1914	150,000.00		
Portland St. Ry. Co.	5	1st mtg.	Nov. 1, 1916	30,000.00		
Hartford, Manchester & Rockville Tramway Co.	5	1st mtg.	Oct. 1, 1924	200,000.00		
Hartford St. Ry. Co.	4	1st mtg.	Sept. 1, 1930	2,500,000.00		
Greenwich Tramway Co.	5	1st mtg.	July 1, 1931	300,000.00		
Branford Electric Co.	5	1st mtg.	Oct. 1, 1927	63,000.00		
Branford Light & Water Co.	5	1st con. mtg.	Aug. 1, 1951	207,800.00		
Torrington & Winchester St. Ry. Co.	5	1st mtg.	Dec. 1, 1917	150,000.00		
Meriden, Southington & Compounce Tramway Co.	5	1st mtg.	July 1, 1928	175,000.00		
Stafford Springs St. Ry. Co.	5	1st mtg.	July 1, 1956	400,000.00		
Total				$58,661,000.00	$241,000.00	$40,000.00
DEBENTURES.						
New York, New Haven & Hartford R. R. Co.	6	Convertible.	Jan. 15, 1948	$39,029,000.00	$600,800.00	
" " " "	3½	Convertible.	Jan. 1, 1956	30,000,000.00	589,100.00	$50,000.00
" " " "	4	Non-convert.	Feb. 1, 1954	5,000,000.00	45,000.00	
" " " "	4	Non-convert.	Mar. 1, 1947	5,000,000.00		
" " " "	3½	Non-convert.	Mar. 1, 1947	5,000,000.00	9,000.00	
" " " "	3½	Non-convert.	Apr. 1, 1954	10,000,000.00	2,100.00	
" " " "	4	Non-convert.	Apr. 1, 1955	15,000,000.00		
" " " "	4	Non-convert.	May 1, 1956	15,000,000.00		
" " " "	4½	3-yr. deb. notes	May 5, 1911	2,000,000.00		
" " " "	5	4-yr. deb. notes	Jan. 9, 1913	1,350,000.00	55,000.00	
" " " "	5	5-yr. deb. notes	Jan. 2, 1912	300,000.00	50,000.00	
" " " "	5	5-yr. deb. notes	Jan. 9, 1912	6,400,000.00	30,000.00	
European loan of 1907			Apr. 1, 1932	27,985,000.00		
Naugatuck R. R. Co.	3½	Debentures.	Oct. 1, 1930	234,000.00		
Hartford St. Ry. Co.	4	Deb. Series M.	Jan. 1, 1930	165,000.00		
The Consolidated Ry. Co.	3.33 & 4	Debentures.	Feb. 1, 1930	972,000.00	700.00	
" " "	4	1954 Deb.	July 1, 1954	4,255,000.00		
" " "	4	1955 Deb.	Jan. 1, 1955	2,209,000.00		
" " "	4	1955 Deb.	Apr. 1, 1955	1,340,000.00		
" " "	4	1956 Deb.	Jan. 1, 1956	2,011,000.00		
The Farmington St. Ry. Co.	5	Debentures.	July 1, 1924	30,000.00		
Total				$173,320,000.00	$1,381,700.00	$50,000.00
Real estate mortgage				$11,500.00		
Advance payments 3d and 4th installments of subscriptions to capital stock	4			$7,047,062.50	$153,750.00	$3,555,812.50
NOTES PAYABLE.						
	$5,280,364.28 4 / 500,000.00 4½			$5,780,364.28		$4,180,364.28

CONTINGENT LIABILITIES.

Boston Terminal Co. Bonds, $14,000,000.00 on June 30, 1910.
Jointly liable with other roads for any deficiency on foreclosure.
Springfield Railway Companies' Preferred Stock.
Guarantees 4% dividends on $3,387,950.00 and payment of principal at 105% on liquidation.
New England Investment & Security Co. Preferred Stock and 15-year Funding Gold Notes.
Guarantees 4% dividends on $4,000,000.00 and payment of principal at 105% on liquidation.
Guarantees payment of principal, $3,000,000.00, and interest of 15-year funding gold notes dated April 1, 1909
Guarantees payment of an additional $13,250,000.00 and interest of same notes when requested to do so by John L. Billard as per contract.
Providence Securities Co. 4% 50-year Gold Debentures, $19,899,000.00, dated May 1, 1907.
Guarantee by endorsement.
New England Navigation Co. Gold Debentures, $3,000,000.00.
Guarantees payment of principal and interest in case of termination of Old Colony R. R. Co. lease.
New Haven & Northampton Co. 4% 50-year Refunding Gold Bonds dated June 1, 1906.
Guarantee by endorsement to the amount of $2,400,000.00.*
New York & Stamford Ry. Co. 4% 50-year 1st and Refunding Gold Bonds dated Nov. 1, 1906.
Guarantees payment of principal and interest to the amount of $274,000.00.
The Harlem River & Port Chester R. R. Co. 4% 50-year 2d Mortgage Bonds, dated June 1, 1881
Guarantees payment of principal ($1,000,000.00) and interest.
The principal and interest to maturity has been deposited by the N. Y. N. H. & H. R. R. Co. with the Farmers' Loan and Trust Co., trustee
Boston Railroad Holding Co. stock, bonds, notes and other evidences of indebtedness.
Under the provisions of Section 4, Chapter 519 of Acts of the General Court of the Commonwealth of Massachusetts, passed at its 1909 session, the N. Y. N. H. & H. R. R. promises when they shall be sold to guarantee the principal of, and the dividends, and interest upon the capital stock, bonds, notes and other evidences of indebtedness of Boston Railroad Holding Co. held by it.

*In addition, the New Haven & Northampton Company has outstanding $700,000.00 of 5% Northern Extension bonds, of which $54,000 are held in the New Haven Accident & Casualty Fund.

THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY SYSTEM, JUNE 30, 1910.

COMPANIES HELD OR OPERATED INDEPENDENTLY (REVENUE

STEAM RAILROAD AND CONSTRUCT

BOSTON RAILROAD HOLDING CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$3,106,500.00	$3,106,500.00
Debentures, 4%, due Nov. 1, 1959	20,012,000.00	20,012,000.00

This company owns:

6,543 shares Boston & Maine pref. stock out of 31,498 shares; ‡53,571 shares Boston & Maine com. stock out of 288,413 shares; and $390.70 common scrip.

CENTRAL NEW ENGLAND RAILWAY CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Preferred stock (Par $100)	$3,750,000.00	$3,471,000.00
		*184.57
Common stock (Par $100)	4,800,000.00	4,488,550.00
Bonds:		*125.93
Central New Eng. 1st mtg. 5%, due Feb. 1, 1919	1,250,000.00	192,000.00
Poughkeepsie & Eastern Ry. 1st mtg. 5%, due Nov. 1, 1934	500,000.00	500,000.00
Dutchess County R. R. Co. 1st mtg. 4½%, due June 1, 1940	350,000.00	
Central New Eng. gen. mtg. inc., due Feb. 1, 1949	7,250,000.00	7,037,000.00
Maximum rate 5%, beginning in 1910.		*442.39
Newburgh, Dutchess & Conn. inc. mtg. 6%, due Dec. 1, 1977	1,164,500.00	1,164,500.00
Notes payable	2,592,388.96	‡2,592,388.96

‡$150,000 of N. D. & Conn. 1st mtg. 7% bonds (all) pledged to secure note to N. Y. N. H. & H. R. R.
*Scrip.

NEW YORK, ONTARIO & WESTERN RY. CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Preferred stock (Par $100)	$4,000.00	$2,200.00
Common stock (Par $100)	58,113,983.84	29,160,000.00
Bonds:		
Refunding mtg. 4%, due June 1, 1992	20,000,000.00	
General mtg. 4%, due June 1, 1955	3,948,000.00	
Collateral trust notes (two series)	‡2,375,000.00	
Notes payable	944,894 81	

‡First series, $300,000.00 unpaid; last installment due Feb. 1, 1911. Secured by bond and mortgage of Scranton Coal Co.
Second series, $2,075,000.00 unpaid; last installment due Dec. 1, 1915. Secured by bond and mortgage of Elk Hill Coal & Iron Co.
The payments of installments on the coal mortgages in both series are identical with the due dates and amounts of the notes.

PROPERTIES LEASED.

Hartford & Connecticut Western R. R. Co., successor of the Connecticut Western R. R. Co.
Lease runs 50 years from Aug. 30, 1890.
Out of 29,670 shares, N. Y. N. H. & H. owns 705 shares, and Central New Eng. Ry. owns 16,400 shares. Of this latter amount 13,900 shares are pledged for the Central New Eng. Ry. first mortgage and general mortgage income bonds.

PROPERTIES CONSOLIDATED.

The Central New England Ry. Co. is the successor through reorganization after foreclosure of
Philadelphia, Reading & New Eng. Railroad, which was a merger of
Poughkeepsie Bridge Co., and
Central New Eng. & Western R. R. Co., this latter company being a consolidation of
Hudson Connecting R. R. Co. and
Poughkeepsie & Conn. R. R. Co.
Merged with C. N. E. Ry. Co.,
Poughkeepsie Bridge R. R. Co.
Dutchess County R. R. Co.
Newburgh, Dutchess & Conn. R. R. Co., successor to Dutchess & Columbia R. R. Co.
Poughkeepsie & Eastern Ry. Co.

PROPERTIES LEASED.

Utica, Clinton & Binghamton R. R. Co.
Rome & Clinton R. R. Co.

PROPERTIES OWNED

*Ontario, Carbondale & Scranton Ry. Co.	(Purch'd 1889)
‡Ellenville & Kingston R. R. Co.	(" 1903)
‡Port Jervis, Monticello & Summitville R. R. Co.	(" 1905)
Wharton Valley Ry. Co.	(" 1888)
Peecksport Connecting R. R. Co.	(" 1896)

*All stock and bonds of this company pledged in the N. Y. O. & W. refunding mortgage.
‡All stocks and bonds of these companies pledged in the N. Y. O. & W. general mortgage.
First four companies operated under leases

STREET RAILWAY CO

NEW YORK & STAMFORD RAILWAY CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$500,000.00	$500,000.00
Bonds:		
1st mtg. 5%, due Oct. 1, 1931	426,000.00	
1st ref. mtg. 4%, due Nov. 1, 1958	274,000.00	37,000.00
Notes payable	290,030.47	290,030.47

THE RHODE ISLAND CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$9,685,500.00	$9,685,500.00
Bonds:		
Providence & Burrillville St. Ry. 5% bonds	$254,000.00	
Funds deposited with R. I. Hospital Trust Co. to redeem	254,000.00	

THE WESTCHESTER STREET RAILROAD CO

Organized Dec. 8, 1909, to acquire major portion of the property of the Tarrytown, White Plains & Mamaroneck Ry. Co. under foreclosure.
Application now pending before the New York Public Service Commission, 2d District, for authority to issue capital stock.
Notes payable, $21,208.00, due the Connecticut Co.
Cash advances from the New York, New Haven & Hartford R. R. Co., $907,840.43, to be paid in capital stock of company.

THE CONNECTICUT CO.

	Outstanding. Total.
Capital stock (Par $100)	$40,000,000.00

LEASED PROPERTY.

That portion of the Greenwich Tramway Co. west from Mianus River to New York State line.

LEASED PROPERTIES.

Union Railroad Co.
Rhode Island Suburban Railway Co.
Pawtucket St. Ry. Co.
999 years from June 24, 1902.
Total annual rental, $1,061,612.00.

PROPERTIES PURCHASED.

Woonsocket St. Ry. Co.
Columbian St. Ry. Co.
Providence & Burrillville St. Ry. Co.

PROPERTIES LEASED.

*Bridgeport Traction Co.
*Shelton St. Ry. Co.
*Milford St. Ry. Co.
*Westport & Saugatuck St. Ry. Co.
*Derby St. Ry. Co.
*Norwalk St. Ry. Co.
*Norwalk Tramway Co.
*Southington & Plantsville Tramway Co.
*Cheshire St. Ry. Co.
*Naugatuck Valley Elec. Ry. Co.
*Thomaston & Watertown Elec. Ry. Co.
*Waterbury Traction Co. (Street Ry. Dept.).
*The Central Railway & Elec. Co. (Street Ry. Dept.).
†West Shore Ry. Co.
‡South Manchester Light, Power & Tramway Co.

*All except last two companies were leased to Consolidated Ry. Co. by Connecticut Ry. & Ltg. Co. for 999 years from Aug. 1, 1906, and sublet to the Connecticut Co. by the N. Y. N. H. & H. R. R. Co.
† 99 years from Dec. 15, 1895.
‡ 25 years from May 15, 1895.

The Columbi
The Peoples
The Daniels
The Walling
The Winche
The Fair Ha
Meriden Ele
The Norwich
Montville St
New Londo
The Middlet
Hartford St.
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of line we
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Stamford St.
Willimantic
The Hartfor
The Hartfor
The Waterbu
The Torring
The Meride
The Stafford
The Farming

MARINE COMPANIES.

THE NEW ENGLAND NAVIGA

Capital stock (Par $100) $53,
Bonds:
New London Steamboat Co. 1st mtg. 6%, due Jan. 1, 1916.
Debentures:
N. E. Nav. Co. 50-year 4%, due Jan. 1, 1955 .....
N. E. Nav. Co. gold 4%, due Nov. 13, 1955 ..... ‡3,
Providence Securities Co. 4%, due May 1, 1957 19,

† Incorporated as Colonial Commercial Co. May 14, 1901. N
* Funds to redeem these bonds deposited with New York Tr
‡Owned by Old Colony R. R. Co. Interest under terms of to the N. Y. N. H. & H. R. R. Co.
§ Owned by the Norwich & Worcester Railroad Co. Inte Worcester property is payable to the N. Y. N. H. & H. R. R. Co

PROPERTIES PURCHAS

Providence & Stonington Steams
Norwich & New York Transport
New Haven Steamboat Co.
New London Steamboat Co.
Bridgeport Steamboat Co.
Old Colony Steamboat Co.

THE HARTFORD & NEW YORK TRANSPORTATION CO.

	Outstanding. Total.	Owned by N. E. N. Co.
Capital stock (Par $25)	$3,283,000.00	$3,283,000.00
Bonds:		
1st mtg. 4½%, due May 1, 1934	200,000.00	
Notes payable	200,000.00	200,000.00

MAINE STEAMSHIP CO. OF MAINE.

	Outstanding. Total.	Owned by H.&N.Y.T.Co.
Capital stock (Par $50)	$333,350.00	$333,250.00
Bonds:		
M. S. Co. of Maine 1st mtg. 6%, due Apr. 1, 1926	*225,000.00	16,000.00
Portland Consol. S. S. Co. 1st mtg. 5%, due July 1, 1921	‡325,000.00	
Notes payable	119,090.38	119,090.38

Sinking Fund 1st mtg. 6's ... *$77,000 1st mtg. 6's. / 14,000 1st mtg. 5's.
Sinking Fund 1st mtg. 5's ... ‡$2,000 1st mtg. 5's.

MEMORANDUM.

The New England Navigation Co. owns 50% of Merchants & Miners Transportation Co.

NDENTLY (REVENUE FROM WHICH GOES INTO "OTHER INCOME").

AD AND CONSTRUCTION COMPANIES

RY. CO.

utstanding

	Owned by N.Y.N.H.&H.
00	$2,500.00
.84	29,160,000.00
00	
00	
00	
81	

due Feb. 1, 1911.
nal Co.
t due Dec. 1, 1915.
al & Iron Co.
ges in both series
f the notes.

NEW YORK, WESTCHESTER & BOSTON RAILWAY CO.*

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$4,945,250.00	$4,924,800.00
Bonds:		2137.50
1st mtg. 5%, due Oct. 1, 1954	15,000,000.00	15,000,000.00
1st mtg. (temporary) 5%, due June 1, 1957 (N. Y. & Port Chester issue)	100,000.00	100,000.00
Notes Payable:		
City & County Contract Co.	$87,223.24	
Millbrook Co.	195,500.00	283,223.24

*In process of construction
‡Scrip.

MILLBROOK CO.*

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$100,000.00	$100,000.00
Notes Payable:		
City & County Contract Co.	$158,000.00	
Mt. Vernon & Eastern R. R. Co	$8,072.26	208,072.26

*Construction company to construct the Westchester & Northern R. R. Co.

WOOD RIVER BRANCH R. R.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$60,000.00	$37,600.00
Bonds:		
1st mtg. due July 1, 1924	$6,300.00	
Notes payable	4,500.00	4,500.00

(Purch'd 1899)
" 1903)
" 1905)
" 1888)
" 1896)

ped in the N. Y
ged in the N. Y.

THE CITY & COUNTY CONTRACT CO.*

	Outstanding. Total.	Owned by N.Y.W. & B.
Capital stock (Par $100)	$690,000.00	$670,000.00
Notes Payable:		
N. Y. N. H. & H.	$150,000.00	
Westchester & North'n.	55,000.00	205,000.00

*Construction company, constructing the N. Y. W. & B.

WESTCHESTER NORTHERN R. R. CO.*

	Outstanding. Total.	Owned by C.&C.C.Co.
Capital stock (Par $100)	$60,000.00	$60,000.00

*Construction not yet begun

MEMORANDUM OF CERTAIN OTHER INVESTMENTS.

	Per cent. owned.
Park Square Real Est. Trust	100
New York Connecting R. R. Co.	50
Boston Terminal Co.	40
Roxbury Central Wharf Co.	100
South Bay Wharf and Terminal Co.	100

STREET RAILWAY COMPANIES.

E CONNECTICUT CO.

Outstanding

	Total.	Owned by N.Y.N.H.&H.
r $100)	$40,000,000.00	$40,000,000.00

BERKSHIRE STREET RAILWAY CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100	$1,948,100.00	$1,928,800.00
Bonds:		
Berkshire St. Ry. 1st mtg. 5%, due June 1, 1922	800,000.00	
Hoosac Valley St. Ry. 1st mtg. 5%, due July 1, 1917	100,000.00	
Pittsfield El. St. Ry. 1st mtg. 4%, due July 1, 1923	350,000.00	
Hoosac Valley St. Ry. ref. mtg. 4%, due Sept. 1, 1924	300,000.00	
Debentures:		
Berkshire St. Ry. 5%.	200,000.00	
Notes payable	496,067.00	

BENNINGTON & NORTH ADAMS ST. RY. CO.

	Outstanding. Total.	Owned by N.Y.N.H.&H.
Capital stock (Par $100)	$650,000.00	$650,000.00
Notes payable	351,498.18	351,498.18
Livingstone deficiency judgment	363,389.03	363,389.03

THE HOOSICK FALLS RAILROAD CO.

Application to New York Public Service Commission, 2d District, for authority to issue $100,000.00 capital stock.

Organized May 17, 1910, to acquire property of Bennington & North Adams St. Ry. Co. in the State of New York under foreclosure of mortgage. When stock is issued it is to go to N. Y. N. H. & H. R. R. Co.

THE GREENWICH TRAMWAY CO.

That portion west from Mianus River to New York State line.
No stock or liabilities
Leased to N. Y. & Stamford Ry. Co.

THE SUFFIELD ST. RY. CO.

No stock or liabilities.
From just south of Suffield to Massachusetts State line.

THE PEOPLES TRAMWAY CO.

That portion from West Thompson, Conn., to North Gresvenordale.

Street railway line from North Gresvenordale to Massachusetts State line.

PROPERTIES PURCHASED

The Colombia Traction Co.
The Peoples Tramway Co. (Portion south of W Thompson)
The Danielson & Norwich St Ry Co.
The Willimgford Tramway Co.
The Waterbury Traction Co.
The Fair Haven & Westville R R Co
Meriden Electric R. R. Co.
The Norwich St. Ry. Co.
Montville St. Ry. Co.
New London St. Ry. Co.
The Middletown St. Ry. Co.
Hartford St. Ry. Co.
The East Hartford & Glastonbury St. Ry. Co
The Greenwich Tramway Co. (Equipment and that portion of line west to the Mianus River.)
The Branford Lighting & Water Co. (Railway portion only and exclusive use of power house.)
Stamford St. R. R. Co.
Williamntic Traction Co.
The Hartford & Middletown St. Ry. Co.
The Hartford, Manchester & Rockville Tramway Co.
The Waterbury & Pomperaug Valley St. Ry. Co.
The Torrington & Winchester St. Ry. Co.
The Meriden, Southington & Compounce Tramway Co.
The Stafford Springs St. Ry. Co.
The Farmington St. Ry. Co.

PROPERTIES MERGED.

Hoosack Valley St. Ry. Co.
Pittsfield Electric St. Ry Co.

PROPERTIES MERGED.

Hoosick Railway Co.
Bennington Electric Ry. Co.

EW ENGLAND NAVIGATION CO.†

	Outstanding. Total.	Owned by N.Y.N.H.&H.	In N.Y.N.H.&H. Reserve Funds.
	$53,000,000.00	$53,000,000.00	

6%, due Jan. 1, 1916. *$9,000.00

m. 1, 1955. $675,000.00
13, 1955 2,600,000.00
May 1, 1957. 19,809,000.00 $719,000.00

ercial Co. May 14, 1901. Name changed to above Oct. 18, 1904.
gotiated with New York Trust Co., trustee.
o Interest under terms of lease of Old Colony property is payable

ucester Railroad Co. Interest under terms of lease of Norwich & N. Y. N. H. & H. R. R. Co.

PROPERTIES PURCHASED.

fidence & Stonington Steamship Co.
ich & New York Transportation Co
Haven Steamboat Co.
London Steamboat Co.
eport Steamboat Co
Colony Steamboat Co

ELECTRIC LIGHT, POWER, GAS AND WATER COMPANIES.

HOUSATONIC POWER CO

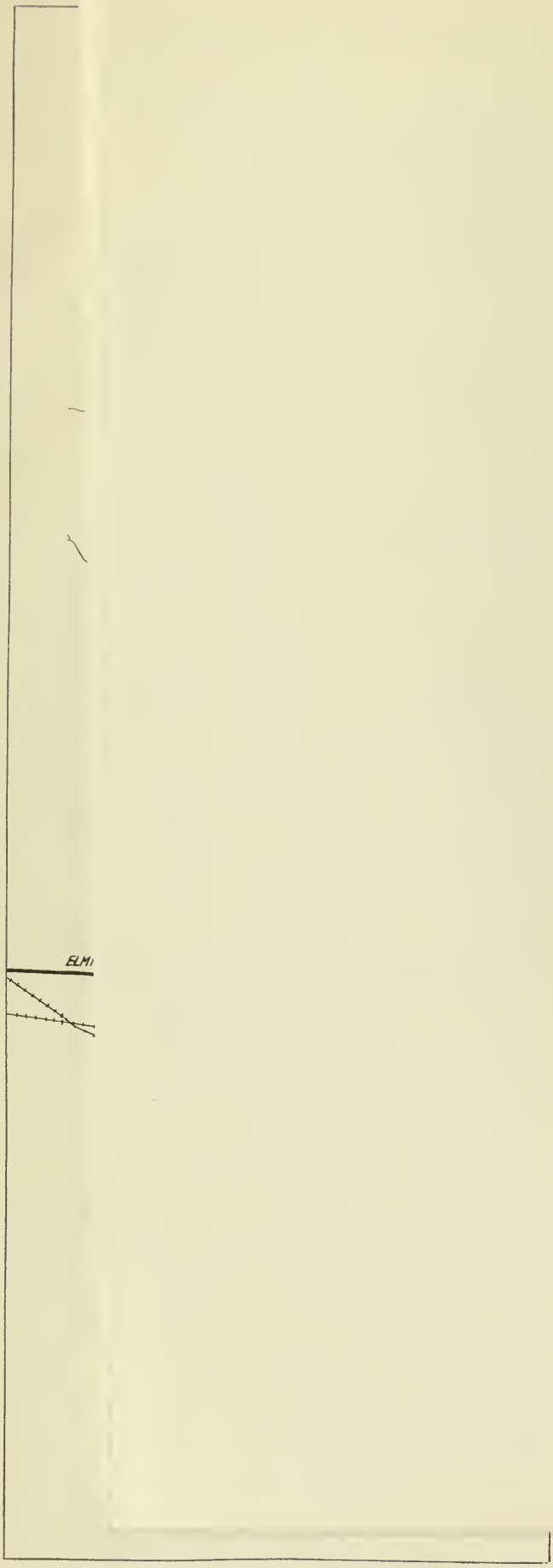
	Outstanding. Total.	Owned by N. E. N. Co.
Capital stock (Par $100)	$3,000,000.00	$3,000,000.00
Bonds		
New Milford Power Co. 1st mtg. 5%, due Aug. 1, 1932.	1,000,000.00	
Notes payable	979,565.23	979,565.23

PROPERTIES LEASED.

Norwalk & South Norwalk Elec. Light Co.
Norwalk Gas Light Co.
The Central Railway & Elec. Co. (Lighting Dept.)
Greenwich Gas & Elec. Lighting Co.
Naugatuck Electric Light Co.
Waterbury Traction Co. (Lighting Dept.)
Operated by United Gas & Improvement Co. for the benefit of H. P. Co.-Waterbury Gas Light Co

PROPERTIES PURCHASED.

The Branford Lighting & Water Co.
(Lighting and water portion and power station.)
Village Water Co. of Suffield.
New Milford Power Co.
Power Station and Transmission Line at Quassapong.



Des Plaines Valley Line of the Chicago & North Western.

New Haven and New York.

Big and swift as were President Clark's mergers he has been surpassed in the development of the system by his successor,

whose main work has been in six directions: (1) the almost complete reconstruction of the main stem with adaptation to higher train loads and equipment to match; (2) the acquisition of the New York, Ontario & Western and (3) of the Poughkeepsie bridge system, built up into high prosperity by transfer of freight; (4) the development of the New England Navigation system and the purchase of new boat lines; (5) control of the Boston & Maine; and (6) the extensive acquisition of street railways.

The results are evidenced impressively but yet incompletely by the genealogical chart shown herewith, for it does not include the many lines merged into the Boston & Maine, nor the trolley systems of Worcester, Springfield and elsewhere in Massachusetts held under "sympathetic" control by the New England Investment & Security Company. It may be stated summarily, however, that the New Haven system proper has 4,460 miles of single track (the road mileage being about 2,000); adding the Boston & Maine single trackage of 4,175 miles, the total reaches 8,635 miles. But the expansion of the street railway policy under President Mellen has been even more striking. When he took hold, seven years ago, the New Haven controlled but two small, localized trolley lines in Connecticut. It now has seven-eighths of the trolley mileage of that state; almost all the Rhode Island trolleys; and some 500 miles in Massachusetts, the total single track mileage of street railways owned or controlled by the corporation is about 1,400—and the end is not yet. As a whole, the trolley investments of the company are just about self-supporting. There is a net gain in Connecticut; about a corresponding loss in Rhode Island; while the Massachusetts trolleys about wash the investment. As the trolley business moves steadily upward the situation means future profit along with the important advantage of parallel trolley control and defense.

As a measure of the degree of consolidation the official statement can be cited that the New Haven system now represents no less than 305 corporations and properties originally independent.

SUPERHEATED STEAM IN LOCOMOTIVE SERVICE.

Two reports relating to research work on locomotive performance by Dr. W. F. M. Goss, under the patronage of the Carnegie Institution at Washington, have been published. The first related to the performance of a locomotive using saturated steam, and the second to that of a locomotive using superheated steam. Liberal extracts from these reports, dealing more particularly with the Purdue tests, were given in a paper by Dr. Goss which forms a part of the proceedings of the American Railway Master Mechanics' Association for 1909.

A more elaborate presentation of the facts in the second report has recently been made in publication No. 127 issued by the Carnegie Institution of Washington. The various sections of the report relate to: First, foreign practice in the use of superheated steam; second, the American attitude toward the use of superheated steam in locomotives; third, tests to determine the value of superheating in locomotive service; fourth, performance of boiler and superheater; fifth, performance of the engine and of the locomotive as a whole; sixth, locomotive efficiency as affected by its running schedule; seventh, economy resulting from the use of superheated steam; the appendix contains all data and diagrams in detail.

Under foreign practice is given an interesting account of the development of the superheater for locomotives on the Prussian State Railway, commenced in 1898 by Wilhelm Schmidt and Robert Garbe. This also describes the special design of piston valve and piston rod packing used in Germany for superheater locomotives.

In the statement relating to the American attitude toward the superheater, Dr. Goss says: "These statements will serve to show that the ideal underlying practice in the development of the modern American locomotive has placed power-capacity and continuity of service upon a higher plane than thermodynamic efficiency. This ideal has on the whole not been misleading. It has produced locomotives of unprecedented power; it has satisfied a legitimate demand for service; and it has resulted in the development of a machine which must always be regarded as a mechanism of remarkable quality. This in itself has been a great achievement. It is, therefore, not discreditable to the railways of America that their interest in superheating has thus far been hardly more than academic, for the advent of the superheater brings complications of mechanism with it and introduces new problems in maintenance. . . . The time is approaching when, in the natural order of development, the railways of the United States will leave no stone unturned in their efforts to increase the thermodynamic efficiency of the American locomotive. Such an attitude involves no abandonment, but merely an enlargement of existing ideals. Progress in this direction means, in its ultimate analysis, the sacrifice of nothing already possessed, but the addition thereto of greater economy in the use of fuel and an extension in the amount of power developed."

The tests of the superheater locomotive on the Purdue testing plant were made November, 1906, to July, 1907, and during that time the locomotive performed a service equivalent to 4,851 miles. "The intermittent tests were designed to disclose the effect on its efficiency of certain conditions which enter into the normal operation of a locomotive. The writer long ago called attention to the fact that not less than 20 per cent. of the total fuel used by the average locomotive in this country was not utilized in advancing trains over the road, but was consumed in starting fires, in raising steam, in keeping the locomotive hot while waiting for its trains, while stopping at stations and at passing points, or remained in the firebox at the end of the run. Obviously, no embellishment in the design of a locomotive can effect a saving in that portion of the total fuel supply which is thus accounted for. The advantage to be derived from such an embellishment as a superheater must, therefore, be judged by the effect it can produce on not more than 80 per cent. of the coal consumed. If, for example, it were shown that the superheater can effect a saving of 20 per cent. in the amount of fuel used, the saving in total fuel which it will be necessary to supply will be 20 per cent. of 80, or 16 per cent. only."

The advantage of increased power obtained by the use of superheated steam is explained as follows: "It has been shown that for the development of equal amounts of power the combined boiler and superheater of the superheating locomotive have an efficiency which equals or exceeds that of the saturated-steam boiler; hence the boiler-power which it may be made to deliver as a maximum equals or exceeds that which the boiler of the saturated-steam locomotive can be made to deliver. But each unit of power delivered from the boiler in the form of superheated steam is more effective in doing work in the cylinders than a similar unit of power delivered in the form of saturated steam; hence, at the limit, the superheating locomotive is more powerful than the one using saturated steam, and the difference is that which measures the difference in the economy with which the cylinders use steam. The same question may be dealt with through another series of facts, as follows: It can be shown that the power of any locomotive is limited by its capacity to burn coal, and coal-burning capacity is a function of the draft. The data shows that for the development of a given cylinder power the draft values of *Schenectady No. 3* (superheating) were in all cases less than those of *Schenectady No. 2* (saturated). Tests at 160 lbs. show that the power developed in return for a given draft is from 10 per cent. to 16 per cent. greater for the superheating locomotive than for the saturated-steam locomotive. Obviously, there is no reason why the draft for the former should not be increased to limits practicable with the latter, and when this is done the power developed by the superheating locomotive will exceed that which is possible with the saturated-steam locomotive."

The possible economy resulting from the use of the super-

heater and its relation to the degree of superheat is discussed as follows: "The Purdue tests dealt principally with steam superheated to approximately 150 deg. Fahr. The gain in any service resulting from superheating is a function of the degree of superheat employed. The Prussian State Railway prescribes a boiler pressure of 180 lbs., and a degree of superheat of 190 deg. Fahr. is regarded as satisfactory, while the maximum limit never to be exceeded is 280 deg. Fahr. Under normal conditions in Prussian State Railway practice, the superheating is considerably above 200 deg. Fahr. Comparing this with the Purdue locomotive working under a pressure of 180 lbs., the temperature of the steam in those tests may have been increased by 33 per cent. without exceeding the limit which has proved practicable in the every-day practice of the German railways. The saving in water and fuel resulting from this increase would be proportionate to that increase."

The whole question of the economy of superheating, as far as fuel is concerned, is thus summarized: "The actual net reduction in the amount of fuel needed for locomotive use by a railway having all of its locomotives equipped with satisfactory superheaters, over that which would be necessary if all required saturated steam, will not be far from 10 per cent. This value is not to be accepted as of strictly scientific import, but merely as an estimate based on such facts as have appeared in the course of a rather careful study of the problem."

A summary of conclusions relating to the whole investigation is given below:

SUMMARY OF CONCLUSIONS.

1. Foreign practice has proved that superheated steam may be successfully used in locomotive service without involving mechanism which is unduly complicated or difficult to maintain.

2. There is ample evidence to prove that the various details in contact with the highly heated steam, such as the superheater, piping, valves, pistons, and rod packing, as employed in German practice, give practically no trouble in maintenance; they are ordinarily not the things most in need of attention when a locomotive is held for repairs.

3. The results of tests confirm, in general terms, the statements of German engineers to the effect that superheating materially reduces the consumption of water and fuel and increases the power capacity of the locomotive.

4. The combined boiler and superheater tested contains 943 ft. of water-heating surface and 193 ft. of superheating surface; it delivers steam which is superheated approximately 150 deg. The amount of superheat diminishes when the boiler pressure is increased, and increases when the rate of evaporation is increased, the precise relation being

$$T = 123 - 0.265P + 7.28\ H$$

where T represents the superheat in degrees Fahrenheit, P the boiler pressure by gage, and H the equivalent evaporation per foot of water-heating surface per hour.

5. The evaporation efficiency of the combined boiler and superheater tested is

$$E = 11.706 - 0.214\ H$$

where E is the equivalent evaporation per pound of fuel and H is the equivalent evaporation per hour per foot of water heating and superheating surface.

6. The addition of the superheater to a boiler originally designed for saturated steam involved some reduction in the total area of heat-transmitting surface, but the efficiency of the combination when developing a given amount of power was not lower than that of the original boiler.

7. The ratio of the heat absorbed per foot of superheating surface to that absorbed per foot of water-heating surface ranges from 0.34 to 0.53, the value increasing as the rate of evaporation is increased.

8. When the boiler and superheater are operated at normal maximum power, and when they are served with Pennsylvania or West Virginia coal of good quality, the available heat supplied is accounted for approximately as follows:

	Per cent.
Absorbed by water	52
Absorbed by steam in superheater	5
Utilized	57
Lost in vaporizing moisture in coal	5
Lost in CO	1
Lost through high temperature of escaping gases	14
Lost in the form of sparks and cinders	12
Lost through grate	4
Lost through radiation, leakage, and unaccounted for	7

9. The water consumption under normal conditions of running has been established as follows:

Boiler-pressure. *Pounds.*	Corresponding steam per indicated horse-power hour. *Pounds.*
120	23.8
160	22.3
200	21.6
240	22.6

The minimum steam consumption for the several pressures is materially below the value given. The least for any test was 20.29 lbs.

10. The coal consumption under normal conditions of running has been established as follows:

Boiler-pressure. *Pounds.*	Coal consumed per indicated horse-power hour. *Pounds.*
120	3.31
160	3.08
200	2.97
240	3.12

11. Neither the steam nor the coal consumption are materially affected by considerable changes in boiler pressure, a fact which justifies the use of comparatively low pressures in connection with superheating.

12. Contrary to the usual conception, the conditions of cut-off attending maximum cylinder efficiency are substantially the same for steam superheated 150 deg. as for saturated steam. With superheated steam, when the boiler pressure is 120, the best cut-off is approximately 50 per cent. stroke, but this value should be diminished as the pressure is raised, until at 240 lbs. it becomes 20 per cent.

13. Tests under low steam pressures, for which the cut-off is later than half stroke, give evidence of superheat in the exhaust.

14. The saving in water consumption and in coal consumption per unit power developed which was effected by the superheating locomotive *Schenectady No. 3* in comparison with the saturated-steam locomotive *Schenectady No. 2* is as follows:

Saving in water consumption.				Saving in coal consumption.			
	Locomotive.				Locomotive.		
Boiler-pressure. *Pounds.*	Saturated steam. *Pounds.*	Superheating. *Pounds.*	Gain. *Per cent.*	Boiler-pressure. *Pounds.*	Saturated steam. *Pounds.*	Superheating. *Pounds.*	Gain. *Per cent.*
120	29.1	23.8	18	120	4.00	3.31	17
160	26.6	22.3	16	160	3.59	3.08	14
200	25.5	21.6	15	200	3.43	2.97	13
240	24.7	22.6	9	240	3.31	3.12	6

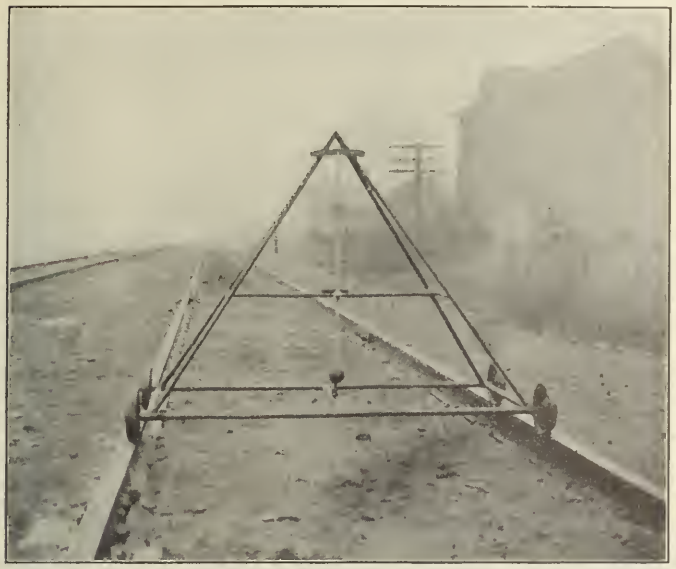
15. The power capacity of the superheating locomotive is greater than that of the saturated-steam locomotive.

16. Tests involving intermittent running show that the steam consumption per unit work delivered is increased when the program of operations is made to involve intervals of rest, due doubtless to the cooling of the cylinders and the connected parts. This loss increases with increase of steam pressure. When the program of operations involves equal periods of rest and running it amounts to from 5 to 10 per cent. of the consumption under constant running; adding to this the losses resulting from low efficiency when starting and the radiation and stack losses during the periods of idleness, the total loss resulting from such intermittent running, as compared with constant running, is approximately 20 per cent.

On November 3 last a new section of the line connecting the West of Minas Railway, Brazil, with the port of Angra dos Reis, in the state of Rio de Janeiro, was opened to traffic. The new section extends from station Rio Claro to Alto da Serra.

HILL TRACK LEVEL.

The Burlington is using a combination track gage and level of a new and novel design, the idea originating with James J. Hill and having been worked out under his direction. As shown in the illustration, it consists of a rectangular base built of 1-in. steel tubing and mounted on four wheels, the wheels being 6 in. in diameter, with ¾-in. flange. The distance out to out of flange is exactly the track gage. On this base a pyramid of ¾-in. tubing is built, with a horizontal cross bar at about one-half the height, to which a level bubble is attached. A pendulum is also pivoted on the same cross bar, the lower end being



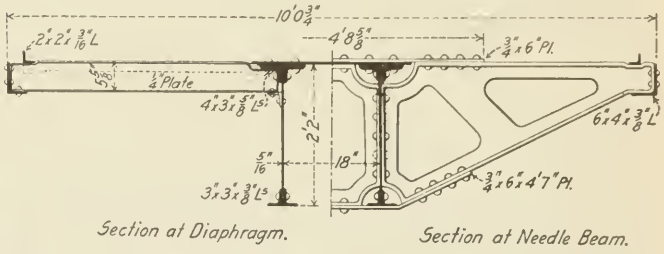
Hill Track Level.

weighted and the upper end running to a point and moving along the arc of the circle, which is fastened to the frame near its top. On level track the pendulum points to zero, the arc of the circle being so graduated that the difference in elevation of the two rails is correctly indicated on the dial, the smallest reading being 0.2 in. By pushing this over the track the foreman is able to check his gage, while the dial reading indicates high or low spots on tangent or the elevation on curves. When not in use the pendulum can be held rigid by a thum screw at the base. About 35 of these instruments are now in use on the La Crosse division, having been built in the company's shops. A patent has been applied for.

The Hungarian authorities have been contemplating an increase in passenger fares. The famous zone tariff, introduced in 1889, made a very great reduction from the high rates previously charged, especially for long-distance travel, of which there had been very little. It is not so generally known that this zone tariff has been raised three times since it was first introduced, with no bad effect on the amount of traffic. The average per passenger mile, however, remains very nearly as low in Hungary as in Austria and Germany, although the travel is much less, and the cost, therefore, greater. When the zone tariff was introduced it was thought that one of its effects would be to fill the trains better, and it had that effect at first: only 24 per cent. of the seats were occupied in 1888; for a short time after the zone tariff was applied the proportion increased to 34 per cent.; then decreased from year to year until it is now about 23 per cent. It is also suggested that when the tariff is changed the zone system be abandoned, and changes be made according to distance, though, perhaps, not in proportion to distance, the rate per mile decreasing somewhat for the greater distances, as is now the case in Italy.

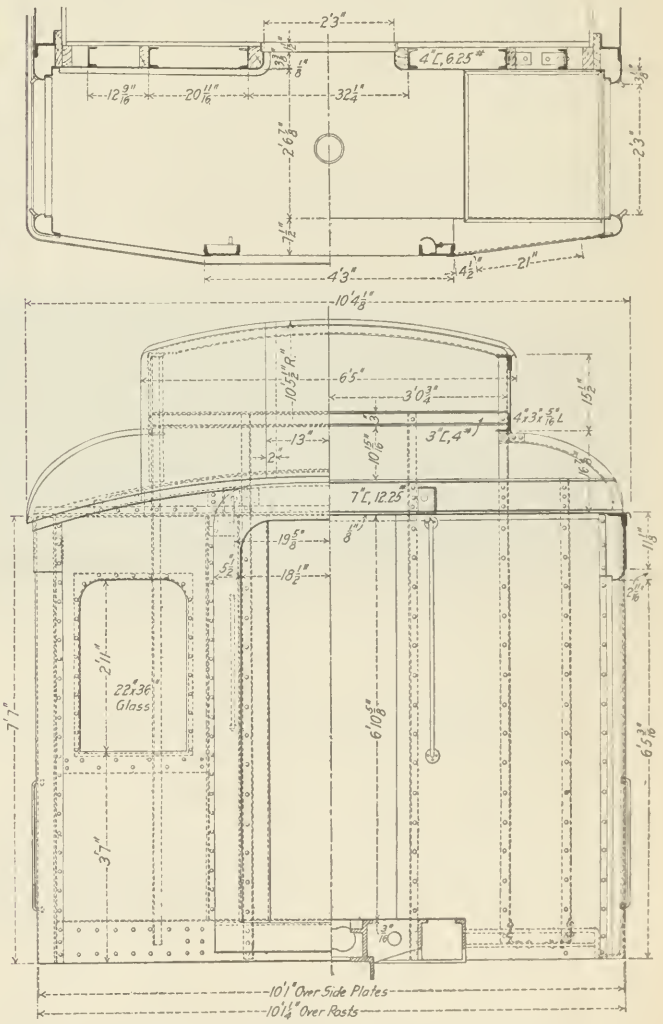
STEEL SLEEPING CARS FOR THE ST. PAUL.

The Chicago, Milwaukee & St. Paul recently received 59 steel sleeping cars from the Pullman Company. These were part of an order which included 59 steel coaches, 20 dining-cars, 8 tourist cars and 4 parlor cars. They are 72 ft. 6 in. long and 10



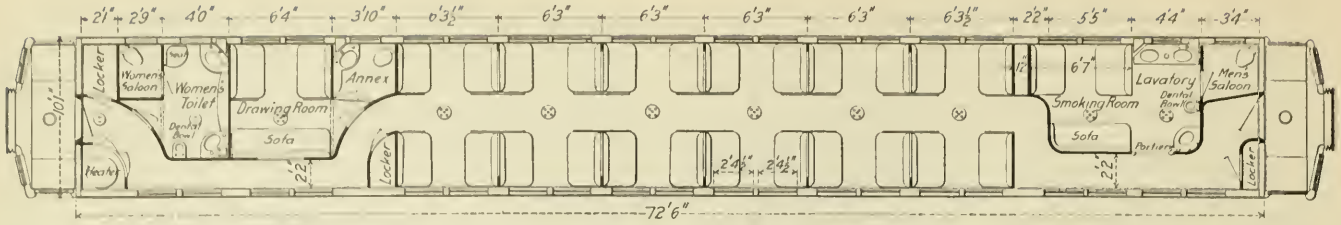
Section Through Underframe.

ft. 1 in. wide over the sills, the width being 5 in. greater than the Pullman standard section. This is in accordance with the regular practice of the road. The construction of the underframe is similar to that used by the Pullman Company for the Pennsylvania Railroad. The two center sills are plate girders

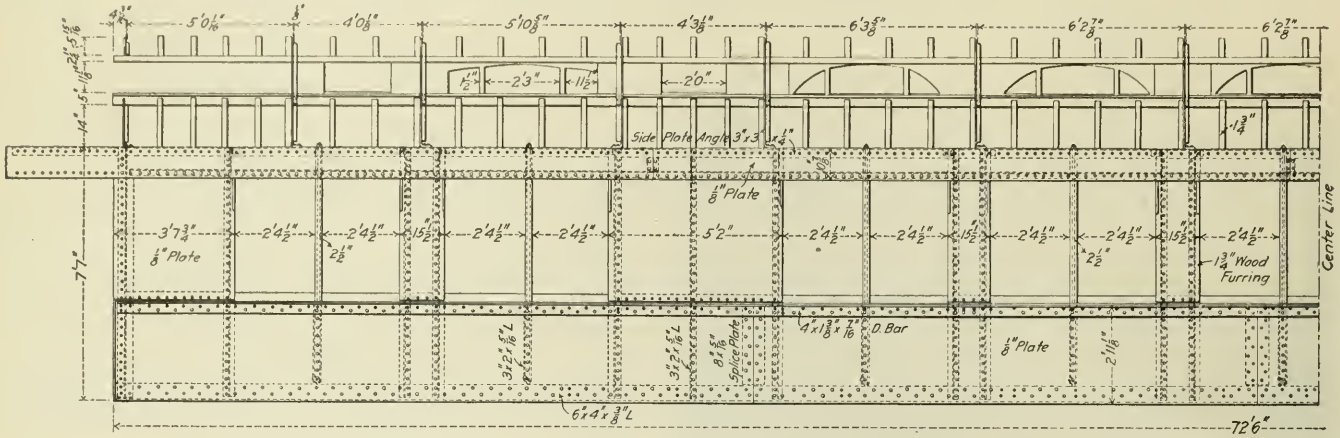


Part Elevation, Section and Plan of Vestibule.

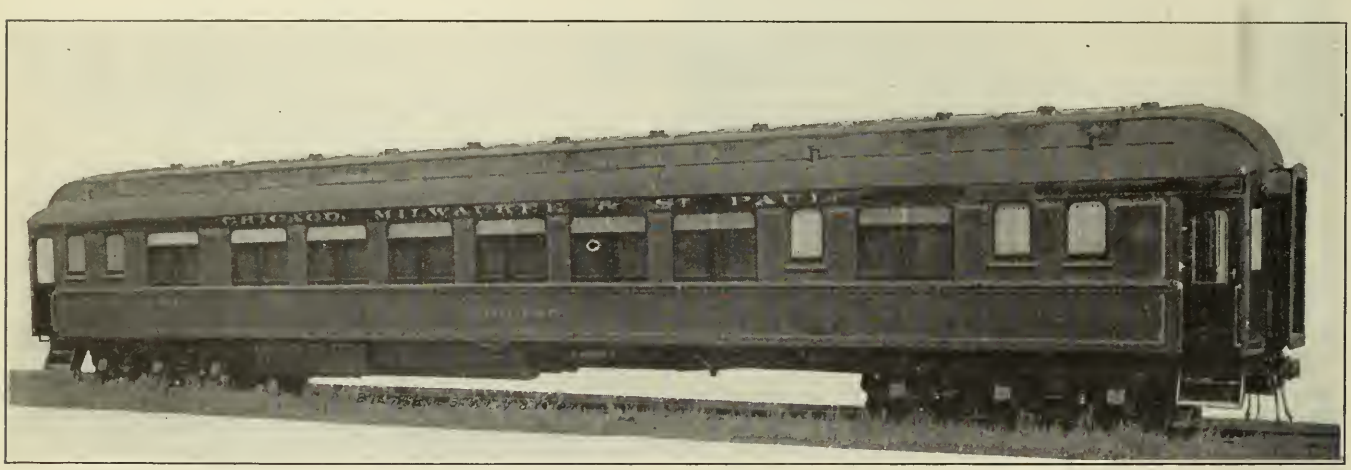
2 ft. 2 in. deep, made up of 4 in. × 3 in. × ⅝ in. upper angles, a 5-16 in. web, 3 in. × 3 in. × ⅜ in. lower angles, and a continuous cover plate on the top, 30 in. × ½ in. The center sills extend between the cast steel double bolsters at the ends, which are composite steel castings, including the bolster and platform. The side sills, 6 in. × 4 in. × ⅜ in. angles are tied to the center sills by two needle beams built up of steel castings and by the



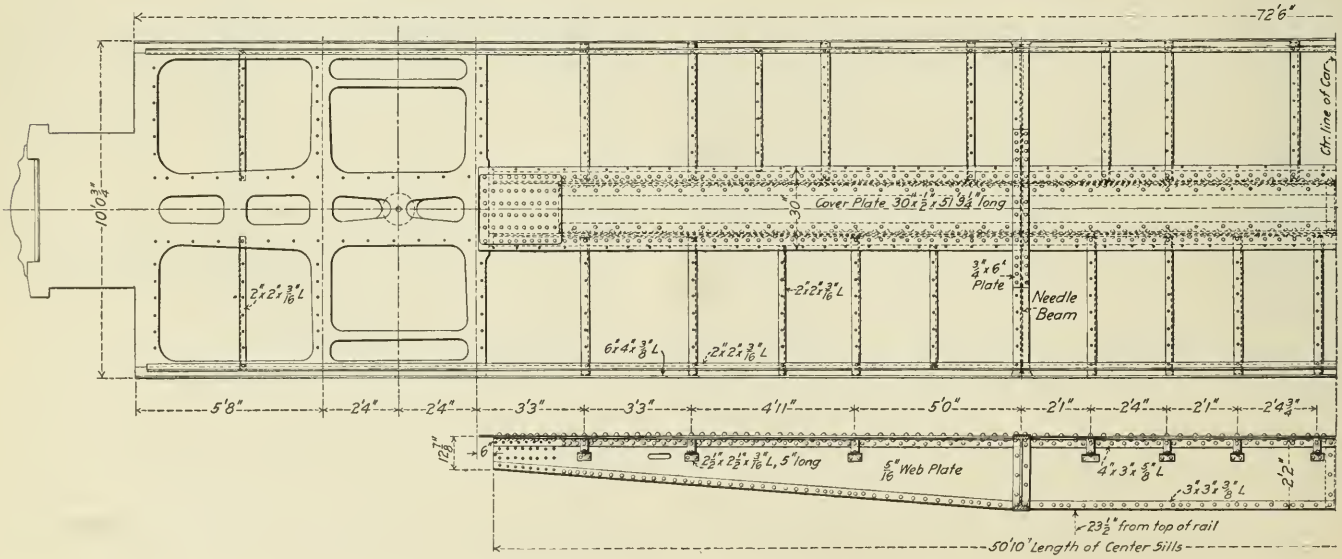
Plan of Steel Sleeping Car; Chicago, Milwaukee & St. Paul.



Part Elevation of Side Framing of Steel Sleeping Car.



Steel Sleeping Car; Chicago, Milwaukee & St. Paul.



Part Plan and Section of Underframe of Steel Sleeping Car.

diaphragms. The illustrations show clearly the underframe construction; also the steel super-structure and the vestibule, which is in accordance with the Pullman standards. The side construction, which is shown in detail, is made up entirely of rolled sections, principally angles; the belt rail is a 4 in. × 1⅜ in. × 7-16 in. angle, and is connected to the side sill angles by 3 in. × 2 in. × ¼ in. vertical angle posts. The floor is built up of 1-16 in. steel plates, corrugated longitudinally; hair felt insulation; wooden furring strips, Keystone flooring and is covered with a layer of Flexolith.

On the inside the sleeping compartment contains 12 Pullman sections. It is finished in Cuban mahogany, the men's smoking



Interior of Steel Sleeping Car; Chicago, Milwaukee & St. Paul.

room and lavatory in English oak, the drawing-room in Koko wood and the women's toilet in Vermillion. The arrangement of these compartments is shown in the plan. The decorations consist of inlaid wood, and "twentieth century" style color work for the ceilings. A dynamo in the baggage car and the railway's standard storage batteries furnish electric light. An auxiliary gas lighting system is provided, and the Chicago Car Heating company's vapor system of heating is used.

The six-wheel trucks have 38 in. Paige wheels, and weigh 21,000 lbs. each. The car body weighs 110,300 lbs., which makes the total weight 152,300 lbs.

Nearly all of the Japanese railways were built as narrow-gage lines, which in a country almost without wagon roads, seemed to serve every purpose. Experience in the Russian war, however, has convinced the authorities that they are not effective when a heavy traffic must be handled, and it has been determined to make the whole lines from Tokio southwest to Shimonoseki, opposite Corea, of 4 ft. 8½ in. gage, and also the road in Corea, from Fusan, opposite Shimonoseki, by Seoul to the Manchurian border at Wiju. The line thence to the South Manchurian railway has already been changed. The line from Tokio to Shimonoseki is 801 miles long; the Corean line about 500; and that connecting it with Siberian line about 150. Traffic with the Siberian and the Chinese railways can be exchanged much better by sea than by this long line, the direction of which is southwest from Tokio to the straits, and thence northwest. Aside from the local traffic, strategical reasons have doubtless determined the change, which is to be completed in 13 years.

EXTENSION OF THE SIBERIAN RAILWAYS.

It is reported that the Russian government contemplates the improvement of the existing Siberian railway and creating duplicate approaches both in European Russia and the Far East. When these works are completed, in 1915, the imperial treasury will have expended on the Siberian railway somewhat over $1,000,000,000, which includes both cost of construction and loss on exploitation. In exchange for this Russia will have a complete double-track system from the Ural mountains to the Pacific, with double approaches, of a total length of 6,844 miles. During 1910 the Ministry of Communications introduced into the Duma three bills providing for parts of this vast work. The first is to double the Baikal-Kultchuk section of the Circumbaikal railway, the second is concerned with the eastern part of the new Amur railway, and the third is for double tracking the existing Transbaikal railway. The most important work strategically is the Amur railway, which will supply Russia with communication with the Far East, running through Russian territory alone, as against the existing Chinese Eastern line. The new Amur line will be 1,344 miles long, and, as officially estimated, will cost $121,050,000, but including rolling stock, and guarding during construction, the cost is put at $149,244,000. With the completion of this work, which has been two years in hand, Russia will for the first time have railway communication with the Far East lying entirely in native territory. The second great work under way is connecting St. Petersburg, Russia, and the European Northern railway system with the main Siberian line, the chief approach to which has hitherto been through Moscow and Central Russia. This new line runs through the towns of Perm, Ekaterinburg, and Tyumen, and joins the Siberian railway at Omsk. The section from Perm to Ekaterinburg is finished. The total cost of this new approach and incidental improvements will be $43,243,000. Doubling and improving the existing track of the Siberian railway is the next work. This was begun in 1907. For three sections of doubling work, and for reconstructing the hilly parts of the Eastern Siberian railway, between Atchinsk and Irkutsk, the Ministry of Communications has asked for $82,309,000, but in addition there are sections for which no estimates have yet been prepared. Adding these costs, calculated on the basis of past outlays, the Russian engineer, Mikhailovsky, puts the cost of reconstructing the existing Siberian line at $97,966,000. This makes a total cost of new works undertaken during the past three years of $290,453,000. Engineering defects in the line will remain in steep gradients in the Transbaikal railway, which require double traction, a large number of short curves, and wooden bridges over the narrow rivers, which are constantly destroyed by fire. The correction of these defects will bring the total to $302,210,000. The statistical department of the Ministry of Communications put the construction outlay up to 1907 on the Siberian and Manchurian railways at $422,412,000. The losses on exploitation during the 14 years which have elapsed since 1896, when the western section of the Siberian line was opened, are given at $211,693,000. The exploitation losses for the six years which will elapse before the present schemes are finished will amount to about $60,831,000. This makes the total cost of the completed Siberian Railway $997,146,000, or about $146,827 per mile, notwithstanding that practically no compensation had to be paid for land, and that more than half the line runs through flat territory.

No new lines were opened for traffic in the Transvaal, South Africa, during 1909, but the construction of the following lines, with an estimated length of 504 miles, was authorized and is now in hand: Pietersburg to Bandolier Kop, 70 miles; Welverdiend to Saltpans, with branch line to Lichtenburg, 146 miles; Ermelo to Piet Retief, 70 miles; extension of Selati line to Tzaneen, 140½ miles; Benoni-Welgedacht line, 18½ miles; Waterworks-Wepener line, 59 miles. All the above are in the Transvaal, except the Waterworks-Wepener line, which is in Orange River Colony.

General News Section.

The Chicago, Burlington & Quincy Association of Operating Officers held its annual meeting at Chicago, February 20, 21 and 22.

President Diaz of Mexico has presented to S. M. Felton, president of the Chicago Great Western, an excellent portrait of himself painted by the Mexican artist, Romero. The portrait is 3 ft. x 4 ft. in size.

Employees of the Pennsylvania Railroad have been notified that the privileges of St. John's Orphanage, Philadelphia, are available for the daughters of employees of the road who have been killed in the discharge of their duties. This orphanage was endowed by J. Edgar Thomson, former president of the road.

Suit has been brought in the federal court at Indianapolis, Ind., against the Cleveland, Cincinnati, Chicago & St. Louis, for alleged violation of the 16-hour law. It is alleged that the crew of a train running between Indianapolis, Ind., and Mattoon, Ill., on January 9, 1911, was kept in service unlawfully more than 16 hours.

E. Moody Boynton, of Massachusetts, who once built a short railway in which the cars ran on a single rail, and who has projected schemes of this kind a number of times in past years, is still alive; and in Boston last week he applied to the legislature for leave to build such a railway from Boston to Fall River, Providence and other places.

The bill providing for the inspection of locomotive boilers under the supervision of inspectors appointed by the President and the Interstate Commerce Commission, was signed by the President February 17. After the passage of this bill in the Senate, as reported in the *Railway Age Gazette* of January 20, it was amended by the addition of a section limiting the total expenditures under it to $300,000 a year.

Northbound train No. 36 of the Southern Railway was stopped by robbers near Gainesville, Ga., on the morning of February 18, and the money in the safe in the express car was carried off. The robbers did not go into the passenger cars. The train was stopped by a red light, at a station, the robbers having bound and gagged the station agent. They went off in an automobile and scattered red pepper along the road to prevent being followed by blood-hounds.

The appraisers appointed by the Massachusetts legislature to make an inquiry as to the valuation of the property of the New York, New Haven & Hartford have filed their detailed report. As announced in these columns perviously, the appraisers find that the value of the property exceeds the securities issued on this property. The appraisers' figure now show that they estimate the property of the New Haven, excluding intangible assets, at $496,000,000, while the total obligations of the company are $340,000,000.

The Western Union Telegraph Company has notified the railways with which it has working contracts that messages not on the business of the railway must not be sent free, because of the liability to incur the penalties of the Interstate Commerce Law. It is said that the messages aimed at by this notice are those in which the railways order tickets and sleeping car berths for passengers. The railways reply that messages of this character are railway business and are not prohibited by the terms of the law.

The Denver & Rio Grande and the Colorado & Southern have made a contract under which the D. & R. G. gets trackage rights over the C. & S. between Gunnison, Colo., and the Baldwin coal mines, and between Gunnison and Ohio City and Pitkin; and the Colorado & Southern gets trackage rights over the Denver & Rio Grande from Leadville, Colo., to Dillon. In each case the trackage rights are exclusive, the owning road retiring entirely from the use of the tracks in question. The two roads own parallel lines between the places mentioned, and the present action means the abolition of fruitless competition.

Offers of compromise amounting to several million dollars have been made by the Southern Pacific to the Department of Justice in an endeavor to end twenty-five suits brought by the Government to recover about 70,000 acres of mineral land in Nevada. The twenty-five suits are now before the Circuit Court at Carson City, Nev. The Government claimed that under the land law of 1862 the Central Pacific, which has been merged in the Southern Pacific, acquired the land illegally. If the offer is accepted and the suits called off the railway company would return to the Government thousands of acres of mineral bearing lands.

The Post Office Department has issued an order that railway mail clerks on the heavy lines shall be required to work an average of only six hours a day, and clerks who have to do terminal work at either end of their runs will be allowed over-time. For many weeks back clerks on many railways, both east and west, have been complaining of overwork, their hours having been lengthened as a part of the general scheme of economy introduced by Postmaster Hitchcock. Many clerks on the heavy runs are on duty ten hours or more every day, for six days, and the average of six hours a day, mentioned in the order, includes the days when clerks remain off the cars and spend two or three hours daily in studying their geography lessons, which study is a part of their duties.

The Lehigh Valley Railroad Company has sent notice to the New Jersey legislature that the company intends to abandon the use of the Morris canal for navigation, surrendering to the state substantially all of the rights enjoyed by it in connection with its control of the canal. The canal company every year falls several thousand dollars short of paying expenses. The largest boat on the canal carries only 70 tons and takes five days to traverse the length of the canal, which is from the Delaware river at Phillipsburg to the Hudson river at Jersey City. This canal was chartered in 1824. Soon after the opening of railways from the anthracite coal mines to tidewater, it went into insolvency; because of the competition of the locomotives; and was reorganized in 1844. The canal company has the right to use water from lake Hopatcong and Greenwood lake. These rights will be surrendered to the state.

The boilermakers in a number of shops of the New York Central Lines went out on strike on Monday of this week, the chief grievance being objections to the piece-work system. The leaders of the boilermakers' brotherhood claim that 800 men have struck, but officers of the road say that this is an exaggeration; also that some of the strikers have returned to work and the places of some others have been filled with non-union men. On the Lake Shore & Michigan Southern, the superintendent of motive power says that of the 203 boilermakers employed by the company, only 97 left their work; and before an hour 16 of these decided to return. This officer says that the men have the option of working by the piece or not; and that the men working by the new plan earned in January 47.6 cents an hour, as against 35 cents made by the men who worked by the day. Similar comparisons are made with reference to other shops. An officer of the road in New York City says that the largest shops east of Buffalo are not affected.

Aristocrats All Around Us.

One statistician tells us that 746,221 individuals own the stock of all the railways and industrial corporations of the country. This is astounding, and we hope the report is exaggerated. If it be true, something should be done about it. It looks very bad to have such a large aristocracy. An aristocracy worthy of the name and the position should be small and exclusive. We are perfectly willing to work hard and support stockholders who are dignified and rare, but they must not allow themselves to become common.—*Life.*

Additional Automatic Stops in New York Subway.

The New York Public Service Commission, First district, has ordered the Interborough Rapid Transit Company to install and maintain stops in connection with all of its stop signals on the local tracks, the work to be done before July 1, 1911. On the express tracks the Interborough has automatic

block signals, with automatic stops throughout, but on the local tracks signals (controlled by track circuits, like block signals) are in use only at curves and other places where the motorman's view of the preceding train is obstructed or obscure. The commission considered a proposition to require the use of the block system complete on the local tracks, but finally concluded to agree with the officers of the road that, with trains stopping every quarter mile or thereabouts, the use of block signals throughout the lines would seriously delay the trains.

3,000 Miles in 75 Hours.

The above heading tells approximately the speed made by a special train which arrived in New York last Sunday night from Yuma, Ariz., over the Southern Pacific, the Rock Island Lines and the New York Central Lines. The train carried Charles G. Gates, who had suffered a slight bodily injury in California and who was in a hurry to reach his family doctor in New York. The time made by the train over different parts of its journey is shown in the record below:

	Distance. Miles.	Time.
Yuma, Ariz. .....Thursday, 16th..Lv. 5:30 p. m., P.T.		
El Paso, Tex.....Friday..... 7:00 a. m.....	564	
Hutchinson, Kan...Saturday..... 6:14 a. m.....	724.5	
	1,288.5	
Chicago, Ill.....Sunday.....Ar. 4:50 a. m., C.T.	738.5	
Yuma to Chicago	2,027	57 h. 20 m.
Chicago, 31st st....Sunday.....Lv. 5:02 a. m., C.T.		
Elkhart ..... 6:48 a. m.....	99	
Toledo ..... 9:04 a. m.....	133	
Cleveland ..... 10:45 a. m.....	108	
Buffalo .....Ar. 1:52 p. m., C.T.	181	
Chicago, 31st street, to Buffalo, Seneca street.....	521	8 h. 50 m.
Yuma to Buffalo.....	2,548	66 h. 10 m.
Buffalo, Seneca street.....Lv. 2:55 p. m., E.T.		
Syracuse ..... 5:32 p. m.....	149	
Albany ..... 8:26 p. m.....	148	
New York .....Ar. 10:49 p. m., E.T.	142	
Buffalo to New York	439	7 h. 54 m.
Chicago to New York	960	16 h. 47 m.
Yuma to New York.....	2,787	74 h. 19 m.

From Yuma to El Paso, the route was over the Southern Pacific; from El Paso to Chicago, the El Paso & Southwestern and other lines controlled by the Chicago, Rock Island & Pacific; from Chicago to Buffalo, the Lake Shore & Michigan Southern, and from Buffalo to New York, over the New York Central & Hudson River. The distances shown in our record differ from those in the time-tables, because of short distances cut off at Chicago & Buffalo. At Chicago, the Rock Island delivered the train to the Lake Shore at Thirty-first street, which is two miles from the terminus, cutting off this distance both from the Rock Island Line and that of the Lake Shore. At Buffalo, in like manner, about one mile is saved.

West of Chicago a large part of the line traversed by this train is single track; and near Volland, Kan., there was a delay of about two hours because of the derailment of a freight train. In spite of this the average speed from El Paso to Topeka was about 45 miles an hour. Between Syracuse and Albany there was about 20 minutes delay, because of a train ahead. From Albany to New York, the time, 143 minutes, is said to be the best which has ever been made over the Hudson division and this, notwithstanding the necessity of changing engines at the beginning of the electric division at High Bridge, seven miles out of New York.

The time from Chicago to New York, which was 1 hour and 13 minutes better than that of the regular 18-hour trains, was a trifle slower than that of a special train which was run in March, 1909. From Yuma to New York, the rate of speed, including all stops, was 40.41 miles an hour.

American Association of General Baggage Agents.

At the annual meeting of the American Association of General Baggage Agents, held at San Antonio, Tex., February 15 and 16, the following officers were elected for the ensuing year: President, F. H. Jones (St. Louis Southwestern); vice-president, Benton Quick (Missouri Pacific); secretary-treasurer, J. E. Quick (Grand Trunk); members of the executive committee, George H. Lee, George L. Alley and C. J. Wiggin. New York was chosen as the place of the next annual meeting.

American Railway Bridge and Building Association.

The March meeting of the Bridge and Building Association will be held at the Auditorium hotel in Chicago, on Wednesday evening, March 22. As many of the members will be in attendance at the convention of the Maintenance of Way Association and the exhibition of railway appliances, it is thought that a good attendance of the members of the association can be secured at this meeting. Further information concerning the meeting can be obtained at the booth of Fairbanks, Morse & Co., in spaces 92-95 at the Coliseum, during the week of the exhibition.

American Railway Engineering and Maintenance of Way Association.

At the Tuesday evening (March 21) session of the American Railway Engineering and Maintenance of Way Association convention, M. H. Wickhorst, engineer of tests for the rail committee, will present an illustrated paper which will be a digest of the investigations made by the rail committee during the past year. After the reading of the paper there will be an informal smoker. The annual banquet of the association will be held March 22 in the Auditorium hotel.

Western Railway Club.

At the regular monthly meeting of the Western Railway Club, held at the Auditorium hotel, Chicago, on February 21, T. W. Demarest, superintendent of motive power of the Pennsylvania Lines at Ft. Wayne, Ind., presented a paper on M. C. B. Interchange Inspection at the Union Stock Yards, Chicago.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; next meeting, March 22, Chicago.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August; New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug.; St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn. Next convention July 25-27, Chicago.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo., 3d Friday in Month; Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911; Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911; Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August; Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Cincinnati Transportation Club has decided to issue a call for a meeting of all the traffic clubs in the country, for the purpose of forming a national traffic organization.

A press despatch from Memphis, Tenn., says that the railways south of the Ohio river, and also some of those north of it, contemplate increasing, by 1 cent per 100 lbs., their rates on lumber.

The Pennsylvania Railroad has adopted a rate of 2½ cents a mile for all local passenger fares on its lines in the state of Pennsylvania. The new tariffs make no important changes except in isolated cases. Some fares are slightly increased and others slightly decreased.

The railways have lengthened the schedules of some of their freight and passenger trains between Chicago and St. Paul, and the traffic committee of the Chicago Association of Commerce has taken steps looking to a conference with the railways, claiming that Chicago shippers are suffering from the slow time.

On February 20 through merchandise car service was established from Chicago to points in the southwest via the Burlington, the Nashville, Chattanooga & St. Louis and connections. The cars will leave Chicago daily at 7.15 p. m., and arrive at Paducah, Ky., at 9.30 p. m. on the second day. Freight will reach Atlanta, Ga., on the second day from Paducah.

The special educational good roads train of the Pennsylvania Railroad, which has lately been traversing the lines of the company in western Pennsylvania, gathered audiences aggregating more than 13,000 people. Sixty-one lectures were given and an additional lecture car was put on the train. The train is in charge of Prof. John P. Jackson, dean of the School of Engineering of the Pennsylvania State College. It is to visit the eastern part of the state. W. B. Thomson, one of the division engineers of the road, is giving addresses on the subject of good roads before farmers' institutes.

Traffic Club of New York

At the meeting of the Traffic Club of New York, to be held on February 28, Calvin Tomkins, commissioner of docks and ferries of the city of New York, will speak on The Port of New York. The lecture will be illustrated by both stereopticon views and models, showing the tentative plans of the proposed railway and canal terminals.

INTERSTATE COMMERCE COMMISSION.

Loss Due to Ignorance of Best Routes.

A. C. Parfrey v. Chicago, Milwaukee & St. Paul et al.

Rate of 34½ cents per 100 lbs. for transportation of cheese boxes in carloads, Richland Center, Wis., to Dodgeville, Wis., found unreasonable. Reparation awarded.

Complainant alleged that the rates exacted by defendants for the transportation of four carloads of cheese boxes from Richmond Center to Dodgeville, Wis., in 1909, were unreasonable in so far as they exceeded a joint commodity rate subsequently established. The freight charges collected amounted to $205.46. The shipments were carried from Madison to destination by the Illinois Central, partly through Illinois. Defendants stated that a joint rate of 17½ cents was in effect over the lines of the Chicago, Milwaukee & St. Paul and the Chicago & North Western wholly within Wisconsin. The distance by the intrastate route is 104 miles, by the interstate route 168 miles. Complainant was unaware of a difference in rates over the two routes, and directed the movement via the Illinois Central upon request of consignee. No rate was inserted in any of the bills of lading. Afterward defendants established a joint commodity rate of 17½ cents; but we are not inclined to hold that defendants should be required to accept a rate which appears to have been deemed reasonable over a much shorter route. On the other hand, we find that the rate collected, amounting to 4.1 cents per ton per mile, was somewhat excessive, and that a rate of 28½ cents would have afforded fair compensation; and reparation is ordered in the sum of $31.33, with interest from October 6, 1909. (20 I. C. C. 104.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1910. (SEE ALSO ISSUES FEBRUARY 10 AND 17.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta, Birmingham & Atlantic	662*	$190,492	$63,375	$268,396	$31,549	$33,268	$15,818	$94,199	$9,522	$184,356	$84,040	.....	$13,145	$70,895	$23,577
Bessemer & Lake Erie	204	261,220	23,881	291,645	71,158	128,197	8,499	137,894	39,544	385,292	—93,648	.....	29,209	—122,857	—127,809
Central New England	277	229,852	27,301	271,327	38,112	23,437	1,547	74,813	3,059	140,968	130,359	.....	9,000	121,359	30,547
Charleston & Western Carolina	341	141,271	38,340	187,606	27,189	13,758	2,829	61,494	3,964	109,234	78,372	.....	4,475	73,897	33,850
Chesapeake & Ohio of Indiana	284	111,512	18,181	136,226	25,137	29,012	4,991	84,979	5,254	149,373	—13,147	.....	3,790	—16,937	—
Chicago & Erie	269	346,479	66,456	458,641	41,987	86,833	20,681	219,403	9,814	378,718	79,923	.....	11,387	68,536	—12,433
Chicago, Indianapolis & Louisville	616	305,862	121,658	470,603	53,124	80,719	15,783	190,688	15,657	355,971	114,631	.....	22,500	92,131	—33,734
Chicago, Rock Island & Gulf	471†	211,854	65,417	293,000	57,434	14,319	8,652	103,130	8,765	192,300	100,700	—$253	2,628	97,819	54,247
Cleveland, Akron & Columbus	212	152,392	45,553	214,427	28,431	33,385	3,399	80,855	4,807	150,877	63,550	.....	12,000	51,550	31,451
Colorado Midland	338	115,340	24,184	162,932	18,650	36,107	2,744	77,715	5,570	140,786	22,146	—685	6,882	14,579	—305
Cumberland Valley	162	191,642	48,915	251,748	30,495	30,075	6,802	88,239	11,029	166,640	85,108	446	5,993	79,561	—17,812
Duluth, South Shore & Atlantic	608	155,411	80,354	249,753	27,731	27,681	8,264	103,659	6,780	174,115	75,638	—310	15,871	59,457	22,163
Evansville & Terre Haute	310	146,495	64,902	231,757	28,745	35,245	5,242	77,527	6,149	152,908	78,849	—970	9,410	68,469	12,120
Florida East Coast	583	194,776	108,585	338,606	41,530	42,405	7,111	103,164	7,310	201,520	137,086	.....	13,753	123,333	39,361
Fort Worth & Denver City	454	370,264	157,905	547,027	46,595	84,949	5,262	168,353	16,072	321,231	225,796	—1,661	10,000	214,135	—3,271
Georgia	307	189,163	88,594	295,385	34,738	44,544	10,750	100,708	7,753	198,493	96,892	.....	2,530	94,362	8,493
Houston & Texas Central	789	436,117	159,907	635,096	85,879	62,342	17,586	243,468	21,118	430,393	204,703	—582	23,275	180,846	57,693
Long Island	390	242,613	388,788	675,831	99,268	142,560	14,302	400,655	25,950	682,735	—6,904	59,417	43,570	8,943	—151,509
New York, Philadelphia & Norfolk	112	209,184	35,258	265,032	24,317	39,951	4,561	108,563	11,582	188,974	76,058	.....	7,450	68,608	8,076
New York, Susquehanna & Western	152	174,314	30,005	232,244	15,494	23,045	2,086	91,536	3,870	136,031	96,213	12,583	11,771	97,025	14,613
Norfolk Southern	602	170,357	69,044	253,977	23,466	31,987	4,794	81,142	13,739	155,128	98,849	399	5,900	93,348	—
Northern Central	471	870,910	179,824	1,126,966	199,831	236,956	20,940	546,460	29,285	1,033,472	93,494	330	31,232	62,592	—171,682
Northwestern Pacific	376	97,639	116,253	234,010	48,666	46,465	2,904	111,086	10,296	219,417	14,593	.....	10,700	3,893	—26,276
Peoria & Eastern	351	247,293	62,984	334,097	31,750	52,341	4,820	146,809	5,549	241,269	92,828	.....	7,878	84,950	7,600
Pittsburgh & Lake Erie	191	923,077	126,086	1,092,133	145,799	143,676	14,579	319,696	22,953	646,703	445,430	—450	24,576	420,404	—296,134
Rutland	468	150,630	80,144	264,272	16,768	48,114	7,923	112,150	9,174	194,129	70,143	.....	10,042	60,101	13,301
St. Joseph & Grand Island	319	91,862	37,786	141,527	30,388	20,601	6,705	62,783	6,297	126,774	14,753	—88	8,597	6,068	20,619
St. Louis, Brownsville & Mexico	501‡	104,755	54,570	170,640	47,348	14,518	2,501	62,011	9,694	136,071	34,569	.....	9,500	25,069	—5,624
Santa Fe, Prescott & Phoenix	364§	105,487	36,109	150,528	24,196	15,401	3,136	45,631	6,981	95,345	55,183	.....	136	55,047	6,574
Southern Ry. Co. in Mississippi	280	77,449	54,576	140,558	20,012	6,613	2,875	39,056	4,309	72,865	67,693	.....	6,250	61,443	20,788
Tennessee Central	294	81,903	37,021	125,452	19,343	16,804	4,721	39,610	7,610	88,088	37,364	.....	3,980	33,384	21
Texas & New Orleans	458	239,413	97,540	356,030	48,784	61,963	7,180	171,541	11,236	300,704	55,326	—323	13,087	41,916	—9,380
Toledo & Ohio Central	444	380,842	51,023	446,892	58,808	66,530	6,820	164,472	7,562	304,192	142,700	.....	28,549	114,151	31,010
Toledo, St. Louis & Western	451	270,145	38,473	327,991	40,296	51,712	8,295	122,375	9,144	231,822	96,169	.....	14,550	81,619	—29,486
Virginian	474¶	273,444	21,799	303,267	33,239	46,135	4,619	87,334	8,225	179,552	123,715	5,526	12,456	116,785	81,274
West Jersey & Seashore	353	143,575	183,867	355,170	64,490	60,153	12,399	211,633	11,309	359,984	—4,814	—12,727	22,773	—40,314	—20,799
SIX MONTHS OF FISCAL YEAR 1911.															
Atlanta, Birmingham & Atlantic	662*	$1,003,392	$330,713	$1,422,741	$166,844	$226,646	$87,728	$513,079	$53,101	$1,047,398	$375,343	.....	$68,145	$307,198	$41,275
Bessemer & Lake Erie	204	4,129,340	215,431	4,394,341	493,904	790,754	48,705	1,182,398	79,079	2,594,840	1,799,501	.....	62,209	1,737,292	—677,196
Central New England	277	1,335,138	194,526	1,610,480	342,100	134,346	11,799	458,343	17,731	964,319	646,161	.....	54,000	592,161	—29,486
Charleston & Western Carolina	341	688,399	199,057	929,075	169,657	117,334	19,217	305,356	23,232	634,796	294,279	.....	26,850	267,429	80,078
Chesapeake & Ohio of Indiana	284	618,866	166,284	826,238	184,952	138,415	37,843	411,673	28,764	801,647	24,591	.....	22,740	1,851	—
Chicago & Erie	269	2,019,767	443,038	2,685,701	325,465	551,203	120,680	1,156,356	57,539	2,211,243	474,458	.....	67,876	406,582	—44,757
Chicago, Indianapolis & Louisville	616	2,117,364	837,757	3,218,373	417,971	444,041	99,290	1,112,163	88,537	2,162,002	1,056,371	.....	135,000	921,371	—122,390
Chicago, Rock Island & Gulf	471†	1,078,900	374,902	1,549,784	255,558	101,500	52,770	539,598	49,154	998,580	551,204	—$1,840	29,673	519,691	—34,552
Cleveland, Akron & Columbus	212	1,026,928	317,009	1,432,219	265,132	216,383	19,040	464,984	23,658	989,197	443,022	.....	54,000	389,022	89,064
Colorado Midland	338	796,080	194,625	1,116,567	146,336	229,698	30,253	464,822	33,711	904,820	211,747	—1,903	49,382	160,462	—95,252
Cumberland Valley	162	1,210,740	353,035	1,636,515	194,084	217,035	29,822	498,954	40,291	980,186	656,329	1,912	34,882	623,359	—18,909
Duluth, South Shore & Atlantic	608	1,091,272	555,678	1,734,947	230,495	175,674	60,695	622,061	44,271	1,133,196	601,751	8,196	105,871	504,076	41,643
Evansville & Terre Haute	310	927,586	380,791	1,439,070	179,529	193,760	33,520	448,110	39,095	894,014	545,056	—4,838	56,460	483,758	6,130
Florida East Coast	583	781,019	447,590	1,402,172	260,703	240,476	29,389	522,707	47,797	1,101,072	301,100	.....	82,410	218,690	79,847
Fort Worth & Denver City	454	1,912,104	941,600	2,975,413	283,301	437,290	36,389	888,596	87,712	1,733,288	1,242,125	—8,645	60,000	1,173,480	—32,754
Georgia	307	1,061,732	483,702	1,643,728	223,144	246,628	63,011	631,076	43,260	1,207,118	436,610	.....	13,100	423,510	—16,521
Houston & Texas Central	789	2,440,856	912,328	3,564,281	442,072	399,576	109,617	1,289,878	129,065	2,370,208	1,194,073	—582	111,634	1,081,857	—1,711
Long Island	390	1,592,741	3,621,094	5,465,114	575,559	733,429	110,582	2,421,711	128,875	3,970,156	1,494,958	456,295	261,422	1,689,831	—390,510
New York, Philadelphia & Norfolk	112	1,416,682	230,110	1,774,038	187,750	287,030	28,840	663,069	66,402	1,233,091	540,947	.....	46,650	494,297	—52,695
New York, Susquehanna & Western	152	992,573	319,288	1,473,546	185,930	137,160	12,690	536,885	26,816	899,481	574,065	3,490	70,173	507,382	77,697
Norfolk Southern	602	912,048	415,605	1,432,352	161,749	170,868	29,365	436,818	81,736	880,536	551,816	3,868	36,200	519,484	—
Northern Central	471	5,042,427	1,236,039	6,660,357	1,151,772	1,230,757	106,579	3,038,518	150,789	5,668,415	991,942	4,283	187,391	808,834	—727,633
Northwestern Pacific	376	808,073	944,822	1,883,540	309,139	250,295	16,783	654,956	54,958	1,286,131	597,409	.....	63,200	534,209	—12,709
Peoria & Eastern	351	1,416,423	391,976	1,944,309	250,981	308,066	37,142	766,417	33,895	1,396,501	547,808	.....	57,878	489,930	—35,770
Pittsburgh & Lake Erie	191	7,646,614	873,816	8,769,078	1,082,630	819,289	84,879	2,004,679	140,773	4,132,250	4,636,828	—2,005	156,576	4,478,247	—942,948
Rutland	468	990,686	658,274	1,863,490	258,556	257,481	43,600	670,124	41,968	1,271,729	591,761	.....	65,283	526,478	8,579
St. Joseph & Grand Island	319	595,740	251,610	919,551	211,406	120,157	39,286	383,766	36,215	790,830	128,721	275	36,190	92,806	—57,553
St. Louis, Brownsville & Mexico	501‡	560,021	278,012	904,982	270,905	77,723	13,737	326,313	47,246	735,924	169,058	.....	29,500	139,558	—1,309
Santa Fe, Prescott & Phoenix	364§	577,265	219,129	851,065	148,200	80,024	16,409	267,628	34,333	546,594	304,471	.....	637	303,834	—15,386
Southern Ry. Co. in Mississippi	280	346,638	219,816	605,979	128,875	38,581	16,439	225,180	23,248	432,323	173,656	.....	29,224	144,432	40,377
Tennessee Central	294	511,399	215,356	770,635	111,348	76,214	29,657	227,692	47,563	492,474	278,161	.....	23,881	254,280	9,415
Texas & New Orleans	458	1,319,161	543,628	1,978,469	358,129	334,064	42,508	773,365	57,926	1,565,992	412,477	2,413	73,997	340,893	—150,367
Toledo & Ohio Central	444	2,406,301	366,049	2,924,300	375,936	375,554	40,308	908,421	46,578	1,746,797	1,177,503	.....	109,812	1,067,691	274,374
Toledo, St. Louis & Western	451	1,614,162	256,917	1,991,165	271,329	260,549	52,999	669,441	58,317	1,312,635	678,530	.....	84,050	594,480	—110,123
Virginian	474¶	1,585,066	141,195	1,774,633	196,391	275,505	31,694	481,432	45,855	1,030,877	743,756	27,914	78,956	692,714	509,034
West Jersey & Seashore	353	980,758	2,358,512	3,557,181	501,790	412,964	110,435	1,362,558	65,656	2,453,403	1,103,778	—39,549	136,637	927,592	39,400

Mileage operated on December 31, 1909.—* 641 miles; † 529 miles; ‡ 456 miles; § 257 miles; ¶ 444 miles; — indicates Deficits, Losses and Decreases.

COURT NEWS.

The new commerce court will hold its first hearings in Washington on April 3, though one of the judges (Judge Mack) is going to California between now and that time to take testimony in suits concerning switching charges at San Francisco and Los Angeles. It is said that probably the case that will be heard at Washington, April 3, will be that of the Louisville & Nashville vs. The Interstate Commerce Commission.

The Supreme Court of the United States, in an opinion by Mr. Justice Hughes, has sustained the constitutionality of the law of Iowa, passed in 1898, enabling an employee of the operating department of a railway to sue his employer for injuries, notwithstanding the fact that he had received injury benefits from a relief department supported partially by the road. The suit was that of Charles L. McGuire against the Chicago, Burlington & Quincy for $2,000 damages for injuries. McGuire had received $882 from the Burlington Relief Department. One of the regulations of the department was that employees must elect between accepting relief from it and prosecuting a claim against the company. The company first contended that the recovery from the relief fund was a bar to the action in court, and, when that was decided against it, an attack was made on the constitutionality of the law. The Supreme Court of Iowa upheld the constitutionality of the law and that decision is now affirmed.

The Supreme Court of the United States has decided in favor of Frederick Weyerhaeuser and others the suit brought by them against Herbert H. Hoyt for possession of Northern Pacific lands. Weyerhaeuser was the grantee of the Northern Pacific of certain lands which the road had selected under a public land grant. Hoyt was the grantee of a homesteader who had filed on the lands subsequent to the date on which the road made its selections and filed them in the land office, but prior to the time the railway's selections were approved by the Secretary of the Interior. In an opinion by Chief Justice White the Supreme Court holds that the action of the Secretary of the Interior in approving the selections by the Northern Pacific related back to the date of the filing of the selections in the local land office and thereby gave priority to the railway. Justices Harlan and Day dissented from the opinion and Justice Harlan read a dissenting opinion in which he held that the majority opinion of the court had reversed the uniform rule of decisions of the Supreme Court and that held that the filing of a list of selections by a railway company under a land grant created no title as of that date; that the title did not vest until the selections were approved by the Secretary of the Interior. On the trial of the case in the Circuit Court for the District of Minnesota the railway grantees won. On appeal to the Circuit Court of Appeals this decision was reversed, and the Supreme Court now reverses the Court of Appeals and sustained the Circuit Court for the District of Minnesota.

The Supreme Court of the United States on Monday of this week issued a large number of decisions. Besides that noted above, cases were decided embodying the following points:

That a passenger has no right to buy tickets with services, advertising, releases, or property, nor may the railway buy services, advertising, releases or property with transportation.

That a state law regulating the size of crews on trains within the state is not an obstruction to interstate commerce, but may be an aid; and a means of public safety.

That the supreme court may review the validity of an order of the Interstate Commerce Commission, even though the two-year limitation on the life of the order has expired.

That a railway may not escape regulation as an instrument of interstate commerce in the matter of wharf privileges because one of its constituent parts is a wharfage company.

That the Interstate Commerce Commission may not reduce a rate as "unjust and unreasonable" merely because it is inequitable under some circumstances.

The most recent section of the Cape to Cairo Railway from the north to be completed is understood to be from Khartum to Wad Madani, a point about 100 miles south of Khartum.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Frederick H. Prince, vice-president of the Chicago Junction Railways and Union Stock Yards Company, has been elected president, succeeding Nathaniel Thayer, resigned on account of ill health, and Eugene V. R. Thayer has been elected vice-president.

Operating Officers.

E. A. Sollitt, road foreman of engines of the Wabash at Montpelier, Ohio, has been appointed trainmaster, with office at Moberly, Mo., succeeding J. W. Jones, promoted.

J. E. Taussig, superintendent of terminals of the Wabash Railroad at St. Louis, Mo., has been appointed superintendent of terminals of the Houston & Texas Central, with office at Houston, Texas.

J. W. Jones, trainmaster of the Wabash Railroad at Moberly, Mo., has been appointed superintendent of terminals, with office at St. Louis, Mo., succeeding J. E. Taussig, resigned, to go to another company.

H. Hatcher, superintendent of the Southern Railway in Mississippi at Columbus, Miss., has been appointed general superintendent of the Georgia, Southern & Florida, with office at Macon, Ga., succeeding O. M. Grady, resigned.

W. H. Averell, whose resignation as superintendent of the Los Angeles division of the Southern Pacific, has been announced in these columns, has been appointed an assistant on the staff of the general manager of the Baltimore & Ohio, with office at Baltimore, Md., effective March 1.

J. A. Gordon, superintendent of the Southern division of the Chicago Great Western at Des Moines, Iowa, has been appointed superintendent of the Eastern division, with office at Chicago, succeeding W. B. Causey, and Mr. Causey succeeds Mr. Gordon on the Southern division. C. E. Carson has been appointed superintendent, with office at Clarion, Iowa, succeeding M. Dailey, resigned.

T. A. Shea, who has been appointed superintendent of the Missouri Pacific, with office at Aurora, Mo., as was previously announced in these columns, was born in Virginia in 1870. He began railway work when he was 12 years old as a messenger for the Chesapeake & Ohio, and he was later made a telegraph operator. In 1889 he became a fireman with the Plant System of Railways, now the Atlantic Coast Line, and was afterwards promoted to engineer and then trainmaster. In 1894 he went with the Illinois Central, where he was conductor for two years, and during the period from 1897 to 1902 he was despatcher and then chief despatcher of the Atlantic Coast Line. His next position was despatcher for the Missouri Pacific at De Soto, Mo. He was promoted to chief despatcher at Poplar Bluff, Mo., in 1906, and was transferred with the same title to Little Rock, Ark., in 1907. He was appointed trainmaster, with office at Little Rock, in 1908, from which position he is now promoted to superintendent as above.

C. E. Carson, who has been appointed superintendent of the Chicago Great Western, with office at Clarion, Iowa, was born January 9, 1867, at Portsmouth, Ohio. He graduated from Carleton College at Syracuse, Ohio, in 1884, and began railway work in the same year with the Kansas City, Ft. Scott & Memphis, now part of the St. Louis & San Francisco, at Kansas City, Mo. He was first a switchman, and was promoted consecutively to brakeman, conductor, yardmaster and general yardmaster. For four years from 1893 he was chief clerk to the superintendent of the Terminal Railroad Association of St. Louis, and was appointed superintendent of terminals of the Missouri Pacific at Kansas City in 1897. In 1902 he was transferred with the same title to St. Louis, where he remained about two years, becoming superintendent of the Colorado & Southern at Denver, Colo., in December, 1903. Three years later he went with the Mexican Central and the National Lines of Mexico as superintendent, with office at Tampico, Mex., remaining there

for two years. He was then made manager of the Mexican Fuel Company, which position he held at the time of his appointment to the superintendency of the Chicago Great Western as above.

Traffic Officers.

C. Lacy Goodrich has been appointed general Oriental agent of the Western Pacific, with office at Yokohama, Japan.

T. K. Partridge has been appointed traveling freight agent of the Kansas City, Mexico & Orient, with office at Wichita, Kan.

E. F. Bertling has been appointed a traveling freight agent of the Union Pacific, with office at Cincinnati, Ohio, succeeding W. G. Tabbert, resigned.

W. P. Moats has been appointed general agent of the Kansas City Southern, with office at Mexico City, Mex., his territory comprising the Republic of Mexico.

A. W. Boyle has been appointed a traveling freight agent of the St. Louis, Iron Mountain & Southern, with office at New Orleans, La., succeeding N. C. Barnett, resigned.

J. C. Fraser, traveling freight agent of the Chattanooga Southern at Birmingham, Ala., has been appointed a soliciting agent of the Central of Georgia, with office at Montgomery, Ala.

M. Clarke, until October, 1910, general agent of the Tonopah & Goldfield at San Francisco, Cal., has been appointed a contracting freight agent of the Illinois Central, with office at San Francisco.

A. D. Aiken, commercial agent of the Chicago, Rock Island & Pacific at McAlester, Okla., has been appointed a commercial agent, with office at St. Joseph, Mo., succeeding R. F. Atwood, promoted.

A. S. Hindman has been appointed agent of the Michigan Central-Lackawanna Fast Freight Line, with office at Chicago, succeeding C. C. Campbell, promoted. W. H. Norie has been appointed a traveling freight agent, with office at Chicago.

C. M. Burkhalter, district freight and passenger agent of the Southern Pacific at Oakland, Cal., has been appointed general agent in the freight department of the Sunset and Atlantic Steamship Lines, with office at San Francisco, Cal. As has been announced in these columns, L. Richardson succeeds Mr. Burkhalter.

S. A. Kendig, traveling passenger agent of the Atchison, Topeka & Santa Fe at Galveston, Texas, has been appointed colonization agent of the Gulf, Colorado & Santa Fe, with office at Galveston, succeeding to part of the duties of G. A. Dobbin, industrial and colonization agent, resigned. H. Y. Williams, assistant city passenger agent at Fort Worth, Texas, succeeds Mr. Kendig as traveling passenger agent, with office at Temple, Texas, instead of at Galveston.

Incident to the promotion of Samuel G. Hatch from general passenger agent of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley at Chicago to passenger traffic manager, John A. Scott, assistant general passenger agent of the Illinois Central at Memphis, Tenn., has been appointed general passenger agent, with jurisdiction over the lines of the Illinois Central south of the Ohio river and over the Yazoo & Mississippi Valley, with office at Memphis. H. J. Phelps, division passenger agent of the Illinois Central at Dubuque, Iowa, has been appointed general passenger agent of the northern and western lines of the Illinois Central and of the Indianapolis Southern, with office at Chicago. W. H. Brill, division passenger agent of the Illinois Central at St. Louis, Mo., has been appointed an assistant general passenger agent of the Illinois Central and the Yazoo & Mississippi Valley, with office at New Orleans, La., and G. H. Bower, general baggage agent of the Missouri, Kansas & Texas at Parsons, Kan., has been appointed an assistant general passenger agent of the Illinois Central and the Indianapolis Southern, with office at Chicago. J. M. Morisey, district passenger agent at Indianapolis, Ind, succeeds Mr. Phelps as division passenger agent at Dubuque, and A. J. McDougall succeeds Mr. Morisey. F. D. Miller, district passenger agent at Birmingham, Ala., succeeds Mr. Brill as division passenger agent at St. Louis, and Robert Anderson succeeds Mr. Miller. The appointments are effective March 1.

Samuel G. Hatch, whose appointment as passenger traffic manager of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, has been announced in these columns, was born March 22, 1865, at St. Louis, Mo. He began railway work in 1880, as a clerk in the general passenger department of the St. Louis, Keokuk & Northwestern, now a part of the Chicago, Burlington & Quincy. Two years later he was promoted to ticket agent of that road and the Burlington at Keokuk, Iowa, remaining there until 1885. In November, 1888, he was made traveling passenger agent of the St. Louis, Arkansas & Texas, now the St. Louis Southwestern; he was afterward promoted to district passenger agent at Louisville, Ky., and then to chief in the general passenger department. He was appointed district passenger and ticket agent of the Chesapeake & Ohio Southwestern at Memphis, Tenn., in March, 1895, and a year later was promoted to general passenger agent. In August, 1896, he went with the Illinois Central as division passenger agent at Cincinnati, Ohio, and was promoted to assistant general passenger agent, at Chicago in April, 1900. In July, 1905, he was appointed general passenger agent, from which office he has now been promoted to passenger traffic manager a sabove.



Samuel G. Hatch.

Engineering and Rolling Stock Officers.

O. S. Jackson, master mechanic of the Chicago, Indianapolis & Louisville at Lafayette, Ind., has been appointed superintendent of motive power of the Chicago, Terre Haute & Southeastern, with office at Terre Haute, Ind.

William P. Carroll, whose appointment as master mechanic of the New York Central & Hudson River, with office at Rochester, N. Y., has been announced in these columns, was born July 21, 1876, at Buffalo. He was educated in the high school of his native town and began railway work in August, 1895, with the Buffalo & Susquehanna as a machinist's apprentice. The following year he left the service of that company to go to the Lukens Iron & Steel Company, and was later a machinist with the Baldwin Locomotive Works. He went to the Pennsylvania Railroad as a machinist in 1898, and the following year left that company to go to the New York Central in the same capacity, since which time he has been consecutively, 1901, engine inspector; 1902, air brake inspector; 1905, engine house foreman, and 1907, general foreman, which position he held at the time of his recent appointment as master mechanic in charge of the territory between Rochester and Syracuse with all branches. Mr. Carroll received most of his railway training under C. H. Hogan, assistant superintendent of motive power of the New York Central & Hudson River.



W. P. Carroll.

Burchill Richardson Moore, whose appointment as superintendent of motive power of the Duluth & Iron Range was announced in the *Railway Age Gazette* of February 3, page 259, was born September 5, 1865, at Sumter, S. C. He was educated at the State Normal Academy at Fredonia, N. Y., and held an apprenticeship at the Brooks Locomotive Works from 1881 to 1885. In the latter year he began railway work with the Union Pacific as draftsman and machinist, and he remained with that company 13 years, first at Omaha, Neb., and later being transferred to Kansas City, Kan.; Cheyenne, Wyo.; and Denver, Colo. His next position was with the Atchison, Topeka & Santa Fe, with which road he did special work in California for a year.



B. R. Moore.

In April, 1899, he was appointed chief draftsman on the Chicago & North Western, and three years later was promoted to mechanical engineer of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn. He was later promoted to assistant superintendent of motive power and machinery at Sioux City, Iowa, and for a year from June, 1908, was engaged in a private enterprise. In May, 1909, he was appointed master mechanic of the Mississippi Central, with office at Hattiesburg, Miss., which office he has just resigned to become superintendent of motive power of the Duluth & Iron Range, with office at Two Harbors, Minn.

Purchasing Officers.

W. L. Cooper has been appointed a division storekeeper of the Mobile & Ohio, with office at Murphysboro, Ill., succeeding D. L. Balch, transferred.

OBITUARY.

Charles D. Simonson, special agent in the freight department of the Chicago, Rock Island & Pacific at New York, died on February 15, at his home in Brooklyn, N. Y., at the age of 70 years.

John Franklin Hinckley, formerly chief engineer of the St. Louis & San Francisco, died on February 20, at the home of his sister in St. Louis, Mo. Mr. Hinckley was born in Boston, Mass., and after being graduated from the School of Technology in that city he went to St. Louis and entered the service of the St. Louis & San Francisco in the engineering department as chief engineer, a position he held until he resigned two years ago to begin private practice.

William Ashbridge Baldwin, former president of the Cleveland & Marietta, which is now a part of the Pennsylvania System, died in Sewickley, Pa., February 17. Mr. Baldwin was born on June 28, 1835, at Philadelphia, and began railway work in November, 1851, with a party of engineers making surveys in Schuylkill county, Pa. In March, 1857, he went to Honduras, Central America, as assistant engineer, leveler and topographer on the Honduras Inter-Oceanic Railway. In December of the following year he returned to this country and entered the employ of the Pennsylvania Railroad. In 1862 he was appointed superintendent of the Western division of the Philadelphia & Erie. By May, 1870, he had become general superintendent of the Philadelphia & Erie division, and in September, 1881, he was appointed manager of the Pennsylvania Lines West of Pittsburgh. In 1888 he went to the Buffalo, Rochester & Pittsburgh as vice-president and general manager, but five years later he returned to the Pennsylvania System and was made president of the Cleveland & Marietta.

Railway Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—An officer writes that a contract has been given to the Superior Construction Company, Ltd., Espanola, Ont., for building an extension of the Manitoulin & North Shore from Crean Hill, to Whitefish. Maximum grades will be 1.5 per cent., and maximum curvature 12 deg. There will probably be three bridges, but the construction of the bridges has not yet been determined. There will be a swing bridge between Goat island and Manitoulin island. The line is being built to carry ore, forest products, live stock and merchandise. (February 17, p. 334.)

Boise & Interurban.—A contract has been given to Edward Hedden for making surveys for an extension, it is said, from Caldwell, Idaho, west to Roswell, about 20 miles.

Canadian Pacific.—According to press reports, this company will let contracts, and start work soon on a line from Toronto, Ont., east via Whitby, Oshawa, Bowmanville, Port Hope, Cobourg and Belleville, thence northeasterly to the main line at Bathurst, from which place double-track is to be laid on the existing line to Smith's Falls. From Smith's Falls the line is already double-tracked to Montreal.

The railway commissioners of Canada have authorized the Canadian Pacific to construct its Moose Jaw branch northwesterly across 108 highways, and to divert the line between mile post 9.59. and mile post 119.6.

Canadian Railways.—Residents of northern Ontario have petitioned the government to build a line to Gowganda and Elk river, in Ontario.

Chicago, Burlington & Quincy.—It is expected that the new line from Thermopolis, Wyo., will be finished soon through the Big Horn canyon, and that this section will be opened for local traffic. The line is to be continued east through Wyoming to Orin Junction.

Columbia & Puget Sound.—Double-tracking work is said to be under way from Seattle, Wash., south to Renton, 12 miles.

Graham County Railroad.—The plans call for building a 43-mile from Topton, N C., north via Robinsville along the Cheowah river. Surveys are being made. D. Merrick, president, Asheville; D. B. Burns, chief engineer.

Grand Trunk Pacific.—This company is said to have finished locating a branch line between Vancouver and Fort George, B. C.

Grants Pass & Rogue River.—This company has been incorporated in Oregon with $900,000 capital. Financial arrangements have been made to begin construction work on a section from Grants Pass, Ore., along the valleys of Rogue river and Williams creek to the Oregon caves in southern Oregon. A. D. Bowen, president; H. L. Chapin, vice-president, Portland. J. E. Riggs, Grants Pass, is an incorporator.

Hawkinsville & Western.—This company expects to complete financial arrangements and begin work soon on a line from Hawkinsville, Ga., northwest to Perry, 22 miles. T. B. Ragan, president.

Hugo & Atoka Northwestern.—This company, which has not yet completed its organization, will probably build a 50-mile line from Hugo, Okla., northwest either via Atoka or Reynolds. Surveys have been made. P. B. Bigger, secretary, Chamber of Commerce, Hugo, may be addressed.

Long Island.—An officer writes that double-tracking work on the Oyster Bay branch between Glen Cove, N. Y., and Locust Valley will probably be finished during 1911. All material is on hand and the work will be carried out by the company's men. No plans have been made at the present time for electrifying the Oyster Bay branch.

Manitoulin & North Shore.—See Algoma Central & Hudson Bay.

Midland Valley.—An officer of the Midland Valley writes that this company operates 300 miles of railway, in connec-

tion with large coal properties in Arkansas, owned by the same interests, all of which have been developed by Philadelphia capital, is extending its line from Arkansas City, Kansas, northwest to Wichita, 55 miles. The Wichita & Midland Valley is building this line, which is to be leased to the Midland Valley. The company has bought about 30 acres of land in the central part of Wichita, for terminal yards and facilities. The city of Wichita and the counties through which the new line is to be built, voted on February 14 $127,000 county bonds, being the full legal amount of county railway aid bonds. At Wichita connections can be made with several transcontinental systems.

Montgomery County Rapid Transit.—This company has decided to extend its line, it is said, from Skippack, Pa., to a number of places in Perkiomen valley, instead of in North Penn valley, as originally planned.

Nevada Copper Belt.—According to press reports, the extension from Mason, Nev., has been finished to Hudson in Smith valley, and is now open for traffic. The extension is to be continued to Morning Star mine, 15 miles from Mason. P. J. Conway, Bridgeport, Cal., is the contractor. (December 9, p. 1130.)

New Orleans, Fort Jackson & Grand Isle.—See New Orleans Southern.

New Orleans Southern.—An officer writes regarding the reports that extensive improvements are to be made on the New Orleans, Fort Jackson & Grand Isle, which operates a 60-mile line from New Orleans, La., to Buras, that no definite plans have yet been made to carry out these improvements.

North Carolina Roads.—The Merchants' & Manufacturers' Association of Greensboro, N. C., associated with residents of that place have applied for a charter to build from Greensboro to Carey. The line is to be extended ultimately to Winston and across the mountains into the coal fields. The line will traverse a fine farming and lumbering section. Connection is to be made at Carey with an extension of the Norfolk Southern, which is to be built from Raleigh, about five miles. A bill is now before the state legislature to authorize the construction of the line. C. H. Ireland, Greensboro, may be addressed.

Pittsburg, Butler, Harmony & New Castle (Electric).—This company will probably build during 1911 a line from New Castle, Pa., north via Wilmington, East Middlesex, South Sharon, Sharon and Sharpsville to Conneaut lake, about 50 miles.

Salisbury Railway.—An officer writes that the plans call for a line from Salisbury, N. C., south via Faith, Mount Pleasant, Monroe and Jefferson, S. C., to McBee, about 100 miles. W. H. Miller, president, Salisbury.

Sand Springs Interurban.—An officer writes that grading contracts have been given to Ketchum Brothers and Albro Martin, for building seven miles between Tulsa, Okla., and Sand Springs. The work involves handling about 7,000 cu. yds. a mile. There will be one 20-ft. steel bridge and two trestles, each 30 ft. long. Charles Page, president; W. H. Hendron, engineer, Tulsa.

Shawnee Short Line (Electric), Shawnee, Okla.—Organized to build interurban lines to Denison, Texas, and from Oklahoma City through Shawnee and Muskogee to Joplin, Mo. The right of way is now being secured for the Denison line. The company has bought a tract of land on Blue river, in Johnson county, having sufficient water power to operate the entire line. Martin J. Bentley, Shawnee, is president; C. C. Wright, Ada, secretary; P. Rodkey, Shawnee, right-of-way agent, and H. H. Hull, Memphis, Tenn., chief engineer.

Southern Cambria (Electric).—This company is said to have begun grading work on an extension between Johnstown, Pa., and Ebensburg, 10.85 miles.

Sumpter Valley.—This company will build an extension, it is said, from Prairie City, Ore., west to John Day.

Texas Roads.—Plans are being made by residents of Fort Worth, Texas, to build from that place, northwest to Jacksboro, 60 miles. The line may eventually be extended into New Mexico. It is understood that construction work will be started soon. W. Capps, S. Davidson, I. H. Burney and W. D. Reynolds, are interested.

Texas Traction.—According to press reports, plans are being made to build an extension from Dallas, Texas, south to Waxahachie, about 35 miles. Surveys for a line between these places were made about two years ago, but nothing was done toward the construction of the line. It is expected that the work will be pushed to completion soon, and when this work is finished a further extension south may be built through Hillsboro to Waco, about 65 miles.

Uncompahgre & Gunnison Valley.—An officer writes that contracts will probably be let this summer to build from Montrose, Colo., north through a fruit section via Clathe and Delta, about 50 miles. The line will have maximum grades of 3 per cent. and maximum curvature of 8 deg. There will be a trestle over the Gunnison and another over the Uncompahgre river. The line is being built to carry coal, sugar, beats, live stock and fruit. T. B. Townsend, president, Denver; Paret & Beard, engineers, Box 667. Montrose.

Washington Roads (Electric).—A company is to be organized by residents of Springdale, Wash., and Spokane, under the name of the Chamokane Contracting Company, to build an electric line from Springdale, to the proposed power plant of the Washington Water Power Company, on the Spokane river. The line will be built if the company is able to secure the right-of-way.

West Penn Railways Company (Electric).—This company, it is said, will issue bonds, the proceeds of which are to be used for extensions in Pennsylvania as follows: Leisenring-Uniontown line; West Newton to Hunkers, 10 miles; West Newton to Scott Haven, six miles; West Newton to Webster, seven miles; Webster to Monessen, three miles; Brownsville to Arnold City, six miles, and Fairchance to Point Marion, eight miles, a total of 52 miles. Surveys have not yet been made for these extensions.

Wichita & Midland Valley.—See Midland Valley.

Winnipeg, Salina & Gulf.—An officer writes that this company, which was organized to build from Winnipeg, Man., south to the gulf of Mexico, 1,500 miles, expects to let contracts in May and financial arrangements will be completed to secure funds for starting the work by that time. The final location surveys are being made from Alva, Okla., west via Buffalo and Gate to Beaver City, about 100 miles. Survey has been finished from Alva to Hooker, but it will be necessary to resurvey this line. The location survey from Cunningham, Kan., almost to Salina, has been made. Arrangements have been made with the Marine Trust & Savings bank, San Francisco, Cal., to guarantee the principal of all stock sold where the money is used for preliminary purposes. There will be five steel bridges and a large amount of trestle work is to be carried out on the line. The company also plans to put up a general office building as well as machine shops. H. Leone Miller, president; G. W. Crowell, vice-president, and C. A. Slayton, chief engineer, Salina, Kan.

FOREIGN RAILWAY NOTES.

The total mileage of the Belgian government railways on January 1, 1910, was 1,268 miles of double track and 1,410 miles of single track.

The Japanese railways at the close of their last fiscal year had 5,029 miles of line, of which more than nine-tenths belonged to the state. Their average traffic was equivalent to 796 passengers and 506 tons of freight carried each way daily over the entire system. The gross earnings were $8,320, and the net $3,860 per mile.

The Jungfrau Railway, Switzerland, continues to make its way upward. The drilling goes on night and day at a height of about 10,800 ft. above sea level, and the tunnel is extended some 11 to 13 ft. daily. At the next station a great "window" is to be cut out on the north side, immediately over the Guggi glacier.

Railway Financial News.

Boston & Maine.—See Boston Railroad Holding Company.

Boston & Maine.—See New York, New Haven & Hartford.

Boston Railroad Holding Company.—The Massachusetts Railroad Commission has approved the petition of the holding company to issue $7,042,400 4 per cent. preferred stock to pay for $6,334,500 Boston & Maine common stock.

Chesapeake & Ohio.—The attorney general of Ohio, acting under the Valentine anti-trust law, has brought suit to exclude the Chesapeake & Ohio from the state of Ohio, and to have trustees appointed for the Hocking Valley and Kanawha & Michigan. The Hocking Valley and the K. & M. are Ohio corporations, but the C. & O. is not an Ohio corporation.

Chicago, Burlington & Quincy.—This company has sold to a New York banking syndicate headed by the First National Bank, $8,000,000 general mortgage 4 per cent. bonds, the proceeds to be used for general development purposes. These bonds are now selling in the market at between 97 and 98. The new Burlington bonds are being offered in Boston at 97½. It is understood that a portion of the proceeds will be used to refund a maturing issue of Hannibal & St. Joseph 6s coming due March 1.

Erie.—This company has asked the New York Public Service Commission, Second district, for authority to issue $12,500,000 collateral notes and $1,382,000 general lien bonds. The proceeds from the sale of the notes will be used to retire outstanding three-year 6 per cent. collateral notes due April 8.

Gulf & Ship Island.—The $500,000 6 per cent. mortgage bonds due April 1, 1911, are to be paid at maturity. Fisk & Robinson, New York, have bought from the company $500,000 of a new authorized issue of $1,000,000 general and refunding 6 per cent. mortgage bonds of 1913-1917, and are offering the holders of the old bonds the privilege of exchanging their bonds at par and interest, for new bonds at 99½.

Hocking Valley.—See Chesapeake & Ohio.

Kanawha & Michigan.—See Chesapeake & Ohio.

Indianapolis Southern.—The trustees of the mortgage securing $10,000,000 bonds, all of which are owned by the Illinois Central, have brought a foreclosure suit. The United States Circuit Court has entered a decree in Illinois providing that unless the company paid $11,056,698, the amount found to be due, by February 19, 1911, the mortgage would be foreclosed and the property sold.

Mobile & Ohio.—Henry Hall and A. W. Mackintosh have been elected directors, succeeding E. L. Russell, deceased, and E. J. Buck, resigned.

New York Central & Hudson River.—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—The Vermont Valley Railroad, a subsidiary of the Boston & Maine, which is itself controlled by the New Haven, has bought $2,352,050 preferred stock of the Rutland Railroad. Heretofore the New York Central & Hudson River has owned a majority of the $9,057,600 7 per cent. cumulative preferred stock outstanding. It is generally understood that the stock bought by the Boston & Maine subsidiary is about half of the New York Central's holdings.

The appraisers appointed by the Massachusetts legislature to make an inquiry as to the valuation of the property of the New York, New Haven & Hartford have filed their detailed report. As announced in these columns previously, the appraisers find that the value of the property exceeds the securities issued on this property. The appraisers' figures now show that they estimate the property of the New Haven, excluding intangible assets, at $496,000,000, while the total obligations of the company are $340,000,000.

New York, Ontario & Western.—White, Weld & Company, and Potter, Choate & Prentice, New York, are offering the unsold portion of the $2,702,000 general mortgage 4 per cent. bonds at 92⅝, yielding about 4⅜ per cent.

Peoria & Eastern.—The full 4 per cent. annual interest of the $4,000,000 non-cumulative income bonds has been declared payable April 1. Four per cent. was paid in 1910, but nothing was paid in 1909. From 1902 to 1908, inclusive, the full 4 per cent. was paid.

Pittsburg & Shawmut.—The *Commercial & Financial Chronicle* says that the company will sell within two months a further block of first mortgage 5 per cent. bonds, to provide for the completion of the road to Freeport, Pa. There are now outstanding $4,000,000 bonds of the authorized issue of $12,000,000.

Rutland Railroad.—See New York, New Haven & Hartford.

Southern Railway.—A dividend of 1 per cent. has been declared payable April 24 on the $60,000,000 5 per cent. non-cumulative preferred stock. In the fiscal year ending June 30, 1907, 4 per cent. was paid; the last payment in 1907 being 1½ per cent. paid from accumulated surplus. From 1902 to 1906, inclusive, 5 per cent. was paid.

President Finley says that he has been authorized by the board to take up the question of the purchase of additional power and equipment, to construct a system of modern "lap" sidings on two important divisions where traffic is heavy, but not sufficient to require double-tracking now, and to improve certain large facilities. In order to strengthen the position of the company with reference to increasing its business, the board has also authorized improvement and expansion of freight facilities at important points.

President Finley says:

"The financial condition of the company having so improved, as shown by the last annual report and the income statement for the six months ended December 31, 1910, as to make such action entirely consistent with a sound and conservative policy, the directors have declared a dividend out of accumulated income as a fair recognition, under all the circumstances, of the just expectations of holders of preferred stock who received dividends for a series of years until the conditions which culminated in the financial panic of the fall of 1907 and the subsequent business depression compelled their suspension. The board has adopted the policy of resuming dividends on a very conservative basis in the expectation that with a continuance of favorable conditions the rate may be gradually increased until the full dividend can again be properly paid. This resumption will not result in any modification of the progressive policy with respect to operation, maintenance and improvement of the property.

It is the expectation to continue the policy of charging to income monthly proportionate amounts of the present balance of discount on securities sold and of making a substantial charge to profit and loss at the end of each fiscal year until such present decreasing balance of discount has been absorbed."

Washington, Baltimore & Annapolis.—The United States District Court at Baltimore has ordered the sale of this property under foreclosure. The upset price is $2,500,000.

FOREIGN RAILWAY NOTES.

More than 1,266 miles were added to the railway systems of Argentina during 1910, not including government lines under construction.

The Argentine congress has approved the bill authorizing the government to spend $19,300,000 on the construction and equipment of state railways.

The Austrian state authorities at the end of 1910 were operating 11,939 miles of railway, of which 3,224 miles were owned by companies, but operated by the state.

Work on the new railway from the port of San Blas, Argentina, to Patagones and Choele-Choele was begun in January. A French syndicate has the contract.

According to the statement of the director general of railways of Argentina the narrow-gage lines produced $18,669,890 and spent $13,647,995 during 1910. The medium-gage lines produced $4,356,975 and expended $2,541,810. The wide-gage railways produced $80,049,545 and expended $45.326,050.

Supply Trade Section.

The Allis-Chalmers Company, Milwaukee, Wis., announces the appointment of F. C. Bryan as general traffic manager, with office at Milwaukee.

The F. W. Miller Heating Company, Chicago, on March 1 will move its Chicago offices from the Railway Exchange building to the McCormick building.

The Union Steel Castings Company, Pittsburgh, Pa., has bought some ground adjoining its present property and intends to build a new plant as soon as possible.

Frank J. Walsh, general foreman of the Chesapeake & Ohio at Thurmond, W. Va., has resigned that position and is now with the Chicago Pneumatic Tool Company, Chicago.

The Buda Company, Chicago, was awarded the gold medal at the Railway Exposition which has just closed at Buenos Aires, Argentine Republic, on its line of motor cars, motor velocipedes, hand-propelled velocipedes, hand cars, track jacks, rail benders, car replacers, new style Palulus track drills, and Wilson bonding drills.

The McKeen Motor Car Company, Omaha, Neb., has received orders from the Oregon Short Line for four 70-ft. motor cars and from the Oregon-Washington Railroad & Navigation Company for one 70-ft. motor car. When these are delivered there will be 104 cars of the McKeen type in service.

At the annual meeting of Manning, Maxwell & Moore, New York, on February 13, W. O. Jacquette and R. A. Bole were elected vice-presidents, succeeding Charles A. Moore, Jr., and J. B. Brady. Mr. Moore also resigned as secretary and as a director, and C. M. Chester, Jr., treasurer, was made also secretary. Mr. Brady remains a director.

At the annual meeting of the King-Lawson Car Company, New York, held at Harrisburg, Pa., on February 8, the following officers were elected: President and general manager, Thomas Lawson; vice-president, A. L. Squiers; treasurer, John M. Delaney; secretary, Roscoe C. Lawson; directors, Edward Bailey, Arthur King and Curtis M. Rogers. The New York offices of the company were moved on February 20, from 1 Madison avenue, to the Singer building.

The circuit court for the county of Saginaw, Michigan, has rendered a decision in the case of the Willcox Engineering Co., Saginaw, Mich., against Harley C. Alger, dissolving the injunction granted to restrain Mr. Alger from allowing the use of his patents on water weighers by the Kennicott company, Chicago Heights, Ill. Mr. Alger is the inventor of the Kennicott water weigher, and is at present manager of the water weigher department of the Kennicott Company.

L. F. Hussey, manager of publicity for the Wells Brothers Company, Greenfield, Mass., has resigned, effective February 25, and will on March 1 become advertising manager of the Standard Tool Company, Cleveland, Ohio. Mr. Hussey has had considerable practical experience in the manufacture of machinery and tools, and has also had charge of the commercial department of a high school at Mechanicsville, N. Y. Two years ago he left that position to create a publicity department with the Wells Brothers Company, and is now undertaking work of even larger scope.

The Pressed Steel Car Company, Pittsburgh, Pa., has issued its report for the year ended December 31, 1910. The gross sales amounted to $27,975,978, as compared with $10,346,816 in 1909. The net earnings from the operation amounted to $1,697,495 in 1910; there was a deficit in 1909. The net surplus for 1910 was $693,366, or 5.54 per cent. on the $12,500,000 common stock, as compared with a $959,583 surplus in 1909, after $1,200,000 had been received from the sale of the common stock of the Canada Car Company. The dividends on the preferred stock amounted to $875,000. President, F. N. Hoffstot says that the company is now in a position to build cars at the very lowest cost in the history of the company.

Frank S. Layng, a director and formerly a vice-president of the Railway Steel-Spring Company, New York, died on February 11. Mr. Layng was born in Steubenville, Ohio, on July 4, 1854. He started work in the steel spring business with the A. French Spring Company, Pittsburgh, Pa., in 1883. He obtained an interest in this company and was made superintendent. In 1886 Mr. Layng resigned this position, though retaining his interest, and went to the Pickering Spring Company, Philadelphia, Pa. He also bought an interest in this company from Charles W. Pickering, the president, and was made secretary and treasurer. Mr. Layng then bought the remainder of Mr. Pickering's interest and remained in full control of this company as chairman of the board until it was bought by the Railway Steel-Spring Company in 1902. On the reorganization of the Railway Steel-Spring Company, Mr. Layng was elected a director and a vice-president in charge of the operating department. On February 28, 1903, he resigned his position as vice-president to look after his own interests, but retained his directorship, which he held at the time of his death. Mr. Layng was also president of the Illinois Zinc Company, Peru, Ill.

TRADE PUBLICATIONS.

Wires, Switches, Generators.—The General Electric Company, Schenectady, N. Y., in bulletin No. 4,787, containing 75 pages of data on wires and cables. Bulletin No. 4,813 describes an oil brake switch for pole line service adapted for use on alternating current series arc systems for sectionalizing feeder systems and similar classes of service requiring a switch to be operated under load. Bulletin No. 4,812 is devoted to small direct current belted generators, ranging in capacity from 1¼-k.w. to 20-k.w., and suitable for lighting small plants, factories, etc.

RAILWAY STRUCTURES.

Bassano, Alberta.—The Canadian Pacific has let a contract for building a dam on the Bow river as part of its irrigation system. Janse, Macdonnell & Company will do the excavating work and Walker, Fyshe & Company the concrete work.

Centralia, Ill.—The Chicago, Burlington & Quincy has announced that the present station buildings will be moved on May 1 to make room for a new passenger station, the property for which has recently been secured by condemnation proceedings.

Cleburne, Texas.—The Gulf, Colorado & Santa Fe has announced that $60,000 will be spent in enlarging its shops.

Coeur d' Alene, Idaho.—The Chicago, Milwaukee & Puget Sound has completed its plans for a terminal station, and it is expected that construction work will begin at an early date.

Empire, Panama.—The engineering board appointed to investigate conditions along the Panama canal favors the construction of a bridge 175 ft. above the surface of the canal at Empire, where convenient connections can be made with the Panama Railroad. The bridge, if built, is to be a combined railway and highway bridge.

Hartford City, Ind.—The city council has refused to close South High street as requested by the Pennsylvania Railroad in its plan for a $40,000 passenger station, and local press reports state that on this account a contract has been let for building a frame station 20 ft. x 40 ft. to cost less than $500.

Toronto, Ont.—An officer of the Canadian Pacific is quoted as saying that the company is planning to spend $5,000,000 in Toronto; of this $2,000,000 is to be spent in North Toronto, West Toronto yards, and on a new station at North Toronto, also new yards between Parkdale and West Toronto. About $2,000,000 has already been spent in securing property between Sincoe and Tecumseh streets, including the Government House site, and $1,000,000 will be spent on the new office building at the corner of King and Yonge streets.

Wichita Falls, Texas.—The Fort Worth & Denver City will begin work on its new freight house as soon as the passenger department has moved into the new union station, allowing the present office building to be torn down. The new freight house will be 30 ft. x 175 ft. and will be supplied with increased trackage facilities.

Late News.

The items in this column were received after the classified departments were closed.

W. J. Robinson has been appointed a soliciting freight agent of the Union Pacific and related lines, with office at Los Angeles, Cal., a new position.

P. F. Bright, assistant trainmaster of the Sunbury division of the Pennsylvania Railroad, at Sunbury, Pa., has been appointed trainmaster, succeeding Jacob H. Swenk, deceased.

A press despatch from Elko, Nev., says 20 passengers were injured in a derailment near Palisade, Nev., of the Southern Pacific train No. 10 eastbound. Seven cars ran off the track.

The St. Louis & San Francisco expects to open for traffic on February 25 the extension from Brady, Tex., to Menard, 37 miles. The line may ultimately be extended south to a connection with the Southern Pacific.

The Chicago & Northwestern has ordered 40,000 tons of rails from the Illinois Steel Company. The Manilla Railways are in the market for 10,000 tons of rails. The Buenos Ayres & Pacific, Argentina, has ordered 15,000 tons of rails.

A rumor says that the Interstate Commerce Commission, in an all-day session on February 22, took the final vote on both the eastern and western rate cases, and that the decision will be prepared and handed down late Thursday or early Friday.

A contract has been given by the St. Louis-Kansas City Electric, it is said, to the L. J. Smith Construction Co., Kansas City, Mo., for building 140 miles of line, between St. Louis and Kansas City. A 10-mile branch is to be built from Columbia to Harrisburg. D. C. Nevin, president, Kansas City.

Officers of the Southern Pacific deny the Washington report that the company has offered to settle suits brought by the government to recover 70,000 acres of Nevada mineral lands granted to the Central Pacific. The railway men say that the S. P. title to these lands is too clear to justify any compromise.

The Dairy Shippers Despatch, Chicago, has ordered 100 thirty-ton refrigerator cars. The Chicago, Indianapolis & Louisville inquiry includes 200 flat cars and 100 automobile cars. The American Refrigerator Transportation Company, St. Louis, Mo., is said to have ordered 1,000 refrigerator cars from the American Car & Foundry Company.

The Interstate Commerce Commission has further suspended the time its order goes into effect in the case of Pacific Coast Jobbers' Association v. Southern Pacific, to May 1, and in the case of the Associated Jobbers of Los Angeles v. Atchison, Topeka & Santa Fe, also to May 1, in order that the Commerce Court may pass upon them.

Justice Parker, in the English court, has decided that the Marconi Wireless Telegraph Co. is entitled to an injunction against the British Radio Telegraph & Telephone Co. to restrain it from infringements of the Marconi patents. He found that the instruments used by the British company were substantially the same as those covered by Mr. Marconi's patents.

The New York Public Service Commission, second district, has given permission to the Erie to issue $12,500,000 in three-year 6 per cent. collateral notes and $1,382,000 of its 4 per cent. general lien bonds. The proceeds are to be used in discharging notes and to reimburse the company for moneys spent from income, amounting to $2,006,032.

The *Liverpool Post* says that the Cunard Steamship Co. and the Canadian Northern have decided to run steamships to Canada from Bristol and probably also from Liverpool. A joint board to consist of directors of both companies will have charge of the arrangements. The formation of this combination is understood to be a counter move to one recently made by the Canadian Pacific.

The Reading & Columbia will replace the present 93-ft. wooden truss bridge over the public road and streams at Ephrata, Pa., with two deck plate girder spans and will also replace the 68-ft. wooden truss bridge north of Shreiners over the public road and creek with a through plate girder span. The contracts for additions and changes to masonry have been given to L. H. Focht & Son, and for the superstructure to the Phoenix Bridge Co.

An officer of the Pennsylvania, referring to reports of retrenchment, says that the company has cancelled no orders for materials or equipment, nor is it contemplated to do other than to reduce operating forces and expenses as is usual in the spring of each year. As weather conditions in January permitted a normal freight movement, and as there is no accumulation of freight, the annual spring reduction in expenses is made somewhat earlier than usual.

A report of Travis B. Whitney, secretary of the New York Public Service Commission, second district, says that 127 formal complaints were made in January against the street railway lines of the various boroughs and against the Fifth Avenue Coach Company. Most of the practices complained against were remedied without formal hearings. The number of complaints made by passengers was as follows: Brooklyn Rapid Transit System, 40; Interborough Rapid Transit Company, 25; Metropolitan Street Railway Company, 10; Fifth Avenue Coach Company, 6; Central Park, North & East River Railroad Company, 5; Coney Island & Brooklyn Railroad Company, 3; New York & Long Island Traction Company, 3; New York & Queens County Railroad Company, 3; Union Railway Company, 3; Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company, 2; Ocean Electric Railway Company, 2, and New York, New Haven & Hartford Railway Company, 2.

In accordance with the resolution passed by the Chicago city council on February 14, providing for the appointment of a railway terminal commission (see *Railway Age Gazette,* February 17, page 328), Mayor Busse has appointed the following: A. J. Earling, president Chicago, Milwaukee & St. Paul; W. A. Gardner, president Chicago & North Western; Samuel M. Felton, president Chicago Great Western; H. U. Mudge, president Chicago, Rock Island & Pacific; H. G. Hetzler, president Chicago & Western Indiana; W. L. Park, vice-president and general manager Illinois Central; Aldermen Foreman, Snow, Clettenberg, Sitts, Rea, Healy, Murray, Littler, Cullerton, Ryan, Reinberg, Powers and Richert; Charles H. Wacker, chairman of the Chicago plan commission; John G. Shedd, representing retail merchandise interests; Arthur T. Aldis, of the Chicago real estate board; E. S. Conway and Clayton Mark, of Mayor Busse's "switch track commission," and Walter H. Wilson, city comptroller.

In the case of Arlington Heights Fruit Exchange et al. v. Southern Pacific et al., the Interstate Commerce Commission has found in favor of the fruit growers. The decision says that the carrying rates for refrigeration of oranges from California to eastern points are not unreasonable, but refrigeration and precooling as practiced by the shippers differs from that furnished by the carriers. The two methods are discussed and the conclusion reached that while it cannot be affirmed with entire confidence that pre-cooling can take the place of standard refrigeration under all circumstances, it is evident that the great bulk of the orange crop may be moved by pre-cooling as applied by the shippers. On the facts disclosed by the record it is found that pre-cooling at the packing house is a practical method which the complainants are anxious to use and for the efficiency of which they are willing to stand responsible, while the method advocated by the carriers is of doubtful practicability and one which the complainants do not care to use and which the defendants are unwilling to guarantee. The service of pre-cooling as these shippers desire to use it can only be performed by the shippers themselves, and the commission thinks that upon the present record it is the right of these complainants to pre-cool and re-ice their shipments. If, however, the carrier has been put to additional expense in the furnishing of the car or in handling the shipment, it should be allowed proper compensation on that account. Carriers are not in case of these pre-cooled shipments entitled to additional compensation because a refrigerator car is furnished, but they are entitled for repairs to ice bunkers to an additional charge per car trip one way. At present the roads charge $30 a car for pre-cooling storage and the commission reduces this charge to $7.50 per car effective April 1.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Rapids & Indiana is in the market for 6 locomotives.

The Delaware, Lackawanna & Western is in the market for 35 locomotives.

The Pennsylvania Equipment Company, Philadelphia, Pa., is in the market for 2 heavy mogul locomotives.

The Bessemer & Lake Erie has ordered 30 consolidation locomotives from the American Locomotive Company. The cylinders will be 22 in. x 30 in., the diameter of the driving wheels will be 54 in. and the total weight in working order will be 205,000 lbs.

The Idaho & Washington Northern has ordered 2 consolidation locomotives from the Baldwin Locomotive Works. The cylinders will be 22 in. x 30 in., the diameter of the driving wheels will be 55 in. and the total weight in working order will be 200,000 lbs.

McDonnell & O'Brien, Hervey Junction, Que., have ordered two mogul locomotives from the Montreal Locomotive Works. The cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in. and the total weight in working order will be 130,000 lbs.

The Inland Steel Company, Chicago, has ordered one six-wheel switching locomotive from the American Locomotive Company. The cylinders will be 17 in. x 24 in., the diameter of the driving wheels will be 44 in. and the total weight in working order will be 94,000 lbs.

The American Brake Shoe & Foundry Company, Mahwah, N. J., has ordered one four-wheel saddle tank locomotive from the American Locomotive Company. The cylinders will be 16 in x 24 in., the diameter of the driving wheels will be 46 in. and the total weight in working order will be 86,000 lbs.

The Chicago, Indianapolis & Louisville has ordered seven consolidation and three Pacific type locomotives from the American Locomotive Company. The cylinders of the consolidation locomotives will be 22 in. x 30 in., the diameter of the driving wheels will be 57 in., and the total weight in working order will be 209,000 lbs. The cylinders of the Pacific type locomotives will be 22 in. x 28 in., the diameter of the driving wheels will be 73 in., and the total weight in working order will be 215,000 lbs.

CAR BUILDING.

The Southern is in the market for four dining cars.

The Escanaba & Lake Superior has ordered 15 flat cars from the Ryan Car Company.

The Virginian has ordered 1,000 steel hopper cars from the Pressed Steel Car Company.

The Richmond, Fredericksburg & Potomac is in the market for 50 box cars and 50 flat cars.

The Great Northern is in the market for ten 60-ft. passenger cars, ten 70-ft. baggage and mail cars, and 15 baggage cars.

The Northern Pacific is in the market for 18 passenger equipment cars, including coaches, baggage cars and dining cars.

The Chicago, Rock Island & Pacific is in the market for 16 steel postal cars and 11 combination mail and baggage cars.

The Pennsylvania Equipment Co., Philadelphia, Pa., is in the market for a number of flat cars, box cars, dump cars and cabooses.

The Boston & Maine, mentioned in the *Railway Age Gazette* of January 6 as being in the market for 300 passenger cars, has ordered 88 of these cars from the Laconia Car Company.

The Atlanta & West Point has ordered six passenger equipment cars from the American Car & Foundry Company, two of which are for service on the Western of Alabama.

The Lehigh & New England, mentioned in the *Railway Age Gazette* of January 27 as being in the market for 500 hopper cars and 300 box cars, has placed these orders. The 500 steel hopper cars were ordered from the Cambria Steel Company, while the American Car & Foundry Company will make the 300 steel underframe box cars.

IRON AND STEEL.

The Canadian Pacific is said to be in the market for 100,000 tons of rails. This is not confirmed.

The Interborough Rapid Transit Co. has ordered 5,000 tons of rails from the Lackawanna Steel Company.

The Isthmian Canal Commission will receive bids until March 3 on miscellaneous supplies, including manganese steel castings, steel castings, wire rope, etc. Circular No. 622. Bids on chain, wire rope, etc., will be opened on March 6. Circular No. 622-A.

General Conditions in Steel.—The buying movement in the steel industry has assumed an aspect of permanency during the past week, which was not the case earlier in February. As long as the buying was confined to the large interests, including the railway orders that have been so long delayed, there were skeptics in the steel trade; but now the smaller consumers and the jobbing trades have come into the market with liberal requisitions; and the market is physically strengthened by these evidences of increased consumption. The bookings of the United States Steel Corporation amount to 30,000 tons a day. The improvement in the industry is largely due to the increase in export business during the last two months.

Tunnel Ventilation

BY ARTHUR RITTER.

About two months ago the Hudson & Manhattan installed at its Washington street power house, Jersey City, N. J., a large Sirocco fan, for the ventilation of the Hudson tunnels in that vicinity. This fan was supplied by the American Blower Company of Detroit, Mich. The apparatus consists of a No. 13 double inlet Sirocco full housed fan, with a blast wheel 78 in. in diameter by 78 in. wide at the periphery containing 64 blades.

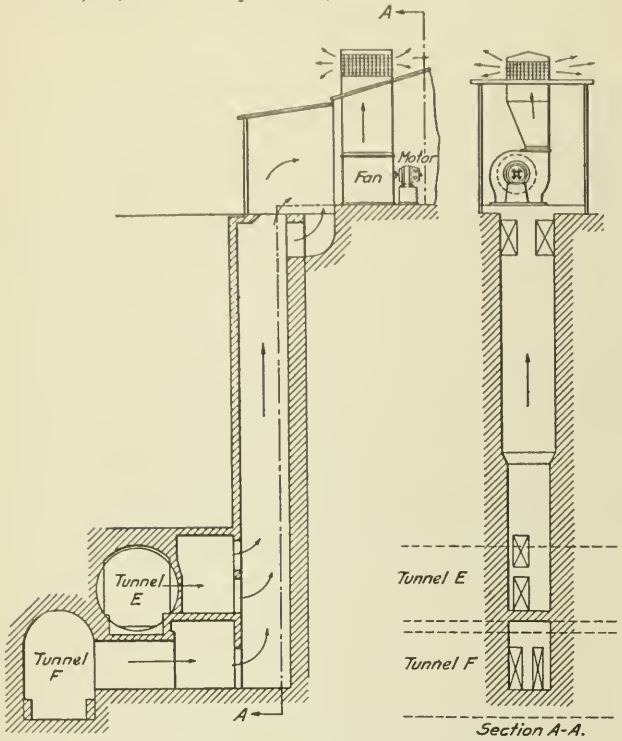


Sirocco Fan for Hudson Tunnels.

Directly attached to the fan shaft by means of a flexible flanged coupling is a 40-h.p. Sprague, slow speed motor, wound for 600 volts direct current. The normal speed is 175 r.p.m. and the maximum speed 200 r.p.m.

The outfit was erected in an air-tight room, the air being exhausted from the tunnels E and F through the air-ways and

shaft, as shown on the accompanying drawing. There are no connections or ducts between the fan inlets and the air shafts, the air velocity being produced by the suction head maintained in the fan room. The fan discharges through an evase stack having a screened outlet hood, similar to those used on mine ventilating fans. The fan was required to exhaust from the tunnels 6,000,000 cu. ft. per hour, or 100,000 cu. ft. per minute.



Ventilating Shaft for Hudson Tunnels.

A complete pitot tube test of the equipment was made by the engineering department of the railway, the results of which are tabulated below. Readings were taken at the inlet as well as the outlet.

Fan, No. 13 D. I. Sirocco. Manufacturer—Am. Blower Co.	Test. Reading in stack.	Reading at inlet.	Reading in stack.	Reading at inlet.
Date of test	12/14/10	12/15/10	12/14/10	12/15/10
Speed of motor—r.p.m.	179	175	200	199
E.M.F.—volts	615	615	615	615
Current—amp.	43	42	58	59
Electric h.p. of motor	35.5	34.6	47.8	48.6
Assumed efficiency of motor, per cent.	80	80	80	80
Brake h.p, of motor	28.4	27.7	38.1	39
Speed at periphery of fan wheel, f.p,s.	61	59.6	68.1	67.9
Pressure at point of test, vel. inches w.g.	.17	.21	.22	.31
Pressure at point of test, static inches w.g.	.....	.78	.....	.94
Pressure at point of test, dynamic inches w.g.	.....	.99	.....	1.25
Static resistance from point of test to fan or outlet, est. inches w.g.	.....	0	.....	0
Total dynamic pressure	.....	.99	.....	1.25

Fan, No. 13 D. I. Sirocco. Manufacturer—Am. Blower Co.	Test. Reading in stack.	Reading at inlet.	Reading in stack.	Reading at inlet.
Area of duct at point of test	67.6	59.8	67.6	59.8
Vel. of air at point of test	1,640	1,820	1,865	2,215
Vol. of air in cu. ft. per min.	110,000	109,000	126,000	133,000
Area of duct at fan outlet	38.3	38.3	38.3	38.3
Area of duct at smallest section.	33.5	33.5	33.5	33.5
Vel. pressure at smallest section.	.....	.67	.....	1
Theoretical h.p. of air	.....	16.9	.....	25.9
Efficiency of fan	.....	61	.....	66.5

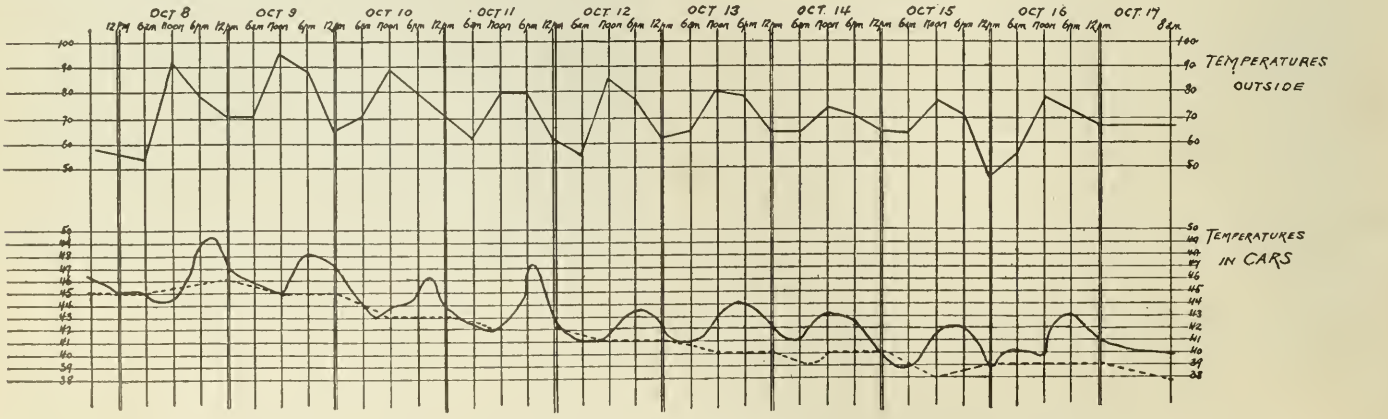
Note.—All pressures in inches water gage.

It will be noted from the above test that the volumetric efficiency of the fan was greater than estimated, the capacity running 30 per cent. above the stipulated amount. The power required to drive the outfit was low, as compared with the volume of air handled and the total pressure maintained, illustrating the high mechanical efficiency established with this fan.

Linofelt Flax Fiber Insulation for Refrigerator Cars.

The insulation used for more than half the refrigerator cars on western lines is Linofelt flax fiber, made by the Union Fibre Company of Chicago. Reports of tests which show the benefit of this material in the saving of ice and the maintenance of even temperatures inside the car have been published in the *Railway Age Gazette* of October 30, 1908, and February 12, 1909. These and other tests show the advantage of using more layers of insulation than are usually employed. Many car builders, as a matter of economy in the first cost of cars, provide only two thicknesses of insulation, but not less than four thicknesses should be used; and more economical results are obtained by the use of six layers of Linofelt. A recent test made in the summer months with heavy insulation by a transcontinental line shows that the addition of only one extra layer of Linofelt made a saving of a ton of ice per car per trip from the fruit district of California to Pacific Junction, Ill. The better temperature regulation obtained is shown by the thermograph chart which is here illustrated and which was made from readings obtained from a clock record on a refrigerator car from Los Angeles, Cal., and Chicago. One car had two thicknesses of Linofelt, and the other had six thicknesses. The saving in ice amounted to 2,500 lbs. The temperature of the fruit after precooling was 51 deg. F. The temperature outside was measured by a thermometer, and observations were made every six hours. The upper line in the chart shows the fluctuation in outside temperature, which was lowest about midnight and highest at noon. The full lower line shows the temperature in the interior of the car with only two thicknesses of Linofelt, and although it remained down to about 45 deg. F., it followed the changes of the outside air as indicated by the upper line. The dotted line indicates the more uniform temperature of the air as obtained inside the car having six layers of Linofelt. The extra layers of felt cost about $42 per car for each layer, and the higher value of the fruit taken from such a car will soon pay for the extra expense.

The development of refrigerating engineering has led in the last five years to a careful study of the economy of heavy insulations in cold storage buildings. This idea of increasing the insulation in refrigerator cars, therefore, is in line with modern scientific thought.



Thermograph Records for Refrigerator Cars; Los Angeles, Cal., to Chicago.

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IN our issue of February 17 we printed a report on locomotive smoke in Chicago by Paul P. Bird, chief smoke inspector of that city, and in this issue will be found a discussion of that paper by C. A. Seley, in which the accuracy of some of the conclusions reached by Mr. Bird is questioned. The principal data which the inspector tried to obtain covers the amount of coal burned by the railways in the city and the percentage of the total smoke produced by them. The main conclusion reached by him was that although locomotives burn only 18½ per cent. of the coal they make 43 per cent. of the total smoke and over one-half the dirt in the city. Mr. Bird also says that his study indicates clearly that electrification offers the only final and satisfactory solution of the locomotive smoke problem, and that the use of special fuel for preventing smoke on steam locomotives is only a makeshift and will not satisfy the public. The railways are not satisfied that Mr. Bird's data is entirely correct. One of the principal reasons is that the time element has not been properly recognized in the calculations. While stationary boilers and house heating furnaces are consuming coal constantly and making smoke a large portion of the day and night, the locomotives are not constantly employed, and it is probable that the total number of engines reported in operation in the city are not in operation more than one-half the time. To take proper account of this time element would materially affect the figures given in Mr. Bird's paper and his conclusions as to the proportion of smoke chargeable to railways. Another objection to his figures is that it is not possible to obtain accurately the amount of coal burned by locomotives in the city limits, as the accounts are not kept with reference to such territory but rather to the local railway divisions which, as a rule, extend beyond the city limits. Mr. Seley also points out that the observations were made principally at junction points, where it is difficult to control locomotive fires and where it is probable that the largest amount of smoke is seen, and, therefore, maximum results are reported by the observer.

IF the question of electrification is to be decided on a showing relative to the proportion of smoke produced by the railways, it is important that the facts in the case be accurately and definitely determined. The Chicago smoke inspector has made an earnest effort to get at the truth. As the railways are not satisfied with his figures, it would seem they should take some measure to get at the facts with greater accuracy. Even if it can be shown that 43 per cent. of the smoke in Chicago is made by the railways it is not reasonable to require the roads to spend millions of dollars for electrification in order to stop that smoke while the owners of stationary boilers are allowed to continue making their usual proportion. It would be as reasonable to require that most of the stationary boilers and heating furnaces in Chicago be replaced by vast power houses for light, heat and power, while railway smoke was left unregulated. These agitations for smoke reduction should not look to electrification alone as a remedy for locomotive smoke, but the city should first seek, in co-operation with the railways, for a reduction in the amount of switching done in the city and in the number of freight trains entering and departing from it, and, consequently, in the number of engines which make smoke inside its limits. These things can be accomplished by the more general construction and use of outside yards and terminals, which would make the problem of electrification within the city limits much simpler. The people of Chicago should also carefully consider, before they take definite action requiring electrification, whether they are prepared to pay the price. The cost would be very great and, as it would be incurred entirely for the benefit of Chicago, in the long run the people of Chicago probably would have to, as they certainly ought to, bear a great part of it in the rates paid by them. Probably electrification in Chicago must come sooner or later; but it should not be required until a thorough investigation by experts shall be made, in which all parties interested shall be given full hearing and all of the important questions involved shall be rationally determined.

THE Idaho legislature, after a bitter debate in which a good many recriminations were bandied back and forth, refused last week to pass a bill to create a state railway commission. There are two interpretations which may be put on its action. One is that the people and law-makers of the state are not satisfied that the work of the commissions in neighboring western

states has been beneficial to the public. The other is that, in view of the fact that railway mileage in Idaho is small, they think public regulation should be deferred until it is larger. The latter interpretation seems, in the light afforded by the debate, to be the more nearly correct. Those who opposed the bill used language indicating that they believed the state should wait until it got more railways before beginning to regulate them; in other words, that it should wait until it catches its hare before beginning to skin it. The argument that seemed to carry the day was that adoption of a commission bill would prevent railway development. But, obviously, any measure which would now prevent railway development would, if passed later, do injustice to capital which hereafter may be invested in railways; for if regulation were reasonable and just it would not prevent railway development. The argument, then, that regulation ought to be postponed until the state gets more railways seems to resolve itself into a contention that it ought to get railways under false pretenses. The fact that even those who argued and fought against the bill opposed it on such a ground, or at least felt that they must give this reason for public consumption, well illustrates the unfortunate attitude toward capital invested in railways which is so generally assumed in the country west of the Missouri river. There seems to be only one way to change it, and that is to conduct the sort of educational campaign which the Oregon Short Line has been waging with success in Utah, Idaho, and other states along its lines during the last few years. That the educational work of the Oregon Short Line has contributed much toward the defeat of the Idaho bill there can be no question. Furthermore, it seems hard to believe, and we cannot believe, that it has not helped to create a much more intelligent sentiment regarding railway affairs than otherwise would have existed.

THE acquisition of half-control (the New York Central had 52 per cent. of the Rutland preferred, so the New Haven now owns 26 per cent.) of the Rutland Railroad by the New York, New Haven & Hartford has several significant points of interest. It is one of those rare, if not almost unprecedented, cases in American railway policy where two large railway systems have voluntarily joined in the control of a third system by the transfer of half of its interest by one of them; and in that aspect it seems to herald closer co-working of the New York Central and the New Haven. As the policy of the New Haven has been to equalize in itself the interests of its two chief allies, the Central and the Pennsylvania, one is not surprised now at the announcement that the long-delayed Hell Gate bridge connection (by which the New Haven gets direct rail connection with the Pennsylvania lines on Long Island) is to be pushed through; and it will be recalled that not long ago the Pennsylvania bought in a large block of New Haven treasury stock. Physical and traffic aspects of the Rutland deal are also suggestive. It gives to the New Haven, along with traffic rights, practically a line of its own from Southern New England to Montreal 16 miles shorter than the old route, with better grades for freight traffic, and invading Grand Trunk territory—this being somewhat of a counterstroke to the Grand Trunk's Providence plan. It opens a new rail and water route to the West via the Rutland's Ogdensburg branch and its fleet of Lake steamers; and it may be regarded especially as a new outlet westward for Boston and that large region of dense population and large factory product formed by eastern Massachusetts and southern New Hampshire. By closer examination of the railway map and the coming extension of the New Haven's White Plains branch to Danbury, Conn.—shortening by some 11 miles the route to the Berkshires—one can work out some other possibilities. For, in that case, a new line of only some eight miles to connect with the Rutland would give the New Haven an eligible route between New York City and Montreal. But such a project uses some miles of the Boston & Albany, and, as it cuts the New York Central's existing long haul to Montreal on the Hudson river route, it may be deferred for the present. Financially, what the New Haven undoubtedly looks for in its Rutland investment is a repetition of its striking Central New England experience—briefly, making a non-profitable system profitable by feeding it traffic from a bigger system. And, in that direction, reciprocity with Canada would be an important factor.

THE FREIGHT RATE DECISIONS.

THE decisions of the Interstate Commerce Commission in the rate advance cases came not merely as a surprise but as a shock to railway officials. Few expected that the commission would grant all the advances sought, but almost no railway man doubted that it would permit some. The immediate effects on business, of course, may not be as bad as many fear. During the period of uncertainty about what the commission would do, railway managers postponed numerous expenditures which were really needed. It seems probable that they will within the next few months place many delayed orders. So far as can be learned, no orders for equipment have been cancelled, and prices of railway stocks have recovered within one or two points from the sharp break which followed the announcement of the decisions. Also, it is probable that the immediate effects will be good in that unreasonable demands for lower rates and higher wages will not get the public support they have had heretofore.

But it is impossible for us to be optimistic about the ultimate effects of the decision. It is a long step toward government ownership. Railway executives such as Presidents Ripley, Brown, McCrea and Willard went on the stand and swore they believed that the rates the railways desired to make were reasonable, and that the roads needed increased revenue which could be secured only through higher rates. Although in the course of the two opinions the commission repeatedly says that it does not want to take the management out of the hands of the present managers, still it seems to place less reliance on the business judgment of these railway men than on its own opinion.

Throughout the commission's history, railway managers have regarded it as being unfair to the roads. Before the passage of the Hepburn act, successful appeals from its decisions were repeatedly made. They hoped that its experience of numerous defeats in the courts and the increased powers given it by the Hepburn and Mann-Elkins acts would increase its sense of responsibility, conservatism and fairness. The decisions in these cases tend to dissipate such hopes. They indicate that the commission is not equal to the responsibility put on it. If it had considered these cases with an eye only to the greatest good to the whole country it could not, if it felt any reasonable doubt as to whether or not the increases were justified, have done otherwise than to grant them. The loss to the shippers would be much less than the gain to the whole country, including these same shippers, accruing from the extensive purchases of material and supplies which the railways would have made in the event of a favorable decision.

In face of the fact that the efficiency with which American railways have been managed has been one of the modern wonders of the world, the commission reflected on their management by saying that "Before any general advance can be permitted, it must appear to a reasonable certainty that carriers have exerted proper economy in the purchase of their supplies, in the payment of their wages," etc. However, in both decisions the extravagant Brandeis claims were belittled. The suggestion that railways must prove proper economy in wages raises the question as to whether the commission thinks the roads have been improvident in increasing wages, and will co-operate with them in resisting future unreasonable demands regarding wages and conditions of employment. It never has done so. Every member of the commission who has arbitrated a labor dispute has given higher wages. The commission's remark implies a demand for greater economy in operation; the public constantly demands the improvement of service. Between these upper and nether millstones there

is danger that any reasonable profit to the stockholders will be ground pretty fine. If the economies suggested were practiced, the result would be apt to be that the public would not get the service it demands and that labor would be dissatisfied. While, as the commission says, earnings in the *fiscal* year 1910 were the largest in history, railway men have felt that figures for the *calendar* year 1910 tell a different story. In the first six months of the calendar year, net revenue increased 6.8 per cent.; in the last six months of the calendar year net decreased 6.6 per cent. The difference was caused mainly by wage increases. The total operating revenues during the calendar year increased about $216,000,000, leaving an apparent net increase of $4,200,000; but if this be apportioned on the basis of increased mileage it shows a net decrease of $40 per mile. Of the increase in operating expenses, $122,000,000 was due to conducting transportation, in which wages constitute the largest item. The commission refused to consider these recent figures, saying that the period covered was too short to have a bearing on the question. Aside from the question of accounting (monthly statements cannot agree with averages arrived at after a full year's figures are available for examination) these recent statements do not necessarily indicate a continued decline in net earnings. For instance, when the movement for increased rates began, earnings were on the decline and there seemed to be good reason to fear a long pull of decreased revenue; yet the year 1910 proved to be one of the most prosperous in railway history.

The law puts on railways the burden of proving that any higher rates they propose are just and reasonable. The roads sought to show, first, that the rates they proposed would be reasonable and, second, that they needed to make advances in order to earn enough money to pay fair dividends and give good service. The commission, though not in so many words, admits that specific increases asked for were reasonable in themselves, but it really decided the cases on the basis of earnings and credit. It confined itself to the question of whether or not the roads' need of money was so great as to require an increase in rates. Accepting this as a basis for judging rates (and the commission, it seems, cannot out-grow its idea that there is such a thing as a "theory" of rate making by which all rates can be regulated) it studied the earnings of the stronger roads. It held that advances ought not to be made because, while weaker lines needed them, stronger lines did not. For fear that some might be made unnecessarily prosperous others must continue to suffer adversity. Though the commission is criticised for this, it could not have done otherwise in the premises. If a weak road is taken as the basis and its rates raised so as to allow it to earn dividends (and, of course, rates of stronger competing lines raised also) it would amount to a tax on the public throughout the territory affected in order to subsidize a road weak through unfavorable location or bad financing. The impression that its decision was based solely on the theory that even the more prosperous roads should not be allowed to earn more than the so-called fair return is supported by this statement in Commissioner Prouty's opinion in the eastern rate cases: "There is no testimony tending to show the cost of reproducing these properties. It is plain that physical valuation would introduce into the calculation a new element which might lead to a different conclusion." Neither the United States Supreme Court nor any other court of competent jurisdiction has held that physical valuation is a proper basis for calculating the reasonableness of an entire schedule of rates. In the case of Smythe *vs.* Ames, the Supreme Court specifically held that the market value of stocks and bonds, density of traffic, operating expenses, and other factors affecting value as a going concern must be considered. In Cotting *vs.* Godard it specifically said that a public service corporation is entitled to reasonable compensation for each service, and that it never had held that rates might be so regulated as barely to avoid confiscation. Yet apparently in these cases the commission definitely committed itself to the theory that rates, as a whole, should be so regulated as to restrict stronger railways to comparatively small return.

The railways have apparently decided to accept the commission's decision and try to work out their salvation under existing rates. This certainly will afford the best test as to whether commission or the managers are right in their opinions of railway needs. If the commission turns out to be wrong, both the roads and the public suffer much more than if the commission had granted advances and subsequent developments had shown them unnecessary. The roads might take the commission's hint and demand valuation as a means of demonstrating, in the only way that apparently will satisfy the commission, that railways are not earning fair return. This would be dangerous because in the eyes of the public it would commit them to acquiescence in a policy of regulating rates on the basis of valuation.

The extent of the commission's authority under existing laws, whether or not it has exceeded that authority, the constitutionality of present laws and the extent of control over railway rates and profit which Congress itself may exercise or delegate to the commission are all unsettled questions. The decisions in these cases show that the commission is committing itself to a theory of regulation which railway managers cannot accept and, at the same time, try to keep faith with their stockholders. It is only a matter of time until the question as to whether the public management of public utilities while they continue to be private property is constitutional must be litigated for final settlement. These decisions of the commission have brought this litigation nearer, and it would seem that, since it is inevitable, the sooner a case directly presenting the great issues involved is got on its way to the Supreme Court the better it will be for all concerned. The existing uncertainty about public's power and stockholder's rights is calculated to steadily discourage development not only of railway business but of all businesses directly or indirectly affected.

MISSOURI PACIFIC.

IT is as an indication of what the Missouri Pacific should be able to do, rather than as a record of what has been done in the past, that the company's report for the fiscal year ended June 30, 1910, is of especial interest. Before, however, an examination is made of the condition of the property, as indicated by the report, and of traffic possibilities, as forecast by last year's showing, it is important to see what arrangements the Missouri Pacific has made for financing future additions and betterments. In 1909 the finances of the company were reorganized and a new mortgage made for $175,000,000. In addition to this a mortgage for $25,000,000 was placed on the St. Louis, Iron Mountain & Southern. The two properties are treated as one in discussing the results of operation. Under the Missouri Pacific mortgage $29,806,000 5 per cent. convertible bonds were issued. Of this amount, $19,700,000 was partly for refunding outstanding bonds and paying floating indebtedness, and under the terms of the mortgage it was provided that $4,653,250 out of the proceeds of this $19,700,000 should be deposited with the railway company to pay for improvements and additions. In addition there were $4,640,500 sold for improvements and additions. This makes a total of $9,293,750. Under the terms of the mortgage $85,993,000 were reserved for refunding bonds and $19,700,000 were reserved to exchange for St. Louis, Iron Mountain & Southern bonds. The remaining $5,300,000 St. Louis, Iron Mountain & Southern bonds out of the total issue of $25,000,000 having been issued to provide for betterments. This leaves, therefore, $52,866,500 bonds which may be issued for additions and betterments to the Missouri Pacific, and $19,700,000 which may be issued for additions and betterments to the Iron Mountain, a total of $72,566,500. In addition, there are $6,500,000 refunding bonds reserved to retire equipment notes. Since these refunding bonds are selling in the neighborhood of 95, this arrangement for the issue of new bonds gives the Missouri Pacific and the Iron Mountain a satisfactory means of raising the new capital that is so badly needed for improvement of the physical property.

In the fiscal year ended June 30, 1910, the Missouri Pacific system spent $8,000,000 for additions and betterments, the two largest items being $1,970,000 for ballast and $1,230,000 for additional main track. The company also spent $470,000 for new equipments and improvements to equipment, in addition to the amount ($706,000) credited to property account through the sale or destruction of old equipment.

In 1910 there was 185 miles of new 85-lb. rail laid in track, partly on the main line between Omaha and Kansas City, and partly on the main line between Kansas City and St. Louis and on the lines in Kansas. On June 30, 1910, there was over 2,200 miles of main track laid with 56-lb. rail and 414 miles laid with 52-lb. rail, while 1,861 miles of main track was laid with 85-lb. rail. This exhibit alone shows strikingly how much will have to be spent on the improvement of the property before it can be put in the same class with such competitors as the Santa Fe. There are still 21 miles of iron rails in main track.

During the fiscal year 1910 a total of 691 miles of track was ballasted with gravel and 20 miles with rock. Of the total system in operation on June 30, 1910, 2,555 miles was unballasted, something over 1,800 miles ballasted with gravel, and over 900 miles with cinders. If the passenger department of the Missouri Pacific is to have a fair show at competitive business, a great deal of track now unballasted will have to have either good gravel ballast or rock.

The increase in operating expenses was about evenly divided between transportation and maintenance; but the transportation expenses are as high as they should be now, while maintenance expenses may need to go even higher, although the following table showing the unit costs of maintenance would seem to indicate that last year the Missouri Pacific spent large sums on maintenance:

	1910.	1909.
*Maintenance of way per mile	$1,995	$1,098
†Repairs per locomotive	2,858	2,971
Repairs per passenger car	1,130	1,040
Repairs per freight car	81	64

*Per mile of main and branch line tracks, no account being taken of sidings and switch tracks.

†Repairs only, no allowance being made for renewals, depreciation or overhead charges.

The traffic department of the Missouri Pacific is good. It has plenty of handicaps to work under, but the geographical position of the Missouri Pacific and its terminal facilities, especially on its roads running out of St. Louis, gives the traffic department a naturally strong position in competing for business. In 1910 there were 11,400,000 passengers carried, an increase of 6 per cent. over 1909. The average distance, however, that each passenger was carried decreased from 41.49 miles in 1909 to 40.38 miles in 1910. Total passenger revenue last year amounted to $10,200,000, an increase of 15 per cent. over 1909. The average amount received per passenger per mile was 2.2 cents.

The total number of tons of freight carried amounted to 20,200,000, an increase of 14 per cent over the previous year; the average haul of revenue freight being 232 miles, just about the same as the year before; and the average revenue per ton per mile was a little over eight mills last year. This is a long average haul and a high ton-mile rate.

The prospects of the Missouri Pacific under a new regime and backed by a strong association of bankers was commented on in these columns last week.

The following table shows the results of operation for the system in 1910, with a comparison for 1909:

	1910.	1,909.
Average mileage operated	6,775	6,489
Freight revenue	$38,201,784	$33,280,482
Passenger revenue	10,210,358	8,893,885
Total operating revenue	53,019,137	46,385,543
Maintenance of way and structures	8,000,104	6,999,729
Maintenance of equipment	7,687,429	7,042,448
Traffic	1,368,745	1,157,524
Transportation	18,889,986	17,237,366
Total operating expenses	37,547,372	33,926,513
Taxes	1,903,004	1,715,758
Net operating income	13,568,761	10,743,272
Gross corporate income	15,462,491	12,437,315
Net corporate income	2,759,411	1,064,509

THE OPINION IN THE EASTERN RATE CASE.

*In re-investigation of the advances in rates by carriers in official classification territory. Opinion by Commissioner Prouty.**

The burden of proof to justify the proposed increase in rates is placed by law on the railways. The advances are justified on the ground that the cost of operation has so increased that although gross operating income has continued to grow, the net operating income has become, and is, insufficient. The question presented to the commission is: are these defendants justified in laying this additional transportation burden on the public for the purpose of obtaining greater net revenue? It might not follow, even though the commission were of the opinion that these carriers were entitled to additional revenue, that they ought to obtain it from an advance in these particular rates. As this case is presented as a preliminary to the consideration of this further question, the commission must dispose of the basic question as above. The commission must stand for the entire public, including the railways; it cannot accede to the mere wish of any class. Next to agriculture, railways are the greatest single industry. Railway extension would mean the employment of additional labor and the purchase of additional material and equipment; and besides asking for increased rates on the ground of the necessity for greater revenue, it is urged by some interests that to grant increased rates would stimulate business, and would put into circulation additional money.

So far as such expenditures are legitimate, they ought to be encouraged. Railways should be kept in a high state of efficiency, and railway charges should be sufficient to permit this, but to the extent that an artificial impulse might be given to railway building and kindred industry, the effect would be in the end baneful, even though the temporary result might seem beneficial.

It must be conceded that railway rates and the treatment of railways should be such as will make the long-time railway bond, which bears a proper relation to the value of the security, a favorite to the investing public. Comparisons which have been introduced between the selling price of railway bonds and municipal bonds would seem to demonstrate that the price of a railway bond is better to-day, as measured by the price of the municipal bond, than it was ten years ago, and this would indicate that in the last decade the credit of the railways has gained and not lost. Never before has the gross amount paid in dividends been as large as in the year 1910, and yet the press, through railway influence, has been filled with forebodings of the disaster. If the railway company is still sound, either at home or abroad, it is not because of, but in spite of, the declarations of railway operators. It would be much better for the government to guarantee bonds than to permit the people and the industries of this country to bear the burden of unreasonable transportation charges.

The railways seek to justify the advances by showing an increased cost of operation, due to increased wages. Figures show that taking the 41 railways involved in this proceeding, the increase in wages for the year 1909 would have amounted to nearly $35,000,000, while the revenue from the proposed advances would only have been $27,000,000.

A comparison has been made between the English act of 1892 and the present United States law. The English act provides that the carrier shall justify the "increase of the rate." Our act provides that the burden of proof shall be on the carrier to show that the "increased rate" is just and reasonable. The English act presumes that the rates in effect December 31, 1892, were reasonable, and the justice of an increase must be tried by that standard. Our act does not intend to say that rates in effect January 1, 1910, are just; on the contrary, any shipper or the commission may attack such a rate. The law was passed at a

*The opinion has been much condensed, but as far as possible the language of the commission has been preserved.

time when the air was filled with rumors of advances in freight rates. The question before the commission is still the same as before the new law, and it is on the reasonableness of the rate in effect, or of the rate to be put in effect.

It appears that during the year ended June 30, 1910, the net earnings of these 41 railways aggregated $51,000,000 more than during the year 1909. The question then, is, to what net earnings are these carriers properly entitled? And the commission follows the United States Supreme Court, in *Smyth v. Ames*, and holds that a reasonable rate is one that affords a fair return on the value of the property. There are two methods of determining value: the cost of reproduction, and the money actually invested in the property. The commission believes that the market value of securities issued against railway property should be taken in consideration in determining a reasonable return. The commission is not fixing the value of a collection of ties and rock and steel rails, but of a railway equipped for doing business. What is that railway worth as a railway for the transaction of a railway business? The market value of railway securities depends largely on the rate which has been charged; and to assume that the market value is a fair index of value for rate-making purposes, is to assume that the rates charged have been in the main reasonable, and these rates were originally in most instances fixed by competition. The commission cannot, of course, allow such rates as will in all cases guarantee prices at which railway stocks have been bought, but in view of the entire situation, it should have that price in mind. The last item mentioned by the Supreme Court in the question of the determination of a reasonable rate is the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, which means information necessary to determine the net revenues which will accrue from the application of particular rates. This information the commission has. Outside of the United States a majority of railway mileage is to-day owned and operated by the government; but in this country a vast amount of private capital has been induced to invest in railway construction and operation. It is therefore not only a matter of justice, but in the truest public interest that an adequate return should be allowed on railway capital.

At the same time the railway rate is in final analysis a tax on nearly every species of property, and also on every sort of activity, and there is no reason why all other kinds of property should be required to pay to this particular species of property an undue compensation. The element of risk is less in railway investments than in most industrial operations. There is little fear of competition. What business can be more attractive to the investor than this in which no rival is to be apprehended; where the amount of business is assured, and where the price for the transaction of that business is protected by the fundamental law of the land? At the present market value, the 4 per cent. preferred stock of the Baltimore & Ohio yields a return of 4½ per cent. It seems probable that any railway stock which was certain to pay a dividend of 5 per cent. year after year would sell readily at par.

The railways contend that besides maintaining their property and paying dividends, they should also earn sufficient to make improvements and additions to those properties of a permanent character. In the Yellow Pine Lumber case, in which the commission was sustained by the Supreme Court, the commission held that in fixing a fair return on railway property for the purpose of determining whether a given advance is reasonable, the railway ought not to treat as part of its operating expenses the cost of permanent improvements. It is contended that railways cannot raise the necessary funds to make improvements, and should therefore be allowed to impose rates that will provide these funds. This argument does not appeal to the commission.

By way of illustration, take the elevation of track. On the whole it is an expenditure which adds nothing to the net income of the railway, but just how is that a reason why this improvement should be paid for out of the present earnings? In other words, where lies the difference between a revenue producing and a non-revenue producing improvement? So long as the improvement is for the future, the present must not be entirely taxed to provide it.

On the other hand, it is a wise thing for a nation, as well as an individual, to lay up something for the future; but if we lay up a fund for future generations to offset the tendency to increase prices, is there any assurance that the fund when provided could be made available? The carriers in the proceeding now before us claim they should be allowed to invest in improvements an amount equal to that paid in dividends. In the year 1910 railway dividends aggregated $405,131,650. If this sum were to be invested in our railways annually for the next half century, it would amount at the expiration of that period to $20,256,582,500, not regarding the item of interest. This sum is far in excess of the present total capitalization of our railways. Until the status of the railway surplus is determined by judicial interpretation, the commission cannot properly permit the advance in rates for the purpose of an accumulation of surplus.

It is also said that railways should be allowed to accumulate a surplus for the purpose of providing for the time being for interest charged on new capital which represents an improvement which is necessary and will finally be profitable, but does not pay an immediate return. To this claim within certain limits the commission assents, but to this surplus fund stockholders should be required to contribute by reasonable reduction in dividends. As to the item of obsolescence, under the present system of accounting railways are required to make a depreciation charge on equipment, but they make no such charge for way and structures, and it seems proper that the accumulation of a surplus should be allowed in this view.

Some of the 41 roads might show an actual need for higher freight rates, while others, like the Delaware, Lackawanna & Western, might show no such need. The commission, therefore, had the question forced on it as to what line should be examined for the purpose of determining whether net revenues may properly be increased, and the commission decided, as in the Spokane case, that it must have regard not altogether to any one particular railway, but to the whole situation. On the whole, it seems fair to include with the Pennsylvania the New York Central Lines on the north, and the Baltimore & Ohio on the south, and to take this group of roads as typical of all the rest.

The railways insist that the unit cost of operation has increased. Including taxes as a part of this expense of operation, operating expenses have increased by a much larger percentage than operating income, in the case of nearly all of these defendants. On the Baltimore & Ohio, the Pennsylvania, and the New York Central & Hudson River, the commission finds that in every case the percentage of operating expenses to operating revenues was greater in 1910 than in 1904, and greater than the average for the seven years. On the other hand, the Pennsylvania Railroad shows the cost per ton mile of handling freight traffic, and according to its reports the cost to the company for the calendar year ended December 31, 1909, was lower than for any other year in its whole history, with the exception of 1901. The inference from the figures given by the Pennsylvania is that, since 1894, the unit cost of handling freight has remained about stationary. In the future there is likely to be some advance in the price of coal, but the general cost to the railway of its supplies will not be greater in the immediate future than it has been in the immediate past, and it is fair to assume that wages will not immediately make a further increase. The demands of the public for better service, etc., will continue to add both to the expense of operation and to the cost of plant. It is also probable that taxes will continue to increase more rapidly than the increase in the value of the property.

The railways say that this increase in expense can no longer be offset by the introduction of further economies. Grades have

been reduced and curves eliminated, so that little remains to be done on first-class railway systems. The shippers claim that by the introduction of what was termed "scientific management," the purpose of which was in various ways to make labor more efficient, at the same time increasing the wage paid the laborer himself, much more than the amount of these advances could be saved. The witness who apparently had most to do with originating and applying these methods, testified that they were in actual operation in not over one-tenth of 1 per cent. of all the manufacturing establishments of this country. The system is everywhere in an experimental stage. Representatives of labor have said that these methods could not and should not be introduced in railway work, and the commission can hardly find that these methods could be introduced to any considerable extent, and that therefore the defendants cannot make good any part of the actual advance in wages by the introduction of scientific management.

The railway is a monopoly. It is also well understood that the same men who are potential in the United States Steel Corporation and the American Locomotive Works are influential in directing the policy of the railways. Now, if the steel trust is to determine the price that should be paid for rails and bridges and if the locomotive trust is to determine the price of engines, the car trust of cars and the labor trust of labor, and if the railways have only to meet the demands made by these combinations and charge over to the public, by an increase of rates, whatever is paid, a most unfortunate situation is developed. Business, both freight and passenger, will continue to increase, but not probably at the same ratio as for the past fifteen years. The increase in traffic may, under certain circumstances, be a disadvantage instead of an advantage. For instance, when it requires double tracking the increase may not be sufficient to pay the interest on the money invested in the second track but may be great enough to forbid economical operation on a single track.

Statements filed by the Baltimore & Ohio, the Pennsylvania and the New York Central, show that on these lines the freight tonnage and the freight revenue of 1907 have never since been equaled, yet the Pennsylvania spent between June 30, 1907, and June 30, 1910, $68,000,000, the New York Central $38,000,000 for additions, and the Baltimore & Ohio $16,000,000 for betterment. As a general proposition, it may not be at all certain but that increase of business in densely populated sections may, even in the long run, be a damage rather than an advantage, mainly by reason of the enormous terminal expenses. There have, however, been forces at work in the past few years which have tended to increase the revenue of the railways, as, for instance, the fact that rebates are no longer given. While the gross amount of the increase resulting from all sources cannot be definitely known, it is indicated in official classification territory, by the advance in the rate per ton mile, that the average per ton mile rate of the Pennsylvania in 1900 was 5.04 mills; in 1910, 5.80 mills; of the Baltimore & Ohio, in 1900, 4.56 mills; in 1910, 5.77 mills; of the New York Central, in 1900, 5.58 mills; in 1910, 6.25 mills.

Answering the question "Should the published tariff be advanced with respect to the three systems selected as typical?" the commission should inquire: What were the net revenues for the year 1910? What would those revenues have been had the present wage scale been applied to the operations of that year?

Would the revenue resulting from the application of the present wage scale to the operation in 1910 have been sufficient for that year?

Will the revenue which would have resulted in 1910 from the application of the higher wage scale be likely to increase or decrease in the future, and, if sufficient in 1910, will it continue to be adequate?

BALTIMORE & OHIO.

From 1901 to 1910, the total operating revenue of the Baltimore & Ohio increased 91.4 per cent.; total operating income 60.2 per cent.; income per single track mile, 16.2 per cent.; income per all-track mile, 5.1 per cent. If the company is to preserve its financial integrity on the basis of its present capitalization and maintain its credit, it is true that it must be allowed to earn a sufficient amount to pay its interest, its preferred 4 per cent. dividends, a dividend on its common stock and have remaining a substantial surplus. The commission is of the opinion that the sum remaining after the payment of fixed charges, including as a fixed charge the dividend on the preferred stock, should be equivalent to between 7 and 8 per cent. on the common stock. The company should have sufficient earnings to pay a dividend of 5 per cent. on its common stock, and carry 2½ per cent. surplus, or pay 6 per cent. and carry 1½ per cent. surplus. This is on the assumption that the capitalization does not exceed its actual value.

Had the increased wage scale been in effect during the entire fiscal year ended June 30, 1910, the Baltimore & Ohio might have paid on its common stock a dividend of 6 per cent., carrying forward a surplus of $2,776,000. Or it might have declared a dividend of 5 per cent. and had a surplus of $4,296,000. In the commission's judgment these net earnings would be extremely liberal to the Baltimore & Ohio, considering its present capital stock and its past history. The commission does not believe that 1910 was an abnormal year, and does not accept the showing made by the road in the seven months since the close of that fiscal year as conclusive. Allowing for interest on the new $40,000,000 notes, the Baltimore & Ohio might have paid a dividend of 5 per cent. on its common stock, and had $2,500,000 surplus. Moreover, the Baltimore & Ohio has a surplus of $22,000,000 accumulated in the last 11 years. It is to tide over just such periods as that intervening between the time when the interest on the $40,000,000 notes begins to be paid and the time when that $40,000,000 begins itself to earn money through economies of operation, etc., that the commission has approved of the accumulation of a surplus.

Should the cost of operation continue to increase, this company may find it necessary in the future to make a general advance in its rates in order to maintain its credit on the basis of its present capitalization, but this record does not contain any satisfactory evidence that this is now necessary.

PENNSYLVANIA RAILROAD.

The operating revenues of the Pennsylvania Railroad were $95,000,000 in 1901, and $166,000,000 in 1910, an increase of 74.4 per cent., while the net revenue during the same period increased from $33,000,000 to $44,000,000, only about 33 per cent.

The operating income of the Pennsylvania Railroad for 1910 was $44,000,000; its rents and interest $21,000,000, leaving available for dividends and surplus $23,000,000. Dividends amounted to nearly $22,000,000, and a 6 per cent. dividend on the total amount of stock outstanding June 30, 1910, would be almost $25,000,000. The Pennsylvania is a great stock-holding corporation, and income on the securities owned amounted in 1910 to substantially $17,000,000; so it appears that during 1910 approximately $18,000,000 remained after the payment of taxes, rent, interest and dividends; so that if the wage scale had been in effect and expenses been $7,000,000 higher, the company would still have had a surplus of $11,000,000. The commission again does not take the showing made in the past seven months as conclusive evidence. While it may be true that in the future, as in the past, the ratio of operating expenses to gross income will somewhat increase, there is nothing to account for such increase in these seven months, and the commission would not be justified in assuming that this increase will continue until actual circumstances has demonstrated the fact. In view of the munificent earnings of this company in the past, there is not any hardship in asking that these rate increases be deferred until their necessity has been shown.

PENNSYLVANIA COMPANY.

Whether the commission examines the Fort Wayne route, either from a standpoint of the owners of the Pittsburg, Ft. Wayne & Chicago, or from the standpoint of the Pennsylvania Company, which now leases and operates it, there is certainly

no suggestion of any necessity of increased revenue, by reason of advanced wages.

PITTSBURG, CINCINNATI, CHICAGO & ST. LOUIS.

After the payment of rents, interest, etc., there was $5,854,000 available for dividends on the Pittsburg, Cincinnati, Chicago & St. Louis, and the company paid 5 per cent. on its common stock, and 5 per cent. on its preferred stock, leaving a surplus of $2,873,000. Considering the high capitalization per mile of this road, it is impossible for the commission not to feel that its earnings for 1910, even when reduced by the full amount of the wage advance, will be extremely liberal for that property.

NEW YORK CENTRAL & HUDSON RIVER.

The operating revenue of the New York Central & Hudson River increased from $54,000,000 in 1901, to $101,000,000 in 1910, an increase of 85.2 per cent.; while operating income increased from $17,000,000 in 1901 to $23,000,000 in 1910, or 33.3 per cent. These figures have less significance, since during the decade the system has increased by the taking-on of several important properties. The commission finds that if the wage increase had been in effect in 1910 and the new interest requirements had also been in effect, the New York Central could not have maintained its present rate of dividends without obtaining more money from some source. As to the arguments made by the railway that its income from other sources was unusually large last year because of the 6 per cent. extra dividend on the Lake Shore stock owned, the commission finds that the Lake Shore is probably amply able to pay every year 18 per cent., which includes this extra 6 per cent. The New York Central & Hudson River came into existence in 1869 by the consolidation of the New York Central Railroad and the Hudson River Railroad, and the evidence shows that the capital stock now contains $57,000,000 par value, for which nothing was ever paid, and there has been paid out on this $57,000,000 stock at least $120,000,000 in dividends. In looking at the financial condition of these companies for the purpose of determining what a reasonable rate should be, the commission cannot entirely close its eyes to bits of history like that.

LAKE SHORE & MICHIGAN SOUTHERN.

Had the increased wage scale been in effect during the year 1910, it would have added to the operating expenses of this company $1,500,000, and would have diminished its net by that amount. During the year 1910, therefore, the Lake Shore could have paid the higher wages and declared its dividend of 18 per cent. and had remaining $5,000,000. It might during that year have easily paid a further dividend of 6 per cent.

MICHIGAN CENTRAL.

The Michigan Central does not present as strong a case as the Lake Shore, but it would have no difficulty in paying the advanced wages and showing a substantial surplus after declaring a dividend of 6 per cent. The three railways together, the New York Central, the Lake Shore and the Michigan Central have certainly made a much stronger showing for an increase in rates than the other two systems previously examined. It should, however, be noted that the present necessities of this system arise mainly from the fact that it is forced to make changes at this time and large outlays, which, while profitable finally, will not yield an immediate return on a considerable part of the amount invested.

The commission, on the whole, finds that the advances have not been justified, but since there may be some cases where the commodity rates may need to be adjusted, the commission dislikes to tie up by hard and fast order, these commodity rates, and has concluded as to all the rates involved in this proceeding, to simply require the defendants to cancel on or before March 10, their advance tariffs on file and restore their former rates, which are the rates now in effect. If this requirement is not complied with, the proposed rates will be suspended, the necessary findings of fact made, and the usual two-year order issued as to all the tariffs involved.

OPINION IN THE WESTERN RATE CASE.

In re investigation of advances in rates by carriers in Western trunk line trans-Missouri and Illinois Freight Committee territories. Opinion by Commissioner Lane.

More than 200 railways operating in Wisconsin, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas and Montana are parties to these rates. The present American law, placing the burden of proof on the railways to justify increased rates as reasonable, should be distinguished from the English law. The English commission has to deal with the increase itself in the rate, and not with the increased rate. This distinction is fundamental in the consideration of the laws of the two governments. The American law places the question of reasonableness not on the increase but on the rate. The purpose of Congress was to give the commission the same plenary power over increased rates that since the enactment of the Hepburn act it has enjoyed over other rates. The assumption of the law is that the railway which increases its rate takes such action knowing that the law casts on it the "risk of non-persuasion." The carriers in the present proceeding have assumed this burden. The common ground for these common advances may be epitomized in the language of the leading witness for the carriers, "we need the money."

Later it became manifest that the purpose of the carriers was not so much to secure approval of their specific rates as to discover the mind of the commission with respect to the policy which the carriers might in future pursue, and to secure, if possible, some commitment on our part as to a nation wide policy which would give the carriers a loose rein. The carriers charged with the public trust were given a free hand in the institution of their own rates until within the last four years, and they now appear asking the protection of a law to increase their rates, which, under the play of economic forces, they say never have been higher. President Ripley, of the Santa Fe, being asked if, in his opinion, the result of operating revenues without regulation had resulted in not making a proper return to the carriers, answered emphatically "I do." "And now that we have regulation, rates should be put on a paying basis." "Is that your opinion?" he was asked, to which his answer was "Yes." Could there be any position less reasonable than to cry out against restrictive legislation and in the same breath ask benefits under this legislation which never were, and admittedly never could have been, in the open field of unlimited competition?

While there doubtless has been spasmodic and demagogic effort in various sections of our country which made for the injury of carriers, the trend of control of regulation, as a whole, has been conservative, wise and sympathetic towards the investors in such enterprise.

On July 1, 1901, there were in the United States reporting to the commission, 195,561 miles of railway, yielding a gross operating revenue of $1,572,960,868, or $8,043 per mile. The net operating revenue amounted to $577,221,171, or $2,951 per mile. On July 1, 1910, there were 238,411 miles of line, with $2,818,411,419 gross income, or $11,822 per mile. The net operating revenue reached the unparalleled figure of $932,848,978, or 3,913 per operated mile, an increase of 50 per cent. in net per mile over the figures of ten years ago.

Coming to a consideration of the return to holders of American railway stocks, we find a result equally gratifying. It is almost axiomatic that the investment in an American railway is not represented by its capitalization. This generalization is subject to a few exceptions. In 1888, 38.56 of stock was paying dividends, and the average rate on the dividend paying stock was 5.23 per cent. In 1910, 67.20 per cent. of the stock was paying dividends, and the average rate on dividend paying stocks was 7.47 per cent. Thus we see that at the very time that the carriers in the East and in the West were taking united action to increase their rates, they were compiling their annual statements, which show from the standpoint of net revenue and of

dividends on stock that the railways of the United States, as a whole, have never before prospered, not even in the heydey of 1907, as they did in 1910, which, be it remarked, was but two years removed from the financial panic of 1907-8.

As to ability to raise money abroad, the American railway man is placed in an awkward dilemma. European shareholders insist on larger dividends because of increasing profits, while he is demanding higher rates in order that his credit at home and abroad may be sustained.

In the Western hearings the burden of supporting the increase in rates has been assumed largely by the Santa Fe and the Burlington; but the commission has also studied the figures of the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the Chicago, Rock Island & Pacific, and the Chicago & Alton. On a capitalization of $84,000 per mile the Santa Fe earns approximately 4 per cent. on $44,000 bonded debt, 5 per cent. on $20,000 preferred stock and 9 per cent. on $20,000 common stock. From a glance at the income statement of the Burlington it will be seen that its net profit in 1910, after deducting all operating expenses, taxes and fixed charges, amounted to nearly $14,000,000, which allowed an 8 per cent. dividend on its stock and a balance or surplus of $5,108,000, or the equivalent of 12 per cent. on the common stock. The railways of the United States in ten years have floated mortgage bonds on their property to the extent of upward of $4,025,000,000. Their mortgage indebtedness increased 77 per cent., while their mileage increased but 36 per cent.; and on this mortgage debt interest was paid in 1899 at the rate of 4.55 per cent., while in 1909 it was paid at the rate of 3.90 per cent.

So far as the bond buyer is concerned, no matter to what elevation rates might be raised, it would not increase by a fraction of a cent the interest which he would receive. The one interest, therefore, that a bondholder has, or the bond buyer has, is in the stability of his security. The stockholder, on the other hand, has an interest in railway revenue, because his interest in the property is necessarily speculative. Railway financiers themselves, who but a short time ago were so reckless in the issuance of stock, which, as they admitted, had no immediate value, but was a capitalization of the future, are taking a position that is more responsive to the best public sentiment.

We next come to the consideration of surplus. The carriers, even under the rules of the commission obtaining only during the last two or three years, are given in the widest latitude as to charges that shall be made against the maintenance accounts. The carriers of the United States have accumulated unappropriated surplus amounting to $800,642,923, whereas in 1899 their surplus as given in the books of the carriers was but $194,106,367. In ten years, with an increased rate of dividend, an increased maintenance charge and a vastly increased fixed charge for interest, these carriers have accumulated a surplus of $606,536,556, an increase of 312 per cent. on 1899, while the mileage has increased 36 per cent. In the last analysis a surplus is a matter of bookkeeping. Rates might be doubled in this territory and leave the surpluses of the carriers where they are to-day. It may well be that with a larger surplus, bonds or stocks might have sold at a higher figure, but this is problematical; and, furthermore, it may be asked, is it wise or necessary to accumulate a surplus much more rapidly than at the rate of 100 per cent. in ten years?

There is much persuasiveness in the argument that surplus should be treated as a public fund, out of which the carrier may create facilities which will produce more efficient and satisfactory service without adding to the liability. A premium must be put on efficiency in the operation of the American railway. Rates cannot be increased with each new demand of labor, nor should rates be reduced with each succeeding improvement in method. The standard of rates must be so high that the needed carrier which serves its public with honesty and reasonable effort may live. And yet rates should be still so much below the *possible* maximum as to give high and exceptional reward to the especially capable management, the well co-ordinated force and plant.

This is the ideal unrealized, perhaps, but it points the way. However, since the commission cannot declare that accumulated surplus shall not be capitalized, the adoption of a plan to treat it as a public fund rests entirely with the carriers. A railway is justified no doubt in maintaining a surplus which will insure dividends to its stockholders during the years, and it may accumulate through years funds to meet obsolescence in plant unless this charge is taken care of in maintenance. The one other legitimate end for which the surplus may, in reason, be accumulated is to supply facilities in the nature of luxuries, which cannot be made to yield adequate return on the capital invested.

The Burlington claimed that it had a legal right to increase its charges because it is not now receiving a fair return on the value of the property which it uses, value being estimated as cost of reproduction. What did the Burlington cost to build? What is its present value? Whence came this value? Is such increase in value a basis for increase in rates? The total investment in the property from the sale of securities was $2,580,000. The company claims its present value is $530,000,000. The difference, $270,000,000, represents investment made out of earnings, an increased value of right of way and terminals. It remains for the supreme court yet to decide that a public agency, such as a railway created by public authority, may continuously increase its rates in proportion to the increase in its value either because of betterment made out of income or because of the growth of the property in value. The commission's position is that a railway may not increase rates on shippers for this reason, and as an outgrowth of the fact that it has accumulated out of rates a balance of profit which has been invested in the property.

In considering what is a reasonable rate, President Ripley testified that a reasonable rate was "what the traffic would bear and still move most freely and enable the products and manufactures of one part of the country to be used to the utmost extent in the other." While this definition sounds most philanthropic, it was doubtless not intended to convey any more subtle or philosophic meaning than this: that an individual rate should not be made with reference to the cost of the service to the railway, nor should it be made with regard to the return which it would yield to the capital invested in the plant. It should be made so low that as great a body as possible of that character of traffic should move, but all the time there must be borne in mind the fact that out of its aggregate rates the property must be made to pay. "What traffic would bear" carried to its last degree permits indefinite discrimination between individuals as well as between communities. The traffic manager of one of the leading roads was asked to assume that one man owned all of the roads in that territory and to give any reason why rates should not be raised to the class basis, or 200 per cent. The traffic manager answered, "Because the advance would be too great of itself." "It would be a shock to my sense of propriety and to my sense of justice," and that was the ultimate word. Rates are no higher than they are, not because there is any maximum standard based on the cost of service or the return to the carrier, but because to increase them would not "be fair, or decent, or proper"; in short, would not appeal to the conscience of the traffic manager; and this same witness was unwilling to acknowledge that his judgment of what was proper, reasonable or just should be subject to review by this commission or any tribunal, a position which may fairly be characterized as a modern extension of the ancient principle of divine right. Possibly it is not too much to hope that in some good day some traffic manager will announce the principle that a railway function is to sell transportation at a fair rate, and that it is beside his place to be the ultimate regulator of economic conditions of the country. To be sure, we can never depart from the ad valorem principle in making rates; no government railway system does.

While the commission finds the carriers contending uniformly that in making a reasonable rate the cost of service is practically a negligible factor, yet the contention is herein made that the carriers should be allowed to increase their rates on that ground; in short, that addition to cost of service justified increased rates.

An analysis of operating costs shows that an approximation of the unit cost of performing transportation service may be obtained. Once the commission has learned the comparative cost for various services, it is not fanciful to say that a schedule of rates may be made which will approach justice as between services.

As to increased costs—there is no general conclusion to be drawn from the figures which have been prepared as to the price of coal; but it is probably fair to say that, as to the average road, $1 worth of fuel in the last five years in the decade would carry a ton of freight as far as it would in the first five years in the decade.

While the standard white oak tie costs five or ten cents more, the general increase in this expenditure is almost unnegligible. It will increase the cost of maintenance less than $50 per mile per year.

[The wage increases of 1910 were in effect during the six months from July 1 to December 31 of last year. This period, therefore, is compared with the previous six months, and with the corresponding six months of 1909 and 1908, and the following figures are abstracts from a number of tables comparing each road considered with itself on a per mile basis.]

The Chicago, Burlington & Quincy's operating income per mile of road in the last six months of 1910 was $1,718, as compared with $1,039 in the first half of 1910, and $1,368 in the last half of 1909. (Operating income is the net return after the payment of expenses, taxes and any deficit from outside operations.)

The Chicago, Rock Island & Pacific's operating income per mile of road in the last half of 1910 was $1,221, as compared with $661 for the first half of 1910, and $1,204 for the last half of 1909.

The Chicago, Milwaukee & St. Paul's operating income per mile of road in the last half of 1910 was $1,176, as compared with $1,031 for the first half of 1910, and $1,330 for the last half of 1909.

The Chicago & North Western's operating income per mile of road in the last half of 1910 was $1,415, as compared with $1,032 for the first half of 1910, and $1,454 for the last half of 1909.

The Illinois Central's operating income per mile of road in the last half of 1910 was $1,743, as compared with $1,348 for the first half of 1910, and $1,290 for the last half of 1909.

The Atchison, Topeka & Santa Fe's operating income per mile of road in the last half of 1910 was $2,126, as compared with $1,711 for the first half of 1910, and $1,986 for the last half of 1909.

The carriers have passed through the period of immediate experiment under these added costs, and found there is promised a continuance of the prosperity this year which was their's in 1910. These six months' figures establish beyond reasonable doubt, taking the carriers as a whole, that the increase in wages does not come out of net, but out of increased gross. If these increased rates are to be allowed must we not say, with Mr. Ripley, that in the past all rates have been too low, and that by force of our power to protect these carriers against intense competition between each other, we will aid in the raising of rates on to a higher level?

A strong plea is made on behalf of what are known as the poorer roads in this territory. It is almost axiomatic that rates cannot be made so as to give high rates to a poorly placed, indifferently operated or isolated road without making the rates absolutely extortionate.

In concluding, the strength of the carriers' case is in these two contentions: (1) That the roads are not earning a fair return on the value of their property; (2) that the cost of operating has increased because of increased wages. It is true that cost of operation has increased by the amount shown as allotted to labor and addition to wages; but it is also true that operating revenues have increased so as to more than absorb increased operating expenses, as is shown in the six months' statement above. Moreover, the figures furnished would indicate that under skillful management an additional tonnage may be handled under a higher wage schedule without increasing the cost of service given.

We are dealing here with a difficult problem involving multitudinous facts and an infinite variety of modifying conditions, which make the establishment of principles and the framing of policies a matter of slow evolution. Congress has laid down a few rules. These rules we are attempting to apply. The railways may not look to this tribunal to negative or modify the expressed will of the legislature. They have laid before us the facts and law, which would make for a justification of their cost in the increasing of rates. To our minds, their justification has not been convincing.

We do not say that the carriers may not increase their income. We trust they may, and confidently believe they will if the time does come when through changed conditions it may be shown that their fears are realized, or approaching realization; and from a survey of the whole field of operations, there is evidence of a movement which makes against the security and lasting value of legitimate investment, this commission will not hesitate to give its sanction to increases which will be reasonable.

HAVANA PASSENGER STATION.

The new passenger terminal in Havana, Cuba, which is in the course of erection for the Havana Terminal Railroad Company, will be one of the finest and most up-to-date structures in Cuba. It is situated on what is known as the Arsenal site near the harbor, and will be built in connection with wharves, warehouses, and all the other necessary terminal improvements.

The building will be used by the United Railways of Havana, the Havana Central, and the Marianao Railroad, thus serving as the union passenger terminal for the city of Havana. As tourists' traveling is becoming more important every year, the station has been designed to take care of this need, and has a capacity which will suffice to satisfy all requirements for many years to come.

The station building itself is 240 ft. x 70 ft., and will be a three-story and attic structure. The main waiting room is 72 ft. x 128 ft., and extends all the way up to the roof, having a clear height of some 60 ft. It will be finished in Italian marble with Mosaic floor, and will have adjoining it the usual men and women's retiring rooms, toilets, etc. These toilets will be divided up into two classes; that is, the first-class toilet will have the nickel-in-the-slot idea, whereas the second-class toilet is the ordinary free arrangement.

The cafe is 40 ft. x 52 ft., and is on the most attractive corner of the building. This cafe will have a high wainscot of elaborate Spanish tiles, and a marble bar. The cafe is entirely open with the street on two sides with a sufficient sidewalk to allow placing cafe tables there, as is done in European cafes. A large baggage room, with the usual mail and parcel rooms, occupies the other end of the building. In addition to the large waiting room, there is a concourse 50 ft. x 200 ft., provided with seats to take care of a large part of the traffic.

On the second and third floors will be the offices of the United Railways of Havana. These offices will surround the main waiting room. These floors are served by two electric elevators in one of the towers of the building, and a freight elevator in the rear.

The exterior of the building is in the style of Spanish Renaissance, and will be built of American terra cotta. A great deal of color will be introduced throughout the building to conform to the tropical climate and the wealth of color which one finds in Cuba. Distinctive features of the front elevation are the twin towers, arising 130 ft. above grade. These towers will contain water tanks of 20,000 gal. capacity, to be used for fire and storage purposes. The towers will also form an excellent point of observation for visitors to Havana. The roof will be covered

with red Spanish tile, which is used freely on Cuban buildings.

A pecular feature of the building is that there will be no glass in the windows, with the exception of a small panel in the shutters, and also panels in the toilet room windows. Double sets of shutters have been provided for all the windows; the exterior set with fixed louvres, to be closed in the case of an ordinary rain-storm, and an interior set with reinforcing bars and extra heavy bolts to be used when the famous Cuban hurricanes come along. The light penetrates so far into the buildings in Cuba, that even with all the shutters closed the rooms seem as bright as in an ordinary American building with everything open. In fact, two of the principal problems in Cuban construction are keeping the light out and keeping the roof on.



Havana Passenger Station; United Railways of Havana.

The construction work of the building, the wharves, the terminal, the yards, and the elevated railway on which all trains will be brought to the station, will be performed by the Snare & Triest Co., constructing engineers, New York City, who have had much experience in this class of work, having built the Hoboken terminal of the Lackawanna, the Staten Island ferry house, and the Whitehall street ferry terminal, in New York City.

The building has been designed by Kenneth M. Murchison, of New York City, who has built the Hoboken terminal and the Scranton station for the D. L. & W., and is now engaged on the Baltimore union station and the Newark station for the Pennsylvania Railroad.

CANADIAN PACIFIC GRAIN ELEVATOR.

The Canadian Pacific recently completed at Victoria Harbor, Ont., on the Georgian bay, an unusually large elevator for unloading the grain boats from the head of Lake Superior. The company had already provided ample elevator capacity at the upper lake ports for transferring to boats the grain shipped down from western Canada, but there was a lack of facilities for storing and transshipping it at the eastern end of the lake haul. The new elevator at Victoria Harbor has been built at a cost of $1,100,000, including the necessary wharf. The wharf is of concrete, 800 ft. long, and is carried down to provide for a depth of water of 25 ft.

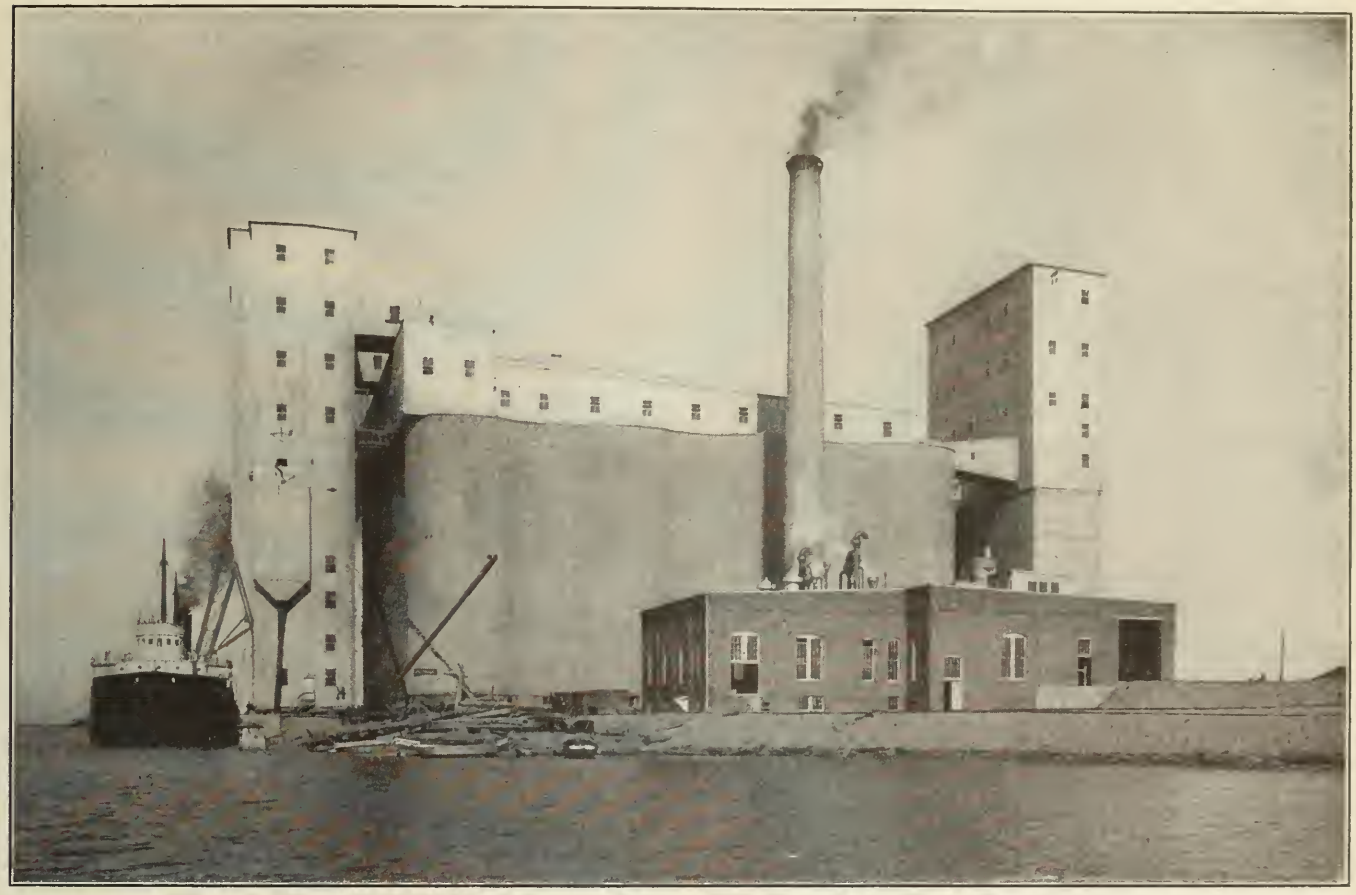
Grain boats are unloaded by two marine towers, 150 ft. high, built of structural steel and covered with corrugated iron. These towers are supported on 40 wheels each, the wheels being arranged in standard frieght trucks, and each is self-propelled independently along the double track which parallels the wharf. This movement is obtained by housing sufficient motor equipment in the base of the tower to operate a large drum winding up a cable which is passed out of the tower, around a fixed block and back to a fixed connection on the tower. This allows both towers to work to full capacity regardless of hatch spacing or hold capacities of incoming boats. The marine legs are specially designed to enter passenger boats as well as freight. The towers have an elevating capacity of 20,000 bushels an hour.

The grain unloaded from boats may be stored or reshipped in cars direct. The storage capacity of the elevator plant is at present 2,000,000 bushels, but arrangements have been made to allow for future extensions that will increase this amount to 10,000,000 bushels. There are 32 storage tanks, cylindrical in shape and 35 ft. inside diameter, built of reinforced concrete, and there are 31 interspace bins, each of which has about one-fourth the capacity of the cylindrical bins. All bins have hoppered bottoms and are thus self-emptying. When cars are to be loaded direct from the boats, grain is handled from the unloading towers, on conveying machinery above the storage bins to the working house shown on the right of the accompanying photograph, into which cars to be loaded can be run direct.

The electric power for the operation of the entire plant is furnished by two 500-k.w. turbo-generators in the power plant, which is in the foreground of the view shown. All conveying

and hoisting apparatus is motor operated. All electric wiring is carried in metal conduits, and the building is fireproof in every respect. Electric lights are provided so that work can be done readily at night, the installation including 750 incandescent lights and 12 arc lamps. Telephones, electric signal light and bell systems, and dust collectors have also been provided.

The construction of the entire plant was under the direction of J. G. Sullivan, assistant chief engineer, and under the supervision of G. G. Ommanney, resident engineer. The plant was designed and built by the John S. Metcalfe Company, Montreal, Que., and most of the conveying and elevating machinery was furnished by the Dodge Manufacturing Company, Toronto, Ont.



Victoria Harbor Elevator; Canadian Pacific.

LOCOMOTIVE SMOKE IN CHICAGO.

In our issue of February 17, we published a full abstract of a paper on locomotive smoke in Chicago by the city smoke inspector, Paul P. Bird. In the discussion of the paper at the Western Society of Engineers' meeting, C. A. Seley, mechanical engineer of the Rock Island Lines, presented the railway side of the question. Following is an abstract of his remarks:

At a meeting of the Western Railway Club in November, 1909, Mr. Bird made the following statement: "As to the exact proportion of Chicago's smoke that is made by locomotives, it is a very hard thing to even make an estimate of. It is largely a matter of opinion." It would now seem as though Mr. Bird believes that he has reduced the matter to an exact science, and in doing so he finds the railways as the chief offenders in the making of Chicago smoke.

I will not question the distribution of the annual consumption further than to say that each of the items are estimated and could hardly be arrived at otherwise. The item of railway coal is said to be accurately estimated, because made by the railways, but we decline the compliment for the following reasons: It should not be a difficult matter to obtain the amount of coal used in a stationary boiler plant, provided one has access to the accounts, but for locomotives the question is complicated. For instance, the Chicago city limits are from nine to twelve miles from the railway depots. Every through train, most of the suburban trains, and many transfer trains of freight cross the line daily, and the proportion of coal actually burned within the city limits is very difficult to estimate. Some of these engines are housed within the city limits, others bring their trains to the depot, and in a half hour are out of the city again. Others arrive from the outside, take their trains to the yard and go out of service, possibly until the following day. Some switching engines are in continuous service within the city limits, while others are not. Railway accounts are made up for the terminal divisions, which extend beyond the city limits, so that the amount of coal burned within the city limits is entirely a matter of estimate.

Not only is this true of the coal consumed within the city limits, but of the number of engines within the limits at one time, so that there are two variables in the estimate. The influence of these may be shown by analyzing some of the figures on the last page of Mr. Bird's paper. The total number of engines in Chicago at one time divided into the total tons of coal burned daily is about four tons per engine per day. The individual roads quoted run from 1.4 to 28 tons per engine per day.

It is stated that a special observer made over 11,000 observations of the density of locomotive smoke in October and November, 1910. Assuming fifty-two working days in that period and eight hours per day, this would make 26.4 observations per hour. As many hours, and perhaps days, had weather that did not permit accurate comparative observation, the rate must have been higher than this. Observations of a stationary stack can be taken for as many minutes as may be desired and the smoke density classified by the Ringlemann charts. The observer and the stack are in a fixed relation, but with a moving locomotive

the distance attained from the observer in one minute may be as much as one-half mile, and, no doubt, many of the 11,000 observations were long distance records. The point of observation is stated to be frequently at junctions of two or more railways. Everyone knows that such points are always approached with caution and frequently stops are required, and it is impossible under such conditions to as fully control the fires and smoke as at other points. As a matter of fact, the table of location of points of observation shows mainly points where such adverse conditions obtain rather than a fair average over the entire line within the city limits, and explains the high percentage of smoke density to a considerable degree.

The smoke densities on the lake front are very low, as compared with all others, indicating that the background of the lake influences the observations as compared with those taken where the atmosphere is already laden with smoke from other sources. I do not believe that my good friends on the Illinois Central will claim to have any better engines or appliances than we have. Many of them are identical in design and operation, and the men are under practically the same rules and instructions. The coal is practically the same, and yet the roads away from the lake front and among other sources of smoke production are shown with greater percentages of smoke density. These features, together with the lack of opportunity for a continuous observation with a fixed relation of the observer and the locomotive leads to the conclusion that the statements made as to density are not fair to the railways. Even if they were, they are in regard to a machine that in most cases is in the city for a limited number of hours, is out of commission and smokeless often for many hours of the twenty-four when in the city, and is never worked continuously to capacity for any great length of time. Yet its record when at work is compared with stationary plants of all kinds, nearly all of which are in continuous operation. In other words, the smoke density of a locomotive which is in service in the city one-half of the twenty-four hours has the same record as if it was operating continuously, so far as these statistics are concerned.

The statement as to the amount of cinders thrown from stacks of locomotives is overstated. There are only a couple of testing plants in this country where experiments have been made to ascertain the amount of cinders passing out of stacks and even these are not exact. During the St. Louis exposition of 1904 the cinders discharged from the stacks and those caught in the front ends amounted to about 10 per cent. of the total weight of fuel burned. These engines were worked at full capacity at various speeds, whereas the engines in Chicago work at full capacity only a portion of the time, so that 10 per cent. is entirely too high. This is particularly true of switch engines, where actual mileage per day is very low, and this class of engine is predominant in the city. The throwing of cinders is probably greatest on suburban engines, which make numerous stops and have to accelerate rapidly.

Although, as stated, I disagree with the conclusions in Mr. Bird's paper, believing that the railways do not make the proportion or density of smoke credited to them, I do agree to the principle of smoke regulation insofar as it can be economically enforced and with due regard to the public health and comfort. Furthermore, I believe that the railways are generally of that opinion and are endeavoring to co-operate with the city to that end. My use of the word economy is in the broad sense. Pittsburgh could not make steel for the world and be a smokeless city, neither can Chicago be the distributing point and clearing house of industry of the middle west and be a smokeless city. True economy means a wise use of our natural resources and a checking of waste. The steam locomotive, as Mr. Bird truly says, is a highly developed machine and, contrary to what many people think, is a highly economical machine. The locomotives in this country, except a few in the anthracite territory, or where oil is available and cheaper than coal, use soft coal and make more or less smoke. Pocahontas coal is cited as making less smoke than others, which is true, but would the business interests of our vicinity regard the use of Pocahontas coal on locomotives as of economic advantage to the community at large? The expenditures of Chicago railways for fuel should go to build up the business interests of Illinois and Indiana, rather than of Virginia. Considerations of economy in this sense, therefore, lead us to use local fuels, but in connection with approved appliances and constant vigilance to keep the smoke to a minimum.

Allusion is made in the paper to electrification as the panacea, "the only final and satisfactory solution of the smoke problem." This is a large question and a debatable one, and I can only touch on a very few points. Although fifteen months have passed, I see no reason to change the views expressed in a paper which I read before the Western Railway Club in November, 1909. I invite you to consider the situation in Boston. That city rather than New York is similar to Chicago as regards electrification requirements. It has water on one side and radiating lines of passenger railway tracks of about 600 miles within the district; it is estimated that it would cost $39,000,000 to electrically operate the passenger traffic. Freight and switching movements have not been considered. Boston recognizes that it would have to pay for that electrification in increased fares or rates and after consideration of the question by a commission of sixteen members and the two railways involved, it was decided by nine members of the commission* that it is not wise nor in the public interest to exact legislation compelling any electrification of railways. A minority report of five members dissented from the above to the extent of recommending legislation that would require a commencement of actual work of electrification at a date to be fixed by the general court or some public agency designated to extend the time for good cause shown. A second minority report signed by two members dissented from the above idea of any compulsory legislation, but would require continuance of investigations and studies as to plans and estimates, taking up the question of rates as well as costs.

According to Mr. Bird's figures, Chicago has about 670 miles of main lines, which compares closely with that of Boston and has in addition over 1,500 miles of sidings, all of which have to be considered for complete electrification. Can Chicago pay the price, as it will undoubtedly have to do if electrification is to be an accomplished fact on her railways? If the public can afford to pay the price for electrification a certain degree of smoke and dirt reduction may be accomplished, but it is doubtful if the general atmosphere of Chicago would be greatly cleared. The enormous quantity of soft coal otherwise used is too great a factor. As regards the matter of health, an examination of the death rate of various American cities does not put one in fear of a Chicago residence as being extra hazardous.

*A summary of the conclusions reached by the Massachusetts Joint Board on Metropolitan Improvements is as follows: Electrification is desirable because of comfort and convenience of the public and some advantages to the railways. Best methods are still undetermined. Electrification of terminals under the present conditions does not result in economy but increases expense, aside from the interest incurred. If greatly increased traffic would result from electrification, the expense per unit would be reduced. Electrification would oblige railways to make charges to operating expenses, due to property abandoned or replaced, in addition to interest on new capital and increased expense of operation. Electrification would require an increase of passenger fares to produce the revenue to pay for it. Electrification, while desirable, is not necessary nor required on the grounds of public safety. To compel electrification would postpone other expenditures demanded by considerations of increasing traffic, etc. Railways are already hampered in obtaining capital by other regulations of the state and government. As a result of the foregoing conclusions, the Board believe that it is not wise nor in the public interest to enact legislation compelling any electrification of railways.

Boston passenger and suburban service is nearly three times that at the Grand Central station, New York, and the number of lines, as compared with New York, makes the expense in Boston much greater than in New York. (This is a consideration which would also rule in Chicago.) It is believed that rates should be raised for both passenger and freight traffic to provide necessary capital if both classes of traffic are required to be moved electrically. Such increase in rates should be borne by Boston business interests. The benefit of electrification in Boston will accrue mainly to commuters and short distance traffic, and owners of property along the lines electrified. An increase of suburban fares will discourage the development of suburban territory and divert travel. For reasons connected with evolution of electric traction, also the demands for increasing traffic in other directions, it is believed that these matters should be allowed to work out themselves without legislative enactment. The report calls attention to the partnership of the public in all such improvements without risk, and its attitude should be to encourage a legitimate and economical expenditure of capital with fair compensation.

Shop Section.

THE first prize of $35 in the car department competition, which closed February 15, has been awarded to Robert G. Bennett, motive power inspector of the Pennsylvania Railroad at the South Pittsburgh shops, Pittsburgh, Pa. The second prize of $20 was awarded to A. G. Pancost, draftsman, Elkhart, Ind. Both of these articles appear elsewhere in this issue. The freight car material storehouse described in Mr. Bennett's article is inexpensive and provides a simple, easy and efficient means of caring for this class of material.

ENGINE house kinks is the subject of the competition which closes March 15. The engine house is a critical point in the operation of a division and the rapid and accurate handling of locomotive cleaning and repairs is of utmost importance. Labor and time saving kinks are absolutely necessary. Most of them are simple both in construction and operation. Send in sketches, photographs or drawings of the best two in your engine house, together with a clear and thorough description of them. A first prize of $35 will be awarded for the best collection of two kinks, and a second prize of $20 for the second best collection. Others that are accepted for publication will be paid for at our regular space rates. More than two kinks may be submitted, if desired, allowing the judges to base their decision on what they consider to be the best two in each collection.

NOW is the time to start work on your contribution to the competition on the instruction of workmen and the education and development of apprentices, which closes April 15. You have great difficulty in developing good mechanics. Are you entirely blameless? Should you not give more attention to their instruction? What are you doing to develop and make good workmen of the younger and brighter laborers and handy men? What results have you obtained from the use of shop demonstrators? Are they not just as essential, or more so, in a day work as in a piece work or bonus shop? This problem of the instruction and development of workmen is vital to the best interests of your shop and road. Then there is the apprentice problem. Much has been written and published about modern apprenticeship on railways. Many shops now have apprentice drawing room and shop instructors. A new field has thus opened up within the past few years. We want to know what problems you have met in the prosecution of this good work and how you have solved them. Are you getting practical results from your efforts to develop the apprentices? Two of the larger systems, the New York Central Lines and the Atchison, Topeka & Santa Fe have elaborate drawing and problem courses and have well equipped schools at each of the larger shops. What are the difficulties met with in this work and how are they overcome? Are these systems a practical success? By the use of traveling instructors the Santa Fe is reaching the smaller shops. But what about the smaller railway systems which cannot handle the work on such a large scale. What methods have they found successful in developing and thoroughly educating the apprentices in the various trades? What does the apprentice boy think about the efforts that are being made in his behalf? How can we exert the proper and best influence on him? Is our duty done when we have taught him how to be a skilled workman, or should we not aim to make a better man and a better citizen of him as well? Should he not be better paid, and can he retain his self respect on the small wage that he is often paid in some shops. Does the railway shop really afford a good opportunity for a bright boy? The education of workmen and apprentices is a vital matter to the railways and to the nation. The questions above are only a few suggestions. There are many other equally important features of this work. We want this competition to be one of the best we have had. The articles should contain from 500 to 1,500 words. A prize of $35 will be given for the best article and $20 for the second best. Articles not awarded a prize will be paid for at our regular space rates if accepted for publication.

SHOP kinks will be the subject of the competition to close May 15. Shop kinks or handy devices of all kinds used in connection with the maintenance and repair of the rolling stock and equipment in charge of the mechanical department will be eligible for entry. A first prize of $50 and a second prize of $25 will be awarded for the two best collections of three kinks. A greater number of kinks may be submitted, if desired, allowing the judges to base their decision on what they consider the best three kinks in each collection. Kinks accepted for publication, but not awarded a prize, will be paid for at our regular space rates.

SO much has been said about the value of time studies that we have asked Mr. Morrison, who has made hundreds of these studies in railway shops to tell just how they should be made. He speaks of one man making a time study and another establishing the standard time or schedule based on it. This could be done in cases where the schedule maker was thoroughly familiar with the machine and the work which was to be done, and had made previous schedules for such work; otherwise it would be necessary to have the time studies made by an experienced man who could not only take a record of the operations and times in which they were done, but who in a broad way could study the machine, the operator and the surroundings with a view to improving the conditions and increasing the efficiency.

IN the articles submitted by our readers in the competitions on increasing shop output and promoting shop efficiency, which have been held during the past year, one factor or phase of the question has been emphasized time and again—the importance of knowing the men and understanding how to handle them. One of the greatest mistakes that has been made by efficiency engineers, and which is considered in the article in this issue on The Mistakes of the Efficiency Men, has been their failure to realize the importance of this factor. Undoubtedly they will deny this, and those in charge of the betterment work which was done on the Santa Fe will point to the elaborate pamphlet which was distributed to all of the mechanical department employees shortly after this work was inaugurated, explaining in detail and illustrating by interesting examples the benefits that the workmen would derive from the installation of the bonus system. It was all very beautiful, and from the standpoint of pure reasoning should have appealed to the men. Why then was there so much opposition to it? Simply because this abstract way of dealing with the men did not and could not appeal to them. The same mistake has been made by railway executives who, suddenly becoming convinced that piece work was a good thing, have issued orders that it be installed within a certain definite period, anywhere from 30 days to six months. Even if all the details could be developed and perfected in such a short time, and men properly trained to install the system were available, it would be impossible to successfully put it into effect, because it takes far longer than this to overcome the prejudices of even a few men in one shop or department, and get them to understand, to realize that the management does not intend to impose on them. Here is where the real executive who understands the human element is absolutely necessary. Without him the work cannot be done successfully. Why have the efficiency engineers failed to realize this?

THE FAILURE OF LOCOMOTIVE CROWN SHEETS.

THE enactment of a federal law for locomotive boiler inspection makes the subject of the causes of boiler failures of timely interest. The most complete and reliable statistics relating to locomotive boiler explosions, failures and casualties are found in the 1910 report of the Master Mechanics' committee on the Inspection of Locomotive Boilers. They cover a period of nearly five years from January 1, 1905, and represent 75 per cent. of the locomotives of the country. When equated for the whole number of locomotives, estimated at 58,000, they will fairly represent the total number of boiler failures which are in the nature of an explosion. The equated figures show a total of 800 failures per year. It should be understood that the figures cover only those failures which resulted in personal injury or death, and the total number of failures, including those in which there was no personal injury, is still larger. Of these, 5 were due to explosions of boiler shells; 68 to explosions of fireboxes, and 700 to damage by burning. Those due to explosions of fireboxes and to damage by burning may be considered as crown sheet failures, since as a rule they are confined to the crown sheet. We, therefore, have a total of 768 failures of crown sheets per year causing personal injury, and an additional number not reported which did not result in personal injury.

The report shows that 98 3 per cent. of the failures were due to low water, and all of these, with the exception of 1.4 per cent., were caused by the neglect of the men in immediate charge of the locomotive to maintain a proper supply of water in the boiler. The only real locomotive boiler explosions which may be charged to the weakness of the boiler are those classed as explosions of the boiler shell, and the average number per year for all the engines in the United States is 5.6, or less than 1/100 of 1 per cent. of the locomotive boilers in service, which is smaller than in any other service, stationary or marine.

The serious damage to locomotive boilers is, therefore, largely due to the failure of crown sheets and, including those which do not cause injury to persons, the average number in the United States per year is now probably 1,000, or about 2 per cent. of the locomotives in actual service, and the number is increasing. Over 98 per cent. of these failures are chargeable to the enginemen. Under such conditions there is little hope for any very substantial improvement by any change in boiler design, by the use of better material, or by more efficient inspection. To make the boiler stronger would only increase the violence of the explosion if it should occur; the practice on some roads is to use crown bolts without heads, so that when the sheet is overheated it will strip the threads and blow down before a very destructive pressure is accumulated. On other roads the front rows of crown bolts are left without heads on the fire side for the same purpose, and then only the front portion of the crown sheet is blown down when overheated. Automatic devices, either to maintain the water supply or to act as an alarm when the proper supply is not provided, have had proper consideration, but it has been determined that such devices are unreliable, and decrease the sense of responsibility of the enginemen.

When so much depends on the regulation of the water level the gage cocks and water glass must be regarded as of prime importance, as they are the only means provided for detecting low water. Considered as safety appliances in a critical position, both of these fixtures should be used as a check on each other. The water glass does not seem to be used to the extent one would expect, although it has been materially improved in a number of ways. It has been made more safe against breakage, and the visual indication is more distinct. The Master Mechanics' Association has frequently discussed the advisability or necessity of using the water glass, and in 1893, in considering recommendations looking to increased safety, adopted a resolution "that the water glass, although a convenience and an additional precaution against low water, was not absolutely necessary to the safe running of locomotives." This was reaffirmed in 1900, but since that time boiler pressures have increased, the conditions of operation are more difficult, and the water glass has been improved.

The testimony of the locomotive builders at the hearing before the House of Representatives committee indicated that about one-half the new locomotives are not equipped with water glasses, showing that their use is by no means general. In its most improved form the water glass is not an expensive fixture, and would pay for itself as an additional insurance against burnt and blown down crown sheets, to say nothing of the greater safety assured the enginemen. The gage cocks should be substantial fixtures, and the openings into the boiler for them, as well as for the water glasses, should be frequently inspected to prevent stoppage by mud and scale.

With such provisions and precautions, the prevention of crown sheet failures due to low water depends entirely on the care and vigilance of the enginemen. Where their own lives are endangered, the occasional failure to maintain a proper level of water in the boiler, like the disregard of signals, may be due in rare instances to mental lapse, but as a rule it can be attributed to the men taking the chance that when the water is out of sight in the glass there may be 3 in. depth still on the crown sheet and that the injector will soon gain on the consumption so that water will presently appear. They find by experience that in some cases the water may be low and the sheet scorched or overheated without blowing down or doing any damage, and this leads to carelessness and willingness to take risks. The failure of crown sheets is, then, as a rule, a personal matter rather than one connected with the construction of the boiler, its strength or its inspection, and the effort to reduce these failures should be directed to the cultivation of greater care and watchfulness on the part of the enginemen.

EFFICIENCY.

THE following quotation from the opening chapter of Frank B. Gilbreth's book on Motion Study,* is deserving of thoughtful attention since it is based on the practical experience of an engineer and employer, whose work as a contractor in the construction of buildings and other engineering work has met with more than ordinary success. "There is no waste of any kind in the world that equals the waste from needless, ill-directed, and ineffective motions. When one realizes that in such a trade as bricklaying alone, the motions now adopted after careful study have already cut down the bricklayer's work more than two-thirds, it is possible to realize the amount of energy that is wasted by the workers of this country. . . . By motion study the earning capacity of the workman can surely be more than doubled. Wherever motion study has been applied, the workmen's output has been doubled. This will mean for every worker either more wages or more leisure." The editor of *Industrial Engineering*, in which Mr. Gilbreth's book was first published as a serial article, was so impressed by it that he decided, as an experiment, to apply some of the principles of motion study to the handling of the outgoing mail in the circulation department. As a result the output of the girls who had charge of folding and enclosing the letters in envelopes, and sealing them, was increased fourfold.

The first stage of motion study is to discover and classify the best practice. To do this Mr. Gilbreth recommends (1), reducing the *present* practice to writing, (2), enumerate the motions used, (3), enumerate the variables which affect each motion, (4), reduce the *best* practice to writing, (5), enumerate the motions used, (6), enumerate the variables that affect each motion. The variables group themselves into three general divisions: Variables of the worker; variables of the surroundings, equipment and tools; and variables of motion. A chapter is devoted to each of these three general divisions in which the principals are outlined; examples are given of the application of

*Published by the D. Van Nostrand Company, New York. Price $2.00. Cloth, 5 in. x 8 in. 116 pages.

the principals, most of the illustrations being taken from the bricklayers' trade.

Is the book of value to a railway officer or foreman, and if so, how? Let us consider the mechanical department which has been singled out by the efficiency engineers as the one which is most in need of scientific management. An important feature, which has been developed and emphasized by the efficiency engineers, is that of making scientific time studies of the different operations in order to eliminate waste motion and establish the proper piece work price, or the standard time in which the work should be completed, if the bonus system is used. Such time studies, if properly made, are invaluable and are just as important in a day work shop as in one operated on a piece work system, for in either one it is essential for those in charge to know that the work is being done efficiently and that the men are delivering a fair return for the wages paid them. To properly make a time study, in our opinion, it should be done by an experienced man who is properly trained not only in observing and timing the various operations that are required to complete a given piece of work, but who is broad enough to study the worker and his characteristics, to analayze the conditions surrounding him, to study the tool he is working on to see if it can be improved, and to take into consideration the many other details that may have some influence, direct or indirect, on his work. To men who wish to tackle the problem in this way Mr. Gilbreth's book is invaluable.

Whether the large saving mentioned by Mr. Gilbreth could ever be made in a railway shop is a question. The large number of different operations that are performed and the number of trades represented would undoubtedly make it inadvisable to go into the detail which would be warranted in a single trade in which the number of operations and motions are limited. However there are great possibilities of improvement in most railway repair shops. Time studies should be made of the more important operations, and standard instructions should be provided for doing the work. In doing this the variables mentioned by Mr. Gilbreth should receive proper consideration. In the classification the variables of the worker includes anatomy, brawn, contentment, creed, earning power, experience, fatigue, habits, health, mode of living, nutrition, size, skill, temperament and training. The variables of surroundings, equipment and tools are appliances, clothes, colors, entertainment, music, reading, heating, cooling and ventilating, lighting, quality of material, reward and punishment, size of unit moved, special fatigue eliminating devices, surroundings, tools, union rules and weight of unit moved. The variables of motion are acceleration, automaticity, combination with other motions and sequence, cost, direction, effectiveness, foot-pounds of work accomplished, inertia and momentum overcome, length, necessity, path, "play for position" and speed.

In developing this study in the bricklayers' trade, Mr. Gilbreth found it advisable to relieve the bricklayer of much work which could easily be done by laborers. Union rules and regulations would not allow this to be done in most trades, and to obtain the best results it will be necessary to re-classify the trades and standardize them. This would prove such a tremendous task, that Mr. Gilbreth suggests that it be done by a permanent bureau, sustained by and under the direction of the government.

Few jobs in a railway repair shop can be compared to the bricklayer's trade. There are, of course, some classes of work where the operations are short and the worker performs them many times a day. In these cases it might be well to carry the motion study to the extreme advocated by Mr. Gilbreth. On the other hand, there are a great number of jobs which are so complicated or extensive that no considerable advantage could be gained by making a study of the exact motions which were required. When the cost of making such a study for the dozen or more trades represented in a railway shop is considered, its folly can be realized; but on the other hand many of the variables suggested by Mr. Gilbreth can be investigated for all the operations and undoubtedly a considerable improvement can be made by rough studies of this kind. It must be kept in mind, however, that there is a certain critical point beyond which this work cannot be carried without a greater expenditure than would be warranted by any returns which might be gained from it. Even in a trade such as the bricklayer's, where the men go through exactly the same motions hundreds of times during the day, it takes much time and patience to induce them to adopt standard methods. They have become so used to doing things in the way in which they learned to do them when apprentices, and have so seldom been rigidly trained to use a certain number of definite motions, that it is a difficult matter to get them to work according to standard methods.

EXCESSIVE WEIGHTS OF LOCOMOTIVE MACHINERY

IN nearly every article that has appeared in the *Railway Age Gazette* relating to steel car design, we have called attention to one important objection which is characteristic of American practice—that of excessive weight. Comparison with foreign practice will show that the weight of such cars has been increased in this country to a point which is not justified either by considerations of safety or good engineering. The excessive weight of cars has naturally led to the requirement of more powerful locomotives, and in the designs for these general dimensions in some instances have reached the maximum limits which roadway clearances will permit. In the construction of these gigantic machines there appears to be little effort made to obtain the most powerful machine with the least weight per horse-power, but, on the contrary, there is a strange pride on the part of both locomotive builders and railways in the production or ownership of the "heaviest locomotive in the world."

The disregard of any relation between weight and strength of materials is seen in the practice of some railways that use wrought iron for driving axles, main and side rods and other parts of the locomotive machinery. The tensile strength of this material never exceeds 45,000 to 48,000 lbs. per sq. in., and the elastic limit is rarely as high as 25,000 lbs. Compare this with machinery steel having an ultimate strength of 85,000 lbs. and an elastic limit of 45,000 lbs.; or with the alloy steels having an ultimate strength of 100,000 to 125,000 lbs., and an elastic limit far exceeding the ultimate strength of the best hammered iron. The alloy steels are now generally used for those parts of machine tools and marine engines that are subjected to heavy stresses, and, in fact, in these fields they have almost entirely replaced the ordinary carbon steels formerly used.

For locomotive machinery it is now possible to obtain at moderate cost steel having an elastic limit double that of wrought iron, and if the areas of sections are made inversely proportional to the elastic limit it should be possible to reduce the weight of the parts 50 per cent. without exceeding the safe working unit strength per sq. in. The reason why there is a distrust of steel by some railways, and also why advantage is not taken of its superior strength in the proportions of locomotive machinery, is partly because the steel has been forged by the railways and has not received proper heat treatment. High carbon steel, when heated and cooled in the same manner as wrought iron, develops internal stresses that are liable to cause failure under loads not exceeding those imposed on the much weaker wrought iron; the crude treatment of steel is thus responsible for the persistent use of iron, which requires the sections to be much larger and the weight of the finished parts considerably greater than necessary.

Steel crank pins failed frequently by fracture when first introduced; on some railways the remedy applied was to increase the diameter at the hub fit; others retained their standard sizes and had the pins forged and given proper heat treatment at the steel works. This will largely explain why on most lines locomotive

steel forgings have increased in size far beyond the strength requirements. The purchasing agent and the master mechanic are to blame where ordinary steel is bought for rods and pins and forged in the railway smith shop in order to save the extra expense for special steel forged and treated at the steel works. The specifications for new locomotives should also take account of this difference between home-made and specially treated forgings, and the designs should show a closer relation between the strength of the material and the area of section than is ordinarily found in present practice.

The disregard for this relation is especially to be deplored in the excessive weights of reciprocating parts. The difference between American and foreign practice in this respect may be illustrated by a comparison between the weights of the pistons, crossheads and main connecting rods of a recently designed American compound locomotive and the corresponding parts of a French balanced compound of the same class and capacity.

	Weight in Pounds.		Per cent. French to
	American.	French.	American
High pressure piston and piston rod	332	198	60.
High pressure crosshead and pin	310	238	77.
Low pressure piston and piston rod	481	344	71.5
Low pressure crosshead and pin	310	238	77.
High pressure main rod	668	310	46.5
Low pressure main rod	623	440	70.5
Total	2,724	1,768	65.

The weight of the reciprocating parts of the French locomotive, including the entire weight of the main rod, is only 65 per cent. of the corresponding parts of the American locomotive of the same cylinder capacity. The disturbing effect due to the inertia of the reciprocating parts at high speeds reaches large proportions when these parts are unnecessarily heavy. Considering the weight of the front end of the main rod and the other weights as given, at a speed in miles per hour equal to the diameter in inches of the drivers, the force due to inertia is about 10 tons more at the end of each stroke in the American engine than in the French engine, due to this unnecessary increase in the weight of the reciprocating parts.

The same disregard of the use of materials of high tensile strength for reciprocating parts is seen in the design of American piston heads. In marine practice and in French locomotives these are made of forged steel having a tensile strength of 85,000 lbs. or more per sq. in., while in American practice they are usually made of cast iron with an average tensile strength of 20,000 lbs. or less. For a boiler pressure of 200 lbs. a 15-in. piston of marine design weighs 91 lbs.; for the French locomotive, 104 lbs.; while the American locomotive cast iron piston weighs 218 lbs. Even in the larger diameters of pistons, cast iron is usually retained, and the relation of the weights is as follows for a 25-in. piston: Marine design, 193 lbs.; French locomotive, 233 lbs.; American locomotive, 362 lbs. The 15-in. marine piston weighs only 42 per cent. and that for the French locomotive only 48 per cent. of that for the American locomotive, while the 25-in. marine pistons have only 53 per cent. and the 25-in. French locomotive pistons only 65 per cent. of the weight of the American piston of the same diameter.

The Pacific type locomotive now in general use for fast heavy express service has a large margin of weight on drivers beyond that required for adhesion, and, as there is ample opportunity for a reduction in its weight this improvement should commence with the reciprocating machinery. The designs for these parts should be revised so that advantage will be taken of the greater strength of alloy steels.

When the Walschaert valve gear was first introduced in this country strong claims were made for the reduction in weight as compared with the Stephenson gear, but that merit has been long forgotten, and the more recent designs for the former appear to show little regard for economy of material and good proportion. The housings for the pin-connected valve gear are also as formidable in size. The trailing trucks with outside bearings for both Atlantic and Pacific type engines are complicated and heavy to a degree wholly unwarranted by necessity, and here also there is opportunity for a modified design which shall be much simpler and lighter.

The proportion of dead weight in both locomotives and cars of American design has increased enormously in recent years, and when its first cost, the expense for repairs, and the cost of hauling excess weight at high speeds are considered, there will be found good reason for a wholesale revision of the designs for American rolling stock so as to make them lighter but amply strong. We have referred to some of the principal locomotive details which should be reduced in weight, but, with the exception of the boiler, the same fault extends throughout the whole engine.

MECHANICAL ARTICLES DURING FEBRUARY.

THE following articles of special interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of February 3:

Locomotive Boiler Inspection Legislation. Editorial comment on the new bill, as amended and passed. That it is fairly satisfactory is due largely to the fact that the railways did not oppose legislation on the subject, but insisted that any law that might be enacted should be fair and wise; to accomplish this they tendered the services of their experts.—February 10, page 266.

Nickel and Chrome Alloys for Chilled Iron Car Wheels. Robert C. Totten, in a communication, directs attention to the great improvement in cast iron car wheels due to the use of these alloys.—February 10, page 268.

Scientific Management. F. Lincoln Hutchins, in a communication on this subject (February 10, page 268), severely criticized the article on The Mistakes of Efficiency Men in the issue of February 3. Mr. Hutchins' letter was replied to in detail by the author of the above-mentioned article in the issue of February 17, page 311. Editorial notes on these communications appear on pages 265 of the issue of February 10 and 307 of the issue of February 17. Other communications on the subject appeared on pages 310 and 311, February 17, and page 344, February 24.

The Supply Department. The last of the series of articles by H. C. Pearce, general storekeeper of the Southern Pacific, deals with the system of buying under contracts or agreements and explains how to install the plan without disorganization; also considers the weakness and strength of the present supply system.—February 10, page 276.

Mallet Locomotive with Articulated Boiler Rebuilt from Old Power. By M. H. Haig, mechanical engineer, Atchison, Topeka & Santa Fe. A detailed description of an experimental Mallet rebuilt from two Prairie type locomotives. A flexible boiler with a ball joint is used and is said to be giving satisfactory results.—February 10, page 279.

The Repair Track and Its Relations to Traffic. A brief article from the yard-master's viewpoint.—February 10, page 290.

Federal Boiler Inspection. The value of the new law will depend largely on the ability and wisdom of the inspector general who will have charge of its administration.—February 17, page 308.

Locomotive Smoke in Chicago. The department of smoke prevention in Chicago has made a scientific study of this subject. The results were given in a paper read before the Western Society of Engineers by Paul B. Bird. An abstract of the paper appears in the issue of February 17, page 321.

Pacific Type Superheater Locomotive; Chicago & North Western. These locomotives, which were placed in service last July, have given such good results that superheaters have been specified for 30 of an order of 50 consolidation locomotives which are now being delivered to this road. A description of the locomotive and superheater appears on page 325 of the February 17 issue.

New York State Boiler Inspection. Editorial comment on the results which have been obtained by the regulations in force in New York state. This sort of inspection is of value to both the railways and the public and the expense to the latter is limited to the salaries and traveling expenses of two men.—February 24, page 342.

Brooks Spark Arrester. This device, which is described in detail, has been tried out on 75 locomotives on the Chicago, Milwaukee & Puget Sound and has given such good results that it is being applied to the other locomotives as fast as opportunity affords.—February 24, page 348.

Mallet Locomotives on the Santa Fe. The Baldwin Locomotive Works has built two Mallet locomotives for this road having flexible boilers; also 38 with rigid boilers of the separable type. One of the flexible boilers has a bellows type connection and the other a ball joint arrangement.—February 24, page 351.

Superheated Steam in Locomotive Service. A liberal abstract from a report on this subject made for the Carnegie Institution at Washington by Dr. W. F. M. Goss.—February 24, page 357.

Steel Sleeping Cars for the Chicago, Milwaukee & St. Paul. Fifty-nine of these cars have been received from the Pullman Company.—February 24, page 359.

THE MISTAKES OF THE EFFICIENCY MEN.*

BY ONE WHO HAS WORKED WITH THEM.

III.

Neglect of the Human Element.

Criticism of the theories of the efficiency men may be more or less a matter of opinion, but criticism of methods and practices, based on actual results, and backed up by the evidence of practical men who have intimate knowledge of the working of the so-called efficiency systems, ought to bear weight. And it is not to their credit that the efficiency men dismiss such evidence with scant consideration. Of the mistakes that have been made some are recognized so universally that it is to be wondered at that the efficiency men themselves fail to appreciate and correct them—so far reaching are they in their effects. Among these mistakes, perhaps none has been more apparent or more surely fatal than their failure to recognize the human element, in other words, their ignorance, at least in practice, of human nature. The millennium has been a long time coming, but most of us are willing to accept a little less than perfection, as we understand it, because we have learned by experience that perfection is an ideal to be striven for—seldom to be reached. There are practical and visionary idealists; the one appreciates the limitations of men and the frailties of human nature without sacrificing his ideals, the other, living apart in a world of fancy, can be satisfied only by perfection—and therefore forever remains unsatisfied.

This fundamental mistake is not confined to the relations of efficiency men to the rank and file of workmen; it extends alike to foremen, superintendents, managers and those in executive authority. How the efficiency men can expect to receive a favorable audience for presenting their cause after following the course they usually pursue is hard to imagine. What has been their general attitude toward these various classes? They have criticized railway executives because their philosophical discussions have not been taken seriously, forgetting that they are men of action rather than of words. They have charged railway and industrial managers with incapacity in dealing with intricate problems that have resulted from the growth and consequent complexity of their business, ignoring the power that comes only from intelligent and intimate knowledge of actual conditions. They have referred to superintendents, foremen and others in direct charge of operations as "of the old school," and to their management as "rutty," because they have depended on a practical experience and an ability to handle man rather than on artificial systems, to secure permanently good results, forgetting that the standards attained by such men have not been generally improved upon under any so-called efficiency system. They have substituted for comparatively simple methods of determining costs and earnings, complicated and theoretical schemes without preparing the way for a clear understanding of their elements. In all of this, however worthy their object and however correct their reasoning, they have depended more on the force of logic to carry their plans to a successful conclusion than on a reasonable attitude which takes into account the elements of human nature that are common to the large majority of men. They have talked and written too much, and it is not surprising that the term "scientific management" has been given little serious thought in certain quarters.

One of the leading efficiency men has stated that "it is not men or materials, money, machines and methods that count, but more potently theories and principles." We shall not quarrel with them regarding the principles that underlie all successful industrial and railway management. Efficiency men are not alone in recognizing them. Abstract reasoning has its place, but in itself cannot make two blades of grass grow where one grew before, nor turn the wheels of industry. Great as imagination is, and however necessary a part it plays in broad and comprehensive plans for the improvement of the human race, it must be translated into the concrete before it is really vital. And it is not true that what is correct in theory is likewise always correct in practice. Scientific management of railways and industrial plants is not a system of philosophy; it is common sense applied to the working out of the problems that cannot be solved except through men—practical men, men who *know*.

A number of years ago one of the now leading efficiency engineers was engaged in a large industrial plant to introduce a piece work system. For two years he labored. Stop-watch in hand, he timed the various operations and tabulated the results. His attitude toward the workmen was impersonal. He was a scientist (?) in his laboratory. He was a man apart. The men around him recognized him as such. Lacking their confidence, co-operation was impossible. But from the standpoint of the efficiency engineer this was unnecessary; his faith was in his theories and principles. Consequently, when he appeared in the shop and began his observations, machines would often be slowed down with loss of output or speeded up with damage to tools. Every device known to the various trades was resorted to to block him at each turn. The result was that after two years of effort the establishment of a satisfactory piece work system was as far from realization as it had been when the task was started. Then a practical man was called in. He acquainted himself with the machines and their capacity. He mingled with the men and gained their confidence. He explained that the object in view was two-fold, to increase the output at a reduced cost per unit to the company, and at the same time to enable the men to earn more. Within six months he had accomplished results that the efficiency man had spent two years in an effort to secure. Why? Because he appreciated the importance of the *man* element.

Yet they tell us that practical men follow the rule of thumb, that they have not had the time and do not possess the ability to analyze closely the successive steps in the almost myriad operations of a large shop, that because of a lack of scientific knowledge they are not competent to determine proper methods of work or secure the best results from operation. It is undoubtedly true that many practical men lack the peculiar qualities required by the efficiency engineer. Not a few successful men would be more successful if they possessed more fully the faculty of analysis and co-ordination and had a more lively appreciation of the theory of scientific management. But are the efficiency men assisting them in this direction? Rather, are they not practically ignoring the experience of practical men in their endeavors to establish the efficiency system, or to clarify the atmosphere surrounding it? Do they not give too little credit to the capacity of such men—inherent in some, acquired by many—to handle men, to convince them of their mistakes, to gain their sympathy and to establish that *esprit de corps* without which no organization is efficient? Under these conditions, efficiency engineers should not be surprised that practical men view with distrust their efforts in fields in which they have had no actual training. While there is perhaps no little prejudice back of such an attitude, it is nevertheless a real situation, and the success or failure of many an attempt in scientific management, as interpreted by the efficiency men, has been foreshadowed by the extent to which the confidence has been secured of the men behind the guns.

An understanding of the psychology of the crowd as represented by a shop filled with workmen, possessed in large measure by most successful factory and railway managers, master mechanics, round house and shop foremen, cannot be replaced by a theory of management nor ignored with impunity in introducing efficiency methods. Of two men entering a shop apparently equally equipped, one was found to be analytical and critical both in respect to the details of his work and his

*The first article appeared in the January 6 issue and considered the extravagant statements and claims made by efficiency engineers. The second article, in the issue of February 3, considered the failure of many of their theories when brought to the test of practical application.

fellow workmen, but lacking the magnetism that makes for leadership. The other, with less analytical ability and often wrong in his theories, possessed a personality that gave him an influence over the men around him. Which, naturally, became the leader, afterwards the foreman, then the superintendent? Such men, by the law of selection, represent the great majority of those who manage our railways and superintend our industrial and railway shops. Whatever their failings, they are to be reckoned with.

Why have so many of the plans of the efficiency men miscarried? It is not because the principles of scientific management are wrong. The cause is manifold: high overhead costs, impracticable methods, untrained men, impossible standards, labor difficulties, lack of harmony, distrust, impatience for results, but chiefly because the efficiency man has considered his system as a thing apart from knowledge gained through experience, depending for success not on men, but "more potently on theories and principles." Gaining the confidence of the workmen is often subordinated to the desire to prove the correctness of his theories, irrespective of the attitude of those whose interests are most intimately concerned.

An eminent efficiency engineer was retained to establish the efficiency system in a large and important shop. A reduction in costs of at least 30 per cent. had been assured after he had made the usual special investigation. At the end of a year, although certain somewhat spectacular reductions in cost had been effected, which were cited as evidence that the system was making good, it was found that the cost per unit had remained practically the same. The efficiency system was in disfavor. The confidence of the men—the first essential—had not been gained. Early in the following year a new superintendent was employed. He made the best use he could of the efficiency methods, but at the end of the second year the reduction in costs has been very slight. The efficiency system was in greater disfavor. Overhead costs had increased and practically offset any reductions that had been attained in direct costs. Thereupon the efficiency system was discontinued. At the end of the third year it was found that costs had been reduced more than three times as much as the combined reductions of the first two years. What caused the change? Ample time—much longer than had originally been called for—had been given to establish the efficiency system. The principles and the theories were both present. A factor had been absent, however, without which the system was but an empty shell—a man who understood men. The new superintendent knew how to bring men around to his point of view. He gave fair treatment and received like treatment in return. He recognized their abilities as well as their failings. He was firm in discipline but impartial. It would be incorrect to say that he had no system. He could not have succeeded without it. But his was a system based on practical experience, not evolved in the closet by a theorist. This was not all—he understood human nature and was able to accomplish in twelve months what the efficiency engineer would never have accomplished.

While many a shop foreman, superintendent or master mechanic may have no proper appreciation of the beauties of the philosophy of efficiency, may be unable to follow the line of reasoning of the efficiency men, may be mistaken in his belief that his men are more efficient than the "assays" have shown, and may have much to learn, he has usually reached his position because of certain qualifications possessed in greater measure by him than by the other men with whom he has been associated. And in introducing efficiency methods in his department it is a fatal mistake to omit the first essential, his good will, because almost invariably except through him the good will of the men cannot be secured. Too often the system is worked out with insufficient consideration being given to the men most closely affected; whose suggestions given with the best of intentions are ignored. Little pains are taken to explain the details of the system to those who must understand and favor it if it is to succeed. The word has gone out that the old system must give way to the new, and short shrift is given to the opposition. Thus it happens, that while this is farthest from their thought, the attitude of the efficiency man and that of the foremen and workmen are antagonistic. *Lacking the initial meeting of the minds and agreement on essentials, efficiency plans are foreordained to fail.*

A leading efficiency engineer has recently said that their claims have been "received with astonishment, skepticism, ridicule and anger because they have been misunderstood." In all fairness, it should be said that they are not *intentionally* misunderstood. It would be untrue to say that the efficiency men are to blame for all misunderstandings that have arisen. But they should put themselves in the other fellow's place, and perhaps they would be able then the better to appreciate his point of view. Instead of accepting the evidence of practical men, those who work and those who direct alike, they insist that all criticism is prejudice and assume the attitude of *laissez faire*—"let us alone." There are weaknesses in their structure, and the efficiency man is wise who gives greater place in his system to the greatest of all studies—*the study of man.*

BOILER SHOP TOOL ROOM PRACTICE.

BY L. M. STEWART AND R. B. VAN WORMER.
Foreman Boiler-Maker and General Foreman, Atlantic Coast Line, Waycross, Ga.

A systematic and satisfactory method of handling and maintaining the small tools in the boiler shop is in effect at the Waycross, Ga., shop of the Atlantic Coast Line. Each boiler-maker and boiler-maker apprentice has a number for checking in and out. When first employed he gives his name and check number to the tool room keeper, who makes a record of it, and furnishes him with six tool checks and a small iron tool box with a number on it corresponding to the check number. The tool room man sees that each tool box is at all times equipped with three flat chisels, three cape chisels, two round nose chisels, one center punch, one 12-in. monkey wrench, one standard alligator wrench, one hand hammer, one electric light extension cord and lamp, three drift pins and two hand calking tools. The tool boxes of men assigned to certain classes of special work are also temporarily supplied with the tools that may be required. The tool boxes are returned to the tool room every Saturday night; they are checked over, and all broken or badly worn tools are replaced with repaired or new tools.

All other tools required by a boiler-maker, including pneumatic tools, are checked out under the tool check system. The number of checks furnished to one man is limited to six in order to prevent any one workman having more tools than actually required, and at the possible expense of other work. If he should require additional tools he can exchange with some of the six tools already checked against him. This reduces the number of tools required to a minimum, and their time in actual service to maximum. No boiler-maker or apprentice is allowed to keep any tools in his clothes locker or private box, as such practice keeps a large number of tools out of service, which cannot be easily located. The boiler-maker has his helper carry the six checks, which are secured to a ⅛-in. brass wire safety pin that can be fastened to the jacket. The boiler-maker sends his helper for the tools and holds him responsible for the checks. The boiler-maker is, however, held responsible for both the tools and the checks.

All pneumatic tools must be returned to the tool room every night. The hammers are stored in a tank of oil over night. The air motors are placed on suitable racks and every morning both the air drills and the hammers are thoroughly oiled for service. Every small or portable tool used in the boiler shop is kept in boiler shop tool room. All wedge bars and holding-on bars are stored on a rack adjacent to the tool room and under supervision of the tool room keeper. We have adopted a stand-

ard make of air hammer and air motor, and keep a small number of repair parts in stock at the tool room to facilitate rapid repairs to all air tools, including those sent in from outlying points.

We have experienced decided success in driving staybolts with a long stroke air hammer and find it results in the saving of time, as well as giving excellent results in bad water districts.

STOREHOUSE FOR FREIGHT CAR MATERIAL.

FIRST PRIZE ARTICLE IN CAR DEPARTMENT COMPETITION.

BY ROBERT G. BENNETT.

Motive Power Inspector, Pennsylvania Railroad, South Pittsburgh Shops, Pittsburgh, Pa.

An economical and efficient means of storing and accounting for the material for freight car repairs was recently installed at Thomson, Pa., on the Monongahela division of the Pennsylvania Railroad. The enclosure in which the material is stored is somewhat similar in outside appearance to a stockade, and is 40 ft. wide and 85 ft. long, and constructed of rough hemlock boards. The floor is made of old car sills which extend 4 ft. beyond the side walls on the outside so that material may easily be trucked to and from the storehouse. A plan of the enclosure is shown in Fig. 1, and the details of the construction of the storage bins in Fig. 2. As shown on the plan, access may be had to the enclosure at two points only, one of which is used for delivering the material to the workmen and the other for receiving material from the cars. A roof is provided over the bins, which extend along the four sides. These bins contain the smaller material, a large part of which it is necessary to protect from the weather and keep in a dry place. A small office building, 8 ft. 2 in. by 8 ft. 2 in., is placed near the center of the enclosure. The upper portion of the four sides of this structure contains a large amount of window area, as indicated on the drawing, thus enabling the man in charge, while doing such clerical work as may be necessary, to see that the workmen are promptly waited on at the delivery counter.

The bins along the four side walls are divided into sections, designated by the letters A, B, C, D, E and F; the remaining space in the enclosure is divided into two sections, G and H. An iron rack, with a roof, and a knuckle rack are also placed within the enclosure, as indicated. Sections G and H are used for storing such material as journal boxes, stake pockets, brake shoes, etc., which cannot conveniently be placed in the bins and which are not greatly affected by climatic conditions. Section I on the outside is used for storing couplers and section J for brake beams and couplers. This material is too heavy to be passed over the counter and is kept outside on either side of the entrance where the attendant can supervise its distribution.

The class of material that is kept in each of the sections of bins is shown in Table 1. In order to accurately designate the

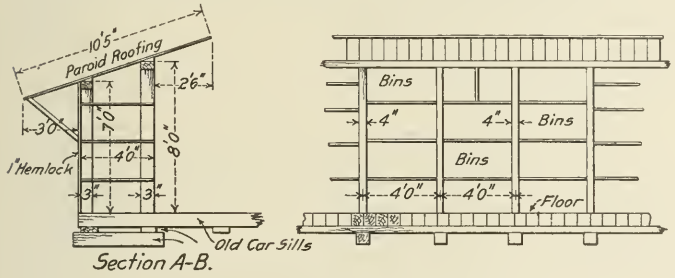


Fig. 2—Arrangement of Storage Bins.

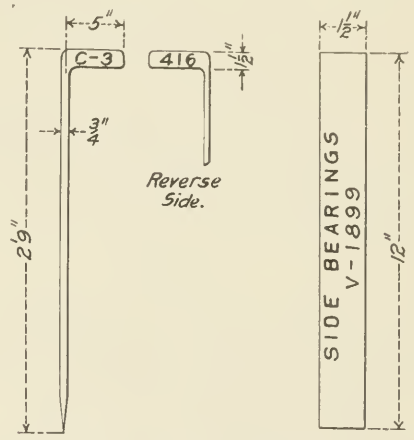


Fig. 3—Marking Stake for Floor Spaces and Label for Bins.

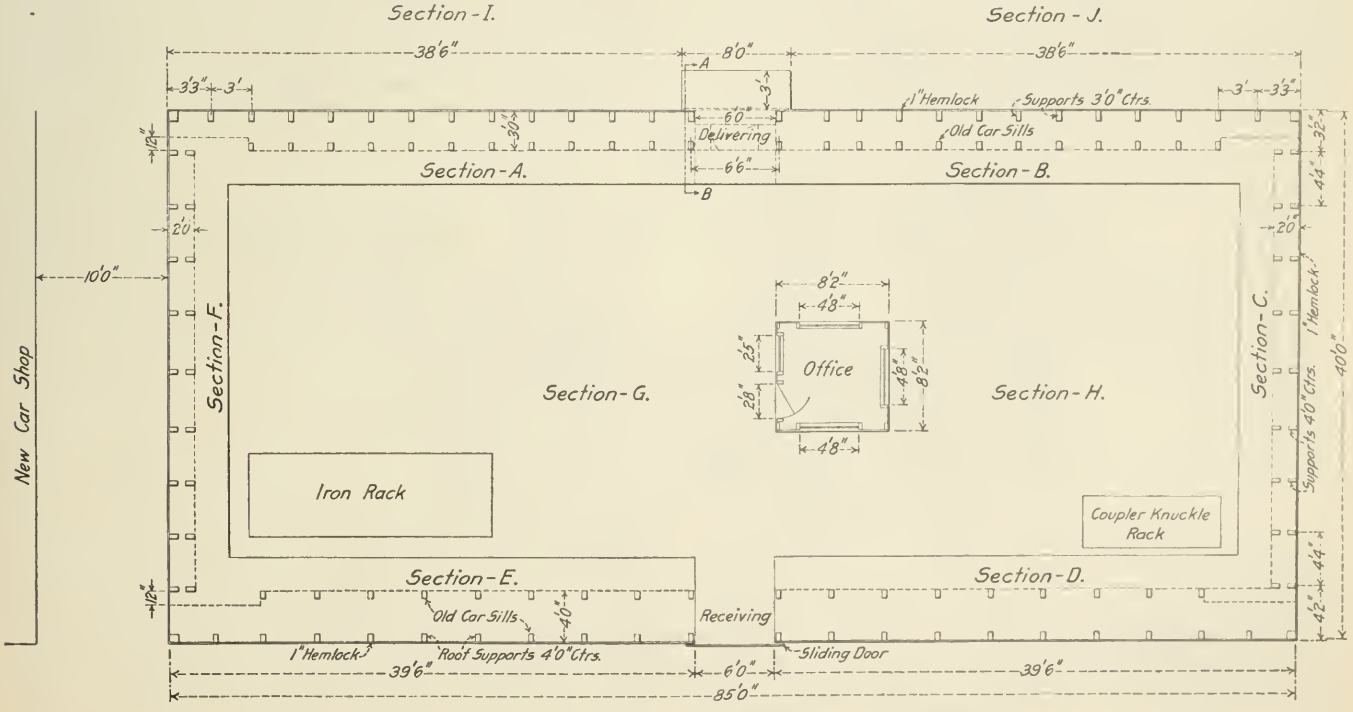


Fig. 1—Storage Bins and Yard for Freight Car Repair Material.

location of material, each section is divided into rows, and the bins in each row are numbered consecutively. Table No. 2 shows the rows and bins into which section A is divided and the class of material that is carried in each bin. Table No. 3 shows the rows and spaces into which the floor section H is divided and the material that is kept in each space. A tin label, of the dimensions shown in Fig. 3, is used for marking the bins.

use of the freight car pool sheet shown in Fig. 4. A separate sheet is used for each section and covers a period of one month. The sheet is fastened to the board shown in Fig. 5 by the thumb tacks A, and is held in place at the lower end by the plate washers B, which are tied to the screw eyes at the top of the board by cords. During inclement weather and at night the boards are detached and placed in the office. Each board is

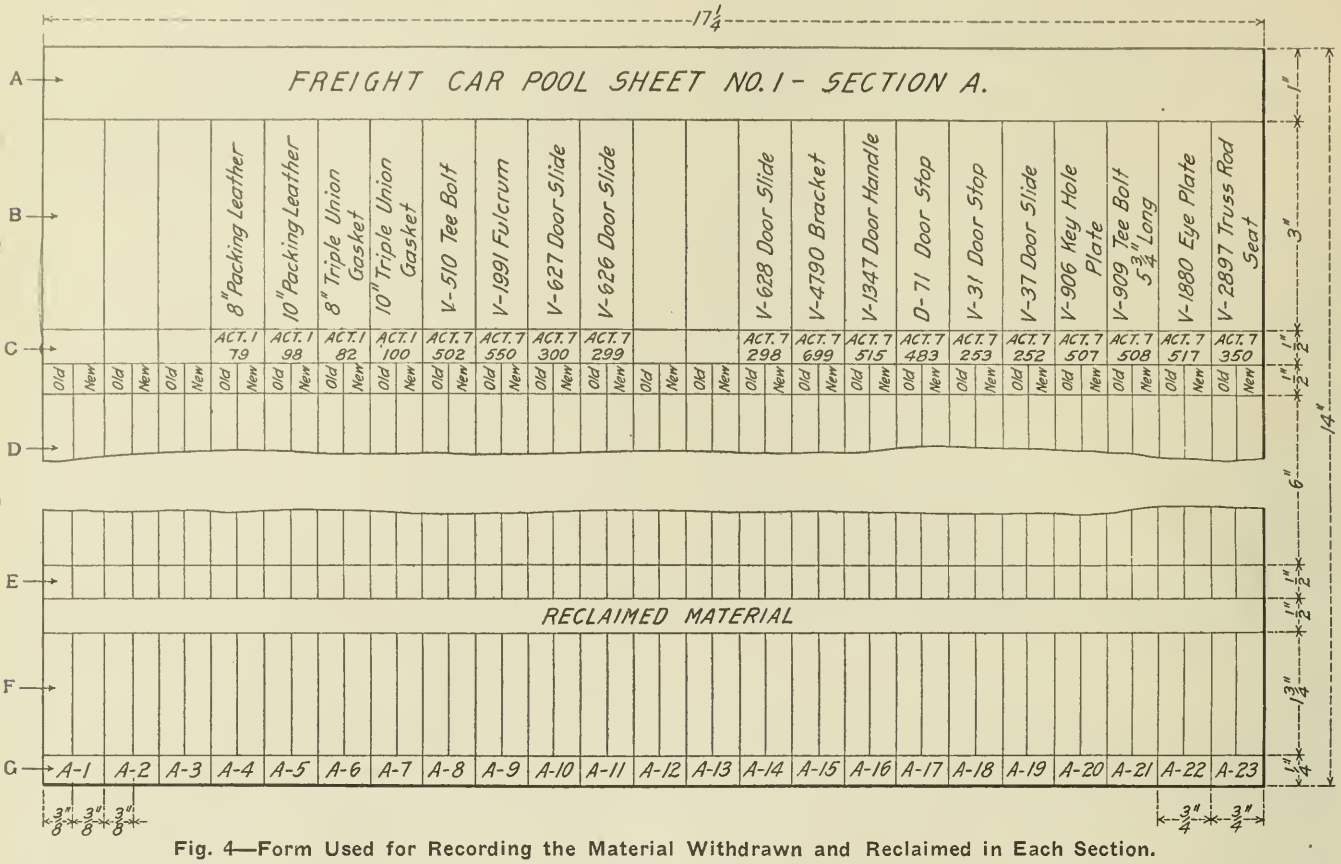


Fig. 4—Form Used for Recording the Material Withdrawn and Reclaimed in Each Section.

It is tacked at the top of the bin and the kind of material and the casting number are painted on it. A flag marker, as shown in Fig. 3, is used for indicating the floor spaces. On one side of the marker the row and bin number are painted, and on the opposite side the stock book reference number.

The accounting of the material in each bin is done by the

located near the center of its respective section; those for sections G and H are placed on the side of the office building nearest the section to which they refer. The board is shown in its working position in Fig. 5. On the pool sheet, Fig. 4, the sheet number and section are shown in space A; the contents of the bins in space B; the inventory account number and stock book

Table 2.

MATERIAL AS ARRANGED IN SECTION A.

Bin.	Row A.	Row B.	Row C.	Row D.	Row E.	Row F.
1.	Empty.	⅜-in. gas pipe elbows.	1¼-in. service elbows.	⅜-in. unions.	⅜-in. leather gaskets.	⅞-in. nut locks, single.
2.	Empty.	½-in. gas pipe elbows.	1¼ in. x 1 in. elbows.	½-in. unions.	½-in. leather gaskets.	1-in. nut locks, single.
3.	Empty.	1-in. gas pipe elbows.	⅜-in. sleeves.	1-in. unions.	1-in. union gaskets, Pc. No. 1778.	1⅛-in. nut locks, single.
4.	8-in. packing leathers.	1¼-in. gas pipe elbows.	½-in. sleeves.	1¼-in. unions.	1¼-in. union gaskets, Pc. No. 2183.	1¾-in. nut locks, single.
5.	10-in. packing leathers.	¾-in. service elbows.	¾-in. sleeves.	1-in. triple unions.	Air hose gaskets.	1¾-in. nut locks, single.
6.	8-in. triple union gaskets.	½-in. service elbows.	1-in. sleeves.	1¼ in. x 1 in. bushings.	¾-in. nut locks—2-hole.	⅝-in. nut locks for dfts.
7.	10-in. triple union gask's.	1-in. service elbows.	1¼-in. sleeves.	1¼-in. triple unions.	⅝-in. nut locks—2-hole.	Empty.
8.	V-510 tee bolts.	V-494 draft supports.	V-1649 journal bearings.	Second-hand bearings.	.....	.....
9.	V-1991 fulcrums.	V-486 draft supports.	V-360 journal bearings.	V-3244 journal bearings.	.....	.....
10.	V-627 door slides.	V-2878 double sheaves.	V-3243 journal bearings.	V-2682 journal bearings.	.....	.....
11.	V-626 door slides.	V-149 brake shaft hgrs.	V-2540 journal bearings.	V-2752 journal bearings.	.....	.....
12.	Empty.	V-3212 brake shaft hgrs.	Empty.	Empty.	.....	.....
13.	Empty.	Brake heads, National hollow.	V-1407 Christie brake heads.	V-1331 truss rod seats.	.....	.....
14.	V-625 door slides.	V-142 ratchet wheels.	V-1899 side bearings.	V-593 truss rod seats.	.....	.....
15.	V-4790 brackets.	V-4123 ratchet wheels.	V-844 side bearings.	V-1330 truss rod bridges.	.....	.....
16.	V-1347 door handles.	Empty.	V-848 Graham draft followers.	Empty.	.....	.....
17.	D-71 door stops.	V-532 box washers.	Empty.	Westinghouse friction draft gears comp't.	.....	.....
18.	V-39 door stops.	V-660 box washers.	Empty.	Empty.	.....	.....
19.	V-37 door slides.	.....	.....	.....	.....	.....
20.	V-906 key-hole plates.	.....	.....	.....	.....	.....
21.	V-909 tee bolts.	.....	.....	.....	.....	.....
22.	V-1380 eye bolts.	.....	.....	.....	.....	.....
23.	V-2897 truss rod seats.	.....	.....	.....	.....	.....
24.	V-3405 shaft bearings.	.....	.....	.....	.....	.....
25.	V-3406 operating levers.	.....	.....	.....	.....	.....
26.	V-4337.	.....	.....	.....	.....	.....
27.	V-905 door hasps.	.....	.....	.....	.....	.....
28.	V-4791 brackets.	.....	.....	.....	.....	.....
29.	V-2744 door handles.	.....	.....	.....	.....	.....

reference number in space C; the amount of material withdrawn, and whether old or new, in space D; the totals for each column in space E; the amount of each class of material which

Table 1.

GENERAL ARRANGEMENT OF MATERIAL IN ALL SECTIONS.

Section.	Contents.
A	See itemized table of contents.
B	Small iron castings, carriage bolts, nuts, plate and cast washers, wire nails, lag screws, and spring cotters.
C	Square head bolts.
D	Small iron castings, small W. I. pieces, bolts and nuts.
E	Air brake material, small W. I. pieces, chain, and pipe fittings.
F	Small W. I. pieces, small iron castings and rivets.
G	Iron castings, large W. I. pieces, iron rod, and pipe.
H	See itemized table of contents.
I	Couplers.
J	Brake beams and couplers.

is reclaimed in space F, and the row and bin number in which the material is stored in space G. This sheet replaced the old card system and offers a convenient means by which the division storekeeper may check the consumption of material at the re-

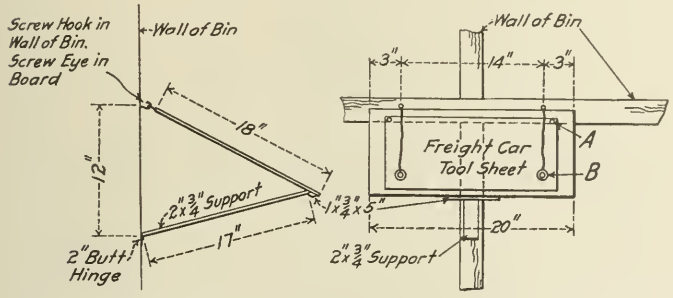


Fig. 5—Detachable Support for Freight Car Pool Sheets.

pair point as the pool sheets are forwarded to him at the end of each month.

The car repair yard at Thomson handles from 80 to 100 cars in a day of 10 hours, and two men are required for handling the material in the storehouse. One is in charge and does such

Table 3.

MATERIAL AS ARRANGED IN SECTION H.

Bin.	Row A.	Row B.	Row C.	Row D.
1.	V-2751 journal boxes.	Single stake pockets.	V-5470 brake shoes.	R. E. Janney knuckles.
2.	V-2539 journal boxes.	St'd chafing irons.	V-173 brake shoes.	R. E. Janney knuckles.
3.	V-6091 journal boxes.	3½ in. x 5 in. stake pockets.	Gr. sill steps.	Detroit knuckles.
4.	V-2766 journal boxes.	4 in. x 4 in. stake pockets.	Gl. sill steps.	Emergency knuckles.
5.	V-1646 journal boxes.	.....	Empty.	Empty.
6.	V-6092 journal boxes.	.....	8-in. cylinder and 8-in. reservoir combined.	Empty.
7.	.....	.....	10-in. reservoirs, Pc. 21838.	Empty.
8.	.....	.....	Kelso knuckles.	Empty.
9.	.....	.....	Kelso knuckles.	Tower knuckles.
10.	.....	.....	Pitt knuckles.	Tower knuckles.
11.	.....	.....	Melrose knuckles.	Empty.
12.	.....	.....	Latrobe knuckles.	Empty.
13.	.....	.....	Latrobe knuckles.	Climax knuckles.
14.	.....	.....	Buckeye knuck's.	Empty.
15.	.....	.....	Monarch knuck's.	10-in. cylinders, Pc. 4868.
16.	.....	.....	Monarch knuck's.	Empty.
17.	.....	.....	Chicago knuckles.	Gla. sill steps.
18.	.....	.....	Munton knuckles.	Ge. sill steps.
19.	.....	.....	Major knuckles.	Empty.
20.	.....	.....	Gould knuckles.	.....

clerical work as is necessary and keeps up the stock; the other distributes material at the counter. When giving out material the attendant makes the proper entry in column D on the pool sheet. Good material, which can be picked up in the yard and returned to the storehouse, is placed in the proper bins and entered on the pool sheets under "reclaimed material." At the end of the month these sheets are totaled and checked with the stock books. The balance, which is computed, should agree with the supply in the bins. The proper handling of freight car material at outlying points, so as to keep a thorough account of its consumption as well as to keep down the stock, is an important item in economical management, and this method of housing, caring for and accounting for material offers a ready and cheap solution of the problem.

CAR INSPECTORS' KINKS.

SECOND PRIZE ARTICLE IN THE CAR DEPARTMENT COMPETITION.

BY A. G. PANCOST, Draftsman, Elkhart, Ind.

The following two kinks may be used to advantage by car inspectors. They are simple but greatly increase the efficiency of the inspector.

CAR INSPECTOR'S PINCHERS.

Few tools used by car inspectors can be put to as many uses as the pinchers shown in Fig. 1. The tool weighs very little

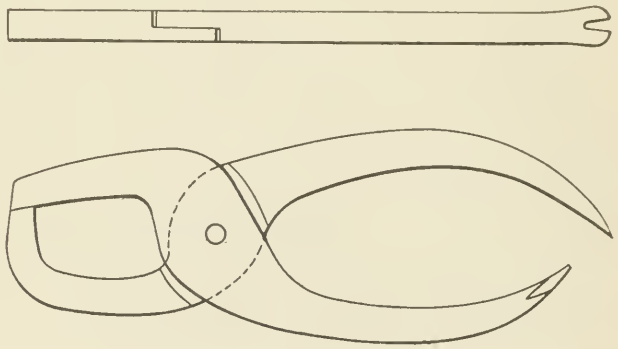


Fig. 1—Car Inspector's Pinchers.

and may be carried in the pocket without inconvenience. The two parts are forged from a good grade of tool steel and may be polished if desired. The end of one part of the handle is tapered to a sharp point, while the other is flattened and shaped for use in pulling tacks. The tool as it is used for removing a rubber gasket from an air or steam hose is shown in Fig. 2. Every inspector is familiar with the trouble that is experienced

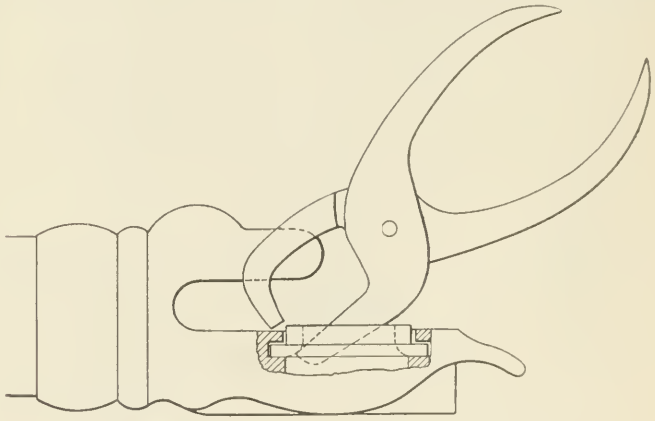


Fig. 2—Removing a Gasket from Air Hose Coupling.

in removing these gaskets, especially old ones, which often stick in the recess. Should any of the pieces of gasket or dirt or scale remain in the recess, they can easily be removed by inserting the sharpened end of the handle and scraping them off. In placing a new gasket in the coupling it is necessary to double it up and force it through the opening, which is, of course, considerably smaller than the overall diameter of the gasket. In some instances the gasket does not fit properly in the recess and kinks up. By placing the nose of the pinchers in the opening in the gasket, as shown in Fig. 3, and turning the tool around several times, pressing down at the same time, the gasket may be spread and forced into the proper position. In replacing

broken glass on cars it is often necessary to remove moldings. This can be done without injury to the molding by the use of the pinchers, as shown in Fig. 4. The tack puller end of the handle can be used to pry up the molding and loosen the brads. The latter can then easily be pulled out. Car inspectors

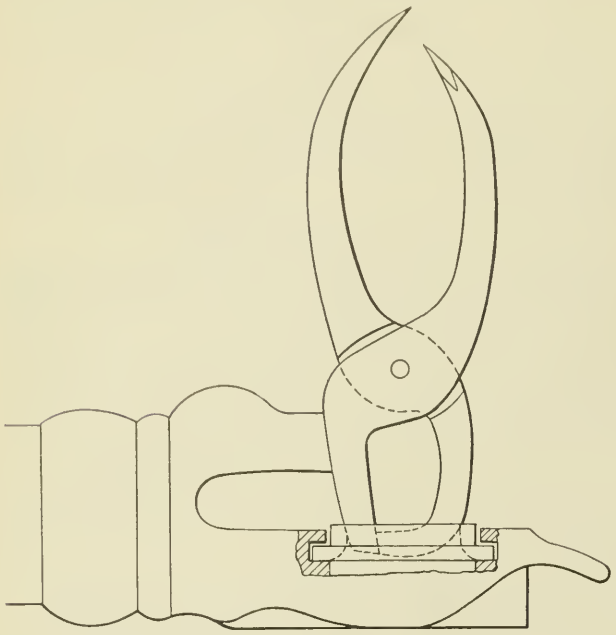


Fig. 3—Forcing Gasket to Seat Properly.

do not like to carry tacks with them. When equipped with these pinchers it is not necessary to do so, for they can easily remove a tack from the side of a car at any time it is needed. Flat places are left on the pinchers so that they can be used to advantage in driving tacks.

APPLYING BRAKE HEADS.

Diamond Special brake beams have heads arranged as shown in Fig. 5. The head is held to the beam by a cast lug, which is

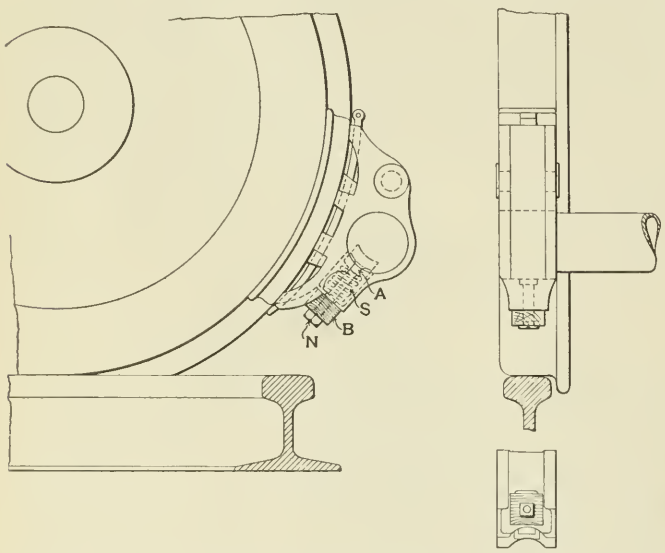


Fig. 5—Simple Method of Applying Brake Head to Diamond Special Brake Beam.

forced into a recess in the beam by a strong spring. The position of the lug when the head and beam are locked is shown by the dot and dash line on the sketch. The usual method of releasing the spring S is to turn the nut N a distance of about 1¼ in. along the threaded end of the bolt, which is fastened to the lug. Even if the nut was in such a position that it could easily be gotten at, this is a tedious job; but considering the angle at which it is set and the short distance between it and the top of the rail, it is almost necessary for a man to lie flat on his back to adjust it. A simple method has been devised for overcoming this inconvenience, so simple that it is strange that it was not discovered sooner. The heads are received from the maker with the lug drawn back ready to slip over the beam. When these are received a wedge is driven in at X to hold

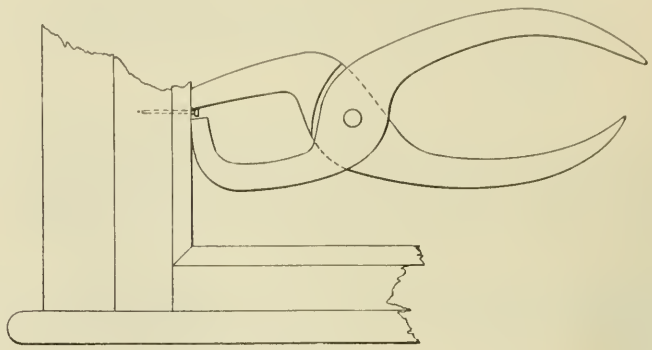


Fig. 4—Removing Brads from Molding.

the lug in this position. The nut is then removed and a block of wood about 2 in. square and 1¼ in. thick and having a ⅝-in. hole through its center, is slipped over the bolt. The nut is replaced and securely tightened. When the head is slipped over the beam the piece of wood is given one blow with an inspector's hammer, breaking it to pieces and allowing the lug to fly into the recess with a snap, locking the brake head to the brake beam.

HOW TO MAKE A TIME STUDY.

BY C. J. MORRISON.

The time study is nothing more or less than a record of the time of each motion comprising any given operation; consequently time studies are as various as are operations. Any trained observer can make a time study regardless of whether or not he understands the operation. Possibly one of the simplest time studies would be that of a man sweeping a measured section of a shop floor and might appear about as follows:

Time in hours. Running.	Elapsed.	Movements.
0.00	0.00	
0.10	0.10	Look for broom.
0.15	0.05	Going to assigned section.
0.45	0.30	Sweeping.
0.55	0.10	Talking to other workmen.
0.75	0.20	Sweeping.
0.95	0.20	Borrowing chew.
1.20	0.25	Sweeping.
1.45	0.25	Away from work in another section.
1.75	0.30	Sweeping.
1.90	0.15	Getting wheelbarrow.
1.95	0.05	Oiling wheelbarrow.
2.05	0.10	Taking up sweepings.
2.10	0.05	Resting.
2.30	0.20	Wheeling sweepings to dump.
Total	2.30	

Area swept, 1,800 sq. ft.

Summary.....1.55 hours useful work.
0.75 hours wasted.

Unless the man who made the time study has sufficient experience to set the standard time, his responsibility would end here and some more experienced man would set the standard for sweeping 1,800 sq. ft.

Another simple time study is that for laborers trucking material. A series of such studies in one shop showed that 1.5 hours was used for oiling each truck each day, and that empty trucks went in both directions. As in this particular shop there was practically always rough material to be trucked in one direction and finished material in the other, there was

no excuse for empty trucks, and in setting the standard time only loads were considered. What constituted a load was also defined. The result was that empty trucks became rare, one oiling a day was found to be sufficient, and, by the use of brains in loading, 1½ to 2 loads were carried each trip.

From these simple studies pass to the more complex, where considerable preliminary work is necessary. Consider the case of operations on an engine lathe. Here it is necessary to know the speed of cut and the feed for every possible combination, the rough and finished dimensions of the work, the kind of material, the tools used, and the condition of the machine. A sample time study would be something as follows:

Machine No. 0425.
Drawing No. 17289.—Material, Cast Steel.

Tools.	Cuts.	Speed.	Feed.
A-11	1	3	4
A-11	2	4	4
B-17	3	6	3

Time in hours. Running.	Time in hours. Elapsed.	Motions.
0.00	0.00	
0.40	0.40	Set up work.
0.90	0.50	Look for blueprint.
0.95	0.05	Set tool.
1.35	0.40	Cutting (1).
1.45	0.10	Look for calipers.
1.65	0.20	Grind tool.
1.70	0.05	Set tool.
1.72	0.02	Caliper work.
2.27	0.55	Cutting (1).
2.57	0.30	Away from machine.
2.59	0.02	Caliper work.
2.79	0.20	Grind tool.
2.84	0.05	Set tool.
3.24	0.40	Cutting (2).
3.34	0.10	Away from machine.
3.74	0.40	Cutting (2).
3.80	0.06	Change tools.
4.50	0.70	Cutting (3).
4.70	0.20	Clean up for noon.
4.90	0.20	Get out blueprint, calipers, etc.
5.00	0.10	Cutting.
5.40	0.40	Wait for helper.
5.70	0.30	Take out work and set on floor.
Total	5.70	

Summary.....3.90 hours useful work.
1.80 hours wasted.

The time study can now be placed in the hands of the trained man, who, with the aid of the data table on this machine, and the blueprint, will be able to set a standard time. After a number of time studies have been made on any given machine and these are tabulated with the actual performances, a trained man can set standard times for work on that machine without the necessity of first making a time study. One well known firm of machine tool builders has for a number of years kept records of time studies and actual performances on their machines, and now make a practice of supplying customers with standard times and operation charts for work on their machines. These times are remarkably accurate, and by following the operation charts customers all over the world have been able to attain the standards set. As an illustration; one purchaser was dissatisfied because the machine purchased took 32 minutes on a certain operation. A blueprint of the work was sent to the builder, who set a standard time of 15 minutes and furnished an operation chart to show how this time could be achieved. A little later the customer reported that the work was being done in 18 minutes, and after a few weeks announced that the average time was 14 minutes.

There is an infinite variety of time studies, but the principles are the same in all. The essential elements are a trained observer, common sense and a stop-watch. A trained observer is not of necessity a man familiar with the business. A young man taken from a stock broker's office made an observer who was able to carry a five or six time studies simultaneously. Time studies made by this man on work with which he was entirely unfamiliar were used in setting standard times that proved entirely satisfactory both to the company and the workmen. His only instructions were: "Take the stop-watch and record the time of every movement." These instructions, combined with common sense are the keynote of successful time studies.

BRAKE HANGER ANGLES.

BY R. W. BURNETT.
General Master Car Builder, Canadian Pacific.

The noticeable tendency of certain wheels to slide, in investigating the causes of wheel sliding, led to a careful consideration of the brake hanger angle. From the results of this investigation, as well as from those of other tests, it can be shown that the standard angle of brake beam hanger recommended by the Master Car Builders' and Air Brake Associations is not the proper angle for service conditions. A moving car cannot be stopped by any force within itself, but must be stopped by a force or resistance applied from some external source. It is not the friction of the brake shoes which actually stops the car; the brakes merely make the wheels hard to turn. It is the resistance of the rail at the points of contact with the wheels which keeps them rolling against the brake shoe pressure. It is this resistance which stops the car. The truck is therefore held back by this force at the rails but is shoved ahead by the momentum of the car body. These two forces acting in opposite directions produce a transfer of load from rear to forward truck, also a tilting or upsetting tendency in the truck itself and a consequent transfer of weight from the rear to the forward pair of wheels directly proportional to these forces, the wheel base of the truck and the height of the center casting of the truck above the rail. This transfer of weight may be calculated as follows:

Let Z = The actual weights of the wheels on the rail (4-wheel truck).
N = Normal weight of a pair of wheels on the rail.
Y = Transfer of weight from the rear to the forward truck.
X = Transfer of weight from the rear to the forward pair of wheels of each truck.

$$\text{Then } Z = N \pm X \pm \frac{Y}{2}$$

Let Y = Transfer of weight from the rear to the forward truck, as above.
H = Height of center of gravity of car body above face of center casting.
B = Distance between centers of center castings.
W = Weight of car body.
P = Ratio of brake shoe pressure to weight of wheel on rail.
C = Co-efficient of friction.

$$\text{Then } Y = \frac{W \times P \times C \times H}{B}$$

Let X = Transfer of weight from the rear to the forward pair of wheels in each truck, as above.
H_1 = Height of center casting above rail.
H_2 = Height of center of gravity of truck above rail.
B_1 = Wheel base of truck.
W_1 = Weight of car body on center casting.
W_2 = Weight of truck.
P = Brake percentage or ratio.
C = Co-efficient of friction.

$$\text{Then } X = \frac{W_1 \times P \times C \times H_1}{B_1} + \frac{W_2 \times P \times C \times H_2}{B_1}$$

Example (Fig. 1):

Weight of car body	70,000 lbs.	= W
Weight of car on center casting	35,000 lbs.	= W_1
Weight of truck	15,000 lbs.	= W_2
Distance between centers of center castings	52 ft.	= B
Wheel base of truck	8 ft.	= B_1
Height of center of gravity of car body above center casting	3 ft.	= H
Height of center casting above rail	3 ft.	= H_1
Height of center of gravity of truck above rail	1½ ft.	= H_2
Ratio of brake percentage to weight	1	= P
Co-efficient of friction	.20	= C

Transfer of weight from rear to forward pair of wheels in each truck

$$= \frac{35{,}000 \times 1 \times .2 \times 3}{8} + \frac{15{,}000 \times 1 \times .2 \times 1.5}{8} = 3{,}187.5 \text{ lbs.}$$

Transfer of weight from rear to forward truck

$$= \frac{70{,}000 \times 1 \times .2 \times 3}{52} = 807 \text{ lbs.}$$

Actual weights. $25{,}000 \pm \left(3{,}187.5 \pm \frac{807}{2}\right) = 28{,}950,\ 22{,}220;\ 27{,}780,\ 21{,}410$ lbs.

Normal weights ..... = 25,000, 25,000; 25,000, 25,000 lbs.

Equalizer spring compression due to the pull of the brake beam hangers must not be considered as affecting the weight of the wheels on the rails. Whatever pull is exerted downward by a brake hanger on a truck is caused by an equal upward pull on

the wheel, and vice-versa. The pressure of the wheel on the rail is therefore unchanged. With unequal weights on the various pairs of wheels under a car during a stop, equal brake shoe pressures on all these wheels will produce unequal tendencies to wheel sliding. The rear pair of the rear truck (4-wheel) will be most likely to slide with the rear pair of the forward

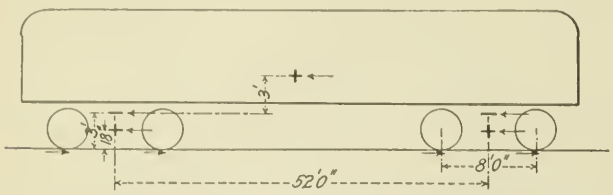


Fig. 1—Diagram of Car Considered in Calculating Transfer of Weight on Wheels Due to Braking.

truck next; the forward pair of the forward truck will be least likely to slide.

When a brake beam hanger is so hung that a line drawn through the centers of its connection pins is at right angles to a line drawn through the center of the brake shoe and wheel, the brake shoe pressure should neither be increased nor decreased by a difference in the direction of motion of the car. This is the present standard practice. If the angle formed by the hanger is greater than 90 deg. on an inside hung four-wheel truck, when the wheel is turning upwards toward the bottom of the hanger the brake shoe pressure will be increased, or when the wheel is revolving downward away from the bottom of the hanger the brake shoe pressure will be decreased. This alteration of the brake shoe pressure due to the varying angles of brake beam hangers is calculated as follows:

Let S = Shoe pressure against wheels.
W = Weight of pair of wheels on rail.
P = Ratio of brake shoe pressure to weight of wheel on rail.
C = Co-efficient of friction.
T = Tangent of angle formed by variation of hanger angle from M. C. B. standard.
Then $S = W \times P (1 \pm C T)$

Example (Fig. 2):

Weight of pair of wheels on rail	=	25,000 lbs.
Ratio of brake shoe pressure to weight of wheel on rail	=	1
Co-efficient of friction	=	.2
Tangent of angle formed with M. C. B. standard (30 deg.)	=	.577
Shoe pressure against wheels 25,000 × 1 (1 ± .2 × .577)	=	27,890 and 22,100 lbs.

When the brake beam hangers on an inside hung four-wheel truck are hung away from the wheels at a greater angle than 90 deg., the brake shoe pressure on the rear pair of wheels of

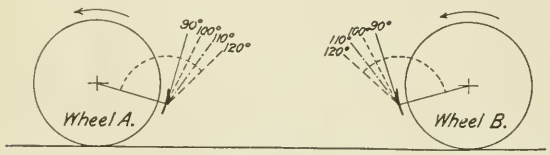


Fig. 2—Illustrating Variation of Brake Hanger Angles.

each truck will be decreased and the brake shoe pressure on the forward pair increased. But as there is a transfer of weight from the rear to the forward wheels in making the stop, if the brake hanger angle is properly proportioned, the alteration in the braking power can be made closely proportionate to the transfer of weight and the liability of wheel sliding will be considerably reduced. The transfer of weight and the alteration of the brake shoe pressure due to the angle of the hanger are alike dependent on the co-efficient of friction, and if calculated for any one co-efficient will be proportionate for all. The comparative brake shoe pressure and weights of wheels on the rail for different brake hanger angles and rates of travel are shown in Table 1. These make the effect of an alteration of the hanger angle very apparent.

The principle of varying the brake beam hanger angle to offset the transfer of weight in stopping may be applied to other types of trucks. The angle of the brake beam hanger on the center beams in six-wheel trucks should always be 90 deg. Outside hung beams on any class of truck should have the beams hung at angles of less than 90 deg. Ample allowance must be made for slack in the hangers, pedestals, boxes, etc., in addition to the wear of shoes and tires, all of which will tend to increase the angle of the hanger in service. The angle assumed should the average angle in service, that is, with the shoes, tires, etc., half worn.

The actual brake beam pressures and the increase or decrease of that pressure due to the friction between the shoe and the wheel and the angle of the brake beam hanger have been considered. This has been tabulated with the transfer of weight due to the retardation of a car in making a stop. There are many conditions which affect the pressure delivered to the brake beam, such as the height at which the brake beam is hung, the angularity of the brake beam hangers as compared to the line of pull of the brake rods, release springs, and transfers of weight in six-wheel trucks due to the pull of the hangers, angularity of brake rods and levers, etc. These should be calculated in designing the foundation brakes, and are not considered here as they have no direct bearing on the transfer of weight nor the alteration of the brake shoe pressures due to the angle of the brake beam hanger.

The principle of varying the standard brake beam hanger angle is a big departure from previous practice. It is most important on passenger equipment. While it will not be advisable to adopt angles quite as radical as the calculations indicate, the general facts outlined are worthy of careful consideration and will be borne out by the past experience of those who have had the opportunity to observe wheel sliding under various conditions of road service and brake hanger angles.

INCREASING SHOP OUTPUT.*

BY W. H. SNYDER.
Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

An important recent addition to our equipment was the installation of a radius planer attachment on a 32-in. planer, for planing links and link blocks. Formerly we filed and straightened all links by hand. All new links and link blocks were shaped or slotted and then filed to a finish. The addition of the radius planer decreased the time required for doing this work and greatly improved the workmanship.

Piece Work.—The introduction of piece work has increased the output. The men we have working entirely on piece work are

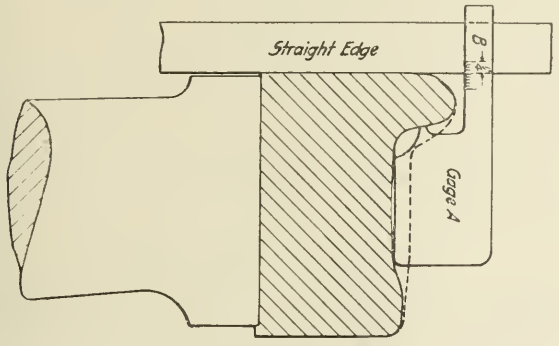
*Submitted in the competition which closed December 15, 1910.

Table 1.

Speed in miles per hour.	Co-efficient of Friction.	Hanger at 90 deg. 1st Pair.	2nd Pair.	3rd Pair.	4th Pair.	Hanger at 105 deg. 1st Pair.	2nd Pair.	3rd Pair.	4th Pair.	Hanger at 120 deg. 1st Pair.	2nd Pair.	3rd Pair.	4th Pair.	
Standing	...	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	Weight of wheel on rail.
		25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	Shoe pressure on wheel.
Up to 10 miles per hour	.2	28,590	22,220	27,780	21,410	28,590	22,220	27,780	21,410	28,590	22,220	27,780	21,410	Weight of wheel on rail.
		25,000	25,000	25,000	25,000	26,340	23,660	26,340	23,660	27,890	22,110	27,890	22,110	Shoe pressure on wheel.
From 10 to 20 miles per hour	.15	27,690	22,910	27,090	22,310	27,690	22,910	27,090	22,310	27,690	22,910	27,090	22,310	Weight of wheel on rail.
		25,000	25,000	25,000	25,000	26,000	24,000	26,000	24,000	27,170	22,830	27,170	22,830	Shoe pressure on wheel.
From 30 miles per hour upwards	.10	26,790	23,610	26,390	23,210	26,790	23,610	26,390	23,210	26,790	23,610	26,390	23,210	Weight of wheel on rail.
		25,000	25,000	25,000	25,000	25,670	24,330	25,670	24,330	26,440	23,560	26,440	23,560	Shoe pressure on wheel.

ambitious and are on the lookout for new ideas which often result in good shop devices.

Turning Driving Wheel Tires.—We have a good system for turning driving wheel tires. The operator can determine before he starts turning just how much he has to take off the tire to make a full flange. With the old system of turning tires at random the wheel lathe operator took a good big cut. When he came to finish it he often found that he could not get a standard flange and it was necessary to take another cut. Sometimes he would get the cut too deep, thereby wasting the tire. Make a gage, A, from No. 16 or 18 boiler steel. Put a line at B corresponding to the standard thickness of the flange, graduating it back about ½ in., as shown. Put a straight-edge across the inside of tire, and read the amount the flange is worn as indicated by the gage. Opposite this amount in the table the depth of cut will be found in column B and the reduction in diameter in column C. If the flange is worn ¼ in., as shown in the illustration, the depth of cut will be 7/16 in. and the reduction in diameter ⅞ in. Caliper the smallest diameter of the tire with the worn flange and close up the calipers ⅞ in., and you are ready to turn off the proper amount accurately and with no guess-work. The table can be printed on good paper with a typewriter and put in a small frame and hung up at the wheel lathe so that it may be referred to conveniently. It has given splendid results in our shop.



A. Flange Worn.	B. Depth of Cut.	C. Reducing Tire in Diam.
1/32 in.	1/16 in.	⅛ in.
1/16 in.	⅛ in.	¼ in.
3/32 in.	3/16 in.	⅜ in.
⅛ in.	¼ in.	½ in.
5/32 in.	5/16 in.	⅝ in.
3/16 in.	11/32 in.	11/16 in.
7/32 in.	⅜ in.	¾ in.
¼ in.	7/16 in.	⅞ in.
9/32 in.	½ in.	1 in.
5/16 in.	17/32 in.	1 1/16 in.
11/32 in.	9/16 in.	1⅛ in.
⅜ in.	⅝ in.	1¼ in.
13/16 in.	21/32 in.	1 5/16 in.
7/16 in.	11/16 in.	1⅜ in.
15/32 in.	¾ in.	1½ in.
½ in.	25/32 in.	1 9/16 in.

Gage and Table Used for Turning Driving Wheel Tires.

The secret of shop output is to get right after the weak points and make a special effort to help the machine or the department that is always behind. Often a slight change of equipment or of method will greatly increase the output of a certain class of work. The successful shop foreman is the one who makes a careful study of the dispositions of the men under his supervision. He must see that his men have sufficient work laid out for them, for the average man is better satisfied if he has plenty of work ahead. If he does not know what his next job is to be he will naturally hold on to the one he has and make it last as long as he can. The successful foreman must also look ahead when he knows of a certain job coming and should get all the information possible pertaining to it. If he is a machine foreman he must get busy and find out what machine the job can best be performed on so there will be no delay when the operator is ready to go on the job.

LOCOMOTIVE BUILDING IN EUROPE.

BY CAPTAIN GODFREY L. CARDEN, U. S. R. C. S.*

The past ten years have witnessed signal advances in locomotive building in Europe. This is especially true in Germany, Sweden, Belgium, France, Italy, Austria-Hungary and Russia. There was a time when American locomotives were necessary to the continental market; that time has passed. Today Europe buys from us when her own shops are unable to meet the demands. In the course of two years' inspection work abroad the writer has visited many locomotive building plants. Practice it was found differed in different countries, but without exception the standards maintained are very high. These standards are generally indicated by state railways' authorities, which in turn means government plans and government inspection.

The question of whether American locomotive works can successfully compete in Europe today rests largely on our ability to construct European designed locomotives at a profit in American shops. On all orders emanating from Europe the foreign railway authorities may be depended on to insist on their own designs and to supplement the designs with specifications of an exacting character.

The greater part of the machine work on European locomotives can be handled by American tools. At the same time there are a number of special tools in service abroad which possess merit. The latter machines are of foreign origin and appear to have been built especially for the locomotive trade.

BORSIG WORKS, GERMANY.

The Borsig Works at Tegel on the outskirts of Berlin employs about 5,300 men, and is one of the best all-round machinery works in Germany. Borsig is turning out 300 locomotives per year; the greatest number built in any one year was approximately 350. It is doubtful if any other works except those at Cassel, Germany, are exceeding this output. Few of the European locomotive works find it possible to devote their entire attention to locomotive building, in other words, to specialize. The Borsig shops, for example, are engaged in building hydraulic presses, steam engines, ice machines, boilers, compressors and locomotives, and yet the tendency at Borsig's is to specialize, for not long ago, it dropped the building of gas engines. However, there was no work in hand more important than the locomotive orders. The Borsig shops are building for Russia, Sweden, Chile, Argentina and the far East. For Argentina, American type locomotives are furnished. By that I mean, the general type of the locomotive is American.

Practically all the locomotives built at Borsig's are of the plate-frame type of construction. These plates are cut out by oxygen-gas tools, the work being done quickly and in a most economical manner. The oxygen-gas tools are obtained in Berlin. At the Breslau shops in Germany hydraulic presses stamp out the plates. The general practice, however, in the German shops is to punch out the plate frames and to finish off with special types of milling machines. Chemnitz and Offenbach machine tool makers are offering special lines of milling machines for this plate frame work. The opinion was expressed by a director of one of the foreign locomotive shops that there did not appear to be available a good American line of heavy vertical millers.

At the Borsig shops and elsewhere in Germany copper fireboxes and copper stay bolts are the rule. These are specified by the Prussian State Railways' authorities.

Building French Locomotives at Borsig's.—At the time of the writer's visit, Borsig was building French locomotives for 1 mark 10 pfennigs (26.2 cents) per kilo (2.2 pounds). Borsig officials declared that they were losing money at this rate. At

*Captain Carden was detailed for two years in Europe as special agent for the Department of Commerce and Labor. His duties required him to report on the general machinery situation, especially with reference to machine tools. During this service he visited several hundred plants. The reports covering these visits are on file in the Bureau of Manufactures at Washington.

the same time they were advised that an order for French locomotives had been taken by the American Locomotive Works at a rate which amounted to 85 pfennigs (20.2 cents) per kilo. It is since understood that the American Locomotive Works was only inconvenienced in respect to receiving essential elements from abroad which the designs specified should be incorporated in the locomotives.

Wages.—At the Borsig works good tool men are expected to make at least 85 pfennigs (20.2 cents) per hour. Two workmen picked out at random were questioned by the shop manager for my benefit as to wages they were earning. One man received five marks ($1.19) per day on an eight hour basis, while the second said he was making about seven marks ($1.66) per day. The manager declared that the first man was not earning as much as the shop permitted. In other words, it is possible to earn seven marks per day if a man puts forth the effort.

Fireless Locomotives.—Fireless locomotives form an important part of the construction work at Borsig. So far as the writer knows this type of engine is practically unknown in America. The fireless locomotives use superheated water and when leaving a charging station the pressure is 170 lbs. At the Borsig Works one of these fireless locomotives was in almost constant service throughout the day and I was informed that it was only necessary to connect up twice during the working hours with the boilers of the power plant—in the morning before work commenced and again during the noon hour. Connection was made with the plant to the front end of the locomotive through flexible pipe and about fifteen minutes sufficed to charge. These are in much demand in Scandinavian logging camps and are especially recommended where insurance might be prejudiced through the use of electric or fuel-fired engines. It was found in practice that even at pressures of one to two atmospheres considerable work could be accomplished and at a pressure of one-quarter to one-half an atmosphere the engine was still able to go to the filling tank. The Borsig engine which I had occasion to examine while in service seldom required to be filled oftener than once in four hours.

HANOVER LOCOMOTIVE WORKS.

The Hanover Locomotive shops employ about 3,300 men. These works have built more than 5,000 locomotives, and their latest type of high-speed passenger engine is specially well spoken of. It is known as the Atlantic type and resembles closely the American locomotive of the same class. In this type one observes the bar-frame construction, but generally speaking the plate frame form is adhered to. The Hanover shops apparently build as many bar frame engines as they do plate frame, while Borsig's build more plate than bar. Borsig, however, supplies bar frames when his customers prefer them, but says that he has not found it necessary to provide special tools for the purpose of making bar-frames, which would indicate that plate-frames can be made with the same tool equipment as bar-frames.

The Hanover shops are sending about 30 per cent. of their locomotive output abroad. To the year 1907, when locomotive No. 4800 was completed, 22 per cent. of this company's output was for foreign countries.

Lentz Poppet-Valve Gear.—For all high-speed engines for the Prussian State Railways the poppet valve gear of the Lentz type* is used. I was assured by the Hanover Works that there was a saving of not less than 20 to 25 per cent. when a comparison is made between the poppet valve gear using superheated steam and slide-valves operating with saturated steam. One high-speed locomotive of the Prussian State Railway had already run 60,000 miles using this type of valve gear. Twenty-three engines of the International Works at Vienna had this type of gear installed on all the high pressure cylinders and in one year's time the entire cost of the change was saved in coal consumption. The management of the power plant of the Leipsic Street Car Railways not long ago, it was stated, converted four steam engines and equipped five boilers with superheaters; as a result of the utilization of the poppet valve gear with superheated steam 48,350 marks (about $12,000) was saved per year.

The Hanover shops are using the Pielock type of superheater with the Lentz poppet valve gear. It was stated that the introduction of this type of poppet valve was brought about largely because of the obstacles arising from using superheated steam. The Prussian State Railways are not using superheaters with compound arrangements. This is, however, at variance with the views of the engineers at the Hanover shops. From what I can learn, the success of the poppet valve gear has proved so great from an economical standpoint that it is now quite common for locomotives in service to be altered and provided both with superheaters and poppet valve gears. The change necessitates a new cylinder, as well as valve chest, since the poppet valve box and cylinder are cast in one piece.

Wages.—At the Hanover shops expert men at the machine tools receive on an average 70 pfennigs (16.6 cents) per hour, which is about 15 pfennigs (3½ cents) less than the men at Borsig's are paid. The Hanover shops own about 150 houses, which are rented at an average of 15 marks ($3.57) per month. The income is sufficient to keep up repairs, and no attempt is made to derive a profit.

OTHER GERMAN LOCOMOTIVE WORKS.

The Hohenzollern A. G. Locomotive Works are located near Düsseldorf and employ about 1,400 men. The plant is turning out about 140 locomotives a year. These shops employ plate-frame construction almost exclusively, and all plates are cut out by punching machines. Pielock and Schmidt superheaters are used, but I could not learn of any special valve gear being employed. This firm is building for Scandinavia and Indian railways.

Still other locomotive shops in Germany are those at Cassel, Breslau, Altoona and Munich. The Schwartzkopff shops are not far from Berlin and the general practice there resembles closely that at Borsig's.

Wages.—At the Hohenzollern Works expert tool men receive about 70 pfennigs (16.6 cents) per hour. The rate paid in the Berlin territory is higher than elsewhere in Germany. The lowest rate paid is in the Chemnitz district, where expert machine men seldom receive over 50 pfennigs (11.9 cents) per hour. The rates in the Rhine territory and in the Hanover district are about equal, namely 70 pfennigs (16.6 cents) per hour for good machine tool men.

LOCOMOTIVE DEVELOPMENT IN GERMANY.

During the past five years locomotive development in Germany has tended toward higher speeds and greater economy. The general increase in the size and power of locomotives is due to continental traffic conditions. Superheaters appear to be coming more and more into use. On the Prussian State Railways the authorities have limited the maximum steam pressures to 170 lbs. In Saxony and Bavaria four-cylinder compound locomotives are much in vogue, and some of the lines have been experimenting with this system in connection with superheaters. Balanced compounds are much liked abroad, due to ability to construct a stronger engine frame.

There has been little change in the matter of finish and form on the continent for a number of years, and the opinion is general that the standards exacted are onerous. The German locomotive builders found the recent French contracts especially hard. Many of the parts were required to be case hardened and the designs called for slide-valves of a particular kind of bronze. The standard metal which could be supplied readily and easily, and which the experience of years had indicated was excellent, would not suffice. It was almost a universal comment in Germany that the French when they prepared their designs

*The Lentz poppet valve gear has four valves; two on the inside for admission, and two on the outside for exhaust. They are actuated by a cam rod and are weighted by springs. They have given good service at high speeds, working safely and exactly at three hundred revolutions per minute.

had plenty of money to spend. Where a standard German design would require only one slide bar, the French, it was pointed out, had managed to incorporate four slide bars. I asked one German director if his firm expected to make much money on these contracts. His reply was: "We shall at least gain considerable experience and shall know what to expect when we take a second contract." There is no question that the finish and form demanded abroad is expensive, but the trade apparently demands it.

It was my practice whenever opportunity presented to chat with the engineers of the high-speed locomotives of the Prussian railways. These men are for the most part clever and intelligent, and exhibit a certain self-reliance which may be expected of men in their calling. They invariably praised the poppet valve gear and declared that it gave no trouble and where used with superheated steam, was a great saver of coal. The Prussian engineers regard briquettes as poor fuel for high-speed locomotives, declaring that they pack too hard on the fires and do not permit of the spread which can be obtained with loose coal. The Metcalf feed-water heater seems to be in general service throughout Germany. The Hanover shops, however, are developing a new type of feed-water heater, from which much is expected.

In counter-distinction to the German practice, the Belgians seem to favor non-compound engines with superheaters, and this form of engine is common in the express locomotive service. For freight engines the Belgians are utilizing the two-cylinder non-compound engines with superheaters.

Germany is exporting approximately 400 locomotives per year. In 1907, for example, Germany exported 395 locomotives. This number was absorbed by Belgium, France, Italy, Russia-in-Europe, Turkey-in-Asia, Southwest Africa, Prussia, Egypt, India, East Indies, Argentina and Chile. For 1907, France took 555,500 lbs.; Italy, 504,460 lbs.; Egypt, 594,600 lbs.; Chile, 449,460 lbs., and Argentina, 446,160 lbs. Egypt took more than any other country, followed in order by France, Italy, Chile, Argentina and Russia-in-Europe.

FRANCE.

At Le Creusôt in France, Schneider & Company are building some of the best engines of French design. This firm is to France what Krupp is to Germany, that is to say, Le Creusôt is the great ordnance establishment of France. In addition to building guns these works also construct both marine and stationary engines, railway equipment and locomotives. The shops at Belfort will turn out more locomotives in a year doubtless than Le Creusôt, but for high grade work, there is nothing finer in France than is produced by Schneider & Co.

SWITZERLAND.

The Swiss Locomotive Works at Winterthur employ about 1,800 men. This is one of the best locomotive shops in Europe. Its engines are sent to all parts of the world, and it is doubtful if there is a higher finish to be found on any European locomotive. This firm is about to undertake bar frame construction, and at the time of my visit the first set of bar frames had just been received. These frames were of forged steel and were received from Germany. Among the engineers in charge of departments was one gentleman who saw service in the Baldwin Locomotive Works for several months and whose observations on the general locomotive situation were among the best I have heard in Europe. In fact, those engineers whom I met at the Swiss Locomotive Works impressed me as being of very high order. A large number of American machine tools were in use in the Winterthur shops. I also observed a number of the heavier types of English tools. English tools ten years ago formed the major complement of most of the continental locomotive works, but in recent years few English tools are going into these shops. When new tools are obtained, they are almost invariably of German or American origin. There are a few English tools which are offering sharp competition to American machines. I refer particularly to Herbert of Coventry; Smith & Coventry of Manchester, Darling & Sellers of Keigley; Kendall & Gent of Manchester, and Richards of Broadheath.

The three-cylinder compound engine has not been tried to any great extent on the continent, although the Jura-Simplon Railway, which is now the Swiss Federal Railway, has several mogul engines of the three-cylinder compound type at work. This same railway has mogul engines of the four-cylinder compound type. The special three-cylinder compound type of engine which was in use in the United Kingdom for a number of years has now entirely disappeared. So far as could be learned superheaters have not been applied abroad to Mallet locomotives.

ITALY.

At the Breda Locomotive Works in Milan the force employed numbers approximately 4,500; of this number about 2,000 are engaged in the locomotive department in Cittá. Breda is turning out a new high-speed locomotive, designed for a speed of 120 kilometers (74.5 miles) per hour. It is a beautiful four-cylinder machine working compound and operating four cranks. The compounding is independent for each side. Superheat is not used. About 40 of these engines have been turned out for the Italian State Railways. Krupp and Bochum furnish practically all the wheels and axles used. As elsewhere in Europe, copper fireboxes and copper stay bolts are the rule. Here, as in German shops, one is impressed with the great amount of unnecessary work. In the finishing shops no less than 12 applications of paint and varnish follow filling. All this filling, varnishing and painting, that is to say the exact number of applications, are fully prescribed by the state engineers in the specifications.

Breda bores all six cylinders on the new passenger locomotives simultaneously. He makes his own boring tools and turns out a gang of horizontal borers designed, as above stated, to take the two high-pressure and two low-pressure cylinders and piston-valve chamber simultaneously. All the plate-frames at Breda's are worked with triple slotting machines. I observed no oxygen-gas cutters or hydraulic presses in use for stamping out frame parts. I saw but very few German tools in these works. The foundry is turning out especially fine cylinder combinations, readily made and in one casting. Only plate frame form of construction is used and the steel comes both from Germany and Italy. The Breda firm is representative of modern and progressive Italy. Workmen receive about 40 centimes (7¾ cents) per hour on an average throughout the year, ten hours comprising the working day. The men are working fast, and there is a care and attention bestowed on the locomotive work in keeping, almost, with some of the best work I have seen in automobile shops. No superheaters are used. Breda builds almost entirely for Italy, as the firm finds it difficult to compete abroad with the Germans. A few locomotives, however, have been built for Denmark and Roumania. The new engines for the Italian State Railways are using the highest steam pressures on the continent, 235 lbs.

The first cog-wheel railway of the Abt system in Germany was opened in the Harz mountains 25 years ago. This anniversary is called to mind by a list of the principal railways, or parts of railways, of that system now existing. There are 55 such lines, with an aggregate length of 288 miles, on which the cog-wheel is used; the engines are made to run by friction where the lines are level enough. There are 7 in South America, 1 in Australia, 1 in Japan and 2 in India. The only one in this country is the line up Pike's Peak, which reaches a greater elevation than any other. There are 317 Abt locomotives on these lines, the smallest weighing but 5,400 lbs., while on the Transandine railway is one weighing 92 tons. The inventor, Roman Abt, still lives in Lucerne, Switzerland, and has held important positions on the Swiss railways.

PICKED UP ON THE ROAD.

BY GULF.

I was talking with the manager of a large machine tool works the other day, and he was half deploring, half wondering at the reason why, in all of his experience, no graduate of a technical school had ever developed into a first-class designer, whereas a number of just plain boys, out of the high school, who wanted to work at mechanics had evolved into brilliant successes. His solution was that it was not because boys with a natural aptitude for the work did not go to technical schools, but because when they did go they were so imbued with ideas of their own high value that they failed to realize the fictitiousness of that value until they had been ripened by experience and so had not the patience to continue their preliminary training in the hard school of shop routine at ten dollars a week until they were worth more.

It may as well be said of the engineer and designer, as of the poet, that he is born not made, for there is something that must be inate in the heart and soul and mind of a man that enables him to instinctively detect the eternal fitness of things and so blend the hard calculations of the pencil with experience and what seems right, that the product shall be not only a mechanical but a commercial possibility. It is this lack of mechanical instinct that bars many a trained engineer from being a success as a designer; just as it is the failure to appreciate the commercial necessities of a problem that has prevented hundreds of natural born mechanics and prolific inventors from being little more than a charge on the public and their friends. It certainly is not all training that makes a successful engineer, but that peculiar combination of adaptability, which, in one form or another, makes for success in every walk in life.

From this talk and the criticism of the various aspects of technical education that we see and hear, I am led to fear, though I hope my fear is unfounded, that the faculties, individually and collectively, are open to the same criticism that I offered years ago regarding similar bodies of academic colleges. This was to the effect, that they utterly disregarded the teaching of experience, or rather barred experience from any entrance or effect on their own life and teachings. When a sensible builder of steam engines sends out a sample of his wares, he follows it up and learns of its performance, and so changes his later designs that he overcomes the difficulties and defects that were found to exist in the earlier ones. The academic professors never did anything of the sort. They taught Latin and they taught Greek in the same way for fifty years; and they taught Latin and Greek utterly regardless and oblivious of the good or ill effects that it might have on their pupils or victims. They never knew and seemingly never cared whether Latin and Greek were universal panaceas for all mental weaknesses, or whether their students left them only to curse them for their stupid bigotry that could not see that every boy did not want the same mental dose any more than every sick man needs a dose of the same physic. In short they did not know the value or lack of value of their own teachings. Their universal advice to rich and poor, brilliant and stupid, linguist and mathematician, was to come to us and be filled or stupified, according to its effects, by the dope we have to offer. Is it possible, then, that the teachers in the technical schools are falling into the same pit? Do they never see that it will be as impossible to make engineers out of some boys as it is to make the mythical silk purse from ear of a sow? Do they ever take such a boy aside and try to indicate the path he should follow, even though it may be depart from their own specialty? If they do not; are they not at fault? Are they not disregarding what experience should have taught? Are they not showing that it is fair to presume that they are ignorant of the value of their own teachings? Fortunately many of them have awakened, or are awakening to their responsibilities and the possibilities of good that it is in their power to accomplish. The imperative need is for more men of the type of Prof. Herman Schneider, of Cincinnati, who has done such splendid work in introducing the co-operative courses in the engineering department at the University of Cincinnati and of introducing the continuation school (*Railway Age Gazette,* May 6, 1910, page 1171 and January 6, 1911, page 27) in connection with the public school system.

PIECE WORK NOTES.

BY HARRIE R. HAMER.
Piece Work and Shop Methods Office, Canadian Pacific, Angus Shops, Montreal, Can.

The workman must be in charge of a machine that will do his ability proper credit. The foreman must see that the machinist does not have to look for work, and must find it for him. The men should not have to hunt for bolts or tools with which to clamp a job in position. Bolts and nuts used for clamping purposes, especially for repetition work, should be placed in charge of a tool man, whose duty it is to replace any that require repairing. I have seen men waste from 10 to 15 minutes looking for a couple of bolts. I have seen them pick up a bolt with a damaged thread, and if it was the required length, go to the tool stores for a set of dies, and run over the thread, using another man's vise while doing so, thus keeping the vise-hand from working, as well as leaving their own machines at a standstill. Even with an apprentice, this sort of thing should not be tolerated. Can an expensive machine pay its owner by standing idle for 10 or 15 minutes, at intervals? Emphatically, No!

If a machine is not good, then it obviously cannot give good results, and it will pay the owner to instal a good one. Penny wise and pound foolish is an old adage the results of which I have observed in many shops.

Apprentices should understand from the outset that the employer's interests are also their own. They should learn to read a working drawing correctly and readily, and if they take an interest in their work let them have plenty of scope in which to prove their ability. Boys should not be kept on one machine for 12 months, as I have seen done, but should be moved about, thereby not only interesting them in their work, but also making them of some account on the productive force.

Demonstrators are a great factor in the success of the system and must be interested in their work. They must be capable of actually demonstrating to the men in the shop what is to be done and the best method of doing it. A demonstrator is placed in the shop to demonstrate shop methods—not as an ornament. He must possess tact and initiative. A demonstrator who would rather sit in the office than be in the shop, cannot possibly be interested in his work, therefore, the best results are not to be expected. To be effective he must be a man of action.

Another factor which materially affects a piece work system is the question of belting. How often is a machinist, whose machine is belt driven, to be seen standing idle (not only the man, but the machine) whilst waiting for a broken belt to be repaired. The matter of belting, therefore, calls for a good belt upkeep and repair system. I have noticed with interest the rapid progress in this direction which the Tabor Manufacturing Co. has made.

A successful piece work system thus depends on several factors, which are not always given the attention they deserve. These details must receive proper consideration or the system will not be a thorough success.

During the past 30 years the total mileage of electric railways in the United Kingdom has increased from about 300 to 2,562 miles. The capital expenditure has increased from $20,475,068 to $359,837,083, the number of passengers carried from 146,000,000 to 2,743,000,000, and the net receipts from $1,123,947 to $24,068,672.

Shop Kinks.

Five of the eighteen collections of shop kinks, which were submitted in the competition which closed January 15, are reproduced on the following pages. The first and second prize articles and one other were published in the issue of February 3.

ELIZABETHPORT SHOPS; CENTRAL RAILROAD OF NEW JERSEY.

BY FRANK J. BORER.

Foreman, Air Brake Department, Elizabethport, N. J.

Credit also due to William Alter, General Foreman Car Department.

SAND BLAST MACHINE.

A sand blast machine, mounted on a low four-wheel truck not shown on the drawing, is illustrated in Fig. 43. This machine has been in use for two years and has sand blasted about 1,600 steel coal cars and 100 engine tenders. Two laborers can

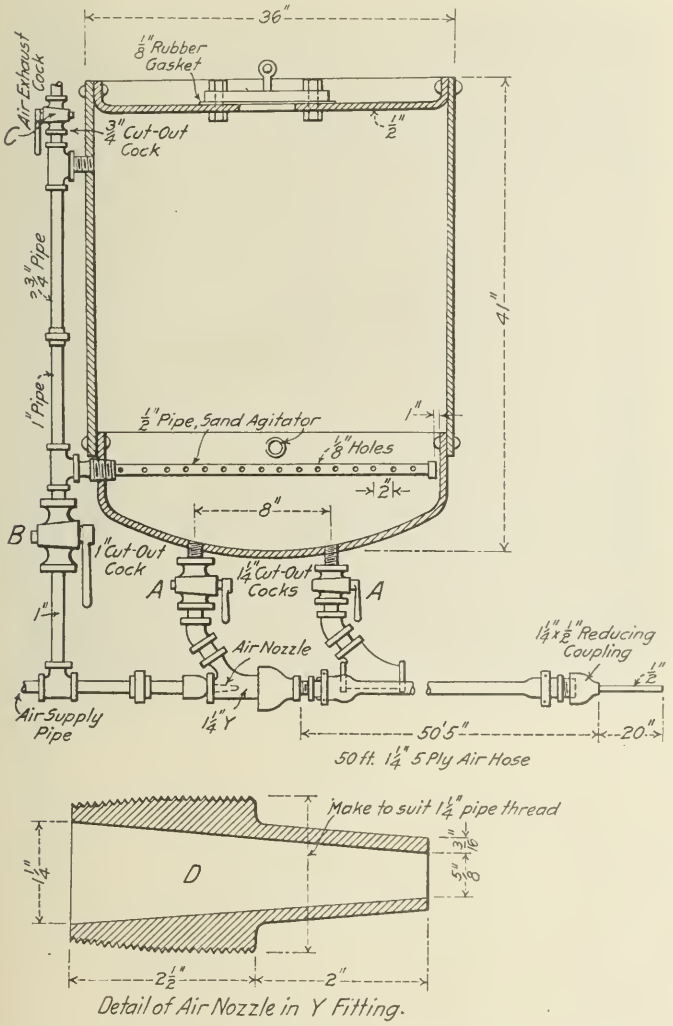


Fig. 43—Sand Blast Machine for Cleaning Steel Cars and Locomotive Tenders.

sand blast a steel car complete in less than half an hour. The machine is operated by compressed air at from 80 to 90 lbs. pressure. The 1¼-in. cut-out cocks A regulate the flow of sand from the machine. The cock B is always open while the machine is in operation. The ¾-in. cut-out cock C releases the air pressure from the tank when the work of sand blasting is discontinued, or when it is desired to refill the tank with sand. In order to agitate the sand so that it will flow freely into the two outlet pipes, air is forced into the tank through the two ½-in. pipes near the bottom, which have ⅛-in. holes drilled in them. Unless this provision is made all of the sand will not flow out of the tank, particularly if it is at all damp. Air also enters the tank through the ¾-in. T just below the cock C. It also flows through the nozzle D in the 1¼ in. Y and joins the flow of sand from the tank, thus forming a partial vacuum in the Y fittings, causing the sand to flow uniformly in the proper quantity, and at a velocity that will give the most efficient results. Hard crystal ore sand gives the best results, although any sharp sand of medium fineness may be used. We have used the same sand several times, but find that it does not cut well after the third time. After it is useless for air blast purposes, it may still be used to advantage on locomotives. The screen shown in Fig. 44 is used when it is desired to use the sand a second or third time. It will pass through the screen and funnel into the tank as fast as two men can shovel it.

The track used for this work should be so arranged that the cars or engine tenders to be sand blasted will run to and from the sand blast machine by gravity, thus making the use of a special engine to shift the cars unnecessary, or doing away with the slow method of pushing the cars with pinch bars. In order that no time may be lost in refilling the tank of the sand blast machine, an old box car has been rebuilt and is used as a sand storage car. It is filled with sand at the sand house by means of two drop doors in the roof of the car. Two

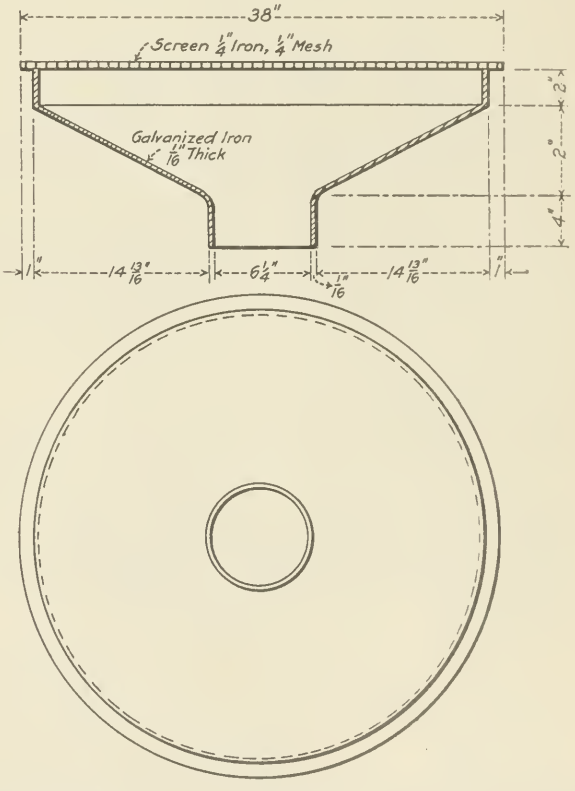


Fig. 44—Screen and Funnel for Filling Tank of Sand Blast Machine.

pockets or hoppers are provided in the car, each holding about 10 tons of sand. Two small sliding doors are placed on one side of the car, through which the sand may be run directly into the tank of the sand blast machine. To open or close the inlet to the tank, it is necessary to remove or replace six 1-in. nuts and the cover plate. As there are two separate sets of air inlet and air and sand outlet pipes, which are independent of each other, two men may sand blast different parts of the car at the same time, which is an important advantage.

Before the sand blast was used for removing the rust and old paint from cars and tenders, we used steel brushes, scrapers, revolving steel brushes operated by air motors, and other devices, but with very little success. They do the work only half as well and require twice the time. The most important places to be scraped and cleaned, which are around the rivet heads and at the angles and joints, could not be cleaned at all, or not very well, with these devices. The sand blast machine is simple to operate and cleans the steel around the rivet heads and in the joints and corners thoroughly. Two men can sand blast a car at the same time, one working on each side. Because of the agitator in the tank, damp or partly wet sand will not interfere with the working of the apparatus. The supply of sand to the hose is uniform and there is no waste of either sand or air. The machine is also used to advantage for sand blasting the brass trimmings from passenger cars, these parts thus being given the appearance of statuary bronze or old gold.

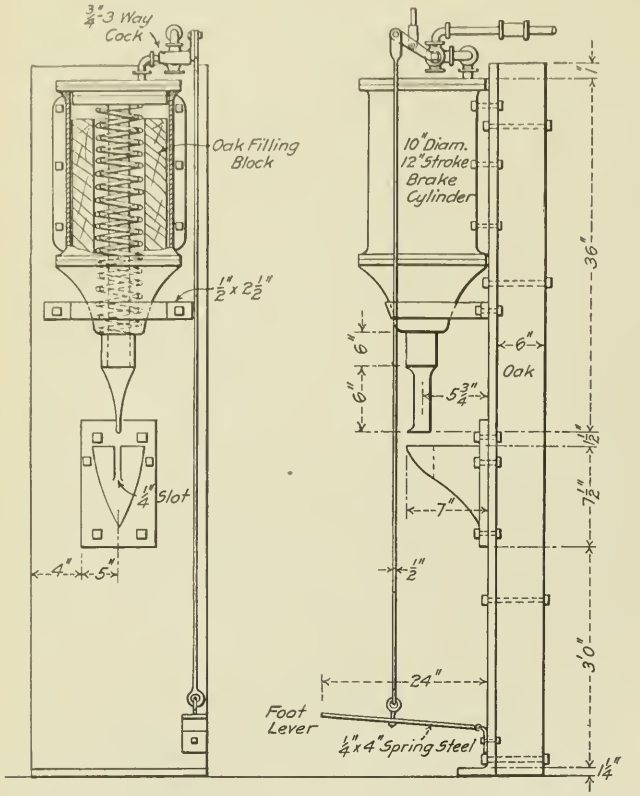


Fig. 45—Air Operated Machine for Cutting Air Hose Clamp Bolts.

STRIPPING AIR HOSE.

The apparatus for stripping the fittings from air brake and steam hose shown in Figs. 45 and 46 has caused a saving in time of from 60 to 70 per cent., and a saving in air hose clamps of from 20 to 30 per cent., as compared with the methods formerly used. By means of the air hose clamp bolt cutting machine shown in Fig. 45, and the stripping machine shown in Fig. 46, an ordinary laborer can cut the bolts and remove and assort all the fittings for 100 air brake hose per hour, and this without injury to the fittings. We have stripped about 45,000 air brake and air signal hose and 2,000 steam hose with this apparatus, which was constructed about a year ago. The bolts which hold the clamps are first cut on the machine which is illustrated in detail in Fig. 45. It consists of an old 10-in. passenger car brake cylinder fitted with a plain head. Air is admitted to

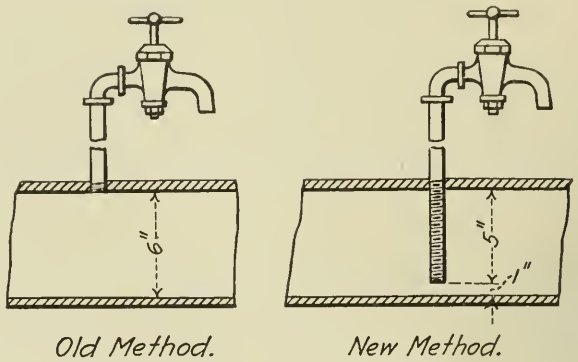


Fig. 47—Improving the Water Supply to the Shop Faucets.

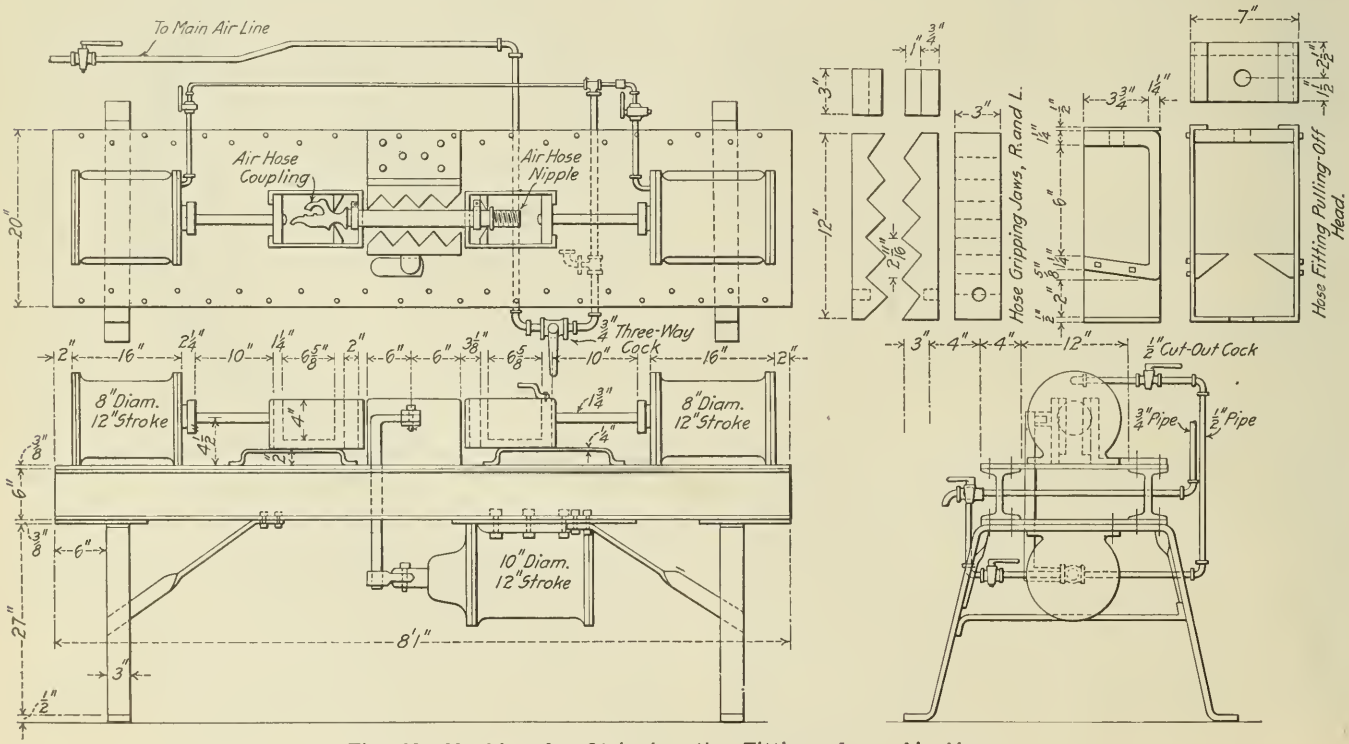


Fig. 46—Machine for Stripping the Fittings from Air Hose.

the upper end of the cylinder through the ¾-in. three-way cock, to the handle of which a coiled spring is attached from above. The spring, which is not shown in the drawing, automatically returns the three-way cock to the release position as soon as pressure is removed from the foot lever. The standard brake cylinder piston release spring returns the piston to its upper position after each stroke. The stroke is limited to 2 in. by the oak filling block which is 9¾ in. in diameter and 10 in. long, with a 6-in. hole through the center for the piston rod and the release spring. The frame which supports the device consists of two old 1¼-in. by 5 in. arch bars, which are backed up by two pieces of oak, 6 in. square. The upper part or shank of the chisel which cuts the bolts fits over the end of the piston rod and is held in position by a ⅝-in. set screw which is not shown.

After the clamp bolts have been cut, the hose is placed in the stripping machine, shown in Fig. 46. By operating the three-way cock air is admitted to all three of the air cylinders at the same time. The forked end of the piston rod of the air cylinder underneath the table is connected to a lever which operates the clamps that grasp the hose firmly near its center. At



Fig. 48—Turning and Boring a Cylinder Bushing in One Operation.

the same time the pistons of the two cylinders at either end of the top of the table move outward, pulling off the air hose coupling, nipple and clamps. The three-way cock is then placed in the release position and the pistons of all three cylinders are forced to their normal positions by means of the ordinary brake cylinder piston release springs. A filling block 4 in. thick has been placed in each of the two top cylinders to shorten the stroke; the blocks are cut out at the center to make room for the piston and release springs. The two top cylinders are old 8-in. freight car brake cylinders and have been fitted with plain heads on both ends, one head being fitted with a packing nut and stud to allow the 1¾-in. piston rod to pass through it. The outer end of the piston rod is threaded for a distance of 2 in. to take the heads which fit over the hose coupling and nipple.

WATER SUPPLY TO SHOP FAUCETS.

We had considerable trouble with the water supply from the main water pipe to the ½-in. faucets in the shops. This was due to the fact that the main water pipe runs parallel and close to the main steam pipe, and also because the water main was tapped at the top. After opening the faucets we would obtain dirty and greasy water. The method of taking the supply from the main water pipe was changed, as shown in the accompanying sketch, Fig. 47, thus overcoming the difficulty.

WAYCROSS SHOPS; ATLANTIC COAST LINE.

BY R. E. BROWN.
Machine Foreman, Waycross, Ga.

BORING AND TURNING CYLINDER BUSHINGS.

A method of boring and turning cylinder bushings at one operation on a vertical boring mill is shown in Figs. 48 and 49. The rough bushing is made 4 in. longer than the cylinder, with a flange at one end for clamping. After clamping it to the

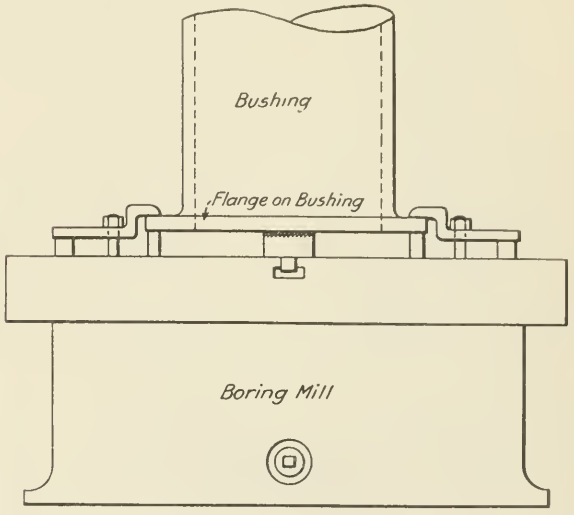


Fig. 49—Cylinder Bushing Clamped to Boring Mill Table.

table one head of the boring mill may be used for turning and the other for boring. This requires about one-half the time of the old method and eliminates any liability of the bushing being sprung out of round.

FINISHING TRUCK WHEEL CENTERS ON A BORING MILL.

Blocks for holding the truck wheel centers on a boring mill table are shown in Fig. 50. Four of these are fastened to the

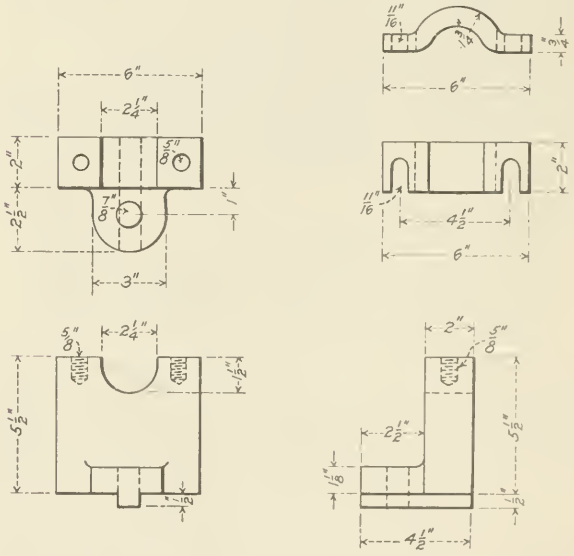


Fig. 50—Blocks for Centering and Clamping Truck Wheel Centers on a Boring Mill.

table by bolts through the flanges and are set in a circle 90 deg. apart. The tongues on the bottom of the blocks fit in the slots in the boring mill table. The wheel is dropped on the

blocks, the spokes resting in the depressions, and is clamped to them by adjustable clamps which fit over the spokes. The wheel requires no further setting, as the blocks in which the spokes fit bring it central. Our wheels have eight spokes. For wheels having an odd number of spokes, or a number not a multiple of four, the block could be bolted in the proper position on a plate which could in turn be secured to the boring mill table.

MACHINING THE OUTSIDE OF SOLID ROD CUPS.

A device for machining the outside of solid rod cups, rocker arm bosses, etc., on a drill press, is shown in Fig. 51. The

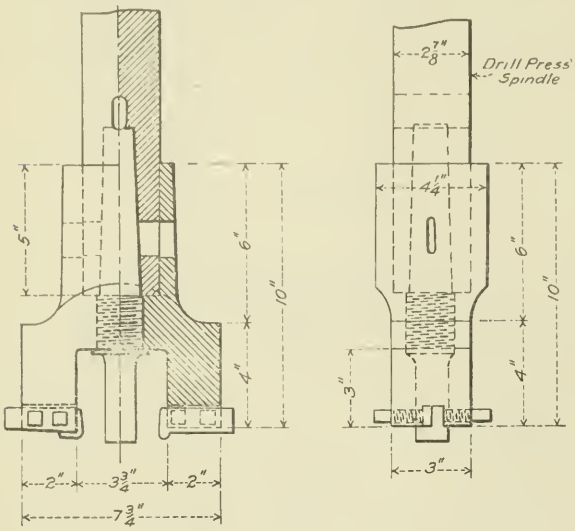


Fig. 51—Tool for Machining the Outside of Solid Rod Cups.

sleeve at the upper end fits over the drill press spindle and is held in place by a flat taper key. The forked end is milled at the ends of the two forks to take ½ in. by 1½ in. tools which are secured by set screws as shown. One of the tools is made

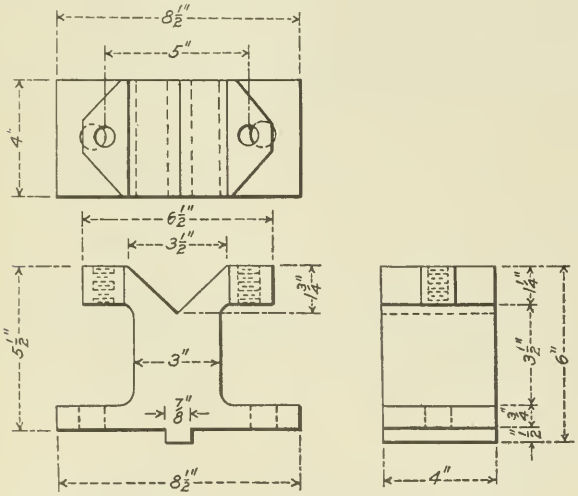


Fig. 53—Ordinary V-Block for Use on a Crank Planer.

with a straight face for finishing the rod at the bottom of the cup, and the other is rounded for the finishing cut and filleting. The tool with the straight face at the bottom is set a little in advance of the other tool and takes a roughing cut on the side of the cup as it is fed down, the other tool following it with a finishing cut. Cups may be finished on the outside in fifteen minutes with this tool. A pin may be placed in the center of the tool, which will act as a guide and furnish stability during the operation. Different sizes of these pins may be used for different classes of work; in turning a cup or boss a hole is first drilled for the insertion of the pin. The tool may be used with or without the pin, as the nature of the work requires.

V-BLOCKS FOR PLANING CROSSHEADS ON A CRANK PLANER.

V-blocks used for supporting and clamping the piston rod when planing crossheads on a quick return stroke crank planer are shown in detail in Figs. 52, 53 and 54. They are of simple design, one being an ordinary V-block and the other having an overhang of some 10 in. to provide a more rigid support. Any

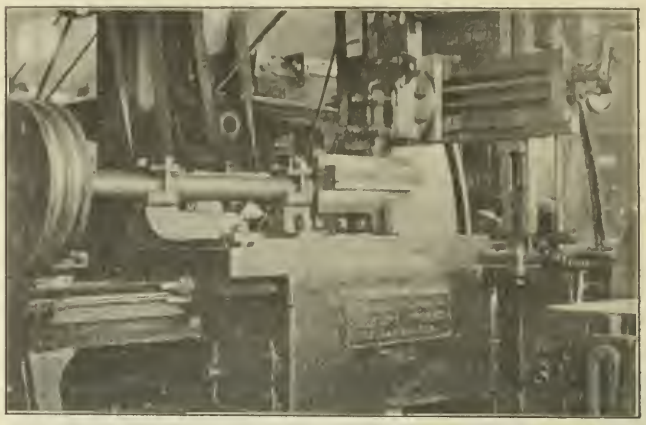


Fig. 52—V-Blocks for Supporting and Clamping the Piston Rod When Planing Crossheads.

style of crosshead may be used with them, and as the crank planer is much quicker in movement than other types of machines, it is evident that much time may be saved. These blocks

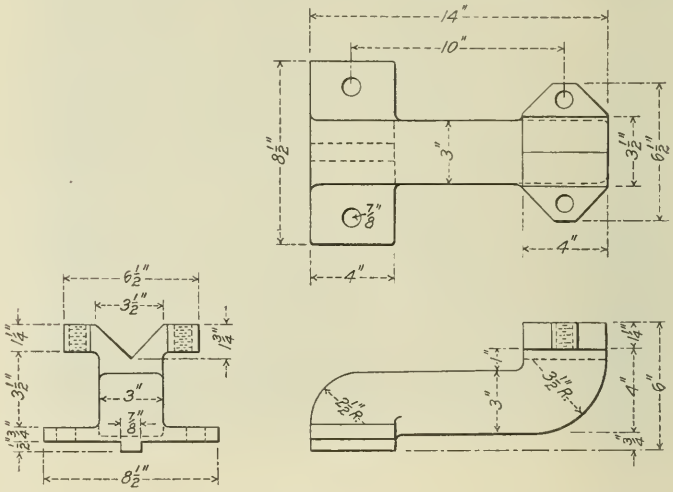


Fig. 54—Overhanging V-Block for Use on a Crank Planer.

are made of cast iron. The crossheads are planed with the piston rods keyed to them to insure perfect alinement with the rod. A master bar cannot be used because of the difference in taper and the size of holes for the piston rod fit on different classes of locomotives.

SUSQUEHANNA SHOPS, ERIE RAILROAD.

BY H. L. BURRHUS.
Assistant to General Foreman, Susquehanna, Pa.

FIRE RAKES.

Dies and tools for making fire rakes in three operations, after the iron is cut to shape, are shown in Fig. 55. The machine for bending the handle is shown at the lower part of the illustration. A roller A is fastened to the wheel under the bed plate, which is turned by admitting air to the cylinder C, causing the pin or roller A to travel around in the grove B. A rod is placed between A and D and is bent into proper shape for the handle when the above operation takes place. A stop, not shown on the drawing, is placed just beyond the letter B to

gage the proper length of stock for the handle. The hot iron must first be bent slightly so that the straight portion of the bar will fit between the two parallel bars that are riveted to the top of the table, while the hot end extends between A and

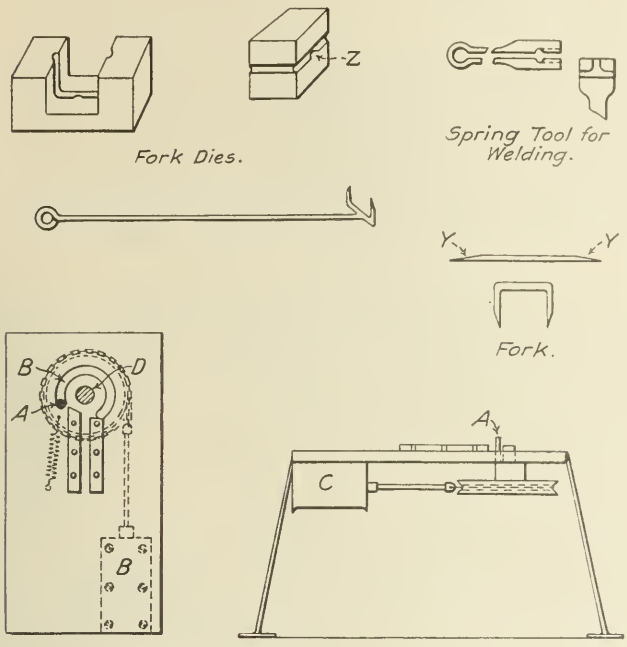


Fig. 55—Tools for Making Fire Rakes.

D and rests against the stop. A spring attached to the wheel under the bed plate quickly brings the roller A back to the initial position after the handle is bent.

The hook or fork part of the rake is sheared to the required length with the ends pointed as shown. It is then bent in the dies, the point Z on the male die making the proper scarf in the center of the fork to weld the handle to. These dies can be made for a bull-dozer or for use under a steam hammer. The handle and fork are welded together with the spring tool shown in the upper right hand corner of the illustration. The weld can also be made in an up-setting machine. The end of the handle is cut at the necessary angle for properly welding to the fork. These tools are inexpensive and may be made of old material usually to be found about a railway repair shop.

REMOVING CAR WHEELS.

A scheme used in connection with a car wheel press, so that car wheels may be applied or removed without changing the heavy movable head on the press, is shown in Fig. 56. It is simple and inexpensive, and saves considerable time ordinarily

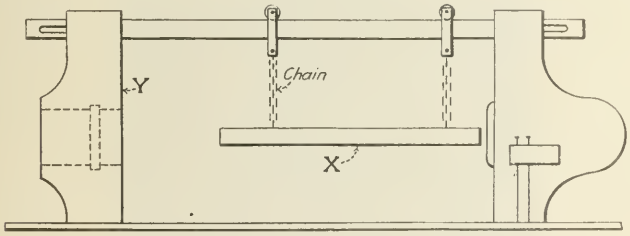


Fig. 56—Simple Device for Removing Car Wheels.

required for changing the press. The bar X may be made of an old piston rod, and when not in use may be unhooked from the supporting chains and placed to one side out of the way. To remove the wheels from the axle, hang the bar on the chains and roll the wheels in the press so that the inside face of one wheel rests against the surface Y. The bar is hung on rollers, as shown in the drawing, so that it may easily be moved back and forth with the plunger.

PUNCH FOR STAYBOLT TELL-TALE HOLES.

A punch used in a bolt heading machine for punching and countersinking tell-tale holes 1¼ in. deep in staybolts at one operation is shown in Fig. 57. The body of the punch may

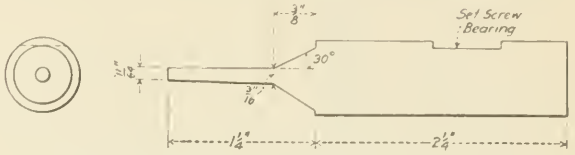


Fig. 57—Punch for Staybolt Tell-Tale Holes.

be made any size to suit the machine; a tool of this kind will punch from 2,000 to 4,000 bolts without bending or breaking. It should be made of tool steel and in tempering care should be taken not to make it too hard. If tempered to a light blue it will give the best results.

SPEED REDUCER FOR AIR MOTOR.

A speed reducer used in connection with an air motor is shown in Fig. 58. This device is especially useful in reaming holes, as it is powerful and runs smoothly. It does not operate fast enough to burn the reamer, but makes a slight cut at every revolution. Large holes may be drilled easily with this device. It is also used to pull in valve or cylinder bushings when they

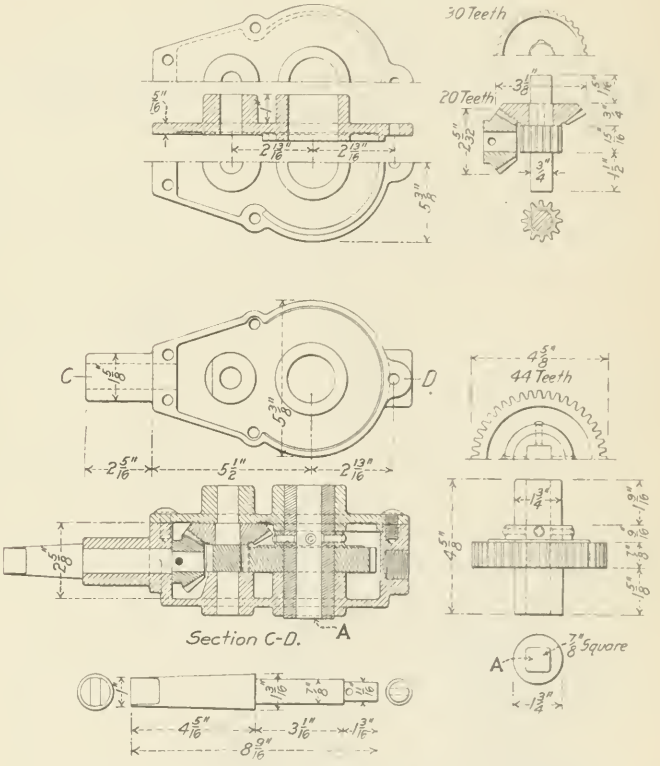


Fig. 58—Details of Speed Reducer for Air Motor.

are put in cold and are pulled in with a rod and nut. In this case it is necessary to have a hexagonal hole in the center gear the size of the nut used on the drawing-in rod. The machine is geared at a ratio of 5 to 1, and the bushing has to fit pretty tight to stall the machine, after it has once started.

DRILLING KNEE OR "OLD MAN."

A servicable drilling knee or "old man" which is intended for use in the boiler shop, but has been found useful in repairing steel cars and also in the locomotive erecting shop is shown in Fig. 59. The upright or support is made of 2-in. steel tubing or heavy pipe about 30 in. long with a rod running through the center; the knee or arm may be adjusted on the tubing by a set screw. When once the upright is set a number of holes

may often be drilled without changing the base. Another good point is that on a rounding surface the base may be blocked with wood allowing the drilling knee to be set at almost any angle. By bending the rod at its lower end and blocking the

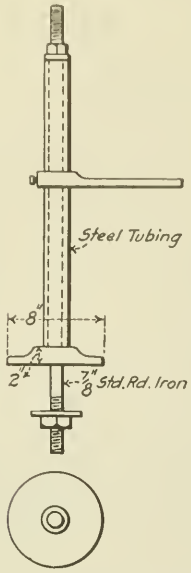


Fig. 59—Drilling Knee or "Old Man."

base in this way it is possible to set the drilling knee at an exceptionally large angle from the position it would normally occupy. The device is especially useful in drilling mud ring corners.

SOCKET WRENCH.

With the wrench shown in Fig. 60 it is not necessary to use a lever bar to tighten up a nut. The wrench is so designed that

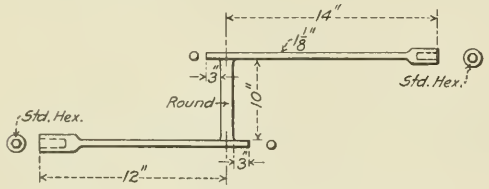


Fig. 60—A Socket Wrench Which Does Not Require the Use of a Bar.

good leverage can be obtained by grasping the projections extending beyond the bends. Wrenches of this kind can be made all sizes to suit any work.

PREPARING CYLINDERS FOR AIR HOISTS.

A cheap and good way to prepare a piece of pipe for the cylinder of an air hoist or an air jack is shown in Fig. 61. Fill

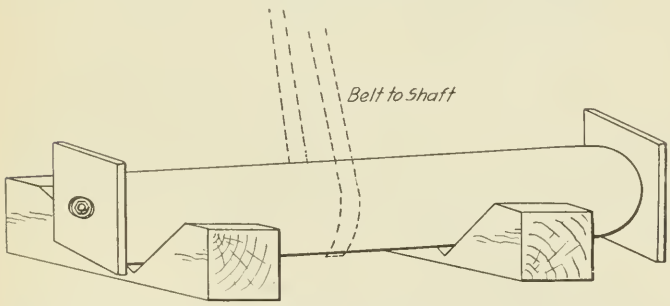


Fig. 61—Device for Finishing the Inside of a Cylinder for an Air Hoist.

it about half full of sand and pieces of iron scrap; also two or three long pieces of round iron or pipe. Bolt a piece of wood over each end with a rod extending through the center as shown in the sketch; place the pipe on V blocks and revolve by running an old belt around the center and over the line shaft. The action of the sand and pieces of scrap on the inside will smooth and polish it nearly as perfectly as it can be bored on a machine. The long pieces of round iron wear down the ridges or high spots. Care should also be taken to select pipe with as smooth an inside surface as possible. In one case in which the pipe was quite rough on the inside we used several pieces of round iron and pipe without any sand. After revolving the pipe one day the bumps and ridges were worn down. When once started in operation the device does not require attention and it may be run two or three days, or until the inside is perfectly smooth. We have finished the inside of both cast iron and wrought iron pipe from 48 in. to 84 in. long in this way.

BORING TOOL FOR BUSHINGS.

A handy tool for boring and turning air pump bushings is shown in Fig. 62. It is so arranged that two cutting tools, ¾ square, both cut at the same time. One tool turns the outside while the other tool bores the inside. Both tools may also be

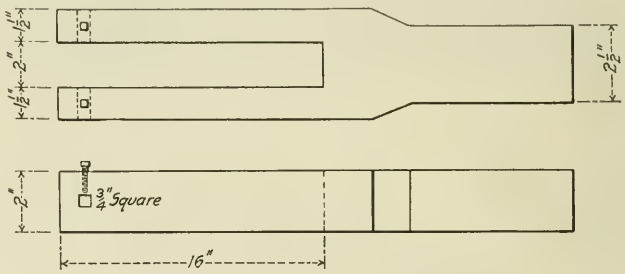


Fig. 62—Boring Tool for Bushings.

used for boring a cylinder by turning one tool upside down and reversing the tools so that they both face out from the holder. When used in this way two cuts are taken on the inside at the same time. While the tool is intended for machining air pump bushings, it may be made any size to suit other work.

MACON SHOPS; CENTRAL OF GEORGIA.

BY W. H. FETNER.
Master Mechanic, Macon, Ga.
Credit also due to C. L. Dickert, General Foreman.

SMALL AIR-OPERATED BENDING MACHINE.

The portable air-operated bending machine shown in Fig. 63 was built for bending small work, such as car brake hangers,

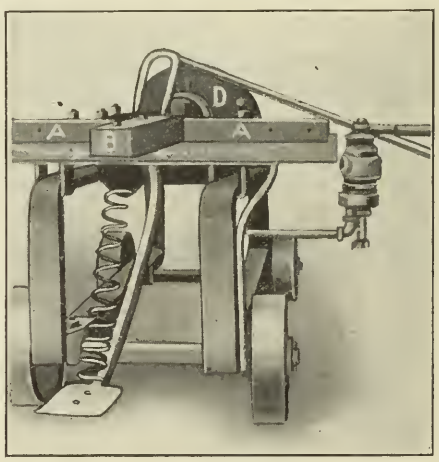


Fig. 63—Portable Air-Operated Bending Machine for Small Work.

stake pocket bolts, etc. The cylinder D is an old 12-in. brake cylinder with a suitable crosshead fitted on the end of the piston rod. The bending arms A are pinned loosely to the table at

their inner ends and are connected to the crosshead by links. When the piston is forced outward the arms travel as indicated by the arrows. The forming block B is shaped to give the desired size and form to the parts that are being bent. The bending arms A have two holes drilled through them for bolting on different sizes of forming plates. A treadle, fulcrumed to the bottom of table, is connected to a grip block and clamps the work to keep it from slipping while being bent. Fittings for all kinds of bending are provided. This is a very handy machine for the smith shop.

CLINKER RAKES.

The dies shown in Figs. 64 and 65 are used to weld the forks of clinker rakes to the handles. The dies were designed for use in a 2½-in. bolt heading machine, but this work may also be done in a forging machine or a bulldozer. Fig. 64 shows the fork and handle in position for welding. After being welded the fork is bent to shape in the bending machine shown in Fig. 63. By this method the operator may weld and bend the rakes in one heat; 300 rakes have been welded and bent in nine hours. The fork is made of 1-in. round iron taken from scrap material and is cut to length and pointed in a bolt header or under a steam hammer. The handle is made of ⅞-in. round iron and is cut to the length required. The handles are bent on an eye-bending machine, 500 being bent in nine hours. The total labor cost of making the rakes complete is 4½ cents per rake.

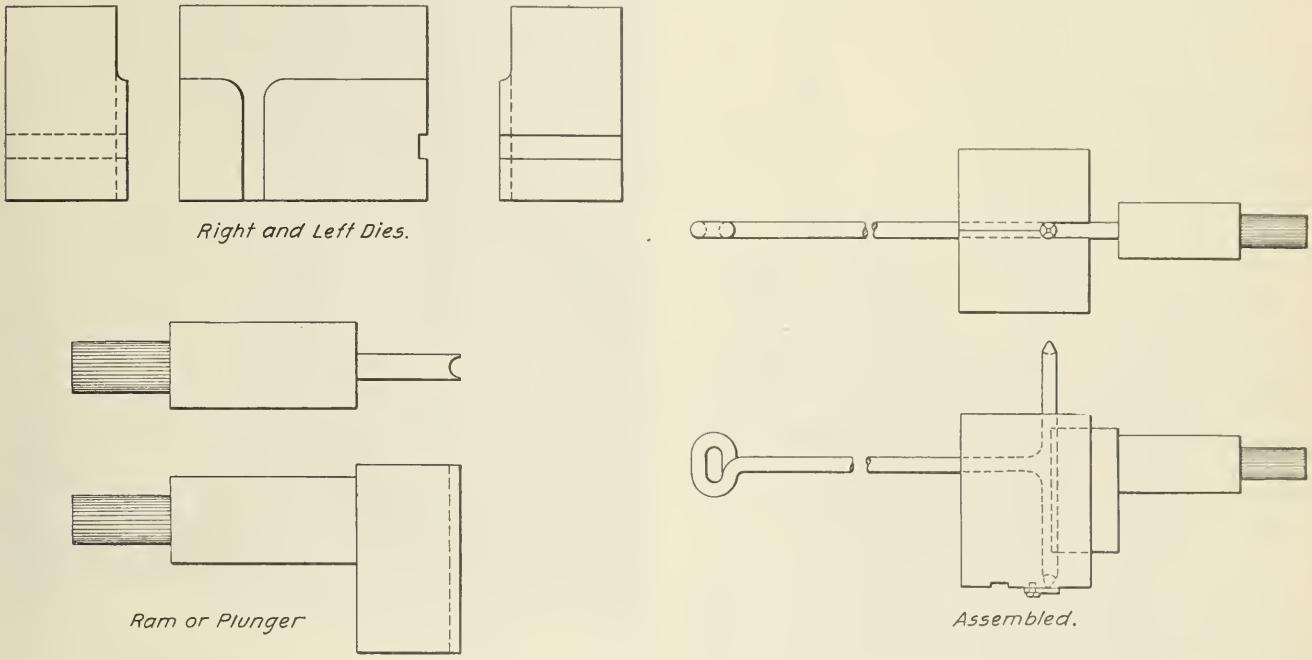


Fig. 64—Dies for Welding Fork on Clinker Rakes.

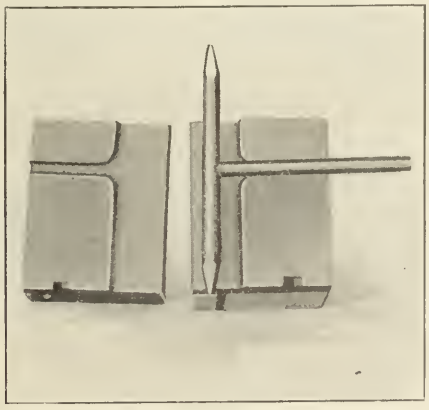


Fig. 65—Dies for Welding Fork on Clinker Rakes.

TIRE HEATER.

A portable oil tank and heater for use in connection with a tire heating ring is shown in Fig. 66. This is a simple and economical device for removing or applying driving or truck wheel tires in an engine house. The oil tank A is an old 12-in. x 33-in. auxiliary reservoir. A ⅜-in. feed pipe extends from the tee just above the top head down into the tank and to within one inch of the bottom. One end of the tee is connected to the ¾-in. supply pipe C, provided with a check valve, which goes to the heater B. The other end of the tee is connected to the air supply, which may be throttled down to give the desired mixture for proper combustion. At the side of the tank is an air pipe connected to the air system through a reducing valve set to 20 lbs. This gives the pressure necessary to drive the oil from the tank A through the heater B to the ring. The heater B, made from an old 12-in. air brake cylinder with 9 ft. of ¾-in. pipe coiled inside of it, heats the oil, forming a gas. This pipe comes out of the heater at D and is connected to the pipe extending to the heating ring by a coupler at E.

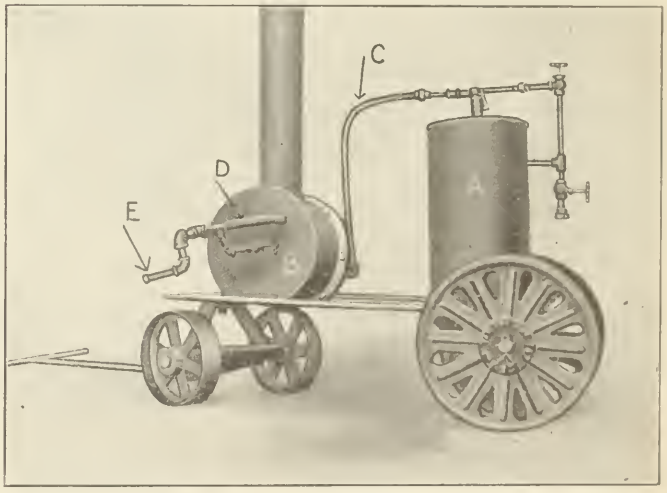


Fig. 66—Tire Heater.

The heater is heated by wood, charcoal or by a burner fed from the oil pipe. The tire heating ring is made of 1-in. pipe, with openings ½ in. long and the width of the hack saw blade used, which gives a good wide flame. This arrangement comes in very handy where driving tires are to be tightened at outlying points.

CYLINDER PACKING RING SAW.

The machine illustrated in Figs. 67 and 68 was devised to save time and labor in cutting and fitting cylinder packing rings. Ordinarily they are cut with a hack saw and filed to fit, which

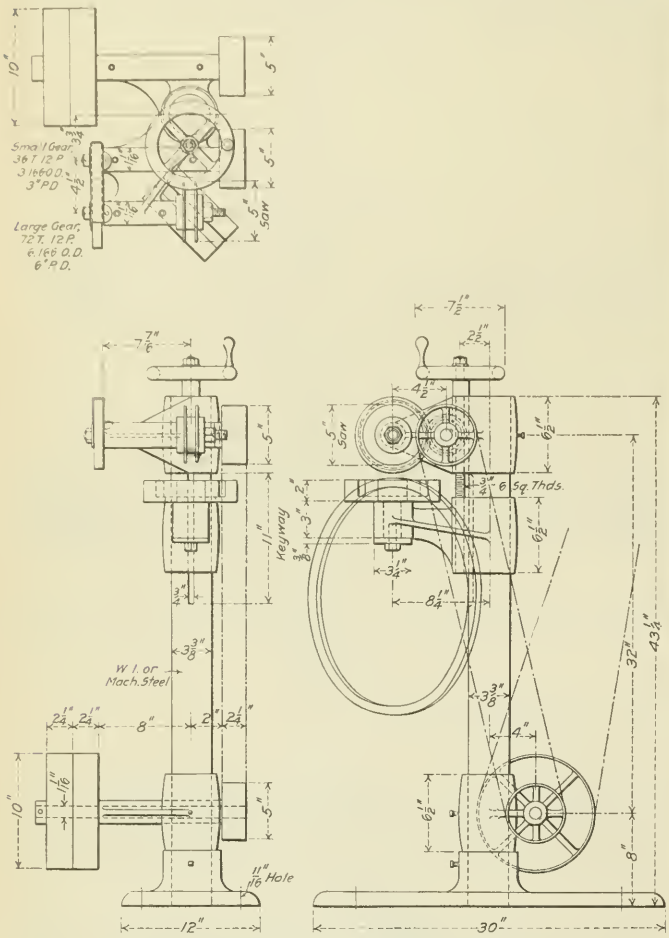


Fig. 67—Cylinder Packing Ring Saw.

usually takes from 15 to 30 minutes; with this machine the same work may be accomplished in one minute, making a much better fit. The 1/16-in. x 6-in. slitting saws are used with an adjustable collet between them to give the desired width of gap. The ring is held in a swivel chuck, making it possible to cut the rings at any desired angle. The chuck may be raised or lowered by the hand-wheel and ¾-in. screw. The rings are gripped in the chuck by set screws. The machine as shown is belt driven, but by extending the driving shaft with a suitable connection either an air or electric motor may be used, and it may then be readily converted into a portable machine, if it is desired. It has been used for three years with splendid results.

ASH PAN HOES.

Dies for welding the blades on ash pan hoes are shown in Figs. 69 and 70. Die A is cut away to the depth of the hoe blade and is grooved to conform to the rods used. Die B is cut to the depth of one-half the diameter of the rod and is grooved to match A. The face of plunger C is made the full width and length of the hoe blade, and is grooved with a radius of 13/16 in., which is one-half the diameter of the rod plus the thickness of the hoe blade. The groove laps the blade half way around the hoe back, making a strong and neat looking weld. The dies are used in a 2½-in. bolt machine. Before using these dies a cross-rod must be welded to the end of the

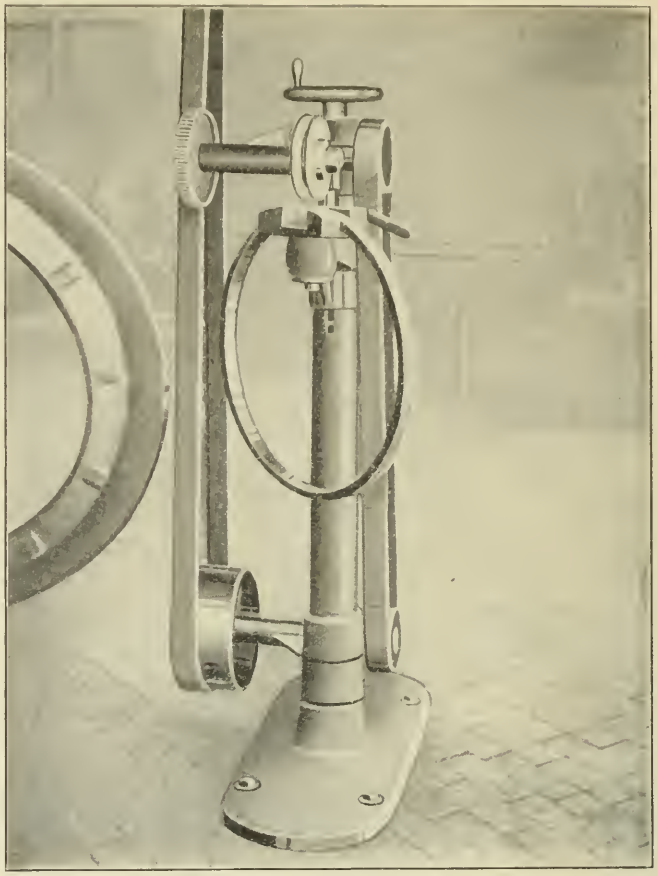


Fig. 68—Cylinder Packing Ring Saw.

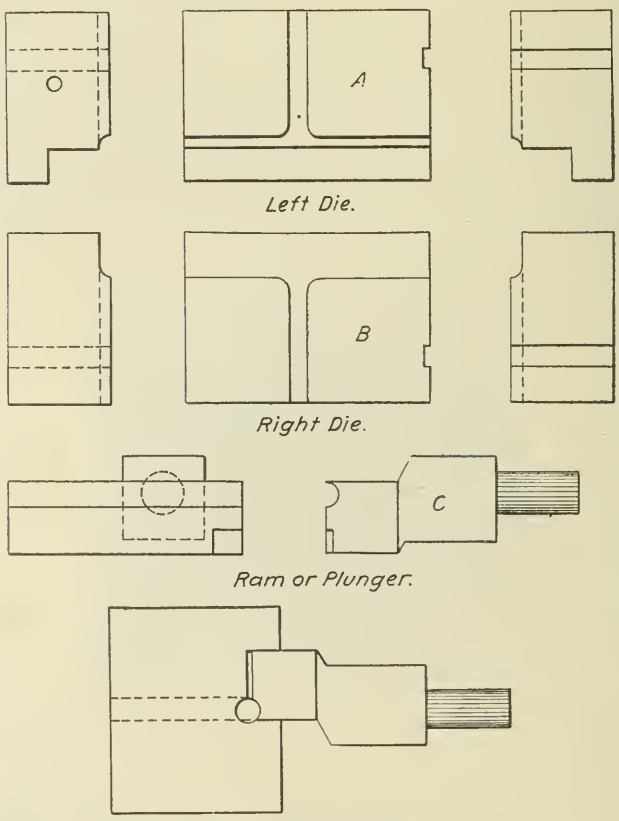


Fig. 69—Dies for Welding Blades on Ash Pan Hoes.

handle similar to that used for the clinker rakes, the same dies, Figs. 64 and 65, being used. After the desired number of cross-pieces have been welded to the handles the dies are replaced in the machine by those for welding on the hoe blade. The rods used are



Fig. 70—Dies for Welding Blades on Ash Pan Hoes.

1-in. round iron taken from scrap and the blades are cut from scrap boiler plate. One hundred and fifty of these hoes may be welded in nine hours. The eyes in the handles are bent in an eye-bolt machine.

BUFFALO SHOPS: PENNSYLVANIA RAILROAD.

BY C. C. LEECH.
Foreman, Buffalo, N. Y.

PNEUMATIC CARPET CLEANER.

A simple arrangement for cleaning carpets with compressed air is shown in Fig. 7. The carpet is first rolled on a wooden roller, which is hung in the brackets A. One end is then carried up over the rollers and underneath the air pipe B, which has a 1/16-in. slot on its underside where it comes in contact with the carpet. The air blows the dirt out of the carpet, which is slowly moved along until the end can be made fast to the roller C. The remainder of the carpet is then drawn slowly through the machine by revolving the roller C by the hand wheel at the side of the machine. When the carpet has been wound on the roller C it may be removed by lifting the hinge E on the frame. The frame is constructed of wood.

HOIST USED FOR RIVETING YOKES ON COUPLERS.

When riveting yokes on couplers it is desirable to have a special hoist by which the coupler may easily be handled and

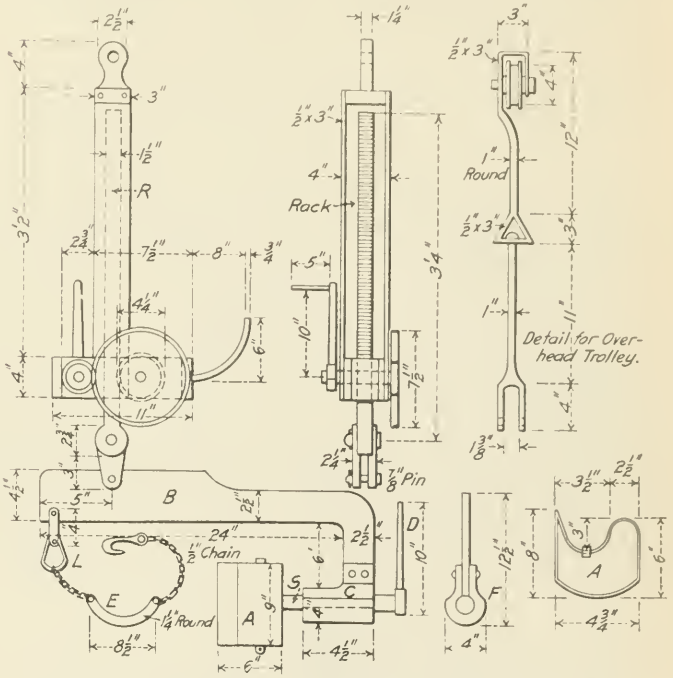


Fig. 72—Hoist Used for Riveting Yokes on Couplers.

turned over. The hoist for this work, shown in Fig. 72, consists of two ½-in. x 3 in. pieces of iron, between which iron blocks are riveted at the top and bottom. The rack gear R is

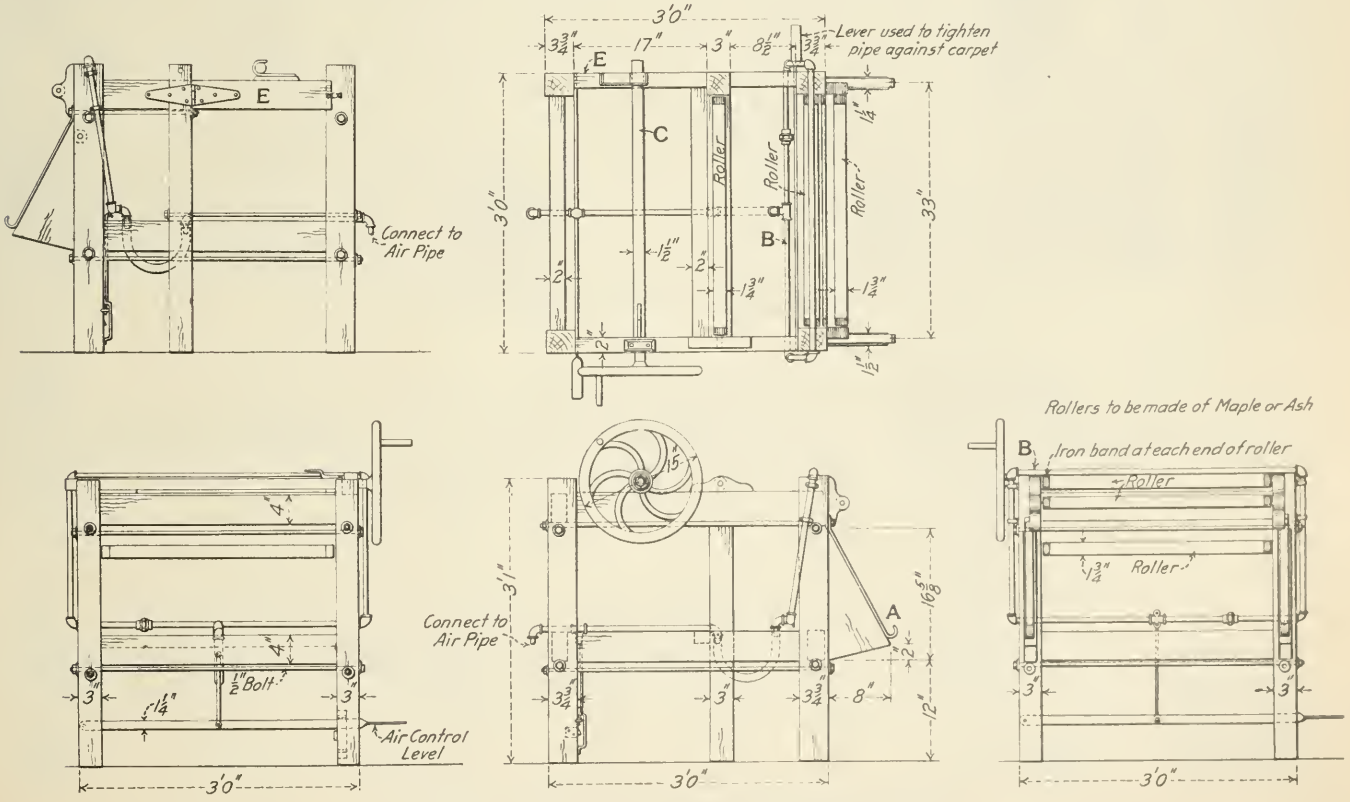


Fig. 71—Device for Cleaning Carpet with Compressed Air.

raised and lowered by the hand wheel and the spur gears. At the lower end of the rack is a wrought iron bracket B. The piece A, which is fastened to the spindle S, is made of ½ in. boiler plate and is so designed that it fits freely into the coupler and knuckle, and may be turned by the handle D. At the other end of the bracket B is suspended a piece of ½-in. chain. In lifting the coupler from the ground this chain is passed around the shank of the coupler, which rests in the piece E, and the hook at the end of the chain is slipped into the loop L. The coupler can be lifted to the proper height for riveting by operating the hand wheel and the rack R, and may easily be turned over or swung into any position under the hammer. A lug consisting of a piece of ¾ by 2 in. iron is riveted on the inside of A and is bent at one end, projecting beyond the edge of A. On the other end it extends far enough beyond A to allow a pin to be put in after the coupler has been dropped into place. This prevents the coupler from falling out when it is turned over. An overhead trolley, the details of which are shown in the drawing, may be constructed, so that the coupler can readily be carried to and from the hammer.

PORTABLE STRAIGHTENING PRESS.

The portable straightening press, which is shown in Fig. 73, is used largely for straightening main and side rods and in applying or removing bushings from them. The base of the truck is an iron casting and is mounted on 10⅛-in. wheels with 3-in. treads so that it may easily be moved from one part of the shop to another. The uprights and the top cross piece are forgings; the screw, which is 3¼ in. in diameter, is threaded for a distance of about 20 in.

PORTABLE BENDING AND UPSETTING MACHINE.

The portable bending and upsetting machine shown in Fig. 74 has for its base a 12 in. x 4½-in. I-beam, which is reinforced

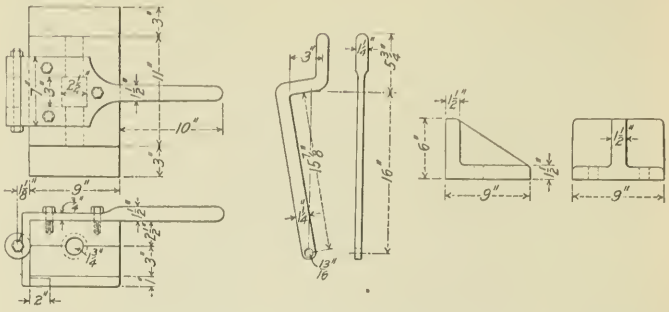


Fig. 75—Details of Hinged Die Used on the Portable Bending and Upsetting Machine.

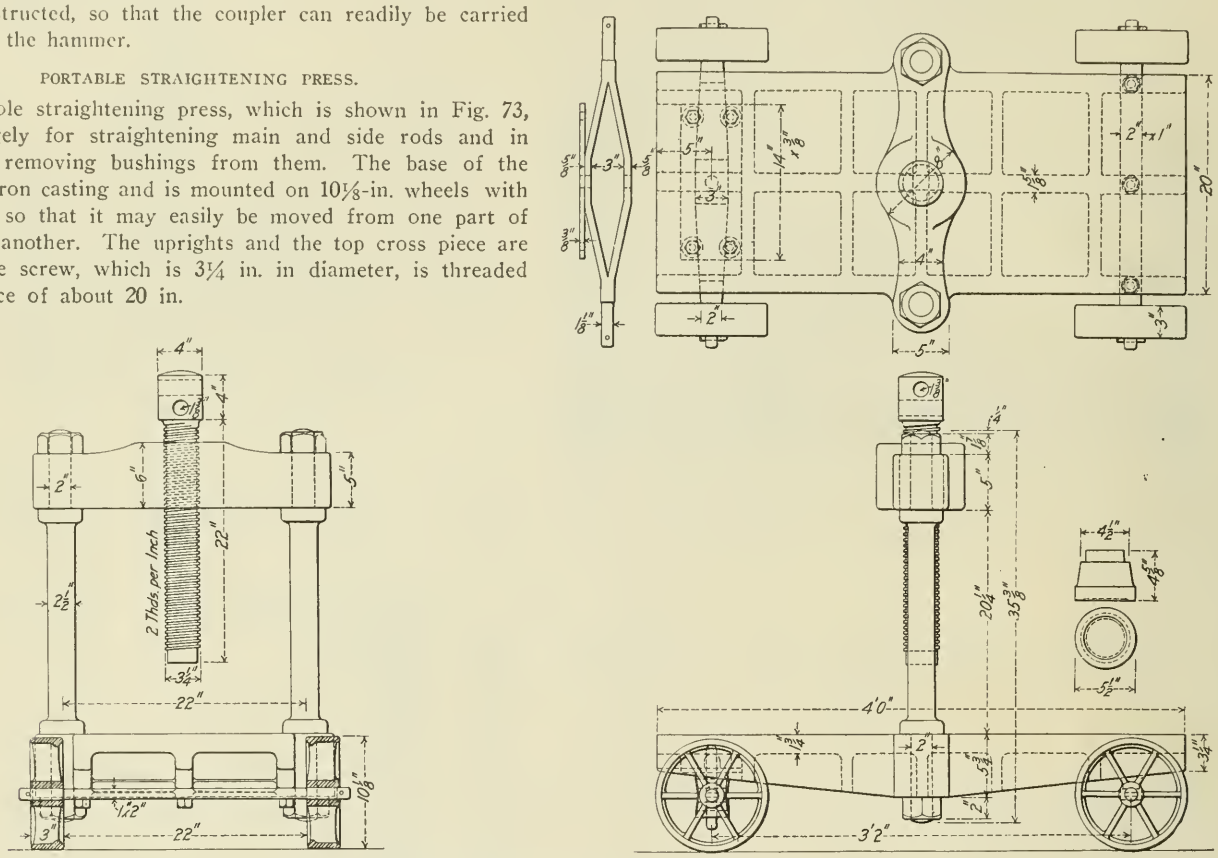


Fig. 73—Straightening Press for Rod Work.

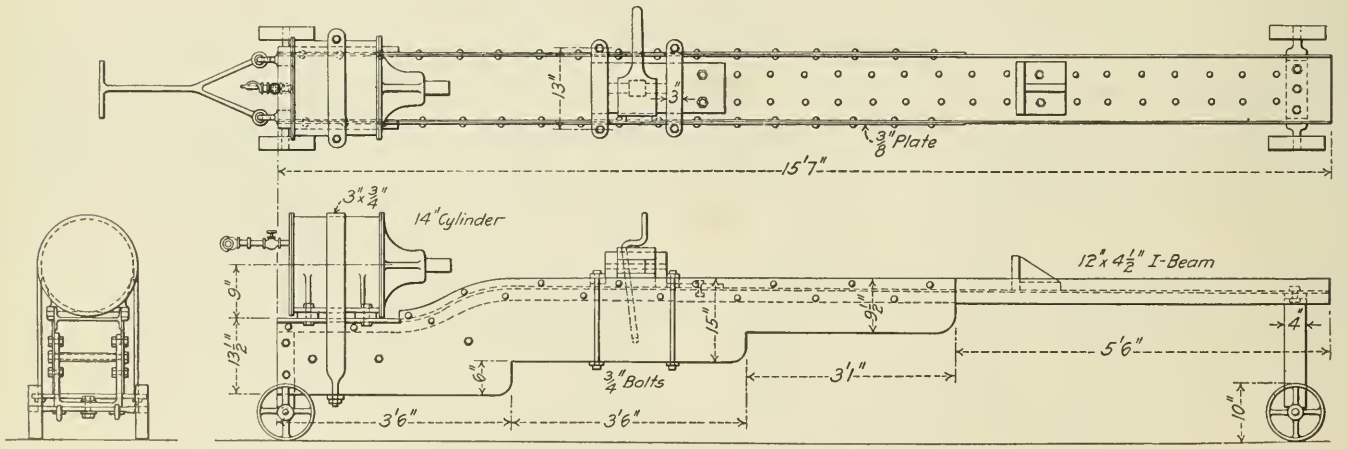


Fig. 74—Portable Bending and Upsetting Machine.

at the sides on one end by ⅜-in. steel plates. The 14-in. air cylinder is bolted and strapped to the bed, as shown. The machine is especially useful in the blacksmith shop for upsetting brake shafts, making brake hangers, bending uncoupling rods, etc. The adjustable hinged die near the end of the machine is shown in detail in Fig. 75, and is used for holding the shaft

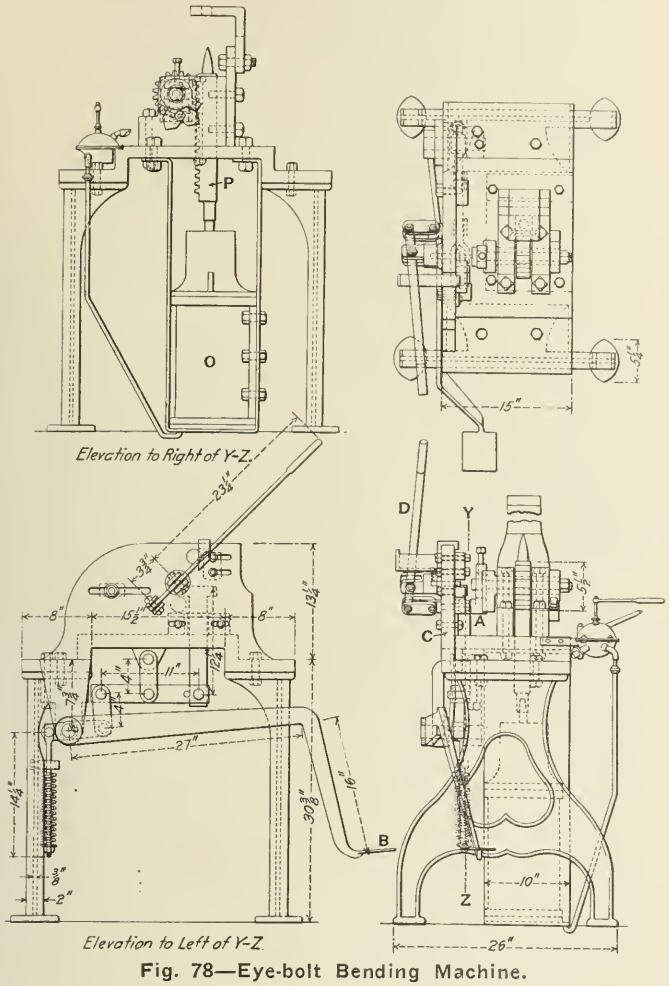


Fig. 78—Eye-bolt Bending Machine.

at the point where it is to be upset to make the shaft large enough to form the square part on which the ratchet wheel fits. The square portion is formed under a steam hammer or in a bulldozer. The bracket or stop near the other end of the machine is used for backing up the stock that is to be bent and may be adjusted for various lengths of work by using the different sets of holes in the web of the I-beam. The machine was originally built for brake shaft work but was afterwards modified to do the other classes of work mentioned above.

BENDING CLAMP.

A convenient bending clamp for use in the boiler shop is shown in Fig. 76. It consists of a cast iron base, supported at its ends on substantial wooden blocks. The clamp is a 12-in. steel I-beam, reinforced on either side along the web by ⅝-in. steel plates, which are riveted to the web. It is operated by the hand screws at each end, and is especially valuable where there is not work enough to warrant the use of a power clamp.

TABLE OR REST FOR EMERY WHEEL.

A simple and convenient table for use with a grinding wheel is shown in Fig. 77. It can be adjusted so that its surface is

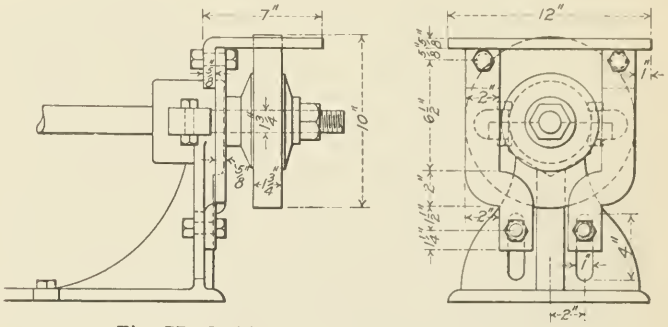
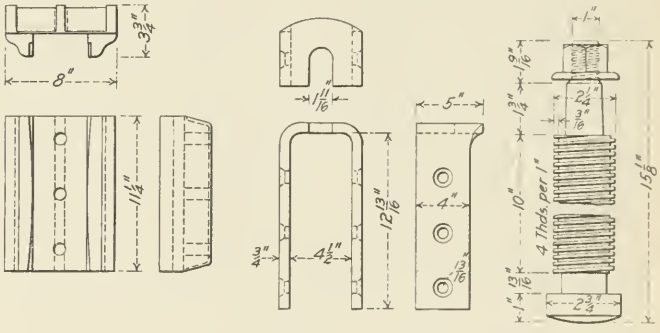


Fig. 77—Table or Rest for Emery Wheel.

slightly below the top of the grinding wheel, and will be found especially useful for grinding light work.

EYE-BOLT BENDING MACHINE.

An air operated eye-bolt bending machine is shown in Fig. 78. The rack P is forced upward by the air cylinder O, thus revolving the arm A, on the end of which is a pin over which a roller, whose size depends on the size of the eye and the stock, is slipped. The heated iron is placed in the machine just above



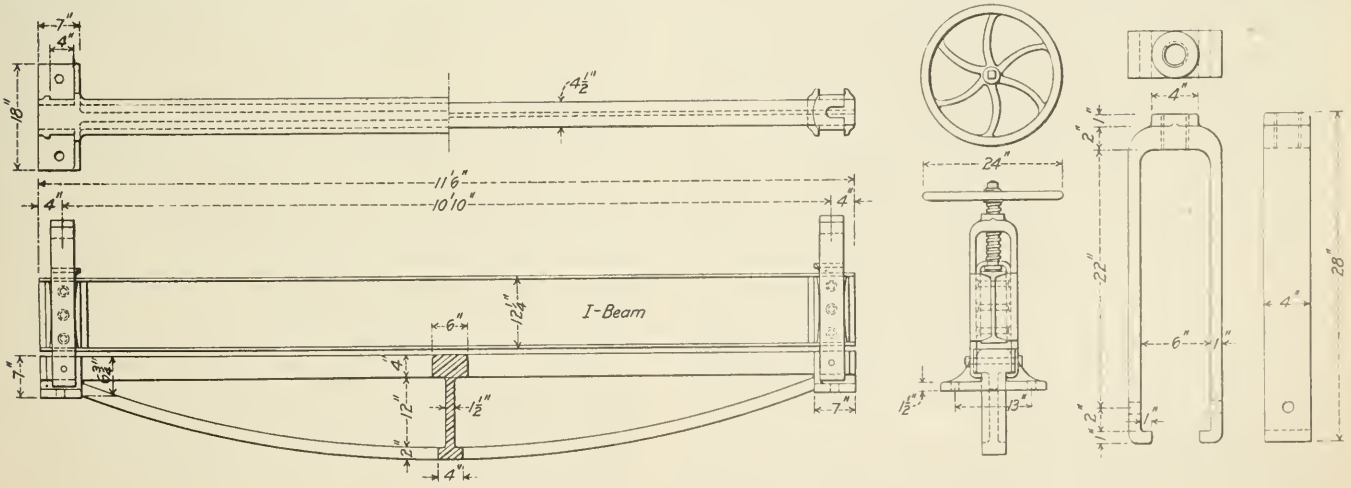


Fig. 76—Hand-operated Bending Clamp.

this roller and is clamped by operating the foot lever B. This forces the large pin upward clamping the stock between its head and an adjustable lug or stop above. A pin whose diameter is the same as that required for the eye of the eye-bolt, is forced inward by means of the lever D. Air is admitted to the cylinder and the arm A describes a circle about this pin, the roller forming a perfect eye on the stock. The pressure is then removed from the foot lever and the stock is automatically relieved by the action of the spring. The machine may be adjusted for any size eye-bolt or diameter of stock. It does not, of course, form a welded eye.

CAR INTERCHANGE.*

BY F. W. DEMAREST,
Superintendent Motive Power, Pennsylvania Lines, Fort Wayne, Ind.

There is, apparently, more or less of a general impression that, in order to facilitate the movement of freight cars between connections with a minimum of delay, some positive change in present methods is necessary. With the exception of some of the larger terminals, the railways are supposedly governed by the M. C. B. rules of interchange. At many of the larger terminals, to better meet the conditions, the M. C. B. rules have been modified by local agreements which vary in detail. Apparently, none of these have proven entirely satisfactory, as there was presented to us some time since a proposed new code to be known as the "run-repair-or-transfer-system." There is only one general code to which all roads are amenable, i. e., the M. C. B. code of rules, and, before advocating a new code, it would seem pertinent to establish, first, that the M. C. B. code is deficient, and, second, in what respect. The requirements of an adequate system of interchange are, first, safety; second, protection to the car owner, and, third, maximum speed of movement of the car and lading or car between connections with a minimum of expense.

For the past three years the American Railway Association, through its committee on car efficiency and the committee on relations between railways, has given a great deal of attention to the interchange of cars and reports of cars interchanged. So many weaknesses developed that it requested the appointment of a joint committee of the Master Car Builders' Association and of the Association of Transportation and Car Accounting Officers to investigate conditions throughout the entire continent, if necessary, and to report on them. In response to this request a joint committee was created by the action of the Master Car Builders' Association, viz., the arbitration committee and the Association of Transportation and Car Accounting Officers, the joint committee being created in June, 1909. This committee at a meeting held January 26, 1910, at the headquarters of the Master Car Builders' Association, Chicago, decided as follows: (1) To ascertain whether a system could be devised to improve the accuracy of reports of cars interchanged; (2) To endeavor to ascertain what, if any, modification should be made in the M. C. B. rules as they exist which would tend to expedite the movement of cars and at the same time conserve the safety of operation. It was further decided that the only method which would furnish definite data would be a practical test.

In view of the commanding position of Chicago as a railway center and the consequent magnitude of interchange at that point, it was decided that the test should be made in Chicago, and, because of the compact situation and also because of the report of a sub-committee appointed by the General Superintendents' Association of Chicago, the Union Stock Yards district was selected as the most desirable district in which to make the test. The approval of the General Superintendents' Association of Chicago was duly received and the test inaugurated July 1, 1910. After the plan had been in effect for ninety days, it was extended to June 30, 1911.

Before inviting your attention to the results obtained, it seems advisable to review the general question of interchange in Chicago, the various modifications made in the interchange system and the conditions existing under the present system. In reviewing this early history and various rules and agreements covering the interchange of cars at Chicago and vicinity, we find that at a convention of the railway superintendents and master car builders held at Chicago on December 14 and 15, 1876, a revised set of rules was presented and adopted governing the conditions of and repairs of freight cars for the interchange of traffic. This code of rules, apparently, remained in effect for a number of years, but, as its requirements were not generally followed, defect cards not always being furnished when requested and cars refused and returned contrary to the rules, causing delays, the question of improvement became necessary. The late Peter H. Peck at the December, 1889, meeting of the Western Railway Club, presented a paper treating on the conditions as they existed at that time. This paper contained the statement that the daily interchange ranged from 4,000 to 7,000 cars, and that 30 per cent. of the cars offered in interchange were in a more or less defective condition with cardable defects. The causes of the delays were very clearly brought out by Mr. Peck, and he advocated the adoption of a joint inspection arrangement and the formation of a committee to present a new set of interchange rules. The committee was duly appointed by the Western Railway Club, January 1, 1890, to recommend a joint interchange card and a set of rules governing the use of such a card in order to facilitate the prompt handling of loaded and empty cars between lines centering in Chicago.

This committee recommended the use of the "Chicago joint defect card," and rules providing for the use of this card for old defects or missing material, and where the delivering line inspector was located so far from the receiving yard that it would be impracticable to procure a regular M. C. B. defect card. The rules and the "Chicago joint defect card" were adopted by a number of the roads at that time, and later on (about September, 1893) the General Superintendents' Association passed a resolution that the rules be adopted on all lines at Chicago.

These rules also proved inadequate, and we find reference made to a new interchange plan at the meeting of the Western Railway Club, November, 1894, at which meeting the chairman of the committee advised that two meetings had been held at which a large number of roads centering in Chicago had been represented and that they had formulated a small code of rules for the interchange of cars, auxiliary to the M. C. B. rules of interchange. Reference to this new agreement is also found in the proceedings of the Western Railway Club for 1895.

[Here follows a history of the various changes in the use of the defect card by the M. C. B. Association and the various Chicago associations, governing inspection in the Chicago switching district and the stock yards, and covering a period of 17 years, from 1893 to 1910. The paper also contains an appendix giving the various rules adopted by the Chicago associations during this time.]

In effect, the interchange of cars in the Chicago switching district is handled under the M. C. B. code of rules, with the vital exception of Rule No. 8 of the General Superintendents' Association of Chicago, reading as follows: "It is understood that in the interchange of cars within the Chicago switching district the parties to this agreement will accept, as their own, the record of the receiving line, so far as the condition of the car is concerned, and that M. C. B. defect cards will be furnished for such defects when proper request is made, if based on M. C. B. rules and this agreement." In other words, the cars are received on notation, and defect cards are requested after receipt of the car. In this connection, attention is also called to Rule No. 10 of the General Superintendents' Association, reading as follows: "Defect cards shall be issued by the delivering company when justified under the M. C. B. code of rules governing the interchange of cars, within sixty days from date of request, ——."

* Abstract of paper read at a meeting of the Western Railway Club, February 21, 1911.

The consequences can readily be imagined, and we who are interested in the interchange at Chicago are all acquainted with the results (1) that as the car is received on notation and request for defect card made after car is received, it is not possible to hold the car until the receipt of the card, and to avoid delay it must be permitted to go forward; (2) that requests for defect cards are not promptly honored, and in a great many instances the receipt of the card is so delayed that the car is not only away from the terminal but entirely off the line of the receiving road before the defect card is received; (3) there is brought about an expensive system of tracing cars, not only on the receiving line, but also between connections. (To cover this situation there has grown up the practice on some roads in the Chicago interchange of applying to a car on receipt the so-called "condition card" as a substitute for the M. C. B. defect card, which "condition card" shows all the information shown on the M. C. B. defect card and requires the same length of time to make out and apply); (4), failure to furnish defect cards by the delivering line to the receiving line on request.

The number of unsettled claims for defect cards, as above, due all lines became so great during the early part of the year 1908 that the lines interested decided that some arrangement must be effected whereby defect cards due the various lines would be furnished and the records closed. Meetings of the superintendents of motive power of the various lines interested were held April 21 and July 31, 1908. A. E. Manchester, superintendent motive power of the Chicago, Milwaukee & St. Paul, was elected chairman, and, after a thorough discussion, it was decided that all roads be requested to send a representative to a meeting to be held on August 23, with the further request that each representative attending the meeting submit a statement showing the number of unsettled claims against their connections.

At the meeting held on August 23 representatives of twenty roads reported a total of 17,886 outstanding claims for defect cards due from connecting lines. While at this meeting the representative of one of the lines interested reported having settled 9,822 claims since the meeting of July 31, it appeared that the general situation was no better than at the first meeting held on April 21. A committee of seven was appointed to be known as "The Special Committee On Defect Card Claims," with the understanding that the matter would be taken up with the General Superintendents' Association and with the suggestion that the special committee be given full authority to act for the General Superintendents' Association.

Since the above period the situation has been getting very much worse, and at a meeting of the special committee held on January 14, 1911, it was found that, although the committee had settled a total of 97,730 cases from June 1, 1909, to January 1, 1911, and that 7,779 of these cases were settled during the month of December, 1910, the total number of unsettled cases on December 31, 1910, was 12,103. The special committee on defect card claims is still endeavoring to devise some plan to better this situation.

I think the injustice of the situation will be evident to all of you. It would appear that a simple solution of the entire question could be practically worked out, and that is by the application of the defect card upon receipt of the car.

In view of the general statements that have been made from time to time that the M. C. B. rules which provided for the above condition were not sufficiently elastic to apply to large terminal interchange territories; in view of the variations made from the M. C. B. rules at large terminals said to be on above account; and in view of the general situation as it exists in Chicago, the joint committee appointed by the American Railway Association decided that, in addition to endeavoring to devise a plan for improvement in the car interchange record, it would also endeavor to ascertain in what respect the M. C. B. rules were defective, with the view of not only reporting to the American Railway Association and the Master Car Builders' Association the success of the trial method and the car interchange record, but also what changes it would be necessary to make in the M. C. B. rules. The Union Stock Yards district was selected as the district to be covered by the trial and a joint car inspection and interchange bureau established at that point July 1, 1910. This bureau, besides the usual work of inspecting and carding cars in interchange in accordance with the M. C. B. rules, carries, in addition to the physical condition record of cars, a record of seals, commodity, point of shipment, final destination, and time of interchange. The territory included covers an area of about six square miles with approximately 200 miles of track, in addition to private sidings. The principal interchange between the 29 roads interested, including the C. J. and the C. R. & I., is handled at seven points, namely, Loomis street, Ashland avenue, 47th street and Center avenue, 40th and Halsted streets, Wabash Elevator, Santa Fe Elevator, and 34th and Iron streets. There are approximately 3,000 cars interchanged at these points every 24 hours.

The work of inspection and recording of data required by the car accountants is handled by a force of one chief interchange inspector, four foremen (three day and one night, the time of two of the foremen being almost entirely engaged in representing roads in making settlements for damaged cars with private car owners), one chief clerk, one assistant chief clerk, three clerks on miscellaneous work, seven typists and two messenger boys. The expense of the bureau is divided on a basis of 45 per cent. to the transportation department and 55 per cent. to the mechanical department, at an average cost per car interchanged of about $0.028 and $0.037 respectively to each department.

The bureau, as stated previously, was started July 1, 1910, for a three months' trial period. On September 1, 1910, owing to difficulties experienced in perfecting the organization due to the necessity of educating the inspectors in regard to the proper application of the M. C. B. rules and carding for delivering line defects, also on account of the resignation of the chief interchange inspector and chief clerk, it was decided by the General Superintendents' Association to continue the trial until July 1, 1911; it being understood that cars would be interchanged strictly in accordance with the M. C. B. rules, except Rules Nos. 117 and 118 of the 1909 code and Rules Nos. 91 and 92 of the 1910 code, these rules pertaining to the responsibility of switching lines. The efficiency of the bureau has been constantly improving as the men become more familiar with their duties and as the different roads themselves arrive at a better understanding, and we are confident that at the time the trial is ended its operation will be practically satisfactory to all the roads interested.

The M. C. B. rules, with the exceptions as outlined above, have been in effect since the bureau was organized and cars have been carded on receipt from the delivering line by the joint interchange inspectors. Errors in making out the cards have occurred, as is natural, also cardable defects have been passed over, but the situation in this direction has improved steadily and will continue to improve as the inspectors become more proficient in their duties; it being understood that in this district the majority of the interchange inspectors have never been required to become familiar with the use of the M. C. B. defect card. The joint committee to date has not been able to find that the interchange of cars is affected by the application of the M. C. B. code of rules, although there are one or two minor suggestions to make.

The Western Railway Club has always been deeply interested in the car interchange situation, not only generally, but as particularly applied to the Chicago terminal interchange. The joint committee appointed by the American Railway Association, therefore, calls the matter to your attention with the suggestion that the Western Railway Club appoint a committee to investigate the operation of the joint interchange and inspection bureau at the stock yards and report the adequacy or inadequacy

of the M. C. B. rules to handle any interchange situation, the necessity for the Master Car Builders' Association making any changes in its rules at the coming convention, and the feasibility of applying the M. C. B. code of rules to the entire Chicago terminal territory; it being admitted, we believe, that a code of rules which will prove adequate in Chicago will prove adequate in any other terminal situation and obviate the presumed necessity for special local agreements. [After prolonged discussion the club appointed a committee in accordance with the above suggestion.]

PREVENTION OF ACCIDENTS IN SHOPS.*

BY JOHN CALDER.

Industrial accident reporting is still very incomplete in the United States, yet Bulletin No. 78 of the Bureau of Labor, September, 1908, states that, among adult wage earners alone, the yearly mortality from accidents is between 30,000 and 35,000. The non-fatal injuries inflicted can not be much less than 2,000,000 additional. It is believed that, by proper supervision and precautions in all plants and industrial processes and the cultivation of greater care by operatives, at least one-third of the present annual sacrifice of life and limb can be prevented, thus increasing our national assets, and obviating a large amount of human suffering and sorrow. In analyzing many thousands of industrial accidents, with a view to devising remedies, the author has found the following to be the chief causes: Ignorance, carelessness, unsuitable clothing, insufficient lighting, dirty and obstructed workplaces, defects of machinery and structures, and absence of safeguards.

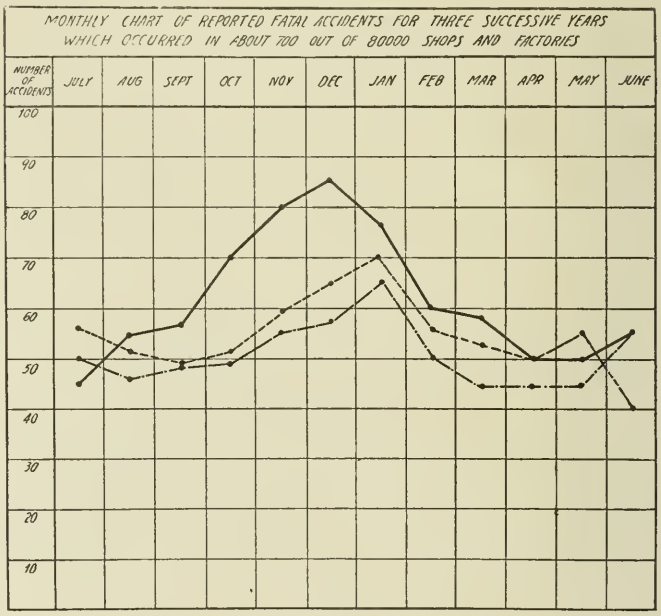
Ignorance.—In spite of ample facilities now afforded to all for the acquisition of some knowledge of mechanical principles, the author has found some superintendents, a number of foremen, many operatives and not a few managing owners of smaller plants grossly ignorant of the nature of the forces and mechanical arrangements which it is in their power either to control, or to set free with resulting danger to themselves and others. It has been a constant matter for regret that organized labor with its unique opportunities has done so little to supplement or complete the mechanical education of its members. Accidents due to the culpable as well as excusable ignorance of supervisors, engineers, millwrights, elevatormen, firemen and guardians of general facilities are frequently very serious and nothing but administrative vigilance in selecting and instructing these employees for their own special risks will suffice to prevent such occurrences.

Carelessness.—Sometimes combined with ignorance, sometimes sheer thoughtlessness, folly or horseplay, carelessness by operatives stands highest as a cause of industrial accidents from the results of which nothing external can do much to shield the worker and those whom he sometimes involves. All plant executives know that many things workmen do and suffer under this head would hardly be credited by the sympathetic outsider with no knowledge of the facts. The bright and nervy American workman, so admirable in many respects, is easily first in taking foolish and wholly unnecessary chances with his life and limbs; chances which in no way add to his efficiency or his earnings. The exaggerated ego manifests itself frequently in ostentatious independence full of danger to himself and to others. The maintenance of strict discipline in the shops, the adoption of salutary punitive measures and the firm elimination of the dangerous employee is all that can be done, in addition to a campaign of education throughout the plant.

Unsuitable Clothing.—Accident is caused at many machine parts which are necessarily exposed near the operator and with which he would never come into dangerous contact but for unsuitable or neglected clothing. The ragged sleeve ends, loose ties and open jackets of untidy machinists have again and again been wound upon seemingly trivial parts in motion and through the powerful effect of coil friction have inflicted frightful and often fatal injuries. Not a few survivors have to thank the inferior strength of the overall or dust jacket for escape.

Insufficient Lighting.—Insufficient lighting is the cause of numerous accidents, and particularly of serious and fatal falls. A maximum of accidents occurs towards the close and beginning of each year, that is during November, December and January, the months of minimum daylight. The accompanying illustration shows the seasonal distribution for three successive years of about 700 deaths annually from industrial accidents which were reported with other injuries from an area embracing 80,000 plants of varying extents. The influence of the duration and intensity of natural light in working hours on fatal and serious accidents is particularly noticeable in such operations as have to be carried on within large spaces, often entirely in the open air and not easily illuminated artificially to the exclusion of deep shadows.

Within plant buildings the intensity of artificial lighting at



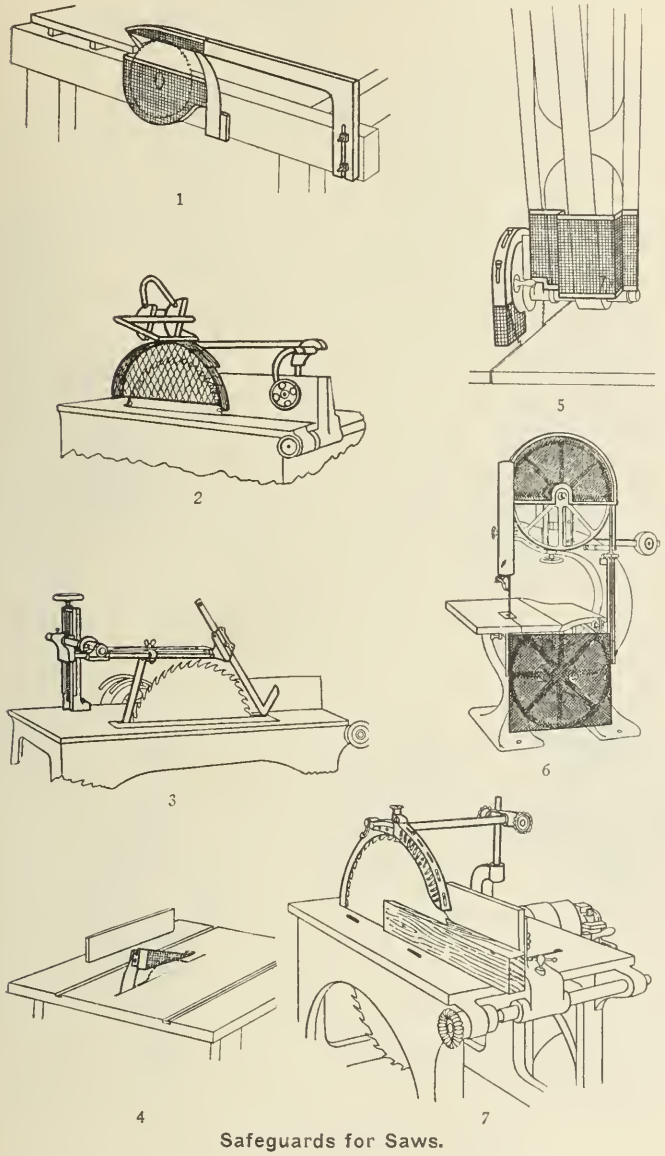
Influence of Daylight on Accidents.

the cutting point of tools, for instance, and on very limited machine-tool or bench areas is frequently far above actual requirements and a source of much physical discomfort, while all around the operative a semi-darkness prevails which has a blinding effect in the sudden transitions of the vision required by his employment. It has been found by exact photometric observations of shop lighting conditions both during the day and at night, that the concentrated illumination by means of shades of ordinary 16 c. p. incandescent units on cutting tools in machines and the area near them is often several times the intensity of ordinary daylight on the same parts. It is difficult to convince the operative that he is suffering from too much light at any place and the call is constantly for more light. From the safety point of view and from consideration of power economy this excessive hard light on spots only, which causes eye-strain and poor vision of surrounding areas with resulting accident, should be eliminated by good illuminating engineering. A more generally diffused light of less unit intensity is now easily obtained by the use of fewer but larger screened units experimentally located to suit varying shop requirements and reflecting from whitened wall and ceiling surfaces.

Dirty and Obstructed Workplaces.—Dirty and obstructed work places are closely allied to defective illumination as a source of

*Abstract of a paper on The Mechanical Engineer and the Prevention of Accidents, read at the New York meeting of the American Society of Mechanical Engineers, February 14, 1911. Mr. Calder is manager of the Remington Typewriter Works, Ilion, N. Y.

accident. The literal "shedding of light" on waste and rubbish is often the sure forerunner of their removal and avoidance of accidents due to them. Every management should see to it that the cleaning of floors and passages and the removal of wastes is systematically provided for. Sometimes this condition is due to the habits of the employee himself and he has to be educated to better ways. At other times floor space is economized and machines and workers are crowded together without due regard to safety in moving about in the confined area. The tidy shop



Safeguards for Saws.

1. Mesh Guard for Constant Diameter Overhung Saw Requiring Clear Bench for Sliding Table Feed. 2. Automatic-Positioning Mesh Guard for Variable Diameter Converting Saw. 3. Automatic-Positioning Bar Guard for Variable Diameter Converting Saw. 4. Mesh Guard for Constant Diameter Saw Requiring Clear Bench for Lumber. 5. Adjustable Mesh Guard for Swing Saw and Belt. 6. Band Saw Guarded against Contact at any part and also against Saw Breakage. 7. Adjustable Shield Guard for Variable Diameter Converting Saw.

is less costly in the long run than the dirty one and has a noticeable effect on the morale of the whole establishment.

Defects of Machinery and Structures.—It has been infrequent, in the author's experience, to find machines or processes in operation which were essentially dangerous because of defective design or arrangement, or from lack of repairs or renewals, and thereby liable to break down and cause injury. It certainly does not pay any employer to keep a defective tool in operation; nor is it in the interest of the employee, particularly if he is paid by the task, to use imperfect apparatus which reduces his possible earnings. On the other hand, it is by no means infrequent to find workmen, who have their choice of the best materials and apparatus and who possess the intelligence to apply these correctly, showing a striking disregard for their own safety and that of others, especially in framing structures and arrangements of a temporary nature. Workmen persisting in practices of this nature should be eliminated as unfit and dangerous employees and the ability of any untried operative to construct safe facilities to be used by himself and others should never be taken on trust. Overloaded machines and structures, decayed gangways, worn-out floors and stair treads, unannealed chains and hooks, frayed and stranded ropes and tackle and a host of minor industrial equipment are items which should pass under systematic and intelligent review from time to time as possible sources of accident. Such attention to safety need be no burden. In the daily routine of plants, whether large or small, if machinery and other equipment is properly selected and installed, and hurry calls for repairs promptly responded to by competent people, and the employees made to feel that suggestions as to real or even imagined defects in the apparatus they must use are welcomed, the team work of good organization will help greatly to eliminate avoidable accidents from these causes, which are usually a reflection upon the executives.

THE POSSIBILITIES OF SAFEGUARDING.

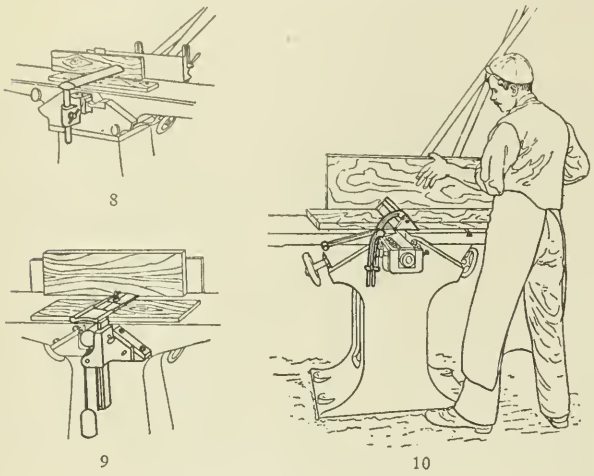
Absence of Safeguards.—In many cases of injuries to operatives caused by the absence of a possible safeguard it will be found that it has been removed or rendered ineffective by the employee for lack of supervision in such matters or that protection has never been provided. Safeguarding absent at one machine is sometimes actually afforded elsewhere under the same roof and the accident is due to the operation of the principle, that what is permitted to be everybody's or anybody's business is in daily life nobody's business. The safety engineering of no plant should be left to the haphazard initiative of a number of individuals. Some degree of finality is necessarily attainable in the simpler forms of safeguards about power houses, transmission machinery and dangerous details common to all machines, and most failures to prevent accidents from these are due to lack of consistency and thoroughness in applying the recognized remedies.

The Machine Tool Builder and Safeguards.—The machine tool builders accomplish a great deal of most useful safeguarding, particularly in protecting the workman from the dangers of toothed gears in metal working and other tools. Now and again, however, a so-called guard is encountered which is simply no guard at all but rather a snare, and which shows conclusively that its designer had appearance rather than utility in mind. Numerous instances might be cited of the vague notion expressed in some current machine designs that anything which looks like a cover for a part of a machine necessarily constitutes in daily service an efficient safeguard; sometimes no regard is paid to the actual direction of rotation or to reversal of motion or to the necessity for frequently removing a clumsy cover which is as likely as not to be left off permanently. The real points of danger in daily operation need to be studied before a satisfactory protection can be provided. A well designed and neatly applied guard on a machine is seldom a prominent feature. Shafts and spindles, low pulleys and belts, intaking sides of gears, narrow clearances between fixed and moving parts, couplings, projecting screws, nuts and pins and numerous similar risks on moving parts of machines are best handled for protection by the machine builder. In any case the safeguarding of these when within the reach of the operator is usually obligatory upon the employer and always desirable.

Guarding of Equipment Built Into Position.—Under this head are embraced all power generators and a very large class of machines and industrial apparatus whose accident risks at dangerous parts depend on the environment, the manner of installation and the precise nature of the workmen's duty around them. Protection against accident at such apparatus is not se-

cured, as is sometimes supposed, by guarding merely the dangerous moving parts. All stationary portions of such prime mover structures as may cause injury to attendants and others should be equally included in the scheme of protection. In power houses the edges of all stairs, platforms, ladders and gratings should have low fenders of metal on both sides which will prevent nuts, bolts, tools and other small parts rolling off into the machinery or striking employees in their fall. In addition a double metal railing not less than 3ft. high and not nearer any moving part than 12 in. should be provided at all dangerous places such as crank and flywheel pits, etc., and at the inside and outside edges of all stairs and elevated platforms. Engine attendants have necessarily to operate often where the footing is slippery and insecure and should be safeguarded when reaching out to bearings close to crank pits and other parts, or in passing around tail-rods and under low fly-balls and other similar parts which can and do cause many serious and not a few fatal injuries particularly on the older prime movers still in service.

Guarding of Transmission Machinery.—The extensive use of multiplied motor drives, properly screened or at a safe elevation, has done away with many transmission belts, shafts, pulleys, collars and couplings in dangerous proximity to workmen. The managers of many industries, however, have still to reckon daily with the accident risks of the older type of buildings and transmission arrangements and the latter when not safeguarded are sometimes the cause of horrible fatalities and ought to be closely scrutinized in every detail. Metal tube and disc guards should be used for shafting, bearings and pulleys requiring to be approached closely while in motion. Seven feet clear of every moving part is considered the least height from the floor level without guarding and, even then, where a horizontal belt drives across a frequented passage at this minimum elevation it is well to have the lower side screened close to the belt to avoid injuries caused by "whipping" when the belt breaks. Special care should be taken to see that all belt shifting and machine starting and stopping gears are positive in their action. Many accidents have occurred at machines through inefficient or defective fast and loose pulley and belt arrangements suddenly starting a tool which was under examination or adjustment.

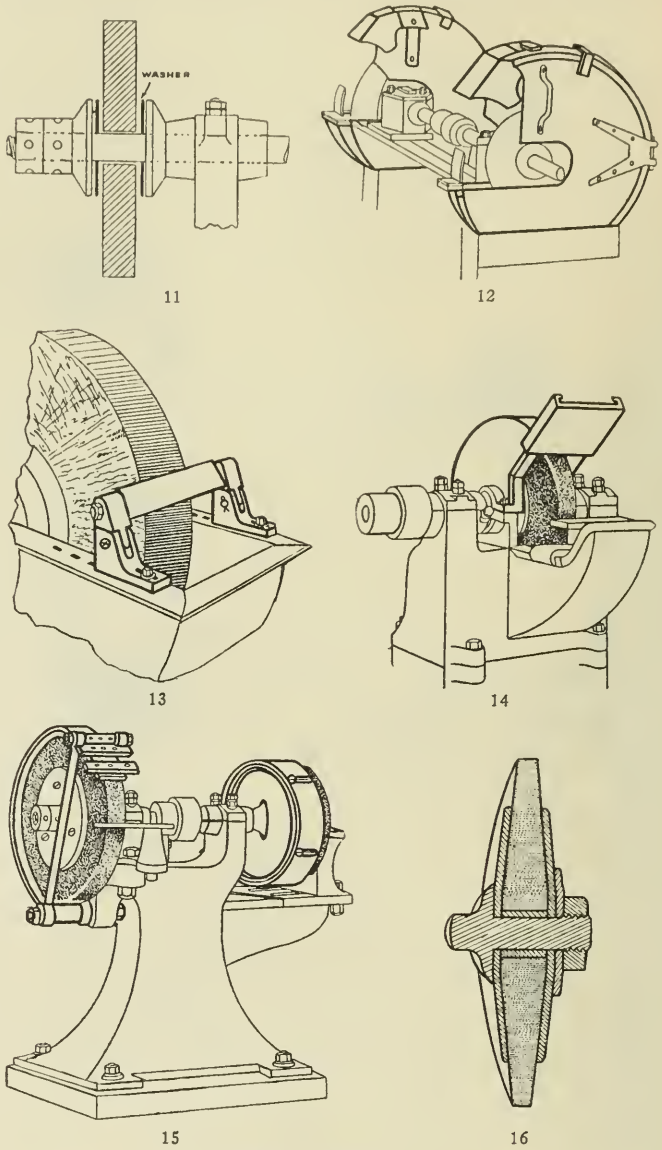


Safeguards for Jointers.

8. Adjustable Jointer Guard. 9. Telescopic Jointer Guard. 10. Automatic-Positioning Jointer Guard.

ESPECIALLY DANGEROUS MACHINERY.

No machine is effectively protected by any guard which hampers a workman, reduces his speed and earnings and has not been designed for the actual working conditions. Such inadequate apparatus is naturally removed by the workman or wholly or partially put out of action at the first opportunity and the particular safeguarding problem becomes the subject of a fruitless triangular controversy between the employer, the employee and the factory inspector. To educate the employee to use caution and foresight about dangerous machines is difficult enough and it should not be rendered more so by calling upon him to work with an impracticable safeguard. What is needed in such a case is careful inquiry by a competent engineer experienced in the study of safeguarding problems into the conditions under which the employee has to operate and a solution, where such is possible, which will enable him to work with efficiency and safety or at least to reduce considerably the accident risk of his occupation.



Safeguards for Grinding Wheels.

11. Safe Mounting of Grinding Wheels. 12. Adjustable Heavy Armor for Disc Grinders Subject to Rapid Wear and Shock. 13. Releasing Grindstone Rest. 14. Safety Adjustable Hood for Disc Grinder. 15. Safety Adjustable Hoods for Disc and Face Grinders. 16. Safety Cone-Formed Grinding Wheel.

Woodworking Saws.—A close approach by the fingers of workmen to sharp cutting tools running at a very high rate of speed is essential in operating efficiently many woodworking saws and cutters. Consider first that king of accident producers, the common circular saw. In spite of claims to the contrary such an article as a universal saw guard does not exist on the market. On the other hand, except in the case of small diameter checking and grooving saws covered by the work, it is quite possible to safeguard all saws to varying degrees conditioned by the uses to which they are put. An efficient as well as a safe saw guard is one which may have to fulfil all or any of the following condi-

tions: (1) The safeguarding must be strongly made and once adjusted must be able to retain its position and form without special care on the part of the operator. (2) It must so protect the saw, both above and below the bench and before and behind the saw, that no one can accidentally touch or fall on the saw. (3) It must not permit the work in a ripping saw to close on the blade, mount it, or be projected to the danger of those around. (4) It must not obscure the workman's vision of the line of the saw. (5) It must be especially adapted to the class of work done on the saw bench and where required must leave all the area of the saw table clear of obstruction and also the space above the guard itself.

The ways in which these conditions for reducing saw accidents, while maintaining efficiency, have been met in the author's experience are shown in the accompanying sketches.

Woodworking Cutters.—The common jointer accounts for a large number of finger and hand amputations every year, and three forms of effective guard are illustrated. In Nos. 8 and 10, two movements, vertical and horizontal respectively, are necessary to adapt the guard to any given piece of work. In No. 9, the guard supported on springs rises automatically when pushed by the work and only the transverse sliding motion is necessary for positioning. After the work has passed the guard the latter returns automatically to a position close to the cutter gap. In the other two types the guards maintain their height above the table until readjusted. All these guards can be readily swung out of the way for cutter adjustments and as easily returned for use.

Emery and Other Grinding Wheels.—Emery wheels, grindstones and other abrasive tools when over-speeded, or when strained or shocked while in motion within the limits prescribed by the makers, sometimes burst with great violence and spread death and serious injury in the path of their flight. Various methods for confining the wheel fragments to the machine casing, or at least rendering their velocity harmless, have been worked out, and a few are shown in the illustrations. In all of them ample side clearance between the wheel and its casing is a primary requisite. No. 11 shows the method of safely mounting the wheel and avoiding all initial stress due to wedging, keying and driving it on the spindle. No. 16 is the cone-sided wheel so shaped that fragments due to a fracture starting at the wheel center cannot escape beyond the washer plates. Nos. 14 and 15 show various forms of armoring successfully used to retain fractured wheels on disc and face grinders. No. 12 is especially armored for large wheels subject to shock. It has hinged sides of plate steel and a strong cast-steel front guard also hinged. The guard as a whole can slide parallel to the plane of the wheel to take care of reducing diameter due to wheel wear and the hinged front guard can be dropped to meet the same condition. Wheels have been tested to destruction under all the guards illustrated without projecting fragments. No. 13 is a form of releasing grindstone rest which prevents accidents due to tools catching between the usual fixed rest and the stone.

Durability and Identification of Safeguards.—Safeguards, where at all possible, should be constructed of metal to secure durability. Reinforced steel mesh work is preferred for all but the heaviest machinery. It is superior to guards of opaque material since it permits easy inspection without detaching the safeguard and interferes as little as possible with lighting conditions. In steel mills, foundries and heavy work plants of various descriptions, where the wear and tear of equipment is very great, nothing but strong castings or steel plate work should be used for the majority of the guards. It is the practice of the author to have all safeguards readily distinguished by painting the body of them vermillion and the reinforced edges black. This allows executives to detect at a glance in going through the shops a displaced or defective guard, such parts being often small in area, in inconspicuous places, and liable to be overlooked.

Warning and Caution Notices.—These should be sparingly used and be as brief as possible. They give a possible legal protection from certain kinds of accident damage suits but they are practically worthless in every sense if no attempt is made to enforce them. The supervisory and educational efforts of fully instructed and sympathetic foremen receiving full credit for the safeworking of their respective departments and a few well-considered and enforced regulations prominently displayed in print are far more effective than a long catalog of works rules which few will read and none will remember.

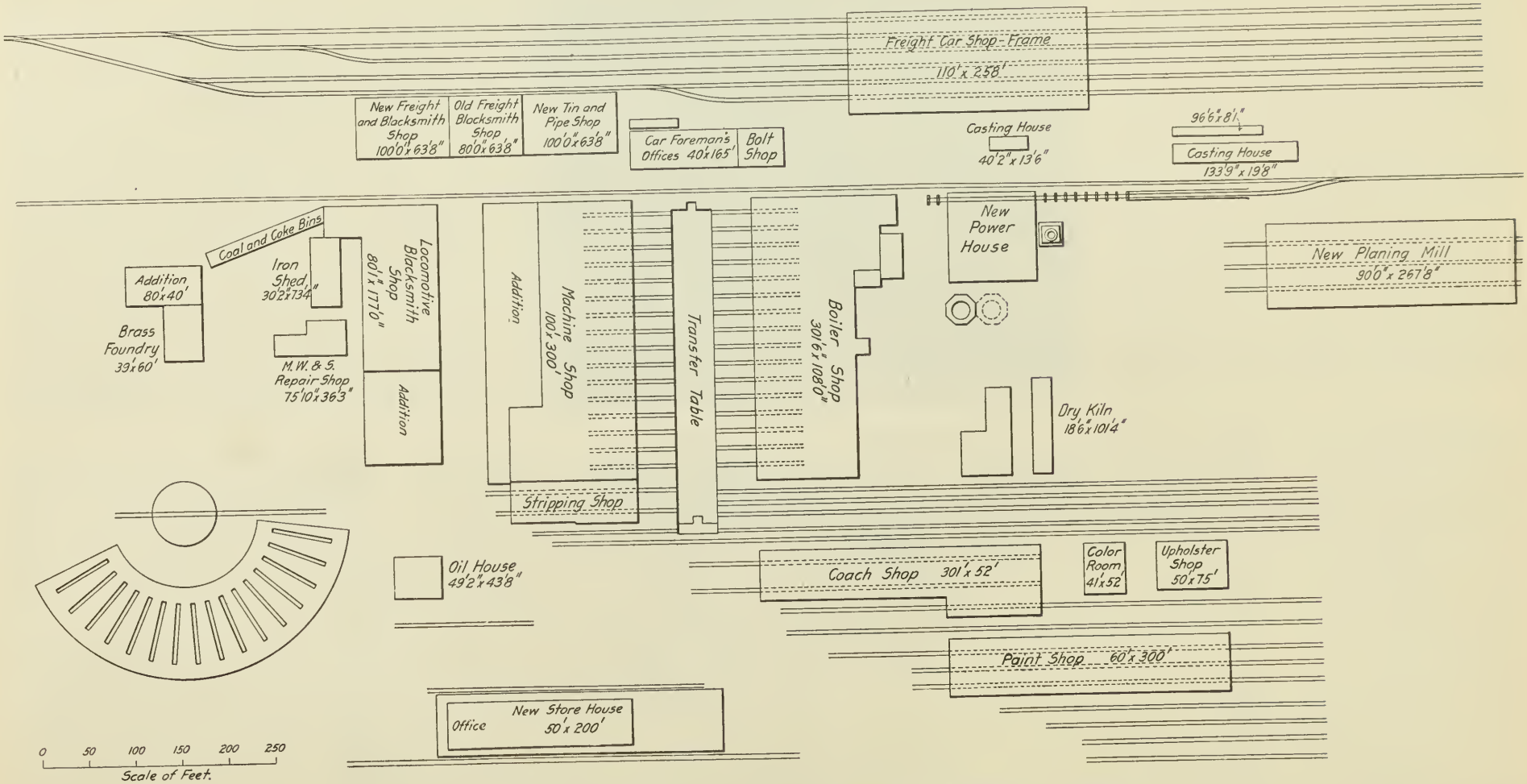
SHOP IMPROVEMENTS AT HUNTINGTON, W. VA.; CHESAPEAKE & OHIO.

The Huntington, W. Va., shops of the Chesapeake & Ohio were constructed 30 years ago; they were well built but arranged without regard to the necessity for future extensions. Separate steam engines were used for driving each of the line shafts, necessitating the use of several engine rooms and boiler plants. No facilities were provided for lifting the engines by power. The larger number and the greater size of the locomotives to be repaired at this point necessitated the enlarging of the shops, and after a careful study it was thought best to utilize the old buildings as far as possible. To do this it was found necessary to install a central power plant, a stripping shop, a planing mill and a storehouse, and to make additions to the machine shop, the boiler shop, the locomotive and freight car blacksmith shops and the brass foundry.



Locomotive Hoist in Stripping Shop.

Stripping Shop.—The stripping shop, which is 135 ft. long and 45 ft. wide, is elevated for 50 ft. at one end and is equipped with a hoist which spans the two longitudinal tracks through the building and is used for lifting locomotives from their wheels and placing them on trucks so that they can be pulled on the transfer table and moved into the old erecting shop, at one end of which the stripping shop is placed. When repairs have been completed in the erecting shop, the locomotive is transferred back to the stripping shop, and by means of the hoist is placed on its own driving and truck wheels. Jacking up of the engines for removing and replacing the wheels, a difficult problem with the extremely heavy power recently placed in service, is thus obviated. In the section of the stripping shop that is not served by the hoist are pits where the locomotives can be completed after they have been wheeled without transferring them back to the erect-



General Arrangement of the Huntington, W. Va., Shops of the Chesapeake & Ohio.

Additions have been made to the old machine shop, the locomotive blacksmith shop, the brass foundry and the old freight car blacksmith shop. The building formerly used for a boiler shop and a planing mill is now used entirely for boiler shop purposes. New buildings have been added for the planing mill, storehouse and power plant. An addition to the machine and erecting shop is used as a stripping shop.

ing shop. It was found necessary to change the drive of the old transfer table from a pair of air engines to an electric drive. Current for the motor is supplied from three overhead trolley wires; two mechanical speed changes are provided to prevent overloading the motor when starting or when moving unusually heavy loads. It is said that the introduction of the stripping shop has assisted in doubling the output of the erecting shop and has materially reduced the cost of locomotive repairs.

Machine Shop.—To provide for the additional machine tools that it was necessary to install, an extension, 300 ft. long and 60 ft. wide, with brick walls, steel roof trusses and skylights in the roof, was built along the wall of the old machine shop. As it was necessary to build only one longitudinal wall, the cost per unit of floor space was low.

Boiler Shop.—The boiler shop was formerly contained in a building, one-half of which was used as a planing mill. The



Cooling Tower and Partial View of Power House.

planing mill was removed to a new building, allowing the old one to be used entirely for boiler repairs. The old equipment was re-arranged and a number of new tools were provided, the most important of which were a sectional flanging press with an extra large flanging and annealing furnace for firebox work; an accumulator and hydraulic pump operating at 1,500 lbs. per square inch to supply power for the press, and with sufficient capacity for the future installation of a hydraulic riveter; an outfit of staybolt machinery for the manufacture of staybolts; a horizontal flange punch; bevel shear; flue sheet and mud-ring drill; extra heavy punching and shearing machines with 60-in. throats; stake riveter; staybolt breaker, etc. An electrically operated five-ton walking gib crane, with a 25-ft. radius, operates longitudinally through the shop. It is used for carrying material from the machine to the erecting side of the shop. An extension to this building, that was formerly used as a power plant, has been converted into a flue shop, and another small addition has been built alongside for the flue rattlers.

Locomotive Blacksmith Shop.—An addition, 100 ft. x 80 ft., has been made to the blacksmith shop, increasing the floor area about 50 per cent. The equipment has been rearranged, the steam hammers being placed in the center of the shop, with a row of double forges on one side and the bolt and forging machinery on the other side. The heavy work and slabbing is done under a 5,000-lb. steam hammer, near which is a large furnace for heating the scrap and extra heavy forgings. An open frame hammer for making repairs to locomotive frames is placed in one corner. The steam hammers, furnaces and many of the forges are served by gib cranes.

Brass Foundry.—The capacity of the brass foundry has been increased by an addition 80 ft. x 40 ft. It is of wood construction to match the old building. To reduce the cost of the output to a minimum, an automatic molding machine, a crude oil brass furnace, sprue cutter, wire cutter, new tumbling barrel, magnetic separator, and a ladle heater have been installed.

Planing Mill.—A substantial two-story fireproof structure, 268 ft. x 90 ft. and having brick walls, steel roof trusses and a concrete slab roof, was erected for planing mill purposes. The first floor is a concrete slab and has two standard gage longitudinal tracks and a transverse track for transporting material. The second floor is made of hollow tile and reinforced concrete and is supported by the side walls and steel columns extending through the center of the shop. The second story is used as a cabinet and pattern shop and for the repair of cabs, hand cars, etc.

The machinery is arranged in groups and is driven by induction type electric motors; the two large planers have individual motors. The planing mill is parallel to the yard tracks instead of at right angles as formerly, making it more convenient for handling the material from the mill to the repair tracks and the passenger car shop. It is located about half way between the lumber yard and the freight car repair tracks.

Freight Car Blacksmith Shop.—Brick structures, 100 ft. x 64 ft., with wooden roof trusses, have been placed at each end of the old freight car blacksmith shop. One of these is used for smith shop purposes and the other as a tin and pipe shop. The equipment in the blacksmith shop was rearranged and several machines were added, including a No. 9 Pullman type bulldozer, a large furnace for straightening steel car material, bulldozers, power hammers, rivet machines and an eyebolt machine.

Storehouse.—The space occupied by the old storehouse was badly needed for other purposes and a new and thoroughly modern storehouse and office building was placed opposite one end of the machine and erecting shop and near the coach shop. It is a two-story brick building, 200 ft. x 50 ft. At the end used for office purposes a third story, 50 ft. long, has been added. A platform 8 ft. wide has been placed along three sides of the building; on the fourth side it has been extended 96 ft., this part being used for the storage of castings and heavy forgings. The building is equipped with an electrically operated freight elevator.

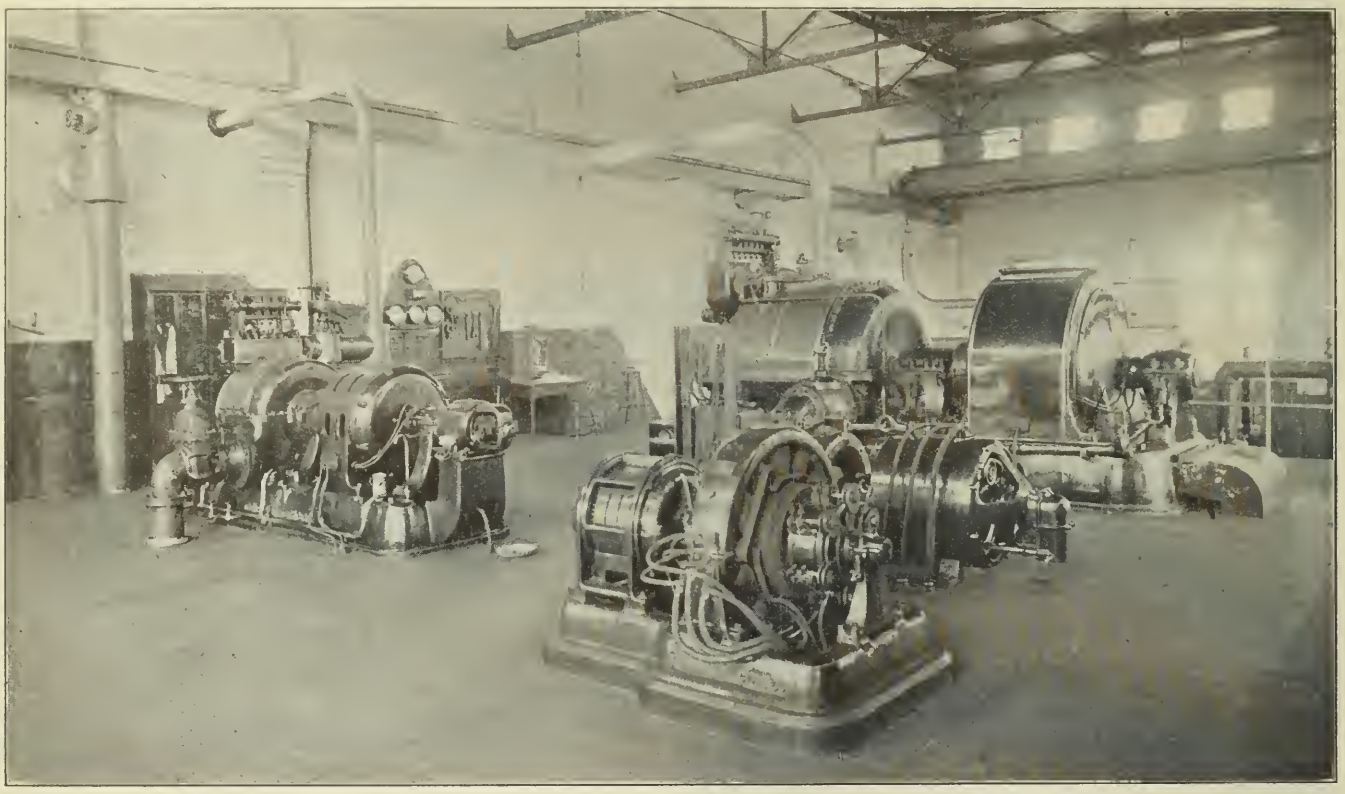
Power Plant.—The arrangement of the power-house is unique. The boiler room floor is approximately at the ground level, while that for the air compressors is slightly higher. The floor of the room in which the turbines are installed is 6 ft. above the air compressor floor, and underneath one-half of it is a basement 6 ft. deep. As the air compressors are run non-condensing, there is no need of having a basement under them, and the cost of the installation was considerably reduced by having them at the ground level. The large turbines require space underneath them for condensers, and part of this space is also utilized for feed pumps, return pumps, exhaust header, etc. The power-house, which is 80 ft. x 93 ft., is fireproof throughout, having brick walls on concrete foundations, steel roof trusses, and a concrete slab roof. A 7½-ton hand-power crane is installed in

the turbine room. A coal bin underneath an elevated track with a trestle approach is placed alongside the power-house. There is also an overhead ash bin with an electric hoist and a bucket for elevating ashes. The bin is fitted with a spout for loading the ashes into cars by gravity.

The power-house equipment includes one 750-k.v.a. General Electric turbine set operating condensing; one 125-k.v.a. General Electric turbine set operating non-condensing; the current used is three-phase, 60-cycle, 440 volts. One turbine and a motor-driven exciter are provided for the alternating current generators. Space is left for the future installation of a 750-k.v.a. turbine. The boiler equipment consists of five 271 h. p. Stirling water tube boilers operating at 150 lbs. pressure. The furnaces of these boilers are arranged to burn slack coal, and the boilers are ordinarily operated at a 50 per cent. overload. The chimney, which is 200 ft. high by 7 ft. 6 in. in diameter, is constructed of hollow tile and reinforced concrete. The old stack, which was heavily constructed and too small for any possibility of salvage, was pulled down by the use of a locomotive, a rather unusual but inexpensive method. Two air compressors taken from the old power-house were installed in the new one.

The supply of water available for condenser purposes was small and it was necessary to erect a cooling tower having a steel shell 90 ft. high and 20 ft. in diameter. Thirty feet at the lower part of the shell contains a grillage of cypress planking having a surface of about 30,000 sq. ft. The water after being used to condense the steam from the turbine is pumped from the condenser and spread over the grillage by a system of perforated pipes. As it falls in thin filaments over the surface of the grillage it is sufficiently cooled by contact with the air to be again used in the condenser. The movement of air within the tower is accomplished by natural draft. The condenser is of the Westinghouse Le Blanc type, driven by an induction motor directly connected to a shaft on which are mounted both rotary circulating and air pumps. On one of the hottest days last summer, with the thermometer 95 deg. in the shade, a vacuum of 26 in. was easily maintained throughout the day. The installation of the new power plant has resulted in a decrease of 50 per cent. in the coal consumption, with an increase of over 100 per cent. in the amount of power supplied.

General.—The rebuilding of these shops has resulted in an increase in the locomotive output of approximately 100 per cent., with a material decrease in the cost of repairs per locomotive and an increase of about 50 per cent. in the planing mill output, with no increase in the cost of labor. The work of extending the shops was carried on under the direction of J. F. Walsh, general superintendent motive power; C. H. Terrill, superintendent motive power; T. M. Ramsdell, master car builder; W. S. Buckley, master mechanic, and was designed and executed by Westinghouse, Church, Kerr & Co., New York.



Turbine Room in Power House, Huntington Shops; Chesapeake & Ohio.

FOREIGN RAILWAY NOTES.

The Hungarian minister, who has had charge of the state railways declares that they can no longer make both ends meet with the present rates. It will be a very unpopular thing to raise them, but it must be done. Formerly the cost per ton per mile was 0.73 cent, while the income was 1.32 cents. Now the cost has gone up to 0.88 cent, while the income has decreased. An increase of 8 per cent. in freight rates, which has been proposed, will not be enough.

The many nationalities included in Austria,—Bohemians, Poles, Ruthenians, etc.—are in many parts pretty well mixed with Germans and with each other. Several have secured laws providing that in their provinces their own language shall be used by the railway men, as well as German, and that all names on signs and in time tables, etc., shall be so expressed. Further, there is apt to be a good deal of friction if the larger number of the officials with whom they come in contact are not of their race. The new Austrian minister of railways, himself a Pole, says that in these districts of mixed languages the situation of the officials is often insufferable. The years which one spends there can only be called years of conflict. They are continually appealing to their superiors to transfer them to some other district.

General News Section.

Officers of the New York Central say that they have filled the places of the boilermakers who struck on February 21.

President Taft has awarded a railway life-saving medal to Miss Nettie Caskey, of Fairmount, Ind., who at the risk of her life saved a little child from being run over by a train.

The Upper House of the legislature of Oklahoma has adopted, without debate, a resolution designed to repeal the provision in the constitution of that state which forbids the sale of a domestic railway to a foreign company.

A special train, consisting of an engine and three cars, carrying officers of the road, was run over the Pennsylvania from Altoona to Philadelphia, 235.1 miles, on February 28, in 3 hours, 29 minutes, or at the rate of 67.5 miles an hour.

According to a press despatch from Syracuse, N. Y., 248 railway mail clerks have formed an association, and have affiliated themselves with the American Federation of Labor. This revolutionary action is taken, we are told, because the clerks have been denied the right of appeal to the higher officers of the post office department.

Officers of the Pennsylvania have denied reports published last week, following the decisions of the Interstate Commerce Commission in the freight rate cases, that important retrenchment orders had been given. The shops at Altoona were closed one day, February 25, because of the necessity of keeping the expenditures for the month within a certain fixed appropriation.

According to a Buffalo paper, 25 bill-clerks in the freight office of the Pennsylvania in that city, struck and left their work last week Friday, their grievance being that a new division freight agent had prescribed unreasonable regulations. The principal thing objected to seems to have been a rule making each bill-clerk responsible for losses of money due to errors in billing.

The Barge Canal Terminal Commission of the state of New York has submitted to the legislature its final report. It recommends that the state appropriate the sum of $16,500,000 to be spent for the construction and equipment of public terminal facilities for the canal, such sum to cover the purchase of necessary lands where such lands are now not publicly owned.

The express car of a train of the St. Louis, Iron Mountain & Southern was robbed, last Tuesday night, about 8 o'clock, in the city of St. Louis, the robbers having boarded the train at Broadway station and walked through the passenger coaches to the express car. They are said to have secured about $2,000. After binding the messenger hand and foot, they jumped off the train as it approached Tower Grove station.

According to a press despatch from El Paso, railway traffic in Mexico south of Chihuahua is tied up in many places, on account of the destruction of bridges and tracks by insurgents. The National lines are running only second-class coaches and are using only the oldest locomotives. In the northern part of Mexico, railway traffic, which has been interrupted for a month because of insurrection, is somewhat improved.

The Western Union Telegraph Company has so largely increased its business by the introduction of low rates for night letters, that it announces that it will accept "day letters" also at reduced rates; but these will be transmitted only when the wires are clear of regular day messages. For night letters the rate for 50 words is the same as for a regular ten-word day message; for day letters the rate will be 50 per cent. higher than for night letters.

The Chicago, Milwaukee & St. Paul has dismissed a large number of shop employees and some men in the track and other departments. This news was given out the day following the announcement of the Interstate Commerce Commission's decisions in the freight rate cases, the explanation given being that the officers of the road feared that the decision would cause a slackening of business in the Northwest. On Thursday, before the rate decision was announced, the St. Paul, it is said, had offered its telegraphers an increase of 6 per cent. in wages, but on Friday it was withdrawn.

The War Department has denied the applications for extension of the piers in the North river, New York City, which applications were made because of the need for providing dock room for the White Star Line's new steamships, which are about 100 ft. longer than the longest New York dock. The denial is based on the recommendation of the Harbor Line Board, and applies not only to the application of the steamship companies, which wanted to extend their piers 100 ft. into the river on the New York side, but also to that of the Riparian Commission of New Jersey, which desired a general extension between Fifteenth street, Hoboken, and Weehawken Cove. The new ships are to be put in commission within a few months. It is said that they could find convenient docks at New London or Boston; and Mr. Peters of the Long Island Railroad says that a pier to accommodate them could be built at Montauk Point by June.

Boiler Inspector Appointed.

President Taft has nominated for chief inspector of locomotive boilers, under the law recently passed, John F. Ensign, of Colorado; and for assistant chief inspectors Frank McManamy of Oregon and G. P. Robinson of New York. Mr. Ensign is a member of the Brotherhood of Locomotive Engineers, and Mr. McManamy, of the Firemen's Brotherhood, and both are now safety appliance inspectors of the Interstate Commission. Mr. Robinson is chief inspector of locomotive boilers for the New York State Public Service Commission, second district. The good results of the New York state inspection have recently been noticed in the *Railway Age Gazette.*

Rail Production in 1910.

Statistics prepared by the American Iron and Steel Association show that the total rail production of all kinds in the United States in 1910 amounted to 3,634,029 tons, as compared with 3,023,845 tons in 1909. The increase over 1909 was 610,184 tons, or over 20 per cent. Rail production in this country reached its high water mark in 1906, when the total tonnage was 3,977,887. Only 172,856 tons of rails were rolled during 1910 from purchased ingots or blooms, crop ends, seconds or renewed or rerolled rails, while 3,460,943 tons were rolled from ingots made by the rail manufacturers. The remaining 230 tons were iron. The rail production, according to weight for the last eleven years, was as follows:

Kinds of rails. Gross tons.	Under 45 lb.	45 lb. and less than 85.	85 lb. and over.	Total. Gross tons.
Bessemer rails	190,455	861,591	865,854	1,917,900
Open hearth rails	31,977	424,381	1,259,541	1,715,899
Iron rails	230	.....	.....	230
Totals for 1910	222,662	1,285,972	2,125,395	3,634,029
Totals for 1909	255,726	1,024,856	1,743,263	3,023,845
Totals for 1908	183,869	687,632	1,049,514	1,921,015
Totals for 1907	295,838	1,569,985	1,767,831	3,633,654
Totals for 1906	284,612	1,749,650	1,943,625	3,977,887
Totals for 1905	228,252	1,601,624	1,546,053	3,375,929
Totals for 1904	291,883	1,320,677	672,151	2,284,711
Totals for 1903	221,262	1,603,088	1,168,127	2,992,477
Totals for 1902	261,887	2,040,884	645,162	2,947,933
Totals for 1901	155,406	2,225,411	493,822	2,874,639
Totals for 1900	157,531	1,626,093	602,058	2,385,682

"Labor" Legislation Galore.

[A general manager quoted in the *Wall Street Journal.*]

Proposed labor legislation, which directly attacks the treasuries of the railways, has never been more voluminous in the legislatures and Congress than at present. This tendency has now assumed alarming proportions. The recent successful conclusion reached in the wage negotiations by the employees has made them arrogant. The ease with which they secured increases in wages ranging from 10 per cent. to 100 per cent. has convinced them that they can safely go to any lengths. The result has been a flood of bills introduced all over the country, which although labeled "for the public service," are nothing more than efforts by employees to secure for themselves shorter hours, less work and more pay. In this the employees are aided by politicians who are willing to lend their aid to these measures in return for the labor vote.

In Ohio, Indiana, Illinois, Nebraska and New York, we are

compelled constantly to fight this adverse legislation. The Clearance Bill now before Congress, which, if passed, will cost the railways over $440,000,000, is but one example of the extremes to which this labor legislation has reached. The full crew bill in Indiana is another. An extra brakeman has to be carried on every train. It will be hard to find any general manager who considers this anything but a useless expense.

In Indiana, a bill has just been introduced into the legislature providing that a railway cannot employ a man as a switchman until he has had a year's experience. The bill does not say what experience is necessary. This bill, instead of being referred to the regular Committee on Transportation, was referred to a special committee made up wholly of labor's representatives in the legislature. Although presumably for the public safety, if passed it will make it impossible to employ new men in case of a strike. The penalty provided is $1,000 fine for each offence. When this was objected to by a railway representative at the hearing, it was proposed to make the penalty $500 fine and five months' imprisonment.

In Ohio a bill has been introduced requiring that all cabooses shall be 24 ft. long. This will mean that our road alone would have to buy 1,000 new cabooses.

The situation has reverted into one where the railways are compelled to constantly fight their own employees. Every labor organization maintains a lobby at the state capitals and at Washington. They have their own representatives in the law-making bodies. Candidates are pledged before election, nor can they ignore their pledges after. Everybody can play politics but the railways, and there is no single interest that has more legislation directed against it than the railway interest.

Last week the Supreme Court upheld the constitutionality of the Arkansas full crew law. This effectually forestalls carrying any further the fight against the Indiana law. We can now expect that similar bills pending in the state degislatures of New York, New Jersey, Ohio and Illinois will be passed. Eventually it will mean that all of the states will adopt such laws.

Extension of Time on Safety Appliances.

Following the hearing by the Interstate Commerce Commission at Washington, February 27, it was announced that the commission would soon issue an order extending the time within which railways must comply with certain provisions of the law of April 14, 1910, requiring uniform running-boards, handholds, hand-brakes and other safety appliances. After conference with representatives of the railways and of the employees' brotherhoods, a form of order was drawn up providing that the time for complying with the law respecting brakes, ladder-clearances and certain other features of freight cars, should be extended for five years from July 1, 1911; the time to make similar changes on passenger cars for three years from the same date; on road locomotives two years, and on switching locomotives one year. The bill now before Congress, appropriating money for the expenses of the Interstate Commerce Commission for the next fiscal year, contains a clause empowering the commission to postpone the date of compliance with this law, not only as regards old cars but also as regards cars put in service up to July 1, 1911. As the law was passed, originally, the commission could not extend the time limit except in relation to cars which were in service April 14, 1910.

Railway Storekeepers' Association.

The eighth annual convention of the Railway Storekeepers' Association will be held at the Hotel Pfister in Milwaukee, Wis., May 22-24. The subjects to be discussed are as follows: Regular subjects: The Need of Standard Material Classification and Disbursements in Order to Intelligently Compare the Work of the Various Supply Departments and the Relative Stock of Material Which They Maintain; The Railway as a Manufacturer; The Standardization of Tinware; The Standardization of Storehouses, Oil Houses, Scrap Docks, Supply Cars, etc.; Timber Treating. Topical subjects: Stock Upkeep and Stock Reduction; Outline of Methods in Handling Navy Department Stores; Return of Cement Sacks, Carboys, Drums, etc.; Standard Railroad Electric Light Fixtures. Committee reports will be received at the convention from the committee on Recommended Practice; Piece Work; Scrap Classification; Accounting; and Membership.

Engineers' Club of Kansas City.

The Engineers' Club of Kansas City, Kansas City, Mo., was organized in January, 1911, and now has a membership of 100. The club was established for the purpose of bringing together representatives of the engineering profession to engage in general discussions of matters of professional interest, and to cultivate friendly social relations. The first dinner meeting of the club was held on February 17, and was followed by an illustrated talk on the Detroit river tunnel by W. S. Kinnear, president of the Kansas City Terminal Company, and formerly chief engineer of the Detroit River Tunnel Company. The officers of the club are as follows: President, John Lyle Harrington; vice-president, F. W. Pratt; secretary, A. Hurlbut. The headquarters are in the rooms of the University Club of Kansas City.

American Society of Mechanical Engineers.

The sixty-third meeting of the American Society of Mechanical Engineers will be held in Pittsburgh, Pa., on May 30 to June 2. The executive committee, consisting of E. M. Herr, chairman; George Mesta, J. M. Tate, Jr., Chester Albree, D. F. Crawford, Morris Knowles and Elmer K. Hiles, secretary, will have charge of these meetings. An attendance of 300 or 400 is expected. There will be professional sessions when papers will be read and discussed. There will also be inspection trips through the leading local industrial establishments.

American Institute of Consulting Engineers.

At a meeting of the council of the American Institute of Consulting Engineers New York on February 24, it was decided to oppose all the bills now pending in the New York legislature to license civil engineers. The president, Mr. Boller, and the committee on legislation of the institute were instructed to attend the hearings on these bills at Albany, and to use all legitimate means to prevent their passage; also to co-operate with other engineering bodies having a like object in view.

Central Railway Club.

At the regular meeting of the Central Railway Club at Buffalo, N. Y., March 10, John P. Kelly will present a paper on the Influence of Gravity on Trains Descending Grades, and Brake Power Necessary for Safe Control. The standing committee on rules of interchange will also present its report of recommendations for the consideration of the Master Car Builders' Association.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on March 1, a paper by Albert R. Raymer, M. Am. Soc. C. E., entitled the Pittsburgh & Lake Erie Railroad Cantilever Bridge over the Ohio River at Beaver, Pa., was presented for discussion.

Canadian Society of Civil Engineers.

At a meeting of the mechanical section of the Canadian Society of Civil Engineers, March 2, a paper by Col. Alex. Bertram on Recent Advances in Machine Tool Construction, was read by the author and illustrated by lantern slides.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; next meeting, March 22, Chicago.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911, Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday, Chicago; annual, July 29, Chicago.
Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; next convention July 25-27, Chicago.
International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday, Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.
Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis; annual, Oct. 20, Atlanta.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.
Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs., Jan., April, August and Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

An agricultural instruction train is to be run over the standard gauge lines of the Denver & Rio Grande in Colorado, the railway company co-operating with the Colorado Agricultural College.

The Los Angeles Traffic Club, Los Angeles, Cal., is to be reorganized, and representatives of shippers will be admitted to membership. Hitherto, the club has been composed wholly of railway men. The president of the organization is E. S. Blair, traveling freight agent of the Missouri Pacific.

The New York State Barge Canal Terminal Commission has made its report to the legislature. It covers the location and the estimated expense of the terminals recommended, the character of facilities necessary for the trans-shipment of freight and maps indicating the places in the several cities in which the terminals are recommended. There is a full description of prominent European waterways and terminals, and an extended compilation of the port dues and charges at leading seaports and inland harbors.

A press despatch from Decatur, Ala., says that the suits which have been filed in the courts against the Southern Railway and the Louisville & Nashville, in connection with fraudulent bills of lading on cotten sent to Europe, number 37, and the aggregate damages demanded will amount to $2,000,000. These suits have been transferred to the Federal court, and will be tried at Huntsville in April. The plaintiffs are English and German creditors of Knight, Yancey & Co., the cotton firm which failed for about $6,000,000.

At a largely attended meeting at the Western Trunk Line offices in Chicago on Wednesday, it was decided to make no appeal from the recent decision of the Interstate Commerce Commission denying the roads the right to increase freight rates. It was argued that if the roads comply with the decree without objection, there will be an opportunity at a later date to submit advances on certain rates, some of which may meet with favor.

The legal officers of prominent roads met in New York and considered the commission's decision, but no action was taken.

The Southern Railway will next week run an agricultural educational train over the lines of its Richmond division, the Virginia State Department of Agriculture and Immigration co-operating with the officers of the railway. A similar train is to be run in Kentucky in co-operation with the Department of Agriculture and the College of Agriculture of that state. In connection with other railways the Southern is furnishing free of charge a train with which the State College of Agriculture of Georgia is making a 47-day tour of that state. This large expense is borne by the railways in the belief that their interests are identical with those of the farmers.

Southern Commercial Congress.

The first session of the Southern Commercial Congress which is to be held at Atlanta, Ga., meets March 8. The congress is the guest of the Atlanta Chamber of Commerce. The program gives the names of a large number of men who are to speak at the first session. Among others who will give external views of the South are: James Wilson, secretary of the Department of Agriculture, who will speak on the agricultural obligations of the South; Judge Gary, who is invited to speak on the manufacturing obligations of the South; George Westinghouse, who will speak on electricity in the development of the South, and many others. Chairman Clements of the Interstate Commerce Commission, has been invited to speak on public service corporations; President Hadley, on the valuation of stocks and bonds, and Charles Hansel, on the valuation of railway property.

Financial Results of Mexican Railways.

Since the National Railways of Mexico do not report to the Interstate Commerce Commission their earnings are not included in our table of monthly earnings. An officer of the railways has furnished figures regarding the financial results of the operation of these lines during the six months ended January 1, 1911. The lines whose results are included in the statement are the

National Railways, Interoceanic Railway, Mexican Southern and Texas-Mexican Railways, having a mileage of 7,385 miles. The Veracruz & Isthmus is not included.

Gross earnings during this period were $36,561,586 as compared with $32,621,387 in the same months of 1909, an increase of 12 per cent.; operating expenses $21,715,718, as compared with $20,423,440 in 1909, an increase of 6 per cent., and net earnings $14,845,868, as compared with $12,197,946 in 1909, an increase of 21 per cent., all in Mexican money. The estimated earnings of the National Railways of Mexico alone for the month of January, 1911, were $6,150,970, an increase over the same month of 1910 of $342,743, or 5 per cent., and for February, $1,350,267, an increase of $157,007, or 13 per cent.

In transmitting the above statement the officer in question said: "In view of the stories you have heard in regard to revolutionary conditions in this country, the above statement of our earnings is the best refutation of them; at least they show the results of the revolutionary efforts are very local, being confined to the state of Chihuahua, and not affecting business generally."

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 89-A, giving a summary of car shortages and surpluses by groups from October 27, 1909, to February 15, 1911, says:

"There was a further increase in the surplus of 19,254 cars, making a total for this report of 175,609. There was practically no change in the box car surplus, the increase being entirely in coal and miscellaneous cars. The surplus at present is about three times as large as for the same period last year, the greatest difference being in coal cars, of which class there was a very small excess in February, 1910. It is probable that this difference is due less to a reduced traffic than to the comparative freedom from congestion which has been the result of favorable weather conditions existing during the present winter."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts give biweekly totals for 1907, 1908, 1909, 1910 and 1911.

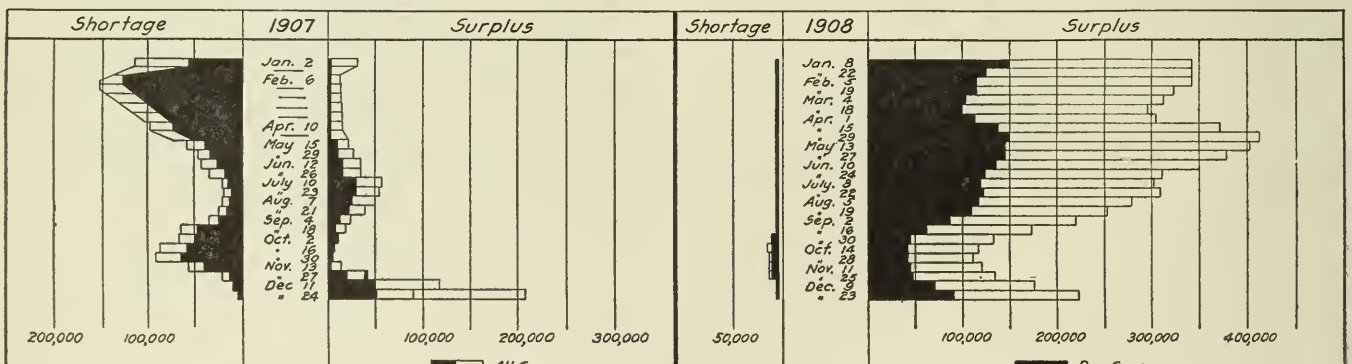
Work of the Railway Ticket Protective Bureau.

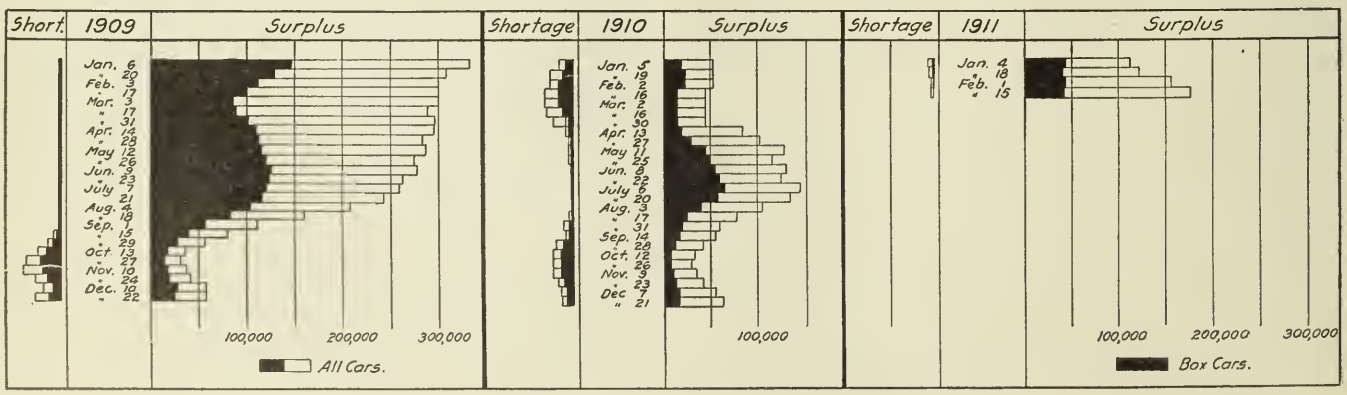
The Railway Ticket Protective Bureau has issued a statement regarding its work since November 12, 1909. Boston has been entirely cleared of the ticket scalping evil. Owing to conditions beyond the control of the officers of the bureau, one ticket scalping office is being operated in New York City. A temporary injunction prohibiting the ticket brokerage business at Syracuse, N. Y., has been made permanent. In several instances, brokers

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—February 15, 1911	8	253	1,377	3,068	179	4,877	0	0	50	8	58
" 2.— " 15, 1911	23	4,186	575	19,266	8,964	32,991	8	0	2	16	26
" 3.— " 15, 1911	24	5,706	1,603	39,064	5,385	51,758	0	100	100	16	216
" 4.— " 15, 1911	10	3,680	91	4,208	1,918	9,897	0	193	0	0	193
" 5.— " 15, 1911	17	1,958	481	5,750	994	9,183	0	45	50	0	95
" 6.— " 15, 1911	22	8,836	1,175	4,729	5,745	20,485	73	8	34	167	282
" 7.— " 15, 1911	3	433	96	1,271	822	2,622	0	0	0	0	0
" 8.— " 15, 1911	15	6,479	770	5,596	3,028	15,873	0	0	0	0	0
" 9.— " 15, 1911	13	3,301	377	345	784	4,807	0	0	0	7	7
" 10.— " 15, 1911	21	5.460	2,780	3,364	9,996	21,600	2	0	0	4	6
" 11.— " 15, 1911	6	57	668	42	749	1,516	727	0	0	332	1,059
Total	162	40,349	9,993	86,703	38,564	175,609	810	346	236	550	1,942

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages.

who formerly operated at Buffalo and Niagara Falls tried to re-establish offices. Evidence was collected under which they were fined from $50 to $250, and this has suppressed the practice there. Scalpers tried to establish offices at Toledo to deal in Sunday excursion tickets, but injunctions prohibiting their operations were secured. Ticket scalping is still being carried on in the vicinity of the union station at Columbus, Ohio, but the bureau will try to secure action either by the courts or the city council that will correct the situation. There are no regular scalping offices maintained in Indianapolis, and with the co-operation of the city's police department and local railway representatives the bureau was able to suppress a traffic in week-end or Sunday excursion tickets which was carried on principally by boys and young men. Injunctions issued by state and federal courts closed all the scalping offices in Detroit. Six brokerage offices were operated in Chicago last summer, four of which were obscurely located in basements and conducted in conjunction with other businesses. Early in the season three were compelled by the bureau to close, and the proprietors of two were prosecuted under the Interstate Commerce act for dealing in railway passes and fined $50 each. Against the other a similar indictment is pending. One conviction for contempt of court, consisting in the violation of an injunction, was secured, and the judgment was suspended by the court on condition that the offender permanently retire from the ticket scalping business. Two other trials for contempt are yet to take place.

Frequent investigations have shown that no open effort has been made to re-establish ticket brokerage at St. Louis, although in some cases live stock passes have been sold. Several scalpers at Kansas City successfully resisted the efforts of the bureau to put them out of business for a long time. After months of patient investigation, however, the bureau was able to lay before the state and municipal authorities proof of the criminal nature of their transactions. As a result, the brokerage offices in the city were closed, and the persons arrested were held for the grand jury. Indictments were obtained and the trials are now in progress.

Decrees issued by the courts at Salt Lake City two years ago closed the regular brokerage offices, but it developed later that hotel clerks, porters, cab drivers and keepers of cigar stands were dealing in returned portions of tourist and excursion tickets. Copies of the injunctional decrees were served on these persons, and with the co-operation of the hotel proprietors scalping was stopped at both Salt Lake City and Ogden. Despite the fact that the bureau has succeeded three times in closing all the brokerage offices in Denver, the business of scalping has, in one form or another, been as often re-established. Most of the scalping has been done in the suburbs of the city. Litigation to put the brokers at this place out of business is already in progress. Last summer two brokerage offices were opened at Los Angeles. The proprietor of one has been twice indicted by the grand jury for violating the law by offering tickets for sale through the mails at less than the lawful published rates. Hearing on the second indictment is now pending.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 28, certain tariffs, on grain, filed by the Chicago, Rock Island & Pacific.

The commission has suspended until September 15, tariffs showing increased rates on coal from West Virginia and Virginia to points on Lake Erie, filed by the Baltimore & Ohio, the Chesapeake & Ohio and the Norfolk & Western.

Reparation Awarded.

Miller & Lux, Inc. v. Southern Pacific et al. Opinion by Commissioner Lane:

Rate collected on shipment of live stock found unreasonable because released valuation was not written in live-stock contract. (20 I. C. C. 129.)

George D. Henry v. Eastern Railway of New Mexico et al. Opinion by Commissioner Meyer:

Rate imposed on shipment of sheep in double-deck cars from Vaughn, N. Mex., to Kansas City, Mo., fed in transit at Pampa, Tex., found to be unreasonable. (20 I. C. C. 171.)

Browne Grain Co. v. Gulf, Colorado & Santa Fe et al. Opinion by the commission:

Rate of 52½ cents per 100 lbs. for transportation of snapped corn in carloads, Erath, La., to Miles, Tex., found unreasonable, and rate of 31 cents prescribed for the future. (20 I. C. C. 163.)

National League of Commission Merchants of the U. S. v. Atlantic Coast Line. Opinion by Commissioner Clark:

Rates on vegetables from Charleston, S. C., district to Buffalo, N. Y., and Pittsburg, Pa., found to be unreasonable to the extent that they exceed the combinations on Baltimore, Md. (20 I. C. C. 132.)

Complaint Dismissed.

W. I. & J. R. Thompson v. Louisville & Nashville et al. Opinion by the commission:

Charges on carload of plows from Evansville, Ind., to Huntsville, Ala., not unreasonable. (20 I. C. C. 161.)

William D. Scott v. Texas & New Orleans et al. Opinion by the commission:

Rate of $3.30 per net ton on coal, Carbon Hill, Ala., to Herbert switch, Tex., not found to be unreasonable. (20 I. C. C. 167.)

B. E. Blake & Son Hardware & Mfg. Co. v. Baltimore & Ohio et al. Opinion by Commissioner Prouty:

The rate on shipments of wrought-iron pipe from Youngstown, Ohio, to Liberal, Kan., is not found unreasonable, or in violation of section 3 of the act. (20 I. C. C. 139.)

Reduced Rate to Meet Competition.

Georgia-Carolina Brick Co. v. Southern Railway et al. Opinion by the commission:

The reduction by carriers of a rate via a long route to equal the rate via the short line is not of itself conclusive evidence of the unreasonableness of the higher rate, and claims for reparation based on the ground that the rate was reduced to meet such short-line rate must be denied. *Menefee Lumber Company* v. *T. & P.*, 15 I. C. C., 49, and *Commercial Coal Co.* v. *B. & O.*, 15 I. C. C. Rep., 11, reaffirmed. (20 I. C. C. 148.)

Commodity Rate Not Covered by Missouri River Case.

Wheeler & Motter Mercantile Co. v. Chicago, Burlington & Quincy. Opinion by Commissioner Clark:

Proportional third class rate applicable only on shipments from Atlantic seaboard territory, established under order of the commission in the *Burnham, Hanna, Munger case,* 14 I. C. C., 299, did not, and does not, apply to the movement of cotton piece goods, for which carriers maintained a commodity rate. (20 I. C. C. 141.)

Lower Rates via Silver Bow Prescribed.

E. P. Stacy & Sons v. Oregon Short Line et al. Opinion by Commissioner Clark:

Rates on apples and other deciduous fruits from Utah points to points in North Dakota, made in full combination on Silver Bow, Mont., and in excess of rates from same points of origin to same destinations via Omaha, found to be unreasonable. (20 I. C. C. 136.)

Restriction on the Freedom of Contract.

Baltimore Butchers' Abattoir & Live Stock Co. v. Philadelphia, Baltimore & Washington et al. Opinion by Commissioner Lane:

The refusal of defendants to deliver to the sidetrack of complainant, at Gwynn's Run, Baltimore, the live-stock shipments consigned thereto found unreasonable and in violation of law. Order issued that such delivery be hereafter made.

Carriers should not make contracts which abrogate the act to regulate commerce; they should not refuse, because of their own contract, to furnish a delivery that is reasonable on tracks which they use as a terminal for the shippers; and they should not discriminate between commodities in the delivery which they give, where no reason exists for such discrimination excepting the presence of a contract made with a private corporation, as in this case. (20 I. C. C. 124.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1910. (SEE ALSO ISSUES FEBRUARY 10, 17 AND 24.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance—Way and structures.	Maintenance—Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$118,012	$54,300	$184,299	$21,587	$24,320	$3,878	$58,585	$5,942	$114,312	$69,987	—$23	$5,596	$64,368	$7,121
Alabama Great Southern	309	273,425	114,456	420,191	50,884	89,486	9,811	126,319	9,209	285,709	134,482	—1,565	13,805	119,112	5,767
Ann Arbor	301	124,723	36,728	171,641	22,421	20,003	3,656	61,249	7,571	114,900	56,741	—4,510	14,265	37,966	4,716
Arizona Eastern	364*	93,725	34,897	136,792	26,136	12,088	2,342	38,699	3,969	83,234	53,558	—151	6,944	46,463	29,030
Carolina, Clinchfield & Ohio	236	126,970	10,386	140,524	14,324	17,206	5,127	35,907	8,952	81,516	59,008	550	5,500	54,058	33,372
Carolina, Clinchfield & Ohio of S. C.	18†	8,280	1,324	9,771	742	49	924	2,711	503	4,928	4,842	.....	200	4,642	6,259
Central Vermont	411	219,520	69,334	312,744	17,589	62,205	7,698	152,421	9,032	248,945	63,799	200	10,750	53,249	69,448
Chicago, Indiana & Southern	329	326,636	22,788	359,805	38,953	65,694	8,538	136,785	9,267	259,237	100,568	—300	12,818	87,450	—4,895
Cincinnati, New Orleans & Texas Pacific	337	613,144	156,542	808,979	77,757	177,605	23,361	231,472	18,459	528,654	280,325	—2,408	21,500	256,417	—20,075
Detroit, Toledo & Ironton	441	117,921	12,896	144,778	37,221	19,712	2,745	94,287	6,238	160,203	—15,425	.....	6,712	—22,137	—12,164
Georgia Southern & Florida	395	117,796	78,315	232,160	22,725	50,547	6,069	83,548	8,721	171,610	60,550	.....	7,921	52,629	—7,772
Grand Trunk Western	347	430,243	152,773	616,400	33,585	56,978	20,725	247,455	15,398	374,141	242,259	—1,268	31,697	209,294	73,273
Gulf & Ship Island	307	127,851	38,663	180,173	20,661	29,600	1,461	50,822	7,567	110,111	70,062	.....	5,303	64,759	11,814
Hocking Valley	350	489,603	72,256	583,562	92,373	109,221	8,727	216,290	20,709	447,320	136,242	.....	28,650	107,592	—30,773
International & Great Northern	1,159	571,301	206,082	827,053	92,050	110,048	20,304	406,552	22,342	651,296	175,757	—882	22,000	152,875	—10,191
Iowa Central	559	242,771	45,080	300,326	28,937	45,311	5,775	134,171	8,317	222,511	77,815	.....	9,813	68,002	25,268
Kanawha & Michigan	175	217,706	29,538	252,480	26,488	52,385	1,998	78,415	7,543	166,829	85,651	—10	7,193	78,448	45,614
Kansas City, Mexico & Orient	740	131,686	37,194	178,078	33,342	28,670	8,522	76,470	7,778	154,782	23,296	.....	2,705	20,591	19,136
Louisiana Ry. & Nav. Co	350	124,237	23,387	157,759	24,371	15,965	5,203	68,600	7,070	121,209	36,550	.....	4,400	32,150	19,801
Louisiana Western	207	126,317	60,687	196,725	31,620	19,936	6,906	57,427	7,702	123,591	73,134	—912	12,987	59,235	6,854
Minneapolis & St. Louis	1,027	292,793	91,651	414,844	41,597	57,057	9,383	178,163	18,109	304,309	110,535	—33	20,257	90,245	38,952
Minneapolis, St. Paul & S. S. Marie	3,573‡	1,167,350	375,113	1,668,017	167,597	266,984	54,676	716,283	39,050	1,244,590	423,427	333	93,168	330,592	—112,610
Missouri Pacific	3,920§	1,308,063	363,594	1,883,178	217,083	312,348	52,506	974,282	69,972	1,626,191	256,987	—2,304	83,500	171,183	—58,921
Morgan's La. & Texas R. R. & S. S. Co.	348	494,377	115,629	644,759	55,007	49,130	12,294	194,241	14,113	324,785	319,974	1,775	30,452	291,297	42,157
New Orleans & Northeastern	196	272,186	59,505	352,150	36,269	43,629	9,316	123,647	13,224	226,085	126,065	—241	10,037	115,787	21,539
New Orleans Great Northern	282	89,971	34,011	132,865	22,493	20,725	2,338	38,667	5,938	90,161	42,704	—94	2,200	40,410	—1,457
New Orleans, Mobile & Chicago	404	130,950	34,433	175,018	21,436	14,807	2,525	48,003	8,883	95,654	79,364	.....	5,435	73,929	13,753
New Orleans, Texas & Mexico	264	97,340	16,711	123,533	17,668	9,865	3,395	52,468	7,496	90,892	32,641	.....	3,388	29,253	36,601
St. Louis, Iron Mountain & Southern	3,316¶	1,801,698	577,488	2,576,696	392,924	298,410	53,288	825,723	78,107	1,648,452	928,244	—2,996	78,919	846,329	72,074
San Antonio & Aransas Pass	724	254,146	90,018	363,944	77,339	44,266	5,095	142,089	9,775	278,564	85,380	.....	10,000	75,380	1,982
San Pedro, Los Angeles & Salt Lake	1,105	469,616	245,102	763,276	100,220	113,133	33,213	269,490	18,989	535,045	228,231	—7,306	30,206	190,719	69,841
Spokane, Portland & Seattle	433	201,707	81,053	293,217	37,674	12,697	3,887	76,741	9,979	140,978	152,239	—2,644	38,500	111,095	111,299
Trinity & Brazos Valley	462	200,176	32,747	237,975	33,466	26,952	8,137	90,185	13,482	172,222	65,753	.....	4,685	61,068	15,548
Vicksburg, Shreveport & Pacific	171	84,213	55,968	151,168	20,828	21,532	2,787	46,499	5,204	96,850	54,318	—201	4,675	49,442	14,929
Western Maryland	543	466,690	60,148	553,416	54,139	75,177	7,725	234,375	13,246	384,662	168,754	—2,781	19,500	146,473	—
Wheeling & Lake Erie	457	436,095	47,085	520,932	40,782	129,042	8,634	214,494	14,886	407,838	113,094	8,518	20,209	101,403	—49,806
SIX MONTHS OF FISCAL YEAR 1911.															
Alabama & Vicksburg	143	$600,816	$270,257	$937,509	$119,043	$147,981	$22,541	$309,854	$31,695	$631,114	$306,395	—$281	$28,446	$277,668	$21,824
Alabama Great Southern	309	1,530,682	600,798	2,319,316	279,658	521,183	60,961	693,893	54,684	1,610,379	708,937	—4,546	79,464	624,927	88,596
Ann Arbor	301	668,622	278,533	1,011,298	140,273	116,172	23,753	336,453	40,095	656,746	354,552	7,877	85,591	276,838	23,733
Arizona Eastern	364*	568,490	199,098	825,053	151,601	75,102	11,896	233,442	25,017	497,058	327,995	—151	34,988	292,856	—7,097
Carolina, Clinchfield & Ohio	236	668,349	88,011	781,004	76,491	108,823	31,862	172,823	48,871	438,870	342,134	550	33,000	309,684	165,872
Carolina, Clinchfield & Ohio of S. C.	18†	36,080	8,659	46,371	3,662	308	5,493	13,993	3,081	26,537	19,834	.....	1,200	18,634	—
Central Vermont	411	1,278,563	614,435	2,044,572	264,751	305,286	45,224	867,615	44,146	1,527,022	517,550	3,977	63,867	457,660	807
Chicago, Indiana & Southern	329	1,604,565	158,496	1,813,910	264,825	349,826	56,018	705,639	54,288	1,430,596	383,314	1,461	80,693	304,082	—131,064
Cincinnati, New Orleans & Texas Pacific	337	3,710,537	867,601	4,810,112	515,454	871,679	124,223	1,301,126	107,025	2,919,507	1,890,605	—6,369	129,000	1,755,236	219,945
Detroit, Toledo & Ironton	441	870,037	94,202	1,044,612	195,806	177,550	17,376	527,874	33,961	952,567	92,045	—73	40,272	51,700	—14,305
Georgia Southern & Florida	395	660,325	400,397	1,231,002	134,132	247,386	36,292	449,792	54,216	921,818	309,184	.....	57,304	251,880	—30,589
Grand Trunk Western	347	1,847,893	1,058,134	3,118,551	335,271	441,577	109,624	1,290,050	78,617	2,255,140	863,411	—6,884	190,184	666,343	—148,320
Gulf & Ship Island	307	721,270	223,474	1,012,575	122,114	173,104	10,298	283,851	47,070	636,437	376,138	.....	31,364	344,774	35,348
Hocking Valley	350	3,450,620	487,040	4,204,611	543,886	614,541	54,042	1,271,145	97,355	2,580,969	1,623,642	.....	178,335	1,445,307	—32,055
International & Great Northern	1,159	3,587,334	1,134,742	5,024,925	692,520	686,547	116,411	1,943,890	128,711	3,568,079	1,456,846	—2,171	130,000	1,324,675	379,251
Iowa Central	559	1,416,078	306,133	1,800,507	219,801	315,514	42,048	721,679	53,257	1,352,299	448,208	.....	58,741	389,467	—26,648
Kanawha & Michigan	175	1,470,779	190,925	1,695,567	185,531	300,750	14,351	453,806	39,537	993,975	701,592	—80	47,229	654,283	243,767
Kansas City, Mexico & Orient	740	720,550	245,412	1,019,662	195,137	199,491	46,467	452,305	46,707	940,107	79,555	.....	25,276	54,279	—53,660
Louisiana Ry. & Nav. Co	350	665,682	126,124	870,731	156,765	101,428	29,893	354,696	37,289	680,071	190,660	.....	26,400	164,260	61,592
Louisiana Western	207	679,092	322,036	1,050,813	113,231	147,293	37,357	304,480	44,088	646,449	404,364	530	43,372	361,522	—28,350
Minneapolis & St. Louis	1,027	1,910,887	692,552	2,779,922	312,788	341,238	65,992	1,056,762	87,645	1,864,425	915,497	—228	122,976	792,293	—76,347
Minneapolis, St. Paul & S. S. Marie	3,573‡	8,140,120	2,740,451	11,615,076	1,195,139	1,558,027	262,227	4,050,366	240,723	7,306,482	4,308,594	93,155	649,583	3,752,166	—1,562,539
Missouri Pacific	3,920§	9,378,486	2,569,495	13,270,655	2,052,696	2,121,890	361,137	5,743,051	421,341	10,700,115	2,570,540	13,727	501,000	2,055,813	—
Morgan's La. & Texas R. R. & S. S. Co.	348	1,980,517	595,862	2,729,326	343,140	301,763	66,615	915,710	80,696	1,707,923	1,021,403	—10,519	119,233	891,651	30,302
New Orleans & Northeastern	196	1,385,891	319,524	1,815,355	180,797	267,947	55,375	634,806	67,045	1,205,970	609,385	—461	52,787	556,137	40,359
New Orleans Great Northern	282	568,091	196,402	836,965	126,491	121,407	18,636	228,301	28,354	523,189	313,776	—479	10,950	302,347	77,895
New Orleans, Mobile & Chicago	404	674,590	177,452	912,830	125,595	72,655	17,524	267,789	47,489	531,052	381,778	.....	26,576	355,202	70,699
New Orleans, Texas & Mexico	264	462,955	88,688	595,522	102,714	66,355	21,978	245,106	45,212	481,365	114,157	.....	5,282	108,875	76,507
St. Louis, Iron Mountain & Southern	3,316¶	10,156,437	3,133,997	14,424,721	2,263,808	1,972,352	338,785	4,904,558	456,280	9,935,783	4,488,938	—16,185	471,499	4,001,254	—464,843
San Antonio & Aransas Pass	724	1,664,684	604,694	2,393,497	380,577	285,394	29,657	774,697	56,609	1,526,934	866,563	.....	56,000	810,563	126,020
San Pedro, Los Angeles & Salt Lake	1,105	2,455,828	1,401,724	4,113,650	763,225	598,360	183,598	1,440,984	99,931	3,086,098	1,027,552	—29,958	160,657	836,937	—248,202
Spokane, Portland & Seattle	433	1,768,343	525,594	2,411,834	268,030	147,227	23,224	628,527	57,840	1,124,848	1,286,986	—5,366	197,600	1,084,020	605,132
Trinity & Brazos Valley	462	916,642	205,616	1,168,383	202,416	194,733	47,944	500,439	65,788	1,011,320	157,063	.....	22,185	134,878	4,462
Vicksburg, Shreveport & Pacific	171	473,750	265,937	797,497	109,904	131,574	20,330	237,122	27,392	526,322	271,175	—279	34,850	236,046	51,106
Western Maryland	543	3,034,388	579,788	3,776,090	475,848	442,620	59,432	1,275,470	75,540	2,328,910	1,447,180	—1,722	117,000	1,328,458	—
Wheeling & Lake Erie	457	3,101,346	340,794	3,685,800	430,653	702,577	51,998	1,281,779	82,603	2,549,610	1,136,190	20,339	126,858	1,029,671	—16,417

Mileage operated on December 31, 1909.—* 336 miles; ‡ 3,425 miles, including Wisconsin Central for both years; § 3,881 miles; ¶ 2,610 miles.
† Commenced operation December 11, 1909. — Indicates Deficits, Losses and Decreases.

Followed Routing Instructions.

West Oregon Lumber Co. v. Astoria & Columbia River Railroad et al. Opinion by the commission:

A carrier does not misroute a shipment when the routing instructions given by the shipper are observed, and it is not liable to the shipper for charges applicable over such route in excess of the charges over another available route. (20 I. C. C. 151.)

Dubuque Bridge Charge Not Unreasonable.

Board of Railroad Commissioners of Iowa v. Illinois Central Railroad et al. Opinion by Commissioner Harlan:

A total charge approximating 30 cents per passenger, consisting of a toll of 25 cents and mileage, for passage across the Dubuque bridge found not to be unreasonable when viewed from the standpoint of all the carriers participating in the traffic.

The net revenues of a carrier have often an undoubted and important bearing on the question of the reasonableness of its rates, but the fact that they are greater than the returns on ordinary business enterprises is not sufficient in itself to justify a finding that the rates are excessive; the value of the service and other factors that enter into the construction of rates must also be taken into consideration. (20 I. C. C. 181.)

Given a Lard Substitute Rate.

Nucoa Butter Co. v. Erie et al. Opinion by Chairman Clements:

Complainant refines cocoanut oil, and ships, under trade names, a pure cocoanut oleine, which is chiefly used as a substitute for lard, and a pure cocoanut stearin, which is used as a substitute for cocoa butter. Defendants, under the Official Classification, rate complainant's oleine with cocoanut oil and rate its stearin with cocoa butter. Cocoanut oleine competing mainly with lard and lard compounds should be rated not higher than lard and lard substitutes, and that this record furnishes no ground on which to modify the present rating of cocoanut stearin. (20 I. C. C. 174.)

Failure to Load Properly.

Consolidated Water Power & Paper Co. v. San Pedro, Los Angeles & Salt Lake et al. Opinion by the commission:

A tariff provided that when more of an article is shipped on one day by one consignor to one consignee than can be loaded in one car, if the first car is loaded to its full visible capacity, the balance may be carried in a second car at the carload rate on the actual weight. It appears that though the shipment herein could have been so loaded as to bring it within the privilege of this rule and both cars shipped on the same day, or could have been so loaded that the weight in each car would have exceeded the minimum weight applicable thereto, it was not done. The complainant is not entitled to reparation for the difference between the minimum weight on the part carload and the actual weight thereof. (20 I. C. C. 169.)

South Western Rate Decision.

On February 24 the commission announced three important decisions. Two of these, affecting large numbers of roads, are noticed in another column. The third was the case of the Railroad Commission of Texas against the Atchison, Topeka & Sante Fe and other carriers, known as the Southwestern rate case. In this the commission decline to disturb the commodity rates or the first class rates complained of, but orders the defendants to reduce the second class rates, which were increased from $1.21 to $1.29, to $1.25. On the remaining classes the roads are required to restore the rates in effect before the increased rates were published. The opinion was prepared by Commissioner Harlan. The amount of the increased revenue involved in the proposed advances was not so considerable as in either of the other cases. The increases were defended by the carriers, however, on the same grounds of insufficient revenues and inadequate returns on investments. In the general rate revision made by the roads the first class rate from St. Louis to Texas common points was increased from $1.37 to $1.47, and corresponding increases were made in the other classes. The commodity rates also were substantially increased. Commissioner Harlan finds that the roads in the Southwest have not prospered as have many in other parts of the country and he declines to disturb the increased first class rate.

STATE COMMISSIONS.

Henry Jastremski has been elected secretary of the Railroad Commission of Louisiana.

Winfield A. Huppuch has been appointed a member of the New York State Public Service Commission, Second district, in place of John N. Carlisle, whose term has expired.

COURT NEWS.

The Full Crew Law Decision.

The Supreme Court of the United States has sustained the law of Arkansas, regulating the number of men to be employed on freight trains, as briefly reported in the *Railway Age Gazette* last week, page 366 (February 24). The suit was that of the Chicago, Rock Island & Pacific against the state, the supreme court of Arkansas having sustained the law.

The law requires an engineman, a fireman, a conductor and three brakemen on every freight train of 25 cars or more, "regardless of any modern equipment." Railways not over 50 miles long are excepted; penalty $100 to $500 for each violation, but the penalties are not to apply during strikes of trainmen. The train with which the offense was committed was equipped with both air brakes and automatic couplers and it had two brakemen; and the company declared that the requirement of a third man was unnecessary, and therefore a taking of its property without due process of law.

The decision, by Justice Harlan, says that the principle sustaining this law has been fully settled by former decisions, but quotations are given from a few of these earlier decisions. In the case of the Alabama law requiring locomotive enginemen to have licenses, Justice Matthews laid down the dictum that legislation might affect commerce without constituting a regulation of it. The Alabama license requirement only indirectly, incidentally and remotely affects interstate commerce, although the engineman in the case tried ran regularly to and from a point in Mississippi. The Alabama color blind law was decided in the same way. The law was not directed against commerce and affected it only incidentally.

The New York law, forbidding fires in passenger cars, was assailed by the New York, New Haven & Hartford as repugnant to the constitution, but the court held that it was for the protection of all persons traveling in the state of New York; and interstate passengers are entitled to as full protection as others. There may be a doubt as to the wisdom of such regulations, but that is a matter for the state to determine. Even if interstate trains were delayed and passengers inconvenienced, such inconvenience cannot be avoided so long as the individual states are sovereign. This law, like the Arkansas Full Crew law, does not apply to short railways, but this exception was justified by the court on the ground that the law-makers had undoubtedly deemed it more important to protect heavy through trains. The contention that the statute denied the plaintiff the equal protection of the laws, was therefore rejected.

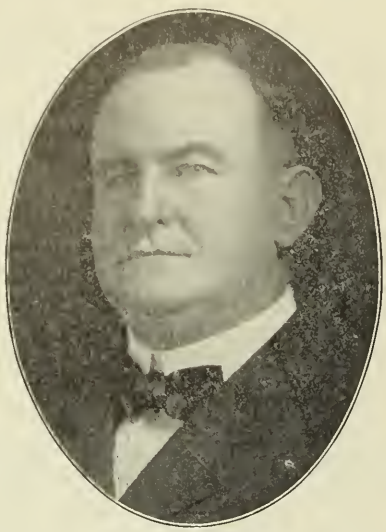
Justice Harlan holds that in Arkansas passengers on interstate trains are as fully entitled to the benefits of local laws as are citizens of the state. The state has never surrendered its power of caring for the public safety, and the validity of such statutes is not to be questioned in a federal court unless they are clearly inconsistent with some power granted to the general government, or with some right secured by the federal constitution, or unless they are purely arbitrary in their nature. The Full Crew law was enacted in aid, not in obstruction of interstate commerce. There is room for controversy as to the wisdom of the law, but it is not so unreasonable as to justify the court in condemning it because of its arbitrariness. It is a means employed by the state to accomplish an object which it is entitled to accomplish, and such means, even if deemed unwise, are not to be condemned if they have a real relation to that object. Undoubtedly Congress in its discretion may take entire charge of the whole subject of the equipment of interstate cars and establish such regulations as are necessary and proper for the protection of those engaged in interstate commerce; but it has not taken action in regard to train crews, and until it does, the statutes of the state, if not arbitrary, and if they really relate to the rights and duties of all within the jurisdiction, must control.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Richard Vipon Taylor, whose election as vice-president and general manager of the Mobile & Ohio, with office at Mobile, Ala., has been announced in these columns, was born on August 11, 1859, at Newbern, N. C. Mr. Taylor was educated at Barton Academy, in Mobile, Ala., and began railway work on September 27, 1877, as a clerk in the accounting department of the Mobile & Ohio. He held various positions, including that of general bookkeeper, in that department until 1888. He was then appointed general auditor, remaining in that position until October, 1904, when he was made general manager of the same road, which position he held at the time of his recent election as vice-president, in addition to his duties as general manager. Mr. Taylor is also vice-president and general manager of the Southern Railway in Mississippi.



R. V. Taylor.

Charles Edmund Pugh, first vice-president of the Pennsylvania Railroad Company, whose retirement on March 1, under the pension rules of the company, has been announced in these columns, was born at Unionville, Chester county, Pa., February 25, 1841. He was educated in the public school of his native town, and at the State Normal School at Millersville, Lancaster county, Pa. On graduation he went to work in the office of his father, Elijah Pugh, who was in business as a merchant. Mr. Pugh entered the service of the Pennsylvania Railroad as agent at Newport, Perry county, Pa., on October 1, 1859. He served as a passenger conductor for six months. In 1864 he was appointed train despatcher of the Philadelphia division, and in August, 1870, was made general agent at Philadelphia. On April 1, 1879, he was appointed general superintendent of the Pennsylvania Railroad division; and in October, 1882, was appointed general manager. He was elected in March, 1893, third vice-president; and on February 10, 1897, second vice-president. In this position his duties were principally concerned with the operating department of the road, including motive power. On March 24, 1909, Mr. Pugh became first vice-president in charge of the purchasing, insurance, real estate and pension departments. He was also first vice-president of the Northern Central, the Philadelphia, Baltimore & Washington and the West Jersey & Seashore; and a director of the Long Island Railroad and of many other companies in the Pennsylvania system. The following is an extract from the minutes adopted by the board of directors on February 24: "As vice-president he was charged with the supervision of the transportation, engineering, real estate, purchasing and insurance department. He has also been a member of the advisory board of the Pennsylvania Railroad employees' voluntary relief department since its organization in 1886, and a member and chairman of the board of officers of the pension department since its establishment in 1900, and in both of these departments has always manifested a lively interest, and has been a potent factor in their development and administration. For eighteen years he has sat in the highest councils of the company, contributing to their deliberations the benefit of his intimate knowledge of its properties, and of an experience gained in thirty-four years of actual contact with practical railroading during the period of its greatest development. Mr. Pugh's value to the service is not measured solely by his ability and skill as a transportation and executive officer. Endowed by nature with a happy combination of firmness of character and a most gentle and lovable disposition, he has ever been held in high esteem as well by the army of employees over whom he exercised authority as by his official associates, and the conspicuous loyalty of his subordinate officers is attributable as much to their personal affection for him as to the esprit de corps which is the stronghold of the Pennsylvania Railroads organization. In recording his retirement, the board bear testimony to the value of his long, efficient and intelligent service, and to the fidelity to duty and earnestness of purpose which have characterized half a century's devotion to the interests of the company, and while congratulating him upon the attainment of a well earned relief from the burden and strain of official responsibilities, express the hope that it may bring with it many years of health and happiness, and that the severance of official relations may serve to bind closer the personal ties which have existed for so many years."



Charles E. Pugh.

David Bosman, secretary of the Erie Railroad, at New York, has been elected vice-president and secretary, and F. H. Wright has been appointed an assistant secretary, both with offices at New York.

Daniel Willard, president of the Baltimore & Ohio, has been elected president also of the Cincinnati, Hamilton & Dayton, with office at Baltimore, Md., succeeding William Cotter, who has resigned from that company, but retains the presidency of the Pere Marquette. G. F. Randolph, first vice-president of the Baltimore & Ohio, has been elected vice-president also of the Cincinnati, Hamilton & Dayton, in charge of traffic, with office at Baltimore.

Sydney Rhodes Prince, whose appointment as general counsel of the Mobile & Ohio, with office at Mobile, Ala., has been announced in these columns, was born September 11, 1876, at Mount Sterling, Ala. He graduated from Barton Academy, Mobile, in 1893, and three years later was given the degree of A. B. by the University of Alabama, and in 1898 he graduated from Georgetown University law school. He was appointed personal injury attorney for the Mobile & Ohio, January 1, 1901, and in December, 1906, was made attorney for the Mobile & Ohio system. He was appointed assistant general counsel in January, 1908, which position he held at the time of his recent appointment as general counsel.

Operating Officers.

Thomas F. Brennan, general superintendent of the Buffalo, Rochester & Pittsburgh, has been appointed general manager, with office at Rochester, N. Y.

M. J. Wise has been appointed superintendent of the Southern Railway in Mississippi, with office at Columbus, Miss., succeeding H. Hatcher, resigned to go with another company.

G. L. Griggs, trainmaster of the Chicago, Burlington & Quincy, at Sterling, Colo., has been appointed trainmaster, with office at Omaha, Neb., succeeding J. B. Austin, assigned to other duties. W. F. Pate succeeds Mr. Griggs.

Otto Holstein, whose appointment as trainmaster of the Central Railway of Peru, with office at Lima, Peru, was recently announced in these columns, has been promoted to operating manager (superintendent of transportation), succeeding W. E. Paige, resigned.

H. E. Warner, superintendent of the Southern division of the Detroit, Toledo & Ironton at Springfield, Ohio, has had his jurisdiction extended over the Northern division, with office at Springfield, succeeding on the Northern division W. M. Lockard, assigned to other duties.

H. Hatcher, superintendent of the Southern Railway in Mississippi, has been appointed superintendent of the Georgia, Southern & Florida, instead of general superintendent, as previously announced in these columns, with office at Macon, Ga. O. M. Grady, general superintendent at Macon, having resigned to go into other business, that position has been discontinued.

James T. Robertson, assistant general manager and general freight and passenger agent of the Cumberland & Pennsylvania, has been appointed general manager, with office at Cumberland, Md., succeeding C. L. Bretz, deceased. Mr. Robertson was born in 1873, at Ocean, Md., and was educated in the public schools. He began railway work in May, 1890, on the Cumberland & Pennsylvania as a messenger at Lonaconing, Md. He studied telegraphy, and in 1891 was appointed telegraph operator at the same place, remaining in that position for three years. He was then transferred to the general offices in Cumberland as clerk and stenographer to the general freight and passenger agent and to the superintendent. In June, 1904, he was appointed chief clerk to the general manager, remaining in that position until July, 1907, when he was made general passenger and freight agent. He was later appointed assistant general manager and general freight and passenger agent.



J. T. Robertson.

Harvey Rittenhouse, engineer maintenance of way of the Cumberland & Pennsylvania, has been appointed assistant general manager, with office at Cumberland, Md. Mr. Rittenhouse was born in Montgomery county, Pa., in 1868, and was educated in the public schools, and later at the Norristown (Pa.) high school. He then took a course in civil engineering at the Polytechnic College of Pennsylvania. He began railway work in July, 1889, on the Norfolk & Western as assistant supervisor, and was later supervisor, roadmaster and assistant engineer. In November, 1899, he was appointed assistant engineer maintenance of way on the West Virginia Central & Pittsburgh, now a part of the Western Maryland, and in August of the following year left that company to go to the Denver & Rio Grande, where he was engaged in location, construction and maintenance work. From November, 1903, to March, 1904, he was in charge of a party making preliminary surveys in Utah for the Denver, Northwestern & Pacific, and from August to September, 1904, he was roadmaster of the Rio Grande Southern. He was appointed engineer maintenance of way of the Cumberland & Pennsylvania in September, 1904, which position he held at the time of his recent appointment.



H. Rittenhouse.

Henry W. Thornton, whose appointment as assistant general superintendent of the Long Island, has been announced in these columns, was born November 6, 1871, at Logansport, Ind. Mr. Thornton was educated at St. Paul's school, Concord, N. H., and later studied civil engineering at the University of Pennsylvania, graduating in 1894. He began railway work in December of the same year as draftsman, in the chief engineer's office of the Pennsylvania lines west of Pittsburgh, and held various positions in that office and the construction department until June, 1897, when he was appointed supervisor at Columbus, Ohio. From November, 1897, to April, 1899, he was assistant engineer of the Cincinnati division, and then for seven months was engaged in special work under the general manager. He was appointed engineer of maintenance of way of the Erie & Ashtabula division November 1, 1899, and in March, 1901, was made superintendent of the Marietta division. He went to the Cleveland, Akron & Columbus as superintendent in April, 1902, and returned to the service of the Pennsylvania System as superintendent of the Erie & Ashtabula division in December, 1903, which position he held until his recent appointment as assistant general superintendent of the Long Island.



H. W. Thornton.

Traffic Officers.

A. E. Yardley has been appointed a traveling freight agent of the Chicago, Milwaukee & Gary, with office at Chicago.

S. C. Baird has been appointed traveling passenger agent of the Illinois Central, with office at Chicago, succeeding R. Anderson, promoted.

J. F. McDoel having resigned as commercial agent of the Chicago, Indianapolis & Louisville, with office at La Fayette, Ind., that office is abolished.

J. E. Bell has been appointed a commercial agent of the Chicago, Rock Island & Pacific, with office at McAlester, Okla., succeeding A. D. Aiken, transferred.

A. A. Poland, agent of the Rutland Transit Company at St. Louis, Mo., has been appointed westbound agent of the New York Central Lines, with office at St. Louis.

R. D. Jones, freight solicitor of the Empire Line at Chicago, has been appointed agent, with office at Milwaukee, Wis., succeeding F. L. Wolfe, resigned to go into other business.

William W. Ruth has been appointed a commercial freight agent of the Baltimore & Ohio, with office at Baltimore, Md., succeeding H. W. Atkinson, resigned to go into other business.

F. D. Colby, special agent coal traffic of the New York Central Lines east of Buffalo, N. Y., with office at New York, has resigned to go into other business, and that position has been abolished.

Charles Reid has been appointed agent of the Western Railway Weighing Association and Inspection Bureau, with office at Little Rock, Ark., succeeding E. F. Crehore, resigned to engage in other business.

C. K. Bothwell, district passenger agent of the Missouri Pacific at Joplin, Mo., has been appointed district passenger agent,

with office at Wichita, Kan. Frank P. Prosser, city passenger and ticket agent at Joplin, succeeds Mr. Bothwell.

R. A. Chadwick, assistant general freight agent of the Tennessee Central at Nashville, Tenn., has been appointed general freight and passenger agent, with office at Nashville, succeeding Theodore A. Rousseau, resigned, and his former office has been abolished.

Paul D. Warren, general agent in the passenger department of the Michigan Central, the Lake Shore & Michigan Southern and the Cleveland, Cincinnati, Chicago & St. Louis, with office at Toledo, Ohio, has had his jurisdiction extended over the Toledo & Ohio Central.

E. A. Niel, traffic manager of the Buffalo & Susquehanna Railroad and the Buffalo & Susquehanna Railway, at Buffalo, N. Y., having resigned, that office has been abolished and the duties of that position will be performed by W. E. Farris, general freight and passenger agent, with office at Buffalo.

H. G. Elliott, assistant general passenger agent of the Grand Trunk, at Chicago, has been appointed general passenger agent, with office at Montreal, Que., succeeding George W. Vaux, resigned. J. D. McDonald, district passenger agent, at Toronto, Ont., succeeds Mr. Elliott, and A. E. Duff, district passenger agent, at Winnipeg, Man., succeeds Mr. McDonald.

George W. Luce, general freight agent of the Southern Pacific at San Francisco, Cal., has been appointed assistant to the vice-president in charge of traffic, with office at San Francisco. Thomas A. Graham, assistant general freight and passenger agent at Los Angeles, Cal., succeeds Mr. Luce. John G. Stubbs, assistant general freight agent at San Francisco, has been appointed a general freight agent of the Southern district, and F. E. Batturs, assistant general passenger agent at San Francisco, has been appointed a general passenger agent of the Southern district, both with offices at Los Angeles.

George H. Bower, whose appointment as assistant general passenger agent of the Illinois Central and the Indianapolis Southern, with office at Chicago, has been announced in these columns, was born August 29, 1868, at Newark, Ohio. He graduated from a private high school at Pomeroy, Ohio, and began railway work in 1884 in the passenger department of the Lake Shore & Michigan Southern at Cleveland, Ohio. In June, 1887, he went with the Missouri Pacific at St. Louis, Mo., as assistant chief rate clerk, and in January of the next year he became chief clerk to the general passenger agent of the Louisville, New Orleans & Texas, now the Yazoo & Mississippi Valley, at Memphis, Tenn. He went with the Illinois Central in March, 1892, as a rate clerk, and has been promoted consecutively to chief rate clerk, chief clerk, and assistant general passenger agent, as above. It was erroneously stated in our issue of February 24, that Mr. Bower was formerly general baggage agent of the Missouri, Kansas & Texas at Parsons, Kan.

Engineering and Rolling Stock Officers.

J. H. Bransford has been appointed a general foreman of the Chesapeake & Ohio, with office at Thurmond, W. Va., succeeding Frank J. Walsh, resigned to go to the Chicago Pneumatic Tool Company.

M. R. Smith, master mechanic in charge of terminals of the Chicago, Indianapolis & Louisville at Lafayette, Ind., has been appointed shop master mechanic, with office at Lafayette, succeeding O. S. Jackson, resigned to go to another company.

E. N. Layfield, division engineer of the Baltimore & Ohio Chicago Terminal Railroad (and formerly chief engineer of the Chicago Terminal Transfer) at Chicago, has resigned to become a member of the grade separation commission of Grand Rapids, Mich.

A. C. Adams has been appointed superintendent of motive power of the Spokane, Portland & Seattle, with office at Portland, Ore. He will have charge of the maintenance of the motive power, machinery and equipment, and conjointly with the general superintendent, the operation of the same.

W. J. Lank has been appointed a division engineer of the Atchison, Topeka & Santa Fe, with office at Clovis, N. Mex., succeeding R. J. Gatewood. G. E. Hanson has been appointed a roadmaster on the Eastern division, with office at Topeka, Kan., succeeding John Hauke. W. Eglinton, roadmaster on the Middle division at Mulvane, Kan., has had his headquarters changed to Arkansas City, Kan., and Leroy Bradley has been appointed roadmaster on the Colorado division, with office at Pueblo, Colo., succeeding J. G. Butcher.

Purchasing Officers.

R. J. Moore has been appointed a division storekeeper of the Atchison, Topeka & Santa Fe, with office at Argentine, Kan., succeeding A. P. Kephart.

W. R. Shrodes has been appointed chief clerk and purchasing agent of the Quincy, Omaha & Kansas City and the Iowa & St. Louis, with office at Kansas City, Mo., succeeding L. A. Irwin, resigned.

W. L. Cooper, assistant storekeeper of the Chicago & Alton at Bloomington, Ill., having resigned to accept service with another company, the duties of that office are combined with those of the general storekeeper, and the title of assistant storekeeper has been abolished.

Special Officers.

Charles G. Hall, general advertising agent of the Chicago & North Western, with office at Chicago, has resigned to join the staff of the Curtis Publishing Company.

Stanley D. Roberts, assistant advertising manager of the Chicago, Milwaukee & St. Paul, has been appointed advertising agent, succeeding Charles S. Young, resigned.

OBITUARY.

Daniel Carmichael, formerly engineer of construction work of the Union Pacific, died at Los Angeles, Cal., on February 24, at the age of 67 years.

Frank K. Kelly, traveling freight agent of the Chicago, Burlington & Quincy, with office at Chicago, died at his home in Milwaukee, Wis., on February 19.

W. H. Bradford, formerly for many years general agent at Milwaukee, of the Great Western Railway of Canada, and the Detroit & Milwaukee, both now parts of the Grand Trunk, died recently in Milwaukee at the age of 86 years.

Charles D. Simonson, one of the oldest and best known freight men in the East, died on February 15, at his home in Brooklyn, N. Y., after a short illness, as previously announced in these columns. He was formerly on the Pacific coast, representing the old Sutton Line of packet ships, just before the overland railways were built. Then he was for a number of years general eastern agent of the Atchison, Topeka & Santa Fe, at New York, from which position he resigned ten years ago to become the general eastern agent of the Colorado Midland. While representing that company he secured an unusually large amount of business for such a comparatively small road. In July, 1910, the Colorado Midland having merged its outside agencies with those of the Chicago, Burlington & Quincy, Mr. Simonson was appointed special agent, freight department, of the Rock Island, which position he held at the time of his death. He was a man of great energy, always cheerful and courteous, and he easily won the friendship of those in authority and of the many others with whom he came in business contact in transportation circles. He is survived by a widow and one daughter.



C. D. Simonson.

Railway Construction.

New Incorporations, Surveys, Etc.

Alexandria & Western.—An officer is quoted as saying that this road is to be built in the near future from Alexandria, La., westerly towards Leesville and eventually into Texas. W. H. Larson, secretary and treasurer; I. W. Sylvester, chief engineer, Fort Worth, Texas. (April 1, p. 917.)

Atchison, Topeka & Santa Fe.—According to press reports, this company will build an extension under the name of the Pecos Valley & Northeastern from Pecos, Texas, south about 150 miles to Boquillas.

Badger Railway & Light Co. (Electric).—This company is about to begin work on a line between Lake Geneva, Wis., and Whitewater, 22 miles. The company will carry out the work with its own men. G. Prickhard, chief engineer, 711 Majestic building, Milwaukee. (February 10, p. 301.)

Blue Ridge.—Organized with $600,000 capital, to build a 30-mile line from near Winchester, Va., to a connection with the Southern Railway. Mrs. A. M. Moore, Cleveland, Ohio, is the principal promoter.

Buckhannon & Northern.—The Patterson, Moran & Luck Co., Pittsburgh, Pa., who have the contract for building a 30-mile section from the Pennsylvania-West Virginia state line, to Rivesville, W. Va., have sub-let the work as follows: The first five miles to G. S. Fogel & Co., St. Albans, W. Va.; second five miles to Zeverly & Co., Morgantown; the next 15 miles to the Pennsylvania Contracting Co., Pittsburgh, Pa., and five miles to Marshall, Sale & Co., Roanoke, Va. Grading work will be started at once. The line will open up a coal district in West Virginia. (February 17, p. 335.)

Canadian Northern.—Announcement is made that work on the connecting line from Ottawa, Ont., west to Port Arthur, is to be started this coming spring. In addition, plans have been made to build about 1,500 miles of branch lines in the prairie provinces. (August 26, p. 372.)

Canadian Pacific.—An officer writes regarding the reports that contracts are to be let soon for building between Toronto, Ont., and Smith's Falls, that the question of carrying out this work is under consideration, but the work has not yet been authorized. (February 24, p. 368.)

This company is ready to receive bids for the construction of the second section of 30 miles of the Kootenay Central. The line is projected a distance of 175 miles and when completed will connect Golden, B. C., on the main line, with a point near Galloway, on the Crow's Nest extension. The first section of 10 miles was completed some time ago. The line is to be built in sections of about 40 miles, as circumstances in the British Columbia new settlement district seem to warrant.

Chicago & North Western.—Under the name of the St. Louis, Peoria & Northwestern, it is said that this company will build a 100-mile line from Peoria, Ill., into the Illinois coal fields.

Announcement has been made by the Chicago & Northwestern Railroad that about $700,000 is to be spent in improvements at Boone, Ia. A new yard of three times the present capacity will be installed.

Cleveland, Akron & Columbus.—An officer writes that surveys for a proposed change of line between Brinkhaven, Ohio, and Danville, three miles, have been made, but the company does not intend to carry out this work in the near future.

Eastern Utah.—Incorporated in Utah with $500,000 capital, to build about 60 miles of line from Wellington, Carbon county, Utah, southwest to Emery, Emery county, about 60 miles. The incorporators include: H. Wade, president, Price; O. Seely, vice-president, Castle Dale; N. V. Maloney, secretary, and I. R. Parsons, treasurer, both at Price.

Fort Smith & Western.—According to press reports, this company will take out a charter in Oklahoma in the near future for the purpose of building an extension from the present western terminus of the St. Louis, El Reno & Western, at El Reno, Okla., southwest to a connection with the Kansas City, Mexico & Orient, near the Red river.

Frederick Railroad.—An officer writes regarding the reports that a number of extensions are to be built, that the company is increasing its terminal facilities, but does not contemplate building any lines through Middletown valley. The company now operates a 17-mile line from Thurmont, Md., to Frederick.

Garden City, Gulf & Northern.—An officer writes that an extension is being built under the name of the Scott City Northern, from Garden City, Texas, north to Scott City, thence via Logan county, to Winona, on the Union Pacific, 50 miles. It is expected to have the line finished by July 1, 1911. Track has been laid on 20 miles. The work is heavy and includes handling about 15,000 cu. yds. per mile. Maximum grades will be 0.7 per cent. There will be 10 trestle bridges, to have a combined length of one mile. The line is being built to carry live stock, sugar beets and farm products. Contracts have been let to A. L. Sedbrook, S. S. Shaw, H. W. Harper, A. J. Canady, S. Brown, all of Scott City, and the Midland Bridge Company, Kansas City, Mo. (December 2, p. 1096.)

Georgia Roads.—J. N. Searwood, president of the Searwood Lumber Co., Brooklet, Ga., writes that this company which now operates six miles of line from Brooklet, south, is planning to build an extension either to Pembroke or Groveland, about 20 miles from Brooklet; also, that an extension may be built north to Oliver, 12 miles. It is the intention of the company to complete four miles of the southern extension at once, for which rails have already been received.

Grants Pass & Rogue River.—An officer writes that contracts are being let and work is to be started early in March on a line from Grants Pass, Ore., to the head of Williams valley, 30 miles. The line is being built to carry lumber, fruit, ore and agricultural products. A. D. Bowen, president, Spalding building, Portland; J. E. Gardner, chief engineer, Grants Pass.

Hawkinsville & Western.—An officer writes that this company is building from Hawkinsville, Ga., northwest via Browndale to Perry, 22 miles. Grading has been finished on about 12 miles. The work is being carried out by day labor and section work. There will be one steel bridge, 100 ft. long, and about 1,200 ft. of trestle work. The line is being built to carry cotton, farm products and live stock. T. B. Ragan, president, and J. J. Gilline, chief engineer, Hawkinsville. (February 24, p. 368.)

Kansas, Oklahoma & Panama.—An officer is quoted as saying that construction work will be started in the near future south through Elk City, Okla., Port, Carter and Sentinel to Mangum. The company already has a section built from Mangum south towards the Red river. F. A. Mosher, secretary-treasurer, Port, Okla. (February 3, p. 256.)

Kentucky-Tennessee Traction.—An officer writes that contracts are to be let early this spring to build from Hopkinsville, Ky., southeast via Salubria Springs, Pembroke and Trenton to Guthrie, on the Louisville and Nashville about 25 miles. There will be three steel bridges and one overhead railway crossing. Plans are made to put up a power house and substations. The Arnold Co., Chicago, are the engineers. Charles Vanden Burgh, general manager, Hopkinsville. (October 28, p. 810.)

Kootenay Central.—See Canadian Pacific.

Laramie, Hahn's Peak & Pacific.—According to press reports, financial arrangements have been made to extend this line from Fox Park, Wyo., across northwest Colorado into eastern Utah.

Licking River.—An officer writes that the plans call for a line from Yale, Bath county, Ky., southwest along Beaver creek, via Scranton to Frenchburg, in Menifee county, about 12 miles. Contracts are to be let in March for some of the work. Seven miles has been finished and is now in operation. There will be a 40-ft. steel bridge, also a station building at Frenchburg. J. H. Fulmer, Jr., president, and J. O. Johnson, general manager, Yale.

Madison County.—An officer writes that half the work is finished on a 10-mile line which the company is building with its own forces from Union, N. C., to Allenstand. The work is difficult, being mostly mountain work. The line is being built to carry lumber, minerals, iron ore, etc. A. G. Betts, president; Stackhouse and W. N. Garrett, engineer, Hot Springs.

Midland Pennsylvania.—This company, which was incorporated in Pennsylvania in February, 1910, is building a line from Millersburg, Dauphin county, Pa., northeast via Killinger, Berrysburg, Gratz, Sacramento, Valleyview, Hegins, and Mabel to Ashland, Schuylkill county, 44 miles, over a private right-of-way, 60 ft. wide. There will be about 10 miles of sidings. W. E. Harrington, president; J. H. Williams, secretary, Pottsville. (September 23, p. 558.)

New Orleans, Mobile & Chicago.—An officer is quoted as saying that the company is planning to begin construction work at once on an extension north towards the Ohio river.

Oklahoma Roads.—Plans are being made to build from Chickasha, in Grady county, Okla., west to Anadarko, thence northwest via Weatherford to Woodward, about 140 miles. James Gordon, Atlanta, Ga., is the principal promoter.

Oregon Trunk.—Announcement is made that this company has started freight and passenger traffic over this line, from Clarke, Wash., on the north side of the Columbia river, south to Madras, Ore., 115 miles, through the Des Chutes valley, providing a direct line into Oregon in connection with the Spokane, Portland & Seattle, as well as making about 5,000,000 acres of government land immediately accessible. The line is to be eventually extended south to Bend.

Oregon-Washington Railroad & Navigation Company.—Trains are now in operation on four miles of the relocated main line between Portland, Ore., and Yoakum, and the remaining 12 miles will be opened for traffic soon. The bridge at Coe was completed recently, as well as the 543-ft. tunnel at that place, and a 400-ft. cut at the east end. The new line is over a mile shorter than the old line and eliminates the horseshoe curve.

Pecos Valley & Northeastern.—See Atchison, Topeka & Santa Fe.

Pueblo & Southeastern.—An officer writes that a contract has been given to Joe Nix, Pueblo, Colo., to build 3.5 miles of line between Pueblo and the Atchison, Topeka & Santa Fe and Missouri Pacific at Nepesta. The work will involve handling about 5,000 cu. yds. a mile. Maximum grades will be 0.3 per cent., and maximum curvature 1.5 deg. There will be 575 ft. of trestle on this line. Additional contracts are to be let at once for work on the line, which is to have a total length of 50 miles. B. H. Tallmadge, president, Topeka, Kan.

Scott City Northern.—See Garden City, Gulf & Northern.

Stephenville, North & South Texas.—An officer writes that grading work is nearing completion on the extension from Hamilton Junction, Texas, which is 5.5 miles north of Hamilton, via Gustine, to Comanche, 31.5 miles. The work includes a number of steel bridges and three trestles. Brick passenger stations are to be put up at Lamkin and at Comanche. The line is being built to carry cotton, agricultural products, live stock and merchandise. Thompson & Scott, St. Louis, Mo., are the contractors. (October 7, page 674.)

St. Louis, Peoria & North Western.—See Chicago & North Western.

St. Louis, El Reno & Western.—See Fort Smith & Western.

St. Louis & San Francisco.—Announcement is made that the extension from Brady, Tex., southwest to Menard, 37 miles, has been finished and regular freight and passenger service is now in operation.

Uintah Railway.—According to press reports, this company will start work soon on a nine-mile extension in eastern Utah and western Colorado, northeast towards White river. An officer is quoted as saying that the existing 54-mile line from Mack, Colo., northwest to Dragon, Utah, will be made standard gage and that some heavy work will be carried out eliminating the grades.

Union Pacific.—A contract has been let for building a 50-mile section of the Laramie cut-off from Northport, Neb., northwest to Gering, paralleling the Chicago, Burlington & Quincy tracks. This extension will eventually be built to a connection with the present main line near Medicine Bow, Wyo., and will form part of the through route, considerably reducing the grades of the Omaha-Ogden line.

Railway Financial News.

Cairo & Thebes.—This road is to be leased to the St. Louis, Iron Mountain & Southern at an annual rental of 4 per cent. on the $2,000,000 bonds. The road runs from Cairo, Ill., to a bridge across the Mississippi river at Thebes, 25 miles. It was built by what was understood to be an independent company, although it was rumored that the road would be leased to the Louisville & Nashville. The passenger and freight terminals at Cairo are of standard modern construction.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, are offering $10,000,000 or £2,000,000, St. Paul & Kansas City Short Line first mortgage 4½ per cent. bonds, due 1941, at 93½, yielding 4.90 per cent. income. Roberts Walker, chairman of the executive committee, says in part:

"The new railway company has contracted to acquire substantially all of the stock and bonds outstanding of St. Paul & Des Moines, which operates a line from Des Moines northward to Mason City, Iowa, connecting with the Chicago-St. Paul line of the Chicago, Rock Island & Pacific, and will build from Allerton, on the Chicago-Kansas City line of the Chicago, Rock Island & Pacific, northward to Carlisle, near Des Moines, with the right to operate from Carlisle into Des Moines, including terminals at that city. The "Short Line" will give the Rock Island lines the shortest and most direct line between Kansas City and the so-called "Twin Cities" of St. Paul and Minneapolis, will traverse a well-settled agricultural country and will open large coal fields in Lucas and Marion counties, Iowa, reducing the fuel cost of the Rock Island lines and furnishing valuable traffic."

Cincinnati, Hamilton & Dayton.—This company has sold to J. P. Morgan & Co. 110,000 shares of the common stock of the Pere Marquette Railroad Co.

The transaction includes arrangements for financing substantial improvements to the Pere Marquette Railroad to be commenced at once. In that connection the Pere Marquette Railroad Co. has authorized and will issue $8,000,000 of five-year 6 per cent. notes under collateral indenture, the notes being secured by the deposit of $16,000,000 of 50-year 5 per cent. bonds, issued under an improvement and refunding general mortgage.

Cleveland, Cincinnati, Chicago & St. Louis.—The directors at their monthly meeting have taken no action toward declaring a dividend on the $47,056,300 common stock. In 1908, 1 per cent. was paid; in 1909, nothing; in 1910, 4 per cent.

Erie Railroad.—J. P. Morgan & Co., New York, have bought the entire issue of $12,500,000 three-year notes of the Erie, recently authorized by the New York Public Service Commission.

Norfolk Southern.—The stockholders have authorized an increase in the issue of bonds from $12,000,000 to $35,000,000. The capital stock of $16,000,000 will remain unchanged. Of the old authorized $12,000,000 bond issue, there are outstanding $5,780,000, with $3,220,000 reserved to retire underlying securities.

The United States Circuit Court has discharged the receivers of the Norfolk & Southern Railroad.

Pere Marquette.—State Railroad Commission of Michigan has authorized the Pere Marquette to issue $8,000,000 five-year 6 per cent. notes, of which amount, it is stated, $2;500,000 will be used for improvements and extensions. See also Cincinnati, Hamilton & Dayton.

Pittsburgh & Lake Erie.—Officers are quoted as saying that the company is contemplating an issue of $4,200,000 additional stock. Formal action on such a proposition is expected in the near future.

Southern Pacific.—Kuhn, Loeb & Co., New York, have made arrangements for the sale to a syndicate of French banks, of 250,000,000 francs ($50,000,000) of Central Pacific 4 per cent. 35-year bonds. These bonds are guaranteed by the Southern Pacific Company and will be issued in denominations of 500 francs each.

St. Louis, Iron Mountain & Southern.—See Cairo & Thebes.

Supply Trade Section.

The Cincinnati Car Company, Cincinnati, Ohio, has increased its capital from $100,000 to $1,500,000.

The Buckeye Mfg. Co., Alliance, Ohio, has increased its capital stock from $30,000 to $50,000, fully paid.

The Chicago Bearing Metal Company, Chicago, has increased its capital stock from $250,000 to $500,000.

William B. Mason, president of the Mason Regulator Company, Boston, Mass., died on Saturday, February 4.

The Ohio Seamless Tube Company, Shelby, Ohio, has increased its capital stock from $350,000 to $1,000,000.

The Rail Joint Company, New York, has moved its Chicago office from the Monadnock block to the Railway Exchange.

The Chicago Pneumatic Tool Company, Chicago, at the meeting of the board of directors, February 20, re-elected the retiring directors with the exception of J. W. Duntley, who is succeeded by J. H. Ward. Mr. Duntley has retired to engage in other business.

The Railway Steel-Spring Company, New York, at the recent meeting of the board of directors elected the following to membership on the board: H. K. Devereux, succeeding Julius E. French; George B. Motheral, succeeding Philo N. French, and Charles Scott, Jr., succeeding George G. McMurtry.

Percival Roberts has been elected a member of the finance committee, of the United States Steel Corporation, succeeding W. E. Corey. Mr. Roberts was president of the American Bridge Company, New York, when it was taken over by the steel corporation. He was elected a member of the board of directors, but resigned in June, 1902.

The employees of the Yueh-Han Railway, China, are organizing a railway club, and with it a library. For this purpose catalogs of all sorts of railway supplies, and more particularly of rolling stock and shop equipment are desired. E. C. Chang, assistant storekeeper of the Yueh-Han Railway, 32 Fung Yuen Ching street, Canton, China, may be addressed.

The annual report of the Union Switch & Signal Company, Swissvale, Pa., for the year ended December 31, 1910, shows gross sales of $6,256,824, an increase of $3,645,168 over 1909. The total income was $6,259,093, an increase of $3,633,960 over 1909. The balance for dividends was $1,231,507, an increase of $905,525 over 1909. The dividends were $299,784, an increase of $612 over 1909, and the surplus was $931,723, an increase of $904,913.

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has let contracts to the American Bridge Company, Pittsburgh, Pa., for 3,000 tons of structural steel to be used in building two new foundries at Trafford City. Work will be begun within a few weeks. The Westinghouse company has bought 30 acres near Trafford City, and it is planned to have all castings for the various Westinghouse companies produced at these foundries.

Louis A. Shepard, formerly vice-president and general manager of the Titan Steel Castings Company, Newark, N. J., with which company he was connected for seven years, has opened a sales office at 30 Church street, New York, room 517, and will make a specialty of handling railway timber, including cross ties, cross arms, piling, poles, etc. Previous to his connection with the Titan Steel Castings Company, Mr. Shepard was chief engineer for Cornelius Vanderbilt.

The new fiscal year of the Western Electric Company, Chicago, began with January. The earnings for that month were slightly in excess of January, 1910, in spite of the fact that in December every effort was made to clean up orders on hand, in order to make the carry-over as small as possible. The company is in a strong financial position and will be able to continue its policy of concentration at Hawthorne, Ill., this year, without incurring further funded obligations.

The Hayes Track Appliance Company, Geneva, N. Y., has bought ground at Richmond, Ind., where it is building a factory. It is the intention to close the Geneva plant and occupy the new one about April 1. This change is made to secure a location nearer the center of demand. The company has recently secured a standardization contract with the Harriman lines for Hayes derails, and in addition to other large orders in this country has secured a promising export trade, especially in South Africa, India and Australia.

M. H. Westbrook, foreman of the Grand Trunk shops at Battle Creek, Mich., who was awarded the first prize in the *Railway Age Gazette* shop kink competition which closed January 15, has accepted a position with Joseph T. Ryerson & Son, Chicago. The esteem in which Mr. Westbrook was held by the employees at the Battle Creek shops was shown by a farewell reception, which was given him by 500 of the employees, when they presented him with a handsome gold watch and chain, a Masonic fob and a traveling bag.

The Boss Nut Company, Chicago, announces that it has acquired from the B. M. Osbun Company, Chicago, complete rights to the Boss nut. The Boss nut has been used on the equipment of 46 large railways and 52 smaller railways and private car lines, and has also been widely used on special crossing work. Several companies manufacturing frogs and crossings are now using the Boss nut as standard. The officers of the company are: President, Charles Gilbert Hawley; vice-president and treasurer, B. M. Osbun; secretary, John R. Lefevre.

The General Electric Company, Schenectady, N. Y., has received orders from the New York Central & Hudson River for the following apparatus, for the extension of electrification to Irvington, on the Hudson division: Four 2,000-kw. rotary converters of the commutating pole type, 12 735-kw. 11,000 volt transformers, two 20,000 cu. ft. per m. blower sets. Three of these rotaries with their step down transformers and the blowers will be installed in the new substation now in course of construction at Irvington, while the remaining one with transformers will be installed in the substation at Yonkers.

The Nickel-Chrome Chilled Car Wheel Company, Newark, N. J., was incorporated on February 23. The officers of this company are as follows: President and treasurer, Robert C. Totten; vice-president and general manager, Stephen D. Barnett; secretary, Charles A. Millington. The New York office of the company is in the Hudson Terminal building, and the Pittsburgh, Pa., office is in the Frick Annex. The purpose of the company is to furnish nickel chrome alloy to makers of chilled car wheels. It is claimed that, on a mileage basis, the cost of nickel chrome wheels is but one-fourth that of steel wheels and one-half the cost of cast iron wheels.

The annual report of the Lackawanna Steel Company, New York, and subsidiaries, for the year ended December 31, 1910, shows gross sales of $31,302,760 as compared to $25,296,661 in 1909. The net income from manufacturing and operating was $6,330,470 in 1910, and $4,709,823 in 1909. The balance in 1910, after fixed charges was $2,533,105, or 7.25 per cent. on the capital stock, as compared with $778,109, or 2.2 per cent. on the capital stock, in 1909. Compared with 1907, the best previous year in the history of the corporation, the shipments show an increase of 9.15 per cent., and the balance after fixed charges shows an increase of $89,259, or 3.65 per cent., notwithstanding the fact that the average prices of 1910 were 4.36 per gross ton, or 13.1 per cent. less than those of 1907.

The properties of the Hicks Locomotive & Car Works, Chicago, consisting of the entire plants of the company at Chicago Heights, Ill., the good will and all the assets, were sold by William McInnes, trustee of the Hicks Locomotive & Car Works, in bankruptcy, to William Barbour of New York, on February 21. Mr. Barbour is president of the Linen Thread Company, New York, and a director of the Hanover National Bank. He and his associates have now effected an organization to be known as the Central Locomotive & Car Works, with office in the Fisher building, Chicago, which has succeeded to the business of the Hicks Locomotive & Car Works. William McInnes, who with F. M. Hicks, founded the Hicks Locomotive & Car Works, will

actively direct the policies of the new company as president and general manager. A. M. Gardner, the vice-president, was formerly connected with the Linen Thread Company. Mr. Barbour will be treasurer. C. B. Bruce, the secretary, has been with the Hicks company as assistant superintendent at the works for the past ten years. He will be assistant superintendent at the works at Chicago Heights. A. M. Hicks, formerly of the Hicks Locomotive & Car Works, will be the purchasing agent of the new company, with headquarters at Chicago. The Central Locomotive & Car Works will make a number of substantial improvements in the two plants at Chicago Heights, consisting of new machinery and shop tools. It will make a specialty of new coaches, new freight equipment, rebuilt passenger cars, freight cars and locomotives.

Robert Mather, chairman of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., referring to the seizure of the books of the Russian Westinghouse company in St. Petersburg on February 23, by the police, said: "The Westinghouse Russian company had a contract for the electrification of tramways at St. Petersburg. That contract was completed something more than a year ago. In the course of the execution of the contract the municipality withheld from time to time sums of money which it called 'fines' on account of alleged delays by the Russian company in the performance of the work under the contract. The Russian Westinghouse company claims, on the other hand, that those delays had been caused by the municipality itself or by other contractors or other causes for which the Russian company was not responsible. A claim has been pending before the municipal council of St. Petersburg for the payment of those withheld amounts. That claim is at the present time in process of investigation by a committee of the municipal council. So far as the business of the Russian Westinghouse company is concerned, this reported action can have no effect at all, because not only the factory but the general office and staff and all of the affairs relating to the business of the Russian company are in Moscow and not in St. Petersburg." A cablegram later received from Mr. McCarter, manager of the St. Petersburg branch of the Westinghouse Electric & Manufacturing Company, to the New York office said: "Our position satisfactory. All companies having large contracts with municipalities have had their books and papers taken for investigation by a special commission appointed by the government."

TRADE PUBLICATIONS.

Switch Box.—Bulletin No. 121 of the General Railway Signal Company, Rochester, N. Y., is an illustrated folder describing the universal switch box model 5, form A.

Electric Railway.—The Stone & Webster Engineering Corporation, Boston, Mass., has published a 12-page illustrated booklet on the Seattle-Everett Electric Railway, built by it in Washington. This is a reprint of an article which appeared in the *Electric Railway Journal.*

Tramrails; Furnaces.—The Rockwell Furnace Company, New York, in bulletin T illustrates the advantages of the Moyer tramrail in modern foundry practice. Bulletin 27 of this company argues the superiority of gas and oil-burning rivet heating furnaces over the coal and coke-fired forge.

Corrosion-Resisting Metal.—The Canton Culvert Company, Canton, Ohio, has published a useful little booklet on No-Co-Ro metal. This booklet is an interesting treatise on corrosion and its causes, and includes the results of some tests which show the superiority of No-Co-Ro metal over ordinary iron and steel in purity, homogeneity and resistance to corrosion.

Coal.—The American Locomotive Company, New York, has issued bulletin No. 1008, giving the classification, analysis and comparative heating values of different grades of coal. This bulletin is a condensed report of tests made by the United States Geological Survey at the fuel testing plant at St. Louis, Mo., and is compiled with the idea of making a handy reference for railways.

RAILWAY STRUCTURES.

Bellingham, Wash.—The Northern Pacific is planning to put up a large station at Bellingham.

Berkeley, Cal.—The Southern Pacific is asking for bids for putting up a power station at Berkeley, to be used in connection with the electrification of its lines in that section.

Burlington, Vt.—An officer of the Central Vermont is quoted as saying that plans have been made for building a new passenger station and a new freight house at Burlington. It is understood that the improvements will cost about $75,000.

Calgary, Alb.—The Canadian Pacific is said to have bought land at Calgary as a site for a hotel, to cost $250,000.

Cascade, Mont.—The Great Northern station at Cascade has been destroyed by fire.

Comanche, Tex.—See Stephenville, North & South Texas, under Railway Construction.

Farmington, N. Y.—The New York Public Service Commission, Second District, has ordered the elimination of the present grade crossing of the Lehigh Valley at the Manchester-Victor road in the town of Farmington, Ontario county. The highway is to be carried over the tracks on a steel superstructure, to have a clearance above the top of the rail of not less than 22 ft., with proper approaches. A temporary crossing is to be maintained during the construction of the overhead crossing and approaches. The viaduct will cover a space sufficient for six tracks. The present line has but two tracks, and the excess in cost to span six tracks is to be paid for by the Lehigh Valley. The work will cost about $70,000.

Frenchburg, Ky.—See Licking River, under Railway Construction.

Kelso, Wash.—The Northern Pacific has plans made for putting up a new station at Kelso.

Lamesa Springs, Cal.—The San Diego & Cuyamaca is said to have plans made for putting up a new passenger station at Lamesa springs.

Letha, Idaho.—The Payette Valley has had plans made for building a station at Letha.

Los Angeles, Cal.—The Southern Pacific will spend $500,000, it is said, for improvements to its shops and to the shops of the Pacific Electric, at Los Angeles. This includes an additional building, to cost $100,000, on which work is to be started at once.

Medford, Ore.—The Oregon Trunk has secured land to be used as a site for a station, also for a freight house at Medford. The construction work will be started at once.

New Haven, Pa.—Plans are being made by the Pittsburgh & Lake Erie and the Western Maryland to jointly build a stone and brick passenger station, 38 ft. x 100 ft., at New Haven. The cost of the building will be about $50,000.

North Pomona, Cal.—The Atchison, Topeka & Santa Fe Coast Lines will enlarge and improve the passenger station at North Pomona.

Pasadena, Cal.—The Atchison, Topeka & Santa Fe Coast Lines, it is said, will build an addition to its passenger station at Pasadena.

Pecos, Texas.—Local press reports state that plans and specifications for a $30,000 passenger station have been prepared by the Texas & Pacific.

Portland, Ore.—The Oregon Trunk Railway has let contracts for the steel bridges on that line as follows: The American Bridge Company and the Pennsylvania Steel Company under separate contracts will supply manufactured steel for all bridges, including the one over the Columbia river. Porter Brothers, Portland, Ore., have the contract for the substructure of the Columbia river bridge, and Bates & Rogers, Chicago, for the sub-structure of all other bridges. The Missouri Valley Bridge & Iron Company, Leavenworth, Kan., has the contract for the erection of all steel.

Ripon, Wis.—The Chicago, Milwaukee & St. Paul will put up a new passenger station at Ripon, to cost $10,000.

Salem, Ore.—The Salem, Falls City & Western has asked for permission to build a bridge over the Willamette river at Salem, to cost $100,000.

Seattle, Wash.—The Columbia & Puget Sound will build a bridge, it is said, over the Black river.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Long Island has ordered 2 switching locomotives from the Baldwin Locomotive Works.

The Bingham & Garfield has ordered 1 Mallet locomotive from the American Locomotive Company.

The Southern Railway is in the market for 25 mikado locomotives, 15 Pacific type locomotives and 15 switching locomotives.

The New York, Chicago & St. Louis is said to have ordered 25 mogul locomotives from the American Locomotive Company. This is not yet confirmed.

CAR BUILDING.

The Western Maryland is in the market for 500 coal cars, and is rumored to be making inquiries for 25 passengers cars.

The Southern Railway is in the market for 35 first class coaches, 20 postal cars and 10 combination passenger and baggage cars.

The Northern Pacific is not in the market for 18 wooden passenger cars as mentioned in the *Railway Age Gazette* of February 24. This is a part of the inquiry of the Spokane, Portland & Seattle mentioned in the issue of February 3.

The Cuban Railway has placed orders with the American Car & Foundry Company for 100 flat cars, 50 box cars, 3 sleepers, 2 first-class coaches, 6 second-class coaches, 3 baggage cars and 1 inspection car.

The Atlantic Coast Line has ordered 25 coaches and 4 combination passenger and baggage cars from the Pullman Company. This line is in the market for from 1,200 to 1,400 steel underframe box cars, 100 steel underframe flat cars and 50 steel underframe phosphate cars.

The Escanaba & Lake Superior has ordered fifteen 40-ton, 41-ft. flat cars, as mentioned in the *Railway Age Gazette* of February 24. The order was placed with the National Railway Equipment Company, Chicago, instead of the Ryan Car Company, as stated in the previous mention.

IRON AND STEEL.

The Southern Railway has ordered 1,800 tons of 85-lb. rails from the Illinois Steel Company.

The Cleveland, Akron & Columbus has ordered 2,000 tons of rails from the Carnegie Steel Company.

The Oakland Traction Company, Oakland, Cal., has ordered 1,000 tons of rails from the Pennsylvania Steel Company.

The Pan American of Uruguay has ordered 45,000 tons of 65-lb. rails from the United States Steel Products Company.

The Bangor & Aroostook, mentioned in the *Railway Age Gazette* of February 17 as being in the market for 13,000 tons of rails, has ordered 13,500 tons of rails from the Pennsylvania Steel Company.

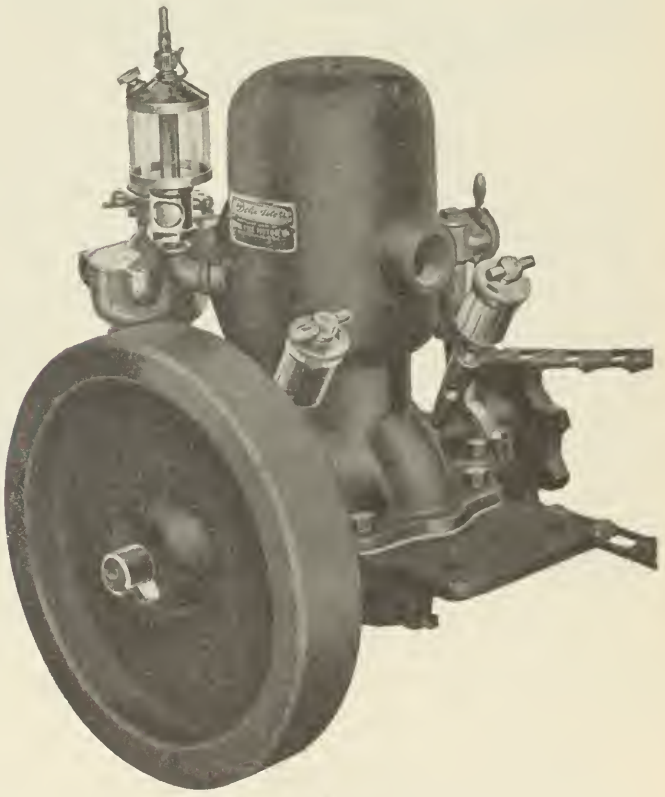
General Conditions in Steel.—The falling off in orders since the rate decisions has been very slight, and it appears that even this depression is only temporary. Orders for what the roads need will not be held up any longer. The daily bookings of the United States Steel Corporation during February were between 35,000 and 40,000 tons, as compared with 30,000 tons in January. This means that the corporation is now operating at a larger percentage of its capacity than at any time since early last summer. The prices have not gone up with the increase in orders. One of the reasons for this is the recent over production. It was made known, however, that the prices might be raised at any moment, and the result was that the buying movement was immediately stimulated. The export business is still responsible for a large share of the daily bookings, and it is interesting to note that the only equipment order of even a moderate size, placed last week, was for a foreign road.

SIGNALING.

The Buffalo, Rochester & Pittsburgh has ordered from the General Railway Signal Company, Rochester, N. Y., equipment for automatic block signals on 35 miles of its line from Clarion Junction, Pa., north of Johnsonburg, south to Falls Creek, Pa. This line is double track throughout. The signals will be three-position semaphores, the arms moving in the upper quadrant.

A Velocipede Motor.

The Concrete Form & Engine Company, Detroit, Mich., is manufacturing a small gasolene engine which may be easily applied to velocipede cars; the price is so low that it is being used by signal men and track foremen, who equip their cars for

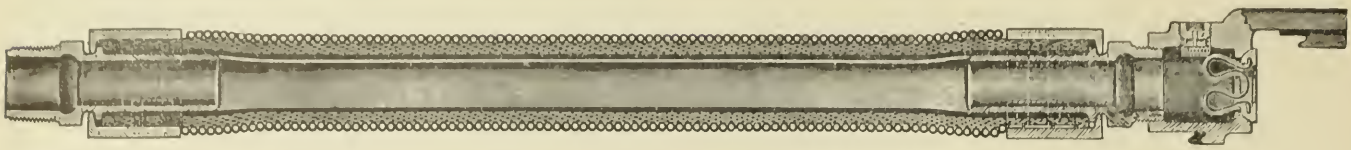


Gasolene Engine for Velocipede Cars.

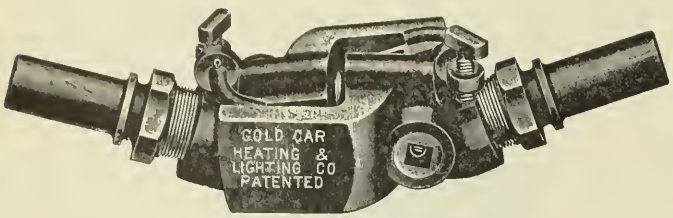
power in this way at their own expense. The cost of a 2½-h. p. gasolene engine, including accessories, is $49.15. The engine, which is here illustrated, measures 11¼ in. high from center of the crank shaft, and weighs only 73 lbs. It will drive a car from 5 to 30 miles per hour and uses one pint of gasolene per h. p. hour. It will also operate with kerosene or alcohol. The engine is strong and durable, as has been proved by its use in motor boats and velocipedes which have been equipped with it during the past few years. In its application to rail velocipedes a sprocket is keyed and fastened to the outside of one of the drive wheels of the car, and is driven by a chain from a sprocket on the motor. Blueprints and complete instructions to show the proper method of installation are furnished with each engine.

Steam Hose and Coupling for Cars.

An altogether new and practical steam hose and coupling, as shown in the accompanying illustrations, has been designed and patented by Edward E. Gold, president of the Gold Car Heating & Lighting Company of New York. It was designed to meet the conditions of the present improved train service, and is not only durable, reliable and strong, but may be considered as a safety appliance as well. The hose is 5-ply, bound around by covered wire, which makes it stronger than the ordinary 8-ply hose. It is easier handled by the trainmen, the wire not materially affecting its pliability. The wire also gives it a protection from being cut or chafed not found in ordinary hose, and prevents any undue swelling from high pressure steam. The



Gold Wire Wound Steam Hose.

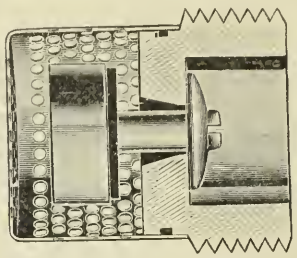


Gold Improved Steam Hose Coupling.

hose is clamped to the nipples by a two-piece clamp especially designed to withstand the high pressures.

The coupling is an improvement on the Gold coupling now used with the addition of a device which gives a positive lock to the connection after it is coupled, preventing vibration from working it loose. This lock is simply a curved piece of round iron held in a bearing on the coupler by a split pin on one side and flatened projection on the other. In this projection, and off the center line of the bearing, is located a thumb screw, which when turned bears on the coupling and rotates the round iron in its bearing, bringing the curved end hard down on the opposite half of the coupling, and holding it in place.

An improvement to the gravity steam trap is also included in this coupling and is shown in the accompanying illustration. It consists of a small valve with a fiber disc on its under side, which seats against the outlet as soon as the steam pressure is turned on. This outlet is cut conical, so that when there is no pressure the valve will fall from its seat and allow the water to drain from the hose and coupling. Dirt is prevented from obstructing the trap by the strainer shown. This trap not only serves to drain the coupling and keep it from freezing, but also may be used by the trainman to ascertain if the steam is shut off before he uncouples the hose, thus eliminating danger of scalding. A steam tight joint is maintained in the coupling by two gaskets made of vulcalebston, which have ball joint seats insuring a perfect connection.

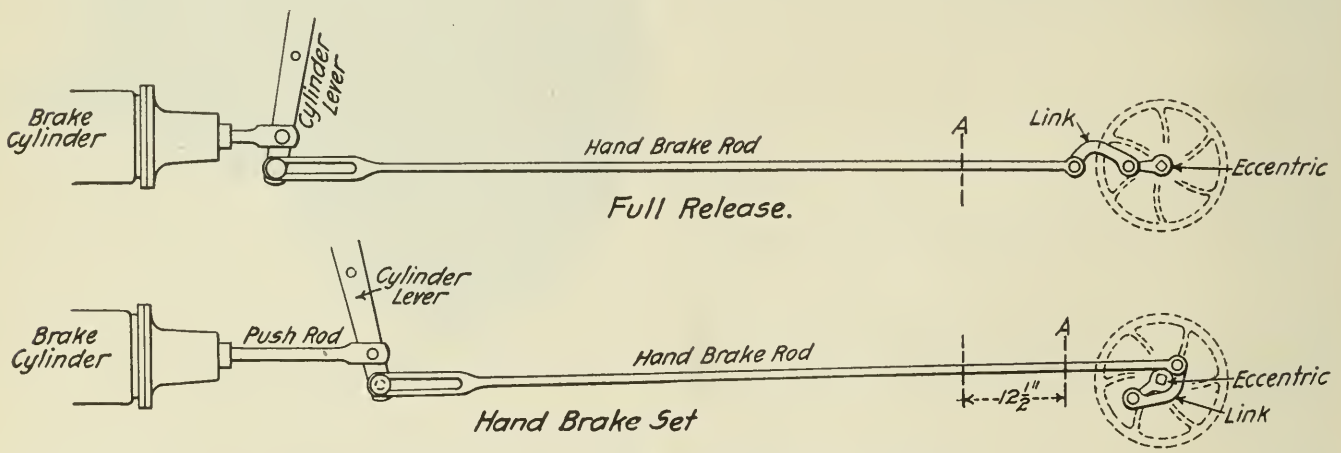


Gold Gravity Trap for Hose Coupling.

Burdette Chainless Hand Brake.

A new hand brake rigging designed to take the place of a chain on the brake staff is shown in the accompanying illustration. It consists of a short lever, marked "eccentric" with a square hole which fits on the brake staff and is secured to it by a dowel pin. The other end is connected to a curved link by a pin. This link operates the hand brake rod, which is connected to the cylinder lever by a pin working in a long slot. The upper view shows the hand brake in full release with the eccentric and link in line with the brake rod. The revolution of the brake wheel causes the eccentric to wind the link about the brake shaft, the hand brake rod moving 12½ in.

When the air brake is set the pin connecting the cylinder lever to the brake rod slides forward in the slot without moving the rod, and when air is released it returns to the end of the slot again, there being no slack, as in chain-connected brake rigging. The brake staff stirrup is dispensed with as a winding



Application of the Burdette Chainless Hand Brake.

bearing on the staff is not required, and the brake staff can be made shorter. The device has been successfully tested in railway service, and special designs are made for its use on street railway cars. The forgings for the chainless hand brake are supplied by the Pacific Railway Supply Company, Great Northern building, Chicago, the general offices of the company being in the Pacific Electric building, Los Angeles, Cal.

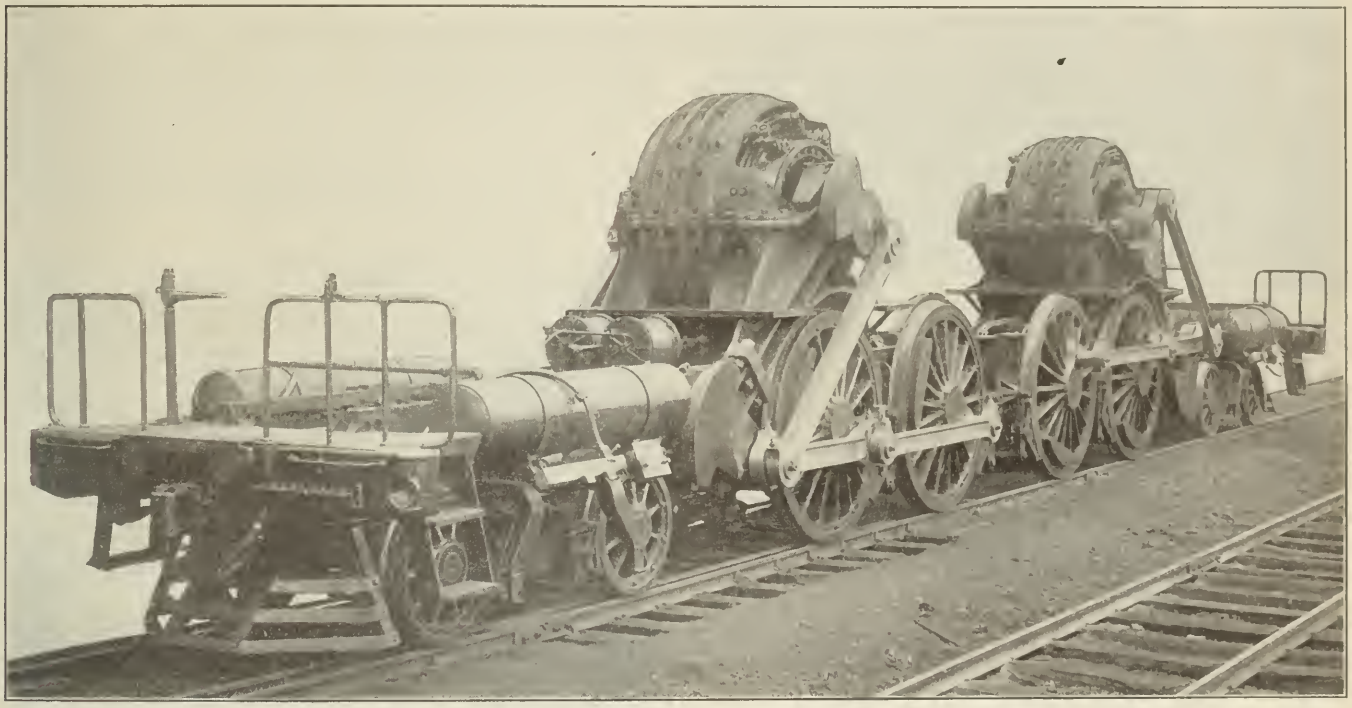
Electric Locomotives for the Pennsylvania.

The Pennsylvania Railroad has ordered nine more direct current, 600-volt, electric locomotives, aggregating about 40,000 horse-power, from the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., which are to be completed by July 1, 1911. The new locomotives will be of the same type as those which are now being operated in the Manhattan Terminal, New York, and will supplement the 24 already in use. The cabs, frames, running gear and mechanical parts will be built by the Pennsylvania Railroad at its Juniata shops. The air brakes will be supplied by the Westinghouse Air Brake Company; the electrical equipments will be built and the complete locomotives assembled at the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company. These are the most powerful electric locomotives ever built. They are articulated, of double cab design, each half carrying its own motor and complete equipment, and are coupled together at their driving-wheel ends. The frames, driving wheels and trucks of the running gear are similar in general character to those of an American type steam locomotive.

Each cab is provided with the Westinghouse automatic and straight air brake equipment, apparatus for train lighting, electric head lights, pneumatically operated whistle and sanders, as well as its motor unit switches and master controller. The coupled ends are fitted with permanent couplings of twin draw bars and Westinghouse friction draft gears, so arranged that the leading half serves as a leading truck and the other half as a trailer in whichever direction the locomotive may be moving. The wheel and motor arrangement was selected only after careful experiments with several other forms, the governing motive being to secure the greatest possible steadiness at high speed. The machines are so arranged that in event of one motor being cut out, the entire machine may be operated from either cab with the remaining motor. The halves are interchangeable, and if one is out of service it may be replaced by another half while repairs are being made. The unit switch field control permits two or more locomotives to be coupled together and all to be operated from either end of any one cab, and affords flexibility of speed regulation. It gives two additional running notches, and at the same time economizes power consumption during acceleration. These locomotives are designed to start and accelerate a 550-ton train on 2 per cent. grades. The following are some of the principal dimensions:

Weight of locomotive, complete	156 tons.
Weight on drivers	200,000 lbs.
Weight on each driving axle	50,000 lbs.
Weight on each truck	57,000 lbs.
Total length overall, inside knuckles	64 ft., 11 in.
Rigid wheel base of each half	7 ft., 2 in.
Total wheel base of each half	23 ft., 1 in.
Total wheel base of locomotive	55 ft., 11 in.
Diameter of drivers	72 in.
Contract tractive effort	60,000 lbs.
Maximum drawbar pull (recorded on test)	79,200 lbs.
Normal speed with full train	60 mi. per hr.
Frames	Cast steel.
Motors	D. C. Interpole.
Weight of each motor complete with cranks	43,000 lbs.
Height of motor frame above cab floor	5 ft., 6½ in.
Height of center of shaft above cab floor	2 ft., 1½ in.

Since the opening of the Manhattan Terminal on November 27, 1910, all through passenger trains of the Pennsylvania have been handled through the tunnels by electric locomotives of this type without a hitch and to the entire satisfaction of the operating force. Heavy trains, far beyond the capacity of the usual passenger locomotive, have been handled over the tunnel grades with ease.



Electric Locomotive with Cabs Removed; Pennsylvania Railroad.

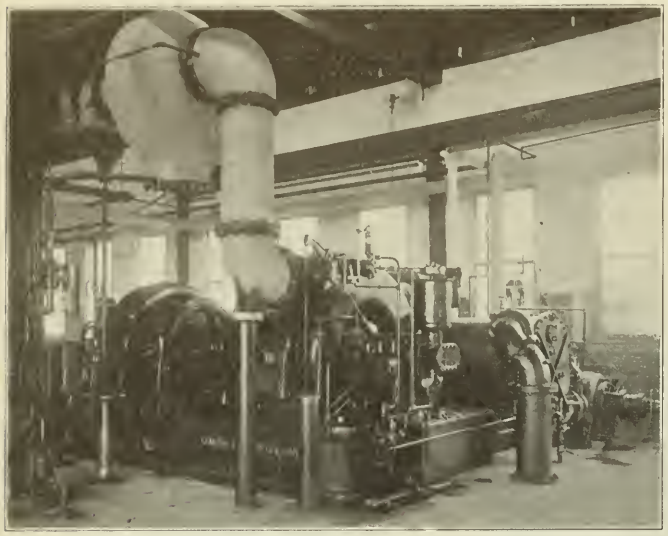
Low-Pressure Turbine for the Bettendorf Axle Co.

BY P. BENDIXEN, Master Mechanic.

About two years ago the Bettendorf Axle Company, of Davenport, Iowa, made a thorough investigation of the various prime movers suitable for an addition to its power plant. The power equipment at that time consisted of two 100 k.w. direct-connected, high speed, tandem compound, engine-driven units, a number of hydraulic pumps, and an air compressor, all exhausting into one header, making an ideal arrangement for connection to an exhaust turbine. Taking into consideration the heating of the shops in winter and the fact that the old power plant was running non-condensing, it was decided to install a 500-k.w. horizontal low pressure Curtis turbine built by the General Electric Company of Schenectady, N. Y. This was put in operation in September, 1909, and has been in service about fourteen hours a day since. It supplies all electrical power required by the plant, which at present amounts to 250 k.w. aver-

age load; this power is used mostly for the operation of cranes, the lighting of shops and for lifting magnets.

Although the turbine is fed from the exhaust of the prime movers, an auxiliary live steam supply is provided through a 4-in. by 8-in. Foster pressure reducing valve in case the exhaust steam supply should be shut off or be reduced. This arrangement works satisfactorily, as the valve operates within a range of one half pound drop in pressure. The average back pressure is about three pounds, and to take care of an excessive back pressure the exhaust header is provided with a 12-in. relief valve set to operate at five pounds pressure. All steam to the turbine passes through an 18-in. two stage separator, which



Curtis 500 K. W. Low-Pressure Turbine for the Bettendorf Axle Company.

separate all oil and moisture from it. A 3,150-ft. Worthington condenser is installed, the condensed steam being returned to the boiler feed water heater. While no data are available to substantiate a statement as to the exact performance of the turbine, it is thought that when running with a 28-in. vacuum, 75 per cent. of the energy delivered to the pumps, compressors, and reciprocating engines is recovered. In cool weather it has been possible to run for weeks with a vacuum of from 29 to 29½-in.; this, of course, makes quite a difference in the steam consumption. In order to maintain a good vacuum, it has been found necessary to pipe the steam seal in which the carbon packing rings are located with high pressure steam to insure against any leakage of air around the shaft. The amount of steam required for this purpose can best be found by experiment, and when once adjusted requires little attention.

Before putting the turbine in service it was run for a few days under various loads, the generator being loaded on a water box. It was found that sufficient exhaust steam was available to furnish 425-k.w. continuously and as much as 575-k.w. for short periods. Six boilers of about 120-h.p. each were in service at that time. The results of the test would indicate that 75 to 80 per cent. of the energy delivered to the engines and auxiliaries was recovered.

The governing of the turbine is good, as with a load fluctuation of about 500 amperes the variation in potential does not exceed two or three volts. The lighting load consists of enclosed arc, flame arc, mercury vapor and incandescent lamps, all of which show up much better when operated by the turbine than when the engine-driven units carry the load. This improved performance is due to the better regulation of the turbine. The emergency governor is tested regularly once a week; it has never failed to respond to an increase in speed, invariably tripping the stop valve on the turbine.

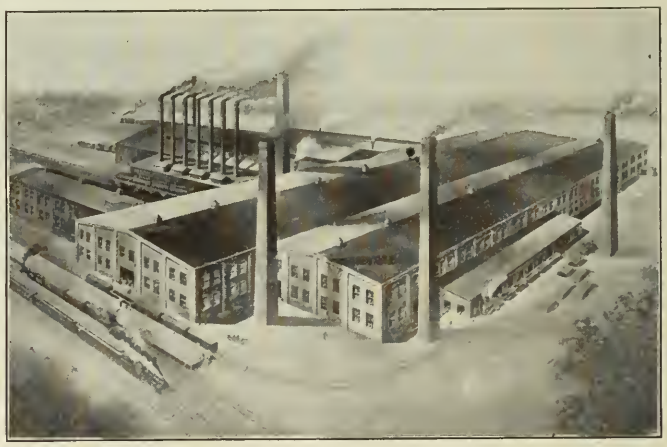
In operating the turbine, a practice is made of drawing a few buckets of oil from the tank every two weeks and adding the same amount of fresh oil; this seems to keep the oil in good condition. No trouble has been experienced in keeping the bearings cool, this being accomplished by means of circulating water. In order to maintain a uniform flow the water is taken direct from the mains and is passed through a reducing valve which takes care of any fluctuation in pressure in the main supply. The attention required by a turbine generator of this size is not as much as that demanded by one of the engine-driven units. Good results are obtained without the use of a receiver generator between the units and the turbine, as the reducing valve makes up for any deficiency in the steam supply.

The longest continuous run so far made with this turbine has been five days and nights. No shut-downs due to trouble of any kind with it have occurred since the turbine was first put in operation, and the Bettendorf Company can conscientiously recommend the installation of a low pressure turbine in any place where a sufficient supply of exhaust steam is available for its operation.

Ohio Seamless Tube Works.

The manufacture of seamless cold-drawn steel tubes in the United States is a comparatively new industry. The first tube factory for this purpose in America was built in the town of Shelby, Ohio, in 1889, and soon developed a successful and flourishing business. It passed into the hands of the United States Steel Corporation, and was destroyed by fire in 1908. Soon after this the Ohio Seamless Tube Company was organized, and the new tube works, here illustrated, were built on the site of the old Shelby factory. The local officers of the original concern became stockholders, and were given the management of the new company. The old employees also invested in stock and were employed, so that the large experience of both officers and workmen, which was obtained in developing the Shelby Tube Company, has been used to advantage in the management of the new company, and in the designing of the buildings and the machinery for the new works.

The seamless tube business now requires a wide variety of machinery for the manufacture of special work, such as is required for automobiles, locomotive, marine and stationary boiler tubes, and for the high-grade tubes required by the government. The cold drawing operation tends to harden the metal, and in order to adapt the tubes to their various uses they are annealed and cleaned of scale by pickling. The annealing process is varied according to the requirements of the user, and designated as soft, medium or hard anneal. The soft anneal is furnished where tubes are subjected to severe physical stress requiring ductility; the medium anneal where there is but little stress,



Ohio Seamless Tube Works, Shelby, Ohio.

and the hard anneal where rigidity or stiffness is required. Unless specially ordered, the cold drawn tubes are furnished with medium annealing. Where higher strength and elastic limit are required higher percentages of carbon are used in the tubes, and to meet exceptionally exacting conditions a nickel alloy is used up to 3½ per cent.

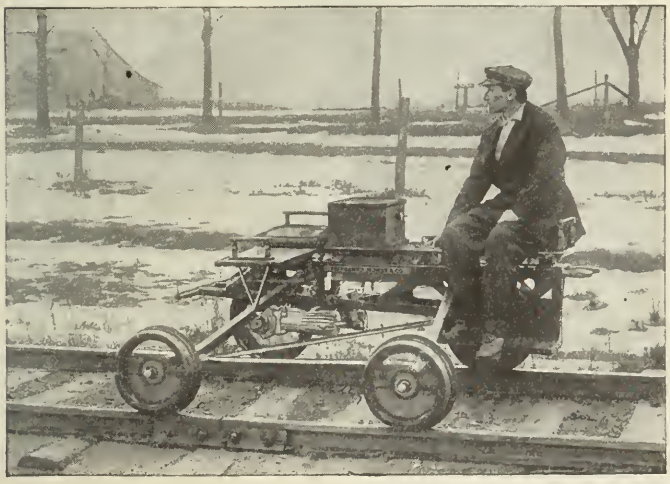
A. C. Morse, general manager of the Ohio Seamless Tube Company, was employed by the Shelby mill when it was first started, and he has grown up with the business, learning the process of manufacture in all its details. H. E. Brubaker, the present superintendent, also served with the Shelby company as an assistant under Mr. Morse. The capacity of the new plant

when working day and night gangs is normally about 1,000 tons, but this can be increased if necessary to 1,500 tons per month. The Ohio Seamless Tube Company carries a large stock of finished tubes in standard sizes, and this stock is available for all concerns that use tubing in small quantities, as well as large. The company makes a specialty of furnishing tubes for automobiles and mechanical purposes of all kinds, and has a complete equipment for doing this kind of special work.

New Motor Car.

A new Sheffield motor car in which many novel and interesting features are embodied is made by Fairbanks, Morse & Co., of Chicago. It is intended for all purposes where a small one to three man car is required. The frame is made of pressed steel, square steel tubing and steel stiffeners. The pressed steel members are made from one piece of steel, being stamped to the proper form, while in the flat sheet and then flanged and bent to the required shape. The necessary holes in the frame are drilled in a jig at one setting so that the frames are absolutely interchangeable. They have a decided advantage over those of wooden construction in that they are more easily braced, more durable, and if any part of the frame becomes bent it may be straightened and used again. The most important improvement in the car, however, is in the engine, which instead of driving the rear axle, the method usually adopted for this type of car, is arranged to directly drive the front axle, the cylinders and crank cases being partly under the frame of the car; the lower flange of the frame is sloped up towards the front to allow of this construction.

The engine has two cylinders, 3¼ in. x 4 in., and is of the two cycle, three port, air-cooled type. The cranks are enclosed so that there is no opportunity for dirt or sand to get into the



Sheffield Motor Car.

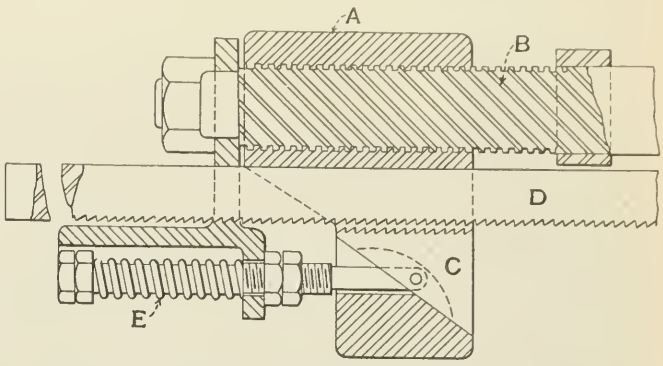
working parts, which materially increases the life of the engine. The use of the two cycle principle introduces several advantages which can not be obtained with an engine of the four cycle type. There are no valves of any kind, which does away with the springs, cams, chains, etc., which are necessary for their operation. This in itself reduces, by a large amount, the difficulties which ordinarily appear in such cars. Lubrication of the whole engine is accomplished by mixing the oil with the gasolene in the supply tank and allowing the mixture to pass through the carbureter to the crank case and cylinders, the oil entering as a spray while the gasolene is vaporized. This gives a thorough and economical lubrication to all parts of the engine and leaves no opportunity to burn out bearings, for as soon as the engine starts lubrication begins.

The car may be made for any gage over 24 in.; its wheel base is 3 ft. 10 in., and the length over-all is 7 ft. The wheels are 17 in. in diameter, with wooden centers. The car is controlled by levers on the seat, regulating the spark, throttle and the brakes. It will seat three persons and will run 30 miles per hour; the 4-h.p. engine consumes about 2¼ gallons of gasolene for each 80 miles. The total weight of the car is about 400 lbs.

Shop Equipment.

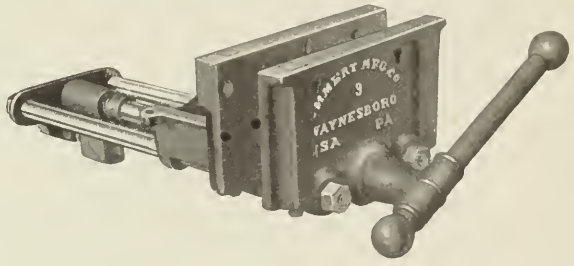
Quick Clamping Wood Vise.

The Eureka Rapid Transit vise, made by The Emmert Manufacturing Company of Waynesboro, Pa., is the result of three years of experimenting and investigating on rapid acting and securely locking vises for woodworkers. This vise is locked or unlocked automatically by simply turning the handle about one-quarter turn, either to the right or to the left. The essential



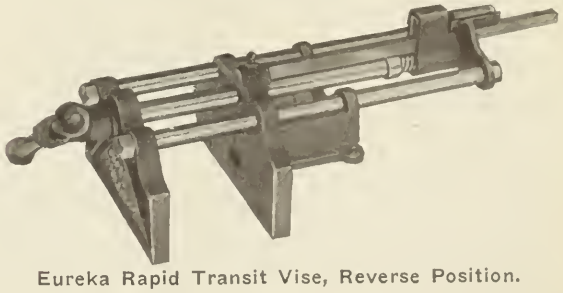
Locking Device for Eureka Rapid Transit Vise.

feature of these vises is this positive locking device which works on the screw B and engages with a case-hardened ⅝-in. square steel lock rod D, placed within 3/16 in. of the main screw of the vise. The nut A and the screw B have full threads which gives the vise the strength of a common screw vise. The lock rod passes through the nut and is gripped firmly on two sides, by the nut on one side, and the triangular shaped toothed wedge C, which is contained in the nut on the other. This wedge operates against a slanting surface in the nut, so that when the main screw of the vise is turned to the right the nut moves forward



Eureka Rapid Transit Vise, Upright Position.

lifting the toothed wedge directly upward, meshing it with the grip rod. This is accomplished without any pressure being applied to the main jaws of the vise. The toothed wedge and grip are of case-hardened steel and will wear indefinitely. After the toothed wedge has been forced into position, as described, the nut becomes rigid with the grip rod and may then properly be considered a part of the rear jaw of the vise. The screw then



Eureka Rapid Transit Vise, Reverse Position.

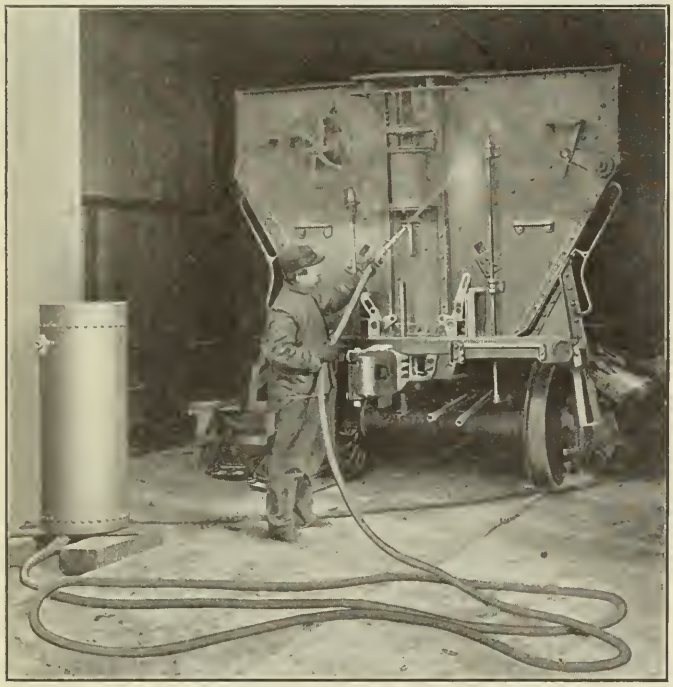
passes through the nut, drawing the front jaw inward against the work and compressing the spring E. The toothed wedge once in position cannot be displaced without reversing the screw and relieving the jaw pressure. This locking device has been

subjected to every possible test for more than a year and has never failed to give a positive lock and at the same time without any noticeable wear of the parts.

A tilting or angle jaw is provided for holding tapers or wedge like shapes. Each of the main jaws of these vises is provided with slotted holes so that a wood pad form may be attached to the angle jaw, and if a greater angle is desired this wood pad may be of a wedge shape. The vises are also provided with vise stops or holding dogs which are concealed within the vise jaw when not in use. The illustrations show the Eureka Rapid Transit Vise No. 130 in the upright and reverse position.

Sand Blast Apparatus.

The Mott sand blast apparatus as used by the Goodman Car Co. at Stickney, just outside of Chicago, is shown in the accompanying illustration. This apparatus is simple and economical. In the Goodman shop one man is able to clean three steel cars a day ready for the painter. The work, formerly done by hand, required fourteen men three days. The sand blast does the work more effectively because it leaves a clean, smooth surface, smoothing off all rusted places and getting into the corners around the bolt heads and rivets, where hand tools did not do effective work. The Mott apparatus will work with any air pressure, from five to one hundred pounds. The ninety pounds usually available in railway shops is more than is needed for economical work. The manufacturers, the Mott Sand Blast Mfg. Co. of Chicago, have made the price of the apparatus low, preferring to install more machines than to get a high price for a few. The Mott sand blast is also used to

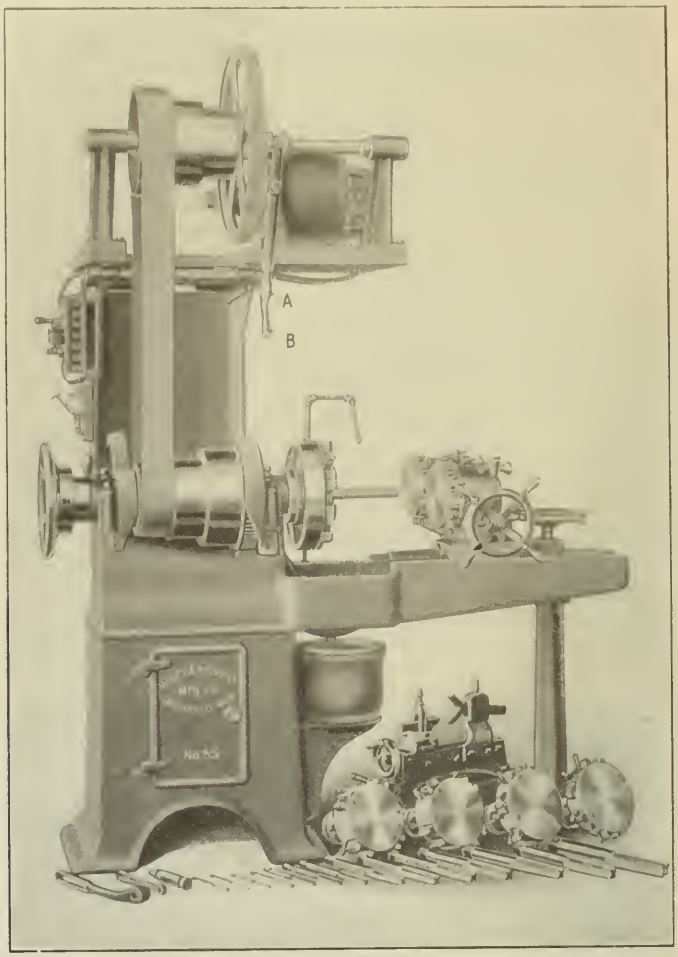


Mott Sand Blast for Cleaning Steel Cars.

clean steel bridges and the exposed frame work in steel buildings before painting. In cleaning steel bridges it is possible to take air pressure direct from locomotive air brake supply.

Opening Die Machine.

An interesting motor application to a standard combination opening die machine, made by the Wiley & Russell Manufacturing Company, Greenfield, Mass, is shown in the accompanying illustration. It is equipped with patented quick-change opening dies, and may be used as a bolt-cutter, nut-tapper, pipe-threader or cutting-off machine. The motor rests on a shelf secured to a bracket which is fitted and bolted to the bed of the machine. This shelf is hinged at the back, and has finished projecting lugs that rest on cams, which are operated by the lever A. By swinging this lever the shelf may be raised or lowered on the cams, giving the belt its necessary tension. This device is also useful when shifting the belt from one step to another. The lever B, in front of the motor, controls the clutch in the large spur gear, making it possible to stop the machine independently



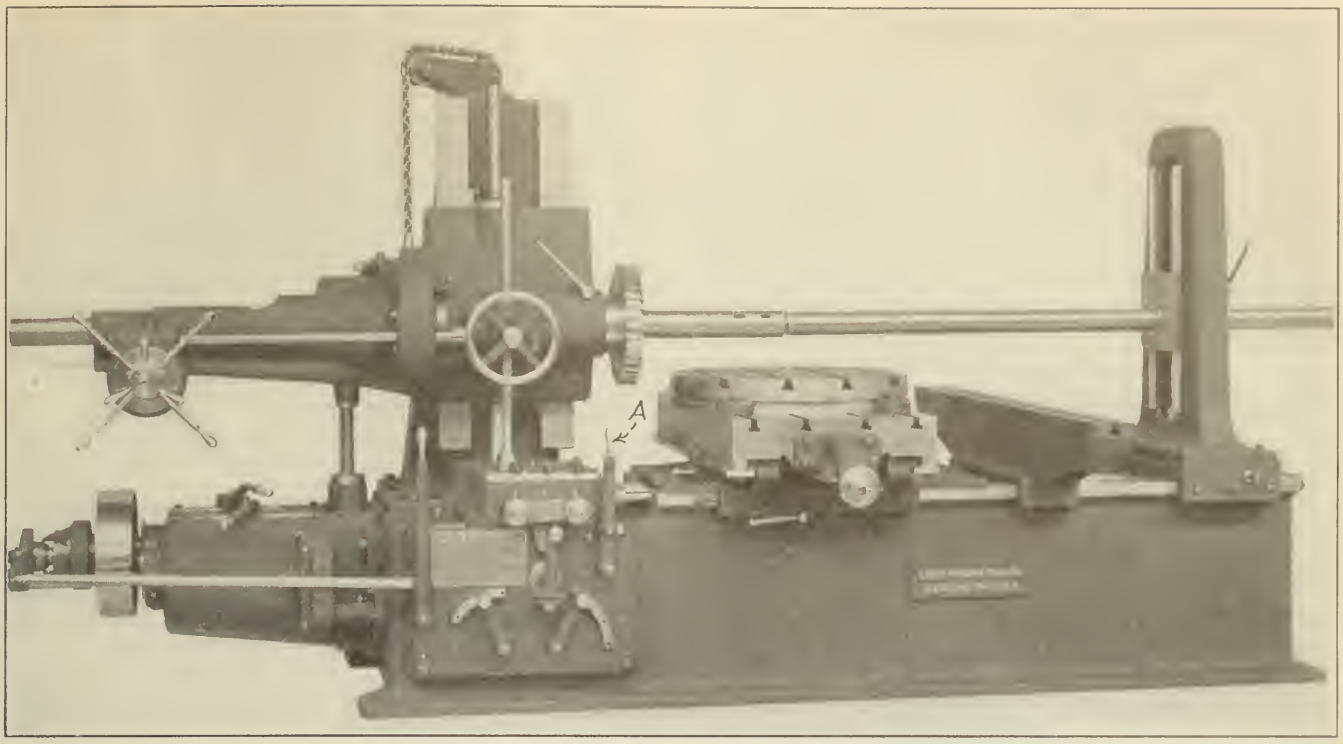
Combination Opening Die Machine.

of the motor. The 2-h.p. motor runs at constant speed, is back-geared and is fitted with a rawhide driving pinion. Reversing or non-reversing motors may be furnished for direct or alternating current. The arrangement is strongly and carefully constructed, and the machine is guaranteed to cut bolts and pipe up to 2 in. in diameter. The total weight of machine and motor is 2,300 lbs.

Cement for High Temperatures.

Engineers have experienced difficulty in the proper maintenance of brick settings of furnaces of all types and have been compelled to depend largely on the ordinary fire clay as a bonding material; as this fuses at a comparatively low temperature, the bond between the bricks is rapidly destroyed, opening up cracks in the walls which eventually cause it to collapse. Also refractory bricks become porous and clinkers from the coals soon form on the surface; in removing them the bricks are often broken.

After several years devoted to research work on refractory cements to overcome these troubles, the H. W. Johns-Manville Company, New York, are now offering to the trade a line of cements called J-M refractory cements, which are rated to resist temperatures as high as 3000 deg. F. These cements may be used for the following purposes: Furnace setting of various types, cupolas, lining brass furnaces, assayers' crucibles, oil burning, tilting and rotary furnaces, and for patching and facing bricks in place on the fire zone under various conditions. They have also produced a coating for walls known as J-M Brickline cement, which seals the pores of the brick and prevents clinkers from adhering to them. Realizing that there are variable con-

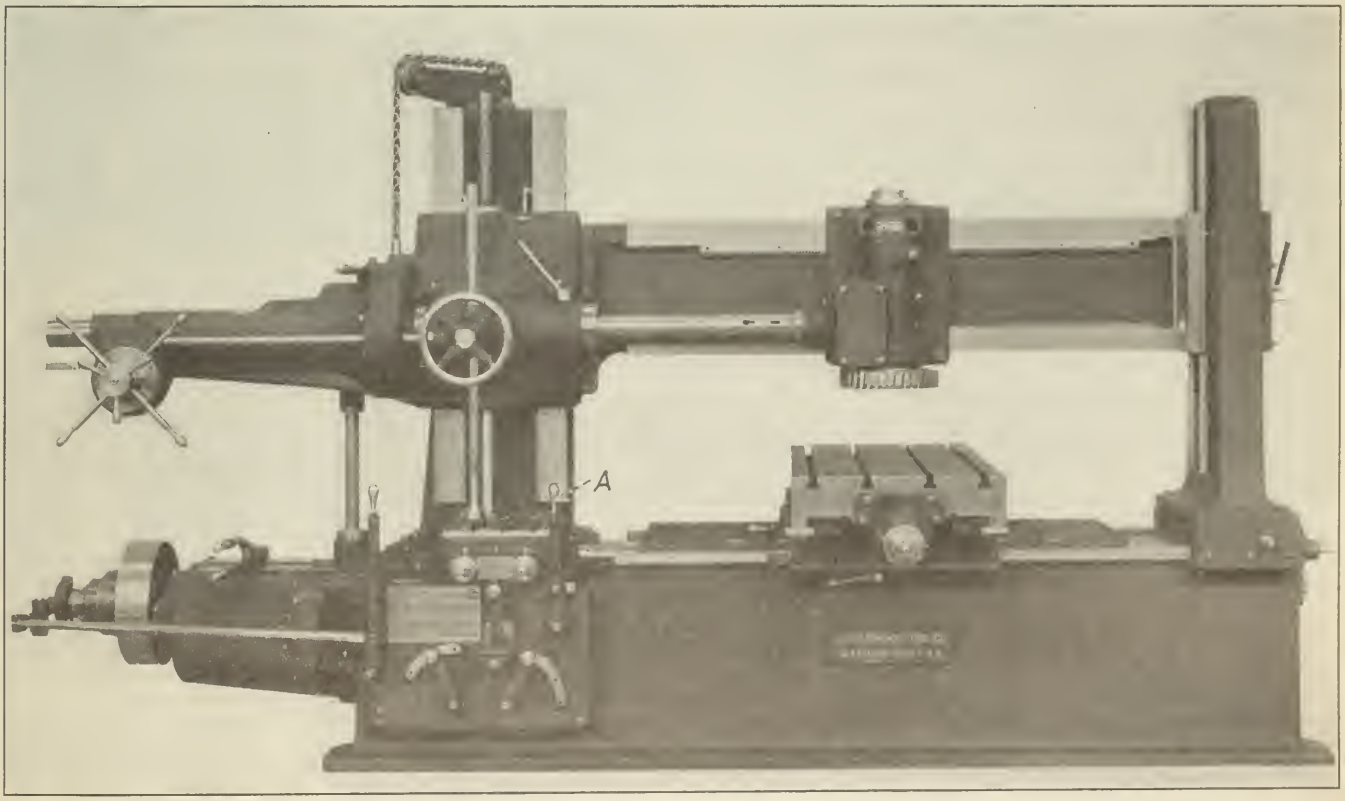


Lucas Precision Boring, Drilling and Milling Machine.

ditions under which these cements are used, they have been made so that they may be modified to meet conditions as they exist. The Johns-Manville Company will be glad to make a careful investigation into troublesome conditions, and offer suggestions tending to overcome the difficulties.

Precision Boring, Drilling and Milling Machine.

A boring, drilling and milling machine of new design and construction, and one that will find extensive use in railway shops, has recently been placed on the market by the Lucas Machine Tool Company, of Cleveland, Ohio. This machine, shown in the accompanying illustration, is the result of ten years of development and improvement. The feature that is common to all Lucas type machines is the raising and lowering of the spindle head which, being a constant weight, may be more accurately compensated for than the raising and lowering of the table with its great variety of loads. This feature gives the opportunity of properly distributing the metal to the best advantage. Its construction allows the use of a deep bed of great



Lucas Precision Boring, Drilling and Milling Machine Arranged as a Vertical Milling Machine.

stiffness which gives a solid foundation; the weight is so distributed that the machine may be satisfactorily operated without placing it on a foundation. The 24 in. x 48 in. platen is of extra size and weight, providing a large working surface of ample strength and rigidity. The greatest distance from the top of the platen to the center of the spindle is 24 in. The adjustable back rest which carries the tail block is well proportioned, and its base has liberal bearings on the bed of the machine. It may easily be removed from the base to accommodate extra long work without impairing the general rigidity of the machine. The spindle head and the tail block are raised and lowered together, being connected by a shaft and planed bevel gears. The tail block has long V bearings, which make it impossible for the back rest to spread, so that when the tail block and back rest are bound together, they become practically one piece. The spindle drive is transmitted, in the most direct manner possible, from the source of power to a gear of large diameter on the spindle sleeve. The back gears are on the head, where they should be, and are operated by a convenient lever.

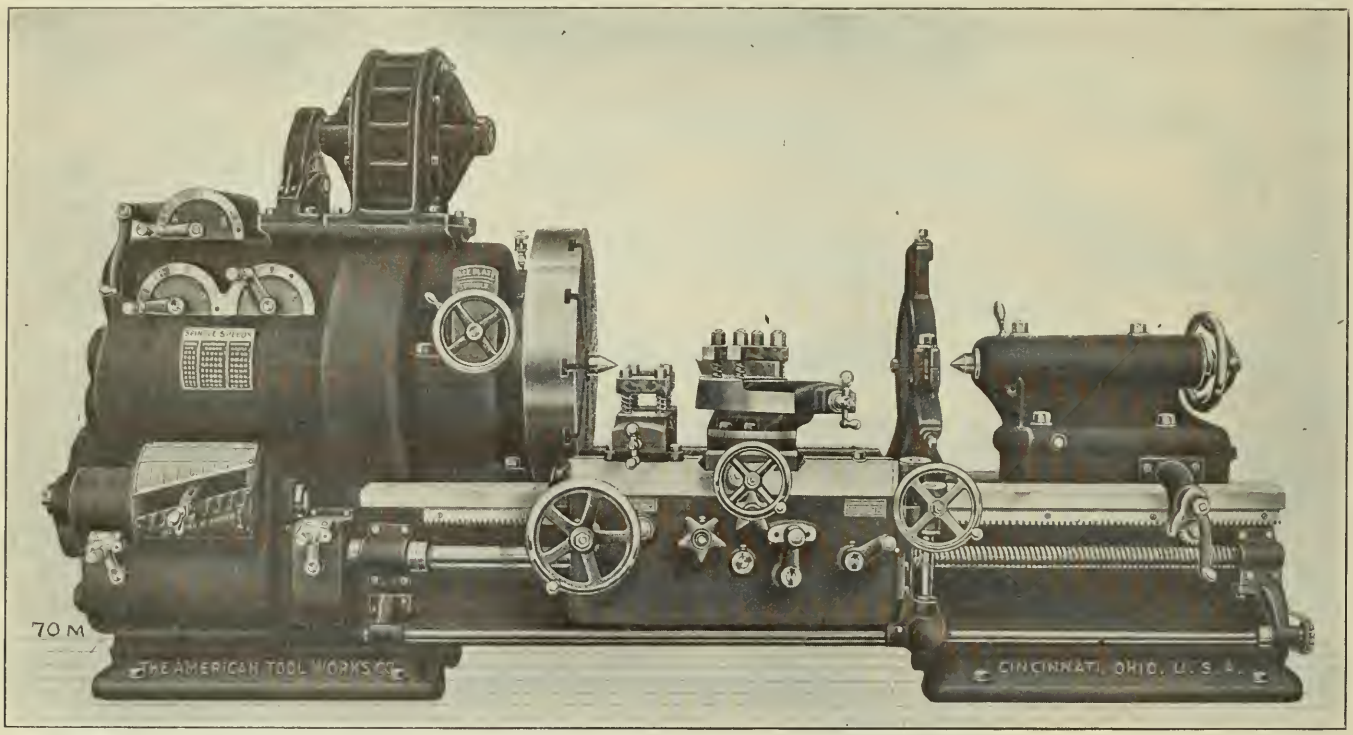
The principal feature in this machine, which differs from former machines, is the feed mechanism. It has a constant speed quick return which may be applied wherever the feed is being used. It is operated by the lever A which, when in the left-hand position, gives the quick return, and when in the right-hand position allows the feed to operate. The feed is operated by two levers controlling sliding gears and giving nine changes for either position of the spindle back gears, which gives a total of eighteen changes ranging from .004 in. to .600 in. per revolution of the spindle. These feeds may be applied to the spindle, spindle head and tail block, saddle and platen; they are so arranged that not more than one feed can be engaged at the same time. All feed screws are true to pitch, and are provided with dials graduated to read to thousandths of an inch, which allows the work to be done accurately and interchangeable parts produced without the use of jigs. The machine may be driven by belt or by a direct connected motor. If by belt, the speed should be such as to drive the 16 in. pulley on the machine 300 r. p. m.; if electrically driven, a 7½ h. p. constant speed motor running at 1,000 to 1,200 r. p. m. should be used. These speeds give the spindle a range of from 7½ to 150 r. p. m. The machine will take work 6 ft. long between the face plate and the outer support, and has a 36 in. cross feed provided with an automatic trip. Its total weight, skidded for shipment, is about 12,000 lbs.

The machine is also shown with a cross rail allowing it to be used as a vertical milling machine. The cross rail is bolted to the spindle head and the outer support. On it slides a head, carrying the verticle spindle which may be fed along the rail either by hand or power. The verticle spindle is constructed along the same lines as the horizontal spindle, which is of forged steel, and has a large taper front bearing. It runs in a solid bronze bushing in the solid head of the machine, with a collar between the shoulder on the end of the spindle and the end of the bronze bushing. This makes a solid construction, and a slight reduction in the thickness of the collar allows for any adjustment that may be necessary after long use. The rear bearing is straight, but the split bushing is taper on the outside, and can be adjusted by the locking nuts to compensate for all wear. Milling cutters of large diameters like the 12 in. cutter shown, may be bolted directly to the spindle flange. The combined movement of the head and platen gives this form of machine a wide range for surfacing work.

High Duty Lathes.

Although the high duty lathes here illustrated are strictly new in design, they are by no means in an experimental stage, as they have been installed in shops and have performed service that has exceeded the expectations of the makers, the American Tool Works Company, Cincinnati, Ohio. As an illustration of their capacity, a 20-h.p. motor is recommended for the electrically driven machines, and the makers guarantee that the lathe will work in continuous service without being strained with a 50 per cent. overload on the motor. The lathe is made specially heavy and the metal is placed where it is most needed to give the required rigidity, thereby overcoming the possibilities of chatter and vibration. The bed is of deep section and is thoroughly braced by cross box girths at short intervals throughout its entire length, and is further strengthened by a web cast through the center. The wall of the bed at the tailstock end is cut out to permit of slipping the tailstock off without taking out the bolts.

The lathe may be driven by motor or belt, the belt being applicable to both the geared head, with a single pulley, or to the regulation cone pulley. If motor driven a constant speed motor is recommended with a speed between 700 and 1,000 r.p.m., but if a variable speed motor is preferred, a speed variation of only 35 per cent. will be required, on account of the range of spindle speeds obtained from the gears in the headstock. The geared head is of the triple geared type and is connected to the main

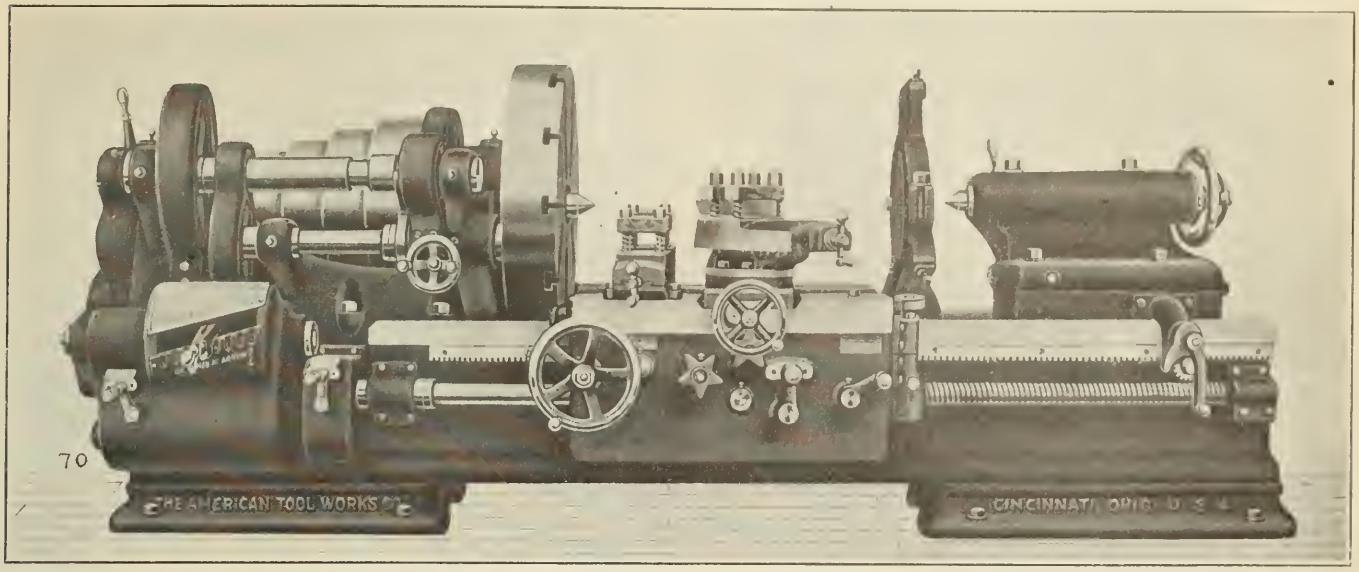


American High Duty Lathe, Arranged for Motor Drive.

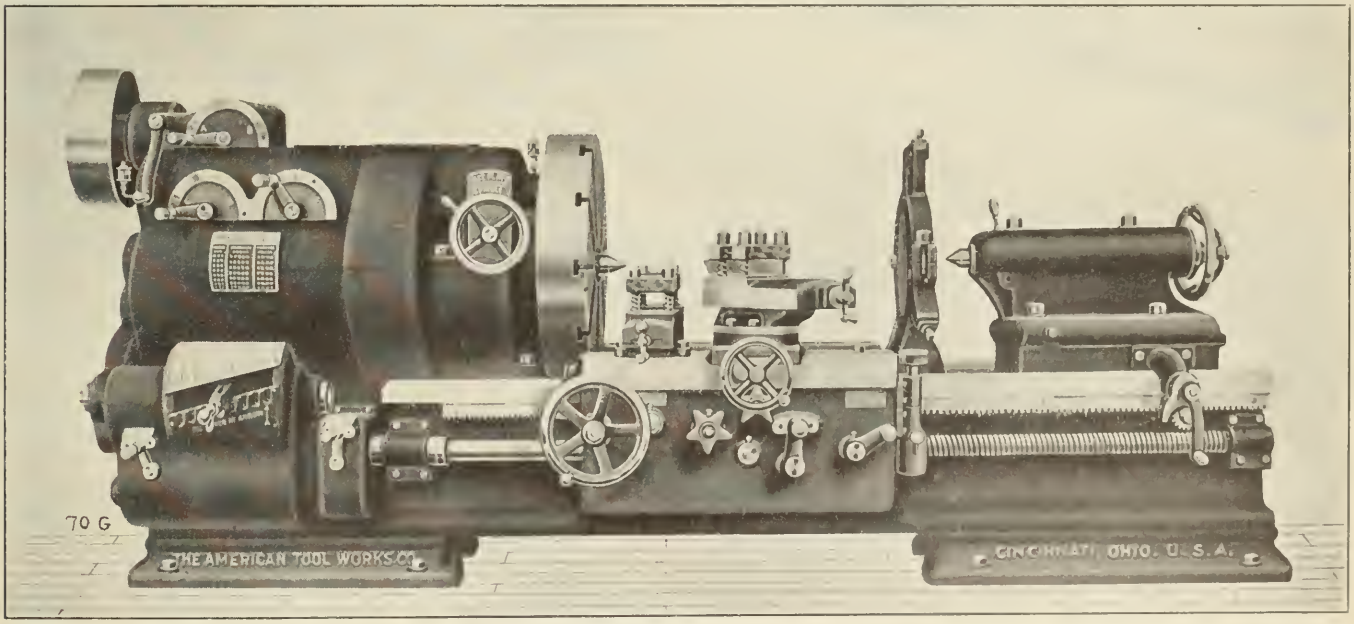
driving shaft through spur gearing. Sixteen spindle speeds are provided by means of positive clutches, of the "selective type," and slip gears, the teeth of which are rounded causing them to slide easily into mesh. Eight of these speeds are obtained directly through the spindle gear and the other eight through the face plate drive.

A sensitive but powerful friction clutch, the handle of which is shown to the right of the pulley in the illustration of the belt driven lathe, is provided, which facilitates making speed changes without shock to the parts. The gears are made with a coarse pitch and wide face and are all mounted on long bronze sleeves which are oiled by means of sight feed oilers from the outside of the head. All the driving is either done through short shafts, or sleeves, which eliminates the possibility of binding or chattering sometimes found in long shafts under excessive torsional stress. The spindle is made of high carbon, hammered steel in taper form, a construction common to heavy wheel lathes, and has only one gear which is set close against the front bearing. This arrangement adds greatly to the life of the spindle itself. Bearings throughout the head are all bored from the solid and are lined with massive phosphor bronze bushings. All speed changes may be made without stopping the initial drive of the machine, thus enabling the operator to quickly make the various speed changes. The positions of the levers for the various spindle speeds are plainly indicated on the index plate, a copy of which is shown herewith. This plate has been carefully worked out and the simplicity with which each spindle speed is obtained will be appreciated.

An important feature of the lathe, and one that was designed entirely on original lines, is the quick change gear mechanism. Forty-eight changes are provided for feeding or screw cutting, 32 of which are obtained by simply arranging the levers as directed by the index plate, and the others through a compound quadrant gear on the end of the bed. These different feeds are all obtained from the same driving speed, which feature gives this lathe a distinct advantage. The range of threads for screw cutting is from ½ to 28 threads per inch, including a 11½-in. pipe thread, and the range of feeds is from 4 to 224 cuts per inch, or just eight times the corresponding screw threads. The feed box is a complete unit, embodying what is usually carried in two sections, and consists of a gear box on front of the bed with two levers and a steel sliding tumbler, the latter working in conjunction with a cone of eight steel gears. The cone of the gears and the tumbler gear are of the Brown &



American High Duty Lathe, Arranged for Cone Pulley Belt Drive.



American High Duty Lathe, Geared Head.

Sharpe 20-deg. involute pointed tooth type, which provides a strong tooth and permits of instant engagement while running, without the gears riding on the top of one another before dropping into place. The clutches used are of the "selective type," making the engagement practically instantaneous. An important feature of this unit is the arrangement of gears so that coarse

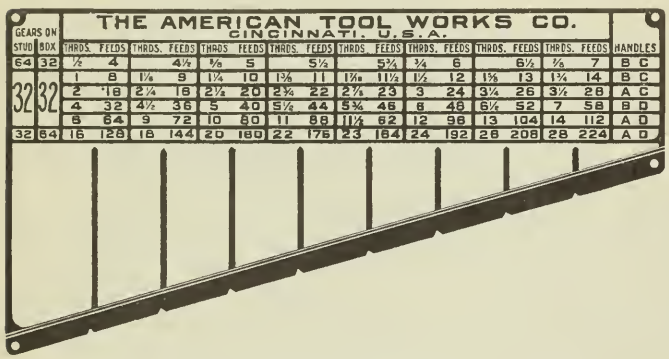
THE AMERICAN TOOL WORKS CO.,
CINCINNATI, U.S.A.

HANDLES ON	SPINDLE R.P.M.	FACE PLATE R.P.M.
A D E	250	19
B D E	180	14
A C E	130	10
B C E	95	7
A D F	70	5½
B D F	50	4
A C F	36	2¾
B C F	26	2

Index Plate for Spindle and Face Plate Speeds.

threads and feeds are all secured with the direct drive, thereby doing the heaviest work with the least amount of gearing. A reverse plate at the spindle gear arranges for either right or left hand threads. The index plate shown herewith is placed in full view of the operator, on front of the gear box, and shows the exact setting for each thread or feed.

The carriage is very heavy and is particularly deep, due to the

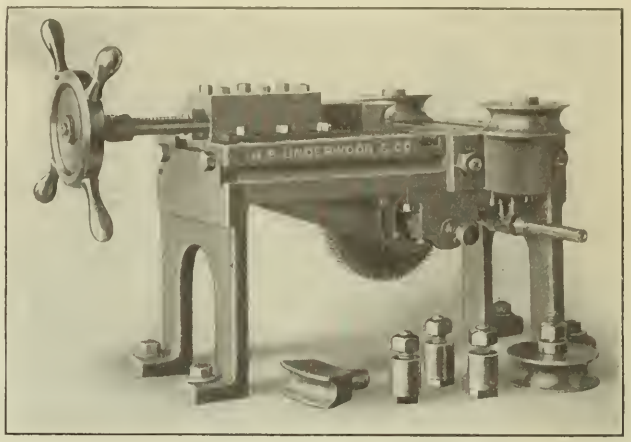


Index Plate for Screw Threads and Tool Feeds.

drop V bed which is a special feature in this lathe. It has a full continuous bearing of 50½ in. on the V and additional bearings on the top and inner surface of the front tail stock V. The apron is tongued, grooved and firmly bolted to the carriage. It is double which gives all shafts passing through it a double bearing. Both the longitudinal and cross feeds are reversed by a lever from the front of the apron, which is much more convenient than that in most lathes where these feeds are reversed in the headstock. The tailstock is of heavy construction, having ample bearing on the ways. It is moved along the bed by a crank and gear and is held in place by a pawl, engaging in a rack cast in the center web of the lathe, in addition to its quadruple clamping studs. It is provided with a taper attachment of the offset type which allows the compound rest to be set in a plane parallel to the bed. The accompanying illustrations show these lathes arranged for motor and belt drives. They are built in sizes of 36 in. and 42 in., both having the same general dimensions.

Power Bender and Straightener.

A machine for bending pipe, structural iron and round and flat bars of various kinds and sizes, has been developed by H. B. Underwood & Company, of Philadelphia, Pa. It is capable not only of bending, but also of straightening material in a quick and efficient manner. Instead of requiring a multiplicity of dies or formers, as in most machines, it is only necessary to have a set of formers for the different diameters. These may be set in different locations and permit of bending an infinite variety of shapes, as well as radii. Being belt driven, with a tight and loose pulley on the shaft, it is much more economical than compressed air, and may be used where the latter is not obtainable. A much greater power may also be brought to bear on the work. The ram is actuated by an eccentric shaft of small throw, which moves with a fixed stroke. This shaft is powerfully back-geared, giving the ram considerable power. Sliding in the ram is an-



Power Bender and Straightener.

other shaft which carries the former to be used, and is moved in or out by a screw operated by the hand wheel. This gives a delicate means of adjusting the formers so the work may be bent to the exact shape, and any number of pieces may be bent to the same shape by noting the last position of the hand wheel.

But little skill is required to operate the machine; there is no complication, and by just moving the pipe along and turning the hand wheel the work is given the desired shape. The formers or resistance studs slide in a T slot on each edge of the bed. T slots are also placed across the bed so that the formers may be fastened therein, thus allowing many different arrangements. The effect of bending in this manner, by the former following up the work and exerting at each stroke a little more pressure, is much better for the material than a sudden severe bend, or trying to shape the piece in one movement. Pieces of pipe, bars, etc., that have been bent in various shapes have been straightened easily and quickly.

FOREIGN RAILWAY NOTES.

The section of the Cape to Cairo railway from Broken Hill, Rhodesia, north to the Star of Kongo mine in the Belgian Kongo has just been opened. At present the most northerly places of importance in the Kongo to which communication will be maintained are Elizabethville and the Star of Kongo mine, the latter on a branch line about seven miles from Elizabethville. The length of this extension from Broken Hill to the Kongo border is 132 miles, and thence about 60 miles to the Star of Kongo mine. A semi-weekly train service has been arranged for this extension, being continuations of the trains de luxe leaving Buluwayo, British South Africa, on Tuesdays and Fridays. The Belgian authorities are arranging for the further extension of the line to the north to open up the Kongo, and it is expected that a contract will be let for this work early in 1911.

A bill has been introduced in the Cuban congress for railway construction as follows: To authorize the Executive to grant a subvention not exceeding $9,500 per mile on the plain and $16,000 per mile in the Cordillera de los Organos, to the company which will build the following lines: (a) From Guanajay, connecting Cabanas, Bahia, Honda, Rio Blanco, La Palma, and Vinales with Pinar del Rio, (b) from Los Arroyos de Mantua, connecting Mantua, Montezuelo, Luis Lazo, Isabel Maria, and Cabezas with Pinar del Rio, (c) from La Palma, to connect with San Diego de los Banos and Paso Real de San Diego, Herradura and Dayaniguas, and (d) from Paso Real de Cuane, through the tobacco zone to Los Remates by way of Cayuco, Las Martinas, La Grifa, and La Fe.

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THE twelfth annual convention of the American Railway Engineering & Maintenance of Way Association, which will be held in Chicago on March 21-23, will bring together the prominent engineers of the railway systems of the United States, Canada, and Mexico, and the interest shown indicates that the attendance this year will exceed that of any previous convention. Among the reports to be considered which merit special attention are important and lengthy studies of the steel rail problem and of the effect of impact on bridges, with special reference to the effect of moving loads on these structures. Both embody the results of extensive investigations and are examples of the highly valuable work of the committees of the association. No one realizes this value more than the railway companies themselves; and the association has practically their unanimous support. In order that its effective work may continue and grow along its present lines, it is often necessary for the various committees to collect data derived from the actual results of operation of the individual railways. The responses to requests for this material often have not been satisfactory. While there may be some data which a road may have good reason for not giving out, resulting, perhaps, from the use of some special operating device or method developed on that one road, there is not much that cannot properly be given to the association, especially in view of the fact that, as it is its practice to refer to the different roads furnishing data by some letter or symbol, rather than by name, when this is desired, the source of information is not necessarily disclosed. For these reasons it would seem that the railways often should more freely and fully furnish information requested by the committees. So long as railways sometimes withhold important data because of the fear of publicity, or, perhaps, because of the cost of compiling it, so long will the association be seriously hindered in accomplishing the full measure of work it has laid out for itself. When the various members of the committees, all busy men, devote their time gratuitously to its service, the item of cost in furnishing data should not be considered by the railway. In such an organization problems common to all the roads can be worked out for the benefit of all at the cost of but a single investigation. The sooner the full support of all the railways is secured the earlier will the American Railway Engineering and Maintenance of Way association be able to attain the full measure of its ambitions and possibilities, and the greater will be the resulting benefit to all the railways.

WHILE the unit system of organization as developed by Major Hine is in use on the Sunset lines of the Southern Pacific, as well as on the Union Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation, a modification of the Hine system has been in effect for over six months on the lines west of El Paso. The officers themselves speak of it as the "consolidated" organization. As on the other Harriman lines, the superintendent has authority over all branches of the service on his division and reports to a general superintendent. He has an assistant superintendent, who is a first-class operating man, entirely capable of taking the superintendent's place whenever the superintendent may be absent. The positions of master mechanic and division engineer, as well as their titles, are retained; but the idea of consolidation is to get them all, with their clerks, into one common office which connects with the superintendent's private office. There is one common office file for operating, engineering and mechanical correspondence, and there is one superintendent's chief clerk, over whose desk all of the correspondence of the consolidated office passes. The division engineer and the master mechanic each have their own bureau, which handles exclusively engineering or mechanical matters; but by having one chief clerk the undoubted advantages that the Hine system has, of doing away with an enormous unnecessary correspondence between different departments of the same division, is retained. Those who have tried the sytsem and are strongly in favor of it claim that certain disadvantages of the Hine system are done away with; and certainly the system has strong points in its favor. The advantages of having always in the office, an operating man rather than an assistant superintendent who may be a mechanical man or a division engineer, are claimed to be great. The advantages of retaining the title of master mechanic and giving him duties that have to do with the mechanical department almost entirely are worth considering. The same is true of the division engineer. The objection that another man, the assistant superintendent, is added to the division organization applies also we undertsand to the Hine system. We believe that the Hine system does not specifically call for an extra officer. It has been the general experience on the Harriman lines that this addition to the force becomes necessary. The forces are brought together through frequent meetings in the superintendent's office. Of course, just how close a relationship is established between the superintendent and his various subordinates, and between the subordinates themselves, depends

largely on the personality of the superintendent. On one division of the Southern Pacific it is a regular custom after dinner to have the heads of departments in the superintendent's office, when he is there, for a discussion; not a formal conference but really a chat about how things are going. The different departments are made to feel at liberty to make criticisms and suggestions in regard to each other's work, and to tell their own problems as well as point to their own achievements. By having an assistant superintendent who is really the office man, the superintendent is enabled to spend a great part of his time out on the division. He spends at least 20 days out of each month on the line, and because of the high class of men who are being selected as assistant superintendents he feels free to turn over the routine work of the division to his assistant and devote himself to any special problem that presents itself. For instance he can go out and camp beside some water station, that he thinks is being run economically and make a thorough study of it. He can perform one of the most important duties of an executive: he can drop work and think. This, on a long, busy division, is enough justification for an additional man in the organization.

THE Indiana legislature has finally given the railway commission complete authority to require the use of the block system throughout the state, on both steam and electric railways, and with no limitation as to the earnings of the roads. The new law is highly commendable in spirit, but slovenly in its language. It goes into effect January 1, 1912, and makes it unlawful after that date to run any train or car on any railway, unless such railway has in operation an automatic block system, or other system approved by the railway commission . . . unless the time therefor be extended by the commission. Power is conferred on the commission to extend when it shall be made to appear that reasonable necessity for such an extension shall exist. Power is conferred also to relieve a carrier from the obligation of the law, if the volume of traffic is such that "the same can be despatched without substantial hazard to life and property"; also to permit, in place of the automatic, either a controlled manual or a manual block, or a "despatcher's block," or any other form of block or other signal . . . if it shall be made to appear that such other form shall reasonably conserve the safety of life and property. The penalty for a violation of the law is $1,000 a week, applicable to any person, firm, corporation, receiver, or lessee. The use of "automatic" as the initial word in the most important clause indicates a well-meaning preference for the best; but in view of the violent difference between the cost of block signals, which are really automatic (and satisfactorily effective) and the resources of the poorer roads, this phrase, implying that the commissioners ought to try to have automatics introduced everywhere, is hardly the one one might expect. One is inclined to think that the word has been used in mere carelessness or ignorance, as it has been used in the past by the national convention of railway commissioners. What is meant by "despatcher's block" is also a puzzle. In most of the reports that we have seen where this mongrel term has been used in discussion the speakers referred to the ordinary train-order system; that is to say, to roads having no space-interval system whatever. Possibly, however, our friends in the Indiana legislature refer to the tripartite manual block system, which is in use on the Erie Railroad in that state. On that section of the Erie the despatcher directs all of the movements of the block signal men. As that system has made a very good record on the Erie for over 20 years, it is well that the law should recognize it, of course; but "manual block system" would sufficiently describe it in the statute. The clause of the new law giving the commission power to postpone the date for compliance will give the members of the board a great heap of trouble, without apparent compensating advantage. The added financial burden imposed by the introduction of the block system cannot be made anything but a burden in the beginning, at least, and there is no use in trying to disguise it. It might have been better for the legislature itself to set a later date (requiring compliance this year on a part of each company's line) rather than impose on the commission the difficult task of adjudicating the varying financial pleas of different companies. The discretion which the commission is charged to exercise as to what kind of block system each particular road ought to have, also means perplexity. If the commission is able to see that each road has *some means* which will effectively maintain a space interval between trains, it will be doing all that ought to be expected of it.

RAILWAY DEVELOPMENT IN CANADA AND THE WESTERN UNITED STATES.

IT is well known that railway construction is taking place much faster in proportion in Canada than in the United States, or even than in the less developed parts of this country. In a recently published supplement to the London *Statist* dealing with American railways, there are some comments on the extent to which railway development in Canada is being stimulated by the example of the prosperity of the Canadian Pacific which ought to contain a lesson for the people and the railway regulating authorities of the United States. The *Statist* says, in part:

> Everyone is aware, of course, that the development of the Northwest was originally brought about by the enterprise of the men who built the Canadian Pacific; but the existing direct and indirect influence of the Canadian Pacific in causing the western district of Canada to be rapidly opened up to population is not so generally recognized. The Canadian Pacific itself has in recent years built and opened up a great amount of new mileage in Manitoba, Saskatchewan and Alberta. . . . But the advantage to Canada of the Canadian Pacific is much greater than the provision of this great system. . . . Undoubtedly the success of the Canadian Pacific has done more than anything else to impress investors with the advantages of Canada as a field for investment and has induced them to find capital both for the construction for the great amount of new mileage built by the Canadian Pacific and of the vast amount of mileage that has been and is being constructed by the Grand Trunk Pacific and the Canadian Northern. The development of Canada was retarded for many years by the unprofitableness of the Grand Trunk Pacific, but the prosperity of the Canadian Pacific has entirely removed the ill-effects of the disappointing results of previous investments.

Many persons would say that the chief incentives to new construction of the new lines in Canada have been the large subsidies that the Canadian government has granted. These subsidies have helped. But they alone would not have induced much investment. A government subsidy reduces the amount of private capital which must originally be put into the enterprise. A guarantee, such as has been given in some cases by the Canadian government, of a limited return on a limited part of the private capital invested reduces the risk that the private investors take. But the intelligent capitalist knows that in the long run he must rely on the net earnings of the property for an adequate return. Canada thus far has allowed the owners of the Canadian Pacific to enjoy the fruits of the remarkable courage and enterprise that they showed in building the road, of the skill used in locating it and of the great ability that has been exercised in managing it. It is apt to be said further that the Canadian Pacific's increasing prosperity has been due to the rapid development of the country. But this is only part of the truth. The rapid development of the country has also been due to the enterprising policy of the Canadian Pacific. Furthermore, if its management had not efficiently handled the business that came to it the road's profits would not have risen as they have. As the *Statist* points out, the average revenue trainload increased from 229 tons in 1901 to 340.25 tons in 1910, or 49 per cent. These figures illustrate a marked increase in efficiency of operation. The railways of Canada have experienced advances in the wages of labor and the costs of materials similar to those in the United States; and there, as here, without increase in the efficiency of management the growth of traffic would not have been sufficient alone to cause anything like the increase in net earnings that has taken place. Even with an increase of 137 per cent. in the density of its freight traffic in ten years, the Canadian Pacific pays from earnings from operation dividends of only 7 per cent., the other 3 per cent. of the dividends declared this year being derived from sales of land, outside investments, etc.

It is interesting to note the extent to which differences in the attitudes of regulating authorities toward investment in railways

affect the attitudes of investors, as illustrated by the cases of the Union Pacific and the Canadian Pacific. Both roads now pay 10 per cent., 6 per cent. of the dividends of the Union Pacific being derived from earnings from operation and 4 per cent. from outside investments. The capitalization of the Union Pacific is much larger per mile than that of the Canadian Pacific, but, on the other hand, it operates through a much more highly developed territory, and in consequence both its gross and net earnings per mile are much larger. On the whole, therefore, but for one thing, investors probably would regard Union Pacific stock as highly as they do Canadian Pacific. This one thing is that while the Canadian government seems disposed to permit the owners of the Canadian Pacific to continue to enjoy the fruits of judicious investment and wise management, the Union Pacific is under attack in a suit to dissolve its combination with the Southern Pacific and practically dissolve its combination with the Southern Pacific, and practically all of its rates are the subject of litigation in the so-called intermountain cases. Consequently, while Canadian Pacific common sells for 213, Union Pacific common sells for only 171.

The territory in Canada which is not provided with railway facilities is much larger than in the United States, but there are large areas in this country which need railways as much as does any part of Canada. The line of the Chicago, Milwaukee & Puget Sound for some distance in Montana follows closely that of the Northern Pacific, and nowhere are they more distant from each other than fifty miles. North of them there is a territory in this state bounded by the Milwaukee and the Great Northern which is three-fourths the size of the state of Illinois, and which has not a mile of railway. Illinois has 11,834 miles of railway, being in point of mileage second among the states, Texas being first. There are equally large sections in Texas without railway facilities; and in some of the older states, such as Missouri, and even in some of the Eastern states, notably Maine, there are large areas without them.

There is no tariff on capital; no reciprocity arrangement is necessary to enable it to pass from the United States into Canada, and already a large amount of American capital has found investment in Canadian railways. If the Canadian government continues to follow its present liberal policy in dealing with railways, and government regulation in the United States continues to become more restrictive, it is hard to see how it can be doubted that transportation development on the other side of the border will continue to be faster than on this side. Railway development means the development of the country. As there is no tariff on capital, so there is none on men; and the main thing that is attracting thousands of immigrants from the United States to Canada annually is the opportunity which is being afforded by the rapid increase of railway mileage in western Canada, for acquiring lands cheaply and rapidly getting well fixed by its cultivation and increase in value. It is passing strange that the people of the western part of the United States do not see the significance of these facts. They indicate as plainly as anything can be that it is to their interest to encourage, as Canada is doing, the construction of new railways and the improvement of the existing lines by leaving them free to manage their affairs without interference and to earn as large profits in proportion as other concerns, as long as they give good service at reasonable rates. But they are not doing so. The average number of miles of railway in the United States per hundred square miles of territory is eight; the number of miles of line per hundred square miles in the state of Montana is 2.85, and yet at the present session of the Montana legislature there have been introduced 78 bills for the regulation of railways, an average of 1¾ for each working day of the session. If all or even a considerable part of them were passed they would put restrictions and burdens on the railways in that state which would greatly retard both the improvement of the existing roads and the construction of new ones. If all the rate reductions which are seriously sought in the West were made, the earnings of the railways in that territory would be so reduced, and the confidence of capitalists in the safety of investment in them so seriously impaired, that the development of the whole territory would be seriously retarded for years.

If the people of the western part of the United States desired that capital should seek investment on the north side of the national boundary line rather than on the south side, they could not adopt a policy better adapted to producing this result than that of continuing to attack and harass capital invested in railways and other corporations. On the other hand, if the leaders of public opinion and politics in Canada continue to be wise, they will recognize the fact that they cannot in any way better promote the development of their great areas which are yet untouched by the plow of the farmer or the pick of the miner than by continuing to let the capital invested in railways alone so long as the roads give good service at rates which are reasonable in view of the conditions under which the service is rendered.

PENNSYLVANIA RAILROAD.

ONCE again the Pennsylvania directors suggest that they may have plans for large improvements which will cost many millions of dollars, and which, like the New York passenger station, cannot be expected to earn a sum anywhere near commensurate with their cost. The Pennsylvania has continuously to make large expenditures for new facilities to keep its property up to the pressing demands of new business; but this source of expenditure, such as, for instance, the proposed fifth and sixth track between Morrisville and Trenton, make directly for more economical operation and quicker handling of business, with consequent greater earnings, both gross and net.

In his annual report for the calendar year ended December 31, 1910, President McCrea says: "The Broad street station and approaches have previously been gradually improved and enlarged, but with a consequent increase in the number of passenger trains, which, based on track capacity, is not exceeded in any other large terminal in this country, it is evident that further extensions and improvements to accommodate properly the passenger traffic in and out of Philadelphia must be undertaken on a larger scale."

The preparation of plans for this work in Philadelphia has been put in the hands of a board of engineers, who are to submit their findings to an advisory board consisting of the executive, engineering and operating officers. How great the expenditures on the Philadelphia terminal will have to be the officers themselves, of course, do not know, but the New York Central's experience in rebuilding the Grand Central station shows to what extent it may be necessary to enlarge a terminal which only a comparatively few years ago was considered amply large enough for any increase in business that the company might fairly be expected to get.

In 1910 the Pennsylvania Railroad—that is, the five grand divisions directly operated east of Buffalo—carried 20,280,000,000 tons one mile and 1,694,000,000 passengers one mile. This is an increase of slightly over 6 per cent. in ton mileage, and is the largest ton mileage of any year with the exception of 1907, when the road carried 21,473,000,000 ton miles. Passenger business was 9.42 per cent. more than in 1909, and was the largest in the history of the company.

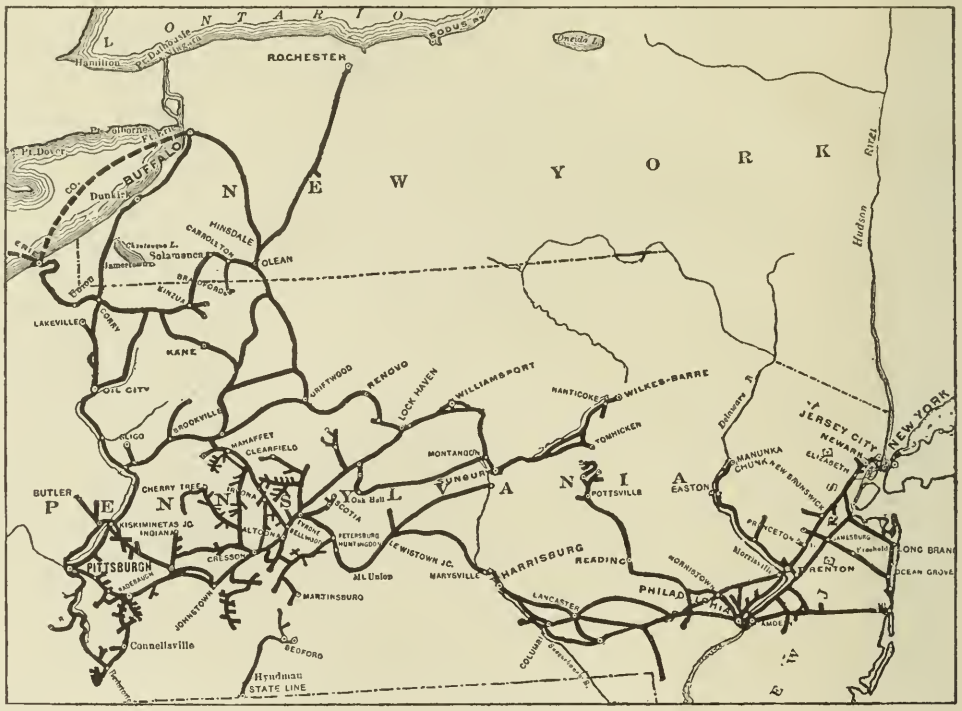
Gross earnings kept pace with the increase in business. Total operating revenues were $160,500,000 in 1910, or $10,900,000 more than in 1909. The average receipts per ton per mile were 5.83 mills in 1910, or .03 of a mill less than in 1909; and the average receipts per passenger per mile were 1.959 cents in 1910, or .05 of a mill less than in 1909.

Since the determination of the rate advances cases by the Interstate Commerce Commission, and the elaborate statement of theories of railroading held by the commission, it becomes more than ever necessary to examine a road's accounts to make sure that the company has spent sufficiently large sums, as well as to see what economies have been effected. In this regard the Pennsylvania Railroad may fairly be said to be the most notable example of conservatism and far-sightedness among all the rail-

ways of the United States. On any basis of comparison that we know of, the Pennsylvania's maintenance charges have been high and their expenditures for additions and betterments paid for out of income have been very great. With the change in the form of accounting prescribed by the Interstate Commerce Commission, it became necessary for the Pennsylvania Railroad to change somewhat the language in which it informed its stockholders that it was building up their property out of earnings, as well as adding to it through the issue of new securities; but it is a change in form only. The policy and the principles which have made the Pennsylvania what it is today are being adhered to as religiously as ever before.

In 1910 the company spent $21,800,000 for construction, equipment and real estate on the main line between New York and Pittsburgh, of which $7,500,000 was charged to capital account, $6,900,000 against net income, and $1,000,000 against the extraordinary expenditure fund, created out of net income, set aside in 1909. President McCrea says: "These two latter expenditures, aggregating $7,900,000 were necessary to maintain the earning capacity and the value of the railway facilities, and in effect offset depreciation and obsolescence." In addition the company set aside out of the 1910 net income $3,700,000 as a reserve for additions and betterments. Further than this, in 1910 the company wrote off and debited to profit and loss $12,400,000 from the amount applied toward the construction of the New York tunnel extension, and also wrote off $12,995,000 as amount applied in the reduction of cost of securities and adjustment of other accounts.

In 1910 total operating expenses amounted to $114,800,000, an increase of $12,600,000 over 1909. After the payment of taxes, the company had operating income amounting to $37,960,000, which is less by $3,700,000 than the operating income in 1909. There was an increase, however, in income from sources other than operation, and a considerable decrease in fixed charges, due to the retirement of funded debt, both of which will be commented on more fully below. Net corporate income amounted to $37,800,000 in 1910, an increase of $2,800,000 over 1909.



Pennsylvania Railroad.

Transportation expenses increased out of proportion to the increased cost in maintenance. The increase itself was due to the higher wages paid during the last four months of the year and to the larger business handled. In 1910 transportation cost $57,200,000, an increase of $7,800,000. Maintenance of way and structures cost $20,300,000, an increase of $1,500,000; and maintenance of equipment cost $31,100,000, an increase of $2,700,000.

The details of operating expenses show clearly the effects of the increase in wages, and also apparently show an increase in the salary of men not belonging to the brotherhoods. What we mean is illustrated by the fact that superintendence, under maintenance of way, cost $1,024,000 in 1910, an increase of $96,000 over 1909; superintendence under maintenance of equipment cost $1,077,000, an increase of $129,000; superintendence under traffic cost $223,000 for the passenger department and $372,000 for the freight department, a total increase of $42,120; and superintendence under transportation was $2,047,000, an increase of about $300,000.

On the basis of comparison for units of maintenance, the Pennsylvania spends very large sums.

The following table shows the unit costs of maintenance:

	1910.	1909.
*Maintenance of way and structures.....	$2,625	$2,462
†Repairs per locomotive	3,015	2,693
Repairs per passenger-train car.....	908	898
Repairs per freight-train car	113	116

*Per mile of first, second, third, etc., track, two miles of sidings being taken equal to one mile of main track.

†Repairs only, no account being taken of renewals, depreciation or overhead charges.

While the ton mileage increased 6.14 per cent., freight train mileage increased 7.32 per cent. The average train load was 649 tons, a decrease of 7.27 tons. On the other hand, the average number of loaded cars in a train was 24.20, which is a decrease of but 0.18 cars; while the average number of empty cars in a train was 12.36, a decrease of 0.94 cars. The average haul was 156.17 miles, a decrease of 2.51 miles. It will be seen that the slightly smaller train load is not accounted for by a larger empty car movement, and it is not accounted for by a larger proportion of high-grade freight. Every class of commodity under products of mines showed a larger tonnage in 1910 than in 1909, and the heavier and lower grade products under manufactures also showed a larger tonnage last year than the year before, while the tonnage of dressed meats, poultry and game, etc., and also the tonnage of lighter articles was less in 1910 than in 1909. Last year, of the total 129,900,000 tons carried on the Pennsylvania Railroad, 85,600,000 tons, or 66 per cent., of the total was products of mines, about half of these products of mines being furnished by bituminous coal.

The Pennsylvania has continued its experiments with the dynamometer car and with tonnage tests, especially over the Middle division. It may be recalled that the Pennsylvania began making these tests something over two years ago, and the very large increase in train load in 1909 over 1908 was ascribed in part to use made of the information furnished by these tests. The decrease in train load in 1910 is but 1.1 per cent., and the fact that the company did not show an increased train load last year may be due to a great number of small causes, among which might be mentioned the severe weather in January and February, and experiments which the company made with various classes of locomotives in an attempt to furnish faster freight service.

The Pennsylvania Railroad's finances are on such a vast scale that only by the liberal use of cyphers is it possible to discuss them. Last year $82,500,000 was raised by the sale of stock at par, and

from the proceeds of this sale $60,000,000 short term notes, which matured March 15, 1910, were redeemed and $20,000,000 general mortgage bonds, which matured July 1, 1910, were paid off. This accounts for the considerable decrease in fixed charges previously mentioned; but it must be remembered that money to pay off these bonds and notes was raised by the sale of stock on which the company is paying 6 per cent. dividends, and on an investment of stock like the Pennsylvania, adequate dividends amount to what one might call a morally fixed charge. There is now $22,000,000 stock authorized but unissued, in addition to the stock reserved to be exchanged for outstanding convertible bonds. The directors have asked the stockholders for authority to increase the authorized amount of capital stock by $100,000,000, to be issued as the directors see fit. The present needs of the company will require about $40,000,000, and the directors expect to raise this sum by the issue of a 10 per cent. allotment at par, which would amount to about $41,000,000, of which $22,000,000 would be provided by the stock at present authorized. When, therefore, the new $100,000,000 stock is authorized, there will remain available for future issue about $80,000,000.

During the year the Pennsylvania bought considerable blocks of both Norfolk & Western stock and New York, New Haven & Hartford stock. In 1909 the Pennsylvania Railroad Company owned $1,000,000 New Haven stock and $23,000,000 Norfolk & Western common, in addition to $5,500,000 adjustment preferred. During 1910 the company added $2,500,000 New Haven stock to its holdings, making a total of $3,500,000, and added $8,660,000 Norfolk & Western common, a total of $31,660,000 common out of the $68,975,000 total outstanding Norfolk & Western common.

The balance sheet of December 31, 1910, is in the form prescribed by the Interstate Commerce Commission, and the 1909 balance sheet has been recast to make comparisons possible between these two years. Total working assets amounted to $70,970,000 at the end of 1910, of which $32,400,000 is cash. This is a decrease in the cash held of $75,400,000 from 1909. Total working liabilities amounted to $34,200,000 at the end of 1910. This is more by somewhat over $4,000,000 than working liabilities in 1909, and is mainly due to an increase of $3,900,000 in loans and bills payable, the total in 1910 being $3,950,000. The table below shows the results of operations in 1910 as compared with 1909:

	1910.	1909.
*Average mileage operated.....	4,045	4,015
Freight revenue	$117,434,920	$109,759,101
Passenger revenue	32,687,423	29,996,558
Total operating revenue.....	160,457,298	149,593,833
Maint. of way and structures..	20,342,489	19,800,162
Maint. of equipment.....	31,117,989	28,390,615
Traffic	2,221,803	1,969,093
Transportation	57,200,886	49,423,716
Total operating expenses.....	114,812,628	102,190,430
Taxes	6,374,736	4,767,029
Operating income	37,960,546	39,637,697
Gross corporate income.....	53,241,503	53,403,538
Net corporate income.....	37,775,484	35,022,088
Equipment trust certificates.....	3,418,658	3,597,710
Extraordinary expenditures	3,504,597	9,581,810
Dividends	24,410,860	19,173,743
†Reserved for additions and betterments	3,700,000	2,000,000
Surplus to profit and loss.....	2,432,847	450,400

*The accounts given for 1909 are not the same as were given in last year's report, because this year the Buffalo & Allegheny Valley, which was operated separately in 1909, is included in the operations of the Pennsylvania Railroad and the accounts have been readjusted in 1909 to make comparisons accurate.

†This is after the payment of certain charges for the purchase of securities, and in 1909 for sums credited to sinking funds. See also remarks in regard to profit and loss account.

NEW BOOKS.

The Pittsburgh Transportation Problem. Report to the Mayor of Pittsburgh by Bion J. Arnold, consulting engineer.

This is a book of 202 pages, 6 in. x 9 in., with 21 maps and diagrams on sheets 9 in. x 12 in. Mr. Arnold has made a very thorough study of the immediate and future needs of the surface street railways in Pittsburgh and vicinity, and this book embodies his conclusions. Seventeen pages are taken up with a review of the development in public utility control, with special reference to street railways; a valuable condensed history of what has been done the last dozen years in Chicago, Cleveland, Philadelphia and other cities.

Letters to the Editor.

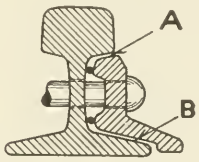
LOOSE JOINTS IN TRACK.

February 24, 1911.

To the Editor of the Railway Age Gazette:

The track foreman, like a doctor, must make a correct diagnosis before he can apply the proper remedy. He is often much perplexed to locate the cause of a rough spot, especially if it is at a joint; and it usually is.

The illustration here given shows how a cause of difficulty may creep in and, because the source of the trouble cannot be seen, go undetected for sometime:



It is commonly known that splice bars are designed to take up whatever wear develops at A and B. This is done by drawing the splice bars closer together periodically by tightening the bolts. This wedging effect at the ends of the rails keeps the joints solid. When the splices have been drawn to the web of the rail they are worn out and new ones are substituted. The cut shows that bond wires behind the splices may prevent the drawing of the splice bars to the rail, and any wear at A or B will result in lost motion. This lost motion will cause the splice plates to wear very fast and the trackman will scratch his head searching for a cause of that loose joint. Even though the wires are carefully put in just over or just below the bolts, the expansion of the rails will cause the wire to "blow" and get in position to cause the trouble. Bond wires are generally applied outside the splice bars; but the facts suggested illustrate a cause of trouble which was somewhat common in the days when this method of applying bond wires was common, and which may account for some rough spots in tracks where this method is still followed. W. M. P.

TELEPHONE LINES IN FOGS.

February 6, 1911.

To the Editor of the Railway Age Gazette:

I have read the article which appeared in the *Railway Age Gazette* of January 13, entitled "A Despatcher Who Does Not Like the Telephone," and I think that the writer should have told us more about his neighbors' experience. How many other despatchers agree with him? Our experience with the telephone shows that operators answer with more promptness than they did with the telegraph. The telephone bell can be heard farther than the telegraph, and agents whose work often calls them outside the office consequently answer the telephone when they would not hear the telegraph.

The objection made "that everybody butts in on the telephone" is, of course, an exaggeration; this fault is not due to imperfection of the telephone, but to the method of operation. It is entirely within the power of the management to make the telephone as exclusive as the telegraph, and prevent its us by anyone but the despatchers and operators, if thought best to do so. The company for which I work has thought best not to confine it exclusively to the use of the despatchers and operators; telephones have been installed in section houses at different points and also in foreman's car, so that these men can get information from the despatcher as to the movement of trains. This is unquestionably of great convenience to the maintenance of way department, but if it is carried to too great an extent, the company must understand that it consumes time; and if business is heavy, additional help will be required in the despatchers' office, or this feature of the work must be cut out.

We do not find that "everybody butts in on the line"; those who use the telephone besides operators are foremen, signal maintainers, and trainmen asking for information as to trains. We find the telephone superior to the telegraph in the following ways: Absolute freedom from fog trouble, whereas the tele-

graph wires are often useless for hours at a time, on account of heavy fogs from the ocean; the labor and time consumed in raising operators is practically cut out; greater speed with equal safety; much better for getting information at first hand from train and enginemen, also foremen, and others who are not operators; less friction between the despatchers and operators, as well as trainmen, with whom they do business.

ONE WHO HAS HAD A YEAR'S EXPERIENCE.

MISCELLANEOUS ANNOYANCES.

New York, Dec. 20, 1910.

To the Editor of the Railway Age Gazette:

I have traveled a considerable mileage, but never on the ———, and on my last journey home I decided to try it. The results of this trip may be of interest to those who have followed what you have written regarding courtesy and good service.

I arrived at the Union Station, famous for the incivility of its employees, at 10:05 a. m. to take a train starting at 10:30. The first unpleasant incident that awaited me was trouble with the baggage express company, which it would take too much space to explain here, but which lost that company one patron and his family for good.

After taking my family through the gate I asked the Pullman conductor, who was standing between the observation car and the adjoining sleeper where car No. 2 was, to which he replied "two cars ahead"; but I found that the car next to which he was standing was car No. 2, according to the letter on its head end. I then returned to straighten out the baggage question, and after paying what the expressman demanded, in excess of a prearranged price, which had been prepaid, was allowed to have our small baggage which was to go in the drawing room and stateroom. There were several heavy pieces (as we were moving to New York for good), and the next five minutes were spent searching the station for someone resembling a porter to help me. Finally I found a man on the sidewalk ("express transfer" on his cap), who helped me load the baggage. So far the service was woefully in contrast to that at the other company's station.

The plush seats in our rooms were filthy and could not have been *really* cleaned or beaten in a long time. At night I "turned in" early, intending to use the much advertised feature of the new cars—lights in the upper berths—but found that neither of them would light; therefore I started to go to sleep. I was about accomplishing that feat when a noise like thunder woke me up. I realized we were in the ——— station. An engine was next to us, under the shed, with a heavy drag of cars, working very hard, and making enough noise to wake the dead. (On the road where I work all noise next to sleepers at night is carefully avoided.)

Next morning I started for breakfast and reached the diner after squeezing my way past the Pullman conductor—the same one that I had encountered the previous forenoon—sprawled across the aisle, sitting on a berth arm and talking to the porter. With much pomp a waiter, after being told by the head waiter, spread a clean napkin in front of me over the dirty table cloth, and about two seconds later spilled the greater part of the contents of the cream pitcher over it, right under my nose. He made no attempt to clean it up, so I finally mopped it up myself.

There was a defective triple valve on our car which went into emergency every time, a few seconds after the brakes were applied, giving one's neck a successful jerk by no means pleasant or necessary. All of the above incidents are trivial by themselves, and mostly all are the fault of the Pullman Company, but nevertheless they are not what the traveling public has a right to expect on a supposedly high class train, on which extra fares are paid. I am employed by one of the best railways in this country and am a strong supporter of the railways, but this gave me an excellent chance to see matters from the public's point of view, and made me realize that seemingly small things, if there be enough of them, can make a trip unpleasant. A SUBSCRIBER.

EFFECT OF UNDULATING GRADES ON TRAIN VELOCITY.

BY F. S FOOTE, JR.

Many writers on railway location have assumed, like the late A. M. Wellington, that a line of undulating grades, where all the rise and fall is similar to that in Fig. 1, requiring neither the use of brakes nor the shutting off of steam, may be operated as a virtually level line, the velocity being allowed to vary from a maximum at the bottom of each sag to a minimum at each summit. This view would be exactly correct if the train resistance and draw bar pull could be maintained constant at the velocity changes. To the contrary, however, we know that train resistance increases as the speed increases. Also with a nearly constant power output by the engine (i. e. throttle and reversing lever unchanged, as assumed in this case), the engine exerting full power throughout, the draw bar pull exerted will decrease as the speed increases, since the steam making capacity of the boiler is limited. From these facts it would appear that a train passing through a sag, ABC, Fig. 1, acquiring comparatively high velocity, would have delivered to it by the engine less work (force × distance) than if the grade had been uniform between points A and C, and in the case of the sag more of the work actually delivered by the locomotive would be used in overcoming train resistance on account of the higher resistance due to higher velocity. If this is true, then the train should arrive at C with a velocity less than it would have had, had it run over a uniform grade from A to C. As an example, consider the following problem:

Let s = Space passed over in feet
a = Acceleration in feet per second per second
v = Velocity in feet per second
f = Force (drawbar pull) in pounds
g = Acceleration due to gravity
w = Weight in pounds
V = Velocity in miles per hour

$$v = \frac{5{,}280}{3{,}600} V$$

W = Weight in tons
$w = 2{,}000\ W$

By the law of falling bodies, $h = \frac{v^2}{2g}$

Similarly, $s = \frac{v^2}{2a}$

$$a = \frac{v^2}{2s}$$

But, force = mass × acceleration

$$f = \frac{w}{g} a$$

$$a = \frac{fg}{w}$$

Equating values of (a),

$$\frac{v^2}{2s} = \frac{fg}{w}$$

$$f = \frac{v^2 w}{2gs}$$

$$f = \left\{\frac{5{,}280}{3{,}600} V\right\}^2 2{,}000\ W \left\{\frac{1}{2gs}\right\}$$

$$= \frac{66.9\ V^2 W}{s}$$

If the force f is to accelerate the load from velocity V_1 to velocity V_2.

$$f = \frac{66.9\ (V_2^2 - V_1^2)\ W}{s}$$

If W = one ton, f being expressed in pounds per ton,

$$f = \frac{66.9\ (V_2^2 - V_1^2)}{s}$$

Making an average allowance for the work necessary to accelerate the rotation of the wheels, in the case of a freight train,

$$f = \frac{70\ (V_2^2 - V_1^2)}{s}$$

$$s = \frac{70\ (V_2^2 - V_1^2)}{f}$$

If $V_2 = V_1 + 1$

$$s = \frac{70\ (2V_1 + 1)}{f}$$

Assume a consolidation locomotive of the following dimensions:

Total weight	232,500 lbs.
Weight on drivers	207,000 lbs.
Weight on trucks	25,500 lbs.
Loaded tender	149,600 lbs.
Diameter of drivers	63 in.
Cylinder, diameter and stroke	23 in. x 32 in.
Boiler pressure	200 lbs.
Total heating surface	3,705 sq. ft.
Coefficient of friction	$\frac{1}{4.5}$

The tractive effort of this engine is limited:

1. By adhesion to $207{,}000 \times \frac{1}{4.5} = 46{,}000$ lbs.

2. By cylinder power to approximately $\frac{0.85\ P\ d^2\ s}{D} = 45{,}677$ lbs.

Where P = Boiler steam pressure
d = Cylinder diameter
s = Stroke
D = Driver diameter

3. By boiler capacity. Using a slightly modified form of the formula developed and published by Professor Goss:

$$T = 161\ \frac{H}{V} - 3.8\ \frac{d^2\ s}{D} - w\ (2 + \frac{1}{4}\ V) - 0.11\ V^2$$

In which
H = Heating surface of boiler
V = Velocity in miles per hour
d = Cylinder diameter
s = Stroke
D = Driver diameter
w = Weight on truck and tender wheels, in tons.

Substituting the values of this problem:

Table I.

V.	T.	V.	T.
10	58,224	23	24,178
11	52,778	24	23,071
12	47,234	25	22,048
13	44,386	26	21,104
14	41,085	27	20,226
15	38,218	28	19,410
16	35,706	29	18,645
17	33,488	30	17,931
18	31,514	31	17,261
19	29,743	32	16,631
20	28,142	33	16,038
21	26,701	34	15,477
22	25,384	35	14,946

Our conclusion as to the change of tractive effort with changes of speed, with this particular engine, would be that below 13 miles per hour the pull is limited by the cylinder power to 45,677 lbs., and at 13 miles an hour and above, it is limited by the steam making capacity of the boilers to the figures shown in the table. On a minus 1 per cent. grade the draw bar pull

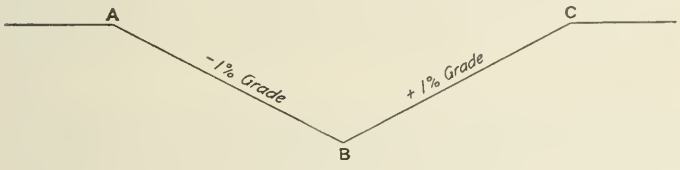


Fig. 1.

would be increased by an amount equal to 1 per cent. of the total weight of the engine and tender, or decreased by the same amount on a plus 1 per cent. grade. Assume the engine loaded to its full capacity for a speed of 20 m. p. h. on a level tangent.

Table II.

Speed. M.P.H.	Resistance. Pounds per ton.
20	5.0
21	5.1
22	5.2
23	5.3
24	5.4
25	5.5
26	5.6
27	5.7
28	5.8
29	5.9
30	6.0

Referring to the experimental results of the University of Illinois train resistance tests for cars averaging 45 tons in weight (Table II) we have five pounds per ton as the train resistance. The draw bar pull (Table I) is 28,142 lbs. We have then a train of $\frac{28{,}142}{5} = 5{,}628$ tons behind the tender, a very heavy train.

Let us consider our train as concentrated at its center of gravity and as entering the grade all at once. This involves some error, especially with a long train and such a comparatively short sag as this one proves to be, the center of gravity of the train not descending to the bottom of the sag, but it seems to be the only feasible method of solving the problem. Let us solve for the length of down grade AB necessary to accelerate the train from the velocity of 20 m. p. h., with which it approaches A on the level track, to 30 m. p. h., the locomotive working full power throughout. Dividing the tractive effort of the engine at various speeds by the above value of the train load we have the tractive effort in pounds per ton for each speed on level track. Dividing 1 per cent. of the weight of the engine in pounds by the train load in tons, we get in this case 0.7 lbs., the quantity by which the tractive effort in pounds per ton will be increased on a minus 1 per cent. grade and decreased on a plus 1 per cent. grade.

Table III.

Speed.	Tractive effort in pounds per ton. On level.	On — 1per cent. grade.	On + 1 per cent. grade.
20	5.0	5.7	4.3
21	4.7	5.4	4.0
22	4.5	5.2	3.8
23	4.3	5.0	3.6
24	4.1	4.8	3.4
25	3.9	4.6	3.2
26	3.8	4.5	3.1
27	3.6	4.3	2.9
28	3.4	4.1	2.7
29	3.3	4.0	2.6
30	3.2	3.9	2.5

Now apply our formula, $s = \frac{W}{f}\ 70 - (2\ V_1 + 1)$, letting W = 1, and f = tractive effort available for acceleration in pounds per ton for a speed which is the average of (V_2) and (V_1) miles per hour; f being (on a down grade) the quantity from Table III, column 3, plus the accelerating force due to grade, minus the train resistance in pounds per ton, this giving us the force available for acceleration.

On minus 1 per cent. grade:

$$S\ (20\text{-}21) = \frac{70\ (40+1)}{20 + 5.55 - 5.05} = \frac{70 \times 41}{20.5} = 140$$

$$S\ (21\text{-}22) = \frac{70 \times 43}{20 + 5.3 - 5.15} = \frac{70 \times 43}{20.15} = 149$$

$$S\ (22\text{-}23) = \frac{70 \times 45}{20 + 5.1 - 5.25} = \frac{70 \times 45}{19.85} = 159$$

$$S\ (23\text{-}24) = \frac{70 \times 47}{20 + 4.9 - 5.35} = \frac{70 \times 47}{19.55} = 168$$

$$S\ (24\text{-}25) = \frac{70 \times 49}{20 + 4.7 - 5.45} = \frac{70 \times 49}{19.25} = 178$$

$$S\ (25\text{-}26) = \frac{70 \times 51}{20 + 4.55 - 5.55} = \frac{70 \times 51}{19.0} = 188$$

$$S\ (26\text{-}27) = \frac{70 \times 53}{20 + 4.4 - 5.65} = \frac{70 \times 53}{18.75} = 198$$

$$S\ (27\text{-}28) = \frac{70 \times 55}{20 + 4.2 - 5.75} = \frac{70 \times 55}{18.45} = 209$$

$$S\ (28\text{-}29) = \frac{70 \times 57}{20 + 4.05 - 5.85} = \frac{70 \times 57}{18.20} = 219$$

$$S\ (29\text{-}30) = \frac{70 \times 59}{20 + 3.95 - 5.95} = \frac{70 \times 59}{18.00} = 229$$

1,837

On plus 1 per cent. grade:

$$S\ (30\text{-}29) = \frac{-70 \times 59}{2.55 - 5.95 - 20} = \frac{70 \times 59}{23.4} = 177$$

$$S\ (29\text{-}28) = \frac{-70 \times 57}{2.65 - 5.85 - 20} = \frac{70 \times 57}{23.2} = 172$$

$$S\ (28\text{-}27) = \frac{-70 \times 55}{2.8 - 5.75 - 20} = \frac{70 \times 55}{22.95} = 168$$

$$S\ (27\text{-}26) = \frac{-70 \times 53}{3.0 - 5.65 - 20} = \frac{70 \times 53}{22.65} = 164$$

$$S\ (26\text{-}25) = \frac{-70 \times 51}{3.15 - 5.55 - 20} = \frac{70 \times 51}{22.4} = 159$$

$$S\ (25\text{-}24) = \frac{-70 \times 49}{3.3 - 5.45 - 20} = \frac{70 \times 49}{22.15} = 155$$

$$S\ (24\text{-}23) = \frac{-70 \times 47}{3.5 - 5.35 - 20} = \frac{70 \times 47}{21.85} = 151$$

$$S\ (23\text{-}22) = \frac{-70 \times 45}{3.7 - 5.25 - 20} = \frac{70 \times 45}{21.55} = 146$$

$$S\ (22\text{-}21) = \frac{-70 \times 43}{3.9 - 5.15 - 20} = \frac{70 \times 43}{21.25} = 142$$

$$S\ (21\text{-}20) = \frac{-70 \times 43}{4.15 - 5.05 - 20} = \frac{70 \times 41}{20.9} = 137$$

1,571

The vertical drop from A to B is then 18.37 ft., and the rise from B to C is 15.71, a loss of velocity head of 2.66 ft., which is

the price we pay for the higher average speed from A to C, and this loss is greater with a deeper sag. It appears that although we may, by proper changes of velocity, very greatly reduce the grades on the virtual profile when the track profile shows an undulating grade line, it is not proper to consider that virtual profile as an unbroken horizontal line.

TIES PURCHASED IN 1909.*

The total number of wooden cross-ties purchased by the steam and electric railways of the United States in 1909 was 123,751,000. This represents an increase of 11,285,000 ties, or 10 per cent., over the number purchased in 1908, but a decrease of 29,952,000, or 19.5 per cent., from the number reported for 1907. Nearly 16,437,000 ties, or 13.3 per cent. of the total number, were reported as purchased for new track in 1909, whereas in 1908 only 7,431,000 ties, or 6.6 per cent. of the total purchased, were for this use. Of the ties bought for new track in 1909, the steam railways reported 13,822,000, or about 84 per cent., and the electric roads 2,615,000. The ties purchased for new track by steam roads formed 12 per cent. of all ties purchased by them, while the corresponding proportion for the electric roads was 31.4 per cent. More than 63 per cent. of all ties purchased were made from some species of oak or from the Southern yellow pines. The following table shows—

Cross-ties purchased in 1909, classified according to method by which made and kind of wood.

Kind of Wood.	Total.	Hewed.	Sawed.
Total	123,751,000	95,499,000	28,252,000
Oak	57,132,000	48,009,000	9,123,000
Southern pine	21,385,000	17,452,000	3,933,000
Douglas fir	9,067,000	1,952,000	7,115,000
Western pine	6,797,000	4,466,000	2,331,000
Cedar	6,777,000	4,964,000	1,813,000
Chestnut	6,629,000	5,026,000	1,603,000
Cypress	4,589,000	3,994,000	595,000
Tamarack	3,311,000	2,981,000	330,000
Hemlock	2,642,000	2,215,000	427,000
Redwood	2,088,000	1,770,000	318,000
White pine	556,000	179,000	377,000
Lodgepole pine	487,000	459,000	28,000
Gum	378,000	332,000	46,000
Spruce	225,000	155,000	70,000
Beech	195,000	163,000	32,000
All other	1,493,000	1,382,000	111,000

The two leading timbers were the same as in 1908. Oak, with an increase of 9,022,000 ties, contributed a slightly higher proportion of the total number of ties purchased in 1909 than in 1908. Southern pine, on the other hand, furnished a slightly smaller number of ties than in 1908 and a smaller proportion of the total. The increasing use of relatively unimportant tie woods, especially gum, spruce, and beech, is noteworthy. The number of gum ties purchased, which in 1907 was only 15,000, increased to 262,000 in 1908, and reached a total of 378,000 ties in 1909. Spruce and beech also showed heavy gains during the past two years. The increasing use of these species which are lacking in decay-resisting qualities is evidence of the growing use of methods of wood preservation through chemical treatment.

Approximately 77 per cent. of all ties purchased in 1909 were hewed. Although the proportion of hewed ties was lower than in 1908, it was the same as in 1907 and higher than in 1906. In the case of cedar ties the number of hewed ties shows a steady and heavy decrease since 1907, while the number of sawed ties has increased correspondingly. The steam roads purchased 115,432,000 cross-ties in 1909, or 93.3 per cent. of the total quantity purchased. Of these, 77.9 per cent. were hewed and 22.1 per cent. sawed. The electric roads purchased 8,319,000 ties, or 6.7 per cent. of the total in 1909, a gain of 1,894,000 ties over 1908. Of these, 67.5 per cent. were hewed and 32.5 per cent. sawed. Next to oak ties the electric roads purchased more ties made of chestnut than of any other species. The less durable woods are little used by the electric roads, doubtless because these roads lack facilities for preservative treatment. The total cost of all cross-ties purchased in 1909 was $60,320,700. The table below shows the average cost of ties purchased by steam and electric roads in 1909, 1908 and 1907:

	Average Cost.		
Kind of Wood.	1909.	1908.	1907.
Total	$0.49	$0.50	$0.51
Oak	0.51	0.51	0.53
Southern pine	0.52	0.54	0.54
Douglas fir	0.41	0.45	0.47
Western pine	0.53	0.51	0.50
Cedar	0.46	0.49	0.50
Chestnut	0.44	0.49	0.48
Cypress	0.41	0.44	0.46
Tamarack	0.41	0.50	0.49
Hemlock	0.33	0.38	0.34
Redwood	0.53	0.51	0.59
White pine	0.43	0.47	0.41
Lodgepole pine	0.46	0.48	0.50
Gum	0.52	0.45	0.23
Spruce	0.49	0.47	0.39
Beech	0.36	0.44	0.40
All other	0.45	0.38	0.44

It appears that in the case of each of the leading kinds of tie timbers, except western pine, the average price was less in 1909 than in 1907, though the prices paid for chestnut, tamarack and hemlock were greater in 1908 than in 1907. Western pine ties showed an average cost of 53 cents in 1909, as compared with 51 cents in 1908 and 50 cents in 1907. Sawed ties of this timber were purchased for less in 1909 than in 1908 or 1907; but there was a remarkable increase in the cost of the hewed ties, due probably to the inclusion in the reports of large numbers of ties which had been treated with a preservative before purchase.

In 1909 the steam roads and electric roads each paid the same average price for hewed ties. Sawed ties were purchased for the same average price (49 cents) as hewed ties by the steam roads, but the electric roads paid 4 cents more for sawed ties. Although the average tie used by the electric roads is smaller than that used by the steam roads, the price paid for it is generally greater. This is due not only to the disadvantages incident to contracts for smaller quantities of material, but also to the fact that the electric roads are more likely to purchase ties at points where the price includes railroad transportation charges.

The highest average price reported by the steam railways was 64 cents for sawed redwood ties and the lowest 33 cents for hewed hemlock. The electric roads paid as high as 82 cents for hewed Western pine ties, these being practically all treated, while the lowest average price paid by them was 31 cents for hewed hemlock.

Of the 78 species of timber which the different specifications of the steam railways of the United States permit to be used as cross-ties, over one-half are acceptable for such use only after the application of a preservative. Among the woods most commonly treated are pine, red or black oak, Douglas fir, hemlock, gum, spruce and beech. The remarkable increase in the use of Western pine, gum, spruce and beech cross-ties, apparent in the reported purchases of ties in 1909, is doubtless due to the use of wood preservatives.

The following table shows the number of ties reported as purchased already treated or as treated after purchase:

Class of railway purchasing.	Total treated.	Treated before purchase.	Treated after purchase.
	1909.		
All railways	22,033,000	7,663,000	14,370,000
Steam railways	21,198,000	7,081,000	14,117,000
Electric railways	835,000	582,000	253,000
	1908.		
All railways	23,776,000	10,973,000	12,803,000
Steam railways	23,157,000	10,566,000	12,591,000
Electric railways	619,000	407,000	212,000
	1907.		
All railways	19,856,000	8,389,000	11,467,000
Steam railways	19,192,000	7,975,000	11,217,000
Electric railways	664,000	414,000	250,000

There are now more than 70 wood-preserving plants in the United States. A number of the large steam roads possess expensive plants fitted to handle large quantities of timber in a very efficient manner. The principal preservatives used were

*Census Bulletin; Forest Products, No. 8.



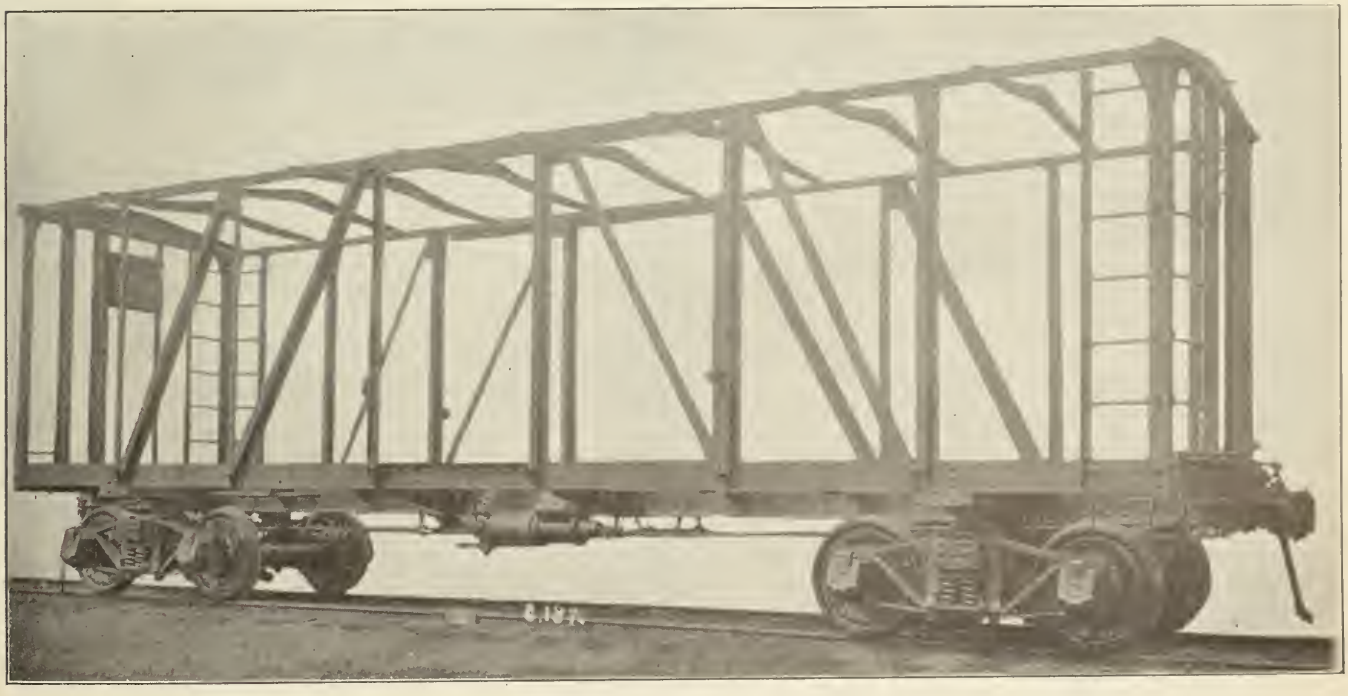
Steel Frame Box Car; Canadian Pacific.

creosote oil, and, to an almost equal degree, a solution of zinc chloride.

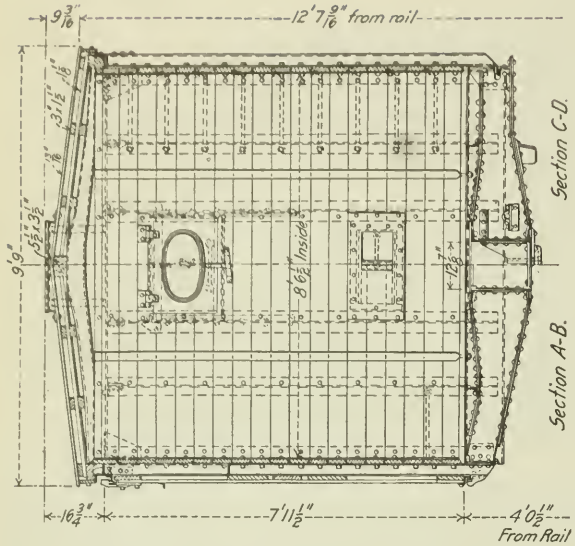
Many of the ties are treated with an emulsion of creosote oil and a solution of zinc chloride, and one road treated large quantities of its ties with a heavy injection of crude petroleum. Other preservatives are also used. The electric railways own but a few cylinder-treating plants, and these companies are generally obliged to purchase treated ties or to use some less expensive method of treatment, such as dipping the ties in a bath of the preservative. Many different preservatives are used in this manner.

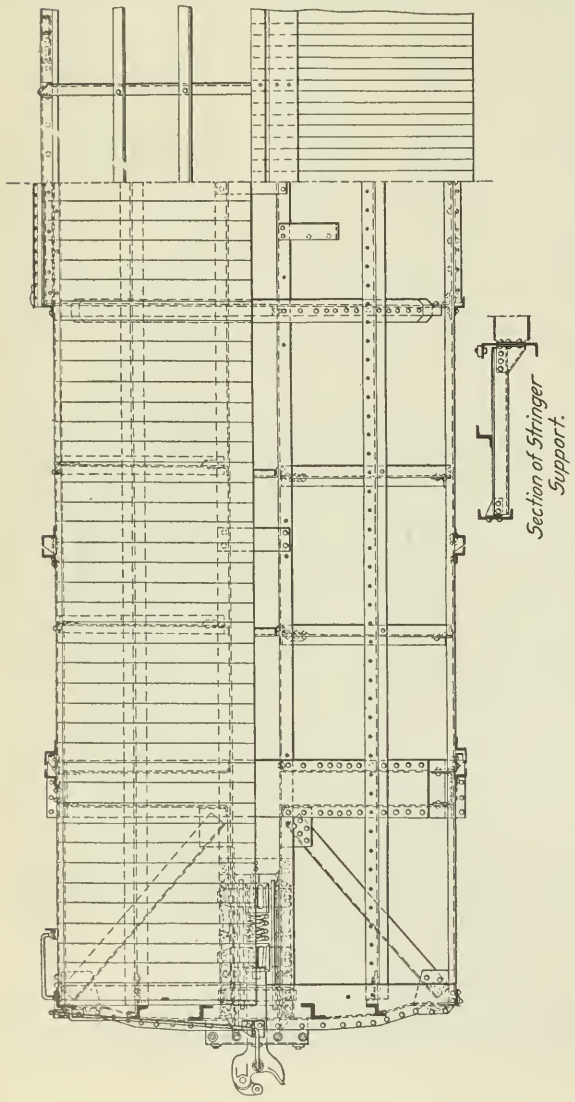
STEEL FRAME BOX CARS; CANADIAN PACIFIC.

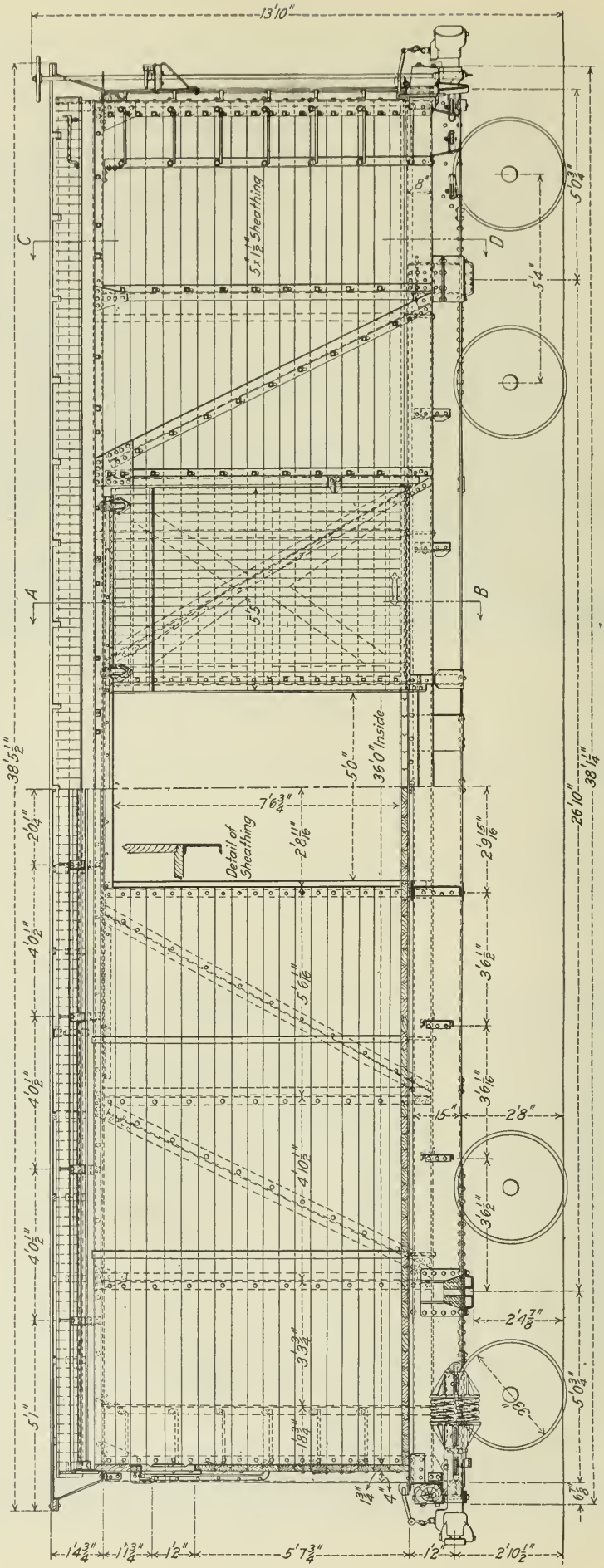
About three years ago the Dominion Car & Foundry Company built 500 box cars for the Canadian Pacific, in which the framing was of steel throughout. These cars were so satisfactory that 2,000 additional ones of the same design were ordered and placed in service, and these have been followed with an order for 2,000 more, which has recently been given the Canadian Car & Foundry Company for early spring delivery. The cars are of unusual appearance, the framing being entirely outside the lining. They are of 80,000 lbs. capacity, 36 ft. inside length, 8 ft. 8 in.



Steel Frame of Canadian Pacific Box Car.





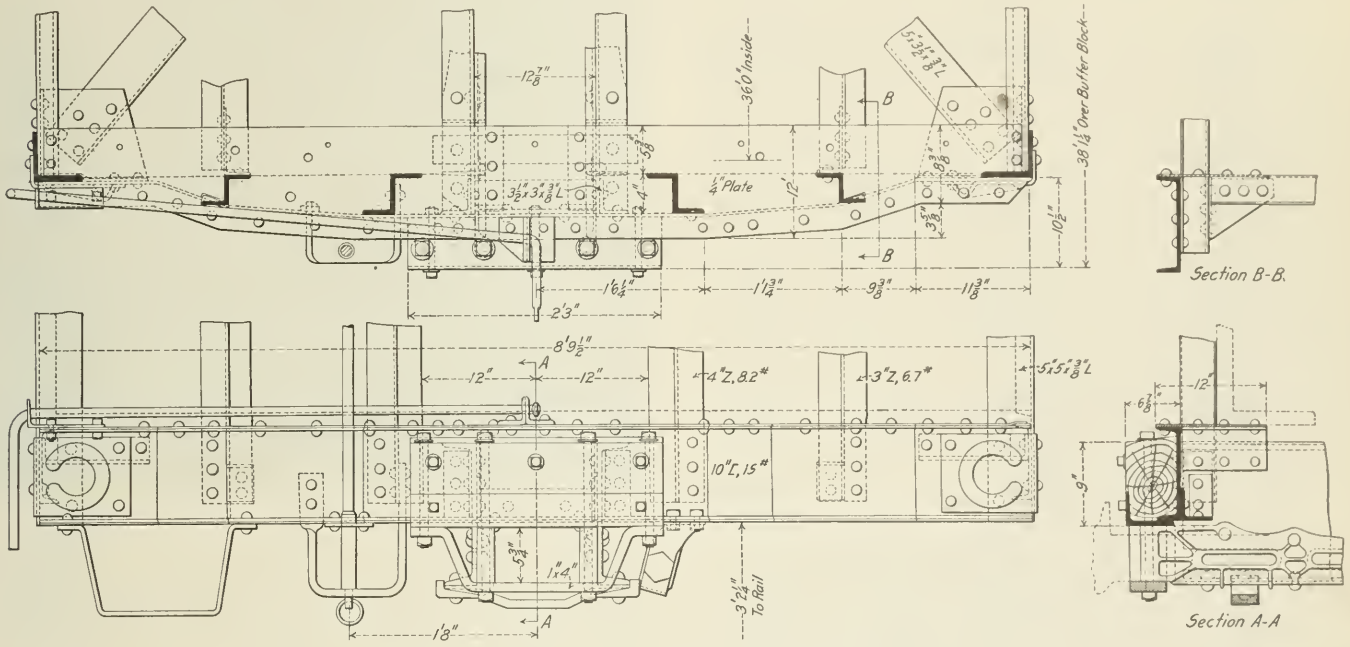


Steel Frame Box Car; Canadian Pacific.

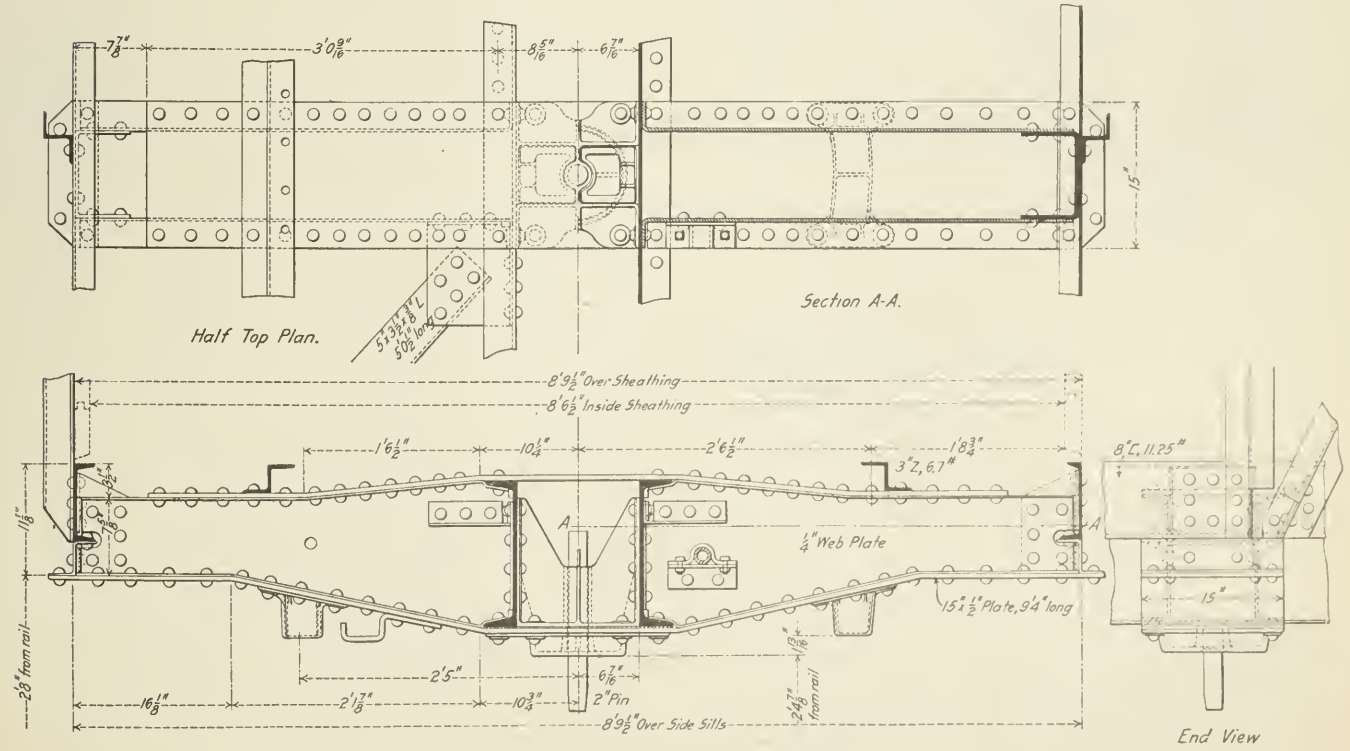
inside width, and weigh light about 36,900 lbs. The floor, side sheathing and roof are the only parts made of wood.

The two 14 in. channels set 12⅞ in. apart and continuing from end sill to end sill form the center sills. The side sills are 8 in. channels and are set with their top faces 1½ in. above the level of the top flange of the center sills. The other longitudinal sills are 3 in. Z bars located midway between the sides and center sills and resting on top of the body bolsters and cross bearers. The floor is bolted to the 3-in. Z bar stringers, using one bolt through each board; this is the only fastening between the floor and the underframe of the car. The body bolsters are pressed steel diaphragms built up with ½-in. cover plates, top and bottom. The bolsters extend below and beyond the side sills which are connected to them by angles and corner brackets. Near the center of the underframe, just below the door posts, are two built up cross bearers composed of pressed steel diaphragms with 6 in. x ½ in. cover and bottom plates, neither of which extend all the way to the side sill connection. Both the body bolsters and the cross bearers are constructed to permit the intermediate sills, 3 in. in depth, to rest on them.

The end sills are 10 in. channels pressed to permit the Z bar end posts being secured back of them. Between the bolsters and the cross bearers are two cross braces consisting of channels secured between the side and center sills. There is also a diagonal brace from the corner of the car to the connection between the center sills and the bolster. The side framing is composed of 3-in. standard Z bars secured outside the side sills and to an angle-iron plate; the top connections are reinforced with gusset



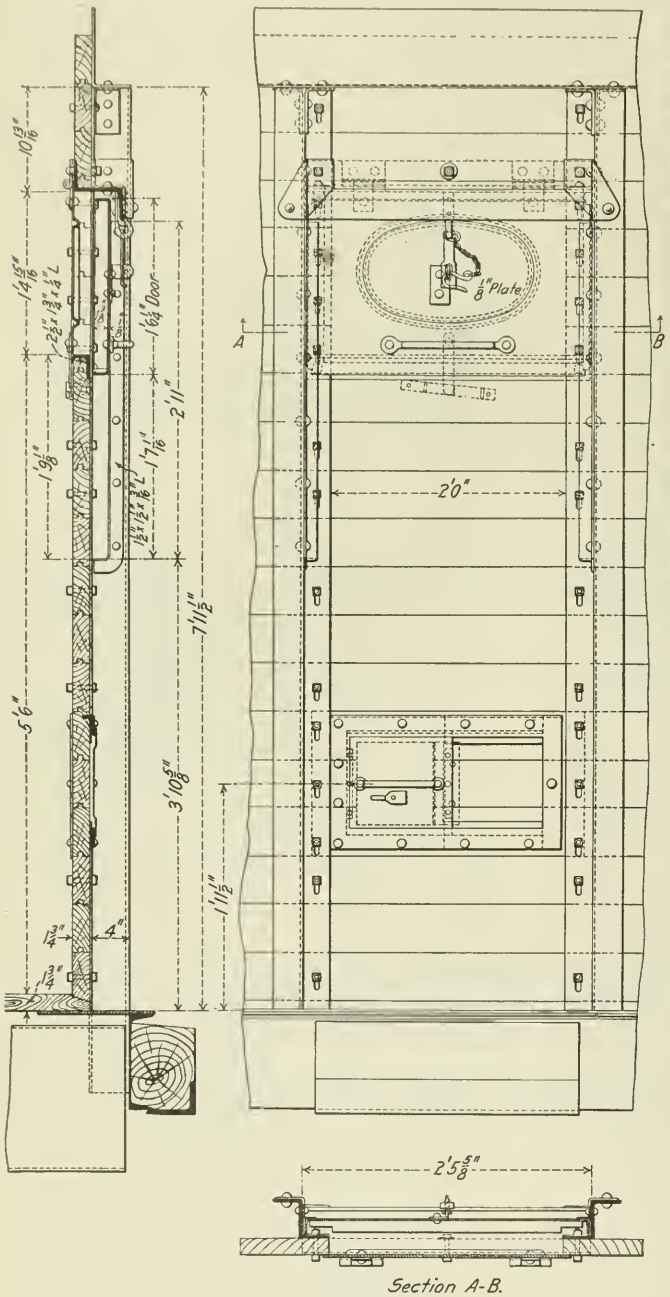
End Sill Construction; Canadian Pacific Box Car.



Body Bolster; Canadian Pacific Box Car.

plates. The corner posts are 5 in. x 5 in. angles and the two center end posts are 4 in. Z bars, the intermediate end posts being 3 in. Z bars. These are secured to the steel end carlins, which are of Z section. The other carlins are of pressed steel U section; they are arranged to lip over the side plate and are secured by a rivet through the vertical flange of the plate.

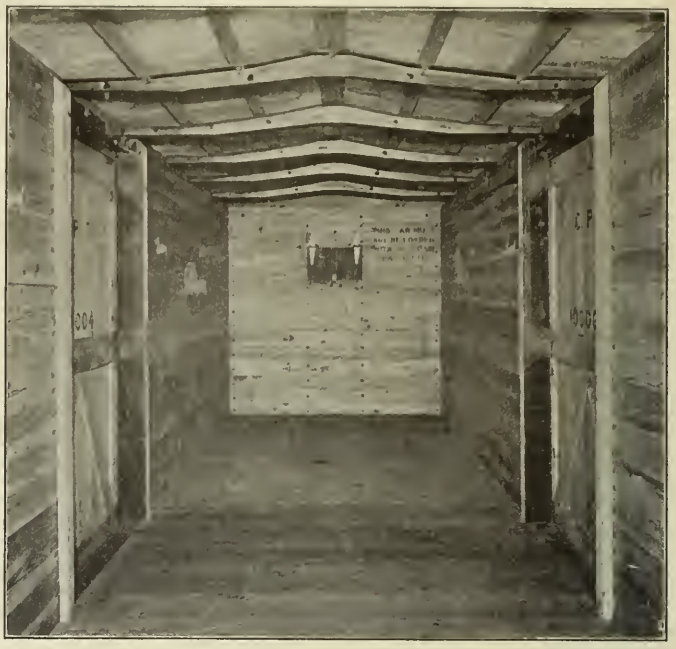
The inside lining or sheathing for the sides and ends is 1½ in. x 5 in. pine, tongued and grooved, bolted to the Z bar members



End Door Construction; Canadian Pacific Box Car.

of the frame with ½ in. bolts, the holes for the bolts through the steel posts and braces being slotted. This provides for the necessary adjustment due to shrinkage when the lumber from which the sheathing is made is green or not perfectly dry when it is applied. The sheathing extends about 3 in. above the bottom of the plates, and if it dries out or loosens up sufficiently to develop cracks between the planks, the bolts may be slacked off and the sheathing pulled together by means of steel strap rods, which extend up on the inside and hook over the top board; the bottom end is forged round and extends through the steel side sill and is threaded for a nut. There are two of these strap tie bars at each end of the car and four on either side; by screwing up the nuts at the bottom of the straps a total adjustment of 3 in. may be obtained.

The cars have standard 5 ft. side doors, and some of them have two end doors, the upper and larger one being for lumber loading, and the small door near the floor for steel rails. These cars are easily repaired when damaged, the outside posts and braces serving as a protection to the sheathing which is seldom



Interior of Steel Frame Box Car; Canadian Pacific.

injured. The inside of the car presents a smooth surface and is well adapted for carrying grain, or similar lading. The American patents for cars of this type are owned and controlled by Wm. V. Kelley, R. P. Lamont and W. W. Butler.

MR. CLAUSEN ON SIGNAL ASPECTS.

L. R. Clausen, superintendent of the Chicago, Milwaukee & St. Paul, at Chicago, and formerly president of the Railway Signal Association, read a paper before the Canadian Railway Club at Montreal, on Tuesday of this week, replying to that of Mr. Rudd, of the Pennsylvania, which was read before the same club last November. Mr. Rudd is chairman of the committee of the Railway Signal Association, which has reported the well-known scheme for a uniform system of signaling, and Mr. Clausen is one of the leaders of the minority of that committee which objects to some of the conclusions of the report. Mr. Rudd took occasion at Montreal to set forth his views on the general subject which had been dealt with by his committee, and now Mr. Clausen presents the opposite side.

Mr. Clausen gives a brief sketch of what has been done since the subject of aspects was first taken up in a systematic manner six years ago, noting that before that it was dealt with by Mr. Sperry, in a paper before the Signal Association in May, 1903, and by a committee headed by C. H. Morrison in November of that year; by a committee of the Pennsylvania Lines in 1903, and by a committee of the New York Central Lines appointed in 1904.

The first report of the Rudd committee was made at Washington in 1906; in this 24 indications being provided for. At Milwaukee in October, 1907, a revised report was made, which was approved by the association. In March, 1908, this report was presented to the M. W. Association at Chicago, and substantially approved by that association. At Washington, in October, 1908, the Signal Association committee presented another

report, containing a new list of indications and otherwise modified. This report was accepted as a progress report. It came up again before the M. W. Association in Chicago the following March, when Mr. Stevens of the Atchison, Topeka & Santa Fe, a member of the committee, presented an additional list of aspects, 23 in number. At this meeting it came out that Mr. Stevens, Mr. Clausen and others were not satisfied with the report of the majority. In October, 1909, a third report was presented, further modifications having been made. This report provided for 16 primary indications and 4 secondary, and recommended among other things the use of lunar white lights. The minority presented a brief dissenting statement. This report when sent to letter ballot, failed of adoption. In the following March the differences in the committee came out again at the M. W. Association, and so the committee was instructed to take the whole matter before the American Railway Association; and there it now rests, the committee of that association having taken no action.

Continuing, Mr. Clausen said:

Present Differences of Opinion.

As a member of the minority referred to, I desire to take this opportunity to explain some of the differences of opinion that resulted in a minority report. I also wish to state the minority's position clearly and remove any wrong impression you may perhaps have gained from the paper read before this Club by a prominent member of the majority some time in November. I refer to Mr. Rudd, of the Pennsylvania Lines East, who is justly celebrated as a signal engineer, and whom I claim as a warm personal friend.

As to the Number of Indications and Aspects.

The majority recommends a system of signaling which includes 14 primary indications and 4 secondary. It requires a large number of aspects or pictures to represent them, nearly 60 in all. We, the minority, take the position that there is no demand for such an elaborate scheme and that it is impracticable, unnecessary, and confusing to the runner and other train employees. We believe that, regardless of the large number of aspects used to represent the indications, train employees will classify certain of them as meaning *stop,* certain of them as meaning *caution,* and the remainder as indicating *proceed.* The engineer frequently is compelled to read signals under very adverse weather conditions and, if he is to run safely, he should never be in doubt as to the meaning of a signal. A signal should mean something perfectly definite to him, which he cannot mistake, under any conditions of wind and weather. The engineman has no time to hesitate or deliberate over the meaning of a signal when he is running at high speed.

The aspect and its meaning must be so simple and so distinct that it immediately produces an impression on the mind of the runner, without the necessity for any intervening thought or mental process. If this impression should be followed by an involuntary action to comply with the signal without mental process we have a still more desirable condition and one that makes for safety and immunity from accident. To obtain these results the number of indications and aspects must be limited to a very small number, we believe less than half a dozen, and signals must be acted upon as a train meets them, and not at some point in advance, as the majority recommend.

As to the Use of Three Stop Indications.

Because of the fact that the majority has provided several different proceed aspects, it is necessary for them to use three stop aspects. That is to say, if several different arrangements of signal arms are used to indicate proceed, it results in several different stop aspects when those arms are restored to their normal position. These aspects are called:

1. Stop until authorized to proceed
2. Stop and proceed
3. Stop and investigate

The minority is unable to see why it is necessary to show on the face of a signal why a train must stop, or what it may or must do after it has stopped, before the stop is made. The all important and the only necessary information is that the train must stop. Why telegraph ahead by a specially shaped signal what the stop is being made for? One kind of signal will stop all trains just as effectively as three or more kinds.

As to Use of Three Arms on Interlocking Signals.

The majority has assumed that there are three permissible speeds at interlocking plants, viz.: normal, limited, and low. Each speed is provided with a signal arm, the normal-speed arm being at the top of the mast and each arm arranged for operation in three positions. This arrangement makes it possible to give a considerable variety of information. The limited-speed indication is designed to make possible a speed of thirty to fifty miles per hour through long crossovers.

The minority feels that the method now largely used of providing a two-arm signal, giving a proceed indication by means of the upper arm for the normal speed or through route, and a caution indication by means of the second arm for all diverging routes, is entirely sufficient for practical purposes. We favor, however, the use of the same proceed and caution aspects as are used elsewhere, which make it unnecessary to use more than one arm on signals used at interlockings. It seems unnecessary to say more than "Proceed" when the normal or through route is set up, and if so, why not use the same proceed aspect as is used elsewhere for proceed? In the same way we now give with the second arm, what is, in effect, a caution indication when a diverging route is set up, why not then use the caution aspect we already have available and dispense with the use of the second alarm? We believe that the indications stop, caution and proceed, given by the three positions of a one-arm signal, are entirely practical, sufficient and adequate to safely control the movement of trains at interlocking, as they will elsewhere. The simplicity of the arrangement is apparent.

The Interpretation of the Caution Indication.

The majority has provided no caution aspect per se, but has attempted to provide separate indications and aspects for each of the conditions arising on a railway that require caution. The 45-degree position of the arm has been limited to repeating signals in advance. In the various discussions of these matters, the majority has held that the word "caution" described the "function of a distant signal." Also it has been held that the 45-degree position of the arm should "imply and assure clear track to the next signal." The same aspect, modified by the addition of a distinctive mark for both day and night, is recommended for the permissive manual block signal. The distinction is made because the first indicates

"Proceed with caution to a known point."

and the second,

"Proceed with caution to an unknown point."

Also for the further reason, the members of the majority state, that trains shall be allowed to pass the distant signal at any speed provided they can be stopped at the next signal. They state further that serious delays to traffic would follow if engineers were compelled to observe the distant or caution signal at the signal. The indication is worded "Proceed—Prepare to stop at the next signal," which leaves it optional with the engineer when he shall cease regarding the first part of the indication and begin to regard the second part.

The minority regards this interpretation of the distant or caution signal as erroneous, dangerous and productive of laxity in the observance of signals as well as accidents. A number of serious and fatal accidents in the past few years, wherein the engineman failed to properly observe the caution signal, but fully intended to stop at the next signal, testify most conclusively to the correctness of our position in this matter.

We hold that:

1. It is impracticable to provide a separate signal for each of

the conditions on a railway requiring cautious running and to maintain the fine-haired distinctions necessary to their interpretation.

2. It is unnecessary, and in fact dangerous, to tell the engineman by fixed signal how he shall control his train at some point in advance.

3. Advance information so given is misleading and unreliable, as it is subject to change without notice and, therefore, the engineman can not safely use it. If he does so use it, it is done at the expense of safety.

4. The conditions of modern railway operation do not require trains to be run at full speed past caution signals, and that any time gained by this practice, is gained at the expense of safety.

5. Each signal should indicate *stop* or *caution* or *proceed* and have no relation to signals in advance or in the rear.

6. That each signal should be observed in turn as the train comes to it and not at some point in advance at the option of the engineman.

7. That with signals properly located, it is time a train should be run with caution if it has reached a point so close to preceding trains or stop signals in advance that a caution signal is received.

8. That no proceed or caution indication should "imply or assure clear track to a point in advance." That railway signaling devices and our methods of communication have not reached the perfection that will admit of this being done. We cannot know positively if the track is clear and further, it may not stay clear. We are under a moral obligation not to give such misleading information.

9. That the giving of information by signal indications about conditions in advance, whether it be regarding the next signal or the next station or any other object or condition, is wrong practice, productive of laxity and a fruitful source of danger and accident.

10. That it will be difficult, if not impossible, to maintain discipline and proper observance of the great variety of caution indications proposed by the majority because of the fine distinctions involved.

As to Low Speed Indications.

In the majority's recommended scheme appear

Indications 13—Proceed at low speed.
14—Proceed at low speed, prepare to stop.

We feel that a simple caution indication, combined with ordinary judgment on the part of employees, will avoid the use of these indications and the separate aspects used to represent them. Why use two? If the engineer is running at low speed, he is already prepared to stop.

As to Number of Red Lights Displayed.

One of the principal objections made by operating officials and train employees to signal practice at interlockings in the past, has been with regard to the number of red lights displayed. Also, objection has been made because it is necessary for enginemen to disregard and run by one or more red lights on a mast when passing a signal having more than one arm. A glance is sufficient to show that the number of red lights would be very largely increased under the plan recommended by the majority. This is principally due to the use of the red marker light on nearly all signals. We feel that it is against the principles of good operation to provide so many red night signals, and especially those that are not used. We also feel that all red lights that are not absolutely necessary should be eliminated.

Harmony With Standard Code.

Attention is called to the fact that the standard code of the American Railway Association shows at present but four indications. The majority feels that the code is incomplete and should be amplified by the addition of 10 more primary and several more secondary indications. We are of the opinion that the code contains all the indications that are necessary and needful.

Present Status of Signaling.

At the present time—speaking in general terms—the signaling of America is represented by a small mileage rather intensely signaled and a very large mileage with a very few signals. One, at least, of the causes contributing to this condition is the fact that much of the signaling already installed has been so elaborate that the expense has been prohibitive for thinner traffic lines. Further than this, the "elaboration of interlockings at many of our crossings, junctions and terminals has been carried to a foolish limit of unnecessary and impracticable attempts to tie up every human action, leaving nothing to discipline and good sense of employees. Also, great expense has been unnecessarily incurred to overcome human frailty by installing more complicated lockings and appurtenances than are demanded by the conditions."

It has been our custom to spend large sums of money on appliances for checking the work of the individual employee but, on the other hand, very little or none on the man himself. Each new accident has called for additional checks and devices when the true remedy for the condition lay with education, discipline or, perhaps, some similar action. We are in all the United States, prone to make new laws or legislation for every condition or abuse, when old laws, properly enforced, will take care of the situation. It is the same in the operation of railways.

It should always be borne in mind that it is impossible to prevent all accidents by means of new checks or devices, as these appliances are all subject to failures and do fail in the same ratio as other signal devices. Further, all of these checks tend to laxity on the part of employees, which is, in itself, a source of accident. New circumstances always arise, whatever checks and appliances are installed. Everything cannot be done by machinery and apparatus; something must be left to human intelligence.

Because of certain accidents, we have heard much recently with regard to automatic stops. I do not, personally, recall any that could not have been prevented by the proper instruction of employees and good discipline. From the often-quoted records of the English railways in handling passengers, I judge that travel on English railways is reasonably safe and that the record is fairly satisfactory. Let us not forget that this record is made without the use of automatic stops or other checks and under conditions that are substantially worse than exist in America, on account of the prevalence of fogs.

True Function of a Signal.

The true function of a fixed signal is to control train movement. It is not the function of a fixed signal to show in its aspect or appearance the specific purpose for which it is being used. I know of no better definition than the one in the Standard Code, which reads as follows:

"A fixed signal covers such signals as slow boards, stop boards, yard limits, switch, train order, block, interlocking, semaphore, disc, ball or other means of indicating stop, caution or proceed."

The function of a stop signal is to stop trains, not to indicate by its appearance why the stop must be made. The same is true of a caution signal.

The signal engineer, with his intimate knowledge of the mechanical and electrical construction and inter-connection of signaling devices, sees circumstances and opportunities under which slightly increased speed may be maintained. To obtain this result, an elaborate scheme of indications and aspects has been recommended which involves refinements designed to give shades of meaning that are unnecessary, confusing, and bound to be very expensive to install and maintain. We believe that any benefits to be derived are imaginary rather than real; that any increase in speed will be at the expense of safety.

The complicated scheme advanced introduces fine differentiations of caution and speed indications which require prompt reading as they are met, and remembrances for execution when some point in advance is reached. We believe that there are too many localities and sets of conditions to permit of representing each of them by fixed signals. The signal engineer has assumed a burden in attempting to do this, which is not justified by the experience of operation of trains.

Generally speaking, the simplest scheme of signals and the smallest number of indications and aspects that will do the work is the best one to use. We believe that the indications *Stop, Caution* and *Proceed,* with corresponding three aspects, will do the work and take care of practically every operating condition, if due investigation is made. We believe further that the present diversity of practice, which has finally resulted in the recommendation of the elaborate scheme presented to the Signal and Maintenance of Way Associations, is due to the adoption and use of new forms of indications and aspects without full investigation of the signaling principles involved or the possibilities of the simple scheme, *Stop, Caution* and *Proceed.*

It should not be overlooked that the relative chance of error on the part of train employees under any two signal schemes, is probably represented by the ratio of the respective squares of the number of aspects.

THE NEW HAVEN VALUATION.

The valuation of the New York, New Haven & Hartford properties, just completed under the order of the Massachusetts legislature, is a pioneer valuation of its kind. State valuations have heretofore been made by Michigan, Texas, Washington, Wisconsin and Minnesota; but that made by Massachusetts is the first to include an interstate railway system, one operating in four states. Moreover, it has been undertaken not merely with the assent but with the eager co-operation of the railway itself, seeking validation by Massachusetts of the company's securities—the expense to the company being about $100,000. The Massachusetts Board of Railway Commissioners, the Tax Commissioner and the Bank Commissioner as official principals in the valuation have had under them a host of experts headed by Prof. G. F. Swain of Harvard, who makes the leading report and whose investigations have reached into every branch of the property—physical, financial and historical—and have covered several months of time. A report follows that fills more than 300 typewritten pages, of which Prof. Swain's section alone comprises 163. The valuation, subject to some minor criticisms to be made later, is of commendable thoroughness both in method and material. It has relied, in part, on the valuation of Vice-president Stevens, made by him as an officer of the company and completed some two years ago; but as the experts brand his valuation conservative the appraisal gains rather than losses in its accuracy by that fact.

Coming immediately to the figures, the physical valuation gives the following comparisons in its more important items:

	Stevens' Appraisal.	New Valuation.	Depreciated Valuation.
Engineering	$4,470,894	$5,574,038	$5,574,038
Right of way and station grounds	55,935,451	62,789,916	62,789,016
Real estate	3,289,573	5,240,052	5,240,052
Bridges, trestles and culverts	20,496,112	20,917,682	17,780,030
Ties	2,404,764	4,646,658	2,787,995
Grading	28,224,823	30,263,853	30,263,853
Rails	6,918,565	8,777,985	7,022,388
Ballast	4,946,114	3,970,389	3,970,388
Crossings and signs	4,856,374	4,989,436	3,492,605
Shops, engine houses and turn tables	1,879,713	2,725,112	2,043,834
Docks and wharves	5,128,766	7,573,705	5,301,593
Electric power plants and property	1,266,107	6,215,690	5,594,121
Equipment	33,684,640	77,557,514	54,145,056

Including interest and commissions, the totals of the Stevens valuation was $283,024,858. As appraised by the commissioners, the physical property is valued at $279,871,460, excluding trolley lines. The latter are held by stocks and bonds as of subsidiary or holding companies and are, presumptively, excluded from both the Stevens and commission valuations of physical property.

As distinguished from comparative valuations of physical and other properties, the general summary of the commissioners shows the contrasts of book values with their appraisal. They have applied in the case of the securities various tests depending on the nature of the securities held—such as earning power of the various properties, their physical valuation based on replacement, market values and their dividend returns. In some cases book values sink greatly, in others they go up. But the net result is a large gain, as was to be expected, in the surplus of the company as compared with the balance sheet of the last annual report, where it was returned as $14,196,253. Contrasted with those figures the "readjusted surplus" of the commission appraisal now rises to $102,133,237 on a total valuation of $496,280,081—this not including certain "intangible" assets, franchises among them to be referred to later.

Some of the details in these subtractions and additions are interesting. Thus in the Rhode Island trolleys the New Haven's interest is valued at about $6,000,000, or one-quarter of its cost to the New Haven. In the case of the New England Navigation Company, the so-called "cold storage" holding corporation of the parent company, there is a reduction from book values $17,569,572 to $8,710,174. So in the case of the New York, Westchester & Boston—the New Haven's White Plains extension, with its Bronx terminal—the New Haven is allowed but $12,066,921, as against actual investment of $21,279,594. On the other hand there is the great increase of the Harlem & Portchester appraisal to $41,222,191, as against a book value of $25,334,833; and of the New Haven company's Central New England investment, where at the commission's valuation of stock alone the book value of $1,582,066 would rise to $4,470,450, saying nothing of two or three millions more increase in the income and other bonds—and the commission valuation of the Central New England shares, especially of the common stock, is apparently low. The appraised value of investment securities is $184,319,763, which compares with a book value of $204,866,998.

The commission excludes from its appraisal "intangible" assets of the company, which, however, it describes as very valuable, including the franchises. Among them and of somewhat specialized interest is the New Haven's traffic contract between Woodlawn and the Grand Central station, which on the basis of taxation the commission estimates at $5,940,428, but as "intangible" excludes from its valuation. The commission could have emphasized its views on franchise value still further by reference to franchise taxes or—in the specific case—the millions paid by the New Haven for the "Milbrook" franchises underlying its New York, Westchester & Boston extension. But omission of such indeterminate values, expressed by final analysis usually in the earning power of a corporation, was undoubtedly the better theory for a state commission charged with the validating of securities by appraisal of concrete assets. It would hardly, however, have been amiss for the commission to have pointed out more clearly than it has the relations of copious stock watering to values in the case of the Rhode Island and Connecticut trolleys, in which the investment holdings of the New Haven are so large. An "intangible" value there—besides their obstructive value as against competing parallels—is their steady expansion of earnings. But it is a value not yet realized.

In his own very able section of the report Prof. Swain sets forth at length his views of the principles guiding such a valuation, in which views students of railway affairs will find a wealth of suggestion. Railway valuation, he says, can be considered from several viewpoints—as a basis of taxation, as a basis of present capital, of issue of securities, of rates, of estimate of wealth of the nation. He holds that physical valuation is not a measure for rates and that, if rates are not unreasonable in themselves, a fair return should be allowed on total capital, including the risk of the undertaking; that physical valuation is not a scientific basis for estimate of public wealth, for that wealth depends on the value of the property as a going concern; that as to securities held the value now is the proper

basis of capital; that a railway should be allowed to earn a proper income on appreciated capital; that replacement value is not an absolute test—a seasoned roadbed, for example, being more valuable than a new one; that a railway as a whole, should practically be kept in operation as good as new, and the cost of doing it charged to operating expense, while the company should be allowed rates sufficient for full repairs and renewals. To quote Prof. Swain's words: "Physical valuation, either for the purpose of justifying rates or capitalization, should fairly allow the appreciated value of real estate and any other elements which have appreciated . . . provided the property is maintained in good condition." It will be undoubtedly a source of gratification, both to the corporation and the public, that Prof. Swain reports the physical condition of the New Haven's property remarkably good.

The main body of the commission report reviews at great length the legal—and illegal—relations of the New Haven Company to the state of Massachusetts, and refers to the discontinuance of the state and federal suits. In that connection the commission does not say that for thirty years or more Massachusetts, in law vulgate, "slept on her lights," and did not wake up until the New Haven began to acquire trolleys in the State. Nor does the commission explain that the transfer of the trolley holdings and the Boston & Maine share to individuals and to a "sympathetic relation," which could not be legally assailed, was the real block to both the federal and state suits. Coming to remedies, the commission wisely urges that the new and brave liberal policy of the state in the matter of railway capitalization and acquisition of securities and properties be made to square with her law. Attacking next the knotty problem of the divergent and, indeed, rival policies of Massachusetts and Connecticut and the New Haven Company's claim of general rights under its Connecticut charter, the commission insists on the co-ordinate and restrictive power of Massachusetts as regards general acts of the corporation and matters not localized in another state. But, admitting the difficulties of the past and danger of their recurrence, the commission urges uniform legislation in all the New England states. Should the New Haven continue to disregard Massachusetts law and policy, the commission recommends as penalties the taxation of New Haven stock in the hands of resident holders, the closing of the savings banks and other financial institutions of the state against the company's securities, and the personal liability of the corporation's officers.

The commission refuses to validate $50,000,000 of new stock issued by the company and three-quarters paid in on a basis of $125 per share, on the ground that the new issue must receive approval of the Massachusetts authorities or the company file affidavit that the proceeds are to be used outside the state. But it validates $394,147,563 of the company's liabilities, eliminating $56,616,818 from the corporation's last annual report.

The report and the appraisal of the railway property have several points of acute interest for railway men; but two of them stand out prominently. At the end of several years of controversy involving the legislature and costly litigation in the courts, and at one time reaching out into state politics, Massachusetts has now so far surrendered as to leave the Boston & Maine under New Haven control and validate the great mass of New Haven securities, many of them held by her courts to have been illegally issued or acquired. But the state still leaves invalid the New Haven's acquisition of several hundred miles of trolleys in the state, while submitting to the fiction under which the New Haven maintains control by the indirection of a holding company, individual control of that company and a "sympathetic relation" to the real corporate owner. And the state still leaves the bars down for future and indefinite friction amid the conflicting statutes and policies of New England commonwealths. This is one point. The other is that the official appraisal of the New Haven, a work of remarkable skill, thoroughness and fairness when the short time allowed and the complexion of the property are considered, gives a surplus of more than $100,000,000 in a general balance sheet—very much more if intangible assets are reckoned in. On the basis of the valuation, the stock of the company is shown to be worth at least 175, while selling in the market at some 25 points less, and the company not quite earning its 8 per cent. dividend. Such a contrast between valuations much increased from book value, but a part of the corporation's necessities, while defective in separate earning power is impressive. But the appraisal has at least the value of impairing public criticism of dividends and rate charges based on a "fair return" on the property. Finally, there is a phase of the matter bearing specifically on the New Haven's financial and physical policy. It has greatly expanded its system and is still expanding it, paying high prices for new lines and for some of its extensions. During this transition period of rapid growth a large divergence between capitalization and valuation, on the one hand, and net earning power, on the other, must be expected. One cannot yet foresee what the net earning power will be later when the system becomes more closely welded, when revenues from 1,400 lines of trolleys increase, when advances like the $21,000,000 already plowed into the New York, Westchester & Boston extension begin to make returns from operation—and when reciprocity with Canada, if that comes about, supplies new traffic.

PERFORMANCE OF PACIFIC TYPE LOCOMOTIVE; PENNSYLVANIA LINES.

A heavy passenger locomotive of the Pacific type that had been built for service on the Pennsylvania Lines West for hauling heavy trains between Pittsburgh and Chicago was described in the *Railway Age Gazette* of August 30, 1907. The locomotive has cylinders 24 in. in diameter with a piston stroke of 26 in., and weighs 272,500 lbs., in working order, of which 183,900 lbs.

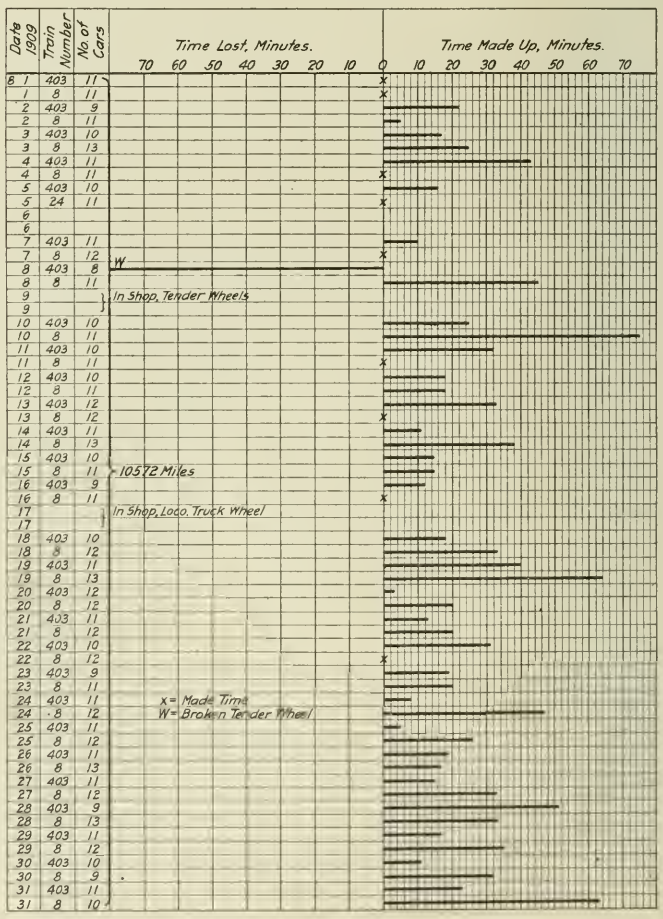


Diagram Showing Performance of Pennsylvania Lines Pacific Type Locomotive During August, 1909.

are on the drivers. The average weight per driving wheel is but 30,650 lbs.; the front drivers carry 61,000 lbs., or 30,500 lbs. per wheel. The driving wheels are 80 in. in diameter and the boiler has a total heating surface of 4,448 sq. ft.

One locomotive of this class was built and in service a year before the publication of a description was authorized. The reason for its construction was that the weights of trains on the Northwest system had become so great that the ordinary engines were having difficulty in handling them. It was undecided whether the weight of the locomotive should be increased or whether the trains should be divided and run in lighter sections. The engine was designed therefore, somewhat in the nature of an experiment and in order to be prepared for the construction of a class of heavy engines if the management should decide to operate the heavy trains. The Pacific type was chosen in order that the weights per driving wheel might be kept about 30,000 lbs.

The locomotive was put in service in August, 1906, and from that time on was closely watched in all of its daily performances, in order to correct any defects that might develop and to be certain that in a duplication of the design no mistakes should be made. The results obtained in this long trial have been so satisfactory that orders have been placed for a number of these engines for the lines both East and West, some of which have been delivered.

These locomotives were designed for service between Pittsburgh and Chicago, via Crestline and Fort Wayne. The line is divided into three divisions with terminals at Crestline and Fort Wayne. The lengths of the divisions, starting from Pittsburgh, are 188, 148 and 131 miles, respectively. The line has an undulating profile with maximum grades of about 1 per cent. The trains hauled varied in length from 8 to 13 cars, with an average for the express service of about 12 cars. Accommodation trains are shorter. A résumé of the log of the engine, working under these conditions, and covering the period from August 1, 1906, to January 1, 1910, is as follows:

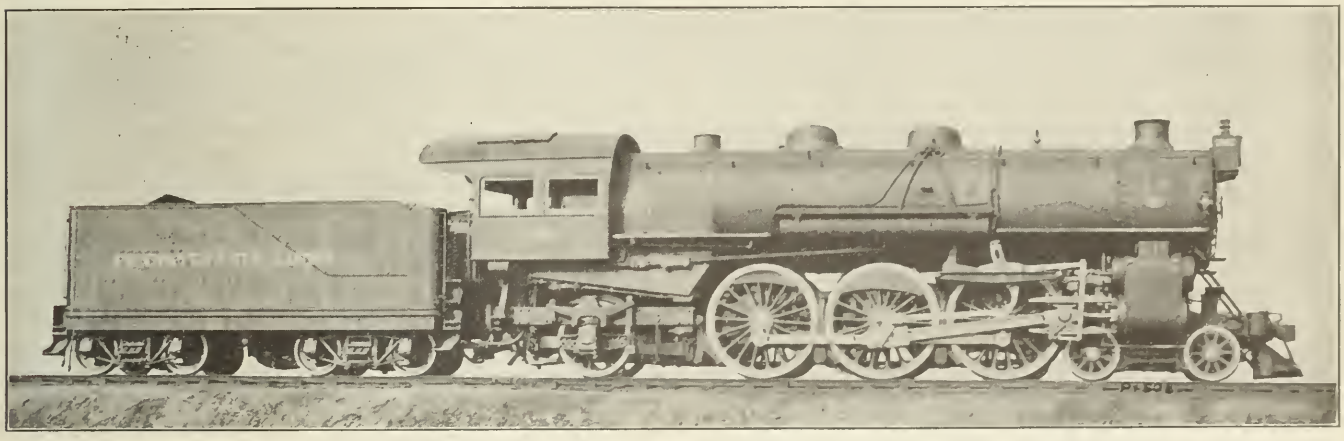
Performance of Locomotive 7067 in Passenger Service.

Made time	133 trips	21.6 per cent.
Made up time	446 trips	72.5 per cent.
Lost time	36 trips	5.9 per cent.
Total number of trips	615	
Total mileage		117,137

Detentions due to

Not steaming	10
Hot driving boxes	10
Hot crank pins	1
Injector failure	1
Pump failure	2
Loose wedges	1
Steam hose	1
Taking coal	1
Flues leaking	1
Gage cocks leaking	1
Lap and lead lever broken	1
Detentions due to	
Springer hanger broken	1
Piston rod broken	1
Coupler knuckle broken	1
Tender wheel broken	1
Transmission bar broken	1
Main driving axle broken	1
Total detentions	36

The form in which the record was kept is shown in the illustration; the central line indicates schedule time and the horizontal lines extending to the right and left the minutes made up or lost on individual runs. The diagram shows the service rendered during the month of August, 1909. It is taken at haphazard from a number that are available and shows that, for that month, the engine either ran on scheduled time, or made up time in every case but one, when there was a delay of 80 minutes due to a broken tender wheel. It was hauling trains Nos. 403 and 8 between Pittsburgh and Crestline. No. 403 from Pittsburgh to Crestline might be called a fast local. It makes 15 stops in 175 miles and hauls 11 cars; the schedule time is 4 hr. and 40 min., or an average of about 37.5 miles per hour. This, of course, means a much higher speed between stations and a rapid acceleration. No. 8 from Crestline to Pittsburgh is a slightly heavier train and has a slower schedule. It makes the run in six hours with from 12 to 13 cars, and with 13 stops. This gives an average speed of 29.2 miles per hour, including stops.



Pacific Type Locomotive; Pennsylvania Lines.

The diagram shows, by the way in which time was made up as occasion demanded, that the engine could really play with these trains. On the 10th of the month for example, 75 minutes were made up on No. 8, cutting the running time down to 4 hr. and 45 min., or a speed of 36.8 miles an hour with 13 cars and 13 stops in 175 miles. There was hardly a run on which some time was not made up.

The engine steams freely and the fireman has no difficulty in maintaining the steam pressure over a division. And finally the machine rides easily and, for a locomotive, quietly. It is, therefore, on the basis of these performances that the design has justified itself and that the class will continue to be used in the heavy traffic of the Pennsylvania lines both East and West.

Final plans for the extension of a branch of the Central of Brazil Railway which will connect the station, G. Portella, on that railway with Vassouras on the Spaucahy Railway, also for the extension of a short line to Itacurussa have been approved. One of the most important of the recent extensions on the Central is to be a branch to Monte Claros, 37 miles long, and to cost $800,000. Twenty-one miles of the line running north from Lafayette are to be changed to broad gage in accordance with the general plans for the standardization of the main line of the Central of Brazil running into the state of Minas Geraes from Rio de Janeiro.

SOME REFLECTIONS ON THE RATE CASE DECISIONS.

Railway men having recovered from the first shock of the decisions of the Interstate Commerce Commission in the rate advance cases, have had time to do a little reflecting about the principles on which they were based. One point which the decisions settle is that the commission ought not to use its authority to control advances in rates in the same way the English commission does. As Commissioner Lane points out, what the English law requires the commission to do is to determine whether "the *increase* of the rate or charge is reasonable." On the other hand, what the Interstate Commerce Commission is required to do is to find out whether the *increased rate* is reasonable. The English commission construes the law under which it acts to mean that the carrier must show that there has been an increase in the cost of handling the specific commodity on which it is proposed to raise the rate. As the amended Interstate Commerce act only requires the Interstate Commerce Commission to ascertain if the *increased rate* is reasonable, it is unnecessary for it to inquire whether there has been an increase in the cost of handling the specific commodity; for it is possible a rate may be too low as compared with other rates, and, therefore, an advance in it may be reasonable even if accompanied by an actual reduction in the cost of transporting the particular commodity. The burden of providing the reasonableness of the higher rate is put on the carrier; but this is a very different thing from putting on it the burden of proving that the specific advance itself is reasonable. It is curious that while the commission fully recognized the fact that it was its function to decide, not whether the *advances in rates* were reasonable, but whether the *advanced rates* were reasonable, it really did decide, as the language of its opinions plainly shows, not that the *advanced rates* were unreasonable, but that the *advances* were unreasonable.

* * * * * * *

The commission, especially in Mr. Prouty's opinion in the eastern rate case, fully and explicitly recognized the fact that whether a railway or a group of railways is or is not earning a fair return on its mere physical valuation is not the sole criterion of the reasonableness of its rates as a whole; and it discussed at considerable length the other factors in the value of a railway which the Supreme Court, in Smyth v. Ames, said must be considered. But its language plainly implies that it believes that preponderant consideration should be given to the cost of physical reproduction, and it indicated that a physical valuation would introduce into the question of rate advances an element of great importance. In fact, its general tone indicated that if it had had available a valuation as a guide its decision might have been different. In other words, it has been able for years without the aid of a valuation to determine that rates ought to be reduced; but it is unable to determine without the aid of a valuation that they ought to be raised.

The railway which most directly presented the question of valuation was the Burlington. Its counsel contended that it had a constitutional right to earn at least a fair return on the physical value of its property, and that while the original investment was about $29,000 per mile of road, it was entitled, owing to the increase in the value of its property, to earn a return on about $60,000 per mile of road. Commissioner Lane, in the opinion in the western case, struggled long and desperately to escape from this logic. He said:

> Our position is that a railway may not increase rates upon shippers for the reason and as an outgrowth of the fact that it has accumulated out of rates a balance of profit which has been invested in the property.

Again, commenting on the contention that the railway is entitled to earn a return on its "unearned increment," he said:

> In a very real sense, these added land values do not come to the railway as a railway, but as an investment in land which has been dedicated to a public use; and being so dedicated it may be strongly urged that the increment added thereto from year to year by communal growth is an imposition of additional rate burdens upon the public.

Again, he said:

> It is a conservative statement of the law to hold that a railway may not increase the rates upon a number of commodities solely because its real estate has risen in value.

It is no doubt true that a common carrier may not increase the rates on a number of commodities *solely* because its real estate has risen in value. Nobody contends that a railway may charge excessive rates in order to earn a fair return, or any return, on its value. But suppose it seeks to raise its rates, not solely because of an increase in the value of its real estate, but because its operating expenses have increased, because the value of its property has increased and because the advanced rates are reasonable in themselves. Then an entirely different question is presented. The valuation theory, as enunciated by its advocates, seems to be a jug-handle affair. According to their view, if it can be shown that a railway is earning more than a fair return on its valuation based on its cost of reproduction, its rates should be reduced or, at least, should not be permitted to be raised; but if it be shown that, owing to the increase in the value of real estate and other causes, it is not earning a fair return on the physical value of its property, it may not be permitted to raise its rates. The *Railway Age Gazette* long since pointed out that the valuation scheme is a two-edged sword, and that its logical use would involve, as real property increased in value, increased in rates to enable the roads to earn a fair return, rather than reductions, to prevent them from earning more than a fair return. The Supreme Court of the United States, in the Consolidated Gas Company case, held in express words that the value to be considered is the value of the property at the time the rates in question are under consideration, and that if the value of the property of a public service corporation had risen, this increased value must be taken into consideration. In view of its past decisions, it is very hard to believe that the Court will ever agree with Mr. Lane, that physical valuation should be used as a basis for reducing rates, but that an increase in physical value caused by an increase in the value of real estate or investment of earnings, cannot be used to justify advances. We have never taken much stock in the valuation theory; but if it is to be accepted as a basis for railway regulating policy, it must be adopted as a whole, and under all circumstances, and not merely in those instances where it will justify reduction, or the prevention of advances, in rates.

Table—Eastern Roads.

	Passenger density per mile.	Passenger train revenue per mile.	Freight density per mile.	Freight revenue per mile.
Average for groups I, II, and III	231,700	$4,989	1,862,000	$12,146
Pennsylvania R. R.	367,489	9,014	4,409,694	24,982
Pennsylvania Co.	260,073	6,591	3,682,407	22,102
New York Central	474,153	10,473	2,293,914	14,221
L. S. & M. S.	334,965	8,946	3,421,211	17,823
Michigan Central	185,216	4,523	1,565,257	9,697
Baltimore & Ohio	172,127	4,019	2,313,510	13,444

If the policy of limiting railway profits is to be adopted, it would seem that, as the commission said in the Spokane rate case, the whole situation should be taken into consideration. The rates must not be made with reference merely to what the stronger lines or the weaker lines can earn on them, but with reference to what the average road can earn. The language of the commission in the rate advance opinions would indicate that it accepted and applied this principle in these cases. The facts show it did not. In the eastern rate cases it took the Pennsylvania Railroad, the Pennsylvania Company, the New York Central, the Lake Shore & Michigan Southern, the Michigan Central, and the Baltimore & Ohio as "typical" roads, and investigated their situation for the purpose of determining what are the needs of the railways in general in Official Classification territory. Official Classification territory is composed of what are designated in the statistics of the commission as groups I, II and III. The above table gives the average passenger and freight

densities per mile and the average passenger train earnings and freight train earnings per mile of all the roads in these groups in 1909, and also of the roads used by the commission as typical:

It will be seen that the passenger densities and the passenger train earnings of all the roads used as typical, except the Baltimore & Ohio and the Michigan Central, are greater —in some cases very much greater—than the average for the territory, and that the freight density and the freight revenue of every road taken as typical, except the Michigan Central, are greater than the averages for the territory. The roads selected as typical are not typical at all, but are very much better situated and more prosperous than the average.

The roads taken as typical in western territory are the Santa Fe, the Chicago & Alton, the Burlington, the North Western, the St. Paul and the Rock Island. The following table for western territory corresponds to the one given for eastern territory:

Table—Western Roads.

	Passenger density per mile.	Passenger train revenue per mile.	Freight density per mile.	Freight revenue per mile.
Average for groups VI, VII and VIII	97,304	$2,315	675,764	$5,683
Santa Fe	123,905	3,163	678,717	6,956
Alton	210,263	4,622	1,342,532	7,656
Burlington	117,058	2,721	733,745	5,790
North Western	122,092	2,754	636,972	5,713
C., M. & St. P.	89,736	2,190	672,485	5,637
C., R. I. & P.	122,914	2,709	530,131	4,935

It will be noted that every railway in the group, except the St. Paul, has both a greater passenger density and greater passenger train earnings per mile than the averages for the group; that three of the so-called "typical" roads have a greater freight density than the average, and four greater freight earnings per mile. The selections made in western territory are not open to as severe criticism as those made in eastern territory. Just the same, everyone knows that these roads are generally recognized as better located and managed than the average road in the middle west.

In his opinion in the eastern rate case, Commissioner Prouty said, "No general advance in rates should, however, be permitted until the carriers have exhausted every reasonable effort toward economy in their business." This statement is unexceptionable. It recalls, however, a story about a conversation between Madame de Stael and Sir James MacIntosh. "Napoleon," said Madame de Stael, "is not a man. He is a system." Sir James loudly applauded the statement. But a hard-headed gentleman who was sitting by disturbed the serenity of the occasion by saying, "Yes, it is fine; but what does it mean?" That the carriers should not attempt to impose an added burden of rates on the public to increase their net earnings until they have done all they "reasonably" can to get their operations on an economical basis is a truism. But what economies are reasonable? Would a reduction in wages be reasonable? The railways between Chicago and St. Paul recently, in order to effect economies, have taken off some trains and lengthened the schedules of others. Is that reasonable? The roads could refrain from spending such large sums as many now are on handsome passenger stations. Would that be reasonable? They could very substantially increase minimum carload weights and compel shippers to load the large cars now in service much nearer to their capacity. This would effect a great economy. Would it be reasonable? There is no man connected with or familiar with the railway business who cannot suggest scores of ways in which great economies could be effected. But there is hardly a method that could be adopted without incurring antagonism and opposition either from employees or travelers or shippers. There are many economies which railway men firmly believe it would be reasonable to make, and the language of the commission in these opinions gives them a good right to ask that, when they try to make them, they shall have at least the moral support of the commission.

The commission, like many others, seems to overlook the fact that there is a difference between efficiency from the standpoint of the railway manager and owner, and efficiency from the standpoint of the railway user. Unquestionably, there are many ways in which efficiency from the standpoint of the manager and the owner might be introduced without impairing the service rendered to the public. Never does a week pass when the *Railway Age Gazette* does not suggest or describe some new plan which ought to be or has been adopted to effect small or great economies. But the greatest economies that at the present time are possible are perhaps impracticable because of the opposition they would receive from the railway brotherhoods and the public.

It is seriously questionable if wages ought to be reduced to a lower basis. The wages of employees engaged in office work ought to be substantially raised. But in view of this decision of the commission, the roads should and must in the future powerfully resist demands from the railway brotherhoods for further raises in wages and modifications in conditions of employment which will tend to increase expenses. Rather, the effort must be to get more and better labor for each dollar of wages.

On the other hand, the railways ought not to take any steps that will impair the services rendered to the public. Shortcomings in and inadequacy of the service have contributed much toward creating the present hostile public sentiment towards the roads; and impairment of the service will tend to nullify all efforts that may be made to educate public sentiment on the railway question. In the long run it will be best to give the best service practicable; and if developments show that in doing so a fair profit cannot be earned without higher rates the roads should again go to the public and the Commission, and if necessary to the courts, with a demand for rate advances.

The commission in discussing the question of railway efficiency broadly intimated that owing to the dominance of the same financiers in large industrial corporations and in the railways the roads are paying higher prices than they ought to for supplies. There is no question that certain powerful combinations have been able to a large extent to dictate the prices that the railways have paid for some supplies. But this may not be due wholly, or even mainly, to the fact that the same financiers are dominant in many industrials and many railways. The roads also have had to pay in recent years much higher prices for lumber than formerly, more or less because of concerted action by the big lumber interests. Now, the controlling factors in the lumber industry are not strong factors in the railway business. The increases in railway expenses have been mainly due to the activity of monopolies in whose affairs the big financiers can scarcely be said to have much influence. These are the labor combinations.

The Commission specifically says that before the railways can be allowed to raise their rates they must show that they have exercised reasonable economies in the purchase of supplies, labor, etc. It especially disavows any intention to constitute itself the general manager of the railways. But obviously if it is going to determine the reasonableness of rates with a view to the reasonableness of the wages and prices that the railways pay for labor and supplies, it must determine whether the prices paid for supplies and the wages paid for labor are reasonable. It already controls the receipts of the railways. If it is to determine the reasonableness—in other words to control—their expenditures, also, it will be their general manager indeed. When the railway managements go into the market for supplies and labor, and the manufacturers ask excessive prices for supplies and labor asks excessive wages, they can do only one of two things. They can pay the prices and wages demanded, or they can refuse to buy the supplies and labor. A deadlock in the railway supply and labor market would mean quick deterio-

ration, or even cessation, of the railway's service to the public. For this the public would hold the railway managers, and not the government, solely responsible. If the government is to extend its control over railway operations as far as it logically must to regulate rates on the principles apparently laid down by the Commission it should and must either step in and actively defend the roads against the exactions of excessive prices and wages, or become the nominal as well as the actual manager, and also the owner, of the properties, so that the public may hold it to a direct accountability for the results of its management. Public management and private ownership will in the long run prove incompatible.

There is one most important point about the relations between the large industrial concerns and the railways on which the commission neglected to comment. Those in control of the big industrial concerns have much oftener used their power to extort unfairly low rates than to get unfairly high prices. The consequence has been, and is, unjust discrimination. The law makes it the commission's duty to attack these discriminations. The influence of big industrial concerns in rate-making was written all over the tariffs involved in these cases. Certain of these discriminations were specifically referred to by some of the witnesses. We regret to note that while there are many criticisms of railway tariffs in the decisions, there is not one word in them about this most glaring and harmful vice in them.

* * *

Commissioner Lane in his opinion discussed at length the question of the proper basis for rate-making. Many of his criticisms of the railways for not having developed a more scientific method of cost accounting, and for having repudiated cost of service as a principle in rate-making, and having advocated the value of the service as a basis in very sweeping terms are just. The cost of the service not only ought to be, but is, a very important factor in rate-making. If rates were made regardless of cost of service they would be like postal rates—the same regardless of distance. Cost of service is recognized by traffic men not only in making the rates for different distances but in framing the classifications. Of two articles having the same value per ton, but having different bulks in proportion to their weights, every traffic man would, if other conditions permitted, put the more bulky commodity in the higher class. Railway men would do themselves more justice, and present their cases more effectively, if they would disillusionize themselves of the idea that they do not base their rates largely on cost of service and frankly admit to themselves and others that rates should be and are based, both on the cost of the service and the value of the service, the principle which governs in any particular case depending on conditions. Rates often do not depart from the cost of service basis as far as many are apt to think, nor, sometimes, as far as they ought. We are apt to say that the reason why coal is often hauled for 4 mills per ton per mile while a rate of perhaps 2½ cents per ton per mile is charged on first-class, is due to the difference in the values of the services of hauling coal and dry goods, for example. But the cost of the service of hauling a 90,000 pound carload of coal and a 15,000 pound carload of dry goods are substantially the same, and a rate of 4 mills per ton per mile on such a carload of coal and a rate of 2½ cents on such a carload of dry goods would yield almost exactly the same revenue per car per mile. Now, in this case, while the costs per 100 pounds of hauling the coal and the dry goods would be widely different, the costs per car-mile of hauling them probably would not be substantially different; and the cost per car-mile is the true unit of cost and not the cost per 100 lbs. The one rate is about 500 per cent. higher than the other, and yet on a strictly cost of service basis the difference is justifiable. Contrary to the general opinion the application of the cost of service principle to the rates for different distances probably would cause a very much greater revolution in railway tariffs than its application to rates on different commodities. Its use as the only basis of rate-making or rate regulation would be destructive of the best interests of the railways, the shippers and the public; but its use as one of the main principles of rate-making is essential.

* * *

The practice of making many permanent improvements from earnings has been so peculiarly characteristic of the railways of the United States that it has been called the "American plan." One of the main contentions of the carriers in these cases was that this was a wise policy because it prevented the upbuilding of an excessive capitalization, and that they should be allowed to charge higher rates in order that it might be continued. The commission said that there was some merit in this contention, but it pointed out that the question whether, when earnings have been invested in the property the owners are entitled to earn a return on the part of its value thereby created, has never been settled by the courts. It cited the decision of the Supreme Court in I. C. R. R. v. I. C. C., 206 U. S. 441, in which the court said that on principle "it would seem as if expenditures for additions to construction and equipment, as expenditures for original construction and equipment, should be re-imbursed by all of the traffic they accommodated during the period of their duration, and that improvements that will last many years should not be charged wholly against the revenue of a single year." It, therefore, held, in effect, that railways should be permitted to earn only enough to pay reasonable interest and dividends and to accummulate the surpluses in fat years that will tide them over lean years; and that all permanent improvements should be made from new capital. It is a very interesting question what effect this will have on the future financial management of the railways of the United States. Between 1889 and 1909 railway capitalization in this country increased only $11,200 per mile, or 23 per cent. This was very much less than the amount of money spent per mile on permanent improvements. If all permanent improvements are hereafter to be capitalized, increase in capitalization is apt to take place much faster in future than it has during the last two decades. The result will be to keep down the amount that the present generation must devote from earnings to permanent improvements, and, on the other hand, proportionately to increase the amount that the next generation will have to apply from earnings to interest and dividends on the new capital that must be invested in permanent improvements if they are to be made. If the change in railway policy suggested takes place, the next generation probably will regard it with less favor than the present one. We talk much in these days of the conservation of our national resources for the benefit of future generations. Evidently, some of us do not believe in the application of this principle to railway transportation.

* * *

There is a marked difference between some things that were said by many regarding the need for advances when the rate cases were pending and the comments of the same persons on the decisions of the commission. The *Railway Age Gazette* never believed that a favorable decision would raise the railways to the heights of affluence or that an unfavorable decision would reduce them to the depths of bankruptcy. We believed that advances should be granted, not because the railways were financially worse off than in many past years, but because we believed that railway rates and earnings were and had been too low on the average. When the railway business was full of speculative possibilities it was practicable, in spite of the low average return to investments in it, to get a great deal of capital which was attracted into it mainly by these speculative possibilities. Under government regulation the average return becomes of more importance because such regulation tends to eliminate the speculative possibilities. We believed that some action to increase the average rates and earnings was desirable in order adequately to stimulate improvements and new construction. The decisions do not change this opinion; they confirm it. The commission's analysis of the financial condition of the leading railways in the East and Middle West shows that even most of them are not

extremely prosperous and that those of them that recently have been making the largest expenditures for improvements and extensions are the ones most in need of larger revenues. The commission fully recognizes the need for enterprise, skill and efficiency in management. It may be that increases in traffic and better methods of management will enable the roads to increase their net earnings much more than is now generally anticipated. The commission, having recognized the need for enterprising management and having insisted that the roads must show efficiency in management before asking for higher rates, hardly can consistently, in future, if efficient management does increase net return, reduce the rates in order to reduce the net earnings merely because the shippers say the net returns are too high. Nor is it very likely that the railways themselves, under conditions which have practically eliminated competition in rates, and after having so loudly demanded higher rates, will, soon at least, make any very substantial reductions. In view of these facts it seems probable that rates in the territory from Missouri river common points to the Atlantic sea-board and north of the Ohio and Potomac rivers will not undergo any material reductions for some years to come. The main change in these rates that is to be hoped for in the near future is the elimination of the unfair discriminations in favor of certain large industries to which reference already has been made. It is questionable if this can be accomplished unless the commission is given and exercises the power to raise rates that are too low, as well as to reduce rates that are too high, and legislation giving and requiring it to exercise this power should be the next step in government regulation of railways. It is a power the possession and proper and effective exercise of which by the commission would be of more importance to the public than a physical valuation of railways.

EFFECT OF ELECTRICITY ON REINFORCED CONCRETE.

The *Revue Industrielle* reports that according to some investigations made by Dr. Rohland, who is a professor at Stuttgart, it seems that electricity has an injurious effect on reinforced concrete. The electric current serves to destroy the metal encased in the concrete. With a current intensity of 0.1 ampere continued for a few weeks, it has been possible to produce quite heavy rust deposits. It is not the occasional currents of high tension and great intensity that are to be feared, but rather the currents of low tension and weak intensity that circulate frequently and regularly through the metal. These latter quickly destroy the close adhesion of the metal to the concrete, which it may cut down to from 83 to 93 lbs. per sq. yard. Then the concrete serves no longer as a protection to the metal; the dampness and the oxygen of the air penetrate the mass, bringing about the conditions favorable to the production of rust. In order effectively to protect reinforced concrete, it is necessary to render it water-proof by coating it with a tar or asphalt paint, for dryness is the best factor for the prevention of the generation of an electric current.

Attention is also called to a curious fact cited by the *Electricien.* Reinforced concrete construction, even when not provided with a lightning rod, seems to be protected from lightning. A sufficient number of observations are not yet available to establish this hypothesis; but it also does not seem impossible that the nest of metal in reinforced concrete is amply sufficient to carry a lightning current, in case it strikes, to the ground without injury to the structure, especially if the foundation is in contact with underground water. There is no doubt that the metallic framework will then be traversed by a current, but without any great risk to the building.

Recent dispatches from Peking show that the Chinese government is anxious to complete as early as possible the Canton-Macao railway. The strategical importance of this line is thoroughly realized by the government.

DEMURRAGE COLLECTED REGARDLESS OF RAIN.

[From Statement of E. E. Mote, Manager Pacific Car Demurrage Bureau.]

In our report for November, 1910, we took occasion to refer to the heavy increase in uncollected demurrage as shown by the September reports of fourteen other demurrage bureaus which had adopted the National demurrage code and among the other causes contributing to such increase we ventured the opinion that this was partially due to the "weather rule" which makes it possible to avoid or at least defer payment by the mere claim of consignee that because of the weather he was unable to employ men or teams to load or unload, or that in process of removal to or from the car the freight would be seriously injured. As the rules of the Pacific car demurrage bureau provide that "no allowance in free time or demurrage will be made on account of weather conditions," it seems to be taken for granted by those who are not informed of the actual facts, that the climatic conditions in our territory are at all times so favorable that the removal of freight to or from the car would not be prevented on that account.

While it is true that the weather conditions with us are generally favorable throughout the greater portion of the year, it must not be understood that we are entirely free from rain or snowfall. Our rainfall during two or three months is sufficient to last the entire year, and when it *does* rain, the windows of the heavens are opened.

The rainfall in San Francisco during the month of January, 1911, according to the official reports of the Weather Bureau was 13.79 inches or 2.51 inches greater than the heaviest rainfall at Chicago in any single month during the last forty years.

That the rainfall in San Francisco was not permitted to interfere with "the removal of freight to or from the car" and that our consignees did not use the pretext that it would be seriously damaged if so removed is indicated by the fact that but one car out of a hundred subject to the $6 demurrage rate was held overtime, this being with a single exception the lowest percentage of cars held overtime in any month since June, 1909. The percentage of $1 cars held overtime was 9.35, that being precisely the monthly average on such cars during the past nineteen months. During the time in which we made allowances for weather conditions 20 per cent. of the entire amount refunded was in settlement of weather claims. This only goes to show that in placing the full responsibility for prompt removal of freight with the consignee, he may be depended upon to adopt the means necessary to that end, and our own observation and experience has been that no particular hardship has resulted either in exposure of men and teams or damage to freight while being removed.

FOREIGN RAILWAY NOTES.

The formal opening of the Rosario and Puerto Belgrano Railway, Argentina, took place on December 15, 1910. This line was built by a French company under a concession from the federal government. It traverses the provinces of Santa Fe and Buenos Aires, between the points named, a distance of approximately 490 miles, and passes through a fertile agricultural region.

There was recently a change in the Austrian cabinet, in consequence of an adverse vote in parliament, and among those retiring was the railway minister, Wrba, who had been for more than forty years in the service of government in connection with railway affairs and who had much to do with the measures which have recently brought the principal lines in the country into the state system. He is succeeded by Dr. Glombinski, who for most of his life has been professor of political economy in the University of Lemberg, but who has been also an active member of parliament for 18 years. Dr. Glombinski is well known for his works on economics and finance, published originally in the Polish language.

General News Section.

The Lehigh Valley has increased the pay of its firemen, the increase taking effect March 1.

At Gainesville, Ga., March 3, three train robbers were sentenced to imprisonment for 20 years, 15 years and 15 years each, for robbing the express car of a train on the Southern Railway a few weeks ago.

Sir Thomas Rees Price, Commissioner of the South African railways, arrived in New York this week, on a visit to America for the purpose of studying the railways of the country on behalf of the South African government.

Annual card passes are to be issued by the Baltimore & Ohio to all freight and ticket agents who have been in its service for three years or more. The passes will be good over the division on which the recipient is employed.

On Sunday last Lieut. Bague in a Bleriot monoplane flew from Antibes, near Nice, France, over the Mediterranean sea, to the Island of Gorgona, off the coast of Italy, 125 miles, the longest flight ever made entirely over water. Lieut. Bague was not accompanied by any boat.

The pay of track men on the Canadian Pacific has been increased from 12½ per cent., and on some divisions 15 per cent., as a result of the decision of a Board of Conciliation. According to a press dispatch from Winnipeg, the rates now adopted by the Canadian Pacific will also be adopted by the Canadian Northern.

In a flight from St. Cloud, near Paris, France, to Puy-de-Dome, last Tuesday, Eugene Renaux, carrying a passenger, made the distance of 217 miles in five hours and eight minutes, and won a prize of $20,000. Puy-de-Dome is 4,800 ft. above the level of the sea. Renaux made a stop of 17 minutes at Nevers. He used a Farman biplane.

Professor H. C. Adams was the last witness before the railway securities commission, of which President Hadley is chairman, at the last public meeting which was held in New York March 7. There will be no further formal public meetings of the commission, but the definite recommendations of the full report will not be made for some time.

The Chateau Laurier which is being built by the Grand Trunk Railway at Ottawa and which will be opened next Autumn, will be one of the finest railway hotels in the world. The naked shell now completed cost over $1,000,000 and it is expected that another million will be expended in decorations and furnishings and on the grounds. The same company is building a magnificient union station at Ottawa.

The committee on railroads of the Illinois house of representatives has reported favorably a full crew bill, and vigorous arguments for and against the bill were made before the committee by representatives of the labor brotherhoods on the one hand and the general managers of the railways on the other. A full-crew bill has been the subject of hearings before a legislative committee at Albany, N. Y.

In 1910 there was a total number of tickets sold on the New York subway of 270,221,490, as compared with 256,768,981 in 1909 and 220,991,212 in 1908. Of the total number of tickets sold, 12.4 per cent. were sold at Brooklyn stations in 1910, 11.08 in 1909 and about 10 per cent. in 1908. The first station in Brooklyn (Borough Hall) was opened in January, 1908; three more stations in May, 1908.

The Chicago, Rock Island & Pacific has appointed a committee on "Office Methods and Practices," with the object of investigating the methods in use in various company offices and if possible determining the standards to govern this work. The committee includes LeRoy Kramer, assistant to second vice-president, chairman; F. D. Reed, assistant to vice-president; L. K. Luff, auditor of disbursements; E. S. Gentle, district accountant, and F. J. Easley, superintendent.

On the Pennsylvania Railroad last year 228 lectures on First Aid to the Injured were given to the employees, and about 7,000 men listened to them. This year it is intended to do even more in this direction. As a supplement to the lectures there has been printed a pocket card, containing in brief language the main points to be remembered in cases of hemorrhage, fracture, burns, shock, fits and sunstroke. The lectures now deal fully with the methods to be used for resuscitation from electric shock.

The Sundry Civil Appropriation bill passed by Congress last week includes a provision authorizing the president to designate any member of the Interstate Commerce Commission, or of the Court of Commerce, to exercise the power and duties of a member of Boards of Conciliation in railway labor disputes, the power and duties heretofore devolving by law exclusively on the chairman of the Interstate Commerce Commission (acting in conjunction with Dr. Neill of the Department of Commerce and Labor).

Acting under this law, President Taft has designated Judge Knapp, chief judge of the Commerce Court, to perform the functions indicated. Representatives of railways or of employees who desire to take advantage of the Erdman law providing for conciliation will therefore have the same men to deal with in the future as in the past, Messrs. Knapp and Neill.

The Secretary of War has decided to permit the construction of a temporary extension to one of the Chelsea piers, New York City, for the benefit of the White Star Line, which this summer will put into commission two steamships each 882 ft. long. The steamship people, and others interested, appealed to the secretary from the decision of the Board of Engineers, who had refused to recommend an extension of the piers, and he gave them a hearing on Monday last. The extension will consist simply of clusters of wooden piles of sufficient size and stability to protect a vessel lying at the dock from being struck by others moving up or down the river; and after the War Department, in conjunction with the Governors of New York and New Jersey, has agreed on a permanent plan for the accommodation of long vessels in some other place, the Chelsea extension will be removed.

New Railway Laws in Indiana.

The new block signal law of Indiana is noticed in the editorial columns. There has been passed in that state also a law providing for the appointment by the Railway Commission of a locomotive boiler inspector at a salary of $2,000, and one forbidding the use of cabooses less than 24 feet long. The date set for complete compliance with the caboose law is January 1, 1914.

Howard Elliott Not to Head Missouri Pacific.

Despatches from St. Louis stating that Howard Elliott has refused the presidency of the Missouri Pacific have been confirmed by Kuhn, Loeb & Co., New York. Mr. Elliott's refusal was based on his failure to secure the consent of George F. Baker and other Northern Pacific people who have stood back of him since he assumed the presidency of the Northern Pacific. Mr. Elliott did not wish to leave the Northern Pacific against the wishes of these men. So far as he is concerned the matter is, therefore, closed.

Mail Car Requirements.

The law designed to compel the use of stronger mail cars, as passed by Congress last week, to go into effect July 1 next, is as follows:

. . . That no part of the [appropriation for mail cars] shall be paid for the use of any car which is not sound in material and construction, and which is not equipped with sanitary drinking water containers and toilet facilities, nor unless such car is regularly and thoroughly cleaned: Provided further that after the first of July, nineteen hundred and eleven, no pay shall be allowed for the use of any wooden full railway post-office car unless constructed substantially in accordance with the most approved plans and specifications of the Post Office Department for such type of cars, nor for any wooden full railway Post-office car run in any train between adjoining steel cars or between the engine and a steel car adjoining, and that hereafter additional cars accepted for this service shall be of steel, or with steel underframe, if used in a train in which a majority of the

cars are of like construction: Provided further, That after the first of July, nineteen hundred and sixteen, the Postmaster General shall not approve or allow to be used or pay for any full railway post-office car not constructed of steel or with steel underframe, if such post-office car is used in a train in which a majority of the cars are of steel or of steel underframe construction.

Wages Increased on Wabash.

After conferences lasting about two months, the Wabash has made settlements regarding wages with its enginemen and trainmen west of Chicago and Tilton; and also with trainmen east of these points, where the enginemen already were being paid according to the western scale. West of Chicago and Tilton the advance for both classes is 10 per cent., taking effect March 1. These rates will conform to the scale which was agreed to by the other western roads on the first of last January. East of Tilton and Chicago the trainmen receive an advance of 6 per cent., bringing their wages up to the level of the rates paid by the Pennsylvania Lines and the New York Central; and the men are promised that on July 1, 1912, the Wabash will pay the same rates in this territory as on its western lines. The enginemen and trainmen employed by the Wabash on its trains running over the Grand Trunk between Detroit and Buffalo will have, after January 1, 1912, the scale which has been agreed to in that territory by the Grand Trunk, namely, the Canadian Pacific scale. The advances now granted by the Wabash will increase its pay rolls $350,000 annually. The men had demanded that all of the increases above noted should be granted at once, but finally consented to the deferred dates. This change in dates makes the burden on the company about $60,000 less than it would have been otherwise.

Gasolene Passenger Cars on the Ann Arbor.

The Ann Arbor Railroad has bought five McKeen gasolene motor cars, to be run on certain light runs, in place of regular passenger trains. The cars are 70 ft. long and 200 h. p. each. It is intended to run these cars on schedules which will permit them to stop at highway crossings, the aim being to afford passengers the same accommodations that they get on interurban electric lines.

Steel Corporation's Share in Total Output of Iron and Steel.

Notwithstanding the hundreds of millions of dollars the United States Steel Corporation has spent for new construction and the acquisition of new properties, its relative position from the point of production of steel to the country's total output is not as strong as it was at the time of organization. The Steel Corporation has increased its capacity in the neighborhood of 75 per cent. since organization, but its competitors appear to have made even heavier gains. The following table gives the Steel Corporation's per cent. output of pig iron, steel ingots and steel rails in 1901, 1908 and 1910, compared with the country's total percentage output of similar products:

Pig Iron:—

	1910. Per cent.	1908. Per cent.	1901. Per cent.
Produced by U. S. Steel.....	43.2	43.5	43.2
Produced by other manufacturers..	56.8	56.5	56.8
	100.0	100.0	100.0

Steel Ingots:—

	1910. Per cent.	1908. Per cent.	1901. Per cent.
Produced by U. S. Steel.....	56	56.4	66.2
Produced by other manufacturers..	*44	43.6	33.8
	100.0	100.0	100.0

Steel Rails:—

	1910. Per cent.	1908. Per cent.	1902. Per cent.
Produced by U. S. Steel.....	57.9	54.7	64.8
Produced by other manufacturers..	42.1	45.3	35.2
	100.0	100.0	100.0

*Estimated.

If the furnaces and mills were allowed to operate fully, the United States Steel Corporation could turn out annually close to 14,500,000 tons of pig iron, between 17,000,000 and 18,000,000 tons of ingots, between 3,000,000 and 3,500,000 tons of rails, and 13,500,000 tons of finished steel "for sale." It would be difficult to make comparisons based on actual capacity. It has been stated that the country is in a position to turn out at least 35,000,000 tons of pig iron if the furnaces were able to operate full for 12 months. The Steel Corporation's 14,500,000 tons would, therefore, represent about 41 per cent. of the country's maximum capacity. The Steel Corporation's ingot capacity is greatly in excess of its pig iron capacity. The following table shows the production of certain classes of iron and steel of the United States Steel Corporation from 1902 to 1910, inclusive, in tons:

	Pig Iron.	Steel Ingots.	Steel Rails.	Finished Steel.
1910.....	11,800,000	14,150,000	2,100,000	*11,100,000
1909.....	11,618,350	13,355,189	1,719,486	9,859,660
1908.....	6,934,408	7,838,713	1,050,389	6,206,932
1907.....	10,819,968	13,099,548	1,733,814	10,376,742
1906.....	11,267,377	13,511,149	1,982,042	10,578,433
1905.....	10,172,148	11,995,239	1,727,055	9,226,386
1904.....	7,369,421	8,406,378	1,242,646	6,792,780
1903.....	7,279,241	9,167,960	1,934,315	7,635,690
1902.....	7,975,530	9,743,918	1,920,786	8,197,232

*Estimated.

New steel construction over the last five years was more pronounced than in the preceding five years. The Steel Corporation, as well as the independents, have been aggressive in this direction, but it is believed that extensions will be limited over the next five-year period. This will be due to the fact that the country's steel capacity is now believed to be in excess of actual consumptive requirements. The corporation has been spending at the rate of about $40,000,000 a year for new construction for five years back and relatively heavy expenditures have been made by the independents.—Abstracted from an article in the *Wall Street Journal.*

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held on March 17 at the building of the United Engineering Societies, New York. The Committee on Electrification which expected to make a formal report has decided not to do so as it finds that the one made a year ago represents the situation up to date. It has, however, arranged for short addresses by a number of recognized experts and authorities, including the following: Prof. George F. Swain, of Boston, Mass.; Samuel M. Vauclain, of the Baldwin Locomotive Works, Philadelphia, Pa.; C. L. Bardo, superintendent electric division, N. Y. C. & H. R.; H. Gilliam, electrical superintendent, N. Y., N. H. & H.; and William McClellan. Invitations have also been extended to and affirmative replies hoped for from J. R. C. Armstrong, H. G. Stott, W. B. Potter, A. J. Armstrong, L. B. Stillwell, W. S. Murray, E. W. Rice, Thomas F Mullaney, and Frank J. Sprague.

American Society of Mechanical Engineers.

At the meeting of the American Society of Mechanical Engineers co-operating with the American Institute of Electrical Engineers, to be held on March 10, at the United Engineering Societies building, New York, the topic for discussion will be The Cost of Power Generation. Representatives of the large power stations, small isolated plants, and the public service commissions will discuss the question and present figures of actual costs of power production.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; next meeting, March 22, Chicago.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June, Washington, D. C.; annual, November, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday, Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; next convention July 25-27, Chicago.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday, Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs., Jan., April, August and Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Canadian Pacific will this spring start 50 towns on the lines of its branch railways in Saskatchewan and Alberta, which were built last fall.

The trunk lines, like the roads west of Chicago, have decided to comply with the requirements of the recent decision of the Interstate Commerce Commission, and withdraw all propositions to increase freight rates.

The Delaware, Lackawanna & Western has withdrawn from the agreement under which the railways leading west from New York City pool the immigrant traffic to western points, and there is much talk of a possible disruption of the pool and consequent cutting of rates.

The package express service from Philadelphia to suburban points on the Philadelphia & Reading, which has been handled for the past twenty-two years by the United States Express Company, will be transferred to the direct control of the railway April 1. The tariffs now in force will be little changed, but the radius of territory to which the package rates will apply has been extended to include 300 stations in all, an increase of about thirty stations.

The Western Passenger Association lines have decided to adopt the uniform baggage rules, making them effective May 1. Under these rules an extra charge will be made for the transportation of any trunk or other piece of baggage whose greatest dimension exceeds 40 in., the extra charge for each additional inch to be equal to the charge for 10 lbs. excess baggage.

The Railway Business Association has published in its Bulletin number 6 a story of the freight rate advance cases, written by its secretary, Frank W. Noxon, under the title "The Rate Decision and Railway Credit." Mr. Noxon's review of the cases was intended to be entertaining as well as instructive, and it is both to a marked degree. It is an unbiased and very interesting abstract of and commentary for the testimony and the decisions.

The Chesapeake & Ohio is understood to have made a contract, running about two years, under which coal from mines on the line of the Chesapeake & Ohio, destined for Lake Erie, will be carried over the Norfolk & Western, from Kenoova to Columbus. From Columbus the coal will go by the Hocking Valley. This arrangement will probably continue until the Hocking Valley shall have been double-tracked, so as to be able to take these shipments direct from the Chesapeake & Ohio.

Railway officers in Chicago have been advised that the Interstate Commerce Commission has changed its ruling regarding the issuance of free or reduced transportation to employees on private or special cars which are not the property of the common carriers. The commission held in a former ruling that free or reduced transportation could not in such cases be given. It has more recently ruled that where the employees are necessary to the operation of these cars they may be regarded as train employees.

For about a year Mr. Anderson, of the National Claims Bureau, New York, and R. J. Donovan, also of New York, have been engaged in a suit before the Interstate Commerce Commission endeavoring to get lower express rates to and from England. The commission has ordered a reduction of 25 per cent. to and from New York and Brockton, Mass., Whitman, Taunton, etc., effective February 6, applying, however, only on boat and rail line shipments. The rate was formerly $1 per 100 lbs. by rail, or rail and water. To secure the reduced rate of 75 cents, packages must be marked "boat and rail."

Complying with an order of the New Jersey Public Utilities Commission, the Pennsylvania Railroad has reported relative to passenger train service on the New York division, answering a complaint that local trains were retarded through discrimination in favor of express trains for the month of February, the records show that of the 2,499 trains arriving at Jersey City 92 per cent. made the schedule. Forty of those late were express and sixty-eight were local trains. Thirty-one locals were de-

layed because the right of way was given to through trains. The longest delay was 12 minutes; there were two delays of 10 minutes, and the others averaged about 5 minutes.

Commissioner Clark of the Interstate Commerce Commission took testimony at Chicago last week in the case brought by T. H. Sinclair & Company, meat packers at Cedar Rapids, Iowa, in which it is alleged that the railways discriminate against this concern in favor of the large meat packers in the rates on dressed meats. Sidney E. Sinclair, president of the company, in his testimony pointed out that while the rate on dressed meat from Omaha, Neb., and St. Joseph, Mo., to Chicago is 23½ cents per 100 lbs., this company has to pay 11 cents per 100 lbs. to transport live hogs to its plant at Cedar Rapids and a rate of 13½ cents per 100 lbs. on the dressed product to Chicago, a total of 24½ cents.

Walter E. McCormick, attorney for ten independent salt companies, has forwarded a petition to the Interstate Commerce Commission alleging that 175 railways are giving excessive divisions of through rates to the Michigan, Indiana & Illinois steamship line, which is controlled by the Morton Salt Company and to the Ludington Transportation Company, controlled by the Stearns Salt and Lumber Company of Ludington, Mich. It is alleged that the control of these boat lines by the large salt companies makes these excessive divisions equivalent to rebates to the controlling companies. The case is really one between the independent and the large salt companies, as many railway men concede that the allowances given are excessive.

Traffic Club of Chicago.

The Traffic Club of Chicago will hold its annual meeting at the La Salle Hotel on March 28, when the election of officers for the ensuing year will take place. The nominating committee suggests the following names: For president, Frank P. Eyman (Chicago & North Western); first vice-president, F. B. Montgomery (International Harvester Co.); second vice-president, V. D. Fort (Illinois Central); third vice-president, W. D. Hurlbut (Wisconsin Pulp & Paper Mfg. Co.); secretary, Guy S. McCabe (Pennsylvania Co.); treasurer, John H. Grace (Great Northern); directors for two years, John T. Stockton (Jos. Stockton Transfer Co.); L. T. Jamme (Union Transfer Co.), W. J. Lynch (New York Central), L. Richards (Quaker Oats Co.).

Special Tourist Car Trains on Union Pacific.

The Union Pacific will run special trains composed of tourist cars from Omaha to the Pacific coast on March 11, 12 and 13, and April 8, 9 10 and 11, for the accommodation of colonist traffic. The tourist cars will originate on the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the Chicago Great Western, and the Illinois Central, mainly at Chicago. They will leave Chicago on various trains on these roads the day before they are to be taken out of Omaha by the Union Pacific. Usually during the first few days of the period during which colonist rates to the Pacific coast have been in effect, the Union Pacific has had to handle a large number of tourist cars on its various trains. It was decided that it would be more economical for the road and more satisfactory to its patrons if these cars were consolidated into solid trains and run through on fast schedules. The schedule will be eight hours faster than tourist service previously afforded. The trains will leave Omaha at about 5 p. m., and will be en route two days and three nights, arriving at San Francisco at 8 a. m on the third day, at Los Angelos at 2:30 p. m. of the third day, and at Portland at 11:15 a. m. of the third day. It would be practicable to make the run in two days and two nights, but it is felt that this would not be satisfactory to the travelers, in as much as it would land them in San Francisco and Portland at night.

It was originally planned to put lunch or cafeteria cars in service on the Union Pacific for the accommodation of the tourist-car passengers, but the cars could not be got ready in time, and, in consequence, each of these special tourist trains will have a dining car in which meals will be served at popular prices. A meal consisting of ham, or bacon and eggs, potatoes, butter and bread will be served for 30 cents. If passengers choose to carry their own provisions, they may get to use with them coffee, fruit, etc., in the dining cars at low prices. The railway rates charged on these trains will be the regular colonist rates of $33 from Chicago, $32 from St. Louis, and $25 from Omaha, and the tourist sleeping car rates will be the usual rates of $7 from Chicago, $6.50 from St. Louis, and $5.75 from Omaha.

President Finley Before the Richmond Chamber of Commerce.

Believing that the highest degree of prosperity can be brought to the south by a full utilization of southern resources, it is the policy of the management of the Southern Railway Company to encourage, in every way that it properly can, diversification in agriculture and in manufacturing. Bearing in mind that the south has a great economic advantage in its practical monopoly of producing the cotton supply of the world, the management of the company is co-operating with the United States Agricultural Department and the agricultural authorities of the several states to encourage the more general adoption of those methods of growing cotton which will result in larger average yields per acre. The effect of this will be to enable our section to supply the increasing demand of the world for cotton, and, at the same time, permit our farmers to devote part of their lands to other crops, particularly corn, and to live stock growing.

The industrial development of the south is being built up on the solid foundation of the manufacturing of southern raw materials. Formerly by far the greater proportion of such materials were shipped out of our section to become the basis of profitable industries elsewhere. To a constantly greater extent are now being put through at least the first processes of manufacture in the south, and our people are adding the profits of these industries to the profits of producing the raw materials. The next great step forward, and one which the management of the company is constantly urging upon the southern people, is the more general development of secondary industries which will use as their raw materials the products of the primary industries of the south.

Notwithstanding the great progress that has been made in recent years in the use of structural steel and of reinforced concrete, the demand for forest products in the United States still continues at a rate in excess of the annual growth of our forests. It follows that any state having considerable areas of timber lands possesses a natural resource of great and constantly increasing value. A practical problem confronting the people of such a state is that of so using this resource as to obtain the greatest benefits from it. In the European countries it has been demonstrated that forest lands can be made the sources of continued income, and, at the same time, be preserved as sources of wealth for future generations. I believe the same results can be accomplished in the United States, and that the owners of considerable tracts of wood lands will find it profitable to practice forest conservation by cutting only the mature timber and insuring a constant reproduction of the more valuable species.

Consideration of the relation of the Southern Railway Company to Virginia should not be narrowed to its relation as a carrier only of those things that are produced and also consumed within the state. In measuring its relations to Virginia it should always be kept in mind that it furnishes a highway, by means of direct transportation over its own rails, to the wide markets of the south for the agricultural, industrial, and commercial interests of your state. It brings to your manufacturers the raw materials of other states. Through the extensive industrial development on its lines in this and other States it furnishes a market for a large proportion of the coal mined on the lines of other railways in Virginia. Furthermore, through its direct touch with the coal development of southwestern Virginia, it markets the production of the operators in that region in connection with the steam and domestic requirements of the south and also will afford them an opportunity for export shipments.

The Southern Railway Company is a citizen of Virginia. As a citizen, owning, maintaining, and operating a great property employed in a public service, it is vitally interested in the governmental policies of the state. While abstaining from political activities, in the sense of securing, or endeav-

oring to secure, the success of men or of parties, it is nevertheless its right, as a citizen and a property owner, to be heard in argument or in protest before the bar of public opinion on all matters affecting its interests and its public relations. It stands before the law on an equal footing with every other citizen of Virginia, and is entitled to the same protection by the law and by public opinion that is accorded to all its fellow citizens. I have no fear that the enlightened public opinion of Virginia will not always recognize this.

As a result of the intimate relations between the interests of the people of the state and the interests of its railways, and of the degree to which these relations may be affected beneficially or injuriously by governmental policies, it is of the highest importance that railway officials and employees on the one hand, and the general public on the other hand, should understand the economic principles underlying these relations. For this reason I believe that those of us who are engaged in the management and operation of the railways of the United States should study these matters closely and should embrace every proper opportunity to present the case of the railways to our fellow citizens. We may do so, I believe, with full confidence in the fairness and justice of the American people and with the assurance that the ultimate effect of those policies which are fair and just to the railways and which encourage investments in railway enterprises will be beneficial to all of the people. As a result of the general discussion of these matters within the past few years, they are already coming to be better understood, and I believe that, in our section, at least, we may look forward to an era in which the railways and the people, working together in harmonious co-operation, will unite in the upbuilding of a greater and more prosperous south.

Crop Indications.

The crop reporting board of the Department of Agriculture estimates that the quantity of wheat on farms, March 1, 1911, was about 179,690,000 bushels, or 25.8 per cent. of the 1910 crop, against 173,344,000 bushels, or 23.5 per cent., of the 1909 crop on farms March 1, 1910, and 154,031,000 bushels, or 23.3 per cent., the average for the past ten years. About 54.5 per cent. of the crop will be shipped out of the counties where grown, against 59.3 per cent. of the 1909 crop, and 57.0 per cent., the average of the past ten years so shipped.

The quantity of corn on farms March 1, 1911, was about 1,265,634,000 bushels, or 40.5 per cent. of the 1910 crop, against 1,050,865,000 bushels, or 37.9 per cent., of the 1909 crop on farms March 1, 1910, and 953,100,000 bushels, or 38.3 per cent., the average for the past ten years. About 22.2 per cent. of the crop will be shipped out of the counties where grown, against 23.1 per cent. of the 1909 crop and 20.7 per cent., the ten-year average so shipped. The proportion of the total 1910 crop which is merchantable is about 86.4 per cent., against 82.6 per cent. of the 1909 crop and 83.6 per cent., the ten-year average.

The quantity of oats on farms March 1, 1911, was about 421,535,000 bushels, or 37.4 per cent. of the 1910 crop, against 363,159,000 bushels, or 36.1 per cent., of the 1909 crop on farms March 1, 1910, and 317,985,000 bushels, or 36.4 per cent., the average for the past ten years. About 31.2 per cent. of the crop will be shipped out of the counties where grown, against 32.7 per cent. of the 1909 crop, and 28.1 per cent., the ten-year average.

The quantity of barley on farms March 1, 1911, was about 31,062,000 bushels, or 19.1 per cent. of the 1910 crop, against 41,220,000 bushels, or 24.2 per cent., of the 1909 crop on farms March 1, 1910. About 50.4 per cent. will be shipped out of the counties where grown, against 51.7 per cent. of the 1909 crop.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended tariffs presented by the Chicago & Alton, naming allowances to be granted to the Manufacturers Railroad of St. Louis. The allowances were to have gone into effect on March 17, but are now suspended until May 1, pending an investigation.

The commission has announced that applicants for relief from the long and short haul provision of the Interstate Commerce law—the fourth section—as regards passenger fares must if possible relieve the situation themselves by readjustment of tariffs. In order to give the carriers ample time to make the suggested readjustments, the commission orders:

First—That not later than July 1, 1911, all carriers must have on file tariffs of fares between points upon their individual lines which observe the rule of the fourth section, except in so far as a departure has been authorized by specific orders of the commission. In all cases where the carrier intends to insist upon charging a fare in disregard of the rule of the fourth section it must, by April 1, 1911, file with the commission a written statement, pointing out the specific fares upon which it will insist, or it may file a new application covering only these fares.

Second—Not later than December 1, 1911, all carriers must have on file joint passenger tariffs which observe the rule of the fourth section, except as relieved by specific orders of the commission, in case of all fares within the several passenger [association] territories. If carriers intend to insist upon maintaining joint fares within these territories which disregard the rule of the fourth section, they must, on or before May 1, 1911, file a statement, etc.

Third—On March 1, 1912, all the passenger tariffs, both joint and individual, of all carriers on file or in effect must observe the rule of the fourth section, except as relief has been granted by specific orders of the commission. If any carriers intend to insist, etc., they must by June 1, 1911, file with the commission a statement, etc.

Demurrage Charges Reasonable.

Riverside Mills v. Charleston & Western Carolina et al. Opinion by the commission:

On account of damage to complainant's mill and stock, occasioned by flood, complainant was unable to receive and unload promptly inbound shipments, although carriers were in a position to make deliveries. Nevertheless, the assessment of demurrage charges was not unreasonable. (20 I. C. C. 153.)

Exception to Cheapest Route Ruling.

Crescent Lumber Co. v. Illinois Central et al. Opinion by the Commission:

Two routes, over which the same rate applied, were available from points of origin to destination. Over one of said routes reconsignment in transit was permitted by proper tariff publication, but such reconsignment was not permitted over the other route. In the absence of routing instructions by the shipper, or notice that its shipments were to be reconsigned in transit, the initial carrier is not liable in damages for failure to forward the traffic over the route via which the reconsignment privilege was available. (20 I. C. C., 228.)

The Sugar Lighterage Question at New York Settled.

Federal Sugar Refining Co. v. Baltimore & Ohio et al. Opinion by Commissioner Harlan:

A carrier is not warranted under section 15 of the act in making an allowance to one shipper who provides a facility and performs a service in the transportation of his own property, while refusing a similar allowance to another shipper, competing in the same markets and in the same line of business, who provides a similar facility and performs the same service in the transportation of his property. The allowances paid by the defendants on the sugar brought by Arbuckle Brothers on floats and lighters to their regular freight stations on the Jersey shore, no allowances being paid to complainant on sugar brought by it on lighters to the same stations, result in inequalities, preferences, and discriminations and are unduly prejudicial to the complainant as a shipper over the defendants' lines in competition with Arbuckle Brothers in the same markets. The fact that Arbuckle Brothers operate their dock in Brooklyn as a terminal for the defendants does not justify an allowance to them for lightering their sugar to the regular stations of the defendants on the Jersey shore so long as an allowance to the complainant for lightering its sugar to the same stations from Pier 24 is refused. A receiving station operated for carriers by a competitor in the same line of business is not a reasonable facility of transportation to offer a shipper. (20 I. C. C., 200.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1910. (SEE ALSO ISSUES FEBRUARY 10, 17, 24 AND MARCH 3.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta & West Point	93	$59,596	$44,151	$113,239	$10,922	$17,357	$4,804	$32,198	$4,964	$70,245	$42,994	—$70	$5,672	$37,252	$9,309
Atlantic & St. Lawrence	167	109,177	23,008	142,522	15,034	32,363	4,651	64,549	4,973	121,570	20,952	.....	8,452	12,500	—24,632
Atlantic City	167	56,327	40,006	101,784	27,155	14,128	1,285	67,433	841	110,842	—9,058	—5,003	7,000	—21,061	364
Buffalo & Susquehanna R. R.	265	139,691	9,138	154,577	22,647	32,394	1,866	61,805	5,911	124,623	29,954	.....	2,600	27,354	— —
Buffalo & Susquehanna Ry.	91	35,862	6,975	44,607	5,577	29,156	580	24,202	2,450	61,965	—17,358	—11	1,400	—18,769	— —
Butte, Anaconda & Pacific	46	75,781	6,092	87,439	6,075	20,366	587	49,411	2,932	79,371	8,068	.....	1,614	6,454	—10,734
Chicago, Peoria & St. Louis	255	115,105	23,471	145,408	20,661	37,614	7,137	78,491	6,017	149,920	—4,512	.....	4,500	—9,012	—24,486
Cincinnati & Muskingum Valley	148	70,883	19,324	96,241	12,591	12,373	1,803	38,529	1,529	66,825	29,416	.....	6,190	23,226	—1,361
Cincinnati Northern	246	83,567	17,111	106,942	13,254	22,153	3,960	44,166	2,918	86,451	20,491	.....	6,605	13,886	—11,425
Denver, Northwestern & Pacific	215	64,121	11,930	80,651	12,888	12,043	1,002	34,097	3,300	63,330	17,321	.....	3,000	14,321	13,173
Detroit & Mackinac	360	56,353	26,297	88,715	7,985	17,814	2,031	31,681	3,138	62,649	26,066	—77	11,313	14,676	20,836
Detroit, Grand Haven & Milwaukee	191	124,611	42,371	190,635	20,058	21,694	6,788	90,873	5,509	144,922	45,713	—114	3,009	42,590	—10,040
Duluth & Iron Range	191	95,301	31,192	136,509	—50,544	41,858	527	206,432	40,207	238,480	—101,971	—3,915	47,349	—153,235	14,241
Duluth, Missabe & Northern	293	79,219	41,414	125,845	166,148	82,852	1,773	69,138	35,998	355,909	—230,064	—2,091	80,642	—312,797	—176,181
Fort Worth & Rio Grande	196	59,954	31,153	97,307	14,736	10,938	3,321	50,129	3,800	82,924	14,383	.....	416	13,967	—8,281
Houston East & West Texas	191	83,991	35,132	125,298	21,235	9,734	1,533	41,295	3,948	77,745	47,553	.....	4,094	43,459	1,208
Indianapolis Southern	179	80,087	19,465	103,305	15,035	15,360	2,070	43,681	1,788	77,934	25,371	.....	4,000	21,371	—5,070
Lehigh & Hudson River	96	129,259	3,563	134,414	11,852	20,650	1,067	43,101	5,154	81,824	52,590	.....	3,100	49,490	9,576
Louisiana & Arkansas	255*	98,190	19,607	122,526	15,704	16,684	2,509	34,162	4,800	73,859	48,667	.....	2,825	45,842	6,025
Louisville, Henderson & St. Louis	200	67,718	32,899	107,016	22,108	11,726	7,918	41,727	2,537	86,016	21,000	241	2,667	18,574	—13,858
Midland Valley	324	82,163	40,343	128,387	21,874	16,305	2,489	35,047	10,663	86,378	42,009	1,138	847	42,300	5,732
Nevada Northern	165	125,097	12,580	141,586	5,104	10,913	265	30,564	3,720	50,567	91,019	.....	10,273	80,746	13,369
New York, Chicago & St. Louis	561	839,875	113,659	991,800	116,075	105,661	45,115	430,806	14,745	712,402	279,398	—2,159	14,820	262,419	—72,011
Pecos & Northern Texas	296†	110,632	33,137	148,950	19,142	27,596	2,361	44,710	4,452	98,261	50,689	.....	1,745	48,944	35,295
Pittsburgh, Shawmut & Northern	240	108,831	8,393	119,072	12,196	30,819	985	49,786	5,112	98,898	20,174	.....	1,559	18,615	—8,587
Richmond, Fredericksburg & Potomac	83	91,598	70,776	187,423	15,886	22,674	2,612	68,078	5,938	115,188	72,235	.....	200	72,035	7,658
St. Louis, San Francisco & Texas	243‡	76,042	30,907	117,747	22,979	15,752	2,890	63,208	3,961	108,790	8,957	.....	—779	9,736	31,672
Southern Indiana	236	111,409	17,340	130,337	13,366	46,008	1,661	54,833	125	115,993	14,344	816	6,928	8,232	—24,779
Southern Kansas of Texas	125	103,129	18,242	126,044	15,105	31,164	2,145	43,346	4,293	96,053	29,991	.....	—1,611	31,602	—7,060
Spokane International	141	60,606	19,090	83,621	12,574	5,883	2,407	28,058	3,048	51,970	31,651	.....	—1,300	32,951	—12,871
Texas Central	296§	68,665	38,162	114,643	10,569	12,009	1,438	33,220	4,993	62,229	52,414	428	7,660	45,182	2,468
Toledo, Peoria & Western	248	72,882	38,329	116,049	18,300	20,790	2,008	43,884	3,266	88,248	27,801	.....	5,000	22,801	5,828
Virginia & Southwestern	242¶	106,334	13,661	124,163	13,258	30,244	1,353	42,764	4,386	92,005	32,158	.....	4,524	27,634	7,826
Washington Southern	36	29,742	36,612	88,785	11,309	10,095	1,041	34,925	2,395	59,765	29,020	.....	2,345	26,675	—3,360
Western Ry. of Alabama	133	70,387	44,772	125,600	18,319	19,465	5,072	32,573	5,129	80,558	45,042	—267	6,580	38,195	7,011
Wichita Falls & Northwestern	228‖	103,791	30,129	135,483	9,827	8,054	1,661	32,987	2,064	54,593	80,890	.....	1,350	79,540	67,006
SIX MONTHS OF FISCAL YEAR 1911.															
Atlanta & West Point	93	$307,654	$244,822	$605,117	$74,145	$105,113	$29,714	$172,018	$27,600	$408,590	$196,527	$889	$27,719	$169,697	$25,530
Atlantic & St. Lawrence	167	433,894	168,573	663,284	160,040	135,370	24,744	303,287	19,674	643,115	20,169	.....	50,714	—30,545	—148,900
Atlantic City	167	395,073	752,488	1,201,396	153,110	70,999	18,828	543,545	8,283	794,765	406,631	—32,104	42,000	332,527	64,802
Buffalo & Susquehanna R. R.	265	708,503	49,699	791,349	159,719	147,258	9,747	274,445	30,774	621,943	169,406	.....	13,671	155,735	— —
Buffalo & Susquehanna Ry.	91	319,702	67,151	403,639	48,681	168,757	5,003	162,782	19,357	404,580	—941	.....	10,329	—11,270	— —
Butte, Anaconda & Pacific	46	491,142	57,217	583,147	75,583	100,908	3,772	249,321	12,200	441,784	141,363	.....	12,613	128,750	—40,386
Chicago, Peoria & St. Louis	255	725,115	176,603	946,582	143,463	192,029	42,738	417,098	34,285	829,613	116,969	.....	27,000	89,969	—86,989
Cincinnati & Muskingum Valley	148	355,551	129,927	517,364	72,849	71,284	12,447	210,222	8,866	375,668	141,696	.....	26,284	115,412	—43,473
Cincinnati Northern	246	539,841	129,763	704,311	102,956	143,273	21,834	259,196	17,898	545,157	159,154	.....	29,105	130,049	—39,896
Denver, Northwestern & Pacific	215	388,003	216,397	634,860	75,642	81,546	14,896	195,819	20,826	388,729	246,131	.....	18,000	228,131	41,280
Detroit & Mackinac	360	381,984	178,253	597,413	60,379	95,376	12,682	193,761	16,107	378,305	219,108	2,972	52,977	169,103	34,197
Detroit, Grand Haven & Milwaukee	191	586,104	319,529	1,048,770	158,573	122,613	37,618	483,259	26,787	828,850	219,920	—173	18,054	201,693	—92,839
Duluth & Iron Range	191	4,857,424	159,661	5,072,579	438,577	368,746	3,008	989,963	85,913	1,886,207	3,186,372	13,340	246,400	2,953,312	—1,196,820
Duluth, Missabe & Northern	293	7,178,357	251,086	7,472,805	670,107	596,098	10,281	1,031,755	95,786	2,404,027	5,068,778	49,744	378,563	4,739,959	—1,425,680
Fort Worth & Rio Grande	196	322,774	168,992	528,834	97,297	60,588	20,718	232,201	22,957	433,761	95,073	.....	12,828	82,245	—7,117
Houston East & West Texas	191	476,273	190,826	706,233	124,557	58,730	10,145	226,674	23,796	443,002	262,331	.....	20,719	241,612	—5,765
Indianapolis Southern	179	460,246	134,554	619,662	128,744	88,375	15,765	223,167	10,574	466,625	153,037	.....	23,861	129,176	8,086
Lehigh & Hudson River	96	686,557	26,278	724,059	87,045	96,744	7,168	229,975	22,767	443,699	280,360	.....	18,600	261,760	3,616
Louisiana & Arkansas	255*	593,169	101,610	723,035	118,804	100,837	14,902	191,757	26,931	453,231	269,804	.....	15,750	254,054	23,036
Louisville, Henderson & St. Louis	200	383,974	218,722	642,653	157,754	69,394	30,595	204,829	16,564	479,136	163,517	2,193	16,000	149,710	—15,270
Midland Valley	324	432,853	207,227	677,779	122,600	103,902	12,990	188,352	41,349	469,193	208,586	6,899	32,853	182,633	10,630
Nevada Northern	165	657,675	73,392	755,625	41,944	76,227	1,934	156,071	22,345	298,521	457,104	.....	26,007	431,097	—22,720
New York, Chicago & St. Louis	561	4,699,122	879,818	5,789,353	666,051	744,259	304,733	2,285,943	94,798	4,095,784	1,693,569	—9,309	187,320	1,496,940	—391,994
Pecos & Northern Texas	296†	645,212	168,520	849,932	108,773	135,412	12,647	265,856	27,660	550,348	299,584	.....	16,764	282,820	—23,130
Pittsburgh, Shawmut & Northern	240	666,335	58,039	735,692	120,769	181,527	7,463	261,147	27,832	598,738	136,954	.....	9,427	127,527	—5,486
Richmond, Fredericksburg & Potomac	83	564,714	392,311	1,092,979	153,400	131,085	16,984	379,827	34,671	715,967	377,012	.....	1,200	375,812	44,480
St. Louis, San Francisco & Texas	243‡	394,937	154,573	583,196	114,245	79,437	17,312	303,326	22,585	536,905	46,291	.....	6,493	39,798	49,183
Southern Indiana	236	756,069	111,050	878,683	95,602	238,976	9,771	283,873	23,760	651,982	226,701	.....	41,571	185,130	—69,407
Southern Kansas of Texas	125	608,942	109,815	747,388	89,899	151,943	12,243	236,790	25,371	516,246	231,142	.....	8,956	222,186	—78,484
Spokane International	141	421,421	131,510	583,808	100,290	32,933	14,439	164,515	19,896	332,073	251,735	.....	16,627	235,107	27,962
Texas Central	296§	316,605	198,601	556,407	83,209	59,776	8,974	174,785	24,143	350,887	205,520	2,113	20,584	187,049	3,554
Toledo, Peoria & Western	248	398,519	245,964	679,752	111,501	127,704	13,827	247,129	19,126	519,287	160,465	.....	30,000	130,465	1,828
Virginia & Southwestern	242¶	573,689	81,012	677,376	78,036	145,367	8,705	201,722	21,398	455,228	222,148	.....	27,142	195,006	15,651
Washington Southern	36	197,699	203,998	529,117	67,624	48,016	7,150	190,309	14,740	327,839	201,278	.....	14,069	187,209	14,304
Western Ry. of Alabama	133	357,590	234,195	645,556	104,660	114,623	30,502	169,017	30,649	449,451	196,105	1,298	26,035	168,772	10,034
Wichita Falls & Northwestern	228‖	459,158	129,164	601,391	39,230	29,779	7,548	130,730	12,065	219,352	382,039	.....	8,100	373,939	298,395

Mileage operated on December 31, 1909.—* 225 miles; † 152 miles; ‡ 132 miles; § 268 miles; ¶ 188 miles; ‖ 33 miles; — indicates Deficits, Losses and Decreases.

STATE COMMISSIONS.

The Minnesota Railway Commission will begin an investigation of the reasonableness of the express rates in that state in St. Paul on March 29.

J. H. Hale, of South Glastonbury, has been appointed a member of the Connecticut State Railroad Commission, in place of William O. Seymour, deceased.

The Wisconsin Railway Commission has issued an order requiring the Chicago & North Western, Chicago, Milwaukee & St. Paul and Green Bay & Western to reduce the rate on bituminous coal from Milwaukee, Sheboygan, Manitowoc and Green Bay to points in the Fox River valley paper mill district, from 75 to 65 cents a ton. The order was issued on petition of thirty paper and pulp manufacturers. The commission refused the petition of manufacturers of the Wisconsin River Valley, of a like nature, and decided that the existing tariff of $1 a ton was equitable and not excessive.

COURT NEWS.

Iowa Law Regulating Employees' Insurance Sustained.

The decision of the Supreme Court of the United States, sustaining the law of Iowa, forbidding railway companies to require from members of relief associations an agreement that if they accept the benefits of the association they will not sue the company for damages, was briefly noticed in the *Railway Age Gazette* of February 24, page 366. The suit was an appeal from a decision in which C. L. McGuire recovered $2,000 from the Chicago, Burlington & Quincy for an injury. The law, which was passed in 1898, says, in substance, that railways shall be liable for damages due to neglect of agents and no contract which restricts such liability shall be binding; also that the acceptance of relief, insurance, benefit or indemnity shall not constitute a defense to any cause for action; but settlements made between the employer and the employee after the injuries have been received, are not forbidden.

The decision is by Justice Hughes. He does not discuss the merits or demerits of the relief plan, as the only question before him is whether the statute is repugnant to the federal constitution. It is clearly within the competency of a legislature to prescribe the measure of responsibility of a railway corporation for injuries to employees. The legislature, provided it acts within its constitutional authority, is arbiter of the public policy for the state. If dealing only with the common law, a court might uphold or condemn contracts according to its own view of public policy, but where the legislature has acted, the court must yield to the legislature's will, if expressed in accordance with the organic law. The legislature has not placed any obstacle in the way of insurance, nor does it forbid a settlement of damages which an injured employee may make fairly after an injury is received. The statute merely nullifies a stipulation, made in advance of an injury, that the subsequent acceptance of benefits shall constitute full satisfaction of claims for damages.

This, it is claimed, violates the constitutional right to make contracts; but freedom of contract is a qualified, not an absolute right. The guaranty of liberty does not withdraw from the legislature the power to provide restrictive safe-guards. The government may rightfully restrain some individuals from all contracts as well as all individuals from some contracts. Decisions are here quoted sustaining the right of the federal government to regulate matters of national concern and of the states to regulate hours of labor, the sale of intoxicating liquors, the sale of cigarettes without license, the making of contracts for options on grain, the employment of women in laundries more than ten hours a day, etc. Where legislative action is arbitrary and has no reasonable relation to a purpose which it is competent for the government to effect, it is unconstitutional. But the court in deciding the question of power must not confuse that with considerations of policy. Whether the law is wise or unwise is to be settled by the legislature. If the legislature may require the use of safety devices, it may prohibit agreements to dispense with them. If it may restrict employment in mines to eight hours a day, it may make contracts for longer service unlawful. The interference with the right to contract is incidental to the main object of the regulation.

Employers and employees often do not stand on an equality. Employers may lay down rules which the employees are practically constrained to obey. The self-interest of the employer is often an unsafe guide and the legislature may properly interpose its authority. The state may have a duty to protect a man against himself. It retains an interest in his welfare, however reckless he may be. In the Iowa law under review, the legislature extended the liability of the common law by abolishing the fellow-servant rule. Having authority to establish this regulation, it is manifest that the legislature was also entitled to insure its efficacy by prohibiting contracts in derogation of its provisions. In the exercise of this power the legislature was not limited with respect either to the form of the contract, or the nature of the consideration, or the absolute or conditional character of the engagement. It was as competent to prohibit contracts, which on a specified event, or in a given contingency should operate to relieve the corporation from the statutory liability which would otherwise exist, as it was to deny the validity of agreements of absolute waiver. If the legislature had the power to prohibit contracts limiting the liability imposed, it certainly could include in the prohibition stipulations of that sort in contracts of insurance, relief, benefit or indemnity, as well as in other agreements.

But if the legislature could specifically provide that no contract for insurance relief should limit the liability for damages, upon what ground can it be said that it was beyond the legislative authority to deny that effect to the payment of benefits, or the acceptance of such payment, under the contract? The asserted distinction is sought to be based upon the fact that under the contract of membership the employee has an election after the injury. But this circumstance, however appropriate it may be for legislative consideration, cannot be regarded as defining a limitation of legislative power. The power to prohibit contracts, in any case where it exists, necessarily implies legislative control over the transaction, despite the action of the parties. The payment of benefits is the performance of the promise to pay contained in the contract of membership. If the legislature may prohibit the acceptance of the promise as a substitution for the statutory liability, it should also be able to prevent the like substitution of its performance.

Whether the policy declared by the statute in question is approved or disapproved, it cannot be said that the legislative power has been exceeded, either in defining the liability or in the means taken to prevent the legislative will, with respect to it, from being thwarted.

It was claimed that this act denies the equal protection of the laws because there are members of the relief association to whom it does not apply; but, says the decision, it was entirely competent for the legislature in enacting the prohibition, for the purpose of securing the enforcement of the liability it had defined, to limit it to those cases in which the liability arose.

Life Passes Unlawful.

The Supreme Court of the United States has reversed the decision of the Court of Appeals of Kentucky, in the case of Mottley and wife, who had a contract for a life pass throughout the lines of the Louisville & Nashville, but who were deprived of the pass after the amendment of the Interstate Commerce Law in 1906, because the road held that to continue it would be contrary to the law.

The decision is by Mr. Justice Harlan. Mottley and his wife were injured in a collision in 1871, and the contract for free rides was given in liquidation of damages. The first question is, whether Congress in adopting the law in 1906 intended to invalidate a contract like this which had been running 35 years; it being admitted that the contract was lawful at the time it was made. The Interstate Commerce Law, as passed in 1887, prohibited the transportation of any person for "a greater or less compensation" than was exacted from other persons. The amendment in 1906 made this read "a greater or less *or different* compensation." It cannot be supposed that Congress introduced the two additional words without a distinct purpose. The aim was to cure a defect in the law; to prohibit carriers from receiving compensation except as indicated in their published tariffs. The Louisville & Nashville therefore, could not lawfully accept from Mottley any compensation dif-

ferent *in kind* from that mentioned in its published tariffs. And it cannot be doubted that the tariff rates were payable only in money. They cannot be paid in any other way without producing the utmost confusion and defeating the policy of Congress. It would be of no avail for a prospective passenger to examine the published tariffs if the rates therein could be disregarded in special cases by the acceptance of property of various kinds and of such value as the parties immediately concerned chose to put upon it. A ruling of the Interstate Commerce Commission to this effect is quoted with approval. If a person reading a tariff cannot be sure that it tells him what will be exacted from all other persons, the door is opened to the grossest frauds upon the law.

Congress in passing the law made exceptions; certain classes might receive free transportation; but it did not make any exception for existing contracts. On the contrary, the prohibition applied to "any" carrier for "any" services. Congress having made a number of exceptions, the court cannot add an exception which Congress forbore to make.

It is further said that Mottley's pass was not strictly a free pass, as the railway received a valuable consideration; but this argument is not sound, for the pass would be illegal by reason of not being paid for in money.

On the question of whether Congress in 1906 may thus invalidate a contract made in 1871, innumerable past decisions settle the right of Congress to regulate commerce among the states, with no restrictions except those found in the constitutions. In numerous similar cases heretofore decided, the court has held that contracts must be assumed to have been made subject to the contingency that the law might be changed. For example, the Union Bridge Company (204 U. S. 364,400) had lawfully erected a bridge, but to facilitate navigation the government afterward compelled the bridge company, at its own cost, to make certain changes and alterations. The bridge company, says the court, had erected the bridge subject to the possibility that Congress might at some future time, when the public interests demanded, take action to protect navigation. No obligation of a contract can extend to the defeat of legitimate governmental authority. That the exercise of constitutional power by Congress may be hampered by contracts previously made between individuals is inconceivable. The framers of the constitution never intended any such state of things to exist. There can in the nature of things be no vested rights in an existing law which precludes its change or repeal, nor vested rights in the omission to legislate on a particular subject. If the legislature had no power to alter its police laws when contracts would be affected, then the most important and valuable reforms might be precluded by the simple device of entering into contracts for that purpose.

On the question of whether Mottley may recover damages from the railway, on account of loss of his rights under the contract, the court expresses no opinion.

Exchange of Transportation for Advertising Illegal.

The Supreme Court of the United States on February 20, sustained the circuit court of the northern district of Illinois, in holding illegal a contract between the Chicago, Indianapolis & Louisville, and *Munsey's Magazine,* under which the road for a one-page advertisement was to grant $500 worth of passenger transportation. Suit was brought by the government under the clause of the Interstate Commerce Law which provides that the Interstate Commerce Commission, having reasonable ground to believe that a carrier is carrying passengers at less than the published rates, may ask the circuit court to summarily inquire into the circumstances. The contract was for the year 1907, and the petition alleged that for the first three months the transportation granted by the road amounted to $145.10, while the only compensation received was a quarter-page advertisement, which was valued at $125.

The decision, by Justice Harlan, is based on the same considerations as those in the case of Mottley, above reported. Money has a certain value known to all, while commodities have not. The railway company in its defense, cited an Indiana statute prohibiting free transportation but excepting that issued in payment for printing and advertising, but of course no state enactment can be of any avail as regards interstate commerce, where Congress has taken contrary action.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

The officers of the Jonesboro, Lake City & Eastern, which was recently reorganized, are as follows: R. E. Lee Wilson, president; C. T. Coleman, vice-president and general counsel; Wright H. Smith, vice-president and general manager; Doswell Brown, secretary and general passenger agent, and J. E. Parr, treasurer, all with offices at Jonesboro, Ark.

Charles E. Pugh, first vice president of the Pennsylvania Railroad, having retired, as has been announced in these columns, Samuel Rea, second vice-president, has been elected first vice-president; J. B. Thayer, third vice-president, has been elected second vice-president; Henry Tatnall, fourth vice-president, has been elected third vice-president; W. W. Atterbury, fifth vice-president, has been elected fourth vice-president, and W. H. Myers, general manager, has been elected fifth vice-president, all with offices at Philadelphia, Pa.

Samuel Rea, second vice-president of the Pennsylvania Railroad, has been elected first vice-president, succeeding Charles E. Pugh, whose retirement has been announced in these columns.



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Samuel Rea.

Mr. Rea was born in Hollidaysburg, Blair county, Pa., September 21, 1855. His first position on the Pennsylvania Railroad was in the engineering department in 1871, as a chainman and rodman on the Morrison's Cove, Williamsburg and Bloomfield branches. The panic of 1873 stopping all engineering work, he entered the office of the Hollidaysburg Iron & Nail Company early in 1874. In the spring of 1875, he re-entered the service of the Pennsylvania Railroad on the engineering corps, and was stationed at Connellsville. From 1875 to 1877 he was assistant engineer in the construction of the chain suspension bridge over the Monongahela river in Pittsburgh, and on its completion was appointed assistant engineer of the Pittsburgh & Lake Erie, then in course of construction, with which he remained until the completion of that road. In 1879 he returned to the Pennsylvania system as assistant engineer in charge of the construction of the extension of the Pittsburgh, Virginia & Charleston. From 1879 to 1883, he was the engineer in charge of surveys in Westmoreland county and of the rebuilding of the western Pennsylvania to make it a low-grade freight line. This work was under the direction of J. N. DuBarry. In 1883 Mr. Rea was transferred to Philadelphia as assistant to vice-president DuBarry, with the title of principal assistant engineer, which he held until 1888, when he was made assistant to the second vice-president. In 1889, he resigned to go to Baltimore as vice-president of the Maryland Central, and chief engineer of the Baltimore Belt. In 1891, on account of ill health, he resigned and left Baltimore, doing no active work for a year. After an absence of three years from the Pennsylvania Railroad, Mr. Rea was on May 25, 1892, chosen assistant to the president of that company. On the day of his appointment he left for London, where he made an examination of the railways terminating in the English metropolis, and of the underground railways—then constructed and proposed—and, subsequently, he made a special report thereon. The result of this experience was afterward put to good service on the Pennsylvania Railroad's New York tunnel extension. After the death of vice-president DuBarry in 1892, Mr. Rea was assigned to general construction work then in

progress, the acquisition of right of way and real estate for same, the promotion of all new lines or branches, and the financial and corporate work incident thereto. These duties, with the exception of construction work, have since been discharged by him. On February 10, 1897, he was appointed first assistant to the president, and in June, 1899, following the election of A. J. Cassatt as president, Mr. Rea was elected fourth vice-president. On October 10, 1905, he was advanced to third vice-president, and on March 24, 1909, to second vice-president, and in addition to his former duties was placed in charge of engineering and accounting. Mr. Rea is also second vice-president of the Northern Central Railway, Philadelphia, Baltimore & Washington and West Jersey & Seashore Railway companies, and a director of the Pennsylvania Railroad Company, and many other railway and financial corporations. He is a member of the American Society of Civil Engineers and of the Institution of Civil Engineers of London. He is the author of "The Railways Terminating in London," a comprehensive study based on laborious personal investigation of the physical and financial condition of the English railway system. For many years he was interested in the project to bridge the Hudson river from Hoboken to New York City, and thus establish in the metropolis a terminus for the railways using ferries from the New Jersey side. He was one of the incorporators of the North River Bridge Company, chartered by an act of Congress. The other railways failed to join the Pennsylvania Railroad in the project to bridge the Hudson, and after a very careful examination and report on the entire project by engineering experts, the Pennsylvania Railroad determined to build its own tunnel and terminal in the city of New York. After this plan had been fully approved by President Cassatt and the board of directors of the Pennsylvania, Mr. Rea was given direct charge of the work.

Operating Officers.

Ernest Stenger has been appointed general manager of the St. Joseph & Grand Island, with office at St. Louis, Mo.

E. E. Lillie has been appointed superintendent of car service and telegraph of the Oregon Trunk, with office at Portland, Ore.

W. H. Roberts has been appointed superintendent of the Jonesboro, Lake City & Eastern, with office at Jonesboro, Ark.

W. R. Davidson has been appointed a trainmaster of the Middle division of the Grand Trunk, with office at Hamilton, Ont.

John B. Munson, vice-president of the Georgia, Southern & Florida, has been appointed also general manager, with office at Macon, Ga.

C. L. Bardo, superintendent of the electric division of the New York Central & Hudson River, at New York, has resigned to go to the Lehigh Valley, with office at Bethlehem, Pa.

E. P. Tatum, chief despatcher of the Vicksburg, Shreveport & Pacific, has been appointed trainmaster, with office at Shreveport, La., succeeding C. W. Gable, resigned. L. Pridgen succeeds Mr. Tatum.

J. L. Blake having resigned as general manager and traffic manager of the Fort Dodge, Des Moines & Southern at Boone, Ia., the duties of general manager will be assumed by the vice-president.

R. E. Stanfield has been appointed superintendent of the Macon & Birmingham, with office at Macon, Ga., succeeding O. M. Grady, resigned, and the position of F. W. Scott, master of trains, at Macon, has been abolished.

J. C. Hanrahan, assistant trainmaster of the Pennsylvania Lines West, at New Castle, Pa., has been appointed division operator, with office at New Castle, succeeding F. J. Perry, promoted. J. B. Patterson succeeds Mr. Hanrahan.

Robert V. Massey, division engineer of the New York division of the Pennsylvania Railroad, has been appointed superintendent of the New York, Philadelphia & Norfolk, with office at Cape Charles, Va., succeeding Elisha Lee, promoted.

Simon C. Long, general superintendent of the Western Pennsylvania division of the Pennsylvania Railroad, at Pittsburgh, Pa., has been appointed general manager, with office at Philadelphia, succeeding W. H. Myers, promoted. R. L. O'Donnel, general superintendent of the Buffalo & Allegheny Valley division, at Buffalo, N. Y., succeeds Mr. Long. J. G. Rodgers, assistant to general manager, at Philadelphia, Pa., succeeds Mr. O'Donnel. Elisha Lee, superintendent of the New York, Philadelphia & Norfolk, at Cape Charles City, Va., succeeds Mr. Rodgers. M. Trump, general superintendent of transportation, at Philadelphia, Pa., has been assigned to special duties on transportation problems in connection with the regulations of the national and state railway commissions, with office at Philadelphia. C. M. Sheaffer, superintendent of passenger transportation, at Philadelphia, succeeds Mr. Trump. D. C. Stewart, assistant superintendent of the Pittsburgh division, at Youngwood, succeeds Mr. Sheaffer, and Joseph H. Gumbes, engineer on the Pittsburgh division, at Pittsburgh, succeeds Mr. Stewart.

Traffic Officers.

David H. Street has been appointed traveling freight agent of the Baltimore & Ohio, with office at Philadelphia, Pa.

J. P. O'Donnell has been appointed a commercial agent of the Kansas City, Mexico & Orient, with office at Fort Worth, Tex.

H. D. Harvey has been appointed traveling passenger agent of the Denver, Northwestern & Pacific at Denver, Col., succeeding C. T. Turner, deceased.

W. B. Morgan has been appointed a traveling freight agent of the Central of Georgia, with office at Macon, Ga., succeeding B. P. O. Edwards, resigned.

The title of James Gass, New York State passenger agent of the Wabash Railroad, with office at Albany, N. Y., has been changed to district passenger agent.

H. H. Kamp has been appointed a traveling freight solicitor of the Pittsburgh, Cincinnati, Chicago & St. Louis, with office at Richmond, Ind., succeeding W. H. Phillips, promoted.

C. H. Crooks, general freight and passenger agent of the Fort Dodge, Des Moines & Southern, has been appointed traffic manager, with office at Boone, Iowa, succeeding J. L. Blake, resigned.

M. J. Costello has been appointed a district passenger agent of the Northern Pacific, with office at Cincinnati, Ohio, succeeding J. J. Gartner, traveling passenger agent, resigned to accept service elsewhere.

M. G. Buffington, traveling freight agent of the St. Louis & San Francisco, has been appointed division freight agent, with office at Tulsa, Okla., succeeding W. L. Coleman, resigned to engage in other business.

Charles H. Hagerty, district passenger agent of the Pennsylvania Lines West, at Louisville, Ky., has been appointed an assistant general passenger agent, with office at Louisville, and his former position has been abolished.

H. K. Deale has been appointed a commercial agent of the Georgia, Southern & Florida, with offices at Atlanta, Ga., succeeding W. H. Oliver, resigned, and H. W. Watson has been appointed a traveling freight agent, with office at Cordele, succeeding J. L. Lashley, transferred.

D. Aspland, assistant general agent of the Tonopah & Tidewater and the Bullfrog Goldfield, at Goldfield, Nev., has been appointed general agent, with office at Goldfield, succeeding W. W. Keith, resigned, and the position of assistant general agent at Goldfield has been abolished.

L. C. Shirah, formerly soliciting freight agent of the Georgia, Southern & Florida, and recently in the general passenger department of the Denver & Rio Grande at Denver, Colo., has been appointed soliciting freight and passenger agent of the San Pedro, Los Angeles & Salt Lake, with office at Denver.

W. P. Kenney, assistant traffic manager of the Great Northern at St. Paul, Minn., has been appointed acting general traffic manager, with office at St. Paul, succeeding W. W. Broughton, general traffic manager, resigned to engage in other business. Mr. Kenney will have entire charge over all traffic matters.

E. E. Gibson has been appointed commercial agent in the

freight department of the Missouri Pacific, with office at Lake Charles, La., succeeding J. W. Hailey, resigned. H. C. Young, traveling passenger agent at Pittsburgh, Pa., has had his jurisdiction extended to include the Cleveland territory, excepting the city of Buffalo, N. Y., which is assigned to the general eastern passenger agent at New York City, and the office of traveling agent at Cleveland has been abolished.

Robert A. Chadwick, whose appointment as general freight and passenger agent of the Tennessee Central, with office at Nashville, Tenn., has been announced in these columns, was born February 9, 1869, at Huntsville, Ala., and was educated in the public and private schools of his native town. He began railway work August 1, 1888, with the Memphis & Charleston, now a part of the Southern Railway, remaining with that company until 1900. He was then with the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, for a short time in 1901, and returned to the Memphis & Charleston the same year, remaining with that company until 1902. His next position was in the general freight office of the Georgia Pacific, at Birmingham, which was absorbed by the Southern Railway in 1903. He remained in that position until 1907, when he went with the Alabama Great Southern as chief clerk to the general freight agent, and was later appointed soliciting agent and then assistant freight agent. In November, 1908, he went to Nashville, Tenn., as assistant general freight agent of the Tennessee Central, which position he held at the time of his recent appointment as general freight and passenger agent of the same company.

Harry Judd Phelps, whose appointment as general passenger agent of the Illinois Central and the Indianapolis Southern, with office at Chicago, has been announced in these columns, was born September 3, 1861, at Elmira, N. Y. He was educated in the public schools and at Elmira Academy, and began railway work in July, 1882, with the Illinois Central. He was a telegraph operator until 1887, and was then promoted consecutively to station agent at Onawa, Iowa; ticket agent at Sioux Falls, S. D.; freight and passenger agent at Baton Rouge, La. From November, 1894, to July, 1905, he was city passenger agent and then city passenger and ticket agent at Chicago. His next promotion was to division passenger agent at Dubuque, Iowa, which office he held until the time of his appointment to general passenger agent.



H. J. Phelps.

Eugene Mock, who has been appointed general freight agent of the Midland Valley, with office at Muskogee, Okla., as was previously announced in these columns, was born May 17, 1878, at Coatesville, Mo. He received a common school education, and began railway work in June, 1894, as a messenger for the Keokuk & Western, and he was promoted consecutively to operator, agent, relief agent, relief clerk in various departments, and traveling auditor. In June, 1900, he became a clerk in the accounting department of the Chicago, Burlington & Quincy at St. Joseph, Mo., and six months later went with the St. Joseph & Grand Island at St. Joseph with the same title. He was appointed traveling freight and passenger agent of the Choctaw & Northern, now part of the Rock Island Lines, at Geary, Okla., in April, 1901, and the next year became chief clerk to the division freight agent of the Rock Island at Oklahoma City, Okla. In October, 1902, he was made auditor of the St. Louis & Gulf and the St. Louis, Memphis & Southeastern, and in June, 1904, went with the St. Louis & San Francisco at St. Louis, Mo. He was apopinted chief clerk to the traffic manager of the Midland Valley at Ft. Smith, Ark., in August, 1904, and from February, 1907, until February 13, 1911, when he was appointed to the above position, he was traffic manager of the Oklahoma Coal Operators' Association at McAlester, Okla.

Eugene W. Clapp, who has been appointed assistant general freight and passenger agent of the Southern Pacific and general freight and passenger agent of the Arizona Eastern, with office at Tucson, Ariz., as was previously announced in these columns, was born February 25, 1874, at Memphis, Tenn. He was educated in the public and private schools of Memphis, and spent two years in Webb Brothers' School for Boys, at Belle Buckle, Tenn. He began railway work in October, 1891, as a stenographer to the assistant general superintendent of the Southern Pacific at San Francisco, Cal., and soon afterward was transferred to Tucson, Ariz., as stenographer-clerk to the division superintendent. In November, 1895, he was transferred to train service, and the next year became a ticket clerk at Lordsburg, N. M., where he was promoted to chief clerk and cashier in January, 1897. Six months later he was made agent and assistant trainmaster. He was promoted to traveling freight and passenger agent at San Francisco in November, 1905, and the next year to district freight and passenger agent at Reno, Nev., in charge of Nevada territory and part of California, where he remained until November, 1909. He was then transferred to Fresno, Cal., as division freight and passenger agent, and to San Francisco as chief clerk in the general freight office in August, 1910. In November, 1910, he was appointed general agent of the Sunset Route and the Atlantic Steamship Lines, with office at San Francisco, from which position he has just been promoted.

Engineering and Rolling Stock Officers.

The position of chief engineer of the Macon & Birmingham held by W. C. Shaw, Jr., at Macon, Ga., has been abolished.

G. C. Nichols has been appointed master mechanic of the Jonesboro, Lake City & Eastern, with office at Jonesboro, Ark.

F. H. Reagan has been appointed superintendent of the Scranton (Pa.) locomotive shops of the Delaware, Lackawanna & Western.

A. C. Watson has been appointed assistant division engineer of the Pennsylvania Company, with office at Fort Wayne, Ind., succeeding A. S. Bland, transferred.

C. N. Page, trainmaster of the Lehigh Valley, at Auburn, N. Y., has been appointed also master mechanic, with office at Auburn, succeeding J. N. Mowery, resigned.

R. L. Doolittle, master mechanic of the Atlanta, Birmingham & Atlantic, with office at Fitzgerald, Ga., has been appointed superintendent of motive power, a new position, and his former office has been abolished.

A. C. Adams, superintendent of motive power of the Spokane, Portland & Seattle, has been appointed superintendent of motive power also of the Oregon Electric and the United Railways Co., with office at Portland, Ore.

G. P. Palmer, assistant engineer of the Baltimore & Ohio at Chicago, has been appointed division engineer of the Baltimore & Ohio Chicago Terminal, with office at Chicago, succeeding E. N. Layfield, resigned.

D. K. Colburn, bridge engineer of the Galveston, Harrisburg & San Antonio and the Louisiana Western at Houston, Tex., has been appointed engineer of maintenance of way, with office at Houston, succeeding A. V. Kellogg, deceased.

T. A. Lawes, master mechanic of the Chicago, Terre Haute & Southeastern at Terre Haute, Ind., has been appointed mechanical engineer of the New York, Chicago & St. Louis, with office at Cleveland, Ohio, succeeding L. B. Morehead, resigned.

John Williams Corcoran, supervisor of roadway and track of the Pittsburgh & Lake Erie, has been retired under the pension rules of the company. Daniel F. Harvey has been appointed supervisor, in charge of roadway and track of Sub-district No. 3, with office at Beaver Falls, Pa.

G. J. Duffey, assistant master mechanic of the Lake Erie & Western, the Fort Wayne, Cincinnati & Louisville and the Northern Ohio, at Lima, Ohio, has been appointed master mechanic, with office at Lima, succeeding F. H. Reagan, resigned,

to accept service with another company. W. T. Kuhn succeeds Mr. Duffey.

Minot R. Smith, whose appointment as master mechanic of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., has been announced in these columns, was born November 5, 1870, at Erie, Pa. He was educated at Marshall College, Huntington, W. Va., and began railway work in 1886 as a machinist apprentice on the Chesapeake & Ohio at Huntington. In 1890 he went to Covington, Ky., as a machinist with the Kentucky Central and its successor, the Louisville & Nashville. He then returned to the Chesapeake & Ohio, going first to Lexington, Ky., and then to Covington, where he was at different times machinist, tool-room foreman and gang foreman. In 1904 he was transferred to Russell, Ky., as general foreman, remaining there for six years. His next position was machine shop foreman of the Louisville & Nashville, first at Louisville and then at New Decatur, Ala. He was appointed master mechanic in charge of terminals of the Chicago, Indianapolis & Louisville at Lafayette, Ind., in December, 1910, which position he held until his recent promotion.

Purchasing Officers.

W. A. Hopkins has been appointed supply agent of the Missouri Pacific, with office at St. Louis, Mo., succeeding C. A. How, promoted.

F. H. Greene, general purchasing agent of the New York Central Lines, at New York City, has resigned to become president of the Hale & Kilburn Manufacturing Company, Philadelphia, Pa.

Special Officers.

Dr. Guy G. Dowdall has been appointed chief surgeon of the Illinois Central, with office at Chicago, succeeding Dr. John E. Owens, assigned to consulting duties.

Charles C. Custer has been appointed general advertising manager of the Chicago & North Western, with office at Chicago, succeeding Charles G. Hall, resigned.

OBITUARY.

J. W. Maxwell, general superintendent of the St. Louis Southwestern, died at Tyler, Texas, on March 7.

W. B. Gwyn, formerly secretary of the Norfolk & Southern, now the Norfolk Southern, was killed in an elevator accident on March 3, at Norfolk, Va.

C. M. Case, assistant engineer of the St. Louis & San Francisco, with office at Fort Worth, Tex., died on March 4. Mr. Case was formerly chief engineer of the Chicago, Rock Island & Gulf.

Harry Hickley Hall, general counsel of the New Orleans & Northeastern, the Alabama & Vicksburg and the Vicksburg & Shreveport, at New Orleans, La., died March 7. Mr. Hall was born February 12, 1846.

J. G. Searles, formerly general coal freight agent of the Pennsylvania Railroad, died at Philadelphia, Pa., March 7. Mr. Searles was born in Tiffin, Ohio, December 20, 1848, and was educated in the district schools. At the age of sixteen he entered railway service as a clerk on the Dayton & Michigan, and in June, 1865, went to the Atlantic & Great Western. On March 1, 1867, he was appointed agent of the Farmers' Railroad at Petroleum Centre, Pa., and in October, 1871, he was appointed joint agent at Irvineton, of the Philadelphia & Erie, Empire Line, and Oil Creek & Allegheny River. In June, 1875, he was transferred to Erie as agent of the Empire Line, and on March 1, 1877, he was transferred from Erie to Baltimore, as agent of the Empire and Anchor Lines. He was appointed division freight agent of the Baltimore division of the Northern Central and the Baltimore & Potomac, with office in Baltimore, in July, 1885, and in May, 1892, he was promoted to coal freight agent, having special charge of the coal and coke traffic of the Pennsylvania Railroad and the making of rates therefor. On June 1, 1903, the organization having been changed, he was made general coal freight agent, and on account of ill health, on May 25, 1910, Mr. Searles was assigned to other duties.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona Eastern.—The Grant Brothers Construction Company, Los Angeles, Cal., has been given a contract for changing the line near Hayden, Ariz., and Winkelman. The present line between Hayden and Kelvin is to be relaid with 90-lb. rail.

Atlanta, Waycross & Northern.—Contracts are to be let in about 90 days to build from tidewater at St. Marys, Ga., northwest via Garrant, Barrows Bluff and Abbeville, to a point north of Grovania, about 200 miles. The prospects of building the line are good. Track has already been laid on 12 miles, and work is now under way completing the surveys. The plans call for putting up terminals, wharves, etc. B. G. Zeigler, consulting engineer, Rocky Ford.

Bedford & Hollidaysburg.—See Pennsylvania Railroad.

British Columbia Electric.—This company proposes to double-track its line between Vancouver, B. C., and Eburne.

Canadian Northern.—An officer is quoted as saying that the line between Montreal, Que., and Ottawa, Ont., will be finished during 1911, although it is not expected to be ready for passenger traffic this year. Work on the new line from Ottawa to Toronto will probably be finished during 1911.

Work is to be started at once by the Cowan Construction Company, it is said, on about 200 miles in Alberta from the Pembina river, westward to the Yellow Head Pass.

This company has commenced work, it is said, on lines in the island of Vancouver, B. C. The first work to be carried out will be from Victoria, northwest to Alberni.

Canadian Roads.—Plans are being made by C. J. Leyland, Haggerstown Castle, Scotland, who owns coal property near the Yellow Head Pass, B. C., to build a 20-mile line to connect the mines with the Grand Trunk Pacific.

Central Vermont.—See Grand Trunk.

Eastern Maine.—Application has been made for a charter in Maine. The plans call for building from Brewer, Me., north to Houlton, with trackage rights over the Maine Central from Bangor to Brewer. The route from Brewer runs east about 20 miles, thence north crossing the Vanceboro division of the Maine Central at or near Bancroft. E. H. Blake, A. Warren, C. P. Thomas, S. H. Woodbury and A. G. Thomas, are interested.

Durango & Llano Grande.—See National Railways of Mexico.

Erie Railroad.—An officer writes regarding the reports that double-tracking work is to be carried out west of Salamanca, N. Y., during 1911, that the company is simply going ahead with the double-tracking work, but has no definite plans at the present time.

Fresno, Hanford & Summit Lake Interurban.—This company has entered into a contract with the Hudson Counties Company, New Jersey, for building from Fresno, Cal., southeast to Kingsburg, thence northwest via Sanger, returning to Fresno. The work includes putting up some station buildings. A subcontract has been given to the Pinkerton Construction Company, Philadelphia. All the work is to be finished within one year.

Georgia & Florida.—The Sparks Western, which has been taken over by this company, expects to have construction work finished within 30 days and the line open for operation from Sparks, Ga., to Moultrie, 22 miles.

Grand Trunk.—This company has finished the work of replacing the 80-lb. rail between Montreal, Que., and Toronto, Ont., with 100 lb. rail and will continue similar improvements during the coming summer between Niagara Falls and London, Ont. It is the intention to lay 100-lb. rail with rock ballast on the entire double-track system.

Surveyors are now at work laying out a 50-mile line to be built by the Central Vermont between Windsor, Vt., and Brattleboro, to avoid using the Boston & Maine tracks.

Details are being arranged with the various towns and villages through which the extension of the Grand Trunk to Providence, R. I., is to pass. Right-of-way is being secured, and it is expected that all the preliminaries will have been completed by the coming spring. (June 17, p. 1568.)

Isothermal Traction Co.—An officer writes that this company will take out a charter under the name of the North Carolina Interurban, to build from Gastonia, N. C., which will probably be changed to Charlotte, west via Dallas, Cherryville, Waco, Shelby, Forest City, Rutherfordton and Chimneyrock to Asheville, about 75 miles, with branch lines from Cherryville, south to Kings Mountain; Cherryville, north to Hickory; Shelby, north to Morgantown; Rutherfordton, southwest to Tryon, and from Asheville, north and west. The work will not be difficult outside of the section crossing the Blue Ridge mountains. Maximum grades from Gastonia to Rutherfordton will be 2 per cent. and from Rutherfordton to Asheville, in the mountain section, about 3 per cent. Maximum curvature, 16 degrees. There will be 12 steel bridges, varying in length from 25 ft. to 125 ft. each. All plans and estimates for the section from Rutherfordton to Asheville have been finished, and for the section from Rutherfordton east, will be finished soon, as well as for power houses to be built at Chimneyrock. Contracts will be let about June 1. Construction on one or two short sections will probably be started in the near future. The company will consider any applications from good reliable firms or corporations to carry out the work. The line will carry products from cotton mills, as well as timber. The officers of the company are L. L. Jenkins, president, Asheville; Geo. L. McKay, general manager, and Wythe M. Peyton, chief engineer, both of Rutherfordton.

Kansas & Southeastern.—An officer writes that a contract has been given to the St. Louis Construction Company, and the prospects of building the line are good. The plans call for a line from Almena, Kan., southeast to Anthony, 250 miles. There will be a number of concrete bridges. The principal commodities the line will carry are wheat and other grains and coal. S. V. Wardall, president, and E. W. Wardall, chief engineer, Larned.

Kettle Valley.—According to press reports, this company proposes to let contracts in the near future, and expects to have the 60-mile gap between Merrit, B. C., and Midway finished by August.

Kootenay Central.—Bids are to be asked in April, it is said, for building a section of 50 miles south of Golden, B. C.

Lawton, Duncan & Ardmore.—A preliminary survey has been made from Lawton, Okla., southeast via Duncan to Ardmore, and construction work is to be started soon. This is the first section of a line which is eventually to be extended southeast from Ardmore to Denison, Texas, or Sherman. A bonus of $100,000 has been raised by residents of the city of Ardmore and a similar amount is to be given by Lawton, and Duncan will subscribe about half that amount, as well as 21.5 miles of the right-of-way. The Lawton Board of Trade was the original promoters. The Development Corporation of Philadelphia has since become interested, and the railway company was chartered recently with $2,000,000 capital. E. R. Sutton, president, Philadelphia. Dr. Herbert M. Howe, associated with R. L. Robertson and J. L. Hamon, Lawton, are interested.

Lock Haven & Jersey Shore (Electric).—This company proposes to build from Lock Haven, Pa., northeast along the Susquehanna river to Jersey Shore. Right-of-way has already been secured, with the exception of the section through Woodward township. L. M. Patterson, president, Lock Haven. C. E. Covert, Harrisburg; R. S. Walton and A. M. Hoagland, Williamsport, and G. J. Patterson, Pittsburgh, are interested.

Maine Central.—A bill has been introduced in the Maine legislature, authorizing this company to build under the name of the Rangeley Lakes & Megantic, from the Rangeley Lakes terminal of the Main Central, north about 40 miles to a junction with the Canadian Pacific and Quebec Central, at Lake Megantic, Que.

Mahoning & Shenango Railway & Light Co.—An officer is quoted as saying that this company will spend $500,000 during 1911 for improvements to be made between Leavittsburg, Ohio, and New Castle, Pa. Some of the existing lines are to be double-tracked.

Marshall & East Texas.—An officer writes that an issue of $5,000,000 of bonds has been authorized to secure funds for building extensions and for reconstructing the present line between Marshall and Winnsboro, Texas, 74 miles. It has not yet been decided when this work will be started. The company now has 92 miles of railway in operation from Winnsboro southeast to Elysian Fields. (May 13, p. 1237.)

Minneapolis, St. Paul, Rochester & Dubuque (Electric).—An officer writes that contracts are to be let in March, April and May to build a 70-mile extension from Northfield, Minn., south via Faribault, to Owatonna, thence east via Dodge Center and Kasson to Rochester, about 65 miles. The company already has 40 miles of track laid. The work involves handling about 12,000 cu. yds. of earth a mile. There will be some cuts 32 ft. wide, and fills of 16 ft. Maximum grade will be 1.5 per cent. compensated and maximum curvature 5 deg. There will be three or five steel bridges, each 80 ft. to 125 ft. long, and few trestles over 150 ft. long. F. G. L. Hunt, chief engineer, Minneapolis.

National Railways of Mexico.—According to press reports, the National Railways of Mexico will build the line from Durango, Mex., southeast to Gutierrez, Zacatecas, which is on the old main line of the Mexican Central, 155 miles. The government of Durango has granted a subsidy of about $600,000 for that portion of the line through Durango, and it is understood that the state of Zacatecas has granted a subsidy for a similar amount. (October 21, p. 759.)

Work is being pushed on the Durango & Llano Grande, building from Durango, Mex., westerly to Llano Grande, about 65 miles. (November 25, p. 1023.)

North Carolina Interurban.—See Isothermal Traction Co.

North Coast.—See Oregon—Washington Railroad & Navigation Company.

Oakland & Antioch (Electric).—Application has been made in Contra Costa county, Cal., for a franchise to build from Concord to Castle Rock, at the base of Mount Diablo.

Oregon Roads.—According to press reports, plans are being made to build a line from Madras, Ore., southeast to Prineville, about 35 miles. F. S. Forest and G. Nelson, officials of the Inland Empire Development Co., are said to be interested. This is thought to be a project of the Hill lines. It is understood that there will be a race between the Hill lines and the Harriman lines to secure right-of-way for a branch to Primeville.

Oregon-Washington Railroad & Navigation Company.—Contracts were recently let for work on about 40 miles of the North Coast between Spokane, Wash., and Ayer, on the Snake river, which are 103 miles apart as follows: G. A. Carlson & Co.., W. L. Trimble, and George Chew, Spokane, and Eschbach, Bruce & Co., North Yakima. The work includes piercing nine tunnels and all the work is to be finished within 18 months. A large force of men will be put to work at once. (February 17, p. 334.)

Panama-David.—The Panama government has announced that it will ask for bids until June 30, to build from the city of Panama, west to David, near the Costa Rican frontier. The line is to have a total length of 362 miles. Surveys have been made for a long time. The new line is to be the Panama link of the proposed Pan-American Railway, through Central America to a connection with the Mexican extension of the Southern Pacific. (February 10, p. 302.)

Pennsylvania, Monongahela & Southern.—See Pennsylvania Railroad.

Pennsylvania Railroad.—The report of this company for the year ended December 31, 1910, under date of March 3, 1911, shows that in addition to the Filbert street extension leading into Broad Street station, Philadelphia, Pa., further extensions and improvements at the Broad Street station are contemplated to accommodate the passenger traffic in and out of Philadelphia. Plans for this work are now being made. Satisfactory progress was made revising the grade and completing the four-track system through Greensburg, including a new passenger station and the elimination of the Greensburg tunnel. Two additional tracks through Greensburg have been finished and the old tunnel abandoned. Work is nearing completion on the Northumberland classification yard, and the new line between the Williams-

port and Sunbury divisions in connection with this work has been finished. A large amount of grade elimination work in New Jersey and Pennsylvania was carried out during the year. It is expected that work will be finished this year on the elimination of the grade crossings in the city of Bristol, Pa., which called for the construction of a new line through the city. Construction work on the eastern section of the relief line between Newark, N. J., Trenton and Morrisville will be started. Contracts for rebuilding the Cortlandt street ferry, New York City, necessitated by establishing new street and harbor lines, have been let and it is expected the work will be finished in 1912. It is also expected that the new rapid transit line, which included the electrification of the present tracks, from the Hudson & Manhattan tunnel system, near Summit avenue, Jersey City, to Manhattan Transfer, and a branch from that place to Park place, Newark, will be finished during the summer of 1911. Elevation work on the Kensington branch, including the elimination of all grade crossings on that branch, has been finished, as well as improvements in the Kensington station. The Harrison yard and its facilities, now known as Manhattan Transfer, near Newark, N. J., was placed in operation in November, 1910. The New York tunnel extension was finished during 1910 and the East river division from the Pennsylvania station, New York into Long Island, is now in operation. The western portion, from the station, in the borough of Manhattan under the North river to Harrison, N. J., has also been opened for traffic. The remaining work on the tunnel extension at Harrison, N. J., and at Sunnyside yards, Long Island, and the electrical and station facilities and equipment will be fully completed in the early part of the present year. Extensive improvements were made on the Buffalo division, Western New York & Pennsylvania Railroad, including changes of line and grade, also additional track and sidings. The extension of the Bedford & Hollidaysburg Railroad was completed and opened for operation from Imler, Pa. to Brooke's Mills, 10.81 miles. Further work was carried out on the Rice's Landing extension of the Pennsylvania, Monongahela & Southern, to provide track and station facilities. The new yard and engine house at Orangeville, Md., near Baltimore, is nearing completion, and considerable progress was made on the construction of the new passenger station at Baltimore, and the enlargement of the facilities and rearrangement of the tracks. On the West Jersey & Seashore the elevation of tracks from Wright avenue to Spruce street in Camden, N. J., has been completed and placed in operation. See comments of this company elsewhere in this issue.

Rangeley Lakes & Megantic.—See Maine Central.

Southern Railway.—The Southern Railway's new cut off around Lynchburg, Va., which is ten miles long and cost $4,000,000, was opened for freight traffic March 1. Passenger trains will use the new line in about one week.

Sparks Western.—See Georgia & Florida.

St. Louis Southwestern.—This company has given a mortgage to secure funds for the new extension under construction from Stuttgart, Ark., north to Hazen, 45 miles, and from England, east to Stuttgart. All the grading has been finished and track laid on 30 miles. It is expected to have all the track laying finished during March.

St. Paul Southern (Electric).—An officer writes that grading work will probably be started early this spring on a line from St. Paul, Minn, southeast via Hastings, Wacouta and Lake City to military camp grounds, 57 miles. There will be about 17,000 cu. yds. of material to be handled a mile. The work includes a 400-ft. bridge, with approaches, over the Mississippi river north of Hastings. Address W. L. Sonntag, general manager of the St. Paul Railway Promotion Co., St. Paul.

West Jersey & Seashore.—See Pennsylvania Railroad.

Western New York & Pennsylvania.—See Pennsylvania Railroad.

West Penn Traction.—An officer writes that the company now has work under way on three extensions as follows: Leisenring, Pa., southwest to Uniontown, eight miles; Greensburg to Jamison, seven miles, and Masontown to Martin station, three miles. Material has been bought and contracts have been let for the work. (February 24, p. 369.)

Railway Financial News.

Atchison, Topeka & Santa Fe.—Augustus D. Julliard has been elected a director, succeeding Paul Morton, deceased.

Baltimore, Chesapeake & Atlantic.—The Pennsylvania Railroad and the Philadelphia, Baltimore & Washington have been granted permission by Maryland Public Service Commission to buy at $70 a share the $478,100 minority preferred stock of the B. C. & A. deposited with the Colonial Trust Company of Baltimore. The Pennsylvania already owns all of the $1,000,000 common and 78 per cent. of the $1,600,000 preferred.

Boston & Maine.—A press despatch from Boston says that the Vermont Valley Railroad, a subsidiary of the Boston & Maine, has bought the interest held by the Sortwell estate in the Montpelier & Wells River, the Barre Bridge Railroad and the Barre Railroad. The Montpelier & Wells River runs from Wells River, Vt., to Montpelier, with a branch to Barre, a total of 45 miles.

Buffalo Creek Railroad.—The New York Public Service Commission, Second district, has authorized this company to make a mortgage securing $5,000,000 first refunding mortgage 5 per cent. 50-year bonds. The company is authorized to issue $1,000,000 bonds to retire at par its 5 per cent. bonds of 1891. In addition, the company is authorized to issue $1,021,000 bonds to make additions to its property.

Chicago, Milwaukee & Puget Sound.—Kuhn, Loeb & Co. and the National City Bank, both of New York, have bought $25,000,000 first mortgage 4 per cent. bonds of 1909-1949, principal and interest unconditionally guaranteed by the Chicago, Milwaukee & St. Paul.

The Commercial & Financial Chronicle, in a recent issue, says that an initial dividend of 2 per cent. had been declared on the $100,000,000 stock of the Puget Sound, all of which is owned by the St. Paul.

Chicago, Milwaukee & St. Paul.—This company and the Chicago & North Western have made a bargain with the New York Central interests as a result of which the North Western and the St. Paul will each acquire 20 per cent. of the Indiana Harbor Belt's stock and 20 per cent. of its outstanding notes. It is planned that the Indiana Harbor Belt shall authorize the issuance of $12,000,000 more bonds, the proceeds to be used in completing its second track and enlarging its track facilities at junction points. The Indiana Harbor Belt now connects with the St. Paul at its Franklin Park yard and with the North Western at its Proviso yard. The acquisition of interest in it by the North Western and the St. Paul no doubt indicates that it is to be in future a more important connection between the New York Central lines and these roads for the transfer of cars which do not need to be moved into or out of the business district of Chicago.

Chicago & North Western.—See Chicago, Milwaukee & St. Paul.

Chicago, Terre Haute & Southeastern.—F. J. Lisman & Co., New York, are offering the unsold portion of $3,100,000 outstanding first and refunding mortgage 5 per cent. bonds of 1910-1960 at 98, yielding about 5.10 per cent. income. The balance of the $20,000,000 authorized bonds are reserved for extensions, additions and improvements and for retiring underlying bonds. This company bought the properties of the Southern Indiana and the Chicago Southern. There are about 298 miles of main line and 52 miles of branches. The bonds are a first mortgage on the line between Chicago Heights and the Indiana-Illinois state line, about 114 miles, with some equipment.

Corvallis & Alsea River.—A press despatch from Monroe, Ore., says that this road and the Portland, Eugene & Eastern are to be merged, and when the lines are completed they will be electrified.

Detroit, Toledo & Ironton.—Application has been made to the federal court for permission to issue $500,000 receivers' certificates in order to meet pay rolls, repair road and bridges, etc.

Illinois Central.—The New York Stock Exchange has listed $2,740,000 additional refunding mortgage 4 per cent. bonds, due 1950. These bonds have been issued in exchange for $78,000 St. Louis division and terminal 3½ per cent. bonds and $2,662,000 purchased lines 3½ per cent. bonds.

Indiana Harbor Belt.—See Chicago, Milwaukee & St. Paul.

Jonesboro, Lake City & Eastern.—We are informed that the ownership of the capital stock of this company has changed hands and that the company has been reorganized. See the new officers under Railway Officers.

Lake Superior & Ishpeming.—Stockholders are to vote March 30 on the question of authorizing the issue of new first mortgage bonds. The last of the first mortgage bonds of 1896 were called for payment on January 1, 1911.

Lancaster, Oxford & Southern.—John A Nauman has been appointed receiver of this company, which owns and operates a narrow gage line from Quarryville, Pa., to Peach Bottom. The petition for receivership is by the stockholders.

Long Island.—Holders of the $1,000,000 Brooklyn & Montauk first mortgage 5 per cent. and 6 per cent. bonds, matured March 1, 1911, are offered the privilege of exchanging their bonds for Long Island refunding mortgage 4 per cent. bonds maturing March 1, 1949, guaranteed principal and interest by the Pennsylvania Railroad. The refunding bonds are taken at 97, and the difference of $30 will be paid in cash at the time of exchange. Bonds that are not exchanged are redeemed in cash.

Marshall & East Texas.—Directors have authorized a mortgage to secure $5,000,000 bonds, to be sold as required for extensions and improvements.

Minneapolis, St. Paul & Sault Ste. Marie.—This company has made a mortgage securing $1,358,866 equipment trust certificates. These certificates are to be issued to pay for steel cars of various kinds.

New Orleans Terminal Co.—This company has sold to Lee, Higginson & Co., Boston, Mass., $4,000,000 first mortgage 4 per cent. bonds of 1903-1953. The bonds are guaranteed principal and interest jointly and separately by the St. Louis & San Francisco and by the Southern Railway, and are part of an authorized issue of $15,000,000, of which $14,000,000, including this issue, are now outstanding. The bankers are offering these bonds at 88, yielding about 4.65 per cent. income.

New York Central & Hudson River.—The directors have declared a quarterly dividend of 1¼ per cent., payable April 15. In 1907 the rate was increased to 1½ per cent. quarterly; in 1908 it was reduced again to 1¼ per cent.; in March, 1910, it was increased to 1½ per cent. quarterly.

Northern Central.—The Maryland court of appeals has affirmed the decision of the circuit court of Baltimore holding the lease of the Northern Central to the Pennsylvania as not redeemable under Maryland laws.

Oneida Railway.—See West Shore.

Pennsylvania Railroad.—For the first time the Pennsylvania Railroad and the Pennsylvania Lines West have prepared their monthly statements of operating revenues and expenss, which they distribute to interested stockholders and bankers, so as to show the total amount of operating revenues and of operating expenses and the increase or decrease, as compared with the corresponding month of the year before. The statements are made up for the various companies operating the lines west and there is also a statement showing the combined revenues and expenses for the entire system east and west. Heretofore the Pennsylvania has made monthly statements simply showing the increase or decrease from the corresponding month of the year before. See Baltimore, Chesapeake & Atlantic

Pittsburgh, Binghamton & Eastern.—The property of this road, which was projected to run from Binghamton, N. Y., to Keating Summit, has been sold under foreclosure. It is understood that the part in Lycoming and Clinton counties was sold for $25,000 to a subsidiary of the New York Central & Hudson River. The remainder of the road and the grading was sold separately.

Pittsburgh & Lake Erie.—The directors have voted an increase in capital stock of $4,200,000 giving the privilege to stockholders to subscribe in the ratio of 20 per cent. of holdings at par. The directors have also declared a cash dividend of 25 per cent., payable March 31.

Southwestern of Texas.—The Railroad Commission of Texas has authorized the company to issue $35,000 stock and $354,905 first mortgage 5 per cent. bonds of 1907-1937, secured on the 30 miles of road in operation from Henrietta to Archer City.

St. Joseph & Grand Island.—The Union Pacific offers to buy the minority holdings of stock at $53.91 per share of first preferred, $37.49 per share of second preferred and $20.07 per share of common. Judge Lovett says in part:

"In view of the inquiries from time to time respecting the prospects for dividends, especially on the first preferred stock, the following is submitted:

"All the bonds issuable under the mortgage of the railway company have been issued, except $1,000,000 reserved exclusively for the construction of additional lines of railway, and even those can be issued only at a rate of not exceeding $6,000 per mile of new railway. The company is without other means of raising money for the additions and betterments absolutely necessary to bring the property up to the condition in which it must be maintained to secure and properly handle the traffic it should enjoy, and to buy the necessary engines and other equipment.

"Its earnings are the only source to which the company can fairly look for the money with which to meet these expenditures, at least until the condition of the property and the company's business are such as to establish for it a credit that will enable it to borrow the money at reasonable rates, notwithstanding the existing mortgage. How long this will be is uncertain. It seems plain, however, that the board of directors would not be warranted in declaring dividends at this time.

"The St. Joseph & Grand Island was for a number of years a part of the Union Pacific system, but became detached through foreclosure and reorganization proceedings. It seemed, however, that the former relations should be restored, and to that end the Union Pacific in 1906 acquired a considerable amount of the stock of the St. Joseph & Grand Island. During the fiscal year ended June 30, 1910, purchases were resumed, as shown by the published annual report of the Union Pacific for that year, and at this date it owns 58.07 per cent. of the entire capital stock. The average prices paid for all stock purchased since such purchases were resumed during the last fiscal year are as follows: For first preferred shares, $53.91 per share; for second preferred shares, $37.49 per share; for common shares, $20.07 per share."

St. Louis & San Francisco.—William Salomon & Co., New York, have bought $2,700,000 4 per cent. refunding bonds of the Kansas City, Fort Scott & Memphis of 1901. The bonds are guaranteed principal and interest by the St. Louis & San Francisco. Of the proceeds of the sale of these bonds, $2,055,300 will be used for refunding purposes.

St. Louis Southwestern.—This company has sold to the Guaranty Trust Co. and Rhoades & Co., both of New York, $800,000 Central Arkansas & Eastern first mortgage 5 per cent. bonds of 1910-1940, guaranteed principal and interest by the St. Louis Southwestern. These bonds are a first mortgage on the new extension under construction from Stuttgart, Ark., to Hazen, and from England to Stuttgart, a total of 45 miles. See this company under Railway Construction.

Temiskaming & Northern Ontario.—The Province of Ontario is to borrow $5,500,000, of which $2,500,000 is to be advanced to a hydro-electric project and the remaining $3,000,000 will be advanced to the Temiskaming & Northern Ontario.

Union Pacific.—See St. Joseph & Grand Island.

West Shore.—The Oneida Railway has asked the New York Public Service Commission, Second district, to approve an agreement running 475 years providing for the operation by third rail of passenger and express cars by the Oneida company over the West Shore between Utica and Syracuse.

Supply Trade Section.

There are now in service over 100,000 Willard train-lighting cells, made by the Willard Storage Battery Company, Cleveland, Ohio.

The Montreal Locomotive Works, Montreal, Que., has received orders from the Canadian Pacific for two steam shovels and from the Grand Trunk Pacific for one steam shovel.

F. H. Greene, general purchasing agent of the New York Central & Hudson River, has resigned to become president of the Hale & Kilburn Manufacturing Company, Philadelphia, Pa.

The Pay-As-You-Enter Car Corporation, New York, and the Pay-Within Car Company, Philadelphia, Pa., have been merged into one organization. The new company will be the Prepayment Car Sales Company, with office at 50 Church street, New York.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Sand Springs Interurban Railway for one 70-ft. gasoline motor car. This will make 41 railways either having these motor cars in operation or on order at the present time.

The Bowman-Blackman Machine Tool Company, St. Louis, Mo., is the successor to the firm of Albert B. Bowman, dealer in machine shop equipment. The formation of the new company is due to the entrance into the firm of G. H. Blackman. Mr. Blackman is a graduate of the mechanical engineering department of the Missouri State University, and is an experienced machine tool man. He has been with the Bowman company for several years.

The Acme universal uncoupling device, made by the Acme Railway Equipment Company, Philadelphia, Pa., is being applied to the following cars: Four hundred and fifty hopper cars and gondola cars, being built for the New York, Ontario & Western; 2,150 miscellaneous cars and 30 locomotives being built for the Pittsburg & Shawmut, 1,000 miscellaneous freight cars being built for the New York, New Haven & Hartford; and 800 box and hopper cars being built for the Lehigh & New England.

The Portland Railway, Light & Power Company, Portland, Ore., has ordered six 1,000-k.w. motor-generators sets from the General Electric Company, Schenectady, N. Y. Four of these will furnish power to the electric railway system and each will consist of a 1,060-h.p. 10,000-volt 3-phase synchronous motor connected to a 1,000-k.w. 600-volt direct current generator. The other two will furnish power for lighting and each will consist of a 1,060-h.p., 10,000-volt 3-phase synchronous motor direct connected to a 1,000-k.w. 300-volt direct current generator.

The annual report of the Railway Steel-Spring Company, New York, for the year ending December 31, 1910, shows that gross sales were $10,035,435, an increase of $2,192,143 over 1909. The surplus, after fixed charges, was $810,077, or 6 per cent. on the $13,500,000 common stock, as compared with 5.32 per cent. earned on the same stock in 1909. At the annual meeting Otis H. Cutler, president of the American Brake Shoe & Foundry Company, Mahwah, N. J., was elected a director to succeed the late Frank S. Layng. The officers of the company and the other directors were re-elected.

The annual report of the Cambria Steel Company, Johnstown, Pa., for the year ended Deceber 31, 1910, shows that the earnings or income from operation, after all expenses incident to same (including those for ordinary repairs and maintenance) had been deducted, added to other income was $5,461,336 in 1910, compared with $3,329,849 in 1909. The net income was $4,553,332 in 1910, compared with $2,538,087 in 1909. The dividends paid out in 1910 were $2,250,000 compared with $1,800,000 in 1909. The balance carried to profit and loss was $113,294 in 1910, compared with $38,087 in 1909.

The Chicago Pneumatic Tool Company, Chicago, as mentioned in our issue of January 20, has acquired from the Duntley Manufacturing Company, Chicago, the right to make and sell the Rockford gasolene motor cars. The manufacture will be conducted on a large scale and workmanship and material will be maintained at the same standard that the company insists on for its pneumatic tool products. All parts will be made to jig and templet, insuring interchangeability and thereby facilitating repairs. The frames will be entirely of welded steel and a number of other improvements are being made which have been suggested by the experience gained in the operation of some 800 cars in actual service. There are at present cars of the Rockford type in use on 132 railways, all of which have been put in service during the last two years.

The Kennicott Company, Chicago Heights, Ill., announces that to provide adequate facilities for its steel car department an extensive addition is being made to its plant and the most modern machinery and appliances are being installed to economically handle heavy steel work. The car department is one of the newer lines of the Kennicott company, and is becoming a very important part of its business. The department is prepared to handle structural steel freight and passenger equipment, steel underframes for all classes of equipment, steel tank cars complete, steel re-enforcers or strengtheners for wooden equipment, trucks and mine cars and general plate construction. An order has just been taken for 10 steel box car underframes for the Erie; and 250 steel twin hopper underframe and six steel postal car underframes have just been completed for the same company.

The Consolidated Concrete Tie Company, Cairo, Ill., has been organized to make and sell concrete ties under the Sneed and Cowan patents. The capital stock is $100,000, and is fully subscribed. The officers of the company are: J. R. Sneed, president; A. E. Reader, first vice-president; D. W. Heilig, second vice-president; H. B. Eshleman, secretary and treasurer; R. J. D. Cowan, general manager. The Sneed patent covers a one-piece tie of reinforced concrete with wood or paper cushions to take the shock of the rolling stock. The Cowan patent covers a three-piece reinforced concrete tie which also uses wood or paper cushions as above. The company is at present making the one-piece type and test ties are being placed in a number of stretches of track on various railways. The Illinois Central has had 12 of these ties in service in a side track at Dongola, Ill., since October 15, 1910. Up to the present the ties have shown no signs of deterioration.

Frank H. Greene, general purchasing agent of the New York Central Lines, has resigned to become president of the Hale & Kilburn Manufacturing Company, Philadelphia, Pa. Mr. Greene was born on April 3, 1868. At the age of 17 he entered the railway service as clerk in the purchasing department of the Grand Trunk. Since then he has been, consecutively, chief clerk in the general stores department of the Chicago & North Western; secretary to the superintendent of motive power of the same road; and traveling auditor in charge of material and supplies for the same road. In July, 1899, he was made secretary to the superintendent of motive power of the Lake Shore & Michigan Southern. From January, 1900, until January, 1906, he was purchasing agent of the Lake Shore & Michigan Southern, the Lake Erie & Western and the Indiana, Illinois & Iowa, with office at Cleveland, Ohio. On January 1, 1906, Mr. Greene came to New York to fill the position which he has just resigned. Mr. Greene is a member of the Engineers Club, the New York Railroad Club and the Western Railway Club.



Frank H. Greene.

TRADE PUBLICATIONS.

Georgia, Florida & Alabama.—The traffic department of the Georgia, Florida & Alabama has published a booklet describing the communities along its line that offer special agricultural and commercial opportunities.

Ingot Iron.—The American Rolling Mill Co., Middletown, Ohio, has published a 35-page booklet on American ingot iron, giving results of tests, a list of articles made of this metal and tables of dimensions and prices.

Southern Pacific.—This company has published exceptionally attractive booklets on the Walla Walla Valley, Wash.; on Eugene, Ore.; on Salem, and on Oregon City. The opportunities, resources and industries are so illustrated and described that from a hasty glance one can get a good idea of what these regions offer.

Motors.—The Crocker-Wheeler Co., Ampere, N. J., has published Bulletin No. 126 on polyphase induction motors. These motors vary from ½ h. p. to 250 h. p. and can be applied to nearly all forms of industrial machinery. This booklet describes these motors and gives illustrations of the interiors of some industrial plants in which they have been installed.

Storage Batteries.—The Willard Storage Battery Co., Cleveland, Ohio, has devoted Bulletin No. 34 to Willard storage batteries. Descriptions and illustrations of the stationary types for use in railway signaling and tables of dimensions and prices are included. Bulletin No. 29 is a folder describing the construction and qualities of the Willard standard plates for signal service.

Locomotives.—The Hannoversche Maschinebau-Actien-Gesellschaft, Hannover-Linden, Germany, has published folders No. 1003, 1005 and 1007, giving the principal dimensions and gross ton loads for different gradients for 45-ton switching locomotives, 67-ton consolidation locomotives and 74-ton double-ender tank locomotives, respectively. The data in these folders is printed in different languages, including English, and valuable conversion tables are given on the back of each.

Car Ventilators.—Burton W. Mudge & Company, Chicago, are distributing a handsomely illustrated booklet covering the special features of their Garland system of ventilation for passenger coaches, street cars and freight equipment. The illustrations show in the best way possible the application and advantages of this system. Drawings are also included to illustrate the suction effect which is produced by the moving car and which is a feature in this ventilating system.

RAILWAY STRUCTURES.

Atlanta, Ga.—The Southern Railway has given a contract to R. W. Walker, Atlanta, for putting up a three-story freight house and a six-story office building on Madison avenue, in Atlanta. The freight house is to be built of reinforced concrete, and the office building is to have a reinforced concrete frame with pressed brick face. The buildings will be 50 ft. wide, and together will have a total length of 740 ft.

Augusta, Me.—The governor has signed a bill allowing the closing of Court street in Augusta. This will permit the Maine Central to build a new passenger station on the site selected.

Brooklyn, N. Y.—The Coney Island & Brooklyn is planning to spend $100,000 for a new terminal on Surf avenue, Coney Island.

Calgary, Alb.—Bids are wanted until March 22 by the division engineer of the Canadian Pacific, at Calgary, for 26 section houses, five stations and freight sheds, three stations, two bunk houses and two 6-stall roundhouses, to be built in Alberta and Saskatchewan.

Chimneyrock, N. C.—See Isothermal Traction under Railway Construction.

Eagle Lake, Texas.—The Gulf, Colorado & Santa Fe has let the contract for building a new combined passenger and freight station at Eagle Pass to cost between $8,000 and $10,000.

Everett, Wash.—The Great Northern is having plans made for a new station at Everett, to cost $500,000. (January 20, p. 147.)

Great Falls, Mont.—The Great Northern, it is said, is planing to put up a freight house at Great Falls, to cost $80,000.

Hastings, Minn.—See St. Paul Southern (Electric) under Railway Construction.

Lebanon, Pa.—The Hummelstown & Campbellstown Railway is planning to put up a car barn and power plant in Lebanon.

Los Angeles, Cal.—The Southern Pacific, according to statements of President Lovett, is to build a new passenger station on the site of its present station. Negotiations for building a union station have not met with the favor of the railways interested, and it is not likely that an agreement can be reached.

Marquette, Mich.—The Lake Superior & Ishpeming has let the contract for its No. 2 ore dock. The dock will be of steel and concrete construction, and it is estimated to cost $1,250,000.

Medicine Hat, Alb.—It is understood that the Canadian Pacific will make improvements at Medicine Hat, to include a double-track steel bridge to cost $314,000.

Montreal, Que.—An officer of the Canadian Northern is quoted as saying that the company has definitely decided to enter the center of Montreal. It is the intention of the company to build a large terminal instead of continuing to use the old Moreau street terminal on the outskirts of the city.

Nebraska City, Neb.—The Missouri Pacific has agreed to an ordinance that was passed by the city council some time ago granting the right to the Chicago, Burlington & Quincy to close South Sixth street in order to build a passenger station and a subway. The Missouri Pacific is interested in this subway on account of the fact that it will carry the Burlington under a portion of the Missouri Pacific right of way.

New Haven, Conn.—According to press reports, the New York, New Haven & Hartford will make extensive improvements at New Haven, in connection with the new roundhouse and machine shop plant on the Quinnipac meadows.

New London, Conn.—According to press reports, a new railway bridge is to be built over the Thames river at a point 400 ft. north of the present structure, for which plans have been made. It is expected that the work will be started during 1911.

New York.—The Board of Estimate has approved the spending of $605,742 for strengthening the end spans of the Williamsburg bridge over the East river, to permit the operation of subway trains over the structure.

Oakland, Cal.—The Southern Pacific has filed a building contract for improvements to its pier at Oakland, to cost $14,700.

Portland, Me.—The Portland Union Railway Station Co. proposes to change its name to the Portland Terminal Company, and to eliminate grade crossings in the cities of Portland, South Portland and Westbrook.

South Bend, Ind.—A bill authorizing the elevation of railway tracks in South Bend has passed both houses of the state legislature.

Spokane, Wash.—The North Coast is said to have given a contract for building a bridge over the Spokane river.

St. Louis, Mo.—The St. Louis Southwestern has bought land in the heart of the terminal district of St. Louis at a cost of about $1,250,000. This land will be used for freight yards and a freight station when plans now under way have been completed. The property covers three blocks and measures about 900 ft. by 275 ft., situated directly between the freight terminals of the Pennsylvania Railroad and the Burlington. Tracks of the Terminal Railroad Association of St. Louis, in which the St. Louis Southwestern holds an equal interest with fourteen other lines, run on both sides of the property. This will make the facilities offered by the new location unsurpassed. Increase in the Cotton Belt's traffic in and out of St. Louis made these arrangements necessary.

Sydney, N. S.—The Intercolonial station was damaged by fire recently, with an estimated loss of about $60,000.

Vancouver, B. C.—The Great Northern will put up a new freight house, it is said, at Vancouver.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Pere Marquette is said to be making inquiries on 50 locomotives.

The Kansas City Southern is said to be making inquiries on 20 locomotives.

The San Antonio & Aransas Pass is in the market for 4 mogul locomotives.

The Atlantic Coast Line has ordered 29 locomotives from the Baldwin Locomotive Works.

The Western Maryland is in the market for 30 consolidation locomotives, 5 Mallets and 5 Pacific type locomotives.

The Pan American of Uruguay is said to have ordered 8 locomotives from the Lima Locomotive & Machine Company.

The Laurinburg & Southern has ordered one 10-wheel locomotive from the Baldwin Locomotive Works. The dimensions of the cylinders will be 18 in. x 26 in., and the diameter of the driving wheels will be 56 in.

The Louisville, Henderson & St. Louis has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works. The dimensions of the cylinders will be 20 in. x 26 in., and the total weight in working order will be 132,000 lbs.

The Illinois Central, reported in the *Railway Age Gazette* of January 20 as being in the market for 5 Pacific type locomotives, 20 consolidation locomotives and 20 mikado locomotives, has ordered 40 mikado locomotives from the Baldwin Locomotive Works.

The Delaware, Lackawanna & Western has ordered 35 locomotives from the American Locomotive Company. This order includes 15 consolidation locomotives, 7 mogul locomotives, 7 six-wheel switching locomotives and 6 eight-wheel passenger locomotives.

The Crystal City & Uvalde has ordered one mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 24 in., the diameter of the driving wheels will be 54 in.. and the total weight in working order will be 120,000 lbs.

The Spokane, Portland & Seattle has ordered 2 ten-wheel locomotives from the Baldwin Locomotive Works. The cylinders of these locomotives will be 22 in. x 26 in., the diameter of the driving wheels will be 72 in., and the total weight in working order will be 160,000 lbs.

The Nova Scotia Steel & Coal Company, New Glasgow, N. S., has ordered one six-wheel switching locomotive from the Montreal Locomotive Works. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels 50 in., and the total weight in working order 124,000 lbs.

Corrigan, McKinney & Company, Cleveland, Ohio, have ordered 2 six-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 123,000 lbs.

CAR BUILDING.

The Montreal Street Railway is in the market for 50 pay-as-you-enter cars.

The Chicago, Rock Island & Pacific is said to be making inquiries on 1,450 freight cars.

The Baltimore & Ohio is said to have ordered 1,000 box cars from the American Car & Foundry Company.

The New York, Ontario & Western will be in the market shortly for 350 coal cars and 100 gondola cars.

The Birmingham Southern is in the market for 55 gondola cars, 20 flat cars and 25 steel underframe box cars.

The Nashville, Chattanooga & St. Louis has placed with the American Car & Foundry Company an additional order for 100 box cars.

The Boston Elevated has ordered 40 subway cars from the Standard Steel Car Company and 20 coaches from the Pressed Steel Car Company.

The New York Central Lines have ordered 25 all-steel postal cars from the American Car & Foundry Company and 25 all-steel postal cars from the Pressed Steel Car Company.

The Algoma Central & Hudson Bay has ordered 175 forty-ton steel underframe flat cars from the Canadian Car & Foundry Company and 50 fifty-ton ore cars from the Hart-Otis Car Company.

The Illinois Central has authorized the building of 500 forty-foot thirty-ton steel underframe refrigerator cars at its shops at Burnside, Ill. The cars will be equipped with Bettendorf underframes and trucks.

The Ann Arbor, mentioned in the *Railway Age Gazette* of February 17 as being in the market for 110 freight cars, has ordered 50 steel underframe box cars and 60 refrigerator cars from the Standard Steel Car Company.

The Chicago, Indianapolis & Louisville, mentioned in the *Railway Age Gazette* of January 27 as being in the market for 400 freight cars, has ordered 200 forty-ton flat cars and 100 forty-ton automobile cars from the Haskell & Barker Car Company.

The Delaware, Lackawanna & Western, mentioned in the *Railway Age Gazette* of February 17 as being in the market for 12 milk cars, has ordered this equipment from the American Car & Foundry Company, and is now in the market for 3 combination smoking and first-class coaches.

The Richmond, Fredericksburg & Potomac, mentioned in the *Railway Age Gazette* of February 24 as being in the market for 50 box cars and 50 flat cars, has ordered 50 steel underframe box cars from the Standard Steel Car Company. Orders for the 50 flat cars will be placed in the near future.

The Wabash-Pittsburg Terminal, mentioned in the *Railway Age Gazette* of February 10 as being in the market for 1,000 coal cars, has ordered 500 steel hopper cars from the Pressed Steel Car Company and 500 steel hopper cars from the Standard Steel Car Company.

The Lehigh & New England, as reported in the *Railway Age Gazette* of February 24 has ordered 500 all steel hopper cars from the Cambria Steel Company and 300 steel underframe box cars from the American Car & Foundry Company. The hopper cars will be built at Johnstown, Pa. Their capacity will be 50 tons and they will weigh 34,000 lbs. The inside measurements will be 30 ft. long, 9 ft. 5½ in. wide and 6 ft. 10½ in. high. The over-all measurements will be 31 ft. 6 in. long, 9 ft. 11⅛ in. wide and 10 ft. high. The box cars will be built at Berwick, Pa. Their capacity will be 30 tons and they will weigh 34,000 lbs. The inside measurements will be 36 ft. long, 8 ft. 6 in. wide and 7 ft. 9¼ in. high. The over-all measurements will be 37 ft. long, 9 ft. 4¾ in. wide and 13 ft. 7 in. high. The special equipment on both types will be identical except where indicated.

Bolsters, truck	Gould.
Brakebeams	Davis solid truss.
Brakeshoes	Am. Brake Shoe & Fdy. Co.
Brakes	Westinghouse.
Couplers	Gould.
Draft-rigging	Farlow on hopper cars.
Draft-rigging	Miner twin spring.
Journal bearings	Ajax.
Journal boxes	Gould on 250 hopper cars and on box cars.
Journal boxes	Symington on 150 hopper cars.
Journal boxes	Union Spring & Mfg. Co. on 100 hopper cars.
Paint	Dixon's silica-graphite on hopper cars.
Paint	Nobrac on box car underframes.
Paint	Metallic brown on box car bodies.
Springs	Union Spring & Mfg. Co.
Wheels	National Car Wheel Co. on hopper cars.

IRON AND STEEL.

The Harriman Lines will place orders for 150,000 tons of rails shortly.

The Havana Central is 1,000 tons of 45-lb. rails and 200 tons of 70-lb. rails.

The Pan-American of Uruguay is in the market for about 40,000 tons of rails.

The Atlantic Coast Line has ordered 1,600 tons of rails from the Carnegie Steel Company.

The Chesapeake & Ohio has ordered 2,000 tons of rails from the Carnegie Steel Company.

The Manila Railways have ordered 10,000 tons of rails from the Lackawanna Steel Company.

The Lake Shore & Michigan Southern is in the market for 1,700 to 1,800 tons of structural steel.

The Pennsylvania Lines West are in the market for 2,000 tons of structural steel for grade crossings.

The Cleveland, Akron & Columbus has ordered 10,000 tons of rails from the Carnegie Steel Company.

The Georgia Coast & Piedmont has ordered 1,500 tons of structural steel from the Virginia Bridge & Iron Company.

The Delaware & Hudson has ordered 4,000 tons of structural steel from the McClintic-Marshall Construction Company for use in its shops at Watervliet, N. Y.

The Transcontinental (for eastern section of Grand Trunk Pacific) has ordered 61,000 tons of rails. The Algoma mills will roll 35,000 tons and the remaining 26,000 tons will be furnished by the Dominion Iron & Steel Company.

The Canadian Pacific, mentioned in the *Railway Age Gazette* of February 24 as being in the market for 100,000 tons of rails, has placed this order with the Lake Superior Iron & Steel Company and the Dominion Iron & Steel Company. This road is still in the market for 20,000 tons of rails.

General Conditions in Steel.—The new orders of the United States Steel Corporation during February averaged 40,775 tons a day, the largest reported since early last year. This is an increase of 18 per cent. over the January average. The true conditions in the industry, however, cannot be ascertained until after the period of suspense is over regarding the Oil and Tobacco decisions and the tariff revision. The orders now on the books are sufficient to warrant average operations of about 75 per cent. through March and April, and it is generally believed that daily orders in March will even exceed those of February.

MACHINERY AND TOOLS.

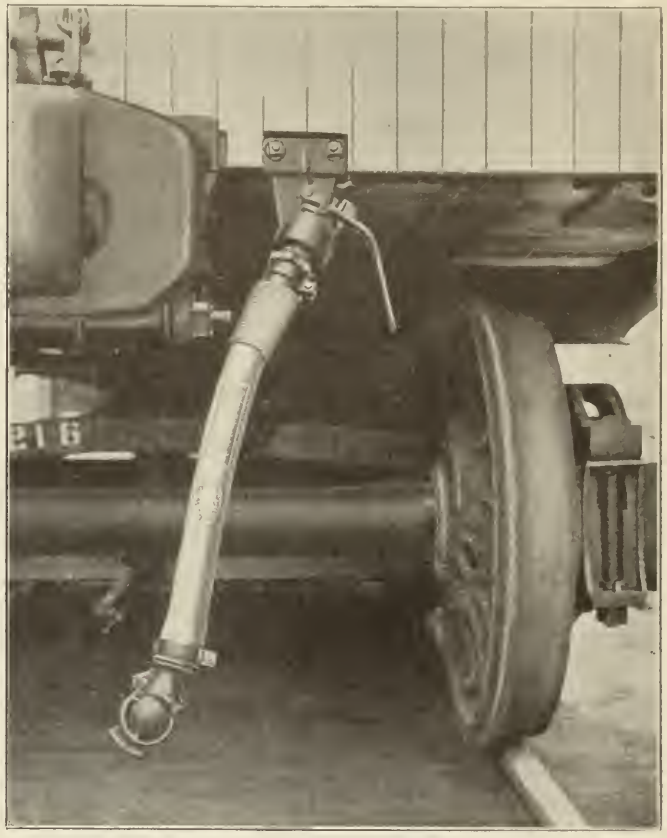
The Carolina & Northwestern is in the market for a number of machine tools.

The Illinois Central has authorized the purchase of a list of machine tools to cost about $30,000. The following machines are included in the list, upon which prices are now being received: One 600-ton wheel press, two 2-in. bolt cutters, two 2-in. pipe cutters, one 72-in. radial drill, one 48-in. milling machine, one cold saw, one 1½-in. bolt header, one 36-in. by 12-ft. engine lathe, one 24-in. by 10-ft. engine lathe, four 20-in. by 8-ft. engine lathe and one 30-in. by 12-ft. engine lathe, one crank shaper, one 10,000-lb. hoist, one air compressor and a set of straightening rolls for steel car work.

Bracket for Brake Angle Cock.

The M. C. B. standard for air brake train pipes, adopted in 1904, specifies that the hose angle cock threaded to the end of the train pipe should be located 13 in. from the center line of the coupler, and 13 in. from the face line of the knuckle, and that the angle cock should be set at an angle of 30 deg. On an inspection trip made recently through the switching yards and terminals at Chicago, on nearly 70 per cent. of the cars examined the angle cocks were not in the required position, and the train line pipes were loose and easily shifted on account of insecure fastenings. The appliances in general use are made of two pipes of wrought iron bolted together and clamped around the train pipe, but these are not effective enough to hold the pipes rigid in the proper position, and no provision is made to insure the angle cock being held at the proper angle.

The Monogram bracket, here illustrated, will overcome these derangements, and thereby eliminate train pipe repairs due to broken and leaky joints, caused by the movement of the train pipe through the brackets now in general use. It will positively lock and hold the angle cock in a 30 deg. position, thus reducing the loss of the angle cock and hose on account of the breaking of the nipple. The maintenance of the 30 deg. angle is important, as it results in the brake hose being held in the position most favorable for coupling and uncoupling, and prevents kinks in the hose which interfere with the free passage of air through it. The Monogram bracket has been in successful use for several years, and has so demonstrated the advantage above described that it has recently been applied to a large number of cars for several large railways. It is manufactured and sold by Guilford S. Wood, Great Northern building, Chicago.



Wood's "Monogram" Bracket for Brake Angle Cock.

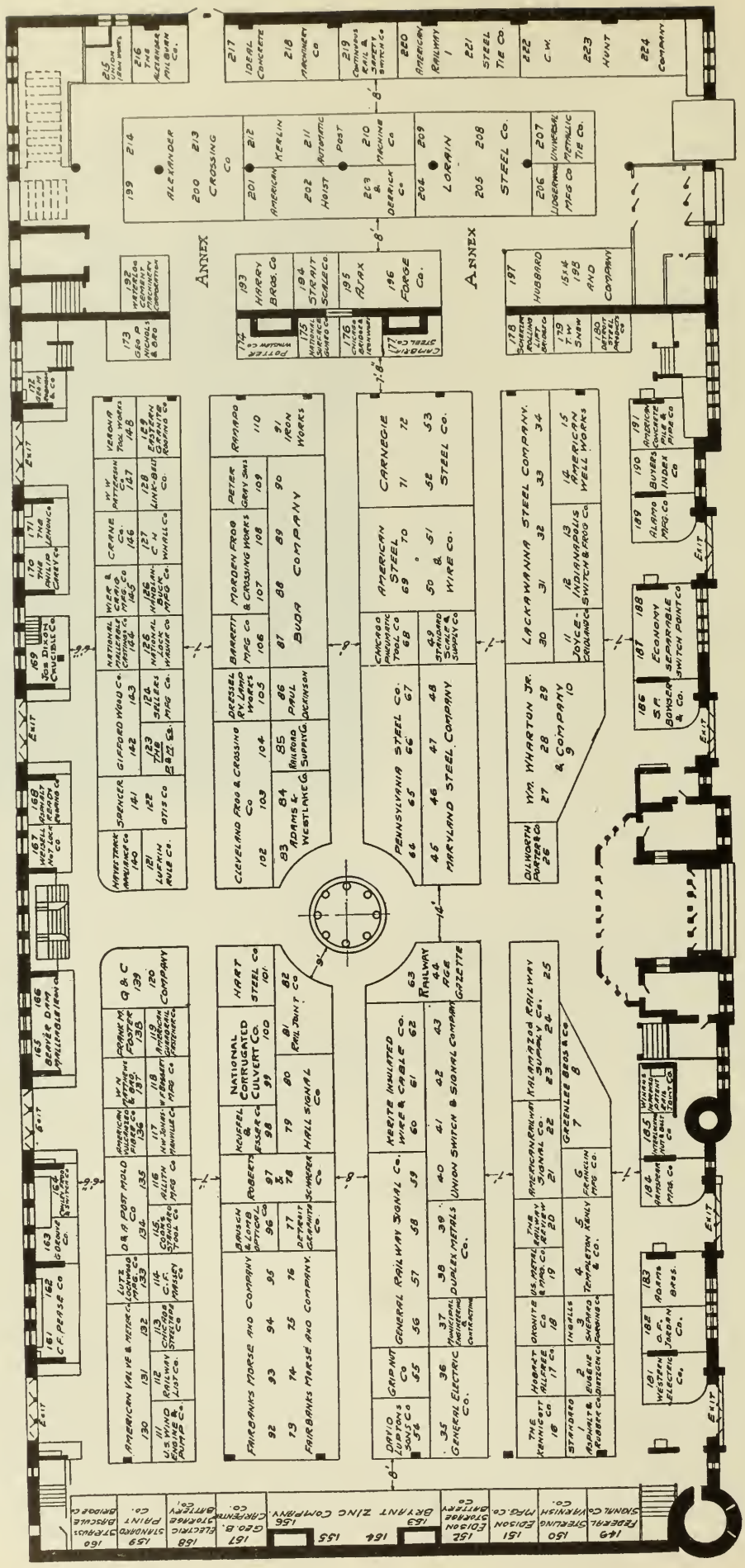
Railway Appliances Association.

Final preparations are being made for the exhibition of railway appliances to be held in the Coliseum, Chicago, during the convention of the American Railway Engineering and Maintenance of Way Association. The exhibition last year was so great a success that a resolution was passed by the Maintenance of Way Association recognizing its high merit, and commending the Railway Appliances Association for its efforts. The number of engineers attending the exhibition was large, and plans are being made to care for an equal number this year. Free automobile service will be provided for all delegates from the Congress Hotel to the Coliseum, making it easy to reach the exhibit whenever spare time is available.

The musical program at the Coliseum this year will be furnished by the Ellis Brooks' Band, which will give a popular program each afternoon and evening.

The feature of greatest interest to many will no doubt be the monorail car, which is to be in daily operation at the south end of the balcony. It has been arranged to present this model car to one of the engineering universities for a permanent exhibit. The university which is to be so favored will be determined by vote of the railway officials attending the exhibition.

The exhibit this year will be larger and better than any previous one. A total of 49,211 sq. ft. of floor space will be occupied by exhibitors. This includes the entire main floor, the entire annex and practically the entire balcony. A few good spaces are still available on the balcony, which may be secured by application to John N. Reynolds, secretary, 303 Dearborn street, Chicago. See floor plan on following page.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SINCE the supreme court has upheld the constitutionality of the corporation income tax law, we may expect to have considerably more publicity given to the affairs of corporations. It can make no difference with the accounts of railway corporations, since these already have about as much privacy as the life of Louis XIV, but with a corporation such as the Standard Oil Company, for instance, the new law, which among other things provides that a stockholder may have access to the returns made to the tax commissioner, should throw a good deal of light on the business methods of these corporations, which heretofore have been known exclusively by a few insiders. While presumably the supreme court did not bother itself with details of how the new law was to be administered, it would be rather interesting to know how carefully the secretary of the treasury is carrying out the strict letter of the law and how far he finds it impossible to do this, and therefore makes rules for his own guidance. The added expense to the railways is comparatively slight. Railway taxes have increased from $245 per mile in 1899 to $401 per mile in 1909, or 64 per cent., and the additional increase imposed by the new law, in the face of such large increases, is simply an additional annoyance rather than a serious hardship.

"THE law," someone has said, "is the last interpretation of the law given by the last judge." Similarly, what is "reasonable" in legislation affecting railways is what is held to be so by the last court in its last decision. The supreme court of Kansas has rendered a decision upholding as reasonable a law of that state which few students of railway affairs would accept as such if the august court had not so determined. In 1905, the Kansas legislature fixed "single line" and "double line" rates to be charged on shipments of oil, the former in each case being lower for a given distance than the latter. For example, the single line rate for 6 miles or less is 2½ cents per 100 lbs.; the double line rate, 4 cents; the single line rate for 50 miles and over 40 miles, is 5½ cents; the double line rate, 7 cents, etc. The rates are the same *per pound* regardless of weight; for example, a 10-lb. can of oil takes the same rate *per pound* as a 100-lb. can, or as a tank carload. The universal rule of rate-making is to apply a minimum charge, which is the same for 100 lbs. or any less amount, and to make a distinction between shipments in carloads and less than carloads. The principal reason for making these distinctions, of course, is that it costs more per pound or per ton to haul a small shipment than a large one. It seemed reasonable to the traffic men and lawyers of the railways affected by this legislation to construe single line as one line, and double line as two lines, and, when a shipment moved over three lines, to charge the sums of the double-line and single-line rates; when it moved over four lines to charge the sum of the double-line rates, etc. But when the law was tested in the Kansas courts, they held that the making of the same rates per pound, regardless of weight, was reasonable, and that double line meant any number of lines exceeding one. Under the law as thus interpreted, the shipper can route freight through whatever junction points, and over whatever number of railways, that will enable him to get the lowest combination rate, and it often happens that a consignment of trifling weight and yielding insignificant revenue is routed over six or seven roads. For example, there recently was forwarded from Neodosha, Kan., to Haddam, a tank car containing 47,694 lbs. of gasolene. It was routed from Neodosha to Fredonia, 13 miles, via the 'Frisco; from Fredonia to Emporia, 74 miles, via the Santa Fe; from Emporia to Junction City, 62 miles, via the Missouri, Kansas & Texas; from Junction City to Clyde, 56 miles, via the Union Pacific; from Clyde to Concordia, 15 miles, via the Missouri Pacific; and from Concordia to Haddam, 31 miles, via the Burlington. From the transaction the 'Frisco earned $2.55; the Santa Fe, $14.77; the Missouri, Kansas & Texas, $12.37; the Union Pacific, $11.17; the Missouri Pacific, $3, and the Burlington, $6.22. In moving 251 miles the car had to be switched to and from the tracks and trains of six different railways; and the total revenue received from this very expensive haul was $50.08, or but 8 mills per ton per mile! The agent of the Missouri, Kansas & Texas, recently was offered a shipment of 40 lbs. of oil, routed via the Katy from Chanute to Eldorado, via Pickway and the Missouri Pacific, a distance of 98 miles. The double-line rate between these points is 8½ cents per 100 lbs., so the revenue of the roads from the shipment would have been just 3 cents. The shipper, under the law, could have tendered the 40 lbs. of oil in a tank car and compelled the roads to transport it 98 miles for a little more than the price of a postage stamp! That the Kansas court, in view of the absurdities and injustice that the law in question results in, could hold it "reasonable" and constitutional, illustrates the fact, that common legal sense does not always influence courts in determining which is reasonable.

TRACK SCALES.

In the general improvements in methods of measurement the railways have kept pace with industrial establishments. It is a remarkable fact, however, that the instrument used in weighing heavy and bulky commodities in carload lots, from whose transportation a large part of the railways' total earnings are derived, is notoriously inexact. Track scales are a development of the simple system of light levers which is employed in weighing wagons. In adapting this mechanism to the heavier requirements of the railway business, the makers have produced a scale that may answer for low capacity cars, but which in several respects has not been adequately developed with the increasing weights of cars and lading. In designing the mechanical part of track scales, and in constructing their foundation, and wooden parts, the roads usually have simply followed the traditional plans. The consequence is that as a means of weighing the larger cars with their heavy loads the scales are apt to be found defective and inadequate. The Minnesota Railway Commission says in its recent annual report that a scale expert inspected all the track scales in the state, 128 in number. Of these 37 were found to work correctly; 66 to weigh less than standard, and 25 more than standard, by substantial amounts. Eight were found to be broken; 10 to have poor foundations; on 20 the levers were shifted; 15 had worn out pivots; and binding impaired the accuracy of 23.

The principal defects in track scales are due to poor foundations which cause the main bearings to rest unevenly, thus placing irregular stress on, and causing twisting of the levers. The use of timber for the principal longitudinal members and main frames has been continued under loads which are too heavy for such material, and there is certainty of decay in a short time, so that the wooden structures do not have the required stability or permanence. The levers, although apparently heavy and stiff enough, have been found to deflect a sufficient amount to prevent correct registration of the load. Even pivot bearings as ordinarily made are often found worn out and not in true adjustment. One of the worst features of the usual track scale construction is the introduction of the permanent third rail. This requires columns to project through the main scale structure, preventing the best lever arrangement and seriously interfering with the proper inspection of the lever bearings. These and other defects have contributed to the unsatisfactory condition of track scales and prevented the weighing of cars and their lading with accuracy.

During the past two or three years the Pennsylvania Railroad has made a careful investigation of scales as usually constructed to ascertain their principal defects and how they could be overcome. The chief scale inspector, with the assistance of the mechanical engineer's department, has made some notable improvements, involving the introduction of several novel and interesting features.

We illustrate elsewhere in this issue one of the new scales recently installed at Brownsville Junction, Pa. A comparison of this substantial machine with the scales usually found on railways is instructive. The massive foundations and pit walls are of solid concrete. The third rail has been omitted and a system of toggles operated by a torsion shaft and air cylinders relieves the bearings of load and shock when they are not required for weighing. The only wood used is that for the cross ties, and the main scale frame is built up of heavy eye beams which insure a permanent construction that will remain in alinement for years, instead of requiring constant inspection and repairs; and there is no deflection to interfere with the accurate operation of the levers. The levers have been redesigned and made larger and heavier, and careful attention has been given to the design and making of the knife edges and their bearings. The weight and cost of this new and improved track scale may be regarded as excessive and unnecessary, but as it is the chief instrument for determining the amount of money that should be received for the transportation of freight in car loads, true economy requires whatever expenditure is necessary to secure the greatest accuracy in its operation.

DELAWARE, LACKAWANNA & WESTERN.

The Delaware, Lackawanna & Western would not have made much of a showing in an argument for increased rates based solely on the need for additional profit, but Mr. Truesdale's objection to the testimony presented to the Interstate Commerce Commission in regard to efficiency of railway managements is certainly well taken. He pointed out that the D. L. & W. handled 60 per cent. more tons of freight in 1910 than in 1900, and handled 80 per cent. more tons one mile. The road handled 80 per cent. more passengers in 1910 than in 1900, and 77 per cent. more passengers one mile. This service was rendered with an increase of 5 per cent. in freight train mileage and 8 per cent. in passenger train mileage. The increase in tons handled per freight train mile was 74 per cent., the earnings per freight train mile 65 per cent., and per passenger train mile 60 per cent. Mr. Truesdale says: "Operations of the government in any branch in this country cannot show such progress in efficiency . . . Surely it is time that the people of the country should insist upon their representatives in congress, the legislatures, and elsewhere turning their attention to the question of producing greater efficiency and the reducing the profligate waste in administering the affairs of government, that the enormously increased burden of taxes paid more or less directly by the people may be reduced as it can and should be."

The Lackawanna as has often been pointed out before, is a unique railway company in a number of different respects. It owns larger anthracite coal fields, situated nearer tidewater, than those of any other large railway company. Since the charge for hauling coal from the mines to tide water must be the same, whether the haul be long or short, the Lackawanna receives a high ton mile rate. It is a company without bonded debt, and with a very low nominal stock capitalization. Its earnings, therefore, expressed in a percentage on par value of capital stock, are very high as compared with other railway companies. In 1910 it paid its regular 10 per cent. dividend and its regular extra 10 per cent., a total of 20 per cent.

The total operating revenue amounted to $36,050,000, in 1910 an increase of $1,200,000 or 3.56 per cent. over 1909. The total operating expenses amounted to $20,600,000, an increase of $1,900,000, or 10 per cent. Thus the company operated on a 57.20 per cent. ratio last year, as against 42.80 per cent. the year before.

The following table gives the unite cost of maintenance of equipment:

	1910.	1909.
*Repairs of locomotives	$1,820	$1,732
Repairs of passenger train cars	614	601
Repairs of freight train cars	53	52

*For repairs only, no account being taken of renewals, depreciation or overhead charges.

The "additional income" amounts to $4,500,000 in 1910 as compared with $8,500,000 in 1909, and after the payment of fixed charges and dividends and a charge of $2,500,000 for renewals and betterments, the company had a surplus of $4,700,000 in 1910 as against $10,100,000 in 1909. The substantial decrease in "additional income" was due to the fact that in 1909, the profits, amounting to $2,500,000, from the sale of Lehigh Valley stock were included in additional income, and also to the fact that the coal department earnings were less in 1910 than in 1909.

The Lackawanna owns and operates its own coal mines, and until the Commodities Clause was passed as a law it also sold its own coal at tidewater. After the Supreme Court had upheld the Commodities Clause the Lackawanna formed the Delaware, Lackawanna & Western Coal Company, distributing the coal company's stock to its own stockholders, and the coal company now buys Lackawanna coal at the pit's mouth. In 1909 this arrangement had only been in effect during five months, so that during the other seven months the profits from the sale of coal were included in the Railroad company's additional income. In 1910 the Railroad company mined about 373,000 tons more coal than during 1909, the cost per ton of coal produced being slightly more than during the preceding year.

The traffic statistics of the Lackawanna show general prosperity in the coal trade as well as in the general business of the territory which the road serves. The total number of tons of coal carried one mile amounted to 1,681,000,000, a very slight increase over 1909, while the total number of tons carried showed a decrease and the average rate per ton per mile also showed a decrease, being 8.37 mills in 1910 as against 8.61 mills in 1909. This decrease in ton mile rate with an increase in average length of haul illustrates the point previously mentioned in regard to the rate on coal being a flat rate, regardless of the number of miles carried.

The total number of tons of merchandise freight carried one mile was 1,788,000,000 in 1910, an increase of 9.88 per cent. over 1909, while the total number of tons carried increased 14.46 per cent., the average haul being 6 miles less last year than the year before, and the average rate per ton per mile being 6.96 mills in 1910 as against 7.00 mills in 1909.

Passenger traffic as well as merchandise freight traffic showed an increase in 1910. There were 26,000,000 passengers carried, an increase of 1.28 per cent. over 1909. The average distance each passenger was carried was 19 miles, and the average receipts per passenger per mile were 1.454 cents in 1910 and 1.385 cents in 1909. It will be recalled that during the year the Lackawanna made increases in its commutation rates in and out of New York. The Lackawanna spent a considerable per cent. more for traffic expenses, that is for soliciting freight and passenger business last year than it did the year before; and the substantial gain in merchandise tonnage may be, and probably, is in part due to the greater activities of the traffic department. In 1910 the company earned $854,000 from the transportation of milk, an increase of $58,000 over 1909; and the president's report commenting on this fact, says that it demonstrates that this branch of the company's traffic is capable of further development.

The Lackawanna is a road that has not only succeeded in actually giving a high class of service to its patrons, both to the traveling public and to shippers, but has succeeded to an unusual degree in convincing the public that this is a fact, with the consequences that it has an unusually loyal set of patrons. The annual report lays special stress on the high standard of upkeep, which has been adopted for the company. In laying new rails and ties the most modern methods of construction were followed as respects the use of heavy tie plates and screw spikes, at a largely increased cost for both labor and materials used. The report says that the standards adopted by the management as to track construction will, it is believed, within a few years result in the company's tracks being brought to a condition equal in every way to those of any railway in this or any other country. It is interesting to note that through expenditures made last year for the construction of new telephone train despatching lines the work of this character on all the main lines and branch lines of the company has been completed.

Mr. Truesdale says the "condition and outlook for the anthracite coal industry as a whole seems to be most satisfactory . . . the general business conditions remain good throughout the entire country, and the outlook for the year 1911 indicates with reasonable certainty that in all lines of activity the volume of business will continue on as large a scale at least as during the year just closed. The probabilities favor a further increase . . ."

The results of operation of the D. L. & W. for 1910 as compared with 1909 are as follows:

	1910.	1909.
Average mile operated in	957	957
Coal freight revenue	$14,067,778	$14,464,221
Merchandise freight revenue	12,443,473	11,393,860
Passenger revenue	7,290,943	6,825,430
Total operating revenue	36,052,932	34,815,011
Maintenance of way and structures	3,804,932	3,298,389
Maintenance of equipment	5,034,605	4,797,073
Traffic	716,347	651,888
Transportation	10,379,455	9,340,845
Total operating expenses	20,623,448	18,743,509
Operating income	14,121,315	15,039,687
Gross corporate income	18,669,311	23,513,595
Net corporate income	13,264,101	18,078,650
Renewals and betterments	2,542,117	2,099,454
Dividends	6,028,800	5,831,586
Surplus	4,693,184	10,147,609

THE FUTURE OF THE RAILWAY WAGE EARNER.

WHATEVER may be the doubts as to the influence of various forces in decreasing the net earnings of the railways, there will be accord as to the major cause. Considerable stress will be laid on such elements as the increased cost of railway supplies, the public demand for facilities and other factors. But the wage question and its collateral problems stand out by themselves. Nor is that question a simple one expressed in the mere sum total of the millions of dollars that show the wage increases. It is complicated by the continued and increasing assertiveness of labor; by its successful demand for shorter hours and more limited runs; and its resistance to piece work and its diminished efficiency due to that and other causes, with reliance on the union replacing loyalty to the corporation and responsibility to the operating manager. Not the least suggestive of the comments of some of the leading railway heads on the recent rate decisions has been their opinion that, had higher rates been granted, organized labor would ere long have tried to absorb them.

As the case stands the situation in regard to the future of the railway wage earner is economically a very interesting one. While it cannot be stated positively, there are the strongest indications that the upward wage movement has reached the summit of its curve. Earnings of the railways, save in a very few and exceptional cases, can stand no further wage increases, which during the calendar year 1910 are estimated at a minimum of $100,000,000 to which are to be added other millions since the opening of the present year. The tendency on the other hand must be toward getting more work done for a dollar. It will take the shape which the railway managers had about agreed on early in 1908, when the Roosevelt letter to the Interstate Commerce Commission interfered—namely the normal all-round wage reductions of a post-panic year. Or it will take the alternative form (and has already in some cases) of the 1908 reduction of force and the translation of reduction of pay into reduction of the number of men on the payroll. Operating in the same direction is the important element of cost of living, on which the demand for increased wages has been successfully based. Cost of living has not yet very palpably or practically gone down. But, like wages, it has apparently reached its highest curve. Some commodities are actually lower and there are signs as to others. The magnitude of the question in politics and its dominance in the Canadian agreement are indications not to be ignored. Nor to be disregarded are the forecasts of our best economic prophets who tell us that two changes—liquidation of labor and liquidation of commodities—are necessarily ahead before the bed-rock of solid prosperity is reached and the strong reaction upward is begun. If their prognosis is correct, the responsibility for peaceful or violent readjustment of railway conditions will rest with the wage earner. Two phases of such a possible readjustment, whether it is far or near, attract speculative attention. Hitherto the policy of the unions has been the acceptance of arbitration in labor disputes. To a certain degree it has been a cheering sign as avoiding the sinister and calamitous alternative of the strike. The unions have, as a policy, opposed the theory of compulsory arbitration, but voluntary arbitration they have usually not merely accepted but have urged as a policy. But it has been arbitration on an *ascending* wage scale—arbitration not for a decrease but for an increase, and where, at the worst for labor, the old wage would stand. Suppose, however, the revised conditions in which, owing to lowered cost of living and other relevant causes, the railway corporation appeals to arbitration for a *decreased* wage. Will the unions then accept the old fashioned dictum that it is a poor rule that does not work both ways, and be as hospitable to arbitration downward as they have been to arbitration upward? And, as the second phase of the situation, will they go a step further and accept the maxim that wages, high or low, are not money and its denominations but what the money buys? Will the railway wage earner recognize the fact that the $2.50 a day that buys more is higher pay than the $3.00 a day that buys less?

Coming down to actual figures, the best returns available,

those of the Interstate Commerce Commission, indicate that wage increases on the railways have even now outrun the cost of living.

For the ten years which ended in 1908 the pay of engine men had increased 20 per cent.; of firemen, 25 per cent.; of conductors, 22 per cent.; and of trainmen, 34 per cent. To these wages, at a very moderate estimate, 10 per cent. would have to be added for increases since 1908, especially if shorter runs and hours be counted, though saying nothing of lowered efficiency. The campaign of higher costs of living are much more difficult, owing to the variation of prices in different regions of the country, and the varying amounts in which different articles enter into consumption. But the best estimate based on both prices and consumption in a recent arbitration indicated a rise during the last year of somewhat less than 19 per cent. Taking the returns comparatively, there can hardly be the slightest doubt that railway wages have gone above costs of living during the last ten years. If now those costs are to recede, the logic and consistency of the railway wage earner will be put to a severe test should arbitration downward be rejected after the benefits of arbitration upward had been welcomed and received. It may not come to that. It is not impossible that the railways, after their trying experiences with labor during the last two years, may, even on a descending scale of costs of living, sacrifice logic to peace. But the outlook has contingencies which make the future attitude, action and policy of the railway labor organizations a matter of extreme import. If not a prime solvent or marplot, as the case may be, of the railway problem, it has in it a most conspicuous place.

NEW BOOKS.

Comparative Analysis of Railroad Reports for the fiscal year ended June 30, 1910. H. H. Copeland & Son, New York. Ten charts bound separately in folders 10 in. x 5½ in.; published annually.

As a general rule, any manual of railway statistics contains an *abstract* of figures published by the railway companies, with possibly certain derived figures added; as, for instance, the figures worked out on a per mile of road basis. These analyses of railway reports are in no sense abstracts, and in the case of nearly every road covered there are figures given in the charts which cannot be derived from the annual reports of the railway companies. Each folder contains two charts, one showing the income, the expenditures, and the profit and loss accounts of about 15 roads in the same general geographical territory, and in addition there is a column showing the average for the roads in that group. The second chart shows the balance sheet figures in the form prescribed by the Interstate Commerce Commission for each of the roads, the capital changes during the year, and a group of physical statistics selected with care. No matter how familiar a man may be with the returns made by railways to their stockholders, when he comes to compare these statistics with the returns to the Interstate Commerce Commission he encounters a great number of difficulties. In the first place, roads like the Pennsylvania and the New York Central report to their stockholders for the calendar year, and to the Interstate Commerce Commission for the fiscal year ended June 30. The analyses of railway reports have been made up both from the annual reports of railways and from the returns to the Interstate Commerce Commission, but they have been carefully and intelligently readjusted so as to show figures for all roads on the same basis, and show all roads for the fiscal year ended June 30.

It is hard to do full justice to as careful a piece of analytical statistical work as these charts show in the space of a single review. Under income the total revenue from operation is shown, both as a total figure; as per mile of road operated; per revenue train mile; passenger, freight and average; per ton mile; per passenger mile, and as a per cent. of operating revenue. Freight and passenger, etc., revenue is shown on the same basis. Under expenditures, expenses of operation are shown as a total and are divided into a number of very interesting and illuminating separate accounts. For instance, the total cost of labor is shown as a total and on per road miles operated, a per train mile basis, and as a per cent. of operating expenses, and also per mile of all tracks and sidings, excluding trackage rights. Under physical statistics, to mention but a few, there are figures showing the miles of straight line and per cent. of total and miles of level line and per cent. of total, average weight of rails per yard, miles ballasted and per cent. of total, average age per unit of each class of equipment, and the principal commodities carried, with their density.

The charts are in no sense a work of handy reference. An expert statistician might, with the expenditure of a very considerable amount of time, make such an analysis of one road as is given in these charts, providing he could have access to all the figures furnished the Interstate Commerce Commission. Naturally such an analysis as this can only be used to advantage by some one who is thoroughly familiar with the use of railway accounts. To such a one it is of the very highest value. Any comparisons made between different roads are apt to be misleading unless full allowance is made for their limitations, but such a comparison as is made in these analyses, when taken intelligently, has great instructive value.

Letters to the Editor.

ONE OF THE COMMISSION'S ARGUMENTS.

New York, March 4, 1911.

To the Editor of the Railway Age Gazette:

I note your reference to $57,000,000 of New York Central stock having been issued without payment, and the intimation, at least, that dividends thereon could hardly be expected.

Is this old stock watering of 1869 to hang over the road indefinitely, like William H. Vanderbilt's celebrated sentiment? Presuming there was such a stock watering as you mention 42 years ago, has not much more than $57,000,000 of the stockholders' money been put back into the road in the intervening years in the shape of payments from surplus? If such is the case, it constitutes a legitimate solidification of the water, so-called, and dividends on the amount thus plowed into the property are in order. Not long ago the Ontario & Western management—very reputable and conservative people—not only took credit for surplus earnings invested, but issued bonds against such investment.

So why not say a word of favorable comment concerning the New York Central episode of 1869? Yours truly,

F. W. SAWARD,
General Manager *The Coal Trade Journal.*

[The reference that Mr. Saward refers to was an abstract of Interstate Commerce Commissioner Prouty's opinion in the eastern rate case, and the reference was just about in Commissioner Prouty's own words. The argument of the commission was that on an average about 6 per cent. had been paid on New York Central stock since 1869, and this is not far from right as given in Poor's Manual; and that therefore the money that according to Mr. Saward had been plowed back into the property was not stockholders' money primarily, but money earned through presumably excessive freight rates; in other words, that the surplus earned and put back into the property was in the nature of a tax on the general public to pay off the debt of the incorporators of the company to the property. Our opinion as to the soundness of the commission's argument has been stated elsewhere, since it was not possible to publish the full opinion of Commissioner Prouty in these columns, we state his argument as we understand it. From the point of view of the stockholder, there is, of course, no doubt that long ago all of this water has been solidified.—Editor.]

NORTHUMBERLAND FREIGHT CLASSIFICATION YARD; PENNSYLVANIA RAILROAD.

BY WILLIAM FORSYTH.
Associate Editor, *Railway Age Gazette.*

The movement of freight traffic on the Pennsylvania Railroad from western Pennsylvania to the southern portion of the state and to New England has in recent years been more and more diverted from the main line to the Williamsport division, and this passing to the terminal at Sunbury, which is congested with traffic from four other divisions, has made it necessary to build a large classification yard at Northumberland, Pa. In the construction of this yard, which is almost completed, advantage has been taken of the experience of the Pennsylvania Railroad in building and operating several large classification yards and locomotive terminals, and the Northumberland yard is interesting as embodying the results of the careful study of these and of classification yards of other railway systems. This relates not only to the size and arrangement of tracks in the different yards, but to the design and construction of the various buildings required. The study of traffic conditions in the neighborhood of Sunbury,



Large Culvert Crossing the Yard Between the Engine House and the Coal Wharf.

Pa., was an obvious preliminary, as it was found necessary to transfer the classification yards bodily from Sunbury to Northumberland.

The freight traffic at Sunbury now requires the handling of a maximum of 4,000 cars daily, and two separate yards are used—one at the north end of the town and the other at the south end. The space at each yard is contracted and the operation of the two separate yards is unusually expensive and inconvenient. Sunbury is a natural location for a freight terminal, so far as direction and density of traffic are concerned, but space for a large yard with tandem tracks is not available. Three divisions of the Pennsylvania Railroad and two of the Northern Central concentrate at this point: the Williamsport, the Lewiston and the Sunbury divisions of the Pennsylvania Railroad; and the Susquehanna and the Shamokin divisons of the Northern Central.

The number of cars passing through the yard at Sunbury in 1900 was 804,000, or an average of 2,203 for each day in the year. The normal movement is now about 3,500 cars per day or 85 trains, the passage of a car into and out of the yard being considered one, and not two cars.

In order to provide better facilities for increased traffic, three locations were considered: first, an extension of the present yards at the south end of Sunbury; second, Augusta, on the opposite side of the Susquehanna river, about two miles farther south; and, third, a tract on the west branch of the Susquehanna river at Northumberland. To determine the best location from an operating standpoint, the traffic was analyzed to find the average daily reverse movement for each location for 3,500 cars, which is the average maximum movement. The result of this analysis, showing the percentage of the entire movement going to and coming from each of the radiating roads, was slightly in favor of Northumberland. The probabilities of changes in the routing of traffic which would affect reverse movements were also considered. There are four things which may affect these movements: first, through freight in either direction now routed over the low grade line between Pittsburgh and Harrisburg may be sent over the line by way of Red Bank, Driftwood and Sunbury at such time as the Enon line may be built for traffic to and from the west which is now going through the Pittsburgh district; second, traffic from the middle division, which formerly moved over the high grades of the Lewistown division, is now routed via Tyrone and the Bald Eagle Valley branch to foreign line connections at Wilkesbarre and Mt. Carmel, and comes into Sunbury from the west; third, through trains between the anthracite coal region and Harrisburg may be established when the volume of business warrants; fourth, the anthracite coal movement on the Sunbury and Shamokin divisions westward over the Williamsport division is growing.

In regard to the first and second items, the yard at Northumberland would be in the line of direct movement for the traffic, while the one at East Sunbury or Augusta would produce reverse movements. The third item relates to through coal trains between Harrisburg and the anthracite coal region at Shamokin and Nanticoke. This movement will be taken care of by the retention of a few sidings in the old yard south of Sunbury, thus avoiding backward movements in the Northumberland yard. The fourth item relates to the increase of westbound anthracite shipments. This business will be in direct movement through the Northumberland yard, but would be reverse for the other two locations.

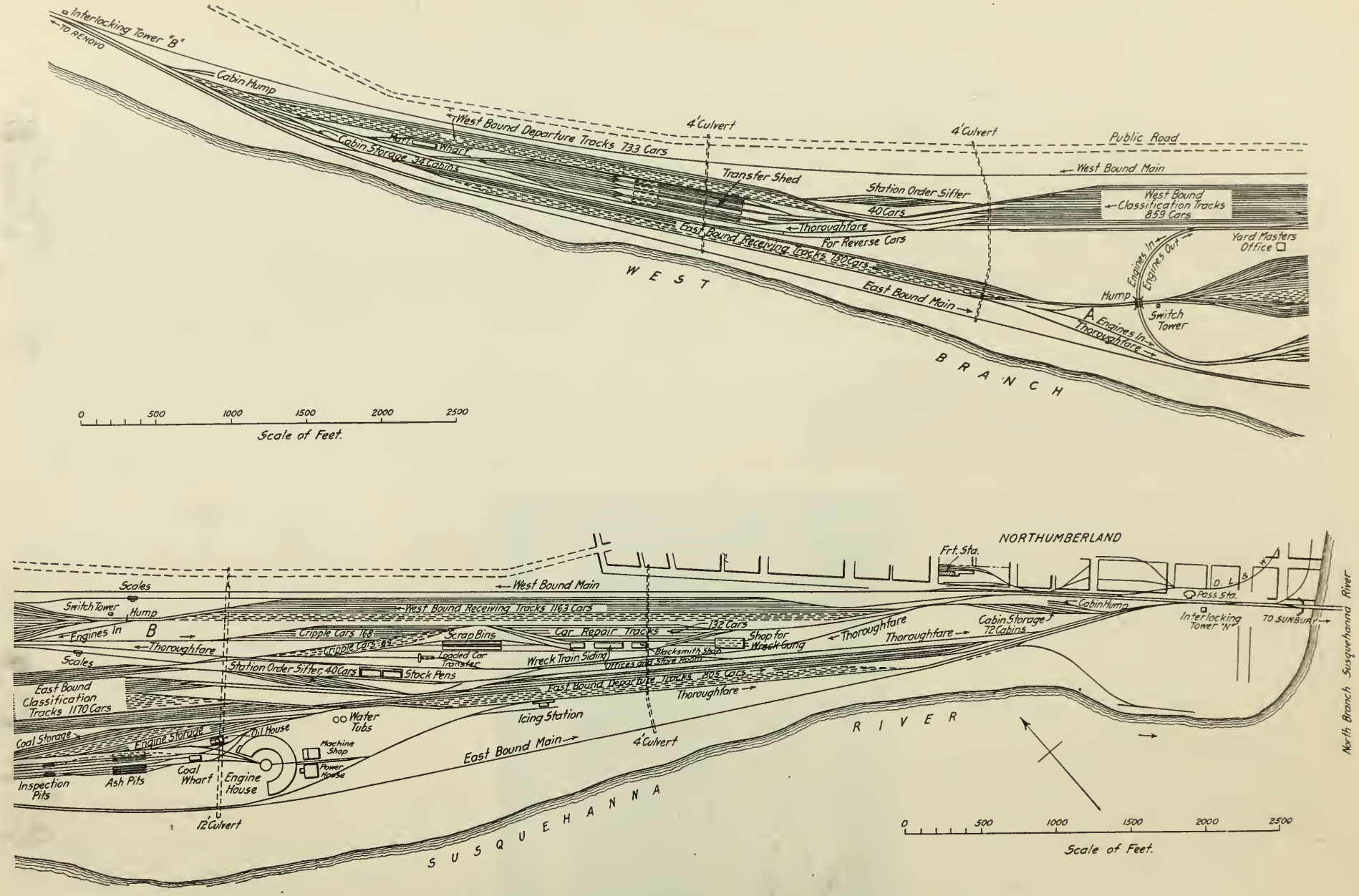
It was decided that the cost of building a yard at Northumberland would be less than at either of the other locations considered, the figures for grading, tracks and buildings at that point being approximately $2,800,000; land, $200,000, including the cost of a new connecting curve with the Sunbury and Wilkesbarre division, on the east side of the north branch of the Susquehanna river, and a new one connecting with the Bloomsburg division of the Delaware, Lackawanna & Western, on the west side of that branch.

PLANS AND GRADING.

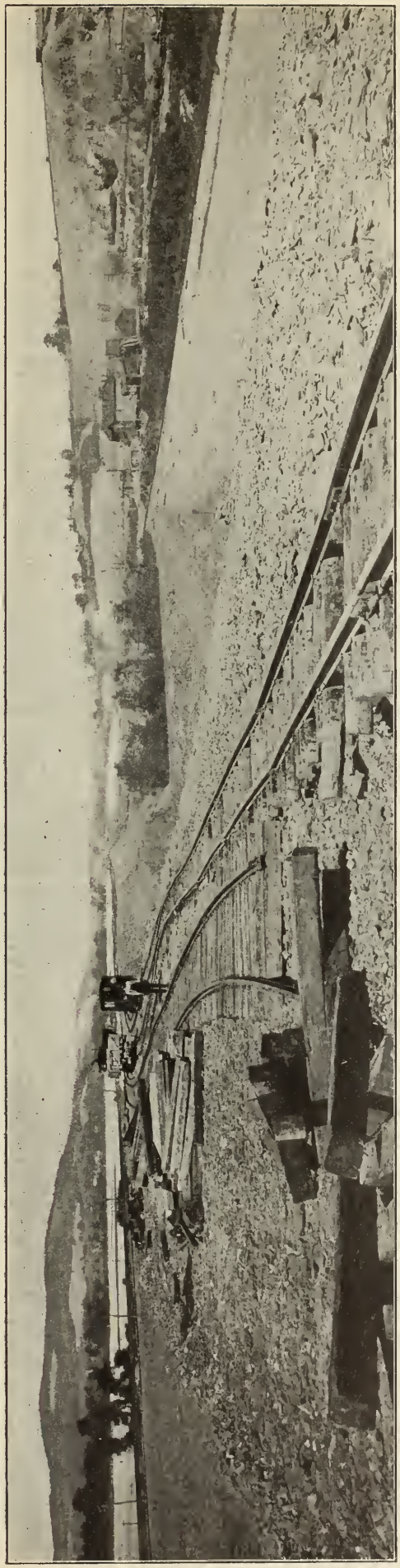
In the preparation of plans for the Northumberland yard, the necessity of departure yards and the proper length of classification yards were thoroughly discussed, and it was finally decided to use the departure yards, and that classification yards need be only of an average length of 35 cars. It is believed that in addition to other reasons, a departure yard is necessary in order to properly comply with the laws relating to safety appliances, and especially the testing and inspection of air brake fixtures. The loaded car movement in both directions exceeds the empty car movement.

The photographs show the general contours during the grading period. The tract selected occupies the former level of farm lands along the west branch of the Susquehanna river, about 3 miles long, having a maximum width of 1,500 ft., and comprising 350 acres. The portion farthest from the river extends into a ridge which provided ample material for filling and raising the general level well above the river flood heights. The yard will be graded for 100 miles of track, but only 75 miles will be laid at present. These are shown in full lines on the plan, while future tracks are indicated by dotted lines.

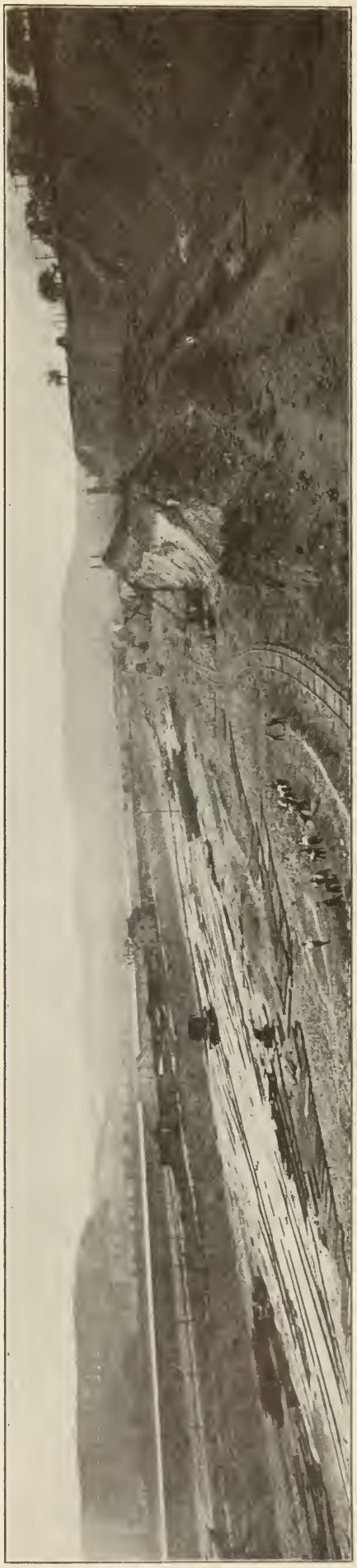
The work was begun in July, 1909, and in 14 months 3,000,000 cubic yards of earth and rock cutting had been handled. It is



General Plan of the Northumberland Yard; Pennsylvania Railroad.



Northumberland Yard; Looking North from the Hump over the Circular Track.



Northumberland Yard; Looking North-west from the Hump Approaching the West-bound Classification Yard.

expected that the yard will be fully completed and in operation by May, 1911. The contractor for the grading and concrete foundations, culverts, etc., was the Eyre Shoemaker Construction Co., Philadelphia, Pa.

The first work consisted in transferring the main tracks, which occupied the middle of the tract, to a high bank along the river. This fill, about 45 ft. high and 3 miles long, was raised from the river bank and made ready for trains in three months. The tracks are ballasted with material from the old blast furnace slag banks at Bellefonte. Yellow pine ties have been used, and the partly worn rails from the main track are here utilized in the yard sidings, except at switches and turnouts.

Near the center of its length, between the engine house and coal wharf, the yard is crossed by a concrete culvert 12 ft. wide; a finished portion of this is shown in a photograph. Further provision is made for carrying off storm water from the neighboring hillsides by three other concrete culverts 4 ft. wide; their location is indicated on the plan view. Referring to the plan of the yard, it will be seen that it begins directly at the junction of the north and west branches of the Susquehanna river, with the initial interlocking tower at the east end, directly opposite the passenger station. Here the main line tracks diverge, the westbound passing along the extreme west side of the yard and the eastbound on the high embankment along the river shore. There are also through tracks, called thoroughfares, for movement in each direction, passing between the east and westbound yards. These provide clear entrance to the various minor yards, repair tracks and transfer sheds, and are the principal avenues for locomotives to and from the engine house.

ENGINE MOVEMENT.

Advantage is taken of the high elevation of the hump between the eastbound yards in providing an archway with double circular tracks passing under the hump, and these, in connection with the thoroughfare tracks, provide the entrance to the engine house and at the same time turn the engines without requiring them to go to the turntable. To illustrate the movement, westbound trains are handled by road engines to the end of the westbound receiving yard. Here the engine is cut off, and it passes around the kite-shaped track or loop to the inspection pits, ash pits and coal wharf. If repairs are needed it enters the engine house; if not, it goes to the storage yard and is headed in proper direction for an eastbound train.

An engine in the eastbound receiving yard having arrived from Renovo or other points west would saw out of the yard at the point "A," marked on the plan just west of the loop, and it would then enter the engine house tracks and after receiving inspection and supplies go to the storage yard, still headed east. This disposes of inbound engines from the east and the west. It is expected that 66 per cent. of the engines will not require turning, and all inbound engines when they are in the storage yard will be headed east. All locomotives at this terminal being pooled, there will be little selection in despatching them, except as to size, and the majority of the engines are of the consolidation type. It will require 15 switching locomotives to operate the yard, and 152 road engines will be tributary to it.

If an engine is required for Sunbury, Wilkesbarre, Lewistown or Harrisburg, it will move directly from the storage yard head on to the eastbound departure yard and take its train.

An engine wanted for Renovo or other westbound trains would be headed east in the storage yard, but it should, however, be headed west for its train. Such an engine would move out of the storage yard and back around the loop, cross over the inbound track at "B" and having gone around the loop would be headed west. Therefore, all engines in the storage yard are headed east and can be moved directly east, or around the loop west, as may be necessary.

YARD CAPACITY.

The ladders at the yards are on a No. 7 angle, and the frogs are No. 8. The capacity of the yard is based on a length of 40 ft. per car. The westbound receiving yard when entirely laid with rail will have 12 tracks and a capacity of 1,163 cars. The tracks have a capacity of 77 to 110 cars each. Eight of the shorter tracks will be laid at present. The weighing requirements at Northumberland are not such as to warrant the use of scales at the humps, and the 63 ft. scales are on a straight through track. The westbound classification tracks will be entirely completed at present, and there will be 20 tracks with a total capacity of 859 cars.

Between the westbound classification and departure tracks there is a small grid of 8 tracks with a capacity of 8 cars each. This is called the "station order sifter," where the cars for small local freight trains are classified.

The westbound departure yard is planned for 8 tracks, with a capacity of 90 to 100 cars each, and a total capacity of 733 cars. Only one-half of the tracks will be laid at present. At the west end of the yard there is the cabin hump with only two tracks, but ample space is graded for further enlargement, and there is a cabin storage yard, with a capacity for 34 cars.

The eastbound yards are arranged tandem like those above described, but with larger capacity. The receiving yard will have 8 tracks of full train length, and a total capacity of 750 cars. The rails will be laid for 5 tracks at present. The two tracks at the east end of the yard pass over the concrete arch at the hump, and a switch with inclined track permits road and yard engines to descend to the lower level in order to reach the coal wharf and engine house.

The eastbound classification yard has the largest number of tracks, but they are shorter, having a capacity of 28 to 50 cars. The yard is graded for 30 tracks, with a total capacity of 1,170 cars, and rails will be laid on these with the exception of 6 tracks. The east end of this yard has three outlets, one leading directly to the station order sifter. Directly north of the sifter there are two yards for crippled cars, one with a capacity of 158 cars; the other is graded for 5 tracks holding 65 cars. The other two outlets lead directly to the eastbound departure yard, which is graded for 10 tracks to hold full length trains with a capacity of 805 cars. This yard terminates at the east end, with a cabin yard for 72 cars and a cabin hump with three tracks. The usual movement of the engine after leaving the house is to back into the cabin yard, get its cabin car and place it on the adjoining hump. It then pulls the train out of the departure yard with its rear end beyond the cabin hump, when the cabin car descends the grade and attaches itself to the train automatically.

A subsequent article will take up the locomotive terminal buildings and other structures.

FOREIGN RAILWAY NOTES.

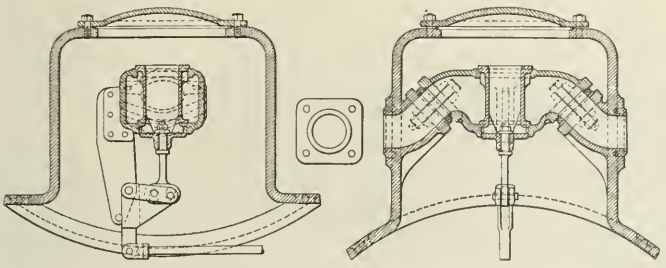
A large increase in the trade, both import and export, of Yunnan, China, is reported to be following the opening of the French railway to Yunnan-fu. Several large foreign houses are stated to have already opened in that city. The Chinese government has sent officials into the province of Yunnan to make investigations and surveys with a view to opening more marts in that province to international trade.

For nearly 10 years the Chinese have been bent on building the Szechuen railway in China themselves. Considerable energy was shown in inducing investors to buy shares, and for years money was collected until a total sum of about $10,000,000 was realized. The subscribed shares are about 25 per cent. of the whole, the remaining 75 per cent. being derived from various taxes. According to a statement made a few months ago by the president of the railway, the company had then about $600,000 on hand, and there was an annual income from shares and other sources of over $1,200,000. The chief engineer and the acting chief engineer were instrumental in building the Peking-Kalgan railway, the successful completion of which shows much ability.

MALLET ARTICULATED LOCOMOTIVE; CHICAGO GREAT WESTERN.

The Chicago Great Western has recently placed in operation between Oelwein, Iowa, and Dubuque ten Mallet locomotives having the 2-6-6-2 wheel arrangement, which were built by the Baldwin Locomotive Works. The engines are intended to operate between Oelwein, Iowa, and Stockton, Ill., where a new terminal is very nearly completed. The high pressure cylinders are 23 in. x 32 in., the low pressure cylinders, 35 in. x 32 in., and the driving wheels 57 in. in diameter. These engines are not fitted with a feed water heater or a superheater, and the boiler is of the ordinary construction. The cast steel dome is shown in detail and it will be seen that it has the openings for the high pressure steam pipes cast integral with flanges for connection by ball joints to the throttle valve, making a simple and direct design. The steam pipe is 5.56 in. inside diameter, the body being wrought iron pipe fitted to cast iron flanges and caulked with a 1/16 in. copper gasket.

The exhaust from the high pressure cylinder is placed on the center line of the boiler with the ball joint at the back end, which coincides with the center of the articulated frame connection. Thus the variation in the length of this receiver pipe is due to temperature changes only, and to compensate for this the slip joint is provided. The high pressure cylinders are bolted to the saddle, while the low pressure cylinders are cast with the saddles which are joined at the center line. The valves are of the plain flat



Steam Dome Showing Throttle Arrangement.

type, but balanced, and are controlled by the Walschaert valve gear. The Ragonnet reverse gear is used in which the cylinder ports are arranged so that the motion of the hand lever is the same as the usual reverse lever; that is, a forward position of the lever controls a forward motion of the engine.

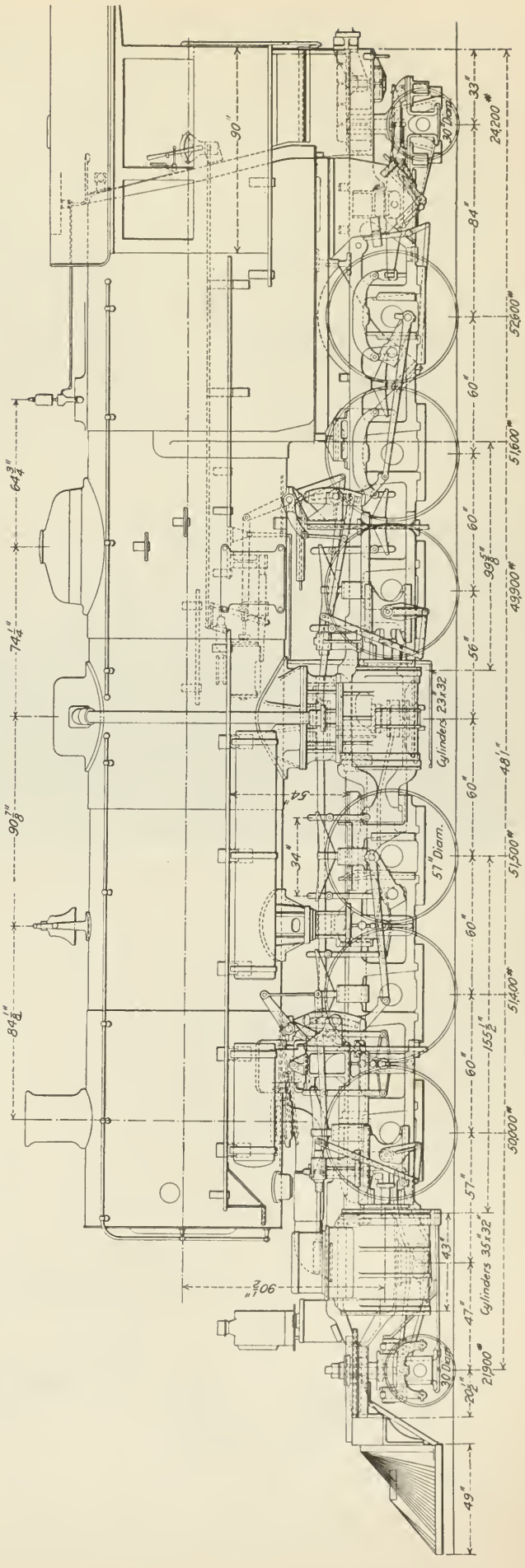
The main frames are cast steel, with the rear ones in one piece and the forward ones having a separate front rail. The main frames are 5 in. wide and the auxiliary front frames 4½ in. wide. The locomotives are equipped with pneumatically operated cylinder cocks for the low pressure cylinders, and there is a force feed oil pump for lubricating them. The high pressure cylinders and the air pumps are oiled from a lubricator placed in the cab, and a separate oiler is provided for the power reverse cylinder. There are two sand boxes for the front group of wheels, which are placed over the front deck plate, and the back group is supplied with sand from a large box placed over the boiler in the usual way. Following are the principal dimensions and ratios:

General Data.

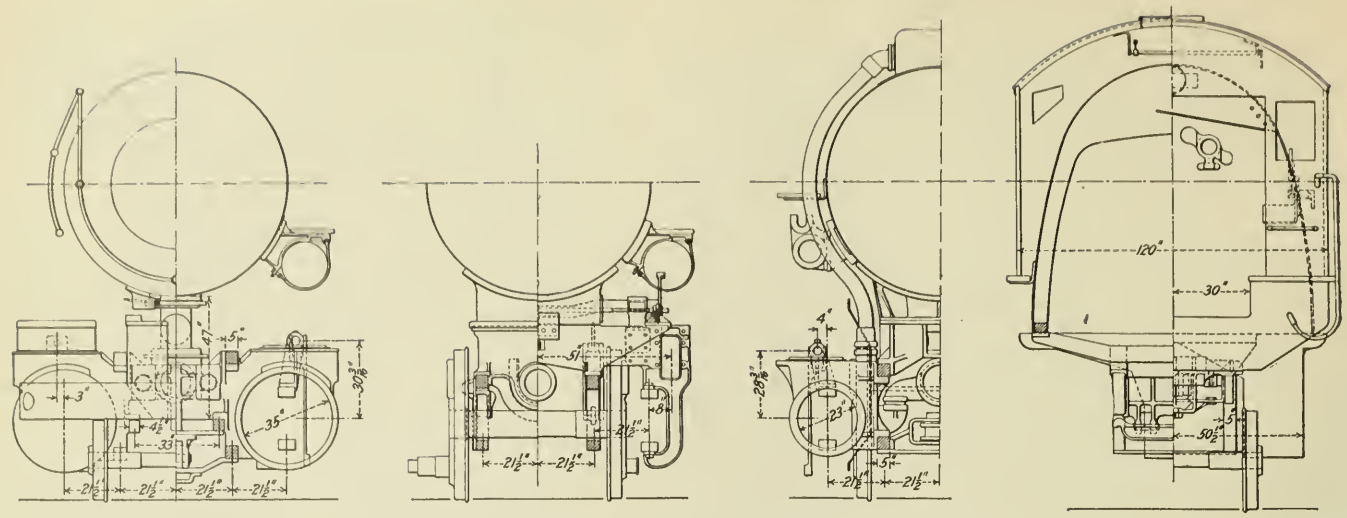
Type	2-6-6-2
Service	Freight.
Fuel	Bit. coal
Tractive effort	81,000 lbs.
Weight in working order	353,100 lbs.
Weight on drivers	307,000 lbs.
Weight of engine and tender in working order	505,000 lbs.
Wheel base, driving	29 ft. 8 in.
Wheel base, total	45 ft. 4 in.
Wheel base, engine and tender	71 ft. 11½ in.

Ratios.

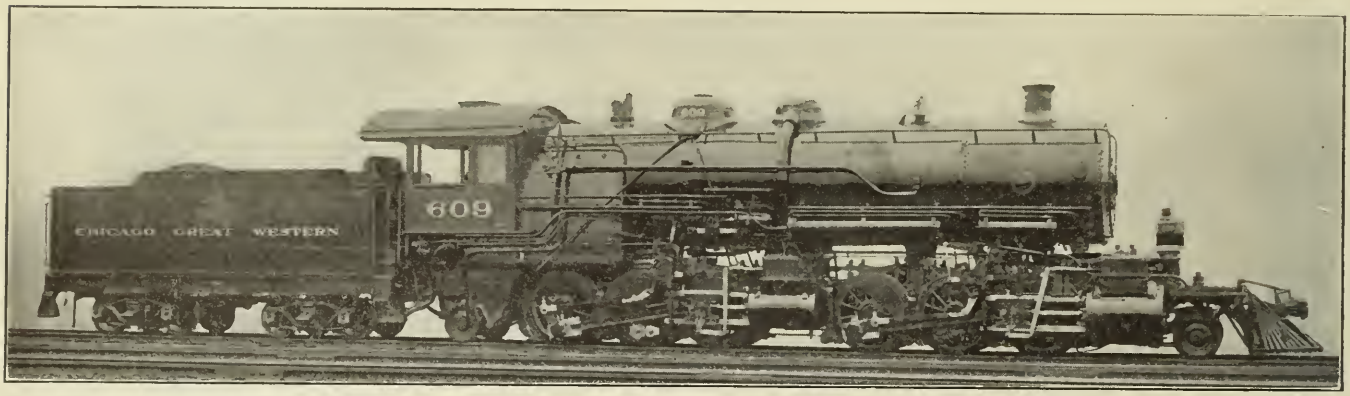
Total weight ÷ tractive effort	4.36
Weight on drivers ÷ tractive effort	3.79
Tractive effort × diam. drivers ÷ heating surface	801.
Total heating surface ÷ grate area	74.
Firebox heating surface ÷ total heating surf., per cent.	3.92
Weight on drivers ÷ total heating surface	53.2
Total weight ÷ total heating surface	61.1
Volume equivalent simple cylinders, cu. ft.	24.1
Total heating surface ÷ vol. cylinders	370.
Grate area ÷ vol. cylinders	3.24



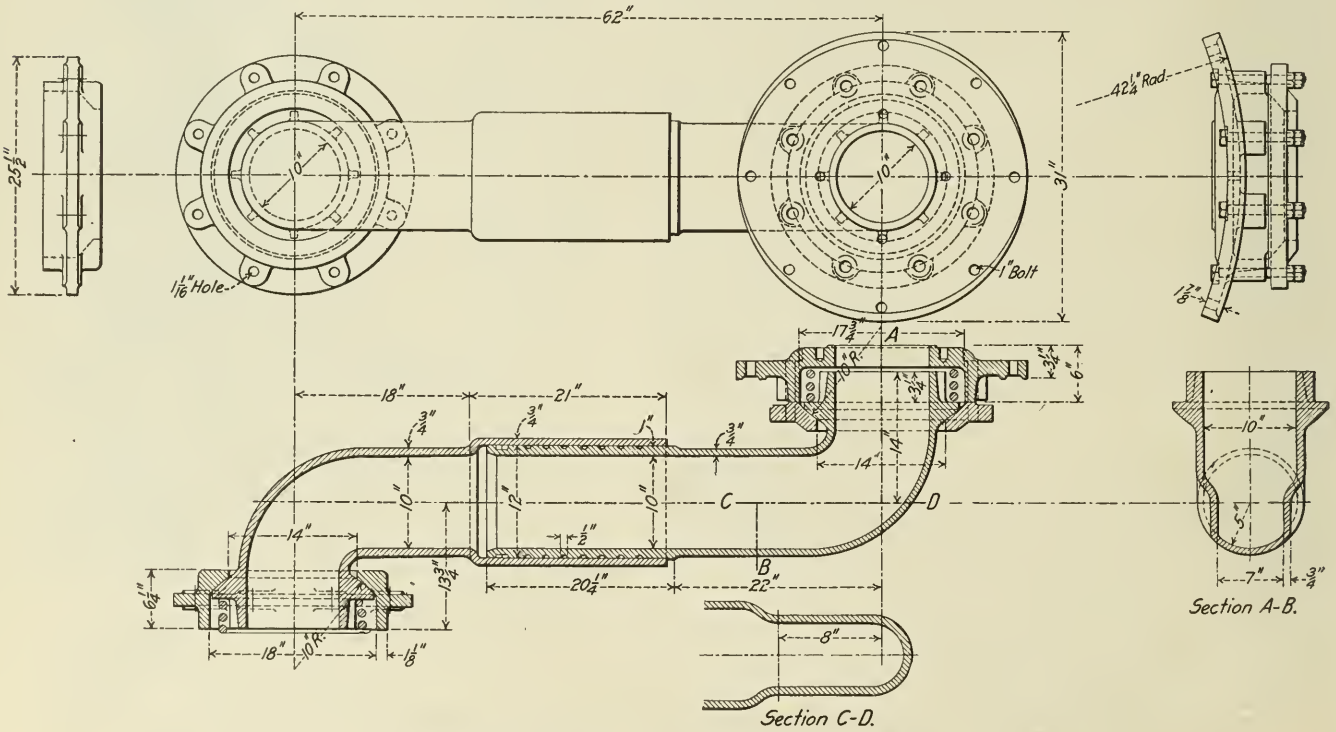
Mallet Locomotive for the Chicago Great Western.



Sections of Mallet Locomotive; Chicago Great Western.



Mallet Locomotive; Chicago Great Western.



Low Pressure Exhaust Pipe for Mallet Locomotive.

Cylinders.	
Kind	Compound
Diameter	23 in. and 35 in.
Stroke	32 in.
Valves.	
Kind	Slide
Wheels.	
Driving, diameter over tire	57 in.
Driving, journals, main, diameter	10½ in. x 12 in.
Engine truck, diameter	30 in.
Engine truck, journals	6 in. x 12 in.
Trailing truck, diameter	30 in.
Trailing truck, journals	6 in. x 12 in.
Boiler.	
Style	Straight top
Working pressure	205 lbs.
Outside diameter of first ring	86 in.
Firebox, width and length	96 in. x 117 in.
Tubes, number and diameter	450—2¼ in.
Tubes, length	21 ft.
Heating surface, tubes	5,540 sq. ft.
Heating surface, firebox	226 sq. ft.
Heating surface, total	5,766 sq. ft.
Grate area	78 sq. ft.
Tender.	
Wheels, diameter	33 in.
Journals	5½ in. x 10 in.
Water capacity	8,000 gals.
Coal capacity	16 tons

NATIONALIZATION OF RAILWAYS.*

BY ERNEST R. DEWSNUP,

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As a matter of practical politics, the problem of the desirable relationship of the state towards the railway has been settled in most countries of the world by the adoption of a policy of nationalization. In but three or four of the more prominent countries does the state take no part in railway management, and, in the case of England, one of the two great strongholds of independent railway enterprise, it is interesting to note, that, in in nearly all of her colonies, possessions, and protectorates, the imperial or colonial governments have freely undertaken the responsibility of railway management. The record of the last few years shows very clearly that the tide of railway nationalization is strong and steady. The acquisition, by the state, of the Western Railway of France, of the West of Flanders Railway of Belgium, of the railways of Japan and Switzerland, the extensive purchases of private lines by Austria, and the resumption of state operation by Italy, are examples in very recent years of the vigor and vitality of the movement. The forces underlying this development have been very complex. Political unity, social amelioration, industrial progress, and financial gain have all been influential motives, varying in relative intensity, of course, in different countries. If, however, one examines the history of that period from which the substantial growth of nationalization really dates, namely the third quarter of the nineteenth century, the importance of political motives in promoting this movement is very conspicuous. Thus, in Belgium, as in Switzerland a quarter of a century later, the fear of foreign financial control of the railway system was a powerful factor in inducing the resumption of state activity in the railway industry. In Austria and Italy the relation of the state railway system to political harmony and to military strength was regarded as a very important one. Because of this fact, the rehabilitation of state railway systems inaugurated in the decade 1868 to 1878 must not be viewed as a vindication, justified by the history of the previous generation, of the economic benefits of state as against private management of railways. The record of state railway management up to that time had been a very discouraging one. In Belgium, for instance, for five years after the opening of her first mileage, the state constructed and operated all railways, but the financial results were so unsatisfactory that the extension of the system was entrusted to private enterprise. In Austria and Prussia the inability of the state to secure adequate financial returns from its railways led to the temporary abandonment of the policy of state expansion. Similar experiences, it will be remembered, were the lot of certain states of this Union. There were no facts in 1870 which could be adduced to establish the economic advantage of state railway systems. On the other hand, there were conspicuous examples of the successful working of private roads in America, in England, and even in continental Europe. At the very time when the Prussian Diet expressed itself in favor of continuing further with the project of a national system, private enterprise was clamoring for railway concessions, in spite of all restrictions that the government had imposed upon construction and working. One of the considerations that induced the Belgian government, in 1871, to resume its railway activities was the too successful competition of the private companies with the state lines. Some companies, it is true, had not met with success, but the financial failures of such roads seem to have been mainly due either to the excessive restriction of governments inclined to paternalism or to the fact that they had been located, under the influence of the state, in regions of scanty population and poor economic possibilities.

Apart from ideas of the promotion of political unity or political aggrandizement, some fear was entertained that this new industrial power, promising to become of huge magnitude, might become a political danger, if left in private hands. The unconciliatory and undiplomatic spirit, manifested, at times, by some of the railway managers, served but to foment such a feeling. A more general influence in favor of the movement towards nationalization was the reaction against the *laissez-faire* teachings of the Smith school, which by this time, had gained considerable strength, as is concretely evidenced by the economic congresses of Eisennach and Milan in the early and middle seventies. There was thereby induced a more favorable attitude towards the intervention of the state in the field of economic production than at any previous period of the century. Since that time the affection of the peoples of continental Europe for government paternalism has, if anything, grown greater, and, as a whole, they are inclined to accept, without argument, the theory of the beneficence of state railways. Nor is this feeling imited to these countries. Twenty-five years ago, Professor Hadley, in concluding his book on railway transportation, said, "There is a strong popular feeling, to a large extent unsuspected by those in authority, in favor of government ownership of railways as a system." Undoubtedly, in England and America, there are today, among the working classes particularly, strong leanings in this direction—the doctrinaire product of social idealism but nevertheless to be reckoned with in the near future. A similar, though less extensive, impression has apparently been made on other classes of society. I have sometimes wondered whether the large increase in the number of state employees, which has naturally accompanied the growth of entrepreneurial and regulative functions on the part of the state, has not had an appreciable influence upon public sentiment. The ideas of the majority of such employees as to the functions and capacity of the state are apt to be affected by their very relationship to it, and these would easily be disseminated, by their medium amongst a considerable section of the public. This concept of the general beneficence of state policy has fostered the belief that, under the ultimate influence of state management, the railway system may be so organized as to promote the social amelioration and industrial progress of the community in a manner impossible under conditions of private operation. During the last generation, governments undertaking railway nationalization, and other advocates, have laid increasing emphasis upon this assumption. They have unrolled before their audience, the people, an attractive picture of railway systems without capital charges, levying minimum rates and fares, with innumerable resulting advantages for every one. To what extent this picture has found realization in actual conditions we shall shortly see. But, however, that may be, its influence on the progress of nationalization is unquestionable.

Interwoven with the strands of this medley of politics and

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social idealism, here and there appears the motive of artificial stimulation of economic development. The desire of relatively undeveloped communities to hasten the natural growth of their estates is not a surprising one, nor is it strange that they should select the state management of railways as their means to that end. Whether their object is best attained in this way is another matter. The construction of a larger amount of railway mileage may be thus secured, with attaching increments of traffic, but this does not in itself justify the policy. The direct financial losses usually involved, the indirect losses arising from an arbitrary diversion of national resources of labor and capital from other interests, the effect of the distraction of the attention of the government from those very important elements of national welfare which are not economic, the possibility of the stimulation of private enterprise, under judicious supervision and with suitable aid, into the accomplishment of its aims, all need to be taken into full account; but, unfortunately, such communities scarcely ever take the time to cast a trial balance of gains and losses.

Such are some of the leading influences that have led towards nationalization, each one of which would form a most interesting study. Obviously, only the bare outlines of the general movement could be sketched in this paper, sufficiently distinctly to indicate that, from the point of view of permanent public welfare, there is still justification for further discussion of a problem which practical politics has declared settled.

The leading aspects of such a discussion are twofold, (1) the effect of the state upon the railway; (2) the effect of the railway upon the state. Under the former head falls the question of the financial remunerativeness of state railways, an important, though not conclusive, test of efficiency. Varying conditions of construction and operation render the correct application of this test a very difficult one. For instance, to attribute greater efficiency to Australian railways as against British railways, because of a 4 to 4½ per cent. dividend as against a 3½ per cent. would be ridiculous. Owing to the value of land, state regulations, and standards of construction, the capital per mile of railway in Great Britain is five times that of Australian railways, some of the recent extensions of which, by the way, have been made at the low figures of $5,000 per mile, sufficient to lay down but the flimsiest of tracks with the absolute minimum of facilities. Differences of capitalization and of rate levels may make interest rates incomparable things. A still further difficulty appears in the frequent unreliability of the financial statements of state undertakings of large capital and revenue accounts. The utilization of other state funds for the reduction of railway debt is an attractive financial manipulation which has notably vitiated the significance of quite a few capital accounts. Discussing the industrial domain, with particular reference to factories for the provision of army and navy supplies, Bastable says, "On purely financial grounds, state industries of the kind are open to serious criticism, owing to the very defective system of keeping accounts which is characteristic of such establishments. The amount of invested capital is hardly ever properly estimated; receipts that should go to capital are assigned to revenue, and expenditure that ought to be met from revenue is defrayed from other state funds or by borrowing." And as he reminds us in a footnote, Richard Cobden, in his last speech in the British Parliament, now some forty-six years ago, protested that, "Throughout the inquiries before Parliamentary committees upon our government manufactories, you find yourself in a difficulty directly you try to make the gentlemen at the head of these establishments understand that they must pay interest for capital, rent for land, as well as allow for depreciation of machinery and plant." In his illuminating articles upon the Belgian state railway system, published some four years ago in the *Revue Politique et Parlementaire*, M. Marcel Peschaud charged the state's system of railway accounts with the greatest confusion, credits relating to the railway having been distributed among five different budgets. Among other defects, he noted the fictitious nature of amortization as represented in the railway accounts, with the result that, "it is not possible," he said, "to fix with accuracy the actual amount of capital expenditure, nor, in consequence, the real charges relating to this capital." This same element of fictitiousness in the amortization accounts appeared, he stated, in the Prussian railway accounts. Elsewhere he remarked, "Nothing is more difficult than to ascertain exactly the financial results of a state enterprise. This is true, no matter what may be the country or the industry concerned. While simplicity and clearness of accounts are the law of private industry, complication, fiction, and obscurity are the rule in state industries." In state railways, therefore, we need apprehend no danger of understatement of capital percentages of surplus earnings, and while such figures, whether correct or incorrect, are not adequate indications of relative efficiency, they may still be used, in a rough sort of way, to throw some light upon the general financial productiveness of state railway systems. Generally speaking, the results have been poor. For instance, in 1907, quite a favorable year for railway traffic, the state systems of Europe, excluding Prussia and Saxony, earned possibly 3 per cent. upon their reputed capitals. Thus France (l'ancien réseau de l'Etat) 1.87, Italy 2.18, Norway 2.64, Sweden 2.75, Denmark 2.92, Würtemburg 2.47, Austria 3.01, Belgium 3.29, Bavaria 3.45, Hungary 3.50, Imperial Railways of Alsace-Lorraine 3.58, Switzerland 3.62, Baden 3.90 per cent. In 1908, when the effects of the economic depression which commenced in the United States in the fall of 1907 really began to be felt, the average return fell considerably below 3 per cent. Such results indicate that most of these railways, on a proper representation of capital probably all of them, were actual burdens upon the finances of their respective states, for the latter have usually had to pay from 3½ to 4 per cent., or even more, for the necessary capital. It has been urged that most of the state railway systems of Europe show little or no financial success because the governments have used their railways, not for purposes of gain, but for the promotion of trade and industry by low transportation charges. The argument is a very sophistical one. If this were a characteristic of state management, then the most important state railway administration, that of Prussia, would not have been paying dividends of 5, 6 and 7 per cent. for the last thirty years. Bismarck, it is true, promised the Prussian diet that, if the purchase of the private railways were authorized, railway surpluses should be used for improvement of the system, not for the financial benefit of the treasury. But fat railway surpluses have proved too much even for Prussian self-restraint, and the state has hugely enjoyed them. There is not a railway-owning government of Europe but would be glad to secure help to its national finances from the profits of railway working. The low railway charges of such countries, in so far as they are low, are to be largely credited to the irresistible pressure of very limited individual purchasing power. But while passenger rates are low, there is reason to doubt whether this can be said of freight rates, an adjustment which savors more of political expediency than of economic advantage. Attempts to make state railways more profitable have not been unknown. But recently, Austria and Hungary have appreciably raised their charges. Russia, Denmark, and other states, at different times, have made general increases, in some instances realizing to their discomfiture that such increases may destroy sufficient traffic to leave unaltered, or even to reduce, gross revenue. In countries where the average income of the great mass of the population is low, charges that appear low from the standpoint of, say, an American, may actually be as high as the traffic can be made to bear. It is not denied that, in a number of instances, the taking over of private lines has been signalized by some reduction of rates and fares, a preliminary taste as it were of the future good things that the government had in reserve, but the process has hardly been a continuing one. Take, for instance, the state railway system of France as against the private companies, and one finds that, whereas, from 1888 to

1908, the state receipts per tonne-kilométre increased from 5.15 to 5.23 centimes, those of the private companies fell from 5.66 to 4.20 centimes. Even in passenger kilométre receipts, the favorite altar for the propitiatory sacrifices of government, the decrease in the state system was but 9¾ per cent. as against 28 per cent. in the case of the private companies. The passenger receipts of the state are still slightly the lower, though part of the difference can be put down to its appreciably higher proportion of third class traffic.

Saxony has had somewhat better fortune than the states just dealt with, for though the percentage earned on reputed capital was but 3.78 in 1908, for some few years preceding 4 and 5 per cent. surpluses were the rule. Prussia, however, is the one example of marked financial success over a period of considerable length. This unusual achievement was favored by the fact that active state control was undertaken just about the time when the great economic advance of Germany was commencing. Financial prosperity was assured in advance. It is fair to inquire whether under such conditions, the Prussian state railways have accomplished for the economic development of their country all that might reasonably have been expected from them.

Despite statistics showing the growth of the commerce and industry of Prussia, which prove nothing, as no one can tell what would have been the results with a different system of management, I am inclined to think that they have not done so. So far as my reasons for this opinion can be expressed in brief they are as follows: Prussia is operating her railway system under peculiarly advantageous conditions, namely, compact territory, dense population, favorable physiographic conditions, unity of railway management arising from the fact of state operation, low labor cost, low taxation, a people temperamentally and by military training inclined to take severe restrictive control as a matter of course. For instance, Prussia has five times as many people per mile of line and twice as many miles of line per unit of area as the United States. The enormous physical obstacles to economical operation offered by the Rocky Mountains are absent. The practical monopoly enjoyed obviates many expenses of organization and of competition for traffic. Taxes per mile of line are little more than half those of the United States. Railway labor cost per individual averages about half that of this country. Add to these the high average intelligence of its people and the rapidity of economic progress, and all the elements of efficient and economical operation, making easy the combination of very low charges with high rates of profits, are present. Yet what has been accomplished? For one thing comes the reply, extraordinarily low passenger rates, rather less than one cent per passenger mile, in 1908, as against 1 9/10 cents in the United States. But there are several points to be noted in connection with this. In the first place, Prussia, with its denser population, affords to the railways a passenger density of four and a half times that of the United States, and such enormously greater density, in the case of traffic that handles itself, lowers the cost per mile very considerably. In the second place, the third, and especially the fourth class in Prussia represent facilities which the average American traveler would not put up with for the small annual amount he would thereby save. In the third place, the cheapest accommodation that can be properly compared with that of American passenger trains, the second class, averages 1 6/10 cents per passenger mile, a charge which represents quite as much to the average German as 1 9/10 cents does to the average American. In the fourth place, though operating costs are low, there is ground for suspicion that Prussian fourth class rates are more helpful politically to the government than profitable to the railway. Passengers, however, bring in but 28 per cent. or so of total operating income, while freight traffic produces about 65 per cent., a similar ratio to that of the United States. Moreover, of the two branches of the service, freight traffic is the one which calls for the exercise of most skill; it is also readily susceptible to reductions of cost. The Prussian Railway Department seems to have failed to realize its opportunities. From 1880-1908 freight transportation charges in Prussia decreased about 15 per cent.; in the United States, during the same period, they decreased nearly 40 per cent. The average ton-mile receipt of Prussian railways, in 1908, was 1.24 cents; in the United States .754 cents, nearly 40 per cent. less, really about 60 to 65 per cent. less if equivalent purchasing power be taken into account. The Aushahme tariffs, covering wagon loads of 22,000 lbs. and over, and accounting for 21,144 million tonne-kilométres out of a total of 32,810 million, very largely coal, ores, lumber, stone, earth, raw materials and grain, worked out at an average receipt per ton mile of 90 cents, in spite of the depressing influence of political export rates, a figure very appreciably higher than the average for all classes of goods here. The normal tariffs for wagon loads, accounting for 9,600 million tonne-kilométres, gave an average receipt of 1.5 cents per ton mile. These figures are only averages and easily liable to misinterpretation, but the differences indicated are so great as hardly to leave room for any doubt as to the superior economy of American freight transportation to its users. There is a much closer similarity in the general make-up of the tonnage than some writers have supposed. Nor can the difference in average haul have any greatly disturbing effect on the comparison, for the great bulk of the tonnage in both countries is low class carload traffic, loaded and unloaded by shippers and consignees. Terminal charges for handling this class of traffic are comparatively light, and therefore cannot be responsible for the difference of costs, such as occurs in short and long distance hauls of freight that has to be loaded and unloaded by the railway. Then it has to be borne in mind, in connection with this carload freight, that increase in length of haul means increase in the number of division yards that have to be passed through, involving rehandling in the case of most trains; also that wages of enginemen and trainmen, cost of fuel and supplies, and cost of maintenance of rolling stock tend to keep pace, more or less exactly, with increase of haul. The density of freight traffic, it should be observed, is nearly the same in both countries.

Further, throughout the whole comparison, the different wage costs need to be borne in mind. In the United States, 60 per cent. of total operating expenses is consumed by wages and salaries, and the average rate of pay of the American railway employee runs at least 100 per cent. greater than that of Prussian employees, including all allowances and so forth. This means that, if American employees were paid on the same basis as Prussian, freight rates could be reduced to just half Prussian rates and passenger rates to the same level, while net income would actually be greater than it is now.

The contrast between the freight and passenger rates of Prussia is such as inevitably to create the impression that the former constitute more or less of a tax upon facilities, and this feeling is emphasized when one bears in mind the severe restrictions, such as those of the demurrage and loading regulations, to which the freight traffic is subjected. It may be good political policy to maintain passenger fares at a low level, but, if this means that profits have to be bolstered up at the expense of freight charges, it is unfortunate. Since an infinitely smaller proportion of the income of the average individual is spent on railway passenger traffic than on freight transportation, low passenger fares are, in general, of much less economic importance to the community than low freight charges.

Like state managements in general, that of the Prussian railways seems to be inelastic. Some half dozen years ago, the Prussian operating ratio was about 62 per cent.: it was 62.67 in 1905. In the three following years, it rose 12 points, reaching the unprecedented figure of 74.62. In France the increase was from 52 to 58, in England from 62 to 64; in the United States from 66.78 to 70. In all these countries the same economic influences were at work during the period, a general upward movement in the cost of railway labor and supplies, and, during the last year, the pressure of the financial panic which commenced

abruptly in the United States towards the close of 1907. A similar relationship is revealed when the ratio of the state railways of France are compared with those of the five great private lines (the Western being excluded because of the embarrassment of its working by anticipations of purchase). The former increased its ratio from 72.2 in 1905 to 80.69 in 1908, while that of the latter lines increased from 50.2 to 54.8. I do not wish to make the mistake of laying undue emphasis upon figures which represent the results of the action of complex and varying combinations of forces, but such dissimilarities as do exist seem hardly capable of explaining away the criticism of state management involved in the comparison. One of the most eminent students of international railway policy, M. Colson, said but recently, "Les administrations d'Etat, generalement (sont) moins habiles que les compagnies a serrer les prix de revient, a découvrier et a réaliser toutes les economies possibles."

Yet, in some ways, the railway administration of Prussia has been inclined to push economy to the extreme. In 1906 an expenditure of $50,000,000 on equipment was authorized, and much has been made of this action as an illustration of the advanced policy of enlightened state management. But, as a matter of fact, the conditions of car service had become absolutely lamentable, and the government did not undertake this expenditure until it was actually unavoidable. The 1907 report of the Chamber of Commerce of Essen says: " . . . the increase of our roadway accommodations, and the provision of rolling stock, etc., has not taken place in a manner corresponding to the development and the necessities of traffic, and, further, . . . no progress of general importance has been made in the matter of our good traffic." Charges of this kind are common in the history of the Prussian state railways. Ten years ago, Professor Dr. Arthur Böhltingk, in his pamphlet "Unsere Deutschen Eisenbahnen", wrote: "Although his Excellency Von Thielen has not once been able to provide sufficiently for the demands for rail transport, and although he has repeatedly declared that the railways had reached the limits of their capacity, he seems to have thought less than ever of making them equal to such demands by means of additions and improvements."

Short of an exhaustive analysis impracticable within the limits of this paper, sufficient evidence has been brought forward, perhaps, to indicate how little reliance can be placed upon the argument for nationalization which is based on the results of Prussian railway management. In spite of all its apparent success, I am convinced that the state government has failed to live up to its opportunities. With all the disadvantages and defects of the privately managed American railway system, and notwithstanding the restrictions placed upon its working by federal and state governments, it has contributed far more to national economic development than has the state system of railways in Prussia.

There are certain other features of state railway management, a brief statement of which must suffice, though their importance is considerable. There can be no question but that, where economic conditions render it at all practicable, state railways will endeavor to make profits. The history of Prussia indicates very clearly that, under such circumstances, there is a great probability of too intimate a relationship being established between the financial and railway departments of the state. This is likely to lead, as it has led in Prussia, to a subordination of the economic interests of the industry to the fiscal necessities of the treasury. Again, with the nationalization of the railway system, the experts of that branch of industry become government servants, and as such liable to less searching criticism than when, as the representatives of private enterprise, the sword of government investigation and regulation was constantly suspended above their heads. Like individuals, government is not apt to criticize itself. The depressing effect of government management upon the initiative and self reliance of employees is an old charge, and I will do no more than quote from the report of the recent Board of Trade investigation of Italian railways: "There is one element in connection with the transfer from private working, and that is the change which has taken place in the management of the personnel. Numerous removals have been effected consequent on promotions being made in order of seniority, which is not in all cases compatible with merit. One hears traders who have had close associations with the officials, in the days of private ownership, deploring the disadvantages caused by the removal of local officials possessing intimate knowledge of the working, and their replacement by officials from probably quite a different part of the country, owing to some claim of seniority. Again, in the staff themselves there has been noticed, it is said, a change occasioned by the transfer from private to state ownership. As state officials, there does not seem to be quite the same amount of willingness to take responsibility; the strict letter of the rules and regulations is the boundary line over which there is no disposition to step."

So much for the influence of state management upon the railway. We may now ask what is the effect of the state railway upon general state administration. This question is worthy of a much more elaborate answer than I can possibly give at the present time, and I shall not attempt to do more than outline some of the leading considerations. First, then, the entry of the state into general or specific industrial competition with its own citizens is neither wise nor proper. Its natural position as the disinterested and unbiased dispenser of justice, revealer of frauds, and adjuster of inequities is prejudiced thereby. Confidence in its impartiality becomes weakened, capital hesitant, private initiative less keen, with corresponding retardation of the material growth of the community. Secondly, the duties necessarily imposed upon the executive of the modern state in connection with the fundamental functions of administration of justice, protection of the community from physical and moral violence, whether in social or strictly economic relations, and guardianship of its physical and mental health, constitute a heavy burden in themselves; and an efficient discharge thereof is far from being attained in the most advanced countries. To superimpose upon these duties the responsibilities of the industrial entrepreneur is to diffuse the energies of the state through a still wider field, over which it is likely to exercise a still less satisfactory control. The capacity of government is not unlimited. Thirdly, in so far as the railways are productive of surpluses, to that extent the executive of the state is relieved from drawing upon the pockets of the taxpayers. It is admittedly difficult even in the most democratic states to keep the executive in responsive relationship to the legislature and to the public. The more dependent the executive is upon funds raised by taxation, particularly direct taxation, the less arbitrary can it become. The ultimate political well-being of the democracy rests upon the practical recognition of this canon of government. Fourthly, fiscal reliance upon railway earnings is apt to prove embarrassing to state finances, at recurring periods, from shrinkage of receipts—a difficulty that is accentuated by the apparent inability of government railways to adjust themselves readily to economic vicissitudes.

From the point of view either of the influence of the state upon the efficient management of the railway system, or of the influence of the responsibility of railway management upon the efficiency of state administration, there is reason to dispute the advantage so loudly claimed for nationalization. The real meaning of railway nationalization is the substitution of uncontrolled state management for controlled private management, and the change is unfavorable to economic progress and efficient government.

The Mogyana Railway and Navigation Company has been authorized to build and operate a railway extending from Igarapava, in the state of Sao Paulo, Brazil, to Uberaba, state of Minas Geraes, to be incorporated with the Jaguara-Araguary Railway. By the terms of the contract, the line must be concluded and opened to traffic by September 30, 1912.

REINFORCED CONCRETE BUSH TRAIN SHED.

In the Bush train sheds heretofore designed, concrete has been used only for certain details. In the belief that it might be advantageously used to a much greater extent in some localities, Lincoln Bush has made some determinations in reinforced concrete for train shed construction, and found that the structure could be satisfactorily built entirely of this material. The accompanying drawing shows the design he has worked out.

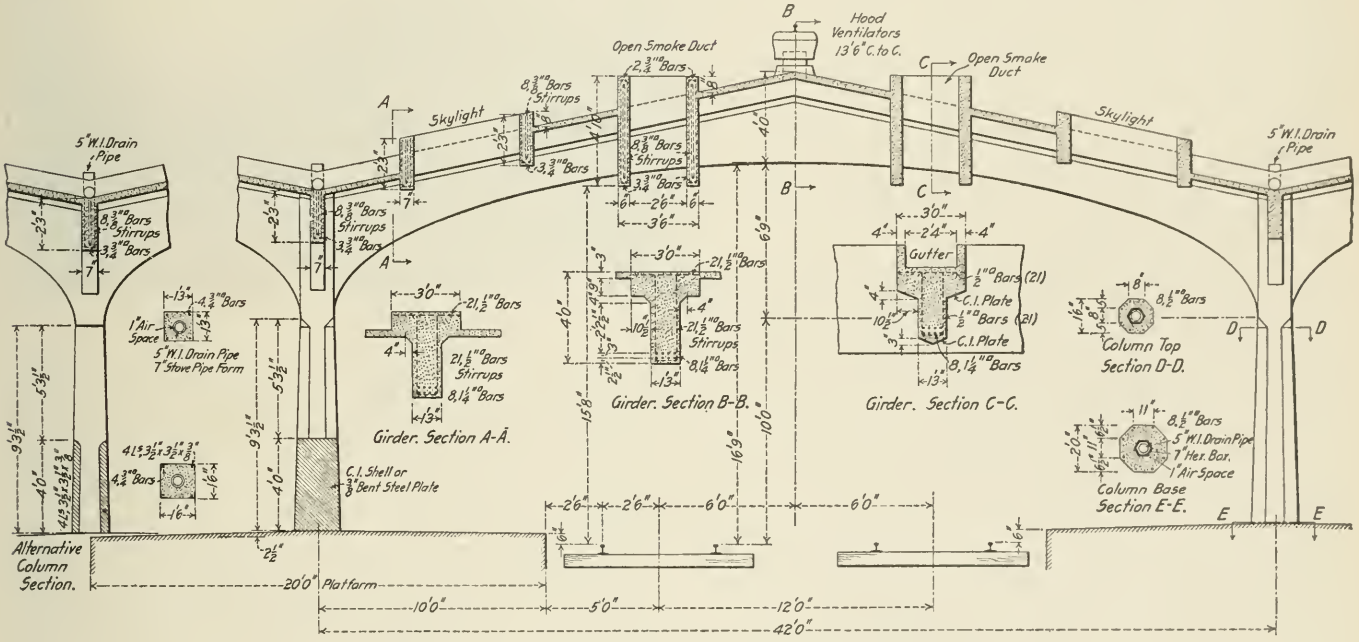
The top cord of the main rafter would be a T-shaped section, and the smoke duct purlins and curbs supporting the skylights, with one longitudinal strut on the center line between columns, would form the longitudinals without any intermediate rafters, the roof slab being built directly into the purlins referred to. The drawing shows the top of the T-section of the main rib rafter flush with the top of the concrete roof. The drainage would be satisfactorily taken care of by carrying the wrought iron drain pipe down inside the center of the concrete column, surrounding this drain pipe with a cast iron hollow pipe which would have about 2 in. larger internal diameter than the outside diameter of the drain pipe. The cast iron shell referred to would form an air insulating chamber between the drain pipe and the cast iron shell; and the cast iron shell would also take the place of reinforcement in the concrete column and would not rust. It is not thought safe to take chances in freezing climates by running the concrete around the wrought iron drain pipe.

A careful estimate of the cost of one full bay 27 ft. long and 42 ft. wide center to center of columns, with liberal unit prices, indicates that the cost, with a good fair margin of profit for the contractor, would be, complete, $1.47 per sq. ft. This is substantially the same cost as that of the Hoboken shed of the Delaware, Lackawanna & Western (the first Bush train shed erected) which was $1.50 per sq. ft.; but the Hoboken shed had very much larger areas of skylights in proportion, which increased the cost materially per sq. ft. over this design in which the skylight areas are considerably reduced, but are of ample areas to give an abundance of light.

The loads and stresses are as follows: Live load assumed to be 20 lbs. per sq. ft.; dead load estimated to be 38 lbs. per sq. ft. for 3 in. concrete slab, and for slag roofing 5 lbs. per sq. ft.; column load = 56 tons, approximately; maximum stress in concrete = 650 lbs. per sq. in.; maximum stress in steel = 16,000 lbs. per sq. in.; columns are spaced 27 ft. center to center. longitudinally.

The live load of 20 lbs. per sq. ft. is somewhat under a good many specifications for snow roof load; but, in the opinion of the designer, the roof is seldom loaded with a greater weight of snow than 20 lbs. An increase, however, of 10 lbs. per sq. ft. live load would not very materially increase the sections, as the dead load in this structure is relatively heavy in comparison to the live load.

The drawing shows an alternative square column design. It occupies less area by 6 in. on the platforms than the octagonal column does, but its appearance would not harmonize so well with the rest of the structure. The lower part of the square column would have its corners protected by metal angles, while the lower part of the octagonal one would be entirely incased.



Design for Bush Train Shed in Reinforced Concrete.

of the foundation or supporting substructure, which in all cases bears a fixed relation to the support of the dead-rail, would be serious. During the travel of a loaded steel car over the scale it imposes a high stress successively on all the scale members. It is by free and unimpaired motion that a lever or any series of levers can fulfill their given functions. The magnitude of frictional effort increases in motion, and where the greatest arc of motion is performed the greatest care must be exercised to obtain the least friction. But, at the same time, friction increases with pressure, manifesting itself when the scale is loaded to its capacity by the prevailing sensitiveness. Where serious deflection occurs, as in weak scales, it increases the errors irregularly with the velocity at which any load may be applied to the scale platform.

To overcome these defects the Pennsylvania Railroad undertook the design of a new standard 52 ft. scale. The first one of these to be installed was at West Brownsville Junction on the Monongahela division. It has several original and unique features, including the suspension bearings supporting the platform, the mechanical relieving gear which eliminates the dead-rail, and the mechanical hump which provides the proper control of the movement of cars over the scale. It will be seen from

TRACK SCALE WITH MECHANICAL HUMP; PENNSYLVANIA RAILROAD.

The increase in the weight of rolling stock during the last few years has rendered many track scales incapable of sustaining the heavier loads without serious deflection of the members. Of course, scales are not expected to weigh locomotives daily, but travel of the engines over the scale must be safe. Failure

Fig. 2, which shows a longitudinal section through the scale and the mechanical hump that all wooden substructure has been eliminated and that the main bearings are of the suspension type, providing greater freedom of action of the platform, in that they get rid of the gyration of the knife-edges across the face of the hardened steels. They also provide greater freedom of action of the platform, due to the greater arcs of motion from the point of platform suspension to the base of the scale rail. In analyzing this bearing, which is shown in detail in Fig. 4, it must be understood that the main lever is rigidly supported from the bed-plate castings and that a saddle block, with compensating steel inserted, engages the knife-edge. From this, in turn, two links are suspended, supporting the yoke casting at eight different points, it being a four-section scale. These yoke castings are bolted to Bethlehem section I-beams, forming a metal bridge from which the scale rails receive their direct support.

With this form of construction it is possible to secure for the platform in a longitudinal direction an oscillating motion ("cradle principle") with sliding friction at the supporting ends of the links. Transversely, however, an undisturbed pendulous motion is secured, while uniform stresses are obtained at all times for the links by the compensating steels in the saddle blocks. All of the main lever stands and the extension lever stands supported from the four main bed-plates are provided with self-compensating steels wherever a pivot contact is made. Means have also been provided to maintain the independent alinement of each individual lever by suitable adjustments at their connections, and leveling pads are provided on all levers, with the faces machined in the same plane with the neutral axis line through the levers.

The scale is provided with a beam reading to 300,000 lbs., and is equipped with a poise operated on specially designed ball bearings, which reduces the resistance of the poise from about four pounds to three or four ounces. A mechanical adjustable spring has also been provided to operate the latch in order to insure its perfect seating in the teeth of the beam at all times. In this type of scale wind pressure or snow and ice on the platform will not affect the empty balance, as the surface platform is supported entirely independent of the scale mechanism. The tipping of the platform and the overhang at the ends of the scale have been eliminated, and all the vital parts of the scale are accessible. The lever system has been scientifically worked out, and 100 per cent. has been allowed for impact, so that the stresses are entirely within the field of experience. This is a point that has been given practically no consideration in the past.

Considering the design of the scale with special reference to the length of the knife-edge and pivot contact, a maximum load of about 4,000 lbs. was provided for each lineal inch of knife-edge, whereas in some of the older types of track scales each inch of knife-edge under a maximum static load had to support as much as 10,000 lbs. or more. Notwithstanding the fact that the length of the knife-edge and pivot contact has been greatly increased, and in some cases the weight of the levers has been increased three or four times, the sensibility of the scale has not been materially affected. This is due, in a measure, to more machine work that has been done on the scale throughout, causing all parts to be suspended in more perfect repose; and by this same means the neutral axes of the various levers are more nearly preserved. It is also partly due to the fact that more uniform distribution of the load on the lever system can be maintained, owing to the permanent means provided in the main supporting bearings for overcoming inequalities due to wear. All of the friction steels and contact points are made of special vanadium steel. They are said to be less susceptible to corrosion and to give longer life and more enduring accuracy.

Four-section type scales are superior in most respects to those with any greater number of sections, for the reason that all parts in suspension (except the fifth lever) are supported directly from the foundation. When more than four sections are used in a track scale connecting levers must be introduced,



Fig. 1. Standard Scale Office; Pennsylvania Railroad.

which have no multiplying function but simply transmit the motion, and by their use additional fulcrum points are introduced, which are not necessary.

Probably the most radical departure from the old form of construction is the introduction of the relieving gear, taking the place of the rigid dead-rail system with its cumbersome supporting columns that practically fill the vault, preventing proper inspection and maintenance of the bearings and other vital parts of the scale. It also eliminates the second track over the scale, as well as the approaches and switches at either end, leading to and from the scale. The primary construction of the relieving gear consists of a series of eight toggle lever jacks, supported in pairs by the universal bed-plates as shown in Fig. 5. These jacks are operated by the torsion shaft with suitable link connections at each of the four sections. This shaft is, in turn, operated by a double-ended cylinder (Fig. 6) controlled by the weighmaster in the scale-office. The controlling power used is either air or water, air pressure being prefer-

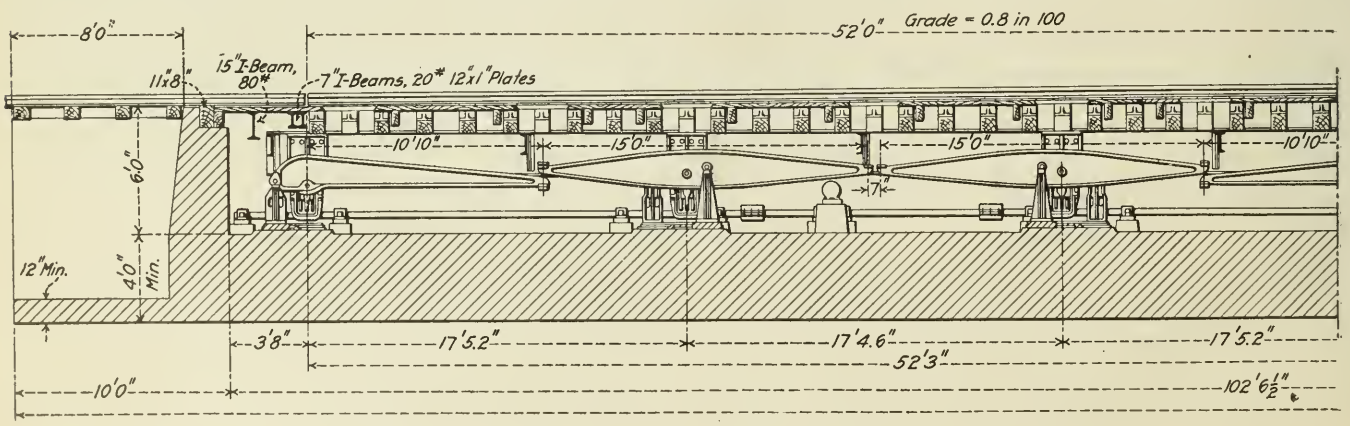


Fig. 2. Longitudinal Section Through the Scale and the Mechanical Hump.

able. In case the power gives out, however, the apparatus is provided with a hand-operating mechanism that can be quickly connected.

When it is desired to make a dead track of the scale track, the weighmaster simply operates a four-way control valve, which causes the four pairs of toggle jacks to move so that the vertical pistons or plungers travel upward against the I-beam supporting the metal bridge. This action raises the platform from a position of repose on the suspension links by taking all weight off the knife-edges without causing their contact on the bearing steels to be disturbed. It will, therefore, be seen that the throwing in and releasing of the relieving gear is accomplished without changing the original alinement of any part of the scale system, and, as the knife-edges do not leave their seats on the steels when the platform is raised, the balance of the scale is practically maintained when the bridge is again lowered on the knife-edges, and the perfect repose of all parts in suspension is practically maintained. When the jacks are operated for the purpose of making the scale track a dead track, the semaphore arms at either end of the scale (which are indirectly connected

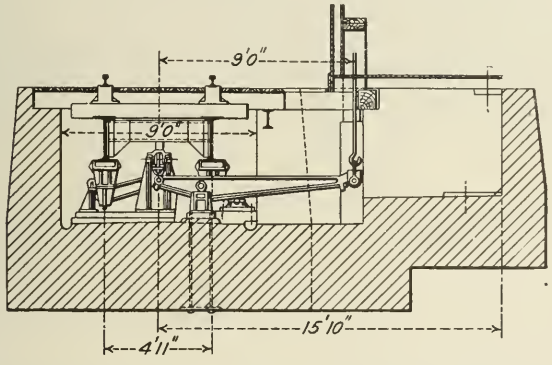


Fig. 3. Cross Section Through Scale.

to the torsion shaft) are simultaneously operated, the position of the arms always indicating when the scale can be used for weighing or when the dead-rail has been set for the use of locomotives, etc.

The total weight of the platform is about 38,000 lbs.; with about 80 lbs. pressure per square inch in the cylinder the bridge can be raised so that a loaded class "H-6" engine and part of the tender (about 267,000 lbs.) will not show any weight on the beam when going over the scale. It will, of course, be impossible to work the operating gear under a superimposed load, but this is not necessary, since the average interval between the cuts of cars is only about 18.6 seconds, and the relieving gear can be operated in one second.

MECHANICAL HUMP.

The object of the mechanical hump is to provide simple and effective means whereby, with the minimum of attendance, cars may be passed rapidly and without stoppage over the platform of the scale with the proper velocity to permit each car to be weighed regardless of variations (within the usual limits) in the lengths of successive cars. To accomplish this, the track over which the cars pass to the scale platform is provided with a hump having a fixed apex at a short distance from the adjacent edge of the scale platform so that when the cars are pushed at a uniform rate up the side of the hump remote from the scale, and are uncoupled from each other, before or while being pushed up the hump, each car will run down the hump and on the scale platform with the proper velocity to permit it to be accurately weighed.

Cars passing over a railway scale located at the head of a classification yard are not of one type, and the distances between the front and rear wheels varies on different cars. With the advent of the mechanical hump, however, this variation in wheel-base length is, in a measure, automatically compensated for. When the side of the hump adjacent to the scale platform is short, as it should be, the increase in velocity acquired by the cars running down that side of the hump varies inversely with the length of the wheel-base of the car, other things being equal. This is at it should be, for the interval in which a moving car may be weighed is that between the time when the rear wheels pass on the scale platform and the time when the front wheels pass off, and, in order to keep this interval down to the desired minimum, cars having a long wheel-base should move more slowly across the scale platform than cars having a shorter wheel-base. For rapid and accurate weighing, it is desirable to have the scale platform and the side of the hump nearest the scale as short as possible, and in practice it has been found advisable to make the side of the hump adjacent to the scale platform about equal to the distance between the centers of the truck wheel bases of the cars having the shortest wheel-base.

The hump has been so constructed that the elevation of its apex above the scale platform can be adjusted in order to get the desired relations insuring proper rates of speed of the cars. For instance, the elevation of the hump required in a given installation depends on and changes with the season. In winter, when everything is taut from contraction, the apex of the hump should be somewhat higher than in the summer, when the cars form less rigid structures. The lubricant also becomes stiff, which affects the free running of the cars. With reference specially to yards at which nothing but loaded cars are classified and weighed, or at points where necessity demands that loaded cars should be weighed and empty cars classified over the same hump, a compromise may be effected by changing the elevation of the apex.

It has been common practice to provide artificial humps in classification yards using track scales to facilitate the distribution of cars, etc., but the mechanical hump provides a track running to the scale platform, having its apex at a fixed and determined distance from the scale platform. It also provides

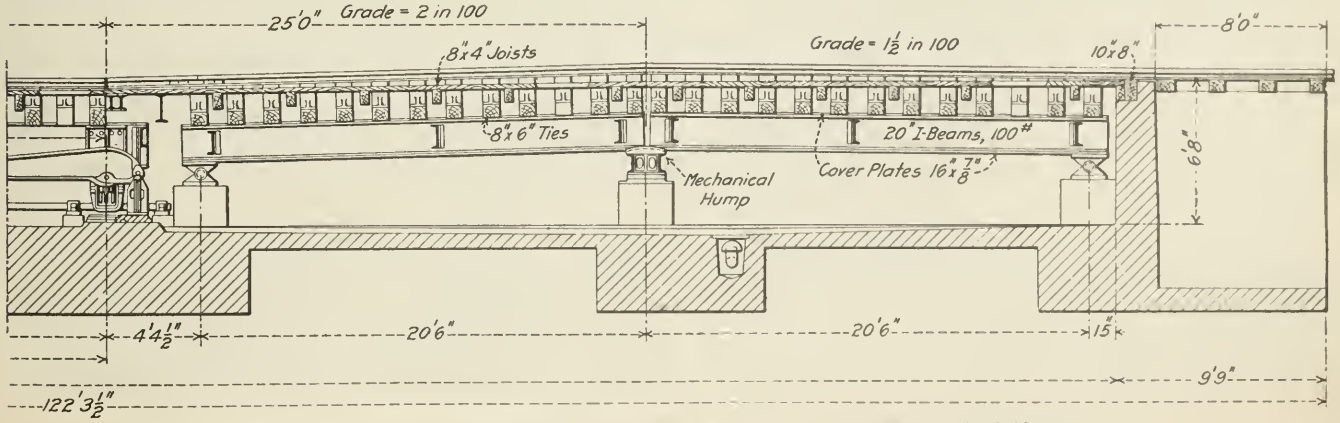


Fig. 2. Longitudinal Section Through the Scale and the Mechanical Hump.

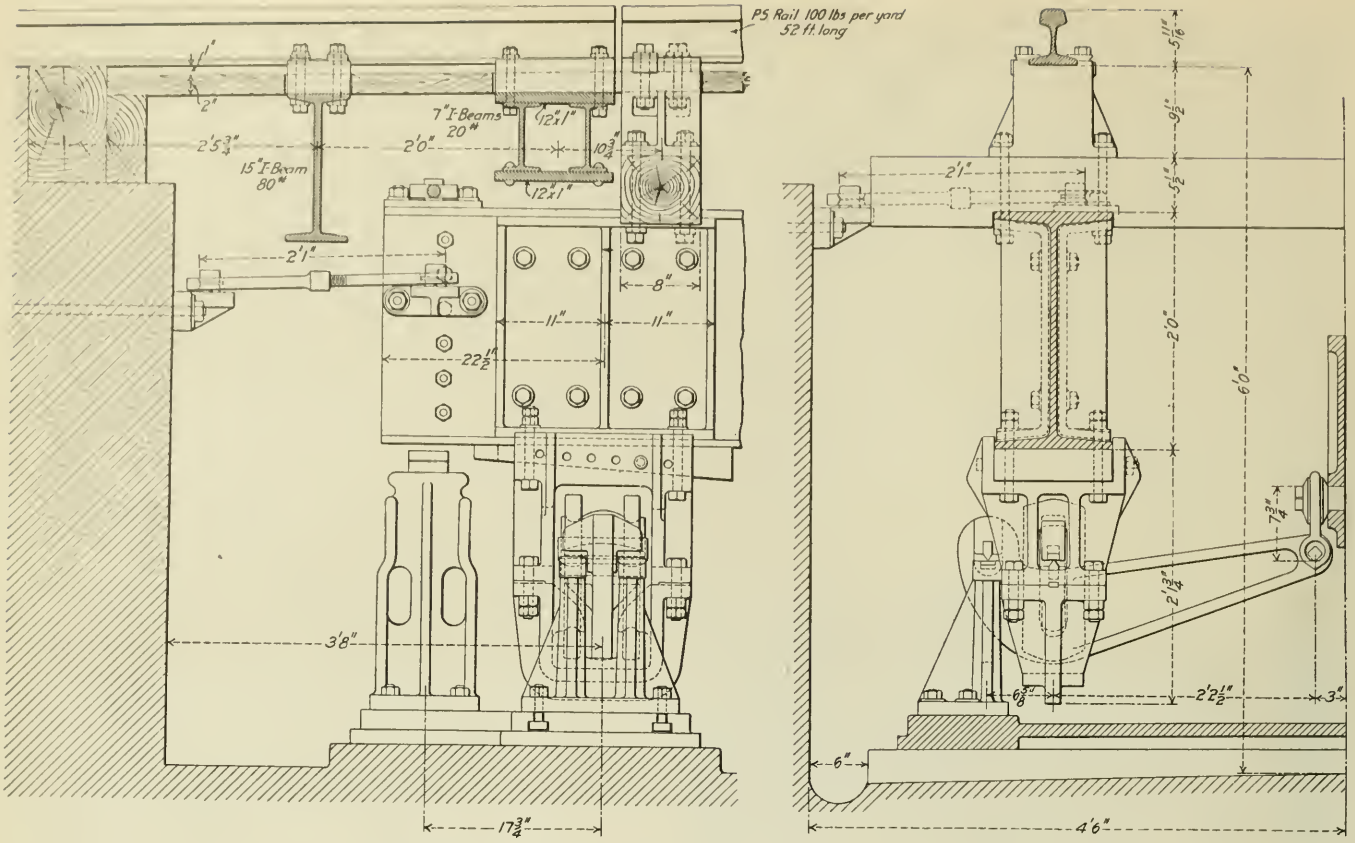


Fig. 4—Important Details of Scale Construction; Pennsylvania Railroad.

a structure of such character that the slope of the hump and the location of its apex will not be changed in time, either by the cars which pass over the hump forcing the cross-ties down in the ballast, or in the repairing of the roadbed by the trackmen. So far as we know, the mechanical hump installed at

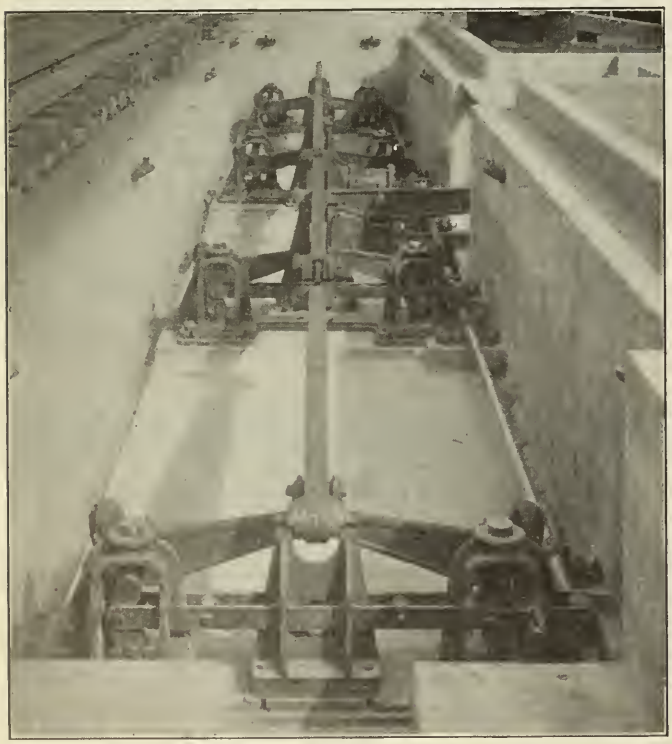


Fig. 5. Torsion Shaft and Toggle Levers for Operating the Relieving Gear.



Fig. 6. Cylinder and Torsion Shaft for Operating Relieving Gear; Also Middle Extension Levers Connected



Fig. 7. Ratchet and Toggle for Raising Hump.

West Brownsville Junction is the first to provide a hump structure in which the elevation of the apex of the hump can be definitely adjusted as desired.

The construction of the hump provides for two sets of box chords or girders, amounting to four in all, running parallel with and directly under each rail forming the track overhead. These two sets of box chords are supported at the center (which forms the apex of the hump) by rigid steel castings located parallel with the track, and these are in turn supported by abutments on either side, to which bed-plates are bolted. These same abutments also support on either side (directly under a vertical center line through the rails) two toggle lever jacks of the Sampson screw type, which are universally connected by an extension socket and are operated by a hand ratchet with a lever arm at the center (Fig. 7). At the four ends of the box chords are bolted pivotal castings which are also supported by bed-plates on the abutments. Surfaced hard wood ties are bolted to the box chord system, to which in turn are bolted square cast iron columns which project through the platform covering the top of the inclosure, and to these columns the rails forming the track over the hump are bolted with rail clips. The present construction of mechanical hump provides for a vertical rise of eight inches at the apex, the latter being located about 25 ft. from the scale.

When the apex is raised to suit the requirements, distance pieces or liners are inserted under the center casting, after which the jacks are released. This method rigidly supports the center casting at the apex at all times, the jacks not being used to support the superimposed load, but merely providing means for raising and lowering the apex. Means are also provided for taking care of the change in the length of rail due to raising or lowering the apex, also any change in the length of the rails on the hump and approach due to expansion and contraction caused by atmospheric changes. This is accomplished by simply placing a bronze friction plate at the base of the four pivotal castings on either end, which permits a free change in a longitudinal direction of the four pivotal castings bolted to the box chord of the scales.

Standard plans have been adopted for heating the vaults of these track scales by a hot water circulating system; also of



Fig. 8. Metal Bridge and Girder Supports for Mechanical Hump.

the electric lights for lighting the vaults when inspection is to be made, as well as the lighting of the yard in close proximity to the scale. The Pennsylvania Railroad Company is to be commended for having worked out such a substantial and accurate system of track scales as it has opened up a new era

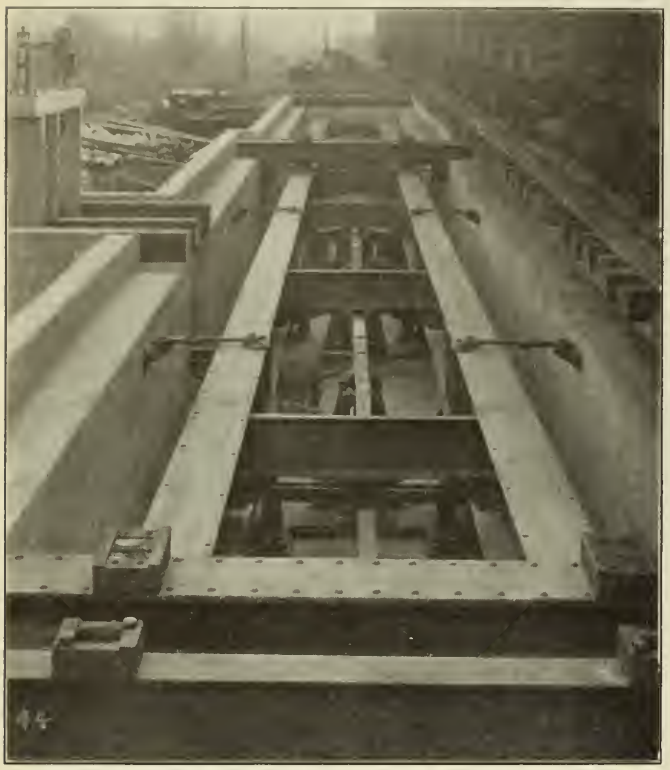


Fig. 9. Method of Checking the Metal Bridge When in Position; Track Scale, Pennsylvania Railroad.

in the weighing of freight cars. Most of the features in this railway track scale have been covered by patents, which were taken out by A. W. Epright, scale inspector of the Pennsylvania Railroad.

FACTORS SOMETIMES FORGOTTEN IN PUBLIC CONTROL OF PUBLIC SERVICE CORPORATIONS.

BY CLARENCE P. FOWLER.
Consulting Engineer.

With our rapid industrial expansion many changes have come in our commercial methods, in order to cope with the new order of things. Not one of the least of these signs of the times, has been the evolution of the corporation, the existence of which has been brought about largely owing to the growing complexity of our business relations, which have given rise to various drawbacks to the conduct of many affairs by individuals or partnerships. As chief among the reasons why individual effort has been supplanted by corporate enterprise, may be mentioned:

(a) Interruption to business caused by death of the individual or individuals involved.

(b) The unlimited liability of business men hampers development through the necessity of excessive caution in contracting obligations.

(c) Economies of operation resulting from concentration.

(d) Ability to attract and retain the highest order of managerial talent, owing to large scale organization.

(e) Limitations incident to individual wealth.

It is clear, then, that modern business conditions have created a demand for a new type of enterprise, which the corporation supplies, the public service corporation being a typical example.

In the earlier days, public service corporations were enabled to meet this demand under unobstructive circumstances, as then new enterprises were so welcome to the public that it received them with open arms. This public attitude is well illustrated by the provisions of the charters granted by the state of Massachusetts to three of the first railways in this country, organized in 1829 and 1830, which stated that "rates of fare and freight, the construction of the roads, the form of cars and all other matters and things in relation to the use of the roads should be wholly within the discretion of the directors." At that time the total railway mileage in the United States was less than twenty-five miles and the public naturally, for many subsequent years, continued to be more vitally interested in the establishment and development of transportation facilities than in how it could impose new burdens upon these public servants through the agency of governmental regulation and control. This experience of the early steam roads was repeated when the street railway was introduced in 1852, and its successor, the electric railway about 1886; also when the telephone and electric light made their first appearance in commercial use in 1876; for the territories which they served were soliciting their introduction and gave no thought to their regulation.

All this stands out in marked contrast with the state of affairs surrounding public service corporations at present, when governmental control is moving forward with giant strides in practically every part of the United States. In fact, in this connection it is interesting to note that in their messages to the legislatures which have convened since the first of the present year, the governors in practically all of the states have either recommended the formation of public utilities commissions where none now exist or advised enlargement of the powers of existing commissions, and it is now the rule to find public service corporations within the control and regulation of public governing bodies in respect to capitalization, debt, rates, service and general conduct of the business of such undertakings.

Various reasons have been assigned for the difficulties under which public service corporations labor to-day, due in many instances to unbusinesslike supervision, antagonistic legislation and adverse public sentiment. Looking broadly at these differences between the public service corporation and the public it serves, it would seem that while the former, at times, has played the role of the offender, the past few years have witnessed so much antagonistic legislation, in accordance with popular demand, that all concerned have not yet had time properly to digest what has taken place, resulting in much confusion in the public mind.

It is generally conceded that not a little of this agitation has been instigated by those who with selfish motives, seek to provoke prejudice of the public against all corporate interests, irrespective of whether the latter are good, bad or indifferent. It is obvious from this, that if the well-meaning public service corporations would receive fair treatment at the hands of the public it is essential that an endeavor be made to bring the public and the corporations to a better mutual understanding.

Some of the salient features of public service corporations about which the public needs enlightenment are what may be termed economic peculiarities of these public servants. These should be considered in connection with some of the benefits such enterprises confer upon the communities they serve.

An important economic advantage favoring the ordinary manufacturing enterprise as compared with the public service undertaking is that the former makes a *commodity* while the latter renders a *service*. In the case of the public service enterprise, the service furnished cannot, for lack of a present demand, be stored away and kept for a better market. If it is not sold to-day, because no fair price can be obtained for it, it can never be sold. On the other hand, a commodity may be made at a uniform rate of production, with all the attendant economies, and after manufacture it may be placed in storage, and kept until the manufacturer can sell to best advantage.

Another economic feature peculiar to the services rendered by quasi-public enterprises, such as gas, electric light, telephone,

electric and steam transportation companies is that while these services have done much to mold the trend of our civilization, they do not comprise, so to speak, the fundamental requisites of life, such as food, clothing, shelter and fuel, all of which latter things form the basic elements necessary to perpetuate human existence. As bearing upon this question it should be noted that authentic statistics show that the public have for years suffered without comment, the steadily advancing prices of these necessities of life (during which time the average cost to the public of practically all classes of services furnished by our public service corporations showed a marked decline) and still it insists that the best standards of light, communication and transportation be maintained at a further reduction in the rates.

In fact, actual statistics recently collected by a "Cost of Living Commission" in one of our eastern states reveals the fact that public utilities, in general, are conspicuously absent from the list of contributory causes responsible for the growth of the family budget. The results of the investigations of this commission show that the maximum net price charged for gas and electricity in practically all cities in the state subject to inquiry, during the period from 1890 to 1910 have suffered a reduction per unit of service of about 50 per cent., and it is well known that telephone rates have decreased by substantial amounts during the same period. With the street railway the same condition is prevalent. Its fares are stationary, extensions of transfer systems, improved standards of equipment and service, together with lengthened mileage, all resulting in decreased cost of transportation and improved service to the public.

This condition of affairs is all the more peculiar, when one stops to consider some of the further economic advantages that industries, supplying the necessaries of life, enjoy when compared with those furnishing public service. This arises primarily from the greater flexibility of the former class of enterprise as compared with the latter, to meet varying conditions. For example, if a manufacturer in times of depression, wishes to economize in expenses he lays off hands and shuts down his plant. Our most recent period of depression supplied ample illustration of the truth of this statement. Again, if a manufacturer finds adverse local conditions becoming burdensome, such as increased taxes or high labor costs, he can, at least as a last resort, move to a locality where circumstances will be more conducive to economical operation. Think of trying to stop operations temporarily in transportation, lighting and communication simply because times are "hard." To carry the idea further it is at once apparent that if a public utility corporation finds labor, taxes or expenses too high in one locality it cannot "move" its property to another possessing more favorable characteristics. Then, again, the field for marketing the manufacturer's product is broad, he being able to ship it to considerable distances, while the public service company may sell its service only to the community it serves and may then be subjected to ruinous competition, in a territory which is incapable of properly supporting even one company.

That the public utilities are subject to further economic limitations not common to manufacturing enterprises will be understood, when it is remembered that the latest and most authentic statistics show that it requires an investment of from three to four times as much capital in the former as in the latter, to produce the same net return, which ratio may be expected to increase with the enactment of additional restrictive legislation.

As a result of this large amount of capital required for establishment of public service enterprises, together with some of the features inherent in the operating expense statement of such corporations, a large part of the total expenditure made is fixed and independent of the volume of business done. It will be seen, therefore, that this unfortunate circumstance tends to further aggravate the condition previously referred to, viz., that the public utility enterprise finds itself debarred from most of the economies, of which other industries can avail themselves in times of necessity.

These examples of the disadvantages under which the public service companies struggle for an existence could be multiplied, but a sufficient number of typical instances have been cited, it is hoped, to indicate their general character. It is important to keep in mind the fact that these disadvantages of the public service company are inherent—a characteristic that the most improved form of equipment and economical management of the highest order, cannot overcome. That these drawbacks, always peculiar to the public service industries, in addition to the steady rise in the cost of operation, have militated against the possibility of obtaining anything like an adequate return on the capital invested in such enterprises is shown by the following figures which may be regarded as typical.

Reliable statistics show that for the last quarter of a century the steam railway stocks in the United States averaged a rate of less than 2½ per cent. per annum. If only the last half of this period be considered, it will be found that the average rate was still well below 3 per cent. per annum. It is significant that in the same period, returns in the states of greatest population, density, and volume of traffic, the average rates were still below 6 per cent. per annum. It may be claimed that the average rate of dividend is low on account of "watered" stock, but the amount of so called "watered" stock is probably counterbalanced, in some degree, at least, by stock that has been destroyed by foreclosures. The capitalization of steam railways in the United States is not much more than one-half as much per mile as the lowest, and not more than one-quarter of the highest capitalization per mile found in the case of European roads. In fact, the railway commission of the states of Minnesota and Washington etsimated that the cost of reproducing the roads in their states would be much greater than the capitalization of such roads.

Another serious condition of affairs is indicated in the electric railway industry of one of the most densely populated New England states. The official commission's preliminary report for nine months ending June 30, 1910, shows that out of 78 companies reporting operations, only 35 paid dividends and only 5 paid 7 per cent. or over, only one paying 10 per cent. The operation of these roads was directed by a high grade of managerial talent, as is evidenced by a systematic reduction in the operating ratio; and that cultivation of traffic was evident is shown by the increased gross receipts per car-mile.

Surely most of the rates of dividends just quoted can hardly be said to constitute fair compensation to investors in these enterprises for the risk they take; and if the service of additional capital is to be freely enlisted for the creation and development of these necessary public service industries, they must not be unnecessarily hampered by unreasonable governmental restraint, but must be afforded every reasonable opportunity for economically conducting their businesses. It is not natural to expect that an investor will willingly take the risk of putting his funds into the stock of a new public service enterprise and pass patiently through the earlier years of unprofitable exploitation, only to find that when the property has reached the successful stage he is limited to a rate of return upon his capital which is little better than savings bank rates.

It should be further borne in mind that any arbitrary legislation which reduces the income below a reasonable return adversely affects the interests of the small investor, as the general public holds a large proportion of the securities of the public service undertakings.

The many conveniences enjoyed by the public through the services furnished by various public service corporations have now become so common-place that the public gives little thought to the many ways that these enterprises have been its benefactor.

The vast territory of the west and south would still be a wilderness if pioneer railways had not developed it. Without the widespread efficient service which railways are rendering today, land values in these states would be vastly less than

they are. Not only did the railways push their tracks through wide areas of uninhabited prairie land and then fill up the country with settlers, but they stood by these pioneers in solving the hard problems of agriculture in an arid soil. Free seed was distributed, by the roads, experimental stations established and farmers taught what and how to plant. In the southwest the railways helped the farmer fight the grasshopper and drought. In the northwest they helped him to select seed and raise the best wheat in the world.

Without fast freight and refrigerator cars live stock and perishable fruits from the west could not have endured the long journey east, and an inexhaustible market would not have been opened up to the west. To-day a number of western trunk lines are running fast freight trains at short intervals, almost on passenger schedules, to enable the shipper to deliver his fruit in Chicago in first-class condition and obtain high prices. No less important have been the achievements of the roads of the eastern half of the United States, which have taken the products gathered by the western roads from the farms and forests, and distributed them to the markets and consumers of the east. As American progress and prosperity rest mainly on the growth of her agricultural production, the importance of the work of bringing the new lands into cultivation and increasing the productivity of the old, made possible through adequate transportation facilities, can be hardly overestimated.

Consider, now, some of the monetary and sociological advantages that accrue to communities served by the electric street railway.

By the extension of modern systems of rapid transit the value of outlying real estate is increased, thus adding to the amount of assessable property, thereby tending to act, as a check upon the increase in the local tax rate. It is interesting to note that the outlying portion of one of our largest metropolitan centers grew over 1,000 per cent. in value from 1882 under the cable car system to 1909 under the electric street railway. This same extension of lines also results in an advantageous redistribution of population by lessening its congestion, which in turn results in greater ownership of homes, securing of low rental with better sanitation, which means a lower death rate. As bearing upon this matter it is interesting to note that recent statistics show that the street railways serving some of the larger centers so actively pushed their lines into sparsely settled territory during the period from 1902 to 1907, that they show considerably decreased earnings per mile of track. The trackage reported by companies in the above class in 1907 was 87.7 per cent. greater than the trackage reported for 1902 with an increase of only about 75 per cent. in gross receipts.

It should be further pointed out that the value of the time saved as a result of modern rapid transit, by the total number of passengers carried, even when estimated at a very conservative rate, would total up to a sum of vast proportions. The redistributing power of the wages and salaries of a large number of employees is an invaluable asset to any community, and, as with other gigantic undertakings, the large amounts spent by street railways for maintenance and renewals contribute largely to the general prosperity.

In conclusion, it may be said that in a discussion of this length it is, of course, possible to touch only some of the "high spots" of so broad a topic, but an endeavor has been made to show that public service corporations, even under the most favoring circumstances, are, owing to their very nature, at a decidedly economic disadvantage when compared with other forms of enterprise, not to mention the good they do for the communities they serve.

In all fairness to these undertakings, it would therefore seem that what is most needed today is a better appreciation of these and other facts, by the public, which is not an unreasonable body and which, it is believed, would, with a better understanding of the situation, set its stamp of approval upon wiser legislation to the end that there may be a nearer approach to the conservation of all interests concerned.

THE IMPORTANT FUNCTION OF THE ACCOUNTING DEPARTMENT.

The rate controversy has brought into court as never before, the railway income accounts. Its factors have been under closest scrutiny. Theories of public railway policy have been evolved on this as a text. This income account is the especial custody of the Accounting Department, which is charged with gathering the myriad items that go into its totals, verifying those items, classifying and accumulating them to grand totals and certifying to these totals. With the greater attention to the detail significance of this income account, the duties of the department compiling it are receiving greater emphasis.

The function of the Accounting Department is to *make* and *to keep the records* which are the inventories of property and transactions affecting the values of property. The department is the outgrowth of the "Auditor" function. The Auditor's first concern is with cash and money values, and from this, the scope of his work widens to include things of indirect money significance. Before taking into his records a property or a transaction affecting his property he audits the transaction, that is, he identifies it against a specific authorization of the organization, and next he identifies it against average practice. This is the process of *auditing*. Incidental to this operation are developed the functions of *accountancy*, which is the method of gathering facts and grouping them by factors to verify them. Still further as an incident of auditing, in order to identify a thing against average standards to locate inefficiencies, the auditor develops the *statistical* method, which differs from the accounting in that the groups are now by one factor and now by another until there is inductively involved the principle of classification for each set of facts.

The auditor as record man comes to bear the relation of the court of review to the rest of the organization. He reaches to every part of it; he is in touch with all rules and regulations which in a subordinate way define authority, and also with all standards of efficiency which qualify the acts under specific authority. His function carries back to the highest seat of authority—namely, the president, the board of directors, the stockholders and the state. This recognition of his position is established in the Interstate Commerce law when it provides that the commission, through its statistician, shall prescribe the forms of all accounts and shall permit no accounts except by this authority. Such a conception of the function of the auditor for the public is carried over into the railway organization to give a defined status to that part of the organization which performs that function for a particular road. The growth of the idea is necessarily slow, and different on different roads. On some the "Auditor" has not advanced beyond the position of a "necessary evil" whose prerogatives have been grudgingly yielded by a sort of usage rather than by specific definition, and are limited to those phases about which there can be no dispute—such, for instance, as watchfulness over the cash accounts of the railway and responsibility for accounting in certain routine ways for revenues and disbursements. At inventory time he may or may not be recognized as a factor. Gradually as a matter of convenience to the operating offices he may accumulate a file of contracts whereby he clerically checks disbursements.

On other roads his definition of function has been more specific and more embracing, but this definition has been made by the President, and therefore, at last, the activities of the "Auditor" are limited to the consent of the President. On other roads still, this authority is carried up to the form of a specific resolution of the Board of Directors; for it may be embodied in a by-law of the corporation, and finally, the "Auditor's" status has now come to be defined, so far as responsibility is concerned within certain area, by the requirement that he shall personally swear to the exhibits which he makes.

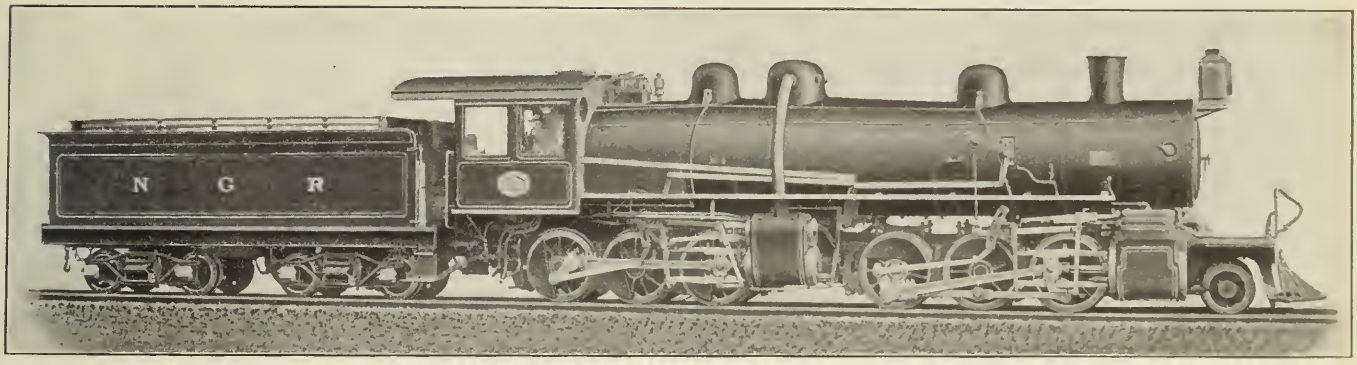
Having arrived at this point of ultimate court in stating in the balance sheet and income account of the road, what is and what is not, the next stage is to give the "Auditor" facility, with a

larger organization, to verify his figures at each stage of their compilation. That is, to give official status to his prerogative as accountant and statistician whereby he may by any method of evidence which is found available, prove to his own satisfaction the facts which he records; and this is *accountancy.* Furthermore by proper means he may determine qualifying factors; and locate, for the benefit of the executive, the board and the public, the efficient and inefficient phases of operation according to well-established standards of practice; and this is his function as *statistician.*

The character of his work on the one hand as a gatherer of data for his totals, embraces the whole scope of operations regardless of departmental lines, and also extends, so far as may be found desirable, to the first source of information, to the actual contact with men and conditions from which his records are made. And on the other hand, because his facts are, in different stages, information of value for every part and grade of the organization, his compilations should be accessible from the lowest to the highest ranks, and as a by-product of his work he becomes a ready index to these facts—a student of their significance, and by that token a Counselor in the formulation of the ultimate policies of the road. * * *

HEAVY LOCOMOTIVES FOR NATAL GOVERNMENT RAILWAYS.

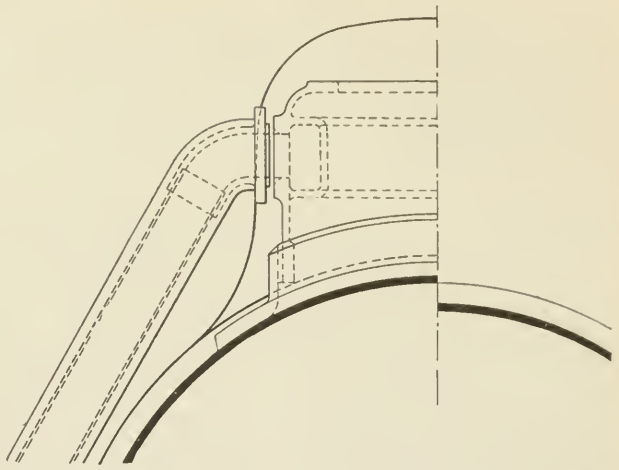
The Natal Government Railways of South Africa have two heavy experimental locomotives in service that were built by the American Locomotive Company, one being of the Mallet and the other of the 4-8-2 type. The work that has been done in this country with the Mallet locomotives and their restricted construction to heavy designs, is apt to cause one to overlook the fact that M. Mallet originally intended his design for light railways, so that an expression of surprise at the adaptation of the Mallet locomotive to narrow gage work is not well founded. The gage of the Natal Government Railways is 3 ft. 6 in., and these locomotives are the heaviest of their class that have been put into a service, which is necessarily severe because of the heavy grades, rising to 3.3 per cent. As heavy Mallets go, the locomotive is not very large; it weighs only 196,000 lbs., and has a tractive effort of but 46,600 lbs.



Mallet Locomotive for Natal Government Railway.

In general both locomotives follow American practice in their design, although they have a number of purely English features, such as copper fireboxes and staybolts, bronze driving boxes and the automatic vacuum brake on the tenders. Except for the application of the two-wheel leading truck, the design, as far as the characteristic features are concerned, follows the builders usual practice for this type of locomotive.

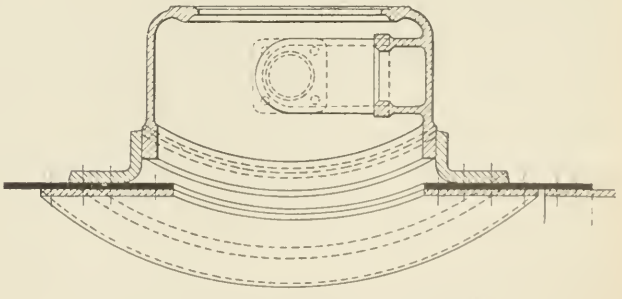
The high pressure cylinders are 17½ in. in diameter by 26 in. in stroke, and are equipped with piston valves, while the low pressure cylinders are 28 in. in diameter, and are equipped with Allen-Richardson slide valves. The low pressure cylinders are similar in design to those of the Mallet articulated compound locomotives built by the same company for the Eastern Railway of France, the wheel arrangement of which also included a leading truck. In this design of cylinders, the exhaust passages



Steam Pipe Connection at Dome; Mallet Locomotive.

are so arranged that the steam exhausts through openings in the front of each cylinder casting into a Y pipe which is connected to the exhaust pipe in the smoke box by means of elbows and a pipe fitted with a slip joint. This arrangement was necessary in order to increase the length of the exhaust pipe so as to reduce the angle of its deflection when the locomotive passes through sharp curves, which on some parts of the line have radii as low as 300 ft. In order to provide room between the bottom of the smoke box and the top of the low pressure cylinder castings for the flexible exhaust pipe connections, it was necessary to flatten the bottom of the smoke box so as to give an offset of 5 in.

Both high and low pressure valves are operated by the Walschaert valve gear and the arrangement of the reversing mechanism is such that the link block of the high pressure gear is lowered while that of the low pressure gear is raised when being thrown into forward motion. In this way the weights of the



Steam Dome; Mallet Locomotive.

parts of the two sets of valve motions counterbalance each other. As the high pressure valves have inside admission, and the low pressure outside admission, the eccentric cranks lead their respective main pins in both sets of valve motions. Reversing is effected by means of a screw and hand wheel. Wrought iron frames 4 in. wide are used throughout, and there is a single articulated connection between the front and rear engines. That part of the weight of the boiler which is carried on the front system, is supported by a single self-adjusting sliding bearing which is located between the first and second pair of driving wheels.

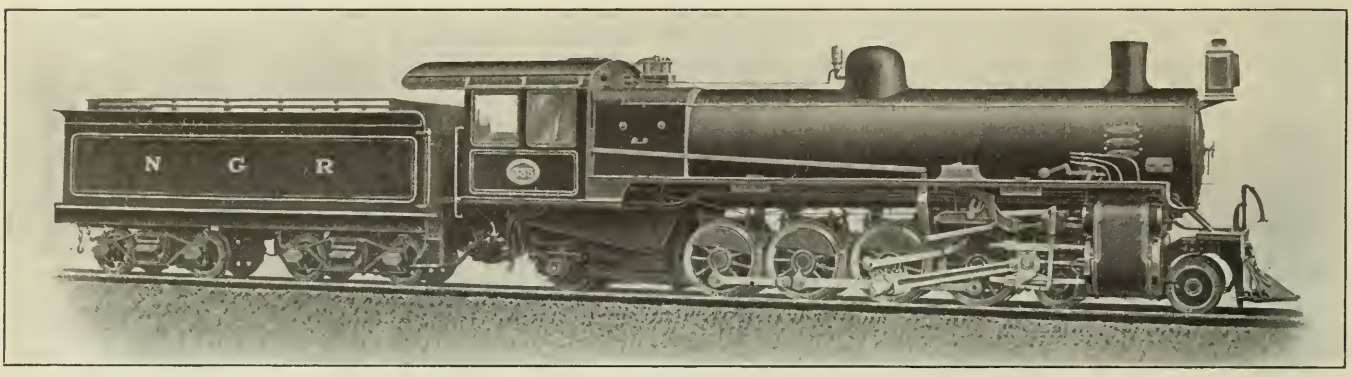
The 4-8-2 type locomotive is fitted with a superheater and the steam pressure is cut down to 160 lbs. on that account. The superheated steam is distributed to the cylinders by 11 in. piston valves. The Walschaert valve gear is operated by a reversing screw and hand wheel. The boilers are of the extended wagon top type for the Mallet and the straight top with a Belpaire firebox for the 4-8-2 types. In the Mallet locomotive the dome is a steel casting with a steam belt running around the front half having openings at the side for the high pressure steam pipe connections. On the center line there is an opening for the throttle, as shown on the engraving which is reproduced herewith.

The barrel of the boiler measures 66 in. in diameter at the front end and is fitted with 172 2¼-in. tubes and 15 5¼-in. tubes which contain the superheating pipes. The tubes are 18 ft. 9 in. long and the total heating surface of the boiler is 2,417 sq. ft., of which the tubes contribute 2,268 sq. ft. and the firebox the remainder. The superheater is of the firetube type, with side headers, and has a heating surface of 358 sq. ft. Full advantage has been taken of the opportunity afforded by the use of trailing wheels to provide a deep firebox.

The trailing truck is of the radial outside bearing type and the design is of a modification of that previously used by these builders. This modification consists principally in the elimination of the supplementary frames and the use of a special design of spring saddle guide, thus simplifying the construction. The semi-elliptic spring which transmits the load to the journals, rests on a spring saddle, which in turn rests on a sliding plate provided with a circular boss which fits into a recess in the top of the journal box. A projection on the bottom of the spring saddle fits into a diagonal slot in the top of the sliding plate. This slot is at right angles to the line passing through the radius bar pin and the center of the box, thus serving to keep the truck in positive alinement at all times and also to relieve the radius bar of undue strains. The spring seat is guided vertically between the jaws of the cast steel spring saddle guide, which is rigidly bolted to the rear frame. The trailing truck is equalized with the rear driving wheels and all the driving wheels on each side are equalized. An interesting feature of the design, which differs from American locomotive practice, will be noticed in the use of plain tires on the leading driving wheels. The engine truck is of the three point suspension swinging bolster type and is designed to give a lateral play of 4 in. on each side of the center.

Following are the principal data and dimensions for these locomotives:

General Data.		
Type	4-8-2	2-6-6-0
Service	Freight	Freight
Fuel	Bit. coal	Bit. coal
Tractive effort	41,320 lbs.	46,600 lbs.
Weight in working order	172,000 lbs.	196,000 lbs.
Weight on drivers	126,700 lbs.	179,500 lbs.
Weight of engine and tender in working order	271,200 lbs.	295,200 lbs.
Wheel base, rigid	12 ft. 9 in.	8 ft. 4 in.
Wheel base, total	22 ft. 6 in.	33 ft. 2 in.
Wheel base, engine and tender	49 ft. 7 in.	60 ft. 2¾ in.
Ratios.		
Total weight ÷ tractive effort	4.16	4.20
Weight on drivers ÷ tractive effort	3.61	3.85
Tractive effort × diam. drivers ÷ heating surface	778	832
Tractive effort × diam. drivers ÷ equivalent heating surface*	637	.....
Total heating surface ÷ grate area	68.2	63.6
Total equivalent heating surface* ÷ grate area	83.5	.....
Firebox heating surface ÷ total heating surface, per cent	6.16	4.9
Firebox heating surf. ÷ total equivalent heating surf.,* per cent	5.05	.....
Weight on drivers ÷ total heating surface	52.4	70.5
Weight on drivers ÷ total equivalent heating surface*	42.9	.....
Total weight ÷ total heating surface	71.16	76.9
Total weight ÷ total equivalent heating surface*	58.20	.....
Volume equivalent simple cylinders, cu. ft.	12.54	11.44
Total heating surface ÷ vol. cylinders	192.17	222.6
Total equivalent heating surface* ÷ vol. cylinders	235.5	.....
Grate area ÷ vol. cylinders	2.82	3.51



Experimetal 4-8-2 Type Locomotive for Natal Government Railway.

Cylinders.		
Kind	Simple	Compound
Diameter	24 in.	17½ in. and 28 in.
Stroke	24 in.	26 in.
Valves.		
Kind	Piston	Piston and Allen Richardson
Travel	5½ in.	5 in. and 5½ in.
Steam lap	15/16 in.	1 in. and ⅞ in.
Lead, forward gear	⅛ in.	3/16 in.
Wheels.		
Driving, diameter over tire	45½ in.	45½ in.
Driving, journals, main, diam.	9 in. x 10 in.	8 in. x 10 in.
Engine truck, diameter	28½ in.	28½ in.
Engine truck, journals	5½ in. x 9 in.	5½ in. x 9 in.
Trailing truck, diameter	30 in.	.....
Trailing truck, journals	6 in. x 12 in.	.....
Boiler.		
Style	Belpaire	Ext. wagon top
Working pressure	160 lbs.	200 lbs.
Outside diameter of first ring	66 in.	65¼ in.
Firebox, width and length	63 in. x 81 in.	60 in. x 96 in.
Firebox, plates, thickness	½ in.	½ in.
Firebox, water space	4 in. and 3 in.	4 in. and 3½ in.
Tubes, number and diameter	172—2¼ in.; 15—5¼ in.	230—2¼ in.
Tubes, length	18 ft. 9 in.	18 ft.
Heating surface, tubes	2,268 sq. ft.	2,422 sq. ft.
Heating surface, firebox	149 sq. ft.	125 sq. ft.
Heating surface, total	2,417 sq. ft.	2,547 sq. ft.
Heating surface, superheating	358 sq. ft.	.....
Heating surface, total equivalent*	2,954 sq. ft.	.....
Grate area	35.4 sq. ft.	40 sq. ft.
Top smokestack, above rail	12 ft. 6 in.	12 ft. 5⅛ in.
Tender.		
Wheels, diameter	30 in.	30 in.
Water capacity	4,000 gals.	4,000 gals.
Coal capacity	9 tons	9 tons

* Total equivalent heating surface equals total heating surface (2,417 sq. ft.) plus 1½ times the superheating surface.

General News Section.

Passenger trains of the Missouri, Kansas & Texas now run to and from the new Union Station at Houston, Texas.

The public utilities commission bill and the anti-pass bill introduced in the Utah legislature have both been defeated in the senate.

Suit has been begun by the Government in the Federal Court at St. Louis against the Wabash Railroad, to recover penalties for 53 violations of the federal law limiting the hours of work of trainmen.

The American Express Company has established at Los Angeles, Cal., an industrial department. It is in charge of Wm. H. Lovesay. This department, for the benefit of farmers and fruit growers, is claimed to be the first of the kind ever created by an express company.

Five Mallet locomotives, each weighing 461,000 lbs., which is said to be 51,000 lbs. heavier than any locomotive now in service, have just been shipped to the Baltimore & Ohio from the Schenectady works of the American Locomotive Company. The tender weighs 181,000 lbs. loaded, making the combined weight of the engines and tender 642,000 lbs. The new locomotives will be used on the mountain division.

The strike which was declared some weeks ago by the Brotherhood of Locomotive Engineers on the Southern Pacific Lines in Mexico and the Sonora Railway has proved a complete failure. The roads employed Mexicans to take the places of the Americans who quit work, and the former employees have withdrawn from the scene and have sought employment on the Southern Pacific and other roads in the United States.

The California State Railroad Commission recently issued an order reducing from $6 a day to $3, the rate to be charged as demurrage on delayed freight cars, but subsequently it was decided to further consider the question, and the order has been vacated. Under the new railway law of California, which was noticed in the *Railway Age Gazette* of February 17, page 324, the commission has full power to fix demurrage rates and also to prescribe regulations in regard to the collection of demurrage.

The stockholders of the Union Switch & Signal Company at their annual meeting this week adopted a profit sharing plan. The directors were authorized to sell or otherwise dispose of 2,000 shares of the authorized and unissued common stock to or for the benefit of such employees whether stockholders or not (excluding directors and general officers) as the board shall deem proper. The directors have the power to fix the price, not less than par, and to make all suitable conditions and regulations.

The California legislature has started already to amend its new railway law—again illustrating that as long as a legislature is in session nothing is safe from disturbance. The senate has passed an amendment adding to the list of those who may be granted free passes executive officers of mercantile organizations traveling for the advancement of trade or development of industry, and another empowering the commission to require one railway to switch to private tracks of shippers on its own line, the cars of a connecting railway, and to regulate compensation for such service.

The unfilled tonnage of the United States Steel Corporation at the close of February was 3,400,543 tons compared with 3,110,919 tons at the close of January. The increase in February over January was 289,624 tons, which is less than the gain of January over December, which was 436,162 tons. This, however, is explained by the fact that the shipments in February were 29,000 tons a day compared with 24,000 tons a day in January. Had the shipments been the same in both months the February increase would have exceeded the gain of January. The February unfilled tonnage was greater than any month since last August, when it was 3,537,128 tons.

The amounts set aside annually for pension allowances for employees of the Pennsylvania and controlled lines east of Pittsburgh and Erie now aggregate more than $850,000. The number of employees entitled to pensions on December 31 was 2,505. The Pennsylvania basis for payment of pensions provides that there shall be paid for each year of service 1 per cent. of the average regular pay for the ten years immediately preceding retirement, the monthly allowance being determined by ascertaining the total amount of wages the employee actually earned and for which he was carried on the pay-rolls during the ten year period, and dividing that amount by 120 calendar months.

About 1,000 drivers and helpers of the Adams Express Company in New York City, struck and left their work last Saturday on the ground that the company had not kept the agreement which was made in the settlement of the strike which occurred several weeks ago. The company seems to have moved nearly all of its perishable freight without much delay, and by the fourth day it was said that the strikers were beaten. There was a good deal of violence in the streets and a number of drivers were wounded by stones and other missiles. Officers of the company declare that the dismissal of three men, which seems to have been the cause of the strike, was because of flagrant misconduct.

The Baltimore & Ohio has lately set up a large number of new machines in its Baltimore shops and in connection with the installation of the new machines, improved methods of safeguarding the men employed to operate them were adopted. Exposed parts of the machinery that would in any way jeopardize the safety of the mechanics have been protected so that it is almost impossible for a man to come in bodily contact with them. Guard rails have been built to enclose belting, and exposed gears have been encased under metal covers. Notices have been posted on these guard rails that it is against the rules for employees to oil, adjust or repair tools while running. The large traveling cranes have been equipped with gongs as a protection to employees. All elevator shafts have been protected by guard rails and automatic drop gates. The foremen of the shops have been instructed to keep aisles free from obstructions. These methods for the protection of men are being carried out at all the shops on the road. Bridges are being equipped with safety platforms for the protection of men working on the track.

White firemen employed by the Cincinnati, New Orleans & Texas Pacific went on a strike on March 9 in pursuance of an order from a committee of the Brotherhood of Firemen. The action was taken after a long conference with Vice-President T. C. Powell. While the brotherhood representatives were ordering the strike Mr. Powell was telegraphing to Washington asking for mediation by the federal authorities under the Erdman act. The union officers declined to join the railway in asking for mediation, asserting that their experience had led them to believe that the men would lose by it. The strike is due to a dispute regarding the status of negro firemen. The union holds that they shall not be employed except on local and slow freight trains and yard engines. The railway maintains that the negroes are entitled to work on the same terms as white men. Press despatches of Sunday, Monday and Tuesday reported that there had been a good deal of shooting along the line and that nine men had been killed, including negroes employed as "strike breakers," and two detectives. Enginemen were afraid to stay on their engines and it was with difficulty that passenger trains were kept running, even with heavy guards. The company brought large numbers of detectives from St. Louis and asserted its determination to maintain its right to employ negro firemen. The railway company offered a reward of $500 for the arrest and conviction of any person interfering with the traffic of the road. At Kings Mountain, Ky., several trains were stopped by a so-called vigilance society and the men in charge intimidated. Two of the fatal shootings occurred at this place. From a report from Somerset on Tuesday, it appeared that twelve men had been badly injured in conflicts along the line on that day. W. S. Carter, head of the Firemen's Brotherhood, held a long conference at Washington with Judge Knapp.

"Ready-Made Farms."

According to an officer of the Canadian Pacific, the scheme by which that company has induced settlers to take up new lands in western Canada, by making preparations for them

beforehand, is being introduced in South Africa and Australia. The applications presented at the Canadian Pacific offices for these farms come in faster than they can be supplied. As adopted for introduction in Australia, the plan provides for setting apart farms of 100 to 160 acres each, and building fences around such parts of the land as may be necessary; then 10 acres will be prepared for planting cotton; a house will be built and a well dug, and each settler will be supplied with a cow, some poultry and enough seed for the first year. Payment will be made in ten annual payments.

Possibilities of Hertzian Waves.

The frequency of the electrical waves sent out by some forms of wireless transmitters approaches a million per second, and by either an increase in the amplitude of these vibrations or by a more sensitive receiver, the distance over which these waves (which undoubtedly extend to an infinite distance) may be recorded, can be greatly increased.

In an experiment made by Doctor Peter Cooper Hewitt with powerful wireless tranmission apparatus, including a mercury vapor interrupter, it was found that the effect of the high-frequency discharge upon the iron in the building occupied, such as water and heater pipes, quickly produced incipient fires within the room where the apparatus was erected, thus demonstrating the wonderful power of this incomprehensible force and suggesting great possibilities in the transmission of electrical energy without wires.

The transmission of electric energy without wires will be especially valuable for signaling purposes and for the control of machinery at a distance.—*George Westinghouse,* before Southern Commercial Congress.

Proposed Freak Legislation in Texas.

An officer of one of the railways in Texas has sent us a copy of a bill recently introduced in the senate of that state, which he believes "takes the palm" among all the freak measures that have been introduced in that state. It is Senate Bill No. 218, and is entitled "An Act to render more equitable the relations between master and servant." Its provisions, summarized, are that any employer who shall engage an employee "with the intention of keeping him in such service for any indefinite length of time and shall not make a specific date when such service shall terminate, but shall keep such employee in such industrial relation by holding out to him inducements in the way of promotion, advancement or other forms of apprentice agreements and contingent emoluments, shall use due diligence to keep such promise, and shall at any and all times be held amenable to the rulings of the proper civil court for the equitable adjudication of such emoluments when such employee shall bring into the proper court a properly certified statement of such services. . . ." It is further provided that the operation of the act shall not apply to contracts where the considerations to be rendered by both parties shall have been definitely stated both as to volume and quality.

Value of the Static Transformer.

Twenty-five years ago it was the general conviction that electricity would be limited to local use in the lighting of densely populated districts or the supply of power to adjacent factories, but it was demonstrated that considerable electric power could be cheaply transmitted if means could be found to utilize safely high-voltage current. It often happens, when something is greatly needed for any great purpose, that invention or discovery meets the demand, and so it was in the matter of invention and discovery which gave us a simple static device, consisting of two coils of copper wire surrounded by sheets of iron, which could, without an appreciable loss of energy, transform alternating electric currents of high voltage and small quantity, dangerous to life, into low voltage currents of large quantity, safely available for all power, light, heat and other purposes.

To the part I took in bringing forward in the '80's of the last century the alternating current system of electric generation and distribution, I owe much, if not all, of the reputation accorded to me as one of the many pioneers in what is now a great and important industry. The introduction of alternating current apparatus was bitterly opposed by those who were then exploiting direct current apparatus, and legislation was sought to prohibit its use because of its alleged danger to life. This incident shows that restrictive laws are not always advantageous, for had the legislation sought for by the opponents of the alternating current system been secured and enforced, I would not now have any justification for this address, because the influence of electricity in the development of the South would be too unimportant to entitle it to consideration on this occasion.—*George Westinghouse,* before Southern Commercial Congress.

Recording Depreciation on Rolling Stock.

Keeping equipment depreciation accounts, as a whole or by series, is unsatisfactory in many ways and offers no check on mistakes that may be made by neglecting to write off equipment retired from service, or to make proper entries for cars converted from one class to another. By the use of the form shown here, it is an easy matter to obtain at any time the value at which any car is carried upon the books and also the amount of accrued depreciation. These forms may be kept either on cards or preferably as sheets in a loose-leaf binder, indexed according to car numbers.

When equipment is built or purchased, a form is made out for each car and the amount charged to additions and betterments is entered as the record value. The life of the car is then estimated and the annual rate of depreciation ascertained. One-twelfth of the annual depreciation is thereafter charged monthly to operating expenses and credited to the replacement fund. The accrued depreciation for each car is entered upon the form but once each year, and at that time the total of the depreciation columns of all the sheets, should of course, correspond with the general ledger account "reserve for accrued depreciation," likewise the totals representing record value should agree with the sum of the ledger accounts, "Cost of Equipment to June 30, 1907," and "Cost of Equipment since June 30, 1907."

NORTH & SOUTH RAILROAD — EQUIPMENT DEPRECIATION RECORD

Class Hopper Bottom Steel Gondola. No. 26487

Record Value $ 926.70 — Depreciation Accrued at 5 %

Estimated Scrap Value

Depreciation Required

Builder Railway Steel Car Co.

Capacity 100,000 #

Owner City Trust Co. Series D

Placed in Service July 1, 1906.

Retired from Service

Disposition

1908		---	--	Ford	
1909		46	34	1921	
1910		46	34	1922	
1911				1923	
1912				1924	
1913				1925	
1914				1926	
1915				1927	
1916				1928	
1917				1929	
1918				1930	
1919				1931	
1920				1932	
Ford				Total	
	Year	Ends		June 30th	

Philadelphia Street Car Service.

Ford, Bacon & Davis, of New York, have filed with the State Railroad Commission of Pennsylvania a pamphlet summary of their report in the matter of the complaints filed at various times against the service rendered by the Philadelphia Rapid Transit Co., operating street surface, elevated and subway railways in Philadelphia. This firm was commissioned on May 27 last to make an examination of the service and equipment, and in its detailed report to the commission it presents a series of tabulated statements, maps and diagrams, representing the principal features of the information gathered and forming the basis for the conclusions and recommendations contained in the summarized report.

In brief it is found that the Philadelphia company's car equipment and rush-hour car service is inferior to that furnished by companies operating in cities of as large and larger population, notably New York, Brooklyn, Boston and Chicago. In their observations covering a period from July 12 to February 1, 1911, they find that the company runs in winter about 39 per cent. more cars, and in summer about 45 per cent more cars during the evening rush hour, than on its schedules for the middle of the

day, whereas other large transit companies have as many as 100 per cent. more cars in service during the rush hours than in the middle of the day. They find the seating capacity of the cross-seat cars which are used in Philadelphia to be 40 and the standing capacity 29, or a total of 69. If equipped with large prepayment platforms this total capacity could be brought up to 76, bringing the standing capacity up to from 75 per cent. to 90 per cent. of the seating capacity; and it is recommended that the company furnish sufficient rush-hour car service to bring the capacity up to this basis. To provide the service as recommended the company would require 2,265 cars, or 489 cars more than it now has. Of the 3,292 cars owned by the company about two-thirds are of the small single-truck type; that is to say, about 70 per cent. of the total equipment is unsuited to present conditions. The experts criticize the general plan of seating, etc., in the Philadelphia standard pay-within cars, and recommend the equipment of all surface cars with mechanical sanders, automatic wheel-guards and non-projecting draw-heads. They estimate that at least 100 more cars per year will be required to provide for the growing traffic. The experts also submit a tentative plan of rerouting cars throughout the city.

Need of Consolidation of Industrial Enterprises.

The advantages of co-operation in the development and supply of electricity cannot be overestimated. Further co-operation in this great work for the benefit of the public, if not voluntary in the future, should, in my opinion, be an enforced one, notwithstanding the outcry which has been raised by the ill-informed with reference to an imaginary monopolization of the water-power of the nation. Encouragement should be given to the investment of capital in the development of these enterprises under wise and reasonable regulation.

In the larger industrial developments which I foresee for the South there are other important factors which equal in importance the development of the waterproof resources. I have particularly in mind those existing restrictions which make it difficult and expensive for a small corporation to carry on conveniently and in a simple manner its business with ramifications in several states, which restrictions, however, the great corporations of the country can easily surmount by reason of their financial ability.

A Federal Incorporation Act, which the President advocates, under which all companies doing an interstate business could organize, would be a solution of difficulties which are now almost insurmountable, and which are being added to in an alarming manner in the endeavor of the legislatures of the several states to curb a few of the tens of thousands of companies and firms doing an interstate business.—*George Westinghouse* at Southern Commercial Congress.

Our Government Railway.

The medicine which the government applies to the railway business is not the medicine which it takes itself, as appears from the redistribution of the freight rate via Panama. For four years the total annual freight across the isthmus both ways averaged 46,000 tons, but this year 51,000 tons moved in one direction in four months, and 49,000 tons in the other direction. In other words, the business is growing, and the profits ought to be rising. The railways have been told that they ought to look to this for their larger expenses, and that they ought not to advance rates when their business is growing, and the cost per unit is falling.

But Uncle Sam thinks otherwise regarding his railway. He has been collecting 30 per cent. of a rate of $8 per ton for everything moving. He now substitutes commodity rates, and takes 40 per cent. as his share, thus reducing the share of the connecting steamship lines from 70 to 60 per cent. The reason is that he is embarrassed by his own prosperity. The connecting steamship lines are in a war with the Tehuantepec route, and reduced their rates to such an extent that the Panama railway had more business than it could do and take care also of the canal business. So it was thought that a reduction of the shares of the connecting steamship lines would give them less leeway to cut rates . . . The cutting of rates by any member of a pool to which the United States belongs is something which we hesitate to characterize.

The government shows good business management also in prohibiting the private carriers from competing with the government steamship line. They are allowed 22 per cent. of the commodity rate, but they have not yet received permission to run to Philadelphia. The Panama railway holds that Philadelphia is within its sphere at the port of New York, and wishes to reserve New York, including Philadelphia, for itself. Far be it from us to criticize anything the government does to get the money it needs. But the government wants different treatment for its railways from that administered by the Interstate Commerce Commission. By the way, why was not this matter brought before the commission, the decision delayed for ten months instead of being rendered after a talk among gentlemen, and a result reached which surprised everybody?—*New York Times.*

Alaska's First Railway.

On March 15 the Copper River & Northwestern was formally opened. This is the first truly Alaskan railway, if we except the short Canadian White Pass and Yukon mining road; the latter merely enters Alaska for a few miles near Skaguay.

The Copper River & Northwestern runs from Cordova bay for 200 miles up the Copper river valley to the Bonanza mine. The road was intended as the beginning of an extended plan of development which would open up the best coal and metal-mining fields of Alaska. It was also expected to develop agricultural possibilities, which are of greater extent than is commonly realized. Great hopes were based on the economies resulting from closely associated copper mines, smelteries and coal. Plans were under way to develop an enormous industry which would supply the entire Pacific seaboard with Alaska's anthracite and high-grade bituminous coal, and permit the economic smelting of iron ores along the Pacific coast from Alaska south to Lower California.

Then from a clear sky there fell the thunderbolt of government interference. Regardless of locations already made; regardless, too, of the expenditure of over $1,500,000 by bona-fide prospectors (exclusive of such sums as are at all alleged to bear any evidence of taint), Alaska's coal deposits which it was planned to develop were totally withdrawn from entry.

The plans of empire building in Alaska have been brought to a halt, let us hope but temporarily. It appears pretty certain that the investment of $15,000,000 in the present railway would never have been made could present conditions of government interference have been foreseen. Contracts were already in force, however, and could not be abrogated. Further investments to meet with the original plans, are now out of the question.

The misdirected ardor of uninformed government employees, and the vacillating attitude of boneheaded and backboneless politicians catering at Washington to the approval of the voting masses, are to blame for present conditions.

Alfred H. Brooks, in charge of the Alaska division of the United States Geological Survey, asserts that "it is a mistaken policy that would compel the 30,000,000 people of the west to continue to pay toll to the railroads and steamship companies for hauling their coal, coke, iron and steel from the east. Alaska's coal should be made available for the use of the manufacturers of the Pacific coast." A better informed and more able authority on Alaska than Doctor Brooks, it would be impossible to find. A couple of weeks ago the Mondell royalty bill on Alaska's coal, a bill which would have offered some, at least, temporary relief, was defeated in Congress.—*The Mining World.*

Railway Proposals in Canada.

In the Canadian House of Commons last week, Hon. G. P. Graham presented the annual railway budget statement, announcing definitely that a vote will be included in the supplementary estimates for a start on the Hudson railway. The government proposes to establish terminal facilities at either Nelson or Churchill, and to arrange for a steamship service to Europe. Mr. Graham grew enthusiastic over the possibilities of the road, declaring that it would be an ideal route for the western cattle trade. He estimated the cost roughly at $30,000,000. Referring to the arguments for the construction of the Georgian bay canal Mr. Graham declared that the fears of diverting traffic through the enlarged Welland by way of Oswego and New York were groundless. Even with the deepened Erie canal, the average draught would only be 12 ft., and it would take a vessel seven days to reach New York, owing to the frequent locking. Compared with the Lake Erie and St. Lawrence route to Mont-

real, the Oswego route had many drawbacks, and Mr. Graham advocated bringing the terminal facilities at Montreal to such a high state of equipment that that gateway should be more than ever in a position, not only to compete successfully with New York, but to take away trade from that port.

Mr. Graham reminded his hearers that transportation had as much to do with the prosperity of a country as tariffs. Unless good facilities were provided for getting products to markets, the good effect of tariff legislation was nullified. It was the policy of the government not to give any further land grants to railways. Land was too valuable, and it was more practical to give aid in money. He had no fears as to the future prosperity of the Canadian railways.

Mr. Graham paid a tribute to the work of the railway commission, which he declared was doing better work than any similar tribunal in the world. An operating department had recently been added to the board. There had been suggestions that a counsel for the public should be appointed, but by the democratic system under which the commission was operated every man with a grievance which he desired to have redressed had merely to communicate with it, and if he had grounds for his complaint prompt justice would be meted out.

Speaking of the improvements being made by the great railways, Mr. Graham said that the Canadian Pacific improvements now under construction at the two cities of Calgary and Toronto alone will involve an expenditure of $17,000,000. At Calgary a million dollars will be devoted to the building of a huge hotel. The railway station, new only two years ago, is to be greatly enlarged. At Toronto new stations, new freight sheds and a huge sixteen story building are to be erected.

Railway Signal Association.

The programme for the March meeting of this association, which is to be held at the Congress hotel, Chicago, next Monday, beginning at 10 a. m., provides for the submission of committee reports at the forenoon session. At the afternoon session there will be presented two papers, one by A. H. McKeen on Portable Storage Batteries as Used on the Harriman Lines, and one by L. F. Howard on Alternating Current Signaling.

The report of Committee No. 1 is devoted wholly to symbols to be used in signal drawings, and the committee presents a revised code of such symbols, filling 12 pages of the journal.

Committee No. 10 submits for discussion some proposed paragraphs for specifications of materials.

Secretary C. C. Rosenberg reports that all of the subjects which were referred to letter ballot at the annual meeting of the convention, which was held at Richmond last October, have been acted on affirmatively, with the exception of drawings 1045 A and 1046 A, showing signal aspects. These drawings received a majority of favorable votes but not the necessary two-thirds. Most of the votes showed a very large affirmative majority, but the semaphore lamp and specifications, and the lamp equipment, were adopted with very few votes to spare. The conclusions of the committee in regard to desirable characteristics of automatic stops and cab signals were adopted by a vote of 354 to 118.

St. Louis & San Francisco's New Cold Storage Process.

In an address before farmers of the Rio Grande valley at San Benito, Texas, B. F. Yoakum, chairman of the board of the St. Louis & San Francisco. announced the adoption by that road of a new cold storage process called the intermittent vacuum precooling process.

This cooling device, used successfully by the Southern Pacific, will make it possible for the 'Frisco to deliver vegetables from the Texan coast country to cities of the far north in good condition.

Mr. Yoakum said, in part: "There are north of Fort Worth and Dallas in St. Louis, Kansas City, Chicago, the Twin Cities and Denver more than 5,000,000 people, who will take vegetables from the farms of the Gulf coast country of Texas. We will furnish transportation if the farmer will furnish the products.

"Besides encouraging the growth of products which are profitable to the grower and in order to carry vegetables from Texas to northern points, we are going to construct a cold storage plant, which we believe has passed the experimental stage."

Congress of Technology.

A Congress of Technology will be held in Boston, April 10 and 11, in celebration of the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology, Boston. The fifty or more papers which will be presented at the congress will be written by graduates of the institute, and will thus serve to record the part the alumni of the institution have taken in the development of scientific industry. The papers will cover a wide range of subjects, including Mechanical Handling of Materials and the Necessity of Improvement in Present Methods at Rail and Steamship Terminals, by Richard Devens, M. I. T. '88, of the Brown Hoisting Machinery Company, Cleveland, Ohio; Mail Handling Machinery at the Pennsylvania Terminal and the New United States Post Office in New York, by J. E. Woodwell, M. I. T., '96, consulting engineer; The Scientific Thought as Applied to Railroad Problems in Contrast to the Methods of the Practical Railroad Man, by B. S. Hinckley, M. I. T., '99, engineer of tests for the New York, New Haven & Hartford.

Association of Railway Electrical Engineers.

The semi-annual convention of the Association of Railway Electrical Engineers will be held in the Washington Terminal station, Washington, D. C., June 16-17. The annual convention will be held at the La Salle Hotel, Chicago, November 6-10. The entire nineteenth floor of the hotel will be reserved for the meeting and the exhibits of the members of the Railway Electrical Supply Manufacturers' Association. The convention will open with a reception on the evening of November 6.

Traffic Club of Pittsburgh.

The ninth annual dinner of the Traffic Club of Pittsburgh will be held on March 30 at the Fort Pitt hotel. The honor guests will be George F. Baer, president of the Philadelphia & Reading; J. T. McCleary, secretary of the American Iron & Steel Institute, New York; Frank S. Black, former governor of New York. Willis L. King, vice-president of the Jones & Laughlin Steel Company, Pittsburgh, Pa., will be toastmaster.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on March 15, a paper entitled Dams on Sand Foundations: Some Principles Involved in Their Design, and the Law Governing the Depth of Penetration Required for Sheet-Piling, by Alfred C. Koenig, Assoc. M. Am. Soc. C. E., were presented for discussion.

Canadian Society of Civil Engineers.

At the meeting of the Canadian Society of Civil Engineers, held on March 16, a paper on The Upper St. Lawrence River —its International History, Development of Navigation, and Future Possibilities was read by Henry Holgate.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.; annual, November 6-10, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday, Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; next convention July 25-27, Chicago.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday, Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; March 20, Chicago; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs., Jan., April, August and Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The United States district attorney at Chicago has brought two suits against the Rock Island and ten against the Indiana Harbor Belt charging violation of the 28-hour law governing shipments of live stock.

The Santa Fe has distributed among its employees buttons, which are to be worn on the lapel of the coat, bearing the words "Get the Safety Habit." "A mental tickler," is the way it is described by J. D. M. Hamilton, claims attorney of the road, at whose suggestion the buttons were got up.

Attorneys for the Burlington have notified Attorney-General Major of Missouri that on March 20 they will file in the United States Supreme Court a motion for a re-opening and re-argument of the Missouri maximum freight rate and the two-cent passenger rate cases, which were argued before the supreme court about five months ago and taken under consideration by it.

The Texas legislature has passed a bill to authorize the exchange of newspaper advertising for intrastate railway transportation. It is understood that Governor Colquitt favored permitting an exchange of advertising and transportation, but the bill as finally passed permits the issuance of free transportation to so many classes of state and federal officers that he may veto it.

The eastern lines have decided to make summer tourist rates from Chicago and St. Louis to Atlantic coast points slightly higher than last year. The round trip rate from Chicago to the Atlantic coast on the differential lines last year was $25.50 and on the standard lines $28.20. This year the rate on the differential lines will be $26 and on the standard lines $30. From St. Louis the rates will be, respectively, $32 and $35.

Suit has been begun in the Federal Court at Buffalo against the Pennsylvania railroad, for granting illegal rebates to the Standard Oil Company in 1905. It is said that the shipments on which this suit is based are the same on which was based the long pending criminal suits against the New York Central and the Standard Oil Company, which were recently decided in favor of the government. The oil was transported from Olean, N. Y., to points in Vermont.

The railways entering Chicago have decided to apply the schedule of switching rates for the Chicago district, which was published in the *Railway Age Gazette* of November 18, 1910, page 979. These rates are intended as a substitute for the rates fixed by the Illinois railway commission in its so-called "rule 23," and it was understood that their application would settle the question of switching rates in Chicago. The prospects now are that the question of the validity of the commission's rule 23 will be litigated to a conclusion in the federal courts. Seven of the roads have objected to the rates adopted by the railways.

The Secretary of War, exercising his authority over the operation of the Panama railroad, has notified the steamship companies that on freight from San Francisco to New York, the railway company, for its share of the haul from Panama across the isthmus by rail and thence by steamer to New York, will demand 40 per cent. of the through rate; 18 per cent. to go to the railway and 22 per cent. to the Atlantic steamship. Secretary Dickinson proposes to adopt a freight classification in place of the present rate of $8 a ton, applicable to all commodities. It is further decided that through rates will not be made with steamships on the Atlantic side other than those belonging to the Panama road, except on shipments to places other than New York and Philadelphia.

The secretary of agriculture announces that 11,000 square miles of additional territory has been released from quarantine for Texas fever of cattle. This action is taken as a result of good progress made during the past year in the extermination of cattle ticks which spread the disease. The total area released from quarantine since the eradication of the ticks was systematically undertaken in the summer of 1906 by co-operation between federal, state and local authorities now amounts to nearly 140,000 square miles, and includes territory in the states of Virginia, North Carolina, South Carolina, Tennessee, Kentucky, Georgia, Mississippi, Arkansas, Oklahoma, Texas and California. The territory released by the recent order is in

Virginia North Carolina, Tennessee, Mississippi, Oklahoma and Texas.

Commissioner Clark of the Interstate Commerce Commission and counsel for the railways and shippers have reached an agreement as to a basis for settlement of a large number of claims presented by shippers growing out of the decision of the Interstate Commerce Commission in the Denver rate case. The commission's order reducing the rates from Atlantic seaboard territory to Denver would have become effective on July 1, 1909, but because they were suspended by an injunction of the federal circuit court which finally was dissolved by the Supreme Court, the reduced rates were not actually made effective until October 26, 1910. The stipulation entered into is that the date of the delivery of goods to the shipper at Denver shall determine the question of the validity of the claim, and that on all shipments which, as shown by the expense bill, reached Denver after July 1, 1909, and prior to October 26, 1910, reparation will be made. Ordinarily the rate in effect at the time a shipment begins to move is controlling, and the decision to make reparation with reference to the date on which shipments were received was agreed to save the trouble and expense of tracing back to find the date of origin of the various shipments.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in the committee presenting statistical bulletin No. 91, giving a summary of car shortages and surpluses by groups from November 10, 1909, to March 1, 1911, says:

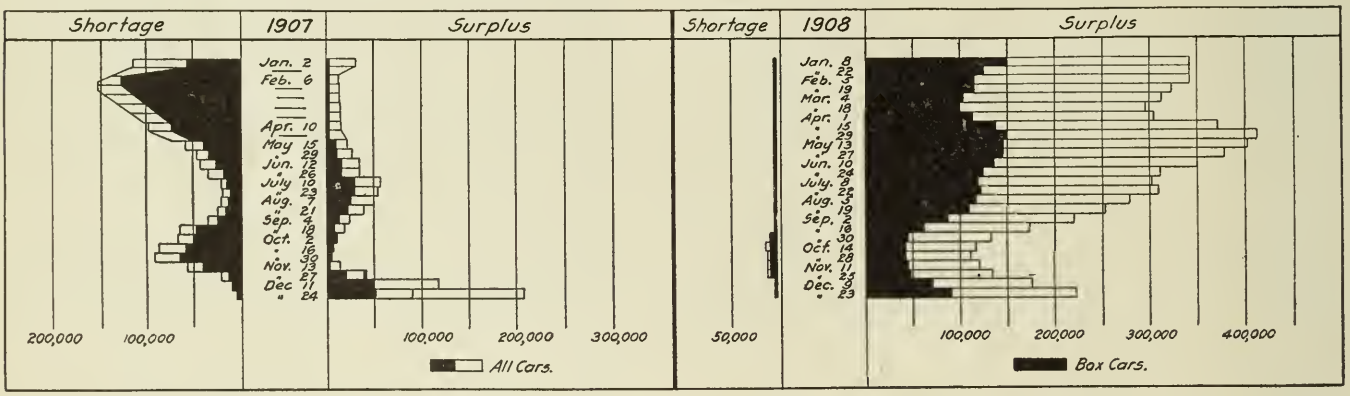
"This report shows a further increase in the surplus of 17,064 cars, making a total of 192,673. This increase is practically all in groups 2 (Eastern), and 3 (Middle), and is made up almost entirely of coal and gondola cars. While the situation so far this year is unprecedented, as regards increases in the surplus during the first three months of the year, it will be noted that the box car surplus has remained stationary since the first of the year, with a slight reduction in this bulletin. This seems to bear out the theory that the difference between the surplus this year and last year is due largely to milder weather conditions existing during the present winter, coupled with the increase in available equipment, which amounts to practically 100,000 cars as compared with a year ago."

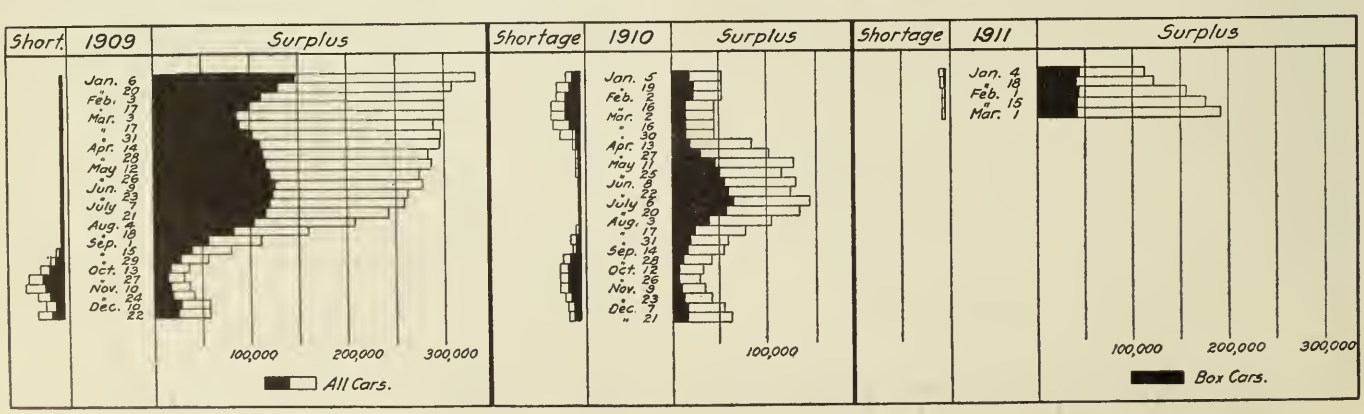
The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts show total biweekly figures for 1907 to 1911 inclusive.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—March 1, 1911	8	79	1,300	3,033	246	4,658	220	50	0	21	291
" 2.— " 1, 1911	24	2,038	387	21,845	10,222	34,492	0	0	0	24	24
" 3.— " 1, 1911	27	5,963	2,371	51,524	4,431	64,289	125	0	0	301	426
" 4.— " 1, 1911	10	2,699	141	7,172	1,808	11,820	39	201	0	0	240
" 5.— " 1, 1911	18	2,686	687	5,397	1,233	10,003	33	0	56	4	93
" 6.— " 1, 1911	22	8,860	1,242	5,037	5,726	20,865	60	8	30	107	205
" 7.— " 1, 1911	4	999	114	1,592	1,243	3,948	0	0	0	0	0
" 8.— " 1, 1911	15	6,804	728	4,850	2,843	15,225	0	0	0	3	3
" 9.— " 1, 1911	11	3,279	370	310	750	4,709	0	0	0	0	0
" 10.— " 1, 1911	19	5,425	2,747	2,955	10,016	21,143	0	2	0	4	6
" 11.— " 1, 1911	5	49	771	27	673	1,520	1,227	0	0	316	1,543
Total	163	38,881	10,858	103,742	39,191	192,673	1,704	261	86	780	2,831

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,526*	$4,596,506	$1,913,940	$7,035,085	$1,009,122	$1,228,019	$153,430	$2,326,700	$155,937	$4,873,208	$2,161,877	.....	$261,048	$1,900,829	$623,011
Atlantic Coast Line	4,495	1,749,108	722,381	2,700,486	348,441	401,891	49,151	923,574	69,806	1,792,857	907,629	.....	95,500	812,129	—31,470
Baltimore & Ohio	4,434	4,897,543	1,073,395	6,413,315	604,047	1,415,754	151,217	2,948,250	156,767	5,276,035	1,137,280	—$64,675	201,145	871,460	—384,751
Boston & Maine	2,243	2,051,358	1,050,964	3,370,566	319,126	484,999	34,288	1,759,461	86,897	2,684,771	685,795	—1,671	186,313	497,811	—69,858
Central of New Jersey	631	1,578,325	324,476	2,010,003	163,875	305,184	31,687	606,268	42,824	1,149,838	860,165	—15,201	78,886	766,078	87,273
Chesapeake & Ohio	1,940	2,230,664	371,956	2,710,307	244,775	528,320	46,480	862,656	60,642	1,742,873	967,434	—5,418	93,623	868,393	—90,744
Chicago, Milwaukee & Puget Sound	1,973†	871,828	84,643	991,071	117,053	146,290	28,436	479,450	18,680	789,909	201,162	—4,186	50,307	146,669	—181,023
Chicago, Milwaukee & St. Paul	7,511	3,222,355	996,820	4,736,624	534,667	837,195	84,063	2,629,212	98,128	4,183,265	553,359	6,079	226,616	332,822	—72,119
Chicago, Rock Island & Pacific	7,548‡	3,273,686	1,481,341	5,071,614	609,525	752,462	160,271	2,221,162	136,652	3,880,072	1,191,542	—10,526	206,883	974,133	321,578
Cleveland, Cincinnati, Chic. & St. Louis.	1,979	1,554,313	580,929	2,344,881	275,121	418,886	83,685	1,140,912	60,550	1,979,154	365,727	—7,865	80,000	277,862	—244,167
Delaware & Hudson R. R. Dept	819§	1,350,690	174,725	1,572,611	73,934	246,271	18,046	672,621	45,606	1,056,478	516,133	—1,704	38,758	475,671	82,786
Delaware, Lackawanna & Western	930	2,145,936	537,820	2,877,511	191,872	433,045	52,399	945,366	62,828	1,685,510	1,192,001	11,543	138,028	1,065,516	—148,970
Denver & Rio Grande	2,542	1,301,139	300,788	1,682,384	149,695	357,985	38,328	675,221	53,741	1,274,970	407,414	—7,056	73,000	327,358	95,433
Erie	1,994‖	2,747,301	613,775	3,646,269	311,892	686,689	92,155	1,404,271	82,629	2,577,636	1,068,633	—53,972	120,631	894,030	86,392
Great Northern	7,274*a*	2,147,568	791,070	3,285,815	509,329	635,912	79,739	1,451,496	99,199	2,775,675	510,140	—1,225	249,739	259,175	—490,211
Illinois Central	4,574*b*	3,659,299	1,049,275	5,349,610	446,267	974,804	113,841	1,990,607	112,020	3,637,539	1,712,071	7,301	242,231	1,477,141	339,067
Lake Shore & Michigan Southern	1,663	2,408,402	840,091	3,716,506	483,693	612,067	81,511	1,549,513	74,686	2,801,479	915,036	—5,511	135,000	774,525	—400,531
Lehigh Valley	1,433	2,514,725	279,952	2,906,730	252,473	495,411	72,853	1,063,772	66,610	1,951,119	955,611	—44,042	101,300	810,269	81,110
Louisville & Nashville	4,591	3,286,132	948,924	4,508,459	710,773	819,955	112,311	1,541,783	91,247	3,276,069	1,232,390	—8,524	150,000	1,073,866	—160,345
Michigan Central	1,803*c*	1,618,585	500,738	2,364,919	310,948	367,224	72,240	1,149,340	45,360	1,945,112	419,807	—2,932	110,000	306,875	—126,805
Missouri Pacific	3,920*d*	1,229,330	342,108	1,786,389	291,641	271,336	56,948	1,013,092	67,183	1,700,200	86,189	—3,005	83,500	—316	—214,458
New York Central & Hudson River	3,591	4,712,782	2,187,044	7,708,056	1,054,789	1,542,577	179,143	3,469,659	202,152	6,448,320	1,259,736	47,937	383,390	924,283	—439,518
New York, New Haven & Hartford	2,041	2,390,626	1,954,683	4,777,719	505,953	596,511	24,131	2,090,686	170,893	3,388,174	1,389,545	110,911	275,000	1,225,456	119,822
Norfolk & Western	1,990¶	2,511,732	317,531	2,931,037	306,535	604,700	48,984	926,972	64,813	1,952,004	979,033	—540	115,000	863,493	—132,401
Northern Pacific	6,028*e*	2,837,450	1,114,371	4,254,916	383,059	647,690	84,420	1,815,016	106,074	3,036,259	1,218,657	11,464	212,746	1,017,375	326,169
Pennsylvania Co.	1,416	2,356,669	660,051	3,417,850	428,543	707,265	88,605	1,528,797	84,888	2,838,098	579,752	—4,398	179,405	395,949	—520,308
Pennsylvania R. R. Co.	3,977*f*	8,927,221	2,498,948	12,359,831	1,662,728	2,600,696	169,414	5,162,653	337,024	9,932,516	2,427,315	—182,422	531,228	1,713,665	—1,091,838
Philadelphia, Baltimore & Washington	713	660,669	602,330	1,441,442	241,025	259,024	24,975	678,943	34,023	1,237,990	203,452	.....	47,396	156,056	—46,733
Pittsburgh, Cincinnati, Chic. & St. Louis.	1,467	2,089,460	627,221	3,112,714	305,587	608,928	81,451	1,324,288	64,995	2,385,249	727,465	—857	135,290	591,318	—243,882
St. Louis & San Francisco	4,732	2,208,019	936,167	3,412,839	328,629	448,730	88,268	1,325,946	105,170	2,296,743	1,116,096	.....	144,772	971,324	157,885
St. Louis, Iron Mountain & Southern	3,316*g*	1,755,740	553,804	2,512,396	309,671	269,427	55,023	815,682	75,197	1,525,000	987,396	—4,713	78,916	903,767	310,575
Seaboard Air Line	3,046*h*	1,220,538	408,890	1,838,150	235,838	255,052	66,896	657,237	48,469	1,263,492	574,658	842	70,000	505,500	23,187
Southern	7,038	3,234,111	1,271,267	4,869,440	604,401	811,652	125,864	1,862,718	163,758	3,508,393	1,361,047	937	190,748	1,171,236	82,189
Union Pacific	3,473*i*	2,399,695	828,321	3,623,577	282,193	527,004	113,872	1,160,356	101,514	2,184,939	1,438,638	—13,082	150,650	1,274,906	—246,547
Wabash	2,514	1,663,439	516,788	2,367,495	218,613	408,196	77,921	1,090,651	96,033	1,891,414	476,081	—3,614	76,948	395,519	—163,543
Yazoo & Mississippi Valley	1,372	722,406	268,489	1,049,312	141,382	114,821	14,977	335,805	24,310	631,295	418,017	—444	36,053	381,520	168,171

SEVEN MONTHS OF FISCAL YEAR 1911.

Atchison, Topeka & Santa Fe	7,526*	$35,129,923	$13,435,360	$52,649,855	$7,621,399	$8,049,374	1,021,785	$15,250,184	$1,085,408	$33,028,150	$19,621,705	.....	$1,677,867	$17,943,838	$1,852,711
Atlantic Coast Line	4,495	11,975,595	4,378,460	17,623,470	2,356,938	2,738,565	317,775	5,809,664	481,089	11,704,031	5,919,439	.....	663,000	5,256,439	—92,418
Baltimore & Ohio	4,434	40,687,919	9,539,218	53,409,692	6,436,275	10,030,965	1,205,807	20,140,103	1,093,825	38,906,975	14,502,717	—$79,388	1,520,010	12,903,319	—2,024,726
Boston & Maine	2,243	15,155,889	9,726,164	26,900,348	3,532,173	3,423,199	303,661	12,291,441	633,415	20,183,889	6,716,459	26,807	1,251,567	5,491,699	—1,270,059
Central of New Jersey	631	10,721,742	2,867,132	14,293,064	1,507,636	2,195,445	223,225	4,149,561	276,356	8,352,223	5,940,841	109,033	663,543	5,386,331	—250,764
Chesapeake & Ohio	1,940	14,805,884	3,262,998	18,842,236	2,141,539	3,490,324	315,503	5,547,307	418,608	11,913,281	6,928,955	—15,433	554,123	6,359,399	—619,651
Chicago, Milwaukee & Puget Sound	1,973†	7,436,430	843,146	8,504,572	488,420	881,064	201,777	2,996,160	91,200	4,658,621	3,845,951	13,516	277,307	3,582,160	—
Chicago, Milwaukee & St. Paul	7,511	27,829,759	8,832,834	40,259,013	5,449,242	5,596,909	739,153	17,274,233	625,937	29,685,474	10,573,539	124,020	1,529,618	9,167,941	—1,224,504
Chicago, Rock Island & Pacific	7,548‡	25,293,781	12,021,458	39,594,598	5,747,886	5,284,130	1,101,622	14,847,529	968,795	27,949,962	11,644,636	—73,302	1,567,202	10,004,132	380,259
Cleveland, Cincinnati, Chic. & St. Louis.	1,979	12,015,239	4,936,068	18,586,618	2,478,252	3,189,572	612,256	7,831,032	402,689	14,513,801	4,072,817	—54,279	573,548	3,444,990	—1,488,529
Delaware & Hudson R. R. Dept	819§	10,036,117	1,916,914	12,334,676	944,534	1,683,928	160,240	4,219,305	284,390	7,292,397	5,042,279	1,789	323,638	4,720,430	—140,418
Delaware, Lackawanna & Western	930	15,483,116	4,607,645	21,412,330	2,424,127	2,979,462	414,780	6,351,933	408,211	12,578,513	8,833,817	137,613	945,053	8,026,377	—1,505,546
Denver & Rio Grande	2,542	10,763,622	3,265,631	14,664,103	1,741,439	2,467,334	335,754	4,946,225	344,697	9,835,449	4,828,654	14,458	493,000	4,321,196	265,670
Erie	1,994‖	21,244,749	5,608,673	28,929,765	3,444,807	4,839,384	699,346	9,408,450	558,115	18,950,102	9,979,663	—135,425	810,203	9,034,035	328,844
Great Northern	7,274*a*	27,187,498	8,264,015	38,109,412	5,226,775	4,543,892	590,901	10,821,490	674,698	21,857,756	16,251,656	141,733	1,944,001	14,449,388	—1,058,788
Illinois Central	4,574*b*	24,564,435	7,888,738	36,744,030	4,549,370	7,361,235	788,475	12,385,354	737,840	25,822,274	10,921,756	—26,232	1,488,822	9,406,702	2,397,348
Lake Shore & Michigan Southern	1,663	19,008,581	7,044,683	29,423,589	4,915,173	4,584,413	725,031	10,347,864	549,521	21,122,002	8,301,587	—33,797	1,045,182	7,222,608	—3,185,095
Lehigh Valley	1,433	18,041,679	2,817,311	21,620,766	2,214,063	3,623,942	584,805	7,030,739	455,717	13,909,266	7,711,500	—190,582	661,700	6,859,218	— 736,536
Louisville & Nashville	4,591	23,529,084	7,003,270	32,453,309	5,232,502	5,601,614	675,252	10,336,375	631,308	22,477,051	9,976,258	7,642	976,800	9,007,100	—1,835,864
Michigan Central	1,803*c*	11,481,397	4,736,426	18,072,331	2,667,249	2,583,462	541,030	7,405,803	341,012	13,538,556	4,533,775	—26,758	805,020	3,701,997	—1,394,430
Missouri Pacific	3,920*d*	10,607,816	2,911,603	15,057,045	2,344,337	2,393,226	418,085	6,756,143	488,525	12,400,316	2,656,729	—16,733	584,500	2,055,496	—
New York Central & Hudson River	3,591	34,626,878	19,175,261	60,149,642	8,495,229	10,225,372	1,473,854	22,638,119	1,525,290	44,357,864	15,791,778	65,445	2,784,886	13,072,337	—2,670,870
New York, New Haven & Hartford	2,041	17,888,437	15,978,929	37,142,941	4,266,508	4,190,555	201,709	14,335,470	1,037,711	24,031,953	13,110,988	856,983	2,187,000	11,780,971	—264,170
Norfolk & Western	1,990¶	18,073,536	2,598,254	21,425,659	2,461,480	4,013,040	348,557	6,355,669	426,754	13,605,500	7,820,159	—6,058	745,000	7,069,101	—611,531
Northern Pacific	6,028*e*	27,069,053	11,018,025	40,733,467	5,110,589	4,744,046	614,103	13,143,631	596,591	24,208,960	16,524,507	382,164	2,002,766	14,903,905	—2,092,246
Pennsylvania Co.	1,416	24,132,257	5,158,496	31,820,881	3,749,996	5,489,651	575,780	11,195,375	594,459	21,605,261	10,215,620	—37,928	1,242,590	8,935,102	—2,274,067
Pennsylvania R. R. Co.	3,977*f*	67,878,069	20,162,697	94,268,256	11,852,480	17,692,878	1,379,594	34,417,421	2,362,195	67,704,568	26,563,688	—683,133	3,037,303	22,843,252	—5,507,733
Philadelphia, Baltimore & Washington	713	5,712,559	4,568,877	11,400,581	1,729,483	1,836,207	205,847	4,682,950	248,909	8,703,396	2,697,185	.....	340,838	2,356,347	—130,617
Pittsburgh, Cincinnati, Chic. & St. Louis.	1,467	16,356,148	5,016,182	23,985,417	3,059,895	4,371,764	530,675	8,962,445	459,545	17,384,324	6,601,093	—5,733	964,449	5,630,911	—1,522,350
St. Louis & San Francisco	4,732	16,295,298	6,954,459	24,978,209	3,509,220	3,399,887	595,014	8,703,085	715,799	16,923,005	8,055,204	.....	993,802	7,061,402	660,452
St. Louis, Iron Mountain & Southern	3,316*g*	11,912,177	3,687,802	16,937,117	2,573,479	2,241,779	393,808	5,720,240	531,477	11,460,783	5,476,334	—20,898	550,415	4,905,021	—154,269
Seaboard Air Line	3,046*h*	8,160,425	2,721,385	12,141,413	1,668,364	1,652,796	429,779	4,117,734	347,492	8,216,165	3,925,248	—6,961	460,000	3,458,287	93,165
Southern	7,038	23,395,742	9,889,433	35,968,796	4,447,186	5,774,423	908,783	11,912,555	1,029,825	24,072,772	11,896,024	10,439	1,276,950	10,629,513	376,466
Union Pacific	3,473*i*	23,163,807	6,915,678	32,667,179	3,127,138	3,613,885	723,870	8,234,763	758,269	16,457,925	16,209,254	—27,821	1,093,045	15,088,388	—673,410
Wabash	2,514	12,259,517	4,675,299	18,238,764	2,049,089	2,827,802	550,727	6,981,618	516,316	12,925,552	5,313,212	—10,839	527,302	4,775,071	—320,004
Yazoo & Mississippi Valley	1,372	4,568,733	1,716,757	6,676,198	1,219,310	941,768	104,885	2,010,373	164,293	4,440,629	2,235,569	—3,505	233,995	1,998,069	803,295

* Excludes R. G. & E. P. R. R. 20 miles, independently operated beginning January 1, 1911. † Mileage operated on January 31, 1911, 1,462 miles. ‡ Includes 153 miles of the Chicago, Rock Island & El Paso Ry. acquired December 31, 1910. § Excludes Cooperstown & Charlotte Valley R. R. now separately reported.

‖ Mileage operated on January 31, 1910—1,961 miles; *a* 7,129 miles; *b* 4,550 miles; *c* 1,746 miles; *d* 3,881 miles; *e* 5,852 miles, Yellowstone Park Ry. 10 miles acquired January 1, 1911; *f* 3,947 miles; *g* 2,610 miles; *h* 2,996 miles; *i* 3,411 miles.

¶ Includes 38 miles of Big Stony Ry. acquired December 31, 1910.

Iowa Railway Commissioner Favors Abolition of Iowa Long and Short Haul Law.

At a time when the question of the application of the long and short haul clause of the Interstate Commerce act is pending, it is of interest and significance that N. S. Ketchum, one of the members of the Iowa railway commission, has expressed himself in favor of the repeal of the long and short haul clause of the Iowa law. Iowa is the only state in which the long and short haul rule has been steadfastly and consistently insisted on. The Iowa law prohibits a railway from reducing its rates between two points, where it is a long line in order to meet short line competition, unless it shall make proportionate reductions between other points on its lines. Mr. Ketchum's statement is as follows:

"I favor the abolition of the long and short haul clause of the Iowa freight tariff. I would not restore to the railways the power to make these rates. I would leave that power to the discretion of the railway commission. The present tariff absolutely throttles competition. Marshalltown and Des Moines are on the North Western and Short Line railways. A man wishing to ship goods from Des Moines to Marshalltown naturally uses the Short Line because it is a shorter distance and the North Western, under the laws of the state, if the North Western made a rate as low as the Short Line rate, then it would be compelled to establish a low rate for the same distance in every part of Iowa. That would be manifestly unfair, for in some parts of the state the rate might be confiscatory.

"Again the North Western was the first road between Carroll and Council Bluffs. Many factories and mills were built along the line of this road. In later years the Great Western has cut across the North Western and formed a short line between Carroll and Council Bluffs. Yet the North Western cannot put in operation the short-haul rates to meet the Great Western competition because if it puts them in there it must establish them over its entire system. With many factories and mills on the North Western the owners pay a higher rate than they really should.

"Now, my plan would be this: Abolish the long and short haul clause, leaving the rates the same, and then let the railway commission use its discretion in applying these rates. If this was the situation we would tell the North Western to put in the short-haul rates between Marshalltown and Des Moines which are used by the Short Line, and at the same time we could let the road use the long-haul rates for the same long distances in other places. Giving the commission this power would restore the competition between Marshalltown and Des Moines."

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

Carstens Packing Co. v. Southern Pacific et al. Opinion by the commission:

Charges assessed for transportation of eight carloads of live stock from Klamath Falls, Ore., to Portland, Ore., via Weed, Cal., not found to be unreasonable. (20 I. C. C. 165.)

W. F. Maxwell v. Wichita Falls & Northwestern et al. Opinion by the Commission:

Rates of 6½ cents per 100 lbs. on house blocking, Burkburnett, Tex., to Devol, Okla., and 11 cents per 100 lbs. on fence posts, Devol, Okla., to Olney, Tex., found unreasonable in so far as they exceeded, respectively, 3½ cents and 7 cents. (20 I. C. C., 197.)

C. B. Havens & Co. v. Chicago & North Western. Opinion by the commission:

On a shipment of anthracite coal from Chicago to Sturgis, S. Dak., for government use, the complainant is not entitled to the benefit of a land-grant rate not published when the traffic moved, although subsequently made applicable to similar traffic for a time by lawful publication. (20 I. C. C. 156.)

Pacific Coast Biscuit Co. v. Oregon Railroad & Navigation et al. Opinion by the commission:

A transcontinental tariff provided one rate on wax or gummed paper and a lower rate on wrapping paper. The paper shipped by complainant was slightly waxed with paraffin, and although sometimes used as an outside wrapper, it was what is known to the trade as wax paper. Having established a specific rate on wax paper, defendants were compelled to apply that rate to all grades and qualities of wax paper, regardless of the use to which it might be put. (20 I. C. C. 178.)

Rate on Sash Weights Reduced.

W. K. Henderson Iron Works & Supply Co. v. Texas & Pacific. Opinion by the commission:

Rate of 23 cents per 100 lbs. from Shreveport, La., to Marshall, Tex., found unreasonable, and a rate of 6½ cents per 100 lbs. established for the future. (20 I. C. C. 159.)

Rates on Vegetables from Charleston Reasonable.

Truck Growers Association of Charleston v. Atlantic Coast Line et al. Opinion by Commissioner Harlan:

Rates on potatoes, cabbages, and vegetables, n. o. s., from Charleston, S. C., to New York, Boston, Philadelphia, Baltimore, and other northern markets found not to be unreasonable in themselves or when compared with the water-compelled rates on the same commodities from Norfolk and producing points in that district. Rates from the same points of origin to the same destinations found not to be out of line with the current rates on the same commodities from Florida points; the control of these markets enjoyed by Florida growers shown to be due not to rates but to climatic and other conditions. (20 I. C. C., 190.)

STATE COMMISSIONS.

The Minnesota Railway Commission has postponed its investigation into the reasonableness of express rates in that state at St. Paul from March 29 to April 5.

The State Railroad Commission of Pennsylvania has caused action to be taken in the court of Dauphin county, to compel compliance by the Baltimore & Ohio with an order of the commission, directing the reduction of passenger rates.

The Louisiana railway commission has issued a notice stating that in its investigation into the reasonableness of express rates and charges it will consider all phases of the question, including the establishment of a new graduate scale of charges to apply on packages weighing less than 100 lbs., should the investigation prove that the present graduate charges are excessive or unreasonable. Hearings will be held on the general question of express rates and service at Monroe on March 27, Shreveport on March 28, Alexandria on March 29, and at New Orleans on March 30.

COURT NEWS.

The federal court at Sioux Falls, S. D., on March 10 issued a restraining order prohibiting the South Dakota railway commission from making a general reduction in rates in the state west of the Missouri river. The case is set down for hearing on April 13.

Judge Ross of the federal circuit court at Los Angeles, Cal., on March 13, threw out of court the suit brought by George E. Roberts and others to dispossess the Southern Pacific of a large amount of oil lands in the Midway and Maricopa fields in Kern county. The ground on which the suit was brought was alleged false entry.

The Kansas supreme court on March 11 rendered a decision holding unconstitutional a state law requiring the railways to haul members of the State National Guard when on duty for one cent a mile. The law was originally passed in 1895. The railways did not contest its validity until after the state railway commission issued an order establishing the two-cent fare in that state. The court held that the law improperly discriminated between members of the National Guard and other persons.

The Federal Circuit Court for Nevada has rendered a decision holding that state rates have no bearing on interstate rates. The Nevada Railway Commission ordered reductions in intrastate

rates. The railways attacked them on the ground that their application would interfere with interstate commerce, and the court held that the only question to be considered was whether the state rates were reasonable, and that if the state commission made reasonable rates the order making them could not be held unconstitutional because the rates conflicted with rates fixed by the railways for interstate traffic.

The New Jersey Court of Errors and Appeals, in the case of Larned vs. Central of New Jersey, has affirmed a judgment for the plaintiff, holding that a railway checking baggage on a passenger's ticket assumes entire control of it, and thereby takes it primarily as a carrier. The fact that the passenger does not take the same train on which the baggage is carried does not modify or change the responsibility of the company. The court says. "The methods of carrying baggage have changed greatly of late years, even to the extent of running trains exclusively for baggage, and it is notorious in many cases, especially at certain seasons, the passenger has no assurance whatever that his baggage will go on the same train as that which he takes himself, even when checked in due season for that purpose."

The Galveston Terminal Case.

The decision of the Supreme Court of the United States, sustaining the order of the Interstate Commerce Commission forbidding discrimination by the Southern Pacific Terminal Company at Galveston, which was briefly noticed in our issue of February 24, gives interesting details of an unsuccessful attempt of the Southern Pacific to legally lease a part of its docks at Galveston to a factory. The deed and charter under which the docks are owned and operated contain strong provisions dedicating the lands to public transportation uses.

The decision is by Mr. Justice McKenna. One of the three piers owned by the company was leased to E. H. Young for $15,000 a year; and, buildings having been put up for him, he used the premises for grinding cotton seed meal, the cotton seed being received by rail from points in Texas and other states, and the meal being shipped by sea to foreign countries. Wharfage being charged on shipments of all other parties, while Mr. Young paid no wharfage (except his rent), he rapidly took the cotton seed meal business away from his competitors, being able to undersell them to the extent of 30 or 40 cents a ton. The other dealers complained.

The original deed for the property to C. P. Huntington stipulated that it should be used for terminal facilities for the Southern Pacific railway and steamship systems; and the city of Galveston, in surrendering the right to lay out streets on or near the property, made a similar stipulation. There was also a clause subjecting the wharfage charges to regulation by the State Railway Commission, and it was required that the railway tracks should connect with other railways and that the terminal company should not consolidate with the Galveston Wharf Company or any other rival.

The Southern Pacific tracks are the only tracks having connections with those of the terminal company, and the S. P. does all of the switching. The terminal company has no engines and issues no bills of lading. It publishes a wharfage tariff, which, however, is not filed with the Interstate Commerce Commission. The tariff, naming 20 cents a ton as a charge on cotton seed meal and cakes, does not show that any exception is made as to the dock occupied by Mr. Young. Piers A and B are sufficient for the business of the company; and pier C, for the use of Mr. Young, was built on land to the westward, lying idle and not needed. Mr. Young pays a yearly rent of $15,000, and agrees to route all shipments over the terminal and its connections (that is to say, the Southern Pacific); but if rival lines should make lower rates, he must give the Southern Pacific a chance to meet such lower rates. Mr. Young's machines on the dock represent an investment of $50,000.

The order of the Interstate Commerce Commission, requiring the railway to cease favoring Mr. Young, was to run for a term of two years, which would end November 15, 1910; but the court holds that this expiration of the order cannot hinder it from deciding the case. The issues involved are continuing issues and considerations affecting them are not to be defeated by short term orders. In the case of the Trans-Missouri Freight Association, there was an attempt to defeat the purpose of the suit before the court by a voluntary dissolution of the agreement, but the court adjudicated the questions at issue, there having been no extinguishment of the rights of the public.

Four principal claims were made: (1) The commission had no jurisdiction over the terminal company, and (2) had no power to declare the lease illegal; (3) the lease is not an unlawful discrimination within the meaning of the act to regulate commerce; (4) the commission, by its order, assumed to control intrastate and foreign commerce not subject to the act to regulate commerce.

These claims are based largely on the assumption that the owners' title to the property was absolute, but this overlooks the conditions in the deed and in the city ordinance (and also in an act of the legislature). It was claimed that the terminal company was a purely wharfage company, having no power to act as a common carrier, but in point of fact it did construct tracks and terminal facilities, to accommodate the export and import traffic of Galveston. These are instrumentalities of traffic; wharfs are as essential as steamships and railways. Again, the property is controlled by the Southern Pacific Company through stock ownership. Verbal declarations cannot alter the facts; the control and operation by the Southern Pacific of the railways and the terminal company have united them into a system and the terminal company is a necessary part of the system. It was contended that stock ownership did not make a union, but the court says that the record "does not present a case of stock ownership merely, or of a holding company which was content to hold." In support of the contention that the traffic was not interstate and was not foreign commerce of the class covered by the Interstate Commerce Law, it was urged that the cake and meal were shipped to Galveston for delivery, and Galveston was the final destination of the shipments; but the court brushes this argument aside. Some of the meal and cake were bought at points north of Texas and directly exported. The shipments were in fact all destined for export and by their delivery to the Southern Pacific must be considered as having been delivered for transportation to their foreign destination.

Corporation Tax Law Sustained.

The Supreme Court of the United States has unanimously sustained the corporation tax law. The decision by Mr. Justice Day, was issued last Monday. The Court says:

The tax is imposed not upon the franchises of the corporation irrespective of their use in business, or upon the property of the corporation, but upon the doing of corporate or insurance business, and with respect to the carrying on thereof, in a sum equivalent to 1 per centum of the entire net income over and above $5,000, received from all sources during the year. It is a tax upon the doing of business with the advantages which inhere in the peculiarities of corporate or joint stock organizations of the character described. The income is not limited to such as is received from property used in the business, strictly speaking, but is expressly declared to be upon the entire net income above $5,000 from all sources, excluding the amounts received as dividends on stock in other corporations . . . also subject to the tax.

After Justice Day had given the interpretation which the court had put upon the provisions of the act he proceeded to answer objections. He first took up the contention that it was a direct tax and unconstitutional, for the same reason that the famous income tax law was declared unconstitutional in 1895. He pointed out that the income tax was held by the Court to be direct because imposed upon property simply because of its ownership. But in the present case the tax is not payable unless there is a carrying on or doing of business in the designated capacity. On the objection that a tax levied upon the exclusive right of a state to grant corporate franchises, the opinion says that such business activities, though exercised because of state-created franchises, are not beyond the taxing powers of the United States. If it be true that the forming of a state corporation would defeat this purpose, by taking the necessary steps required by the state law to create a corporation and carrying on business under rights granted by a state statute the federal tax would become invalid, and that source of national revenue be destroyed, except as to the business in the hands of individual or partnership. It cannot be supposed that it was intended that it should be within the power of individuals acting under state

authority to thus impair and limit the exertion of authority which may be essential to national existence.

Justice Day next addressed himself to the objection that the tax was unequal and arbitrary. He said there was a substantial difference between the carrying on of business between corporations taxed and the same business when conducted by a private firm or individual. The tax is laid upon the privileges which exist in conducting business with the advantages which inhere in the corporate capacity of those taxed, and which are not enjoyed by private firms or individuals. The continuity of the business, without interruption by death or dissolution, the transfer of property interests by the disposition of shares of stock, the advantages of business controlled and managed by corporate directors, the general absence of individual liability, these and other things inhere in the advantages of business thus conducted, which do not exist when the same business is conducted by private individuals or partnerships. It is this distinctive privilege which is the subject of taxation.

Measurement of the tax by the net income of the corporation is not so unequal and so arbitrary and baseless as to fall outside of the authority of the taxing power. The right to select the measure and objects of taxation devolves upon the Congress and not upon the courts, and such selections are valid unless constitutional limitations are overstepped.

The court held that it was no part of the essential governmental functions of a state to provide means of transportation, supply artificial light, water and the like. Therefore it was determined that the Coney Island & Brooklyn Railroad and the Interborough Rapid Transit Company of New York are subject to the tax.

As to the so-called publicity features of the act which require certain returns to be made to the government as an aid in the assessment of a tax, it is for Congress to determine what means are appropriate and adapted to the purposes of making the law effectual.

The opinion thus summarized covers fifteen of the eighteen cases in which the constitutionality of the tax was assailed. The non-applicability of the act to real estate trusts was decided in the other three cases. The Department Store Trust and the Cushing Real Estate Trust, both of Boston, were not organized under the statutes of the state or of the United States, but existed merely under the common law. The Minneapolis Syndicate was held not liable to the tax because the real estate which it held before a recent reorganization had gone out of its control, and therefore the syndicate was not "doing business" within the meaning of the law.

Fines for Rebating.

In the United States Court at Buffalo Wednesday the Pennsylvania Railroad pleaded guilty to twenty counts on an indictment found in 1907 for granting preferential rates on shipments of oil made by the Standard Oil Company. The New York Central pleaded guilty at the same time to twenty counts of one indictment and fifteen of another indictment for the same offence growing out of the same shipments. These indictments were based on shipments made in 1905. The Standard Oil Company was convicted of securing preferential rates on the same shipments in the United States Court at Buffalo some months ago, its conviction affirmed by the Circuit Court of Appeals for the Second Circuit, and at the present term the United States Supreme Court refused to grant a writ of certiorari to review such judgment of affirmance. The railway companies plead guilty, the Pennsylvania Railroad being fined $20,000 and the New York Central $35,000. This disposition of the case was had pursuant to an agreement with the government, and the court in imposing the fines, which were promptly paid, expressed himself as approving the disposition so made. The transaction out of which the offences grew occurred six or seven years ago. The department was satisfied that they had ceased, and for that reason pleas of guilty and the payment of these fines were accepted as a sufficient vindication of the law."

For the information of those who would find a great market for our grain in China, it may be noted that the Chinese Eastern Railway is blocked by the deliveries of grain at the Manchurian stations. At a single station not long ago 1,500 carloads were waiting for cars.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

John Borland Thayer, who was recently elected second vice-president of the Pennsylvania Railroad, was born on April 21, 1862, at Philadelphia, Pa. After leaving the University of Pennsylvania, in 1881 he entered the service of the Pennsylvania Railroad as a clerk in the Empire Line office, and about eighteen months later was transferred to the general freight department. Upon the reorganization of that department he was appointed chief clerk. Three years later he was appointed freight solicitor of the United Railroads of New Jersey division. From February, 1889, to May, 1892, he was out of railway work. He returned to the service of the Pennsylvania Railroad in May, 1892, as division freight agent of the Northern Central, with headquarters at Baltimore. On December 1, 1894, he was promoted to assistant general freight agent, with office at Philadelphia, and in March, 1897, was made general freight agent in charge of through traffic. In May, 1899, he was appointed general freight agent, also of the Northern Central, Philadelphia, Wilmington & Baltimore, and West Jersey & Seashore railway companies. Mr. Thayer was elected fifth vice-president in charge of traffic on June 1, 1903, and in October, 1905, he became fourth vice-president. On March 24, 1909, he was elected third vice-president. Mr. Thayer is a director of the Long Island Railroad and various subsidiary companies.



J. B. Thayer.

Henry Tatnall, whose election as third vice-president of the Pennsylvania Railroad, with office at Philadelphia, Pa., has been announced in these columns, was born April 30, 1855, at Wilmington, Del. He is a grandson of Edward Tatnall, one of the organizers of the Philadelphia, Wilmington & Baltimore, now a part of the Philadelphia, Baltimore & Washington. Mr. Tatnall was educated in private schools of his native town, and at Westtown Boarding School. His first position was in a real estate office at Wilmington, and in 1879 he entered the service of the Girard Trust Company of Philadelphia as a clerk. Two years later he became the treasurer, and from 1885 to 1900 was the vice-president of that company. In 1900 he became president of the Franklin National Bank of Philadelphia, and on June 1, 1904, was elected sixth vice-president and treasurer of the Pennsylvania Railroad. He was elected fifth vice-president and treasurer in October, 1905, and in March, 1909, was elected fourth vice-president in charge



Henry Tatnall.

of the company's finances; and now becomes third vice president.

William W. Atterbury, fifth vice-president of the Pennsylvania Railroad, who has been elected fourth vice-president, with office at Philadelphia, Pa., was born at New Albany, Ind., January 31, 1866. After receiving a liberal preparatory education, Mr. Atterbury was graduated from Yale University, and began railway work in 1886 as an apprentice in the Altoona shops. From 1889 to 1892 he served as assistant road foreman of engines on various divisions of the Pennsylvania and the Philadelphia, Wilmington & Baltimore. In 1892 he was promoted to assistant engineer of motive power in the Pennsylvania Company's Northwest System, and in 1893, to master mechanic of the Pennsylvania Company at Fort Wayne, Ind. On October 26, 1896, Mr. Atterbury was advanced to general superintendent of motive power of the Pennsylvania Lines East of Pittsburgh and Erie, and was appointed general manager of the Pennsylvania Lines East of Pittsburgh and Erie on January 1, 1903. On March 24, 1909, he was elected fifth vice-president, in charge of transportation, and now becomes fourth vice-president. Mr. Atterbury is a member of the Rittenhouse, Union League and many other clubs of Philadelphia, Pittsburgh, Washington and Baltimore. He is also a member of the American Academy of Political and Social Science, the American Society of Mechanical Engineers and the American Society of Civil Engineers.



W. W. Atterbury.

William Heyward Myers, general manager of the Pennsylvania Railroad, who has been elected fifth vice-president, with office at Philadelphia, Pa., was born in San Antonio, Tex., April 9, 1856, and was educated in private schools and at the School of Mines of Freiberg, Germany. Mr. Myers began railway work on the Pennsylvania Railroad, January 17, 1876, as rodman in the office of the general supervisor at Altoona. He was appointed assistant supervisor at Downingtown in June, 1876; supervisor at Lancaster in April, 1879; assistant engineer of the Tyrone division in January, 1881; assistant engineer of the Middle division in September, 1881; assistant engineer of the Philadelphia division, January 1, 1884; superintendent of the Bedford division, April 1, 1889; superintendent of the Belvidere division, September 1, 1889; superintendent of the Schuylkill division, January 1, 1891; superintendent Middle division, January 1, 1899. Mr. Myers was appointed general superintendent of the Philadelphia & Erie division and Northern Central, August 1, 1900, and on March 24, 1909, he succeeded W. W. Atterbury as general manager of the Pennsylvania, which position he held until his recent election as fifth vice-president. It is understood that in his new position Mr. Myers will have charge of the purchasing, real estate and insurance departments, the same departments which heretofore were under Mr. Pugh.



W. H. Myers.

Charles R. Webber has been appointed an assistant to the general counsel of the Baltimore & Ohio, with office at Baltimore, Md.

B. E. Eaton has been appointed general counsel of the Gulf & Ship Island, with office at Gulfport, Miss., succeeding J. H. Neville.

E. W. Clark, superintendent and general freight agent of the Pacific Coast Railway, at San Luis Obispo, Cal., has been elected vice-president.

H. M. Atkinson, receiver of the Atlanta, Birmingham & Atlantic, has been appointed also receiver of the Fitzgerald, Ocilla & Broxton.

W. J. Oliver has been elected president of the Savannah, Augusta & Northern, with office at Knoxville, Tenn.; L. L. Lewis has been elected vice-president, with office at New York, and L. W. Armstrong, general manager and general freight agent, is now auditor and general freight agent, with office at Statesboro, Ga.

The Spokane, Portland & Seattle has taken over under long lease the lines of the Northern Pacific between Willbridge, Ore., and Goble. All of these lines from Willbridge to Holladay, including the line from Warrenton to Fort Stevens, and the Portland terminals, will be known as the Astoria division of the Spokane, Portland & Seattle, and all employees of this new division will report to the general officers of that company.

Operating Officers.

L. E. Wooten has been appointed general manager of the Savannah, Augusta & Northern, with office at Statesboro, Ga.

D. Sullivan has been appointed trainmaster of the Missouri, Oklahoma & Gulf, with office at Calvin, Okla., succeeding E. N. Gates.

W. H. De Witt has been appointed superintendent of the Fort Dodge, Des Moines & Southern, with office at Boone, Iowa, succeeding Frank Arnold.

J. M. Sims has been appointed superintendent and general freight agent of the Pacific Coast Railway, with office at San Luis Obispo, Cal., succeeding E. W. Clark, promoted.

W. C. Loree, superintendent of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed general manager of the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio. E. A. Peck, superintendent of the Pittsburgh division of the Baltimore & Ohio, succeeds Mr. Loree, with office at Pittsburgh, Pa.

H. F. Clark has been appointed a trainmaster of the Rock Island Lines, with jurisdiction over the territory from Winnfield, La., to Eunice, and roadmaster also of the territory from Milepost 195 to Eunice. Sam Crawford has been appointed a special agent in the operating department, with jurisdiction over the Louisiana division, succeeding R. E. Love, resigned.

M. J. Buckley, whose appointment as acting general manager of the Oregon-Washington Railroad & Navigation Company at Portland, Ore., was announced in the *Railway Age Gazette* of February 10, page 299, has resumed his former position and duties of assistant general manager. J. D. Stack, who was also an assistant general manager, and who temporarily succeeded to the duties of Mr. Buckley, resumes his former office, and L. R. Fields, who temporarily succeeded Mr. Stack, resumes the superintendency at Portland.

Marion J. Wise, whose appointment as superintendent of the Southern Railway Co. in Mississippi, at Columbia, Miss., has been announced in these columns, was born August 16, 1883, in St. Louis county, Mo. He was educated in the public and high schools, and began railway work January 11, 1901, as a clerk in the claim department of the Mobile & Ohio, and in June was appointed a clerk in the rate department. In March of the following year he was transferred to the general manager's office. From April, 1903, to February, 1907, he was secretary to the general manager, and was then appointed chief clerk to the superintendent of transportation. In December,

1907, he was appointed chief clerk to the general manager, which position he held at the time of his recent appointment as superintendent.

T. H. Williams, has been appointed assistant superintendent of the Stockton division of the Southern Pacific, with office at Stockton, Cal., succeeding G. D. Wright, assigned to other duties. Mr. Williams was born on March 10, 1877, and began railway work in May, 1892, as car record clerk and car accountant in the office of the Chicago & Alton. From August, 1896, to September, 1906, he was consecutively freight brakeman, switchman, train gateman, clerk in the superintendent's office and chief clerk to the superintendent of car service on the same road. He was then for about ten months car distributor on the Southern Pacific at Oakland, Cal. In July, 1907, he went to the Indiana Harbor Belt Railroad as superintendent of car service and the following November was appointed train and station inspector of the Southern Pacific, which position he held at the time of his recent appointment as assistant superintendent of the Stockton division of that company.

Daniel C. Stewart, whose appointment as superintendent of passenger transportation of the Pennsylvania Railroad has been announced in these columns, was born on April 2, 1862, at New Florence, Pa., and was educated in the public schools of his native town. He began railway work on December 1, 1878, with the Pennsylvania Railroad, as mail carrier, and in September, 1880, became telegraph operator. In July, 1884, he was appointed train despatcher of the Pittsburgh division, remaining in that position until November, 1895, when he was made assistant trainmaster, and from March, 1900, to July, 1902, was assistant trainmaster at Derry. He was then appointed division operator of the Pittsburgh division, becoming passenger trainmaster in July, 1903, and in March, 1905, was made superintendent of telegraph. In April, 1907, he was appointed assistant superintendent of the Pittsburgh division, which position he held at the time of his recent appointment as superintendent of passenger transportation.

Elisha Lee, who was recently appointed assistant to the general manager of the Pennsylvania Railroad, was born in Chicago, September 24, 1870. He was graduated from the Massachusetts Institute of Technology in 1892, and in November of that year, entered the service of the Pennsylvania Railroad in the office of the assistant engineer of the Tyrone division. He was made a rodman in 1897, and on April 17, 1899, was promoted to assistant supervisor on the Western Pennsylvania division. He was then consecutively to August, 1903, assistant supervisor West Jersey & Seashore, assistant supervisor Philadelphia division, supervisor Eastern division Philadelphia & Erie Railroad, supervisor Philadelphia division. On August 20, 1903, he was promoted to division engineer of the Buffalo & Rochester division, and three years later, was appointed division engineer of the Philadelphia Terminal division. On April 1, 1907, he became principal assistant engineer of the Philadelphia, Baltimore & Washington. On March 24, 1909, he was promoted to superintendent of the New York, Philadelphia & Norfolk Railroad, which position he held until his latest appointment.

Robert V. Massey, whose appointment as superintendent of the New York, Philadelphia & Norfolk Railroad, with office at Cape Charles, Va., has been announced in these columns, was born at Dover, Del., on September 29, 1871. He graduated from Yale University in 1892, and the same year began railway work in the engineering department of the Pennsylvania Railroad. In 1895, he was attached to the office of the principal assistant engineer at Altoona, and on November 1 of the same year, he was appointed assistant supervisor on the Western Pennsylvania division. On April 1, 1897, he became assistant supervisor of the Baltimore division, and in April, 1899, assistant supervisor on the middle division. Mr. Massey was promoted to supervisor on the Schuylkill division August 1, 1900. In 1902, he went to the Maryland division in the same capacity, and on December 15, 1905, was transferred to the Pittsburgh division. He became division engineer of the Schuylkill division on April 1, 1907, and on January 1, 1909, was appointed division engineer of the New York division, which position he held until his recent appointment as superintendent of the New York, Philadelphia & Norfolk.

Michael Trump, whose appointment to special duties in connection with transportation problems, on the Pennsylvania Railroad, has been announced in these columns, was born March 14, 1854, at Philadelphia, Pa. Mr. Trump was educated at the Friends High School, Philadelphia, and at the Polytechnic College of Pennsylvania, from which he was graduated as a civil engineer in June, 1874. He entered the service of the Pennsylvania Railroad in July, 1880, and was assigned to special duty on the Pittsburg, Virginia & Charleston. The following month he was transferred to the office of the assistant engineer of the Pittsburgh division, and in April, 1881, he was appointed assistant supervisor of Division 10, at Brinton station. In August of the same year he was made assistant supervisor and assistant trainmaster on the Southwest Pennsylvania, and one month later was appointed assistant engineer of the West Pennsylvania Railroad division, at Blairsville. On October 1, 1882, he was transferred to the Pittsburgh division as assistant engineer, and one year later was appointed assistant superintendent. In February, 1897, he was appointed general superintendent of transportation, which position he held until his recent assignment to special duties on transportation problems in connection with the regulations of the national and state railway commissions.

Charles Miller Sheaffer, who has been appointed general superintendent of transportation of the Pennsylvania Railroad, with office at Philadelphia, Pa., was born on March 4, 1858, at Pittsburgh, Pa., and graduated from the commercial department of the Pittsburgh Central High School in June, 1874. He entered the service of the Pennsylvania Railroad on April 1, 1877, as a messenger in the superintendent's office of the Pittsburgh division, and has been in the continuous service of the company ever since; consecutively as telegraph operator, yard master, train despatcher and division operator. From July 1, 1901, to June, 1903, he was superintendent of telegraph; he was then promoted to superintendent of passenger transportation, which position he held at the time of his recent appointment as general superintendent of transportation.



C. M. Sheaffer.

Clinton Lloyd Bardo, whose resignation as superintendent of the electric division of the New York Central & Hudson River was recently announced in these columns, has been appointed assistant to the general manager of the Lehigh Valley, with office at South Bethlehem, Pa. Mr. Bardo was born on October 24, 1867, at Montgomery, Pa., and began railway work May 30, 1885, with the Pennsylvania Railroad as an extra operator on the Eastern and Susquehanna divisions, Philadelphia & Erie Railroad division. The following December he was appointed an operator at Beaver Valley and Tamanend on the Catawissa division of the Philadelphia & Reading. From May, 1886, to November of the following year he was telegraph operator and supply agent of the Tidewater Oil Company in the construction department at Mauch Chunk, and then went to the Lehigh Valley as telegraph operator and train despatcher at Wilkesbarre. In May, 1892, he was appointed assistant trainmaster of the Wyoming division, and in September of the same year was promoted to trainmaster of the same division of the Lehigh Valley. He was transferred in May, 1901, to the New York division, and in November, 1904, he went as freight trainmaster to the New York division of the New York, New Haven & Hartford at Harlem river, N. Y. From December, 1905, to June, 1907, he was assistant superintendent of the same division, and since June, 1907, was superintendent of the Grand Central station and the Electric division of the New York Central & Hudson River. As superintendent of the Electric division and Grand Central terminal Mr. Bardo has had to handle what is perhaps the

most congested traffic in the country. Between the terminal and the Mott Haven yards—4½ miles—there are 700 movements in 24 hours. During the past three years the traffic has been handled without interruption in the midst of confusion of an entire reconstruction of the terminal. Mr. Bardo is especially known for his success in dealing with his men. While other superintendents have been harassed by labor organizations and have seen their forces demoralized, he has enforced without compromise an even handed discipline. The morale has been steadily lifted and held inflexible on an unusually high basis. It is interesting that this rigid insistence on discipline has come not only to command the respect of the men individually, but the active official co-operation of their brotherhoods. This has had formal expression in the visit at different times of committees instructed to assure the superintendent that his vigorous discipline had their endorsement. The "investigations" have been model procedures, penalties have been visited with certainty, but with explicit statement of the offenses and explanation of the automatic character of the penalty. The discipline has been without fear or favor, and without the admixture of the personal element, which so often defeats the ends of corrective measures.

Simon Cameron Long, whose appointment as general manager of the Pennsylvania Railroad, has been announced in these columns, was born September 7, 1857, near Harrisburg, Pa., and was educated in the public schools of Pine Grove, and at Lafayette College, from which he graduated in June, 1877, with the degree of C. E. He began railway work with the Philadelphia & Reading upon leaving college, and went to the engineering department of the Pennsylvania Railroad April 3, 1881, and in April, 1882, he was transferred to the general superintendent's office at Altoona. From November, 1882, until May of the following year he was assistant supervisor in the Pittsburgh yard, when he was transferred in the same capacity to Walls, now Pitcairn, and in August, 1884, he was again transferred in the same capacity to the Philadelphia yard. He was promoted to supervisor in February, 1885. From November, 1889, to January, 1893, he was assistant engineer of the Delaware division, and was then transferred to the Maryland division. On August 1, 1900, he became superintendent of the Bedford division, and in May, 1902, was transferred to the River division of the Allegheny Valley Railroad. Mr. Long was appointed superintendent of the Pittsburgh division in January, 1903, and on April 1, 1907, was promoted to general superintendent of the Western Pennsylvania division, which position he held at the time of his recent appointment as general manager.



S. C. Long.

Traffic Officers.

L. D. Bell has been appointed a commercial agent of the Missouri & North Arkansas, with office at Joplin, Mo.

W. H. Waters has been appointed a soliciting freight agent of the Mobile & Ohio, with office at St. Louis, Mo.

J. C. Ewing has been appointed a commercial agent of the Fort Dodge, Des Moines & Southern, with office at Minneapolis, Minn.

A. V. Harger, traveling passenger agent of the Baltimore & Ohio, with office at Chicago, has resigned to engage in other business.

E. Harding has been appointed a commercial agent of the Rock Island lines, with office at McAlester, Okla., succeeding A. D. Aiken, promoted.

C. R. Coughlin, coal agent of the Chicago, Terre Haute & Southeastern at Chicago, has been appointed a commercial agent, with office at Chicago.

C. H. Helpling has been appointed chief of the tariff bureau of the Western Pacific, with office at San Francisco, Cal., succeeding H. G. Toll, resigned.

J. W. Platt has been appointed a traveling freight agent of the Cincinnati, New Orleans & Texas Pacific, with office at Cincinnati, Ohio, succeeding R. Hamilton, transferred.

M. R. Sutton, formerly general agent of the Colorado Midland at Kansas City, Mo., has been reappointed to that position. The office was abolished on June 30, 1910, and is now reopened.

G. L. Albert has been appointed secretary of the Southern Demurrage and Storage Bureau, with office at New Orleans, La., succeeding R. L. Jones, resigned to accept service with the Missouri Pacific.

A. G. Busch, formerly traveling freight agent of the Missouri Pacific, at Cincinnati, Ohio, has been appointed a commercial agent of the Louisiana & Arkansas, with office at Shreveport, La.

H. B. Tooker, general freight and passenger agent of the Ray & Gila Valley, at Kelvin, Ariz., has been appointed also general freight and passenger agent of the Bingham & Garfield, a road under construction in Utah.

L. B. Shepherd, city passenger agent of the Chicago & Alton at Kansas City, Mo., has been appointed a traveling passenger agent, with office at Denver, Colo., succeeding C. J. Kays, resigned. T. M. Sommers succeeds Mr. Shepherd.

F. H. Judson, soliciting freight agent of the Union Pacific at Kansas City, Mo., has resigned to engage in other business, and J. M. Mills, also a soliciting freight agent at Kansas City, succeeds to the duties of Mr. Judson. R. A. Peters succeeds Mr. Mills.

Isaac Benson, traveling freight agent of the St. Louis & San Francisco at Cincinnati, Ohio, has been appointed commercial agent, with office at Indianapolis, Ind., a new agency. J. J. Gartner, traveling passenger agent of the Northern Pacific at Cincinnati, has been appointed a traveling freight agent of the Frisco, with office at Indianapolis. L. B. Williams, soliciting freight agent at Cincinnati, succeeds Mr. Benson as traveling freight agent, and Robert McDowell succeeds Mr. Williams.

John A. Scott, who has been appointed general passenger agent of the Illinois Central and the Yazoo & Mississippi Valley, with office at Memphis, Tenn., as was previously announced in these columns, was born March 1, 1865 at Memphis. He was educated in the public schools and began railway work in September, 1880, in the superintendent's office of the Louisville & Nashville at Memphis. Two years later he was made assistant ticket agent; for four years from 1884 he was city passenger agent, and was then ticket agent for five years. In 1893 he became general agent of the Kansas City, Ft. Scott & Memphis, and returned to the Illinois Central and the Yazoo & Mississippi Valley as division passenger agent in 1896. He was promoted to assistant general passenger agent at Memphis in 1903, which position he held until he was appointed general passenger agent on March 1, 1911.



J. A. Scott.

T. R. Farrell, chief clerk in the general traffic department of the Wabash at St. Louis, Mo., has been appointed an assistant general freight agent, with office at St. Louis, succeeding W. H. Wylie, resigned to engage in other business. W. E. Creamer, traveling freight agent at Kansas City, Mo., has

been appointed a general agent, with office at St. Joseph, Mo., succeeding George A. McFarland, who takes Mr. Farrell's place as chief clerk in St. Louis. L. C. Hodkins, contracting freight agent at Kansas City, succeeds Mr. Creamer.

Harry George Elliott, whose appointment as general passenger agent of the Grand Trunk, with office at Montreal, Que., has been announced in these columns, was born on August 22, 1860. He began railway work in 1882, as city ticket agent of the Central Vermont, at Montreal, remaining in that position until April, 1897. From May to June, 1897, he was ticket agent of the Grand Trunk, at Montreal, and in July of the same year he was made excursion clerk in the general passenger and ticket department. From August, 1899, to April, 1900, he was chief clerk in the same department, and was appointed assistant general passenger and ticket agent in May, 1900, remaining in that position until June, 1909. The following month he was appointed first assistant general passenger agent at Montreal, and since June 15, 1910, until his recent appointment, he was first assistant general passenger agent of the same company, at Chicago.



H. G. Elliott.

James D. McDonald, whose appointment as assistant general passenger agent of the Grand Trunk, with office at Chicago, has been announced in these columns, was born at Toronto, Ont., August 27, 1855. He received his education in the public schools and began railway work in September, 1868, with the Grand Trunk. In 1869 he was made assistant ticket clerk at Toronto, and six years later was appointed ticket agent at Buffalo, N. Y. He was promoted to city passenger and ticket agent at Buffalo in May, 1896, and six years later was appointed district passenger agent, with office at Toronto, which office he held until he was appointed assistant general passenger agent as above.

James Alfred Stewart, whose appointment as general passenger agent of the Chicago, Rock Island & Pacific, with office at Topeka, Kan., has been announced in these columns, was born September 8, 1867, at London, Ont. He received a high school education, and began railway work December 5, 1881, as a messenger in the freight department of the Great Western Railway of Canada. Two years later he was appointed ticket clerk, and in 1885 went with the Union Pacific, first as freight clerk at Abilene, Kan., and then as chief clerk at Salina, Kan. He went with the Chicago, Rock Island & Pacific in May, 1888, as freight clerk at Kansas City, Mo., and he was then promoted consecutively to traveling passenger agent at Chicago, southeastern passenger agent at Pittsburgh, Pa., traveling passenger agent at Kansas City, Mo., and city passenger agent and division passenger agent at Des Moines, Ia. In April, 1901, he was appointed general agent at Kansas City, Mo., and was later promoted to assistant general freight agent, remaining in Kansas City until December, 1909. He was then appointed first assistant general passenger agent, with office at Chicago, which office he held until his recent promotion to general passenger agent at Topeka.



J. A. Stewart.

Engineering and Rolling Stock Officers.

C. H. Montague has been appointed master mechanic of the Quincy, Omaha & Kansas City, with office at Milan, Mo., succeeding A. W. Quackenbush.

A. S. Bland, assistant division engineer of the Pennsylvania Lines West at Fort Wayne, Ind., has been appointed assistant engineer on the Chicago terminal division, with office at Chicago.

G. B. Herington, division engineer of the Sacramento division of the Southern Pacific, at Sacramento, Cal., has resigned to become superintendent of construction of the Mountain Quarries Co. Railroad, with headquarters at Auburn.

C. H. Niemeyer, division engineer of the Conemaugh division of the Pennsylvania Railroad, at Pittsburgh, Pa., has been transferred to the Pittsburgh division, and F. W. Smith, Jr., supervisor of the Philadelphia Terminal division, at West Philadelphia, succeeds Mr. Niemeyer, both with offices at Pittsburgh. C. I. Leiper, division engineer of the New York Terminal division, at New York, has been transferred to the New York division, with office at Jersey City, N. J., and J. H. Harris, division engineer of the Delaware division, at Wilmington, Del., succeeds Mr. Leiper; W. F. Greene, division engineer of the Philadelphia Terminal division, at West Philadelphia, Pa., succeeds Mr. Harris, and W. T. Covert, division engineer of the Williamsport division, at Williamsport, succeeds Mr. Greene. G. R. Sinnickson, supervisor of Division No. 2 of the Philadelphia division, at Paoli, has been appointed division engineer of the Williamsport and Susquehanna divisions, with office at Williamsport; J. Schimmel, Jr., supervisor of the Schuylkill division, at Reading, succeeds Mr. Sinnickson; D. C. Baird, assistant supervisor of the Pittsburgh division, at Pitcairn, succeeds Mr. Schimmel, and M. J. Jones, assistant supervisor of the Bellwood division, succeeds Mr. Baird. S. E. Holland, supervisor of the Cresson division, at Barnesboro, has been transferred to the Philadelphia Terminal division, with office at West Philadelphia; R. R. Nace, assistant supervisor of the Maryland division at Lamokin, succeeds Mr. Holland; N. D. Vernon, assistant supervisor of the Monongahela division, at Dravosburg, succeeds Mr. Nace, and W. T. Bevan, transitman in the office of the engineer maintenance of way, succeeds Mr. Vernon. R. L. Fleming, transitman in the office of the engineer maintenance of way, has been appointed assistant supervisor of the Conemaugh division, with office at Blairsville.

Purchasing Officers.

F. M. Johnston, auditor of the Fort Dodge, Des Moines & Southern, at Boone, Iowa, has been appointed also purchasing agent, succeeding in that capacity J. L. Blake, resigned to engage in other business.

OBITUARY.

Edward W. Madden, assistant trainmaster of the middle division of the Pennsylvania Railroad, at Harrisburg, Pa., died on March 5.

W. R. Kelly, general counsel of the San Pedro, Los Angeles & Salt Lake at Los Angeles, Cal., and formerly general solicitor of the Union Pacific at Omaha, Neb., died in Los Angeles on March 9. Mr. Kelly was born in Perry county, Ohio, in January, 1849, and received his training as an attorney at Clinton, Ill. He became general solicitor of the Union Pacific in 1895, having previously had charge of the law business of that road in Nebraska. He went to Los Angeles in 1906, and has been with the San Pedro, Los Angeles & Salt Lake since 1907.

John Sloan, formerly roadmaster of the St. Louis, Iron Mountain & Southern at Arkadelphia, Ark., died recently at Conway, Ark. Mr. Sloan was born in Ireland and came to Illinois when a child. He worked at grading and construction work on

different Illinois roads in the sixties, and was consecutively track foreman, roadmaster and general roadmaster of the old Indiana, Bloomington & Western, now the Peoria & Eastern. He then went to the St. Louis, Iron Mountain & Southern as roadmaster, and he retired about ten years ago on account of ill health. He was one of the early presidents of the Roadmasters' Association.

Howard E. Laing, for twenty-five years city passenger agent of the Chicago, Milwaukee & St. Paul, died in Chicago Tuesday.

Kenyon Cox, formerly a prominent railway man, died at his home at Long Beach, Cal., on March 13, at the age of 80 years. He was interested in the construction of the Canada Southern and in other railway enterprises. He leaves a widow, a son, and a brother, Charles F. Cox, treasurer of the Michigan Central and other New York Central Lines west of Buffalo.

Hale D. Judson, general superintendent of the Chicago, Burlington & Quincy, with office at Galesburg, Ill., died at Rockport, Texas, on March 11. Mr. Judson was born May 30, 1853, at Waupaca, Wis., and began railway work in 1872 as a telegraph operator on the Chicago & Iowa. A year later he was promoted to agent, was train despatcher for ten years from 1875, and from 1885 to 1890 was general superintendent. When the Chicago & Iowa was absorbed by the Chicago, Burlington & Quincy he was appointed superintendent of the Chicago division of the Burlington and in 1902 he was made superintendent of the Illinois lines. Two years later he was promoted to general superintendent, with office at Chicago, and in February, 1910, was transferred with the same title to Galesburg, Ill.

Joseph W. Maxwell, general superintendent of the St. Louis Southwestern and first vice-president and general superintendent of the St. Louis Southwestern of Texas, with office at Tyler, Tex., died at his home in Tyler on March 7, as was previously announced in these columns. Mr. Maxwell was born October 18, 1851, at Urichsville, Ohio, and began railway work as a messenger for the Pittsburgh, Cincinnati & St. Louis in 1866. The next year he was promoted to telegraph operator, and in 1870 went with the Missouri Pacific as a train despatcher. From 1871 to 1882 he was train despatcher at different times for the Missouri, Kansas & Texas and the St. Louis, Iron Mountain & Southern. He was then made trainmaster of the latter road, and held the same office consecutively on the Wabash, the St. Louis, Arkansas & Texas and the Missouri, Kansas & Texas until January, 1887, when he was appointed division superintendent of the Missouri, Kansas & Texas. Five years later he was promoted to superintendent and in 1895 to general superintendent. He was appointed assistant general manager in July, 1903, and held that office until three years ago, when he went with the St. Louis Southwestern as vice-president and general superintendent in Texas.

FOREIGN RAILWAY NOTES.

The legislature of the state of Sao Paulo, Brazil, has authorized the construction of a line between Itiacy and Campinas. This line will connect all the lines of 3 ft. gage of the states of Minas Geraes, Sao Paulo, Goyaz, Matto, Grosso, Parana, Rio de Janeiro and Espirito Santo with Rio Grande do Sul and the republics of the River Plata and Paraguay on the southern frontier.

In some respects the Sunning railway is the most promising line in all China. It was capitalized, planned, engineered, and constructed by Chinese, without any foreign help whatever. If it has technical faults and is not run altogether in accordance with foreign ideas, it is nevertheless an effective line, prosperous and well managed, so far as results can show, and is a standing example of what Chinese effort and Chinese talent will accomplish in China in the near future.

The most active railway construction work being carried on in the north of Brazil is that at present in the hands of the South American Construction Company in connection with the system in the state of Ceara, known as the North Eastern Railway. Final approval has been given by the government for the construction by the contractors of a total of about 100 miles of line, comprising 49 miles from M. Calmon to Iquatu, 13 miles for a branch to Cedro and 37 miles for a branch connection between the Sobral and the Baturite railways. The total appropriation for this work is $2,348,000.

Railway Construction.

New Incorporations, Surveys, Etc.

Birmingham & Northwestern.—An officer writes that bids will be let about April 1, to build from Dyersburg, Tenn., southeast via Friendship, Crockett Mills, Alamo and Bells to Jackson, about 45 miles. The work will be light and calls for handling about 10,000 cubic yards a mile. Maximum grades will be 0.5 per cent. and maximum curvature 3 degrees. There will be a 70-ft. steel bridge and a trestle over Forked Deer river. R. M. Hall, president, and Mike Harvey, chief engineer, Dyersburg. (October 28, p. 809.)

Buffalo, Rochester & Pittsburgh.—A contract has been given to the Miller Construction Company, Lock Haven, Pa., for work between Mount Jewett, Pa., and Johnsonburg. This includes handling about 300,000 cu. yds. of earth and reducing the curves and alinement.

Burr's Ferry, Browndel & Chester.—An officer writes that there is no immediate prospect of extending this line to Burkeville, Texas. The company is in the market for a 100-ft. steel bridge.

Canadian Northern.—This company is said to be making surveys from Cook, Minn., on the Rainy Lake division, to Point island and east of that place.

Canadian Pacific.—The railway committee of the Canadian House of Commons has approved a bill which authorizes this company to build about 1,000 miles of branch lines in the western provinces of Canada, and also authorizes the company to issue securities amounting to $30,000 a mile for such lines.

Circuit Terminal.—An officer writes that this company expects to lay about 31 miles of track around Indianapolis, Ind., during March. The work is being carried out by the company with its own men. There will be six steel bridges, four trestles and one tunnel. O. W. Johnson, president; H. Holton, general manager, and J. A. Shafer, chief engineer, Meridian Life building, Indianapolis

Colorado, Oklahoma & New Orleans.—Incorporated in Oklahoma with $55,000,000 capital and headquarters at Oklahoma City, Okla. The company was organized to build from Trinidad, Colo., southeast through Texas, Oklahoma, Arkansas and Louisiana to New Orleans. W. J. Thompson, W. L. Peck, L. T. Poole, C. F. Woodward, S. A. Horton and D. J. Grigsby, Oklahoma City, Okla., are incorporators.

Connecticut Roads (Electric).—A contract has been given to the Aetna Construction Company, New Haven, Conn., to build an electric line from Bridgeport, Conn., to Danbury. The work is to be started at once, and includes a 400-ft. steel bridge, and some small concrete bridges.

Copper River & Northwestern.—See item regarding this company on page 513.

Duluth & Iron Range.—A new branch, called the Eastern Missabe branch, has been opened for business from Missabe, Minn., north to Boulder, 11 miles.

Farmington, Albuquerque & Gulf.—Residents of Farmington, N. Mex., have organized this company. Surveys will be made, and rights-of-way will be secured soon, it is said, from Farmington, southeast to Albuquerque, about 150 miles.

Grand Trunk Pacific.—This company is pushing work on a 60-mile branch from Edson, Alb., which is 129 miles west of Edmonton, southwesterly to reach large coal fields that are being developed in the Yellow Head Pass country.

This road has been extended from Edmonton, Alb., west to Edson, 130 miles.

Indianapolis & Delphi Traction.—Incorporated in Indiana with $100,000 capital, to build from Carmel, Ind., northwest to Delphi. The first section to be built will be from Carmel to Sheridan, about 15 miles, on which grading work is to be started soon. H. L. Smith, Indianapolis; M. E. Cox, W. M. Mendenhall, Westfield, and E. Thistlewaite, Sheridan, are incorporators.

Lake Erie and Northern.—The Railway Committee of the Canadian House of Commons has passed the bill authorizing this company to build from Port Dover, Ont., on Lake Erie, via Simcoe, Waterford and Brantford to Paris, thence to Galt,

with a branch from Paris to Glenmorris and Ayr. The company is authorized to issue securities for an amount not to exceed $30,000 a mile. J. Muir, R. Ryerson, W. S. Brewster and W. D. Schultz, all of Brantford, are interested. (January 13, p. 104.)

Mexican Pacific.—Final arrangements have been made to build this road, it is said, from Salina Cruz, Mexico, west through the territories of Oaxaca and Guerrero to Acapulco harbor on the Pacific coast. Joseph Castlelot, vice-president, Mexico City, Mexico.

Mexican Roads.—According to press reports, the Oaxaca Coal & Iron Co. has plans well under way for building an extensive system of railways in southeastern Mexico. The company owns large iron ore fields in the state of Oaxaca, and a line will be built to connect the iron deposits with the coal fields. A north and south line from Puebla is to be built through Oaxaca and the Rio Verde valley.

National Railways of Mexico.—Contracts are said to have been given by this company for building new lines in Durango, Mex., and Zacatecas, as follows: To the Campania Brancaria de Obras y Bienes Raices, for building about 105 miles out of Durango City, and to the International Contracting Company to build from Canitas, Zacatecas to Sombrerete.

Northern Pacific.—An officer is quoted as saying that construction work will be started at once on the line between the Tacoma, Wash., water front and Tenino. The right-of-way around the west water front of Tacoma has been secured. The work will be heavy and includes piercing two tunnels. (January 20, p. 143.)

Oregon Roads.—A company has been organized in Kansas City, Mo., with a capital of $50,000, to build a line to connect Hartford, Ark., Huntington, Mansfield and Midland. The headquarters of the company will be at Huntington. It is understood that the Rock Island interests are back of the project.

Panuco Mountain & Monclova.—This road is now in operation from Monclova, Mex., southeast to Panuco, 42 miles.

Pittsburgh, Butler, Slippery Rock, Grove City & Northern (Electric).—This company, which was recently chartered in Pennsylvania, expects to begin work about June 1. The plans call for building about 66 miles of line at a cost of $3,500,000. A line is to be built from Butler, Pa., to Grove City, 26 miles, from which point it is to be extended to Meadville. Right-of-way has been secured on the first 26 miles from Butler. C. Gibson, Jr., president, and J. H. Barrett, engineer. J. C. Kerr, Slippery Rock, and W. N. Galbraith, Pittsburgh, are directors.

Pittsburg & Shawmut.—A contract has been given to the Miller Construction Company, Lock Haven, Pa., for grading nine miles of the Pittsburg, Shawmut & Northern east of Kittanning. There will be a large number of cuts, and the work involves handling some 800,000 cu. yds. of rock and earth.

Pittsburg, Shawmut & Northern.—See Pittsburg & Shawmut.

Rockport & Port Arkansas.—An officer writes that as soon as the location of the harbor line has been made contracts will be let for work between Rockport City, Tex., and tidewater on Harbor island. About half the grading has already been finished. There will be a large amount of fill work. Maximum grades will be 4 degrees. About two miles of trestles are to be constructed, mostly through boggy lands, and there will be one steel bridge. The company expects to put up docks, wharves and buildings. C. G. Johnson, president; Percival & Son, engineers and contractors, both at Rockport.

San Antonio, Rio Grande & Tampico.—According to press reports, work has been resumed on this line, which is to be built from San Antonio, Tex., southwest to a point in La Salle county, about 90 miles, and eventually extended to a point in Mexico. Grading work has already been finished on a section of 25 miles north to Jourdanton, and grading is now under way between Jourdanton and San Antonio. Right-of-way has been secured for the first section of 90 miles, which it is expected will be finished during 1911. J. F. Edwards, president, St. Louis., Mo., and G. W. Nock, chief engineer, San Antonio, Tex.

St. Louis, Brownsville & Mexico.—The new Brownsville-Matamoros international railway route is to be formally opened for through freight and passenger traffic about April 15. It is planned to inangurate a through Pullman service between New Orleans and the city of Mexico via the new route.

St. Louis, Oklahoma & Southern.—This company has recently been reorganized and it is understood that work will be pushed to completion on a line from South West City, Mo., southwest via Tahlequah, Okla., to Muskogee. The line is eventually to be extended to Honey Grove, Tex. Grading has been finished to Tahlequah, and some of the ties have been laid. The northern terminus will eventually be at Joplin, Mo. C. E. Thomas, E. A. Peters, St. Louis, Mo.; S. Cook, East St. Louis, Ill; J. B. McDonald, New York, and A. D. Marshall, Dover, Del., are interested.

Tuscaloosa Mineral.—According to press reports, this company is securing rights-of-way from Tuscaloosa, Ala., east to Brookwood, 20 miles, and it is expected that construction work will be started at once. The company plans to put up a new station in Tuscaloosa, to cost $30,000. F. G. Blair, president. Woolsey Finnell, Tuscaloosa, may be addressed. (December 2, p. 1907.)

Twin City Light & Traction Company.—This company, it is said, will extend its line to a connection with the Grays Harbor & Puget Sound.

Union Pacific.—An officer writes that this company has authorized laying double-track between Council Bluffs, Iowa, and Ogden, Utah, as follows: At Lexington yard, Neb., 0.27 miles; from O'Fallon to Julesburg, Colo., 64.52 miles, and Dana, Wyo., to Rawlins, 29.92 miles, a total of 94.71 miles. The company already has double track in operation between Council Bluffs, Iowa, and Ogden on 534.54 miles, and between Julesburg, Colo., and Denver on 4.81 miles.

United Railways Company (Electric).—Train service on this road has been extended from Burlington, Ore., to North Plains, 11.2 miles.

Utah Roads.—The Union Coal Co. will be incorporated in Utah with $1,500,000 capital, to develop coal lands and to build a railway from Helper, Carbon county, Utah, west about eight miles. J. H. Moyle and R. Van Cote, Salt Lake City; A. N. Holdaway and G. M. Smoot, Provo, and J. Barbeglie, Helper, are interested.

Winston-Salem Southbound.—Train service has been extended from Whitney, N. C., to Albemarle, 10 miles.

FOREIGN RAILWAY NOTES.

In view of the increasing volume of traffic to Rhodesia, Africa, from the south, the Mashonland Railway Company, by which the whole line from Beira to Broken Hill is at present worked, has decided that the headquarters of the railways should be removed from Umtali to a more central position. Buluwayo, British South Africa, has been selected, because it is the most important railway junction on the system, and the transfer will be effected as rapidly as possible.

A concession has been granted by the Spanish government to MacArthur Bros. & Co., an American firm, to build a railway which will parallel the Northern. This road has been in project since 1892, when a Spanish company obtained the concession for its construction, but little more was done by this company than to purchase the right of way. It is undertsood that the American company has secured a majority of the stock of holdings of the old Spanish company.

The short section of the Sunning railway between Kung-yik and Tow-shan, China, which was opened to traffic last year, has proved profitable and its extension to Sunwui, whence it would have water connection with Hongkong, is expected in the near future. The earnings of the railway have averaged about $10,000 a month. The road was built with funds three-fourths of which were raised by Chinese from the Sunning district living in California and the remainder locally. All of its cars and most of its locomotives were made in the United States. The promoter of the railway was a Chinese who had spent many years in America.

Railway Financial News.

Astoria & Columbia River.—See Spokane, Portland & Seattle.

Fitzgerald, Ocilla & Broxton.—H. M. Atkinson has been appointed receiver of the Fitzgerald, Ocilla & Broxton by Judge Whipple of the Cordele Circuit. The F. O. B. is a subsidiary of the Atlanta, Birmingham & Atlanta, and runs from Broxton, Ga., to Fitzgerald, 23 miles.

Fonda, Johnstown & Gloversville.—Ladenburg, Thalmann & Co., of New York, have purchased the balance of Fonda, Johnstown & Gloversville 4½ per cent. bonds, due 1952, unissued under the first consolidated general refunding mortgage, making it a closed mortgage. These bonds were recently authorized by the Public Service Commission for the Second district of New York.

Hocking Valley.—A press despatch from Columbus, Ohio, says that attorneys for the Hocking Valley have made a proposition to Attorney General Hogan of Ohio that both sides unite in making the Ohio Supreme Court hear as soon as possible all of the ouster suits which have been brought against the company; and the attorneys agree to abide by the Ohio Supreme Court's decision as final.

Minneapolis, St. Paul & Sault Ste. Marie.—The directors have authorized an increase of 21 per cent. in the capital stock. Each stockholder will have the right to subscribe at par for seven shares of preferred and 14 shares of common for every 100 shares of stock held.

Missouri Pacific.—At the annual meeting of stockholders on March 14, Paul M. Warburg, E. D. Adams, E. L. Marston, George J. Gould, Edwin Gould, Kingdon Gould, E. T. Jeffrey, F. T. Gates, Cornelius Vanderbilt, E. B. Pryor, S. F. Pryor, Charles S. Clarke and R. Lancaster Williams were elected directors. This election, it is understood, carries out the agreement made between George Gould and the banking interests which have recently announced their intention of taking an active part in the management of the property. R. Lancaster Williams is a member of the banking firm of Middendorf, Williams & Co., of Baltimore, and he is understood to represent independent stockholders, of whom Frank Gould has the largest individual holdings. A few days before the annual election a statement was given out by Frank Gould in which he said that he had given his proxies to Mr. Williams, believing that the best interests of the property would be served by having a director on the board who should represent neither the banking interests nor the Gould estate interests. A statement to the same effect was given out by Middendorf, Williams & Co. It is understood that C. S. Clarke, who is vice-president of the Missouri Pacific, will resign from the board of directors when the new president of the Missouri Pacific is appointed.

New York Central & Hudson River.—The New York Public Service Commission, Second district, has given the company authority to issue its $30,000,000 three-year notes, to be sold at a price which shall cost the company not more than 5 per cent. for its money.

Norfolk Terminal Railway.—Stockholders are to vote March 20 on the question of authorizing $2,000,000 mortgage bonds to provide money to pay for terminal facilities and build a station and railway. Stockholders are also to vote on the question of making a lease of these facilities to the Virginian Railway and Norfolk & Western and the Norfolk Southern. The company was incorporated in 1910 to build a union passenger station.

Northern Pacific.—See Spokane, Portland & Seattle.

Old Colony Railroad.—The company sold at auction on March 15 $800,000 par value stock recently authorized by the Massachusetts Railroad Commission.

Pennsylvania Railroad.—Stockholders have voted to approve of increasing the capital stock by $100,000,000, and have voted to approve the increases in pensions made by the directors and the acquisition of the Ridgeway & Clearfield Railway.

Reading Co.—The New York Stock Exchange has listed $9,155,000 Reading Company and Philadelphia & Reading Coal & Iron general mortgage 4½ per cent. bonds, due 1997, with authority to add $11,188,000 additional bonds on the notice of sale. Of the total $20,343,000 bonds, $1,532,000 were issued to pay for new equipment and $18,811,000 were issued to retire a like amount of consolidated mortgage bonds due June 1, 1911.

Spokane, Portland & Seattle.—This company has bought the property of the Astoria & Columbia River Railroad, and the Columbia River has ceased to be an operating company. The S. P. & S. has also leased for a long period the Northern Pacific line between Willbridge, Ore., and Goble. The revenues and operating accounts heretofore kept under the name of the Astoria & Columbia River and leased lines will become a part of the accounts of the Spokane, Portland & Seattle.

St. Louis, Iron Mountain & Southern.—Frank J. Gould, R. M. Galloway and O. L. Garrison have been elected directors, succeeding John T. Terry, H. B. Henson and Lawrence Greer.

St. Louis, Oklahoma & Southern.—See Railway Construction News in regard to sale of this property.

Temple & Northwestern.—In connection with the recent sale of this property to interests represented by C. F. Carter, the assistant attorney general of Texas has been asked to give an opinion as to whether the Texas Central can legally lease the Temple & Northwestern. The Temple & Northwestern in part parallels the Missouri, Kansas & Texas, which controls the Texas Central.

Texas Central.—See Temple & Northwestern.

Texas & Pacific.—E. L. Marston has been elected a director, succeeding Winslow S. Pierce, resigned, and John L. Milbank succeeding Thomas P. Eckert, deceased. Other directors were re-elected.

Underground Electric of London.—The entire issue of £1,000,000 ($5,000,000) 5 per cent. prior lien bonds, callable at par but due in 1920, have been called for redemption. The company has sold in order to make this payment part of the 4 per cent. preferred stock of the London Electric Railway comprised in the collateral security for the prior lien bonds and junior issues.

Wabash-Pittsburgh Terminal.—The *Wall Street Journal* of March 13 says: "By far the most important development of the past six months in the reorganization and affairs of the Wabash-Pittsburgh Terminal is an agreement just entered into between the Chaplin and the Wallace first mortgage protective committees, by which the two committees will effect a consolidation and will hereafter co-operate in bringing about the reorganization of the properties. On every point at issue between the two committees the Chaplin committee has won a signal victory. The entire membership of five comprising the Chaplin committee will be on the new consolidation committee, while only five of the Wallace committee will remain and five will be dropped. The new committee will act without a chairman, but a sub-committee will be appointed, composed of James N. Wallace and Haley Fiske, of the Wallace committee, and James C. Chaplin and Richard Sutro, of the Chaplin committee. Mr. Wallace will be chairman of the sub-committee."

Wisconsin & Michigan.—It is understood that control of this property has been bought by John Marsh, a railway contractor of Iron Mountain, Mich.

Emilio Carrasco, the concessionaire of a trans-Andean line which will start from Salta in the Argentine Republic, has selected the port of Mejillones, Chile, as the terminus of the line on the Pacific ocean. According to the concessionaire, the selection of Mejillones is due to the unusual advantages which it offers to the shipment of nitrate, particularly that produced in the southern section of the department of Tocopilla. This zone abounds in nitrate, but the deposits have never been exploited, because of the lack of adequate transportation facilities. Mr. Carrasco will begin the construction by first building the section between Mejillones and the nitrate zone, in Aguas Blancas and Boquete, so as to expedite exploitation. When the bill granting subsidies to private railways shall have passed the national congress, he will then extend the line to Salta. The concessionaire is also considering the construction of a branch line from Mejillones to Antofagasta, connecting the trunk line.

Supply Trade Section.

The Isthmian Canal Commission will receive bids until April 5 on lubricating oils and greases for all types of engines. Circular No. 624. Bids on cross and switch ties will be opened April 10. Circular No. 625.

H. E. Creer, general car foreman of the Missouri Pacific at Atchison, Kan., has resigned to become mechanical expert for McCord & Company, Chicago, succeeding the late D. J. McOscar, who died on December 22, 1910. Mr. Creer's headquarters will be in Chicago.

The Pawling & Harnischfeger Company, Milwaukee, Wis., has elected the following directors: S. H. Squier, W. H. Hassenplug and F. P. Breck. Mr. Squier has been elected also secretary, and Mr Hassenplug, formerly sales manager, has been elected also second vice-president.

The Wilmington Institute Free Library, Wilmington, Del., has for several years been developing its department of applied science and is now anxious to obtain a full line of trade catalogs published by the various manufacturing concerns throughout the country. Any trade catalog will be of value to this collection and will be appreciated.

The American Electric Railway Manufacturers' Association, George Keegan, secretary, announces the opening of an office at 165 Broadway, New York City. This office will be the headquarters of the association, and out of town members are invited to use the rooms for the receipt of their mail and for carrying on correspondence, while in the city.

W. R. Hulbert, manager of sales for the Goldschmidt Thermit Company, New York, lectured on the Thermit welding process before the Cleveland (Ohio) branch of the American Chemical Society, at its March meeting. In addition to a general description of the process and its various applications, with lantern slides, Mr. Hulbert gave a demonstration of Thermit welding, comprising a number of experiments to show how the process is used commercially for repairing wrought iron and steel sections, and for welding pipes up to 4 in. in diameter.

The gross sales of the Western Electric Company, Chicago, for February were not only 20 per cent. larger than the corresponding month in 1910, but established a record for February business. In January the making up of returns for last year may have thrown some of the business into February which otherwise would have come into the January sales-returns, but that will not account for the entire increase. On the basis of two months for which reports have been received, gross sales for the year should be about $71,000,000. This would exceed by $2,000,000 the previous high record of 1906. Western Electric's sales for twelve years, if the present year turns out as indicated, will total well over half a billion dollars. Favorable weather conditions in the west and southwest point to a good demand for telephone equipment from agricultural districts this year, and the company is well prepared for the expected enlargement in sales. At present there are 24,000 persons in the company's employ.

Judge Rellstab in the United States circuit court for New Jersey recently rendered a decision in a suit brought by the National Malleable Castings Company against the American Steel Foundries, holding that the patents owned by the National Malleable Castings Company on the Climax coupler are valid and are being infringed by the American Steel Foundries. The infringement, he held, consists in the manufacture and sale of locks intended for repair purposes with the Climax coupler. A final decree has been entered for the complainant. The case is reported in 182 Fed. Rep., page 26. The decision will prevent the further making and sale of repair parts for a patented coupler by others than the original maker. The American Steel Foundries has issued a statement saying that in consequence of this decision it can no longer lawfully furnish for repair purposes knuckles, locks, etc., for patented couplers, except those the patents for which it owns itself, whether these parts are themselves subject to separate patents or are simply parts of a general coupler patent.

TRADE PUBLICATIONS.

Friction Clutches.—The Carlyle Johnson Machinery Co., Manchester, Conn., has devoted catalog E to the descriptions and advantages of its friction clutches. This catalog is illustrated, contains 35 pages and includes dimension tables and the latest price lists.

Side and Center Bearings.—Edwin S. Wood & Co., Chicago, have published a 45-page booklet describing the Woods side and center bearings, and giving some valuable data on the general subject of rollers under load, concerning which there is little reliable information in print.

Track Jacks.—Templeton, Kenly & Company, Ltd., Chicago, have prepared a special catalog, No. 12, on Simplex track jacks, for the use of officers of seven western railways, including the Southern Pacific, the Union Pacific and the San Pedro, Los Angeles & Salt Lake. The booklet lists four types of track and car jacks, giving full information concerning each.

RAILWAY STRUCTURES.

Bronxville, N. Y.—The New York Public Service Commission, Second district, has decided on the plans for the elimination of the grade crossings on the Harlem division of the New York Central & Hudson River in Bronxville, made necessary by the electrification of that road. The plan adopted provides for the construction of an undergrade crossing, 50 ft. wide, at about the location of the present station. The cost will be about $150,000. The commission has also ordered the elimination of the Main street grade crossing in Irvington. An overhead crossing is to be built about 300 ft. north of the present grade crossing and a subway for pedestrians is to be constructed about on the line of the present Main street crossing. The total cost of this improvement will be about $80,000.

Burlington, Vt.—An officer of the Central Vermont writes that the question of building a new station at Burlington is now under consideration, but no definite plans have yet been made to carry out the work. (March 3, p. 436.)

Council Bluffs, Iowa.—The Chicago, Rock Island & Pacific transfer elevator at Sixteenth street and Twelfth avenue was burned on March 8, the loss including eight box cars.

Doaktown, N. B.—See Marysville, N. B.

Everett, Wash.—The Seattle & Everett Railroad and the Everett Railway, Light & Water Company will jointly build a passenger station at Everett, for which bids are now being asked. The cost of the improvement will be about $60,000.

Irvington, N. Y.—See Bronxville, N. Y.

London, Ont.—Bids are wanted up to noon, March 25, by A. L. Hertzberg, division engineer of the Canadian Pacific, at Toronto, for constructing a 22-stall engine house, also a boiler and machine shop at London.

Kansas City, Mo.—The Union Pacific has given a contract to the Foundation Construction Company, New York City, for rebuilding its bridge over the Kaw river to conform to the plans of the Kaw Valley Drainage Board.

Marysville, N. B.—The Intercolonial will put up a new steel bridge, it is said, over the Nashwaak river above Marysville; also a steel bridge near Doaktown.

Memphis, Tenn.—According to press reports, the Nashville, Chattanooga & St. Louis will spend a large amount of money for terminal improvements at Memphis. The work includes putting up a freight warehouse and enlarging the roundhouse.

Port Arthur, Texas.—The Southern Pacific has let a contract to McKnight & Co., Beaumont, Texas, for building a brick passenger station 88 ft. x 38 ft., to cost about $20,000.

Tuscaloosa, Ala.—See Tuscaloosa Mineral under Railway Construction.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Pennsylvania Lines West are said to be considering an order for 2 locomotives.

The Atlantic Coast Line, mentioned in the *Railway Age Gazette* of March 10 as having ordered 29 locomotives from the Baldwin Locomotive Works, is still negotiating with this company. No contract has been consummated.

The Solvay Process Company, Syracuse, N. Y., has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 122,000 lbs.

The Bingham & Garfield, as mentioned in the *Railway Age Gazette* of March 3, has ordered 1 Mallet locomotive from the American Locomotive Company. The dimensions of the cylinders will be 26 in. and 41 in. x 28 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 454,000 lbs.

CAR BUILDING.

The St. Louis & San Francisco is in the market for 11 postal cars.

The San Diego & Arizona is in the market for 30 forty-ton box cars and 90 fifty-ton flat cars.

The San Antonio & Aransas Pass is in the market for a number of box cars and stock cars.

The Kansas City Southern is in the market for 125 ballast cars, two tseam shovels, one ditcher, one wrecking crane and one pile driver.

The New York, Westchester & Boston has ordered 30 seventy-two-foot all steel passenger cars from the Pressed Steel Car Company.

The Chicago, Rock Island & Pacific, mentioned in the *Railway Age Gazette* of March 10 in an unconfirmed item as being in the market for 1,450 freight cars, is not in the market for any freight equipment.

IRON AND STEEL.

The Grand Trunk has ordered 65,000 tons of rails.

The Pere Marquette has ordered 20,000 tons of rails.

The Canadian Northern has ordered 75,000 tons of rails.

The Chicago & Western Indiana has ordered 1,000 tons of rails.

The New York, Chicago & St. Louis has ordered 5,000 tons of rails.

The Chicago, Milwaukee & St. Paul has ordered 390 tons of structural steel for a viaduct.

The Atlantic Coast Line has ordered 1,750 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The New York, Westchester & Boston has ordered 5,600 tons of rails from the Pennsylvania Steel Company.

The Vicksburg, Shreveport & Pacific has ordered 1,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The St. Louis & San Francisco is said to have ordered 3,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Lake Shore & Michigan Southern has ordered 1,800 tons of structural steel for six bridges, the order being divided between the American Bridge Company, the King Bridge Company and the McClintic-Marshall Construction Company.

General Conditions in Steel.—Since the first of the month there has been a slight falling off in orders, but the steel men feel that the lull is only temporary and are confident that conditions will show a marked improvement very soon. Prices have held in spite of this decrease and no reduction is expected at the conference of steel manufacturers to be held in New York this week. Although orders are small, inquiries are large, so a boom is predicted for the near future.

MACHINERY AND TOOLS.

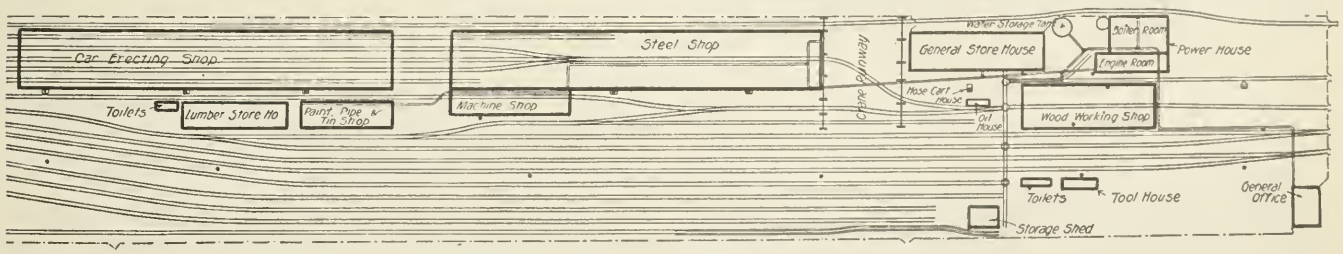
The Union Pacific has issued a list of machine tools calling for bids on about $25,000 worth of machinery.

SIGNALING.

The Alabama Great Southern is to install automatic block signals between Tuscaloosa, Ala., and Moundville. The Alabama Great Southern is now equipped with automatic block signals as follows: Wauhatchie to Batelle, 28 miles; Woodstock to Tuscaloosa, 26 miles; and Livingston to Meridian, 36 miles. The completion of the 17 miles just authorized will give 107 miles protected by automatic block signals, or about 36 per cent. of the entire mileage of the road. It is the intention of the officers to ultimately equip the entire line from Chattanooga to Meridian with automatic block signals. The northern section of the Queen & Cresecent Route—the Cincinnati, New Orleans & Texas Pacific, Cincinnati to Chattanooga—has long been thus equipped.

The Whipple Car Shops.

The Whipple Car Company occupies the plant that replaced the old car shops of the Chicago, New York & Boston Refrigerator Company, which were burned in 1907. The original plant was used to repair the refrigerator cars of the New York Despatch and the National Despatch lines, but the new one was built with the intention of entering the field of car construction. Since its opening the company has built a large number of refrigerator cars for the Baltimore & Ohio, about 5,000 new underframes for the Santa Fe, and quite a number of steel underframes for tank cars, as well as keeping up the repairs on the cars of the refrigerator lines, as in former years. These shops extend from Fifty-first street to Fifty-fourth street, Chicago, directly west of St. Louis avenue, and are near the Elsdon yards of the Grand Trunk. They also have connections with railways entering Chicago by means of the Belt railway and the Baltimore & Ohio Chicago terminal. Referring to the plan, the first building to the left is the wood car erecting shop, which has a capacity of 50 cars on the five tracks extending the full length of the shop. This building is 80 ft. x 500 ft., and is of steel



Whipple Car Shops.

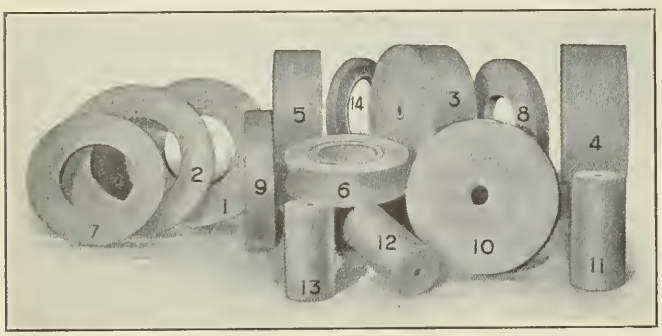
construction. The sides and ends are covered with galvanized iron and the doorways with the Kinnear roller curtains. At the side of this shop there is a small brick building which includes the paint shop, pipe and tin shop.

The steel erecting shop is 80 ft. x 500 ft., and is of similar construction to the wood car erecting shop, except that it is provided with a 7½-ton Niles crane, which has a span of 78 ft. The scaffold platforms in this shop are supported from the roof trusses leaving the floor space free. A brick lean-to, 35 ft. x 160 ft., is used as a machine shop, and is equipped with axle lathes, wheel boring mills and wheel presses, all of which are made by the Niles-Bement-Pond Company and are motor-driven. This shop is spanned by a 1-ton Sprague traveling crane, the operation of which is controlled from the floor by the use of pendants. The planing mill is a brick structure 60 ft. x 180 ft., and a small portion at one end has a second story which is occupied as a pattern shop. The planing mill is equipped with sufficient wood working tools of modern designs to finish material for 25 new cars per day in addition to the usual amount of repair work required. These tools are also motor-driven.

The power house is arranged in three divisions: two used for the boilers make a structure 50 ft. x 80 ft.; and the engine house is 50 ft. x 100 ft. There are seven horizontal boilers which have a total capacity of 840 h. p. The brick chimney is 125 ft. high, 5 ft. in diameter at the top and 7 ft. at the bottom. The engine room is lined with white enamel tile, and is equipped with three direct connected d. c. generators to engines having a total capacity of 570 h. p. There is also one small spare generator of 6 k.w. capacity for emergency lighting, a Franklin air compressor with a capacity of 420 cu. ft., and an Ingersoll-Rand compressor of 740 cu. ft. capacity; also one fire pump with a capacity of 100,000 gal. per min., at a pressure of 100 lbs. The storehouse, 50 ft. x 180 ft., is of brick and steel construction; between it and the steel erecting shop is a 5-ton Niles traveling crane having a span of 100 ft. The space which this traverses is used for the storage of heavy material, which may be handled by the crane to the shops or to the cars either in receiving or shipping. The office is a brick building, 38 ft. x 54 ft., two stories high. The first story is occupied by the general superintendent and his clerks, and the second contains a drafting room, dining room and kitchen. The president of the Whipple Car Company is Walter W. Whipple, and the superintendent of shops is George T. Anderson. The Chicago office of the company is in the Commercial National Bank building.

Vitrified Grinding Wheels.

A group of unusual grinding wheels made by the Carborundum Company, Niagara Falls, N. Y., is shown in the accompanying illustration. The largest is the one numbered 2. It is 48 in. in diameter and is said to be the largest vitrified grinding wheel ever made. It is made of Aloxite, the new steel grinding

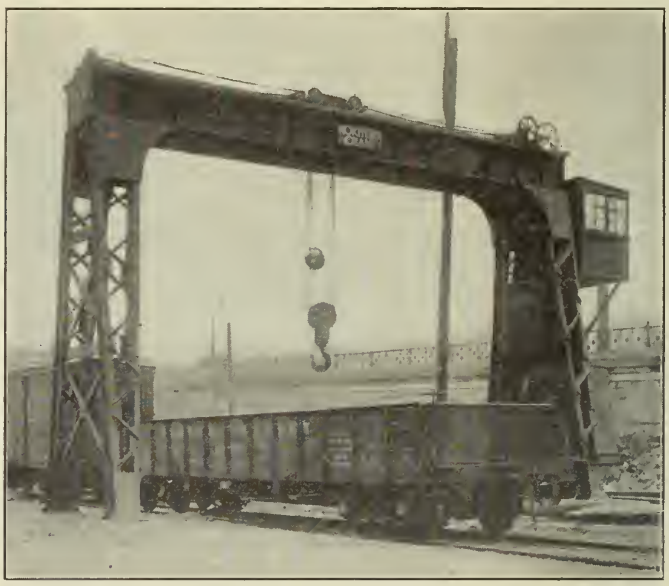


Vitrified Grinding Wheels.

abrasive recently put on the market by this company, and is to be used for tool grinding by one of their customers in France. This group shows wheels used for a variety of purposes. No. 1, made of silicate Aloxite, is 48 in. in diameter by 3 in. thick, and is to be used for grinding cutlery steel. Nos. 3 and 4 are drums, 39¼ in. in diameter by 16⅛ in. thick, and are to be used for hulling grain. No. 5, made of silicate Aloxite, is 40 in. in diameter by 14 in. thick and is to be used to grind mower sections. No. 6, made of vitrified Aloxite, is 36 in. in diameter by 9 in. thick, and is used for pointing cast steel wire. No. 7, made of silicate Aloxite, is 39 in. in diameter by 3 in. thick, and is to be used in glass grinding. No. 8, made of vitrified Aloxite, is 36 in. in diameter by 4 in. thick and is to be used in grinding angle iron. No. 9, of silicate Aloxite, is 40 in. in diameter by 4 in. thick and is to be used in grinding corset steel. No. 10 is 40 in. in diameter by 8 in. thick, and is to be used in grinding structural steel. No. 14, made of silicate Aloxite, is 36 in. in diameter by 4 in. thick, and is to be used for tool grinding. The other three, made of vitrified carborundum, are 12 in. in diameter by 26 in. long and are to be used to grind vitrified tile. The net weight of this group of wheels is 8,350 lbs. The Carborundum Company not only has a ready supply of regular or standard shapes and sizes, but can supply any special shapes and sizes.

Thirty-Ton Hoisting Crane.

A 30-ton crane built by the Northern Engineering Works, Detroit, Mich., is shown in the accompanying illustration. The crane has a main hoist of 30 tons capacity and an auxiliary hoist of five tons capacity, the latter being for high speed service. A separate hoisting mechanism is provided for each hoist. The crane differs somewhat from the usual design in that all the hoisting machinery is located on the end post and is so ar-



30-Ton Crane for Loading and Unloading Cars.

ranged that in emergencies it can be operated by hand power. All controlling apparatus is located in the upper cab shown on the extreme right. The housing for the hoisting mechanism is shown just below the cab. This crane is now in service in the Lehigh Valley yards in New York City, being used for transferring freight from wagon to car and from car to wagon The machinery is motor operated, the motors receiving power from an alternating current circuit.

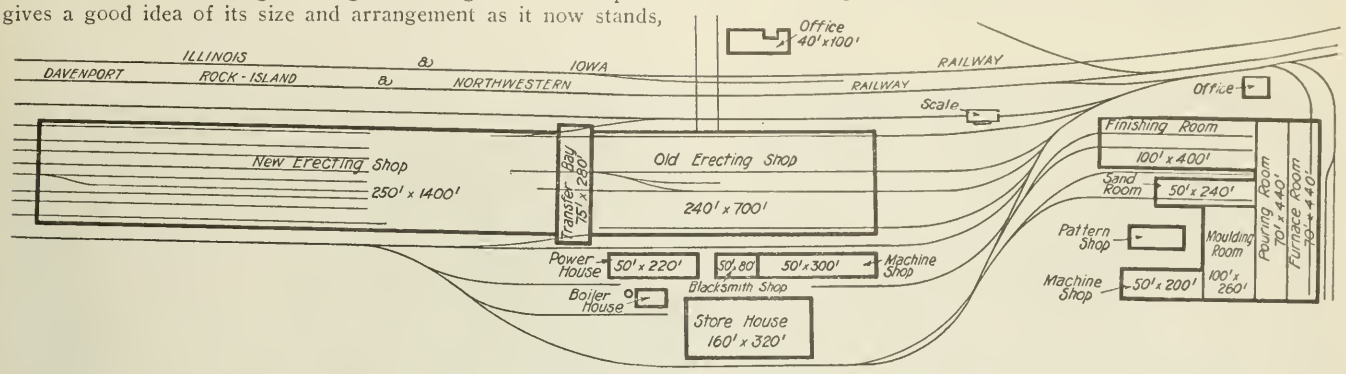
FOREIGN RAILWAY NOTES.

The minister of transportation and public works of Brazil has approved the plans for the extension of the Goyaz Railway from Ipamory to Antas, a distance of 159 miles, the first-named station being 122 miles above the initial station of the road. In another order further plans for the extension of the same railway from Perdicao to Palestina have been given final approval. This section of the line is to be 263 miles in length and will cost $2,100,000 to build, according to specifications now accepted.

The minister of industries and public works of Chile has approved the final plans for the construction of a railway from Cajon to Llaima. The distance to be covered by this line will be 28 miles.

New Bettendorf Steel Car Plant.

The steel car plant at Bettendorf, Iowa, which was built in 1902, was described in the *Railway Age Gazette* of October 16, 1908. In the past two years it has been enlarged to such an extent that the plant of 1908 is only a small corner of the present one. The original tract for the old plant covered 40 acres, while the factory grounds now cover an area of 100 acres, and the buildings have an aggregate area of 800,000 sq. ft., or 18 acres under roof. The drawing showing the arrangement of the plant gives a good idea of its size and arrangement as it now stands,



New Car Shop and Steel Foundry; Bettendorf Axle Company.

and the photographic views serve to illustrate to some extent the character of the buildings and some of the equipment.

The original shop is a brick structure 700 ft. x 240 ft., and in the recent improvements there has been added to it a main fabricating and erecting shop 1,400 ft. x 255 ft. x 60 ft. high, which is of steel frame and brick construction, thus making one building 2,100 ft. x 255 ft. In addition to this there has been erected, a 540 ft. x 440 ft. steel foundry arranged with wings on the bays. This set of buildings covers 160,000 sq. ft. and lies directly east of the main shop. The engine and pump house, located south of the main shop, is 220 ft. x 50 ft. The boiler house is 80 ft. x 50 ft., and is located directly south of the engine and pump house. East of the engine room is the machine shops, 380 ft. x 50 ft., and the storehouse, 320 ft. x 160 ft.

The boiler house is equipped with four vertical water tube boilers, and two more may be added to meet the demands of the growing business. These boilers are equipped with automatic chain grate stokers, economizer and a conveying equipment, with automatic coal weighing hoppers, that will handle the coal and ashes. The engine house contains two duplex fire pumps having a total capacity of 2,000 gals. per min. Six hydraulic pumps are provided, giving a pressure from 350 to 3,000 lbs. per sq. in., and having a capacity of 1,230 gals. per min. These pumps supply the hydraulic presses throughout the plant and are governed by three weighted and two actuated accumulators, the last two being designed and built by the Bettendorf company to suit the requirements of the plant. Compressed air is obtained from three compressors having an aggregate capacity of 3,400 cu. ft. of air per min. Electric power is obtained from an exhaust steam turbine direct-connected to a 500-k.w. direct-current generator, as described in the *Railway Age Gazette* of March 3, and from two tandem compound engines each direct-connected to a 100-k. w. direct-current generator. There are also generator and dynamo sets for lighting the streets and homes in the town of Bettendorf. From the power plant extends a large 1,263 ft. concrete tunnel carrying the hydraulic, air power lines and the electric conductors to the foundry. Another tunnel carries the hydraulic, air and oil lines to the main shop where they are placed overhead and tapped at the various presses and machines.

The main shop in which the underframes and cars are made is equipped with 15 electric traveling cranes of 3 to 10-ton capacity, having approximately 60 ft. and 70 ft. spans. The old part of this building, or the original shop, is divided into five bays, the two south bays being devoted to the manufacture of bolsters and the two north bays for the manufacture of small car parts and truck spring plants. One end of the center bay is used principally for storage and the other end for the assembling and manufacture of underframes. At this end of the center bay and connecting it to the new addition is a transfer bay equipped



New Bettendorf Steel Car Plant; Bettendorf, Iowa.



Bettendorf Steel Foundry.

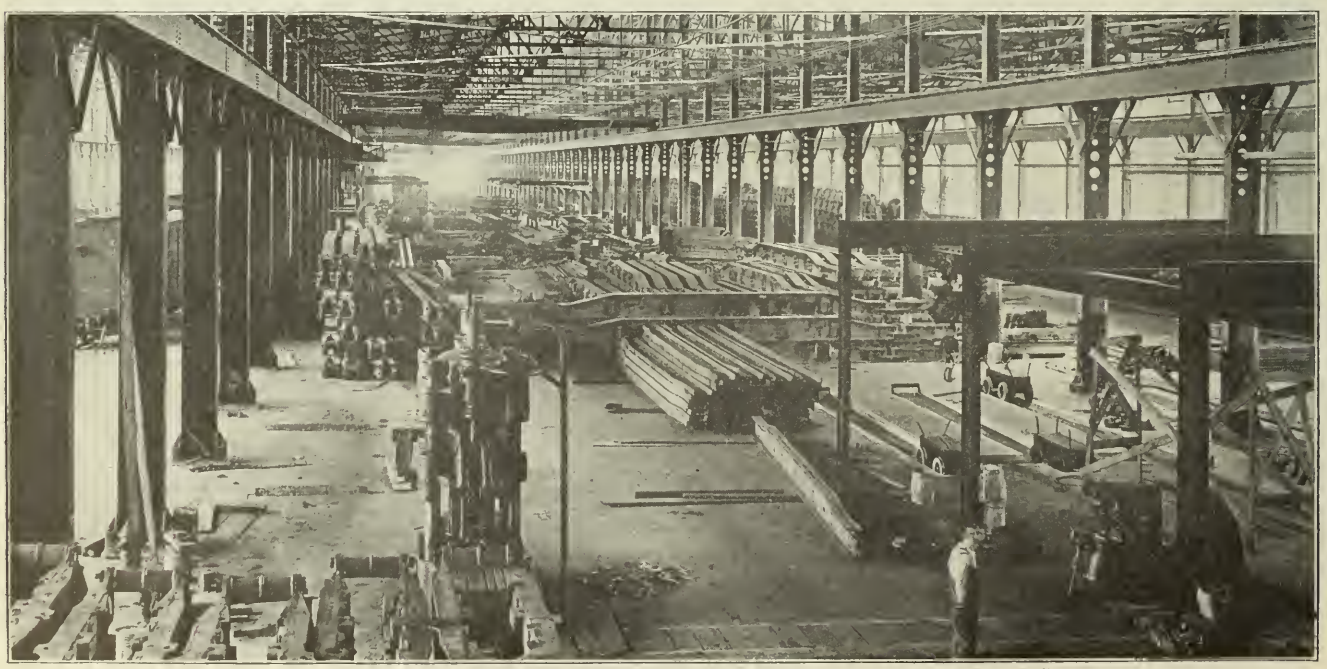
with necessary appliances (cranes, magnets, etc.) for distributing material from the old shop to the four bays of the new addition. The two north bays in the new addition are used for the fabrication and erection of underframes and steel cars. The south center bay is used for the application of floors and sides to the underframes and the south bay for the storage of small car parts and specialties. There are 39 hydraulic presses in this shop, ranging in capacity from 50 to 2,500 tons, which were especially designed and built by the Bettendorf Axle Company to meet the requirements of the Bettendorf construction. Near the center of the two north bays are located a series of subways



Painting and Loading Department for Steel Underframes; Bettendorf Steel Car Shop.

for assembling and riveting the underframes which is done by means of compression gap riveters, above which are located electric or air hoists suspended from small overhead cranes or trolleys for handling the heavy sills, etc. Numerous Bettendorf low pressure air furnaces are used to heat the rivets and other materials requiring hot shaping. Running through this shop longitudinally are eight standard gage tracks connecting with the various yard tracks. Two locomotives and three locomotive cranes are used for transportation of material over the tracks at this plant, which have a total length of eight miles. The heating of the shop is supplied by the Evan-Almiral hot water system, having 75,000 sq. ft. of radiation, which is found to comfortably warm this large shop.

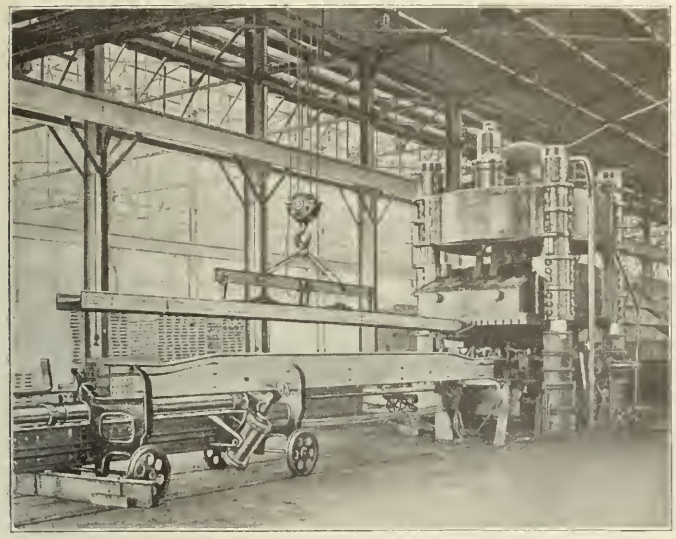
The Bettendorf underframes for freight cars, of which there are 45,000 now in use, are made in this shop; all have their longitudinal sills continuous from end to end. They are made from commercial rolled shapes and have attached to them the draft sills in which the necessary draft gear stops, lugs and pockets are cast integral. This gives better alinement and eliminates the possibility of shearing draft gear stop rivets. These underframes have also continuous end sills body bolsters and needle beams which pass directly through the center sills transmitting the load on the cross members directly to the center sills and from member to member without depending on the medium of rivets and gussets to sustain the load. Rivets and gussets are used only to hold the various members in position, thereby reducing the weight and number of parts and making inspection, repairs and painting less difficult. Complete gondola, flat and tank cars are made in this shop and are designed in the same manner as the underframes, their respective members transmitting the load from member to member directly. The Bettendorf I-beam bolsters are also made here, and like the other products of the plant are made from commercial rolled beams shaped cold, in specially designed hydraulic presses, to prevent forging stresses, and to which, after shaping, are riveted the necessary cover plates, side bearings, column guides, and center plates. There are over half a million of these bolsters in service. Since the erection of the steel foundry, described later in this article, the Bettendorf Axle Company is prepared



One Half Erecting Bay; Bettendorf Steel Car Shop.

to furnish either the built-up bolster or those made of cast steel.

Aside from the specialties described above, this concern is gradually drifting into the manufacture of cars in their entirety. An all steel box car was built and is now being tried out in service. In each design the effort is made to eliminate most of the objections to steel superstructures which have so frequently been raised. This company has also designed several other kinds of cars for special service and is prepared to design



2500-Ton Hydraulic Press for Center Sills; Bettendorf Steel Car Shop.

and build any type of freight car demanded by the railways. Sills, etc., are shaped cold in hydraulic presses to prevent internal forging stresses and are punched and sheared in such a manner that one sill is completed in two strokes of the press, which insures perfect alinement of all holes. The necessity of drifting and reaming, to make rivet holes match, is thereby eliminated and the fractures in metal caused by drawing up are prevented. All sills are interchangeable with no variation in the spacing of holes. These sills are handled between machines by powerful lifting magnets and are fed into the presses by compressed air handling, turning and feeding trucks especially designed by the company.

The main machine shop is devoted entirely to the building and repairing of the hydraulic presses, machines and the elaborate dies used in the presses throughout the plant. It is a well equipped, up-to-date and strictly modern shop equipped with motor-driven tools, such as planers from 28 in. x 28 in. x 5 ft. single head to 48 in. x 50 in. x 20 ft., with 40 ft. bed open side, double head; lathes from 18 in. x 8 ft. to 32 ft. x 16 ft.; 2 in. and 3 in. turret lathes; 4 ft. 6 in. to 6 ft. radial drills; 18 in. and 24 in. crank shapers; saws; and bolt cutting machines; also drill presses of various sizes. To assist in setting the work a 5 ton 49 ft. span traveling electric crane is employed. The blacksmith shop is used exclusively for making and trimming shop tools and is a well equipped modern shop with the necessary forges, hammers, press and hardening furnaces with electric pyrometers as well as a bolt and rivet heading machine. This shop is located in the machine shop building and occupies 80 ft. of the 380 ft. shop. The electrical department, which is located within the main shop, is well equipped and affords facilities for winding and baking armatures and field magnets and repairing motors.

The steel foundry, located directly east of the main shop, is a steel brick structure divided into wings or bays and designed to permit of ample enlargement. It was commenced in 1909, and the first heats were taken from the furnaces in the summer of 1910. The furnace bay, 70 ft. x 440 ft., is equipped with two 5-ton, 70 ft. span, electric traveling cranes for handling molds and castings; one 3-ton electric traveling wall crane; one 35-ton, 70-ft. span ladle crane with a 35-ton main hoist and a 5-ton auxiliary hoist and two 3-ton jib cranes for handling the furnace spouts. Through this department is a continuous sand conveyor for handling sand and conveying it to the sand mixers in the



Machine Shop; Bettendorf Steel Car Plant.

sand room. The two molding rooms, each 260 ft. x 50 ft., are equipped with two 5-ton, 48 ft. span, electric traveling cranes and miscellaneous jib cranes, pneumatic ramming tools, Bettendorf molding machines and core machines, and a continuous sand conveyor delivering sand at the various machines from the sand mixer. The sand room, 240 ft. x 50 ft., is equipped with concrete bins for sand storage, one 5-ton, 48-ft. span, electric crane with ½ yard grab bucket, two 25-ton continuous heavy sand mixers and two 15-ton facing sand machines. The annealing and chipping rooms, arranged in two bays each 400 ft. x 50 ft., are equipped with two continuous annealing ovens of the Bet-



Sand Mixer and Conveyor; Bettendorf Steel Foundry.

tendorf design which greatly expedite the process and render castings of a uniform quality. A Bettendorf hydraulic press, of 775 tons capacity and specially designed for this service, is used to straighten and test truck frames to insure perfect alinement. Five ton, 48-ft. span, electric traveling cranes are used to carry castings to the various parts of these departments and for loading castings on cars.

A metal pattern and machine shop, 200 ft. x 50 ft., occupies another bay of this structure and is equipped with the necessary up-to date motor driven tools to build and repair the metal patterns, molding machines and other machinery used throughout the foundry. In another bay, 140 ft. x 50 ft., is the wood pattern shop on the upper floor, equipped with motor driven, automatic start and stop planer, joiner, pattern grinder, saw tables, band saw, lathe, and revolving oil stone. On the ground floor of this building is a well arranged locker room, lavatory and swimming pool for the convenience of the employees.

In this foundry are produced the Bettendorf one-piece cast steel truck frames, with the arch bars, columns and journal boxes cast into one piece, thereby producing a truck having a low cost of maintenance, light weight due to reduction in number of parts, great strength, and flexibility due to the method of tying the two frames of the truck together, they being tied by means of a spring plank with the pivot connections at the side frames, which renders the truck free to adjust itself to track irregularities. There are now about 250,000 of these truck frames in service, and they are guaranteed against failure by breakage. On account of their simplicity and the great reduction in the number of pieces, the cost of repairs is much less than that of the arch bar or trucks of other designs using more pieces. The Bettendorf cast steel center sill ends are also produced here and possess that peculiarity so common to the Bettendorf construction—reduction in the number of parts and weight, together with increased strength.



Annealing Furnaces; Bettendorf Steel Foundry.

The town of Bettendorf now has a population of about 1,500 people, and is to a large extent under the control of the Bettendorf Axle Company, through a town improvement company. This company under franchises obtained from the town council has put in a system of water works to supply the town from an artesian well and a stand pipe located on a bluff. The improvement company also supplies electric light to the town and private houses, the current being obtained from the shop engine room. It has spent about $100,000 in putting in the water and lighting plants for its employees' homes.



Pouring Room in Bettendorf Steel Foundry for Truck Sides.

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The exhibition of signaling apparatus at the Coliseum this week gives a good idea of the remarkable development that has taken place in this department of railway engineering during the last year. The devices which are being shown exemplify many improvements in the design, use, and manufacture of signaling materials. A number of new devices are being introduced, and the makers of signals and interlocking plants are taking full advantage of the excellent opportunity afforded by this annual exhibition to show them to railway men. There is probably no line of railway work in which such marked progress has been made during the last twelve months as in signaling, and while recent developments in connection with government regulation may affect for a time the general tendency of railways to spend money for improvements, it does not seem probable that signaling will be much affected. There are two main causes for this. One is the fact that legislative bodies are showing considerable activity in the framing of compulsory safety measures, and the other is that railway managers seem at last to have come to recognize that signals will actually increase the operating capacity of a track to an extent that will more than repay the interest on the investment necessary to install them. For these reasons the exhibitions of signal appliances are proving exceedingly interesting and instructive to many officials who probably never before took occasion to examine them, and, on account of the many engineering problems involved in the recent developments and new designs, signalmen will be more interested than ever before. It is interesting to note that the committee on signaling, which was appointed some time ago by the Railway Commission of Indiana to investigate the various systems of block signaling now available, is planning to have a meeting in Chicago during this week, with a view to studying the various types of signals for steam and electric roads which will be on exhibition.

Custom permits the prefixing of the term "progress" to almost any kind of committee report, whether it really indicates progress or not. Thus there are some so-called progress reports presented at various association meetings which do not mean very much. In some cases these take the form of excuses rather than records of actual work done. It is plain to be seen, however, that there is no necessity for questioning the propriety of this term with respect to the work of the Railway Signal Association committees, for most of the reports submitted at its stated meetings indicate, not only a comprehensive grasp of the work assigned, but also substantial progress toward its completion. And yesterday's meeting was no exception in this respect, for the reports in the main show that the committees are taking hold of their respective subjects in a way that promises well for the quality of the reports representing the year's work, which will be submitted at the annual meeting next October. In view of the fact that it is only about two months since the committees were appointed, they are to be congratulated upon the excellent showing already made. The "neighborhood meetings," which were tried in 1910, and which proved very helpful, will, no doubt, be found even more profitable this year. In general, the present committees, while they realize that their predecessors have done some excellent work, seem determined, to exceed even the high mark of last year in the quality of their own reports.

The morning session of the Railway Signal Association meeting was devoted largely to a discussion of the proposed standard symbols submitted by Committee 1. The subject of standard symbols is one in which every man in the signaling profession is vitally interested, and it was only to be expected that many opinions would be expressed. It was recognized from the beginning of the committee work that the formation of a system of symbols would necessitate some arbitrary conclusions, and, as a few of the members stated, the committee several times despaired of reaching a satisfactory working basis. Then there was the question of the number of situations to be covered, which alone is a big problem, and in the minds of some has received too little attention at the hands of the committee. For example, there was a demand by some for a system of symbols that would be so complete as to tell at a glance the type of power used to actuate a signal, and many more details that would seem to be evident in the average case "from the context," i. e., fully explained by the general characteristics of the particular installation in question. Others thought that there were too many symbols in certain parts of the report. It was brought out, too, that while the symbols which shall be decided upon will be, perhaps, of more value to manufacturers than any one else, still an effort should be made to present them in such shape that they will be equally intelligible to the signalmen of all the railways interested in joint facilities. Mr. Mountain of the board of railway commissioners of Canada raised the point that there should be some provision for symbols representing changes at plants, or substitutions or alterations with which manufacturers have little or nothing to do. His comment, from the standpoint of one who has to approve or disapprove of proposed schemes, brought a third factor into the work, which probably will require more consideration than has been given to it, though a way of

distinguishing between functions that are to be taken out, to remain intact, or to be added, is found in the use of colors, as was brought out. On the whole, however, the report is a long step forward, and furnishes a basis for a system of conventional signs that will require comparatively few changes to put into good shape for adoption. This system will, of course, suffer more or less change when it is put in use by the different signal departments, but any system, no matter how much discussion and work were put on it by the committee and the association, would be subjected to such modifications.

One of the most valuable activities of the Railway Signal Association is the recent publication, in pamphlet form, of various committee reports, which are sold at a low cost to those interested.

This method of handling the reports ought to prove a good revenue producer, for some of the committees have made such thorough and exhaustive studies of the subjects assigned to them that the pamphlets containing the results of their work embody nearly all there is to be said on the matters in question. A notable instance of this is the "Index to Signaling Literature," compiled by Mr. Eck's committee on the promotion of signaling education, which is a very valuable addition to technical literature. The report of Committee X on electric signaling for electric railways, is another excellent work and one that will undoubtedly be very highly appreciated by electric railway signalmen particularly. The various specifications are also now available in a form convenient to supply the demand for them, which has grown to considerable proportions in the last few years.

At a meeting on March 19, 1911, Committee X of the Railway Signal Association made several changes in its report, and in consequence, the form in which it was presented to the association on Monday, March 20, was not the same as that in which it was published in the advance sheets. The revised portions of the report were read by Mr. Balliet, and are included in the proceedings published elsewhere. They include some important changes and make the report much more complete. The committee also added outlines for line fixtures, switch indicators, electric locks, junction terminals, lighting arresters, number plates and numbers, locks, signal lanterns and lamps, concrete and paint, and also a number of definitions involving the meaning of terms relating principally to alternating current installations on electrified lines. The committee practically completed the outline of its year's work, and probably its future labors will be mainly for the purpose of filling in this outline.

The heavy advance registration and largely increased number of early arrivals for the twelfth annual convention of the American Railway Engineering and Maintenance of Way Association, opening this morning, forecast a very profitable convention. This interest shown and the earnest and intelligent work done by the committees during the past year, indicate a state of healthy growth and activity. When one considers the amount of really constructive work which has been done by the association in its short life, he realizes the important place it occupies in the engineering—and especially in the railway engineering—field. Its scope is constantly broadening and the possibilities of study becoming greater, particularly with respect to the subjects of electricity, rail and impact tests on iron and steel structures. The investigations of these matters are but fairly begun. While much has been done in the study of economics of railway location, a very large portion of this field is still undeveloped. In fact, each year's study opens up other worlds for conquest. When busy men, such as the members of the association, voluntarily take the time, not merely to attend the conventions, but the much greater time required for committee work, the prospects are bright for a continued forward movement by the association.

President Denney's ruling limiting the discussion of Mr. McKeen's paper to the relative merits of the storage and primary batteries from an operating standpoint, was well taken, as by it he avoided what might have proved an embarrassing situation. The discussion would have resolved itself into a comparison of figures by representatives of manufacturers, and, as Mr. Denney said, it is not within the province of the association to decide such questions. His view was that the association is not in possession of the facts necessary to a determination of the matter. They are all in the hands of the supply men. Mr. Shaver's speech, published in the proceedings, was an admirable statement of the case. It is useless to compare results as between roads, or even parts of roads, as conditions are always different, and mere variations in plant are not a sufficient criterion of the variations in practice needful for the satisfactory operation of the different roads. In other words, conditions govern practice, and practices, therefore, cannot be accurately compared unless conditions are similar.

SIGNAL ASSOCIATION REPORTS.

The subjects which have occupied the attention of the various standing committees of the Railway Signal Association have become each year more nearly standardized, until now practically the only treatment some of them require consists of revising the work of previous years. Meanwhile, however, new subjects growing out of the increasing importance of signaling and its rapid extension to a greater mileage are constantly arising. When one of these has proved important enough to be handled by a special committee, the Signal Association has quickly met the situation by appointing the needed new committee.

After the 1909 annual meeting at Louisville, Ky., Committee X was appointed to report on electric signaling for electric railways, and special committees were created to study thoroughly methods of recording signal failures and the promotion of signaling education. The report of Committee X, explaining the principles of the use of alternating current on electric lines and describing a number of installations, forms an exceedingly valuable addition to the work of the association, while Mr. Eck's index to signaling literature has already become well-nigh indispensable.

Since the last annual meeting at Richmond, Va., in October, 1910, two other new committees have been appointed,—XI on the Manual, and XII on Contracts. The making of a Manual of Recommended Practice, which is to be the work of Committee XI, is decidedly worthy of the association's best efforts; and if it shall succeed in producing a Manual which shall represent accepted practice in signaling as well as the Manual of the Maintenance of Way Association represents standard engineering practice, it will indeed have done a work of which to be proud. Signaling standards are now in such shape that there is no reason why a good start cannot be made on the Manual, and substantial results obtained within a comparatively short time.

The subject of contracts, assigned to Committee XII, is a live one in signal departments. Agreements between the different roads interested in the construction, maintenance, and operation of joint interlocking plants very often are prolific sources of trouble and inconvenience, most of which would undoubtedly be removed by the adoption of a standard method of apportioning this joint expense. In cases where special contracts must be made to cover local conditions the standard form of agreement could at least be used as a basis. The work of this committee is, therefore, extremely important, and it should be given the hearty support and co-operation of every member. It is true that a few of its conclusions may of necessity be somewhat arbitrary, or at least appear so to some, but unless those who think thus are willing to give way to the majority and abide by the arrangement that shall be adopted, the troubles that make a standard form desirable will not have been overcome. The

objections that may be brought up after standard values for each function, or unit, have been agreed on are the same objections that operate against the determination of these values in the first place. In other words, they are fundamental, and if the majority agrees that they have not sufficient importance to prevent the adoption of arbitrary values they should not be brought up as arguments against the report after it is accepted as the Signal Association's standard. Therefore, every member who has an opinion on this subject of the division of expense and the proper value to be given each function, or unit, should make it known while the matter is under consideration by the committee in order that when the work is done it may stand as the association's accepted practice, and not be nullified by repetition of the very objections that may be disposed of by the committee.

PAPERS READ AT SIGNAL ASSOCIATION MEETING.

The papers which were read and discussed at the stated meeting of the Railway Signal Association, and which are reprinted elsewhere, cover two subjects of much interest to the signaling profession.

The source of the power for the control and operation of a signal system is as much of a factor in its ultimate success or failure as any part of it, and, perhaps, has more to do with its efficiency. This subject is dealt with in A. H. McKeen's paper on Portable Storage Batteries.

Unfortunately, however, Mr. McKeen does not seem to be judicial in his attitude toward his subject. His somewhat partisan attitude is emphasized most strongly in his summary of estimated and known costs of portable storage batteries, as compared with primary batteries. For example, no account is taken of the cost of the steel battery receptacles at the bases of the signals, which are necessarily for storage batteries, but are not needed for primary cells. It is true that the case in question accommodates the relays also, thereby obviating the need for separate relay boxes, but there is a decided difference in cost, nevertheless. Although not specifically so stated, one is led to believe that more help would be required per mile of track with primary than with storage battery, but such is actually not the case, as many prominent roads using the former type employ less men, as no special storage battery man is needed. It is also possible to effect important economies by the use of separate line batteries with a primary system, which is frequently done, for one of the chief sources of current drain is the line circuits. No account has been taken of this.

The most interesting and valuable feature of the paper is the set of instructions for handling storage batteries. These instructions embody an important feature too often overlooked, viz., lucid and concise explanations of the necessity for the various rules. Few maintenance men have sufficient technical knowledge to comprehend without such explanations the reasons for the particularly careful handling which a storage battery requires, and generally these explanations are rather difficult to obtain. Such a set of rules should have great value in stimulating the interest of the men in charge, and in inciting them to do their work with intelligence and understanding, rather than as a mere matter of routine.

Now that alternating current is coming rapidly to the front as the source of energy for the operation and control of signals, both for steam and electric roads, a thorough understanding of the various systems offered by the makers of apparatus is an important item of the signal engineer's stock in trade. For this reason the paper on the fundamental principles involved, by L. Frederick Howard, is very apropros. But to do such a subject complete justice would require treatment at a much greater length than Mr. Howard had time or space for, and he was thus forced to condense at the expense of clearness. This was necessary to such an extent that many who are less expert than he in the theory of alternating current could follow him only with difficulty.

Of the two committee reports published in the advance notice, that of Committee No. 10, consisting of specifications for alternating current signal material, is hardly more than an outline, with plenty of blank spaces to be filled in as desired. It is interesting to note that it contains provisions for lower-quadrant and left-hand signaling, two subjects not recognized officially by the association. In fact the association is on record by letter ballot as specifically committed to upper-quadrant signaling exclusively.

The same criticism applies also to the report of Committee I, which consists of a revised system of symbols for signal drawings. Provision is here made also for lower-quadrant indications. Otherwise the system is consistent within itself, though the method of representing the functions and aspects of signals appears rather awkward, and in many instances strained. There are, in addition, many omissions of important functions and aspects, which are supposed to be provided for under the heading of specials. The question naturally arises, why not provide a complete system and secure uniformity on all roads, since that is the avowed object of such a system, and the only excuse for its treatment by the association? Pehraps a simpler system, one capable of being more easily and quickly applied to drawings, could be devised by the use of numbers and letters placed on the blade. In the matter of apparatus, the symbols do not differ materially from those adopted by the manufacturers some time ago and now in general use. There is, however, room for amplification of the matter. For example, should there not be a distinction between an inductive resistance and a non-inductive resistance? Further, it is a matter of experience that workmen have some difficulty in properly interpreting the present signal circuit controller symbols, chiefly on account of their positions with respect to the blade. The scheme now recommended does not remedy this, but seems likely to lead instead to further confusion. Several new and useful symbols have been added, however, and many inconsistencies eliminated. It is earnestly to be desired that before the report goes to letter ballot a complete and consistent scheme will have been worked out from the present one, which is in many respects superior to anything heretofore in use.

PROGRAM.

The twelfth annual convention of the American Railway Engineering and Maintenance of Way Association will open in the Florentine room of the Congress Hotel Tuesday, March 21, at 9 a. m. It will adjourn at 12:30 p. m. for luncheon, reconvene at 2 p. m. and adjourn at 5:30 p. m.

Evening Session.

At 8 o'clock on Tuesday evening an illustrated lecture on steel rails, being a digest of the investigations made by the rail committee, will be given by M. H. Wickhorst, engineer of tests for the rail committee.

Following the lecture there will be an informal smoker in the Florentine room, admission to which will be by membership or guest badges.

Reception and Dinner.

At 7 o'clock on Wednesday evening there will be a reception given by the president and officers of the association, to which all members are invited. This will be followed by the annual dinner in the Gold room.

Exhibition of Railway Appliances.

The Railway Appliances Association will hold its exhibition at the Coliseum during the week of the convention, to which all members of the Maintenance of Way and Signal associations and their friends are invited.

Association Headquarters.

Room 1166 will be used as an office during the convention. Members are requested to register at this room immediately on arrival. Each member on registering will receive a badge and his membership number, a copy of

the official program, and a complete set of committee reports in leaflet form. Unless members desire to do so, it will be unnecessary to bring their copies of bulletins to the meeting.

Convention Program.

(Order may be changed by a two-thirds vote of convention or by time required for consideration of reports.)

Morning session, each day, 9 a. m. to 12:30 p. m.

Afternoon session, each day, 2 p. m. to 5:30 p. m.

FIRST DAY.

Tuesday, March 21.

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees.
XII. Rules and Organization.
X. Signals and Interlocking.
XVIII. Electricity.
Special: Brine Drippings from Refrigerator Cars.
XIV. Yards and Terminals.
VII. Wooden Bridges and Trestles.
XV. Iron and Steel Structures.
XVI. Economics of Railway Location.

Evening Session.

8 p. m.

Illustrated Lecture on Steel Rails, by M. H. Wickhorst, engineer of tests for the rail committee, being a digest of the investigations made by the rail committee.

Informal Smoker.

SECOND DAY.

Wednesday, March 22.

II. Ballast.
III. Ties.
V. Track.
IV. Rail.
VIII. Masonry.
XIII. Water Service.
IX. Signs, Fences and Crossings.
Annual dinner at 7 p. m.

THIRD DAY.

Thursday, March 23.

XI. Records and Accounts.
XVII. Wood Preservation.
Special: Grading Rules for Maintenance of Way Lumber.
VI. Buildings.
I. Roadway.
Special: Uniform General Contract Forms.
XIX. Conservation of Natural Resources.
New Business.
Election of Officers.
Adjournment.

AUTOMOBILE TRANSPORTATION BETWEEN COLISEUM AND HOTEL.

Four automobiles have been provided by the Railway Appliances Association for the convenience of railway officers who desire transportation between the Coliseum and the Congress Hotel. These cars can be identified by streamers bearing the letters, "M. O. W." They leave both the Coliseum and the Congress seven minutes apart, and are available throughout the day for the conveyance of all persons wearing badges indicating their membership in the American Railway Engineering and Maintenance of Way Association, or the Railway Signal Association.

THE INFORMAL SMOKER TO-NIGHT.

Admission to the smoker in the Florentine room, Congress Hotel, to-night, will be by "member" and "guest" badges only. M. H. Wickhorst's lecture on Steel Rails, which will precede the smoker, will begin at 8 o'clock, and be about 30 minutes long.

ELECTRIC RAILWAY ASSOCIATION SIGNAL COMMITTEE.

The committee on signaling of the American Electric Railway Association, of which J. M. Waldron, signal engineer of the Interborough Rapid Transit, New York City, is chairman, will hold a meeting at 9 a. m. Wednesday, March 22, 1911, at the Congress Hotel.

ANNUAL MEETING, RAILWAY APPLIANCES ASSOCIATION.

The annual meeting of the Railway Appliances Association will be held at the Coliseum to-day (Tuesday) at 11 o'clock a. m., in the room above the annex at the south end of the building. Each exhibitor will be entitled to have one voting representative, and such voting representatives are requested to sit on the delegates' side of the hall. The officers to be elected are president, vice-president, secretary-treasurer and six members of the executive committee.

ADMISSION OF RAILWAY OFFICERS TO COLISEUM.

All railway officers are entitled to free admission to the Coliseum. Tickets can be obtained from John N. Reynolds, secretary-treasurer of the Railway Appliances Association. Any railway officer who goes to the Coliseum without a ticket can gain admission by showing to the doorkeeper any evidence of his railway connection, such as a personal card, a railway pass, or an envelope addressed to him. The doorkeepers have instructions to honor every evidence indicating that an applicant for admission is a railway officer.

SPEAKERS FOR THE ANNUAL DINNER.

The following have been invited to make addresses at the annual dinner of the American Railway Engineering and Maintenance of Way Association, in the gold room of the Congress Hotel, on Wednesday evening: B. L. Winchell, president Frisco Lines; S. M. Felton, president Chicago Great Western; John F. Wallace, chairman board of directors, Westinghouse, Church, Kerr & Co.; Sir Thomas R. Price, commissioner of South African government railways and harbors; W. B. Poland; Dr. F. W. Gunsaulus; Rev. R. A. White, and John Barton Payne, general counsel of the Chicago Great Western.

All the speakers have sent acceptances. No subjects have been assigned them.

CHICAGO SIGNAL CLUB.

On Tuesday, March 21, at 8 p. m., the moving pictures taken at Richmond, Va., during the annual meeting of the Railway Signal Association will be shown at the rooms of the Western Society of Engineers, seventeenth floor of the Monadnock building, Chicago, under the auspices of the Chicago Signal Club. These pictures were taken by representatives of the Edison Companies, and they furnish an exceedingly interesting record of some of the doings at the convention. The annual baseball game between the East and the West is especially well pictured.

These pictures were shown in Chicago in January under the auspices of the Chicago Signal Club, and signalmen from Chicago and vicinity found them a source of great enjoyment. It is extremely fortunate that they can be seen again during convention week, as many more signalmen can see them than would be possible during almost any other week in the year. The club invites all visiting signalmen and their friends to view the pictures.

Proceedings.

The stated meeting of the Railway Signal Association at the Congress Hotel, March 20, was called to order by President C. E. Denney (L. S. & M. S.) at 10:15 a. m. The Report of Committee I was presented by J. C. Mock (Detroit River Tunnels), chairman of Sub-Committee 1.

SIGNALING PRACTICE AND STANDARDS.

This committee was instructed to (a) continue investigation of, and report on, a uniform system of signaling. (b) Continue work on standard designs and submit progress reports at the March and June meetings; and (c) advise the chairmen of Committees II., III., and IV., through the chairman, of the work to be performed by his committee which will affect the work of these committees.

Committee I. consists of A. H. Rudd (P. R. R.), chairman; L. R. Clausen (C., M. &. St. P.), vice-chairman; C. C. Anthony (P. R. R.); H. S. Balliet (G. C. T.); C. A. Christofferson (N. P.); C. E. Denney (L. S. & M. S.); W. J. Eck (Southern);



C. E. Denney, President.



C. C. Anthony, Vice-President.

W. H. Elliott (N. Y., C. & H. R.); G. E. Ellis (K. C. T.); A. S. Ingalls (L. S. & M. S.); J. C. Mock (D. R. T. Co.); E. P. Patenall (B. &. O.); J. A. Peabody (C. & N. W.); W. B. Scott (Harriman Lines); A. G. Shaver (C., R. I. & P.); T. S. Stevens (A., T. & S. F.); H. H. Temple (B. &. O.); and J. C. Young (U. P.).

SIGNAL SYMBOLS.

At the annual meeting, November 10 and 11, 1903, at Detroit, Mich., there was submitted to the association and discussed, the question of standard symbols. At that time a committee was appointed on definitions and nomenclature, but as very little was done by this committee, the manufacturers, about four years ago, united in compiling a code of symbols for the representation of apparatus on signal plans. This code was considered quite adequate for the demands of that time and was quite universally adopted. Since that time the growth of railway signaling has been so extensive that all have come to realize that advancement must be made in the graphic representation of signal apparatus as well as in the apparatus itself. Railroad companies, as well as signal companies have, therefore, been forced to the adoption of certain special symbols to supply their own demands. This sort of procedure naturally breeds confusion. The manufacturing companies, realizing the necessity for expansion and revision of symbols, recently called together a committee composed of one representative from each signal company to revise the book issued by them in 1906.

Meetings of the manufacturers' committee have been held as follows:

At New York, July 28, 1910, August 19, 1910, August 31, 1910, September 23, 1910, October 7, 1910, November 18, 1910; at Buffalo, December 29, 1910; at Albany, January 12, 1911, January 13, 1911.

The sub-committee on Standards had introduced this subject into its program and it was considered important that the two comittees work together. The manufacturers having done most of the work, the joint meetings between Sub-committee No. 1 and the manufacturers were more in the nature of reviews and revisions. Joint meetings were held at Buffalo, December 28, 1910, and January 25, 1911. At the last meeting, it was decided that the symbols be re-drawn by Subcommittee No. 1 and published in the advance notice for the March meeting.

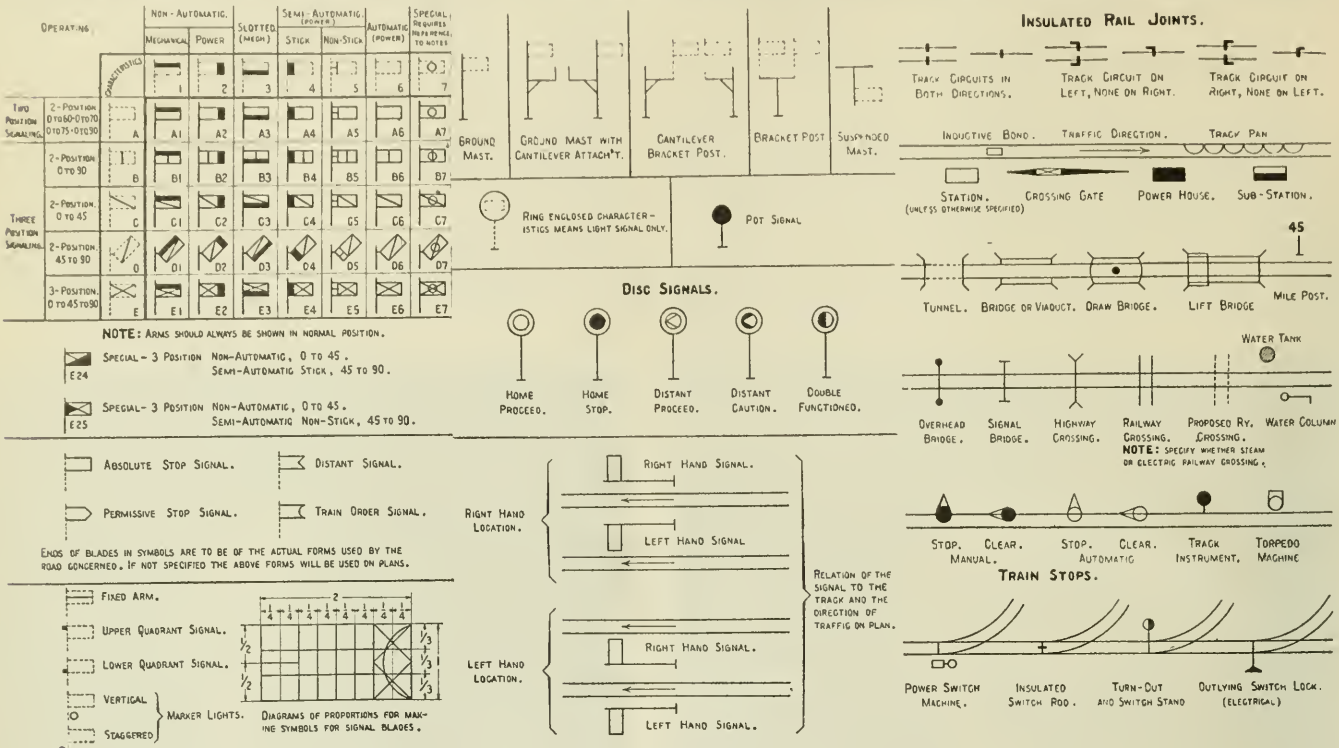
The effort has been to supply symbols that will be adequate and practical, and the importance of simplicity from a draftsman's standpoint has been kept in view. It has also been the purpose throughout to produce a systematic scheme that will be logical and easy to read. Arbitrary features have been avoided as far as possible, and the committee has sought to avoid any more radical changes from former practice than are absolutely necessary.

Pages 6 and 7 have to do with symbols for signals. On account of the very great recent development, not only methods of control, but also in the number of aspects which signals are made to display, it is here that the most radical changes

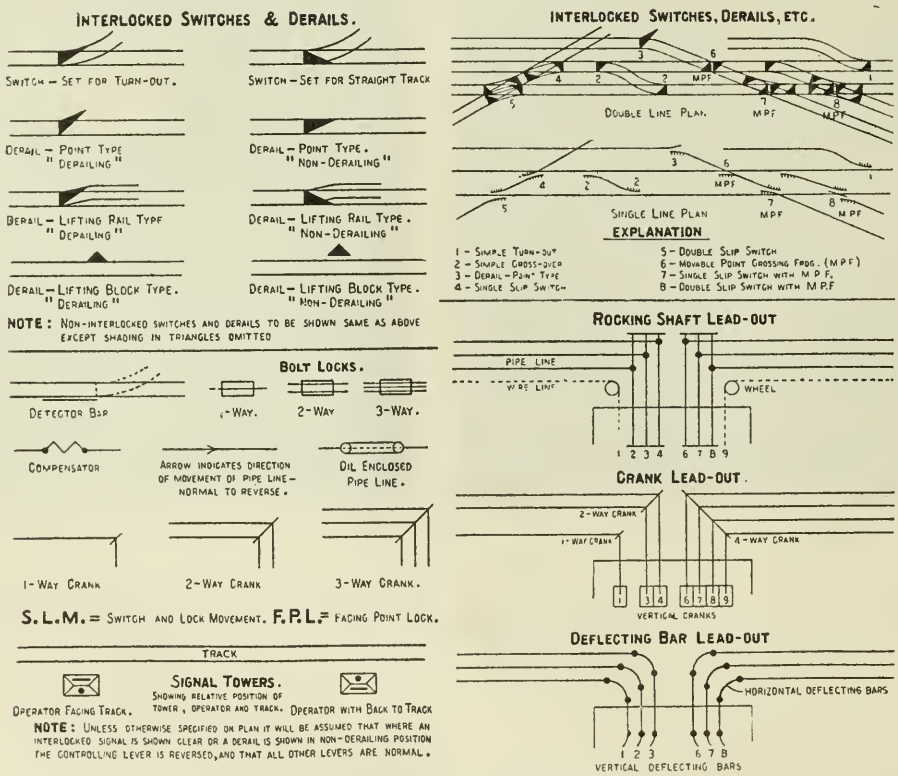
have become necessary. It will be noted on page 6 that the horizontal column of characteristics, which might be termed the characteristics of operation, are grouped under six headings, with a seventh to cover special or unusual features.

By "non-automatic" signal is meant a signal which is in no way controlled by a track circuit, while "automatic," of course, refers to a signal, the primary control of which is the track circuit, or perhaps more properly, it is a signal which automatically gives indication in regard to the integrity of the track through its block. The term "slotted" is only made to cover a mechanical signal equipped with an electric slot. A "semi-automatic" signal is taken to be a manually-controlled automatic signal and may, or may not, be interlocked. As to whether it is, or is not, interlocked will be apparent from its position on the plan and its relation to other signals. It is to be understood that this manual control is direct and that a signal is not to be considered "semi-automatic" because some feature of its control is dependent upon another signal which is manually controlled. By "stick semi-automatic" signal is meant a semi-automatic signal which will not clear automatically after it has been put to stop by interruption of the track circuit until the lever controlling it has been restored to normal and reversed again. A "non-stick semi-automatic" signal is taken to be a signal which will operate automatically as long as the controlling lever is reversed.

Again referring to page 6, it will be noted that the vertical

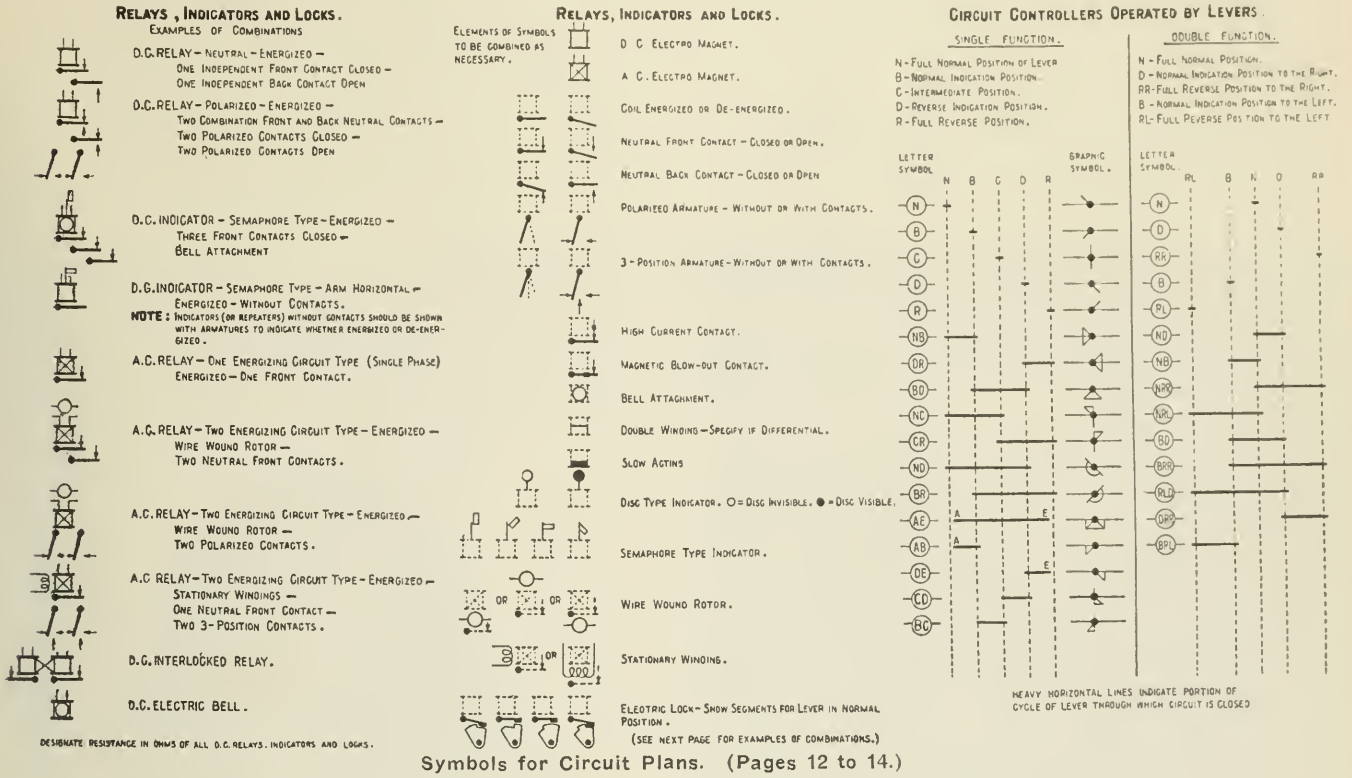


Standard Signal and Location Symbols. (Pages 6 to 8.)

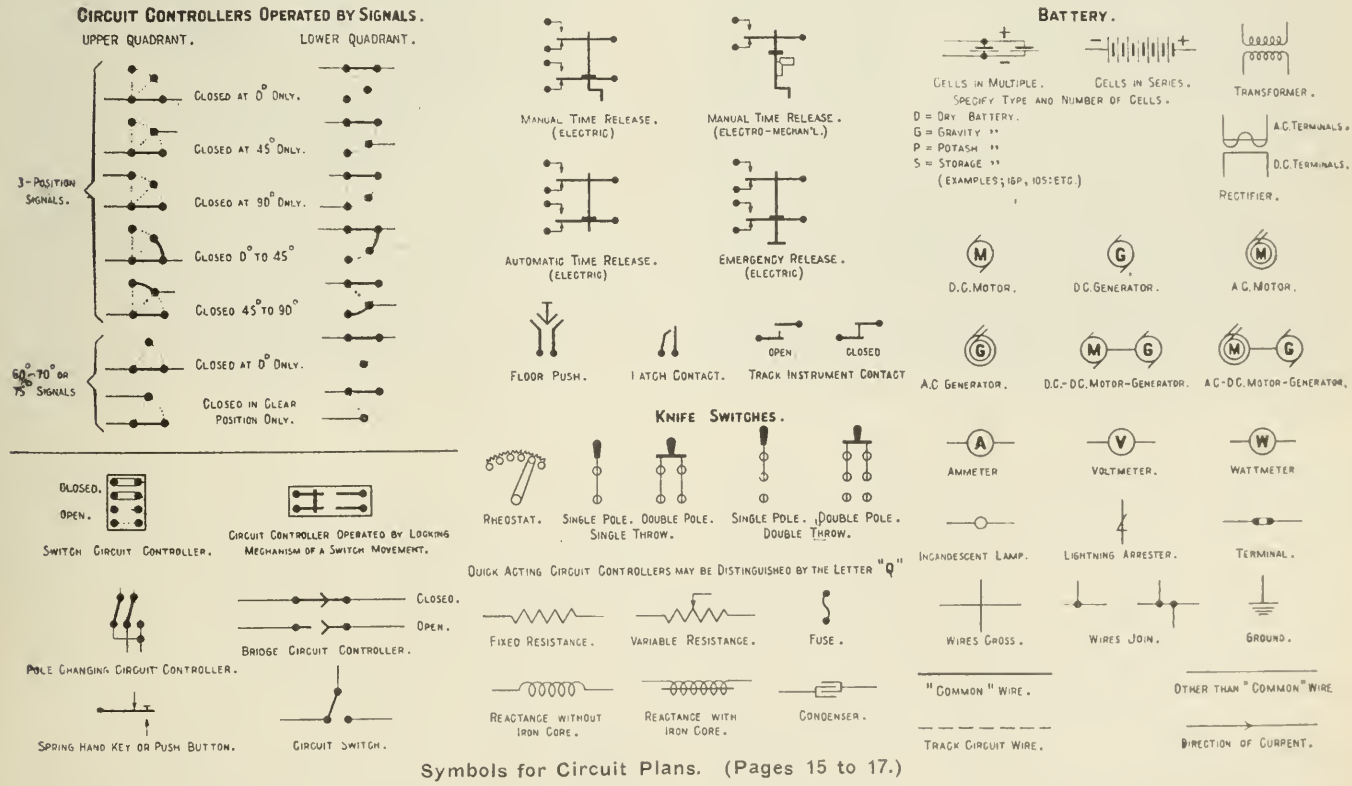


Location Symbols. (Pages 9 and 10.)

column of characteristics has to do with the positions which the signal is capable of assuming. In "three-position" signaling these characteristics are represented by lines, which are not necessary in the case of "two-position signaling." The distinction between "two-position signaling" and "three-position signaling" should not be lost sight of. "Two-position signaling" is understood to include signaling where a distinct-horizontal to the vertical. When this signal is shown on the plan in the 90 deg. position, it has the line drawn in the same position with respect to the outline of the blade, but is horizontal with respect to the signal mast, and, therefore, indicates that the signal is capable of moving from vertical to horizontal. The 0 deg. to 45 deg. signal has a diagonal line sloping downward from the signal mast. Theoretically, this



Symbols for Circuit Plans. (Pages 12 to 14.)



Symbols for Circuit Plans. (Pages 15 to 17.)

ive arm is used to display the distant indication, while "three-position signaling" includes signaling where one arm may give both the home and distant indications.

Referring to the 0 deg. to 90 deg. signal in "three-position signaling:" It will be noted that this is distinguished by a vertical line, meaning that it is capable of moving from the line should be at an angle of 45 deg. from the upper left-hand corner of the signal arm, but, for simplicity in drafting, this is shown in the 45 degree position, the same line means that moves from the horizontal to the diagonal. Where the signal is shown in the 45 degree positon, the same line means that it moves to the horizontal. The symbol of 45 deg. to 90 deg.

signal has the line in the reverse position, and the symbol for the signal taking all three positions—0 deg., 45 deg. and 90 deg.—has both of these lines. It will be noted that the symbol for the fixed arm is absolutely in accordance with the same basic principle.

The committee is thoroughly aware of the fact that there are a great number of different conditions that may enter into the control of a signal; in recognition of this fact, the column headed "Special—Requires Reference to Notes" has been provided. Also two of the more generally used special conditions of control are covered by the two special symbols E24 and E25.

Other features having to do with signal symbols are shown on page 7 and need no explanation. The remaining pages are quite self-explanatory, covering "Location Symbols" and "Symbols for Circuit Plans." An attempt has been made to bring about uniform practice along this line. Heretofore no uniform scheme has been followed. In order to afford as large latitude as possible, both letter symbols and graphic symbols have been provided. Letters have been assigned to the basic positions over which a lever passes—full normal, normal indication, intermediate, reverse indication, and full reverse. Graphic symbols for each of these positions are given, by combination of which all necessary symbols may be derived.

The committee, therefore, respectfully submits this matter to all those interested in railway signaling and asks for hearty co-operation in its universal adoption.

The report is signed by J. C. Mock (D. R. T. Co.).

Discussion on Standards.

Mr. Mock: "If the chairman of the committee on signaling symbols is here, I would like to have him help me out. If Mr. Hovey is not here, I would like to have Mr. Wight. The sub-committee on standards has been requested to supply some material for each of the stated meetings for discussion. We have to offer to this meeting a preliminary report on signal symbols." Mr. Mock then read the introduction to the report, and moved to insert, after paragraph 2, the following: "The following explanation and interpretation of the symbols is substantially as submitted by the manufacturers' committee, and approved by Sub-Committee No. 1."

W. H. Elliott (N. Y. C. & H. R.): It is my understanding that this is a report of Committee No. 1. I would like to inquire whether the remarks of the members of the association to-day will be referred to the sub-committee or the committee for final adoption later by the association.

The President: Yes, it is hoped that we can fully discuss the symbols at this meeting, and unless the sub-committee between now and the June meeting changes them, they can again be discussed at that meeting, so that by the time of the annual meeting, the sub-committee and Committee No. 1 and the entire association will be so well satisfied, or have the ideas that they have in mind so fully explained, that there will be no question about adopting them at the annual meeting; and I assume that the sub-committee will, after securing the advice of the March and June meetings, or whenever they see fit, refer it to Committee No. 1, to be submitted as a part of the annual report of that committee.

Mr. Elliott: Then my understanding is correct, that any action that is now taken is with reference to the recommendation of Committee No. 1 to consider such suggestions.

The President: Yes, and for the advice of the sub-committee on standards. In other words, I believe the sub-committee wants to have the opinion of this meeting on the symbols for their further information.

Mr. Elliott. I would like to ask if it is the intention to discuss each one of these symbols by groups, or as a whole?

Mr. Mock: There was need for quick action on the part of the committee, in view of the urgent request on the part of the manufacturers that a scheme of symbols be adopted at an early date. They have given, as you know, very considerable study to the subject, and, in connection with the report which is submitted for discussion at this meeting, it was hoped that all points, where changes are to be made, might be settled upon at this meeting. I have written the chairman of Committee No. 1, who advises that it is not necessary that the whole committee approve the report until it is ready for submission to the annual meeting.

Mr. Elliott: In looking over this report there are several minor changes which seem to me might be suggested, and in order to have each one separately considered and discussed, I would like to bring up, in connection with the first chart suggested on page 6, which is the most important one, and the one we are most vitally interested in, that the scheme suggested is very complete. At the same time, however, it changes several fundamental symbols, as I would consider it, which we have been using for a number of years, and makes such a wide departure that I think the matter should certainly be given careful consideration. It is very complete, but at the same time I notice that the symbols make use of an outline diagram as well as a diagram which has been partly filled in. The use of these symbols will make it impossible, or at least difficult, for us to show on a plan those signals pertaining to the work shown on that plan, and other signals with which the plan is not concerned, or with which work is not to be done. And yet, while installing the signals, it is desirable to represent on the plan other signals already installed at such places. We use the broad distinction in filling in certain parts of the represented scheme of the signals for such signals as are to be worked on, or are concerned with the particular contract. We use signals in outline, to show that certain signals are in existence, but are not concerned in any work for which we are writing a specification. This distinction makes a very necessary difference which we wish to have shown on the plans. If these symbols are adopted it will be hard to make that distinction.

Then, again, I notice there is a wide difference in that the slant of the line shown on the face of the arm



A. H. Rudd,
Chairman, Committee on Signaling Practice and Standards.

diagonally in one direction to show 0 to 45 deg., and diagonally in the opposite direction, to show a travel of 45 to 90 deg. We have been using these lines to make a distinction between upper and lower-quadrant signals, and have found that to be a desirable and easily followed out distinction. The method adopted by this plan to distinguish between an upper and lower-quadrant signal is shown on the lower part of page 6, by two little dotted or solid lines, on the left side of the "masters" represented. This does not seem a sufficient distinction to enable us to look at a plan and realize what kind of a signal is called for. It is more important, in my opinion, to distinguish on the plan between lower and upper-quadrant signals than between signals of 0-45, or 45-90 deg. Then, again, the particular arrangement of outline diagrams would have the effect that a large part, or practically nearly all, of our plans of signals would be shown in outline, and very few with the solid characteristics. I believe it would be desirable to simplify the symbols between the two-position, 0-90 deg., and the three-position, 0 to 45, or 90 deg., because with the three-position 0 to 45, and 45 to 90, the control in the movement is covered in the lower set of diagrams which are marked E, and the other would follow as a matter of specification. I think one of the lines might be eliminated, and fewer distinctions shown by the symbols.

T. S. Stevens (A. T. & S. F.): Unquestionably every one of us can find something to criticize in these symbols. They will bump up against something which we have

been using continually for years. But the manufacturers present to us here a set of symbols which are consistent, which none of the symbols we have had before this have been; and they are the people who are vitally interested in this proposition. It seems to me a signal engineer should know what kind of a signal he is designing for some point, and should not care what the symbol is; and the only thing we want, it seems to me, is some consistent scheme which we can put on our plans and submit to all the manufacturers, so that they can bid intelligently on the work we want done. I think we should discuss this present report, but I believe it ought to be adopted as something which has been given a great deal of thought, and upon which a considerable sum of money has been spent in its preparation.

W. H. Arkenburgh (C. R. I. & P.). In regard to the distinction between the upper and lower-quadrant signal, I do not see that that is of any particular importance, inasmuch as the association is on record as being in favor of the upper-quadrant signal exclusively. Perhaps it might be as well to have something to show that, but as far as the lines in the main scheme and its indication are concerned, I do not think it makes any difference.

The President: The association has approved certain upper-quadrant signals, but distinctly states in the proceedings that anything is approved which does not discredit existing good practice. Now, we must realize that the manufacturers want to know, when they receive plans, with or without specifications, whether or not the signal is upper or lower-quadrant. While, as Mr. Elliott says, the diagram shown on page 6 would probably not all be used by any one railway, the manufacturers must feel that they are all necessary in order to secure the information which they desire from the railway companies.

I think it would be well if some representative of the manufacturers' committee would give their side of the case, and also state the basis on which this scheme was arrived at. I believe I am safe in assuming that it was not the first one tried. The number of meetings referred to in the report would indicate that the first scheme submitted was not adopted unanimously.

W. G. Hovey (Hall Signal Co.): I met with the manufacturers' committee, and we had three distinct schemes, before we were able to agree upon one. We spent several days on one scheme that looked pretty good to us, when we discovered that the committee was divided on it. Then another scheme was proposed, and we spent several days on that. We got along, we thought, pretty well, and it seemed to be working out nicely. But there were things it did not cover, it was too elaborate, and it appeared finally that we could not agree. Then a certain gentleman on the outside had some suggestions to make that sounded pretty good, and we got busy on them, dropped the first two plans, and worked on the new one, and finally discovered that it was better in our estimation than either of the other two, and we did succeed in getting together. Finally the committee agreed to adopt it, and that is the scheme we are offering you here. We understand fully that other schemes might be presented that would be just as good, and, possibly, better, and that changes could be made which would possibly improve it, but we spent about 15 or 20 days on it, and believe that this is a scheme that covers the present situation fairly well. As to symbol changes that are desired to be made, we are inclined to be liberal, but we, as manufacturers, would like to have some scheme that we would be able to use, a uniform scheme, and this is what we are offering. We believe that we can use it, and we are asking this association to think it over carefully, and see if they can join with us.

Mr. Arkenburgh: I think my remarks were misunderstood altogether. I simply wished to bring out the fact that I did not think it was of sufficient importance to initiate the scheme.

The President: I want to make clear, in replying, that we have both upper and lower-quadrant signals in service, and that if a scheme of symbols is adopted, it will naturally lead to some confusion in railway plans, but more



B. H. Mann, Vice-President.



C. C. Rosenberg, Secretary.

with manufacturers, who have plans from everybody; that is, the old plans won't be right. If, for example, it is desired to put in some three-position signals on a plan that shows some two-position signals, it is necessary, if the plan is to be used after the change is made, to distinguish between the two. For that reason, and because the manufacturers naturally want it, as they are selling a great many lower-quadrant signals, it seems it is as necessary to distinguish one as the other.

Mr. Arkenburgh: I agree with you thoroughly, but the point I make is that the scheme here provides as good a distinction as any, and the mere matter that it is not specific, is not of sufficient importance to make the committee revise the whole scheme to provide something else.

Mr. Mock: As has been said, in particular instances we might improve, but I hope that this committee will be willing to accept the general scheme, and, in order to make it specific, I move that the general scheme as shown on page 6, be accepted.

Mr. Stevens: I think Mr. Elliott brought out an important point, in that there is no provision made to show signal forms on the present plan. I would like to ask if the scheme for showing the form signals could not be shown, and if they would not include a note to that effect.

Mr. Elliott: Answering the point made by Mr. Arkenburgh, I will state if we use signals that do not apply to a particular diagram, we will be in difficulty showing the signals. We have observed on the plans that we now make dotted lines for signals that are to come out and solid lines for those that are to come in.

Mr. Mock: That point was very carefully discussed in the committee, and it was felt that we cannot, by diagram, explain everything. It is a very small matter to make a note on a plan. It is hardly possible, if you have a complicated interlocking system, and part of it is lower-quadrant signals, and part upper-quadrant signals, some to go in and others to go out, that you can show that all clearly by symbols. I think, to avoid any confusion, you should add a note of explanation. I don't believe it is possible, when you consider all of the symbols that are to be learned by the draftsman, which have to be looked up by the ordinary man who looks over the plan, that you could get all of that in without a great deal of confusion. I think we have plenty on the plan now.

Mr. Elliott: I believe it is possible to arrange a scheme of symbols that will give practically all the information here shown, along the line suggested by me, and if the committee will give the matter consideration, I will be pleased to draw the matter up and send in such a diagram. One was almost worked out by me, but there are several little things in it I would like to change. I believe one scheme can be worked out, giving all this information, and yet will let us have outline signals represented as being those that do not refer to a particular plan, and are not affected by a contract, and reserve dotted line signals for those which are to be taken out.

J. M. Waldron (Interborough Rapid Transit): There are some roads which must use the upper left-hand quadrant symbol. There are no symbols here representing that.

Mr. Mock: We cover that by note.

Mr. Waldron: I agree with the chairman, that the upper left-hand quadrant signal would have to go on the left-hand side of the post. There is no doubt about that, but why should not that be covered in a report of this character? It seems to me that the report ought to be large enough to cover the whole field of signaling.

Mr. Stevens: I suggest that any gentleman who feels that way should apply to Mr. Patenall, who will send him a blue-print covering this floor, showing the different things that we can provide symbols for in a signaling system. I have one of them, and I hadn't room for it, and had to put it out of the window.

Mr. Shaver (C. R. I. & P.): It is my recollection that the association has adopted, or one of the committees has worked on the subject, and presented a report on the shape of the ends of blades, and it is my recollection, too, that the train or signal blade had the round end outward. If that is so, I would suggest that this aspect on page 6, the third paragraph, train order signal, be revised to show the curve outward, and then it will be with the shape of the blade as recommended.

Mr. Rhea: I will say that the committee considered that point in detail, and what we have shown in the present instance seemed to be the best knowledge that we could get from the Maintenance-of-Way Manual, and what we found available. It was our effort to make as few changes in the existing signals as possible. Therefore, we left it as we now understand it is shown, and that is the intent of the present symbols.

The President: I believe that affects no other symbols.

Mr. Rhea: I might say in that connection, we also considered some of the existing practices, and the New Haven has the practice that the round end of the interlocking signal is not a train order signal.

H. Fernstrom (Virginian Ry.): I would like to ask the committee if, in answer to Mr. Elliott, it would not be possible to show the signals dotted, and then use the letters to indicate the character of the signal? In answer to Mr. Waldron, it seems to me you simply show the indication on the left hand, and then it makes the report complete. If that does not make it complete, then I think we ought to call on Mr. Waldron to assist.

Mr. Rhea: You will notice in this scheme that we show only an arm that is filled in solid. We would be willing to accept an amendment that an arm of an existing signal, on which no information whatever was intended to be conveyed, would be shown solid. I think you will find that a position that will not disturb anything.

The President: You understand that the action of this committee is not final, so far as the association is concerned. I think the principal question involved on page 6 is whether the general scheme is all right. The committee will, without doubt, refer to the proceedings of this meeting and take care of any special points which they can, but unless the whole scheme is wrong, it would seem advisable to vote on the basis of the scheme rather than on the details. The discussion in regard to the signals displayed to the left of the post can possibly be better taken up as a part of page 7, on which a reference is made to left-hand signaling. Is there any further discussion on page 6? If not, I think it advisable to secure an expression of opinion page by page, and then on the entire motion.

Mr. Waldron: It will take up very little additional space to have this report repeated for the right-hand side of the lower quadrant, and for the left-hand side of the upper quadrant, and then it seems to me there would be no occasion for anyone going astray.

G. H. Dryden (B. & O.): The committee must have decided to change not only the dotted line that we use to indicate a signal that is not intended to be included in an interlocking plant, but also an automatic signal, semi-automatic signal, three-position signal, two-position signal, and every other symbol as far as I can see that we are using to-day. I fail to see the necessity for a change, unless it is in being able to adopt something that will stand, not for to-day, but forever. If the symbol shown for an automatic signal to-day is wrong, and it is necessary to make a change, we should make a permanent change. We ought to be able to look at the plans and tell what any plan means by the signals shown. Nothing has been shown on these plans to tell us whether or not a semi-automatic signal is to be operated by high voltage or low voltage, whether it is to be operated by d. c. or a. c. current; whether it is to be an indicating or non-indicating signal, whether it is to be a battery indicating, high voltage indicating, or induction indicating. Considering the advanced stage of the signaling art, I, personally, feel that the committee has done very poorly, for the reason that the general plan that they propose to use is not flexible. We cannot add to it. The old symbols were adopted, I believe, four or five years ago, and are found to-day to be inadequate. Next year this system may have proved inadequate. I must agree with Mr. Waldron, that if the present symbols are to be changed, we should have a method that covers every branch of the signaling art.

Mr. Mock: I think Mr. Stevens replied to that when he said that by a number and letter scheme you can quickly pick out all the characteristics of any signal on any plan.

Mr. Balliet: That is a fine report, regardless of the knocking it is getting I am going to accept your offer to take this report, page by page, and make suggestions to the committee. I suggest that, on page 7, under right-hand location, at the bottom of the page, it would be well for the committee to show, in arrows, in both diagrams, the track to which the signal mast or the arms relate. I have been mixed up by that with half a dozen men, trying to find out what those indications are intended to be. You can translate them several ways. Assume that, in the upper diagram, we call the top set of lines track A, and the bottom track B. I assume that

the committee means that the two signals relate to track A and should be so arrowed. In the lower diagram they relate to track B and they should be so arrowed.

Mr. Elliott: Acting along the line suggested by Mr. Balliet, that sufficient information will be obtained by the committee, if we merely criticize and pass on without taking definite action, I would make the suggestion that, at the top of page 7, the word cantilever be changed to offset, meaning opposite bracket post rather than cantilever bracket post. I have been using the word offset, and believe it more clearly distinguishes the type of construction.

Mr. Shaver: I did not quite get through with page 6. I have a suggestion that came to me that I think is a very good one, which I would like to offer the committee. That is for a fixed arm tied to the mast, with a diagonal line underneath—something on the order of the cantilever; then the middle line might be done away with, and used for some other symbol.

The President: Page 6, without doubt, covers the portion of the report which was most discussed by the subcommittee. I am assuming these things, but our discussion here would indicate that. Mr. Dryden referred to the fact that the present symbols were almost discarded, and for that reason he did not believe that these would be permanent. That is, the old ones were four years old and had become of no use, and then this scheme was complete. I believe the manufacturers' association can give us a little more information as to how they first started this proposition. They said they had two schemes that were started, and I believe this was the third or fourth. It may clear the matter somewhat in our minds, if they will tell us how they first started, and why they had to change and finally get down to this.

Mr. Rhea: In answer to Mr. Dryden, I stated that we tried to confine ourselves to existing symbols as far as possible. The slotted mechanical signal is identically the same as shown in the present recognized symbols; the mechanical signal No. 1 is only partly shaded because we wanted to have some way of indicating the characteristic lines. The power-operated signal is the same as the present symbol. And, when it came to the question of the semi-automatic signal, we left that as at the present, when it was used, as we term it, as a "stick" power automatic signal. That requires the operation of some lever or button to clear it the second time. As to the "stick" signal, which we considered it necessary to provide for, we simply considered it a step toward the direct automatic. Therefore, we did not shade that part, but simply put a line there, and the automatic signal is as shown by the present symbols. Therefore, I do not see that that top line of characteristics has been very materially changed. In answering the question as to whether we would distinguish between a 10-volt signal and a 55-volt signal, or a 210-volt signal and a 2,200-volt signal, we went over that subject pretty thoroughly, and we found that about the only possible thing that could be done was to use a scheme of nomenclature, to have seven characteristics, instead of two, as we have now. We considered the practical operation of this, and therefore made as few changes in the symbols as we possibly could; and while I contended very strenuously for another arrangement, I have finally adopted this as a good, comprehensive system. The upper vertical line characteristic is that a two-position signal needs no suggestion as to what its other position is from the normal. There are only two positions. The three-position signal is based on the idea that the arm would be shown in a normal position and the lines drawn through the arm will show the position to which that signal shall move. That is the basic principle of the vertical characteristics. The two characteristics put together show your system of symbols, and we believe that that is as far as you can go practically, and we also believe, from our standard as manufacturers, that they will give us the necessary information to figure intelligently on plans that come to us; and I think that we may be warranted in considering the thing as knowing and having experience as to the plans that are being prepared and submitted the country over. The committee, I feel, worked on this thing very thoroughoughly, and we had in the committee men who have had a good deal of different experience with the handling of plans that came from all over the country, and were unanimous in feeling that this scheme of signals is consistent and will give us information that will not be changed tomorrow or the day after. The present scheme of signals was formulated something over five years ago, and it is easy to go back and see the radical changes that have come in the art of signaling within the last five years, and that is perfectly obvious to anyone why the scheme of signals which was worked out some eight or nine years ago, in reality and actually put in the form of a pamphlet some five years ago, would, in that time, be found more or less inadequate to cover the present practice, which has been changed so radically by the very large adoption of three-position signaling when before it was almost universally two-position signaling. Now, when you go to analyze the subject from the standpoint of showing the methods, the way of control, the character of signaling, the currents and the kind of relay you will operate with, I think you will readily see it will carry with it such an enormous amount of information that the only possible way to do it is with a scheme of nomenclature, and if you use that, you will have to work up some sort of a dictionary to carry around with you.

J. Beaumont (C. G. W.): I rise to the support of the committee and the manufacturers' committee. It seems to me that the scheme as outlined constitutes a comprehensive basis of signaling, and that every possible condition is covered here that we might meet in future practice. There are cases where it might be necessary to show additional information, which could be very readily done in the case of one or two exceptions that might not be covered here, where some unusual practice was followed. Now, with reference to the existing practice, there is not a shadow of a doubt but what the New York Central and some other lines will be inconvenienced to some extent in making this change, but as a general proposition I believe that the committee should be supported by this meeting here to-day and that they should carry the endorsement of the association as represented here, excepting only that they should pay proper consideration to the various criticisms and suggestions offered with a view to improving the report, if possible, for presentation at the next meeting, and if I am in order I move that the report as presented be recommended by this committee of the whole.

A. R. Raymer (P. & L. E.): Referring to the bottom of page 6, the symbols about the upper-quadrant and lower-quadrant signals placed on the left-hand side of the symbol, I would suggest it might be a little confusing when used in connection with, for instance D1, where the signal is in the vertical position. I will suggest that the right-hand side of the blade be extended a quarter of a length above or below for upper or lower-quadrant, as the case may be, instead of the little block at the left-hand side of the symbol.

H. M. Sperry (General Railway Signal Company): The committee has done a great deal of hard work and has followed its work somewhat closely. Mr. Rhea has pointed out that the present symbols have been in use about nine, or suppose we say ten, years. That would mean that, in a century, we might have to make ten changes. It seems to me the association can stand for ten changes in a century. I suggest that the association instruct the committee to pay attention to what has been said here and go ahead and get this thing finished.

The President: I believe the understanding will be that if the association approves the general scheme the committee will be perfectly free to act on the suggestions as to page 6, made at this meeting.

Mr. Waldron: If the association approves page 6, will the committee act on the suggestions made here?

The President: Surely.

Mr. Waldron: If the association approves the report as it is now, that will put it up to the committee as being adopted by this association and they will have no authority to change it. We ought to look into that carefully and word it so it will not confine the committee to this particular report, that they should have a full opportunity to take advantage of all suggestions that have been made here.

Mr. Mock: The purpose is to have the suggestions by the members in exactly the way that Mr. Raymer has put it. If you do not adopt the general scheme and you want to present something different from this scheme, we have got to change our methods; in other words, this no longer needs any discussion, and the new scheme will be handed up to the committee and they will work that out. We have regarded this as sufficient, in that we are particularly bound to this until we get something better.

The President: In answering Mr. Waldron's question, this meeting can either approve or disapprove what has been submitted. The June meeting may do the same thing. At the annual meeting the report of the committee will come

up for final adoption by letter ballot. That is the only official action we take. Therefore, we can feel perfectly free to either approve or disapprove the committee's report at this meeting, for the information of the sub-committee making the preliminary report, as stated at the beginning.

Geo. A. Mountain (Board of Railway Commissioners for Canada): Acting on the privilege of addressing the meeting, I ask the committee if they have provided anything which would show a plant that is being changed. Mr. Mock will understand what I mean. We get several plans before the Dominion railroad board, to which I have to give advice, some from the Michigan Central, the Canada Southern division, which indicate the old location and position, and show the old semaphores taken down. We desire to have such information in approving a few notations. I admit it has nothing to do with the diagram that is submitted to the manufacturers for their bids, but I would like to ask Mr. Mock if he has made any provision for that. Our commission desires to have such information to know what changes are proposed.

Mr. Mock: The idea of the committee in joint meeting, that the way in which you could show such a signal was to refer to it in a note with an arrow showing the signal that was to come out, or to be moved a certain distance. There is so much variation in the practice that it is pretty hard to cover it by symbol, except by the dotted line, which is our practice now, or was formerly, and I would like to ask Mr. Rhea if he sees any reason why the dotted line will not indicate that sort of condition?

Mr. Rhea: It is our idea that the prevailing conventionality should be carried out and a dotted line indicate a signal to come out. We expected that this would be shown by indicating the symbols of all the apparatus on the plan, and in case of apparatus which was not changed, it would be shown in ordinary language in the blue print which would show white on the tracing, but on plans on which added apparatus is going in, that would be shown in red, which is the conventional practice. That is the general practice in the case of plans presented to railway commissions in my experience, to show in dotted lines the apparatus which comes out, and in full lines the apparatus which remains intact, and in red the apparatus which is added.

Mr. Elliott: If we could get the committee to show that point Mr. Rhea brings out, that the dotted line is to represent signals to come out, it will make the proposed scheme more complete and desirable.

Mr. Arkenburgh: I wish to criticize Mr. Rhea's remarks. The colors may show different on the blue prints, but they will not do so on the tracings.

Mr. Stevens: As a matter of record, I ask whether it is a fact that the railroad board is very much interested in apparatus that is coming out. If such boards are shown the plan as it is intended to be installed, is not that all that is of interest to them?

Mr. Mountain: There are now in Canada a great many crossings that have the old primitive style of four semaphores, with any old blade, which the board is ordering to be changed into complete interlocking systems. To get thorough information regarding these plans, I require, as chief engineer of the board, that a railway submitting a plan for a new interlocking plant shall show me what system was in use previously, with the location of the semaphores to guide me in saying whether the new ones are in proper position. We do the same thing when plans are submitted for tracks. When the railway submits a new yard crossing it shows the old tracks in dotted lines and the new ones in full lines. I agree with the gentleman who spoke last as to the difficulty of showing these matters in colors on tracings. My idea is that what is old and is to be eliminated shall be shown in dotted lines, and what you are to put in shall be shown in full.

The President: The committee can consider these points in submitting its report. Page 6 refers to the showing of signals from an operating standpoint, primarily, what the signals are to do, and they can well extend the report, no doubt, to cover practices for showing additional information on the plans.

Mr. Rhea: The committee, being largely a committee of manufacturers, is on somewhat delicate grounds on some of these matters. We are not presuming to tell the railways how to prepare plans to submit to railway commissions. We are undertaking to work out signal plans covering conventionalities. As to showing what shall come out and what shall go in, I think that is foreign to the subject we have covered. I have had experience with colored plans and do not think there is any way in which you can so effectively and clearly indicate what you are doing as by the use of colored plans. I have in a number of instances submitted plans of the existing apparatus, and then submitted plans of what we proposed to do, making two distinct and separate plans. That is sometimes necessary, particularly in complicated situations.

Mr. Mock: Will it be necessary to change the scheme submitted if we use the dotted line for signals to come out?

Mr. Rhea: I do not think it will.

Mr. Mock: Is that acceptable to the committee, Mr. Hovey?

Mr. Hovey. I do not believe our committee would have any objection to it, as it is not a symbol but merely a characteristic, and I can see no reason why it should not be used for signals to be taken out of the plant.

The President: The committee appears to be in this position: the manufacturers' committee has offered a scheme which they have submitted through sub-committee 1. If we agree that the scheme submitted is correct, then it will be necessary to ask committee I to extend the scheme and ask the manufacturers if what has been proposed as to the application of the symbols will be satisfactory to the manufacturers, and at that time the points brought out in the discussion can be taken care of.

The amended motion that the general scheme as presented in page 6 be approved, subject to revisions which have been suggested at this meeting, which the committee will take into consideration when submitting the scheme for further discussion and final approval, was carried.

The President: Is there any further discussion of page 7 (second figure)?

Mr. Stevens: I would not like to see the association acknowledge that, in connection with the diagram at the bottom of page 7, an arrow should be attached to the signal to point to the track which it governs.

Mr. Mock: We would not have the other track if the two signals applied to one track. To make it clear I offered a suggestion that an arrow be drawn from the line of track to the signal to which it refers.

The President: It would seem that the plan could be revised without the arrows, if we are to use these symbols on plans where we will not use arrows. I think it is principally a question of proportion in so far as the bottom of this plan is concerned, and can no doubt be revised by changing the proportions.

Mr. Balliet (N. Y. C.): It is a coincidence that the signals are set opposite, and in my opinion it is only a question of rearranging the plan to make the matter clear.

C. C. Anthony (Pennsylvania R. R.): We will have to make a careful distinction between the work of preparing symbols and the work of recommending good practice in signaling. I think we all agree that good practice in signaling is to locate signals so the engineman can tell what track they relate to, but unfortunately not all railways in the country locate all signals in that way. If the signal happens to be without a protecting post and happens to be one track over from that on which it governs trains, it will be necessary on the plan to use an arrow point or some indication of the track to which it relates, so that I am heartily in favor of the use of the arrow points.

A motion to refer the diagrams on the bottom of page 7 back to the committee for further consideration was carried.

The President: Is there any further question on page 7? There has been no motion in regard to page 7 other than the one just passed.

E. A. Everett (Michigan Central): I would like to see some form adopted for unprotected crossings.

The President: The symbol need hardly be anything more than the tracks. If you have one of those boards, with two lanterns on it, perhaps that would be a good indication of the unprotected crossing.

Mr. Mountain: In reference to the last remark, the double-bladed semaphore at a crossing is a death trap. A locomotive driver may do the most serious damage and yet not pass the semaphore. So far as Canadian practice is concerned, that type of a semaphore is abolished.

The President: We will now take up page 8.

Mr. Elliott. In connection with the track pan diagram, I would like to make the suggestion that there be a double line on the inside between the rails rather than these semi-circles. We have been using that as a darkened section in between the rails and it has worked out very nicely.

Mr. Mock: The answer is that the indication here is the one adopted by the Maintenance of Way Association.

Mr. Balliet: As representing the interests of one of the committees, I would like to suggest on the same set of dia-

grams, line 2, that "inductive bond" be changed to "impedance bond." That is what Committee 10 has been instructed to use in all its literature.

Mr. Rhea: Is not Mr. Balliet narrowing the use to one particular application? The inductive bond and impedance bond are different when you analyze them as to finalities.

Mr. Elliott: I would like to suggest the elimination of the circle in connection with the power switch machine. We have been using the little square opposite the switch and found that satisfactory. In reference to the insulated rail joints, we mark the widened line parallel with or from the rail line rather than across it. It is a line very much easier to put in and can be arranged to show as distinctly by a little offset line in the corner as well as parts which are equipped with the track circuit. The mere writing in of these cross lines requires that the draftsman will turn his triangle and rule it with the pen, whereas if the widened line was adopted it could be put in free hand and show very nicely.

Mr. Mock: I think the difficulty is in showing the joint so that it will indicate that the track is to the left or to the right of the track circuit.

Mr. Elliott: I think a little line or corner piece that would readily represent the same thing might be put on. Comparatively few of these lines have track to the left and track to the right, and when this is the case it would be possible to use the present indication.

Mr. Shaver: I think it would be a good plan if the cross marks representing rail joints were shown the same width of line as the tracks themselves. I wish to call attention to the fact that in some places we have to show obstructions along the right-of-way, and I do not see any symbols to represent houses, buildings, trees, hills or mountains. We should have something of that sort, I believe.

Mr. Mock: In regard to showing all the physical characteristics along the line, it seemed to be desirable in some place, but very confusing when you have signals to put in at the same place. I think that is additional information that would be useful but hardly necessary.

Mr. Rhea: The manufacturers' committee considered that entirely foreign. We considered the nomenclature of symbols and similar matters entirely out of our range. We might put in a note referring to the journal of the Maintenance of Way Association. That is the authority we have looked to.

Mr. Waldron: In "train stops" the symbols represented are manual and automatic, but semi-automatic have been omitted, and I think it would be a good thing if the committee would give this a little further consideration.

Mr. Rhea: If we are going into the question of automatic train stops in the same way as we have gone into the indication of symbols, we would have to show illustrations of manual, automatic, non-automatic, mechanical, stick, semi-automatic, non-stick, etc.

Mr. Waldron: It is not necessary to print two or three pages of pictures to represent what you will do. When they are in a vertical position they stop the train; when they are in a horizontal position, that means go ahead. But you have the manual and the automatic, and I think you should also show the semi-automatic.

Mr. Mock: That can be shown by the half circle, shaded.

Mr. Rhea: Cannot you have a non-automatic stop which would be power-operated just as you have a power-operated signal? The one would be power-operated and the other would be pipe-connected, and it seems to me that the situation is somewhat analagous.

Mr. Waldron: On page 8 (the last figure) you have automatic, mechanica and semi-automatic signals. On page 8 (the third figure) we have manual stops. They may be mechanically connected, electrically connected, or electropneumatically connected. There are places where they use semi-automatic in connection with interlocking. Why not include that?

Mr. Mock: Perhaps it would satisfy Mr. Waldron if we present another view with the circle half filled to represent the semi-automatic.

Mr. Waldron: Yes, that would do it.

Mr. Rhea: We would like to ask Mr. Waldron whether the signal immediately adjoining the stop will indicate the character of the stop?

Mr. Waldron: I hardly think so. I think it would give you better results to have the character of the stop indicated separately from the signal. There is a different aspect when you are running in two directions on one track and the train stops would have to indicate for both movements.

Mr. Balliet: Station symbol, line 2, page 8 (third figure), has a platform added to it, because the elongation of the platform in its relation to the station has a great deal to do with signal location on many roads. This point will come up also in another committee report.

The President: You will see that there is a foot note "unless otherwise specified." It may be that the committee had that in mind.

Mr. Balliet: Between "power house" and "sub-station" on the same line, I suggest the committee add a symbol for "signal sub-station." It is very important. The sub-station in the report of Committee 10 will be handled in that manner.

Mr. Rhea: It is not the intention that these signal sub-stations shall be called by a distinctive name. I think the suggestion is a good one, to make a distinction between the power sub-station and the signal sub-station, because it is very desirable to have that brought out.

Mr. Everett: In the designation "track pan," would it not be as well to put in an elongated rectangle there?

The President: The designation of track pan is in accordance with the maintenance-of-way standard. We were really in that position in regard to a good many symbols.

Mr. Balliet: Again in the interest of Committee 10 I suggest that we have this track pan enlarged and add on to it a symbol for a railway with electric propulsion and electric signals to show that there is a double-rail track circuit bonded with power bonds. I would also suggest that the committee consider in this track diagram a symbol for a single-rail track circuit under the same conditions, because one of the rails will be a signal rail and should be differentiated from the power return rail for the electrical engineer. This will give the matter very clearly in our joint relations with the other association. We also need a symbol for the third rail alongside of the right-of-way as well as a trolley overhead.

Mr. Waldron: Mr. Balliet did not go far enough. That is a question of the necessity of showing the upper left-hand quadrant signals.

Mr. Balliet: On the same page, in the fifth set of symbols, I would suggest that the committee consider placing a symbol for track gongs. They are used extensively. This recommendation is suggested by the symbol "torpedo machine." I have another suggestion on page 8. The last symbol in the lower right-hand corner is apparently intended for a switch lock, a hand operated switch in a given position in automatic territory, and not an out-lying switch control for an adjoining or adjacent interlocking plant. There seems to be a symbol short.

I would like to make the suggestion with reference to the switch box location, that the cross be shown instead of the circle. The cross there seems hardly distinctive enough to be considered a symbol. I would suggest that the indicators be shown vertically along the line, rather than horizontally. There are few places between the tracks where indicators may be shown horizontally on account of clearances, and a vertical arrangement would seem to be a better one. As to the dotted lines for the connections between the battery and the rail, in the case of the track battery, I would suggest that these lines be shown full.

Mr. Arkenburgh: I think we are again short a symbol. We use two indicators on a ground post for the same purpose as they are shown on the cable post. Also, this symbol for track battery is rather inconvenient to make. It is very seldom that we get a plan drawn to the scales shown in these illustrations, and on the Rock Island we have adopted a little letter "b" to set in between the rails. It serves our purpose admirably, and can be made very handily.

W. J. Eck (Southern): In the interest of the draftsman, I suggest on the cable posts, and their lay-out, we leave off the diagonal lines at the top, and join the circles that indicate relays by a straight line drawn perpendicularly to the post and adjoining the circumference of the circles. It will make it very much easier to draw.

Mr. Balliet: At the bottom of page 10, I take exception to the committee's calling this building a signal tower. The Railway Signal Association, the Maintenance of Way Association, and the American Railway Association all call them interlocking stations.

Mr. Shaver: I doubt whether if we call them interlocking stations, that expression will be used. They are always called interlocking towers. That term is almost universally used, and the sooner we adopt it the sooner we will be in line with customary practice.

The President: I do not know that we can revise what the American Railway Association or some of the other

associations are doing. I do not believe that we will be criticized if we call these towers, in our every-day expressions, or something different from their names as printed in the proceedings.

Mr. Elliott: I would suggest that symbol 4—"Derail, Lifting Block Type" under "Derailing" be inverted and shown with the point touching the rail rather than to show a small space between the triangle and rail as the difference between the non-derailing and derailing type.

Mr. Eck: In the same symbol, I suggest the block be shown between the rail as being more nearly a picture of the actual conditions.

Mr. Elliott: I suggest the symbols representing the relay contacts be arranged directly under each other, rather than overhead as shown, because I find on our circuit plans it is necessary and desirable to arrange them vertically, and we put the relay contact in the line circuit rather than to bring the line up to the relay contact, and by showing the contacts directly below the magnet, a clearer diagram is made. I would also like to suggest under the direct-current electric bell that the circle be placed outside of the square, similar to the highway crossing bell, except that the cross lines from the magnet be omitted.

Mr. Waldron: I do not agree with Mr. Elliott about the indication of the contact points in the relay, especially if you have six, eight or ten contacts there. It is a pretty difficult proposition to get the wiring diagrams made out as desired. I think the committee is right as they have represented this.

Mr. Balliet: I wish to call attention to the note which reads: "Designate resistance in ohms of all d. c. relays, indicators and locks." Would it be permissible to suggest to the committee that that sentence be reframed so as to state that the resistance be shown within the circle or within the outline of the apparatus? It is quite an easy matter where you get a good deal of apparatus on a plan to miss that resistance, or to misunderstand just what it relates to.

Mr. Griffin: I believe that would be confusing with the designation of the relay itself. Very often it would be necessary to get four figures inside of some of the symbols we make, and that would be hard, and possibly not clear.

Mr. Arkenburgh: In line with Mr. Waldron's remarks on the clearness of the plans, as I read the instructions, it will be necessary with the track relay to draw two lines from the relay to the rail, representing the two wires.

The President: I assume that is what is meant.

Mr. Arkenburgh: I have found it is much easier to draw and understand if you have one line. There may be a dotted line going from the relay to the point at which it is controlled. On all Rock Island circuit plans we show one dotted line. That does not represent wires, but merely shows two of the points in the track circuit and relay attached.

Charles Stephens (C. & O.): I suggest the symbols show one polarized contact open and one closed.

Mr. Elliott: With reference to knife switches, I would make the suggestion, as simplifying the drawing, that the knife switch be shown as a quadrangle, and that the posts be shown square rather than circular. It can be put in more readily. With reference to "track circuit wire," I suggest that it be shown in full line rather than dotted line, the committee having admitted that a dotted line represents something to be taken out; and also in connection with the symbol for direction of current, that the symbol be eliminated.

J. E. Saunders (A. T. & S. F.): I believe that Mr. Mallett's suggestion concerning the substitution of "impedance" for "reactance" would probably cause different symbols.

Mr. Stevens: I do not like to see the elimination of these different symbols for the different kinds of wire, as suggested by Mr. Elliott.

Mr. Dryden: It is very convenient to have a symbol showing the direction of current, particularly where the current flows in both directions in the wires at various times. I do not know of any better way of showing that than by arrows.

The President: That refers to the last page of the submitted symbols and the committee will be governed by the suggestions which have been made, in completing their work.

Wr. Waldron: In discussing the flow of current, it seems to me that brings up a question we do not know much about. I think we had better leave the arrows off.

Mr. Balliet: We have a symbol for a. c. terminals, which look like a turn-buckle. I appreciate that this is an electrical symbol, representing terms for electric circuits, but suppose we get this symbol on a mechanical interlocking plant, who is going to find out whether it is a turn-buckle.

Mr. Rhea: It is on the wire.

Mr. Balliet: I am not in a position to make a suggestion for something better, because it just caught my eye. I think the committee should give it some consideration.

The President: Unless the chairman of the Sub-Committee on Standards has something further to submit, we will pass on to the next report.

Mr. Mock: The chairman has not anything to offer to the association in the way of standards further than these symbols. I might say here, however, that your letter ballots have turned down some of these standards, which necessarily puts the committee in a position where they do not know just how to go forward. The reduction of the spacing of arms has not been considered by the committee since the return of the letter ballot, but as I see it, we have a good many of our plans to revise, and, of course, that work cannot be undertaken until we know something as to what the association would like to have. The spacing of arms has been presented to the association for three years, and at each meeting has had the approval of the association. When it came to the taking of a letter ballot, it failed to carry. On the basis on which our work was undertaken, we have endeavored to get standards of ladders and lengths of pole which were very much needed and desired for the manufacturers, and I think perhaps that a great many of you do not realize how much work is required to get a standard of what seems to be an insignificant piece of apparatus in signaling, but it takes a lot of time. That spacing of arms is a vital question, and much depends upon the spacing of arms in the apparatus that we will design in the future. It seems to me that the work of this meeting is not too pressing to admit of a discussion, or some expression, of what spacing should be given.

Mr. Stevens: I was rather surprised to see the association vote on that subject as it did, because while I am absolutely opposed and always shall be to that spacing of arms, still I was led to vote for it in committee because the spacing was used by railways in the country, and the function of committee 1 was to provide the necessary posts and ladders to provide that spacing. I was unfortunately too late to register my vote. I had intended to vote for that drawing, with the proviso that it did not carry any approval of the spacing of the arms. That was my understanding of the way we should vote, not on the spacing of the arms, but as to the desirability of the parts which would make up that spacing of arms.

Mr. Shaver: I think it is a fact that a large number of the members do not appreciate the work involved in preparing drawings and specifications for details of such apparatus. It is evident that in voting for the standard posts and ladders, and projecting the drawing to which Mr. Mock has just referred, that they did not carefully consider what it meant. The same thing is true with respect to many of our specifications. We still never get anywhere if the membership does not give more attention to the work in hand, and if they will not work with us, and do not have more confidence in their committees. The members of the committees work these things over and reach the conclusion which in their mind is best. I am inclined to think that the individual ideas are allowed to govern more largely than a consideration of a majority vote.

The President: The association appears now to be in the unusual position of having approved the plant of all details and turned down the general plan. As a matter of fact, practically everything shown on the two plans rejected, namely 1045-A and 1046-A (pages 287 and 288, Vol. VII, 1910 Proceedings), have been approved in the following plans, and I assume that the committee would like information as to what action shall be taken by them during this year in regard to 1045-A and 1046-A, which is a complete scheme for one, two and three arm signals, whether they shall attempt to change the signals or resubmit them. If any change is made in the general plan, then all the detail plans which have been adopted, must be discarded, and others made.

Mr. Stevens: I would like to say a little about the turning down of that plan and also about the general make-up of our reports. A short sentence put in the report of Committee 1 explaining that it is not a question of signal aspect, but the question of the parts of signals, would probably change that vote. If these symbols had been presented to this meeting with a slight argument as to the basis on which they were designed, we would probably have cut out a good deal of the discussion which has taken place to-day, but I do not believe in any of our reports that we explain enough This puts the association in the peculiar position of having approved the details and not the general design. I feel that it was done by error on the part of the members. We have voted for aspects and not the mechanical designs and signals.

The President: On the basis of your remarks, you would prefer to see the plans revised by omitting "aspects," mak-

ing 1045-A read: Diagram of poles and signals, and 1046-A, which shows the bridge and bracket arms, a diagram of signals rather than a diagram of aspects.

Mr. Stevens: That would help the matter. I understand it and told you how I would vote.

The President: It seems unfortunate that the association could not have approved plans of one, two and three-arm upper-quadrant signals. That is what it amounts to. The road can determine whether or not it wants to use the Signal Association standard, but if it does want the three-arm signal, it has an approved plan to work to.

Mr. Stevens: If we do not want to use the three-arm signal, we still have the one and two-arm signals which could be used.

The Secretary: The word aspect should be removed and the vote be taken on the one, two and three-arm signal. It occurs to me it might not be out of order if I would give the chairman the vote as against this proposition, and he could take this up with the members individually and see what their objections were. Possibly the members did not understand it. If it is the sense of the convention that this should be done, it might help us out to know whether or not to revise the plan.

The President: The only person who could authorize that would be the voter. It might be well for the secretary, if desired by the committee, to ask the various members if they agree to have their votes made known to the committee. If so, the committee can then be advised and it can be taken up with them.

Mr. Elliott: I move that be done by the secretary.

Mr. Beaumont: In my opinion, the committee were in error and not the membership. The word aspect should never have been placed before the membership, with the possibility of having to vote on the aspect rather than on the design itself. The vote against the proposition was undoubtedly a vote against the aspect; there is no doubt about that.

The President: It has been moved and seconded that the secretary ask the members who voted against sections 1045-A and 1046-A, if they wish to have their votes made known to Committee 1 and to discuss it with the committee.

Mr. Beaumont: As an amendment to the motion, I move that the two questions at issue be submitted to letter ballot with the word "aspect" removed. I do not see why that could not be done, in view of the fact that the committee was at fault in the first place in asking advice on something that clouded the subject before the membership.

The President: The committee submitted it, and the annual meeting approved and submitted it to letter ballot. This was done and the matter was rejected. Under our constitution this is as far as we can go with it now.

Mr. Beaumont: Is there anything to prevent a letter ballot on the diagram of signal designs?

The President: We call for a letter ballot on the diagram of signal aspects 1045-A and 1045-B, and they have been rejected, and we must have a revised plan on which to vote. The plan is complete in itself and the vote is required on the passing of the plan. If it is the sense of the meeting that this committee shall take up with the members who voted against it the matter of its further discussion, we have again to submit a plan revised as the committee may see fit, at the next annual meeting, which can then be resubmitted without any change in the actual drawing, and adopted. It seems an easy way out of it.

The motion was carried.

Mr. Mann: On this question of revision, I would like to consider the question of the lamp. If you remember, we adopted a five-inch lens, whereas the tentative vote seems to say 5⅝-in. lens as the one in favor. I would like to know how the committee understands that, whether they consider that vote as binding on the association, that the standard lamp has a 5-in. lens in view of the tentative vote?

The President: In reply to Mr. Mann's question, I think it is unfortunate that the vote carried just as it did on the lamp, because it was really more definite than the opinions expressed at the last annual meeting. But the vote must stand, although the committee may revise a plan this year on the basis of the vote on the lens, or on the basis of their further opinion of the fact as to whether or not the lamp as now approved, shall be shown in the Manual, will rest with the Committee on Manual and the Board of Direction.

Mr. Mann: It seems that we are unfortunate in this scheme. The lamp is apparently adopted with a five-inch lens, whereas, as a matter of fact, in voting for the lamp, some of the members voted for it apart from the lens, having in mind, as we had a tentative vote on the size of the lens, that the vote which carried for the lamp did not standardize the lens. It is a matter of error in the understanding of the members, of the vote as submitted by the committee, and it should be handled in the same way as the question of the aspect. If the members did not vote as they intended, and we are now tied up to a lamp with a five-inch lens as the standard of the Association, we should be able to change that vote.

The President: I will read Mr. Mock's motion at the annual meeting, found on page 330; bound volume VII.

A motion to submit semaphore lamp No. 1100-B to a tentative letter ballot to get an expression from the Signal Association on the standard size of lens, and to approve the other dimensions and the general arrangement was carried.

Mr. Mann: I think that the members voted with that motion in mind, and with the idea that the result of the vote was not final, but was simply to get a tentative vote to show which size should be adopted, and I think Mr. Mock had in mind probably to revise the size of lens. I would like to have that brought out clearly, that the drawing of the standard lamp, as adopted by the association, does not fit the size of the lens,—that any road may feel that it is using the standard R. S. A. lamp regardless of the size of the lens.

The President: I think the vote indicates that.

MECHANICAL INTERLOCKING.

This committee was instructed (a) to investigate and recommend a device or arrangement that, with slotted or power-operated home signals, will equally secure the safety of operation of mechanical interlocking apparatus that is at present afforded by the bolt lock in mechanical plants with pipe-connected units. (b) Reconsider specifications for concrete foundations for signal apparatus, considering reports submitted by various committees at the last annual meeting and the specifications of the American Railway Engineering and Maintenance of Way Association, and submit reports for discussion at the March and June meetings, if possible, and for adoption at the annual meeting. (c) Prepare specifications for interlocking for draw-bridges, and specify particularly the requisites for locking rails and interconnecting rail-locks, bridge-locks, and wedges, and the interconnection of these with derails and signals protecting the drawbridge; and (d) submit floor and lead-out plans for mechanical interlocking cabins.



C. J. Kelloway.

Chairman, Committee on Mechanical Interlocking.

Committee II., Mechanical Interlocking, consists of C. J. Kelloway (A. C.), chairman; F. C. Stuart (Sunset Lines), vice-chairman; S. T. Brotzman (L. V.); L. Brown (A., T. & S. F.); F. H. Buchanan (Vandalia); G. W. Chappell (N. Y., N. H. & H. R.); J. Diefenbach (St. L. & S. F.); E. C. Graham (B. & A.); E. Hanson (G. C. & S. F.); William Hiles (C., C., C. & St. L.); J. A. Johnson (M., K. & T.); T. A. Jones (P. R. R.); T. E. Kirkpatrick (L. S. & M. S.); J. W. McClelland (P. & R.); E. E. Mack (C. & E. I.); W. B. Morrison (D. L. &

W.); S. Miskelly (C., R. I. & P.); Charles Stephens (C. & O.); J. I. Vernon (N. Y., H. & H. R.); C. H. Wiegand (N. Y. C. & H. R.); and W. F. Zane (C., B. & Q.).

Discussion on Mechanical Interlocking.

Mr. Shaver: I think there should be a specification for a drawbridge or at least a revision of the mechanical interlocking specifications necessary to apply to drawbridges. I do not believe that the present mechanical interlocking specifications can be interpreted as covering it as fully as it ought to be covered.

The President: The chairman asks if it is the opinion of this meeting that the specifications for drawbridges should begin where the mechanical interlocking specifications now stop; in other words, if it should be confined to the interlocking of the draw-span. It would seem that points covered in the specification we now have would not need to be repeated in the interlocking specifications of the drawbridges.

Mr. Stevens: It strikes me that all this material which the chairman has placed before us is in the nature of practice more than it is specifications. I doubt whether this association properly ruled on this last question. The use of home and distant signals is more or less governed by the speed over the division and the physical location of the drawbridge, and it seems to me it is not proper to be embodied in the specification.

The President: I think we must finally confine our specifications to the methods of installing and protection, rather than to determine the protection to be installed. The membrs of the association may disagree, but that has practically been our practice in the past.

Mr. Stevens: That is my understanding.

Mr. Kelloway: I have been holding out for home signals and referring to distant signals, etc., as adjuncts, which are so termed by the American Railway Association. To my mind, I think we should refer to home signals only, and then refer to adjuncts, and the local conditions will have to govern the man who is going to install the plant, and he in turn will be controlled by the local conditions.

Mr. Beaumont: It would seem on the face of it as though the drawbridge specification on which the committee desires action should begin at the home signal. It is from the home signal that all the protection in connection with the drawbridge has to deal. The points outside of the home signal are points that run with the ordinary interlocking, and it seems to me that this association should keep that in mind, and I suggest that all the specifications that have to do with the drawbridge location, or the protection of drawbridges, begin at the home signal.

Mr. Waldron: Let those gentlemen who are in favor of having a home signal on the drawbridge state whether they use the distant signal in connection with the home signal. It is a very vital thing to protect the drawbridge.

Mr. Kelloway: It depends on locations. I know of a number of drawbridges that are interlocked, and if you put up a distant signal you would have to put it uptown somewhere, because the home signal is right in the yard. There are other points where you could use distant signals to good advantage, and there are points where it would be good practice to put in derails and other places where it would not.

Mr. Waldron: In that case, it would be in the yard limits. Where the speed is high, do you not use distant signals in connection with the drawbridge?

Mr. Kelloway: That is the usual practice.

Mr. Waldron: Should they not include it in the specifications? Is it not necessary to give absolute protection at drawbridges? It seems to me it is one of the most important points to protect.

Mr. Kelloway: The point is, we cannot make a concrete recommendation which will apply in all cases. There are certain points where you require distant signals, and there are other places where you will not need them.

Mr. Waldron: I agree with you. There are certain points where you cannot use distant signals, and do not want to use them, but still we provide for them in our specifications. Here we have a case where we must use distant signals, and why not provide for them?

The President: It seems to me if the committee will specify the interlocking of the drawbridge functions, which is a subject not covered by the present mechanical interlocking specifications, and also make the specifications for the remainder of the interlocking as complete as the mechanical interlocking specifications are, but not make any recommendation as to the amount of protection to be installed at drawbridges—simply specify the way to do it after you decide what you wish to install—their work would be about complete. We have had some questions come up several times in regard to the proper or necessary protection to be recommended that we have made no recommendations of that kind.

The meeting then adjourned until 2:15 p. m.

POWER INTERLOCKING.

This committee was instructed to (a) continue investigation and submit the following typical plans for electrical interlocking, circuits for one-arm signal and single switch, circuits for selecting signals, switch detector circuits, route locking circuits, and approach locking circuits. (b) Investigate and recommend a device or arrangement which will equally secure the safety of operation of electric interlocking apparatus that is at present afforded by the bolt lock in mechanical plants with pipe-connected units. (c) Reconsider and complete specifications for electro-pneumatic interlocking on the lines of the specifications for electric interlocking; and (d) submit plans, similar to those mentioned in (a), for electro-pneumatic interlocking.

Committee III., Power Interlocking, consists of B. H. Mann (M. P.), chairman; W. F. Follett (N. Y., N. H. & H. R.), vice-chairman; W. H. Arkenburgh (C., R. I. & P.); W. A. Bartley (I. R. P.); E. J. Clark (P. R. R.); M. H. Collins (H. & M. T. Co); J. R. Decker (M. C.); G. B. Gray (Penna.); W. H. Harland (N. Y., O & W); R. C. Johnson (N. Y. C. & H. R.); H. K. Lowry (C., M. & St. P.); W. N. Manuel (G. R. & I.); G. A. Motry (B. & O.); H. H. Orr (C. & E. I.); W. M. Post (P. R. R.); I. S. Raymer (P. & L. E.); A. H. Rice (D. & H.); D. W. Rossell (N. Y. C. & H. R.); Hal Smith (U. P.); F. B. Wiegand (L. S. & M. S.); E. Winans (A., T. & S. F.); A. H. Yocum (P. & R.); and G. A. Ziehlke (U. P.).

The committee requested suggestions from any members who have found points that are not covered in the specifications that have now been in use two or three years.

Sub-Committee A was not ready to make a report, but announced two meetings and announced that plans and specifications would be presented probably at the June meeting and surely at the annual meeting.

Sub-Committee B held a number of meetings and has made investigations of the subjects assigned, but was not prepared to make any recommendations.

Sub-Committee C presented as a progress report typical plans covering circuits for one-arm signal and single switch, and for selecting signals, and switch detector, route locking, and approach locking circuits, and also, plans for wood trunking and petroleum asphaltum for "pitching-in" wires.

Sub-Committee E reported progress on the revision of specifications for electro-pneumatic interlocking as suggested in the discussion at the annual meeting. Chairman Johnson requested advice of the association as follows:

Mr. Johnson: There is one matter about which there is considerable difference of opinion in the committee and upon which I would like to have an expression of opinion here. That is the voltage test of electric apparatus. In drawing the specifications which were submitted at the annual meeting we copied this voltage test exactly from the specifications for electric interlocking, that is, 3,000 volts. The criticisms at the meeting seemed to show that that was too high and that 1,000 volts was the proper test. One of the members of the committee says 3,000 is too low; that it ought to be 5,000. I would like to know what some of the other members of the association think about it.

Discussion on Power Interlocking.

The President: You have heard the question on which the committee wishes advice, as to the voltage test to be applied to apparatus. Are there any replies to that question?

Mr. Mann: Is there a representative of the manufacturers that will say why the ordinary voltage test that we use in other signal apparatus should not apply in this case?

The President: By "the ordinary voltage test" you mean 3,000?

Mr. Mann: Yes.

The President: Are there any signal companies' representatives who care to advise in regard to that?

L. F. Howard (U. S. & S. Co.): So far as the insulation is concerned it is the equal of that on other pieces of apparatus, but it would be somewhat difficult, possibly, to provide the 3,000-volt test in some cases. That is merely around the shell and there is considerable distance between the winding and the shell.

The President: In the absence of any further information the committee will have to use its best judgment.

ELECTRIC SIGNALING FOR ELECTRIC RAILWAYS.

This committee was instructed to (a) continue investigation and make further report on the various systems in satisfactory operation, and (b) prepare specifications for A. C. operated automatic signal installations on electric railroads.

Committee X., Electric Signaling for Electric Railroads, consists of H. S. Balliet (G. C. T.), chairman; C. H. Morrison (N. Y. N. H. & H.), vice-chairman; W. P. Allen (Penna.); Wm. A. Bartley (I. R. T.); M. H. Collins (H. & M.); W. F. Follett (N. Y., N. H. & H.); E. C. Grant (U. P.); W. F. Hudson (N. Y. C. & H. R.); John Leisenring (I. T. S.); H. A. Logue (C. V.); W. W. Morrison (N. Y. C. & H. R.); C. A. Peddle (I. R. T.); John Roberts (N. Y., W. & B.); J. E. Saunders (A., T. & S. F.); E. B. Smith (N. Y. C. & H. R.); W. N. Spangler (P. T. & T.); H. S. Towle (Erie); H. C. Ware (N. Y. C. & H. R.); and F. E. Wass (N. Y. C. & H. R.).

This committee submitted a progress report of detailed specifications for material made up by Sub-committee "B." This



H. S. Balliet.
Chairman, Committee on Electric Signaling for Electric Railways.

report includes specifications for electric motor signals; alternating current line-circuit and track-circuit relays; alternating current supply for operating signals, track-circuits, line-circuit relays and indicators, and signal lighting; circuit-breakers for movable-point frogs, switches, or derails, lever and latch circuit-breakers, drawbridge circuit-berakers and special circuit-breakers; bonding materials including copper, galvanized-iron, and copper-clad bond wires, tinned, copper, and copper-plated channed pins, and impedance bonds; electrical conductors including rubber-covered wire, line wire, and cables for low voltage circuits, and line wire and cables for high-tension circuits; wire conduits, including wood trunking, vitrified clay, fiber, and iron; insulations, including rail joints and fiber and switch-rod, pipe-line and tie-plate insulations; and transformers and gird resistance shelters.

Since the report has been printed the chairman has received a number of compliments from manufacturers, and I believe it is only fair that I read, if the chair will permit, taking a little additional time, the corrections which the committee proposes to incorporate in the printed literature, so you will know where we will stand. As a matter of fact, unless there is some decided action indicated, the chairman proposes to leave the specification stand as it is here printed and present it at the annual meeting. That will let everyone interested get in communication with the chairman during the year before we go to press with the annual meeting proceedings, and anything that is vital or that should be incorporated as a committee report will receive its consideration in the full committee. In that way we hope to go to the annual meeting with this report and have quick action. We find that the heading "Detailed Specifications for Material" is very misleading and the committee proposes to have it read: "Automatic block signal a. c. signal system where d. c. propulsion is used. Requisites of Apparatus and Material."

Now, the next heading, "1, Signal A," now reads "Electric-motor signals," and should be corrected to read "Semaphore signals" Under A, 1, should read: "Semaphore signals shall be of the electric-motor type, right, left-hand, upper, lower-quadrant, two, three, position." In other words, we find that "two and three-positions should be inserted and that it should specifically state that they are signals of the semaphore type. We have added "c" in brackets, which, as the correspondence indicates, should include a subject as follows: "The general design, dimensions and structure shall be according to the following drawings"; and we propose to incorporate under that subheading a one-arm signal according to the standard adopted, two and three arms, bracket, mast, bridge mast, etc. In other words, build up the signal structure to which the semaphore mechanism is fastened or included, as it might be, in a mechanism case. Then we want to have another subdivision as follows: "Electric light-type signals," and that shall then be subdivided just the same as the semaphores are. In other words, we find that the light signal is coming in use very rapidly and should not be omitted. Then we find that circuit breakers should really be circuit controllers.

Those are the only corrections of the report as printed that are important. I have before me, however, the proceedings of March 19, which completes the report. If the chairman would like to have me read that I can do it.

Discussion on Electric Signaling for Electric Railways.

The President: On account of the time I believe it is best to hold to the printed report of the committee, but if there are any parts to which the members take exception or any additional points which they believe should be covered so far as the committee has gone, we would be glad to hear from them. There must be some questions on this new subject.

Mr. Waldron: Under A, where it says: "The signals shall be of the electric motor type," does that include signals of the electro-pneumatic type and solenoid signals? Why not make it general enough to include all the types?

Mr. Balliet: It is not possible to make it general. We have worked two or three months on that attempt and that is why we suggest that we make another paragraph, "B." We are perfectly agreeable and willing to incorporate electro-pneumatic and solenoid signals. In other words we will make it "C" and continue indefinitely.

Mr. Stevens: The association has several specifications already prepared along certain lines, and I would like to ask the chairman of the committee if the specifications for the a. c. work could not be prepared along the same general lines as the specifications for d. c. work and mechanical and electrical interlocking have been prepared.

Mr. Balliet: In answer to Mr. Stevens I will say, as announced in the preliminary report, this is a duplicate of the report made by Committee No. 4 and accepted at Richmond last year. In other words, we have simply adapted the terms to the a. c. conditions. We have coined a new word, and forgotten that there is such a thing as a slotted signal. We find that we cannot adapt it to the new method of things, so we have decided in our committee to call it a holding-device and have framed a definition as to what a holding device is. I would like to have everyone give this pretty serious thought, as we have substituted holding-device for slot.

Mr. Balliet: This entire report is framed for the sole purpose of giving it to the layman on a trolley road, or a steam road, so that a man who desires a signaling system can buy a signal system. That is all that the committee was asked to do.

Mr. Kelloway: There is one point under "bonding," No. 5, paragraph A, article B, galvanized iron bond wire. I would like to know if any members here are obtaining iron bond wires. I have recently got into contention with our purchasing agent, and he with the wire manufacturers, that there is no iron wire made to-day. We are getting steel. We have rejected a number of bond wires, with the result that we will have to take steel. I wrote the chairman of Committee 9, which is handling the wire and cable specifications, and sent him copies of letters which were sent to the wire manufacturers, and he advises that he will handle it with the committee and eliminate the word "iron." I would like to see the word "iron" used and obtain iron wires instead of steel wires, if possible.

Mr. Elliott: On the point mentioned by Mr. Kelloway, I did not think this subject would come up and left the letter of Roebling & Sons upstairs, but at any rate they write that while they have previously furnished EBB wires on a specification reading EBB iron bond wires, and considered that the wire they furnished complied with the specifications, they have recently had some orders returned because the bond wires furnished were not actually iron, and they suggested that the specification be changed to cover the kind of ma-

terial now furnished. It seems that practically no straight iron wire is now made, and that if the association wants it it will have to be made out of Norway iron, which is two or three times as expensive as the wire we are now buying. What is furnished as EBB bond wire is a very mild steel, properly tempered and galvanized to serve as a bond wire, and I believe that the specification should be changed to eliminate the word iron in the title. This matter has just come up, and I have not yet had a chance to bring it before Committee No. 9, but expect to do so at the next meeting, and with the approval of the members to suggest at the Maintenance of Way meeting to-morrow that the word "iron" be eliminated from the title of the specification.

Mr. Waldron: It is information that we are after. Iron shows much longer life than steel. Would not the same apply to bond wire?

Mr. Elliott: As I understand this matter, we have been specifying iron EBB bond wires for years in the past, have been receiving mild steel wire, and that practically nothing but mild steel or the quality of iron we are now using has been furnished us for the last ten years or more, and although we had iron in the title and have ordered it, iron has not been received.

Mr. Kelloway: We will all admit that we have received steel wire, but in that case two wrongs do not make one right. Formerly we have used an iron bond wire which has given twice as long service as the present steel bond wire. I know wrought iron bond wire that has been put in the track that have lasted nine years. We cannot obtain that in steel. If the price is going to be more, it is better to specify iron and obtain iron than to specify steel and have to renew the bond wires in four or five years.

The President: While this is interesting, as referring to bond wires, I think it is a subject that should come up in the discussion of the report of Committee 9, because Committee 10 simply referred to the work done by Committee 9.

The President: Yes, I am referring particularly to our newly-printed specifications, which may not be correct.

Mr. Elliott: I would like to say the specifications were worded to cover EBB bond wires and not iron wires; so in order to have the proper title for the specification as worded, the word "iron" should be eliminated, and if it is desired that a straight iron bond wire specification be made up, another one will have to be drawn.

Mr. Balliet: The chairman suggests that, insomuch as the material which is printed in the state meeting literature is in type, it be corrected to date and reprinted with the minutes of this meeting and that the remainder of the specifications be printed with that as information, and that all manufacturers and others who have signals of this type and are interested communicate with the chairman in the next two months, so that we can bring it up at the general meeting and have the report in concrete form for the annual meeting.

The report was accepted.

AUTOMATIC BLOCK.

This committee was authorized to (a) reconsider specifications for direct-current relays, which were referred back to that committee at the last annual meeting, and submit new specifications based, as far as possible, on the association's present specifications. (b) Continue work on detailed specifications for material, taking them up in the order shown in the report submitted at the last annual meeting; and (c) supply typical automatic signal circuits for single and double-track railroads.

Committee IV., Automatic Block, consists of A. G. Shaver (C., R. I. & P.), chairman; J. M. Fitzgerald (N. Y. C. & H. R.), vice-chairman; E. L. Adams (L. S. & M. S.); E. A. Allen (N. P.); J. G. Bartell (L. V.); L. R. Clausen (C., M. & St. P.); G. R. Cowherd (A., T. & S. F.); G. E. Ellis (K. C. T.); E. A. Everett (M. C.); J. C. Finch (M. P.); A. R. Fugina (L. & N.); J. E. Gilmor (P. R. R.); W. H. Higgins (C. R. R. of N. J.); A. B. Himes (B. & O.); S. P. Hull (N. Y. C. & H. R.); W. R. Hastings (C., R. I. & P.); E. W. Kolb (B. P. & P.); E. W. Newcomb (O. S. L.); F. W. Pflegling (U. P.); H. J. Rhinehart (D. L. & W.); A. H. Rice (D. & H.); T. S. Stevens (A., T. & S. F.); F. E. Wass (N. Y. C. & H. R.); C. P. Woodson (Penna. West.).

The committee on automatic block reported that the subcommittees have made considerable progress in their work and that the specifications for caustic soda primary battery, switch and tower indicators, and fiber, are under way, some of these requiring revisions only.

Discussion on Automatic Block.

Mr. Shaver: In this regard the chairman ran up against a stumbling block in trying to harmonize some of the various details of the specifications. I am inclined to think that it will be necessary for the committee on manual to meet with these committees and help to straighten out the details of paragraphing and numbering, in order that all the specifications will harmonize and that each be put where there is a specification that is common to all, and you can refer to it and there will be no conflict. This committee No. 4 is open to receive suggestions with respect to any specifications which may have been made, or are to be made, and I think the committee on relays would be very glad indeed to get any suggestions that any member may have to offer. I know that Mr. Stevens has been writing out to a number of the signal engineers to get information.



A. G. Shaver.
Chairman, Committee on Automatic Block.

The President: We will next take up the paper submitted by Mr. McKeen on "Portable Storage Batteries as Applied to Automatic Signals on the Harriman Lines."

PORTABLE STORAGE BATTERIES AS APPLIED TO AUTOMATIC SIGNALS ON THE HARRIMAN LINES.

A. H. McKeen, signal engineer, Oregon-Washington Railroad & Navigation Company, read the following paper:

The application of portable storage batteries to signal circuits on the Harriman Lines began in the year 1890 on the Western division of the Southern Pacific, under the direction of W. W. Slater, then master of signals of that company. At the time there were no motor-operated signals on the Southern Pacific lines and the use of portable storage batteries was confined to operating highway crossing bells and indicator and locking circuits at hydro-pneumatic interlocking-plants. The type of battery then in use was crude, heavy, and of generous dimensions for its capacity. No charging plants were in service, and it was necessary to charge the batteries on an arc circuit, carrying approximately 2000 volts. It was found that a considerable saving was effected through the use of these portable storage cells as compared with the cost of operating the circuits with primary and gravity cells and with a view of extending the use of storage cells to several installations of single track electric automatic block signals that were contemplated, tests were carried on for several years with various types of portable storage batteries on the market. The results of these tests were so satisfactory that in 1899 and 1901 when these several installations of automatic signals were completed, the experimental stage had been passed and portable storage cells were decided on as being the least expensive and most satisfactory source of energy for operating the motor circuits.

Gravity batteries were used for the line and track circuits, although later on, the gravity line batteries were dispensed with and the storage battery served the double purpose of operating both line and motor circuits. Each of the above-mentioned signal installations consisted of approximately 20 miles single track. At the foremen's headquarters of each installation a charging outfit, consisting of a two horse-power gasoline engine, belt connected to a 1-kilowatt generator was installed; the foreman attending to the work of charging and inspecting the batteries, and distributing them to the nearest stations on local passenger trains where they were taken to the battery locations by the maintainer on a velocipede or motor car; the discharged batteries be-

ing returned to the charging plant in the same manner. From this small beginning, the operating officers of the associated lines, comprising the Harriman System, recognized the advantages of automatic signaling as a means of facilitating and safeguarding traffic, with the result that each year, additional mileage of automatic signals was authorized, the amount of such mileage usually being the maximum that could be installed by the signal departments of the various lines during the year. With the close of 1910 the entire main lines of the Union Pacific and Southern Pacific from Omaha, Neb., to Oakland, Cal., a distance of 1779 miles, is protected for the entire distance with automatic block signals, except about 100 miles over the Sierra Nevada mountains, where the electric train staff is in service. Also the main lines of the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company between Granger, Wyo., and Portland, Ore., are protected in a like manner, for the entire distance of 941 miles.

The main lines of the Southern Pacific from Portland, Ore., to El Paso, Tex., and the Sunset Lines from El Paso to New Orleans, a total of 3226 miles, are protected with automatic signals for a distance of 1938 miles, or 60% of the entire distance, and it is calculated that the remaining 1288 miles will be completely signaled within two years. The total mileage of road protected by automatic signals on the entire system, on December 31, 1910, was 4719 miles of single track, and 703 miles of double track, or a total of 6125 miles of track so protected. On this mileage there are 12,050 automatic signal blades, practically all of which are operated by portable storage battery. There are in all 9026 battery locations with a total of 48,516 type SS-7 cells in service, of which 12,412 cells, or 25%, are extra cells used for charging.

The methods of transportation to and from the charging plants vary with local conditions. On portions of the line where local passenger service is available, the batteries are loaded into the baggage car and distributed at each station by the batteryman, who accompanies the batteries. From the stations they are taken to the various battery locations by the maintainer on a velocipede or motor car, the discharged batteries being returned in the same manner to the station, where they are picked up by the batteryman and brought back to the charging plant on the return train in the evening. On other sections of the line the batteries are loaded into a specially arranged battery car and handled on local freight trains, stops being made at each battery location, where the batteries are changed by the batteryman and the maintainer on that district. The car containing the discharged batteries is sent back to the charging plant on the first freight train. Another arrangement consists of a charging plant built in a box car, which car is moved on the daily way freight and is set out at each alternate station; the batteries being changed out in each direction from the station by the maintainer. This charging car is fitted up in three compartments; in one end of the car is located the gasoline engine, generator, switchboard, and cooling tank. A large gasoline tank holding sufficient gasoline for one month's supply is suspended under the body of the car. The center part of the car is used as a battery room and is suitably fitted up with a battery bench, lead-lined sink and a large water tank for battery washing purposes. The other end of the car is arranged as living quarters for the batteryman. The car is equipped with heavy draught gear in order to avoid any damage due to rough handling while in transit. During the three years that this portable arrangement has been in service, it has given the best of results, handling on one district 832 cells monthly on a territory of 150 miles of single track signals. An important advantage in this method is that on the 150-mile district referred to, only 80 extra cells are required for changing out purposes; this being only 10% of the total number of cells in service on the district.

On the Harriman Lines there are 52 charging plants, each of which (except the portable plants) is located at the headquarters of the assistant supervisor, where a shop building is provided, and part of this shop building is used to house the charging machinery, hence no special building is necessary. The average territory covered by each plant is 104 miles. Whenever current can be obtained from local power companies, a mercury arc rectifier or motor generator set is installed and at other locations where electric power is not available, a gasoline engine and generator charging outfit is used. Each charging plant is in charge of a special batteryman, whose duties consist of charging, inspecting and cleaning the batteries and assisting the maintainers in changing out the cells on their districts. All cells are returned to the plant monthly and are thoroughly inspected and cleaned before being put on the charging circuit. A record is kept in a book, provided for the purpose, of the voltage, specific gravity and condition of each cell on arrival at the plant and each cell is examined for short circuits or other faults; the hard rubber covers and connectors are cleaned and sediment removed if necessary. Once a year the old electrolyte is replaced with new in order to discard all impurities held in solution.

In the case of stationary batteries it is the usual practice to give an overcharge several times a month, the overcharge having the effect of driving the sulphate out of the plates and keeping them in a healthy condition. Portable cells which are charged once a month only, are subject to considerable sulphating and therefore require a long charge to bring them up to capacity. It is the practice to continue the charge for two or three hours after the voltage and specific gravity has ceased to rise. The uniform gassing of all cells on charge is a good indication of their condition and the failure of any cell to gas is investigated before the charge is continued. During the charge, voltage and specific gravity readings are taken and recorded in the book and any cells not coming up to the proper voltage and gravity are closely watched and given special treatment if necessary. Maintainers are required to make weekly inspection of all cells in service, examining them for loose connections, taking voltage readings and replacing any evaporation of electrolyte that may occur during the time the cells are in service. In replacing the evaporation only water whose purity has been



Battery Car.



Charging Plant.

previously passed on is used. In localities where pure water is not obtainable, distilled water is provided.

For the guidance of signal department employees the following instruction relative to the care of portable storage cells are printed in the book of rules and regulations of the maintenance of way department:

Assembly and Putting Into Commission.

After unpacking and before assembling the parts, carefully remove from them all packing material or other foreign substance, and make an examination for broken lugs or plates. Also examine the rubber jars for cracks or holes made by nails improperly driven into the packing case. Assemble the cell by placing between each positive and negative plate one each of the perforated hard rubber and treated wood separators, the former adjacent to the positive plates. The smooth side should be placed against the negative plate. After slipping the assembled element into the hard rubber jar, fill with electrolyte of 1,210 specific gravity to a point about one-fourth inch below the cover, and allow the cell to stand in this condition for from six to 12 hours before



Batteries in Signal Case.

beginning charge. No harm will be done by allowing it to stand as much as 24 hours, but this is unnecessary. During the standing period and throughout the charge the height of the electrolyte should be watched (some of the electrolyte is absorbed by the plates and separators) and kept well above the top of the plates and separators, by adding 1.210 electrolyte, but not so high that it will overflow when gassing starts.

Charging should be commenced at the rate of five amperes, and this rate should be maintained throughout the entire length of the initial charge. In fact, it will be found a very practical and convenient rate for charging either new or old cells at all times.

As the initial charge progresses, the cells should be watched closely for the first few hours, and any cell developing a tendency to rise in temperature should receive special attention. If the cell continues to rise until a temperature of 100 degrees Fahrenheit seems liable to be reached, it should be cut out of circuit, to be examined for internal short circuit or faulty connection. It rarely occurs that a cell will show such tendency to rise in temperature, and in such cases the cause is usually apparent upon examination.

The initial charge should be of 40 to 50 hours' duration, not necessarily continuous, but such that the total amount of current delivered to the battery shall be approximately 200 ampere hours.

Note carefully, however, that the mere fact that a cell has received 200 ampere hours' charge is not to be taken as proof that it is in fit condition for service. From the time the initial charge is first begun, a complete record of each cell should be kept, particularly as to voltage, temperature and specific gravity, in a manner to be more fully described later, and this record should be the basis upon which the condition of)the cell is determined. After 200 amper hours' charge, a new cell will register approximately 2.55 volts and specific gravity of electrolyte will stand at 1.300 or perhaps a little less. All cells approaching these figures at that time may be considered ready for service. Never on any account begin charging with specific gravity above 1.300.

Ordinary Recharging.

In charges subsequent to the initial charge, the general rule is that the amount of current put into the cell should be twice the amount delivered by the cell during the 30 or less days elapsing since the next previous charge. Under normal conditions and service, the amount of current required of a cell will vary from 45 to 75 ampere hours per month; and the amount of current the cell should receive on recharge will correspondingly vary between 80 and 150 ampere hours. In this connection it should be borne in mind that while the type SS-7 cell has a capacity of only 51 ampere hours at its normal discharge rate, the capacity developed through a discharge extending over a period of 30 days may be as high as 100 ampere hours.

On account of the nature of the service, however, it cannot be known definitely just what amount of current has been delivered from the battery during the month, and it becomes necessary to determine just how many hours the battery shall be charged entirely from voltage and specific gravity readings taken during the progress of the charge.

Just before the cell is placed on charge the voltage and specific gravity should be taken and recorded, and during the progress of the charge similar reading recorded, taken at intervals of about three hours. It will be found that both voltage and specific gravity will gradually rise until a point is reached where charging for two or three hours fails to raise either. Then, and not until then, is the cell fully charged The maximum voltage at this time will vary for cells of different ages, although constant for any particular cell over a period of several months, but the specific gravity of the electrolyte at this point should always be adjusted, if below 1.270, to 1.300 for cells of all ages. It will be found that if cells have not received good care in the past and acid has been added unnecessarily, that the specific gravity will continue to rise greatly above 1.300. This indicates excessive sulphation of the plates, and in such cases the electrolyte should be successively reduced by dilution with pure water, the charge continuing uninterruptedly, until the cell no longer exhibits a tendency to exceed that point. It rarely occurs that a cell will fail to rise to 1.270, but in such an event, and the cell fails to show any rise during a period of six hours' charging, it should be taken off charge and discharged at about 10 amperes to a voltage of 1.5 volts. The electrolyte, which will then register probably about 1.150 or less, should be replaced with new electrolyte of 1.170 specific gravity and the cell recharged. The usual source of such trouble is in the electrolyte having been spilled from the cell while out on the road and replaced with water. Replacement for ordinary evaporation should be made with pure water only, but in replacement for acid spilled of course a certain amount of electrolyte must be used.

Each month, as the cells are returned to the charging station, they should be superfically examined for damaged parts, and the outside of wood cases and tops of rubber jars thoroughly washed. The terminals should receive special attention and all corrosion thoroughly cleaned off and a wipe of vaseline applied. All connectors should be taken apart and rinsed well in bi-carbonate of soda, then in water, and finally, when dry, dipped in some light mineral oil. It is important that corrosion be not allowed to accumulate on terminals and connections where it is almost certain to find its way into the cell.

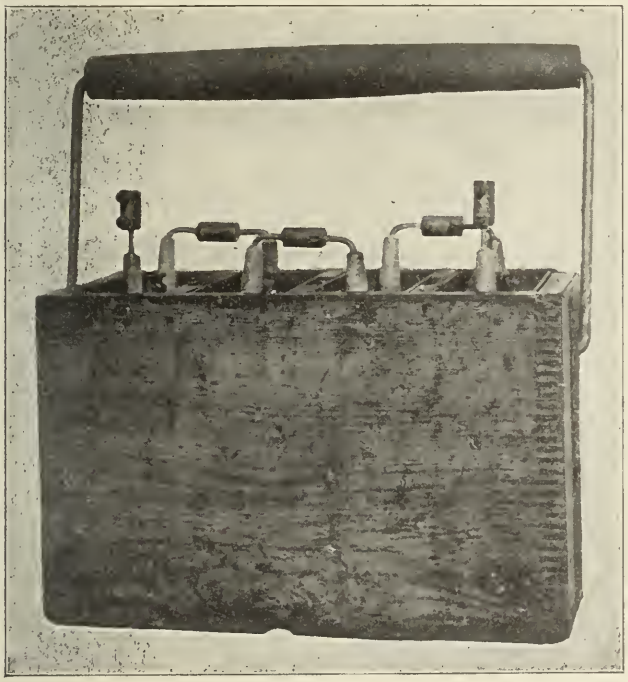
Special Treatment.

Once in six months each cell should be taken apart and closely examined for damaged or defective parts. The sediment should be cleaned from bottom of jar and the plates lightly washed before being replaced. The same electrolyte may be used again. The principal object of this examination is to discover any cell which should be discarded as too old or too much worn to continue in service for another six months, the determination in this case being based principally upon the mechanical condition of the plates with

regard to the amount of active material that has been lost out of them. A system of record should be adopted to insure that all cells receive the examination.

Once each year, the cell, after being charged in the ordinary manner, should be discharged at a rate of 10 amperes to 1.5 volts and a record kept of the ampere-hour capacity of the cell as thus developed. The old electrolyte at this time also should be thrown away and immediately replaced with new electrolyte of the same specific gravity. This is done in order to discard all impurities held in solution in the electrolyte, as it has been found that after a year's work in this service the electrolyte is almost certain to contain a greater or less amount of such impurity. This discharge and subsequent charge are important in more ways than one, and should not be neglected, in that they give a reliable estimate of the value and condition of the cell. Sometimes a cell which has become so badly sulphated as to appear worthless, and one which no amount of continuous charging seems to affect in the least favorably, will be again brought up to first-class condition merely by charging and discharging a few times. If a cell fails to register 40 ampere-hours or more on the first discharge, it should be charged and discharged a second time, and if necessary this process repeated until the requisite capacity is developed or the cell discarded as worthless. If the cell registers 40 or more ampere-hours' capacity on the first charge, a subsequent charge of 25 or 30 hours at five amperes will place it in condition for service.

Cells temporarily out of service should be kept in a fully



Wood Carrying Case.

charged condition by being given a freshening charge of 4 or 5 hours' duration twice per month. If it is not convenient to give them this freshening charge, they should be placed entirely out of commission in the following manner: First, give them a full charge, then remove the plates from the electrolyte and place the negatives and positives separately in water for about one hour to remove all acid. After draining and drying, the positives are ready to store away. If the negatives in drying become hot enough to steam, they should be rinsed or sprinkled with water a second time. When dry, completely immerse the negatives and allow them to stand for three or four hours in electrolyte of about 1.210 specific gravity. After washing and drying as before, they are ready to be stored away. Rubber separators should be rinsed in water and saved, but the wood separators are not worth saving unless comparatively new and in good condition. If saved, they should be kept immersed in water or weak electrolyte. In putting such cells into commission again, treat them as entirely new cells, being governed by the rules relating to placing new cells into commission.

The batteries are arranged four cells to a set, each set being assembled in a wooden carrying case with wood separators between the jars. The weight including the case is approximately 56 pounds per set. On some divisions the jars are set in compound in the carrying case and the tops of the cells sealed, although the majority of the signal supervisors favor having the jars and covers unsealed in order to facilitate inspection of the cells. Where cells are not sealed, the rubber covers are fitted with soft rubber lipped edges, which fit snugly to the sides of the jar and prevents sloppage of electrolyte. The cell terminals consist of a No. 6 copper wire cast into a projecting three inches above the pillar post on both positive and negative groups. The connections between cells are made with a brass battery connector.

The variety of temperatures experienced on different parts of the system has no apparent effect on the batteries and therefore no special housing is necessary to protect them from extremely cold or hot weather. On parts of the line through Idaho, Utah and Nevada the temperature frequently goes as low as 30 degrees below zero, yet no trouble is experienced from electrolyte freezing or batteries failing to operate the signals the required 30 days. During the hot summer months, it is necessary to replace the evaporation of electrolyte occasionally.

The batteries are housed in the lower case of the signal, which makes them easily accessible for inspection. The lower signal case also serves to accommodate the track and line relays. At the end of sidings on single track or other locations where two signals are opposite each other, one set of batteries is used to operate both signals and after the batteries have been in service fifteen days, the maintainer interchanges them with the batteries at the distant signal, this having the effect of equalizing the discharge to a considerable extent on all cells in service and avoids the necessity of charging cells for different lengths of time on their return to the charging plant and also eliminates the possibility of cells being discharged to a point that might result in a signal failure. During the first six months of 1910 there were a total of only 61 signal failures due to weak, dead or defective storage batteries and only 13 failures from poor or broken connections on storage batteries, or a total of 74 failures from all such causes on the entire system, which was less than five per cent of the total number of failures from all causes. The total number of signal movements during the same period was 48,758,000, and the number of movements per failure from storage battery causes amounted to 659,000, which is no doubt a more creditable showing than would be possible if primary batteries were used. In addition to the reliability of operation thus secured, the economical advantages of the portable storage battery over the primary battery, both for installation and maintenance is an important consideration.

Cost of Storage Cells.

1 cell SS-7 storage battery, complete	$4.85
2 battery connectors, @ 8c each	.16
Electrolyte	.03
Freight charges	.30
Total cost	$5.34
Cost of charging machinery and apparatus in 52 plants, @ $450 each	$ 23,400.00
Cost of 48,516 storage cells, complete, including freight charges	259,075.44
Cost of 12,129 carrying cases, @ $2.60 each	31,535.40
Total cost	$314,010.84

Cost of Primary Cell.

1 350-ampere-hour primary cell, complete	$2.00
Freight charges	.20
Total cost	$2.20
Cost of 178,480 primary cells, complete, including freight charges	$392,656.00
Cost of 9,026 concrete battery wells, @ $25 each	225,650.00
Freight charges on 9,026 concrete battery wells, each weighing 1,600 pounds, @ $20 each	180,520.00
Charges for work train and locomotive crane or derrick with crew for unloading and placing 9,026 battery wells, 90 days @ $50 per day (estimated)	4,500.00
Cost of labor for digging holes and setting 9,026 battery wells, @ $10 per well (estimated)	90,260.00
Total cost	$893,586.00

Cost of Maintenance of Storage Cells Per Year.

Interest on investment of $314,010.84, @ 5%	$ 15,700.54
Depreciation on 52 charging plants costing $23,400, at 10%	2,340.00
Depreciation on 48,516 positive groups, costing $1.57 each, @ 22%	16,757.43
Depreciation on 48,516 negative groups, costing $1.835 each, @ 25%	22,256.71
Depreciation on 12,129 carrying cases, costing $2.60 each, @ 10%	3,153.54
Cost of renewals of broken jars, covers and separators on 48,516 cells, at 9 cents per cell per year	4,366.44
Cost of electrolyte renewals on 48,516 cells, @ 3 cents per cell per year	1,455.48
Cost of current, gasoline, oil, etc., at charging plants per year, @ 18 cents per cell	8,732.88
Total cost	$ 74,763.02

Cost of Maintenance of Primary Batteries, Per Year.

Interest on investment of $893,586, @ 5%	$ 44,679.30
Cost of renewals for 178,480 cells per year, at $1 each	178,480.00
Cost of renewals of broken jars and covers on 178,480 cells per year, @ 7 cents per cell per year	12,493.60
Total cost	$235,652.90

With reasonable care, the average life of SS-7 portable cells and their component parts are found to be as follows:

Positive elements	4½ years
Negative elements	4 years
Rubber jars	10 years
Rubber covers	10 years
Rubber separators	10 years
Wood separators	2 years
Carrying cases	10 years

No charges are made for transporting storage batteries either when handled on passenger or freight trains and even though a nominal charge should be assessed, the amount would not exceed the freight charges over foreign lines for renewals for primary batteries. This item is therefore not included in the foregoing cost of maintenance of storage or primary batteries, neither is the expense for labor for charging, inspecting and changing out storage cells or making renewals to primary cells taken into consideration, for the reason that so far as it can be ascertained from Western roads using primary battery, the cost for labor for maintaining primary batteries is practically the same as with portable storage battery. The batteryman looks after the charging of the storage batteries on a district averaging 104 miles, the maintainers assisting in distributing the batteries, which requires on an average two days time of each maintainer monthly. Maintainers' districts range from 14 to 20 miles according to the number of signals, local conditions, etc. The average district is approximately 16 miles with 32 signals. Maintainers have no helpers and are required to look after all work in connection with the maintenance of signals on their district including the care of signal lamps.

The prices as shown for both portable storage batteries and primary batteries are the regular list prices less the usual trade discount. The freight charges are figured on an average basis for the entire system and are reasonably accurate.

The cost for current for operating motor-generator sets or arc-rectifier plants varies from one-half cent to five cents per kilowatt and the cost for generating current with gasoline engine-generator sets is about ten cents per kilowatt. Taking an average for the entire system, the annual cost for charging current is 18c per cell.

The foregoing is intended to cover the conditions existing on the Harriman Lines only and is the result of the experience of 20 years with the use of portable storage batteries on those lines. The conditions on many Eastern roads are no doubt radically different. The item of freight charges on material which is purchased in the East or Middle West is a heavy expense for roads in the Far West, although even with the elimination of these charges from the cost of installation and maintenance, the results under the operating conditions in the Far West, would still leave a substantial difference in favor of the portable storage battery installation.

Discussion on Portable Storage Batteries.

The Secretary: I have two criticisms on the paper, and following the usual custom, if there is no objection I would like to read them. The first one is by Mr. Everett, signal engineer of the Michigan Central.

Mr. Everett: The average life of caustic soda primary battery on the Michigan Central, where the battery operates the motor and slot only on normal clear signals, with an average of 33 movements per day, is about 24 months. We have many cases, however, where batteries have run over three years on one charge, and some that are approaching four years. We seldom find it necessary to renew primary batteries during severe cold weather.

Cost to install caustic soda battery (400 ampere hours):

Battery (permanent parts of 14 cells)	$14.00
Shelter (concrete battery box)	11.00
Labor	6.00
Total	$31.00

Maintenance caustic soda battery per year:

Interest on investment at 5 per cent	$1.55
Depreciation of 2 cents	.50
Cost of renewals	6.30
Labor (one-third day each two years at $2 per day)	.34
Total per signal per year	$8.69

Mr. McKeen does not show labor cost. With caustic soda cells, the cost for labor to maintain per signal per year is 34 cents. With storage battery, using a motor car or hand velocipede car the time of trip to each signal would be shorter than for caustic soda cells, but would need to be made twelve times per year, or twenty-four times to one for caustic soda cells.

Assuming on the Michigan Central that it would be safe for one $2 man to carry two sets of storage batteries on his car, and that he could change them out and return in the same amount of time it takes to carry out material, renew primary battery and return, the cost per signal for changing storage batteries would be 34 cents per month, or $4.08 a year. To this must be added labor for handling at stations and charging plants, including shipping in baggage cars or otherwise. Estimated conservatively under conditions such as would prevail on the Michigan Central, this would cost 30 cents per month per battery, or $3.60 a year, making a total for labor in handling storage battery cells of $7.68 per battery per year, as against 34 cents for the caustic soda primary battery.

A few years ago we tried several different makes of portable storage batteries, but found that the cost of handling and transporting was prohibitive.

The Secretary: The second criticism is from E. E. Hudson of the Edison Manufacturing Company.

E. E. Hudson (Edison Mfg. Co.): I have read Mr. McKeen's paper, entitled "Portable Storage Batteries, as Applied to Automatic Signals on the Harriman Lines," with a great deal of interest, and believe a liberal discussion cannot fail to be of value to all members of the association.

It seems unfortunate, however, that the paper is of such a nature as to bring forth a discussion of the relative merits of two devices from a commercial standpoint, in open meeting of the association. It is with the greatest reluctance, therefore, that I felt impelled to resent a few remarks in criticism of some of the statements contained in the paper.

A careful analysis of the figures discloses a number of apparent inaccuracies, and for this reason I feel, in justice to my company and the other primary battery manufacturers, as well as to those signal engineers who have installed primary batteries in large quantities, that accurate data should be presented.

Under the caption of "Cost of Primary Cell," Mr. McKeen gives the price of one 350 A. H. cell at $2; freight charges, 20 cents; total cost, $2.20. The prevailing price of a 400 A. H. primary cell complete, meeting R. S. A. specifications, is $1.95 in less than carload lots, with freight allowed to points east of or on the Mississippi River. In carload lots the difference in freight between C. L. and L. C. L. to Chicago reduces the cost per cell to $1.90.

The item of 20 cents per cell for freight is probably correct for shipments from New York to Pacific Coast or Rocky Mountain points, but it is greatly in excess of what would be the cost of freight on average shipments to Harriman Lines, especially after deducting the allowance made to equalize Chicago delivery.

The most serious objection to the figure shown as representing the cost of primary battery, however, is that the whole cost of the complete cell, including the active elements and the freight thereon, is shown as a part of cost of installation; whereas, the storage cells are received in an unchanged condition and the cost of maintenance starts from the time they are set up (see the advance notice, "Assembling and Putting into Commission"). In other words, the figures supposed to represent the cost of installation of primary cells include practically all of the cost of maintenance for a year or more, and a like charge is not included in cost of installing storage cells. Therefore only the cost of the inactive or permanent parts of primary cells is properly chargeable to cost of installation or first cost.

The price of a 400 A. H. renewal complete is 96 cents, and after deducting this from the price of the complete cell we get a cost for permanent parts of 99 cents per cell in L. C. L. shipments and about 96 cents per cell in carload shipments.

The shipping weight of the complete renewal is almost exactly one-half that of the complete cell; freight on the permanent parts only should be considered as a part of first cost.

A total of 178,480 primary cells is used by Mr. McKeen as a basis for figuring cost, but he does not explain how he arrived at this figure. The storage battery costs are based on 9,026 battery locations. The number of signal locations is not given. I can see no good reason, however, why more than 16 primary cells per battery location, or a total of 144,416, should be considered necessary, as, if it is considered safe to use a battery of four lead-type storage cells

for two signals at double location, it is certainly equally as safe to use a single battery of 16 primary cells of recent standard construction for the same purpose. In most of the cases with which I am familiar where a single series of primary cells is used for two signals, there are 20 cells to a battery, but in these cases the operation of the signals is more vigorous and clearing is accomplished in a shorter period than with 16 cells on a single signal.

The remainder of the figures in Mr. McKeen's estimate of cost of installation of primary cells relate entirely to the cost of concrete battery wells and the cost of transporting and placing them in position, amounting to $500,930 in a total of $893,586. In these costs Mr. McKeen has assumed the installation of a well of the type for which prices are given at each of the 9,026 battery locations. I am of the opinion, however, that even if it had been decided to use primary battery at these 9,026 locations, it is hardly likely that the Harriman Lines' engineers would have installed such wells at about two-thirds of these locations at points where cold weather is not experienced.

In making my estimate of costs I have not considered the use of wells for two reasons—(1) in nearly all of the cases that I know of where wells have been installed they are not used solely for the housing and protection of soda or potash batteries, and (2) because there are some roads using Edison Primary Cells in large quantities, which use wooden battery boxes. The cost of these boxes varies slightly, according to conditions, the average being about $10 each installed.

Using the foregoing corrected figures as a basis of calculation, the cost of primary battery equipment for a single installation similar to that on the Harriman Lines will be as follows:

Cost of 144,416 cells, less cost of first "renewals".	$138,639.36
Cost of freight in carload lots to average point on Harriman Lines, after deducting freight on active elements and manufacturer's allowance 5 cents per cell	7,220.80
Cost of 9,026 bat'ery boxes, installed $10 each...	90,260.00
	$236,120.16

I have figured on the cost of cells and that part of the freight to be borne by the railroad as in carloads not only because all cells would be shipped in carloads on an installation of this size, but also because it requires only 1,600 complete cells to make a carload, and any representative job would include sufficient cells to secure carload rates.

The cost of the cell is the regular price to railroads, no deduction being made because of the quantity involved, notwithstanding that it is altogether probable these cells could be purchased at somewhat lower prices in lots of 100,000 or more.

I have not included any charge in the above estimate for labor cost of installing cells, as this was not considered by Mr. McKeen for either type of battery; furthermore, I have no figures covering this point either for primary or storage cells.

C. F. Massey, president of the C. F. Massey Company, has furnished me with the following figures representing the estimated cost of battery wells for such an installation as that on the Harriman Lines.

3,009 for points where extremely cold weather prevails during winter months at $22.00 each.....	$66.198.00
6,016 wells for other locations at $15.00 each....	$90,255.00

The transportation charges estimated by Mr. McKeen on battery wells at $180,520.00 or $20.00 per well may be eliminated almost entirely, as figures given above by Mr. Massey contemplate delivery at some central point on the Harriman Lines.

Mr. Massey states that from his experience and records of cost in setting up those types of battery wells, $5.00 per well would pay for the labor of digging the holes and placing the wells in position.

Revised cost of installation of primary battery using the foregoing corrected figures as a basis for calculation would be as follows, for a primary battery equipment for a signal installation similar to that on the Harriman Lines.

Cost of 144,416 cells less cost of first renewals....	$138,639.36
Cost of freight in carload lots to average point on the Harriman Lines after deducting freight on active elements, and manufacturer's allowance, $ .05 per cell	7,220.80
Cost of 3009 style "F" Massey wells at $22.00 each, complete	66,198.00
Cost of 6017 style "E" Massey wells at $15.00 each, complete	90,255.00
Charges for work train and locoomtive crane or derrick with crew for unloading and placing 9,026 battery wells, 90 days at $50,00 per day...	4,500.00
Cost of labor for digging holes and setting 9,026 battery wellls at $5.00 per well.....	45,130.00
	$351,943.16

The figures shown as representing the cost of interest on investment will be reduced materially because of the reduction on first cost of permanent equipment.

Mr. McKeen assumes one renewal per primary cell per year, but the method employed in arriving at this estimate is not given. He states, however, that the total number of automatic signal blades on the entrie system on December 31st, 1910 and 13,050, and that the total number of signal movements during the first six months of 1910 was 48,758,000. Assuming the number of blades to have been about the same during the last six months as during the first six months of the year, the average number of movements per blade per day would have been 22⅓. Under ordinary conditions, a set of primary cells of 400 A. H. capacity would last very much longer than a year on one charge with this amount of work; or even if we assume that a considerable number of additional blades had been installed during the last six months of 1910, and the number of movements or even 30 a day, a set of primary cells would still last very much longer than 12 months on one charge under ordinary conditions.

The amount of energy upon which Mr. McKeen's estimate of the cost of storage battery operation is based may be determined, fairly accurately, by using the figures he has given, and in this way the probable life of primary cells in performing the same service ascertained.

The cost of charging current from small one K. W. plant is given as about $.10 per K. W. hour, and for motor-generator sets arcrectifiers one to $.05 per K. W. hour. As the amount of charging from the two latter methods probably represents a very small percentage of the total, it would undoubtedly be reasonable to assume that the average cost of charging is about $.09 per K. W. hour.

The cost of charging current is given at $.18 per cell per year which would cover an average of 2 K. W. hours per cell per year, or a total input for 48,516 storage cells of 97,032 K. W. hours per year. With this information, it is only necessary to determine the efficiency or effective output from the cells to ascertain the amount of current used per year in the operation of the signals on the entire system. This can also be determined approximately by the use of figures given.

It is stated in reprint from the book of rules and regulations of the maintenance of way department, under the heading "Ordinary Recharging" (see Advance Notices) "Under normal conditions and service, the amount of current required of the cell will vary from 45 to 75 A. H. per month; and the amcunt of current the cells should receive on recharge will correspondingly vary between 80 and 150 A. H." In other words, the ampere hour output is only one-half of 50 per cent. of the ampere hour input. The watt hour efficiency is much less, however, because of the difference between the voltage on charge and discharge. The charging voltage must be about 2.6 per cell, while the mean discharge voltage is 1.98, therefore, it reqires an input of 260 watt hours to obtain an effective output of 99 watt hours, the efficiency in service on this basis being 38 per cent. under normal conditions. But if we take into consideration the current used in a special treatment of cells, as required by the book of rules, as well as the various other losses due to local action, reduction of output in cold weather and the charging of cells not fully discharged in order to avoid sulphation, and we will probably find that the actual efficiency in service does not exceed 30 per cent.

Taking this percentage of efficiency as a basis, it will be seen that from an input of 97,032 K. W. hours for the 48,516 storage cells the effective cutput is 29,110 K. W. hours.

To find the equivalent ampere-hour capacity in primary cells necessary to reduce this amount of energy it is only necessary to take the total of 144,416 primary cells required to displace the total number of storage cells, multiply by .6 the mean working voltage per cell under such conditions as prevail on the Harriman Lines, and divide the product (86,650 volts) into 29,110,000 watt hours (29.11 K. W. hours). This will give us a result of 336, representing the average ampere-hour consummation per year if primary cells were used on this installation.

At this ratio, cells of 400 A. H. capacity would last 14⅓ months on one charge. This estimate compares favorably with the service that is being obtained on other roads where the conditions of service are about the same as those on the Harriman Lines.

At a cost of $.96 per renewal, this makes the renewal cost per cell $.80 per year, without considering the value of the scrap. But as an allowance of $.16 each is made for the exhausted copper oxide and zinc plates when returned to the

manufacturer a still further reduction should be made. This allowance will net the railroad company, after deducting freight, about $.14 per cell, or $.12 per cell per year in this case making the net cost of the renewal $.68 per cell per year instead of $1.00 as shown.

The third item of $.07 per cell per year for the replacement of broken jars and covers is entirely too high. In order to determine just what this amounts to, I went through our records covering shipments of extra jars and covers for one year to a number of roads representing a total equipment of about 110,000 cells, and found that we had shipped to these roads 876 extra jars and 432 extra covers during the year. Assuming all of these jars and covers to have been required for replacing broken ones, the annual percentage of breakage would be 7-10 of one percent or about 2-3 of one cent per cell per year, including freight.

With these figures we are able to arrive at the annual cost of maintenance, for such an installation would be as follows:

Interest on investment of $236,120.16 at 5 per cent.	$11,806.00
Cost of renewals for 144,416 cells per year at $.68 each	98,202.88
Cost of renewals of broken jars and covers on 144,416 cells at 2-3 per cell per year	962.78
	$110,971.66

I cannot agree with Mr. McKeen in his assertion that the cost of labor in handling storage battery is not greatly in excess of that required for the renewal of primary cells. Even if we assume that there would be thirty-two sets of battery on each maintainer's section, the renewal of this number of primary cells would not require more than two days a month that is now devoted to the distribution of storage cells. This leaves the entire cost of the special batterymen chargeable to storage battery maintenance, as being in excess of the labor rquired for th care of primary cells. As each of these men cover a section of 104 miles, I take it there are about 52 on the entire system, and if we place the salary of these men at $100 per month there should be added $62,400 a year for the cost of storage battery maintenance.

The revised figures for maintenance, after including these additional items, are as follows:

Original estimate	$ 74,763.02
Interest on cost of lower battery cases and installation of power houses, $269,702, at 5 per cent.	13,485.10
Fifty-two special batterymen at $1,200 per year	62,400.00
	$150,648.12

The President: Gentlemen, we are full of figures. This paper is without doubt interesting as a description of portable storage batteries as applied on the Harriman Lines. We have had Mr. McKeen's statement of the cost of the storage battery and the estimated cost of the primary batteries and we have heard that it is not all so. We cannot devote much time to the discussion of cost in this connection. I do not think it is advisable to do it, at any rate. Are there any questions in regard to relative merits of service given by either types which would be of information to other members? We can well spend some time in going over it, but we cannot begin to dispute figures, because we haven't any figures. They have them all, and it is hardly within the province of the association to decide whether primary or storage batteries should be used by the railways of the United States. Probably they want to use both. Conditions may vary somewhat. I think the remarks should be confined to the relative operating merits of the scheme. We have heard both sides as to cost, and if there are any questions relating to methods of charging or details of operation we can spend a few minutes on discussion.

Mr. Shaver: I would like to quote a few figures, as a matter of record and information for the association. They are actual figures. We have kept an account of some of the details of work constructed last year, and we found that the actual cost of setting 224 battery wells, of the kind listed in the Massey Company's catalogue as Style C, cost us $5.67 each. The cost of setting up 3,520 cells of potash battery, which includes unpacking and disposal of the rubbish and the like, was thirteen cents a cell. I might explain that this can be done more cheaply, but we have learned to use a great deal of care in setting up a primary battery, and our men take sufficient time to be absolutely sure that all the caustic soda is dissolved and the temperature right before putting it in the well. In giving this question study we have found that battery boxes can be used with good results, such boxes as we have used costing us about $7.00 each, but special care is necessary in the maintenance in some of the colder climates. Then again we find that it is an advantage to have one receptacle in which we can place gravity battery. Therefore, we are using a battery well. In our southern territory we can use a well that is more shallow and costs less money. We paid about $18 each for those wells, while in the northern territory we have been using a deeper well that will keep the gravity battery below the frost line. Such batteries have cost about $45 each. As to the life of a caustic soda battery, a great deal is dependent upon the circuit and the style of signaling used. We have some signals installed with control circuits that lead from the potash battery that operates the signal, and a very careful record kept of that battery showed an average life of a little better than 11 months; in some cases it ran as high as 13 or 14 months. We have other signals with different circuits, where the life of the battery is not so long. Then, again, climatic conditions cut some figure. So I believe it is impossible to make a comparison as between railways. It is, however, possible, to make a comparison as to the cost between different parts of the same road where climatic conditions and the circuits are the same, but unless the circuits and traffic conditions are the same no good comparison can be made.

Mr. Dryden: Nothing has been said concerning the method of charging by means of gravity cells. On the Baltimore & Ohio we have 500 signals operated from a storage battery charged by a gravity battery. On a four-track road one group of six cells of storage battery operates four signals and lights four signals. The charging circuit is from 18 to 22 cells of gravity battery. The life of these batteries is from five to six weeks. The efficiency is all that could be expected.

Mr. Shaver: If Mr. McKeen's article is included in the literature of the association it would be of considerable benefit if we could have a plan of circuits showing the resistance of the various relays and slots, together with a statement of traffic. That, with the figures given, would be a basis for anyone to make comparisons with his own line if he wishes to do so. A vote of thanks was tendered to Mr. McKeen.

The President: We will take up the next paper, "Principles Governing the Selection of Alternating Current Signaling Apparatus," by L. Frederick Howard.

PRINCIPLES GOVERNING THE SELECTION OF ALTERNATING CURRENT SIGNALING APPARATUS FOR RAILROADS.

L. Frederick Howard presented the following paper:

The object of this paper is to state the principles which call for attention in the selection of alternating current signaling apparatus, and to discuss their bearing on the system embodying such apparatus. Both electric and steam road conditions are considered.

Inductive Bonds.

From the point of view of the signal engineer the inductive bond constitutes a leak from rail to rail for the alternating signaling current, the same as do the ballast and ties.

Referring to Fig. 1 it will be seen, however, that, while the leak through the ballast is distributed through the bonds is concentrated at the ends of the track circuit, being the greatest of course through the bond nearest the transformer where the voltage is highest.

Furthermore, since the bonds constitute an inductive leak, while the ballast and ties constitute an ohmic leak, the actual sum of the two kinds of leakage is less than the arithmetical sum.

The leakage through the ballast increases with wet weather. The leakage through the bonds increases when for any reason unequal amounts of propulsion current above a certain value flow through the two halves of the bond winding.

When this inequality exists the bond is said to be "unbalanced."

The unbalancing current is the difference between the values of the propulsion current carried by each rail, and flowing in either half of the winding. The iron core of the bond is magnetized by this unbalancing current as well as by the signaling current. The measure of the magnetizing force of the propulsion current in ampere turns is the unbalancing current in amperes multiplied by one-half the number of turns in the bond. Under ideal conditions no unbalancing exists, each rail carrying an equal portion of the total propulsion current.

Now when iron is magnetized to a certain point, an increase in magnetizing force does not produce as great a change in the degree of magnetization of the iron as it would if the iron were not magnetized to that point.

Hence it comes about when unbalancing occurs, that the iron core being magnetized to a certain point by the "unbalancing" portion of the propulsion current, the alternating signaling current passing through the windings does not produce as great a change in the magnetization as if equal

amounts of propulsion current were flowing in the two halves of the winding, which would be the ideal condition. The reactance therefore decreases and more alternating current leaks through as the unbalancing increases.

To decrease the variability of the leakage through the bond with variation in the unbalancing, there is introduced in the magnetic circuit of the bond an element which, while it will not allow as much magnetic flux to pass with a given magnetizing force, will always, when considered by itself, give a change in flux corresponding to the change in magnetizing force. This element is air. In other words, an air gap is provided in the magnetic circuit of the bond.

The iron may be looked upon as the element which gives to the bond a low but variable value of leakage, making the bond sensitive to unbalancing.

The air gap may be looked upon as the element which gives a high but more constant value of leakage, and lesser sensitiveness to unbalancing.

The typical curves, Figs. 2 and 3, illustrate this. The ordinates show the amounts of alternating current which will leak through the bond when the A. C. voltage marked on each curve is applied across the terminals of the bond, and when the values of unbalanced propulsion current correspond to the abscissae.

In one set of curves there is no air gap in the magnetic circuit of the bond. In the other there is an air gap of 0.05 in. With 0.4 volt A. C. across the bond terminals it will be seen that with no unbalancing the "leak" is 2.5 amperes in the first case, and 4.5 amperes in the other. For the same A. C. voltage but with 160 amperes unbalancing the "leak" is 5.0 amperes and 4.0 amperes respectively.

The decrease of the "leak" with small amounts of unbalancing, (Fig. 3) is due to the fact that at certain stages of the magnetization of iron a given change of the magnetizing f rce (in this case the alternating current) produces a greater corresponding change in the degree of magnetization, and consequently the reactance increases.

The point at which the leak through the bond increases is not necessarily of course the failing point of the track circuit, for this depends also on the factor of safety allowed in the supply of energy to the track circuit.

That is to say, so far as the signal engineer is concerned, he can avoid signal failures due to unbalancing by using a bond with no gap or small one, and using a sufficiently high voltage on the track circuit to take care of the variations due to unbalancing, or by using a large air gap and taking more current initially. In both cases, however, the provision for unbalancing means an expenditure of energy, but with the advantage in favor of the bond with the air gap, because of the increased stability of the track circuit and consequent reduction of voltage variations across the terminals of the relay.

As stated before, the magnetizing force due to the unbalanced propulsion current may be expressed in ampere turns. Therefore, if an unbalancing of 300 amperes, for example, exists in a bond with eight turns, and the tap at the middle, the magnetizing force due to the unbalancing is 1200 ampere turns.

For the purpose of testing how this degree of magnetization is going to affect the "leak" of the alternating signaling current, we can, where a current of say 300 amperes is not available, use a test coil of a large number of turns and taking correspondingly less current.

We cannot apply our alternating voltage to the same coil, however, for the meters would not differentiate between the two kinds of current, so another winding is necessary for the alternating signaling current preferably of low enough resistance to give no appreciable resistance drop.

But the first coil will now act as a secondary to the coil carrying the alternating signaling current, and an A. C. voltage will be set up in it causing reactions on the coil carrying the alternating signaling current which would vitiate the readings. Two bonds with their test coils are, therefore, connected as shown in Fig. 4 to neutralize this transformer action in the coils carrying the propulsion current.

The desirability of a small leak through the bond is accentuated by the fact that all the current leaking through the bond at the relay end of the track circuit has to be transmitted over the rails, with an increase in the voltage across the rails opposite the transformer, over the voltage across the rails opposite the relay, sufficient to compensate for the drop in the rails. The more the current taken by the bond the more the drop over the rails and consequently the higher the average voltage across the rails. This in turn means greater leakage through the ballast, and through the bond opposite the transformer.

But for the same reason that the actual sum of the bond leakage and the ballast leakage currents is less than their arithmetical sum, that is because of their being out of phase, due to the reactive component of the bond impedance, so the drop in voltage over the rails is less than the arithmetical sum of the drops due to the two leakage currents. The two currents will have the greatest phase displacement when the reactive component of the impedance of the band bears the greatest ratio to the ohmic component.

To sum up then, to keep down the power consumption for the signal system the bond should have low resistance, low iron losses and high reactance, or in other words, if the bond is energized with alternating current and properly connected with a ammeter, voltmeter, and wattmeter, it is desirable that the quotient obtained by dividing the volts by the amperes should be as large, and the watts as small, as possible. In this test the voltage should be the same as that to be used in service.

In addition to the reasons already mentioned, there are two others why it is desirable that the ohmic resistance of the bond should be low. Resistance is one of the factors in determining the temperature rise of the bond due to the flow of the propulsion current. It is also a factor in determining the value of the propulsion current voltage to which the relay is subjected when "unbalancing" exists.

Suppose in Fig. 1 the resistance of the two parts of the bond winding from A to B and A to C to be 0.0002 ohm each and that 2000 amperes are flowing in each rail. Then as the watts lost by a current flowing in a conductor are equal to the square of the current multiplied by the resistance of the conductor, the watts lost in the bond and connections due to the propulsion current, will be $2 \times \frac{2}{1000} \times 0.0002 = 1600$, or a little over two horse-power.

This loss shows itself in the form of heat, and the radiating surface of the bond should be sufficient to keep the temperature rise down to a point below that at which the insulating materials used in the bond begin to deteriorate.

As a rule this point is much higher than for most electrical apparatus.

Whether or not the capitalization of the loss would warrant the use of a larger size of copper depends on the cost of the propulsion current.

There is another important result due to unbalancing.

Supposing in Fig. 5 that unbalancing exists to the extent that 2500 amperes are flowing from A to B and 1500 amperes from A to C, then if the resistances from A to B and A to C are each 0.0002 ohm, the voltage drop from A to B is $C \times R$ or $2500 \times 0.0002 = 0.5$ volt. From A to C the drop is $1500 \times 0.0002 = 0.3$ volt.

The difference between these two drops, i. e., 0.2 volt, is the voltage across the rails, due to the unbalanced propulsion current, tending to cause the propulsion current to flow through the windings of the relay or transformer connected to the rails at that point.

It is easily seen from these examples that while resistance in the winding of the inductive bond is objectionable, its effects can be predetermined and allowed for in the design and selection of both the bond itself and the related apparatus. The exact value of the resistance to be used can be decided on when its various effects on cost and operation have been considered.

For the electric railway engineer direct current inductive bonds have at first thought just one point of interest, i. e., circular mils. This is because he always thinks first of the cross sectional area of his rail joint bonds.

What he is really interested in is the resistance introduced by the inductive bond in the return path of the propulsion current, and this resistance depends upon the length of the winding of the bond as well as on its cross section.

Furthermore, the inductive bond may be used only once in a mile of track, while the rail joint bonds occur every rail length, so it is at once apparent that so far as the electric railway engineer is concerned, the winding of the inductive bond may have a much smaller cross section and a much higher resistance than the rail joint bonds, and nevertheless introduce only a small percentage increase in the resistance of the return path of the propulsion current.

What has been said so far concerning reactance bonds has been said with the bonds in mind which are used on D. C. electric roads. The same principles apply in the case of the bonds for A. C. propulsion roads except in the case of unbalancing.

The trolley voltages used with A. C. propulsion are much higher than with D. C. propulsion, and the propulsion current is correspondingly lower. For instance, where 2000 amperes per rail were assumed in a previous example, supposing 500 volt D. C. propulsion, for 11,000 volt A. C. propulsion the current would be, say 100 amperes per rail.

It is at once apparent that the heat generated in the bond by the A. C. propulsion current will be much less than with the D. C. current with a given resistance of winding.

The A. C. propulsion current being small, a given percent-

age of allowable unbalancing means also a small actual value of unbalanced current to be provided for.

Now, the most common cause of unbalancing, i. e., the introduction of resistance in one side of the rail circuit by poor bonding, is common to both A. C. and D. C. propulsion. The effect of resistance in the two cases is different, however. With the D. C. current, doubling the resistance of one side of the rail circuit would mean that one-half as much propulsion would flow on that side as the other, and we would have 33⅓ per cent unbalancing.

The impedance offered by the rails to the flow of the A. C. propulsion current consists of both resistance and reactance however, and the resistance component is larger than the resistance offered by the rails to direct current because the alternating current tends to flow through the shell of the rail. Therefore, if we introduce the resistance, say a poorly-bonded joint which caused an unbalancing of thirty per cent with direct current propulsion, the unbalancing will be about eight per cent with the 25 cycle propulsion, neglecting the transformer action of the bond.

The fact that the unbalanced currents to be provided against with A. C. propulsion, are so much smaller than with D. C. propulsion, is very fortunate, on account of the transformer action which takes place in the bond when unbalancing occurs.

Referring to Fig. 5 it will be remembered that with equal amounts of current flowing through the two halves of the winding there is no magnetic effect on the core of the bond. With unequal amounts of direct current flowing it was shown that the core became magnetized, and a difference of D. C. potential appeared across the terminals of the bond equal to the value of the unbalanced current in amperes multiplied by the resistance from the middle of the bond to the rail.

With the unbalanced alternating propulsion current the difference of potential appearing across the rails, due to the propulsion current flowing through one-half the winding of the bond would be small, if the resistance only were considered, for we have shown that the amount of the unbalanced current against which it is necessary to provide is small. We have, however, shown that it is very desirable to have a bond of high reactance to keep down the leakage from rail to rail of the signaling current. But the flow of the unbalanced alternating propulsion current is also opposed by the react ance and we have a potential set up between the middle part of the bond and the rail, the value of which is proportional to the frequency and amount of the unbalanced current, and the reactance of the bond.

Moreover, as the magnetic circuit of the bond is common to both halves of the bond winding, the other half of the winding will act like a secondary to the first, and we will get twice the potential across the rails which is developed by the unbalanced propulsion current flowing through one-half of the bond wiring. It is seen, therefore, that when the reactance of a bond for A. C. propulsion is increased to reduce the leak of the signaling current, the selective track relay must be able to take care of a correspondingly higher value of the potential across the rails due to unbalanced propulsion current.

Track Relays.

Fig. 6 illustrates one way in which a relay on a steam road may be subjected to the influence of foreign or stray current. A steam road is shown paralleling an electric road for a short distance and finally running into the town where the power for the electric road is generated. The return current from the electric road passes on to the steam road rails, and back over them by way of ground and pipes to the negative side of the propulsion generator. In so doing it may pass through the steam road relay.

In the same manner Fig. 7 shows how a track relay on what has become known as a single rail track circuit of an electric road, may be subjected to the influence of the propulsion current.

Fig. 5 shows the same thing for what is known as the double rail track circuit for an electric road where unequal amounts of propulsion current are flowing in the two rails because of a defective electrical joint, say at the terminals of one of the inductive bonds or at a rail joint. In Fig. 5 the amount of foreign current voltage to which the track relay will be subjected will be extremely variable, and dependent on such unknown and variable quantities as the resistances of the various paths through which the current flows.

In Fig. 6 the amount of foreign current voltage to which the track relay circuit will be subjected can easily be ascertained, and increased for estimating purposes to represent any condition of bad track bonding desired. Its value is the resistance of the continuous rail between points A and C multiplied by the maximum amount of propulsion current which can flow between A and C. The value of the voltage due to the propulsion current which will exist across the terminals of the track relay, will bear the same proportion to the propulsion current voltage between points A and C as the resistance measured across the terminals of the relay bears to the resistance between A and C by way of B. Where the relay is shunted by a coil to divert the propulsion current, the resistance measured across the terminals of the relay is of course the parallel resistance of relay and shunt.

In Fig. 5 the propulsion voltage which would exist across the rails at the inductive bond, when unbalancing exists, has been discussed in detail under reactance bonds.

Having determined the voltage due to the propulsion current to which the track relay may be subjected in service, this voltage should be applied to the track winding of the relay being considered and the effect on the speed of action of the relay and on its temperature rise noted. The lattter should be well below the point causing any binding due to expansion, and below the point at which the insulation would soften on the hottest summer day.

If the relay has two energizing windings the effect should also be tried of short circuiting the terminals of the track winding and setting the moving element in various positions both with the other winding open and with it energized to various degrees with the frequency of alternating current which it is proposed to use.

Where the relay is designed to give protection against broken down insulated joints, the track winding should also be subjected to a voltage differing in phase from that normally supplied, by the smallest amount which could occur in practice. Under these conditions the contacts should of course open. The relation of the pick-up and drop-away voltages should be tested for mechanical reasons.

Transformers.

The selection of transformers for signaling purposes should comprise a consideration (in addition to that of cost) of insulation, regulation, and efficiency.

The insulation should be equal to that of the transformers of the best manufacturers. The ground shield is probably desirable for the same reasons as the grounded secondary of the commercial transformer for which it is a substitute. The regulation of a commercial transformer pertains to the change in secondary voltage which takes place between full load and no load. A signal transformer generally has two or more secondaries. Its load generally consists of a constant part and a variable part, the latter being due in most cases to changes in load on track secondary or secondaries due, for instance, to the presence or absence of a train on the track circuit, and to the operation of the signal motor.

The voltage variation to which the connected apparatus may be subjected being less, therefore, than that which occurs on going from full load to no load, the signal engineer should from his track circuit plan determine for each secondary the conditions which give the maximum and minimum loads on the transformer coincidentally with the maximum and minimum load on any secondary, and specify the voltage variation allowable on that secondary for those conditions.

As regards efficiency, the customer should know the losses in his transformer in order to determine whether or not their capitalization indicates any change of conditions, either in his system or in the transformer, which would insure an ultimate saving. The losses which occur in the transformer when carrying its prevailing load should of course be the determining factor, and not the losses occurring when the signals are clearing or the track circuit occupied, if this occurs but seldom.

The losses occurring under these latter conditions should be given due weight, however.

When a transformer serves the double function of supplying current, and also regulating the amount of current under short circuit conditions, the transfomer losses, should be credited with the losses which would be entailed if some other means of regulating the current were used.

Signal Motors.

The choice of the motor for the signal is influenced by very much the same considerations as for other purposes except that the actual efficiency of the motor, i. e., the ratio of watts input to watts output, is a negligible factor in the energy consumption of a signaling system, since the total energy consumed in clearing the signals is relatively negligible. That is to say, if we are considering steam road conditions, where the power taken by the signal motor is, relatively, of the most consequence, the track circuit, slot, lamp, and transformer losses will probably take an amount of power which at three cents a kilowatt hour would cost a trifle over five cents a day, while the cost of power for fifty operations of the signal, even by a single phase induction motor, would not be over 0.04 of a cent, or less than one per cent of the total power.

The apparent efficiency of the motor, i. e., the ratio of

apparent watts input to the actual watts output, is of interest in but two ways: First, as affecting the increase of the normal supply of current to the signal system in case it has been interrupted, and it is necessary to clear all signals at once (and even here it is seldom of much importance if the transformers on the system have been provided with taps for taking care of normal line drop). Second, as affecting feasibility of distant signal control without the use of line relays.

As regards commutator motors versus induction motors, the balance as regards reliability and ease of maintenance will probably, as in the industrial field, work out in favor of the induction motor. With the single phase induction motor, increased economy gained by phase splitting devices involving contracts, should only be chosen after a full consideration of the degree of reliability likely to be sacrificed.

For signals having a low ratio of gearing, the commutator motor becomes almost a necessity on account of the high torque which it is necessary to develop, the current consumption of the induction motor being, comparatively, almost prohibitive for this condition, unless possibly an exception might be made of the polyphase induction motor. For signals with a high ratio of gearing either a commutator or induction motor has suitable torque characteristics.

Having decided on the lowest voltage at the terminals of the motor at which it will be required to operate, the motor should be tested in the signal with the spectacle, roundels, blade, up and down rod, or other parts with which it is to be used. With the semaphore and connected mechanism in the stop and caution positions it should be ascertained if the application of the minimum allowable voltage decided upon will clear the signal with the voltage maintained constant.

Another test should be made by bringing the motor to a full stop at about every five degrees of the stroke by lowering the voltage. The voltage should be raised after each stop to determine the minimum voltage at which the motor will clear the signal at that position. This series of readings will show the voltage at which the motor will clear the signal from any position.

Discussion on the Selection of Alternating Current Apparatus.

Mr. Balliet: I think this is a good time for Mr. Howard to bring up this question of inductive bonds, for the purpose of harmonizing our literature and keeping things straight.

Mr. Howard: I would be perfectly willing to accept the term "impedance bond." The term would be truly descriptive, and would also offer a description of the action of the bond. It is a word which everybody understands. If you impede anything you hinder it, and the bond impedes the flow of the signaling current.

Mr. Balliet: That is practically the term the committee has accepted, but we are going to eliminate "inductive."

Mr. Hawkins: Mr. Howard's paper refers to track relays of the two-windings of type. I should like to ask Mr. Howard whether he has any recommendations to make in regard to the use of the two-winding relay as compared with the one-winding relay. In my opinion the two-winding relay possesses two advantages over the one-winding relay for track circuit work; first, efficiency, since the greater part of the energy required for operating the relay is to be supplied directly instead of through the track circuit; and second, it offers complete protection against broken-down insulated joints without any special connections, which have certain disadvantages. I cannot agree with Mr. Howard that the use of a transformer ground shield is desirable. In the first place a ground shield occupies a valuable place for the transformer, and decreases its reliability. If no ground shield is present, a breakdown cannot take place through the two weakest points. The only reason for the use of a ground shield is to protect the low-voltage or secondary lines from the high or primary voltage. But the ground shield does not give complete protection against such a contingency, but does protect against a breakdown.

Mr. Howard: No doubt after you get it to a certain length of track circuit you can work more efficiently with the relay with the two windings. With the two-winding relay, economy of power consumption is obtained by putting most of the energy into the line or local winding, and very little into the track winding. All the power that goes into the track winding of the relay has to be transmitted over the rails, and a consequent rise in voltage takes place towards the transformer, resulting in consequent loss of power in the rails themselves and in leakage through the ballast, so it is preferable to keep down the energy you put into the track winding relay, and the more you have to transmit over the rails, the greater the rise of the voltage. If you can make a relay with a single winding, so that it will take less power than the local winding relay with two windings, up to a certain length of track circuit, it is advisable for many reasons to use the relay with the single winding. In using short track circuits the train entering the circuit whose transformer is holding the succeeding signal clear through the broken down insulation joint, will shunt the transformer and put the signal to danger, as it should be, exactly the same as is the case with the standard direct-current relays, which are in use everywhere on steam railroads. So that the danger from this source may be less than with relays of two windings. Now as to the ground shields, I am with the last speaker from the manufacturers" point of view. From the point of view of the maintainer, who may be on the pole working on the transformer, however, I fail to see why he is not given the much greater degree of protection, that he would have when a plate of copper is placed between the primary and secondary windings, and this plate of copper is properly grounded, than he would have if no ground shield were used.

Mr. Howard: I wanted to take up the question of the expediency of using the ground shield, as it was referred to, with the inference that this was accompanied by a decrease in the insulation used. I did not mean to imply that that was my idea of a ground shield. We use as high insulation with the ground shield as we do without it. But I fail to see how, if you have a shield of copper between two coils, and the copper is grounded, a man is going to get a shock from that transformer by the high-voltage current passing out of the primary windings into the secondary windings when it has got to go through the copper plate to do it.

Mr. Rhea: I would like to ask Mr. Howard whether or not in the event of a broken-down joint and a train in the block ahead and a train coming in the second block with a broken rail, the signal will stand clear, It certainly will under those conditions. There are two combinations that happen simultaneously, that will give you a clear signal.

Mr. Waldron: Where is the broken rail?

Mr. Rhea: In the second block back we will say.

Mr. Waldron: Back of the insulated joint?

Mr. Rhea: Yes, sir.

Mr. Rhea: Mr. Howard mentions the test for the double-winding relay. Are there any tests necessary for a single-winding relay?

Mr. Howard: A single-winding relay should be subjected to the influence of a direct current as well as a double-winding relay.

Mr. Waldron: What will be the difference in cost of insulation in the track circuit between single and double-winding?

Mr. Howard: It depends on the arrangement of the signals. It would be the difference of cost between single and double-winding relay, and you are working on high-tension lines. I do not think it would cost $200.00 to do that.

After the discussion of Mr. Howard's paper, a vote of thanks was given him by the association, and the meeting adjourned.

RESULTS OF LETTER BALLOTS.

The reports which were presented at the annual meeting of the Railway Signal Association at Richmond, Va., in October, 1910, and ordered submitted to letter ballot, have been voted on by the members of the association with the following results:

The report of the committee on Signal Practice and Standards, recommending that the Railway Signal Association, while not condemning upper left hand quadrant signals, should recommend the use of upper right-hand quadrant signals for new work and renewals, was adopted.

The semaphore spectacles, 1040, design "A," and 1041, design "B," shown on pages 284 and 285 of the 1910 Journal of Proceedings (all references are to bound Volume No. 7 of the Railway Signal Association Proceedings for 1910), were adopted by a substantial majority. The spectacle rings (1042), ladders and ground masts (1026), ladder clamps and stays (1029), ground signal masts (1035), base for bracket and bridge signal masts (1036), bracket posts and bridge signal masts (1037), lamp bracket (1049), pinnacles (1050 and (1051), ladder foundation (1052), terminal block (1055B), nut and washer for binding posts (1070B), concrete foundation (1080), semaphore lamp and specifications (1100B) and lamp equipment (1101) were adopted. The diagrams of signal aspects (1045A and 1046A) failed of adoption. These standards are shown on pages 286 to 288, and 290 to 303, inclusive, of the Journal for 1910.

There was a tentative vote on the question of standard size for the lens of semaphore lamp No. 1100B, according to the resolution presented by J. C. Mock at the annual meeting in October, 1910 (page 330, Vol. 7.) This expression of opinion showed 155 votes for the 5 inch, 187 for the 5¾

inch, one for the 5½ inch, 18 for the 6¾ inch, 20 for the 6½ inch and one for the 8⅜ in diameter. The tentative vote on the recommendations and specifications for one-inch signal pipe (pages 331 to 333, Vol. 7) stood 290 to 67 for adoption.

The Committee on Mechanical Interlocking recommended the use of pipe-connected home signals at points where the automatic return to normal position is not required, exact locations where special conditions exist, where the installation, maintenance and efficiency of operation make the power type preferable, and the use of power-operated signals at mechanical interlocking plants at points where three-position signals are required to return to the stop or caution position automatically, and at all points where three-position automatic block signals are now in use or are contemplated (page 225, Vol. 7). These were adopted, as were also a number of changes in the wording of general and detail specifications and the recommendation for using the electric lock to prevent a return of the home signal lever latch to normal position except when the circuit is completed through springs on the distant signal in its normal position (pages 223 to 228, Vol. 7).

The specifications for D. C. low-voltage motor semaphore signals (pages 349 to 355, Vol. 7), tinned channel pins (365 to 358), wood trunking (362 and 363), and caustic soda primary battery cell (1053D, pages 359 to 361), were adopted.

The revised specifications for double-braided, weather-proof, hard-drawn copper line wire; rubber-insulated, signal wire; galvanized E. B. B. iron bond wires; double-braided, weather-proof, galvanized B. B. iron line wire; aerial, braided cables; rubber-insulated, lead-covered, armored, submarine cable; and double-braided, weather-proof, hard-drawn, copper clad, steel wire, were adopted (pages 466 to 490, Vol. 7); as were also a form of wire inspection report, and a revised table of stranded conductors and flexible conductors for cables (pages 465 and 466, Vol. 7).

The definitions of the terms "blade-grip" and "blade," as submitted by Committee No. 7 on Subjects and Definitions (page 460, Vol 7), were favorably received and adopted.

The requisites and adjuncts submitted by Committee No. 6 on Automatic Stops and Cab Signals (pages 450 to 455, Vol. 7), were adopted, and the conclusion of the committee that the requisites of installation and the desirable characteristics embodied in this report form an adequate basis on which to design and construct a system of automatic stops and cab signals was adopted by a majority of 41 over the required two-thirds.

The Chicago & Northwestern is planning the installation of considerable single-track automatic block signaling during this season, and the system of operation probably will call for an arrangement of signals and overlaps similar to that recently put in service on the Northern Pacific.

The Chicago, Rock Island & Pacific is installing three-position upper-quadrant automatic block signals on its South Chicago line, 3½ miles of double track between Gresham and Stony Island avenue, Chicago, Ill. The installation provides for alternating-current operation of the signal system. The construction work is nearly completed, and the signals will be put in service in the near future.

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Mann, L. R., Supr. Sigs., Mo. Pac. R. R., St. Louis, Mo.
Manuel, W. N., Sig. Supr., G. R. & I. R. R., 23 Brainard St., Grand Rapids, Mich.
Mock, H. F., Sig. Inspr., C. & N. W. Ry., West Chicago, Ill.
Mock, J. C., Elec. Engr., Detroit River Tunnel Co., Detroit, Mich.
Montzheimer, Arthur, Chief Engr., E., J. & E. Ry. Co., 113 Pine St., Joliet, Ill.
Moore, S. J., Chief Sig. Inspr., M. C. R. R., 3rd & River Sts., Detroit, Mich.
Morris, D. R., Sig. Inspr., I. C. R. R., 12th St. Station, Chicago, Ill.
Motry, G. A., Supr. Sigs., B. & O. R. R., 218 Pauley Ave., Hazlewood Station, Pittsburg, Pa.
Munthe, A., Asst. Engr., Northern Pacific Ry., 1185 Burns Ave., St. Paul, Minn.
Oppelt, J. H., Supr. Interlocking, N. Y. C. & St. L. Ry., Bellevue, O.
Orr, H. H., Sig. Inspr., C. & E. I. R. R., 7700 Wallan St., Chicago, Ill.
Parker, Chas. W., Chief Sig. Inspr., Canadian Pac. Ry., Windsor St. Station, Montreal, Can.
Parnell, Loy, Sig. Inspr., Wabash Ry., Montpelier, Ohio.
Patenall, F. P., Director, Sig. Engr., B. & O. R. R., Baltimore, Md.
Peck, J. W., Gen. Sig. Inspr., U. P. R. R., care Sig. Engr., Omaha, Neb.
Pflasterer, C. S., Asst. Sig. Engr., Oregon Short Line, 654 24th St., Ogden, Utah.
Pflasterer, H. B., Gen. Sig. For., N. C. & St. L. Ry., 928 Broadway, Nashville, Tenn.
Pry, E. B., Sig. Inspr., Penna. Lines West, 1021 Union Station, Pittsburg, Pa.
Ragland, R. R., Sig. Supr., Mo. Pac. Ry., De Soto, Mo.
Rainey, P. A., Asst. Sig. Supr., P. R. R., Harrisburg, Pa.
Rice, D. S., Sig. Supr., L. V. R. R., Geneva, N. Y.
Richards, B. H., Supt. Const., Sig. Dept., C., R. I. & P. Ry., care of A. G. Shaver, La Salle St. Station, Chicago, Ill.
Rosenberg, C. C., Secretary-Treasurer, Consulting Signal Engineer, Bethlehem, Pa.
Rossell, D. W., Inspr. Sigs., Elec. Div., N. Y. C. & H. R. R., 298 East 134th St., New York.
Saunders, J. E., Asst. Sig. Engr., Santa Fe Ry., Topeka, Kan.
Schultz, P., Supr. Sigs., Southern Pacific Co., S. P. Depot, East Portland, Ore.
Seifert, A. J., C., R. I. & P. Ry., Chicago.
Shatwell, E. V., Sig. Inspr., C. & N. W. Ry., West Chicago, Ill.
Shaver, A. G., Director, Sig. Engr., C., R. I. & P. Ry., La Salle St. Station, Chicago, Ill.
Smith, Earl B., Inspr. Sigs., Elec. Div., N. Y. C. & H. R. R., Room 1612, G. C. T. Bldg., Depew Place and 45th St., New York.
Smith, M. E., Sig. Engr., D., L. & W. R. R., Hoboken, N. J.
Spencer, Chas. H., Engr., Washington Terminal Co., Room 204, Union Station, Washington, D. C.
Steven, Alex., Sig. Supt., Caledonian Ry., 87 Union St., Glasgow, Scotland.
Stradling, E. G., Sig. Inspr., C. I. & L. Ry., Salem St. Office, Lafayette, Ind.
Stuart, F. C., Director, Sig. Engr., Sunset Route, Houston, Texas.
Towle, Harry S., Gen. Sig. Inspr., Erie R. R., 130 Jackson St., Passaic, N. J.
Tracey, Chas., Supt. Sigs., I. C. R. R., Dubuque, Ia.
Trout, Geo. W., Supr. Sigs., C., R. I. & P. Ry., Rock Island, Ill.
Unger, O. R., Sig. Inspr., Mo. Pac. Ry., 2039a Ann Ave., St. Louis, Mo.
Waldron, J. M., Sig. Engr., I. R. T. Co., City Investment Bldg., 165 Broadway, New York.
Weld, C. F., Supr. Sigs., I. C. R. R., Clinton, Ill.
Whitcomb, L. L., Supr. Sigs., L. S. & M. S. Ry., Elyria, O.
Wiegand, C. H., Supr. Sigs., N. Y. C. & H. R. R., Spuyten Duyvil, N. Y.
Wiegand, F. B., Asst. Sig. Engr., L. S. & M. S. R. R., Cleveland, O.
Wilby, Richard I., Asst. Engr., T. P. & W. Ry., 11 Union Station, Peoria, Ill.
Williams, John F., Supr. Signals, C. C. C. & St. L. Ry., Springfield, O.
Winans, Edgar, Supr. Sigs., A., T. & S. F. Ry., Topeka, Kan.
Young, J. C., Sig. Engr., U. P. R. R., Max Meyer Bldg., 11th & Farnum Sts., Omaha, Neb.
Schultz, E. E., Sig. Inspr., care of Sig. Engr.'s Office, C. & N. W. Ry., Chicago, Ill.
Young, J. W., Ch. Sig. Insp., Erie R. R., Jersey City, N. J.
Zane, Wm. F., Chief Draftsman, Sig. Dept., C., B. & Q. R. R., 209 Adams St., Chicago, Ill.

Junior Members.

Doxsee, C. F., Sig. For., C., R. I. & P. Ry., 400 South Ottawa St., Joliet, Ill.
Hyder, J. D., Sig. Repairman, care of N. C. & St. L. Ry., Chattanooga, Tenn.
Kellenberger, K. E., Sig. Inspr., C. & N. W. Ry., 2027 Harrison St., Evanston, Ill.
Love, L. J., Sig. Repairman, Penna. Lines West, 415 N. Cherry St., Canton, O.

Associate Members.

Ames, Azel, Kerite Ins. Wire & Cable Co., 30 Church St., New York.
Atkin, G. H., Mgr., Electric Storage Battery Co., 1425 Marquette Bldg., Chicago, Ill.
Baird, R. I., Salesman, The Electric Storage Battery Co., Marquette Bldg., Chicago, Ill.

Banks, W. C., Pres. and Mgr., Banks Electric & Mfg. Co., 200th St. and Webster Ave., New York, N. Y.
Beck, H. M., Engr., Electric Storage Battery Co., 1400 Association Bldg., Chicago, Ill.
Bliss, E. F., Railway Sig. Engr. Dept., General Electric Co., Schenectady, N. Y.
Brach, Leon St. Clair, Pres., L. S. Brach Supply Co., 143 Liberty St., New York, N. Y.
Brixey, Richard, Pres., Kerite Ins. Wire & Cable Co., 30 Church St., New York, N. Y.
Brown, E. W., Salesman, Edison Mfg. Co., 34 Cambridge Ave., East Orange, N. J.
Cameron, F. C., Corning Glass Works, Corning, N. Y.
Camp, W. M., Editor, Railway Review, Manhattan Bldg., Chicago, Ill.
Cook, W. J., Pres., Cook Railway Signal Co., 1067 Gas & Electric Bldg., Denver, Col.
Cook, W. L., U. S. Electric Co., Chicago, Ill.
Corey, F. B., General Electric Co., Railway Sig. Dept., Schenectady, N. Y.
Delavie, F. J., Mgr., Bat. Zinc Dept., Grasselli Chem. Co., Cleveland, O.
Ferguson, H. K., Railway Sig. Dept., General Elec. Co., 631 Rugby Road, Schenectady, N. Y.
Foster, W. E., Ingalls-Shephard Forging Co., McCormick Bldg., Chicago, Ill.
Gifford, H. E., care of American Conduit Co., East Chicago, Ind.
Hall, G. L., Vice-Pres., Q. & C. Co., 90 West St., New York, N. Y.
Hawkins, L. A., Elec. Engr., Sig. Dept., General Electric Co., Schenectady, N. Y.
Hovey, M. H., Room 405, State Capitol Bldg., Madison, Wis.
Hovey, W. G., Hall Signal Co., 25 Broad St., New York, N. Y.
Hudson, E. E., Mgr. Sales, Primary Battery Dept., Edison Mfg. Co., Orange, N. J.
Hulmes, W. A., Gen. Ry. Signal Co., Chicago, Ill.
Johnson, Sidney, Gen. Sales Mgr., Union Switch & Signal Co., 30 Church St., New York, N. Y.
Langdon, J. L., General Railway Signal Co., Rochester, N. Y.
Lepreau, F. J., Edison Mfg. Co., 304 Wabash Ave., Chicago, Ill.
Lorenz, J. M., Salesman, Central Electric Co., 270 5th Ave., Chicago, Ill.
Macdonough, G. H., General Railway Signal Co., Monadnock Block, Chicago, Ill.
Marshall, Edw. L., Chem. Engr., National Carbon Co., 118 S. Wood St., Freemont, O.
Moore, A. G., Ry. Sig. Dept., General Electric Co., Schenectady, N. Y.
Moore, P. W., Gen. Mgr. P. & M. Co., Chicago, Ill.
Murphy, John, Elec. Engr., Dept. Railways and Canals, 174 Maclaren St., Ottawa, Canada.
Piper, H. L., Hiram L. Piper Co., Ltd., 17 Normand St., Montreal, Can.
Poor, C. O., Gen. Supt., General Railway Signal Co., Rochester, N. Y.
Smith, F. C., American Conduit Co., East Chicago, Ill.
Sperry, H. M., Sales Mgr., General Railway Signal Co., Rochester, N. Y. P. O. Box 1052.
Thompson, A., Jr., General Railway Signal Co., Rochester, N. Y.
Thompson, H. G., Mgr., R. R. Dept., Edison Storage Battery Co., Orange, N. J.
Weld, Harold K., Asst. Sales Rep., McRoy Clay Works, The Rookery, Chicago, Ill.
White, F. J., Salesman, The Okonite Co., 253 Broadway, New York, N. Y.
Workman, W. S., General Ry. Signal Co., 129 Hobart St., Rochester, N. Y.

RAILWAY APPLIANCES ASSOCIATION.

At the last annual meeting of the Road and Track Supply Association, the name was changed to Railway Appliances Association.

In the Daily Railway Age Gazette of March 15, 1910, page 560, there appeared an article which outlined the work of the Road and Track Supply Association from its inception in 1894. We print herewith pictures of the officers and members of the executive committee elected in March last.

The president of the association, T. W. Snow, who, until a month ago was president of the Otto Gas Engine Works, is now making a specialty of water appliances and coaling stations for railways. His identity with the railway supply business dates back to 1878, when he entered the employ of the Pennsylvania Steel Company, under George W. Parsons, then superintendent of the frog, switch and signal departments. Ten years later Mr. Snow was appointed assistant general agent of the United States Wind Engine & Pump Company at Batavia, Ill., and he devoted most of the next ten years to building waterworks plants for villages, towns and railways. From the end of 1898 until his election to the presidency of the company in 1906, Mr. Snow was manager of the western branch of the Otto Gas Engine Works at Chicago.



T. W. Snow.
President.

Robert E. Belknap, the vice-president of the association, is Chicago sales agent for the Pennsylvania Steel Company and Maryland Steel Company. His connection with railway work dates back to 1898, when he was engaged in building the Eighth avenue and Sixth avenue underground trolley conduits for the Metropolitan Street Railway, New York City, as assistant to the engineer for the National Contracting Company. In 1901 he joined the sales force of the Pennsylvania Steel Company, and Maryland Steel Company and after working in all the different departments, especially the rail, frog and switch departments, billet mill, steel foundry and bridge shop, and the forging, machine and marine departments, he was attached to the general sales office at Steelton. In July, 1902, Mr. Belknap was transferred to the new Chicago sales office as assistant sales agent and western representative, and in 1906 was made sales agent.



Robert E. Belknap.
Vice-President.

Both Mr. Snow and Mr. Belknap were elected members of the executive committee in 1908.

The secretary and treasurer, John N. Reynolds, whose pic-



Azel Ames.



A. P. Van Schaick.



W. F. Schleiter.



George Stanton.



John McKinnon.



T. R. Wyles.



John N. Reynolds,
Secretary-Treasurer.



George C. Isbester.

OFFICERS AND EXECUTIVE COMMITTEE OF THE RAILWAY APPLIANCES ASSOCIATION.

ture appears on the page preceding, is western manager of the Railway Age Gazette.

The other members of the executive committee are: John McKinnon, secretary and general manager, Kalamazoo Railway Supply Company, Kalamazoo, Mich.; George Stanton, sales agent, Cleveland Frog & Crossing Company, Cleveland, Ohio; W. F. Schleiter (ex-officio), secretary, Dilworth, Porter & Company, Pittsburgh, Pa.; A. P. Van Schaick, Lackawanna Steel Company, Chicago; Maj. Azel Ames, in charge of railway department, Kerite Insulated Wire & Cable Company, New York; T. R. Wyles, vice-president, Detroit Graphite Company, Chicago, and George C. Isbester, vice-president, Q. & C. Company, Chicago.

REPAIRS TO THE LA SALLE STREET STATION TRAIN SHED ROOF, CHICAGO.

Extensive repairs, made necessary by the deterioration of the concrete in the slabs, have just been completed on the train shed roof of the La Salle Street Station, Chicago.

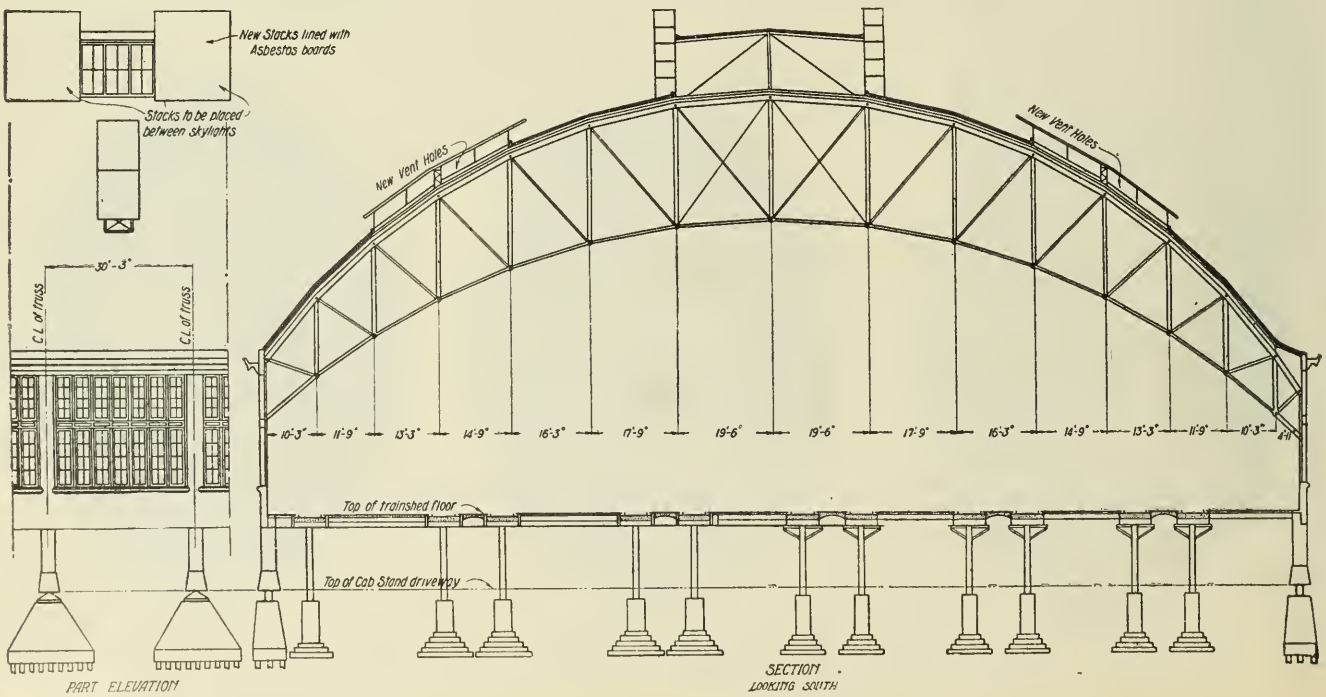
When the roof of the train shed of the La Salle street station, Chicago, was first built the steel framework was covered with cinder concrete slabs reinforced with No. 10 expanded metal having about a 3-in. mesh. These slabs were covered on the outside with a shell of cement and sand concrete about ¾ in. thick. The roof surface of the train shed was broken up into vertical panels by the use of molded wooden strips of an irregular shape but approximating a 4-in. x 6-in. section, spaced 2 ft. 6 in. between centers, the idea of the wood ribs being to break the monotony of the flat surface and to take care of expansion. The roofing used was the H. W. Johns-Manville Company (New York), special Manville brand of asbestos roofing, which was put on vertically and turned up against the sides of the ribs, the edges being cemented to these ribs. A cap of this same material was then put over the vertical ribs and securely nailed with copper nails, after which the whole surface was mopped with a special asphalt roofing coating.

In the original application and fastening of these ribs there was a tendency to crack the concrete shell, allowing some moisture to get in from the top. The fumes and the exhaust steam from the engines penetrated this thin shell, and, coming in contact with the cinders which contained more or less unslacked coal, produced a chemical action which in many cases reduced the steel to absolute rust. This steel, when it began to corrode, expanded and cracked the lower shell, allowing further gases and moisture to penetrate the slab from below.

The first warning that such an action was taking place was given when a piece of the lower shell, about 18 in. square, fell, taking with it a piece of reinforcement which was entirely disintegrated along the edges of this piece. A very thorough examination of the roof was then made by a bridge erecting gang, and it was decided to renew the upper or flat portion of the dome. When the roof was opened up, however, and a more careful examination of the lower portions could be made, it was decided to remove the entire roof covering.

The sides of the original dome were dotted about every 60 ft. with glass dormer skylights, which, being flat on top, simply formed pockets for the gases to accumulate. In these portions of the roof the steel framework was almost entirely eaten out and the copper bars forming the framework for the glass were eaten entirely through in many places. There had also been some sloping skylights along the monitor between the slat louvres. In making repairs to the roof these skylight dormers and sloping skylights were eliminated and permanent sash put in on the monitors. Long vertical hooded slots were put in on each side to allow the fumes and exhaust from the engines to get out of the shed more quickly, where originally all these gases had to travel up the dome of the roof to the monitor to escape. At the north end of the shed five large stacks of steel framework covered with asbestos board were also built to facilitate the escape of these gases.

In making the new slabs a rich concrete of one part Portland cement, two parts torpedo sand and four parts fine crushed stone were used, except on the outside edges, where a 1 to 1 mixture was put in, a woven wire reinforcement being used. Special care was taken in the construction of the frames so that the slabs were of exact dimensions. While drying, the slabs were stacked in the yard with air spaces between them and they were constantly sprinkled while setting. They were waterproofed on all sides by the use of ironite. The slabs were originally designed with four hook bolts, one at each corner to secure them to the iron framework of the roof, but on account of the slot which it was necessary to leave in the slab to receive



Train Shed; La Salle Street Station, Chicago.

the nut weakening the corner and making it liable to crack, the number of bolts was reduced to two for each slab. Small wooden blocks were also inserted in the concrete to facilitate nailing to the vertical wooden ribs. The joints between the slabs were filled with Portland cement mortar and the roofing used was the same as that on the original roof. Some 9,000 slabs, each 2 ft. wide by 5 ft. long and 2½ in. thick were required for this work.

We are indebted for this information to A. T. Hawk, architect of the Chicago, Rock Island & Pacific, under whose direction this work was done.

THE EXHIBIT.

With several thousand invitations out to the officers of railways, to presidents, general managers, superintendents and chief engineers, to come or send their subordinates to see the show at the Coliseum, it devolved on the management of the exhibit to make good and produce something that would come up to the expectations that so lavish a summons warranted. That these expectations have been more than met cannot fail to be the testimony of any visitor, whether it be as a mere lay observer to whom the mass of black and colored objects in their multitude of forms is a meaningless aggregation, or as a student and expert to whom it represents, what it really is, a collection of the latest and best in the development of track and roadbed and the appliances for the most economical methods of their construction and maintenance, as well as those for insuring the greatest safety in the conduct of transportation.

In a case like this, where the same parties are responsible for the results, comparisons cease to be odious, but become the natural method of showing growth and development. So, if we recollect what was done a year ago, excellent as was the impression produced, we at once see that there has not only been a great improvement in the general aspect of the show, but that manufacturers have reached a fuller realization of what it really means, and of what it is worth, and have come in greatly increased numbers to exhibit of their best and latest. Of the general appearance, taught by the experience of the past, there is a uniformity in the method of display and announcement that gives an air of harmony to the whole, which lends an artistic touch that is very pleasing to the eye.

It is impossible here to do more than indicate in the most cursory manner a few of the prominent characteristics of the display, without attempting any detailed description. Apparently it was desired to bring the signal exhibits to the fore, for immediately in front of the entrance and occupying the center of the building, there are four semaphore posts with their arms and attachments. This may have been mere chance, but surely the signal men have come well to the front in what they have to show. Some of it is acknowledgedly experimental and is shown with as much of a desire to sound the opinions of the members as to the desirability or advisability of certain changes, as with the expectation of their immediate adoption. Such a case is to be found in the arrangement for using a light indication for a day signal, instead of a semaphore. This was necessitated by some of the local conditions at the Pennsylvania terminal in New York, and the success attending the venture evidently led to this more advanced proposal. If any one thing could be said to be brought more to the front than another, it might be the use of the electric motor for the operation of signals and switches. The development from the old hand-operated devices has been very rapid during the past few years, until now the motor is accepted as a matter-of-course, and the makers have passed the point where it is necessary to argue the point with the engineer. One of the interesting features of signal operation will be found in the use of an automatic system of permissive blocking for a single track road. With this trains moving in the same direction may be admitted successively into a block between two passing sidings, while there is an absolute block against any movement in the opposite direction.

Closely allied with the signals are the exhibits of lamps for the various purposes demanded. Here, too, there are some novelties, as well as some very beautiful and artistic displays. The advance in the art of signaling has been paralleled with the care with which the lamps are designed and made. Not only is the mechanical work of the most substantial character, but we find that the lamp men have stopped buying lenses that were not designed, but "just growed" like Topsy, and are having them really designed for the purpose for which they are to be used. A casual inquiry from several of the exhibitors who were enlarging upon the value and effectiveness of their wares, as to "who designed the lenses," brought the prompt naming of one or two optical experts noted for their scientific attainments and their skill in the designing of this class of work. In this way manufacturers are putting out lamps that have not only a greater power of illumination, but are capable of throwing that illumination in all its intensity over a wider visual angle and so obtaining results that were not considered possible a few years ago.

But signals and lamps are not all that there are to be seen. There are many notable examples of track, switch and crossing construction, some of them old friends and many with a new wrinkle or improvement attached that adds to their value. In this the trend of the modern railway that looks for a substantial construction rather than a minimum of first cost is very apparent. This is particularly noticeable in the matter of derails. A few years ago, any old thing that would ditch a car was all that was required. It was something that must be cheap, but to-day we find that there are elaborate means of connecting the derails to the switch and interlocking movements, that the parts are made for service and endurance and that the insurance of their operative effectiveness is of as much importance as to have something that could be called a derail to show good intentions.

Then, there is a multiplicity of co-related objects: things that the chief engineer and his roadmasters must use and have for their daily work. If they wish to ride, it would be an exacting and carping official, indeed, who cannot find something in what is shown to carry him, his men or his tools to the point where work is to be done, or an inspection made. There is everything from the push-car and the rail wheelbarrow, to the elaborate gasolene-driven motor car with speed capabilities well up to the safety limit.

These are impressions of the show, but when it comes to the last analysis it would seem that nearly everything is there. The chief engineer can walk into the Coliseum and equip a party with transits, levels, rods, tapes, chains and all the paraphernalia for a survey, and then he can find derricks and excavators to do his grading; he can find ties and rails, and ballast and concrete and culvert pipe for the completion of the work, he can get spikes and joints to hold his rails; he can find barrows and mauls and shovels and picks for its maintenance; he can get poles for his wires, and wires that are bare, are copper covered, or insulated, to carry any sort of current that he wishes; he can bond or insulate or play any electrical trick that may please him, with his rails; he can build crossings and lay out sidings with the material ready to his hand; he can carry from the building the signals and interlocking that will make his road the model of efficiency and operation, and then he may add the externals that come within his province. He can erect his stations and roundhouses and warehouses, and may even harvest the ice that is to keep him cool in summer, or install the heating apparatus that is to keep out the winter's cold. In fact, there is little left for him to do beyond what he can

here find the means of accomplishing. And then, when he has gone through it all and absorbed as much as his brain can hold, he will be quite willing to acknowledge the truth of our opening statement as to the comprehensiveness of the exhibit and its value to any railway engineer who wishes to keep posted and know of what is latest and best in the matters pertaining to his department.

LIST OF EXHIBITORS.

The following is a complete list of all exhibits in place or being installed in the Coliseum yesterday (Monday) afternoon:

Adams & Westlake Company, Chicago, Ill.—Signal lamps, lanterns, railway specialties. Represented by Walter H. Baldwin, G. L. Walters, A. S. Anderson, C. B. Carson, W. J. Pierson, H. G. Turney, E. H. Stearns and Frank N. Grigg. Spaces 83-84.

Ajax Forge Company, Chicago, Ill.—Represented by F. G. Bradley, H. G. Elfborg and H. C. Hutchins. Spaces 195-196.

Alamo Manufacturing Company, Hillsdale, Mich.—Gasoline, gas, kerosene and distillate engines for railway service, pumping outfits, charging storage battery plants. Represented by L. A. Hopkins, J. L. Benedict, B. L. Winchell, Jr., R. A. Paterson, R. C. Bristol and Wm. Prideaux. Space 189.

Alexander Crossing Company, Clinton, Ill.—Continuous-rail non-pounding crossings. Represented by Louis Alexander, I N. Brown and Robert Johns. Spaces 199-200-213-214.

Allegheny Steel Company, Pittsburg, Pa.—O. H. steel plates, sheets, stamping steel, deep drawing steel, electrical sheets, "Reliance" steel and charcoal iron boiler tubes and locomotive flues, pipe, steel castings, stamped steel specialties, plate washers. Represented by T. G. Seixas and A. P. Scott. Spaces 244-245.

Allith Mfg. Company, Chicago, Ill.—Door hangers, approved fire door, warehouse door, continuous parallel door, merchandise carrier and rolling store ladder equipment. Represented by W. D. Jameson. Space 116.

American Concrete Pile and Pipe Company, Chicago, Ill.—Concrete culvert pipes and piles. Represented by S. W. Crocker and J. M. Watrous. Space 191.

American Guard Rail Fastener Company, Philadelphia, Pa.—Anchor guard rail clamps, tie-plate guard-rail fasteners and Vaughan automatic rail anchors. Represented by D. F. Vaughan and Chas. Z. Vaughan. Space 119.

American Hoist and Derrick Company, St. Paul, Minn.—Complete life-size "American Railroad Ditcher," mounted on flat car. Represented by F. J. Johnson, W. L. Manson and W. O. Washburn. Spaces 201-202-203.

American Rail Joint Company, Toronto, Ont.—"Reinforced angle bars." Represented by Thos. D. Beddoe. Space 253.

American Railway Signal Company, Cleveland, O.—Electric automatic signals, electric switch locks, electric dwarf signals, tower and switch indicators, relays and electric interlocking apparatus. Represented by G. L. Weiss, H. M. Abernethy, H. D. Abernethy and J. L. Burrows. Spaces 21-22.

American Railway Steel Tie Company, Harrisburg, Pa.—Section of track with their steel ties. Represented by John G. Snyder. Spaces 220-221.

American Steel and Wire Company, Chicago, Ill.—Right-of-way fencing, gates, signal wire, rail bonds, tie-marking nails. Represented by J. M. Holloway, L. P. Shanahan, S. F. Deems, H. A. Parks, B. H. Rider, H. S. Durant and C. S. Knight. Spaces 50-51-69-70.

American Valve and Meter Company, Cincinnati, O.—Poage automatic water columns, tank valves and fixtures, Fenner drop spout, Economy switch stands, Anderson interlocking switch stands and safety switch locks for main line switches, track devices. Represented by J. T. McGarry and F. C. Anderson. Spaces 130-131-132.

American Vulcanized Fiber Company, Wilmington, Del.—Original vulcanized fiber for rail joint insulation, steel tie insulation, mechanical use. Represented by John Barron. Space 136.

America Well Works, Chicago, Ill.—Deep well and centrifugal pumping machinery with any style of power, air compressors, well drilling and prospecting machinery. Represented by Geo. W. Igo, C. O. McLean and A. W. McLean. Spaces 14-15.

Armspear Mfg. Company, New York, N. Y.—Pressed steel switch lamps, one-day and long-time burners, semaphore and train order lamps, automatic classification and train markers, steel and wire guard lanterns. Represented by F. D. Spear, C. K. Freeman and F. A. Buckley. Space 184.

Asbestos Protected Metal Company, Canton, Mass.—Two sheets of asbestos protected metal. Represented by Wilmot W. Burritt. Spaces 78-97.

Asphalt Ready Roofing Company, New York, N. Y.—Protection brand asphalt roofing, sand and gravel surfaced, with 6-inch lap, which can be laid with no nails exposed on the outside; Arrow brand, sand and gravel surfaced roofing; Stonehenge, smooth surfaced roofing; Hudson brand asphalt felts. Represented by Harry H. Huested and A. Brewster Clark. Space 168.

Banks Electric and Mfg. Company, New York, N. Y.—Banks' signal batteries, Banks' track batteries. Represented by W. C. Banks, Geo. W. Davis and John H. Bush. Space 280.

Barrett Manufacturing Company, New York, N. Y.—Roofing, floor protection particularly adapted for wooden floors in repair shops and freight houses, bridge waterproofing, waterproofing and damproofing for masonry. Represented by L. P. Sibley, W. S. Babcock, H. B. Nichols and C. T. Bilyea. Space 106.

Bausch & Lomb Optical Company, Rochester, N. Y.—Engineering and surveying instruments, transits and levels, etc. Represented by W. Louis Johnson. Space 96.

Beaver Dam Malleable Iron Company, Beaver Dam, Wis.—Tie plates and rail braces. Represented by Lawrence Fitch, J. V. Cowling, F. S. McNamara, E. A. Hawks, W. L. Douglass and D. P. Lamoreaux. Spaces 165-166.

Blocki-Brennan Refining Company, Chicago, Ill.—Carboxide elastic metal preserver and some of the bi-products. Represented by W. F. Brennan and James C. Cleary. Space 261.

Bossert Mfg. Company, W. F., Utica, N. Y.—Triple-lock switch stand, Bossert insulated rail joint, Nickerson safety switch point lock, Bossert improved switch point adjuster, tie plate and guard rail clamp, semaphore blade clasps, Simplex and Duplex track drills. Represented by F. L. Guillaume, Wm. F. Bossert, H. C. Williams, R. E. King and Willis C. Squire. Space 118.

Bowser & Co., Inc., S. F., Fort Wayne, Ind.—Oil storage systems, self-measuring pumps for handling oils, gasoline, varnishes, etc. Represented by C. A. Dunkelberg, W. T. Simpson, F. T. Hyndman and E. H. Barnes. Space 186.

Bryant Zinc Company, Chicago, Ill.—Signal supplies, battery supplies, fiber conduit, Gould storage batteries, crossing bells, battery vaults and chutes, electrical instruments, track and linemen's tools. Represented by A. F. Klink, E. M. Deems, R. N. Baker, Stanley Bryant, H. J. Hovey, R. N. Chamberlain and J. W. Cremerius. Spaces 153-154-155-156.

Buda Company, Chicago, Ill.—Railroad motor cars and velocipedes, track drills, drill grinders, switch stands, ratchet jacks, ball-bearing jacks, adjustable switch rods, solid manganese crossing, replacers, electric crossing gates. Represented by H. K. Gilbert, L. M. Viles, Wm. P. Hunt, Jr., W. B. Paulson, J. T. Harahan, Jr., Geo. B. Shaw, L. Hamill, A. R. Dyer, J. J. Gard and H. S. Evans. Spaces 87-88-89-90.

Burroughs Railway Nut Lock Company, Jacksonville, Fla.—Positive railway nut lock. Represented by Oliver B. Burroughs and J. A. Agnew. Space 281.

Buyers' Index Company, Chicago, Ill.—Book, "Railway Supply Index-Catalogue and Purchasing Agents' Buying List." Represented by Lloyd Simonson, Horace E. Frame, Alexander Smith, D. J. Beaton and F. B. Cozzens. Space 190.

Cambria Steel Company, Johnstown, Pa.—Rails, 100 per cent. splice bars, Morrison guard rails, "Coffin Process" axles. Represented by J. L. Replogle, A. Morrison, C. J. Ellis, H. P. Hubbell and J. L. Adams. Space 177.

Carey Company, Philip, Cincinnati, O.—Roofing, asbestos and magnesia products, insulating materials. Represented by J. L. Morse, W. C. Ignatius, E. S. Main and Frank Carter. Space 170.

Carnegie Steel Company, Pittsburg, Pa.—Section of railroad track, constructed with steel cross ties and Duquesne joints, with various types of fastenings, including insulated wedge fastening; steel cross ties which have been in track since 1904, with information showing weight, service, etc.; light ties for portable track; assortment of Duquesne rail joints; large display of nickel-plated samples, showing representative shapes rolled by Carnegie Steel Company; steel sheet piling, U. S. and Friestedt; bolt and spike tests; steel freight car, engine truck, passenger car and street car wheels; bolt and spike kegs, showing steel hoops. Represented by N. M. Hench, Edwin S. Mills, C. B. Friday, Herbert VanZant, F. Rys, P. W. O'Brien, H. C. Griswold, Kent Porter and Robert Coe. Spaces 52-53-71-72.

Carpenter & Co., Geo. B., Chicago, Ill.—Cordage, cotton duck, tackle blocks, rubber goods, switch ropes, track tools. Represented by Henry W. d'Evers. Space 157.

Ceresit Waterproofing Company, Chicago, Ill.—Concrete and cement mortar slabs waterproofed with Ceresit subjected

to high water pressure, proving the water repelling qualities of Ceresit. Represented by P. H. Hansen. Space 262.

Chicago Bridge and Iron Works, Chicago, Ill.—Model of an all-steel water tank; pictures of bridges, retorts, steel coal chutes and tanks. Represented by Geo. T. Horton, H. B. Horton, M. J. Trees, E. G. Ladd, C. S. Pillsbury and E. W. Steinmueller. Space 176.

Chicago Pneumatic Tool Company, Chicago, Ill.—Section motor cars, pneumatic and electric tools. Represented by C. E. Walker, J. G. Osgood and C. B. Coates. Space 68.

Chicago Steel Tape Company, Chicago, Ill.—Implements for field surveys such as steel tapes, leveling rods, lining poles, marking pins, stadia rods, targets and repairing devices. Represented by L. A. Nichols and S. A. Holland. Space 113.

Cleveland Frog and Crossing Company, Cleveland, O.—"Hard Service" manganese frogs and crossings, improved spring rail clamps, interlocking switch appliances, etc. Represented by G. C. Lucas, Geo. Stanton, A. Peabody, L. G. Parker and Geo. Arnold, Jr. Spaces 102-103-104.

Collins & Co., W. P., Chicago, Ill.—Lubricating oils and greases, Kapak (Elaterite) paint, ready roofing, Lardoilene cutting compound. Represented by W. P. Collins, J. J. Collins, D. Risley, A. B. Cross, J. Roskilly and C. S. Kennerly. Space 282.

Concrete Form and Engine Company, Detroit, Mich.—Collapsible steel form for building concrete culverts, conduits, sewers, etc.; railroad velocipede equipped with Belle Isle gas engine; stationary engines for all purposes. Represented by W. C. Shanafelt, F. S. Freer, L. K. Rumsey and W. D. Waugh. Space 283.

Conley Frog and Switch Company, Memphis, Tenn.—Conley patent frogs, manganese frogs, railway track appliances. Represented by John E. Conley. Space 164.

Continuous Frog and Crossing Company, Reinforced Rail Joint Company, St. Louis, Mo.—Railroad frogs and rail joints. Represented by W. G. Brown. Space 219.

Cook's Standard Tool Company, Kalamazoo, Mich.—Standard bonding drills, Standard track and car jacks, Climax track drills, Magic tool grinders, Magic chucks and high speed bits. Represented by Eugene Cook and F. C. Butler. Space 115.

Crane Company, Chicago, Ill.—Cranetilt steam traps, motor operated steel gate valves, special valves for creosote and zinc-chloride, locomotive safety valves, brass valves, ammonia valves and fittings, cast and malleable iron fittings, Crane railroad ball joint unions and fittings and special fittings for steam, water, gas and air, especially recommended for railroad work. Represented by F. D. Fenn, F. C. Sabin and J. B. Jordan. Space 146.

Detroit Graphite Company, Detroit, Mich.—Paint for bridges, buildings, structural steel, etc. Represented by T. R. Wyles, L. D. Mitchell, Edwin Booth, A. H. Kuerst and B. O'F. Randolph. Space 77.

Detroit Steel Products Company, Detroit, Mich.—Solid steel Detroit-Fenestra windows. Represented by Chas. R. Ayars. Space 180.

Paul Dickinson, Inc., Chicago, Ill.—Cross sections of standard roundhouses showing various styles of buildings, latest designs in smoke jacks, cast-iron chimneys and ventilators. Represented by J. A. Meaden and A. J. Filkins. Space 86.

Eugene Dietzgen Company, Chicago, Ill.—A complete line of modern surveying instruments, leveling rods, ranging poles, tapes, rail profile machines and other supplies which are used by engineers both in the office and in the field. Represented by W. E. Cook, W. O. Phillips, G. C. Moore and C. S. Breckinridge. Space 2.

Dilworth, Porter & Co., Ltd., Pittsburg, Pa.—Railroad spikes and tie plates. Represented by W. F. Schleiter and Chas. Johnston. Space 26.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Dixon's Silica-Graphite Paint. Graphite productions. Represented by H. W. Chase and E. R. Smith. Space 169.

Dressel Railway Lamp Works, New York, N. Y.—Switch, semaphore, tower, station, engine, tail-marker, caboose, crossing gate and water-trough lamps, oil pots, long-time and standard railroad lamp burners, etc. Represented by F. W. Dressel, Robert Black, H. S. Hoskinson, E. W. Hodgkins, A. P. Grenier B. P. Claiborne and F. E. Edmunds. Space 105.

Drouvé Company, G., Bridgeport, Conn.—"Anti-Pluvius" puttyless skylights and the "Lovell" and "Straight-Push" sash operators. Represented by William V. Dee, George J. Adam and R. S. Adam. Space 163.

Duplex Metals Company, Chester, Pa.—Miniature pole line showing results from heavy snowstorm; samples of all kinds of copper-clad steel wire and products, such as nails, cotter pins and bolts. Represented by Frank R. Chambers, Jr., Wm. T. Kyle, Geo. P. Fondersmith, W. W. Lampkin and E. M. Fondersmith. Spaces 38-39.

D. & A. Post Mold Company, Three Rivers, Mich.—"D. & A." cement post machines, molds, posts, reinforcements, car steam curing unit for posts; mold and reinforcement for concrete poles for telephone and telegraph service. The "Shaking System." Represented by G. H. Dougherty, O. Dougherty and L. R. Dougherty. Spaces 134-135.

Eastern Granite Roofing Company, New York, N. Y.—Granite roofing, Evertite crushed stone roofing, "Tisbest" smooth surface roofing, Palmoid smooth surface roofing. Represented by H. Henning, C. F. Barstow, A. E. Roever and A. W. Turner. Space 129.

Economy Separable Switch Point Company, Inc., Louisville, Ky.—"Economy" separable switch points, "Economy" adjustable head rods, "Economy" separable claw bar, "Economy" foot guard, positive rail anchors, positive rail anchor-tie plate combination, positive malleable tie plates. Represented by W. M. Mitchell, W. M. Mitchell, Jr., R. H. Johnson, Geo. A. Johnson and D. C. Byrne. Spaces 187-188.

Edison Mfg. Company, Orange, N. J.—Primary batteries for signal work, automatic block signals, crossing bells, telephone circuits and gas engine ignition. Represented by E. E. Hudson, E. J. Leprean, E. W. Brown and P. A. Garrity. Space 151.

Edison Storage Battery Company, Orange, N. J.—Storage batteries of various types, portable and stationary, for railway signal application; car lighting and ignition batteries. Represented by H. G. Thompson. Space 152.

Edison, Thomas A., Inc., Orange, N. J.—Business phonographs. Represented by L. D. Dexheimer and E. B. Bostwick. Space 287.

Electric Storage Battery Company, Philadelphia, Pa.—"Chloride Accumulator" batteries for drawbridge operation, and Chloride, Tudor and Exide types for car lighting, electric interlocking plants and automatic block signal work; couple types for small lighting plants, telephone and telegraph service. Represented by G. H. Atkin, T. Milton, R. E. Baird and T. A. Cressey. Space 158.

Fairbanks, Morse & Co., Chicago, Ill.—Motor cars for section work and inspection, also for signal and telegraph departments; gasoline pumping engines, steam pumps, railroad pumping windmills, standpipes, gasoline and gas engine generating sets, motors and dynamos, track and bonding drills, ratchet, ball-bearing and hydraulic jacks, scales. Represented by S. F. Forbes, C. W. Kelly, A. A. Taylor, F. M. Condit, L. H. Matthews, E. M. Fisher, G. J. Akers, A. F. Young, F. V. Rey, L. Norvell, H. D. Smith, A. C. Dodge, F. H. Douglas, W. H. Stearns and C. T. Fugitt. Spaces 73-74-75-76-92-93-94-95.

Federal Signal Company, Albany, N. Y.—Electrical and mechanical signaling and interlocking apparatus. Represented by J. T. Cade, A. Dean and W. H. Reichard. Space 149.

Frank M. Foster, Columbus, O.—Foster interlocking switch stands with independent facing point lock and distant signal operated with one movement of one lever. Represented by Frank M. Foster and George E. Kalb. Space 138.

Franklin Manufacturing Company, Franklin, Pa.—Asbestos corrugated roofing and siding; asbestos "Century" shingles; asbestos building lumber and smoke jacks; 85 per cent. magnesia locomotive lagging; steam pipe and boiler coverings; special journal box packing; wool and cotton waste. Represented by R. J. Evans, L. B. Melville, E. R. Rayburn, A. L. Landry, Geo. Stewart and F. S. McNamara. Space 6.

General Electric Company, Schenectady, N. Y.—Railway signal and accessory and supply devices, mercury arc rectifier, gasoline engine generating set and railway signals in operation. Represented by Frank Rhea, H. K. Ferguson, F. B. Corey, L. A. Hawkins, W. W. Brown, A. G. Moore, H. L. Monroe, Chas. Ives, R. E. Russell, A. W. Jones, A. P. Jenks, L. G. Crawford and J. S. Button. Spaces 35-36.

General Railway Signal Company, Rochester, N. Y.—Electric interlocking machines, Model 2-A, electric motor signals for automatic block and interlocking systems, relays and other devices. Represented by W. W. Salmon, G. D. Morgan, M. Wuerpel, W. K. Howe, F. L. Dodgson, H. M. Sperry, J. L. Langdon, C. O. Poor, J. B. Evans, M. R. Briney, F. H. Jones, G. H. Macdonough and W. R. Young. Spaces 56-57-58-59.

Gifford-Wood Company, Chicago, Ill.—Ice handling machinery and ice tools. Represented by N. H. Williams and Geo. B. Vernier. Spaces 142-143.

Goheen Mfg. Company, Canton, O.—Preservative coatings for iron and steel and galvanized iron. Represented by Geo. L. Clapper and John G. Thompson. Space 182.

Goldie, William, Pittsburg, Pa.—Steel railroad tie, method of surfacing track and tie plugs. Represented by Wm. Goldie, Sr., Wm. Goldie, Jr., and E. E. Williams. Space 247.

Gray & Sons, Peter, Boston, Mass.—Signal lamps and lanterns, as follows: Switch lamps, semaphore lamps, engine classification and tail lamps, train tail lamps or markers, platform tail lamps, bridge lamps to government specifications, Gray's chimneyless long-time burners, switch and

semaphore lamps (oil), switch and semaphore lamps (electrically equipped). Represented by Geo. M. Gray and Jos. M. Brown. Space 109.

Greenlee Bros. & Co., Chicago, Ill.—Railroad tie machinery, automatic tie adzing and boring machines, screw spike driving machines, tie dowelling machines. Represented by J. A. Lounsbury, O. V. Haegg and F. Birtel. Spaces 7-8.

Grip Nut Company, Chicago, Ill.—Grip nuts. Represented by E. R. Hibbard, J. W. Hibbard, B. C. Wilt, W. G. Wilcoxson, Thos. P. Swan, J. W. Cuddy and A. E. Magurn. Space 55.

Hall Signal Company, New York, N. Y.—Automatic signal appliances. Represented by W. J. Gillingham, H. L. Hollister and W. H. Lane. Spaces 79-80.

Handlan-Buck Manufacturing Company, St. Louis, Mo.—Handlan Special lanterns, protected, direct top draft, signal lamps, long-time burners, locomotive train number indicators, McPartland rail clutches, track tools, metallic track and train flags, government standard bridge lights. Represented by A. H. Handlan, Jr., and R. L. Cairncross. Space 126.

Harry Bros. Company, New Orleans, La.—Corrugated metal culverts, corrugated iron tanks, knock-down portable galvanized iron houses. Represented by W. W. Chandler, W. H. D. Wheat, T. C. Harry, Jr., J. S. Cave and H. L. Harry. Space 193.

Hart Steel Company, Elyria, O.—Tie plates and spikes. Represented by W. S. Miller, W. T. Bentz, Willis McKee, G. S. Wood, A. W. DeRocher, H. W. Davis and J. M. Van Harlingen. Space 101.

Hayes Track Appliance Company, Geneva, N. Y.—Hayes derails and attachments. Represented by S. W. Hayes, W. Harding Davis, Wellington B. Lee and Arthur Gemunder. Space 140.

Heath & Milligan Mfg. Company, Chicago, Ill.—Mindura, an iron and steel preservative. Cement Coating, for waterproofing and decorating cement; stone, stucco and brick surfaces. Represented by A. M. Heath, J. H. Vance, F. J. Morse, Chas. F. Smale, Jr., Elmer F. Smith and W. S. Morgan. Spaces 275-276.

Hobart-Allfree Company, Chicago, Ill.—Smyth derailers, Freeland derailers, Newton car replacers and Newton divided car replacers. Represented by E. H. Allfree, W. H. England and J. Fremont Murphy. Space 17.

Hoskins Rail Joint Company, Chicago, Ill.—The continuous girder rail joint. Represented by Zach. T. Hoskins and N. L. Towle. Space 264.

Hubbard & Co., Pittsburg, Pa.—Railroad track tools, shovels and scoops, bolts, nuts and washers, pole line hardware. Represented by R. L. Mason, J. A. McLaughlin and B. S. Handwork. Spaces 197-198.

Hunt Company, C. W., West New Brighton, New York, N. Y.—Models of Skip hoist coaling station; automatic railway; conveyor; grab bucket, wheel and axle car with wheel and axle on it; turntable; curve, straight track and switch; charging car; shop car; Duplex valve and Simplex valve; coil of rope and couplings; photographs and drawings, section of conveyor. Represented by C. T. Anderson and A. C. Simmers. Spaces 222-223-224.

Ideal Concrete Machinery Company, South Bend, Ind.—Concrete block machines, concrete block power tamper, concrete brick machine, concrete stone products. Represented by H. I. Purcell, E. M. Blose, G. B. Pulfer and M. Wetzstein. Spaces 217-218.

Indianapolis Switch and Frog Company, Springfield, O.—Manganese frogs, crossings, switches, etc.; a special showing of I. Sw. & F. Company model R-N-R maganese frogs and crossings and tests. Represented by E. C. Price, W. H. Thomas, W. L. Walker, T. D. Hanley, G. S. Shaw, J. A. Foulks and J. C. Jameson. Spaces 12-13.

Ingalls-Shepard Forging Company, Chicago, Ill.—Standard mechanical interlocking parts. Represented by W. S. Foster. Space 3.

Interlocking Nut and Bolt Company, Pittsburg, Pa.—The Clark nut lock. Represented by R. A. Clark. Space 185.

Iowa Gate Company, Cedar Falls, Ia.—Farm, crossing and stockyard gates. Represented by Jos. B. Clay. Spaces 287-288.

Johns-Manville Company, H. W., New York, N. Y.—Asbestos and magnesia materials, electrical supplies, roofings, smoke jacks. Represented by J. W. Meek, J. C. Younglove, F. M. Gilmore, P. C. Jacobs, G. A. Nichol, C. E. Murphy, H. G. Newman, F. W. Doty, W. J. Hennessy, Geo. Christensen and G. W. Gearhart. Space 117.

Jordan Company, O. F., The, Chicago, Ill.—Steel constructed Jordan spreader and snow plows. Represented by M. J. Woodhull and M. Parks. Space 182.

Joyce-Cridland Company, Dayton, O.—Railway jacks. Represented by F. I. Joyce, George W. Llewellyn, Chas. D. Derby and N. Kohl. Space 11.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Manufacturers of hand, push and velocipede cars, Improved track drills, jacks, pressed steel wheels, crossing gates and other track appliances. Represented by John McKinnon, Donald A. Stewart, W. I. Clock, Geo. W. Mingus, C. A. Wallace, W. N. Sidnam, Chas. B. Hays, H. P. Kauffer and Frank B. Lay. Spaces 23-24-25.

Kellogg Switchboard and Supply Company, Chicago, Ill.—Railway telephone equipment, including train dispatching sets, various types of portable telephones, siding telephones and ordinary telephones for use on both steam and electric roads. Intercommunicating sets, composite telephones, insulated telephones and private branch exchanges. Represented by J. C. Kelsey, G. A. Joy, Wm. Booth and Archibald Wray. Space 249.

Kennicott Company, Chicago, Ill.—Water softening plants, steel storage tanks, steel cars, steel underframes, general steel plate construction. Represented by Cass L. Kennicott, E. J. Flemming, Herman Nieter, Thomas Windes, Frank Dunham and Geo. Pratt. Space 16.

Kerite Insulated Wire and Cable Company, New York, N. Y.—Kerite insulated wires and cables. Represented by R. D. Brixey, Azel Ames, P. W. Miller, J. A. Renton, Watson Insulated Wire Company, Chicago, Ill.; J. V. Watson, B. L. Winchell, Jr., and E. B. Price. Spaces 60-61-62.

Kerlin Automatic Post Machine Company, Delphi, Ind.—Concrete fence post machine, reinforcements for concrete posts; lineal concrete railway tie. Represented by W. F. Kerlin, E. W. Bowen, E. R. Smock, Levi Riley, Stewart Benefiel, Wm. Donlin and Robert O'Connor. Spaces 210-211-212.

Kernchen Ventilator Company, Chicago, Ill.—Ventilators for passenger coaches, roundhouses and all buildings; chimney caps. Represented by G. E. Greer, W. A. Walkup and E. H. Miller. Space 278.

Keuffel & Esser Company, New York, N. Y.—Drawing materials, mathematical and surveying instruments, measuring tapes. Represented by Rudolph Link. Space 98.

King Fifth Wheel Company, Philadelphia, Pa.—Interlocking roller-bearing car pivot. Represented by Amos O. Chase. Space 285.

Lackawanna Steel Company, Buffalo, N. Y.—Rails, rail joints, structural and bridge material, reinforced concrete bars, steel sheet piling and track supplies special alloy steels, including Ferro Titanium, Bessemer rail steel. Represented by A. P. Van Schaick, C. H. Hobbs, G. A. Hagar, F. E. Abbott, Paul J. Kalman, H. H. Cook, J. L. Hench, John C. Chandler and A. H. Weston. Spaces 30-31-32-33-34.

Lansing Wheelbarrow Company, Lansing, Mich.—Warehouse trucks and track barrows. Represented by H. H. Ames. Space 254.

Lehon Company, Chicago, Ill.—Roofings, waterproofings, insulating products and paints; Roofrite roofing with overseal lap; car and cab roofing; waterproofed canvas for passenger cars, Lehon's car roofing, car sill covering, and Mule-Hide roofing, Per-Bona insulating paper, Dry-Art insulating paper, Lehon's Duplex refrigerator felt, Niagara waterproof paper, Roofine paint, Damptite waterproofing compounds, Staylastic paint. Represented by Tom Lehon and J. H. Brown. Space 171.

Lidgerwood Mfg. Company, New York, N. Y.—Hoisting engine. Represented by Frank B. Knight, W. G. Wilmot and E. C. Reeder. Space 206.

Link-Belt Company, Chicago, Ill.—Elevating and conveying specialties as applied to the handling of coal, freight, etc., by railways. Represented by J. C. Nellegar, W. W. Sayers and R. C. Turner. Space 128.

Lorain Steel Company, Johnstown, Pa.—Track Material—Solid manganese crossing; built-up crossing, 3-rail type; solid manganese frog; 4-rail manganese center frog; 6-rail manganese center frog; manganese wing rail frog; expansion joint; manganese split switch point; "Tadpole" tongue switch; guard rail clamp; heavy pattern cast steel combination joint; samples of electrically welded joints; sections of deep tee and M. C. B. guard rails; track skate. Represented by S. P. McGough, A. S. Littlefield, S. J. Cotsworth, Carroll Burton, F. J. Drake, A. L. Verner and H. C. Stiff. Spaces 204-205-208-209.

Luck Cement Post Mold Company, Aurora, Ill.—Galvanized molds in which concrete fence posts are made; also posts made in our system of molds. Represented by John G. Birtness, C. G. Birtness, M. J. Griffith, C. H. Klenze and F. S. Townsend. Space 274.

Lufkin Rule Company, Saginaw, Mich.—Measuring tapes of all descriptions, steel rules, etc. Represented by Theo. Huss, S. B. McGee and F. G. Brown. Space 121.

Lupton's Sons Company, David, Philadelphia, Pa.—Lupton steel sash, Lupton rolled steel skylight, Pond continuous sash, Pond operating device, details and large photographs

of shop construction. Represented by Clarke P. Pond and P. A. Sanborn. Space 54.

Luther Grinder Mfg. Company, Milwaukee, Wis.—Hand and foot power tool grinders, grinders of all description, with special attachments for sharpening chisels and twist drills. Represented by C. J. Luther. Space 255.

Lutz-Lockwood Manufacturing Company, Aldene, Union County, N. J., P. O. Roselle, N. J.—Gordon primary cells, "SX" ignition dry cells, "SX" magneto, Aldene dry cells. Represented by Geo. Marloff and W. M. Kinch. Space 133.

Manning, Maxwell & Moore, Inc., New York, N. Y.—Railway and machinists' tools and supplies, electric traveling cranes, Schmidt hack saw machine and other specialties will be shown. Represented by F. L. Peterson, R. S. Dean, R. R. Cuthbertson and C. H. Schmidt. Space 279.

C. F. Massey Company, Chicago, Ill.—Illuminated signals for highway crossings, Massey battery wells and battery chutes, reinforced concrete culvert pipe, relay boxes, posts and markers, rubber covered insulated wire, roofing material. Represented by Chas. F. Massey, R. J. Collins, Geo. R. Boyce, P. F. Lyons, B. J. Libbe and Chas. Pflasterer. Space 114.

Matthews & Brother, W. N., St. Louis, Mo.—Matthews' guy anchors, cable clamps, cable splicing joints, lamp guards, guy clamps and other money saving specialties. Represented by Claude L. Matthews, W. N. Matthews, Victor L. Crawford, Walter E. Bischoff and A. P. Eckert. Space 137.

Matthews & Rothermel, Chicago, Ill.—Steel sash for railway cars; Model of furnace door for locomotives. Represented by E. M. Matthews, W. E. Rothermel and Arthur Doer. Space 237.

McKinnis Switch Lock Company, Chicago, Ill.—Represented by C. E. Rosenfels. Spaces 259-260.

Merillat Culvert Core Company, Winfield, Ia.—Adjustable collapsible cores for making concrete culverts. The Merillat system of culvert construction. Forms in operation. Samples and pictures of work done. Repr sented by P. C. Merillat and C. C. Merillat. Spaces 256-257.

Alexander Milburn Company, Baltimore, Md.—Portable acetylene lights up to 10,000-candlepower for railroad construction, wrecking and inspection work. Represented by A. F. Jenkins and C. R. Pollard, Jr. Space 216.

Morden Frog and Crossing Works, Chicago, Ill.—Manganese frogs and crossings, Unity stand with facing point lock and distant signal, "G. L. M." automatic switch stand, compromise joints, facing point lock for Mansfield stands, guard rail, clamps, switch adjustments, rods and plates. Represented by Arthur C. Smith, H. M. Macke, W. J. Morden and D. H. Cusic. Spaces 107-108.

Mudge & Co., Burton W., Chicago, Ill.—Adams Motor Car. Represented by Burton W. Mudge, Herbert Green, Geo. E. Simmons, Otto P. Hennig, W. E. Adams, J. L. Phillips and Geo. W. Bender. Space 183.

Municipal Engineering and Contracting Company, Chicago, Ill.—Concrete mixing machinery, Chicago improved cube concrete mixer. Represented by C. E. Batrick. Space 37.

Nachod Signal Company, Philadelphia, Pa.—Electric railway track model operating actual signals, high speed trolley contractors, signal relay. Represented by Carl P. Nachod and F. W. Kulicke. Space 263.

National Corrugated Culvert Company, Warren, Pa.—American ingot iron corrugated culverts. Represented by G. H. Charls, G. F. Ahlbrandt, Ray Frazer, Joe DeFrees, A. B. Wilder and H. W. Forie. Spaces 99-100.

National Indicator Company, New York, N. Y.—Indicators for announcing the arrival and departure of trains. Represented by J. Hutchinson and E. M. Smith. Space 238.

National Lock Washer Company, Newark, N. J.—Exhibiting nut locks and special testing apparatus showing power exerted by spring washers under compression, and toughness of steel structure. Represented by F. B. Archibald, R. L. Brown, F. B. Buss and J. B. Seymour. Space 125.

National Malleable Castings Company, Columbus, O.—Malleable track specialties. Represented by F. R. Angell, H. I. Hiatt, J. J. Byers and L. W. DeWitt. Space 144.

National Roofing Company, Tonawanda, N. Y.—Security wide-weld roofing, surfaced with gravel and feldspar; other grades of cheaper roofing; asphalt roof coatings; asphalt paints; graphite paints; stack and metal protecting paints; pure lead, zinc and linseed oil paints; cement waterproofing, etc. Represented by P. E. Sinnett, T. M. Orr, A. E. Arbuckle and D. A. Bonitz. Space 277.

National Surface Guard Company, Chicago, Ill.—Surface cattle guards, track wrench, lock washers, steel grain doors. Represented by J. T. Hall, I. L. Bolinger and C. H. Luthman. Space 175.

Nichols & Bro., Geo. P., Chicago, Ill.—Electric turntable tractor. Represented by Geo. P. Nichols, S. F. Nichols and Henry Fries. Space 173.

Ohio Post Mold Company, Toledo, O.—One battery of six post machines designed for making 30 poured concrete fence posts at one time, one battery of four post machines for making 20 poured concrete fence posts at one time, several sample posts. Represented by A. M. Smith. Space 258.

Okonite Company, New York, N. Y.—Okonite wires; aerial, underground and submarine cables for all kinds and conditions of electrical service; potheads; cable joints; Okonite and Manson tapes; samples of crude rubber. Represented by L. G. Martin, F. J. White, J. M. Lorenz, H. M. Cox and C. E. Kacin. Space 18.

Patterson Company, W. W., Pittsburg, Pa.—Double extra heavy wood tackle blocks for manila rope, double extra heavy steel tackle blocks for wire cable. Represented by W. W. Patterson, Jr. Space 147.

Paterson Nut Lock Company, Philadelphia, Pa.—Paterson nut lock. Represented by D. S. Paterson. Space 293.

Pease Company, C. F., Chicago, Ill.—Automatic blue and white print machinery in operation. "Pease" Peerless Combination Equipment, for printing, washing and drying both the blue prints and the "Pease" Direct White Prints by one continuous operation. Motor driven trimming tables and other blue print apparatus. Represented by C. F. Pease, P. M. Morgan, Thos. Lord, T. K. Murney and C. A. Green. Spaces 161-162.

Pennsylvania Steel Company, Steelton, Pa., and **Maryland Steel Company,** Sparrows Point, Md.—No. 10 solid Manard frog, design 165; No. 10 Manard anvil face frog, design 160, made for Baltimore & Ohio Railroad Company; No. 15 ditto, made for Pennsylvania Railroad Company; No. 16 ditto, made for Lake Shore & Michigan Southern Railway Company; No. 10 Manard anvil face spring rail frog, right-hand, design 278, made for Pennsylvania Lines west of Pittsburg, right-hand Manard switch point, complete with housed stock rail, made for Pennsylvania Railroad Company; No. 8 Manard knuckle rail, design 710, complete with 2 open hearth movable points, made for Pennsylvania Railroad Company, New York terminal; straight double-groove tongue switch, Manard hard center construction, complete with lever box, made of 9-in. girder, Section 263, made for New York Central & Hudson River Railroad Company, and used in paved streets, Syracuse, N. Y.; low New Century adjustable switch stand, model 51-A; low Steelton positive switch stand, model 52-A; intermediate New Century switch stand, model 50-E, with semaphore attachment; intermediate main line safety switch stand, model 56-B; Acme rail brace, made of half-inch stock, to fit section 1001; sample Neverslip interlock switch plate, complete with detector brace and rail section; two sample Q. & C. Bozano compromise joints, model of steel coast line boat as built by Maryland Steel Company, marine department. Represented by G. S. Vickery, J. Drew Allen, Walter H. Allen, H. C. Banks, H. G. Barbee, E. Goodwillie, Stanley Smith, R. L. Weaver, R. E. Belknap, C. F. Rowland, John F. Hennessy, M. W. Long, W. M. Henderson, J. G. Miller, N. E. Salsich, C. Langdon and Thomas Earle.

Pittsburg Metal Products Company, Pittsburg, Pa.—Genuine American ingot iron, 99.94 per cent. pure plates, stack iron, sheets, locomotive jacket steel, boiler tubes, locomotive flues, pipe, merchant bars, angles, channels and rivets. Represented by T. G. Seixas, W. Lester Walker and A. P. Scott. Spaces 244-245.

Pneumatic Jack Company, Louisville, Ky.—Pneumatic lifting jacks and accessories. Represented by J. S. Leake. Space 240.

Pocket List of Railroad Officials, New York, N. Y.—Pocket list of railroad officials. Represented by J. Alexander Brown, Harold A. Brown and Chas. L. Dinsmore. Space B.

Potter-Winslow Company, Chicago, Ill.—Reinforced concrete battery chutes, storage battery containers, concrete foundations, posts, signs. Represented by Frank H. T. Potter, A. C. Heidelberg and George H. Davis, Jr. Space 174.

P. & M. Company, Chicago, Ill.—P. &. M. anti-rail creepers, arc lamp lightning arresters, bond wire protectors, photographs of P. & M. anti-creepers, in service. Represented by Philip W. Moore, Fred A. Preston, Alvar R. Sutter, L. W. Kent, Geo. E. Johnson and David T. Hallberg. Space 123.

Q. & C. Company, New York, N. Y.—Q. & C. Bozano joints, rolled steel step joints, cast-steel step joints; Bozano insulated joints, anti-rail creepers; rail benders; portable rail saws; guard rail clamps, rail braces, track re-laying machine; Kimball concrete tie. Represented by C. F. Quincy, G. C. Isbester, G. L. Hall, J. V. Westcott, H. E. McCormick, J. A. Bodkin, C. C. Rossire, A. R. Horn, J. J. Quinn and T. B. Bowman. Spaces 120-139.

Rail Joint Company, New York, N. Y.—Continuous, Weber and Wolhaupter types, base supporting rail joints. Represented by V. C. Armstrong, L. F. Braine, W. E. Clark, J. A. Grer, Percy Holbrook, H. C. Holloway, J. G. Miller, F. A. Poor, E. L. Van Dresar, B. Wolhaupter and F. C. Webb. Spaces 81-82.

Railroad Supply Company, Chicago, Ill.—Tie plates, derailers, signals. Represented by E. H. Bell, C. P. Cogswell, Jr., J. M. Comerford, E. W. Vogel and A. H. Smith. Space 85.

Railway Age Gazette (Maintenance of Way Daily) and The Signal Engineer, New York, N. Y.—Represented by Edward A. Simmons, Samuel O. Dunn, Lucius B. Sherman, John N. Reynolds, Henry Lee, Frank S. Dinsmore, Cecil R. Mills, Bradford Boardman, E. T. Howson, William Forsyth, W. E. Hooper, A. D. Cloud, H. H. Simmons, E. S. Faust, Kenneth G. Cloud, Harold D. Horton and T. E. Crossman. Spaces 44-63.

Railway List Company, Chicago, Ill.—The Monthly Official Railway List, Railway Master Mechanic, Railway Engineering and Maintenance of Way. Represented by Wm. E. Magraw, C. S. Myers, C. C. Zimmerman, J. M. Crowe, Warren Edwards, L. F. Wilson, N. F. Rehm and O. W. Midleton. Space 112.

Railway & Engineering Review, Chicago, Ill.—Represented by Willard A. Smith, Walter M. Camp, Clyde F. Burns, J. M. Lammedee, Robt. R. Greig, A. E. Hooven, G. E. Ryder, P. G. Stevens and Harold A. Smith. Space 20.

Ramapo Iron Works, Hillburn, N. Y.—Automatic safety switch stands; manganese pointed switches, manganese center frogs, solid manganese reinforced frogs, rolled manganese steel rail, guard rail, rail clamps; special switch slide plates, etc. Represented by Arthur Gemunder, W. B. Lee, W. C. Kidd, F. S. Stowell, James B. Strong, J. Edgar Davidson and W. W. Snow. Spaces 91-110.

Roberts & Schaefer Company, Chicago, Ill.—Working model of a Holmen fireproof structural steel locomotive coaling station, working model of a Sauerman Siamese ccal breaker, enlargements of photographs of various types of locomotive coaling stations. Represented by Edward E. Barrett, Clyde P. Ross, Charles T. Malcolmson and James S. Shannon. Spaces 78-97.

Robertson Company, William, Chicago, Ill.—Plans and photographs of ash conveyors, sand dryers, pneumatic hoists, sand tower and sand valves. Represented by Thomas F. Lynch and William Robertson. Space 290.

Robinson & Co., Geo. M., Dubuque, Ia.—Metallic railway tie and fastenings. Represented by Geo. M. Robinson. Space 172.

Sandwich Electric Company, Sandwich, Ill.—Selective telephone and signal apparatus. Represented by E. C. Hennis. Space 248.

Scherzer Rolling Lift Bridge Company, Chicago, Ill.—Models, photographs, designs, plans, drawings and literature. Represented by Albert H. Scherzer, Fayette F. Soule, C. L. Keller, J. I. Vincent, J. T. Dickerson, W. F. Martin, H. D. Harting, R. W. Flowers and F. Roman Aszman. Space 178.

Sellers Manufacturing Company, Chicago, Ill.—Tie plates, angle bars, "Sellers Anchor Bottom Tie Plate." Represented by J. M. Sellers, J. T. Markham, L. S. Gordon and T. J. Hopkins. Space 124.

T. W. Snow, Chicago, Ill.—Railway water appliances. Space 179.

Spencer, Otis Company, Chicago, Ill.—Tie plates called "Economy Tie Plates;" also exhibiting the American Kron scale. Represented by W. L. DeRemer, Carter Blatchford, L. D. Rockwell, Geo. Ringhausen, W. D. Thompson, C. G. Rank, Chas. A. Coons, H. T. Hart, A. S. Flowers, H. G. Fennel, O. M. Olson, Avery Robinson and G. H. Goodell. Spaces 122-141.

Standard Asphalt & Rubber Company, Chicago, Ill.—Sarco products and methods as applied to waterproofing railway structures. Represented by W. H. Lawrence.

Standard Paint Company, New York, N. Y.—Ruberoid roofing, Ruberoid car roofing, insulating papers, railway equipment and bridge paints. Represented by John H. Thomas, B. C. Beckman and H. A. Inwood. Space 159.

Standard Scale & Supply Company, Chicago, Ill.—"The Standard" scales, freight and warehouse trucks, Eclipse low charging concrete mixer. Represented by M. H. Reed, Jos. Simpson, W. A. Browning, F. F. Gillett and A. N. Hundley. Space 49.

Standard Underground Cable Company, New York, N. Y.—Bare and insulated copper wires, bare and insulated copper-clad wires. Represented by H. P. Kimball, R. G. Harris, E. J. Pietzcker, Russell E. Green and B. S. Stewart. Space 286.

Steam Shovel & Dredge Journal, Chicago, Ill.—A journal devoted to railroad construction work, railroad contractors' supplies and equipment of every description. Represented by T. J. Dolan, Matt. Brady and James F. Conigan.

Sterling Varnish Company, Pittsburg, Pa.—Sterling iron enamel paints, Sterling Row refined linseed oil. Represented by W. V. Whitfield and W. F. Heberd. Space 150.

Strait Scale Company, Kansas City Mo.—Strait Standard heavy special railroad pattern track scales, also other patterns and other scales used by railroads. Strait improved type registering beams. Represented by Wm. M. Welsh. Space 194.

Strauss Bascule Bridge Company, Chicago, Ill.—Photographs, plans and modles of Strauss bascule bridges. Represented by J. B. Strauss and C. S. Davis. Space 160.

Taylor Lock Nut Company, Salt Lake City, Utah.—Lock nuts, showing their application to track and car work. Represented by R. E. Gray and E. W. Taylor. Space 252.

..Templeton, Kenly & Company, Ltd., Chicago, Ill.—Simplex track and car jacks. Represented by A. E. Barron, J. H. Hummel, W. B. Templeton and W. Harding Davis. Spaces 4-5.

Union Iron Works, Hoboken, N. J.—Steam and air pile driving hammers and equipment. Contractors' equipment. Represented by Max Schalscha. Space 215.

Union Switch & Signal Company, Swissvale, Pa.—Interlocking and signaling apparatus for steam and electric railways, including electro-pneumatic, electric and electro-mechanical interlockings in operation; signals, relays and other apparatus for A. C. or D. C. automatic block signaling; staff system for use on steam and electric railways of the "Operator" and "No-Operator" type; electric crossing gates and bells, Keystone insulated rail joints, mechanical interlocking derails, etc. Represented by Col. H. G. Prout, J. G. Schreuder, S. G. Johnson, J. S. Hobson, G. A. Blackmore, H. W. Griffin, T. H. Patenall, W. M. Vanderslius, J. L. Brastow, W. H. Fenley, J. P. Coleman, L. F. Howard, M. D. Hanlon, W. H. Cadwallader and J. D. Taylor. Spaces 40-41-42-43.

United States Electric Company, New York, N. Y.—The Gill selector, railway signals and electrical devices. Designers of railway telephones. Consulting Electrical Engineers. Represented by W. L. Cook., Edw. E. Backus and M. E. Launbranch. Space 250.

U. S. Metal & Manufacturing Company, New York, N. Y.—"Diamond" tapered steel poles; Wolfe automatic rail joint lock; Columbia lock nuts, St. Louis surfacer paints and target enamels. Represented by A. A. Hegeman, Jr., Chas. C. Castle, F. C. Dunham and Arthur Masters. Space 19.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Water columns, tanks, tank fixtures, steel sub-structures (all in model), switch stands. Represented by L. E. Wolcott, A. J. Anderson and C. E. Ward. Space 111.

Universal Metallic Tie Company, Salt Lake City, Utah.—A steel cross-tie. Represented by J. W. Johnson and B. S. Rupp. Space 207.

Verona Tool Works, Pittsburg, Pa.—Track tools, track jacks, track gauges, nut locks. Represented by W. D. Hechler. Space 148.

Waterloo Cement Machinery Corporation, Waterloo, Iowa.—Polygon concrete mixer mounted on trucks with gasoline engine and automatic loader. Polygon contractors' and builders' gasoline hoist. Represented by C. D. Walworth, F. H. Clarke and H. F. Worden. Space 192.

Weir Frog Company, Cincinnati, O.—Railway frog, switch stands, guard rail clamp, maganese frog. Represented by N. O. Goldsmith and F. W. Allen. Space 226, Balcony.

Weir & Craig Manufacturing Company, Chicago, Ill.—Electric turntable tractors, compressed air turntable tractors, pneumatic and hydraulic drop pit tables, transfer tables, electric portable hoists, compressed air portable hoists, locomotive drop pit jacks (pneumatic and hydraulic). Represented by Fred G. Whipple and R. W. Young. Space 145.

Weisell Nut Lock Company, Chicago, Ill.—A nut-lock in the form of a lock nut. Represented by C. J. Grady, M. G. Cheney and E. H. Stolz. Space 167.

Western Electric Company, New York, N. Y.—Railway telephones for train dispatching, siding telephones, portable telephones for train crews and all telephone apparatus, fan motors, arc lamps, installation material; Buffalo grips, Mazda lamps, bells and buzzers. Represented by H. L. Porter, D. C. Guest, M. A. Oberlander, G. K. Heyer, W. H. Doherty and H. L. Grant. Space 181.

C. H. Whall & Company, Boston, Mass.—"Whall's Special Railroad Fibre" for insulating rail joints, etc. Fusees for train protection. Represented by F. R. Whall and John B. Given. Space 127.

Wm. Wharton, Jr., & Company, Inc., Philadelphia, Pa.—Manganese steel switches, frogs, crossings and movable points; switch stands, guard rail clamps, anti-creepers, models, photographs, etc. Represented by V. Angerer, L. R. Ashhurst, Jr.; R. C. McCloy, W. B. Cooke, W. McLain and Arthur S. Partridge. Spaces 9-10-28-29.

Whitehead, Jos., Farmington, Ill.—Composite tie, metal and concrete railway tie. Represented by Jos. Whitehead. Space 291.

Winan's Improved Patent Rail Joint Company, Portland, Ore.—A base supported rail-joint. Represented by Audobon Winans. Space 185½.

At the Coliseum

R. E. Derby, formerly in the sales department of Fairbanks, Morse & Co., Chicago, recently has become associated with Joseph M. Brown, 303 Great Northern building, who is local representative for Peter Gray & Sons, Boston, Mass., manufacturers of railway and signal lamps and lanterns.

The Concrete Form & Engine Company, Detroit, Mich., exhibits the Belle Isle, 2 to 2½ h. p. gasoline engine, designed for track velocipedes used by signalmen. It weighs only 73 lbs. and costs less than $50. The company has at the Coliseum a giant telegram, giving an account of an emergency run made by R. F. Smith, Myerstown, Pa., with one of the Belle Isle engines.

The Vanadium Sales Company of America, Pittsburgh, Pa., recently secured a remarkable test of Vanadium steel taken from cast steel pinions after their final treatment. The tensile strength was 112,010 lbs., the elastic limit 63,180 lbs., the elongation was 20 per cent. in 2 in., and the reduction in area 49.6 per cent. This company predicts that railways will be using Vanadium steel castings for wheel centers, as well as locomotive frames, in the near future.

R. N. Baker, who has been identified with the signal supply business for a number of years, resigned his position with the Bryant Zinc Company, Chicago, last week, to go to the Western Electric Company, Chicago, in one of the departments which are not connected with railroading. Mr. Baker was formerly with the Batteries Supplies Company, now owned by the Edison interests, and was in the sales department of the Western Electric Company previous to his entrance into the signal field.

RESTORED WHARTON MANGANESE STEEL FROG.

The restored frog in the exhibit of Wm. Wharton, Jr., & Co., Inc., Philadelphia, Pa., is one of a number of manganese steel frogs that the Wharton company has brought back to life, so to speak. The process is a patented one belonging to the company, and consists of releveling the surface of the manganese part by bending and grinding and fitting the frog with new rails. The important feature about the frog on exhibition is that this is the second time it has been restored. The original frog was in service a number of years before it was rejuvenated, and almost the same length of time after the process was applied. After the convention the frog is to go back into the track for the third time.

VALVES AND POWER PLANT FITTINGS.

The Crane Company, Chicago, is exhibiting an extensive line of valves, fittings and specialties, for use in power plants, wood preserving plants, and for railway service in general, in space 146 at the Coliseum.

One of the most interesting features of this exhibit is a straight-way valve for creosote with a clean-out pocket. The company is equipped to furnish these valves in both the wedge gate and double disc parallel seat types and for all working pressures. These valves are made from materials that will best withstand the deteriorating effects of creosote or zinc chloride. A working exhibit of steam traps is another unique feature. These steam traps, connected up with other apparatus, illustrate clearly, by actual operation, the inexpensive up-to-date method of removing condensation from steam lines or separators of a power plant and returning it to the boilers. The pipe bends, which span the Crane Company booth, are products of its plant. No expense has been spared in the equipment of this department of the factory. To meet the requirements of modern power plants, the Crane Company recommends motor-operated gate valves. These valves are among the foremost of steam specialties. One of them is on exhibition, connected up as it would be in a power plant.

In addition to the other articles, a complete line of valves for locomotive service is shown. These are especially designed for use in connection with injector, hose sprinkler, air pump, blower, lubricator, steam heat and throttles. These valves are of durable construction, have long threads, and all wearing parts are made to withstand the severest and most trying service.

TIE PLATES.

A few years ago manufacturers of tie plates offered the trade only a few designs to choose from and engineers were compelled to order the one that seemed to be best suited for their needs. The requirements of the different lines, on account of the variation in traffic conditions and also on account of the different kinds of ties used, have necessitated the designing of many new plates to meet the particular requirements of the several roads. The Hart Steel Company, Elyria, Ohio, has recognized this situation and has equipped itself to manufacture a large line of plates. Starting with a flat top flanged plate and a corrugated top flanged plate, it has introduced a four-flanged shoulder plate and a central flanged shoulder plate, besides numerous designs of tie plates which are rolled with or without any flanges on the bottom or with short flanges parallel to the shoulder. It also rolls the heavy double shoulder plate used by the Pittsburgh & Lake Erie. Besides these designs, the company offers a large number of screw spike tie plates, some of which have novel features. Numerous samples are on exhibition at Booth 101 in the Coliseum.

POSITIVE RAIL ANCHOR.

Most rail anchors depend on the gripping of the edge of the rail flange for stopping rail movement, but the Positive rail anchor, which is here illustrated, takes advantage of the natural wedge shape of the base of the rail and obtains the desired result by the use of a wedging jaw. This is a one-piece rail anchor with no bolts, keys, rivets, wedges or set screws. No wrenches or special tools are required for its application, and a light hammer is all that is necessary for



Fig. 1.

this purpose. The manner of application is illustrated in the cuts. In Fig. 1 the small jaw is placed over the edge of rail base and is driven on with hammer until the back wall of the small jaw is in contact with the edge of base. The anchor is then lifted into place, engaged with the wedging jaw, and is then moved forward until its foot is in contact with the tie. The small jaw is then driven forward with a few light blows and this will wedge the large jaw firmly on rail base. The operation is finished by driving the bendable lug on the cap

of small jaw, down on side of rail base, as shown in Fig. 2. This will completely lock the anchor on rail.

To remove the anchor drive a chisel, or wedge the end of a track spike under the back end of bendable lug until it is sprung back to its natural position, then drive the small jaw

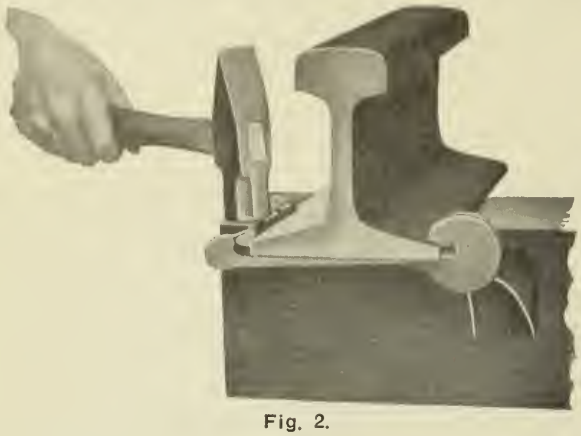


Fig. 2.

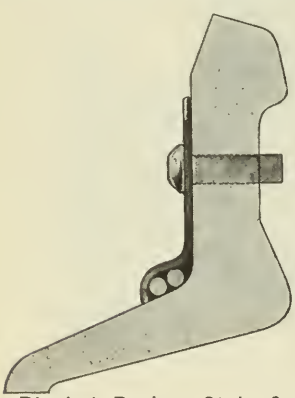
back from tie. The wedging hook can then be removed and the anchor becomes loose. The Positive Rail Anchor Company is incorporated, and the president's office is at 2910 High street, Louisville, Ky. The secretary and treasurer's office is at Marion, Ind.

STEEL WINDOWS.

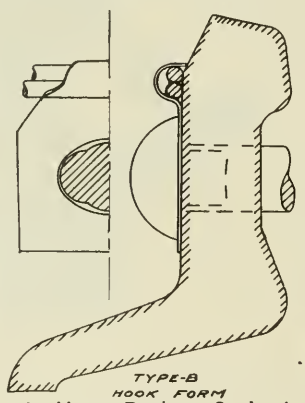
Many architects and engineers are familiar with the merits of Detroit Fenestra solid steel windows for industrial construction, manufactured by the Detroit Steel Products Company, Detroit, Mich., and will be interested to know that this company has just become exclusive distributor in the United States for the metal casement windows manufactured by the Crittall Manufacturing Company, Ltd., London, England. These metal casement windows are used in office buildings, banks, public buildings and residences. The company is now prepared to furnish designs and estimates for steel casement windows for this class of construction.

BOND WIRE PROTECTORS.

During the past year the use of the bond wire protector has been widely extended. The function of this devise is to hold bond wires in such a position with regard to the bolts and nuts in the splice, that they will be free from interference



Riveted Design, Style 3, Type A.



Bolt Head Design, Style 1, Type B.

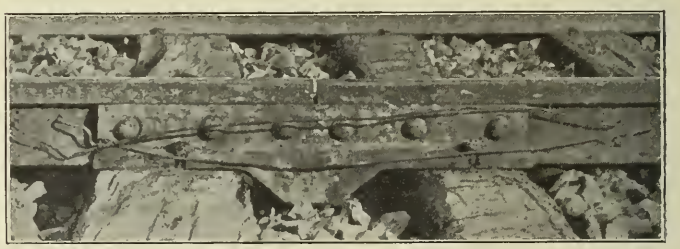
and breakage by track men and incapable of disturbance by malicious persons. During the rapid increase in track mileage under automatic signals, proper maintainance of bond wires has been overlooked in some cases, as shown in the cut herewith.

Only a small percentage of bond wire breakages is ever reported to the signal engineer. In the majority of cases when one bond wire is found broken, the other being in good shape, no signal failure results and the maintainer simply re-bonds the particular broken wire. Bond wire breakage is, however, a very common source of trouble to the maintainer, and quite a source of expense to the railway company. Aside from the large number of breakages which do not cause



Protected Bond Wires.

signal failures, there are a certain number of cases of breakage which do cause signal trouble. The bond wire protector largely does away with such breakage, can be applied at low first cost and requires practically no attention after application. The bond wire protector is offered in two general types. One design is held in place by the bolt head, the second design is riveted into the angle bar with the usual 9-32 in. bonding rivet, the clip being furnished complete with the rivet. Both designs are furnished at the option of the purchaser to hold the wires either above or below the bolts.



Unprotected Bond Wires.

When properly applied, the track bonding presents a very neat appearance.

The bond wire protector is standard on several of the largest railway systems in the country, and its use is extending rapidly. The P. & M. Co., Chicago, which was formerly known as the Railway Specialty & Supply Co., has been marketing this device for the last several years, each year seeing a large increase in sales over the preceding year. A very complete exhibit of bond wire protectors as applied to the rail may be seen at booth No. 123 of the P. & M. Co., at the Coliseum this week.

SCHERZER ROLLING LIFT BRIDGES.

The pronounced tendency in railway development during the last few years both in the United States and abroad has been the concentration of traffic on existing rights-of-way by means of double and multiple track construction rather than the building of adjacent competing lines. On many of our prominent railways traffic has increased so rapidly during the past few years as to require two, four, six and even eight parallel tracks for its accommodation and economic building.

An inherent limitation of the center pier swing bridge for railway traffic is the fact that it cannot be enlarged or widened to accommodate additional tracks, necessitating its being discarded and removed, frequently when only a few years old. This difficulty is overcome by the bascule

bridge, designed by the Scherzer Rolling Lift Bridge Company, Chicago, which can be constructed as a single-track structure and enlarged to a double or multiple track bridge at any time, without disturbing traffic or interfering with the existing bridge, by simply adding any number of new bridges alongside of the existing structure as they are needed. They can be operated as separate units or can be linked together and operated as one structure.

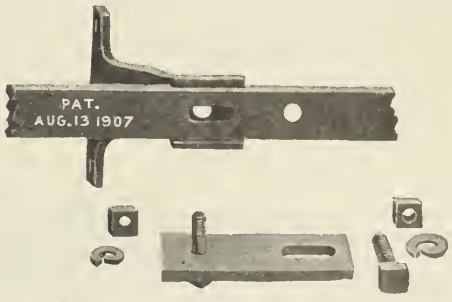
Some of the more notable Scherzer rolling lift bridges are the four-track bridge for the Metropolitan West Side Elevated, Chicago, which has safely carried more than 1,500 trains daily during the past fifteen years; the double-track bridge of the Baltimore & Ohio Chicago Terminal Transfer at the entrance to the Grand Central station—the longest span and most frequently operated bascule bridge in the world, in service for more than ten years; the eight-track bridge at Chicago used by the Pennsylvania Lines, the Baltimore & Ohio Chicago Terminal Transfer and the Chicago Junction, the widest movable bridge ever constructed; the single-track bridge for the Big Four at Cleveland, Ohio; the double-track bridge used jointly by the Big Four, the Lake Shore & Michigan Southern and the Erie at Cleveland; the two adjacent double-track bridges used by the Newburgh & South Shore and Baltimore & Ohio at Cleveland; the 230-ft. span single-track bridge for the Baltimore & Ohio at Cleveland; the double-track 160-ft. bridge at Cleveland, for the New York, Chicago & St. Louis; the two double-track bridges used by the Central of New Jersey, the Reading and the Baltimore & Ohio across Newark bay, New Jersey; the double-track bridge for the Boston, Revere Beach & Lynn, and the six-track bridge at the entrance to the South terminal station at Boston, for the New York, New Haven & Hartford, in service for more than twelve years. This company in the process of multiple tracking its lines has built four-track Scherzer rolling lift bridges at Neponset, Mass., Bridgeport, Cos Cob and Westport, across the Housatonic river, Connecticut, and a long span double-track bridge across the Connecticut river; also a double-track bridge across the Seekonk river at Providence, R. I. Six-track bridges, consisting of three independent double-track bridges side by side, have also been constructed by this company across the Bronx river and across Eastchester bay on the Harlem river branch of their New York division. The New York Central Lines have constructed a double-track Scherzer rolling lift bridge across Wappinger creek on the main lines of the Eastern division, to be four-tracked in the future; double-track bridges for the Lake Shore & Michigan Southern and Chicago, Lake Shore & Eastern have been constructed at Indiana Harbor across the new East Chicago canal. The Norfolk & Western in the process of double-tracking its lines has constructed two Scherzer rolling lift bridges, one across the Southern and the other across the Eastern branch of the Elizabeth river at Norfolk. The Seaboard Air Line has constructed a long span single-track Scherzer rolling lift bridge across Hillsboro bay at Tampa as a part of the new terminal improvements being made at that point. It has also this month completed a Scherzer rolling lift bridge across the Savannah river at Savannah, Ga. A single-track Scherzer rolling lift bridge has been constructed by the Norfolk & Southern, forming a movable span in its very long trestle across Albemarie sound between Edmonton and McKay's Ferry. A single-track Scherzer rolling lift bridge has been completed across Rainy river for the Duluth, Rainy Lake & Winnipeg and Canadian Northern. The San Pedro, Los Angeles & Salt Lake has also completed a long span Scherzer rolling lift bridge across the San Gabriel river at Long Beach, Cal. Other prominent Scherzer rolling lift bridges have also been recently completed or placed under construction for the following railways: The Georgia & Florida at Hazlehurst, Ga.; the Long Island at Long Island City; the Buffalo, Rochester & Pittsburgh at Rochester; the Brooklyn Rapid Transit at Coney Island; the Southern Pacific, Gould Lines and the Santa Fe as a part of the Galveston Causeway, Texas; the Baltimore & Ohio, Cleveland; the M. St. P. & S. S. M. at Portage, Wis.; the E. J. & E. at Whiting, Ind.; the Southern at Augusta, Ga.; the Central of New Jersey at Elizabeth.

The Scherzer rolling lift bridges constructed or placed under construction for foreign railroad service are very numerous, the more prominent being the double-track bridge for the South Eastern & Chatham across the Swale river, England; the double-track bridge for the Fishguard & Rosslare Railways & Harbors Company across Suir river, Ireland, on their high-speed connection with the Great Western Railway of England; three bridges for the Dutch Railroad Company, Holland; two double-track and one single-track bridge for the Buenos Ayres Great Southern at Buenos Ayres, Argentina, a 220-ft. span bridge for the Burma Railways near Rangoon, India; two bridges for the Tehuantepec Railway at Salina Cruz, Mexico; the long span double-leaf bridge for the South Indian Railway, connecting their system with the railway systems of the Island of Ceylon; the Canadian Pacific at Fort William, Ontario; the Furness, England, and the Cape to Cairo Railroad at Port Soudan.

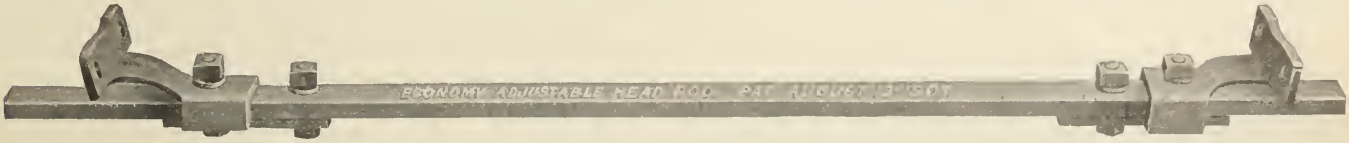
More than eighty single and double track Scherzer rolling lift bridges have also been constructed and placed under construction to accommodate local and interurban electric railway traffic, nearly all of these bridges accommodating double electric railway tracks.

ECONOMY ADJUSTABLE HEAD ROD.

The Economy Separable Switch Point Company, Louisville, Ky., makes an adjustable head rod, shown in the accompanying cuts. It is made of a solid bar of iron or steel, ready for installation in the track. The bars when installed are strong and rigid and require no attention after installation. The adjusting attachments allow for an adjustment of 1½ in. at each end, and are applied at the points of greatest stress in the head rod, forming reinforcements, as well as adjustments. The makers claim for this rod a high efficiency, ease of adjustment, rigidity and strength.



Economy Adjustable Head Rod. Adjusting Attachments.



Economy Adjustable Head Rod.

ELECTRO-MECHANICAL INTERLOCKING MACHINE, STYLE P.

The electro-mechanical machine applies many of the advantages of power interlocking to a mechanical plant, requires less energy for its operation, provides a reliable means for switch and signal indications, permits the use of electric detector locking eliminates facing point locks, bolt locks and detector bars, and, in addition, reduces the size of the tower required.

The large machine is of the Saxby & Farmer type and is furnished in standard sections, the levers being spaced 5 in. center to center. The miniature levers, spaced 2½ in. centers, are mounted above the large levers and so arranged that the small controlling switch levers are directly over the large levers controlled by them. The miniature signal control levers are placed between the switch levers and are for control of power-operated signals. The mechanical locking between levers is actuated entirely by the miniature levers, thus reducing to a minimum the liability of forcing or straining the locking.

The actual operation of a switch is accomplished by the large lever, and the mechanical locking is actuated and the indication taken from the miniature one. The electric levers are fitted with the electric lock and spring combination features identical with those used on the electro-pneumatic interlocking machine.

The miniature levers are made in multiples of two, and the operation of a switch lever is as follows:

1st. Throw the miniature lever to the middle position, actuating the locking and releasing the large lever for the operation of the switch. 2d. Operate the large lever. 3d. Complete the stroke of the miniature lever after the indication is received, which locks the large lever and also completes the stroke of the mechanical locking, releasing the signal levers.

This machine is made by the Union Switch & Signal Company, Swissvale, Pa.

SACRAMENTO BRIDGE; SOUTHERN PACIFIC.

The Missouri Valley Bridge & Iron Co., Leavenworth, Kan., recently completed the substructure for a bridge over the Sacramento river at Sacramento, Cal., for the Southern Pacific. The piers for this structure were sunk



Sinking Pivot Pier, Sacramento River Bridge of the Southern Pacific.

in hard gravel by the pneumatic process, the caisson pivot pier being 54 ft. in diameter. The accompanying view shows the general layout of the work during the construction of this pier, the piles of sand near the pier having been placed there by the government while deepening the channel. A very economical arrangement of concrete plant was used on this work, materials being received in cars on an elevated track back of the bins, which were located above and just back of the mixer. Concrete was delivered from the mixer to the piers by a small locomotive. No wheeling or shoveling was required in the entire operation of placing the concrete.

UNIVERSAL METALLIC TIE.

The Universal Metallic Tie Company, Salt Lake City, Utah, has on exhibition at Booth No. 207, at the Coliseum, several of its Universal Metallic ties. This tie is now in service on several roads and installations are being made on others.

The design is the trough type, being a 6-in. x 8-in. x 8-ft. steel channel. Holes are cut in the web of the channel on



Universal Metallic Tie in Pennsylvania Lines Tracks.

each side of the rail, and this metal is bent up vertically on each side of a wooden block which fits in the channel under the rail. Clamps, fitting over the base of the rail and extending down vertically outside these bent-up portions of the channel, bind the block, rail and tie together. The clamp on the gage side of the rail extends through the hole in the base of the channel about 4 in. into the ballast, giving an additional bond with the roadbed. A bolt with a tapering head at one end and with a tapering washer at the other end holds the connection tight. An insulating fiber is inserted between the rail and the clamp. The weight of this tie is 175 lbs.

The makers claim that with such a tie track work is much simplified, and that spikes, tie plates, rail anchors and braces are eliminated, materially reducing the number of parts to be watched by the section forces. The accompanying photograph shows these ties in service in the main line of the Pennsylvania Lines West, near Emsworth, Pa., where they have been in service since last November. The New York Central is also using them in main line at Fort Washington, N. Y., while they are in the main track of the Pittsburgh & Lake Erie, near Pittsburgh. They are installed in the main line of the Santa Fe, near Twenty-first

street, Chicago, and at Newton, Kan., while they have just been put in the main freight line of the Chicago, Burlington & Quincy, near Western avenue, Chicago.

PEASE BLUE PRINT PLANT.

The C. F. Pease Company, Chicago, is now placing on the market the complete equipment shown in the illustration and known as the Pease Peerless continuous electric blue-printer. The methods first employed in reproducing plans were very crude, consisting of a sun frame projected from the window, subject to the caprices of the weather, and resulting frequently in damaged tracings by a sudden shower. Then came the vertical electric printer, which was a long step in advance but still subject to great limitations and involving a large amount of labor in loading and unloading, necessitating the printing of log tracings in sections. Following this came the continuous electric printer, permitting the printing of tracings of any length in one piece, but still the methods of washing in trays and drying by looping over sticks prevailed, resulting in uneven drying and distortion of the prints. By the process described below, printing, washing and drying can be done



Pease Automatic Blue Print Machine.

automatically, greatly reducing the labor as well as the wear and tear on tracings and producing better prints.

The tracings are placed on the sensitized paper face upward and are carried by an endless canvas belt past the bank of specially designed arc lamps, enabling the operator to see the work as it progresses and immediately give it the proper exposure for best results. All tracings are returned direct to the operator, thereby giving the least possible wear on the tracings and enabling him to handle long tracings from the roll to the roll without kinking, while small tracings can be handled with equal facility. Sixty changes of speed can be made directly through the motor, and it is possible for the operator to make these changes instantly to suit the work without leaving the front of the machine. The endless canvas belt is held in place by tension springs, so that the contact is perfect at all times, and there is no shifting of the belt. At the same time it is possible, by means of the foot treadle, to release a tracing at any moment, thus allowing the printing of a portion of a large tracing. The sensitized paper, immediately after leaving the printer, passes through the Pease automatic washing and drying machine, by which the prints are thoroughly washed and dried as fast as they are printed, winding up automatically at the end of the machine, ready to be cut off at any time. The result of this continuous method of washing and drying is that the prints are free from stick marks and wrinkles and are dried evenly without distortion.

This company also makes a combination machine with which it is possible to make both ordinary blue prints and Pease direct white prints from a tracing without negatives. These white prints are fast color and will not shrink. They are largely used for material bills, statistical matter and maps. It is possible to change this combination machine from direct white prints to blue prints, or vice versa, without stopping its operation. The combination features in this machine effects a considerable saving in space, doing away with large washing trays and also in labor, as the entire work of washing and drying the prints is eliminated.

The Pease Company, in designing the above equipment, has paid a great deal of attention to mechanical details with the idea of producing the largest volume of prints at the smallest operating expense and maintenance cost. This apparatus can be seen during the week of the convention at the Coliseum, sections 161 and 162.

EIGHT-TRACK ROLLING LIFT BRIDGE.

The accompanying cut shows the eight-track Scherzer rolling lift bridge over the Drainage Canal at Thirty-first street and Campbell avenue, Chicago. This bridge, which is the largest structure of its kind in the world, has four



Eight-Track Scherzer Rolling Lift Bridge Over Drainage Canal, Chicago.

154-foot spans, each of the single-leaf type and each designed for an E-55 loading. This structure replaced four incomplete Scherzer bridges of the two-leaf type which had been built in 1901 without segmental girders or operating machinery. The bridges were to have been completed later, and in the meantime were used as three hinged arches. When it became necessary to provide movable spans it was found that the new bridge as actually built would cost but little more than to complete the structure then in place. It was accordingly decided to replace entirely the old structure, which was done without interruption of traffic, only one leaf being out of operation at one time.

Some idea of the weight of the bridge may be gained by considering the fact that each of the eight segmental girders, with a radius of 28 ft., weighs 55 tons, and each of the eight track girders weighs 65 tons. Of the eight tracks, the Pennsylvania Railroad has four, the Chicago Junction two, and the Chicago Terminal Transfer two. The general contract for this structure was let to the Chicago Bridge & Iron Works, Chicago, who completed the work about July 1, 1910.

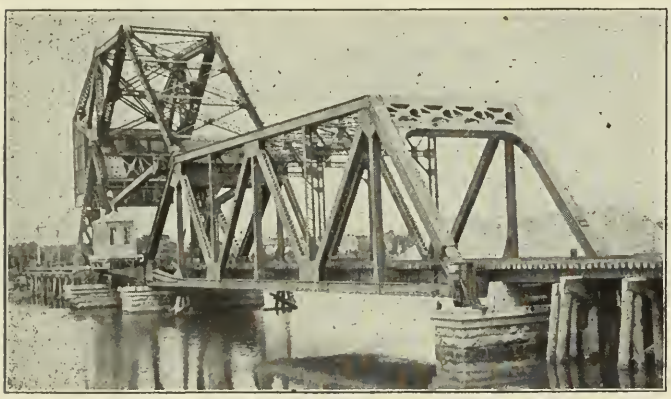
SEMAPHORE OIL.

Semaphore long-time burning oil, which is manufactured and sold only by the Maloney Oil & Manufacturing Company, Scranton, Pa., is refined to meet the exacting demands of signal work. It is produced from a high-grade Pennsylvania crude oil which contains no sulphur. Tests show that it will burn for over 150 hours without causing the lampwick to be crusted over and retains a high candle power until burned out. In one test the lamp was kept burning for four months and the incrustation was so slight that the flame was not materially affected.

This oil is produced at the company's refinery at Oil City, Pa., and is placed in new barrels especially prepared for that purpose. It will remain clear at zero temperature and does not show a cloud at 10 deg. below zero, which qualifies it for winter service as well as summer. The fact that it lasts longer and gives a better light more than compensates for the price being a little higher than for ordinary oil. In fact, the saving in labor of attendance alone will overcome the difference in price. The Semaphore brand is copyrighted.

RECENT INSTALLATIONS OF STRAUSS BASCULE BRIDGES.

The Strauss Bascule Bridge Company, Chicago, has made exceptional progress in the installation of large movable bridges during the past year. This company now devotes itself exclusively to movable bridges and in particular to the Strauss bascule bridge. This design has been perfected to a high degree and the company has been rewarded for its efforts by a large number of contracts from the railways in the United States and Canada.



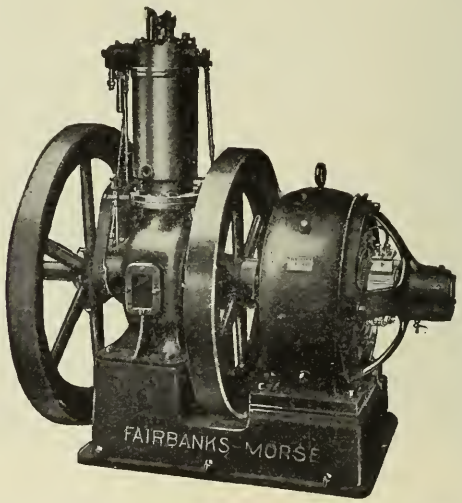
Strauss Bascule Bridge at Buzzard's Bay.

Among the large bridges now under way are the following: A single leaf, double track, double deck bascule bridge, 186 feet long, for the Canadian Pacific at Ft. William, Ont., which is the first of its kind; a single leaf, four-track bascule bridge for the Lake Shore & Michigan Southern at Port Clinton, Ohio, also the first of its particular design; a double leaf cantilever bascule bridge for the city of Portland, Ore., which is 278 feet center to center of piers and 71 feet wide, one of the largest bridges in the world; the bascule span of the Palace bridge at St. Petersburg, Russia, one of the most ornate designs in the world. The Peoria & Pekin Union, the Transcontinental of Canada, the Northern Pacific, the Chicago & Western Indiana and the Lake Shore & Michigan Southern, each have large single leaf, heel trunnion bascule spans, which will soon be in operation. The Erie, the Boston & Maine, the Baltimore & Ohio, the Florida East Coast, the Lake Shore & Michigan Southern and the New York, New Haven & Hartford all have bridges under construction, which will be put in service sometime during the summer of 1911, and several other roads will complete important movable bridges of Strauss design during 1912. Among the new orders received by this company is an ornamental bascule span for the double deck concrete viaduct of the Boston Elevated Railway.

C. S. Davis, formerly chief engineer of the Toledo-Massillon Bridge Company, and vice-president and manager of the Massillon Bridge & Structural Company, has severed his connection with those companies to take charge of the business of the Strauss Bascule Bridge Company in eastern territory. Phil L. Kaufman is in charge of the business on the western coast, John Irving and C. H. Sutherland are Canadian representatives, and K. Hajgaard is European agent for the company. With this representation the company confidently expects large increases in its business. Models of the bascule type bridge are on exhibit in booth 160 at the Coliseum.

GAS ENGINE AND GENERATOR OUTFIT.

An interesting feature of the Fairbanks, Morse & Co. exhibit at the Coliseum, is one of their 9-horse-power gas engines, direct-connected to a 5½-kilowatt generator which is furnishing current for the additional lighting which is being used in their space. This company has so developed its electrical business "in synchronism," so to speak, with its engine business, that they are now producing electric outfits driven by belt or direct connection from internal combustion engines, and these outfits are being used generally by railways not only for lighting, but for charging storage batteries for operating signals and drawbridges.



Fairbanks-Morse Gasoline Engine Direct Connected to Generator.

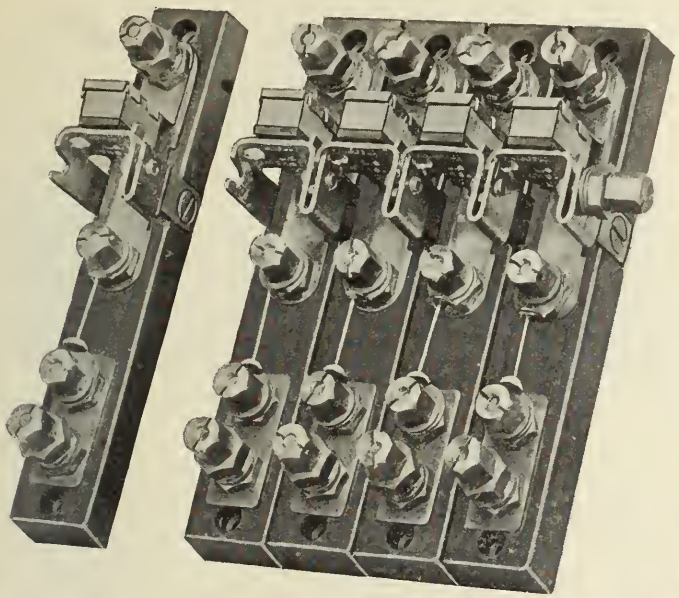
The engine in the generating outfit now on exhibition is known as a special electric engine, being fitted with a special governor that gives a very close regulation, which is necessary in the production of electric current, especially for electric lighting. This machine has been developed from the ordinary "hit and miss" type of engine and the regulation is as close as can be obtained by steam or other power. This special electric direct-connected outfit is made in sizes from 2 to 150-horse-power, in vertical and horizontal machines and is designed to operate on gasoline, gas, kerosene, crude oil, distillate, alcohol, or producer gas.

In connection with isolated plant work, this company has recently issued a bulletin entitled, "Catechism on Direct Current Apparatus," which has been much in demand, and a

large number of copies have already been distributed on application of engineers and other railway officers. This company makes a feature of co-operating with the railways for the development of products to meet their special requirements.

BRACH ARRESTERS.

The L. S. Brach Supply Company, New York, has recently introduced an enclosed type of lightning arrester. This new arrester consists of an insulating shell of special



Type 21 Arrester.

moulded metal made in bell shape. A recess is provided inside to accommodate the operating parts. Means of access to these parts is secured through a threaded plug



Type 23 Arrester.

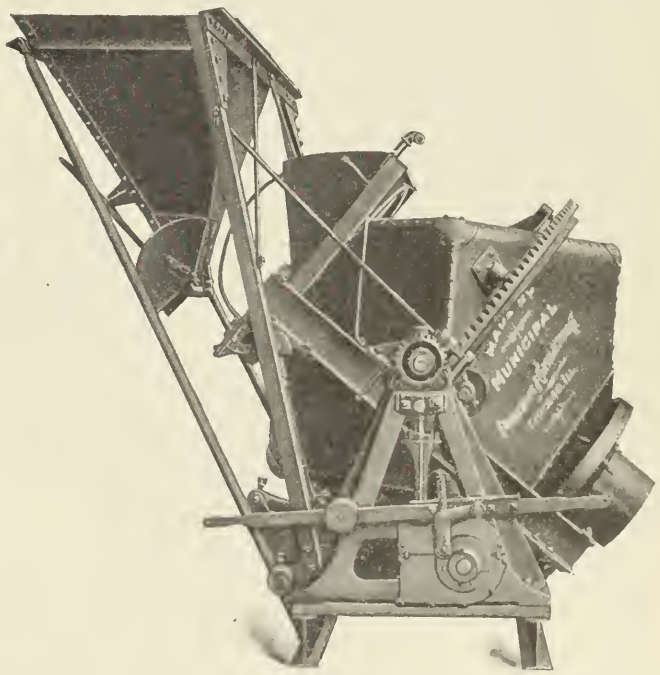
which screws into the bottom of the bell-shaped insulator. Every precaution has been taken to protect all the parts from moisture. Line terminals are moulded in the shell, and the ground terminal attached to the screw plug is protected by a double petticoat flange, which is in harmony with the best electrical engineering practice.

Among the interesting features in connection with this instrument is the fact that it may be either hung to the wire or clamped to the cross-arm, pole or building. A length of wire for making connections enters the top and bottom of this arrester, so that a splicing connection may be made. Another type of the same instrument is provided with a Fahnstock clip for easy and rapid installation. As the Brach arrester cannot become grounded, it can be seen that this type may be put anywhere on the circuit without providing for inspection. Vents of special design in this arrester take care of the accumulation of gases by heavy discharge.

This arrester is being shown at the Coliseum this week and is also illustrated in the L. S. Brach Supply Company's catalogue No. 2, which was recently issued.

CUBE MIXER.

The first form of machine to be extensively used for mixing concrete was a cubical box journaled at diagonally opposite corners and having a door in one side through which the charge of cement, sand, stone and water was filled and the batch of mixed concrete was emptied. While this old, home-made machine was slow of operation, it turned out a concrete so uniformly mixed that no hand-mixed product could compare with it. This same idea of cube has been retained in the Chicago improved cube mixers, made by the Municipal Engineering & Contracting



Cube Mixer.

Company, Chicago. In these mixers there are no scoops, paddles or shelves, but the batch is treated as a unit, being shifted six times in each revolution and given a criss-cross motion. The material is constantly folded over on itself, is having its shape continuously changed and is under constant squeezing and pressure. In this way, as the entire batch is always in motion, each particle is constantly rubbing against some other particle as the mass is folded and refolded on itself, and there is a great crushing, grinding and kneading of the ingredients, every pebble or piece of stone being perfectly smeared with the coating of cement paste.

ROCKFORD GASOLINE MOTOR CAR.

The control and manufacture of the Rockford motor car, originally introduced by the Duntley Manufacturing Company, Chicago, have been acquired by the Chicago Pneumatic Tool Company, Chicago. This company has bought all patterns, patents, goodwill, etc., and made the necessary arrangements for making the cars, and for supplying repair parts. During the two years the Rockford car has been in service, it has shown its advantages in the saving of time and energy, the longer hours of work possible and better condition of the men when at work, and in other ways. Many voluntary letters from the practical men in charge have been written commending the service of these cars under widely varying conditions. The frame construction is of welded steel channels and angles, insuring stability and durability. The power is a two-cylinder, four-cycle engine, direct connected to the driving axle, developing 3½ to 15 h. p., according to style and intended service. The control is so arranged that the speed can be easily regulated.

These motor cars are built in several styles, for regular service in maintenance of way, for inspection purposes, and for extra heavy service, bridge, telegraph and signal work. All these cars are built to pass switches and curves with certainty of staying on the rail, but are easily and quickly removed from the track.

COAL WASHING PLANTS.

Coal washeries are built to remove from screenings as mined impurities, such as sulphur, slate, fire-clay or other substances foreign to the coal itself, by a mechanical process called "washing," and after removing the impurities to separate the washed coal into the established market sizes, such as washed egg, No. 1 washed nut, washed pea, washed slack, etc.

Fig. 1 illustrates a coal washing plant having a capacity of 900 tons per day. The screenings, including all coal 3½ in. in size and smaller, are conveyed from the tipple at the coal mine by a belt conveyor to the unwashed coal storage bin of the washer and from this bin are fed automatically into the washing machines, called "jigs," where the separation of the impurities from the coal takes place. The screenings are immersed in a receptacle containing water which is given a pulsating motion by fast moving eccentrics. This causes the impurities to separate from the coal, the heavier particles or impurities falling to the bottom of the jig and being removed therefrom separate from the coal. The coal is of a lighter specific gravity than the impurities (or refuse) and is floated off the jig at its top surface by the pulsating motion of the jig.

The washed coal on leaving the jigs is sluiced with the washing water to perforated bucket elevators and screens for the purpose of removing the water from the coal and separating the washed coal into the desired market sizes. Each size is put in a separate bin having a capacity of 75 tons, or more than enough for one railway car.

The plant shown first prepares the washed coal in seven sizes and is said to be the only washer operating on bituminous coal that is successfully making this perfect sub-division of sizes. It is just as important to size the coal properly as it is to wash it properly. The refuse is removed from the jig by perforated bucket elevators which deliver it to a small refuse car. This car is actuated by a small hoisting engine, which pulls it up a small incline to the refuse dump. The refuse material is valueless and is simply wasted over the country adjoining the plant.

The plant is provided with adequate settling tanks which permit the coal to settle from the water. The water in the tanks is allowed to overflow and is then recovered and pumped back to the jigs, providing a continuous circulation of water. This is permissible only where the nature of the impurities is such that they will not pollute the water, as happens when an excessive amount of fire-clay is mined with the coal.

Each coal washing proposition is a problem in itself, as a plant suitable for Illinois would not be suitable at all for Pennsylvania or Mexico coal. The quality of coal and the market for it must be carefully considered and the plant designed to suit.

The other picture shows a plant built for the Pittsburg-



Coal Washing Plant at Pana, Ill.; the Bituminous Coal Washing Company.

Westmoreland Coal Co. at Weaver, Pa. It is of reinforced concrete and brick construction throughout, having a washing capacity of 1,800 tons per day, and is equipped with a reinforced concrete washed coal storage bin having a capacity of 1,800 tons.

The operation of this washery is similar to that of the plant above described except that it was designed to remove from the screenings sufficient ash and sulphur to enable the company after washing this coal to make a marketable coke, which would not have been possible had the screenings not been washed. The washing of coal for coking



Coal Washing Plant at Bentleyville, Pa.; Pittsburgh-Westmoreland Coal Company.

purposes is another interesting study, and in this case it is also of the utmost importance that a careful study of the coal with its analysis be made together with the mining conditions before designing the coal washing plant.

The Roberts & Schaefer Co., Chicago, designed and built the plants described above, this being one of the specialties of that company. In addition to coal washeries, the Roberts & Schaefer Co. has departments devoted to locomotive coaling stations, complete coal mining and coal briquetting plants.

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The committee on wooden bridges and trestles went very thoroughly into the practice of pile driving this year, considering both the driving of wood and concrete piles. The principles of practice recommended for publication in the Manual have been worked up very carefully, as the few changes made by the convention in spite of the very thorough discussion show. Appendix B, including the principles of practice which were recommended for publication in the Manual, is to be commended for its conciseness. The Manual has been criticised at various times for the amount of explanatory matter included. To fully comply with its use as a guide for reference and not as a text book, the committees should be very careful to boil down their recommendations, and all explanatory matter should be excluded. Only by watchfulness in this regard can the Manual fullfil its best purpose.

The important subject of brine drippings and its relation to the corrosion of the metal portion of track and track structures is apparently disposed of, and dependence is now placed on the master car builders' ability to so construct refrigerator cars that this expensive destruction will be largely eliminated. Refrigerator cars are now being built in large numbers, and the total equipment is becoming enormous. A slight neglect on the part of a few lines would tend to cause continuance of the corrosion, requiring expensive renewals of track materials. While the Maintenance of Way Association may regard the subject as virtually closed, it is evident that the action of brine drippings on track is one of those evils which require eternal viligance, and further action is required by the Master Car Builders' Association and the American Railway Association, in formulating rules and penalties governing the matter.

The treatment of the report of the committee on Signals and Interlocking of the Railway Engineering and Maintenance of Way Association was chiefly noticeable for lack of discussion. This was a natural consequence of the fact that all the subjects presented had already been acted on by the Signal Association, and the action of this association was simply ratified. The only subject that provoked any remarks was that of bond wires. As was also brought out at the Signal Association meeting, it appears that though iron bond wires have been specified by the Signal Association and the individual roads since this device has been in use, for the past several years true iron has been unavailable and steel has been furnished instead. What is now sought is to make the specification conform to commercial possibilities. Apparently no one believes that true economy could be secured by the use of true iron, for though such bond wires are known to have lasted in service twice as long as mild steel, the cost is more than three times as much.

As will be seen by those who read the report on electricity, it strongly resembles the celebrated lecture of Josh Billings on "Milk," in which no mention is made of the subject in hand. The report dealt for the most part with the third rail and third rail clearances, and with the exception of the last two paragraphs of the recommendations, which deal with organization, it centers about the mechanical features of the third rail. The same holds true of the discussion. The recommendations of the committee were usually accepted without a word, while in cases where there was discussion it usually centered about some bit of verbiage rather than any real essential. For instance, the major portion of the debate was in regard to the determination of the gage line of the third rail, and, disregarding a mere word advocating the retention of the center line as the point of measurement, the talk was as to the whereabouts of the gage line and the definition of gage. So in the case of maintenance. The adoption of the recommendation turned on the use of the word "existing," it being specified that the work should be done by the existing maintenance of way organization. The word was finally left in place, with the understanding that some reference to electrified steam roads should be inserted. The discussion, therefore, while perhaps important, was perfunctory.

The question of providing adequate passenger terminal facilities is receiving unusual attention throughout the entire country. The enormous increase in passenger travel has outgrown most stations both in large and in medium-sized cities. Probably at no time have as many stations been in course of construction or under consideration as at the present time. Those of the New York Central and the Pennsylvania at New York; of the North Western at Chicago, and the Michigan Central at Detroit, Mich., the union station at Kansas City, Mo., the two union stations at Memphis, Tenn., and the union station at Tacoma, Wash., are but a few of the many large terminal stations under way; and there is a still larger number of places where plans are now being prepared and construction is but a short way off. The experience of the New York Central at

New York City and the North Western at Chicago should impress on the engineer the necessity of estimating very liberally the demands of future traffic. As Mr. Kittredge said yesterday in the discussion of the report on "Yards and Terminals," when the ordinance providing for the reconstruction of the Grand Central terminal expired in 1908, the amount of the station and terminal then finished was over 100 per cent. of the original estimate of the entire station, and the work done at that time provided but 40 per cent. of the facilities it was then necessary to plan to provide. The convention very wisely altered the recommendation of the committee by increasing the time for which demands must be anticipated from ten years to twenty years. The expenditure necessary for a passenger terminal is so great that much care should be taken to see that the full benefit be realized from it by securing the normal life from the building and layout. The committee called attention to the need of not only anticipating the demands of the future as far as it is possible to foresee them, but of also so making the design that expansion will be practicable should the increase in traffic exceed expectations. As the determining factors in the capacity of any terminal are facilities for free movement of trains in and out of train shed, and for the handling of express and baggage, special attention should be given to these factors. Trains must be able to move in and out at the same time without interference. With increasing state and municipal legislation, requiring the separation of street and railway grades, the number of stations with track levels either above or below the street level is increasing. This facilitates the handling of the baggage either above of below the track level —probably more commonly below. In separating these levels, greater facility is secured in handling both the baggage and the passengers.

THE TERMINAL ELECTRIFICATION PROBLEM.

President Fritch's address yesterday directed attention forcibly to the fact that government regulation now extends to every branch of the railway business. It first dealt with rates; it later was extended to safety appliances on equipment, and now it deals with so many phases of railway operation that it has become of direct importance to engineering, as well as other departments. The agitation of the subject of electrification in cities, for example—to which Mr. Fritch especially referred—is, of course, of particular interest to engineers.

There are two ways in which the railways can deal with questions such as this. One is to try to so educate public sentiment regarding railway affairs that the people will better understand what it is desirable and practicable to require of railways. The other is, to show public spirit and progressiveness by making such studies of the various questions of public interest that arise as Mr. Fritch suggested regarding the subject of electrification of terminals. When the public believes that the railways ought to do anything, it is the duty of railway officers to the public and to their stockholders either to show the public that the thing ought not to be done or to begin at once the necessary steps for accomplishing it. The Chicago railways long neglected to take such action as they ought in dealing with the agitation for electrification of their terminals. They are now beginning to set an excellent example in dealing with this subject. The presidents of the Northwestern, the Chicago & Western Indiana and the Burlington and the vice-president of the New York Central Lines have accepted appointments on a commission appointed by the Chicago Association of Commerce to make an investigation of the entire subject of terminal electrification. A chief engineer and a staff of assistants are to be appointed to do the work, and the railways have agreed to pay all the expenses involved. This is a move in the right direction. The fair spirit shown by the roads cannot fail to impress public opinion favorably, and the results of an investigation directed by a commission, including city officials, an eminent engineer, such as Dean Goss of the University of Illinois, prominent citizens and railway officers cannot fail to be much more enlightening than the results of one conducted by a body less representative.

A few years ago the city council of St. Louis created a Municipal Bridge and Terminals Commission to study the local terminal problem. Leading business men were appointed to it. The mayor was ex-officio chairman. After a thorough investigation the commission made certain recommendations to the railways for revision of their rates and improvement of their physical facilities. The roads made the rate changes suggested; they acquired at great expense the real estate necessary to make the physical improvements desired; and then the city council refused to pass the ordinances recommended by the city's own Bridge and Terminals Commission, and which were necessary to enable the roads to benefit by their purchases of real estate and make the needful improvements in their physical facilities.

The course of the city of St. Louis was utterly unfair to the roads. It is to be hoped that the Chicago lines will deal as fairly with their city as did the St. Louis lines, and it is to be hoped that if they do the city of Chicago, unlike the city of St. Louis, will give the roads in return a "square deal."

The results of the work of this Chicago commission will be followed with interest throughout the country, for, as President Fritch said, the question of electrification of terminals has become a live issue in several leading cities and the example set by Chicago in dealing with its very complicated terminal problem is apt to be followed by other cities in dealing with their much simpler terminal problems.

IMPACT TESTS.

The work done by the committee on iron and steel structures during the year 1910 is not as fully set forth in Bulletin 130 as the importance of the work done deserves. In Bulletin 125, published in July, 1910, are given the results of the work of the sub-committee on Impact up to that time, and in this report there is material which will repay study, not alone by maintenance officers or bridge engineers, but by operating and motive power officers as well. In the theoretical discussion of impact the counterbalancing of engines is shown to be the prime factor, while the design of the bridges is apparently one of less importance than it has, in the past, been considered. In the table showing the centrifugal force in percentages of the static load on drivers are some comparisons of engines of various types, used in the committee's tests, from the point of view of the amount of excess weight imposed on the rails by engines running at 60 miles an hour. In the last column of this table the percentage of increase over the static weight is shown for each engine, and in the wide variation between the several percentages, not only in the engines on different roads but also between different engines on one road, there is a suggestion that there may be room for improvement in methods of counterbalancing. It is hardly to be questioned that anything which will reduce the effect of impact on permanent way, whether it be on bridges or solid bank, will be a step toward both economy and safety.

It is of course true that in the table referred to both passenger and freight engines are shown, and that a speed of 60 miles an hour is probably more than should be used in determining the proper amount of counterbalance for a freight engine. At the same time the table shows several

passenger engines which have nearly a maximum effect at the assumed speed, and there is no doubt that these can be improved.

This work opens up an interesting field to the engineer, whose decision is final as to the running of a certain type of engine over existing bridges, some of them old and light. The amount of impact may be the determining factor in the unit stress computed, so that it becomes necessary to know with some exactness what should be the allowance. It is evident if the formula suggested by the committee be used in such a case, that if the engines concerned are counterbalanced to the best advantage the impact computed will be far in excess of the actual impact from the engine, and possibly the latter would be prohibited from running over bridges perfectly capable of carrying them with safety.

It becomes plain, then, that investigation into the amount of excess counterbalance possessed by the engine being considered will be desirable, and with this determined it will be sufficient to apply a factor to the formula proposed. Of course, as plainly stated in the report, the committee does not propose the formula as an impact formula for general use, but suggests only that it fairly represents the maxima results of the tests. It seems likely, however, that the formula as presented will, as in the case of the specifications for steel bridges, find wide use. Aside from the publication of results, including the comprehensive theoretical discussion, the sub-committee has done little in the past year. It is proposed to extend the tests this year to the investigation, by new and more delicate devices, of short spans, including some of reinforced concrete; sufficient funds, previously furnished by various railways, are available for the purpose. While the determination of impact on short spans has heretofore resisted all attempts at accuracy, there is good reason to believe that the committee will succeed in obtaining results comparable with those from its work on longer spans. It is worth the trial, and the support, both of the association and of the railways, should be given the work. As a matter of fact, the continuance of such tests, year by year, would, at very moderate cost, give the railways and the engineering profession data which would be of great value, in ways which may perhaps be obscure now but which will in time be evident.

In Bulletin 130 the committee presented specifications for bridge erection for discussion by the association and recommended their adoption. There is no doubt that these also will be valuable and will admirably supplement the specifications already worked up by the committee and adopted by the association.

PROGRAM.

Convention Program.

(Order may be changed by a two-thirds vote of the convention or by time required for consideration of reports.)

Wednesday, March 22.

Morning Session, 9 a. m. to 12:30 p. m.
Afternoon session, 2 p. m. to 5:30 p. m.
XVI. Economics of Railway Location.
II. Ballast.
III. Ties.
V. Track.
IV. Rail.
VIII. Masonry.
XIII. Water Service.
IX. Signs, Fences and Crossings.

Reception and Dinner.

Reception at 7 p. m. in Francis I room, Congress Hotel, followed by annual dinner in Gold room.

MEETING OF SIGNAL APPLIANCE ASSOCIATION.

The Signal Appliance Association held an informal meeting at the Coliseum at 11 o'clock Tuesday morning, March 21. The meeting was called to discuss arrangements for the annual convention at Colorado Springs next October, and various matters in connection with the action of the association at that time were discussed. It was decided to appoint a committee to look into the matter of transportation and rates to and from the place of meeting, and a formal meeting of the committee is planned for Thursday, March 23.

ENGINEERS' VISIT TO THE EXHIBIT.

It was decided at yesterday's meeting that the convention shall adjourn at 4 o'clock p. m. to-night, in order to give the members of the association an opportunity to go in a body to inspect the exhibit of railway appliances at the Coliseum.

In announcing the early adjournment of the convention for the purpose of making this trip to the Coliseum, President Fritch said: "The Railway Appliance Association has done itself proud this year in establishing one of the finest exhibits of railway appliances ever made, and I think it is due to the Railway Appliance Association that we show our appreciation of their efforts and visit this exhibit as much as our time will permit."

INVITATION TO VISITING ENGINEERS FROM CHICAGO ENGINEERS' CLUB.

Robert Isham Randolph, secretary of the Chicago Engineers' Club, has sent to President Fritch of the American Railway Engineering and Maintenance of Way Association, the following invitation to visiting engineers on behalf of the board of directors of the club:

"The Board of Directors of the Chicago Engineers' Club extends a cordial invitation to the members of the American Railway Engineering and Maintenance of Way Association to make use of the rooms and facilities of the Chicago Engineers' Club during the week of your convention. Guest cards can be obtained from Frank Coates, on the first floor of the Auditorium Annex."

MEETINGS OF BURLINGTON SIGNAL DEPARTMENT EMPLOYEES.

The signal department of the Chicago, Burlington & Quincy is planning to hold meetings of the employees at regular intervals, to discuss matters pertaining to the work of the department. The lines east and the lines west will have separate meetings. This plan will be put into effect immediately, and the first meeting will be held on Wednesday, March 22. The supervisors who will be in attendance will take advantage of the opportunity to visit the exhibition at the Coliseum during the day.

ANNUAL DINNER TO-NIGHT.

President Fritch will be toastmaster at the annual dinner of the American Railway Engineering and Maintenance of Way Association in the gold room of the Congress Hotel to-night. The dinner will be preceded by a reception at 7 o'clock, in the Francis I room, which immediately adjoins the gold room, and the receiving party will include the principal officers of the association and some of the past-presidents. The attendance at last year's dinner was 304, and present indications are that this year's attendance will be 350, or, perhaps, even 375. Among the invited guests who have indicated their intention to attend is Daniel Willard, president of the Baltimore & Ohio, who is president also of the American Railway Association.

The list of speakers has been somewhat changed, owing to

the inability of John F. Wallace and B. L. Winchell to be present. The speakers, in their order, probably will be as follows:

S. M. Felton, president Chicago Great Western; Rev. Dr. F. W. Gunsaulus; Judge John Barton Payne, general counsel Chicago Great Western; Sir Thomas R. Price, commissioner of South African government railways and harbors; William B. Poland, vice-president and chief engineer, Philippine railways, and Rev. R. A. White, pastor of the People's Liberal Church, Chicago.

Tickets can be procured from the arrangements committee, room 1166. Music for the dinner will be furnished by Klohr's orchestra, which also furnished it last year.

SIGNAL ASSOCIATION COMMITTEE MEETINGS.

Quite a number of the Railway Signal and the Maintenance of Way Association committees are taking advantage of the fact that all or nearly all of their members are here this week to hold committee and subcommittee meetings. Among these, the Committee on Methods of Recording Signal Failures of the Signal Association will hold a meeting at the Congress Hotel at 9:30 Wednesday morning, March 22. J. C. Young, signal engineer of the Union Pacific, is chairman of this committee. Committee II on Mechanical Interlocking of the Signal Association will meet at the Congress Hotel at 10 o'clock Wednesday morning, March 22.

ELECTRIC RAILWAY OFFICERS INSPECT SIGNAL EXHIBIT.

The Committee on Signaling of the Central Electric Railway Association held a meeting Tuesday morning and visited the Coliseum in a body and made a thorough inspection of the signaling exhibits. The members were particularly interested in the systems of signaling which have been designed for the handling of interurban traffic at a cost which can be met by the small railway. These systems are constructed with a view to their amplification and extension as conditions warrant, so that any road can use them as a basis for ultimate complete block system protection. This committee is to make a report to the Indiana Railroad Commission.

A RECORD-BREAKING ATTENDANCE.

It is probable that the attendance at the Maintenance of Way Convention yesterday broke all records for a first day's session. The registration of members up to 5 o'clock p. m., numbered 314. Last year the registration up to the same hour was only 251; and that compared very favorably with the record of any previous year. The meeting room was pretty well filled during both the morning and afternoon. It being officially the first day of Spring, the weather man ran the temperature up pretty high; and there was considerable complaint about the meeting room being too warm, in spite of the fact that it was well ventilated.

EXTENSIVE ADDITIONAL TRACK ELEVATION IN CHICAGO.

An ordinance has been presented to the city council of Chicago providing for the elevation of the tracks of the Illinois Central from Seventy-ninth street, the end of the present elevation, south to Kensington avenue, a distance of about five miles, together with the Chicago, Rock Island & Pacific's South Chicago branch from State street to Jeffrey avenue, the Chicago & Western Indiana from State street to Stony Island avenue, the Dolton branch of the Chicago & Western Indiana from One Hundred and Eleventh street to the Illinois Central at One Hundred and Nineteenth street, the Belt Railway of Chicago from Pullman Junction to Jeffrey avenue, and the New York, Chicago & St. Louis from Seventy-ninth street to Stony Island avenue.

The essential details of this ordinance have been agreed to by the city track elevation department and the railways concerned, and it is expected that the ordinance will be passed within the next ten days. The separation of the grade crossings at Burnside and Kensington, and the Nickel Plate-Illinois Central crossing are left optional with the roads concerned. The estimated cost of the Illinois Central portion of this work, exclusive of the additional cost of separating grade crossings, will approximate $2,250,000, while the cost to the other roads will at least equal that amount. The ordinance requires that the Illinois Central, the Michigan Central and the Kensington & Eastern (Illinois Central) have their work completed in 1916, while the other roads have until 1918.

The amount of track involved is approximately as follows:

Location—	Roadway.	Track.
Illinois Central, East 79th street to Kensington avenue	4.85	69.07
Nickel Plate, East 79th to East 95th street	2.21	29.02
Rock Island, South State street to Jeffrey avenue	2.38	5.56
Western Indiana, South State street to Stony Island avenue	2.23	12.09
Same, East 111th street to Illinois Central tracks	1.30	3.10
Belt Railway, Pullman Junction to Jeffrey avenue	.72	2.41
Kensington & Eastern, East 111th street to Kensington avenue	.50	1.00
Michigan Central, East 113th street to Kensington avenue	.38	.72
Total	14.57	122.88

ELECTRIFICATION OF CHICAGO TERMINALS.

The Chicago Association of Commerce has been investigating the electrification problem of the Chicago railway terminals for the past 18 months. As a result of this study a commission of 17 railway executives, city officials and business men has been appointed to make a thorough investigation of this subject, going into all of its phases. The railways are co-operating in this movement and they have agreed to pay all the expenses of the investigation. In order to attain the best results possible a chief engineer and a staff of assistants will be engaged to study the engineering problems involved. A permanent organization will be effected at an early date.

The following men were appointed on this commission: W. A. Gardner, president Chicago & Northwestern; H. G. Hetzler, president Chicago & Western Indiana; Darius Miller, president Chicago, Burlington & Quincy; C. E. Schaff, vice-president New York Central Lines; Paul P. Bird, chief smoke inspector of Chicago; Dr. W. A. Evans, commissioner of health; Milton J. Foreman, chairman local transportation committee of the city council; W. F. M. Goss, dean of College of Engineering of University of Illinois; E. R. Graham, of D. H. Burnham & Co.; Richard C. Hall, president Duck Brand Company; Jesse Holdom, attorney at law; Harrison B. Riley, president Chicago Title & Trust Company; John W. Scott, of Carson, Pirie, Scott & Co.; Francis T. Simmons, of Francis T. Simmons & Co.; Mason B. Starring, president Northwestern Elevated Railroad; Frederick H. Rawson, president Union Trust Company.

The personnel of this committee is largely the same as that of the railway terminal commission appointed by Mayor Busse. (See Railway Age Gazette, February 24, page 372.)

ANNUAL MEETING OF THE RAILWAY APPLIANCES ASSOCIATION.

The Railway Appliances Association held its annual meeting in the Coliseum Tuesday morning. The minutes of the last meeting were read and approved. The treasurer's report showed a surplus of $4,869.92 in hand from last year, and a satisfactory estimate of the probable expense of the exhibit now being given.

The election of officers resulted in the selection of Robert E. Belknap, Pennsylvania Steel Co., president; A. P. Van Schaick, Lackawanna Steel Co., vice-president; John N. Reynolds, Railway Age Gazette, secretary and treasurer.

The executive committee selected is composed of C. W. Kelly, Fairbanks, Morse & Co.; Thomas R. Wyles, Detroit Graphite Co.; George C. Isbester, Q. & C. Co.; N. M. Hench, Carnegie Steel Co.; S. W. Hayes, Hayes Track Appliance Co.; H. M. Sperry, General Railway Signal Co.; T. W. Snow, ex-president, ex-officio, on board of directors.

FOREIGN OPINION OF THE A. R. E. & M. OF W. ASSOCIATION.

Just after the opening of the afternoon session yesterday, William McNab, principal assistant engineer of the Grand Trunk, and a past president of the association, took occasion to make a statement illustrating foreign opinion of the work of the association.

"Before the committee on yards and terminals presents its report," said Mr. McNab, "I want to quote from a letter which I received two months ago from the general manager of one of the leading railways of Great Britain to show in what esteem this association is held in Europe. The quotation is in connection with this particular committee. I had sent him a copy of our transactions of last year. He says:

" 'I have delayed replying to you until I could find an opportunity to peruse the volumes. I have now done so. I must say that I found them most interesting. I was in particular interested in the plans of the terminal stations, and I have shown this part of the report to our chairman, Chas. Renshaw, in connection with the reconstruction of a large terminal station, which we have under way at the present time.'

"I present this extract from this letter, not to throw any bouquets at this committee, but to show the whole association that we are recognized across the seas."

BRENNAN MONO-RAIL CAR.

One of the features of the exhibition at the Coliseum this week which is attracting universal attention is the model of Brennan's Mono-Rail Car, which makes trips from one side of the balcony to the other at the south end of the building. Mr. Brennan, the inventor, gives daily demonstrations and lectures on the remarkable and little understood gyroscope principles involved in his car. These lectures take place in the morning at 10, 11 and 12 o'clock; in the afternoon at 2, 3, 4 and 5 o'clock; and in the evening at 8, 8:30 and 9 o'clock. There are two models of the car on exhibition, the larger one having five times the power of the smaller. These are shown running on a cable swung free from one side of the balcony to the other, and also running on a curved track. The smaller model is the style usually used in schools, but the large one was made especially for this exhibition and is to be presented to one of the universities or technical schools of the United States at the close of this exhibit. The award is to be made by a vote of the railway officials present, the vote to be by ballot. These ballots may be obtained at the Bureau of Information, Booth "A," in the center of the main aisle.

Proceedings.

The first session of the twelfth annual convention of the American Railway Engineering and Maintenance of Way Association was called to order at 9:30 a. m. on Tuesday, March 21, in the convention hall of the Congress Hotel, by the president, L. C. Fritch, chief engineer of the Chicago Great Western.

The minutes of the last meeting were approved, without reading, and the president then read his annual address.

PRESIDENT'S ADDRESS.

To the Members of the American Railway Engineers and Maintenance of Way Association:

The progress made by the association during the year just passed has been gratifying, and the thanks of the association are due its committees for their efficient and painstaking labors and the splendid results secured. That interest and enthusiasm in the work has been sustained, is attested by



L. C. Fritch, President.

the fact that all of the twenty-two standing and special committees have presented valuable and comprehensive reports for consideration at this convention.

It is noteworthy that in the midst of the busy lives of the members, time is found to accomplish so large an amount of work, and to perform it in the efficient and thorough manner in which it is presented. This feature is all the more praiseworthy, when it is considered that this organization is a voluntary one, and the time devoted by the members to committee work is frequently given at a great personal sacrifice and at the expense of much-needed rest.

Prior to the formation of the association few railways pursued the same methods, or used similar appliances or devices, in so far as railway engineering and maintenance of way work was concerned, even under similar climatic, physical and commercial conditions, and there was little, if any, approach to uniformity as to methods and practices. A fertile field seemed, therefore, to exist, in which it was

believed much good might be accomplished, by formulating principles of practice and disseminating knowledge pertaining to maintenance of way work.

This association was formed for "the advancement of knowledge pertaining to the scientific and economical location, construction, operation and maintenance of railways," and to attain those ends it was deemed essential to investigate matters pertaining to the objects of the association through standing and special committees; to hold meetings for the discussion of papers and reports; to publish its conclusions and to maintain a library.

The founders of the association wisely concluded that the best results would be obtained through committees, the members of which should be selected with due consideration of their qualifications to deal with particular subjects.

The work of the association was laid out on unique lines. The entire field of railway engineering and maintenance of way work was originally divided into sixteen divisions, and a committee appointed to deal with each subject. Now we have nineteen standing committees, and additional special committees to consider matters not coming within the province of the regular committees.

Each committee is given a particular phase of the general subject, and they are requested to collect all available information on the subject in hand, to digest carefully the data obtained, to draw therefrom such conclusions as the information seems to warrant, and to submit to the association its recommendations thereon. Committee reports are to be formulated on the following general plan: An historical review of the subject under discussion, with an outline of its origin and development; an analysis of the most important elements of the subject-matter; an argument, showing the disadvantages of the old and the advantages of the recommended practice; and, finally, the conclusions of the committee, giving in concise language and in logical sequence its conclusions and recommendations. That these methods have been productive of excellent results is abundantly shown in our proceedings for the past decade.

However, the formulation of principles of practice is not the only or main function of our association. The collection and dissemination of knowledge pertaining to the scientific and economical location, construction, operation and maintenance of railways is quite as important, and it will be conceded that along these lines the association has made an enviable record. Since the formation of the association there have been issued over twenty thousand pages of printed matter, all of it live and useful material pertaining to our profession.

While it may be true that not all of our recommendations have met with universal approval, nevertheless they have served as a guide to the engineer in arriving at a solution of his problems. It would be practically impossible to formulate principles of practice applicable to all sections of the country, with its diversity of conditions of soil, climate and commercial requirements.

Some of our critics have said, "your association is gathering an immense amount of valuable information, but your conclusions are not always sound. Your committee reports need boiling down, the wheat needs winnowing from the chaff."

My own opinion is that there is no foundation for these criticisms, which is evidenced by the fact that our proceedings are used as works of reference by the ablest engineers, not only of this country, but of the world.

There is a Roman adage that says, "whatever you do, do it well, and always consider the consequences of what you do." This is wise counsel, and, in my judgment, it applies to our own work. We should be careful not to spend too much time and effort on details and peculiar methods and neglect underlying principles upon which all good practice is founded. We should aim at principles that may be universally applied. For example, good, sound specifications covering the materials of engineering, which are susceptible of universal application, are of more use than methods or particular plans or designs, which have only limited application. The work of our association that will stand out prominently is that which is of the greatest use to the greatest number.



W. C. Cushing, First Vice-President.



C. F. Loweth, Treasurer.

Perhaps too much stress is laid upon the establishment of standards. In a progressive art, such as ours, there should be no such word as "standard." What is standard to-day may be obsolete to-morrow. Improvement and advancement is the order of the day, and in no profession is this truer than in our own.

The progress of railway engineering during the past year is perhaps best exemplified in the opening for service of the New York terminals of the Pennsylvania, including the tunnels under the Hudson and East rivers. This great achievement, made possible only by the ability, foresight and courage of that splendid type of man and engineer, Alexander J. Cassatt, is a fitting and lasting tribute to his genius and memory. It marks an epoch in railway progress, being the first large trunk line railway terminal, complete in its operation with the use of electric traction. This installation awakens us to the sense of a new responsibility that is placed upon us as engineers, and that is, that we should prepare ourselves for the new problems that it will be our duty to solve. It will devolve upon the engineers of our railways to determine to what extent this new power is justifiable in heavy trunk line service. The question of electrification of trunk lines, and its application to terminals in large cities, has assumed the proportions of a public question in the cities of Boston, Philadelphia, Baltimore, Washington, St. Louis, Chicago, and its extension in New York City to all classes of service is being considered.

It is a problem of great magnitude and involves not only technical skill, but judgment of the highest order, and its solution must, in the final analysis, be made by railway men, familiar with the intricacies of railway operation and its needs. My advice, therefore, would be, that railway engineers prepare for this economic change that has already begun, in order that the problems that demand solution may be solved on a sound basis, and that costly mistakes which ignorance would otherwise impose, may be avoided.

We will miss some familiar faces at this convention—men who have aided us in placing this association on its high plane of usefulness. Among those who have gone to that "other country from whose bourne no traveler ever returns" are Octave Chanute and Samuel M. Rowe, both pioneers in the art of wood preservation; E. P. Dawley, an efficient member of the committee on electricity; John F. Hinckley, a valued member of the rail committee; Ira G. Rawn, an able member of our first committee on yards and terminals; J. E. Schwitzer, late chief engineer of the Canadian Pacific, a valued member of the committee on economics of railway location; H. L. Laughlin, an efficient member of the committee on track.

A notable achievement made during the past year, through the co-operation of the Master Car Builders' Association and our association, is the final solution of the question of the disposal of brine drippings from refrigerator cars, which has been the bane of railways for nearly thirty years. The conclusion reached provides for retaining the brine drippings in tanks between icing stations, and draining them at given points, where facilities are provided for that purpose. This will result in preventing injury to maintenance of way structures and equipment costing the railways in the past thousands of dollars.

There are two important matters coming before this convention for final vote. The name of the association, which has been unfortunately cumbersome in its length, is to be changed to one of shorter length, a desirable innovation.

The proposed change in the constitution, which will grant to the membership at large a voice in the selection of officers of the association, is one that will meet with universal approval.

The railway industry is being circumscribed by governmental regulations to the extent that its operations, to the minutest details, are being regulated by law or prescribed by rules of commissions created under federal or state authority. Some of these regulations are wise and beneficial, and were necessary to purge the railway business of its



Chas. S. Churchill, Second Vice-President.



E. H. Fritch, Secretary.

past sins of omission and commission. However, many of the regulations, conceived by irresponsible persons and for sinister purposes, are a positive menace to the public they were designed to benefit; these will serve no good purpose, but prove a positive check to railway development. In this feature we are vitally interested, and it devolves upon us as citizens, true to our calling, to educate the public to a realization of the rights and the justice that is due the railway industry.

It has been asserted that railways are extravagant and wasteful in their methods of operation, and lack system in conducting their business. These charges are not in accordance with the facts as we know them. Organizations similar to our own are giving their best thought to the improvement of methods and to the promotion of efficiency in all departments of railways.

We have an abiding faith in the fairness and common sense of the American people, and that our incomparable country will progress with undiminished momentum. New lines of railways will continue to be built, existing lines will be revised and rebuilt, and herein lies our duty.

The charter of our existence provides that we shall devote ourselves to the "advancement of knowledge pertaining to the scientific and economical location, construction, operation and maintenance of railways." We maintain that our association has justified itself and that in the future, as in the past, we will endeavor to do our work honorably, thoroughly and conscientiously, irrespective of regulations, as is the desire of every member of the American Railway Engineering and Maintenance of Way Asscciation.

In closing the term of office as president, I wish to thank the board of direction for its hearty co-operation, the secretary for his untiring devotion to duty, and the committees for the splendid work which they have accomplished.

The report of the secretary and treasurer showed the following statements:

Total membership at last annual convention		869
Withdrawals during the year	11	
Deceased members	7	
Dropped for non-payment of dues	20	
	38	38
		831
Additions during the year		136
Total membership, March 15, 1911		967

Consisting of:

Active members	908
Honorary members	3
Associate members	56
	967

Geographical Distribution.

The geographical distribution of the membership is indicated in the following table:

United States	838	Panama	2
Dominion of Canada	76	Australia	1
Mexico	14	Brazil	1
Japan	7	Germany	1
Cuba	6	Great Britain	1
China	5	Guatemala	1
New Zealand	4	Peru	1
Philippine Islands	4	Russia	1
India	2		
Korea	2	Total	967

Classification of Members.

The positions held by the members are indicated in the following table:

Presidents	16
Assistants to President	3
Vice-Presidents	28
General Managers	18
Director Maintenance and Operation	1
Assistant Director Maintenance and Operation	1
Assistant General Managers	6
General Superintendents	10
Assistant General Superintendents	2
Division Superintendents	34
Chief Engineers	114
Assistant Chief Engineers	24
Principal Assistant Engineers	15
Chief Engineers Maintenance of Way	6
Assistant Chief Engineers Maintenance of Way	1
Engineers of Construction	12
Engineers Maintenance of Way	89
Bridge Engineers	28
Engineers Surveys	1
Tunnel Engineers	1
Division Engineers	90
Assistant Engineers	97
District Engineers	14
Electrical Engineers	4
Inspecting Engineers	11
Supervising Engineers	3
Architects	5
Locating Engineers	3
Engineer Track Economics	1
Engineers Track and Roadway	5
Designing Engineers	2
Maintenance of Way Accountant	1
Engineer B. & B.	1
Office Engineers	7
Chief Draftsmen	5
General Roadmasters	2
Roadmasters	14
Master Carpenters	3
Rail Expert	1
Superintendent Bridges and Buildings	3
Supervisors	2
Resident Engineers	30
Signal Engineers	20
Assistant Signal Engineer	1
Managers Timber Department	5
Timber Inspector (Chief)	1
Forester	1
General Foreman Water Works	1
Supervisor Materials	1
Chemists and Eng. Tests	2
Metallurgical Engineers	2
Engineer River Protection	1
Professors in Colleges	16
Associate Professors	16
Government Employes	13
Civil Engineers	59
Consulting Engineers	75
Contracting Engineers	20
Engineer Grade Elimination	2
Purchasing Agent	1
General Agents	2
Receiver	1
Editors	3
Miscellaneous	6
Total	967

Financial Statement.

Balance on hand March 12, 1910	$15,382.57
Receipts during the year	26,423.95
Expenditures during the year	28,593.49
Excess of expenditures over receipts	$ 2,169.54
Balance cash on hand March 15, 1911	$13,216.62

Wm. McNab (Grand Trunk Railway): Before the business of the association begins, may I be allowed to express to the members of the association the regret of Past-President Howard G. Kelley at his inability to be present at these sessions? Mr. Kelley is in Southern California, having taken his wife there to recuperate after a severe illness. This is the first convention since the inception of this association that Mr. Kelley has missed. His disappointment at his non-attendence is keen, but I do not think it is any more so than the members of this association feel at the present time at his absence. I ask your indulgence in allowing me to make these remarks, so that Mr. Kelley's regrets may go on record.

RULES AND ORGANIZATION.

In connection with the work of the committee, books of rules of 61 American railways have been secured and a compilation made showing the subjects covered by them. A few of these rules have been selected and are now presented as an appendix to this report. These rules cover the following subjects:

I. Absence from duty.
II. Accidents.
III. Ballast—covering the purpose for which ballast is used, material, cross-section, preparation of sub-grade, handling, tamping, surfacing, etc.
IV. Batteries—covering the duties of battery-men and care of batteries.
V. Cars—relative to loading and unloading of roadway material.

VI. Deportment.
VII. Discharging men.
VIII. Drainage.

Under the first of the instructions of the board of direction the committee recommends the following changes in the Manual:

Rule 4 under "General Notice" shall be revised to read:

"4. Employees must exercise care and watchfulness to prevent injury to themselves, other employees and the public, and to prevent damage to property. In case of doubt they must take the safe course. They must know that all tools and appliances are in safe condition before using. They must move away from tracks upon approach and during passage of trains, and, so far as practicable, prevent the public from walking on tracks or otherwise trespassing on the right-of-way."

Under the heading "General Notice," add two additional new rules as follows:

"10. Employees must not without proper authority absent themselves from duty, exchange duties with others or engage substitutes."

"11. Employees must conduct themselves properly at all times. They must be civil and courteous to fellow employees and patrons of the road. Employees who are dishonest, vicious, quarrelsome, or use profane, vulgar or immoral language, must be discharged."

Under "Rules Governing Track Foremen, Bridge and Building Foremen and Signal Foremen," Rule 4 in each case shall be revised to read:

"4. They shall employ men as the ——(Title)—— directs. They must treat employees with consideration, and see that they properly perform their duties. They must discharge men



J. O. Osgood.

Chairman, Committee on Rules and Organization.

who are incompetent or neglect their duties, but in no case shall they discharge men without cause. They must keep the required records of the time of their men and of the materials used."

Under "Rules Governing Track Foremen," Rule 5 shall be revised so that the last clause shall read:

"Foremen must provide themselves with reliable watches, and, when possible, compare time daily with a standard clock or with the watches of other employees who are required to have the standard time."

Under the second instruction of the board of direction it is recommended that Rules 1, 2, 3, 4, 5 and 6, under the heading "Inspection of Track," now published on page 66 of the Manual, be omitted in future revisions.

Under the third instruction it is recommended that the instructions to next year's committee provide that rules in the nature of specifications or instructions regarding the conduct of work be prepared, making use of the recommendations of the various committees dealing with these subjects, and of the best practice of the railway companies as embodied in their Books of Rules, with a view to providing material which may be of assistance to railroads formulating maintenance of way rules.

The report is signed by: Jos. O. Osgood (C. R. R. of N. J.), chairman; F. L. Nicholson (N. & S.), vice-chairman; F. D. Anthony (Q., M. & S.), G. D. Brooke (B. & O.), S. E. Coombs (N. Y. C. & H. R.), E. J. Correll (M. P.), B. T. Elmore (Virginian), A. S. More (C., C., C. & St. L.), G. L. Moore (L. V.), D. B. Johnston (Pennsylvania Lines), D. W. Richards (N. & W.).

APPENDIX A.

Suggestions for New Rules.

In connection with the work of the committee this year books of rules of 61 American railways have been secured and a compilation made showing the subjects covered by them. These rules have been studied and suggestions for new rules are here made for a number of subjects.

Absence from Duty.

Employees must not without proper authority absent themselves from duty, exchange duties with others or engage substitutes.

Accidents.

General.—Track foremen must, in case of accident, promptly render all assistance in their power, whether the accident occurs on their own or adjacent sections. They shall investigate and report on Form No. ..... all accidents occurring on their sections, which may be attributable to, or result in damage to, track, roadbed or structures, and preserve all materials which may assist in determining the cause.

Watchmen.—Track foremen must, in case of accident, promptly render all assistance in their power, whether the accident occurs on their own or adjacent sections, and when necessary appoint watchmen to guard the premises and prevent stealing. They shall investigate and report on Form No. ..... all accidents occurring on their sections, which may be attributable to, or result in damage to, roadbed or structures, and preserve all materials which may assist in determining the cause.

Accidents to Individuals.—Employees must exercise the greatest care and watchfulness to prevent injury or damage to themselves, other employees, the public and to property, and in case of doubt take the safe course. They must know that all tools and appliances are in safe condition before using, move away from tracks upon approach and during passage of trains, and, so far as practicble, prevent the public from walking on tracks or otherwise trespassing on the right-of-way.

Ballast.

Purpose.—Ballast is used for the purpose of securing a solid bearing for the ties, holding them firmly in position and supporting the tracks as uniformly as possible, distributing the trainloads over the roadbed, providing rapid and efficient drainage, and preventing as far as possible the freezing of the roadbed.

Material.—Ballast shall be of broken stone, gravel, slag, cinders, chats, chert, burnt clay, gumbo or disintegrated granite. The selection of the particular kind of ballast to be used shall be determined by the title.

Quality and Size—Broken Stone.—Broken stone ballast shall be clean, free from earth and all foreign substances, of the quality and sizes required under the company's specifications for stone ballast.

Quality, Etc., of Gravel.—Gravel ballast shall be of a uniform size, clean and free from fine sand, loam, clay and stones which will disintegrate or cause rough riding track.

Quality, Etc., of Cinders.—The use of cinders as ballast is recommended for the following situations: On branch lines with a light traffic; on sidings and yard tracks near point of production; as sub-ballast in wet, spongy places; in cuts and on fills; as sub-ballast on new work where dumps are settling, and at places where the track heaves from frost. It is recommended that provision be made for wetting down cinders immediately after being drawn.

Quality, Etc., of Burnt Clay.—The material should be black gumbo or other suitable clay free from sand or silt. The suitability of the material should be determined by thorough testing in a small test kiln before establishing a ballast kiln.

The material should be burned hard and thoroughly.

The fuel used should be fresh and clean enough to burn with a clean fire. It is important that a sufficient supply be kept on hand to prevent interruption of the process of burning.

Burning should be done under the supervision of an experienced and competent burner.

Ballast should be allowed to cool before it is loaded out of the pit.

Absorption of water should not exceed 15 per cent. by weight.

Depth of Ballast.—The depth and slope of the ballast shall conform to the standard section for the particular kind of ballast to be used.

Preparation of Subgrade.—Track centers and grade lines shall be given by the engineer previous to ballasting track. The subgrade shall be properly prepared for ballast; all unsuitable material above the bottom of the ties removed, and

banks widened to retain the ballast and secure good drainage. The track shall then be thrown to line and the ballast delivered.

Open Track, Etc.—Track shall be kept in good line and surface when ballasting, and shall be carefully watched to avoid rail buckling and throwing track out of line.

Mixing Ballast With Old Material.—Care shall be taken in handling ballast to prevent mixing with earth, or with old, unsuitable material between and around the ends of ties, or wasting down the slopes of embankments. Ballast forks should be used exclusively for handling broken stone and slag ballast.

Embankments Not Well Settled.—On embankments that are not well settled the surface of the roadbed shall be raised with suitable material. Material for this purpose shall not be taken from the slopes of the embankments.

Tamping.—Ballast shall be well and thoroughly tamped at each end of the ties, directly under and about 15 in. on each side of the rails. The center shall be filled and lightly tamped.

Tamping picks shall be used for tamping broken stone and slag ballast.

Bonded Rails.—Ballast shall not be allowed to come in contact with rails where bonded. At points where it is impossible to prevent such contact, broken stone or clean gravel ballast shall be used.

Surfacing.—The general surface of track must not be raised without proper authority.

Trimming, Etc.—After ballast is placed it shall be neatly trimmed, track accurately gaged and properly surfaced and lined to conform to the standard drawing.

Filling Between Tracks.—The space between double tracks up to the underside of the ties shall be filled with coarse stones and then be leveled off with standard ballast up to the tops of ties.

Heaving, Etc.—When track becomes foul, churns, heaves, or wet spots develop, the bad material shall be removed to the depth and in the manner required to secure drainage and the space filled up with good material.

Batteries.

Batterymen.—Batterymen shall report to, and receive instructions from, the ..... (Title.)

Responsibility.—They shall be responsible for the proper inspection and safe condition of all batteries and connections under their charge.

Batteries (Inspection).—They must inspect all batteries in their districts at least once each week and make renewals as frequently as necessary to maintain constant voltage.

Records.—They must keep detailed records of the performance of batteries, and of the materials used.

Relieving Others.—They must, in case of emergency, render all assistance in their power to the ..... (Title) and at other times, when not interfering with their regular duties.

Maintenance of Batteries.—They shall follow the special instructions, and the directions furnished by the different manufacturers, for maintaining batteries.

Care, Etc., of Materials.—They shall be responsible for the proper care and use of tools and materials necessary for the efficient performance of their duties, and shall make requisition to the ..... (Title) from time to time, as additional supply becomes necessary.

Changes.—They must not make nor permit any permanent rearrangement or change in wiring or connections without proper authority.

Battery Wells, Etc.—They shall keep all battery wells, chutes, boxes, cupboards and houses neat and clean, and locked when not in use.

Care of Batteries (Protection).—They shall keep batteries at as even a temperature as possible and protected from extreme heat or cold.

Renewing Batteries.—They must not keep more than one cell out of service at one time when renewing track batteries, or more than two cells when renewing main or signal batteries.

Batteries—Jars.—They shall handle jars with care to prevent breaking or disturbing the elements, and keep them clean, bright and free from creeping salts. All cracked or broken jars shall be taken out of service immediately.

Battery Solution.—They must not empty battery solution in streams, on roadbed, ties, bridges, or where the solution may come in contact with wires on top of or under the ground.

Batteries (Jumpers).—They shall use jumpers when removing cells to prevent opening normally closed circuits, except where batteries are connected in multiple.

Scrap.—They shall collect all old scrap zinc, copper and other materials and ship to storekeeper once each month.

Cars, Unloading, Etc.

They (track foremen) shall be responsible for the prompt loading, unloading and forwarding of cars containing roadway material. They shall conform to the Master Car Builders' rules governing the loading of material on cars.

Department.

General.—Employees must conduct themselves properly at all times. They must be civil and courteous to fellow-employees and patrons of the road. Employees who are dishonest, vicious, quarrelsome or use profane, vulgar or immoral language will be discharged.

Discharging Men.—They shall employ men as the .... (Title) directs. They must treat employees with consideration, and see that they properly perform their duties. They shall discharge men who are incompetent or neglect their duties, but in no case shall they discharge men without cause. They must keep the required records of the time of their men and of the materials used.

Drainage.

Special attention must be given to the proper drainage of the roadbed for the maintenance of good track. This is essential, and the farther water can be kept away, or the sooner it can be diverted from the roadbed, the better the track will be protected.

Construction.—Ditches shall be constructed in accordance with the standard drawing of the sizes necessary to thoroughly drain the roadbed and afford free flow of all water during heavy rains. The line of the top edges of ditches must be well and neatly formed, and be parallel with and at the standard distance from the rails, except at inlets and outlets, where ditches should diverge from the roadbed to prevent damaging embankments.

Ditches should be drained into natural waterways. At locations where this is impossible or impracticable, special instructions must be obtained from the proper authority previous to starting work.

Washing at Ends of Cuts.—When the roadbed is endangered by water from ditches or other waterways approaching too close thereto, causing washing of the soil, the gullies shall be filled up, and special efforts made to prevent continuance of the wash.

Cross-Drains.—Cross-drains shall be installed where necessary. They shall conform to the standard drawing and be placed at the depths and to the grades required to obtain proper drainage.

Surface Ditches.—Surface water should be intercepted by surface ditches on the upper side of cuts when necessary or practicable.

Road Crossings.—Road crossings shall be drained in accordance with the special instructions given by the proper authority in each particular case.

Wet Cuts, Etc.—When side ditches in wet cuts afford insufficient drainage, drain pipes shall be used. The pipes shall be of the quality and dimensions required and shall be laid, as directed, by the proper authority.

Disposition of Earth.—Material taken from ditches or elsewhere must be deposited on the slopes of embankments, below the ballast, and not be put on the tops or slopes of cuts.

Maintenance, Etc.—The construction of ditches or drains, for public or private use, on lands of the company, must not be permitted except by proper authority.

Adjoining land owners must not be permitted to connect ditches or drains with, or divert water into, the company's ditches or drains without proper authority.

Adjoining land owners must not be allowed to obstruct the company's ditches or drains.

Water must not be diverted through private lands or from its natural channels, along the right-of-way, except by proper authority.

Discussion on Rules and Organization.

Mr. McNab: In regard to this new rule 11, I think this association should not go on record as limiting the range of politeness to be extended by employes of any road. I see here, "Employes must conduct themselves properly at all times. They must be civil and courteous to fellow employes and patrons of the road." It seems to me, if an employe is courteous or civil to a man or a woman, not a patron of the road, they might be induced to become patrons of that road. I think there sho ld be something to take away the limiting of the range of politeness or courtesy. It seems to me it is not right to limit it to the patrons of the road.

C. E. Lindsay (N. Y. C. & H. R.): I quite agree with the views expressed by Mr. McNab. These rules are to be inserted in the manual, and I think they should be expressed in the plainest Anglo-Saxon that we can get. I think that clause might well stop with the word "courteous"—they shall be civil and courteous. I have one other objection, and that is to the opening paragraph, 4, which reads, "employes must exercise care and watchfulness, to prevent injury to them-

selves, other employes and the public, and to prevent damage to property." I think the word "take" would be better than the word "exercise." I think the words "and watchfulness" are redundant and unnecessary. I think the first part is addressed to the employe and the latter part is addressed to the employer. The word "must," in the last line, should be "will"—will discharge—giving warning to the employe that he will be discharged if he violates the rules.

Jos. O. Osgood (C. R. R. of N. J.): Then the next sentence would read, "employes who are dishonest, vicious, quarrelsome, or use profane, vulgar or immoral language will be discharged."

P. C. Newbegin (B. & A.): It would hardly seem to me that we want to go on record that the employes will be discharged if they use profane language. It is best, in my judgment, to have no rules that are not to be enforced.

Azel Ames (U. S. Block Signal & T. C. Board): I do not think it is proper in any rule of a railway to state, "if you do this, you will be discharged." It is assumed that a man will be discharged for non-obedience to the rules, if that non-obedience is flagrant or frequent enough, but I do not think any specific rule should embody in it the threat that if the man does not obey that particular rule he will be discharged.

Mr. McNab: Mr. President, I think the last clause of this rule should not stand. I think it would require unusual perception to determine what is the degree of vulgarity or dishonesty or any other feature connected with these qualifications. I think that any well-regulated railway will see that employes are discharged if they are guilty of that.

A motion to eliminate the last clause of rule 11 was carried.

A motion to insert a clause in rule 4, saying—"when employes are working on double tracks, they should get off of both tracks when trains are approaching"—was defeated.

Mr. Lindsay: I ask if the committee will omit the words "without proper authority" on the first line of rule 10.

The President: That is satisfactory to the committee.

Prof. S. N. Williams (Cornell College): If it is the intention to shorten the rules, might not the words "civil and" be eliminated, so as to make the rule read, "they must be courteous to fellow employes," etc. Or it might be better to have the rule read, as follows: "Employes must conduct themselves properly at all times, and be courteous to fellow employes and patrons of the road," etc.

The President: That is acceptable to the committee.

Mr. McNab: If these rules are to be incorporated in the manual of recommended practice, I think there should be no ambiguity as to the meaning of any word. A man may compare his watch and put it in his pocket, and do nothing more than that. I think the word "verify" would be a better word to use. I ask the committee if they will accept the word "verify" instead of "compare."

The President: That change is acceptable to the committee.

The convention is open to suggestions from the members on the future work of this committee. It is very useful to the committee to know what the wish of the association is with reference to its work, and along what lines it should proceed. It will be found that this committee has done an immense amount of work during the year. It examined the rules of sixty-one railways, and tabulated and compiled the information, which in itself is a large task. These rules were classified under eight different heads, and conclusions were drawn therefrom.

Mr. Osgood: The eight selected represented a very small portion of the rules examined. We found, after making a record of the rules, that there were certain variations, and we then selected a certain number which seemed best to us, and have submitted them as an appendix.

E. F. Wendt (P. & L. E.): I think this committee is working along a line which will result in much good for railways, and the recommendation which they have submitted is certainly one which should be adopted, and the subjects for next year will be along that line. A number of prominent railways have, at the present time, standard books of rules for the government of Maintenance of Way departments, but such books are not in general use. It seems to me that the committee should continue the good work which has been begun, and produce finally a book of standard rules for the Maintenance of Way department, these rules being of general application.

H. A. Lloyd (Erie): In reading over some of the rules, I notice they have entirely different sets of rules governing the track foremen, the bridge and building foremen, and the signal foremen. Since a lot of clauses and paragraphs are applicable to each one, this makes a voluminous book. It seems to me that could be eliminated.

The President: The committee in formulating its work in the preparation of a general book of rules, and wherever it is possible to make a general rule applicable to all employes, it will compile it as a general rule, so as to avoid repetition.

SIGNALING AND INTERLOCKING.

Seven subjects were assigned, as follows:

(1) Revision of Manual;

(2) Continue investigation of outline and description of a complete and uniform signal system suitable for general adoption, conferring with proper committee of the American Railway Association on the subject;

(3) Revise mechanical interlocking specifications presented in Bulletin 108, and include wrought-iron pipe as well as steel;

(4) Review and resubmit electric interlocking specifications, with statement of the results from experience;

(5) Confer with committee on ties, and make report on the effect of treated and metal ties on track circuits;

(6) Confer with committee on yards and terminals, in regard to capacity of terminal layouts;

(7) Make concise recommendations for next year's work.

The following sub-committees were appointed:

Revision of Manual: Messrs. Ames, Balliet, and Wendt, chairman. Uniform Signal System, Sub-Committee "B": To prepare statement to be submitted to the proper committee of the American Railway Association, Messrs. Stevens and Anthony. Met in Buffalo, April 5, and completed its work. Sub-Committee "J": Elected by the entire committee to represent it when called into further conference by the Committee on Transportation of the American Railway Association, Messrs. Anthony, Clausen, Patenall, Stevens, and Rudd, chairman. It has not been called. Sub-Committee "C": To report on the indications after the Committee on Transportation has made a decision on the points of difference between the majority and minority as brought out at the last annual meeting, Messrs. Baker, Besler, Cable, Causey, Clausen, Harahan, Ingalls, Scott, Temple, and Rudd, chairman. No meetings. Sub-Committee "A," on Aspects: Messrs. Patenall, Peabody, Stevens, Young, and Anthony, chairman. No meetings.



A. H. Rudd

Chairman, Committee on Signaling and Interlocking.

Mechanical and Electrical Interlocking Specifications. Messrs. Anthony, Patenall, Peabody, Stevens, and Mock, chairman. Met at Chicago, November 14, all members present.

Effect of Treated and Metal Ties on Track Circuits: Messrs. Christofferson, Elliott, Eck, Hovey, Mock, Rhea, and Denney, chairman. No meetings held.

Conference with Committee on Yards and Terminals: Messrs. Balliet, Eck, Peabody, Wendt, Young, and Elliott, chairman. One meeting.

Recommendations for Next Year's Work: Messrs. Ames, Clausen, Denney, and Rudd, chairman. One meeting.

Conference with Committee on Track—Special. Messrs. Ames, Anthony, Elliott, Patenall, and Rudd, chairman. Mock

afterward substituted for Rudd, as chairman. Two meetings.

REVISION OF MANUAL.

Specifications for rubber-covered wire were adopted March, 1909, and are in the Manual. New specifications have been accepted by the Railway Signal Association and sent to letter-ballot for approval.

It has been the policy of this association to let the Railway Signal Association work out details of signal appliances and to adopt only after adoption by the Railway Signal Association. The committee, therefore, offers for the reasons set forth in the report this conclusion: "That the revised specifications for mineral matter rubber compound insulated signal wire be adopted by the association and printed in the Manual."

The changes from present specifications are as follows:

Title has been changed by inserting the words "Mineral Matter Rubber Compound," as being indicative of the general character of the insulation this specification was drawn to cover, and which is, with the exception of certain other compounds, the type of insulation generally required.

In Clause 1, Conductors, the words "weld or joint" have been inserted as more fully explaining the requirement that a conductor is desired that is of one piece as coming from the wire-drawing machines.

Clauses 2 and 3, Rubber Insulation, have been changed to eliminate all references to quantities which are given under Clause 17, and the word "Upriver" has been inserted as specifying the quality of rubber desired, there being a number of grades of Para rubber.

Clause 4, Braiding, has been changed to eliminate the taping, which was useful only as a mechanical protection, and, besides being quite expensive, was not deemed necessary.

Clause 5, Acceptance, is new and is required to enable the purchaser to assure himself as far as practicable before the product has been manufactured that a satisfactory compound will be furnished. This clause is as follows.

"Acceptance.—5. The product of those concerns only will be accepted who have satisfied the purchaser that the requirements of this specification will be complied with. The decision as to the quality of the wire furnished and the acceptance of the same shall be made by the purchaser."

Clauses 6 and 7, Tests, are practically the same as in the present specification, while clause 8, in regard to interpreting the result of the chemical analysis of the compound, is new. The necessity for this clause is obvious if an analysis is made of the compound. Clause 8 is as follows:

"8. At the option of the purchaser the wire, after being tested, shall not be shipped from the factory until an analysis of a sample has been made by a chemist chosen by the purchaser, and the results of such analysis, as interpreted by the purchaser shall be sufficient ground for rejection should the wire or insulation not conform to the requirements of this specification."

Clause 9, Physical Test of Copper Conductors, has been changed to eliminate all tests except those of elongation and the simple bending tests, these being ample to insure the desired quality of material.

Clause 10, Conductivity Test of Copper, and clause 11, Test of Tinning, are unchanged, while clause 12, requiring an excess of sulphur in the sodium sulphide solution, has been added, as, without this requirement, the test for tinning is valueless. Clause 12 is as follows:

"12. The sodium sulphide solution must contain an excess of sulphur and should have sufficient strength to thoroughly blacken a piece of clean untinned copper wire in five (5) seconds."

Clause 13, Tests of Braiding, is unchanged.

Clauses 14, 15 and 16, Physical Tests of Rubber Insulation, have been changed to specify the rate at which the sample shall be stretched, that the tensile strength per square inch shall be 1,000 instead of 800 pounds, that the test shall be made on a separate sample from that on which the stretching test is made and that the specific gravity shall be not less than 1.75. The increase in tensile strength is recommended, as, when properly made, a thirty (30) per cent. Para rubber compound will meet this requirement, and a compound which contains less quantity of rubber or is of an inferior grade of rubber cannot so readily be made to meet this requirement.

The specific gravity of the rubber compound is specified with the idea of securing a compound of a certain density, and to make unlikely the use of fillers which have but little body.

Clause 17, Chemical Tests of Rubber Insulation: This clause calls for the thirty (30) per cent. of rubber and seven-tenths (0.7) per cent. of free sulphur which is required by the present specification, but in the other requirements is practically new and calls for the best practice from a chemical standpoint that could be devised. In connection with chemical analysis, these requirements are regarded as of the greatest importance as insuring to a greater extent than any of the other requirements that a compound will be obtained which will contain the desired quantity of rubber and be of a satisfactory chemical combination.

Clause 18, Electrical Tests of Rubber Insulation, is the same as the present specification, the one-third (⅓) increase in insulation resistance thought advisable by the committee having been opposed by the manufacturers and, at their request, any recommendations on the subject have been postponed with a view to giving time for the manufacturers to demonstrate the correctness of the position taken by them.

Clause 19 has been changed to require that the wire will be arranged in coils for testing to permit of an easy inspection, which is not possible when the wire is wound on a reel.

Clauses 20, 21 and 22, specifying the length of the wire and size of coils, are new, and are required owing to the practice now being followed of making a wire continuous from one binding post to the other and eliminating joints.

Clauses 23, 24 and 25, Packing for Shipment, are new, and prescribe the methods to be followed when wire is to be shipped.

CONCLUSIONS.

Specifications for cables, weatherproof wire, etc., are closely related to the question of rubber-covered wire, and the committee, although not specifically instructed to do so by the Board of Direction, submits specifications for the following:

(1) Mineral matter rubber compound insulated aerial braided cables for current of 660 volts or less;

(2) Mineral matter rubber compound insulated, lead-covered, armored, submarine cable for 660 or lower voltage service;

(3) Double-braided weatherproof, hard-drawn, copper line wire;

(4) Double-braided, weatherproof, galvanized, B. B. iron line wire;

(5) Double-braided, weatherproof, hard-drawn, copper clad, steel line wire;

(6) Galvanized E. B. B. iron bond wires;

and offers the conclusions that these specifications be adopted by the association and printed in the Manual. The committee further submits the conclusion that the stranding table given on page 156 of Vol. 10, No. 1, of the 1909 proceedings, be changed, and that the following tables for stranded conductors and for flexible conductors be accepted by the association and printed in the Manual:

STRANDED CONDUCTORS.

Approximate Size, B. & S. Gage.	Number of Strands.	Actual Circular Mills.
2000000	127	2000250
1500000	91	1502592
1000000	91	1003275
900000	91	900900
800000	91	804076
700000	61	698389
600000	61	597861
500000	37	506493
400000	37	400192
350000	37	351722
300000	37	299700
250000	37	248788
0000	19	211470
000	19	167884
00	19	132468
0	19	105450
1	19	84018
2	19	66139
3	7	52274
4	7	41503
5	7	33327
6	7	26047
8	7	16464
9	7	12943
10	7	10374
12	7	6300
14	7	4375
16	7	2527
18-7 No. 26	7	1778
20-7 No. 28	7	1113
21-7 No. 29	7	889
22-7 No. 30	7	700

FLEXIBLE CONDUCTORS.

Approximate Size, B. & S. Gage.	Number of Strands.	Actual Circular Mills.
0000	37	210900
000	37	168572
00	37	133200
0	37	105894
1	37	83472
2	37	66822
3	19	52364
4	19	41971
5	19	33516
6	19	26011
8	19	17011
9	19	12844
10	19	10051
12	19	6498
14	19	3990
16	19	2508
18-7 No. 26	19	1501

The previous table was confined to 7, 19, 37 and 49 stranding wire with sizes of strands B. & S. G., 11 to 33 inclusive.

The committee finds it desirable that a standard form of report on which the results of physical and electrical tests of wire insulation may be shown should be used, and recommends that the sheet be adopted by the association and printed in the Manual:

(Size of Sheet—8½"x13¾")

WIRE INSPECTION REPORT No. . . .

. . . . . 191. . . .

Manufacturer . . . . . .

Location of factory. . . . . Reqn. No. . . . . .

Whose order . . . . . Order No. . . . . .

GENERAL DESCRIPTION

Test of . . . . . .

To be located at. . . . . Working voltage . . . . . .

Single conductor: Length. . . .ft. Size. . . .B. & S. Wall. . . .in. Reels. . . .

Length . . .ft. Armor. . . .B. & S. Lead sheath . . .in. Reels. . . . . .

Composition

No. of Cond. Size, B. & S. No. of Strands. Size of Strands. Wall. Cable.

. . . . . .

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SPECIFICATION REQUIREMENTS.

Voltage volts A. C for .min. Insulation resistance. . . .megs. per mile at 60 deg. F.

Tensile strength of insulation. . . .lbs. per sq. in. Tensile strength of copper. . . . . lbs. per sq. in.

Permanent set of insulation, 20% Conductivity, 98% at 60 deg F

Elongation of insulation, 350%. Pure Para rubber, 30%.

PHYSICAL TESTS.

Conductor.	Insulation.
Elongation. . . . .% in. . . . . inches	Elongation. . . . . % in. . . . . inches
Torsion. . . . twists in. . . . . inches	Permanent set. .% in. . . . . inches
Tensile strength. . . .lbs. per sq. in.	Tensile strength. . . .lbs. per sq. in

CHEMICAL TESTS

Conductor tinning test Immersed. . . . . times before blackening

Insulation—Pure Para rubber %. Sulphur .%. Dry mineral matter. .%

BRAIDING TESTS.

Gain . . .% of weight of braid after. . . .hours. Immersion at. . . .deg. F

ELECTRICAL TESTS.

1 Voltage test: Unbraided wire tested. . . .volts A. C. for. . . . . Min.

Remarks . . . . . .

2 Conductivity test. . . . . % of Matthiessen's standard at 60 deg. F

3. Insulation resistance test: Temperature. . . deg. F. Constant. . . .Megs

Time immersed. . . . . Hrs Voltage of cells volts. . . . . .

Coil Nos. Length. Defls. Meg. Mile Coil Nos. Length. Defls Meg Mile:

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. . . . . Inspector

UNIFORM SIGNAL SYSTEM.

On account of the differences of opinion in the committee, its report on this subject was, by vote of the association, referred back to it in March, 1910, with instructions to confer with the proper committee of the American Railway Association. Such conference was held June 8. A Sub-Committee of three was appointed by the committee on transportation to further report to the entire committee, it being understood that their conclusions, when arrived at, would be transmitted to us. To date we have received no word from them.

MECHANICAL AND INTERLOCKING SPECIFICATIONS.

The committee reports that the Railway Signal Association has only this year practically completed the specifications for mechanical interlocking, including wrought-iron pipe and electric interlocking, which are shown in Vol. 7 of its Journal for 1910, and the committee will arrange and report complete specifications on both of these subjects (Nos. 3 and 4) in 1911.

EFFECT OF TREATED TIES AND METAL TIES ON TRACK CIRCUITS.

No meetings were held, as the chairman of the committee on ties advised that that committee would not take up the subject this year, and the committee on wood preservation did not invite the sub-committee to confer with it.

Special Conference with the Committee on Track.

Conferences were held as outlined above, but the entire committee has had no opportunity to pass on this important subject. The committee therefore recommends that if any matters of switch point drilling, spacing of ties, insulation, etc., require consideration after the annual meeting, they be the subject of the joint action by Committees V and X.

The report is signed by A. H. Rudd, Pennsylvania, chairman; L. R. Clausen, C., M. & St. P., vice-chairman; Azel Ames, Train Control Board; C. C. Anthony, Pennsylvania; H. Baker, Q. & C.; H. S. Balliet, N. Y. C. & H. R.; W. G. Besler, C. R. R. of N. J.; W. B. Causey, G. W.; C. A. Christofferson, N. P.; C. E. Denney, L. S. & M. S.; W. J. Eck, Southern; W. H. Elliott, N. Y. C. & H. R.; W. J. Harahan, Erie; M. H. Hovey, Wisconsin Railway Commission; A. S. Ingalls, L. S. & M. S.; J. C. Mock, D. R. T.; F. P. Patenall, B. & O.; J. A Peabody, C. & N. W.; Frank Rhea, General Electric Company; W. B. Scott, Harriman Lines; Thos. S. Stevens, A., T. & S. F.; H. H. Temple, B. & O.; Edwin F. Wendt, P. & L. E.; J. C. Young, U. P.

Discussion on Signals and Interlocking.

Mr. Ames: There is a misprint in clause 12, on page 134, in describing the covering to be placed over the armoring on submarine cables. It says: "Over the armoring a layer of closely woven jute braiding shall be placed." It should read: "Over the armoring a layer of twisted jute roping should be placed."

B. H. Mann (Mo. Pac.): The question of language in the conclusions as recommended by the committee is important. The first specification we adopted was for mineral matter rubber compound insulated signal wire, and that was adopted as being in accordance with the best practice. It seems, though, the mere fact that it was voted to put that in the manual is no reason why we should leave that wording out, for the reason that in the specification under discussion the conclusion reads: "That the specifications for double braided, weatherproof,hard drawn copper line wire presented as prescribing the best practice, be adopted by the association and printed in the manual." There is a doubt, it seems to me, as to whether the committee means that the double braided, weatherproof, hard drawn copper line wire is the best sort of weatherproofing, or whether they mean this will be specified as the best for the double braided wire. As far as the question of whether the double braided insulation is better than a triple braided insulation, or some other sort of insulation, it does not seem to me that this is the time to take that up, and as far as the adoption of the specification by the Signal Association is concerned, it was put through just as the first conclusion we have adopted, leaving out the words "presented as prescribing the best practice." In that way, we will obviate any possibility of some of the railways inferring that the Maintenance of Way Association has said that the double braided, weatherproof wire is the best for insulation.

Mr. Elliott: The committee has no objection to accepting the suggestion made by Mr. Mann.

Mr. Mann: Is that a typographical error, the use of the BB instead of the "Extra B?"

Mr. Elliott: It should be "BB" in the title, and not "Extra B."

The President: That correction will be made.

Thos. S. Stevens (A. T. & S. F.): I would call attention to the fact that the conclusions are apparently in the wrong place. It is a matter for the secretary to take care of when the report is printed.

The President: This order was submitted by the com-

mittee. It is true that the conclusions should be in another place, and should follow the specifications.

Mr. Elliott: The committee asks to eliminate the word "iron" both in the title of the specification and in the second line, as the revised title, "double braided, weatherproof, galvanized BB line wire," more correctly specifies the material, which is furnished, and which is used for this purpose.

Mr. Mann: It is understood the committee reports for the adoption of the association that the use of BB weatherproof line wire is the best practice, and a specification for BB iron line wire, or double B galvanized line wire, is desirable, but it does not say that the extra "BB" is the best.

Mr. Elliott: The two things I understand Mr. Mann has in mind are the use of the word "iron," and whether the double B wire is to be preferred to the extra BB. The committee has drawn up a specification for BB line wire, and finds that is the quality of wire most used for the purpose. Another specification would be drawn for extra BB line wire, if it is desired to have such a specification. The specification, in its revised form, eliminating the word "iron," covers the material as furnished and produced commercially. It is in order to prevent any confusion or difference between the purchaser and the manufacturer that the word "iron" is eliminated. The committee asks permission to eliminate from the second line of the conclusion regarding galvanized E. B. B. bond wires the words: "which calls for the best practice in the furnishing of this product." The committee also asks to eliminate the word "iron," both in the title of this specification, and in the first line of the conclusion, as the revised title, "galvanized E. B. B. bond wires," correctly specifies material which is furnished and used for bond wires.

C. H. Ewing (A. C. R. R.): I would like to call attention to Subject 2. As I understand it, the subject of uniform signal practice is in about the same condition as at the last meeting, with the exception that it has been referred to the American Railway Association committee. It would be of very particular interest if the committee could advise us if they have had any meetings on this subject, and if they have been able to reconcile any of their ideas.

Mr. Elliott: The committee had a conference with the Transportation Committee of the American Railway Association at Niagara Falls last June, and a full hearing and discussion was had. There was a good deal of interest on both sides. I understand the committee of the American Railway Association, having this matter under consideration, has had three or four meetings, and has about concluded its recommendation or decision. At this time we have not had any report as to what that conclusion would be, and until it is finished this committee does not expect to do any further work or take action on the subject. The committee was dismissed with the thanks of the association.

In introducing the report of the committee on Electricity, Chairman Kittredge read the letter which Mr. Berg, a former president, read to the committee at the time the subject was first discussed.

ELECTRICITY.

The following subjects were assigned:

(1) Clearances: G. A. Harwood, R. D. Coombs, A. O. Cunningham, W. S. Murray, George Gibbs, E. B. Katte.

(2) Transmission lines and crossings: R. D. Coombs, A. O. Cunningham, G. A. Harwood, W. S. Murray.

(3) Insulation: J. A. Peabody, R. D. Coombs, W. S. Murray, E. B. Katte.

(4) Maintenance organization: J. B. Austin, Jr., E. P. Dawley, C. E. Lindsay, E. H. McHenry.

(5) Electrolysis: W. W. Drinker, W. S. Kinnear, J. A. Peabody.

(6) Relation to track structures: C. E. Lindsay, E. P. Dawley, E. H. McHenry, J. B. Austin, Jr.

CLEARANCES.

Third-rail clearance line.—Lines beyond which no part of the third-rail structure shall project.

Equipment clearance lines.—Lines beyond which no part of the equipment shall project. Allowance to be made by equipment manufacturer for new equipment for wear on journals and brasses, on axle collars, on rail, on wheels, compression of springs, sagging of center of car, constructional variations, end play, broken springs, etc.

Third-rail gage.—Distance, measured parallel to plane of top of both running rails, between gage of running rail and center line of third rail.

With the adoption of electric traction by railroads using steam equipment, the question of what would constitute safe clearance lines for locating third-rail structures and overhead working conductors immediately presented itself. Most of the roads using steam equipment constructed their third rail so that it would clear the existing equipment, but it was deemed advisable also to fix a limit so that new equipment should not be built to encroach on the space occupied by third rail. Each road could adopt such equipment clearance lines as would meet its requirements, but this would not prevent complications in regard to interchange of foreign equipment and therefore the American Railway Association appointed a committee to establish recommended clearance lines for both third-rail structures and for equipment.

The study of existing third-rail structures, together with the clearance lines adopted by the American Railway Association, has led the sub-committee to recommend the attached diagram, entitled "Recommended Clearance Lines for Equipment and Third-Rail Structures, submitted by the Committee on Electricity."

Owing to the overhang of equipment passing around curves, it is advisable to change the lines adopted by the American Railway Association so that the limits shown on attached sheet will be applicable in all cases where the radius of curves is 800 ft. or less.

It has been the experience of steam railways operating a portion of their territory by third rail that, in spite of rigid requirements that equipment be not allowed to extend beyond the line of maximum equipment, cars frequently have to be cut out of service in the electrified territory because of heavy loading, defective springs or other reasons causing the equipment to project beyond the limiting lines.



G. W. Kittredge.
Chairman, Committee on Electricity.

Principally on account of this reason it is thought that the distance of one-half inch between the outline of maximum clearance for structures and the outline of maximum equipment is too small, and that if structures and equipment are allowed to approach so close there will be trouble from fouling in the event of adverse conditions. The sub-committee recommends a distance of 1⅛-in. apart for these two vertical and horizontal lines and a distance varying from $\frac{13}{16}$ in. to $\frac{15}{16}$ in. apart on the inclined part of the diagram which takes care of the side inclines at approaches to the curves, and specifies that "equipment shall under no circumstances project beyond line of maximum equipment except as provided for on curves of 800-ft. radius and less. Structural variation, end play and wear of equipment shall be provided for by the equipment manufacturer inside this line.

TRANSMISSION LINE CROSSINGS.

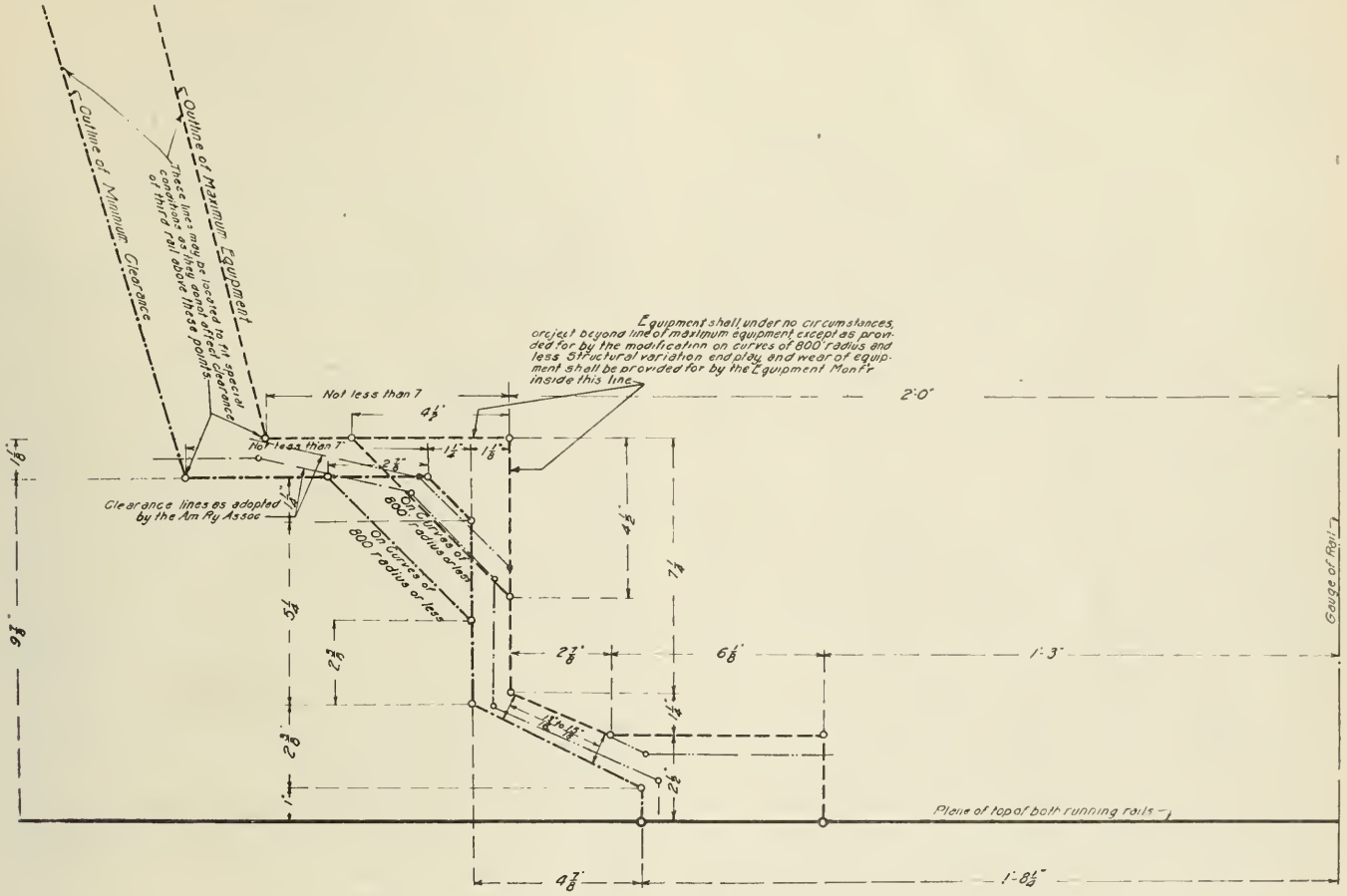
The sub-committee has worked in conjunction with the National Electric Light Association and has issued a progress report, which is included in bulletin No. 127. The increase in the number of high-tension transmission lines and the development in the protective regulations enforced by public service corporations and municipal authorities have created a demand for special methods of construction. The attention now given to the subject is due in large part to the presence of occasional lines of relatively high volt-

age. Any voltage over 250 volts with the currents generally used may cause painful, and, under exceptional conditions, fatal injury. It has, therefore, become necessary to consider all phases of the question as well as all voltages, but as the probability of danger to life or property is mainly confined to the immediate vicinity of the power line and particularly to the space over or under the same, the committee has discussed in this report the so-called "crossings" and not the construction of the power line itself. The more common forms of accidents, together with their causes and results, are discussed. The conditions of loading, cradles, grounding, size and material of wires, insulators, pins, clamping devices, insulated wire, and preservative treatment of cross-arms and poles are dwelt upon in this report, which also includes tables giving the properties of the various forms of wire in common use.

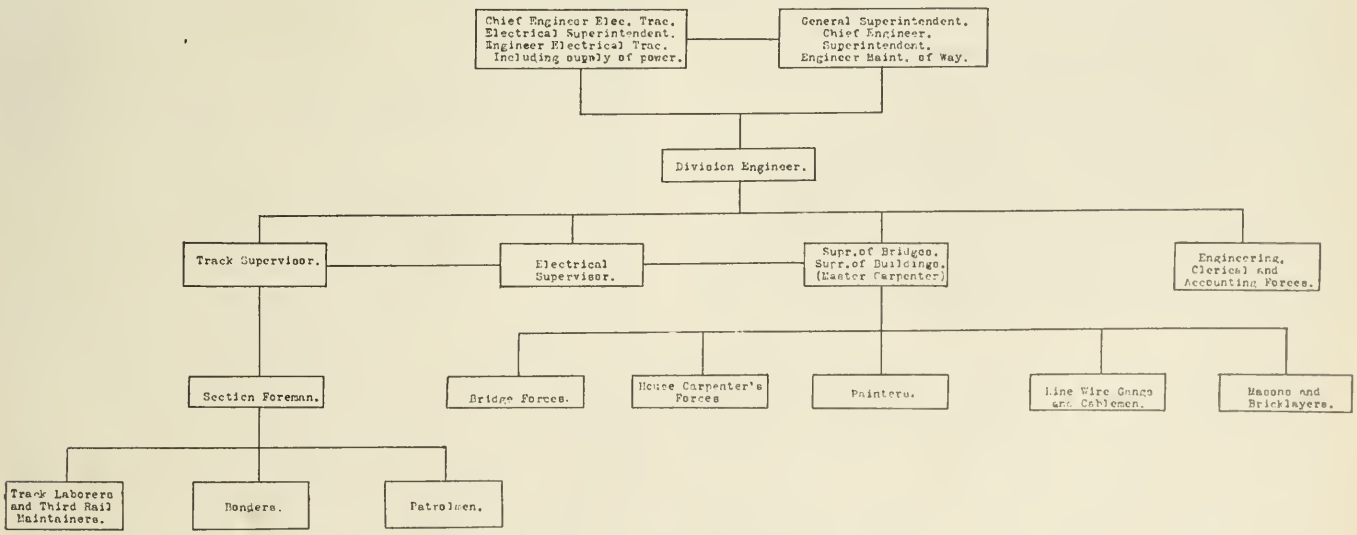
MAINTENANCE ORGANIZATION.

In connection with the sub-committee on relations to track structures, this sub-committee sent out a circular asking for information concerning the effect of electric traction on the maintenance organization and what changes were made necessary in the track standards; also what had been the effect of electric equipment on the track and steel structures. From a study of the organizations now existing the sub-committee believes that the officer in general charge of maintenance of way of a railway operated by steam or electricity, or both, is, or should be, fully equipped to superintend the maintenance of the various appliances that have been introduced in connection with electrical installation, but should have on his staff an electrical engineer, or be able to consult with one.

Similarly, the division officer in charge of maintenance



Recommended Clearance Lines for Equipment and Third-Rail Structures.



Proposed Standard Organization; Electrical Division.

of way should have on his staff a man with sufficient knowledge of electricity peculiar to the installation that will enable him to inspect the work of maintenance performed by the department.

The maintenance of towers or bridges for the support of transmission lines being work of no different nature from that actually performed by the bridge men, there is no reason why it cannot be done under the supervision of the head of the bridges and building forces. The maintenance of the buildings occupied as power houses, sub-stations, battery houses, circuit-breaker houses and cable terminals, is such as is usually done by the building department, and there is no reason for this work being done by any other or by any special department, the only unusual condition being the presence, in some cases, of transmission lines carrying electric current of high voltage, and there is no difficulty in educating men erecting, repairing, painting, etc., around these transmission wires to take the necessary precautions for their safety and for preventing the interruption of the service. The maintenance of aerial cables, wires, suspension bridges of the catenary type composed of wires involves no special knowledge or training that the man in charge of the maintenance of bridges and buildings should not possess. The only care being necessary is to educate the traction linemen actually employed in the work in protecting themselves against personal injuries from high-tension currents and taking the necessary precautions to avoid interruption to the service. This applies with equal force to roads having the third-rail type of contact or the overhead type of contact.

The work of maintaining third rail and appurtenances and track bonds is so closely associated with the work of maintaining track that the section foreman is the logical and proper man to be in charge of all such work on any particular section. The bonds, being usually of the concealed type, necessitate the removal of the joints before they can be inspected or repaired; the third rail is usually supported on the track structure and is in intimate relation with it, so that repairs to the one usually involves repairs to the other, demanding the presence of the section forces, and therefore the section foreman should be the man in control. These remarks apply with equal force to the removing of snow, ice or other obstructions. In yards and at other congested points where there is a number of tracks the work of bond maintenance may be of sufficient amount to warrant having bonders on the section forces, or may be sufficiently great to warrant the organization of an extra gang of bonders, working under an extra gang foreman under the control of the supervisor of track, or, in the event of stretches of territory where the work of bond maintenance would not warrant the employment of a man on each section for that purpose, it could be cared for by bonders under the direct supervision of the supervisor of track, these men to work under the immediate supervision of the section foreman while on his territory.

The work of the patrolman, which, on some roads, has been devoted exclusively to the inspection and minor repair of third rail and its appurtenances, is closely associated with that of the trackwalker, and there is no reason why one man could not perform the duties of both and also give such attention as may be necessary to the mechanical inspection of aerial wires and cables, territories being so arranged as to be reasonably within the physical capacity of the patrolman and so as to give inspection sufficiently often to safeguard traffic and avoid delay thereto.

The electrical supervisor above mentioned who reports to the division officer in charge of maintenance is understood to exercise general supervision over all the electrical work done by the supervisor of track and the officer in charge of bridges and buildings, with a view to securing adherence to standards and proper methods of work, principally from an electrical standpoint.

The committee wishes to emphasize one important feature of this proposed organization, namely, the fact that the classification of expense accounts as established by the Interstate Commerce Commission and by various state commissions places in the maintenance of way the expense of maintenance of transmission lines, contact lines, power houses, etc., so that it seems to be exceedingly logical that the actual supervision of the work of maintenance should be done under the supervision of the maintenance of way organization.

In conclusion the sub-committee recommends:

(1) The adoption of the definitions given for Electrical Supervisor, Bonders, Traction Linemen and Patrolmen.

(2) That the work of maintenance should be done as far as possible by the existing maintenance of way organizations, with such modifications as may be necessary for the special work involved in the electrification.

(3) That a Maintenance of Way Organization, as shown on exhibit attached, will be productive of efficient results.

(4) That these recommendations be printed in the Manual.

RELATION TO TRACK STRUCTURES.

Bond.—A metallic means for connecting two rails to permit of passage of electric current.

Cable.—A rope composed of wires for the transmission of electricity.

As the sub-committee has not received reports from many of the roads on which electric propulsion has been introduced, it does not feel warranted in drawing conclusions at this time.

Recommendations.—(1) That the definition of bond and cable be adopted. (2) That the committee continue its investigations along the lines outlined in the circular of inquiry.

CONCLUSIONS OF THE WHOLE COMMITTEE.

Third-Rail Clearance Lines.—Lines beyond which no part of the third-rail structure shall project.

Equipment Clearance Lines.—Lines beyond which no part of the equipment shall project. Allowance to be made by equipment manufacturer for new equipment for wear on journals and brasses, on axle collars, on rail, on wheels, compression of springs, sagging of center of car, constructional variations, end play, broken springs, etc.

Third-Rail Gage.—Distance, measured parallel to plane of top of both running rails, between gage of running rail and center line of third rail.

Electrical Supervisor.—An officer on the division staff qualified to supervise the maintenance of the electrical transmission and working conductors outside of the power station.

Bonders.—Employes qualified to maintain rail and other bonds and their appurtenances for all railroad voltages.

Traction Linemen.—Employes qualified to maintain wires and cables and their appurtenances.

Patrolmen.—Employes qualified to inspect and make minor repairs to track and third-rail structures, cables and wires, and to use hand signals for the protection of trains.

Bond.—A metallic means for connecting two rails to permit of passage of electric current.

Cable.—A rope composed of wires for the transmission of electricity.

(2) The lines shown on diagram B as third-rail clearance lines.

(3) The lines shown on diagram B as equipment clearance lines.

(4) The principle that electric maintenance should, as far as possible, be performed by existing maintenance of way organization, with such modifications as may be necessary.

(5) A maintenance of way organization, shown on diagram A, will be productive of efficient results.

The report is signed by George W. Kittredge, chairman.

Discussion on Electricity.

Mr. Kittredge: I would like to make a few corrections. Under the heading, "definitions," in the conclusions of the whole committee, third rail gage should be the distance between the gage of the running rail and the gage of the third rail, instead of the center line of the third rail. In the definition of "bonders" the last four words, "for all railroad voltages," should be omitted. Those four words properly belong to the next paragraph, which should read: "Employees qualified to maintain wires and cables, and their appurtenances for all railroad voltages." The committee desires to remove from the conclusions recommended for adoption subdivisions 2 and 3; the lines shown on Diagram B as third rail clearances, and the lines shown on Diagram B, as equipment clearance lines, and consider these as reports of progress. It is expected that before the next meeting we can agree with other railway associations on lines that will be satisfactory to all and we think it would be better to have our recommendation of them postponed until the next meeting.

The recommendations of the committee under the head of "definitions" were adopted.

J. C. Mock (Detroit River Tunnel Co.): I should like a little explanation of the definition of third-rail gage. We have been accustomed to use the center line of the third rail. I would like to have explained just what the gage line would be.

Geo. Gibbs (P. T. & T. R.): In trying to define any third rail gage, the clearing point of the third rail, we are working on very close clearance and we are trying to harmonize close dimensions on both sides. The center of the third rail does not fix any point. The third rail may be two or four inches wide, making a difference of an inch, and that is very important.

Robt. Trimble (Penna.): I suggest that the word "line" be omitted, if you are going to change the word "center gage."

Mr. Ktitredge: The committee will accept that amendment.

C. C. Anthony (P. R. R.): Mr. President, as this is a definition of third rail gage and it evidently means the gage of the distance between two lines, should not the word "line" appear in both cases in the body of the definition, "between the gage line of the running rail and the gage line of the third rail"? And if that is submitted, will it not then be necessary to define the gage line of the third rail?

Mr. Lindsay: I think it will be necessary to adopt the same measuring point on the third rail as on the running rail. The gage is measured at a point one-half inch below the top of the running rail, and that same distance should be adopted on the third rail.

E. B. Katte (N. Y. C.): Because of the very wide difference in the cross section of the third rail, it would not be a very definite line. It would seem to me it should be the distance between the perpendicular line of the third rail and the gage of the running rail.

Mr. Katte: We are interested in a question of clearance, and what we want to know is the space between the vertical plan of the third rail, and the gage line of the running rail. "Gage," I think, is generally understood as being the distance between the verticals.

Mr. Anthony: I would like to emphasize the fact that this definition, as it stands, is not correct in that third rail gage is defined by third rail gage. I cannot see why in the world lines should not appear twice in the gage definition—"gage line of the running rail and the gage line of the third rail."

Mr. Gibbs: Mr. Anthony is entirely correct, but the gage of the track rail is a well-known term, and as we are simply trying to find the measurement between that point and a similar point on the third rail, it will be better defined if we use that term than by any other explanation we could give.

W. M. Camp (Ry. & Eng. Rev.): This is a definition which should be considered pretty carefully. In the gage of track rails, we have the rails right side up, but with the third rail, we may have that rail standing with the head upward or with the head downward. Do we want the third rail gage for the purpose of clearance or is it desired for the purpose of meeting the requirements of the reach of the collector shoe on the car? If the latter is the requirement, then the center of the third rail would be a more desirable point to measure to than the gage line of the head. If the rail is inverted with the head downward, the measurement to the gage side of that head for gage purposes might not be satisfactory, because the base of the rail might be nearer the gage line of the running rail. I would like to ask the chairman what the purpose of this gage is. Is it to determine clearance or to determine the proper distance to the rail for determining the reach of the collector shoe?

Mr. Kittredge: For both purposes. It is essential for one, and essential for the other, too.

Mr. Kittredge: The committee is willing to accept Mr. Anthony's amendment by inserting the word "line" after the word gage, in each case, in the last line of the paragraph.

H. Baldwin (C. C. C. & St. L.): In trying to establish clearance distance why not omit the word "gage" in the second instance? The distance between the gage line of the running rail and the third rail is the question.

Mr. Gibbs: The important point of the third rail is the side of the head which establishes the point where we must place the approach blocks for the side of the inclines on which the shoe will ride it. The top corner and side on the contact part of the rail is the important point, and we must fix that. The other parts will take care of themselves.

Mr. Mock: The distance from the standard rail to the gage line of third rail is not fixed by this definition, because of the great differences of rail sections. It seems to me the line should be fixed, and then whatever the form of rail, it must be placed in a certain relation to that.

Mr. Kittredge: There should not be a confusion between the gage line and the clearance line. The gage line of the third rail is not necessarily any clearance line, either for equipment or structures.

Mr. Kenly: I understand the thing to be determined is the third rail clearance lines, not the location of the third rail itself. Then the next thing is to get the third rail location, so that your contact shoe will reach it, and if the center line of that third rail is measured from your gage line, will not that fix the whole thing?

Mr. Lindsay: I think one great difficulty with the adoption of the center line as the measuring point is the fact that rails are not all symmetrical around the center lines, and where you have an unsymmetrical section, it is difficult to say what is the center line. I think it would be well to drop the track gage as a point from which to measure to the running rail, but take the center of the track, and say that no part of the running rail above a certain level shall be nearer the center of the track than a certain distance.

Mr. Kittredge: It occurs to me that that is fixing the third rail clearances, and not defining third rail gage. This definition is for the third rail gage, and not clearances.

Mr. Camp: I don't believe we can make this definition suit both clearances and gage. I understand Mr. Kittredge to say that the rail might be at the gage and still not have the desired clearance. To establish clearances, you must measure to the nearest part of that third rail. But if you are going to get it in order to determine the length of the reach of the shoe, then you must use that part of it which comes in contact with the shoe. Unless something more is added, I don't see how the definitions can specify both clearance and gage.

Mr. Trimble: Isn't the point that Mr. Camp raises covered by the definition of third rail clearance lines?

L. S. Rose (C. C. C. & St. L.): As I understand it, definition 1 establishes two lines, one on each side of the track. The third rail would have to be placed within these two lines. The gage line of this third rail will be located according to the third definition.

Mr. Ewing: The matter to be determined is not a standard gage distance. That varies according to the type of rail used. The purpose of this definition is simply to indicate where measurements shall be taken; and perhaps the best measurement can be secured from the center of the rail rather than from the side.

Mr. Gibbs: It is difficult to explain to the association, without diagrams, just what we are after. In laying down a third rail on a track, the shoe must be so adjusted that it has sufficient contact area on the top of the rail or on the bottom of it. That generally means that the third rail shall lap over about two-thirds of the head, if the head is about two and a half inches wide. A very important consideration is getting that shoe, which is hanging down off of the rail, up on to the rail when it approaches.

A motion to adopt the definition was carried.

Mr. Porter: In the second definition, "allowance to be" starts the second sentence. Shouldn't that be "shall be" or "will be?"

The President: The committee recommends the words "must be" instead of "to be."

Mr. Kittredge: In the fourth definition, the committee would add, "and sub-stations."

The other definitions were accepted as submitted.

Mr. McNab: It seems to me that the word "existing" in paragraph 4 is not necessary. What is existing today may not be existing six or twelve months from now. I think you will cover the same ground if you leave the word "existing" out.

Mr. Kittredge: I do not see that it is essential that that word be taken out. As a rule the installation of electrical operation comes about after the steam operation. It is not necessary that it should, but in the majority of cases it does, and the idea expressed by this is that a new organization for maintenance is not essential. Any existing organization can be developed and expanded and brought up to the point where it can take care of electrical organization as much as steam organization.

A motion to leave out the word "existing" in this paragraph was defeated.

Mr. Kittredge: I suppose there is more opportunity for discussion on conclusion 5 than on any other conclusion that this committee has recommended. The plan that has been outlined in this paragraph is a plan of organization. We don't say that it is the only plan, or the best plan. It is a plan which will bring efficient results. The conditions which exist on various railways are very different. It may be necessary to enlarge certain parts of the organization on

some roads and on others the duties of three or four persons named here, might be given to one person.

The President: If there is no objection, this will be accepted as information.

Mr. J. B. Austin, Jr. (L. I. R. R.): We have been talking about third rail organization and not about signal organization. If you want to bring the signal engineer under the electrical engineer, that is a matter for each road to settle for itself.

Mr. Lindsay: The committee purposely eliminated the signal side of the question from its outline of organization. Signaling is, in itself, a great and important specialty, and there is nothing in this outline of organization that interferes in any way with the introduction of the electrical system.

Mr. Mann: In connection with the definition of the electrical supervisor, his duties, are not clear to me. He is qualified to do certain things, but to have those things done, he must go to a co-ordinate officer, the master car builder. He is in a sense responsible under this title of electrical supervisor, but if he wants a wire repaired, and the men who repair the wires are repairing a building, is it necessary for him to go to a division engineer and ask that the master carpenter be instructed to do the work?

Mr. Kittredge: In the definition of electrical supervisor, we have made no attempt to describe his duties. We describe the man. An electrical supervisor on one road may confine his attention to one or two things. On another road he may be a very busy man and not have the title of electrical supervisor, and still be the electrical supervisor.

The committee was excused with the thanks of the association.

BRINE DRIPPINGS FROM REFRIGERATOR CARS.

The Master Car Builders' Association has experimented with a plan which provides that the brine drippings from refrigerator cars be retained in the tanks inside of the cars between icing stations and the tanks emptied at icing stations or points where cars are usually re-iced. Some tests had been made, but they were not satisfactory and were to be continued under extremely high temperature conditions. Accordingly, in August, 1909, the committee conducted an eight-hour day test at the Armour Car Line shops, Chicago. The tests extended from August 4 to



J. C. Mock.

Chairman, Committee on Brine Drippings From Refrigerator Cars.

August 11, inclusive. The maximum temperature was 94 degrees, between four and five o'clock, August 8. The committee states the tests justify them in making the following recommendations:

"1. All salt-water drippings should be retained in the ice tanks and drained off only at icing stations.

"2. The total capacity of drain openings should not exceed the capacity of traps, and the capacity of drains and traps should be sufficient to release all drippings within the time limit of icing the train.

"3. The mechanism adopted for handling drain valves should be simple and positive, and so designed as to insure closing the valves before hatch plugs can be returned to their places.

"4. Salt drippings should be conducted from ice tanks through the drain valves above described and thence to the outside of cars through the regular traps and drain pipes.

"The packing companies have co-operated with your committee in their investigation, and have expressed their willingness to put into effect the practice recommended by your committee, if these recommendations meet with the approval of the Master Car Builders' Association."

As the above report was approved by the Master Car Builders' Association, June, 1910, your committee is of the opinion that the present status of the subject does not require submitting of further data, showing the damage caused to railroad property because of the present practice, and concludes:

(1) That this association should request the American Railway Association to approve the recommendations of the Master Car Builders' Association as satisfactory.

(2) That this association should request the maintenance of way departments to provide the facilities needed to dispose of the brine drained from cars at the re-icing stations.

The report was signed by: J. C. Mock, chairman; C. H. Cartlidge, C. B. Hoyt.

Discussion on Brine Drippings from Refrigerator Cars.

The President: I think the thanks of this association and of the railways are due to the M. C. B. association committee, and the committee of this association for finally reaching a conclusion on this matter.

R. G. Kenly (M. & St. L.): I think if we pass this report up to the American Railway Association as having been adopted by this association, we have done our duty and we should not attempt to influence that association by telling them what to do.

The President: The M. C. B. association has already submitted a report to the American Railway Association and it seems to the Chair that it would be proper for us to request prompt action in the matter in order that we may get relief from this burden. The committee of the M. C. B. association did most of the work and they are entitled to the credit for it. It seems to the Chair that the conclusions of the committee are very well taken in the matter.

The report was adopted and the committee discharged with the thanks of the association.

YARDS AND TERMINALS.

The subjects assigned were:

(1) Consider revision of Manual.

(2) Development of mechanical handling as a means of promoting rapidity and economy in the handling of freight.

(3) Submit typical track layout for passenger terminal of medium size, both dead-end and through, and analyze graphically the train capacity of the layout, conferring with Committee on Signals and Interlocking.

(4) Make concise recommendation for next year's work.

REVISION OF MANUAL.

Minor changes in wording only were made.

MECHANICAL HANDLING OF FREIGHT.

Such developments as have been made relate almost exclusively to the handling of cargo at steamship piers in ocean and inland ports. Nothing appears to have been done in the application of mechanical apparatus to ordinary freighthouse work. The cost of freight handling at terminals, however, is entirely out of proportion to the low cost of transportation in modern railway service, and there are possibilities of considerably reducing this terminal cost by the introduction of mechanical appliances.

DESIGN OF PASSENGER TERMINALS OF MEDIUM SIZE.

This subject has been treated as a continuation or supplement to our report on the subject of passenger terminals in the tenth annual report. Typical track layouts are submitted for both dead-end and through stations that we believe to be susceptible (in their main features) of quite general application. In the design and construction of terminal facilities the object should be to provide such arrangement of tracks as will permit the greatest freedom of movement with the least interference, to the end that incoming and outgoing trains may be handled without serious interruption or delay. In this way will be secured the maximum efficiency of tracks and facilities and the minimum expenditure for installation.

In the operation of terminal stations many, and in some cases most, of the trains handled have to be hauled out of the station after they are unloaded, and placed in a car-cleaning yard. Unless the facilities are ample, they must be moved again after cleaning, and placed on storage tracks. From the storage tracks they are shifted in proper order and placed on a track in the station for outward movement.

If it is necessary at any time to provide for trains arriving or departing (or both) in rapid succession it is very important that the track layout be so arranged that the inbound and the outbound movements will not conflict to any great extent. This will make it possible not only to permit trains in many cases to enter stations at the same time that other trains are departing, but also to fill vacant tracks in the least possible time after outgoing trains have left them. This, in turn, will secure maximum efficiency and will reduce to a minimum the number of tracks in a station to properly handle the business.

The train capacity of tracks depends largely on the facilities provided for rapid handling of the baggage and express matter that is loaded and unloaded while trains are standing at station platform. It follows, therefore, that in order to handle the largest number of heavy trains within a given time these facilities must be the best that conditions will permit, and, if possible, such arrangements should be made as will eliminate interference with the movement of passengers. To this end it is suggested that where it is possible



F. S. Stevens.

Chairman, Committee on Yards and Terminals.

to do so, baggage and express should be received, delivered and handled below the train floor and raised and lowered by elevators located near the baggage and express cars. This will avoid trucking long distances on platforms used by passengers, to the great discomfort of all concerned and the loss of much valuable time.

There is a very wide variation in the time required to load and unload passengers, baggage and express at stations, depending largely on the character and volume of the business handled by different trains and the facilities provided to insure rapid movement. As a rule the passengers can be loaded on long-distance trains in much less time than is required to handle the baggage and express, but with the short distance and suburban trains (on account of the comparatively small amount of baggage and express to be handled) the conditions may be reversed. In any case it is evident that to secure the greatest efficiency in handling a passenger terminal the time required to load passengers and ordinary baggage and do necessary shifting must be considered as the time interval between the departure of trains on any tracks. Therefore, the express, theatrical and other extra heavy baggage should be loaded prior to making up and placing such trains at the passenger platforms.

The operating officers in charge of the large number of stations covered by the investigations place widely divergent estimates of maximum capacity of station tracks, ranging from 2 to 12 trains that could be handled on one track, with an average of 6.5 trains per hour. These figures no doubt represent a very close approximation to the very best results that could be accomplished for a period of time not exceeding one hour and only after preparation had been made, and therefore do not indicate results that could be expected if a continuous performance were required. At the same stations we find that the actual performance is from 2 to 8 trains, with an average of 4.1 trains handled on one track during the busiest hour. It follows, therefore, that under average existing conditions the actual performance during busiest hours is approximately 4 trains per hour on busiest tracks and that a maximum average of 6.5 trains per hour could be accomplished on some tracks. It is to be noted, however, that the stations at which high estimates of efficiency are made either have through tracks or do a large suburban business with light trains.

If, however, facilities can be provided that will permit continuous and rapid handling of baggage and express without interference with the movements of passengers, it is believed that results approximating the best estimates can be maintained for much longer periods of time, and that the average of 6.5 trains per hour is well within the limit of efficiency that can be secured. But to do this it is conceded that the station, the track layout and all facilities must be designed in harmony and with the principal object of saving time in handling, and thereby securing results that would ordinarily require a larger installation. With this object in view, we have considered the subject of track layouts at terminal passenger stations, both dead-end and through, and present for your consideration diagrams showing typical layouts embodying and illustrating the suggestions submitted.

Statistics have been gathered showing the general characteristics of 26 passenger terminals of medium size located in cities in this country, and this information has been tabulated in the accompanying tables. From these it appears that a number of stations at important points are now working close to the limit of their capacity and are showing very creditable efficiency as to operation. But as they are being worked beyond the limit for which they were designed, it is reasonable to suppose that the cost of operation is excessive and that, therefore, some rearrangements and improvements would be advantageous, to save time and reduce cost of handling.

In the diagram representing a dead-end station with eight platform tracks, the double-track arrangement at the entrance is preserved to the greatest possible extent, so that the use of station or platform tracks may be made practically continuous. Results are thereby secured closely approximate to the best that could be secured in a station with through tracks and the same length of platforms. It is suggested that where large numbers of passengers arrive in quick succession (as in the case of suburban traffic), full consideration should be given to the question of providing the passages for egress with inclined floors instead of stairs, with the object of increasing capacity and preventing congestion. It is recommended that the grade or fall of such sloping floors be not greater than one in ten (or 10 per cent.), and that all such floors be kept rough at all times, so that slipping may be avoided.

At stations of either type the time required to place a train on a station track, load it, and clear the track for another train is the minimum time interval between departures of trains from any one track. Therefore, to secure maximum efficiency the track layout must permit operation practically without interference, as in stations with through tracks, and baggage and express handling must not retard the movement of trains beyond the time needed to properly handle the passengers. In regard to the track layout for a through station, it will be noted that the location is shown at a junction of two double-track roads. A separate station platform is provided for the movement in each direction. All trains making the station stop must be switched from the main track to one side or the other of one of these platforms, thus clearing the main line while the stop is being made. In some station plans a middle platform separates the two pairs of tracks, but it is the opinion of the Committee that it is unnecessary to switch trains across one of the through tracks (as with a three-platform plan). Therefore, the double station or double platform plan was adopted, the two main tracks being continuous and on their proper line through the station.

It will be noted also that a station of this kind has almost unlimited capacity, and, therefore, there is comparatively little necessity for much additional trackage. The platforms being of ample size, four ordinary trains can stand at the platform at one time. As these platforms are approached from the bottom, and the baggage and express

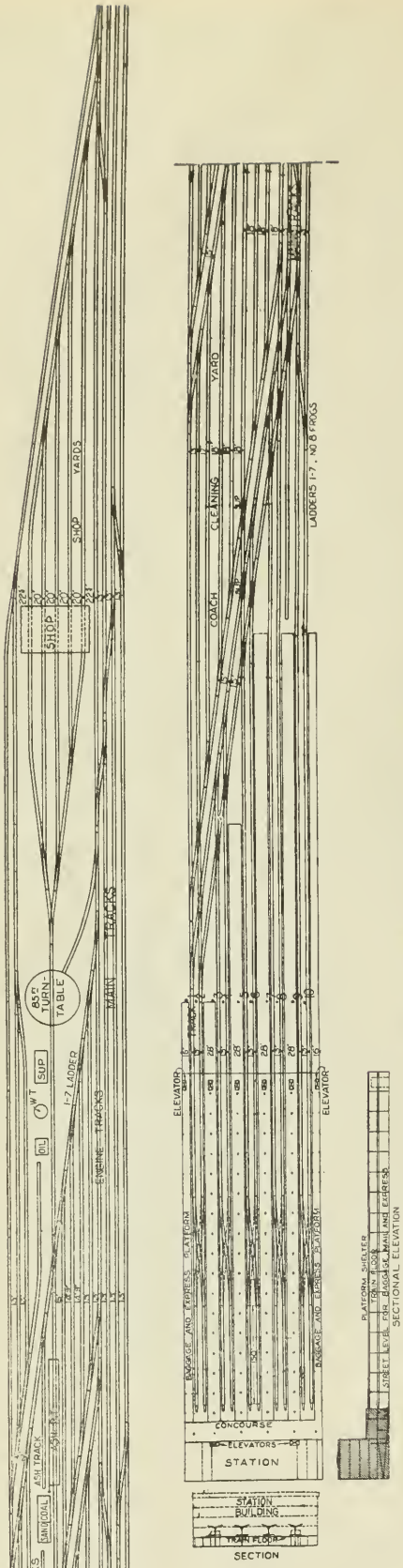


Fig. 1—Typical Track Layout for Dead End Passenger Terminal.

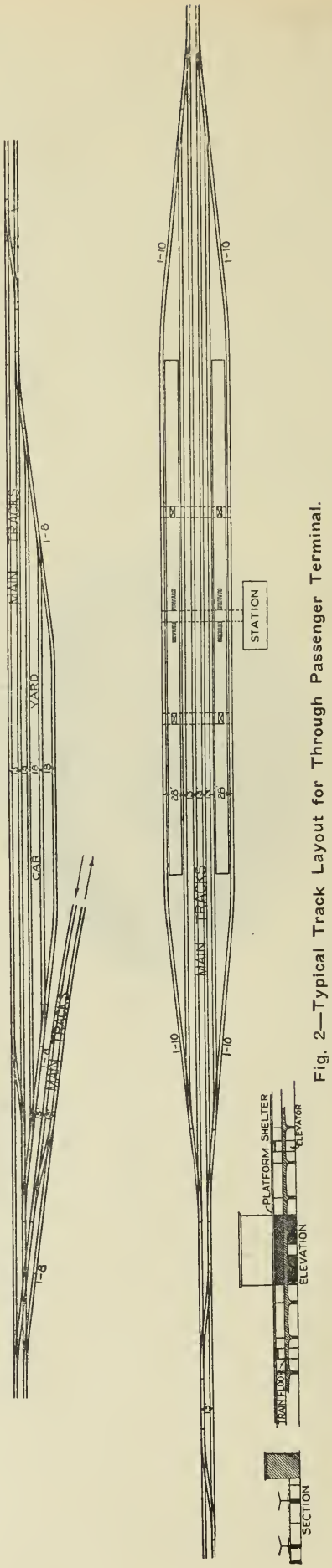


Fig. 2—Typical Track Layout for Through Passenger Terminal.

are handled by elevators, there would be very little interference and the station would be found to have very great capacity.

CONCLUSIONS.

(1) To avoid excessive cost in providing passenger terminal facilities largely in excess of ordinary requirements, it is imperative that provision be made for economical, efficient and practically continuous operation of the terminal during the periods of greatest activity which may reasonably be expected within a period of, say, ten years. To this end the track layout must be designed to permit incoming and outgoing movements to be made at the same time, without interference, as far as it is possible to arrange this.

(2) At passenger terminals where large quantities of baggage and express must be handled, and it does not appear desirable or expedient to provide intermediate platforms to be used exclusively for this service, it is recommended that (where conditions permit), baggage and ex-

FACILITIES AND TRAFFIC AT PASSENGER TERMINALS.

SUMMARY OF TERMINAL DATA.

	STATION.	LOCATION.	TYPE STATION BLD'G. Through.	Headhouse.	Over Tracks.	GRADE OF TRACKS. At End of Tracks.	Side of Tracks.	At Streets.	Over Streets.	Under Streets.	Through Trains Daily.	Trains Originating.	Trains Terminating.	No. of Trains Handled During Busiest Hour.	No. of Trains Handled on One Track During Busiest Hour.	Est. No. of Trains that Could Be Handled During Busiest Hour.	Est. No. of Trains that Could Be Handled on One Track During Busiest Hour.	Number and Spacing of Tracks.	Number and Width of Platforms.	Length of Platforms.	Height Above Top of Rail.	Are Tracks on Tangent or Curve.	Are Switches Interlocked.
1	Dearborn...	Chicago, Ill.....	..	*	..	*	..	*	..	..	0	53	55	14	3	17	3	10 (see Plan)..	See Plan.....	670'.....	6 "	Tangent.....	No.
2	D. L. & W..	Hoboken, N. J...	..	*	..	*	..	*	..	..	0	127	118	29	5	54	8	14-13'0" C.-C..	8-20'; 1-17'....	700'.....	6 "	Tangent.....	Yes
3	Erie.....	Jersey City, N. J..	..	*	..	*	..	*	..	..	0	123	126	28	8	33	12	10-15'0" C.-C..	5-15'.....	650'-700'.....	2 "	Tangent.....	Yes
4	Long Isl'd..	Long Island, N.Y	..	*	..	*	..	*	..	..	0	135	134	60	5	65	12	24-24'-0" C.-C..	9-14'.....	760'.....	9 "	Tangent.....	Yes
5	Union.....	New Orleans, La..	..	*	..	*	..	*	..	..	0	11	11	6	2	12	3	4-24'-0" C.-C...	2-17'.....	704'.....	7 "	Tangent.....	Yes
6	Union.....	Cincinnati, O.....	..	*	..	*	..	..	..	*	0	69	67	28	4	30	5	8.....	4-13' & 15'....	1-600'; 3-650'..	10 "	Tangent.....	No.
7	Union.....	Louisville, Ky....	..	*	..	*	..	*	..	..	6	24	24	14	3	32	12	6-26'&20'C.-C.	3-17'; 2-11'....	450'-600'.....	6 "	Tangent.....	No.
8	Union.....	Savannah, Ga.....	..	*	..	*	..	..	*	..	10	8	8	.....	.....	.....	.....	9-14'to25iC-C.	4-15'; 3-10'....	600'.....	7 "	Tangent.....	Yes
9	Union	Columbus, Ohio..	*	..	..	..	*	..	..	*	25	34	35	19	4	19	5	8-11'-0" C.-C..	1-11'; 3-17'....	2-678'; 2-774'..	8 "	Tangent.....	No.
10	B. & O.....	Philadelphia, Pa..	*	..	..	..	*	..	..	*	20	14	14	6	3	12	4	6-12'&13'C.-C	2-23'; 1-12'....	700'.....	0 "	Tangent.....	Yes
11	B. & O.....	Baltimore, Md....	*	..	..	..	*	..	..	*	26	12	6	8	6	12	6	5-12' C.-C.....	Shed Area....	426'.....	0 "	Tangent.....	Yes
12	B. & O.....	Baltimore, Md....	*	*	..	*	*	*	..	*	37	20	25	6	2	12	3	7-12'&50'C.-C.	3-15'.....	610'.....	15 "	Tangent.....	Yes
13	Union.....	Peoria, Ill.....	*	..	..	..	*	*	..	..	0	43	39	14	4	78	12	7.....	1-18';3-12';1-6'.	480'.....	0 "	Tangent.....	No.
14	Union.....	Troy, N. Y.....	*	..	..	..	*	*	..	..	57	24	20	14	7	25	10	7-12' C.-C.....	4-12'.....	3-400'; 1-310'..	10 "	Tangent.....	Yes
15	Union.....	Albany, N. Y....	*	..	..	..	*	..	..	..	88	35	34	17	6	17	6	8.....	3-28'; 1-27'....	650'-850'.....	6 "	Tangent.....	Yes
16	P. & R. Ry	Reading, Pa.	*	..	..	..	*	..	*	..	32	14	14	12	3	30	5	.....	1-20'; 2-15'....	1100'.....	8 "	Tangent.....	Yes
17	Penna. R. R.	Harrisburg, Pa...	*	..	..	..	*	..	*	*	55	47	45	8	5	30	6	8-12' C. C.....	5-37'-22'.....	765'-860'.....	7 "	Tangent.....	Yes
18	Union.....	Birmingham, Ala.	*	..	..	..	*	*	..	..	6	20	20	.....	.....	.....	.....	10-12' C. C....	5-19½'.....	3-620'; 2-770'..	8 "	Tangent.....	Yes
19	C.M.& St.P	Milwaukee, Wis...	*	..	..	..	*	..	..	..	22	30	32	12	3	20	6	5-13'&20'C.-C.	Shed Area....	1000'—Max...	0 "	Tangent.....	No.
20	Union.....	Minneapolis, Minn.	*	..	..	..	*	..	..	*	44	30	30	16	2	30	2	6-26' C. C.....	Shed Area....	1200'.....	0 "	Tangent.....	No.
21	Union.....	Indianapolis, Ind..	*	..	..	..	*	*	..	..	46	42	40	30	4	37	5	8.....	Shed Area....	.....	0 "	Tangent.....	.....
22	Union.....	Toledo, Ohio.....	*	*	..	..	*	..	..	*	43	39	40	.....	.....	.....	.....	13-12' C.-C....	3-26'.....	.....	0 "	Tangent & Curve.	No.
23	Union.....	Nashville, Tenn...	*	*	*	..	*	..	..	*	10	26	26	11	2	15	4	10-20'&28'C-C	5-20'. 4-11'....	550'-750'.....	9½"	Tangent.....	Yes
24	Union.....	Richmond, Va....	*	*	..	*	..	..	*	..	10	7	7	.....	.....	.....	.....	9-12'; 23'&13'.	2-8'; 5-14½'....	650'-1248'.....	.....	Tangent.....	Yes
25	Union.....	St. Paul, Minn....	*	*	..	*	*	*	..	..	92	46	46	42	5	42	5	14-26'&13'C-C	8-16'.....	800'.....	12 "	Tangent.....	No
26	Union.....	Seattle, Wash....	*	*	..	*	..	..	..	*	6	35	36	.....	.....	.....	.....	11-12' C.-C....	4-18'.....	200'.....	0 "	Tangent.....	No.

SUMMARY OF TERMINAL DATA.—Continued.

	STATION.	LOCATION.	Method of Making Up and Breaking Up of Trains.	Are Engines Changed on Through Trains.	Are Cars Added or Dropped, and Why.	Special Arrangements For Handling Suburban Traffic.	Method of Handling Express and Baggage.	System of Communication From Dispatcher To Train Conductor.	Distance To Engine House.	Distance To Car Storage Yard.	If Union Station, What Is System of Handling
1	Dearborn....	Chicago, Ill.....	Switch Engines..	No.	.....	None...	Trucks.....	None..	5m.....	5.6m.....	Own'g Co. handles
2	D. L. & W...	Hoboken, N. J....	Sw.Eng & Gravit	No.	.....	None...	Trucks & Cars...	Thru Sta. Master..	1800'....	600'.....	Not.
3	Erie.....	Jersey City, N. J..	Sw. & Road Engs	No.	.....	None...	Trucks.....	Semaphores.....	800'.....	700'-4500'.	Not.
4	Long Island..	Long Island, N. Y.	Sw.&RoadEng's.	No.	.....	None...	Sw.Eng.&Trucks	Thru Sta. Master..	¼m.....	¼m.....	Not.
5	Union.....	New Orleans, La...	.....	No.	.....	None...	.....	Thru DispatchOff.	.....	.....	Not.
6	Union.....	Cincinnati, Ohio...	.....	No.	.....	.....	Trucks	Telegraph.....	.....	.....	Sep. sta. empl'ees.
7	Union.....	Louisville, Ky....	Switch Engines..	Yes Sleepers&Diners	.....	.....	Truks & Sw.Eng.	Telegraph.....	1800'....	2800'....	.....
8	Union.....	Savannah, Ga.....	Switch Engines..	Yes Seldom, ...	.....	None...	Trucks & Floats.	Telegraph.....	2&4m...	9300'.....	.....
9	Union.....	Columbus, Ohio ..	Yard Engines...	Yes As Traffic Change	.....	None...	Trucks.....	Telegraph.....	.....	.....	.....
10	B. & O.....	Philadelphia, Pa...	Switch Engines..	Yes Diners.....	.....	None...	Trucks.....	Station Wire.....	1m.....	.....	Not.
11	B. & O.....	Baltimore, Md....	Yard Engines....	No. 1 Sleeper to N. Y	.....	None...	Trucks.....	Thru Sta. Master..	2500'....	2500'.....	Not
12	B. & O.....	Baltimore, Md.....	Switch Engines..	No. Occasionally.....	.....	None...	Trucks.....	Sta. Mas. & Tower	3000'....	2500'.....	Not.
13	Union.....	Peoria, Ill.....	.....	No.	.....	None...	.....	ThruDispatch.Off.	¼m.....	Adj't.....	Sep. sta. empl'ees.
14	Union.....	Troy, N. Y.....	.....	Yes No.....	.....	.....	Trucks.....	Messenger.....	1m.....	1m.....	Sep. sta. empl'ees.
15	Union.....	Albany, N. Y.....	.....	Yes Yes, Connections	.....	.....	Trucks and Elev.	None.....	¾m.....	Adj't.....	.....
16	P. & R. Ry.	Reading, Pa.....	Switch Engines..	No. Yes, Connections	.....	None...	Trucks & Cars...	.....	1m	Adj't.....	Not.
17	Penna, R. R.	Harrisburg, Pa....	Switch Engines..	Yes Yes.....	.....	.....	Trucks and Elev.	Thru Sta. Master..	4150'....	650'.....	Not.
18	Union.....	Birmingham, Ala..	Yard Engines....	Yes Yes, Connections	.....	.....	Trucks and Elev.	Telegraph.....	¼-1m....	¼-1m.....	Not.
19	C. M. & St.P	Milwaukee, Wis....	.....	Yes Added;LocalSer.	.....	.....	Trucks and Elev.	.....	2m.....	¼m.....	.....
20	Union.....	Minneapolis, Minn..	.....	No. As Required....	.....	.....	.....	Telegraph.....	.....	.....	.....
21	Union.....	Indianapolis, Ind..	Yard Engines....	Yes Yes.....	.....	None...	Trucks.....	Teleg. & Telephone	½ to 1½m	½ to 1½m*	Sep. sta. empl'ees.
22	Union.....	Toledo, Ohio.....	.....	Yes AsTraffic Chang..	.....	.....	Trucks.....	ThruDispatch. Off.	Adj't...	Adj't.....	.....
23	Union.....	Nashville, Tenn...	Switch Engines..	Yes Sleepers & Diners	.....	.....	Trucks.....	Telegraph.....	800'.....	800'.....	.....
24	Union.....	Richmond, Va.....	Switch Engines..	Yes Yes.....	.....	.....	Trucks and Elev.	Messenger.....	⅗-3.7m..	½-3.7m....	.....
25	Union.....	St. Paul, Minn....	.....	No. Yes.....	.....	.....	Trucks and Elev.	Telegraph	½m.....	½m.....	Sep. sta. empl'ees.
26	Union.....	Seattle, Wash.....	.....	Yes As Required.....	.....	.....	Trucks and Elev.	.....	None...	1000'.....	.....

* Indianapolis.—Car storage yards ½ to 1½ miles distant; except Pullman yard, 600 feet.

press be received, delivered and handled below the train floor, and raised and lowered by elevators, conveniently located, to avoid interference with the movement of passengers.

The Terminal Officials' Association of Chicago appointed a committee to investigate the handling of interchange traffic and the congestion of a year ago. This committee presented a report at the meeting of that association in September (see Railway Age Gazette, October 14, 1910), extracts from which are included in this committee report. In this report the Terminal Officials' Association committee recommended that outside terminal yards supplement the local facilities, and that while several railways and belt lines are providing additional engines and yard facilities, some more radical step is needed than the improvement of these individual facilities.

The report is signed by: F. S. Stevens (P. & R.), chairman; E E. R. Tratman (Engineering News), vice-chairman; Hadley Baldwin (C. C. C. & St. L.); W. C. Barrett (B. & O.); G. H. Burgess (D. & H.); L. G. Curtis (B. & O.); A. H. Dakin, Jr., New York, N. Y.; H. T. Douglas, Jr. (W. & L. E.); A. C. Everham (C. H. & D.); M. J. Henoch (L. & N.); H. A Lane (B. & O.); L. J. McIntyre (N. P.); B. H. Mann (M. P.); A. Montzheimer (E. J. & E.); W. L. Seddon (S. A. L.); C. H Spencer (W. T. Co.); A. Swartz (Erie); E. B. Temple (Pennsylvania).

Discussion on Yards and Terminals.

E. R. Lewis (Mich. Cent.): In the definition for export pier will it be acceptable to the committee to say, "a pier" instead of "a covered pier?"

The President: The committee accepts that suggestion.

Prof. Williams (Cornell College): It would seem better to put the word "and" in the definition for coach cleaning yard, making it read "located near terminal station and track should be of sufficient length," etc.

The President: That is acceptable to the committee.

Mr. McNab: I do not see why the word "conveniently" is necessary there. We all know that a coach cleaning yard should be in a convenient location to the terminal station. Why put in the word there? Let the clause read—"The coach cleaning yard should be located near terminal station, etc."

The President: The committee accepts that amendment.

Mr. Rose: Referring to the last paragraph under "outbound freight house," it seems to me the freight could be handled more economically by building the freight house alongside the track, and switching the cars to the freight house, rather than trucking the freight down alley ways, at right angles to the freight house.

The President: The committee wishes to retain the definitions now in the manual referring to separating yards and to switching district. It is necessary to include these definitions in the committee's recommendations.

A motion to accept the committee's definitions and recommendations was carried.

Mr. Stevens: The typical track layouts that submitted with the report on passenger terminal design are intended to illustrate the text of the report, and most of the features that are shown are merely incidental. The principal object for submitting the diagrams is to really state the manner in which it is proposed to get trains in and out promptly. The location of engine houses, water cranes, etc., are incidental features which we do not consider have any particular bearing on this case. They are merely inserted to show what might be done in a terminal of that character, if conditions permitted.

The President: The Chair would like to ask the committee, if in place of ten years, it would not be wise to extend the time of the provision for economical, efficient and practically continuous operation during the periods of greatest activity, which may be reasonably expected to twenty or twenty-five years. Ten years is a short period.

Mr. Stevens: The ten year period was discussed at our meeting and was agree as a reasonable time limit to be placed on that.

George W. Kittredge, (N. Y. C. & H. R.: I think a period of ten years is too short a time for which to design a terminal station. I venture that any plant of considerable magnitude which only provided for a ten years growth would be outgrown before it is completed.

Mr. Stevens: If it is proper, I would like to invite attention to the fact that this report is based on the consideration of passenger terminals of medium size.

Mr. Kittredge: The medium station of today is the large station of tomorrow, and I think my remarks still apply.

Mr. McNab: I ask Mr. Kittredge when the Grand Central Station improvements were made a few years ago, how long they were figured for. Within my recollection, which does not go so very far back, there have been three changes made in that terminal.

Mr. Kittredge: I am sorry I cannot answer Mr. McNab as to what my predecessors figured on as to future growth when the last revision was made, but it was not ten years after they made the revision in 1899 or 1900 that they began to rebuild on the present basis. As an example of what growth has taken place since work started on the present terminal, I will say that the first contract with the city provided for the work being completed in five years from the date of beginning, or July 1st, 1908. Prior to July 1, 1908, we had to go to the city for an extension of time. We showed the city at that time that so far as excavation and construction work is concerned, we had then completed 108 per cent of all the work contemplated in 1903, when the improvement was begun, but as a matter of fact, it was only about forty per cent of what was then under contemplation.

Mr. McNab: No doubt that is an exceptional case, but I think the committee's report and its recommendation would stand in that respect.

A motion to amend the conclusion to extend the time to twenty years instead of ten years was carried.

Mr. Kittredge: In conclusion 2 why should baggage and express be "received, delivered and handled below the train floor," rather than "below or above?"

Mr. Stevens: The reason "below" is given is because general conditions will permit that construction better, and the head room can be very much less. If the handling of the baggage and express is above the train floor, probably not less than 18 ft. clear would suffice. If it is below 12 ft. is ample, probably 10 ft. would suffice.

Mr. Kittredge: In connection with the terminal at New York, where we have a double deck structure, we find it much more economical to handle baggage and mail and express that comes in on the upper level, above the tracks, and that which comes in on the lower level below the tracks. I think the words "above or below" should be substituted for the word "below."

E. B. Temple, (Penna.): I think that is a good suggestion. I am glad to know that you have made the change to twenty years instead of ten years. At the Broad Street station, Philadelphia, we find that the business increases 50 per cent every ten years. For thirty years we have been enlarging, every ten years, and are now up against the problem again.

W. H. Courtenay, (L. & N.): The discussion is being based on the largest terminals we have in the United States, and my understanding of these conclusions is that they apply to passenger terminals of medium size. Passenger terminals like that of the New York Central, and the Pennsylvania in New York City and the Pennsylvania in Broad Street, Philadelphia, are not terminals of medium size. It would seem to me that a terminal of medium size was a terminal in a city of 100,000 people or less. In cities of medium size, where the ground is of reasonable cost, it would be cheaper to handle the baggage on the same level. I do not think the committee should recommend for passenger terminals of medium size that the baggage should be handled on a separate level, because in such cases it is very expensive, and hardly justified.

Mr. Temple: We consider that the ideal terminal should be either above the street level or below it, and it does not take any more costly facilities to have the baggage placed on a truck and run on an elevator in the case of such a station, and it is much easier to elevate the baggage to the platform in this manner. If the tracks are in the subway itself, it is as easy to move the baggage from the street level down, as to run it out to the end of the platform. We were dealing more particularly with the ideal station.

Mr. Courtenay: I would like to know what the committee considers the population of the city in which a passenger terminal of medium size would be located.

The President: The committee wishes to ask if you have any alternative conclusion to offer in place of No. 2, which expresses their opinion as to the requirements of a medium sized passenger terminal?

Mr. Courtenay: My opinion is that in passenger terminals of medium size it is better to handle the baggage on the same level. So far as I know, passenger stations of medium size are generally located on the ground surface, neither above nor below. For such a terminal the cheapest way to handle the baggage is to handle it on the same level. If there is much baggage to be handled, it would seem desirable to provide intermediate platforms.

Mr. Webb: It might simplify the matter if the constation improvements were made a few years ago, how

larger size, where large quantities of baggage and express must be handled," etc., and then follow it with another recommendation as to what the committee thinks ought to be done in these moderate sized terminals, because what is very proper and necessary for a terminal like those in New York City would not be acceptable in a city of 75,000 to 100,000 people. I think we should differentiate between the two classes of terminals and it will make the situation clearer.

C. H. Spencer, (Wash. Term. Co.): A number of states are agitating the question of the elimination of grade crossings. Some have already passed laws requiring grade crossings to be eliminated. This means that your terminals are bound to be elevated or depressed. In presenting this report the committee presented what they thought was an ideal terminal to meet what may be expected in legislation of this class. Certainly the ideal condition is the terminal that does away with the necessity of grade crossings of any kind.

G. H. Burgess, (D. & H.): In the committee's list of 26 terminals that are considered medium sized terminals, 13 are either above or below the street level. It seems to me that that largely answers the question Mr. Courtenay has raised.

C. H. Spencer: I would suggest that the committee consider the question from the standpoint of the amount of business done in the station rather than the population of the city where the station is located. You will notice in the table, that the number of trains originating and departing gives an idea of the amount of business being done in the stations. That is what should govern rather than the size of the city.

Prof. Williams: Would it not be better, since we changed the previous paragraph to twenty years, to take into account the possible growth in business of these terminal stations during the next twenty years and is it not likely that the business will increase to such an extent as to make it desirable to have this arrangement of the terminal facilities from the present time on?

Mr. Stevens: The committee considered the question of providing facilities very greatly in excess of the present requirements, but considered that would be somewhat extravagant.

Mr. McNab: As brevity with efficiency is desired by this association, I would ask the committee if they would concur in eliminating the words "desirable or" in the second line of conclusion 2.

The President: The committee accepts that.

A motion to adopt the committee's conclusions was carried.

The President: We would be glad to hear from Mr. Condron, a description of the telpher system being installed in the M. K. & T. freight house in St. Louis, Mo.

T. L. Condron, (Con. Eng.): The freight station is designed for both inbound and outbound l. c. l. freight. The building is of structural steel, 400 ft. long by 240 ft. wide, and is built so that the street on the east is about 20 ft. below the street on the west. The lower level of the station is on the level of the street to the east, or about twenty feet below the level of Broadway, and on this lower level are twelve tracks, 400 ft. long, providing for 120 freight cars of average length. Between the freight cars are twelve 12 foot platforms, and over the platforms are hatchways into the floor above. The second floor on the level of Broadway has four driveways, each 38 ft. wide, running across the entire width of the building, with a platform on each side of the driveway to which teams can back up or drive alongside. The platform space of the second floor is 3 ft. 9 in. above the street level and covers something over one acre of ground. The freight will be received from the wagons that come into the freight house on these platforms, ready to be weighed and distributed by means of overhead telphers, running on mono-rails, to the various hatchways. Likewise freight coming in will be lifted by means of these telphers to the platform level above, and distributed to the wagons. The telphers are carried on 1-beam runways suspended from the structural steel framing of the third floor, the story height between the first floor and the third floor being 34 feet; the column spacing in the building is 40 ft. in one direction and 38 ft. in the other. The telphers will pick up the freight which, in the case of small packages, will be loaded on flat boards having small castor wheels under them and suspended from a frame, so that they can be picked up by the hook of the telpher and raised through the hatchways or raised above the team floors, and passed over the area.

The President: The Chair believes that this is the first application of the telpher system to the handling of l. c. l. freight in a freight station in this country, and it will be very interesting to watch the development of this particular installation.

A. W. Thompson, (B. & O.): The telpher or Sprague system has been in operation about a year on the Baltimore & Ohio pier in Baltimore, Md. This system is similar to the one just described.

The President: Have you much l. c. l. freight to handle there or is it car load freight?

Mr. Thompson: It is both. The largest percentage is l. c. l. It is quite similar to the business done in an ordinary freight house.

The committee was dismissed with the thanks of the association.

WOODEN BRIDGES AND TRESTLES.

The work assigned was:

(1) Consider the revision of Manual.

(2) Continue to co-operate with Committee Q of the American Society for Testing Materials, and other associations, in the preparation, revision and adoption of uniform standard specifications for structural timber.

(3) Continue the study of principles and methods of pile-driving, including information on pile-drivers and equipment, analysis of practical experience in pile-driving, the strength of sheet piles, recommended types of equipment.



H. S. Jacoby.

Chairman, Committee on Wooden Bridges and Trestles.

of sheet piles, of concrete piles, and of formulas for bearing power.

(4) Make concise recommendations for next year's work.

The following sub-committees were appointed:

To consider further revisions of the Specifications for Southern Yellow Pine: F. H. Bainbridge.

To consider further revisions of the Specifications for Douglas Fir and Western Hemlock: L. J. Hotchkiss.

Piles and Pile-driving: R. D. Coombs, chairman.

(a) Sheet Piles: C. C. Wentworth, chairman; L. J. Hotchkiss, I. L. Simmons, Hans Ibsen. (b) Details: W. S. Bouton, chairman; J. A. Lahmer. (c) Mechanical Pile Protection: J. A. Lahmer, chairman; F. H. Bainbridge. (d) Pile Records: F. B. Scheetz, chairman; Hans Ibsen. (e) Concrete Piles: P. H. Wilson, chairman; R. D. Coombs, J. A. Lahmer, L. J. Hotchkiss. (f) Pile-drivers: F. B. Scheetz, chairman; W. S. Bouton, G. R. Talcott. (g) Analysis of Practice: F. H. Bainbridge, chairman; F. E. Bissell, H. S. Jacoby, I. L. Simmons. (h) Bearing Power and Formula: F. E. Bissell, chairman; R. D. Coombs, F. B. Scheetz. (i) Water Jet: G. R. Talcott, chairman; L. J. Hotchkiss, F. B. Scheetz, C. C. Wentworth. (j) Overdriving: L. J. Hotchkiss, chairman; H. S. Jacoby. (k) Enlarged Foot, Screw and Disc Piles: P. H. Wilson.

REVISION OF MANUAL.

No revision of the Manual in regard to the specifications for southern pine or for Douglas fir and western hemlock is recommended, as it is considered that these specifica-

tions should be given a longer commercial use in order to develop points for possible modification.

CONCLUSIONS.

The committee recommends:

(1) That the Pile Record Form be adopted as a standard.

(2) That the Principles of Practice for Pile-driving be adopted.

(3) That the report on Piles and Pile-driving be received as information.

(4) Piling can be protected against marine wood borers by filling sand between the piles and vitrified clay pipe placed around the piles from a point a foot or two below mud line to the same distance above high tide. The expense is such that it is not advisable to apply this treatment to piling which has not been protected against decay.

The report is signed by: Henry S. Jacoby (Cornell University), chairman; F. H. Bainbridge (C. & N. W.), vice-chairman; F. E. Bissell (Civil Engineer); W. S. Bouton (B. & O.); R. D. Coombs (Consulting Engineer); L. J. Hotchkiss (C. B. & Q.); Hans Ibsen (M. C.); J. A. Lahmer (K. C. S.); F. B. Scheetz (K. C. Bridge Co.); I. L. Simmons (C. R. I. & P.); G. R. Talcott (B. & O.); C. C. Wentworth (N. & W.); P. H. Wilson (Civil Engineer).

PILE RECORD FORM.

Pile Record of Bridge.....

LOCATION.....

Weight and Kind of Hammer.....**Date**.....**19**...

Bents Numbered from North or East End **Piles numbered from Left to Right**

Date	Bent No.	No. of Pile	Size of Pile			Kind of Wood	Cut off	Base rail to Ground	Total Penetrat.	Av. Last Five Blows		Kind of Soil	Remarks
			Tip End	Butt End	Length					Drop of Ram?	Penetrat.		

pile should be adapted to the soil which the pile is to penetrate.

(31) It is far more important that a proper length of a pile should be put in place without injury than that its penetration should be a specified distance under a given blow, or series of blows.

Discussion on Wooden Bridges and Trestles.

The first conclusion was accepted without discussion.

Hunter McDonald, (N. C. & St. L.): I move that we add to paragraph 4 of appendix B "and the purpose for which they are intended."

Mr. Jacoby: The committee accepts that suggestion.

W. H. Courtenay, (L. & N. R. R.): I think exception might reasonably be taken to paragraph 7. In the practical operation of driving piles, unless the district is a sandy one, where facilities are ready for the use of a jet, it is quite an expensive matter to get together the apparatus for the jet. In ordinary clay, there is no difficulty in driving a pile sufficiently without jetting, to give all the adequate bearing you can expect a pile to give. A jet does not work very well in clay, and unless the clay is mixed with a very large proportion of sand, I doubt if much good would be obtained by boring holes with a jet for the purpose of placing a pile. In my own experience jets have been used for the purpose of making holes to put piles in for the sole reason that our height of base of rail above the ground was so small that we couldn't get the 70-ft. piles we intended to use in 50 ft. leads, so we had to make holes to put the piles in to get them in the leads, so the hammer could strike them. For that purpose, the cheapest expedient we could devise was to put jets in the ground to start the holes, to get them deep enough to start the pile driver. As soon as that was done, we had no further use for the jet. We have attempted to jet piles in several cases, and have always had difficulty with it. The hole is very likely to close. I do not think this committee should go on record as saying it may be economical to bore several hole in the soil with the aid of the jet, before driving the piles for the purpose of lubricating the piles going down. I do not believe those things would be necessary in order to satisfactorily drive piles in clay soil.

L. J. Hotchkiss, (C. B. & Q.): The paragraph in question refers more particularly to the driving of concrete piles. I have seen several cases myself where it was quite difficult to drive the piles without the jets, without battering up the heads of the piles, but by using the jet as mentioned in this paragraph, the piles went down without any particular difficulty. They went straight and they were got down to a penetration that could not have been reached without the use of the jet. This particular method would only apply in certain kinds of clay, clay with a certain amount of sand or loam. If it were a very stiff clay, the jet would not penetrate. I know since we have been driving concrete piles on the C. B. & Q. we have gotten into the use of the jet to an extent we never have before, and we can get piles down more economically and quickly with the jet than ever before. We have not used it very much in driving wooden piles.

W. F. Steffens (B. & A.): The committee has limited paragraph 7 to boring holes with the water jet. Another case may arise. There is a quality of soil in North Carolina through which it is almost impossible to drive piles even with metal tools. In that soil the use of an earth or clay augur would be advisable. The material so loosened can be removed, leaving a cavity into which the pile can be dropped and then seated, perhaps, with a hammer. I have in mind a case where the use of the jet was advised as a lubricating method and the augur produced a result the committee is seeking to produce entirely by the water jet.

The President: Do you recommend amending paragraph 7 by the addition of your suggestion?

Mr. Steffens: I will offer that to the committee as a suggestion.

Mr. Cartlidge: Such an important matter as that to which our attention has been called should be considered by the committee, and some additional statement brought in later to apply particularly to such a case. I would prefer that the committee bring in a supplementary statement next year.

The President: Is that satisfactory, Mr. Steffens?

Mr. Steffens: I think that would be more desirable.

Mr. Courtenay: I think paragraph 8 is a little too sweeping. On the L. & N. we are now driving piles 100 ft. long through 55 ft. of water. The bottom is sand. We get the piles down very satisfactorily with the aid of a jet to a depth of about 10 ft., and then we strike a stratum of hard material, and we have great difficulty in getting it through. The current is exceedingly strong there—it is tidal current, first north and then south, depending on whether the tide is running in or out. In the case which I cite, I think it would be impossible to jet the piles without the jet being attached to the piles. The current is so swift in the water that a deep-sea diver can't hold himself to the pile without being practically chained to it. In many places, where there is occasion to jet piles down, the jet pipe must necessarily be attached to the pile. Otherwise the two would become to widely separated the jet would do no good.

H. B. Dick (B. & O. S. W.): It used to be the practice on the construction of government jetties to attach the galvanized iron pipe, one to either side of the pile, and a flexible rubber hose was connected from the top of the pipe to the pump. That seemed to be the only successful way in which they could put down piles in sand.

Mr. Hotchkiss: My personal experience with the jet and the pile has been that the jet caught so fast you could not get it down. I remember in one case where the jet was broken.

Mr. Courtenay: We use wrought iron pipe attached to the pile with staples. It would be impossible in 50 ft. of water, with a swift current, to sink a pile with a jet except by attaching the jet and the jet pipe to the pile.

Mr. Hotchkiss: If we could say in this paragraph under consideration that the water jet should not be rigidly attached to the pile, I think that might meet the condition.

Mr. Courtenay: As this matter is general, I think it best to omit No. 8.

Mr. Steffens: What would happen in the case of a concrete pile, cast with the jet hole in the middle? Would the jet be attached on the outside?

Mr. Jacoby: I think there is more difficulty in the jet clogging when it it is a part of the pile than in any other case, and certainly the trend of present practice is to handle the jet separately.

Mr. Courtenay: I move No. 8 be modified to read: "water jet should not be attached to the pile, and should be handled separately when piles are driven in dry ground, but not when they are driven through water."

Mr. Jacoby: Would not Mr. Courtenay's idea be satisfied if we should say "in general the water jets should not be attached to the pile, but handled separately."

Mr. Courtenay: I have no objection to that, but I think

Mr. Jacoby: The Committee will insert the words "in general."

Mr. Courtenay: I would suggest the elimination of the words "provided the head of the pile is not broomed," in paragraph 13. Piles may be damaged by over-driving when heads are broomed as well as otherwise.

Mr. Jacoby: The idea is that if the head is allowed to be broomed the effect of the hammer then becomes lost in large part and the bouncing of the hammer will not indicate any injury in any other part of the pile. It is true, in many cases, that the brooming of the head of the pile indicates also that the driving should be stopped, but the rapidity with which the brooming develops and other indications should show to the one in charge what the conditions really are.

Mr. Courtenay: I think those words are misleading. I have seen piles absolutely broken when their heads were broomed, and as a general proposition I would say that when the heads are badly broomed, you may expect more damage has been done to the piles than when the heads are not broomed. On driving piles on several occasions, I have had to take them out. I have found them badly broken in a variety of ways, and the heads were broomed.

E. H. Fitzhugh, (G. T. Ry.): It is almost the universal custom in driving piles now to use a cap, and when the cap is used, there is no bromming.

Mr. Courtenay: We drive many thousand piles a year and we don't cap them, we ring or band them.

A motion to eliminate the words: "provided the head of the pile is not broomed," in paragraph 13, was carried.

Mr. Loweth: Referring to paragraph 15, I do not see how we can readjust the weight of the hammer every time we have a different length of pile. I suggest that we modify that to read, "the weight or the drop of the hammer."

The President: That is satisfactory to the committee.

Mr. Jacoby: The committee desires to change the numerals in paragraph 26 from 3 in. or 4 in. to 4 in. or 6 in., because a square of 3 in. is too small.

Mr. Courtenay: I would like to see paragraph 26 eliminated. If a pile could be driven without an iron shoe, I

would not advocate pointing them at all. Personally, I am pretty suspicious of piles that are driven with an iron shoe. I think a large proportion of them are damaged.

A. J. Himes, (N. Y. C. & St. L.): I have driven piles through the material in the beds of streams in Pennsylvania that were full of large pieces of flat rock and boulders without the use of shoes, without any difficulty.

J. B. Jenkins, (B. & O. R. R.): I have often found pointing very advantageous. I have made it a practice to drive them without pointing when I could, however. Frequently it has been difficult to get them in at all without pointing

E. B. Temple, (Penn.): In hard material piles should be pointed or they may split at the lower end and may not drive safe.

H. D. Porter, (B. & L. E.): If you eliminate paragraph 26, I am afraid it will give the impression that this convention does not believe in pointing piles. Where you are driving piles into soil that is broken up you can get them to go the way you want them to go better by pointing them, as they will not be deflected by small stones or hardened material. Where we drive piles in an old road bed we point them, as a rule, and in a great many cases use steel points.

A. F. Robinson, (A. T. & S. F.): There are many places where there are boulders and cinders and it is almost impossible to drive a pile unless it is pointed. In other cases where the soil is such that the piles have to be sharpened. If we cut out the paragraph about pointing our piles, then we will have to modify the paragraph covering the shoe which almost necessarily means the pile must be sharpened.

R. G. Kenly, (M. & St. L.): There are certain times when piles should be pointed, and I move as an amendment to Mr. Courtenay's motion that the two words "in general" be omitted from that paragraph and let the latter part of the rule stand as it is.

Mr. Porter: If we say that piles may be advantageously pointed to a 4-in. or 6-in. square at the end, you indicate that that can be done under any and all circumstances, and I do not think any one is trying to advocate that. There must be some modifying expression in place of "in general" without saying "timber piles may be advantageously pointed."

J. P. Snow (B. & M.): Let Mr. Kenly change his amendment so we can put in "in some cases," and allow the word "advantageously" to remain.

Mr. Kenly: That is satisfactory, but I do not see the necessity for it.

The amendment to make the paragraph read "timber piles may be advantageously pointed in some cases to a 3-inch or 4-inch square at the end" was adopted.

William McNab: I ask the committee what they mean by using the word "comparatively" in that clause? Their idea of comparatively may be different from ours. If it has any meaning it is all right. If it has no meaning, I move to strike it out.

Prof. Jacoby: This is quite a large country and the soil conditions certainly vary very considerably, and the interpretation of a word like "comparatively" must have considerable latitude in itself.

Mr. McNab: The word "comparatively" is all right for the present moment, but when it appears in our Manual and comes before us in print we do not know what the committee's meaning of comparatively was, and you can get the same meaning in this clause if you leave out the word.

The President: The committee is willing to accept your suggestion, Mr. McNab.

Mr. McNab: Is clause 29 necessary? Is it necessary to tell the association that the us of a cap is advantageous?

Prof. Jacoby: I think it may fairly be said without any reflection upon the engineering profession that the advantage of the use of a cap is not adequately appreciated throughout the entire country. I might refer to one instance in which a large number of the very finest long-leaf yellow pine piles were to be driven in a certain location. Rings were employed and the results were not satisfactory and then the cap was used. At first, in order to see whether the cap would be of special value, a thin plate was placed on the pole and it was found the piles could be gotten into position without apparent injury, which, without the plate, could not be done. The cap was sent for and used with entire satisfaction.

Mr. McNab: I move that clause 29 be eliminated as superfluous to the report.

Mr. Stevens: It may be pertinent to remark that I have seen piles driven by the use of caps of thin boards of soft wood, where it was absolutely impossible to force them down by the use of rings. The piles would split in spite of the rings, and with the use of caps of soft wood the piles would drive without any apparent injury. As a general proposition the piles will drive better with a cap of soft wood across the top of the pile than rings.

Mr. Kittredge: I would amend Mr. McNab's motion and retain the paragraph in this form: "The use of a cap is sometimes advantageous."

L. J. Hotchkiss, (C. B. & Q.): In this question we are considering not only the driving of timber piles with which we are all familiar but the driving of concrete piles as well, with which many of us perhaps are not familiar. There is no way of driving a concrete pile without a cap unless you want to smash it to pieces.

The amendment was put to a vote and was not agreed to.

Hunter McDonald, (N. C. & St. L.): I move that the word "need" in paragraph 27 be stricken out and the word "should" be substituted in its place. The reason is in No. 20 we are told a pile driven in soft material must be treated as a column and nothing is said about how much power you figure on for the column.

The President: The committee accepts your suggestion changing the word "need" to "should."

Mr. Himes: We use pile foundations and permit the concrete to rest directly on the piles and to cover a situation of that sore I would suggest that we say "Where masonry is to bear directly on the piles such portions of the piles as may have been injured by contact with the hammer should be removed."

The President: That matter will be considered by the committee and reported on next year.

The principles of practice for pile driving included in conclusion 2 were adopted.

G. D. Brooke (B. & O.): I would like to go back to the "pile record form." To bring this form into conformity with the form of the Committee on Records and Accounts, it should be headed with the letters A. B. and C. R. R. and with the size of the sheet stated.

The President: The committee accepts that suggestion.

Section 3 of the conclusions was received as information without discussion.

H. A. Lloyd (Erie): Instead of adopting conclusion 4, I move that we accept it as information. It may or may not be true. I think it is just as valuable for the public at large and this association if it is adopted for information.

The motion was carried.

The committee was dismissed with the thanks of the association.

IRON AND STEEL STRUCTURES.

The subjects assigned were:

(1) Revision of Manual.
(2) Report findings on effect of impact on bridges.
(3) Recommend specifications for bridge erection.
(4) Report on secondary stresses.
(5) Report on influence of theory, experiment and experience on bridge design.
(6) Rules for instruction and guidance of inspectors in mill, shop and field.
(7) Make concise recommendations for next year's work.
(8) Make definition of the word "culvert" as distinguished from "bridge."

In addition, the chairman was advised by the board of direction to hold a joint meeting with the Roadway Committee for the purpose of reconciling the specifications for clearances in bridges and tunnels. This meeting was held on December 30, 1910, in Chicago. The committee reported to the board that it would recommend the insertion, in paragraph 2 of the specifications for Iron and Steel Structures as printed in the edition of 1910, after the word diagram in the second line, the following, "the height of rail shall, in all cases, be assumed as 6 in."

In the case of subject (1) the committee has no changes to recommend, except to correct minor typographical errors. In appendix "A" will be found a report by the chairman of the sub-committee on Impact. In appendix "B" are submitted specifications for bridge erection. In Appendix "C" is a report from the sub-committee on Impact, concerning secondary stresses.

The time at the disposal of the committee has not been sufficient to make a proper report on the other subjects put before it, and it is requested that they be referred back to the committee for further consideration.

With regard to next year's work, your committee would

suggest the employment of a reporter on subjects connected with design and maintenance of steel structures, whose duty it will be to collate reports of prime interest and report them to the committee, as information, which, after being considered and passed upon, may be laid before the Association to be printed in bulletins, so as to be accessible to the membership. The committee recommends that a study of the design of large columns be taken up, and suggests that collaboration with an existing joint committee, appointed for the same purpose, would, perhaps, bring about valuable results.

CONCLUSION.

The committee recommends the adoption of the specifications for bridge erection for publication in the Manual.

The report is signed by: C. H. Cartlidge (C. B. & Q.), chairman; A. J. Himes (N. Y. C. & St. L.), vice-chairman; J. A. Bohland (Gt. Nor.); Charles Chandler (C. G. W.); C. L. Crandall, professor railway engineering, Cornell University; J. E. Greiner, consulting engineer, Baltimore; B. W. Guppy (B. & M.); Charles M. Mills, consulting engineer, New York; C. N. Monsarrat (C. P.); C. D. Purdon (St. L. S. W.); A. F. Robinson (A. T. & S. F.); C. C. Schneider, consulting engineer, Philadelphia; I. F. Stern (C. & N. W.); F. E. Turneaure, dean of College of Engineering, University of Wisconsin; J. R. Worcester, consulting engineer, Boston.



C. H. Cartlidge.

Chairman, Committee on Iron and Steel Structures.

APPENDIX A.

Impact Tests.

Organization.—The importance of the subject of Impact and the lack of adequate information relating to it has been the cause of frequent discussion in the Association, and especially in its committee on Iron and Steel Structures. Funds provided by the railways for a series of tests on structures in service, with the special object of studying the effect of moving loads on such structures. Experiments were conducted in the field during the seasons of 1907 and 1908, and the data from these field tests have been worked up in this report.

Instruments.—The instrument used was designed especially for these tests by the chairman of the sub-committee, and was described at the annual meeting of the Association in 1907.

Test Trains.—The test train used in each case was made up of a selected type of locomotive followed generally by a sufficient number of loaded cars to cover the span. By the arrangement adopted speeds of 60 miles per hour or over were generally obtained, even with freight locomotives.

General Method of Conducting the Tests.—In the case of truss bridges it was the aim of the committee to secure data relative to the deflection at or near the center of the span, and the deformations in all the various kinds of members. With the 12 extensometers in use it was possible to cover the various kinds of members reasonably well with a comparatively few changes of instruments. Generally the tests on the upper and lower chords were confined to one panel, but in most cases at least two of the eye-bars composing a chord member were tested. The same thing is true of diagonal members composed of eye-bars. In carrying out the tests the train was headed in the more favorable direction for speed, and was moved back and forth over the structure at various rates of speed. Such speeds were selected as to cover fairly the range from about 20 miles per hour to the maximum attainable. A few movements were made at from 10 to 15 miles per hour. Little difference was noted in the results at various speeds below 15 miles per hour, and, in general, the results at 10 miles per hour may be considered as practically equal to static stresses. The speed of the train was determined by the use of stop-watches and signals made by observers stationed at the ends of a 500-foot base line. (In the case of very high speeds a 1,000-ft. base line was used.) The locomotive was generally working steam when crossing the span, but in some cases it was not. Differences in this respect caused no noticeable differences in results, so far as the field observers were able to judge, although this point was considered mainly with respect to the higher speeds.

Results.

Causes of Impact in General.—The following may be enumerated as the chief factors in causing impact: (1) unbalanced locomotive drivers; (2) rough and uneven track; (3) flat or irregular wheels; (4) eccentric wheels; (5) rapidity of application of load; (6) deflection of beams and stringers, giving rise to variations in the action of the vertical load.

The term "impact" is here used to include any effect of the moving load which results in stresses exceeding the static stresses. Where caused by open joints or rough or flat wheels, this impact is more or less of the nature of a "blow" on the structure; but where caused by the other factors mentioned, it amounts in effect to a varying load or a series of impulses acting upon the structure. In either case the result is to produce deflections and stresses in excess of the static values, such excess of stress being commonly called "impact" stress, or simply "impact."

The experiments obtained in these tests as well as the results obtained in former tests indicate that with track and rolling stock in good condition the main cause of impact is the unbalanced condition of the drivers of the ordinary locomotive. The result aimed at by the mechanical departments is to so counterweigh the wheels as to secure a reasonable compromise between the effect of the rotating parts and the reciprocating parts. This requires the use of counterweights considerably in excess of the amount necessary to balance the rotating parts. So far as the vertical effect on the track is concerned the reciprocating parts are of little influence, but by whatever amount the rotating parts are overbalanced, just so far will there be a variation in pressure on the rail, due to the centrifugal force of such overbalance.

In consequence of the action of these centrifugal forces during the passage of a train, the load acting upon the bridge is a varying one. It varies with each rotation of the driver, and thus acts as a series of impulses tending to set the structure into vibration. In the case of short span bridges these impulses will be repeated only two or three times during the passage of the locomotive, but in the case of long span bridges they will be repeated many times. If now these impulses correspond in period with the normal rate of vibration of the loaded structure, the effect will be cumulative and the vibrations will be greatly increased. Such cumulative effect cannot occur for bridges of very short span length, as the normal rate of vibration of such structures is higher than the rate of rotation of the drivers at the highest practicable speeds. It may and frequently does occur in structures of span lengths as low as 75 ft. and sometimes less. The speed at which the impulses here discussed show a cumulative effect may be termed the critical speed. This is discussed more fully in following paragraphs.

Other causes of impact are less readily studied than that of locomotive counterbalance. The condition of track and wheels can be defined in rough, general terms only. The effects of these elements, as shown by the tests, were also in most cases such as to make it difficult to express them quantitatively. In same cases the behavior of the loaded cars was such as to cause large impact.

Time of Vibration of Bridges.—A theoretical deduction of a convenient formula which expresses the time of vibration of a loaded bridge in terms of weight of structure and

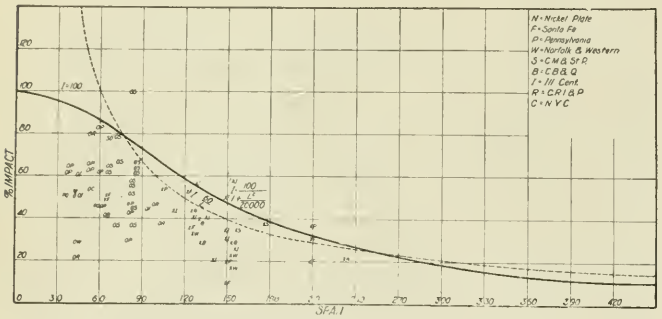
its load, and the static deflection due to the live load will give

$$T = \sqrt{\frac{w + p}{p}} \times d,$$

in which T = time of vibration of loaded structure in seconds.
w = dead load per foot, assumed as uniform;
p = live load per foot, assumed as uniform;
d = static deflection in feet due to load p, as determined by direct measurement.

Critical Speeds.—The speed of the train which will produce cumulative vibration, as described above, depends on the natural rate of vibration of the loaded structure and the diameter of the locomotive drivers. During the passage of a train the total weight on the structure varies to a considerable extent and hence the normal rate of vibration of the structure also varies. Exact agreement, therefore, between driver rotation and vibration period of the structure will exist only for a short time, and hence the cumulative effect will not continue during the passage of the locomotive entirely across a long span structure. The results show clearly the importance and significance of critical speed on all bridges exceeding about 100 ft. in span length. In all such spans it was found that the excess of deflection or stress at high speeds, over the static effects, was due almost wholly to cumulative vibrations, produced at or near this critical speed.

Law of Impact at Critical Speed.—A theoretical analysis of the ideal case of the effect of a rotating weight on the deflection of a beam when such rotation is in phase



Maximum Impact Percentages, Plate Girders and Main Members.

with the vibration period of the beam itself and there producing cumulative effect shows the amplitude of deflection due to the centrifugal force of such rotating weight is given by the expression $x = 2\pi n \frac{Gr}{2W}$, in which G = weight of arm, r = arm of rotating body, W = weight of beam, assumed as concentrated at the center, and n = number of revolutions of weight from beginning of motion. The effect of friction or other resistance in absorbing the energy is not taken into account in this theoretical analysis.

The case of a bridge supporting a rolling load consisting of unbalanced wheels is somewhat similar to the theoretical case here analyzed. The masses are distributed instead of being concentrated and the absorption of energy prevents the development of vibration to the extent assumed by the theory, but the relations brought out in the analysis may be useful in interpreting results. Where the rotating wheels synchronize with the natural period of vibration of the loaded structure then the vibrations will be cumulative somewhat as assumed in this analysis.

We would then conclude that the amplitude of vibration in such a case would be proportional to the moment of the counterbalance and inversely proportional to the weight of the loaded structure. Such vibrations would also increase in amplitude with the number (n) of impulses due to the rotating weight. Obviously the amplitude will not increase indefinitely as the impulses are repeated, but will soon reach a maximum limit where the energy absorbed balances the energy applied by the rotating body.

Maximum Impact Percentages for Truss Spans.—While the individual results vary somewhat, it is thought that an average value for the main truss members will be more significant than the maximum obtained from any one. The extensometer measurements are affected more or less by secondary stresses, and the instruments themselves are not quite as reliable as the deflectometer, so that, on the whole, an average value for these main truss members was considered to be a fair measure of maximum impact for all similar members. It will be seen that the impact values determined from these main members are somewhat greater than the values determined from the deflection records. This is to be expected, partly on account of the effect of secondary stresses, and partly on account of the fact that the deflection itself represents in a measure an average of all of the truss members, and should be somewhat less than the average of a few members.

Effect of Position of Counterbalance.—It is not to be expected that the exact position of counterbalance would have any appreciable effect on spans of any considerable length; but on short-span girders, whose length does not exceed two or three times the circumference of a driver, it would seem that there would be an appreciable difference in impact whether the counterbalance happened to be down or up at the time when the drivers were centrally located on the span.

A marked tendency to give the maximum impact when the counterbalance was in its lowest position was noted, although the variations due to other causes are so great as to mask this effect to a large extent.

Effect of Speed in Application of Load.—Assuming the track perfectly smooth and all of the rotating parts perfectly balanced, the effect of a load moving over a structure at a high rate of speed depends wholly upon the vertical curvature of the track and the effect which this curvature has upon the path over which the center of gravity of the load travels. If the load causes the structure to deflect so that the curvature of the track is concave upward, the pressure of the load upon the bridge will be in excess of its weight by reason of the centrifugal force caused by such curvature. If the track has an initial camber so that when the load passes over the structure the deflection produced is just sufficient to bring the track into a straight line, then there would be no centrifugal force developed and the pressure of load upon the track will be constant and exactly equal to the static load. The impact in that case will be zero.

If we assume the track originally straight and absolutely rigid, the amount of impact or centrifugal force resulting from the deflection of the structure can be approximately determined on theoretical grounds. Such an analysis has been made by Dr. H. Zimmerman for the case of a single rolling load, and a formula which is very closely approximate to his exact formula is as follows:

$$F = P \frac{1}{gl^2/16\, v^2 d - 3}$$

in which F = centrifugal force, P = weight of rolling load, v = velocity in feet per second, d = deflection of structure and l = span length.

Considering the fact that for spans or any considerable length the track is cambered, and the abutments not rigid, we may conclude on theoretical grounds that the impact due to speed of application for spans greater than 50 ft. is of no consequence.

The experimental data with reference to this point are very difficult to obtain by reason of other elements which are always present. The results obtained from balanced compound locomotives and electric locomotives are, however, very significant and indicate that under very favorable conditions as to track and rolling loads the impact is of very little consequence even for short spans.

Effect of Rough Track.—The effect of low or open joints in the track was directly noticeable on stringers and short span girders, and sometimes on floor beams and hip verticals where the rail joints were near the floor beam. It was not noticeable on main truss members or long span girders. The effect produced was, however, very difficult to determine quantitatively. Under these conditions the extensometers were so jarred and shaken up as to make the diagrams unreliable.

Effect of Design.—The most noticeable effect of differences in design is to be seen in the results obtained on stringers and floor beams. The extreme condition of rigidity is illustrated in the results obtained in bridge No. 5 where the rail was supported on steel channels riveted directly on closely spaced crossbeams, and these in turn into the lower chord of the truss. No observations were here made on the crossbeams, but the records obtained on hip verticals indicate a very severe jarring effect transmitted from the rail into the floor system. Many similar results were obtained with the ordinary open floor where the stringer spacing was such as to bring the rail nearly over the stringer. In this case the ties would afford but

little elasticity and the jarring effect resulting from rough track or wheels was very noticeable in nearly all such cases. Where the stringers were widely spaced the elasticity due to long ties relieved this jarring effect very greatly and in most cases gave records nearly or quite free from instrumental vibration.

The effect of a ballasted floor on the results obtained on floor beams was even more marked than that of widely spaced stringers. The most noticeable effect of elasticity of bridge floor was freedom from jar, as shown by lessened instrumental vibration. The actual effect on impact percentage is very difficult to estimate because of the unreliable character of the records taken on the more rigid floors.

The effect of length of panel was not detected, although the deflection of the stringers undoubtedly has some influence on the cumulative vibration when the panel lengths correspond approximately with the driver circumference or the car length.

The effect of design on main girders and truss members is difficult to determine. In considering this problem it should be kept in mind that the main factor in causing impact or excess of stress in main girders and truss members is the cumulative vibration set up by the unbalanced locomotive drivers. This effect cannot be eliminated by the most perfect design for the reason that the structure is an elastic body and subject to deflection and vibration from such causes as here considered.

Table of Centrifugal force at 60 M.P.H. in % of static load on Drivers

R.R.	Engine No.	Weight of Engine only	Diam. of Drivers	Stroke	Weight on Driver Axle	Weight of over balance of Crank Pin center		Centrifugal Force in % of Static Load on Drivers at 60 M.P.H.
						Total	Per Wheel	
N.Y.C.	1013	188000	79"	28"	51000	797	399	29
	904	203500	63"	30"	43250	919	230	31
	1018	188000	79"	28"	51000	797	399	29
	47	157200	63"	28"	40750			
	20	157200	63"	28"	40750			
	34	157200	63"	28"	40750			
	234	149700	69"	26"	38930	567	189	22
	1919	210000	69"	28"	52300	756	252	23
	1921	210000	69"	28"	52300			
B.&A.	2527	187000	84¼"	26"	46500	694	347	22
	2523	187000	84¼"	26"	46500	694	347	22
	2123	216000	69"	28"	48600			
	2703	196600	78"	26"	51000	Balanced	Compound	
	2543	187000	84¼"	26"	46500	694	347	22
Mich. Cent.	1703	178900	62"	28"	44300	1352	451	60
	304	166800	68"	26"	41330	782	261	29
	925	177500	84¼"	28"	46225	1632	816	57
	263	177000	69"	30"	45300	786	262	30
	939	177470	84¼"	28"	46225	1632	816	57
	1672	206000	63"	30"	48800	908	227	29
P.L.	819	193000	69"	26"	46000	762	254	25
	1746	198600	63"	30"	44300	856	214	30
	2200	238850	63"	32"	56150	964	241	28
Mobile & Ohio	147	160000	62"	28"	35500	692	173	29
	185	159000	72"	26"	39000	366	122	13
	181	123700	68"	24"	40300	486	243	26
	573	164000	63"	28"	44010	1233	411	54
	1403	201500	79"	26"	49600	Balanced	Compound	
	1822	248200	69"	28"	57700	Balanced	Compound	
	1824	248200	69"	28"	57700	Balanced	Compound	
So. Ry.	1115	210190	69"	28"	50180	1205	402	38
	542	201500	73"	26"	49600	Balanced	Compound	
	1435	204100	79"	26"	56850	Balanced	Compound	
	1066	210190	69"	28"	50180	1205	402	38
Norfolk & Western	1059	200000	56"	30"	42960	596	149	27
	1033	200000	56"	30"	42960	596	149	27
	594	196250	68"	28"	45645	267	89	10
	603	167700	79"	28"	41970	403	202	18
	494	200000	56"	30"	42960	596	149	27
Penn. Lines	7204	193500	55"	28"	46000	632	158	26
	7027	176600	77"	26"	55300	537	270	11
	7451	207775	80"	26"	61625	Balanced	Compound	
L.V.	3883	191000	78"	26"	54400	650	325	21

Impact Under Cars and Effect of Flat Wheels.—During the progress of the special tests the sub-committee on Impact made such observations as it could relative to the effect of flat spots on car wheels on the stresses in bridges. In one series of tests a car with a wheel having a very decided flat spot was purposely used, and in other tests wheels with flat spots were occasionally noted in the test trains. In one case the tires of the locomotive were badly worn and quite rough. From these observations it is impossible to report any quantitative results. A distinct effect was noticeable on such members as stringers and floor beams. This effect was similar to that produced in the case of rough track. The effect of flat spots on main truss members of a bridge was not definitely noticed in any case.

Maximum Probable Impact as Indicated by These Tests.—In attempting to derive an expression which will represent maximum impact, it is necessary to distinguish between short-span structures, for which the maximum speed is less than the critical speed, and long-span structures, for which the critical speed is likely to occur. It seems reasonable to consider as a basis of conclusions the impact percentages plotted in plate IX. This diagram represents impact percentage for plate girders and trusses based on deflections, and also those based on flange stresses and stresses in main members of trusses.

For short spans a percentage of 100 would appear to be high enough. For long spans, such that the maximum impact is dependent upon the critical speed, theoretical considerations indicate that the impact varies inversely with the span length. Following this suggestion from theory, a curve has been plotted on plate IX, represented by the formula $I = 60/l$, where $I =$ impact percentage and $l =$ span length. This curve is shown by the dotted line. It seems to accord fairly well with the results of the tests, but it may be considered that there are perhaps too many values above this line.

It is very desirable that the law of maximum impact be expressed by a single formula. Adopting as approximately correct the two expressions above mentioned for short and long spans, namely, $I = 100$ for short spans and $I = \frac{60}{l}$ for long spans, a single formula may be derived which will represent fairly well the entire range of span lengths. Such a formula is represented on the two diagrams by the full line. Its equation is

$$I = \frac{100}{1 + \frac{l^2}{20000}}$$

On the whole, this single curve fits the observations quite as well, or better than the two lines representing the different groups of span lengths. This curve is not presented here as a general impact formula, but simply as a curve which represents satisfactorily, in the judgment of the sub-committee, the maximum impact percentages obtained in this series of tests.

Summary of Results.

The following summary of results relates only to the series of tests which have been made by the sub-committee:

(1) With track in good condition the chief cause of impact was found to be the unbalanced drivers of the locomotive. Such inequalities of track as existed on the structures tested were of little influence on impact on girder flanges and main truss members of spans exceeding 60 to 75 feet in length.

(2) When the rate of rotation of the locomotive drivers corresponds to the rate of vibration of the loaded structure, cumulative vibration is caused, which is the principal factor in producing impact in long spans. The speed of the train which produces this cumulative vibration is called the "critical speed." A speed in excess of the critical speed, as well as a speed below the critical speed, will cause vibrations of less amplitude than those caused at or near the critical speed.

(3) The longer the span length the slower is the critical speed and therefore the maximum impact on long spans will occur at slower speeds than on short spans.

(4) For short spans, such that the critical speed is not reached by the moving train, the impact percentage tends to be constant so far as the effect of the counterbalance is concerned, but the effect of rough track and wheels becomes of greater importance for such spans.

(5) The impact as determined by extensometer measurements on flanges and chord members of trusses is somewhat greater than the percentages determined from

measurements of deflection, but both values follow the same general law.

(6) The maximum impact on web members (excepting hip verticals) occurs under the same conditions which cause maximum impact on chord members, and the percentages of impact for the two classes of members are practically the same.

(7) The impact on stringers is about the same as on plate girder spans of the same length and the impact on floor beams and hip verticals is about the same as on plate girders of a span length equal to two panels.

(8) The maximum impact percentage as determined by these tests is closely given by the formula

Discussion on Iron and Steel Structures.

Mr. Cartlidge: There are three changes desired by the committee. In the first paragraph of section 3 of Appendix B we desire to interpolate a sentence after the word "erection" in the second line, reading: "False work will be built by blank." In the last line in that paragraph the words "railroad company" to be replaced by a blank space. In the last paragraph in this section, interpolate in the second line between "used" and "by": "as far as practicable," so that this sentence will read "false work placed by the railroad company under an old structure or for carrying traffic temporarily over a new opening may be used as far as practicable by the contractor during erection; provided it is not unnecessarily cut and wasted." Each one of these blank spaces is to have a dagger referring to the footnote at the bottom of the page, as follows: "Insert railroad company or contractor, as the case may be"

(The secretary then read paragraph 4.)

Mr. Loweth: I don't like the wording of the second paragraph of section 4. The contractor has to get certain authority from the engineer, according to the first line, and certain other authority from the railway company, according to the last line. I think the contractor should be obliged to take from the same person all the information and direction necessary in the conduct of this work, and I would suggest that that clause be changed to read "tracks shall not be cut nor shall trains be subject to any other delay except a reduction of speed, other than authorized by the engineer."

The President: The committee accepts that amendment.

Mr. Earle: In the first clause of section 4 it says, "and so as not to interfere with the work of other contractors." In doing work of that kind, if there are two or three contractors, it is absolutely necessary that one will interfere with the other, and as the work is done under the supervision and in accordance with the directions of the engineer, it seems to me it would be better to leave those words out.

The President: The committee is not willing to accept that.

Mr. Steffens: In the last clause of No. 4 is the usual flagman provision. On some railroads there is a question of the responsibility of the flagman involved, and the specifications for contracts all read that the flagman shall be at the service of the contractor, in order to place responsibility.

Mr. Loweth: I should think that section 5 is in conflict with section 4. They may not be in conflict always, but there are methods of erecting steel bridges whereby these clauses would be in conflict. It is provided in the first clause that there shall be no work train service furnished free, except for unloading material. I know that frequently material is unloaded direct from the cars and put into the structure direct, and some times it is taken from the nearest yard and unloaded, and put into its place in the work. I think the two paragraphs in the heading 5, may be in conflict in a number of methods the contractor might adopt for erecting steel bridges.

Mr. Snow: I have found it necessary in cases like Mr. Loweth has instanced, to make an estimate of what would be a fair charge for unloading. If the material is put right in place, of course the contractor must expect he is going to have free service, while he is erecting his bridge, and in that case, you can simply make an estimate of how long it will take the train crew to unload the material, in the ordinary way. I think the clause is pretty good as it stands. The word "only" helps the matter out.

Mr. Porter: In clause 5 I would like to suggest omitting the words "free of charge." Then in the next sentence I would suggest omitting the word "free." This service, under the Interstate Commerce Act, I understand, cannot be furnished unless it is a part of the contract by which the structure is furnished so that it is not necessary here to know whether it is free or whether it is to be paid for, but is simply a guide in showing what kind of service should be furnished to the contractor, which may either be paid for by the contractor or may be furnished free, in accordance with the contract, so that it would read: "When work train or engine service is furnished the contractor, such service shall consist only in unloading materials, and in transferring the same from a convenient siding," etc.

Mr. Steffens: I would like to see the second sentence in clause 7 stricken out so that it will simply read: "The railroad company's engineers will establish lines and elevations."

The President: The committee makes the point that it is not advisable to eliminate this, because they want the contractor to check the measurements and be a check on the work.

C. E. Smith: It has been my experience that unless you have that clause in the contract and a penalty attached to it, the contractor will go ahead with the work until he finds a discrepancy, and he will notify the engineer, and unless you put a clause in there to make him responsible for his work, he will not be so careful.

Mr. Robinson: This paragraph is intended to prevent long delays or the getting out of a lot of material on to a a bridge for assembling, only to find out, after they get a couple of hundred tons of metal that something is incorrect. The engineer who has established the levels and the lines, is usually not on the ground when the superstructure is erected, and what was intended in this specification was advice to the contractor that before he commences running out iron on to his false work, he should make his necessary rough checks to see whether the distance from base of rail to masonry would allow his iron to go in or whether he could get his iron in between the parapet walls or one the piers.

C. E. Smith: I would like to state a case that happened on the main line of the Iron Mountain about three years ago. They were putting in a small bridge, I think a 36-ft. span. They got the span ready to put it in. The contract provided that the contractor was to check the masonry work before he put it in. He slid his span out, and tried to get it in, but could not because the steel was a little bigger than the opening. The main line was tied up about twelve hours, and I don't doubt but that there are other members who could give similar experiences. There was no redress against the contractor, because the specifications simly said he should "check."

A motion to refer paragraph 7 back to the committee was carried.

The President: In the second paragraph of section 9, beginning with the second sentence, the committee proposes to eliminate the sentence "any changes desired to be made by th railroad company for insuring greater safety to traffic shall be made by its own forces." We also omit the word "and" and begin the sentence "no claim on the part of the contractor for delay or damage on account of such changes will be allowed."

C. E. Smith (Mo. Pac.): Paragraph 8 appeares to assume that all the material will be delivered by a contractor. While this is possible in the case of one or two bridges of considerable tonnage, it is not likely in the case of a large number of bridges of small tonnage, that the contractor will run up excessive demurrage charges and have his men running around from point to point. I move that there be inserted at the beginning of the third line preceding the word "materials" the following: "Where steel work is to be unloaded by the contractor the material shall be placed on skids above the ground," etc.

Mr. Steffens: This sentence as it now stands makes a contractor liable for demurrage charges, and it might be, as Mr. Smith cites that the railway company is under obligations to unload. There might be a case in which the railway does not unload its own material.

Mr. Steffens: The first sentence of paragraph 10 implies the structure is going to be used again, that is, it shall be dismanteled without unnecessary damage, the second sentence begins "when the structure is to be used elsewhere." It would be well to have the first sentence begin "unless otherwise ordered" because there are a large number of old bridges coming out to-day that are scrapped immediately.

The President: The committee changes the words "steel work" in the first line of section 11 to "material."

Mr. McNab: Will the committee consent to remove the words "or abuse" at the end of the first sentence?

The President: The committee accepts that.

Mr. Steffens: I should like to ascertain the views of

the members as to whether it is good practice to depend entirely on the bolts without pins to carry the traffic. There is nothing relative to additional rivets required beyond the usual number, plus the excess. Also, if the contractor loses a number of rivets, should not the rivets that he needs to finish the structure be furnished at his own expense? It seems to me that should be incorporated as a final clause.

Mr. Cartlidge: Mr. Steffens' suggestion as to the limit of rivets is well taken and the committee will incorporate it in a reconsideration of the specifications.

Mr. Courtenay: Referring to section 12, it frequently happens that there are a number of misfits in bridges, and it does not seem to me to be necessary to specify that the engineer shall be there or his accredited representative, always, to actually watch the rectification of the minor misfits. They are reported at the engineer's office, and he can take such steps in connection with the matter as he considers necessary. The question for debate is whether the man shall stand there and see the mechanical work done.

Mr. Cartlidge: That is the idea of the committee. The presence of the engineer during the correction of minor misfits is not necessary, but there are many cases when the engineer is necessary when misfits of a major character are being remedied, and the committee has felt that is a point which should be watched by the engineer and it is good practice to recommend that it be done.

Mr. Steffens: Is it necessary to specify that the hole shall be drilled after the metal is placed? There are certain examples I personally know of where it was a decided advantage to drill them in advance, where it was not contemplated to imbed the bolts in the masonry at that time. The holes were drilled in advance of the steel work.

Mr. Cartlidge: There is no rule without its exceptions. It is very likely that some occasions might arise in which it is preferable to drill holes in the masonry before the steel work with shoes is set, but it is undoubtedly a fact that there are a thousand cases where the contrary is the fact, and we cannot in a specification as general as this cover all the little variations which may occur in carrying them out.

C. F. Loweth (C. M. & St. P.): I hope in reconsidering this the committee will find a way in which they will permit the use of sheet lead in bed plates in paragraph 14.

Mr. Steffens: I hope the committee will see fit to cut that clause out. This matter is one that depends upon the accuracy of the engineering.

Mr. Cartlidge: The committee considered the use of sheet lead and decided against it. This question is entirely apart from the levels of the masonry, or the position of the castings. It is something which provides an accurate bearing for bed plates upon a more or less roughened surface. It is impossible to make the bed plate and bridge seat so smooth as to be an ideal bearing surface and the use of a joint between the casting and a bridge seat in good practice.

The President: The committee recommends the elimination of the words "The railroad company" in paragraph 15, putting the figure with the footnote as on the first page, and the insertion of the words "frame and" between the words "place" and "the."

The committee desires to change the word "contractor" in the first line of paragraph 16 to a blank.

The committee desires to change the second line of paragraph 18 by inserting between the words "employee," and "skilled"; the word "only."

Mr. McNab: Clause 20 says he shall assume all responsibility for injury to the workmen or the public. I think it would be better language to say "to the workmen and to the public."

The President: The committee accepts that.

Mr. Snow: Could not the last paragraph of clause 20, where it says: "he shall comply with the local and government laws," be omitted? I cannot see the necessity of saying that a man shall conform to the laws of the land.

Mr. Cartlidge: It is necessary to call attention to the fact that in the place he may be going, there may be local ordinances to which he must accommodate himself and be governed. This is a clause that would tend to keep him out of trouble.

Thomas Earle (Penna. Steel Co.): Is it the intention of the committee that the contractor shall be responsible for any injury to passengers of the railway company when, through negligence of the railway company they go through a bridge of false work which the contractor has in place.

Mr. Cartlidge: Nothing that the committee may do or say in these specifications will affect the responsibility for an accident caused by negligence. The law is clear as to where the responsibility shall be placed. The railway company is necessarily responsible to the public under the law.

Mr. Earle: We have had advice that the contratcor can, if he wishes to, insure the railway company, and the execution of this specification if made a part of the contract might in certain courts be so construed that the contractor would insure the railway company.

Mr. Cartlidge: That is the intention, to make an insurance clause out of this. Clause 21 says the contractor shall carry such liability insurance as is neecssary to protect himself against loss or damage caused by injuries to his men, etc.

C. E. Smith: We have been informed by our legal department that it is satisfactory for some contractors on erection to do their work without liability insurance. We have recently finished up a contract for erection with a contractor in which the contractor did not carry liability insurance. We took the matter up with the legal department, and they in turn took it up with the bonding company, and the bonding company stated it was their loss if there was any. They investigate the financial standing of the erection company. If they are not satisfied that the erection company is financially sound to carry their own liability they do not issue a bond. I suggest that the committee consider that statement.

Walter Loring Webb: I want to call attention to the fact that there is a matter in clause 9 which will not stand in the courts. It is perfectly conceivable, and perhaps has happened that a railway company has made changes which they might excuse on the ground of greater safety, which would actually make increased cost to the contractor. In a case of that kind, the court would unquestionably allow the contractor damages, and there is no use in putting in a clause saying that the contractor must do that, if the court would not sustain the specification at all.

Mr. McNab: In regard to clause 22 what is the difference between the "accredited representative of the chief engineer" and the "properly accredited representative of the chief engineer."

The President: The committee is willing to have the word "properly" eliminated.

A motion that the specifications be referred back to the committee was carried.

Prof. Jacoby: I desire to offer the following which has a bearing on the matter of secondary stresses:

In connection with steel bridges there is hardly any material available in published form relating to the lessons taught by the observation of bridges under traffic conditions. All over the country bridge inspectors are making their rounds, looking at the details of bridges and making records of conditions discovered and recommendations as to repairs required. After the repairs are made the incident is closed for that structure, and so the matter goes on year after year. There must inevitably be some important lessons taught by the extensive experience of these inspectors which should influence design much more largely than it apparently does. One reason is that the maintenance department is entirely separate from the bridge department in which the designs of new structures are developed. There are doubtless also other influences at work. Designers and draftsmen have but little opportunity to become familiar with these matters by direct observation. It seems that each railway does not get the full benefit of the experience of the maintenance department, thus leading to the continued construction of some faulty details because the designers do not learn, except incidentally, of the actual behavior of bridges previously designed by them.

For example, certain designs of brackets on end floor beams perform their duty in an excellent manner under heavy modern live loads, and the conditions of adjacent track, while others show marked defects; yet the defective designs are built over and over again on the roads in which the maintenance of way department has discovered their weakness.

This condition is not confined to steel bridges. I am convinced that some railways are losing at least two or three years of service in their Howe trusses because of the lesser relative efficiency of the splices in the lower chords. This is an indication that there are details in timber framing which are not receiving sufficient study by designers, although similar timber structures have been used for many years. This is probably true because the conditions under which failure occurs are not brought to the attention of designers.

The committee was discharged with the thanks of the association.

MR. WICKHORST'S TALK ON RAIL MANUFACTURE.

Last evening at eight o'clock, M. H. Wickhorst, engineer of tests of the rail committe, gave a talk on the manufacture of steel rails and a short description of some of the results of the extensive tests he has conducted for this committee during the past year.

In opening Mr. Wickhorst described the reduction of the ore in the blast furnace, then the three processes for making rail steel, the open hearth, the Bessemer and the electric. The latter process is just now coming into use, and possesses the advantage of not requiring a fire at the furnace, as the power may be secured from some distant point. Mr. Wickhorst then went into a discussion of the structure of steel, especially its chemical composition, explaining the relations of the pure iron or ferite, and the carbon element, or pearlite. He compared the rail steel to concrete, with the varying portions of ferite and pearlite intermingled. Slides were shown indicating the position from which sections were removed from rail for analysis and tests, and the reasons for selecting the various locations explained.

He showed a number of sections of rail with split heads and pipes and also slides of sections of rail which showed quite plainly inclusion of tie-plates in the rolling. He dwelt some length on the results of investigations made by the rail committee which are included in the report of the committee, and will be discussed more in detail today.

The talk was heard by a crowd that filled the Florentine room.

THE SMOKER.

The first "smoker" in the history of the American Railway Engineering and Maintenance of Way Association was given in the Florentine room of the Congress hotel last night. In past years the association has stuck exclusively to the very serious business for which its conventions are held, except on the evening of its annual dinner. This year the Committee on Arrangements decided the members needed a little more diversion; and they had it.

The smoker followed M. H. Wickhorst's illustrated lecture on steel rails, and was attended by a crowd that filled the room and overflowed into the lobby. The entertainment was started with a generous distribution of sandwiches, cigars, beer in large, white steins, and Apollinaris water for those who taboo anything stronger than mineral water. Frank Coates, of the committee on arrangements, announced that Caruso was singing in New York City at that moment, and that the committee had made arrangements to transmit the music directly to the Florentine room. The medium of transmittal proved to be a "leetle German bant" of six pieces—mostly punk—which strenuously discoursed the strident airs with which it is accustomed to coaxing coins from the pockets of passersby on the streets. They say the committee tried to hire the band for the evening at a fixed stipend, but that it refused to come if denied the opportunity of passing the hat as usual; so it was allowed to pass it. With the band for accompanist and professional entertainers for choristers the crowd sang all the familiar smoker airs, including "We're Here Because We're Here," "The Good Old Summer Time," "How Dry I Am"—for which there was no provocation—"When Good Fellows Get Together" and "What the 'Ell Do We Care?"

In the midst of the singing a tramp vaudevillian blew in at one of the doors of the room asking for "My friend, Lou Fritch." When he found his friend, and began combing out his tangled back hair with his hand, Mr. Fritch caused a laugh by begging him "not to comb them off in here; they might crawl."

The evening's entertainment was concluded by the introduction of three typical street piano playing Italians—two men and one woman—with their hurdy-gurdy. They played the airs which begin to become familiar to every townsman at about moving time.

The novel entertainment features were intended mainly to furnish amusement for the entertained while they were mixing socially, and they served their purpose well. Never in the history of the association did so many of its members get together merely to spend a few hours in getting better acquainted as men can only on such an occasion. The committee on arrangements of the maintenance of way association is composed of W. A. Wallace, chairman; W. A. Christian, F. R. Coates, A. S. Baldwin, J. B. Cox, E. H. Lee and O. J. West.

SIGNAL ASSOCIATION MOVING PICTURES.

The Edison moving pictures taken at the last annual meeting of the Railway Signal Association at Richmond, Va., were shown under the auspices of the Chicago Signal Club at the rooms of the Western Society of Engineers, Monadnock Building, Chicago, Tuesday evening, March 21. A large number of signal engineers were in attendance, and many who were at the convention had the pleasure of seeing themselves in action in the parade, and at the baseball game. The pictures were supplemented by some excellent new Edison films never before shown in public.

WESTERN RAILWAY CLUB.

The Electrification of Chicago Railways was the subject of a paper read by C. A. Seley, of the Rock Island, at the regular meeting of the Western Railway Club last evening. The paper dealt largely with the report of the Boston Commission, and discussed in detail its various conclusions, by comparing the conditions in Boston and Chicago and showing the similarity of location and requirements. Mr. Seley said that at Boston the conclusion was reached that "Electrification, while desirable, is not necessary, nor is it required on grounds of public safety. It is desirable mainly on account of added convenience and comfort, and the author believes the same applies to Chicago." The paper was discussed briefly by W. K. Barnum, Dr. W. F. M. Goss, W. E. Symons, A. E. Manchester and J. F. DeVoy.

A contract has been given to J. D. McArthur, to build a branch line of the Canadian Pacific from Estevan, Sask., to a point 55 miles west of that place. Contracts are said to have been given recently by this company for building lines in Western Canada as follows: Two lines out of Swift Current, Sask., 80 miles; from Moose Jaw, 35 miles, and from Lacombe, Alb., 60 miles, to Foley, Welch & Stewart, St. Paul, Minn.; three branch lines out of Wilkie, Sask., 82 miles, to W. A. Dutton, Calgary, Alb., and for double-track work from Moose Jaw west for 23 miles and east for 10 miles, to J. G. Hargrave & Co., Winnipeg, Man. An officer writes that contracts have been let to Janse, McDowell & Co., Calgary, Alb., for building 42 miles of the Kootenay Central south of Golden, B. C.

MECHANICAL PROTECTION OF PILES AGAINST MARINE WOOD BORERS.*

On the Louisville & Nashville the methods most extensively used to protect piles against marine wood borers are:

(1) Encasing the piles in a rich mixture of Portland cement and sand, or Portland cement, sand and fine gravel filled between the piles, and removable flasks of wood, or wood and iron.

(2) Filling sand between the piles and vitrified clay pipe

*From Appendix E of a report presented by the Committee on Wooden Bridges and Trestles at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

slipped over the tops of the piles (after heads of piles have been freed) and left in that position, pitch being mixed with the sand at the top.

The cost of the first method is reported to have been in the neighborhood of $1.50, and of the second about $1.10 per linear foot of pile protected. Better results were obtained from the use of Portland cement concrete than from a mixture of cement and sand.

The mortar or concrete filled between the flask and the pile mixed with the mud at the bottom to such an extent that the lower part of the protection often broke off. It was found impossible to overcome this entirely. A more serious fault was the cracking and breaking off of the upper part of the encasement. The second method was adopted to avoid these weaknesses. It is reported that this method gives fairly good results, and has been in general use on the Louisville & Nashville Railroad since 1893. When a section below the top fails it is removed and the upper sections are lowered, after which a new section is formed at the top by fastening cast iron casings (which come in two halves) around the pile and filling as before.

On the Louisville & Nashville the protection was applied to creosoted piles, which Mr. Courtenay, chief engineer, states had been standing in sea water for a sufficient length of time to be no longer immune from the teredo.

In 1902, the Port Arthur Canal & Dock Company, a subsidiary of the Kansas City Southern, protected a large number of untreated pine piles at Port Arthur, Tex., by placing a 24-in. sewer pipe around the piles and filling a mixture composed of one part Portland cement and one part sand between the piles and the sewer pipe. Part of the decks of the wharves were renewed at the sam time. In case the pile to be treated came under a portion of the deck that was renewed, the sewer pipe was dropped over the head of the pile. In case the cap was not displaced, the sewer pipe was cut into halves longitudinally, and after being placed around the pile was fastened together by means of wire. The protection extended from a foot or two below mud line to a little above high tide.

OVERLOADING OF PILES.*

In an endeavor to tabulate the general indications of overdriving, in order that it may be avoided as much as possible, the following suggestions are given for discussion:

(1) In the majority of instances, overdriving is indicated by the behavior of the pile.

(2) The use of a drop hammer instead of a steam hammer and the absence of a water jet often lead to overdriving.

(3) Splices, unless made with great care, are a possible cause of overdriving.

(4) A gradual decrease in the penetration per blow, followed by a sudden and large increase, is often caused by overdriving.

(5) Brooming, shattering or buckling of the pile may all be indicative of overdriving.

(6) The bouncing of the hammer is often an indication that further hammering will result in overdriving.

(7) The dull sound of the blow during overdriving is said to be of sufficient difference to be readily distinguishable.

THE WATER JET.

The first authentic use of the water jet was in 1852, during the construction of a wharf at Decrous Point, Texas. The jet was in general use during the Civil War and tradition gives the early forties as the date of its discovery. It is said that a government engineer standing in the soft mud around a pile-driving operation could not extricate his feet, and that on turning a hose on them he sank deeper and kept sinking as long as he applied the water. After he was extricated he tried his discovery on the piles, reasoning that if he sank into the mud when a jet of water was applied at his feet, the piles should either sink likewise or offer less resistance to driving.

In the late fifties or early sixties a civil engineer named Stevens applied this method in driving screw piles. In order to facilitate the work of screwing the piles into place he attached a pipe to the side of the pile, passing the nozzle through a hole cut in the disc, thus bringing the water to the point of the pile, the idea being merely to loosen the material and facilitate the screwing down of the pile. On the application of the water it was found that the pile sank readily into place by the action of the jet alone without the use of the screw point.

The water jet is essentially a stream of water forced through a pipe or hose alongside the pile. The flow of water loosens the material, and either washes it out, leaving a depression into which the pile sinks, or by lubricating the surface of the pile reduces the side friction. The use of two jets is generally advantageous in securing a more accurate direction or control of the pile.

Water simply poured on the ground around a pile while driving, not applied as a jet, will in some soils materially facilitate the driving, in one instance on record reducing the number of blows of the hammer nearly 50 per cent. Piles driven this way showed a bearing power equal to those driven on the same work without the use of water.

The jet may be used alone or in conjunction with some other method of driving, or, when the material is suitable, a hole may be jetted, the jet removed and the pile dropped into it and brought to bear by hammering.

When the jet has been used in rather dry, light soils it has been shown by tests that the action of the water tends to puddle the material around the pile and that as soon as the water has been absorbed by the surrounding earth or has been drained away, the jetted piles show a greater skin friction than piles driven in the same material without the use of the jet.

There is a difference of opinion upon the part of engineers as to the relative merits of keeping one or all of the jets near the foot of the pile, or of having at least one jet between the surface of the ground and the foot.

In either method the jets should be kept moving in order to facilitate the flow of the water around the pile and to prevent the so-called "freezing" or sticking fast.

In some cases two jets have been used placed on opposite sides of the pile, in order to obtain sufficient volume of water and to keep the pile in alinement. In other cases a single jet, slightly in advance of the pile, has given satisfactory results.

In sand, where the jet acts for some distance, a number of piles may be sunk together. It is claimed that in sand the volume of water is the principal consideration, but that in gravel, etc., a considerable pressure is also required and that holes can be jetted near the foot of the pile into which a boulder will roll out of the way of the pile. On the other hand, it is also stated that in coarse gravel the jet washes out the sand and allows the boulders to roll to the foot of the pile and impede its progress.

There appears to have been very little development in the water jet since its first introduction, and but two U. S. patents; the improvements which have been made are in the method of handling. One of the patented devices uses the water pressure to handle the jet pipe, which acts as a movement of the plunger or jet pipe is controlled by valves at the lower end plunger inside of a pipe suspended from a derrick or pile-driver; the vertical of the suspended pipe.

It does not seem desirable to use a jet pipe smaller than about 2 in. in diameter, on account of the loss of head, due to friction, in the smaller sizes, but this should be reduced at the nozzle in order to increase the velocity, as it is the velocity which loosens the material; the quantity, however, is necessary to bring the material to the surface.

Satisfactory results have been obtained with pressures ranging from that furnished by a single hand pump up to a pressure of 200 lbs. per sq. in. at the pump. The quantity of water supplied at the nozzle runs as high as 500 gallons per minute, 250 gallons per minute giving satisfactory results in compact sand.

STEAM HAMMERS.

Steam hammers are of two general types—single-acting and double-acting.

In the former and older type the steam pressure is applied to the under side of the piston and raises the hammer, which falls by gravity. The force of the blow depends upon the length of the stroke and the movable weight, and the number of blows depends upon the pressure.

In the double-acting type the steam pressure both raises

*From Appendix C to the report of the Committee on Wooden Bridges and Trestles, presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

and lowers the hammer; the force of the blow, as well as the rapidity, being a function of the pressure.

The later apparatus is more compact, lighter and operated with much greater rapidity.

DESIRABLE FEATURES OF A TRACK PILE-DRIVER.

(1) Steam hammer. To secure greater rapidity in driving and with less injury to the pile than secured by the drop hammer.

(2) Water jet apparatus.

(3) Turntable allowing practically a complete rotation. In most cases the work can be done from either side, and in many of the remaining cases it is possible to foresee the nature of the work and to head the driver in the proper direction at the nearest "Y" or turntable. Sometimes, however, the turning facilities may be far distant, or a pile-driver may be caught between two washouts when it becomes essential to be able to turn the machine to perform the work at both places.

(4) Swinging leads. The leads require an efficient rigging to permit driving piles with a batter in either direction. When driving across the track on such work as driving bents for an adjacent track, it is convenient to be able to drive with the leads not fully raised, so as to secure the proper batter.

(5) Self-propelling mechanism. The greater the tractive force and speed the more independent is the pile-driver from locomotive service. They should preferably be sufficient to dispense with a locomotive except for long hauls.

(6) Restricted projection on the side opposite the leads when swung across the track and without unnecessary weight.

(7) High-speed power device for raising the leads. On a main line it is frequently possible to drive only one or two piles before running to a siding. In some cases the character of this apparatus to raise the leads determines whether a single pile can be driven between trains or delaying a train.

(8) Adequate overhang. To enable machines to drive piles as far ahead of the leading wheels and as far sidewise as possible. On work for double-tracking the sidewise reach should be sufficient to drive a bent on the new track from a position on the old track.

(9) Facilities for driving below the track.

(10) Ability to shift the hammer when the leads are down.

(11) No obstructions in the view of the engineman and niggerhead operator.

(12) Length of leads. To accommodate the longest piles practicable.

(13) Strength and rigidity of supports for leads and hammer. They should be adequate to handle the hammer and the heaviest wooden pile without damage. It is now becoming important to be able to handle concrete piles.

(14) Stability. The driver, while standing on its own wheels, without any jacks or special supports, should be able to pick up and drive a pile in any position within its reach.

(15) Flush ends. For convenience of transportation in freight trains, no part projecting beyond the drawheads. Otherwise an idler is required, which then may be used as a tool car.

(16) No lengths of steam hose that might be replaced by pipe.

REGISTRATION—MAINTENANCE OF WAY ASSOCIATION.

ACTIVE MEMBERS.

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At the Coliseum

On account of space limitations the exhibits in the balcony at the Coliseum are smaller than some of those on the ground floor, but their size is no criterion of their interest. It was thought that there would be much less attention paid to the balcony exhibits than to those more prominently situated, and it was hoped that the Monorail Car would serve to call the attention of visitors to those exhibits which could not be accommodated on the ground floor. But the car and the exhibits are both interesting enough in themselves and are attracting large numbers to the balcony.

An indication of the great interest that is being shown in methods of highway crossing protection is found in the large number of devices for this purpose which are to be seen this week at the Coliseum. There are crossings with bells of many shapes and sizes, and warning signs in every style that is calculated to attract and hold the attention of drivers and automobiles. The bells and signs are mounted on iron posts and some are even shown surmounting reinforced concrete poles. The bells are adaptable to every conceivable condition of track circuit and track arrangement, and, on the whole, represent a quality of apparatus and a general neatness in design that permits of their use in city streets and where crossing protection of the kind they afford is considered necessary.

On account of the great interest which electric railway managers are now manifesting in signaling apparatus, the exhibition of various forms of signals which are designed especially for alternating-current operation is attracting a great deal of attention. Some of the signals which are constructed for indications of this kind are to be seen in a number of exhibits. There are signals adapted to give both day and night indications by means of colored lights which are so carefully designed and arranged with respect to efficiency that their indications can be distinctly seen from a 1,000 to 2,000 ft. in daylight, and almost as far in bright sunlight. In addition to the light signals there are many forms of semaphores giving indications in both the upper and lower right-hand quadrant, and the lower left-hand quadrant. There is also quite a showing of standard steam railway semaphores and their operative mechanisms, and one company shows a disc signal of the same type that has been used for many years on railways which is designed to protect the users of highway crossings. The red indication is controlled by the presence of a train within a mile or so of the crossing, and is supplemented by a warning sign printed in large letters on the face of the box enclosing the disc and mechanism.

USES OF VANADIUM STEEL.

Vanadium cast steel locomotive frames are being called for in locomotive specifications by railways that have used them for the last three years. Considering the readiness with which these castings are made, and the satisfactory service they give, the Vanadium Sales Company of America, Pittsburgh, Pa., expects that for many purposes the more expensive forgings will be replaced by this steel.

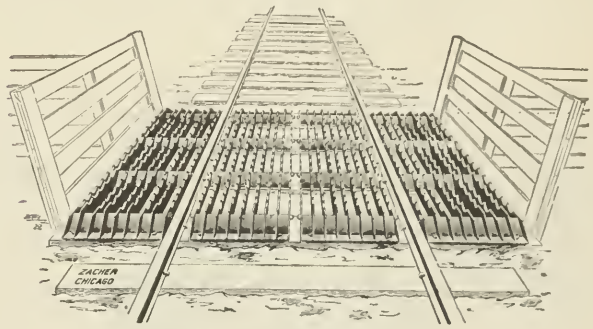
METAL STOCK GUARDS.

The subject of surface stock guards for railway crossings has been an open one for several years, and is still being discussed by railway engineers. Many designs in both wood and metal have been tested.

These years of experimental work have demonstrated that a satisfactory stock guard must embody the principles of moderate first cost, low maintenance cost, strength, and durability. It must be of strong construction, and at the same time have enough vibration after being installed to frighten animals that attempt to cross, also be rigid enough to cause pain should the vibrating qualities be insufficient, but not rigid enough to injure permanently either employes or stock.

Owing to the difficulties of building a surface guard of wood that will meet those requirements, some railways are again turning toward steel. The initial cost of steel guards has been an important item in the past, but, owing to the increase in the cost of suitable lumber for guard construction, the difference in cost has greatly decreased and the greater first cost is offset by the lower cost of maintenance. A metal guard of proper construction requires little attention after being installed, but gives effective service during its natural life, or until accidentally destroyed.

Some have raised the question as to the life of a steel



Metal Surface Guard.

guard on account of the corrosion caused by exposure to salt water drippings from refrigerator cars. Such objection has been recognized by metal guard makers, but it is being eliminated by the growing tendency to equip refrigerator cars with drip tanks.

The accompanying illustration shows one of the seven designs of stock guards made by the National Surface Guard Company, Chicago. This company has spent a number of years in experimenting and developing these different types and has tried to cover the field entirely, furnishing a suitable guard for territories where conditions require special construction, and at a reasonable price.

WHARTON UNBROKEN MAIN-LINE SWITCH.

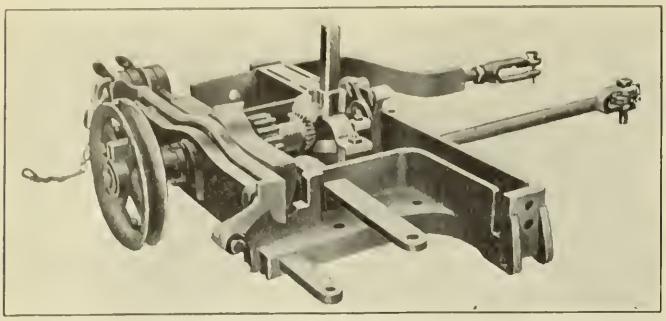
The unbroken main-line switch, made by Wm. Wharton Jr. & Co., Inc., Philadelphia, Pa., was first brought out more than fifty years ago, and it is a curious fact that this switch, in an improved form, is still used to a considerable extent on a number of roads throughout the country.

The Wharton exhibit, in spaces 9, 10, 27, 28 and 29, includes one of these switches, made in accordance with the Chicago & Alton standard.

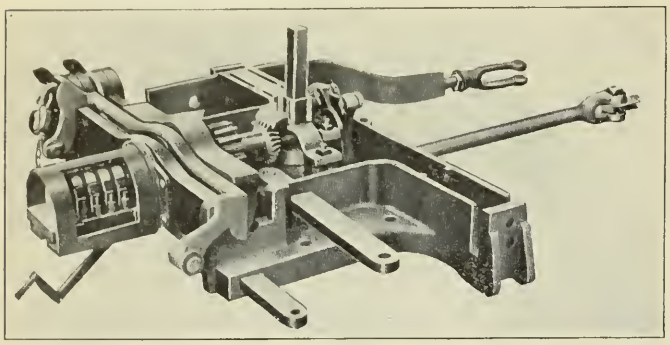
TRIPLELOCK SWITCH STAND.

The importance of safely operating and locking railway switches at junction points and cross-overs has long been realized. Apparatus has been devised to care effectively for the proposition where switches are grouped, but single switches in the main track, where the trains run at a high rate of speed, have not received any great amount of attention. The interlocking plant for groups of switches is an expensive installation for a single switch. The Triplelock switch stand has all the features of an interlocking plant. While it is very simple in construction, it is strong and reliable, rigidly locking the switch-points mechanically both in the stand and with duplex bolt locks. It has the derailer movement and derailer lock under the control and

operation of the switch and signal levers. It also controls the mechanical or electrical signal and can be operated either from a distant point or by the approach of trains through the action of the track circuit. All stands have an



Triple-Lock Switch Stand, Equipped for Controlling Mechanical Signal.

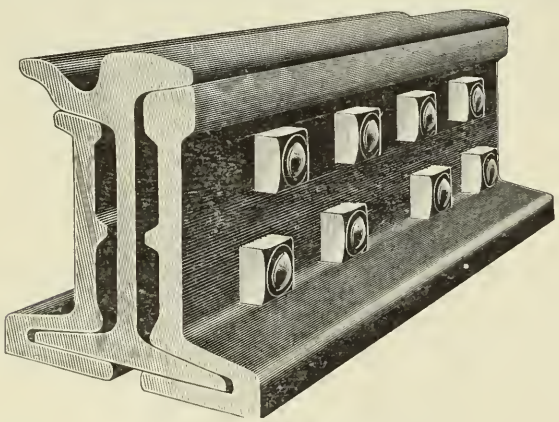


Triple-Lock Switch Stand, with Circuit Breaker for Use in Automatic Territory.

automatic manual control lock, making it impossible to insert padlock unless the lever arms are in a normal position. This device is made by the W. F. Bossert Manufacturing Company, Utica, N. Y.

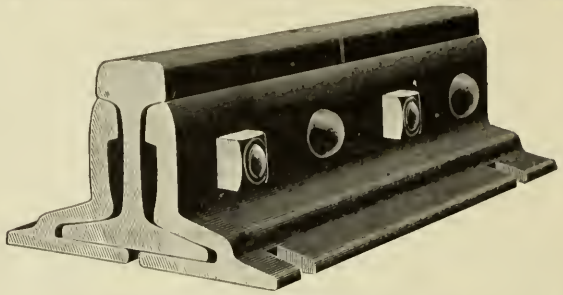
RAIL JOINTS.

Over fifty thousand miles of track are now equipped with the base-supported joints illustrated herewith, which are made by The Rail Joint Company, New York. They are rolled from the best quality of steel billets and are made to any desired length and to fit any section. Contraction

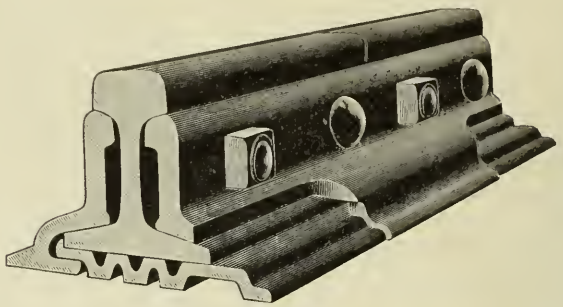


Continuous Girder Rail Joint.

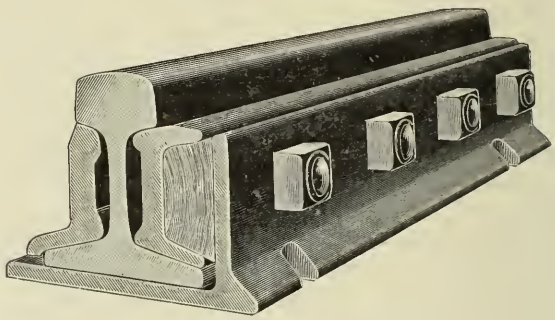
and expansion of the rails are well taken care of, and the joints are also designed to give adequate support to the rail base, maintain rail alinement, eliminate low joints, communicate the load wave uninterruptedly from rail to rail, control all vertical action between the rail ends, and prevent crystallization and the breaking of copper bonds or terminals. These features give smooth riding and reduce the cost of maintenance of both track and rolling stock. The cost of the joint is but little more than that of angle bars and its life is much longer. The same general design



Continuous Rail Joint.



Wolhaupter Rail Joint.



Weber Rail Joint.

of base support is used in the manufacture of compromise or step joints and insulating rail joints, the latter being made in the Weber and Continuous type only. These joints received the highest award at the Paris exposition in 1900 and at Buffalo in 1901, and the gold medal award at St. Louis in 1904.

REINFORCED CONCRETE FENCE POSTS ON THE PENNSYLVANIA LINES.

The Pennsylvania Lines are now making cement posts at nearly a dozen points, and in many instances the posts have been shipped from those plants to neighboring divisions for experimental purposes. One of the plants is on the P. F. W. & C. at Warsaw, Ind., and is representative of those operated by this company. Large numbers of posts have been made at this plant, and most of these have been set along their right of way near Warsaw, though several carloads have been sent to neighboring divisions for setting. The location of this plant seems ideal for making concrete posts for many reasons, the principal one being that it is located in an old gravel pit, where an abundance of the finest materials for their manufacture is at hand. The conditions for curing the posts are also ideal, for the gravel has been taken out till the ground level is only about one foot above water level, so the surface of the ground is always moist. High banks on three sides break the wind, which is detri-

mental to the curing of concrete of any kind, and the ground, being soft, is easily leveled, so that posts have bearing full length while curing.

Equipment manufactured by the D. & A. Post Mold Company, Three Rivers, Mich., is used by the Pennsylvania Lines This equipment consists of what are termed gang molds, and a frame called a shaker, which supports the individual molds up from the ground about two feet. The individual molds are U-shaped in cross-section, making a post with a round back and flat face. There are no corners or crevices to fill in molding, no projections or holes through the post, and no corrugations to weaken the post so it will break in handling. No staples or fence fastening device of any kind are inserted in the post while molding, though they can be easily placed if desired. The fence is fastened by short pieces of wire called tie wires, which go round the posts and wrap the line wires of the fencing, which are intended to be placed on the flat side of the post. It is possible to fasten the fence at any place on the post, at a cost of not to exceed about one cent per post.

The open face of these molds allows the use of any kind or style of reinforcement, such as plain or two-ply cable wire, corrugated or twisted steel or iron bars of any kind, or any of the trussed reinforcements. While these special trussed or roughened reinforcements are necessary in dry-tamped concrete in order to supply mechanical bond of the concrete to the steel, it is considered unnecessary where wet concrete is used. It is true that these special forms, or manufactured trusses, make good posts, but the cost for reinforcement alone is as much, and often more, than the cost of a post equally strong, of same size and shape, properly reinforced with the hoop reinforcement. Reinforcement to be most efficient should be near the surface, and should be distributed in units of small cross-section.

The U-shaped cross-section makes a nearly square post, with the objectionable exposed corners of a square post eliminated. It is believed by some that the triangular post possesses merits by reason of the saving of materials over the square, but if the fence is placed along one flat side it will be found that the half of the post next the fence contains three times the materials the opposite half or corner does, and with equal reinforcement in each corner the concrete will crush on the back corner under about one-half the load necessary to crush the flat side. The square post has a larger cross-section, allowing the use of a coarser aggregate, thereby saving cement.

The shaking for settling the concrete gives the post a very smooth, dense surface, which makes it almost impregnable to the action of the elements, thus preserving the reinforcement to a maximum degree. Further facts are given in "Concrete Posts and How to Make Them," a fully illustrated booklet published by the D. & A. Post Mold Company.

SINGLE TRACK HIGH-SPEED INTERURBAN SIGNALING ON A LARGE SCALE.

The Illinois Traction System, through Vice President-Executive H. E. Chubbuck, recently has contracted with the Union Switch & Signal Company for the largest amount of signaling apparatus ever installed on a trolley interurban road.

Semaphore signals to the number of 131 will be placed on the lines between Peoria, Bloomington, Decatur, Danville, Springfield, Ill., and St. Louis.

These signals are being distributed over four sections of continuous blocking for the protection of sidings and curves, 101 being employed for a total of 27 sidings and 60 miles of road. The remaining 30 signals will protect 35 miles of road divided into 15 "curve protections" of two signals each.

The blocks in the continuous signaling average two miles in length, and extend from siding to siding. The meeting of trains and the operation between sidings are controlled by home signals and their respective distant signals located in the immediate vicinity of the sidings.

In addition, at a number of points where the view is obstructed, signals have been provided to protect train movements.

The Illinois Traction System, on which these signals are to be installed, is a high-speed interurban road operating about 500 miles of line through the most thickly populated section of Illinois. It traverses a very rich farming and coal mining territory, and reaches most of the large cities of the state, thereby making possible an extensive express and through passenger business in addition to the handling of grain, coal and miscellaneous freight.

This installation is receiving the personal attention of Mr. Chubbuck on account of its extensive application to the protection of this class of traffic, while the erection is being directed by John Leisenring, signal engineer of the road.

Q. & C. BONZANO ROLLED STEEL STEP JOINT.

For a good many years it has been necessary to make step or compromise joints of cast steel, or maleable iron, or to upset angle bars. Within the past year, however, the Q. & C. Co., New York City, has perfected and placed on the market the Q. & C. Bonzano Rolled Steel Step Joint which combines the advantages of strength, simplicity of design, and consequent ease of application with low cost. It is claimed that this step joint develops about 500 per cent greater efficiency than cast steel step joints of corresponding sections.

One of the principal points of advantage claimed for the Q. & C. Bonzano rolled steel step joint is that it makes the joint as strong as the larger section of the rail in the combination to be joined. This is accomplished by making the joint of the same cross section throughout, which cross section equals that of the larger rail in the combination.

The Q. & C. Bonzano rolled steel step joint is made of open hearth steel, annealed, and the fit is absolutely perfect.

These joints are on exhibition at Spaces 120 and 139 at the Coliseum.

SIGNAL LAMPS.

One distinct feature that is of interest at the exhibit of the Armspear Manufacturing Company, New York City, is the Twentieth Century signal lamp, which is built to spread light over a wide visual angle. This feature is appreciated by locomotive engineers who are able with a lamp of this type to get a good signal on curves. This lamp is also built for train, engine and semaphore service.

The Armspear bayonet catch outside wick adjustment steel guard lantern No. 106D does not require the opening of the top and removal of the globe in order to light the wick, and this improvement has effected a large saving in the breakage of globes.

A full line of steel signal lamps, including the Railway Signal Association recommended standard semaphore lamp with perfect watershed, is also on display.

EXHIBIT OF ADAMS & WESTLAKE COMPANY.

The exhibit of the Adams & Westlake Company, Chicago, at the Coliseum, spaces 83 and 84, is one of the most attractive there. The company made special preparations this year to get up an exhibit that would do justice to its products. The entire exhibit is made up of the standard Adams & Westlake lamps, especially made of solid brass and finished with gold lacquer. The lamps are all of the standard size, shape, and style that the company furnishes for every conceivable use in connection with railways, and they only differ from the stock lamps in the material from which they are made.

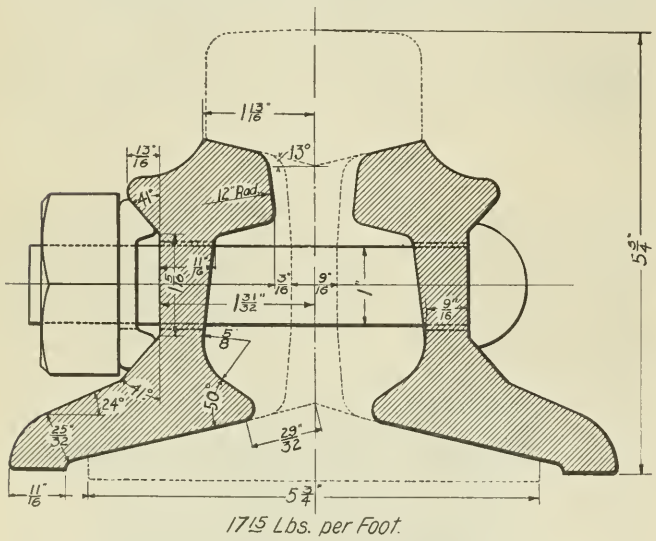
In addition to the lamps, there is an interesting collection

of lamp sections and parts, from which it is easy to see how each piece of material that enters into the construction of a railway lamp or lantern is made, and how the finished product is put together. The name "Adlake" is shown over one of the entrances in illuminated letters which form the front of one of the company's train indicating lamps. The line of padlocks, one of the Adams & Westlake specialties, is also prominently displayed. From the balcony the red, green and yellow lights look like a miniature yard at night.

The train indicating lamp is adapted for carrying train numbers, both regular and special, for day and night indications so that they may be easily read and errors in train identification avoided. The locomotive lamp is placed on the side of the boiler, back of the headlight, in a position where the numbers are not dimmed by the headlight; and the angle at which the lamp is placed is such that train numbers may be easily read by approaching and passing trains. The lamp will also permit of being carried on the caboose, where the easily readable letters and numbers can hardly fail to be properly observed.

REINFORCED ANGLE BAR.

The reinforced angle bar joint, manufactured by the Cambria Steel Company, Johnstown, Pa., is designed to obtain the maximum section and carrying capacity. In this bar provision is made to overcome the weakness of the upper side of the ordinary angle bar, which breaks because of the joint springing upward between the wheel loads and causing a tensile stress in that member, instead of the compression which occurs when the load is directly over the joint. Another weakness of the common angle bar is that the base member is too thin where it unites with the web, frequently resulting in buckling. In correcting these defects, the web of the reinforced angle bar is moved far enough from the

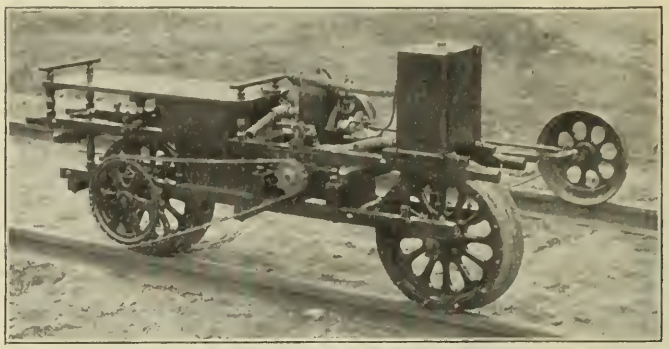


Reinforced Angle Bar.

web of the rail to permit of the strengthening of this base member and provide ample clearance for a square nut on a 1-in. bolt. The moving of the web of the angle bar from the web of the rail also makes possible an increase in area of the head in addition to that of a laterally extending reinforcing rib to provide against breaking of the bar at this point. The spring washer fulfills two functions: first, that of providing a flat frictional surface of large area for the nut, and second, that of a spring washer of great strength, requiring a compression load of from 10,000 to 15,000 lbs., or from five to seven times more than the ordinary nut locks. The bars are made in standard open-hearth steel; in open-hearth steel from .45 to .55 carbon and hot finished; and in open-hearth steel from .45 to .55 carbon, hot finished and oil treated.

VELOCIPEDE CAR MOTOR.

The Kalamazoo Railway Supply Co., Kalamazoo, Mich., has on exhibition at spaces 23, 24 and 25, in the Coliseum, a motor designed for use with a velocipede car. This motor can be installed on a car by anyone, without previous experience. The engine is small and compact, being only 11¼ in. high from the center of the crank shaft. It weighs



Velocipede Car Equipped with Kalamazoo Motor.

but 73 lbs., and yet is strong and durable. It develops about 2 h. p. when running at normal speed and if operated at higher speeds can develop 2½ h. p. The accompanying cut shows this motor attached to an ordinary 4-wheel car. Such a car is very convenient for signal maintainers, telegraph linemen, section foremen, or others desiring a light car for inspection purposes.

SEPARABLE SWITCH POINT.

The Economy Separable Switch Point Co., Inc., Louisville, Ky., makes the Economy separable switch point, which is being placed on many roads in this country. A considerable saving in cost of switch maintenance is claimed for this point, especially when applied to new switch points. New Economy points can be applied to old switch points without taking the switch out of the track, and this operation can be repeated as often as necessary, until the entire switch point is worn out.

The Economy separable switch points are manufactured



Running Side of Economy Separable Switch Point, Attached to an Ordinary Point Ready for Installation in the Track.

from a high grade of open-hearth acid process steel, especially prepared for resisting wear, to enable them to adjust themselves to the worn condition of the main or stock rail, thereby avoiding the expense of changing the stock rail in installing the switch points in the track. They are also made of the highest and most reliable grade of manganese steel.

This company has contracts with some of the largest and



Side of Economy Separable Switch Point, Designed to Fit Against the Stock Rail.

best equipped frog and switch companies in the country, viz.: Cleveland Frog & Crossing Company, Cleveland, Ohio; Ajax Forge Company, Chicago; Conley Frog & Switch Company, Memphis, Tenn.; Elliot Frog & Switch Company, East St. Louis, Ill.; Weir Frog Company, Cincinnati, Ohio; Kilby Frog & Switch Company, Birmingham, Ala.; The Guerber

Engineering Company, Bethlehem, Pa., and the St. Paul Foundry Company, St. Paul, Minn. To these companies the railways ship their old and worn switch points (thereby saving them from the scrap pile) for application of the Economy separable switch points.

FENESTRA.

Fenestra solid steel window sash, for factories, power houses, etc., manufactured by the Detroit Steel Products Company, Detroit, Mich., is a new product of steel. For scores of large new plants that have been built recently, this material has been specified. In several important large plants, steel columns and curtain walls of Fenestra design have replaced the customary brick wall, with satisfactory results. It makes a wall of glass with a steel frame that offers the least obstruction to the light, so that the interior of a building is flooded with soft light, instead of depending on small windows in a brick or concrete wall. When the usual window is retained, the Fenestra sash makes it possible to have larger openings with a convenient plan of ventilation.

The Fenestra sash is made of steel bars, rolled in a special section. It is made in units, each unit containing as many panes of glass as may be specified. The peculiar and original feature of this steel sash, covered by patents, is in the joint where the bars cross. The bar, which is to form the vertical member in a sash, has a slot punched in the web. The head and the remaining outer edge of the web are then spread so the horizontal bar can be inserted. The portion of the web which has been bent out is then pressed into a notch in the horizontal bar. This makes a very strong joint, and makes it possible to build walls with openings of large area



Application of Fenestra to the Plant of the Detroit Steel Products Company.

with light steel bars. While it is not expected to meet the æsthetic requirements of an office or public building, it is particularly suitable for factories, warehouses and other structures in which perfect light and economy in cost and maintenance is the prime consideration. Its application to the factory of the Detroit Steel Products Company is here illustrated.

Double flange bars are used for the outside members of the sash, of a special section which is adapted to either brick work or concrete. Only two sections of bars are used in the manufacture of the standard sash, the T-bar for the inner mullions and the double flange for the outer members. The sash is shipped in units, unglazed, and the standard construction is adapted to take standard sizes of glass from 10x16 in. to 12x18 in. panes. One of the important features in the construction of windows or walls of this type is the opportunity for ventilation. Each unit of the sash is readily arranged to carry a tilting inner sash, or two ventilating sections, which open and close together by the same mechanism. In this way, 20 to 30 per cent. or more of the total area can be used for ventilation.

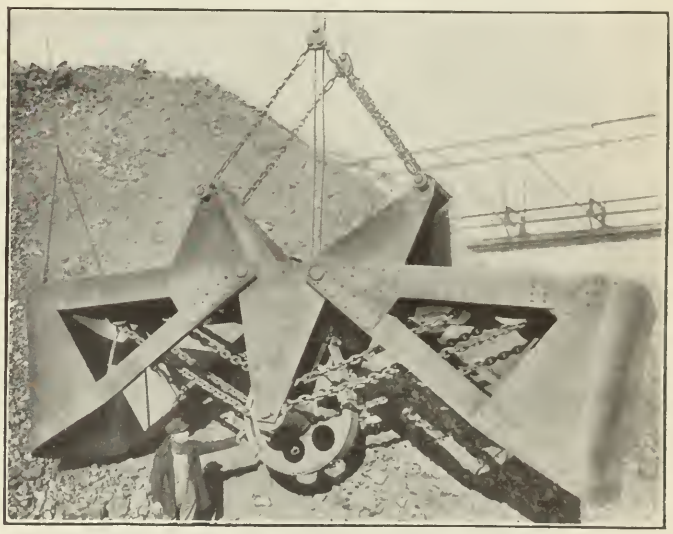
While the cost of steel window sash is necessarily a little greater than wood, the maintenance and depreciation charges are light. If the mullions are kept painted their life is practically indefinite, and even if painting is neglected corrosion does not have the same effect that it would have on sash constructed of sheet steel. The maintenance of windows in a large plant is usually a considerable item of expense.

Light has been found an important factor in efficiency, especially where a large number of operatives are engaged in work which requires constant attention of the eye. A large window area affords the largest possible volume of soft light which does not throw shadows on the work, and at the same time it creates a more cheerful atmosphere for the operatives. An appreciable gain in efficiency has been noted in large plants where the Fenestra system of lighting has been adopted. The perfect ventilation secured by this construction has also been found to have a marked influence on the health of the operatives.

ANDRESEN-EVANS GRAB BUCKETS.

The accompanying illustration of an eight cubic yard grab bucket in operation on a large conveyor bridge on a coal dock at Superior, Wis., shows a grab bucket that has been perfected by the Andresen-Evans Company, Chicago, for handling all kinds of bulk materials, especially coal, crushed stone, gravel and sand, and for excavating and dredging. These grab buckets are made in all sizes, from one cubic yard to eight cubic yards capacity, and for operation with two, three or four lines.

The distinctive features claimed for these grab buckets



Andresen-Evans Grab Bucket.

are: The path of travel of cutting edges and inclination of trays are such as to cause the scoops to dig into, and not out of, the material; the direction of pull of the closing chains pulls the scoops down into the material; the opening is 50 per cent. greater than clam shells. The wide opening is of especial advantage in unloading boats, barges or cars, reducing hand shoveling to a minimum and getting loads where clam shells would not.

These buckets can be used on locomotive cranes, traveling cranes, derricks, dredges, skid excavators, or any equipment having two drums for hoisting, one drum for the closing and hoisting line or lines, and one drum for the hold or dumping line or lines. They are especially adaptable for locomotive coaling stations, in connection with locomotive cranes, and show economy in that the ratio between the dead weight of bucket and weight of material handled is a minimum. The builder reports that in a recent test, unloading a large lake boat, one of these grab buckets averaged 62 per cent. more coal per trip, when taking out the coal directly beneath the hatch, and 71 per cent. more

coal per trip, when cleaning up, than a clam shell of the same rated capacity. They have also been used for stripping work in hard clay, sand and gravel, for concrete mixing plants, and by contractors in excavating for dam sites, sewer work, digging channels, etc. For many classes of excavating these grab buckets, when mounted on long boom excavator machines, will handle material cheaper than steam shovels, on account of the long reach and the ability to dig any required depth, making unnecessary frequent shifts of machinery and tracks.

KENNICOTT WATER WEIGHER.

The Kennicott Company, Chicago Heights, Ill., manufactures a water-weighing device that furnishes a continuous, dependable record of the weight of boiler feed water evaporated. Where a continuous record of the boiler feed water evaporated is not kept there is usually loss of money both in buying and burning the fuel. In a 500-h. p. plant, operating 12 hours per hay, if the saving amounts to only 1½ cents per 1,000 pounds of water evaporated the total will be over $1,000 per year.

The Kennicott water weigher receives water from open heater, standpipe or any other source and delivers it in unit charges of uniform weight into any suitable storage



Kennicott Water Weigher with Storage Tank.

tank. When used in connection with a storage tank, as shown in the accompanying illustration, the supply to the weigher may be regulated by a balanced valve in the inlet, governed by a ball float in the storage tank, which insures that the storage tank is always full of water. A counter registers each unit charge delivered by the weigher and an accurate record of the weight of water is thus obtained.

The wide fluctuations in rate of supply, which are so common in boiler feeding, cause inaccuracy in meters and some other measuring devices. The Kennicott water weigher is unaffected by variations in rate of supply, weighing with equal accuracy whether water is delivered to it at a low or at the maximum capacity of the weigher. Each Kennicott weigher is given a most careful test for accuracy and capacity at the actual temperatures at which it is to be used. Each weigher is assembled and receives an individual test and calibration, the unit charges being accurately weighed on scales, and the exact weight of the unit charge thus determined. A test report and certificate of guaranteed accuracy and capacity accompanies each weigher, which is guaranteed to record the correct weight of water to within ½ of 1 per cent. of absolute accuracy.

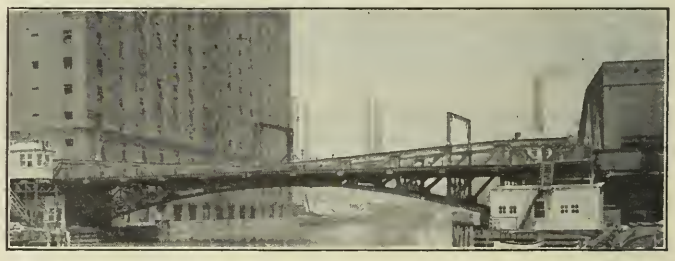
GALVANOMETER TYPE A. C. TRACK RELAY.

The Union Switch & Signal Company, Swissvale, Pa., makes a galvanometer type a. c. relay, designed originally for use on electric roads. When used on steam roads the mechanical construction is the same, the winding only being changed. The two large coils constitute the field winding, which is connected to a local source of alternating current. The moving coil is the armature winding, which is connected to the track. The shaft carrying the moving coil is connected by cranks and a link to a second shaft which carries the contact springs.

To operate the relay it is necessary to have current flowing to both windings, and these currents must be in a certain direction relative to each other. In case direct current flows through the armature it cannot operate the relay since the fields are energized with alternating current. The relay contains no iron in its magnetic circuit, and therefore it cannot be held closed by direct current flowing through the armature after the alternating current has been shunted off. If the polarity of adjacent track circuits is reversed, current coming from the adjacent track circuit in case the insulation joints are broken down, will tend to open the relay contacts. The clearances in the relay are large, and all parts are easily inspected.

STRAUSS BASCULE BRIDGE.

The accompanying illustration shows the Strauss trunnion bascule bridge over the Chicago River on Polk street, Chicago. It is a highway structure carrying a double-track street railway line. It has a clear span 140 ft. The bridge is of the cantilever type, with the exception that there is no anchorage, the lower end of the bottom chord coming to a bearing on



Strauss Bascule Bridge at Polk Street, Chicago.

the front of the pier at a sufficient distance in front of the trunnion so that the live load on the leaf is overbalanced by the total dead reaction on the trunnion. This feature of the Strauss cantilever design contributes materially to the rigidity of the cantilever type and this rigidity is further increased by a motor-driven lock which connects the leaves at the center.

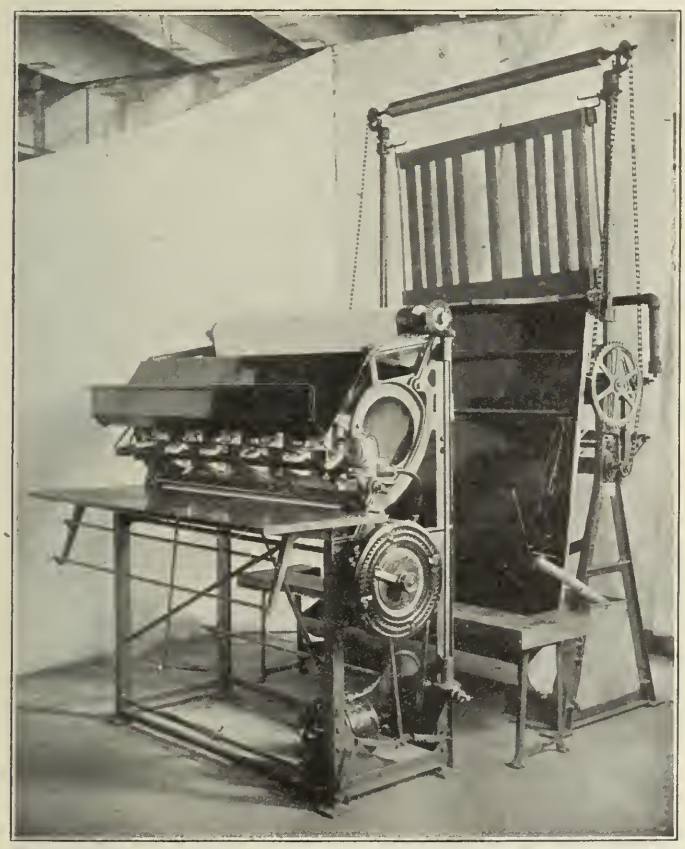
This bridge is the first deviation of the city of Chicago from its standard type of trunnion bridge. The design originally selected for this crossing cuts off one of the tracks of the Chicago Great Western on the east side of the river, and, as a result of a suggestion by the railway company, the city took up the question of finding a design which would leave this track unchanged and still give the full width of clear channel without exceeding the appropriation provided for the construction.

It was found that the Strauss design fully met these requirements, the cost being about $24,000 less than the city's

own type, and the city, therefore, contracted with the Strauss Bascule Bridge Co., Chicago, for the plans and royalty. The structure has now been in service about nine months and has given excellent satisfaction. This bridge, and also the Strauss bridge at Kinzie street, on the Chicago & North Western, can now be seen in operation.

PEASE STANDARD CONTINUOUS BLUE PRINTER.

The tendency on the part of manufacturers and railway engineers toward the use of smaller blue prints for shop use has induced the C. F. Pease Company, Chicago, to introduce a small continuous blue printer. The illustration shows the Pease standard continuous blue printer for tracings up to 30 in. wide, with only three arc lamps of low amperage. The 24-in. machine uses but two arc lamps and has a capacity of fifty to seventy-five 24-in. x 36-in. prints per hour, or double that quantity of 18-in. x 24-in. prints, which fulfills the requirements of many manufacturers, while to those desiring a larger output or larger prints the



Pease Printing, Washing and Drying Machine, with Gas Dryer.

machines can be furnished in any width up to 54 in., the number of lamps depending on the width of the machine. The 24-in. printer occupies no more space than a small drafting table and can readily be placed in a corner of the drafting room, as it is almost noiseless. This printer will compare favorably in price with the vertical printer and occupies no more space, while it is always ready for instant use and no time is lost in loading and unloading. All tracings are fed over the feeding table, on top of the sensitized paper right side up. The printer may be used for printing either from sheets or rolls as desired. The paper and tracings are carried down past the bent glass by an endless canvas belt and drop into the tray below, as shown in the cut, from which they can be taken out by the operator from the front of the machine. Any width sheet up to the width of the machine can be printed and the prints can be made up to the width of the machine and the prints can be made any length in one place. It is possible also to print any portion of a tracing without running the entire tracing through. With one of these printers it is possible to connect at any time with the Pease automatic washing and drying machine and the Pease direct white print apparatus, equipping the operator to print, wash and dry by one continuous operation, doing away with the time and labor consumed in washing and drying, and producing prints free from stick marks or distortions.

Where space is too limited to warrant the installation of an automatic washing and drying machine in connection with the printer, much room can be saved by the installation of a Pease sheet washer instead of a flat tray and the necessary drying rods. These sheet washers are placed against the wall and the washing and drying apparatus takes up no more room than a radiator, while it is possible to wash all sizes of prints up to 42 in. x 72 in. This also avoids wet or sloppy floors, as the prints are washed with a spray of water which passes off into the drain pipe. Thus only fresh water is used and better prints are obtained. This sheet washer is illustrated herewith. These machines can be seen in operation at the Coliseum, sections 161-162.

NO. 28 MOTOR CAR.

About the time the first automobiles were brought out, Fairbanks, Morse & Co., Chicago, began to make gasoline motor cars for railway service. The first cars built were like the first automobiles, rather crude and cumbersome, but they did run and were the basis on which to work for perfection. In those days the problem of obtaining a good combustible mixture of gasoline and air was one of the



No. 28 Fairbanks-Morse Motor Car.

most difficult to overcome. All kinds of mixing valves and carburetors were tried and used, but the automatic float-feed type had not been perfected. The first Fairbanks-Morse motor cars were equipped with a large galvanized iron shell, inside of which was a fine wire gauze over which the gasoline passed. The air drawn through this shell evaporated the gasoline on the gauze, forming a mixture which could be exploded when drawn into the cylinder, compressed and ignited by a spark. The spark was produced mechanically, which called for complicated moving parts to wear out and get out of adjustment. Now all this is changed. The most highly perfected automatic float-feed carburetor is furnished on all cars and the jump spark system of ignition employed.

This company has developed cars to meet the needs of

all the officers of a railway for rapid and convenient transportation over the line. The superintendent's car is, of course, of the automobile type, having comfortable seats for long trips and is usually operated on train orders, being too heavy to lift off and on the track readily. For other railway men, track supervisors, bridge inspectors, signalmen, linemen, etc., smaller inspection cars have been designed, having a carrying capacity of two or three men, but with the weight kept down so that one man can remove them from the track.

The No. 28 car exhibited by Fairbanks, Morse & Co. is their latest car of the light type and after a year's testing and experimenting is being offered to railway men this spring. It has several new and interesting features. The frame is all steel, pressed to shape, all boring being done by jigs at one time, insuring interchangeability. The engine is of the air-cooled, two-cycle type, which eliminates all valves, pawls, cams, sprockets and chain. It is direct connected, one on each side, to the front wheel axle, which is in reality the crank shaft. Cylinders are enclosed and cannot be damaged by dirt or sand cutting them. Lubrication is an important feature, the oil and gasoline being mixed before they are placed in the gasoline tank. This mixture passes from the carburetor into the crank case, then into the cylinder, insuring a positive and automatic lubrication system, which stops when the car stops. Two switches are provided so that one cylinder can be cut out entirely, with no waste of gasoline, as the intake pipe is fitted with a valve to cut off supply of gas to either cylinder. The car's speed is from 8 to 30 miles per hour under absolute control of the operator.

THE WATERPROOFING OF THE BRANDYWINE ARCH ON THE BALTIMORE & OHIO RAILROAD.

In connection with the general work of strengthening bridges on the Philadelphia division of the Baltimore & Ohio, a new double-track stone arch viaduct has recently been completed over Brandywine creek, Wilmington, Del., replacing the pin-connected double-track deck Pratt truss erected in 1882. On account of a general realignment the new structure was built 140 ft. south of the old bridge. The viaduct is 746 ft. long and 114 ft. high from mean low water to the top of the coping. It is composed of a series of seven semi-circular arches, three of 100-ft. spans, two of 90-ft. spans and two of 80-ft. spans, arranged symmetrically about the center. The arches were supported by six piers and two abutments, the center piers being 12 ft. wide at the springing line, while the two piers at the intersection of the 80-ft. and 90-ft. arches were 11 ft. wide. At the outer ends of the 100 ft. arches abutments were built having a width of 17 ft. at the springing line. The entire structure, except the foundations, was built of composite masonry faced with Ohio sandstone.

From the nature of the situation, the work was planned to be distinctly permanent. Consequently, great care was taken to select a waterproofing material to protect the structure from the damaging action of water and frost. Because of the high fill over the structure any repairing to the waterproofing would be very expensive; also it was necessary to use a method and a material sufficiently adaptable in its make-up and application to be flashed into the sharp angles and over the steep slopes readily with no danger of forming air pockets or bad joints. To meet these conditions the following specifications were drawn up:

"On the clean and dry surface of the concrete there shall first be applied, with brushes, a coating of Sarco concrete primer, which coating, as applied, shall be thin enough to penetrate the recesses of the concrete, forming an anchorage for the subsequent waterproof coating. After the priming coat has been allowed to dry there shall then be applied, with mops, a heavy coating of Sarco No. 6 waterproofing, which has been heated to a temperature of 450 deg. F., and while the material is still hot there shall then be introduced a layer of 8-oz. Open Mesh Burlap, all carefully laid down and free from folds or pockets. The surface of this burlap shall then be heavily mopped with waterproofing and two more layers of 8-oz. Open Mesh Burlap laid in the same manner, making a 3-ply burlap waterproof mat, all thoroughly saturated, cemented and bonded together and to the concrete with waterproofing. While the final swabbing coat is still hot it shall be sanded with Torpedo sand to a walking surface."



Applying the Waterproofing.

In doing the work a 3-ply waterproof mat was first laid over the tops of the arches, into the valleys between the crowns of the arches and up the parapet walls as high as it was possible without the use of staging, the strips of burlap being laid lengthwise of the bridge. The mat was then applied to the parapet walls, the strips being laid perpendicularly up the walls and lapping over that portion already laid lengthwise of the structure. Painters' platforms slung from rails laid from coping to coping were used in applying the mat to the parapet walls. In the valleys between the crowns of the arches the height to the coping was 25 ft., making it necessary to use two sets of staging. The top edge of the waterproof mat was sealed in the recess left under the coping by filling the recess with pure Sarco No. 6 waterproofing, the material being held until cooled by a clay stop. This seal was then plastered over with cement grout to carry the water from the coping out toward the center of the bridge.



The Brandywine Arch.

The drainage of this arch structure was in the valleys between the crowns of the arches, downspouts carrying the water to deep holes leading out of the masonry piers. Great care was taken to flash around the drains to obtain a per-

fectly tight seal. After the completion of the waterproof mat a 2-in. layer of concrete was laid over the crowns and valleys of the arches and part way up the side walls, to protect the mat from mechanical injury, due to the dumping of the filling material, consisting of dirt, cinders, quarry chips and clay, from the level of the top of the coping. On completion of the fill the structure was ready for the track-laying.

The care taken in this work is an example of the advance made in the design of permanent structures and a recognition of the fact that in order to be permanent a structure must be waterproof and thus be free from all decompositions resulting from the presence of water in the masonry or concrete.

The waterproofing work was at all times directly in charge of the Standard Asphalt & Rubber Co., Chicago, Ill., and under the direction of one of its engineers. It was under the supervision of the following officers of the Baltimore & Ohio: A. W. Thompson, chief engineer; W. S. Bouton, bridge engineer; J. T. Wilson, district engineer; F. W. Strouse, assistant engineer and J. G. Teders, resident engineer on the on the ground. Charles A. Sims was the contractor for the construction of this arch.



Construction Work Under Way.

FIREPROOF COALING STATION FOR ELGIN, JOLIET & EASTERN.

The Elgin, Joliet & Eastern has recently had built at its roundhouse at Waukegan, Ill., a new fireproof structural steel locomotive coaling station, which is illustrated herewith.

The station has a storage capacity of 100 tons of bituminous coal and 8 tons of dry sand, and is designed to coal and sand locomotives on two tracks. The coal is brought to the station on the receiving track at the rear of the plant in hopper bottom cars and dumped into a 26-ft. concrete receiving hopper. The rails of this receiving track are supported over the hopper on 24-in., 80-lb. I-beam girders. The track hopper is lined with 1 in. of neat cement, sidewalk finish, with well-rounded valleys to the measuring feeder. This method of lining track hoppers has proved more successful than wood plank lined with steel, which will eventually rot out.

The coal from the receiving hopper flows by gravity into a Barrett revolving measuring feeder, which measures 1½ tons of coal and discharges its load automatically into the elevating bucket, preventing overflowing of the bucket and flooding of the pit. This device is so designed that when in the act of discharging a measured quantity of coal into the elevating bucket, it closes the opening in the track hopper as an undercut gate. As the bucket is elevated, the revolving feeder automatically rotates back into its original position, opening the gate in the receiving hopper; and it is then in a position to receive another measure of coal. It rests in this position until the returning empty bucket descends and is again filled from the feeder.

This plant is designed to elevate 40 tons of coal per hour with a single bucket balanced with counterweight. The bucket elevator is operated by a 15-h.p. General Electric motor, taking 3-phase, 60-cycle alternating current at 220 volts, and equipped with solenoid brake, circuit breaker, special controller with Hatch limit switch, a device to cut off the current and stop hoisting when the bucket is carried beyond the discharge point by a careless operator. This device makes the station fool-proof. The motor is directly connected to a 15-h.p. reversible hoisting drum.

The round tank receptacle of the pocket which holds the coal is made of $\frac{5}{16}$-in. and ¼-in. steel plate, properly reinforced with a plate girder at the base to prevent distortion. The balance of the station is of structural steel, the columns being of built-up angle and plate construction.

The hoist house and canopy over the tower are covered with corrugated steel. The entire structure rests on concrete foundations, and the bucket pit is waterproofed.



Coaling Station at Waukegan, Ill.

The contract for this complete "counterbalanced bucket" plant was awarded to the Roberts & Schaefer Company, Chicago, the original promoters of the Holmen balanced bucket type locomotive coaling station.

A small operating model of the coaling station described above may be seen at this company's exhibit in the Coliseum, spaces 78 and 97.

BRIDGE FOUNDATION WORK.

The Missouri Valley Bridge & Iron Co., Leavenworth, Kan., is now building a bridge across the Sacramento river at Sacramento, Cal., for the Northern Electric Company. At this point it was necessary to resort to pneumatic caisson methods. One of the caissons was constructed on a barge and then moved into place, as shown in the accompanying photograph. With some of the other piers it was possible

to build the caissons on shore and then float them into position.

In addition to the usual run of smaller work this company has recently completed the construction of new concrete piers extending 70 ft. below low water by the pneumatic process in connection with the rebuilding of the



Building Caisson, Sacramento River Bridge of the Northern Electric.

bridge of the St. Louis Southwestern across the Arkansas river at Rob Roy, Ark. This company also had charge of the reinforcing of the Pecos viaduct across the Pecos river in Texas on the line of the Southern Pacific, and it recently took a contract for a number of deep foundations for the National Railways of Mexico.

STEEL WATER TANKS.

The accompanying cut of water tanks on the Pennsylvania Railroad at Charleroi, Pa., shows the difference in appearance between wood and steel tanks. The steel tank shown is one of the patented tanks built by the Chicago Bridge & Iron Works, Chicago. Its special features are the elliptical bottom and the large riveted steel riser pipe

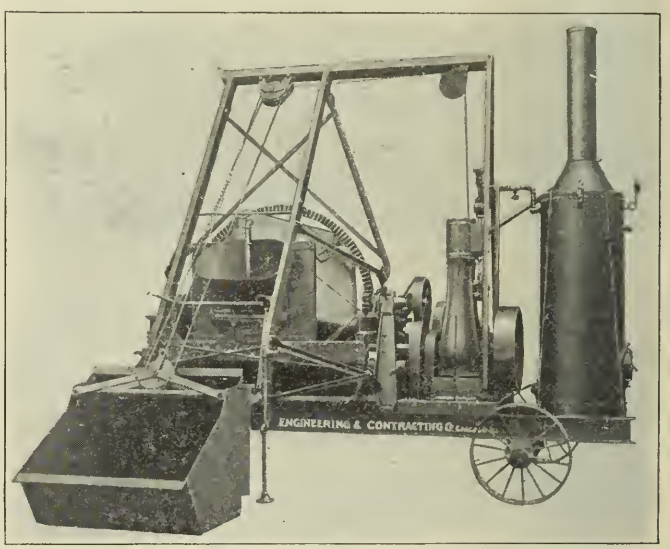


Water Tank on Pennsylvania Railroad at Charleroi, Pa.

or mud drum. The mud drum is made of sufficient diameter to prevent freezing, thereby eliminating the need of any temporary wooden frost casing and putting the tank into the class of permanent structures. The mud drum also acts as a settling basin and is equipped with a wash-out valve at the bottom so that sediment can be washed out at any time without interrupting the service of the tank. The elliptical bottom not only does away with the excessive weight of an I-beam platform but it also makes all the tank plates readily accessible for inspection and painting. At the same time the head to be pumped against is no greater than for the ordinary flat bottom tank. Tanks of this design are in use by 28 of the railways of this country, in capacities up to and including 500,000 gallons, while the builders claim that such tanks can be built in capacities of over 1,000,000 gallons.

CONCRETE MIXER CHARGING ELEVATOR.

Loading concrete mixers by hand labor has long been regarded as an expensive method, especially on small jobs, where it was necessary to move the machine frequently, requiring the building of a platform runway at each setting of the mixer. To eliminate this the Municipal Engineering & Contracting Company, Chicago, has constructed a large elevator to be used in connection with its Chicago improved cube mixers. This elevator has an important feature of special value in railway work, in that it requires no ground supports, and it is, therefore, immaterial whether the surrounding surface be higher or lower than the ground on which the machine is located. Another advantage is that such an elevator offers no extra difficulty in moving the mixer. The elevator consists of a double track, or guides, set at an angle and firmly attached to the mixer



Chicago Improved Cube Mixer, With Elevator.

frame. On this track is mounted a traveling carriage and a bucket of sufficient capacity to hold an entire batch. The bucket is filled within 12 in. of the ground and drawn to the top by a cable wound on a hoisting drum, which is also attached to the mixer frame, and the operation of the hoist, attending of the engine and charging and discharging of the mixer are all performed by one man. When it is desired to lift the bucket, or hopper, the hoist is started and the bucket rocks over until guide flanges on either side engage the supporting rails of the carriage; and in this position it is carried erect to the top of the elevator, when the door in the bottom is released, instantly discharging the entire batch into the mixer. The hopper is then immediately lowered to the ground to be refilled while the batch is being mixed, and, since the mixer is in constant operation and the charging and returning of the bucket to the ground require but a moment, no time is wasted. All the heavy work of elevating the material is done by the machine and consequently fewer men are required.

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It does seem as though a great deal of time and energy are wasted in some sessions of the Maintenance of Way Association in discussions of the Manual. One is at times reminded of the chronicle of the proceedings of the French Academy, which, for the past hundred years, have read: "The Academy held a session last evening. They were engaged upon the dictionary." No one expects the dictionary to be finished. So to some it seems the chronicle of the proceedings of this association might read: "The association met. They were engaged on the Manual." The Manual is very valuable, but, after all, is only recommendatory and carries no obligation to use it, and much of the time spent in its compilation might well be more profitably employed in discussing some of the really excellent work that has been done in committee. For instance, to ignore such an important and masterly piece of work as the impact tests and spend time in discussing the verbiage of a proposal regarding the unloading of material looks like subordinating what is very important to what is relatively unimportant. It is not possible that all of the knowledge on a subject is embodied in the reports, excellent as they are, and even if such were the case, it seems as though the association ought at least to extend the courtesy of a discussion to those who have done such good work. The association in giving so much discussion to the Manual is apt to deprive its members of golden opportunities for personal and professional improvement.

The statistics recently published, giving the production of rails in the United States for 1910, are of much interest as indicating a gradual change in the composition of the rails being rolled. While the production of all kinds of rails for the year did not reach that of the maximum year 1906, when nearly 4,000,000 tons were rolled, the total was 3,634,029 tons, an increase of 20.1 per cent. over 1909. Of this 1,715,900 tons were of open-hearth steel, as compared with 1,256,674 tons of this steel rolled the previous year, or an increase of 36½ per cent. The tonnage of special alloy steel rails rolled in 1910 amounted to 200,621, of which 195,408 tons were titanium and 390 tons were manganese steel, as compared with only 50,724 tons of all kinds of special alloy steel rails rolled in 1909, or an increase of over 330 per cent. The amount of Bessemer rails rolled last year reached a total of 1,917,900 tons, or an increase of but 8½ per cent. over 1909. These figures indicate the growing dissatisfaction with the Bessemer rail, which has been rolled during recent years, and the growing realization of the necessity of securing some other steel. While but little of the open-hearth or special alloy rail has been in track long enough for reliable data to be secured concerning their service, the unsatisfactory service of the Bessemer rail is fully known. The necessity of getting a better rail is so pressing that the railways are more than usually willing to investigate new materials, and the very great increase in the rolling of special alloy steel rails has an instructive bearing on this phase of the subject. Largely untried as they are in service, this increase of over 300 per cent. in their manufacture shows how strong is the feeling of the railways that they must get some other and better material. In spite of the increased cost, they are willing to pay the price for these newer rails, in the hope of getting really satisfactory steel. The original cost of the rail is but a proportion of its total cost. The greater danger of accident, together with the increased vigilance and patrol they make necessary, and the greater cost of replacement their use involves, all tend to offset the lower initial cost of inferior rails.

While the committee on economics of railway location was largely unable to accomplish the work it set out to do during the past year, an investigation which bears promise of giving very important results has nevertheless been carried on under its supervision in the study of train resistance on the Baltimore & Ohio. When the data secured in these tests is worked up and the results published, they will undoubtedly bring out some very valuable facts. Work of this nature is of the greatest importance to the railways, as it directly affects the actual cost of the conducting of their main business—the transportation of traffic. Tests were carried on to ascertain the resistances of trains under various speeds and also in starting after long and short stops. From these studies, as well as from the results of investigations reported last year, it appears so far that the resistance varies but little for changes in speed between 5 and 35 miles per hour. The effect of stops, both long and short, on train resistance has been but lightly touched on as yet. This offers an important field for further investigation, for the starting resistance may be the limiting factor in determining tonnage rating. The question has been raised as to what is the lowest rate to which it is practicable to reduce the gradient. A more thorough investigation of this initial train resistance will largely help in answering this question. In discussing these tests, Mr.

Begien described one test with a freight train leaving the Newark, Ohio, yard of the Baltimore & Ohio, where a pusher was necessary to start the train out of the yard. The resistance reached 20 lbs. per ton and did not fall to the normal until the train had been out of the yard about two hours. As a result of this test, in the construction of new yards at two different points the Baltimore & Ohio has reduced the grades below the ruling grade for some distance out of the yard to equate for this initial resistance, since it is especially important that the trains move readily just out of the terminals. This indicates another important point to be considered in laying out grade line.

THE MANUAL AND CURRENT PRACTICE.

The question is worthy of the serious consideration of the association whether too many details of methods and structure are not being adopted as recommended practice and, as such, put into the Manual. The American Railway Engineering and Maintenance of Way Association is the great authority on all matters pertaining to railway engineering and maintenance of way in North America. Its word is generally regarded—and properly so—as the last word on all the subjects with which it deals. When it adopts anything as recommended practice, it is bound to be generally assumed—whether the association desires it to be or not—that this has been done, not merely because the association regards the thing in question as good practice, but because it regards it as the best practice. This being true, it would seem that only those things should be adopted as recommended practice which the association regards as (1) of very material importance, and (2), not as the best ideal practice, but as the best practice that will be practicable under the actual conditions with which railway engineers have to deal to-day.

Now, in many cases the association has not conformed to this rule. It has adopted, and still is adopting, numerous things as recommended practice which are of relatively minor importance. It also has adopted as recommended practice numerous things, which, if we may judge by the action of a great majority of the roads, are not regarded as improvements or essential. Numerous methods and devices have been recommended in the Manual which were being used at the time by only a small minority of railways, and which were not subsequently adopted by any considerable number of them. Now, in these cases one of two things has been true: Either the practice recommended has not been widely adaptable to the actual conditions with which the railways have to deal, or the railways have been greatly at fault in not making their practice conform to them. Suppose an accident happens which can, by any stretch of the imagination, be attributed to the use of a method or device which has been employed contrary to the judgment of the association as expressed by the Manual, but some person who is injured sues the railway concerned for damages. It may very well be that the method that has been employed or the device that has been used is actually more expensive and better than the recommended practice, but juries know nothing about these technical matters, and the introduction of evidence showing that the practice on which the association had set the seal of its approval had not been conformed to would in most cases be enough to cause the road to be mulcted in damages. Again, government regulation is rapidly being extended to every detail of railway operation. When the legislatures and commissions decide to do some regulating of construction and maintenance they naturally will turn to the Manual for light on what requirements they shall impose. They have a right to assume that whatever the association has recommended as standard is both good and entirely practical; and the railways are apt to wake some morning and find that they have been required by statute to do certain things at once, and at great expense, which have been set up merely as high ideals to be aimed at and which those who recommended them expected to approach only gradually and did not expect to be attained for years.

It is not intended to imply that there should be any hesitation about adopting as recommended practice any method or device which is of first-rate importance and which experience has shown to be desirable. Standards regarding numerous matters are very desirable, because when many railways buy standard articles the makers can turn them out at relatively low cost to themselves and at relatively low prices to the purchasers. For example, there should be great insistance on a high standard of recommended practice for the manufacture of steel rails, bridge timber, cement, etc., and a stronger insistence than there has been in the past on the manufacturers making such materials and supplies according to specifications. But is it not a mistake to specify one location of a freight house with reference to the tracks as preferable to any other arrangement, and to specify a platform on the track side, when local conditions very generally decide what is best and the recommended plan may be entirely unsuited to many locations? Again, the Committee on Water Service recommended the dome roof for specification for wooden water tanks, whereas this is but one of several styles of roofs that are equally good. It would seem that in such cases as this it would be better to accept the committee's report as information—valuable information, indeed, when investigations have been as thorough as they ought to be, and as many are—but nevertheless, so far as the association is concerned, merely information. It has been suggested that perhaps it might be well to embody such recommendations of committees in a separate volume merely for the information of members of the engineering profession, and include such material as—while important—is not in wide enough use to warrant its being recommended practice. The recommendations of a committee of a half dozen or a dozen members, however able and painstaking, are a very different matter from a recommendation by the united voice of the association. There is nothing to prevent the roads from acting individually on such recommendations; but unless the matters dealt with are of very material and the recommendations entirely practical in view of existing conditions, it would seem that the association itself ought not definitely to commit itself to them.

RAIL SPECIFICATIONS.

Conditions relating to the manufacture of rails to specifications approved by the railways do not appear to be any more favorable or encouraging than in the past two or three years. At the last convention of the Maintenance of Way Association the rail committee reported that as far as was known no railway had purchased rails to specifications during the past two years which were entirely satisfactory. Conditions during the past year have not materially changed, and it is safe to say that 90 per cent. of the roads which have ordered rails have agreed to accept rails made under the steel manufacturers' specification. The Pennsylvania Railroad, the New York Central and the Canadian lines are the principal exceptions, and these roads, after some degree of stubbornness in insisting on rails made to their own ideas as to specifications, have been able to secure some changes in the right direction.

The principal feature of the American Railway Association

specification, which is the cause of dispute with manufacturers, and which has not yet been accepted by them, is the clause requiring all test pieces which do not break under the drop to be nicked and tested to destruction, and steel manufacturers are not yet willing to permit the rejection of rails which are shown to have physical defects revealed by this opportunity to examine the structure of the broken test pieces. It has been already demonstrated that good rails can be made having either the A or B section, but the adoption of these sections is not sufficient to secure the manufacture of sound rails, and the principal difficulty now is to eliminate mechanical defects due to poor methods in the manufacture of the steel ingots. The work which has already been done by some of the railways in having rails nicked, broken and tested to destruction has furnished abundant proof that some defects which are found in these test pieces sooner or later appear in an exaggerated form in the broken rails.

Rail failures, as revealed by records relating to rails of recent manufacture, may be divided into two classes; first, those in which the rail is completely broken in pieces, indicating a brittle steel; and, second, those in which the head is crushed or split. The former are caused by irregularity in the composition of the steel, due to carbon and phosphorus much higher than the specifications, which produces brittleness. The defects in the head are mechanical ones, which can be traced back to segregation, dirt and gas in the ingots which, rolled out into the head, still remain as seams which are not completely closed up. Rails having a composition showing too much carbon and phosphorus should be detected under the drop; and if they are not, the drop should be adjusted so that it will detect such defects, and a sufficient number of test pieces made to discover the brittle rails in any heat. The defects of most rails which fail on account of crushed and split heads could be detected by a stricter enforcement of the specification requiring an inspection of the fracture after sample has been nicked and broken.

The use of carbon up to .83 per cent. in open hearth rails, with phosphorus .03 per cent., has resulted in a good wearing steel, but where the carbon is so near the critical point the process of manufacture must be watched more carefully. A good wearing rail can only be made by unusual care in the manufacture of the steel; the problem of making rails free from physical defects, once partially attributable to the rail section, is almost entirely dependent on proper methods in the manufacture and treatment of the steel ingots.

The committee on rail reports only progress in the preparation of a specification, and it thinks it necessary to carry on more tests and experiments before recommending a final specification. Judging from the size of the report on rails this year, there is danger of becoming buried in statistics and accumulating a mass of material relating to steel manufacture which from its mere bulk will render more hopeless a final conclusion as to a proper specification.

Sufficient information is now at hand for the preparation of a specification which, if faithfully followed by the steel works and mills, would produce satisfactory rails, and at a cost which would secure to the manufacturer an ample profit. Most rail defects can be traced in one way or another to rapid manufacture; sufficient time is not allowed for the steel to settle in the ladle or for it to soak to a uniform temperature in the pit, and there is also too rapid reduction in the rolls. The time element is the most important one which needs adjustment. It is unfortunate, therefore, that the past few months have been virtually wasted in the output of rails, and the year's requirements will be turned out in six months at high speed with no improvement in quality. If the orders could be so placed that the mills could be operated steadily on a smaller output per day and at a slower rate in all processes of manufacture, the quality of the product would improve and many of the defects which are now shown up with such apparent satisfaction by some investigators would disappear.

The advantage of slower methods in rail manufacture is shown by the results obtained in the countries north and south of us. In Canada and Mexico, where the converters are not on such a grand scale or the mill machinery so ingenious and powerful, the quality of the rails produced is much superior to the average rail made in the United States.

The roads represented in the American Railway Association could do more toward securing improvement of American rail manufacture and reduction in the number of defective rails by giving the mills sufficient orders to keep them running steadily at moderate speed than it will ever accomplish by tests and analyses and the publication of vast tomes of reports on defective rails.

PROGRAM.

(Order may be changed by a two-thirds vote of convention or by time required for consideration of reports.)

Thursday, March 23.

Morning session, 9 a. m. to 12:30 p. m.
Afternoon session, 2 p. m. to 5:30 p. m.
XIII. Water Service.
IX. Signs, Fences and Crossings.
XI. Records and Accounts.
XVII. Wood Preservation.
Special: Grading Rules for Maintenance of Way Lumber.
VI. Buildings.
I. Roadway.
Special: Uniform General Contract Forms.
XIX. Conservation of Natural Resources.
New Business.
Election of Officers.
Adjournment.

RAILWAY PASSES GOOD AT THE COLISEUM.

It should be remembered by railway men that their passes are good for admission to the Coliseum any time during the week. It is only necessary to show them at the door, and separate admission tickets are not necessary.

MEETING OF BOARD OF DIRECTORS.

A meeting of the board of directors of the American Railway Engineering and Maintenance of Way Association will be held in Room 1166 at the Congress Hotel immediately after the adjournment of the convention today.

PROFESSOR PENCE COMING TODAY.

Prof. W. D. Pence of the University of Wisconsin, editor of the Proceedings of the American Railway Engineering and Maintenance of Way Association, is expected to arrive in Chicago in time to attend at least the afternoon session of the Association today. Professor Pence has been in Panama but is trying to get here before the adjournment.

LUNCHEON TO B. & O. MEN ATTENDING THE CONVENTION.

A. W. Thompson, general manager of the Baltimore & Ohio, gave a luncheon at the Congress Hotel yesterday to 50 officers of this road who are attending the Maintenance of Way convention. After the luncheon brief talks were made by Mr. Thompson; Francis Lee Stewart, chief engineer; J. E. Greiner, consulting bridge engineer; Earl Stimson, chief engineer maintenance of way; F. P. Patenall, signal engineer; and Major Pangborn, of the president's

staff. President Willard was in the city and expected to attend the luncheon but was called away by business. Mr. Thompson, in his remarks, urged the Baltimore & Ohio men individually and collectively to take an interest in the work and participate in the discussions of the Association, saying that this would be beneficial both to them personally and to the road. It is an interesting fact that the Baltimore & Ohio has more representatives among the members of the Association than any other railway. Mr. Thompson is among them, being a director in the Association.

STUDENTS VISIT THE EXHIBIT.

Students from the technical schools in and near Chicago are finding the Coliseum a great attraction this week, and many of them are taking advantage of the opportunity there presented to see the latest and best in railway supplies. Northwestern University, Armour, Purdue, Illinois, Wisconsin and Indiana are particularly well represented.

LARGE CROWD AT THE COLISEUM.

The attendance at the Coliseum on Wednesday afternoon broke all records for this year, and compared favorably with even the highest attendance last year. During the latter part of the afternoon, especially, the exhibits both on the ground floor and in the balconies were well filled. The association adjourned soon after 4:00 o'clock, and many of the members went to the Coliseum.

NEW PURCHASING AGENT OF THE NEW YORK CENTRAL.

Sydney B. Wight, purchasing agent of the New York Central & Hudson River, has been appointed general purchasing agent, succeeding F. H. Greene, whose resignation has been announced in the Railway Age Gazette. W. C. Bower, chief clerk in the office of the president, succeeds Mr. Wight, with office at New York.

A MEMBER CRITICIZES ENTERTAINMENT FEATURES OF THE SMOKER.

W. F. Steffens, engineer of structures of the Boston & Albany, yesterday sent the following letter to President L. C. Fritch:

Chicago, March 22, 1911.

Mr. L. C. Fritch, Pres. American Railway Engineering and Maintenance of Way Association,
Chicago, Ill.

Dear Mr. Fritch:—

Following out the policy of the association as to full discussion of the various matters affecting its interests, I should like to present a personal view of the "smoker" held Tuesday evening.

The fundamental idea of the "smoker," so well known in engineering societies, is an informal gathering at which members and their guests may mingle for conversation and light entertainment, with the usual accessories of refreshments and smoking included. The idea of this association incorporating a "smoker" evening is thoroughly appreciated by the members.

As an individual member, voicing, however, the thought of several other members, I wish to emphatically protest against a recurrence of such vaudeville and low-class comedy features as were introduced last night. It savors too strongly of the ten-cent theatre variety, and in the opinion of some is vulgarity at its best. For future "smoker" entertainments I would suggest that if music is to be provided this be of a high class order as opposed to the street band and hurdy-gurdy sort.

For one, I feel that the entertainment (?) of last evening was an infliction that prevented the members from holding conversation as they had expected would be possible from the announcement.

I have expressed my views freely in the hope that they will be received in the same spirit with which sent, and in the further hope that future entertainments will be of a higher order, as suggested.

Yours very truly,

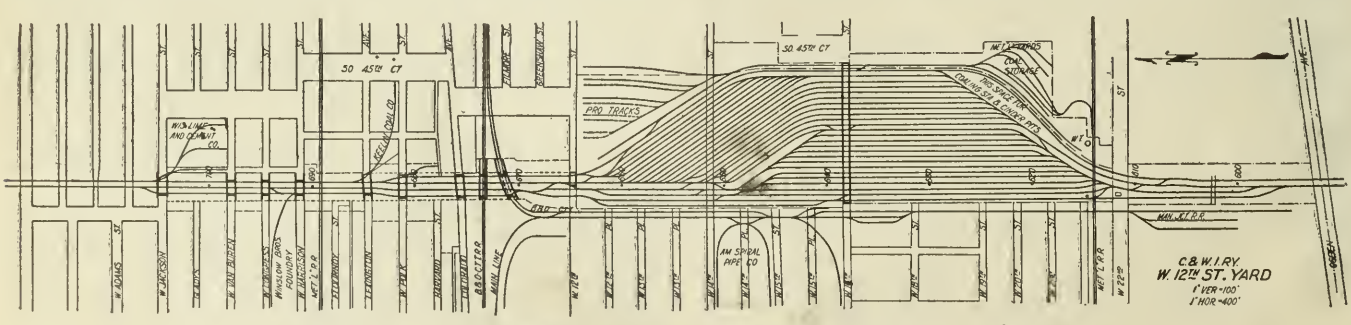
W. F. STEFFENS.

CHICAGO & WESTERN INDIANA TRACK ELEVATION ON FORTY-SIXTH AVENUE, CHICAGO.

The Chicago & Western Indiana is at present completing the work of elevating its Belt Railway tracks between Ogden avenue and Adams street on Forty-sixth avenue, near the western limits of the city of Chicago. The principal work of filling and building abutments for street subways was done during the season of 1910, and only the lining and surfacing of the track, the completion of subway abutments and improvement of the subways remains to be done this year.

This work is on that part of the Belt line which extends from a connection with the Chicago, Milwaukee & St. Paul, near Grand avenue, south on Forty-sixth avenue to Seventy-fourth street. The line has been elevated from its northern end south to Adams street, under the terms of two ordinances, one passed in 1898 and the other in 1902. The line has also been elevated from Ogden avenue to West Twenty-sixth street, provision for this work being made in an ordinance passed September 30, 1882, by the town of Cicero prior to its annexation to the city of Chicago. In addition to the two street subways included in this latter piece of elevation, there is an overhead crossing with the four-track line of the Chicago, Burlington & Quincy just south of Ogden avenue. The work that is now being completed was provided for in an ordinance passed October 22, 1906. It will connect the two sections previously elevated, making a continuous grade on high level from Grand avenue to Ogden avenue.

The Belt line handles a very heavy interchange traffic which requires large classification yards, and to meet the additional requirements in this vicinity a new 23-track yard was built on the new elevation between West Twelfth and West Twenty-



Plan of Track Elevation Work on the Belt Railway of Chicago.

second streets. The accompanying map shows a sketch of the layout of the yard, which is of the "push and pull" type, laid on a level grade. It will have a capacity of 2,000 cars. A water tank, coaling station and cinder pits will be provided at the south end of the yard to care for the switching engines, and switchmen's, car inspectors' and agents' buildings will be provided near West Twenty-second street. The Metropolitan West Side Elevated maintains a coal storage yard adjoining the south end of the Western Indiana yard, coal being delivered from a switching track east of the northbound main track of the Western Indiana. Team tracks are provided at the north end of the yard just south of West Twelfth street.

The building of the yard involved no particular difficulty, as it was only necessary to keep two through tracks open for traffic. A trestle was built from which to start the fill. By shifting the service tracks from one side to the other, the filling was carried on without interrupting traffic. Outside of the yard the method of raising one track at a time and diverting traffic to the other was used. The sand for filling was handled by the railway company in side dump gondolas from Dune Park, Ind., a distance of about 50 miles. The total fill amounted to about 700,000 yds.

The elevation work included the building of 14 subways, two of which were for steam railway crossings, one for the crossing of the Metropolitan Elevated and one for a private subway at the plant of the Western Electric Company. One of the steam railway subways is to provide for the separation of grades at the main line crossing of the Baltimore & Ohio Terminal Transfer. All clearances in street subways are 12 ft. on streets without car lines and 13½ ft. where surface cars must be provided for. The subways are of the Western Indiana's standard concrete abutment and I-beam type, the only special work being at the skew crossing provided for the Baltimore & Ohio Terminal Transfer "Y" connection and the private Western Electric subway.

CHICAGO & ALTON TRACK ELEVATION IN CHICAGO.

An ordinance was introduced in the city council of Chicago last Monday evening for the elevation of the tracks of the Chicago & Alton from South Albany avenue to beyond Kedzie avenue, Chicago, a distance of about three-quarters of a mile. The terms of this ordinance have been agreed to by both the city track elevation department and the railway company, and it probably will be formally passed at the next meeting of the council. Under its provisions the main tracks must be elevated on a temporary structure at Kedzie avenue by September 30 of this year, to provide for the construction of a street car line. By November 30, 1912, the main tracks must be elevated at Washtenaw, California and South Albany avenues, and all main and yard tracks at Kedzie avenue. While only four tracks are to be elevated under this ordinance, eventually the entire Brighton Park yard will be raised. The estimated cost of the work under the main line, including subways, is $750,000, while $500,000 additional will be required for the elevation of Brighton Park yard.

FROM ALL THE FOUR CORNERS OF THE EARTH.

Some very widely separated parts of the world are represented by men who are attending the meeting of the Maintenance of Way Association. Two of the speakers at the dinner last night were William P. Poland, who is from the Philippine Islands, and Sir Thomas R. Price, from South Africa. Among those who come from widely separated parts of North America are G. A. Mountain, chief engineer of the Canadian railway commission, Ottawa, Ont.; B. A. Wood, chief engineer of the Mobile & Ohio, Mobile, Ala.; R. J. Arey, engineer on the Coast Lines of the Santa Fe, Los Angeles, Cal., and Sherman Smith, assistant engineer of the Grand Trunk Pacific at Earl, Sask.

Proceedings.

The Wednesday morning session of the American Railway Engineering and Maintenance of Way Association was called to order at 9:30 o'clock, by President Fritch.

BALLAST.

The following sub-committees were appointed:

Revision of Manual: F. J. Stimson, chairman; W. J. Bergen, C. B. Brown, Jr.

Completing Physical Tests of Stone for Ballast: F. J. Bachelder, chairman; C. S. Millard, C. T. Brimson.

Proper Thickness of Ballast: H. E. Hale, chairman; J. M. Egan, S. N. Williams.

Review Report on Gravel Ballast: J. M. Meade, chairman; J. S. Lemond, C. C. Hill, G. D. Hicks.

REVISION OF MANUAL.

A few minor changes in wording were recommended.

PROPER THICKNESS OF BALLAST.

Some of the reasons for the use of ballast in track construction are:

(a) To provide drainage which will lead any water that may accumulate away from the ties; or to provide a protection for the subgrade from water, as in the case of cementing gravel.



J. V. Hanna.

Chairman, Committee on Ballast.

(b) To distribute the load from the ties more uniformly over the subgrade than would be done if the ties rested directly upon the subgrade.

(c) To provide a material which can readily be "worked" or tamped in all kinds of weather and which will not materially lose its carrying power or change its position as a result of the action of the elements.

The proper depth of ballast under the ties will depend, among other things, upon the following:

(a) The character of the subgrade: (1) rock, (2) firm material, as firm gravel, (3) soft material, as gumbo; (b) the kind of ballast; (c) the number and size of ties per rail length; (d) the stiffness of the rail; (e) the weight and magnitude of the wheel load and the number of applications in a given period; (f) the cost of materials used in construction of the track.

Character of Subgrade.—If the subgrade is of rock it will not be deformed by wet weather and it will carry all the load that can be put upon it by a timber tie; therefore, the depth of ballast required in this case is only sufficient to provide an equal bearing under the tie and sufficient material for tamping purposes.

If the subgrade is soft, then it is necessary to provide a depth of ballast which will produce as nearly as possible a uniform pressure on the subgrade.

Between solid rock and soft material, such as gumbo, there exists material used for subgrade of various capacity for supporting the load of the track. The softer the ma-

terial used in the subgrade, the deeper should be the ballast (within certain limits), to provide as uniform pressure on the subgrade as possible.

Kind of Ballast.—The required depth of ballast under the tie is not materially affected by the kind of ballast, although it is generally the practice to provide a less depth

Name of Railroad.	Height and Slope of Shoulder. Dist. from Top of Tie to Top of Shoulder.	Width of Roadbed. Slope.	Cuts.	Fills.	Tile Drains.	Remarks.
Baltimore & Ohio	1½ in. 1½ in. 1½ in.	c1½ to 1 1½ to 1 1½ to 1	18 ft. 16 ft. 14 ft.	20 ft. 18 ft. 16 ft.		a Includes hard slag. b Incl. granulated slag. c Slope is being changed from c'rv'd to 1½ to 1.
Boston & Maine	1 in. Bottom of tie	1½ to 1 Curved	19 ft. 5 in. 18 ft.	19 ft. 5 in. 18 ft.		d Roadbed has transverse slope ¾ in. to 1 ft. In wet ledge cuts, depth of ballast is sometimes increased to 2 ft.
Canadian Pacific	Top tie rock Others 1 in.	Curved Curved	16 ft. 14 ft.	16 ft. 14 ft.		e Includes furnace slag.
Chicago & Alton	Top tie rock, bot. gr'v'l	1¼ to 1 curved	18 ft.	18 ft.		f Cinders used in sidetracks only.
Chicago, Burlington & Quincy	1½ in.	Rock 1½ to 1 Others 2 to 1	18 ft.	18 ft.	6 & 8 in. pipe under ditch	g Includes burned clay. Ballast varies from 3 in. in sand to 18 in. in clay.
Chicago Great Western	Top of tie, bot. for cementing gravel	1¾ to 1 1¾ to 1 1¾ to 1	20 ft. 18 ft. 16 ft.	20 ft. 18 ft. 16 ft.		h Includes burned gumbo. Depth of ballast varies from 6 in. to 12 in. with local conditions and variation in volume of traffic.
Chicago, Milwaukee & St. Paul	1½ in. 1½ in. 1½ in.	2 to 1 2 to 1 2 to 1				k Rock used on double and 4 track. Only 4-track section shown; sub-grade had transverse slope ¼ in. to 1 ft.
Denver & Rio Grande	About 1 in. About 1 in. About 1 in. About 1 in.	Curved Curved Curved Curved	18 ft. 18 ft. 18 ft. 18 ft.	20 ft. 20 ft. 20 ft. 20 ft.		m Includes slag and disintegrated granite.
New York, New Haven & Hartford	Top tie rock Others 3 in.	1-1 rock 2-1-others	16 ft.	16 ft.		n Includes chats. Depth of ballast varies with nature of soil.
Pennsylvania	Top rock and cinder 1 in. above bot. gravel	1½ to 1	14 ft. 8½ in.	21 ft. 8½ in.	6 in. C. I. pipe cross drain	* Shoulder is dressed to bottom of tie in cementing gravel.
Rock Island Lines	1½ in. 1½ in. 1½ in.	2 to 1 2 to 1 2 to 1	20 ft. 18 ft. 16 ft.	20 ft. 18 ft. 16 ft.	Cross drain where needed	o Includes slag and disintegrating granite.
St. Louis Southwestern	Top tie rock, bot. sand	1½ to 1	17 ft.	18 ft.		p Includes chats. Depth of ballast varies with nature of soil.
St. Louis & San Francisco	1½ in. 1½ in. 1½ in.	2 to 1 2 to 1 2 to 1	20 ft. 18 ft. 16 ft.	20 ft. 18 ft. 16 ft.		* Variation from standard made account of scant supply of ballast.
Texas & Pacific	1 in. from bottom, top tie rock	1½ to 1 1 to 1 rock	18 ft.	15 ft.		r Kind of ballast not stated. Standard not followed in sidetracks.
Wabash	Top of tie Top of tie	Curved Curved	18 ft. 16 ft.	18 ft. 16 ft.		

Name of Railroad.	Class of Track.	DEPTH OF BALLAST UNDER TIE. Center of Tie—Kind of Ballast. Rock.	Gravel.	Cinders.	Sand.	End of Tie—Kind of Ballast, Rock.	Gravel.	Cinder.	Sand.
Baltimore & Ohio	A	a12 in.	b12 in.	12 in.		a12 in.	b12 in.	12 in.	
	B	9 in.	9 in.	9 in.		9 in.	9 in.	9 in.	
	C	6 in.	6 in.	6 in.		6 in.	6 in.	6 in.	
Boston & Maine	A		12 in.				12 in.		
	Bd		12 in.				15 in.		
Canadian Pacific	A	7 in.	7 in.	7 in.		9 in.	9 in.	9 in.	
	B		7 in.	7 in.			9¼ in.	9¼ in.	
Chicago & Alton		e12 in.	12 in.	f12 in.		e13½ in.	13½ in.	f12 in.	
Chicago, Burlington & Quincy		8 to 12 in.	8 to 12 in.	8g to o12 in.		8 to 12 in.	8 to 12 in.	g8 to 12 in.	
Chicago Great Western	A	12 in.	12 in.	12 in.		13 in.	13 in.	13 in.	
	B	9 in.	9 in.	9 in.		10 in.	10 in.	10 in.	
	C	6 in.	6 in.	6 in.		7 in.	7 in.	7 in.	
Chicago, Milwaukee & St. Paul	A		h12 in.	12 in.			h12 in.	12 in.	
	B		h10 in.	10 in.			h10 in.	10 in.	
	C		h8 in.	8 in.			h8 in	8 in.	
Denver & Rio Grande	A		12 in				12 in.		
	B		10 in.				10 in.		
	C		8 in.				8 in.		
	D		6 in.				6 in.		
New York, New Haven & Hartford		9 in.	7 in.	7 in.	7 in.	k8 & 10 in.	9½ in.	9½ in.	9½ in.
Pennsylvania		6 in.	6 in.	6 in.		7 in.	7 in.	7 in.	
Rock Island Lines	A	m6 to 10 in.	6 to 10 in	6 to 10 in.	n6 to 10 in.	m6 to 10 in.	6 to 10 in.	6 to 10 in.	n6 to 10 in.
	B	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.
	C	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.
St. Louis Southwestern	*	12 in.	12 in.	12 in.	12 in.	13 in.	13 in.	13 in.	13 in.
St. Louis & San Francisco	A	o6 to 10 in.	6 to 10 in.	6 to 10 in.	p6 to 10 in.	o6 to 10 in.	6 to 10 in.	6 to 10 in.	p6 to 10 in.
	B	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.
	C	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.	6 to 10 in.
Texas & Pacific	*	8 in.	8 in	8 in.		9 in.	9 in.	8 in.	
Wabash	A	r8 in. r12 in.				r12 in. r8 in.			

of stone ballast than gravel ballast. (This is probably largely affected by the high cost of stone.)

Number and Size of Ties per Rail Length.—The number of ties per rail length, where the roadbed is soft, materially affects the depth of ballast, for the fewer the ties the greater the weight on each tie, and a greater depth of ballast will be required to distribute the load more uniformly over the subgrade.

Stiffness of the Rail.—The stiffness of the rail materially affects the depth of ballast, for with the stiffer rail the wheel load is distributed over a greater number of ties and therefore the load on each tie is reduced. The unit weight being less, it is not necessary to distribute same as uniformly on the subgrade.

Weight and Number of Wheel Loads.—The greater the weight and number of wheel loads the greater the necessity for increased depth of ballast, so as to distribute the weight on the subgrade as uniformly as possible.

Cost of Material Used to Construct the Track.—From an economic standpoint the proper depth of ballast frequently depends on the cost of the various materials of which the track is constructed; for example, where ballast is very expensive it may be advisable to increase the weight of rail and cut down the depth of ballast.

Dimensions of Ballast Section.—As information a statement is given showing the dimensions of the ballast sections on various railways.

CONCLUSION.

On account of the complicated conditions which govern the proper depth of ballast, the sub-committee feels unwilling to recommend any definite rule for the proper depth of ballast, but offer the above information as a guide to determine the proper depth of ballast where the local conditions are known.

Sub-committee B submitted no report.

Sub-committee D did considerable work upon the subject assigned to it and submitted a report to the general committee, but as the committee deemed it advisable to consider the subject of gravel ballast further before adopting the report, it was referred back for further investigation.

The committee asks that the recommendations contained in the report on the Revision of Manual be adopted.

The committee requests that the other matters assigned to it be referred back for further consideration. Some, if not all, of the members feel that there is much valuable information to be gained by further investigation of the subject of proper thickness of ballast; that independent investigations, with possibly some instrument designed for the purpose of measuring actual pressure transmitted by ballast, can be made with profit.

The report is signed by: John V. Hanna (K. C. Term.), chairman; C. A. Paquette (C. C. C. & St. L.), vice-chairman; F. J. Bachelder (B. & O.); W. J. Bergen (N. Y. C. & St. L.); C. T. Brimson (Q. O. & K. C.); C. B. Brown, Jr. (C. P.); J. M. Egan (I. C.); H. E. Hale (M. P.); G. D. Hicks (N. & St. L. R.); C. C. Hill (M. C.); J. S. Lemond (Southern); J. M. Meade (A. T. & S. F.); C. S. Millard (C. C. C. & St. L.); F. J. Stimson (G. R. & I.); S. N. Williams (Cornell College).

Discussion on Ballast.

The sub-committee on gravel ballast secured at a late hour the results of some extensive experiments, which have been made in Germany, on the proper thickness of gravel ballast, but the translation of the article which gave the results of these experiments was not obtained in time to present as part of the proceedings. We expect to use this at a later date, in connection with the work of this committee. There was a joint meeting of the committees on roadbed and ballast on Monday, at which the committees considered the question of the range of the unit pressure on top of subgrade or bottom of ballast. The sub-committee recommended that the article on "Gravel as Ballast," by C. Brauning, published in the Zeitschrift fur Bauwesen, Vol. LIV, 1904, which Mr. Dawley has translated, be published in the proceedings of the association.

Hunter McDonald: (N. C. & St. L.) Referring to the report of sub-committee A, I see no reason for the insertion of the clause, "it shall be free from dirt, dust or rubbish," especially with regard to dust. Dust will certainly pass through a ¾-in. screen. I think that clause should be amended that it shall be free from foreign matter.

C. A. Morse: (A. T. & S. F.) You might have rock with dust in it that would go through a ¾-in. ring, but there are roads in the country that do not make a practice of screening their ballast. I think that clause would make it the sense of the association that ballast should be screened. Regarding the size of the large ring, I would rather have it 2¾-in. than 2½. I do not think 2½-in. represents the practice at this time.

Mr. Williams: The committee made a very thorough investigation a year ago, to obtain the results of the practice from about 37 different railways throughout the country, and we found that about one-half gave the maximum as stated.

J. M. Mead: (A. T. & S. F.) As one of the members of that committee, I argued against that large-sized stone. It is almost impossible for the section men to surface the track or even smooth it up with 2½-in. rock, and it was my judgment that that size should not be recommended. I would favor changing it to 1½-in., or even smaller.

Mr. McDonald: Does not the manual now provide for sizes of 2½-in. and ¾-in.?

The President: The manual says at present: "The maximum size of ballast shall not exceed pieces which will pass through a screen having 2-in. holes."

Mr. Mead: At the last convention the association approved the 2½-in. stone, but that action was not printed in the manual.

The President: The manual has not been reissued. This is an opportune time to make any change so that it may be incorporated in the new manual.

Mr. McDonald: I move that the wording of the clause regarding the size of the stone, as presented by the committee, be retained, with the exception that the dimension of 2 in. be restored, as it formerly appeared in the manual.

Mr. Morse: I would amend that to reduce the lowest size to ⅝ in., making it 2 in. for the maximum and ⅝ for the minimum.

Mr. McDonald: I think that one of the principal matters to be considered in the purchase of ballast is the question of commercial sizes, and if you get the size down so small as that, you will render the amount of screenings derived from it so small that there will be very little money in getting out the ballast. I prefer to retain the sizes as 2 in. and ¾ in.

Prof. Williams: The committee would like to have an expression of the members on this point.

W. H. Courtenay (L. & N.): I express the opinion that the 2½ in., as specified by the committee, should remain.

M. L. Byers: (Mo. Pac.) I think you can separate the stone-ballasted track into two classes, the first being the track for passenger service. In that case you want a clean ballast, the ballast that will give you the minimum amount of dust. There is a great deal of track to which that argument does not apply with any very great force. There is much track in which you are not particularly interested in securing freedom from dust, but you are interested in maintaining the permanence of the position of your track. We have been obliged to do considerable reballasting work on a lot of track which was evidently ballasted with broken stone. I think the specification as to the upper limit probably was that the stone must go between the ties. Now, in that condition, the track is very hard to maintain, and it is hard to get any accurate surface on the track, and yet by filling that track in with smaller material and raising it sufficiently to put the coarse rock down below the bottom of the tie, we have practically formed a macadam surface, in which the ballast below the bottom of the tie has become practically a solid mass, and above the bottom of the tie, and, perhaps, for an inch below the bottom, we have a fine material, which can be cheaply worked. I think it is fairly well known that a man can put in a great many more ties per day in gravel ballast than in sand ballast, the reason being he has a finer material to work with. For track in a soft subgrade, there is no very material necessity for 2½-in. upper limit. Our experience shows that we can use 6-in. stone to very good advantage, provided there is mixed with that 6-in. stone a finer material, just the same as is used in building a macadam highway. That distributes the pressure from the tie to the subgrade to good advantage, and that is one of the principal objects of using the ballast. So I am inclined to think that in our discussion we should keep clearly in view the two requirements: first, the stone ballast for important passenger line, where it is desirable to eliminate dust, and second, where we simply wish to have ballast for the purpose of distributing the pressure from the tie to the subgrade and consequently we want as solid a combined material as we can get.

Prof. Williams: In our investigations we found that the Pennsylvania Lines, the B. & O. and some other roads are using large sizes up to 3 in., and that the lines of great passenger traffic are favoring the larger rock, 2½ and 3 in., and so we did the best we could, and made it 2½ in., instead of 3 in.

Mr. Morse: If we could have ideal conditions, there is

no question we could go from 2½ to 4 in. ballast, but it has not been found practicable to handle it. In the last lift, it is desirable to use fine ballast. As a rule, the larger the ballast used, when the road is first ballasted, the larger the subsequent ballast must be. When you get 2½-in. stone to surface on, you must make a 2½-in or 3-in. lift every time you want to resurface.

Mr. Byers: I think that difficulty can be practically avoided by unloading the ballast in two different unloadings. It means unloading enough ballast to raise the track up to within practically an inch of the final grade, then following that with finer material, unloaded from a center dump, Rodger ballast car, and finishing the raising and ballasting of the tracks with that finer material.

C. E. Lindsay: (N. Y. C. & H. R.) In specifying the maximum size of ballast you add to the cost. The stone that is larger than 2½ in. has to be re-elevated, and again passed through a crusher with additionel waste, and therefore the manufacturer seeks a larger compensation. It would be interesting if the committee would decide what proportion of a given quantity of ballast should be of the different sizes, varying by half inches; how much 2½-in. stone, how much 2-in., how much 1½-in., and now much 1-in. Our stone is not all 2½-in. stone, nor all ¾-in. stone. It is a mixture depending on the sizes and character of fracture of the rock. In my experience with limestone and flat rock, we do not find, with 2½-in. stone, there is any difficulty in keeping the track in first-class alignment.

C. H. Stein: (C. of N. J.) I note the committee says: "Of such size that they will, in any position, pass through a 2½-in. ring," I believe it would be very hard for the rock quarries to produce such stone as would in any position pass through a 2½-in. ring. According to the fracture of the rock, a great deal of it is somewhat slabby, and, while it may have a thickness and breadth of 2 in., it may be 3 or 4 inches long, and you would find a large proportion of the ballast that would not pass through a 2½-in. ring in any position, although it would make good ballast.

Mr. Begien: It should be clearly understood that it is not necessary in the use of 2½-in. ballast to use all 2½-in. stone to raise the track. The section foreman in cleaning out would select a smaller size stone to make a ¼ or ½ in. raise.

W. J. Bergen: (N. Y. C. & St. L.) It is clearly the intention of the present recommendation to eliminate those long pieces. If you specify 2½-in. ring, without saying, "in any possible direction," you are likely to get long, scaly pieces, which will powder and will not make good ballast.

Mr. Osgood: I have very strong doubts whether the 2½-in. stone, which is frequently used for ballast, ever meets this requirement without being much smaller than what we are accustomed to call 2½-in. stone. The difficulty is that in screening the stone, it passes through a screen which has holes of the desired size. There is no possible way of getting the stones so arranged that you will have them in every direction. If you are going to enforce this specification literally, you will not have a 2½-in. stone, but nearer a 1½-in. stone.

Mr. Moss: I move that we change the lower limit to ⅝-in. diameter.

Mr. Stimson: I think it would be a mistake to lower it below ¾ in. We have found that for trap rock and granite ¾-in. is a good minimum size, but for limestone and soft stones, that break up easily, 1 in. gives the best results.

C. C. Cook: (B. & O.) If the minimum size is too small, a great deal of the fine stone will pass through the fork, in cleaning, and it will be loaded with the dirt thrown down the bank. A great deal of ballast is bought by weight. We pay as much for the fine stone as for the large, and we get the use of the stone for two to five years, and it is thrown away.

Mr. Kittredge: A ⅝-in. ring would be all right for trap rock, and very hard stones, but for the majority of cases I think ¾ in. should stand. There are many limestones that are good in the ¾-in. size, which would not be in the smaller size. They would pulverize and become dusty.

Mr. McDonald: I make the point that it was disposed of last year, and we are already on record as having adopted the 2½ in. and ¾ in. sizes, and I don't understand that the committee intended any change at this time in that recommendation, but simply to change the wording of the resolution, how it should appear in the manual. Now to reopen the question of size, I think, before this house, while a discussion is all right, would not be profitable, and if we wish further action we should instruct the committee to further consider it, and not reverse ourselves in this meeting.

The President: Of course the Chair must entertain any motion made by a member to change any previous action of the association. As I understand, the motion is to change the minimum size from that now adopted, to another size.

The motion to change the lower limit from ¾ in. to ⅝ in. was voted upon and was lost.

Mr. McDonald: The words "dust, dirt and rubbish" should be stricken out, and the words "foreign matter" be substituted.

After a short discussion on the wording of the report, the recommendations of the committee were adopted.

ECONOMICS OF RAILWAY LOCATION.

The following work was outlined:

(1) Consider revision of Manual.

(2) Continue the consideration of all questions connected with railway location, grades, lines, and improvement of grades and lines affecting the economic operation with relation to traffic, tonnage, ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections.

(3) Make concise recommendations for next year's work.

Realizing that authentic data with reference to operation of railways was necessary in order to proceed much further with the work as outlined, and knowing the nature of the "walls" with which the railway companies surround their statistics, the chairman of the committee wrote to the secretary on April 6, 1910, suggesting that if the directors and officers of the association, as well as such committee members as could do so, would furnish from their own roads the data required, it would give the committee substantial material to work on. The committee would hold all such information confidential, and in their reports would refer to the roads either by some designating number or letter. The following information was desired: (1) A statement of the percentage to nearest one-hundredth per cent. that each of the primary accounts bears to the total operating expenses, based on the Interstate Commerce Commission's classification of June, 1907. (It is desirable to have this cover a two-year period if possible.) It is particularly essential that the following accounts be subdivided, if possible, in order to make a proper analysis: "Other track material;" "railway and track;" "bridges, trestles and culverts;" "buildings, fixtures and grounds;" and where possible it is particularly desirable that the following be divided between passenger and freight service: "Station employees;" "road enginemen;" "fuel for road locomotives;" "road trainmen;" "train supplies and expenses." (2) Operating expense per freight train mile. Operating expense per passenger train mile. (3) Trains per annum per mile of road; freight; passenger. (4) Approximate average running speed; freight; passenger. (5) Approximate tons train, including equipment; freight; passenger. (6) Number cars per train; freight; passenger. (7) Number pounds coal per train mile; freight; passenger. If fuel oil is used, the quantity per train mile for each class service should be given. The (2) to (7) data should be given for each class of track covered by reports received under clause (1). The committee also needs further information with reference to relative wear of rail on curves, compared to wear on tangent under same traffic conditions. This is essential as one of the elements entering into the value of curvature.

On September 19, 1910, the president sent a letter to each member of the board of direction, requesting that they furnish the desired information. Four replies have been received to the president's letter up to December 13, 1910. Other members of the board may be compiling the information requested. It is certain that nothing of real value can be done by this committee if they are not furnished with sufficient information on which to base conclusions. The work of this committee is vitally connected with the economic operation of railways, and its work must cease if the railways represented in this association cannot furnish the required statistics. Neither can the railways expect members of this committee to devote hundreds of dollars' worth of time to the work if the roads take the position that they do not care to assume the expense of gathering the information. The chairman and some of the members are making such investigation as they may have time for, along the lines of the committee's work, but these are individual studies which cannot extend beyond the narrow field of statistics immediately available. The chairman recommends that the committee be discharged from further study of the question, unless the board considers the

work of sufficient importance to furnish such information as may be required from time to time.

The report is signed by A. A. Shurtleff, chairman.

R. N. Begien: I am sorry Mr. Shurtleff is not here to make a statement to the convention with regard to the failure of the various railways to furnish data for the committee to work on. Up to the present time I believe answers have been received from about seven railways, those being the ones represented by the members of the board of direction. The sub-committee, which had in charge the subject of tonnage rating with respect to economical operation, has conducted certain tests on the Baltimore & Ohio this year to determine train resistance. In order to make those tests final, and as conclusive as possible, engineering corps were organized to run the profiles of the various divisions, which we were to examine. We made, first, tests of passenger trains. There were fourteen runs, aggregating four thousand miles. Then there were 12 runs made of fast freights, with an idea of examining particularly speeds between 20 and 50 miles an hour of freight trains, and after that, about 6,000 miles of slow freight runs were made. We were able to examine the resistance on two divisions only, owing to the time between the finishing of the runs and the time of this convention. On these runs we took observations for coal consumption, water, steam, the train line, position of the reverse bar, and the throttle, and in examining the water consumption, both the calibration of the tank was made and the number of minutes that the injector was in service. We have all of the material for making a very complete report, but it will take considerable time to do it. A year ago the committee reported that on slow freight work but little change of resistance was noted between 5 and 35 miles per hour. After examining the work on our Newark division, between those same speeds, I believe that we are justified in still making that contention. There have been some experiments made during the year which would not seem to bear out that contention, but I believe that on mixed trains containing cars of various weights, it can be safely said that for all practical purposes, there is little change in resistance between 5 and 35 miles per hour. Another point of interest was noted in connection with temperatures. One train was taken out of our yard at Newkirk, Ohio, which had been standing all night. It took two engines to get it out of the yard, although the grade was slightly below the ruling grade. For nearly two hours after the train had started it was noticed that the resistance was high. On leaving the yard the train resistance was about 20 pounds to the ton, and stayed up to that point for half an hour, and it was not until the train went over the summit nearly two hours later, that the normal resistance began to be noted, which averaged very close to what was established in the formula adopted by this convention last year. In fact, I might say that up to date the net results of the experiments have been that the formula published in the proceedings last year, appears to be a fairly good formula for practical use.

The President: The board of direction has given careful thought and attention to this committee, and there is one recommendation which the chairman of the committee made, which the board of direction and the association is not ready to adopt, and that is that this committee be discharged from further study of the question. The members of the board of direction, at least, expect to make every possible effort to furnish information to this committee. Mr. Shurtleff has given a lot of his valuable time, energy and skill to this work, and we are not ready to accept his resignation. I think the association should give this committee all the assistance and support possible in the way of information, because without information this committee cannot carry on its work.

Mr. Kittredge: I want to say possibly in justification of those who have not given the committee the data they desire, that there is really very little information available in actual figures and tests. We all know and appreciate the advantages derived from economic location and changing grades, but very few of us have any figures that we can put into print, showing the actual economics that have been accomplished by changing grades. I appreciate the position of the committee, and yet I do not think it is putting the roads that have not furnished the information quite in the proper light to leave the impression that they have been negligent. We have not been negligent; we have been unable to give it in the way it is wanted.

Mr. Thompson: (B. &. O.): The results of the dynamometer tests which Mr. Begien has mentioned, will be platted up, and the full result and report will be gotten up by the B. &. O., and given to the committee. With due respect to the remarks of Mr. Kittredge, I think some of the roads have not felt the importance of the committee's work, and they probably thought that they did not have any data on this subject. I believe that if each railway would at least recognize the committee's letters, the committee would go farther than they have gone in making an intelligent report. To show the value of one point that Mr. Begien makes, of the resistance of trains out of yards, we are spending on two new yards that we are completing, an additional amount of about $60,000 to reduce the grade out of the yards to give the trains a chance to get out promptly. That point demonstrates how slowly trains move out of the departure yards.

TIES.

Sub-committees were appointed as follows:

Revision of the Manual: E. E. Hart, chairman; W. F. H. Finke, G. W. Merrell.

Statistics: L. A. Downs, chairman; F. G. Jonah, Edward Lass.

Metal, Composite and Concrete Ties: W. F. H. Finke, chairman; H. S. Wilgus, E. D. Jackson, F. R. Layng.

Use of Cypress as Tie Timber: F. G. Jonah, chairman; A. F. Dorley, H. C. Landon.

The sub-committee on revision of the Manual has no recommendation to make for changes in the present version.

Under Appendix A will be found the report of the sub-committee on cross-tie statistics.

Supplementing its previous reports on the subject of metal, composite and concrete ties, this sub-committee presented a progress report. A circular letter was sent to the roads using the various metal and composite ties, and their replies indicate that there has been little change in the condition of these ties from that reported last year, and that these ties are still generally giving satisfactory service. No new type of practical design has been patented or installed.

As opportunity has offered, the sub-committee has examined ties removed from track by sectionmen in the regular work of renewals, and measurements to determine depth of cut were made by means of a straight edge and a wedge-shaped graduated gage. It was found that where ties are not protected by tie-plates the cutting or abrasion of the ties by the rails and the outward tilting of the rails is marked on tangents as well as curves, and adzing of the ties at intervals is necessary on both curves and tangents to maintain the rails in position perpendicular to the plane of the tie. The measurements taken show the maximum cutting of the ties, as all ties examined had been removed from track. From observations and from information obtained, the sub-committee is of the opinion that flanged tie-plates of suitable width and thickness and properly applied on tangents as well as on curved track will lengthen the life of cross-ties from one to two and in some cases three years, and in the meantime the track will have been maintained in better gage, line and surface, and at less cost, than the same track could have been without tie-plates.

CONCLUSION.

The committee presents this report as a report of progress. The report is signed by: E. E. Hart (N. Y. C. & St. L.), chairman; W. F. H. Finke (Southern Ry.), vice-chairman; A. F. Dorley (M. P.); L. A. Downs (I. C.); W. F. Goltra, Cleveland, Ohio; E. D. Jackson (B. & O.); F. G. Jonah (St. L. & S. F.); H. C. Landon (Erie); Edward Laas, Los Angeles, Cal.; F. R. Layng (B. & L. E.); G. W. Merrell (N. & W.); L. M. Perkins (N. P.); H. S. Wilgus (P. S. & N.).

APPENDIX A.

Statistics of Cross-Ties.

The sub-committee issued the following circular of inquiry:

"In endeavoring to collect data relative to statistics of cross-ties, the Committee on Ties has concluded that few railroad companies, if any, have complete or reliable information concerning the life of ties. Most railroad companies have good records of renewals of cross-ties each year, and, in many cases, keep such records by miles.

"It is believed that the approximate life of ties can be arrived at in the case of new track, built within the last ten or fifteen years, the number of ties originally placed in the track being known and also the total number in the whole length of track and the number taken out of track each year.

"During the past ten years you have probably built extensions of some kind, or built new second track, or had grade reduction work where certain kinds of ties,

either treated or untreated, have been put in out of face. It is immaterial if the track is one mile or 200 miles in length. Information of this character is what the committee desires.

"Enclosed herewith is a blank form which can easily be filled out during the year the ties were laid, the number removed each year to date and the kind of ties used, whether treated or untreated.

"Date constructed; between what two cities or towns; state; length of track in miles; number of ties per mile; total number of ties; kind of ties; number of ties used in renewals, according to years, as follows: 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910."

The replies received in answer to this circular have been tabulated and are given in Table 1.

APPENDIX C.

The Use of Cypress as Tie Timber.

The increasing use of cypress as a tie timber has led the committee to make some investigations concerning same, and accordingly a postcard inquiry was sent out to proper officers of all the roads operating in the South Atlantic and Gulf states, where cypress ties are most generally used. The following questions were asked: Number of Cypress ties in track; Dimensions; Kind of Cypress; Red, White, Yellow; Pecky, Clear; Average life; Remarks.

Replies were received from a great many roads giving the information wanted. Several roads replied that they had many cypress ties in track, but had no accurate record, and consequently gave no figures, while a number made no reply. The information obtained is tabulated and published in the appended table.

Discussion on Ties.

Mr. Wendt: I promised the committee to give them some data on the cost of labor in connection with the two experimental sections of track on the Pittsburgh & Lake Erie. This track was originally laid in 1907 and was not resurfaced for fifteen months. In the fall of 1908 both sec-

DATA RELATING TO CYPRESS TIES.

Name of Road	Official Reporting	No. of Ties in Track	Dimensions	Kind of Cypress	Clear or Pecky	Average Life in Track	Remarks
Central of Georgia	C. A. Lawrence, Chief Engr.	1,334,739	7x8x9	Red and black		No accurate date; 10 to 12 years when protected with tie plate.	The number given is the number of red and black cypress ties that have been put in track since 1900, averaging 133,474 per year.
Charlotte & Western Carolina R. R.	A. H. Porter, Engr. R'dway.	440,000	7x9x8½	Red and black		12 to 14 years	White and yellow cypress not used in this section. Will not last more than 2 or 3 years. Tie plates required where traffic is heavy and on curves.
Chicago, Rock Island & Pacific	J. B. Berry, Chief Engr.	None					Think of trying some pecky cypress in Louisiana.
Cleveland, Cincinnati, Chicago & St. Louis R. R.	C. S. Millard, Engr. Track & Roadway	2,200					1,000 on Cairo Division, 1,200 on Vincennes Division in Illinois, been in about 7 years, are in fair condition.
Florida Central Ry	J. H. Davidson, Gen. Supt.	None					We will use red and black cypress after this year.
Florida Railway Georgia & Florida	W. A. Swallow, Ch. Engr. Superintendent,	10,000 20,000		Red Red and white	Clear		O. K. with tie plates. Practically all ties new within last 2 years.
Georgia Coast & Piedmont	T. S. Williams, Roadmaster	50,000	6x8 to 7x10	Red and white All classes			
Georgia Railroad	W. M. Robinson, Roadmaster	30,000	7x8x9	Red, black and yellow	Pecky		Have been in use about 4 years. As cross-tie timber white cypress is of little value.
Illinois Central	A. S. Baldwin, Chief Engr.	2,000,000	6x8x8 7x9x9	Red, black and yellow	Some pecky mostly clear		We find the average of white or yellow cypress ties, if ¾ sap, 2 to 3 years; if all heart, 8 to 12 years; red, 12 to 15 years.
International & Great Northern	O. H. Crittenden, Chief Engr.	200,000	6x8x8	Red and yellow	20% pecky 80% clear	12 years	More than ¾ wear out, life of other ¼ about 12 years.
Louisiana Railway & Navigation Co.	C. R. Mee, Roadmaster	95% of 333 miles	6x8x8 7x9x9	Red		Red, 11 years; yellow and white heart, 8 years.	Cypress is the tie for this climate.
Louisville & Nashville	W. H. Courtenay, Chief Engr.	1,397,915	7x9x9	Red, white and yellow			All laid on divisions south of Montgomery.
Missouri Pacific Railway	M. L. Byers, Chief Engr. M. of W.	100,000	6x8x8	Red and white	Both		Would not recommend using cypress ties unless I could get all heart.
Mobile & Ohio	B. A. Wood, Chief Engr. of Maint.	10,000	7x9x8.5	Red and white	Both		Red and yellow cypress ties are the best, from 2 to 4 years longer than white oak under similar conditions.
Norfolk & Western	C. S. Churchill, Chief Engr.						Up to 1890 this road used large numbers of cypress ties, secured along its line in eastern part of Virginia. We found their life to be from 12 to 14 years. The demand for cypress for shingles, etc., became so great, no longer put on market for cross-ties. We ceased buying cypress for ties in early nineties. Last few years have been using red cypress ties in track in tunnels.
St. Louis & San Francisco	M. C. Byers, Chief Engr. Operation	175,000	6x7x8 6x8x8 6x8x9 7x10x8			10 to 15 years for red and yellow	50,000 red cypress treated ties in Oklahoma, 115,000 red cypress untreated ties S. E. Mo. and N. E. Arkansas. Will outlast oak. White cypress not good. Pecky cypress will last long time but will not hold spikes.

tions were resurfaced, the cost of labor being the cost of track labor.

Three thousand steel cross ties, Carnegie design, with clip and bolt rail fastenings, were placed in northward freight track, McKees Rocks, Pa., in September, 1907, by the Pittsburgh & Lake Erie. These steel ties are laid in a stretch of track 4,400 ft. long. The succeeding 4,400 lineal ft. of the same northward freight track was laid at the same time with new No. 1 white oak ties. New steel rails, 90 lbs. A. S. C. E. section, were laid on these ties, and new limestone ballast was used throughout the entire length of 8,800 ft. of track. The track was originally surfaced in September, 1907, the depth of ballast being about 8 in. Since that time a careful record of all labor expenses in connection with the maintenance of both steel and wooden tie sections of experimental track has been kept. After being originally built and ballasted, these two sections of track were not surfaced a second time for a period of about fifteen months. In November, 1908, both sections were resurfaced, the cost of labor being: Cost of track labor per mile per year where wooden ties are used, $417; cost of track labor per mile per year where steel ties are used, $280. During the following 12 months these two pieces of track were simply patrolled, no labor being expended on either line of surface. In November, 1909, both stretches of track were resurfaced with the following result: Cost of track labor per mile per year where wooden ties are used, $95; cost of track labor per mile per year where steel ties are used, $153. During the succeeding 12 months the track with steel cross ties was resurfaced three times, while the track with wooden ties was resurfaced once, with the following result: Cost of track labor per mile per year where wooden ties are used, $128; cost of track labor per mile per year where steel ties are used, $428. These experimental sections being part of the northward freight track in the four-track system, electric circuits in connection with automatic signals are in use, and it is interesting to know that during the 42 months in which these steel ties have been in use the fiber insulations have given no special signal trouble. The track at the present time is in good line and surface, and while all bolts and clip fastenings on the steel ties are tight, it is a fact that the fiber insulations are considerably worn, and this condition permits the rail to creep in the direction of traffic, which results in the ties being slued. The drainage of this track is good. During 1909, 20 broken angle bars were removed from steel tie joints. During 1910, 18 broken angle bars were removed from steel tie joints. The speed of freight trains at McKees Rocks, where this track is located, averages about 30 miles per hour.

These figures simply represent the annual results in connection with an experiment which has now been in progress three and one-half years. The data is interesting but is not conclusive, for the reason that the relation of the expense in connection with a wooden tie track and a steel tie track varies. In the early days of the experiment, one

DATA RELATING TO CYPRESS TIES—Continued.

Name of Road	Official Reporting	No. of Ties in Track	Dimensions	Kind of Cypress	Clear or Pecky	Average Life in Track	Remarks
St. Louis, Brownsville & Mexico.....	E. C. Burgess, Engr. M. of W.	207,775		Red, white and yellow	Both		
Seaboard Air Line.....	J. C. Nelson, Engr. Maintenance of Way	2,000,000	7x9x9	Red and black	Both		If you are gathering data to get up specifications, I would suggest that you omit the names of different kinds of cypress and simply specify heart cypress. My experience has been that the names are simply local, and that what is known as yellow and red, etc., in one state, may be entirely differeat in another, but the heart of any cypress in any state, no matter what its local name may be, is all right. On the other hand, cypress known as red, black or yellow is worthless, unless it has heart. We get cypress in North Carolina, South Carolina, Georgia, Florida, Alabama and some little in Eastern Virginia. Timbermea in some of these sections will tell you that yellow cypress is all right, and another will say that it is worthless, and after some years' experimenting and groping in the dark, I found that the name cuts no figure, and while along the line of our road we use the names red and black, it really means nothing and we are very careful to specify the heart dimensions.
Sunset Lines, Atlantic System.....	A. V. Kellogg, Engr. M. of W.	5,705,567	6x8x8 7x8x8 7x9x8 7x9x9 8x10x10	White	Clear		
Tampa & Jacksonville.....	F. C. Parrigin, Engineer	7,000	7x9x8.5	White	Clear		These ties have been put in, in last 24 months. Indications are they will last about 4 years.
Texas & Pacific Ry.....	B. S. Wathen, Chief Engr.	2,633,664	7x9x9 6x8x8	Yellow, red and black	Clear		We have not had any cross-ties of this class in use longer than 7 years; believe 10 years about the average life.
Vicksburg, Shreveport & Pacific..... New Orleans & Northeastern.....	E. Ford, Asst. to Prest	175 miles 46,000	7x9x9 7x9x9	Red and yellow Red and yellow	Both	12 years	V. S. & P. Delta Point to Shreveport; 175 miles laid with cypress ties, 2,816 to the mile, only receive red or yellow cypress. Do not object to pecky ties if they are not so pecky as to prevent holding spikes; yellow cypress ties do not last as long as red cypress ties but last considerably longer than pine or oak ties. V. S. & P. has no curvature exceeding one degree; have but little trouble with cypress ties on curves. The cross-ties on the N. O. & N. E. would get too soft and have to be taken out from mechanical wear instead of from decay. Cypress ties on N. O. & N. E. are of poor quality and will not last as long as ordinary pine ties.

Total No. of Ties in Track, 17,780,075.

TABLE I—STATISTICS OF CROSS-TIES.

TABLE I—CONTINUED—STATISTICS OF CROSS-TIES.

Railroad	Kind of Ties	Number	State	Year Laid	NUMBER OF TIES REPLACED FOR THE YEARS 1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
A. T. & S. F. Ry., Olinda Dist.	Burnettized Arizona Pine	11,827	California	1899	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,014	998	1,006	3,202	2,077	2,411	780
B. & O. R. R.	Oak	201,663	Ohio	1899-1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,864	4,276	12,173	22,034	17,071	34,997	.....
Canadian Pacific R. R.	Tamarack	432,810	Saskatchewan	1901	.....	.....	865	2,160	4,320	22,000	41,488	60,936	64,304	59,072	64,825	53,156	37,167	67,086	67,086	.....
Central Railroad of N. J.	Oak, Yellow Pine, Chestnut	4,237,653	N. J. and Penna.	Various	.....	.....	.....	.....	.....	354,018	345,991	347,895	263,922	450,545	403,405	265,617	204,583	297,978	498,942	.....
C. B. & Q. R. R.	Treated Black Oak	40,885	Illinois	1904	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	478	178	761	323
C. B. & Q. R. R.	White Oak	179,534	Illinois	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	105	1,641	1,556	3,256*
C. B. & Q. R. R.	White Oak and Cypress	242,328	Missouri	1903-1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	165	1,021	4,026	15,009	23,520*
C. B. & Q. R. R.	Tamarack, Cedar, Pine	324,774	Nebraska	1905-1906	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,820	33,414	3,225	17,673†
C. B. & Q. R. R.	Treated Pine and Fir	313,808	Wyoming	1906	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,986	586	1,968†
C. B. & Q. R. R.	Treated Pine, Fir, Untreated Pine, Fir, Cedar	430,300	Wyoming and Montana	1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,649	21,607	18,502†
Chicago, Indiana & Southern	Red and White Oak	55,500	Illinois	1899	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13,011	6,971	5,088	5,585	.....
C. M. & St. P.	Yellow Pine	7,500	Iowa	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	695	695	695	695	346
C. R. I. & P.	White Oak	191,700	Texas	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27,608	38,424	22,162	5,782
C. R. I. & P.	Cypress, Gum, W. Oak, Pine	175,500	Louisiana	1907	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19,108	12,431
C. R. I. & P.	White Oak	318,100	Arkansas	1906-1907	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	8,206	17,367	19,350
C. R. I. & P.	White Oak	137,200	Arkansas	1907	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	640	5,216	5,254
Duluth & Iron Range	Tamarack	7,500	Minnesota	1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	460	2,420	2,630
Erie Railroad	Oak	8,665	Ohio	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	615	1,899	250	1,023	265
Ft. Smith & Western	Oak, Yellow Pine	604,300	Oklahoma	1901-1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,090	59,798	116,400	78,655	.....
Ft. Worth & Denver City	Pine	1,433,248	Texas		.....	.....	.....	.....	150,455	149,989	202,075	231,320	100,656	213,808	200,236	130,717	159,432	314,128	318,648	308,907	120,365
Grand Rapids & Indiana	Oak, Cedar	14,117	Michigan	1898	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,750	1,700	600
Grand Trunk System	Cedar	83,200	Canada	1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	800	1,760	2,500
Hocking Valley	White and Mixed Oak	1,075,700	Ohio	1874-76-81	116,400	110,400	135,450	126,311	.....	137,900	152,000	124,700	120,000	135,800	150,000	134,500	126,300	104,000	109,090	155,665
Illinois Central		10,667	Iowa		.....	.....	.....	.....	.....	.....	.....	.....	1,243	.....	1,556	892	1,397	1,809	2,890	1,320
Illinois Central		9,826	Minnesota		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	632	1,376	4,350	3,469
Illinois Central	Chestnut	21,250	Kentucky	1905-1906	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,102	4,137	10,662
Illinois Central	Red Oak	51,200	Tennessee	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82	1,342	458
Illinois Central	Red Oak	22,100	Tennessee	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	257	342	1,899
Illinois Central	Red Oak	38,400	Tennessee	1904	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,350	2,134	1,824
Illinois Central	Red Oak	48,000	Tennessee	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	838	1,469	1,252
Illinois Central	White Oak	351,600	Iowa	1899	.....	.....	.....	.....	.....	.....	88	450	250	5,922	36,073	24,556	16,994	36,232	11,356	42,650
Lake Shore & Mich. Southern	White Oak	369,600	Indiana, Michigan, Ohio	1833-1862	.....	.....	.....	.....	.....	.....	38,196	29,676	33,620	31,496	28,724	33,473	47,253	40,650	64,789	38,000
Lake Superior & Ishpeming	White Oak	57,000	Michigan	1896	.....	.....	.....	.....	.....	.....	.....	.....	3,008	4,464	6,866	9,095	15,106	10,154	6,459	2,758
Louisiana & Arkansas	White and Post Oak	93,900	Louisiana	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	55	65	2,624	12,152	23,828	18,450
Louisville & Nashville	White Oak	24,920	Kentucky	1895	.....	.....	.....	.....	.....	.....	1,200	5,549	3,652	1,487	3,628	3,873	4,825	3,821	2,112	2,479
Memphis, Helena & Louisiana	Cypress, Red and White Oak	236,160	Arkansas	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	400	2,100	86,550	74,175	33,180
Missouri Pacific Ry.					.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Missouri Pacific Ry.	Oak	118,400	Louisiana and Arkansas	1906	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,145	6,725	20,378
St. L. I. M. & S.	White Oak	342,400	Missouri and Arkansas	1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	510	5,384	24,058	39,810
Mobile & Ohio	Oak	646,631	Miss. and Alabama	1897	.....	.....	.....	.....	.....	.....	1,204	8,954	43,951	45,905	43,124	48,904	35,001	69,732	70,248	58,836	56,637
Mobile & Ohio	Pine	646,631	Miss. and Alabama	1897	.....	.....	.....	.....	.....	.....	6,341	12,621	48,131	60,989	54,498	50,092	28,843	24,148	21,649	43,446	14,126
Miss. River & Bonne Terre	White and Post Oak	9,758	Missouri	1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	181	254	233	308	1,532	479
N. Y. C. & H. R. R. R.	Yellow Pine	14,688	New York	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	300	400	200	100	200	100	500
N. Y. C. & H. R. R. R.	White, Rock, Red Oak, Chestnut	150,048	Pennsylvania	1901-1902	.....	.....	.....	.....	.....	.....	.....	2,086	9,201	11,696	15,292	15,296	34,342	30,688	33,886	10,007
P. & R.	White Oak	16,915	Pennsylvania	1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	734	2,806	4,380	5,770	2,200
P. & R.	Yellow Pine	21,805	Pennsylvania	1901	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	210	1,153	1,729	6,340
P. & R. (Little Schuylkill and Navigation)	Oak and Chestnut	5,760	Pennsylvania	1897	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	364	646	1,325	1,475	800	760
P. & R.	Chestnut	2,816	Pennsylvania	1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,876	470
Penna. Lines West	White Oak	127,902	Ohio	1892	.....	.....	.....	10,057	8,973	15,104	17,872	13,389	34,451	10,594	10,870	10,223	9,254	5,230	9,065	9,116
Pgh. Shawmut & Northern	White Oak, Yellow Pine	20,219	Pennsylvania	1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	234	569
Pgh. Shawmut & Northern	White Oak, Yellow Pine	32,256	Pennsylvania and N. Y.	1909	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pgh. Shawmut & Northern	White Oak, Yellow Pine	65,725	New York	1902	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	81	95	953
Rutland Railroad	Cedar, Tamarack, Hemlock, Spruce and Pine	110,880	Vermont	1899-1900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,785	21,506	16,258	10,393	7,647
Texas Midland	Oak	375,000	Texas	1882-1894-96	.....	.....	.....	66,539	51,677	68,725	92,844	40,785	43,764	28,371	40,888	43,464	45,708	56,225	65,206	59,187
T. & N. O.	Hemlock, Cedar and Tamarack	397,440	Ontario	1903-1904	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,390	10,123	35,192	60,925
Uintah Ry.		153,000	Colorado	1904-1905	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	106	498	421	689	2,373
Washington Terminal	White Oak and Yellow Pine	137,000	District Columbia	1904-1906	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,194	3,215

* To August 1st.
† To August 1st. Records prior 1908 destroyed by fire.

character of track could be maintained with a less amount of labor, while in the latter experiment the situation was changed. It is not apparent at this time just what the results will be at the end of the fifth, seventh or tenth year.

RAIL.

The work outlined was as follows:

(1) Consider revision of Manual.

(2) Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

(3) Report on the results obtained from the use of open-hearth and special alloy steel rails, and chemical composition of such rails.

(4) Present reports on the results of tests made in conjunction with the Manufacturers' Committee on the various kinds of rail, made by means of the special machines at the Pennsylvania Steel Company's mill and the Sparrows Point mill of the Maryland Steel Company.

(5) Report on any recommended changes in specifications for steel rails.

(6) Present recommendations on standard rail sections.

(7) Present report on rail joints, showing results of all tests at Watertown Arsenal, and recommend design and specifications.

(8) Reconsider and report any recommended change in standard drilling for rails, as given in the Manual.

(9) Make concise recommendations for next year's work.

REVISION OF MANUAL.

It is believed by the committee that the subject matter on Temperature Expansion for Laying Rails, 1907 edition, page 53, belongs to committee V, Track, and recommends that it be transferred to the chapter containing the recommendations of that committee.

In view of subsequent changes adopted, it is recommended that the Form for Reporting Rail Failures in Main Tracks, M. W. 1200, in the supplement to the Manual, bulletin No. 103, pp. 16 and 17, be withdrawn and replaced by Form M W. 404, Report of Rail Failures in Main Tracks.

The revision of this form was undertaken on account of the suggestion of C. E. Lindsay at the annual convention in March, 1910, that there ought to be a method for indicating the "Gage Side" of the rail, and this deficiency has been supplied by the addition to Question No. 39. At the same time, the numbering of questions was changed to eliminate the letters, and some of the questions were rearranged in what was thought to be a somewhat better order.

STATISTICS OF RAIL FAILURES.

While statistics of rail failures for the six months' period ending October 31, 1909, were published in bulletin No. 121 last year, data from a number of the roads was not received in time to be included. Therefore, the previous work in this bulletin has been included with the data since received in appendix B of this report.

This information is the most complete on the subject ever published. It has been stated by some that they do not believe these statistics furnish any information of value, but the committee believes that a careful study of the information will not warrant this conclusion. There are many hints to be derived from their study, and one of special importance is that differences in the production of ingots and the finished rail made from them may annihilate all advantages derived from any particular rail section. The design of rail section is not, therefore, the main cure for poor material.

EXPERIMENTS AND TESTS.

M. H. Wickhorst, the engineer of tests for the committee, has been conducting experiments and tests under the direction of the committee for the past year, and the results of his work are issued as appendix E of this report. In connection with the eleven separate reports made by Mr. Wickhorst, a statement of the results believed to have been accomplished by this work up to the present time is furnished.

SPECIFICATIONS.

Of course, the principal work of this committee is the preparation of a standard set of specifications for steel rail, and the large amount of data and statistics being published in these reports from time to time by the committee are to enable the members of the association, as well as the members of the committee, to determine upon a set of specifications which will bring about the manufacture of "good steel rails." The subject is a very intricate one and its study carries one back through all the processes of manufacture. It will, therefore, be readily seen that a large amount of time is required for this study, involving, as it does, the making of tests and the carrying on of experiments.

It is believed by the committee that no rails have as yet been purchased under the tentative specifications, but the differences between them and the specifications used by some of the large railroad systems are not very great. They are being brought nearer together all the time.

RAIL SECTIONS.

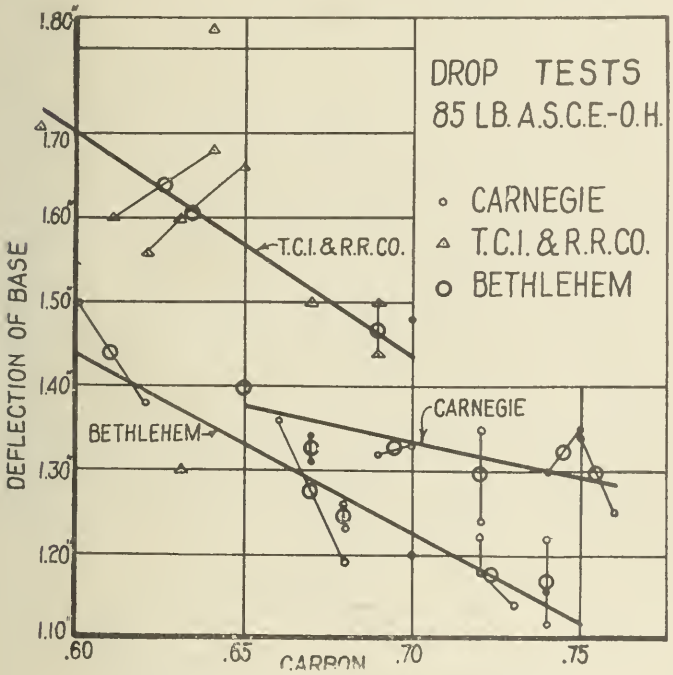
No attempt has as yet been made by the committee to design a new rail section, as many of the large systems have

begun to use the two types, A and B, designed by the American Railway Association, and it has been thought advisable to obtain information derived from service, relative to these sections and others of special design, which may be in use, before making any new recommendations. These new designs are being watched, and it is hoped that in the course of time some definite information will be obtained. At present there are two parties, one favoring type A, representative of the high stiff design with thin head, and the other type B, representative of the lower and more flexible design, with heavy head.

In order to throw some light on the controversy between those representing the thin head, on the one hand, and the heavy head, on the other, Mr. Wickhorst made his study on the "Strength of Rail Head," in his report No. 9 of appendix E. This study was intended also to give some information relative to the claim that the head of a rail is broken down by the excessive equipment loads of the present day, even though there be no physical defect in the interior of the rail head.

TESTS OF RAIL JOINTS.

The first series of these tests, made at the Watertown Arsenal, were published in bulletin No. 123, as appendix A, and are to be be regarded only as a progress report, as the entire series of tests have not been completed. Very guarded



Relation of Carbon Content to Deflection.

use should be made of the information in these tests, as the material in the different splice bars varies so widely that it is difficult to judge of the value of the different designs. The state of affairs is the same as in the case of the rail section, when the committee pointed out that all differences in rail section can be annihilated by the quality of the material.

STANDARD DRILLING FOR RAILS.

This study has been commenced, but has not yet proceeded far. Only progress, therefore, is reported.

MISCELLANEOUS.

Mr. Churchill has made a valuable study, involving the compilation of a large number of tests, which is included with this report as appendix C, Statement of Drop Tests and Chemical Analyses of Rails Rolled for the Norfolk & Western, giving results of various heights of drop on rails of known composition, and a comparison of rail analyses with mill analyses.

A tabulated statement of the different practices in connection with rail rolling in American mills has been compiled and is submitted herewith for the information of the members.

RECOMMENDATIONS FOR WORK IN 1911.

As nearly all of the different items of work of the rail committee are leading up to the preparation of a standard set of specifications for steel rail and the design of a standard rail section, together with the appliances that go with the rail, and as these specifications and designs have not yet been completed ,it is recommended that the outline for the committee's work during the coming year be the same as that for the past year.

Under item No. 4 the committee desires to make a closer study of ingot making, as the principal defects connected with rail manufacture seem to have their origin in the making of the ingot. It is true that the temperature of the bar during manufacture and the amount of work done upon it have a strong effect on the subsequent quality of the finished rail, but the studies of your committee lead it at present back to the ingot as the source of our most serious defects, viz: brittleness, unsoundness and segregation.

The committee also hopes to study the relationship of the chemistry to the deflection under the drop, for the purpose of making a deflection formula, and in this connection it may endeavor to establish a relationship between the tensile strength and the elongation, or between the permanent set, as given by the drop test, and the elongation, so that the ductility of the metal shall be valued in the acceptance or rejection of the material, by means of a co-efficient, as has already been done by Professors Tetmajer and Dormus. Work in this line has already been done for the New York Central Lines by Dr. P. H. Dudley, and his own statement of his practice is submitted as appendix F.

CONCLUSIONS.

The committee presents the following conclusions:

1. That the subject matter on Temperature Expansion for Laying Rails, Manual, 1907 edition, page 55, be transferred to the chapter in the Manual containing the approved resolutions of committee V, on Track.

2. That the Form for Reporting Rail Failures in Main Tracks, M. W. 1200, be replaced in the Manual by Form M. W. 404, Report of Rail Failures in Main Tracks.

3. That the changes in Form M. W. 405 (old No. 2002-B) be approved, and the form included in the Manual.

4. That the drawing showing Standard Locations of Borings for Chemical Analyses and of Tensile Test Pieces be adopted and included in the Manual.

5. That the form for tabulating Results of Drop Tests and Surface Inspection of Rails be adopted and included in the Manual.

The report is signed by: Charles S. Churchill (N. & W.), chairman; R. Montfort (L. & N.), vice-chairman; Robert Trimble (Penna. Lines), E. B. Ashby (L. V.), J. A. Atwood (P. & L. E.), A. S. Baldwin (I. C.), J. B. Berry (C. R. I. & P.), M. L. Byers (M. P.), W. C. Cushing (Penna. Lines), F. A. Delano (Wabash), Dr. P. H. Dudley (N. Y. C.), C. H. Ewing (Atlantic City R. R.), John D. Isaacs (Harriman Lines), Thomas H. Johnson (Penna. Lines), Howard G. Kelley (G. T.), J. W. Kendrick (A. T. & S. F.), George W. Kittredge (N. Y. C.), D. W. Lum (Southern), Joseph T. Richards (Penna. R. R.), J. P. Snow (B. & M.), A. W. Thompson (B. & O.), M. H. Wickhorst, engineer of tests, rail committee.

APPENDIX B.

Rail Failure Statistics for Six Months' Period Ending October 31, 1909.

Statistics for this period were first published in bulletin No. 121, but, owing to the desire to have the report ready for the annual convention in March, 1910, the reports for a number of railways which were late in coming, were omitted. After the convention it was decided by the rail committee that it would be advisable to re-tabulate the information, using all the reports which had been received in answer to A. R. A. circular No. 966. The statistics are for the greater number of the larger railway systems, and the number of tons reported is 7,445,825.

In considering the number of failures, all lots less than 1,000 tons have been ignored, as they usually lead to exaggerated results. It should be borne in mind that these records are for six months only and in some cases the failures have not begun, while in others the poor rails have been pretty fairly weeded out.

Taking all the reports, the failures are divided into: broken head failures, web failures and base failures, according to the following percentages: Broken, 19 per cent.; head, 66½ per cent.; web, 8½ per cent.; base, 6 per cent.

The above are divided for the different weights of rail and between Bessemer and open-hearth steel as follows:

These figures do not show that the breakages of the heavy sections are fewer than the lighter sections, except in the case of 75-lb. rail. The head failures, however, of the 100-lb. rail seem to be materially less than those of 90-lb. and 85-lb. rail. With the Bessemer steel the head failures are the most numerous, those for the 90-lb. being slightly more numerous than for the others. Those for 85-lb. and 100-lb. rails come

next, and are nearly the same. The number of breakages is closely the same in all cases, while the web and base failures are quite insignificant. With the open-hearth steel the head failures of the 80-lb. rail are the most noted. In drawing comparisons between different sections of Bessemer rail, the head failures of P. S. 85-lb. rail are the most noticeable, amounting to 35.8 per 10,000 tons laid, but the explanation given is that they are principally from a lot of 2,045 tons on the Northwest system of the Pennsylvania Lines West of Pittsburg of Carnegie 1909 rails. During the month these rails were rolled many defective heats were found, indicating that the failures were caused by the quality of the material and not the rail section. Broken rails are comparatively few, the most noticeable being the C. S. 75-lb. and then the P. R. R. 100-lb.

In comparing the sections of open-hearth rail, the head failures are the most numerous in the A. S. C. E. 90-lb., G. N. 85-lb., C. S. 90-lb., and A. R. A.-B. 90-lb. There is considerable difference between the A. R. A.-A and the A. R. A.-B 90-lb., but it will be found that the greater number of failures come from Bethlehem, which simply happens to be in this case the A. R. A.-B section. The failures of the same section of rails from the Gary mills are much less in number. This last statement gives the clue to the real cause of the failures and further studying into these statistics will bring out this fact more strongly, viz: that the cause of failures is in the quality of the material and not the design of the rail section.

In making a comparison of failures for different lengths of time, it is pretty generally known that most of the failures of any lot of rails occur during the first four years.

The marking of the rails to distinguish the position in the ingot has become very general, but, of course, the position of most of them is still unknown. In general, the failures of "A" rails are the most numerous, but it is noteworthy that there are many failures down to "D" and "E" and occasional ones in "F." In some cases they are very numerous in "D" rails.

Thoughts Resulting from the Study.

(1) The study of these general statistics does not furnish accurate and specific information so as to determine the value of different sections of rail because:

The condition of traffic are different. The conditions of roadbed are different. The conditions of ingot making and rolling practice are so different that the quality of the material varies widely, and this difference in the quality of material eliminates differences in section.

(2) The study of these general statistics tends to disclose unusual results.

(3) The general statistics are also important in showing the relation between broken rails and failure of head, web and base.

(4) The tabulation of the statistics discloses the differences between steel companies when the sections and chemical composition are practically the same.

APPENDIX C.

Drop Test of Rails.

This report gives statements and tables of drop tests and chemical analyses of open-hearth rails rolled for the N. & W. Railway, giving results for heights of 15 ft., 18 ft. and 20 ft., and a comparison of the mill analysis with analysis of the borings from the rail. They were all 85-lb. rails of the A. S. C. E. section, except some 100-lb. A. R. A. section, type B made at Gary.

The tests were arranged for by C. S. Churchill, and made by J. A. Colby, inspector, at the various mills, through the aid of the manufacturers; and the chemical check analyses and reports thereon were made at the laboratory of the N. & W. Railway by J. H. Gibboney, chemist of the N. & W. Railway. The tests were made on a few melts of a regular rolling.

One piece for drop test was cut from extreme crop end of an "A" rail of each melt and subjected to test in a standard machine to a drop of 15 ft., and a very short section from this same piece was sent to Roanoke, Va., for analysis. In same manner two more pieces from other "A" rails of same melt were subjected to drop tests of 18 ft. and 20 ft.

The tup was 2,000 lbs., the anvil 20,000 lbs., spring supported and supports 3 ft. apart. The sets, also elongation of base and contraction of head under these tests, were noted over six 1-in. spaces.

From the first "A" rail, also from a lower rail from an

AMERICAN STEEL RAIL MILL PRACTICE

COMPILED BY ROBERT W HUNT & CO DEC 12-1910

MILL	LOCATION	KIND OF STEEL	NO. OF CONV. OR FURNACES	SIZE OF INGOTS AT BOTTOMS	NOM. NO INGOTS PER HEAT	NOM. NO 90# RAILS PER INGOT	BLOOM MILL ROLL HIGH	NOM. NO. PASSES BLOOM MILL	BLOOMS RE-HEATED	NO. OF PASSES RAIL MILL TRAIN	TOTAL PASSES INGOT TO RAIL	NO OF HOT SAWS	NO EXTRA HOT SAWS	DIS FROM FIN ROLLS TO NEAREST HOT SAW OR ONE COM USED	SEC TIME BETWEEN 1ST SAW AND LEAVING FIN ROLLS *	BRAND ON TOP OR BOTTOM	BRAND ON RAIL READS FROM — TO — OF INGOTS	
ALGOMA STEEL CO	ST STE MARIE CANADA	BESS O H	2 3	18 x 19½	2 15	4-5	2	17	YES	11	28	1	1	113'	25-30	BOTTOM	TOP (GENERALLY)	BOT.
BETHLEHEM STEEL CO	BETH'M PA	O H	10	19 x 23	25	6	2	15	NO	11	26	1	1	270'	35-40	"	BOT.	TOP
CAMBRIA STEEL CO	JOHNSTOWN PA	BESS O H	4	19¾ x 22¾	4	5	2	15	YES	12	27	4	0	77'	15-20	"		
CARNEGIE STEEL CO	BRADDOCK PA	BESS	4	18½ x 19½	7-8	4-5	3	7	YES	13	20	4	0	43'	12-16	"	BOT.	TOP
COLORADO FUEL & IRON CO	PUEBLO COL	O H	12	18 x 20	30	4	2	15	NO	10	25	1	0	105'	25-30	TOP	TOP	BOT.
DOMINION IRON & STEEL CO	SYDNEY NS CAN	O H	10	18½ x 21½	18	6	2	17	NO	11	28	1	0	107'	10-15	BOTTOM	TOP	BOT.
ILLINOIS STEEL CO	GARY IND	O H	28+	20 x 24	24	7	3-2	9	NO	9	18	5	0	158'	12-18	"	BOT.	TOP
ILLINOIS STEEL CO	SO CHICAGO ILL	BESS.	3	18½ x 19	6-7	4	3	9	NO	9	18	5	0	96'	10-15	"	BOT.	TOP
LACKAWANNA STEEL CO	BUFFALO NY	BESS. O H	4 12	19 x 19	6 34	4	2	6	NO	9	15	1	1	232'	12-18	"	TOP	BOT
LORAIN STEEL CO	LORAIN O	O H	6	22 x 26	20		2		YES							"		
MARYLAND STEEL CO.	SPARROWS PT MD	BESS. O.H.	3 5	19 x 21	6 16	5-6	2	13	NO	11	24	1	1		28-32	"	BOT.	TOP
MONTEREY IRON & STEEL CO	MONTEREY MEX.	O H	4	17 x 22	16	4	2	15	YES	10	25	1	0	205	40-50	TOP	"	"
PENNSYLVANIA STEEL CO	STEELTON PA	BESS. O.H.	3 5+	18½ x 18½	30	4	3	9	YES	11	20	2	1	8'	10-14	TOP		
TENN COAL, IRON, & RR CO	ENSLEY ALA	O H	8	19 x 23	30	6	2	11	NO	10	21	4	0	113'	15-20	BOTTOM	TOP	BOT

FIGURES ABOVE REPRESENT NOMINAL PRACTICE
LORAIN ROLLS CHIEFLY GIRDER AND HIGH TEE RAILS
IN 2 HIGH BLOOMING MILLS RAILS MAY BE GIVEN MORE THAN NO. PASSES ABOVE
PENNSYLVANIA ABOVE IS FOR STANDARD SECTIONS ONLY
TENNESSEE IS DUPLEX PROCESS STEEL
DOMINION " " "
MARYLAND MAYBE " "
CARNEGIE MAY ROLL OH FROM HOMESTEAD

NOTE - * REFERS TO TIME CONSUMED FROM ROLLS UNTIL 1ST RAIL IS CUT

American Steel Rail Mill Practice.

ingot, taken at random from same melt, very short pieces were cut out for chemical analysis to furnish a comparison between the mill analysis and that of the rails, and the position of these chemical test pieces is noted in the statements.

Carbon and Deflection of Rails in Drop Test.

This report covers a study of the influence of carbon on the deflection of a rail in the drop test and is based on the results of the drop tests given by C. S. Churchill. For this study the permanent deflection at 15 ft. was used and the analysis by Mr. Gibboney was used of the sample representing the outer part of the section of the rail, as the outer fibers have more influence on the deflection than the interior ones. Only those results were used where the outer and the interior samples show about the same composition.

The element having the most influence on the deflection is, of course, the carbon, and, judging from our knowledge of the influence of the elements on the tensile properties, it is probable that phosphorus exerts an influence and perhaps manganese does, also. Sulphur need not be considered, and probably silicon has only a minor influence, if any, in the quantities that exist in rail steel. At any rate, it cannot be considered in a preliminary investigation. In order to show up concisely what relationships may exist between carbon and deflection in the various lots of rail tested, I have plotted, in Fig. 1, the carbon-deflection diagrams for the Carnegie, Tennessee and Bethlehem rails, showing the per cent. of carbon horizontally

and vertically the permanent deflection of the base side of the rail under a 15-ft. drop.

In drawing the deflection curves, the "average" points or "centers of gravity" were given a weight according to the number of single points they represent. A few points that fell entirely out of their "zone" were ignored in drawing the curves. The curves are represented as straight lines and no attempt at closer fitting has been made, as with the small amount of data in hand and their small range, there must be considerable doubt as to even the slope of the line, let alone its curvature.

Of course, the deflection lines discussed above represent the combined effect of all the stiffening elements, although the slope would be due to carbon, providing the other stiffening elements were constant. It may be said that in general the phosphorous variations have had no influence on the slope of the carbon-deflection lines shown in Fig. 1. It seems probable that in the Carnegie and Tennessee rails that manganese has had no material influence on the slope of carbon-deflection curve.

It will be noted that within a carbon range from about .60 per cent. to about .75 per cent. the stiffening effect in these tests of a change .01 per cent. carbon was about .009 in. for the Carnegie rails, about .026 in. for the Tennessee rails, and about .021 in. for the Bethlehem rails, all being 85-lb. rails of A. S. C. E. section, with a nominal moment of inertia of 30.0

Very roughly, then this investigation indicates that above .60 per cent. each .01 per cent. carbon increase causes a decrease of deflection of base side of about .02 in. on 85-lb. O. H. rails of A. S. C. E. section when tested in the standard rail drop machine with tup of 2,000 lbs., span 3 ft. and height of drop of 15 ft.

The above study gives us some idea of the quantitative effect of carbon on the deflection of a rail in the drop test, but offers no information as to the effect of other elements. It would seem desirable, however, to know the exact quantitative effect of each factor having an influence on the deflection, so the information could be summarized in one or more formulas, and it is hoped that experimental work may be continued with this end in view, particularly since such information would seem very desirable for use of the sub-committee dealing with specifications.

In this connection I wish to offer some thoughts as to the form the formula should take. Starting with soft iron without any hardening elements, the deflection under a given height of drop would be decreased with each increment of hardening material. It would be increased with an increase in the height of drop and decreased with an increase of the moment of inertia of the section and, perhaps, temperature of rolling should also be taken into account. The formula for deflection would then take the following form:

$$d = (K - cC - pP - mMn)\frac{h}{I}$$

where
d = deflection
K = constant for soft iron
C = carbon
c = constant for carbon
P = phosphorus
p = constant for phosphorus
Mn = manganese
m = constant for manganese
h = height of drop
I = moment of inertia

It is readily possible or even probable that the constants would change with different classes of steel, but the above form of the formula would probably be suitable for all of them, except we may find that the manganese factor may be omitted, and possibly also the phosphorus in special cases, and again, as stated, temperature of rolling may have to be reckoned with.

APPENDIX D.

A Study of Forty Failed Rails.

This report, made by W. C. Cushing, covers a study of forty rails which failed in the main tracks on the Southwest System of the Pennsylvania Lines West of Pittsburgh during the year 1909. The detail reports of the individual rails cover in most cases: 1. A statement of track conditions. 2. General photographs of the failure. 3. Photograph of the etched section. 4. Microphotograph in some cases. 5. Chemical analysis, from interior of head. 6. Physical test, from interior of head.

Sixteen broken rails were examined, and thirteen out of the sixteen were broken in or at the splices. Of these thirteen, two were Weber joints, one Bonzano, and ten six-hole splice bar. Each of these rails was considerably worn in the splicing space, but the metal of five of them was hard and brittle, and in some cases the constituents were considerably segregated.

The result of the examination of twenty-four rails which failed from crushed or split heads showed that all of the failures were caused either by hard, brittle, unsound or segregated metal, or a combination of two or more of them. In three cases investigation showed that foreign material was rolled in the rail section. In one case it was very apparent that this foreign material was an old tie plate. The trouble appears to have occurred from the practice at the Gary mill

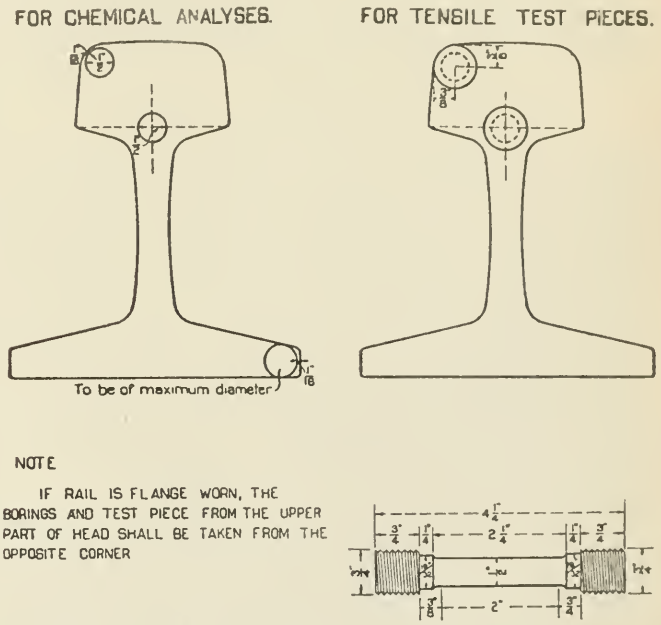


Fig. 1. Standard Locations of Borings for Chemical Analyses and Tensile Test Pieces.

of throwing pieces of scrap on the stool to prevent its cutting during the casting of the ingot.

Mr. Cushing concludes that these forty cases of rail failure point out very clearly that the prime cause of rail failures is the poor quality of the material, as indicated by hardness, brittleness, segregation and unsoundness, all of which must be corrected in the ingot. Only two cases of faulty rolling were found in this lot.

A Study of Sixty-Eight Failed Rails.

This report covers a study of sixty-eight additional rails which failed on the Southwest System of the Pennsylvania Lines West of Pittsburgh, except a few which failed on the Rock Island System.

From this study Mr. Cushing concludes that it is quite

Weight of Rail	Figures below are percentages of total failures							
	Broken		Head Failures		Web Failures		Base Failures	
	Bess.	O. H.	Bess.	O. H.	Bess.	O. H.	Bess.	O. H.
100	20	19	58	40¾	14½	28¼	7½	12
90	17	34	74	50¾	6	12	3	3¼
85	16	21¼	69¾	63¾	6¼	9	8	6
80	15¾	15	73	60	6¼	19	5	6
75	28	..	51½	..	17½	..	3	..

clear that the new rail sections, neither the P. S. section with the heavy head, nor the A. R. A. A. section with the thinner head, have yet brought about any improvement in the quality of the metal by reason of better proportionate distribution of the material in the head, web and base, respectively, in the hope that the conditions of rolling would be so improved as to produce sound material.

The defects must be remedied at the blast furnace, and the changes of improvement must bring about less segregation of the elements and smaller inclusion of gas bubbles and slag, in whatever way the results are to be accomplished, whether it be by more time for the mixing of the elements

and the escape of the gas, or in some other way not yet discovered.

In discussing Mr. Cushing's results, Mr. Wickhorst says that rail failures may be roughly divided in two classes, "broken" rails and "split" rails; the first class including square breaks, angular breaks, and perhaps also broken bases, and the second class including split heads and split webs. Broken rails, according to this lot of failures and the failures summarized on page 259 of part 1 of the 1910 Proceedings of the American Railway Engineering and Maintenance of Way Association, constitute about 30 per cent., and the split rails about 70 per cent. of all rail failures. The material in about half of the broken rails shows satisfactory on test, while the material in the other half shows more or less defective. This means, it would seem, that poor quality in the rail is a contributory rather than a primary cause for the break.

The split rails generally show segregated material from the upper part of the ingot. In fact, this condition is so frequent that we may say that in general split rails are confined to this kind of material.

APPENDIX E.

Tests and Conclusions by M. H. Wickhorst.

Eleven reports have been made, covering the following subjects:

Nos. 1 and 2. Tests of Bessemer Rails—Maryland Steel Company.

No. 3. Tests of Titanium Bessemer Rails—Lackawanna Steel Company.

No. 4. Tests of Bessemer Rails—Illinois Steel Company, South Works.

No. 5. Tests of Open-Hearth Rails—Gary Works.

No. 6. Tests of Bessemer Rails—Edgar Thomson Works, Carnegie Steel Company.

No. 7. Investigation of a Split Head Rail.

No. 8. Segregation as Influenced by Fire-Clay on Ingot.

No. 9. Strength of Rail Head.

No. 10. Drop Test of Rails—Effect of Impact Energy Variously Distributed.

No. 11. Flow of Rail Head Under Wheel Loads.

Drop Test.—The height of drop that a piece of rail will stand depends upon its position in the ingot. Starting from the top of the ingot, the height that is just sufficient to break the rail at first decreases until a "brittle zone" is reached, when the rail may only stand a few feet fall of a weight of 2,000 lbs. Passing this, the allowable height rapidly increases and remains roughly uniform for the rest of the rail bar. The heights called for in various specifications vary from fifteen feet to twenty feet. Close to the top of the ingot the rail may stand such a height, but in the brittle zone, with some makes of material, the rail may stand only five feet or less. In the lower part of the ingot the rail may be able to stand heights of forty to eighty feet, or even more. Just where the brittle zone is in different materials and with different size ingots has not been determined, but an extensive investigation should now be undertaken to work this out.

Segregation.—When molten steel is poured into the ingot the different constituents that compose the liquid mass do not stay together when solidifying, but the carbon, phosphorus and sulphur tend to collect or "segregate" toward the interior and upper part of the ingot. The region of maximum segregation seems to correspond in location with the brittle zone developed by the drop test. The tests indicate that a small amount of segregation is not harmful, but the allowable limit has not been determined.

The problem of ingot making apparently consists of controlling segregation as to maximum allowable limit, and as to location in the ingot, so a small discard will always remove it.

Split Heads.—It has been shown that at least some rail failures, such as are ordinarily classed as split heads, are due to excessive segregation, which results in very fragile metal in the interior of the rail, as explained in detail in report No. 7.

Pipes and Laminations.—Our tests show that laminations occur most frequently in rail from near the top of the ingot, but may occur in any part of the rail bar. They also show that laminations, in themselves, have no relation to the results in the drop tests. Some of the worst drop tests have shown no laminations, while the worst laminations noted have been attended by some of the best results in the drop tests.

Rolling—Our work so far does not show very definitely the influence of such matters as speed of rolling, number of passes in reducing from ingot to rail, temperature of rolling, distribution of rail sections, etc., but they indicate that such matters are of relatively small importance.

Conclusion.—In conclusion, our work of the last nine months has shown fairly definitely that the matter of making safe rails, and in which the different rails of the lot will wear uniformly, is almost entirely a matter of making a good ingot free from excessive segregation, or of cropping off sufficient from the top to remove such excessive segregation.

Investigation of a Split Head Rail.

This report covers a study and tests of a very interesting and instructive rail that failed due to a split head, and is intended to throw some light on the cause of failure. This rail was one of a number that failed in a somewhat similar manner in a lot of 80-lb. A. S. C. E. rails laid in about October, 1909, by the Wabash R. R. on straight track in its main line near Adrian, Mich. It was a 33-ft. Bessemer rail, made at the Edgar Thomson Works at Braddock, Pa., of the Carnegie Steel Company, in September, 1909, heat number 11508. It was removed from service in May, 1910. The rail had no letter showing its position in the ingot. The total tonnage over this rail was about 4.3 million freight tons and the passenger trains additional. The heaviest engines that ran on this rail weighed 103 tons, with a maximum weight of 14 tons per driving wheel. The bearing on the ties as shown by the rust marks on the bottom of the rail averaged 7½ inches and the tie spacing as determined by measuring from center to center of the rust marks averaged 22 in.

The examination consisted of etchings with copper potassium chloride of a large number of transverse and horizontal longitudinal sections cut from the rail, chemical analyses, tensile tests of specimens cut from the rail and microscopic examination.

A rail in service tends to widen at the upper part of the head, that is, the upper part of the head extends transversely. The amount of widening varies considerably with different rails, some showing but little and others a large amount. The compressive effect of the rolling wheels evidently causes the metal to flow transversely, and this flowing seems always to be greatest at about the top of the rail. The metal at the top of a rail is practically always ductile material, but the metal in the interior of the head may sometimes be brittle and incapable of transverse extension, and in such a case, when the top flows and widens, the interior metal, as it cannot stretch likewise, must develop a crack. Of course, anything which takes away the ductility of the metal in the head in a transverse direction would allow of the formation and development of cracks, as, for instance, slag enclosures, seams and laminations, due to gas holes and pipes, or bad segregation. In the case in hand the splitting of the head seems to have been due to bad segregation of the carbon and phosphorus. The metal seems to have been good metal in the ladle, but it evidently went to the bad in the making of the ingot, although the dangerous segregation could, indeed, have been removed with a sufficient discard from the top. This suggests that it would be desirable to make a somewhat comprehensive study of such matters as size and shape of ingot and other conditions influencing segregation.

After a crack has opened up, the metal above it, of course, tends to flow into it under the action of the wheel loads, and after this metal has reached the limit of its ductility in compression, it shears along diagonal lines, resulting in the "wedge" generally seen above a crack. The crack generally comes to the surface at the underside of the head at its junction with the web, although occasionally it runs down into the web and comes to the surface at the side of the web.

Segregation as Influenced by Fire-Clay on Ingot.

This report covers tests made to investigate the effect on segregation of putting fire-clay on the ingot directly after pouring. During the regular pouring of a heat of Bessemer steel of six ingots, two of the ingots were selected for test, one of which was without any covering, and the other of which was covered directly after pouring with a half-shovelful of fire-clay, equal to about two pounds. They were made at the Edgar Thomson Works of the Carnegie Steel Co. at Braddock, Pa., on August 9, 1910, heat 5,101. Mixer metal and scrap steel were blown and poured into the teeming ladle, liquid spiegel being poured in at the same time. The metal was then poured at once into the molds, without any other addition. The ingots were 18½x19½ at the bottom. The stools and molds had been sprayed with a wash of fire-clay. The metal set quietly in both ingots. The uncovered ingot hardened quickly on top, while the covered ingot remained liquid on top for some time.

After being in the soaking pit for about 1 hr. 40 min., the ingots were bloomed to 9½x9½ inches, and instead of making the usual discard from the top, as little as practicable was sheared off. The usual practice at this mill is to cut the bloom into two billets, making the large discard from the top and a small one from the bottom. Each of these billets makes two rails. In the present case, as stated, only a small amount was sheared from the top, and the rails from the top

billet were reserved for this investigation, which happened to be 90-lb. A. R. A. type B section. Previous to rolling into rails, the billets were run through a reheating furnace.

The investigation consisted of drop tests, chemical analyses and etchings of sections. The A and B rails of each ingot were divided into units.

This study seems to show that with a Bessemer ingot weighing about 5,000 lbs. the effect of covering it with fireclay directly after pouring is to cause the greatest segregation to go higher toward the top of the ingot and also to increase its concentration. A small discard, say less than 10 per cent, from the top, does not remove the zone of maximum segregation from either the plain or covered ingot, and the segregation would be worse in the covered ingot. A large discard of 20 per cent. or over removes it more effectively from the covered ingot. This whole study, however, can be taken only as an indication and seems to show strongly the need for a thorough study of the whole subject of ingot-making. Ingots of different sizes and shapes, made of both Bessemer and open-hearth steels and with different treatments, should be made and thoroughly studied, by testing the rails made from them and, what is perhaps more important, by also testing the ingots themselves. Etchings and analyses should be made of various ingot sections to determine accurately the distribution of the various metalloids and of cavities, slag, etc.

Strength of Rail Head.

This report covers tests made to determine the strength of the head of the rail with the load concentrated at the edge of the top surface. Tests were made with a 200,000-pound test machine by canting a piece of rail 18 inches long and applying the load at the edge by means of a block with a radius of 16½ inches to represent a car wheel where it came in contact with the rail. Other tests were made with a reciprocating machine representing a loaded wheel rolling back and forth on the edge of the canted rail. These tests were made at Sparrows Point, Md., at the works of the Maryland Steel Company, who kindly furnished all the material and facilities for them, and were made especially for the sub-committee dealing with rail design. For these tests a rail was taken from stock and six pieces, each 18 inches long, were cut from it for test in the stationary test machine, and six similar pieces were used for test in the reciprocating machine. In order to have the material as uniform as possible throughout the section and in the different pieces a C rail was selected, that is, the third rail from the top of the rail bar. The rail was a 90-pound A. R. A. type B section and the pieces were planed down to thicknesses of head at the side of ⅜ in., ½ in., ⅝ in., ¾ in., ⅞ in., and 1 in., two pieces of each thickness, one for each kind of test. In each case the brand side of the head of the rail, which was the bottom side as rolled, was planed vertical to a width of $1\frac{3}{16}$ inch from the center line.

The arrangement used for making the stationary tests is intended to represent a 33-inch car wheel resting on the edge of the top of the rail. The head is thus tested as a cantilever, the load tending to sag the head locally and to also bend the web.

The load was applied in increments of 10,000 lbs. up to 60,000 lbs. and then in increments of 20,000 lbs. up to 200,000 lbs., the capacity of the test machine. The sag of the head was determined by measuring the distance by means of dividers, between prick punch marks placed on the side of the head near the bottom and on the base, the load being on while taking the reading. The marks on the base were placed about one inch from the web, by gouging some of the metal so as to have a vertical surface on which to prick punch the mark. The amount that the opposite side of the head elevated or the "lift" was determined in a similar manner.

The curves show that a load of 10,000 lbs. does not sag the head with the load applied to the edge of the top side, with any thickness down to ⅜ inch, and probably neither does a load of 20,000 lbs., although, as the load was on when the measurement was taken, we cannct say how much of the sag was elastic and how much permanent. A load of 30,000 lbs. seems to cause a permanent sag with the ⅜-inch head, but not much, if any, with the heads of greater thickness. It had been hoped to determine by these tests the maximum load which each thickness of head would carry, but it is now clear that in any future work of this kind the measurements should be taken after releasing each load, as well as while it is on, and it would also be desirable to make the measurements with a micrometer reading to .001 inch. With these changes it would seem that this test should give this information in a reasonably satisfactory manner.

It is interesting to note in this connection that the web seemed to stand the load of 200,000 lbs. successfully.

Tests were also made with a reciprocating machine in which a piece of rail is moved back and forth under a wheel to which a load can be applied by means of a system of levers.

DROP TESTS OF RAILS.

The tests described in this report were made to compare the results of a given amount of impact energy, variously distributed, as, for instance, in one blow, and the same foot-pounds divided among several blows; also, for instance, the relative effects of tups of different weights, but with heights adjusted to deliver the same foot-pounds of impact.

The drop tests were all made with the base in tension, the rail being placed with its base downward on supports 3 ft. apart with radii of 5 in. The permanent deflection or set was measured both on the top side, including the depression caused by the tup, with a striking radius of 5 in., and on the base side, which latter measurement gave only the actual permanent bending of the rail.

FLOW OF RAIL HEAD UNDER WHEEL LOADS.

The tests covered by this report were made to determine, if possible, what change is made in the microstructure of the head of the rail by the rolling over the rail of heavy wheel loads. At the same time, measurements were made of the spread of the head and the width of the bearing produced. The tests were made at Sparrows Point, Md., at the works of the Maryland Steel Co., who kindly furnished all the material and all the shop and laboratory facilities to make them. They were made on the reciprocating machine by moving a piece of rail back and forth under a loaded cast iron car wheel. The desire was to simulate rather severe service conditions, and a light thin head rail was used. A 70-lb. Bessemer rail was selected from stock, and in order to have material fairly uniform throughout the section and in such several pieces as might be used for test, a "D" rail, that is, the fourth rail from the top of the rail bar, was used, heat 45,437 and fourth ingot of the heat. The piece of rail tested was 12 ins. long, which was set up between two other similar pieces, which acted as end pieces onto which the wheel could roll when leaving the piece under test. The piece tested had the sides of the head planed vertical to a width of head of 2 ins. This width was used partly to accentuate the test and partly to do away with the rounded corner, so as to allow of measuring the width closer to the top of the head, and the sides were made vertical so the measurements could be made satisfactorily with a micrometer along the whole depth of the head.

The test was started with a load of 30,000 lbs. applied to the wheel, using 1,000 double strokes or 2,000 rollings of the wheel over the rail under test. The bearing assumed a width of .64 in. The only effect on the width of head was to spread the top of the head .002 in., and the load was therefore increased at once to 60,000 lbs. and the test continued until the head seemed to no longer spread as measured with the micrometer.

It is also seen that under the conditions of this test and with the load and material used, about .8 of the maximum results was produced by the first 5,000 rollings, and almost the maximum by the first 10,000 rollings. The 22,000 rollings beyond this produced but little additional spreading of the head.

Discussion on Rail.

Mr. Churchill: Referring to the form for reporting rail failures, it is an important matter to show, in case a rail fails, which side of the track the rail was taken from.

Mr. Lindsay: The section foreman's information is not always reliable. He will report that the track was all right, joints all right, road bed all right, yet the track broke. I believe we should have a question in there, "did the rail have a full bearing upon the tie plate"?

Mr. Churchill: I am a little afraid that we would get the same sort of an answer. I believe where a break occurs that is not very clearly explainable at first sight on the foreman's report, there should be an examination by somebody else much higher up than the track foreman, and I think that is the practice on most of the roads today. I am afraid, if we make our report too cumbersome, we will not get it answered in any intelligent manner.

Mr. Lindsay: Referring to the changes recommended in Form 405, I do not understand that it will be necessary to change our definition of a broken rail—"this term to be confined to a rail which is broken through, separating into two or more parts. A crack which might result in a complete break will come under this head." In consultation with the officer of Public Service in the state of New York on this subject, the definition of a broken rail, for the purposes of report to the state, reads as follows: "For the

purposes of this yearly report, a rail shall be considered as having broken when complete fracture into two or more parts has taken place, when there is any break in the head of the rail on the gauge side, or when there is any other break necessitating either the immediate removal of the rail from the track or its reinforcement."

Mr. Cushing: The classification as adopted by the rail committee is based on the common classification generally given by the men who see the failures in service and is intended to explain them as nearly as one would explain them by seeing them on the track. The person reporting this, knows nothing about internal defects and consequently we have attempted to have the different classifications about as they are generally described. The information for the public service commission can be given from these reports by adding together several classifications given by the committee to make up what the public service commission calls a broken rail.

Mr. Lindsay: Conclusion 4 covers the general method of taking borings for chemical analyses. Last night we saw a section of an ingot showing the way segregation takes place. I would like to ask the committee if that segregation is reasonably symmetrical around the vertical axis.

Mr. Churchill: Yes, it is approximately so. The great mass of material at the bottom of the head brings the center of segregation or defective material, from whatever cause, near the junction of the head and the web. It of course extends down, as you saw in the picture, through the web and into the flange, but the web is so thin, if you attempt to take borings, you will get mixed material. For this reason, if for no other, the best location is near the base of the head, where you are sure to get a mass of material that is questionable, in a questionable rail.

C. E. Lindsay (N. Y. C. & H. R.): In looking over reports of causes of our broken rails I find that a very large percentage of the breaks occur on the left hand rail; as high as 90 per cent in some months. In looking further, I have been able to locate some defects due to defective equipment, and in tracing that up, I have reports of flat wheels passing over the road. Following that up, I always found that the car inspector's report showed that the wheel was examined before it left the terminal, and the flat spot was within the limits prescribed.

Would it not be possible to put a flat wheel on the machine that was shown last night for testing the pressure of wheels on the rail to see the effect of flats of different lengths on the rail and whether it is possible to break a rail with a flat wheel?

Mr. Wickhorst: That machine you saw illustrated last night moves at slow speeds, and we could not get the speed effect in it. Mr. Lindsay will find in the proceedings of the American Society for Testing Materials, several years back, some discussion I presented on the cause of breakages on the left hand side. The reason that is given there is that the locomotive is so built that when the counter-balance is down, giving the heaviest vertical load, the engine noses to the left at the same time.

E. F. Wendt (P. & L. E.): During certain months of the winter one hundred per cent of the broken rails occur on the left hand side of the track. The system of records now in use is so complete that we have before us this data.

Mr. Churchill: You are speaking of what must be classed as broken rails under the definition?

Mr. Wendt: I am speaking of rails actually broken and removed promptly.

Mr. Wickhorst: That preponderance of broken rails on the left hand side applies probably to what you would call cross sectional breaks or base breaks. It does not seem to apply to longitudinal breaks such as split heads. I have tried to notice that point in looking over track, and what little information I have secured indicates that it does not make much difference with the latter class of breaks.

W. H. Elliott (N. Y. C. & H. R.): The data on the blow or pressure on the rail for various points of counter-balance of a locomotive wheel were worked out very fully in 1892 in the proceedings of the Master Mechanics' Association. It was then shown, as I recall it, that the left forward driver of an American locomotive is the heaviest of the four driving wheels, but there did not appear to be a difference in blow delivered on the rail to account for such a great difference in the breakages between the left and right hand rail. I would suggest that this matter be taken up with the Master Mechanics' association by our committee, and the blow or weight of the wheels for the drivers of the Pacific type of engines be determined. This matter, I believe, was very fully considered by that association in connection with the wear of tires to account for the driving wheels almost universally wearing more at a certain point midway between the crank position and the counter-balance. It is not directly opposite the counter-balance, but a little ahead of it.

R. N. Begien (B. & O.): This is a matter which we now have under consideration. We have noticed, on our Chicago Division, that practically 90 per cent of breakages in the rails occur on the left hand side. Possibly the use of a heavier rail on the left hand side might be better.

Mr. Kenly: The thought occured to me that probably the broken rails on double track result from loose, or relatively loose track, on the inside rail, due to the fact that the track is not so well drained at the middle between the double tracks, as it is on the outside, and that probably the number of loose ties, or loose heads in the inside rail on the double track, is more the cause of the broken rails than is the thrust, or impact of the engine on the left hand side. I do not know whether we have any information to show that there is more bad surface on the inside rail than on the outside rail, but it occurs to me that that is the cause for broken rails in the case of double tracks.

The President: The committee suggests that is a matter for investigation by the committee on track.

Mr. Churchill: In the matter of specifications, we are somewhat in the same position we were a year ago. We have not gotten much closer. The difference, however, was not very great and we expect during this year to get together. As to the matter of rail sections, we cannot determine at this date with so few rails of the newer sections in use for such a short time which are better, but these reports that are coming in and will come in during this year, and the additional investigation by Mr. Wickhorst and by others interested will help us.

Mr. McDonald: In the matter of the testing of rail joints, I have heard it stated by representatives of manufacturers that some of the joints submitted had been specially prepared for that test and that others had not. I think in order to avoid that it would be well in future for the committee to select their samples from the general run rather than have any special samples.

Mr. Churchill: I think in every instance the joints were taken from stock. There was probably one instance of a joint that came from a manufacturer. Any joint that happened to be in the storehouse was taken on my road. I know that other roads did the same thing. If our report points to anything it is the importance of looking out more carefully for the character of the steel used in rail joints, whoever makes the joint.

TRACK.

The following sub-committees were appointed:

Frogs and Crossings: L. S. Rose, chairman; J. C. Nelson, R. M. Pearce, R. H. Howard, C. H. Stein, R. C. Falconer.

Switch Points: H. T. Porter, chairman; S. S. Roberts, P. C. Newbegin, G. J. Ray, R. A. VanHouten, J. R. Leighty, T. H. Hickey.

Track Fastenings with Treated Ties: Dean Wm. G. Raymond, chairman; Garrett Davis, F. A. Smith, W. D. Wiggins, J. L. Downs.

Spirals: J. B. Jenkins, chairman; Dean Wm. G. Raymond.

REVISION OF MANUAL.

After giving that portion of the Manual pertaining to track much discussion, it was decided that changes be recommended as follows:

(1) Maintenance of line, section (b), for the adjustment of curves, should be changed to read as follows:

"Longer easement curves than the minimum lengths recommended may be used to advantage, and even with increased convenience in their application, but any considerable increase in length is wholly unnecessary and should never be made without careful consideration as to the effect on cost. For minor curves, an increase in length of about 50 per cent. over the minimum is recommended when such increase will not seriously affect the cost, nor adversely affect the degree of curve. The minimum length recommended should be used in all cases where greater length would adversely affect the degree of curve."

(2) Following the last paragraph under section (b), the following should be added.

"The 10-chord spiral, computed by dividing the spiral into 10 equal parts, is recommended. Chords of any length may be used in staking out the 10-chord spiral when the central angle is small. Chords approximating one-tenth the length of spiral should be used when the central angle exceeds 15 degrees."

(3) Maintenance of Surface. The third paragraph following the table of elevation of the outer rail should read as follows: "Ordinarily an elevation of eight inches

should not be exceeded. Speed of trains should be regulated to conform to the maximum elevation used."

(4) Maintenance of Surface, section (a), recommended practice. The following paragraph should be stricken out: "In ordinary practice it is recommended that the elevation be run out at the rate of one inch in 60 feet, but this will be modified by the same conditions that would vary the length of the easement curve used."

(5) Maintenance of Gage, section (a). Paragraph 1 should read as follows: "Tie plates are recommended in all cases where economy in maintenance will result from their use."

GENERAL INSTRUCTIONS FOR ORDERING OR CONTRACTING FOR FROGS, CROSSINGS AND SWITCHES.

Manufacturers shall submit for approval detail shop drawings showing construction and dimensions of all parts to be furnished in accordance with these specifications. The drawings shall be on sheets twenty-two (22) in. wide, with a border line one-half (½) in. from the top, bottom and right-hand edge, and one and one-half (1½) in. from the left-hand edge. The standard length of drawings shall be thirty (30) in., except that, when necessary, longer sheets may be used and folded back to the standard length.

Drawings of one subject only shall appear on a sheet.

Scale of general drawings shall be 1½ in. = 1 ft., details not less than 3 in. = 1 ft. Conventional shading shall be used in sectional drawings. All dimensions and distances shall be shown plainly in figures.

The title shall be placed in the lower right-hand corner.



C. E. Knickerbocker.

Chairman, Committee on Track.

All drawings are intended to form a part of the specifications. Anything which is not shown on the drawings but which is mentioned in the specifications, or vice versa, or anything not expressly set forth in either, but which is reasonably implied, shall be furnished the same as if specifically shown and mentioned in both. Should anything be omitted from the drawings or specifications which is necessary for a clear understanding of the work, or should any error appear in either the drawings or specifications affecting the work, it shall be the duty of the manufacturer to notify the company and he shall not proceed with the work until instructed to do so by the company.

SWITCHES.

Lengths.

1. 11 ft., 16 ft. 6 in., 22 ft. or 33 ft.

Throw.

2. 5 in. at center line of No. 1 rod.

Gage of Track.

3. 4 ft. 8½ in.

Switch Rails.

4. Side planing and bending shall conform to a spread at the heel of 6¼ in. between the gage lines of the stock rail and the switch rail. The gage lines of switch rails shall be straight. The head of switch rail shall fit neatly against the head of stock rail from point of switch rail to point of divergence. The face of web at the point shall be in a vertical line with the inside edge of the head of stock rail.

Top planing shall conform to the measurements shown on Fig. 1 and Table 1.

TABLE 1.

Switch.	A	B
33 ft.		12 in.
22 ft.		9 in.
16 ft. 6 in.		5 in.
11 ft.		5 in.

Bottom of switch rail shall be planed to fit neatly on base of stock rail where bases overlap.

The point of switch rail shall be as shown by Fig. 2.

Holes for switch rod lugs and stop blocks shall be 25/32 in. in diameter and 5 in. center to center. Holes for reinforcing bars shall be 25/32 in. diameter. Number and location as provided under Reinforcing Bars.

Lugs.

5. Lugs shall be as deep as the section of rail will permit and of standard design, as shown in Fig. —. Distance between centers of holes for bolts running through the web of the rail shall be 5 in., diameter of holes shall be 25/32 in.

Distance between web of rail and center of switch rod bolt holes shall be 5 in. Switch rod bolt hole shall be 1 1/32 in. in diameter.

Switch Rods.

6. Switch rods shall be of the standard design, as shown in Fig. —. Rods shall be ¾ x 2½ in. and shall be held in a horizontal plane. Bolt holes shall be 1 1/32 in. in diameter. There shall be at least 1½ in. of metal at end beyond bolt holes.

Rods shall be stamped with ¾-in. letters showing the weight, section of rail and number of rod, the point rod being No. 1.

Reinforcing Bars.

7. A reinforcing bar ⅜-in. thick shall be riveted to each side of each switch rail and point ends shall be made flush with point of switch rail. The bars shall be as long as the heel connections will permit. Bars shall fit against web of rail and shall fill the space between head and flange of rail. There shall be ⅛-in. clearance between outer bar and head of stock rail where the bar projects under head of stock rail, and the top of inner bar, where it projects beyond the head of switch rail, shall be not less than 1⅞ in. below the top of stock rail.

Bars shall be fastened to rail with ¾-in. rivets, except that the first, second, fifth and the holes through which the lugs are fastened shall be bolted. Center of first hole shall be 1½ in. from point and center of last hole in bar to be 2 in. from heel end of bar. Intermediate rivets shall be spaced so that there shall be fastenings at intervals not greater than 12 inches.

Stock Blocks.

8. Stop blocks shall be of approved design with two holes 13/16 in. in diameter and 5 in. apart. Blocks shall be spaced after switch is placed in track as nearly as practicable at equal intervals between the end of planing and heel of switch.

Bolts and Nuts.

9. Bolts fastening lugs and stop blocks and foot guards to switch rails shall be ¾-in. in diameter. Bolts connecting lugs with switch rods and the switch-stand connecting bolt shall be 1 in. in diameter and machine turned. All bolts shall be provided with nut locks and cotters. Nuts shall be hexagonal.

Plates.

10. There shall be on each tie two plates, ⅞-in. by 7 in., planed down to receive the stock rail and braces. Three $\frac{13}{16}$-in. holes outside and two inside are required for ⅞-in. lag screws or screw spikes on all switch ties, except the two head ties, where there shall be three outside and four inside.

Braces.

11. Braces shall be of such a design that 2½-in. clearance for detector bars may be obtained. Three holes for ⅞-in. lag screws or screw spikes shall be provided.

SPECIFICATIONS FOR MANGANESE IN FROGS, CROSSINGS AND SWITCH POINTS.

The committee has investigated so far as has been practicable this year the question of specifications for manganese in frogs, crossings and switch points, but thinks that this subject should be further investigated and that careful records and experiments covering a period of years

should be recorded before it is in a position to recommend a specification that will meet with approval.

TRACK FASTENINGS WITH TREATED TIES.

The following statements seem to be warranted by a study of the replies to circular letters:

(1) Tie-plates with some form of fastening which can be removed and replaced at will without injury to the wood fibers are desirable. Your committee feels that such a fastening has not as yet been fully demonstrated.

(2) In shoulder tie-plates the holes for outside fastenings should be so placed that the base of the rail bears only against the body of the fastenings.

(3) Tie-plates should be flat bottomed, as projections of any kind tend to destroy the tie. One striking photograph is shown of a treated bridge tie entirely sound except where the projections of the plate have injured the fiber. This effect would perhaps be lessened if the tie-plate were independently fastened to the tie by screws other than the rail fastenings, and by use of the principle mentioned in paragraph 5.

(4) The bearing surface of tie-plates should be proportioned by each road to the resistance of the wood most largely used for ties on its line. In general, plates six

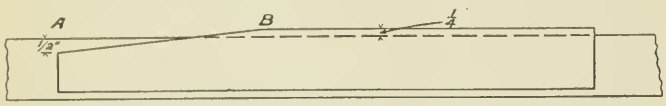


Fig. 1.

inches wide for hard woods and seven inches wide for soft woods should be sufficient, but some roads report trouble with plates of these widths.

(5) A tie-plate thicker through the whole or a part of the middle of its length than at the edges, with only a central bearing, is suggested for trial as theoretically sound. There would be less tendency for such a plate to rock under the action of the passing load and less pressure tending to force first one edge and then the other into the tie, and the plate would be strongest where the bending moment is greatest. The essentials of such a plate are the thicker central portion and the central bearing of the rail.

CONCLUSIONS.

The committee recommends:

(1) That the changes in the Manual, as proposed, be adopted.

(2) That the title of the specifications for spring and rigid frogs adopted by the convention of 1910 be changed to read: "General Specifications for Frogs, Crossings and Switches."

(3) That the General Instructions for Ordering or Contracting for Frogs, Crossings and Switches, as given in the report, shall be prefixed to the specifications mentioned above.

(4) That the plans for rigid and spring frogs, submitted with the report, be adopted and added to the specifications for the frogs, crossings and switches.

(5) That the specifications for switches submitted be adopted and added to the specifications for frogs, crossings and switches.

(6) That the report on Track Fastenings used with Treated Ties be accepted as a progress report.

(7) That the report on Spirals be adopted.

The report is signed by: C. E. Knickerbocker, N. Y. O. & W., chairman; J. B. Jenkins, B. & O., vice-chairman; Garrett Davis, C. R. I. & P.; J. L. Downs, Y. & M. V.; R. C. Falconer, Erie; T. H. Hickey, M. C.; R. H. Howard, Chicago, Ill.; C. B. Hoyt, N. Y. C. & St. L.; John R. Leighty, M. P.; J. C. Nelson, S. A. L.; P. C. Newbegin, B. & A.; R. M. Pearce, P. & L. E.; H. T. Porter, B. & L. E.; G. J. Ray, D. L. & W.; Wm. G. Raymond, State University of Iowa; S. S. Roberts, Louisville, Ky.; L. S. Rose, C. C. C. & St. L.; C. H. Stein, C. R. R. of N. J.; F. A. Smith, Civil Engineer, Chicago, Ill.; R. A. Van Houten, L. V.; W. D. Wiggins, Pennsylvania, committee.

APPENDIX A.

Spirals.

A preliminary examination was made of a number of curves to determine their relative adaptability for use as a railroad spiral, the examination comprising the cubic parabola, a curve whose deflections vary as the square of the distance, the Searles spiral, the Stevens six-chord spiral, a curve whose radius is inversely proportional to the length of arc, as developed by Crandall and Talbot, a curve whose degree increases with the number of 100-ft. chords, and a curve whose chords subtend a constant and inflexible series of central angles. All the above curves accomplish the required results in easing the approach to a circular curve, some less perfectly than others, but still satisfactorily; but in attempting to derive formulas for the various spirals, some one of the following difficulties was experienced in each case. (1) If simple, approximate formulas were used they were not sufficiently accurate. (2) Accurate formulas were too complex. (3) The curve could not be expressed by formulas. (4) Formulas were of the endless-series class. (5) Complex field methods were required to make the field work agree with formulas with spirals of large central angles.

The committee then investigated a practical adaptation of the spiral as developed by Crandall and Talbot in which the curve is considered to be measured by ten equal chords; this curve was found to be susceptible to expression by definite formulas which compare favorably as to simplicity with those of other spirals, the formulas being accurate beyond the degree of accuracy attainable in the most careful field work if the application of the formulas be restricted to such spirals as may actually be required in practice. Tables developed from this formula were presented.

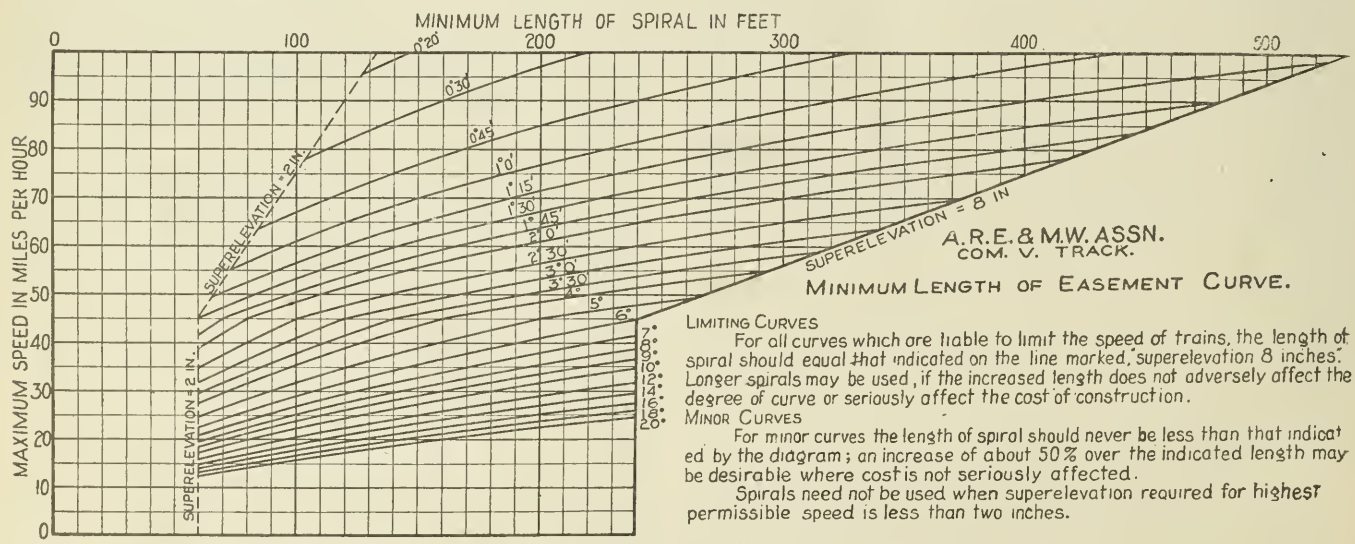
The committee also submitted a diagram indicating graphically the minimum length of easement curve as recommended by the association.

The committee recommends the following changes in the Manual:

Maintenance of Line and Alinement.

(b) Adjustment of curves, with consideration as to easement curves:

Longer easement curves than the minimum lengths rec-



Minimum Length of Easement Curve.

ommended may be used to advantage and often with increased convenience in their application, but any considerable increase in length is wholly unnecessary and should never be made without careful consideration as to the effect on cost. For minor curves, an increase in length of about 50 per cent. over the minimum is recommended when such increase will not seriously affect the cost, nor adversely affect the degree of curve.

The minimum length recommended should be used in all cases where a greater length would adversely affect the degree of curve.

(Following the last paragraph.)

The ten-chord spiral, computed by dividing the spiral into ten equal chords, is recommended. Chords of any length may be used in staking out the ten-chord spiral when the central angle is small. Chords approximating one-tenth the length of spiral should be used when the central angle exceeds fifteen degrees.

Discussion on Track.

Mr. Knickerbocker: In article 3, "Maintenance of Surface," under "Revision of Manual," we wish to have that part of the second paragraph which appears in italics stricken out. The words are: "Speed of trains should be regulated to conform to the maximum elevation used."

In section 2 of the statements on track fastenings with treated ties, we want to insert between the word "rail" and the word "bears" in the second line the two words "does not" so that it will read: "Rail does not bear."

In formula No. 13, under spirals, the T should be T sub S.

In the same portion of the report, the E in the last line of the table of notation should be E sub S.

Under A B in table I, under general instructions for ordering frogs, crossings and switches, the dimensions should be feet instead of inches.

Mr. Lindsay: May not the words "are intended" in the beginning of the 5th section be omitted?

The Chairman: The committee will omit the word "intended."

G. H. Tinker (N. Y. C. & St. L.): It does not seem to me that the first and last paragraphs of the introduction are quite consistent. The last paragraph says that all drawings are to be a part of the specifications. The first paragraph says the manufacturers make the drawings. If the railway company made the drawings, all right. It seems to me that is the proper procedure in any case. Our road makes its own plans, submits them to the manufacturers, and the manufacturers proceed according to the plans, and in that case they are a part of the specifications.

Mr. Knickerbocker: A great many railways cannot afford to make the plans, and these railways ask the manufacturers to submit plans for certain crossings, and they do it. Many railways do not have the opportunity to make these plans, and sometimes they are in a hurry for the crossing and cannot wait to make the plans, and they ask the manufacturers who make the crossings to submit a plan with a proposal for furnishing the crossing, and it is a quick way to obtain a crossing, which you cannot get in any other way.

J. P. Snow (B. & M.): There is a distinction between the first and last paragraph. The first paragraph recites that the manufacturer shall make his own shop drawings, because his shop nomenclature differs from the practice of others, and for this reason he is called upon to make detailed shop drawings. The last paragraph refers to drawings made by the railway company, which may be nothing but a line drawing showing the layout of the crossing.

Mr. Lindsay: In connection with the paragraph on switch rails we will have to take into consideration the drawings which do not show the bend in the stock rail, and therefore are not complete. The web has two faces, and I think it is proper to say that the outer face of the web shall be in a vertical line with the inside edge of the stock rail. It would be better, however, if the words "gage side" were used.

Mr. Knickerbocker: We found in some cases, where the manufacturer did not put in a stock rail, and we had to put that in the track, that the distance from the bend in the stock rail is not uniform. That is matter for consideration another year.

Mr. Lindsay: I move that the committee be instructed to define the bend in the stock rail.

Mr. Rose: If a manufacturer has the point of the switch rail itself given to him, he does not need to know where the stock rail is bent.

Mr. Byers: I move to amend Mr. Lindsay's motion to the effect that the committee be asked to report on this question of the bend of the stock rail as an independent proposition later. Upon vote, amendment to the motion was defeated.

Mr. Rose: If it will satisfy Mr. Lindsay, I think we can add to these drawings the distance from the toe of the switch to the bend in the stock rail as previously figured out by this committee, and that can be readily added to these drawings.

Mr. Lindsay: That is satisfactory.

A motion to insert the words "inner face of the" between the words "between" and "web" was carried.

Mr. Kenly: I would like to ask if the committee has investigated the proposition to make all of the switch rods exactly the same length between the bolt holes and vary the distance from the web to the center of the hole in the lug for the different weights of rail?

Mr. Knickerbocker: We have thought about that a great deal. It would be an advantage for the lugs to be marked

Mr. Lindsay: I move that in clause 7, the distance of one-eighth inch be increased to one-quarter inch, and that after the words "top of stock rail" there be added "The reinforcing bar shall be bevelled to an angle of 45 deg. where it projects beyond the head of the rail. That is the New York Central practice at the present time. The motion to increase clearance was lost. The committee accepted the insertion suggested by Mr. Lindsay.

B. H. Mann (Mo. Pac.): I would like to know if there would be any objection to changing the sketch of switch point details to show the complete length of the point. Then, if a 16 ft. 6 in. point becomes broken, so that it can be planed down to a point that is 11 ft., all that will be required will be to cut the reinforcing bars, using the same holes for the rivets with the new length and at the same time the interlocking feature will be protected.

Mr. Knickerbocker: We would like to do that but until we can determine whether we can use the same distance from the point to the center of the throw rod of a hand thrown switch as with an interlocked switch, we cannot do it.

W. H. Elliott (N. Y. C. & H. R.): The drilling shown in the diagram is the best from the standpoint of the signal engineer. It provides for the best possible signal construction and enables us to better support the point than we can with the drilling which has been used.

A motion that the committee provide in the plates which go on the two head block ties two holes in each plate of the proper dimension and properly located so that the switch can be spiked when disconnected from the switch-stand or from the interlocking apparatus, was carried.

E. F. Wendt (P. & L. E.): I would not like to see an action taken which would commit the association to a standard which might be used in court against the railway company. The switches as proposed are the very best that could be designed from the standpoint of slide plates and brasses, for illustration. There are few railways in this country, if any, which use switches of this standard, because these switches are of a much higher standard than are now in use in America. You will notice that the tie plates extend two ties beyond the heel of the switch. There may be only one, one or two, or possibly three roads in the country that have a standard of that kind, and while I admit it is the best standard, there certainly can be but very few roads that go that far. If it is necessary to burden the railways with all the expense for additional slide plates and additional braces, let us say so, and then let us advocate the appropriation of the money for the work. We do not spend the money for switches of this standard, however, and I take the position that this extreme number of braces for one point is unnecessary from the standpoint of safety. I am using this point simply by way of illustration, so that we may not commit ourselves to any standard which might be used in a court against the railway companies.

Mr. Patenall: If railroads do not follow improved methods, I am afraid we would get into a bad state of retrogression. However, I do not see that we are taking any great responsibility, in point of law, by applying such improvements as may become necessary, and I believe the committee ought to be sustained in its report.

L. S. Rose (C. C. C. & St. L.): I think if we follow that reasoning to the limit, every action we take would come under the same heading.

Mr. Knickerbocker: Some railways use two tie plates with two spikes and some with three spikes. There are other roads that use the tie plates with a brace on each end. We took the position in our report that we thought was proper. We can not get a general standard to fit all conditions.

H. T. Porter (P. & L. E.): We were not asked to get up a switch that would simply be safe. We could have gotten up one very much similar that would be safe under such reasonable inspection as switches get on a railway, but we did

try to design a switch that would ride smoothly and comfortably, as far as we were able. We also endeavored to design a switch that had the longest possible life. Railways are gradually adding more rail braces to their switches.

W. M. Camp: I think the committee is rather extravagant in the use of rail braces. The object of rail braces at a switch is to take the unusual side thrust of the locomotive or car in taking the switch, and that comes at the point where the track changes direction, and according to my observation it is not usual to have braces all the way to the heel of the switchpoint, especially when rails 33 ft. long are used. I do not see how safety is promoted by having braces back of the rod which comes at the end of the planing. All of the force of the thrust comes against the stock rail on one side and the through rail on the other side when the train takes the switch. That is the part to be protected. It looks more substantial to see braces running back to the heel joint, but I do not consider that it is any safer than to omit, say, half the braces on the 33-ft. side. Two spikes can be put down through the plates which will hold the rail very securely.

A motion to adopt the amended conclusion was lost.

A motion to adopt the recommended drilling of the switch point included in the general instructions for ordering, was carried.

A motion to receive the conclusion as information was carried.

The fourth conclusion was received as information.

Prof. A. N. Talbot: In the report on spirals, I desire to suggest two slight modifications in the table of deflection coefficients. Instead of the word "deflections" in the heading, substitute the words "deflection angles." The table should be changed in form so that the coefficients read down the column for the transit at any given point instead of across the page. This will be very much more convenient for use.

Mr. Cushing: The suggestions are accepted.

Prof. Talbot: In the upper left-hand part of the diagram of minimum length of easement curve is given a limit of length of curve for superelevation of two inches. It will be seen by using these formulas that the amount of throw of track from what it would be for a tangent and circular curve is less than one-quarter inch for all of those opposite that particular dotted line. The last sentence of the printed matter reads: "Spirals need not be used when superelevation required for highest permissible speed is less than two inches." I would suggest the addition of the sentence: "Nor when the distance between the tangent and the parallel tangent of the offset of curve is less than 0.2 ft." I am not anxious about that particular value.

Mr. Jenkins: Taking thirty-minute curves at a speed of about 80 miles an hour, I think a spiral would be preferable there, because it would greatly reduce the shock of contact between the flange of the wheel and the outer rail, and in fact for any lighter curves than one degree at speeds of about 60 miles an hour the same thing would be true. The committee covered that point last year in a discussion of the effect of the very short spiral when the offset was slight and cut that out where the spiral would not govern the path of the wheel at all, but where the spiral would produce any effect on the motion of the train, it was introduced. A great many spirals ought to be introduced in all cases, regardless of how small the offset is. In the answers we received some favored the spirals in all instances and some favored spiral distance of 100 to the foot instead of 0.2. The committee took 0.04 as about the minimum.

Prof. Talbot: I would like to make sure that this association feels that the track can be put down at 0.01 ft., as just mentioned, and that it would pay to put down a spiral where the track would not be shifted from a tangent and circular curve more than 0.02 of a foot, or ¼ in.

A motion to add the sentence suggested by Prof. Talbot was lost.

Mr. Jenkins: For light spirals, it would make very little difference whether we use the formulas derived by Prof. Talbot or Prof. Crandall, or some others. When you come to spirals of high central angle, then the character of the formulas makes considerable difference and there are certain approximations that will apply also to all spirals of small central angle. If you try to make the same formulas apply to spirals for a one degree curve, or a spiral 300 feet long to a one degree curve, and try to make the same formulas apply to a spiral 200 feet long, to a 20 degree curve, the formulas will not apply at all. The track committee has obtained formulas that will apply in all cases up to the practical limit of 45 deg. total central angle.

A motion to express to the committee the thanks of the association for its work was unanimously carried.

MASONRY.

The following sub-committees were appointed:

Revision of Manual: Richard L. Humphrey, A. H. Griffith, G. H. Scribner, Jr.

Waterproofing of masonry, covering methods, results, cost and recommended practice: George H. Tinker, L. N. Edwards, W. J. Backes, F. E. Schall, F. L. Thompson.

Define monolithic construction; revise report on durability of all monolithic construction in arches or large abutments with wing walls: W. H. Petersen, C. W. Boynton, Job Tuthill.

Typical plans of retaining walls and abutments, plain and reinforced, with comparison and recommended practice: T. L. Condron, W. W. Colpitts, B. Douglas, R. T. McMaster.

Investigation and report on the use of reinforced concrete trestles, typical designs and cost: A. N. Talbot, C. H. Moore, G. J. Bell.

Recommendations for next year's work: entire committee.

To co-operate with the joint committee on standard specifications for cement: Howard G. Kelley, C. W. Boynton, C. H. Moore.

To co-operate with the joint committee on concrete and reinforced concrete: C. W. Boynton, L. N. Edwards, A. H. Griffith, F. E. Schall, G. H. Scribner, Jr., F. L. Thompson, Job Tuthill

REVISION OF MANUAL.

Minor changes in wording were made and the following new paragraph was added to the recommended practice for designing reinforced concrete structures:

"Shrinkage and temperature reinforcement: Reinforcement for shrinkage or temperature stresses, in amount generally not less than one-third of 1 per cent., and of a form which will develop a high bond resistance, should be placed and be well distributed near the exposed surface of the concrete."

WATERPROOFING OF MASONRY.

A circular requesting information concerning current practice in the waterproofing of masonry was sent to the members of the association, this circular being substantially a duplicate of circular 122, issued at the request of the committee in 1909. Fifty replies were received, of which 27 contain no information. Some of the replies contain detailed descriptions of structures. An abstract of all replies containing pertinent information is presented with this report. These, together with the replies received last year, are summarized in table I.

The last column contains certain information as to cost. The 1909 replies included very little information upon this subject. It was thought that its publication might lead to unwarranted conclusions. More replies have been received this year, but the conditions are so widely different that hardly any two replies cover the same conditions. Under these circumstances an average cost for any one type of waterproofing would likely be far from the true cost. It is also evident that several of the figures are erroneous, sq. ft. and sq. yd. having been confused, each figure should be considered in connection with the particular example to which it refers.

The masonry structures usually waterproofed are the floors of solid-floor bridges and arches over city streets, to prevent the leakage of ballast water; roofs and walls of subways, to prevent the leakage of ground water; basement and building walls, concrete roofs of buildings and retaining walls, to prevent the leakage of rain or ground water; reservoir and tank walls, to prevent loss by leakage.

The subject of waterproofing may be considered from two points of view. It may be an investigation as to the imperviousness of various substances or it may be an investigation of the methods of treating certain masonry structures so as to prevent the leakage of water through them. The first is a laboratory problem and has not been touched by the committee. The second is a practical problem and is the one considered by the committee. There is involved, in a report upon the condition of a structure from this point of view, the element of suitability to use and also the personal equation of the person making the examination. A reservoir wall may be permitted to leak a few gallons daily; a bridge floor must not allow water to drip; in some situations a stain or discoloration would be objectionable and must not be allowed. Different observers might report compliance with any of these conditions as "perfectly satisfactory." In comparing different methods of waterproofing this element must be eliminated.

Another table was presented, grouping the information

shown in table I in four general classes. Class 1, designated as "exterior envelopes," included all those processes of waterproofing by which the masonry is covered with a thick coating of more or less impervious material, generally applied in several layers and generally including tarred felt or similar fabric or burlap. The waterproofing materials used are coal tar pitch, asphalt or bituminous products of petroleum. Class 1 was further divided into four subheads: "a" including all examples of the use of felt and coal tar pitch; "b" felt and asphalt; "c" burlap and either pitch or asphalt; "d" mastic, this being a bituminous material mixed with sand and concrete and applied in one or more thick layers. Class 2 included examples of materials mixed with concrete. Class 3 was designated as "exterior coatings," and included all those coatings of the nature of washes or paints. Class 4 comprised those examples in which no waterproofing is used.

In class 1, out of a total of 23 examples under subdivision "a" 13 showed no leaks, 2 leaked slightly, and 8 leaked badly; out of a total of 55 examples under subdivision "b" 16 showed no leaks, 9 leaked slightly, and 30 leaked badly; out of a total of 13 examples under subdivision "c" 5 showed no leaks, 4 leaked slightly, and 4 leaked badly; while of the 5 examples under subdivision "d" 1 showed no leaks, 2 leaked slightly and 2 leaked badly. With 8 examples in the second class, 5 showed no leaks, 1 leaked slightly, and 2 leaked badly. In the third class out of a total of 42 cases 6 showed no leaks, 9 leaked slightly, and 27 leaked badly. Out of 4 examples in class 4, where no waterproofing material was used, 1 showed no leaks and 3 leaked slightly.

A study and analysis of the replies indicate:

(1) No method of waterproofing has proved entirely satisfactory.

(2) Some cases are reported in each class showing no leaks.

(3) The difference in efficiency between the various classes does not appear to be great. It does not appear to what extent success is due to the quality of the masonry.

(4) Failures are due to faulty details, poor workmanship, poor materials and the formation of cracks in the masonry.

(5) To secure dry work, it is necessary that details should be carefully designed; this includes the details of the masonry as well as of the waterproofing. The materials must be carefully placed by skilled workmen. The supervision must be constant and efficient. Shrinkage and temperature cracks should be prevented by reinforcement.

(6) Concrete masonry designed and placed as above indicated, with properly designed temperature and shrinkage reinforcement, may be made waterproof without the addition of special waterproofing materials.

TABLE 1.

No.	Character of Structure	Materials Used	Results	Costs
1	Roof of Car Barns	Reinforced against shrinkage	8 leaks in 3 acres; 3 years	
2				
3	Roof and Walls of Subway.	Walls, reinforced against shrinkage	No leaks except at bad joints; 5 years	
		Roof, rock asphalt mastic	No leaks; 5 years	
		Bad work repaired with Wunner's bitumen emulsion		
5	Culvert Tops	Medusa compound and truss-con.	No leaks; 1 year	
6	Brick Wall	Mortar mixed with soap and alum	No leaks; 3 years	
7	Reservoir	Crushed dust	No leaks; 3 years	
8	Reservoir, 4	1 Soap and alum and elaterite	No measurable leakage	Two coats soap and alum, 43c per 100 sq. ft.
		3 Soap and alum and asphalt	No measurable leakage	Asphalt, $1.04 per 100 sq. ft.; Elaterite, $1.52 per 100 sq. ft.
9	Arches, Retaining Walls, Bridge Floors	5-ply burlap, pitch and asphalt.	Good results	
10	Arches, Bridge Floors	2-ply burlap and pitch	No leaks; 3 years	Placed by contractors, approximately 20c per sq. ft.
11	Roof of Magazine	Rich mortar plastering	Not perfect	
12	Bridge Floor	6-ply felt and pitch	No leaks except along webs of girders	Approximately 6c per sq. ft.
	Bridge Floor	1-2 mortar	Just as good; 2 years	
13	Bridge Floor	Sarco and burlap	Good	About 8c to 38c per sq. ft.
14	Bridge Floor	4 or 5 ply felt and pitch or asphalt	Few leaks; 8 bridges, 2 leak, 6 O. K.	About 5c per sq. ft.; protection over waterproofing, about 7½c per sq. ft.
15	Bridge Floor	Sarco and burlap	One leak	15c per sq. ft.
16	Bridge Floor	Asphalt	Some leaks around rail joints	24c per sq. ft., including labor and material.
17	Trough Bridge Floor Masonry Arch	5-ply felt and asphalt	Practically water-tight	9.1c per sq. ft.
		Young's mixture	No leaks	Chemical cost, $290.35; Concrete, including chemical cost, $10.23 per cu. yd. or 6.3c per sq. ft.
18	Bridge Floor Concrete Arch	Mastic	9 bridges; 2 tight, few leaks in 7	Natural rock asphalt mastic, 45c per sq. ft.; Hydrex felt, with brick, 25c per sq. ft.; positive Seal felt, 23c per sq. ft.; Special asphalt mastic, 30c per sq. ft.
		5-ply felt and asphalt	9 bridges; 2 tight, few leaks in 7	Natural rock asphalt mastic, 45c per sq. ft.; Hydrex felt, with brick, 25c per sq. ft.; positive Seal felt, 23c per sq. ft.; Special asphalt mastic, 30c per sq. ft.
19	Retaining Walls	Asphalt paint	Can be scraped off	
		Cement and coal tar	Penetrates	
	Bridge Floors	Felt and pitch	Difficult to handle, abandoned	
		Mastic	Cracked, abandoned	
		3-ply burlaps saturated with asphalt	Good results, expensive	
		3-ply plain burlap, asphalt and mastic	Few leaks; tore over columns	About 16c per sq. ft.
20	Masonry Arches with Concrete Backing Cellar Wall	Young's mixture	Leaks	
		Sarco mixture	O. K., 1 year	15c per sq. ft., including material, tools and labor.
		Young's mixture	Failed	N. B.—Conditions different
		Winslow's compound	O. K. 18 mos.	
21	Stone and Brick Arch	Tar paper and pitch	Leaked badly; waterproofing cracked; 1 year	
		4-ply felt and asphalt	No leaks; 4 years	40c per sq. ft.
	Reinforced Concrete Arch	Anti-hydrine damp-proofing	Leaked badly	
		4-ply felt, asphalt and brick	No leaks; 2 years	31½c per sq. ft.
	Reinforced Concrete Arch	Cerian paint and ½-inch asphalt	No leaks	
	Reinforced Concrete Arch	Cerian paint and 1-inch asphalt.	No leaks; 5 years	10c per sq. ft.
	Bridge Floor-plate	2-ply felt, 1 burlap and mastic	Leaks along webs of girders	
	Bridge Floor-plate	Hydrex felt	Small leaks over columns; 1 year	
	Bridge Floor-trough	Asphalt concrete and ½-inch mastic	No leaks in waterproofing	
22	Cellar	3-ply tar paper and asphalt	No leaks; 3 years	About 6c per sq. ft.
23	Concrete Wall	3-ply Barrett felt and asphalt	No leaks; 3 months	5.8c per sq. ft.

TABLE NO. 1—Continued.

No.	Character of Structure	Materials Used	Results	Costs
24	Subway Plate Roof	5-ply felt and asphalt; also red lead paste and brick in asphalt on roof	No leaks; 6 years	
25	Basement	6-ply felt and pitch	No leaks; 6 years	5c per sq. ft. for 3-ply; 10c per sq. ft. for 6-ply; contract price.
26	Retaining Walls	⅛-inch pitch	Fairly satisfactory	3.18c per sq. ft.
	Dust Line	3-ply tar paper and pitch	Unsuccessful; expansion causes cracks	5.91c per sq. ft.
	Subway Walls	4-ply felt and pitch; hollow tile.	No leaks	Hollow tile, 18.5c; waterproofing, 5c per sq. ft.; total, 23.5c per sq. ft.
	Roof—Concrete Arches	3-ply felt and pitch; brick	No leaks	Waterproofing, 3.82c per sq. ft.; brick protection, 9c per sq. ft.; total, 12.82c per sq. ft.
27	Trough Bridge Floor	Iron bark	Failed	
		5-ply Hydrex, 3 tracks	1 dry, 2 leak; 2 years	95c per sq. yd.
		4-ply Barrett, 2 tracks	1 dry, 1 leaks; 4 years	16½c per sq. yd.
		Iron bark, 2 tracks	No leaks; 4 years	
		5-ply Hydrex, 1 track	No leaks; 3 years	
		4-ply Barrett, 1 track	Leaks badly; 3 years	
		Iron bark, 1 track	Failed; 1 year	
		5-ply Hydrex, 1 track	Leaks badly; 2 years	
		5-ply Hydrex, 3 tracks	Leak badly; 3 years	
		4-ply Barrett, 1 track	Leaks badly; 3 years	
		Iron bark, 1 track	Failed; 1 year	
		5-ply Hydrex, 1 track	Leaks badly; 2 years	
		Iron bark, 5 tracks	Removed; 1 year	
		5-ply Hydrex, 5 tracks	Leak badly; 2 years	
		5-ply Hydrex, 1 track	Leaks badly; 3 years	
		4-ply Hydrex, 1 track	Leaks badly; 3 years	71½c per sq. yd.
		4-ply Barrett, 2 tracks	Leak badly; 3 years	
		3-ply Hydrex, driveway	Leaks badly; 3 years	57c per sq. yd.
		4-ply Hydrex, 3 tracks	2 dry, 1 leaks; 3 years	
		4-ply Barrett, 1 track	Leaks badly; 3 years	
		Iron bark, 1 track	Removed; 1 year	
		5-ply Hydrex, 1 track		
		Iron bark, 5 tracks	Removed; 1 year	
		5-ply Hydrex, 5 tracks	Leak badly; 2 years	
		4-ply Hydrex, 3 tracks	Leak badly; 3 years	
		4-ply Barrett, 1 track	Leaks badly; 3 years	
		3-ply Hydrex, driveway	Leaks badly; 3 years	
		6-ply Barrett, 1 track	No leaks; 3 years	24½c per sq. yd.
		4-ply Barrett, 1 track	Leaks badly; 3 years	
		4-ply Hydrex, 2 tracks	Leak badly; 3 years	
		Iron bark, 1 track	Removed; 1 year	
		5-ply Hydrex, 1 track	Removed; 1 year	
		Iron bark, 5 tracks	Removed; 1 year	
		5-ply Hydrex, 5 tracks	2 dry, 2 leak, 1 leaks badly; 2 years	
		4-ply Hydrex, 2 tracks	1 dry, 1 leaks	
		4-ply Barrett, 2 tracks	No leaks	
		6-ply Barrett, 1 track	No leaks; 3 years	
		4-ply Hydrex, 2 tracks	1 dry, 1 leaks badly; 3 years	
		Iron bark, 2 tracks	Removed; 1 year	
		5-ply Hydrex, 2 tracks	1 dry, 1 leaks	
		6-ply Barrett's, brick protection.	No leaks; 1 month	13.2c per sq. ft.
		5-ply Hydrex	1 leak; 1 year	95c per sq. yd., including material, tools and labor.
28	Plate Floor	Pitch	Leaks through boltholes	
	Train Shed Floor	Mastic	Cracked and leaks	
29	Concrete Slab; Bridge Floor	5-ply felt, 1 burlap and pitch	No leaks; 15 months	15½c per sq. ft., including 10 year guaranty.
31	Floor Slabs	3-ply burlap, Sarco		Floor slabs, L. 7.7c, M. 12.5c per sq. ft.; back of walls, L. 1.0c, M. 1.0c per sq. ft.
32	Floor Slabs	Mortar, pitch	No leaks	Between 40c and 50c per sq. ft.
33	Floor Slabs	Felt and pitch	Small leaks; 2 years	Maximum cost, about 30c per sq. ft.
34	Block and Tile Wall	Elaterite	Cracked and curled up; 1 year	M. $1.00, L. 10c per 100 sq. ft.
		Bay State cement coating	Wore off; 1 year	M. $2.60, L. 30c per 100 sq. ft.
		Coal tar and cement		M. 10c, L. 10c per 100 sq. ft.
35	Bridge Floors	Asphalt mastic	Leaks along girders; mastic cracks	15½c per sq. ft. in place.
36	Masonry Arch	Asphalt	Prolonged life 10 years	15c per sq. ft., including removal of fill and supporting of tracks during work.
37	Subway	Asphalt, felt, burlap, Sarco, brick	Bottom and sides, 1 leak per 100 sq. ft.	13c per sq. yd., including brick encasing.
		Hydrolithic cement	Roof leaks a little; 2 years	
38	Cellar	5-ply Barrett's	No leaks; 1 year	About 12c per sq. ft. labor and material.
39	Bridge Floors	Felt	No leaks	
		Mastic	3 out of 7 bridges show leaks along girders	
41	Reservoir	Asphalt	Good results	
43	Bridge Floor	4-ply felt and slag on matched flooring	Many leaks	About 8c per sq. ft. for felt and slag only; done under traffic.
45	Bridge Floor	Barrett's	No leaks; 4 months	
46	Reservoir	Medusa	Reduced leakage; 1 month	15c per sq. yd.
47	Bridge Floors	Pitch on matched flooring	Failed after about 5 years	
		4-ply burlap and elaterite on creosoted plank	Failed second winter	60c per sq. ft.
		1-ply burlap and Sarco	4 bridges, no leaks; 1 bridge leaks slightly; 1 year	11.4c per sq. ft.
48	Bridge Floors			

Note—Numbers in the first column refer to the abstracts of replies having the corresponding numbers, which should be read in connection with the table.

*Nos. 1 to 20 refer to abstracts published in Bulletin 119 and in the Proceedings of the 1910 Convention.

MONOLITHIC CONSTRUCTION.

Monolith of Concrete.—A singles mass of concrete made without joints by a continuous operation of construction.

Monolithic concrete construction is the building of a single mass of concrete without joints by a continuous operation.

In order to judge of the merits of monolithic construction we should examine the various causes which bring about the failure of masonry construction to ascertain whether or not monolithic construction will either prevent or delay failure when masonry is subjected to conditions that are likely to occur during their lifetime.

Below are given causes for various masonry failures as taken from reports of various railroads, and a report by

Prof. Swain, which was gathered from various periodicals for the use of the committee:

(1) Faulty Design: (a) Where masonry is placed on grillage above the water line, the grillage rotting and allowing masonry to settle. (b) Where grillage rests on piling and where the designer used too high a unit stress for timbers in compression. (c) Where U-abutments have their wings built too light. (d) Where the designer has allowed too high a unit pressure on the earth in front of the abutment or on piling upon which it may rest. (e) Settlement which frequently causes a crack to appear where the wing leaves the main portion of the abutment. (f) In case of arches, the wings sometimes separate from the body of the arch or the arch will frequently crack from 10 to 20 ft. on each side of the center line of the track, depending upon the height of the fill. (g) Lack of proper drainage.

(2) Poor material or poor workmanship.

(3) Temperature cracks.

(4) Disintegration of the masonry: (a) On account of the freezing and thawing of exposed surfaces of masonry, particularly where water drips through an arch ring or where the masonry near the ground is exposed to alternate freezing and thawing. (b) On account of masonry being exposed to salt water, alkalies, acids or heat.

(5) Improper filling.

(6) Scouring Away of the Material Underneath the Masonry: (a) On account of unusual freshets. (b) On account of driftwood, wagon bridges, etc., lodging against the masonry. (c) Account of ice gorges. (d) Account of the size of the opening being too small, which causes the water to rise during a freshet and which increases the velocity of the stream sufficient to scour away the material underneath the masonry.

(7) Material sliding and carrying the masonry with it.

Cause 1.—If the settlement in cases (a), (b), and (d) was not uniform in a large monolithic structure they would probably crack unless they were reinforced so as to prevent settlement cracks. If the structure was an ordinary single-track abutment up to about 20 or 25 ft. in height it would probably settle without cracking. If the abutments were built in sections the different sections would be divided in a vertical plane and prevent unsightly cracks.

In the case of arches under high fills and on ordinary soils it is difficult to prevent cracking of the arch abutment and ring unless reinforcement is used, on account of the pressure on the foundation in the center of the arch being very great when compared with the pressure at the end of the wing walls. The monolithic character of the arch abutment and the arch ring are not strong enough to distribute the load uniformly over the foundation, and when a slight settlement occurs in the center it causes cracks that are unsightly but seldom dangerous.

Cause 3.—Several railroads reported temperature cracks in their abutments, while other roads reported abutments built of plain concrete in lengths of from 60 to 100 ft. without cracking, and when the abutment was reinforced in lengths of 150 ft. without cracking. There is evidently a wide difference of opinion as to the effect of changes of temperature on large monolithic structures. The front of the abutment has no forces to prevent its free contraction and expansion on the back, side and bottom of the abutment; however, the concrete contracts and expands more than the material adjoining it and hence when the movement occurs the structure must be strong enough to overcome the friction between it and the adjoining material, or crack.

Causes 5 and 7.—A monolithic structure well designed will resist failure from both of the causes better than an abutment built in sections.

Cause 6.—In designing waterway openings the size of the opening is selected to take care of the maximum amount of water that is likely to come to the opening. It frequently happens that the amount of water has been underestimated or that the opening has been blocked by driftwood, ice gorges or other material which has induced scour in the bed of the stream or raised the high-water mark, or both. When the scour line is below the foundations of the abutments they are apt to move and tip forward or settle bodily downward. When this happens a monolithic abutment will resist the pressure back of it better than one built in sections, because when one portion of the abutment is undermined the balance of the abutment will assist in preventing failure, and, even if the abutment does tip forward, the movement at times is slow, and failure can be prevented by relieving the pressure at the back or putting in props across the bridge opening.

In building abutments for subways it is frequently impracticable to build them as a single monolith, and, even if it were practicable, the abutment when underneath a number of tracks would be long, not very high and any slight settlement would cause an unsightly crack. The abutment would be in a prominent place, where any crack would be observed by the general public and create unfavorable comment.

Again, when abutments are built in horizontal layers and the work is not done continuously, wherever the work has been stopped long enough to allow the lower portion to set before placing the upper portion a seam has been found in the concrete, and when the back filling has been made and become saturated with water the water will pass through the concrete through this seam. In city work this seepage is unsightly, it will form ice on the sidewalks in the wintertime and the action of the frost will disintegrate the concrete. For these reasons it is desirable that when abutments are built in sections they be built of such length that each section can be built continuously.

Conclusions: These conclusions are based upon the supposition that the structure is well designed and that the foundation is good:

(1) That monolithic concrete construction may be used without danger of cracking for abutments of any length that the working conditions will permit, provided the length does not exceed about three times the height.

(2) That where abutments with wing walls are not of monolithic construction, joints should be provided at the intersections of the wing walls and the body of the abutments.

(3) That reinforced concrete abutments may be built in units of any length that economic conditions will permit.

(4) That monolithic concrete construction may be used for arches where the conditions will permit, otherwise the arch ring should be constructed with radial joints.

RETAINING WALLS AND ABUTMENTS.

The committee reports progress and suggests that the work be reassigned.

REINFORCED CONCRETE TRESTLES.

Through the secretary, a circular letter was sent out on October 26 to a large number of railroads, asking for the extent of the use of reinforced concrete trestles, the length of time they had been in service, their present condition and apparent durability and the approximate cost for ordinary conditions. Forty-six replies to this letter have been received. The C. M. & St. P., C. B. & Q., C. R. I. & P. and N. P. railways have built such trestles, while the G. N. and C. G. W. railways have made plans for similar structures. The other replies state that the roads have not used this type of construction, though a number of them use decks of reinforced concrete and structures built in places.

In view of the limited time this form of structure has been in use, it does not seem best to present typical plans for reinforced concrete trestles at this time.

The report is signed by: W. H. Petersen (C. R. I. & P.), chairman; G. H. Tinker (N. Y. C. & St. L.), vice-chairman; W. J. Backes (Cent. N. E.); G. J. Bell (A. T. & S. F.); C. W. Boynton (Univ. Port. Cem. Co.); W. W. Colpitts (K. C. M. & O.); T. L. Condron, consulting engineer, Chicago; B. Douglas (Detroit River Tunnel Co.); L. N. Edwards (Grand Trunk); A. H. Griffith (B. & O.); Richard L. Humphrey, consulting engineer, Philadelphia; Howard G. Kelley (Grand Trunk); R. T. McMaster (P. & L. E.); C. H. Moore (Erie); F. E. Schall (L. V.); G. H. Scribner, contracting engineer, Chicago; A. N. Talbot, professor municipal and sanitary engineering University of Illinois; F. L. Thompson (Ill. Cent.); Job Tuthill (C. H. &. D.).

Discussion on Masonry.

The recommendations for revision of the manual were accepted with very little discussion.

The definitions of monolithic construction, and the conclusions of the committee for publication in the Manual were accepted.

Mr. Steffens: In the matter headed, "Investigate and report on the use of reinforced concrete trestles, typical designs and cost," there is mentioned particularly the flat slab trestle construction, which has been used so extensively by the roads in Chicago. The Southern railway has built another type of flat slab trestle in North Carolina, a trestle of girder construction, of reinforced concrete, and it might be well for the committee to see if plans can not be obtained and a note made in the proceedings.

Mr. Loweth: We have been building something that is

closely akin to a concrete trestle for a good many years, in the form of reinforced culvert tops. The concrete trestle in one way is a larger development of the reinforced concrete culvert tops. We have gone into it quite extensively and so far as our experience goes it will warrant a more extensive use. We find that the cost, speaking generally, is about thirty dollars a foot, sometimes a little less and sometimes a little more, depending on the question of the amount of the work and the difficulties under which it is prosecuted. Sometimes we are able to build the slabs under traffic, but that is not often the case—more usually they have to be made on one side and moved in, or built some distance from the bridge and taken to the bridge and put in. We feel that in many cases there is a field of usefulness for the concrete trestle and that it gives a permanent construction at a cost much less than steel construction. We have in many cases steel spans of greater or less length crossing the main channel, and the approaches to the spans over flats that are subject to overflow only are of concrete trestle type construction. We have used spans up to eighteen feet; the standard being about 15 ft. 6 in. or 16 ft. We have to be careful to use them only in the places where we can use comparatively short spans. Lately there has been more or less apprehension concerning our timber bridges, due to fire caused by cinders dropping from the locomotives. When we get the new ash pan required by law and the concrete trestle we will get away from that danger. Of course, the same thing would be accomplished with a creosoted timber and ballasted floor and while we have used considerable of that type of construction, yet it does not afford the permanency we expect to get out of the concrete.

A. S. Baldwin: There is a suggestion I would like to make, arising from Mr. Loweth's remarks, with reference to the use of creosoted trestles; that is, in a comparison of the two methods of construction it is very important that the liability of the creosoted trestle to take fire should be considered. Our losses during the last year from fires in connection with creosoted trestles have been very heavy. We have had several thousand feet of these trestles burn.

The President: Open deck or ballasted floor.

Mr. Baldwin: Ballasted floor decks. In some cases we have not been able to trace the exact cause of those fires. Investigations show that as a general thing when you capitalize the cost of a creosoted structure, it does not, compare favorably with the concrete structure. At the same time, I believe if reliable statistics could be obtained as to the amount of loss in creosoted structures by fire, that the results would be very different, and we are now endeavoring to get some actual data as to that.

Mr. Loweth: There is an illustration in the report of some of our designs for concrete trestles, but in the light of the experience we have had, we are going to make some modifications. They will be quite minor, but som modifications will be made. We shall probably put a metal plate between the slab and the top of the pier, so as to make a greater resistance in the top of the pier against any slight movement in the slab.

Mr. Smith: I have looked into the question of reenforced concrete trestles, and I have not found where we would be justified in adopting them. Our trestles cost us about $8.00 a running foot, our maintenance about 75 cents per foot, our fire losses about 5 cent per foot. The interest, at 5 per cent on $8.00 per foot, is 40 cents, making a total of $1.20 for the timber trestle. As against that, the reenforced concrete trestle costs $30 per foot, would have an interest charge of $1.50, to which we would add 20 cents per foot for track maintenances, which would be $1.70 or approximately a difference of 50 cents per foot increased cost for the concrete trestle. We have about 155 miles of timber trestles, or 800,000 lineal feet. Of that number, 300,000 feet will ultimately be disposed of, either by filling or by replacement by steel structures. The other 500,000 feet at 50 cents per foot, would increase the cost to the railroad company, $250,000 per year, if we were to adopt reenforced concrete trestles.

W. L. Seddon, (Seaboard A. L.): I would like to ask whether there has been any other experience of fire losses as suggested by Mr. Baldwin. We have not used creosoted trestles long enough to get any data on that, but I hadn't expected a very great amount of loss from creosoted trestles. Creosoted telephone poles went through the fire at Jacksonville, Fla., and were the only things of wood that stood that fire.

Mr. Baldwin: Our experience shows that there is less danger of a creosoted piece of timber catching fire than of a piece of old defective timber. A spark on a piece of defective timber will start fire very rapidly, whereas if it comes against a sound piece of creosoted timber, it does not light, and does not take fire readily; but after the fire starts in those structures, it is so fierce as to be almost uncontrolable. That is the case with creosoted ties that have been placed along the right of way. I do not think they catch quite as readily as other timber. They certainly do not catch as readily as old timbers, but after they start, you cannot do anything with them, the fire is so fierce and the heat is so intense, it is impossible to control the fire.

Mr. Seddon: Has your loss been from fires originating on the right of way?

Mr. Baldwin: In one case the loss was from an adjoining structure. In several other cases we have not been able to find out what was the cause of it.

Mr. Seddon: I examined the poles at Jacksonville after the fire there and they seemed to be charred about an eighth of an inch, and then the fire seemed to have choked itself.

The President: I think there is a general theory that after the lighted oil evaporates from the surface the chance of creosoted material catching fire is remote.

Mr. Smith: We have kept a good record of our fire losses for about two years and we have found that about 95 per cent. of the fires start on top. A good many start from cinders that drop down. A good many of them could be averted by covering the deck with galvanized sheet iron. I understand some roads have used galvanized sheet iron on top of the stringers, which would prevent the stringers catching fire. By placing galvanized iron on top of the ties, at the end of the bridge, over the back walls, the fires would be eliminated.

Mr. Loweth: Last year the St. Paul company fireproofed the timber decks of about en miles of bridges, and we shall probably do as much more this year. That is an added expense, not only for the cost of first construction of the fireproofing, but because it makes the future maintenance of the bridge and the inspection of the bridge more expensive. However, it is forced upon us because there seems to be an increasing danger of fire to timber bridge floors on account of the changes in the locomotive fireboxes which have recently been brought about. All of the timber bridge floors on the coast extension of the St. Paul road are fireproofed from one end to the other, and I feel that we will eventually have to come to protection of that kind on practically all of our timber floors; perhaps not for timber floors on steel structures, but certainly for timber floors where the ties are of timber resting upon timber stringers. Our practice has been to carry the metal protection clear across the full length of the bridge, and at first I tried to eliminate it between the rails, but found that that did not give the full measure of safety, and it was necessary to carry the protection out to and over the outer guard timber. In a great many cases we have put in gravel protection. We are trying out both methods. The gravel protection consists in putting in board strips between the tops, blocking them up above the stringers, and then putting gravel on top of the ties and the board strips. It takes, however, a pretty coarse gravel. In some cases we could not get the gravel that was suitable and we used crushed stone. There is some difficulty, of course, in maintaining the gravel, because the tendency is for it to work to one side or the other. I believe if we compare the cost of an ordinary pile of timber structure with any other prominent type of construction that we must take into consideration the cost of fireproofing timber structures. We have not been able to justify on the score of economy alone the large use which we have made of reenforced concrete trestles, or even creosoted ballast trestles; but I think that we must concede something for better construction, even if it is not economy.

Mr. Smith: We have recently been offered by the mechanical department a lot of scrapped car roofing, which we figure can be applied to our old trestles at a cost of 10 cents per running foot, which is practically no increase in cost. The stringers in our trestles last us eight to twelve years; in the south a relatively shorter period, perhaps eight years.

Mr. McDonald: We have been using galvanized iron as protection for stringers and caps for ten years. We have had a great deal of difficulty in keeping galvanized iron on the stringers. It has a tendency to creep. The cause of creeping we have been unable to determine absolutely, but we have discovered measures that we can depend upon. I have discovered that pine stringers, which have been well covered for ten years, have been in good condition, as good as they were when they were put in. Our fire losses last year on trestle work, out of a total of 7 miles, amounted to 24 lineal feet. Those trestles are all decked. My attention was first called to the question of protecting stringers with galvanized iron by noticing the experience of the Cincinnati Southern.

They had a lot of stringers that were put in in 1871. I had occasion to examine them after they were taken out, in 1889, and notwithstanding the fact that the galvanized iron had not been taken care of, had been permitted to be perforated, and other things, wherever that iron remained over the stringers, those stringers showed almost no rot whatever. They were made of white pine. I find that it costs us 50 cents a lineal foot of trestle to cover, in a very elaborate way, our stringers and caps. A red oak or gum cap can be made to last ten or fifteen years. Ordinary galvanized iron, bought in the open market, when applied to trestle work, will last on some branch lines five or six years, and on the main line, where sand is dropped from the locomotive, it lasts only about three years. Recent experiments have justified us in the adoption of the modern pure iron, as it is called, and we think we are going to get at least an average of seven years life out of that metal, and I expect to fully realize twenty years life out of the timber by that method of protection.

THE ANNUAL DINNER.

The annual dinner of the American Railway Engineering and Maintenance of Way Association was given in the gold room of the Congress hotel last night. President Fritch of the association, was toastmaster. While the dinner was in progress the diners sang a number of songs which had been written for the occasion. Most of them were printed on a pink sheet entitled "Maintenance of Way Extra," but which was generally referred to as the "Sporting Extra." Subsequently, a green "Double Extra," came out containing the story in song of the "Brownsville Trestle," a tale attributed to Frank R. Coates.

The first speaker was S. M. Felton, president of the Chicago Great Western, whose subject was "Economy and efficiency on Railways." The speeches were as follows:

President Fritch.

We are assembled tonight to celebrate the twelfth annual convention of the American Railway Engineering & Maintenance of Way Association. It may be well to state here that on account of the pressure brought upon the railways to enforce economies we have decided, as in other matters, to set the pace and economize by changing the name of our Association to the American Railway Engineering Association. (Applause.) A reduction of just exactly 50 per cent, which is true economy.

We have an interesting program before us tonight, and in addition to the prominent speakers who are to address you, the committee on arrangements has provided some surprise entertainments, which will either condemn or commend them, and we will reserve our judgment until the entertainment has been rendered.

The rehabiliation of the railways has been the most wonderful development in our modern industrial age. The original lines of the most important railways in this country have been almost entirely rebuilt, and in many instances several times. This has been brought about in order to meet the ever increasing demands upon transportation, and the ever decreasing returns for its performance. There is no man in our country today who has taken a more prominent part in this work than our first speaker, who is justly entitled to the term: "R. R. D." or doctor of railways, if such a term could be invented.

S. M. Felton.

When I was asked to speak at the dinner of your association this evening, I expected to be able to find sufficient time to prepare an address on the subject of efficiency and economy of railways that would be more complete than the few remarks I am about to make. Unfortunately, other pressing matters have prevented my treating the subject as exhaustively as it deserves.

The recent decision of the Interstate Commerce Commission in denying to the railways the right to advance their rates, is said, in a great measure, to have been influenced by the plea that the roads were not economically and efficiently managed. The statement has been made, as you are all doubtless aware, that a sum of one million dollars per day might be saved if scientific management was inaugurated. This amount would represent a reduction of 21½ per cent. in all operating expenses and an amount equivalent to the entire item of maintenance of equipment expenses, where it was claimed the principal saving could be made.

There are ways and means in the railway service, as in all other lines of industry, to effect economy and promote efficiency by the application of scientific methods and principles. That they are in effect at the present time in the operation of railways is too well known by gentlemen like you, who have been responsible for many of the economies already effected.

The maintenance of way and structures of our railways call for an annual expenditure of approximately three hundred millions of dollars, every dollar of which is expended with intelligence, honesty and effectiveness. Proof of this fact is evident from the good physical condition of our railway properties. It is not claimed that perfection has been reached by any means, in the application of sound engineering principles in the construction and maintenance of our railways, but that the advance made in the application of scientific principles, economical methods and high grade of efficiency have been applied to a greater extent in the engineering departments of our railways than in any other industrial activities.

The very object of your association is "advancement and knowledge pertaining to the scientific and economic location, construction, operation and maintenance of railways." That this has been most assiduously and earnestly followed is evidenced by the splendid work which you have done. No railway organization, considering the time your association has been in existence, has accomplished as large an amount of work and obtained as good results as the Maintenance of Way Association, and it is through its work that the railways must largely look for the more economic and efficient performance of their operations.

The rehabilitation of the railways of America is a monument to the ability of the engineering profession. There is scarcely an important railway in this country which has not been practically rebuilt within the past twenty years. Millions of dollars have been expended to carry on this work and the economies effected thereby have been justified almost without exception by the reduced cost of transportation which is immediately transferred to the benefit of the public in the form of reduced rates, greater facilities and improved service.

The capitalization of railways in the United States as compared with other countries is greatly in our favor. As an illustration: The cost of construction of the English railways is placed at approximately six billion, four hundred million dollars, and the cost of the railways in the United States at thirteen billion, five hundred million, or the English railways have in the ratio of one-tenth the mileage at one-half the cost of our railways. Carrying the comparison a little further, the service of the American railways is less than that of any other country in the world, save a few small countries having a limited mileage and inferior railways. In 1908 the average receipts per ton mile for freight transportation in England were 2⅓ cents, while in the United States they were ¾ of a cent, or less than one-third.

The ability of American railways to furnish the best service at the lowest rates is largely due to the efforts of the engineering profession which has evolved economies in the form of grade reduction, curve elimination, improvements in track and other structures, which have greatly reduced the cost of maintenance of property.

This work in the past twenty years has contributed largely to the increase in the average net tonnage per train, which raised it from 176 to 388 tons, or 116 per cent.

The committee on rail is performing most excellent service in the studies which are being carried on to perfect a set

of specifications which shall give to the railways a "good steel rail." The public generally little appreciates the amount of time and earnest thought that is being given to the various problems entering into the operation of railways. The work of the engineer is done quietly and without display. He does not sound his trumpet but works quietly in the laboratory and work shop and his reward comes in the satisfaction of work well done.

Economies which are being effected in the preservation of ties and timber used in railway construction will soon show their effect upon the expenses of operation. One of the largest items of the expense of maintenance of track is the renewal of cross ties. The annual requirements of American railways on this item alone are from 125 to 130 million ties. Your association has accomplished a splendid work along the lines of conservation of our natural resources by practically increasing the life of our ties from an average of about seven years to from 15 to 20 years. The economies in the way of reduction in maintenance of ties will be effective some years in the future, or after the treated ties have outlived the average untreated tie. A like economy has been effected in the use of treated timber in the construction of bridges and trestles, which has resulted in the increase of the life of the structures of from 100 to 200 per cent.

During the early period of railway building, the use of masonry and steel in the construction of bridges and trestles was very limited, largely due to the high cost and to the light unit loads of equipment used. As the traffic increased and the weight of locomotives and cars increased, it has been necessary on many lines to renew wooden structures every ten years. The introduction of masonry and steel and the use of concrete in bridge construction has been one of the most interesting developments in the maintenance of our railways. The economies effected in the use of the latter material have been applied in railway operation perhaps to a greater extent than in any other one line of industry. Your association has done a valuable work in its technical investigation of the stresses and strains due to impact on our bridge structures, the actual tests having been made under careful observation with trained, skilled men. The result of these investigations will prove of great economy in bridge design and construction.

In building construction the engineering departments of our railways have devised many methods for economical and efficient operation. The development of the modern coaling station has reduced the cost of handling coal for locomotive use from the cumbersome methods of twenty years ago, when it cost from 15 to 20 cents a ton, down to one or two cents per ton. Maintenance of way work has been made more effective and economical through the introduction of labor saving devices, such as power hand cars, the use of power drills, ditching machines, track laying machines, modern derricks and pile drivers and a superior quality of track tools. The methods of carrying on the work today, in contrast to the crude method of former years, are systematized and intelligently directed and conducted, all of which has resulted in producing economies. These methods apply to the laying of rail, placing of ties, ballast, installing frogs and switches, cleaning right of way, erection of bridges and trestles, the general maintenance of line and surfacing of tracks and other operations having to do with the maintenance of the roadbed and track.

There is, however, one item in the cost of operation of railways that should be largely reduced, and that is the item of taxes and assessments. Unfortunately, this matter is entirely beyond the control of the railways, but lies within the power of authority which likewise prescribes the limit of its revenue.

The reports of the Interstate Commerce Commission show that the total amount of taxes and assessments paid by the railways of the United States for the year ended June 30, 1909, was $90,333,559, or at the rate of $401 per mile of line. In 1889, twenty years ago, the total taxes paid were $27,590,394, or $179 per mile, an increase of $62,743,165, or 227 per cent., being $222, or 124 per cent. per mile of line. The net capitalization per mile of line in 1889 was $48,021, and in 1909, $57,962, an increase of 20.7 per cent. Therefore, taxes per mile of line increased six times as much as net capitalization.

The inequality of taxes levied upon railway property as compared with other corporate and private property is most unjust and in all fairness requires a correction.

A recent investigation in the revenue system of one of our largest states revealed a condition of affairs which shows the extent to which railways are being overtaxed and other corporate and private property undertaxed. In other words, the railways are paying the taxes that are justly due from other corporations and private property.

A just basis of taxation is that every dollar of property be taxed alike, whether it be railway, other corporate or private property. In the state referred to the railway property is assessed at its true value, while other property is assessed at an average of 46 per cent. of its true value. The proportion of corporate property, including railway, in the state is 16 per cent., while private property is 84 per cent. The proportion of taxes paid by corporations (including railways) is 55 per cent., while private property paid but 45 per cent. In other words, corporations owning less than one-sixth of the property paid over one-half of the taxes, while private owners with over five-sixths of the property paid less than one-half the taxes.

The amount of taxes paid on investment of $10,000 in railway property was $19.20, while the same investment in private property paid only $9.20, or less than one-half.

This state places three sets of valuations upon railway property, namely:

First, by the railroad commission for the purpose of regulating the issue of securities and rates, at $210,000,000; second, by the tax commission for the purpose of taxation, $409,700,000; third, by the local assessors, at $330,000,000.

The investigating committee which developed these facts very properly concluded that, "A merchant who would have three yardsticks in the regular course of his business would have trouble with the grand jury, and the state should certainly practice the same standard of honesty that it requires of its citizens."

It is likely that a comparatively similar condition prevails in other states of the Union and that the railways are generally greatly overtaxed and are bearing the burden of taxation of private owners whose very property has been enhanced in value by the construction of the railways.

A fruitful field is open for a committee on efficiency and economy, to see that railways pay only their just proportion of taxes and assessments, and no more.

It must be remembered that the operation of railways is unlike that of any other branch of industrial activity. In the majority of commercial industries the operations are confined to narrow and prescribed limits and every detail can be closely supervised and instantly corrected, if found faulty. On railways the operations extend over thousands of miles and authority must be delegated to men not constantly under the watchful supervision of a trained authority. A certain amount of waste under such conditions is almost inevitable and it requires constant vigilence and untiring energy to produce the results obtained.

While much has been done in the past in the way of establishing a high grade of efficiency, in the operation of railways, much yet remains to be done. The evolution in railway service is rapid. New problems are constantly arising and the ever decreasing rates of transportation enforce the application of scientific methods which will reduce the unit cost of transportation to the lowest possible point. Much responsibility, therefore, rests upon the

engineer in a diligent search for further economies to bring about the desired results, and I am sure the solution of a large part of this intricate problem lies with you gentlemen, members of the Maintenance of Way Association.

Sir Thomas R. Price.

When you were good enough to invite me to be present at this gathering I very gladly accepted your invitation as offering me the opportunity of being among railway comrades in the United States of America, if you will permit me to regard you as such, but that pleasure was considerably minimized when I heard that it was expected of me to address a gathering such as this in a country where there are so many capable and not a few eloquent speakers. I think I might have been inclined to deny myself the privilege of being present, notwithstanding my desire to make the acquaintance of railway men in this country of yours, but for the fact that I was glad to have this opportunity of testifying as only I am able to do, how greatly I appreciate and how greatly the government I represent will appreciate the friendly good will and the unmeasured cordiality and assistance the railway administrations of this country and their officers have extended to me.

It may seem invidious to single out any particular railway administration, or any particular officers, who have extended this cordiality, remembering that one and all have desired to do so, and I believe would have extended similar assistance in carrying out the mission entrusted to me had the opportunity offered, but the assistance that has been given to me by some of the railway administrations and officers has been so conspicuous that I feel I ought to mention them particularly. One of those I desire to mention is the gentleman who has just spoken. When the purpose of my being in this country was explained to him, nothing could have been more ready and cordial than the manner in which Mr. Felton not only offered valued facilities, but went out of his way to get the information that he himself possessed. Similarly I ought to mention Mr. Underwood, president of the Erie Railroad, and Mr. Cook, the general traffic manager. I wish also to convey my thanks in this public manner to the president and officials of the Burlington Railway who gave me similar facilities for seeing for myself the conditions under which you carry on the operations concerning which we in South Africa desired to have the benefit of your experience.

The other reason that I felt myself warranted in trespassing on your time was to take the opportunity of bearing testimony of those from whom I come of their high regard of the railway men of America, and the great things which you are accomplishing. I want to refer to some of the people in our country. I shall not mention any of those who are living, because I shall hope that they will continue to do the great things they have been doing in the past in South Africa, and if it should happen that they ever leave that country (I make you a present of this statement), they are very likely to come back again. But I will mention a few things as indicative of what your people do when they go to a country that really ought to be almost as dear to you as it is to us and that is some portions of the British Empire.

I will instance three men; they have gone to their rest and I am glad to have the opportunity of just mentioning the experience because I am able to speak from personal knowledge. Probably none of you approved of what was known in South Africa as the Jamieson raid. I am not here to defend it; am not here to explain it. I am a government official now, I was a government official then, and therefore in any case my mouth would be closed. But amongst the reformers who went to Pretoria jail, there was more than one who came from your own country and who are so far as I know, still citizens of America. One of them was an old man—his wife is still living, and one of the sweetest women I have had the privilege of knowing. That old engineer of yours and his wife, in the Pretoria prison were the comfort, the life, and, shall I say, the support, of the hundred men who were locked up in the building out of which they could have gotten any day in the week. Now that is the type of man that endears your countrymen and your country to the British Empire wherever the English language is spoken.

In the late war in Kimberly one of the men who stood out most conspicuously, and who rendered magnificent service during the siege, was again an engineer and a countryman of yours. Under the greatest possible difficulty he proceeded to manufacture guns and ammunition, he was a leader and guider and an able man in deed and in action in connection with the defense of Kimberly during the siege. And he did what those who are dear to him ever will be proud of, he gave his life to the country that he had made his home, and for the benefit of his associates with whom he was in daily contact. During the war, just when he was performing very, very able service, his life was cut short by a stray bullet that came from the besiegers. I honor him, and you may well honor the memory of such a man.

The third man I would like to make particular reference to is a man that perhaps some of you may have known, many of you have heard of, and that is your countryman, Louis Seymour. Louis Seymour again threw in his lot with those with whom he had been associated before the war began, and I am able to testify that he believed he was justified in doing so, and that the circumstances justified the action he took. Now, what did Louis Seymour do? When they had to leave Johannesburg, he came down and was the life and the active associate of all the others who were taking action, not only to do the best he could, and they could, for the cause they believed to be right, but he promptly occupied his time in devising means for improving the working of the gold fields as soon as the war was over. And I had the great pleasure of being associated with him in planning a type of trestle that you had been using in America, and adopting a type of truck that we know as the Hopper gold trucks—(you call them dumping cars, I think). While the war was on, the plans were prepared so as to have everything ready immediately the war was over, and we proceeded to place orders in America for the necessary trucks to arrive, so as to have them in time to commence the work. Not only that, but as soon as the war was over he offered his services, and then gave them magnificently in the position he was placed in, in charge of the repairs and renewals of the broken bridges along the railway lines. The work that he did in the repair of a bridge such as Norvalen Punt, adjoining Cape Colony, in the Free State, and following the British Army on and on, to repair the bridges that were broken, is a standing monument to Louis Seymour, and his memory is held very bright and very green in Johannesburg. The Seymour Library in connection with the Technical College at Johannesburg, is the best reference library in the southern hemisphere. No money was spared in establishing that library; no money is spared in maintaining it as the best library in South Africa. He gave up his life for the cause that he believed to be just, and at all events he gave up his life fighting with his comrades at a time when that fighting took the form of re-erecting a very important bridge and also defending the operation against attack. When you have such men as these—and I have only mentioned those who have gone to their homes—can you wonder that we, when we get the best type of your countrymen amongst us, marvel why it is that there should be any difference between you and ourselves—(applause)—and can you wonder that, when I come among you and am received with the welcome and cordiality that has been extended to me, I regard you in the same light that we regard so many of our countrymen who are in South Africa and whom we feel

delighted to have the opportunity of regarding both as comrades and as friends?

I am not going to weary you with the details of the railways in South Africa. You know about them in the same way that we know about your railways, but there may be one or two facts that would interest you that I should mention in passing. The first is that you gauge is known as the standard gauge practically the world over; ours is the gauge of 3 feet 6. Many of the appliances you have, we have. We have the opportunity of knowing what you are doing. We take advantage of that opportunity. In some cases we do not follow your practice because we believe that local conditions and the solving of the problems have required different methods.

The only line that I would like to mention, by way of illustration, is the line that used to be considered visionary, viz.: the line from the Cape to Cairo. That line has already reached Congo Free State from the south. Roughly speaking, the distance from Cape Town to the terminus of that railway is about the distance that it is from here to San Francisco. People think that it is a visionary project, but I believe you will live and others will be living who are now alive, and in middle age, who will regard it as altogether a mistake to think the Cape to Cairo Railway is visionary.

I would like to say one last word, and that is to refer to the impression that my second visit to your country is likely to form on my mind. It is too soon yet to finally determine, but so far as I can judge the impression will be not so much that of an education, because, as I say, we keep ourselves informed on what you are doing, but rather of an inspiration and incentive, and I know of no place better than Chicago to bring about that feeling. Here you are in the center of America. You have no minerals immediately within your borders, and yet you are in a town that, less than eighty years ago, I am told, was reported upon by your government as a spot that ought to be abandoned, the soil was no good, the whole place should be left to its fate. Less than eighty years has brought about, if you will permit me to say so, the establishment of your railway communication that gives you about the largest city in the world; that has enabled you to become prosperous on traffic and at rates that are considered to be usually unremunerative. That is due, as Mr. Felton rightly said, to your endeavors and the result of railway communication. I shall go away with the feeling that you have inspired us, you have set us an example that it will be our business to copy and emulate, and mixed with that feeling will be the pleasant memory of the cordiality you have extended me, the very warm welcome you have given me and the remembrance of the service I have received at the hands of my comrades in the United States. The honor that I have received here tonight from you who have so patiently listened to what I have imperfectly said, will be a particularly pleasant memory to me and to those who care for me in years to come. (Applause.)

Prof. Louis C. Monin.

As a substitute for my chief in this splendid gathering, following the distinguished speakers of this evening, I feel indeed like the little girl who was playing one day in front of her house. Mother was watching her and Mother thought Elsie was naughty. Mother said, "Elsie, come in; I want to speak to you." Elsie said, "Mother, before you speak to me, will you permit me to say my prayers?" Elsie went to the corner by her mother's permission; she knelt down and said, "Oh, Lord, if ever you want to do something for Elsie, now's your chance."

I appreciate very much the honor I have this evening in addressing a gathering like this, and on a topic so broad—a topic which has been discussed so often that it would seem there is hardly anything new to be said—the topic of Education.

The only qualification that I have, I think, which will permit me to stand up amongst you as engineers is the one, that at five o'clock, our president said to me, "You must go and address the gentlemen in my behalf." I obeyed orders. It is the best a man can do, and I think you will all sympathize with me in my endeavor to obey orders.

A few years ago a Spanish nobleman, the Duke of Medinah, inherited, by the death of his father, his estates and his vast realms. According to the custom in Spain, the young gentleman had to present himself before the Queen Regent at the time when the entire court was assembled. He had to enumerate the valiant deeds of his ancestors, and show why he should be entitled to succeed to the dukedom. To the great astonishment of Queen Christiana, and her court, the young man, instead of making a long address, enumerating what his ancestors and forefathers had done, with a very few words laid at the feet of his sovereign, the diploma which he had just received when he had finished his course at the Polytechnic Institute at Madrid and received the diploma of civil engineer. He said: "This is my claim to the dukedom of my fathers." (Applause.)

This young man may have valued his diploma somewhat too much and yet I think he did it in the right spirit, and he did it in the spirit which we should like to inculcate at the Armour Institute of Technology in the young hearts and in the minds of those who are going to follow you in your work; for it is not merely for material matter that the engineer is working, but for human welfare in general.

With this point in view, I am sure you will pardon me if I dwell for a few moments upon the ideals sought in the education of an engineer. What are the things that we must teach? First, we must give the student all that he needs for his own development; second, we must fit him for that which the community needs, and is going to ask one day from him.

In the foreground of our endeavors of work, of course, is the daily task, which comes to every man who has to perform his work. He is to be an engineer; he has to make a living, he has to be an intelligent producer—these ends have to be kept in the foreground in working out the ciriculum of an engineering school.

In the back ground, however, is the idea of the personality. Performance and personality complete the man. This personality is made up of general culture, of character, of a great purpose. Behind the work is the man, behind the engineer is the citizen, behind the living is the life, behind the intelligent producer is the intelligent consumer. It would seem often as if our educational agencies were thinking perhaps a little too much of training the intelligent producer, and not giving enough time and thought to the training of the intelligent consumer. Dickens says: "Income, 20 shillings, expense 18 shillings, balance—happiness. Income, 20 shillings, expense, 21 shillings, balance—misery." It is a good engineering lesson to teach to our boys.

In regard to the performance of the work, what is needed in the performance of every man's work, and especially in the performance of the work of the engineer? I wish to bring before you vividly and sharply the ideals as we conceive them, that ought to be implanted in the hearts of our young engineers. Performance means to be master of one thing; be in sympathy with a great many things, but be master of one thing. The man must have enough power in himself to make an effort. The engineer knows that he can gage mechanical and other work by units. We have the horse power, the ampere, the volt, but fortunately we have not come to gage human effort by such units. It would be a splendid thing if every man could be given a ticket and holes punched in the ticket according to the work performed by him—for so many units of work, so many units of meals, of sleep, and house and dress, and what-not, but we cannot do it.

Our educational work has gone on within the last twenty years in a way that is not quite fitted to develop fiber in young men. We have been told we must make it interesting. A father came to me once and said, "I don't want

this boy to be bothered with mathematics. It is not in the family." I answered, "Why, my dear sir, it ought to be." (Applause.) You don't make an athlete by putting him in an easy chair, never letting him go out into the field and practice until his muscles have grown strong. If you keep him in an easy chair, and all at once you send him to battle and expect him to win victories, you are disappointed. You must teach him to do the uninteresting things well; to make the commonplace significant, and first of all, he must know his business.

Chesterton says the only way to become a successful whist player is to learn the rules of the game in the first place, and then play it a little better than everybody else, or cheat. (Laughter.) Of course, gentlemen, I suppose that none of us, especially anyone occupying the position of an educator, would give the last advice to the student. Learn the rules of the game. That is well to tell our boys. Study your subject. The least we can require from you when you graduate from our school, is that you know your business. You do not need to be petted or sent on a trip abroad as a reward for what you have done in your studies. You will have to learn these things later on. It is only by expert service that we climb up the ladder of success. We tell our men to learn the rules of the game, and when they go out into the world to play a little better than everybody else, and they will be successful.

In regard to the characteristics and character of an engineer I have hunted for many years for information, and so far I have succeeded in getting together thirty-six prominent characteristics necessary for a prominent engineer. (Laughter.) I will not weary you, as we weary our Juniors and Seniors, by giving an hour's lecture on each, but at the bottom of it all it seems to me that the character most needed by an engineer is one that sees the difference in life between that which is fundamental, that which is merely supplemental and that which is incidental. The great trouble with our boys is that they devote their lives between the fundamental and the incidental, so much studying and so much fooling, and there is nothing between.

We think in our institution that the man who can divide his life's work, his reading, his energies, the attention he gives to his profession, to state, church, school, social institutions in the right proportion of, say about 60 per cent. to the fundamentals; making your living, about 15 to 20 per cent to the supplementals that go to make life livable; art, social intercourse, etc.; and perhaps only 10 per cent. to the incidentals—the moonshining and the lovemaking. Behind all these ought to be the greater purpose, the man with an outlook, the man who can make the greater effort, the man who is not bothered when things go wrong with him, for whom the whole horizon is not clouded when the machinery is broken.

Above all, gentlemen, we must try to inculcate a spirit of courage, a spirit of patience. Let us say with the old statesman of France, Thiers, whose watchword was, "I shall begin again!" When he was thrown down, whenever he lost a position, whenever his opponents threw him out of the cabinet, all he would say was, "I shall begin again." I think this is the true engineering spirit, and if you add to this what every citizen, what every true man must add—the three S's, that I should call preeminently the symbol of the engineer's work and the engineer's life and character—sincerity, simplicity and service—you have an engineering education that beats the world. According to the German poet, "He only deserves liberty as well as life who is to earn and win them by his daily toil." These are our ideals. (Applause.)

Hon. John Barton Payne.

I have been thinking, as these gentlemen have been talking and we have been listening, about maintenance of way. Omit "maintenance of" and you have "way." Do you recollect what "way" means; how, from the dawn of civilization, the ways of the world, its roads, its highways, have marched forward as the leader of civilization? How, in Rome, her civilization was evidence by the fact that she built roads and bridges throughout the remotest sections of her empire? To-day, in Spain and the lower countries and other places far from Rome, you see the roads and the bridges built by the Roman emperors. Water was brought to Rome by these great creations which now the engineer represents. In the early history of our own country it was regarded as a feat of so much moment to build a national highway out through the west, and not very far west, that Henry Clay has a monument standing to his name to-day near Wheeling, W. Va., because he originated the national road. Compare the railways of the United States and the railways of other civilized countries with that phase of civilization. The men who guide, create and direct the railways of this country should be the leaders of thought as well as the leaders of action.

Ways dominate civilization always. I do not think we should be disturbed about the phase of legal difficulties through which we are now passing. It is merely a phase and we will outgrow it, grow out of it, triumph over it as clearly and distinctly as we have over difficulties which confronted railway building when we were compelled to build railways throughout the west by country subscriptions.

You know the history of the past in dealing with railway construction. We were simply marching toward the west. We were simply leading the van of civilization through the west, and now that civilization has settled down in some sort, difficulties which confronted railway construction and operation are now exemplified by the 46 or 47 or more state commissions and the great commission of the United States. We must be wise enough to adjust ourselves to these conditions. We must be bright enough to lead in these conditions; we must be strong enough to impress upon the people of the country our conviction of the right in dealing with these conditions. We are growing through state commissions, through every state through which a railway goes; there is the commission to deal with, and that commission restricts, interferes with and, in some sort of way, controls by its often unwise and restricted and selfish action, the dominating power of the United States. What must be the result of this? After a while the United States Commission, by the addition of power given by congress, so far as congress has the right, and by the construction of the constitution which the supreme court of the United States must ultimate make, will assert and exercise the power of dominating rate making and railway legislation to such an extent as to dwarf the power of the state commissions, and when we reach that condition—(applause)—we shall so have impressed ourselves upon the power of congress and upon its wisdom, that congress will give to the railways of this country that power and encouragement which will enable the railways to take the place which the ways of the world have always taken and held. (Applause.) And the only word from the legal department of our road is that we shall be wise and patient and that we shall not beat ourselves against the pricks, but deal with these conditions wisely, because it is a phase of civilization through which we must pass. (Applause.)

W. B. Poland.

I am going to assume that you don't know anything more about the Philippines than I did when I went out there, which was almost nothing, and give you a few facts in regard to them.

First, the Philippines lies about 20 deg. north of the equator. You will see that they are somewhat nearer to the equator than Cuba and Porto Rico. The climate is divided into two seasons, the wet and the dry seasons. They are about six months each. During the dry season, which is from September to the end of May, the climate is almost ideal. During the rest of the year it is very hot, until the rains begin, and then it is quite comfortable, although it is disagreeable until a man becomes accustomed to the rainy season and accustomed to being wet two or

three times a day. As to the general healthfulness, if a man does not drink too much whiskey and carries out a few precautions such as drinking boiled water and eating only vegetables which grow out of the ground, he will have the very best of health, probably better health than he would have in the United States. In fact, the percentage of deaths per thousand is much less among the Europeans in the Philippine Islands than it is in the United States. That of course is largely due to the fact that they are more or less picked men out there, and there are not so many women and children.

Now, the area of the Islands is about 115,000 square miles. About half of that is arable productive land, and the other half is mountainous country. A good deal of it, however, is good grazing land, and is capable of producing a good deal of revenue. The population is about 8,000,000 and, of that eight million, seven million is so-called civilized. The remaining one million consists of the hill tribes, which are, although not altogether, principally savage. They are, however, being civilized very fast and made into a productive people.

It is rather interesting to consider the races which are in the Islands. Apparently they were first settled by what I call Negritos, who have a good many traits of the Africans; but they are very small people, not over five feet in height, and they are very timid. These Negritos were driven to the tops of the hills by what are now called the Montascos, meaning the people living in the mountains. These people undoubtedly originally lived in the lowlands, but as the Malay invasion, which populated the Japanese Islands and Kamstchatka, and afterwards undoubtedly the Aleutian Islands, and our Alaskan Coast, flowed over into the Philippines, being a good fighting people they drove these Montascos up into the mountains. So we have three sets of people there—first, the Negritos, who are the very primitive people, in fact, live in trees to a large extent, and probably not more than 500,000 altogether; then the Montascos, who probably number about 750,000; and then the present Filipino population, which is composed of the Malay invasion, associated with the Japanese and Chinese, principally Chinese and an admixture of other races, which have come in within the last hundred years, as, for instance, the English, and largely the Spanish, and French and other European races. Now, the Filipinos who live in the lowlands are what are usualy referred to as the Filipino people. They are not a homogeneous people. They associate very little, one part with another, so that the people who live on one Island know very little of the language and customs of the people who live on even a closely adjacent island; they do not even speak their language. So that it has been very hard to get any national spirit there. For that purpose, the Filipino Government has instituted the teaching of English, all over the islands, and at the present time there are more English-speaking Filipino than there are those who speak any other language.

You may be interested in the form of government there. There is first, a governor general, who was appointed by the president of the United States; he is supported by a council of seven commissioners, four of whom are Americans and three are Phillipinos. That forms the Philippine commission. Then there is the Philippine assembly, which is an elective body, and consists, as I remember, of about eighty or one hundred members. Any laws in the Philippine Islands must be passed by both the Philippine commission and the assembly, and approved by the governor general. The islands are then divided into provinces, over which there is a provincial governor, who is elected by the people; and under him the province is divided into municipalities, over which there is a municipal presidente, and a council. Those are all Filipinos.

There is a supreme court which is composed at the present time of a majority of Americans—a majority of one, I think. The Filipinos on the supreme court are very able men, and there is no question as to racial decisions. A number of times, when questions have come up between Americans and Phillipinos, they have shown an absolute impartiality; so that there is quite a complete confidence in the decisions of the supreme court in the Philippine Islands, although there is only a majority of one American on it. In order to develop the resources of the Philippines the Washington administration decided that railways were very necessary. Concessions were given for the construction of 800 miles on the great island of Luzon, of which about 375 miles have been constructed. In the Vicene islands, concessions were given for the construction of 250 miles of railway, of which about 133 are in operation. In the building of these railways there were a great many difficulties encountered; the labor was very poor, indeed; there was lots of it but we couldn't get it. I at one time went to the presidente and told him that I must have 500 men on the work; he told me he would have them the next day. The next day came, and the men didn't, and when I went to the presidente, he said, "Well, senor, I went to the men in my district and told them that they must report to you for work, but they told me that they had two sacks of rice in their cabins, they had cocoanuts growing in their yards, they had fish in the streams, potato patches in front of their cabins, and they didn't see why they should work, and I really did not."

The real problem of the Americans in the Philippines is to make the natives unhappy, and make them want what they have not now—make them want shoes and clothes and better costumes for their women, and then we will make them work. Until we can make them unhappy, we cannot expect to get very much out of them. (Applause.) That is what we are trying to do now.

In regard to the construction of the lines in the Philippines we found at the outset it was necessary to adopt a very high standard. The depreciation in the tropics, as you know, is very rapid. We had to abandon wooden construction almost entirely. Everything is of reenforced concrete or steel. The surveys were very expensive. The men who went out on the surveying parties found themselves up against very hard conditions to overcome in transportation. They could not get food in the interior, and they had to hack their way through a dense tropical undergrowth which was almost overpowering in the heat and steam of the tropical sun. We had to build ladders for them to see over the brush, which grows from five to seven feet high on the plains. One of the great costs of the work there is the expensive drainage. The drainage areas are very small and the rainfall is frequently from fifteen to seventeen inches a day in the rainy season, which makes a small drainage area require a very large bridge opening. The equipment is all steel framed throughout. We use 60,000 to 80,000-pound capacity cars as a rule on a three-foot six-inch gage track. That is the so-called oriental gage, the same as adopted in the South African railways. The roadbed is about 16 feet, with 12 inches of gravel or stone ballast. The rail is 60 to 70 pounds, and the ties are of the native Philippine hardwood. They are supposed to last from 20 to 30 years, and they cost us $1 in the track. The buildings are all of reenforced concrete. The Philippine government guaranteed the interest on the bonds at the rate of 4 per cent. for the actual cost of construction in the Philippine islands that was necessary in order to interest foreign capital in the construction in a remote country.

In regard to maintenance, we find that the Philippinos are very satisfactory track laborers after they have learned how to use a jack and the ordinary track tools. We had a good deal of trouble at first, because they put the wheelbarrows on their heads when they were working instead of running it on the wheels. Now, we have gotten to a force of one foreman and two men for a five-mile section of single track and they keep the track up in very good shape under eight or ten trains a day. The operation is largely by Philippine labor. Our track men are Filipinos or Chinese and are becoming more and more Filipinos



Annual Dinner of American Railway Engineering and Maintenance of Way Association.

all the time. Of the train men, about three-quarters are Philiipinos, and they make very excellent engine men after a year or two of training. The engine men get about $30 a month and the conductors about $25 a month, so the operation is very economical. The section men get $15 in gold a month. The principal problem there that all the railways have is, to build up the country along their lines. There is probably no more productive land than that of the Philippine islands, but it is very little worked. I do not suppose they produce 25 per cent. of what they could produce, and the work of the Philippine government as well as that of the Philippine Railway Company has been to develop the sugar, rice, corn, copra and hemp products of the section, and we are meeting with very good success. We have doubled the output of the section adjacent to our lines, and it looks as if within the next four or five years it would be trebled or quadrupled. If that is done, it will make the investment in railways in that country a very satisfactory one from the standpoint of the investors in the United States.

The real turning point with the Philippine Islands came when the Payne bill was passed. Previous to that we had destroyed the Spanish market for the Philippines and had not substituted anything for it. The reducing of the tariff on Philippine products opened up a new market. The total production of the Philippine Islands, as to exports and imports in 1909, before the Payne bill went into effect, was $58,000,000. In 1910, it was $76,000,000, which shows very well what we have accomplished by that very concise legislation. Most of this represents a gain in trade with the United States.

The work which the Philippine government has before it might be summarized in this way: as to education, there are some 450,000 Philippino children, who are now in the schools, and it is easy to be seen that in the course of a year or two, or possibly five or six years, that will produce a good deal of effect on the Philippino people. Road construction is being taken up very vigorously by the provincial governments through the direction of the governor general. There are fine highways—turnpikes you would call them—being built between the different cities of the islands. There is a great development of harbor and river improvements, light house construction, etc., all of which tends toward the development of Philippine commerce.

One of the principal things which the administration is to be given credit for, is that of sanitation. There has been a very satisfactory sanitory organization put in all over the islands. The epidemics of smallpox, which used to carry off every two or three years some 200,000 or 300,000 people have been eradicated, and smallpox has been almost blotted out. Cholera, although you may say it is indegenous to the Philippines, as an epidemic, is almost unknown. This change has been brought about through the work of the Bureau of Public Works.

The whole effort of the government in the Philippines is to train the people for local self government. Just as fast as they show that they are able to properly handle their own administration of affairs without the help of American officers, districts are turned over to them so that the number of American administrators is steadily being reduced, and the number of governors, and mayors and presidents is constantly being increased; also the number of Philippine office holder in the civil government is constantly being increased as they show their capacity for government. This is an important thing for us to realize, because it does not seem to be appreciated by the opponents of the administration in their attacks in congress.

The development of the islands through agriculture, is being carried on through the agricultural department, which has a very efficient administration. They are introducing better grades of corn and rice, and teaching the people how to raise more from a given area of land than before, and the increase is very marked, in certain sections as much as 50 per cent. I think it will show an increase in the exports of the islands of nearly 100 per cent within the next five years.

The political situation in the Philippines is not, and probably never will be satisfactory. We expect the Filipino to recognize what the American government is doing for him and to be grateful for it, but he does not do that, and he never will in my opinion. It is the old, old case of the antagonism of an inferior people toward a superior people. We see the same thing in Egypt toward the English government, and in Java toward the Dutch government, and in India toward the English government. We never can expect anything else, but we have put our hand to the plow, and we must see the work through.

It was very interesting to me in making the trip from the Philippines to the United States to be able to compare what they were doing in the Philippines with what some of the other governments who are carrying on Colonial forms of administration were accomplishing. In Java, for instance ,they will tell you that they have a very much more satisfactory form of government. In a way it is so, but the people of Java are almost slaves. The Dutch governors there have as nominal rulers executives who are called sultans, and they will say to one of the native governors, "you must have your people cultivate this tract of land next year." That tract of land will be cultivated, and well cultivated, and the people will win from it a very good revenue, and they will be as you would think, content and happy. Undoubtedly their physical condition is much superior to that, for instance, of the Filipinos, but the reason that they do cultivate the land is because they know, from past experience, if they do not do it, they will be coerced, they will be forced physically to work even by means of the lash. That is not necessary now, because they have learned their lesson, and have become very docile. The result is that Java is a wonderfully cultivated island. Taking into account its natural resources, its production is probably three or four times that of the Philippines islands, but the people are nevertheless virtually slaves.

Going from Java into the Federated Malay states, which are under English control, we find there one of the most ideal colonial governments that there is probably in the orient. The whole country is governed by a handful of Englishmen who play the game to a finish. The country is being developed fast. It is being developed, however, by bringing into the country Chinese coolies, or the tamal or coolie labor from India. The result is that as far as the administrators are concerned, the country is advancing fast, but probably fifteen or twenty years from now you would find it difficult to discover any of the real inhabitants of the Federated Malay states. They are being driven out by this foreign invasion. The same thing to a less extent is going on in England's colonial estate in Burma. In India, the social condition is very complex indeed. In the past there is no doubt that England has entirely disregarded the interests of the people, but of late years that has been forced more and more upon them, and they are coming now to a realization that India must be governed in the interests of the India people, that is, they are coming to the American ideal of colonial government, which is that the country must be governed as a trust for the people of the country. In Egypt, England seems to have had that ideal before her more than in any other of her colonial possessions, but looking over the whole field, in making the trip from the Philippines to the United States, in passing through these colonial possessions, an American cannot but feel that we have performed a very creditable work and that we have marked out a new path in colonial government, and that as far as we have gone, we are making good. (Applause.)

ELONGATION AND DUCTILITY TESTS OF RAILS FOR NEW YORK CENTRAL LINES.

By P. H. Dudley.

The acceptance of rails under a single drop test of 2,000 lbs., falling a given height, rejects only those of less ductility than is required to take up the energy of the drop before rupture. This range of rejections varies from a small percentage of 1 per cent to 3 per cent of the output, and all in manufacture should be avoided.

Experience has shown that there are likely to be a number of heats of Bessemer and occasionally a melt of open hearth rails in which the ductility is just sufficient to absorb the energy of a single blow of the drop and pass the rails. The butts, however, will break from a second blow without giving any increased elongation, while a number of the rails are so severely strained by gagging in the straightening presses that the strains develop into checks and detailed fractures from service in the tracks.

The percentage in plain Bessemer ranges from 2 to as high as 15 per cent in some rollings, and is yearly increasing in this class of rails. Eighty to 90 per cent of the heats of Bessemer or of the melts of open hearth require two or more blows under the drop to break them, giving a desired range of 12 to 18 per cent of ductility in the rails for service as girders, which experience shows has rendered excellent service in New York Central Lines, where the temperatures often fall to 30 and 40 deg. Fahr. below zero. It is only natural that railway officers should try to secure as good or better material as was possible from 1890 to 1900, in rails for their constantly increasing wheel loads and speeds.

The 1890 specifications of the Boston and Albany and New York Central & Hudson River for the low 0.06 phosphorus and 0.60 to 0.65 carbon Bessemer rails, required a drop test from each heat and that 90 per cent should stand a test of 2,000 lbs. falling 20 ft. without breaking for either the 80, 95 and 100 lb. sections. To this requirement, then, was soon added, "That a butt which broke, yet gave 4 per cent maximum elongation per inch, the rails of the heat would be accepted." It is but proper to say that while a few of the rails had a minimum range of 4 per cent ductility, the majority had from 8 to 16 per cent, and comparatively few breakages occurred. The surface wear and flange abrasion were of slow rates, the rails lasting two and three times as long as more recent Bessemer rails.

To carry the present high speed wheel loads, the former minimum elongation of 4 per cent per inch has been raised to 6 per cent for the maximum inch or two consecutive inches must each give 5 per cent. The ductility of the metal must be exhausted in the test butt from Bessemer heats in which the equivalent of one-tenth of 1 per cent of metallic titanium has been used in the bath of steel. The range of ductility secured in this steel is the minimum specified to 18 per cent per in., though the range of the majority of the heats is from 11 to 16 per cent. The Bessemer heats each, according to weight of section, makes from 18 to 30 rails accepted or rejected by one ductility test.

The basic open hearth melts of 60 to 80 tons each making from 100 to 150 rails, according to section, are accepted or rejected upon the results of three ductility tests, one from the second ingot, one from the middle ingot of the melt, and a third from the next to the last ingot teemed. To accept the rails of the melt each test must show 6 per cent maximum elongation for 1 in., or 5 per cent each for two consecutive in. The ductility of the metal is exhausted in rotation from each of the different tests of the melt and we thus ascertain the general uniformity of the steel of the first to the last teemed. This has tested, but not confirmed, a published statement that the first steel teemed is liable to have so high a temperature that it will be brittle; while the middle ingot will have a proper temperature and be tough, the last ingot will be teemed of steel so cold that it will be brittle. This does not seem to apply to these large melts of rail steel, as shown by the ductility tests. Basic open hearth rails have been rolled under these specifications at Bethlehem, Buffalo and Gary.

The three tests per melt on the open hearth rails call attention definitely to several conditions of mill practice which in hot metal must proceed at the right temperature in a logical and orderly manner. A melt or two at first did not pass, but the causes for failure could be quickly ascertained and remedied in the following melts, the making and rolling of the steel proceeding in a more satisfactory manner to both the manufacturer and customer. The specifications provide that a distinction must be made between a chilled butt and one that is brittle, before acceptance or rejections of rails are made, while the full ductility tests give the low as well as the high range, facts not before available for the manufacturers to study, and guide their efforts to secure the desired range.

The specifications are intended as an aid to good commercial work in manufacture for the necessary quality for present service as well as output. Attention is called to good mill practice after the ingots are teemed and set on top; they should be promptly stripped, weighed and charged into reheating furnaces. This is to avoid unnecessary cooling of the metal developing large shrinkage cavities in the ingots from the inexorable law that molten or hot steel has a greater volume than when cold.

The management of one rail mill has organized a railway service for uniform prompt delivering and charging into the reheating furnaces of its large ingots, with the result of nearly entire elimination of piped rails, under the commercial discard.

CHICAGO PASSENGER SUBWAYS.

Bion J. Arnold, chief subway engineer of the city of Chicago, has prepared general plans for a complete subway system for the city, in a report transmitted to the mayor and the committee on local transportation of the city council under date of January 31, 1911. Detailed construction plans for the complete work are not yet finished, pending the decision of the city council on the financial policy to be adopted. The information compiled by Mr. Arnold in preparing his report is very complete, covering foundations, underground utilities, occupancy of sub-sidewalk space, the character of soils and other difficulties that would be met in this construction.

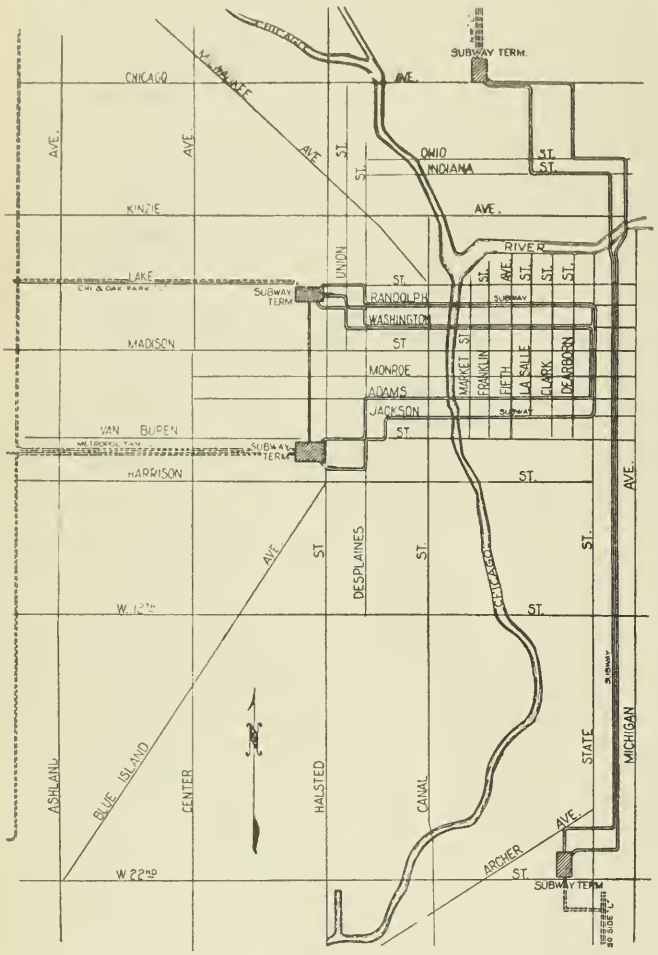
The building of a passenger subway for the city of Chicago has long been considered and many plans have been proposed. In 1900 a plan prepared by John M. Roach, president of the Union Traction Company, was presented to the council's committee on local transportation by all the street railway companies operating in the city at that time, the intention being to build a system of terminal loops to accommodate surface cars without providing for any through routes. These plans were not acceptable to the city council, and in pointing out some of the defects in them, John Ericson, city engineer, drew up a tentative plan, embodying the features that were thought essential, but no definite action was taken on his proposal.

The building of the conduit or tunnel which was begun by the Illinois Telephone & Telegraph Company, and which, after changing ownership several times, is now operated as a freight tunnel by the Illinois Tunnel Company, complicated the design of plans for a passenger subway, since its depth below street level made it extremely difficult to provide for a two-level passenger subway above it.

In 1904 the government ordered the dredging of the chan-

nel of the Chicago River, to allow navigation of the river by large lake steamers. This necessitated the lowering of the three river tunnels that had been built to remove street car traffic from the bridges. In planning for the rebuilding of these tunnels the question of a subway was again revived and the council committee on transportation had one of the assistant city engineers prepare plans for two subway loops connecting the Washington street and La Salle street tunnels and the Washington street and Van Buren street tunnels. It was the intention to run all surface cars using the tunnels through these subways in the loop district.

George W. Jackson, who was the builder of the freight tunnels, proposed a plan for passenger subways as early as 1902, and in 1904, in accordance with a commission by the city council, he presented a report covering the complete local transportation situation, in which he advocated



Subway Proposed by John Ericson, City Engineer.

building of passenger subways, with two routes to the south side, two to the west side, and one to the north side.

In 1908 the mayor sent a communication to the city council, asking for an investigation of the passenger subway problem, in order that the municipal government could seriously consider the question of providing such transportation. In accordance with this request, Mr. Ericson, the city engineer, prepared a very complete report on the subject, which was transmitted to the city council under date of January 2, 1909. Plans submitted with this report provided for the traffic on the elevated roads, as well as those of the surface lines, which further complicated the problem, since no previous plan had been drawn which had in mind the provision of facilities for handling the trains of the elevated roads in the subway. A great amount of local transportation data was collected upon which to base conclusions in the design of the subway. These statistics showed that the population of the Chicago center was 2,172,000 in 1906, and according to the best estimates would be 6,000,000 in 1950. Since it is known that the ratio of increase in the number of passengers in a local transportation system is greater than the city's population, it was estimated from the statistics of past traffic that the number of rides annually per capita in 1940 would have reached 404. The figures for past years were as follows: In 1885, 100 rides per capita, population 850,000; 1908, 230 rides per capita, population 2,300,000.

The routes for subways proposed by Mr. Ericson are shown in the accompanying map and were intended simply as the first steps in the building of a complete system of rapid transit for the city. The plan as outlined includes three main subways, a north and south line extending through the business district on Wabash avenue, and two east and west subways forming loops on Jackson boulevard and Randolph street and Adams street and Washington street. The terminals of these subways are arranged so that elevated trains can be diverted to them, as well as surface lines, from a large district radiating from the termini. Since the north and south lines of the loop subways are on State street, there are no crossings involved in this system, and the entire length could be built at the high level.

Various other systems for providing for rapid transit have been proposed by engineers interested in the city's development. One of the most recent of these is the shuttle system, outlined in a paper presented before the Western Society of Engineers on February 8, 1911, by A. S. Robinson. This plan proposed building a through north and south subway on La Salle or Clark streets and a loop from the west side on Washington, Clark and Van Buren streets, with the addition later of four or five parallel north and south lines, and as many more additional loops from the west side radiating to the northwest and southwest, so as to eventually serve the entire residence district of the city. This plan was not strictly a two-level design, although within the loop district, where crossings were numerous, Mr. Robinson planned to avoid grade crossings by depressing one of the lines under the other. No stations were planned for the low level, however, to avoid requiring passengers from any section of the city to use the lower stations.

Bion J. Arnold was appointed chief subway engineer of the city in 1910, and proceeded at once to submit a report. In preparing his plans, Mr. Arnold seems to have eliminated most of the undesirable or impracticable features of the numerous plans that have been advanced, and it now seems probable that some definite action upon his report will be taken at an early date. This report includes two alternative plans, one for a comprehensive subway system to care for surface, elevated and high-speed subway cars, and the other for a system providing exclusively for surface cars, with the object of relieving the present congestion in the business district.

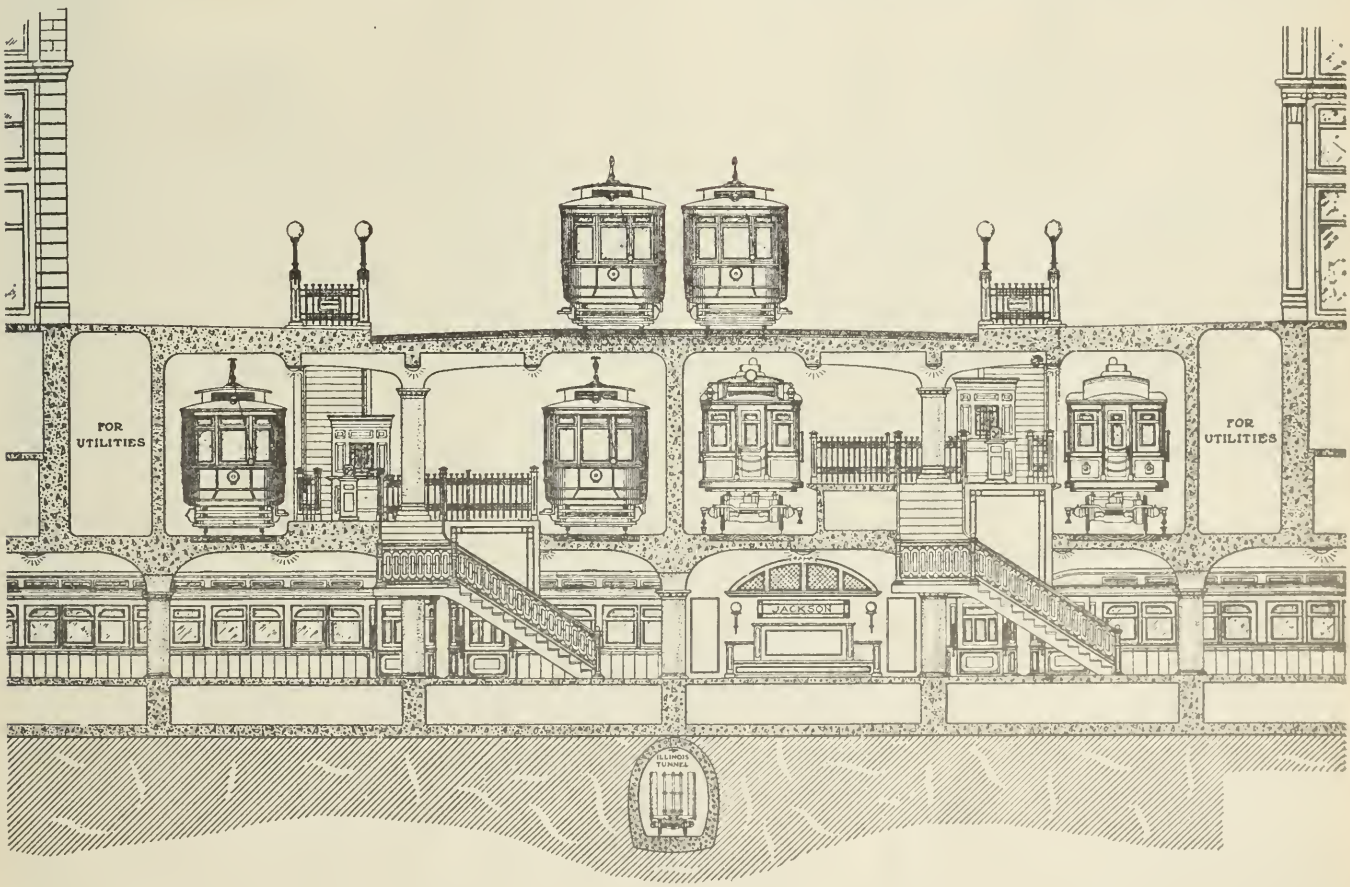
Mr. Arnold says in his letter of transmittal that no subway plans should be adopted involving any system of loops which would prevent the building of a high-speed subway system which will ultimately cover the entire city, for no extensive subway building can be justified as an investment unless the operation of such high-speed trains resulting in low operating costs is provided for. The report does not attempt to deal with the financial aspects of the situation, as it is held that regardless of the possibility of justifying the investment from a financial standpoint, the building of the subways is desired by the city to relieve the present congested condition. The complete system should provide for through operation from southern to northern termini, for similar operation on east and west lines, with loop terminals in the business district, and eventually diagonal subways on diagonal streets to connect these north and south and east and west

lines. The complete system has been divided in the report into a number of parts, with the idea that the parts can be built consecutively as the available capital and other conditions warrant. The portions included in each step are arranged to afford their proportionate share of relief for present conditions, the relief being commensurate with the investment necessary for building each part. The first step would provided a through north and south subway and a double loop from the west side, to relieve much of the surface line congestion in the loop district. The second step would furnish a north and south line to care for the trains of the Northwestern Elevated and the South Side Elevated, and two loops from the west side, one for the Chicago & Oak Park, and one for the Metropolitan Elevated trains. The building of this second section would make possible the removal of the present elevated loop. Step No. 3 would connect the two west side loops for elevated trains, allowing through routing and a more universal service. The fourth step would provide a loop on Chicago avenue, Michigan avenue and Twelfth street, which, in addition to the sections previously built, would furnish a connection between all steam railway passenger terminals in the city. The accompanying map shows the combination of these four steps, with all the stations recommended by Mr. Arnold. Further steps are provided in the report, to care for future needs as the city expands, but these cannot be accurately forecasted and must be largely conjectural at present.

The bore of the subway, according to the plans submitted, would be of reinforced concrete steel construction, with combination eye-beam and concrete construction in some instances. The size of the bore would be such as to allow the cars now used on the elevated railways to pass through with ample clearance, although the provision for this size involves some additional expense over a subway intended only for surface cars.

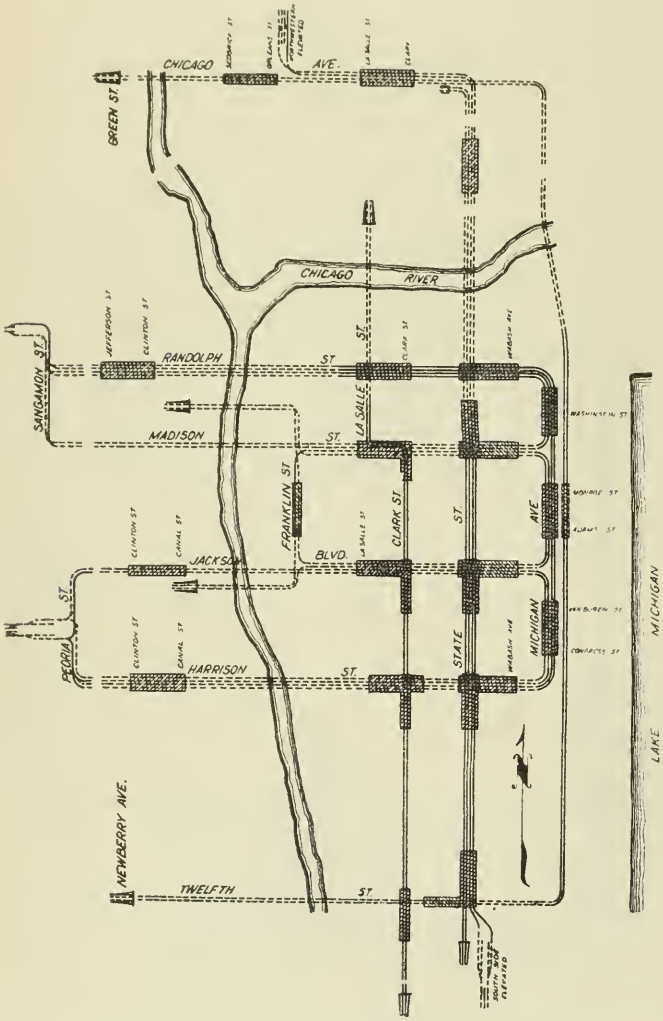
The plans proper do not seriously interfere with the structure of the Illinois Tunnel Company, although at some points this tunnel will have to be slightly changed. The design permits a shallow construction on the high level subways, allows sufficient room for the low level subway to pass under the high level and over the Illinois tunnel, and also allows the low level passenger subway to be placed almost as close to the surface of the streets as the single-decked subways of other cities where mezzanine floors are used. On account of the fact that the freight tunnel is so near the surface that the general use of stations with mezzanine floors is impossible, it will be necessary to increase the width of sidewalks on some of the streets to provide direct stairways from sidewalk to the platform of the high-level subway. The accompanying cut shows one of the recommended stations, the tracks being so located that the entrances to the station can be made directly from the sidewalks without the use of a mezzanine floor. In the stations as designed the cars of the high-level subway will be easy of access from the streets, and passengers will be able to reach the low-level subway without excessive exertion by using the escalators.

The general arrangement of the stations provides straight train or car platforms of sufficient width for all traffic, to or from which passengers may pass expeditiously. Congestion will be avoided by providing that traffic in one direction will not be crossed by traffic in another direction, and at stairways to be used jointly by passengers entering and leaving, railings will be provided where practicable, to separate the traffic going in opposite directions. In general, the island platform type of stations will be used, which is one with its train or car platform between two tracks, so that passengers may be discharged from or loaded upon trains on either side of the platform. If the traffic is to be handled by trains, the platforms will be long enough for trains of ten cars, or 500 feet in the clear, which will permit passengers



Cross Section of Subway Station Looking North in State Street at Jackson Boulevard.

to enter or leave through the vestibules at the end of each car in the train, or through side or middle car entrances. The width of the island station platform is limited by the amount of space available for tracks and stations between the building lines of streets in which the subways will be located, thus limiting the width to 16 feet in most cases, yet giving sufficient capacity for the passenger traffic of trains on the two station tracks at the same time. The stations for passengers using cars of the surface lines not running in trains will have platforms not less than 250 feet long, to permit the operation of cars in strings of at least four cars, not coupled together, but with sufficient space between for safe operation. In addition to the length of train or car platforms required for passengers to enter and leave trains or cars, additional space will be required at each end to



Combination of First Four Steps Recommended by Bion J. Arnold.

provide room for stairways from the street surface, ticket booths, news-stands, telephone booths and public comfort rooms.

The types of high-level subways suggested have sufficient space on each side of the subway structure for utilities. The low-level subways in general permit the location of utilities overhead in galleries, either outside or inside the curb line, and except when the open-cut method is under way at stations, existing utilities need not be distributed.

Mr. Arnold's report includes a detailed estimate of costs of the various steps recommended, which are briefly extracted below: Step 1 will include a two-track subway having 4.128 miles of single track and four stations, at $726,710 per mile, a total of $3,000,000, and 3.663 miles of single track subway and six stations, at $1,364,950 per mile, a total of $5,000,000. Step 2 includes a four-track subway with 10.184 miles of single track and five stations, at $768,550 per mile, a total of $7,750,000, and a two-track subway with 9.5 miles of single track and 14 stations, at $1,421,100 per mile, a total of $13,500,000. Step 3 provides for a two-track subway with 5.954 miles of single track and nine stations, at $1,049,710 per mile, a total of $6,250,000; and step 4 is a two-track subway with 8.78 miles of single track and four stations, at $1,104,780 a mile, a total of $9,700,000. This makes a total estimated cost of $45,200,000 for the first four steps suggested.

NEW CHICAGO PASSENGER TERMINAL OF THE CHICAGO & NORTH WESTERN.

The new passenger terminal of the Chicago & North Western at Chicago, the general design and construction of which have been described in the Railway Age Gazette from time to time, is now nearing completion. The building of this terminal includes not only the constructoin of the terminal building and train shed but elevated approaches connecting with the main lines west about two miles out from the station and north about a mile and a quarter.

The terminal station building has an east and west frontage of 320 ft. on the north side of Madison street, and a north and south frontage of 218 ft. on Canal and Clinton streets. It is a four-story structure of the early Italian Renaissance style of architecture, with a lofty Doric portico at the Madison street entrance, supported on a colonnade of six granite columns. Immediately back of this colonnade and entered by three great arches is a vaulted vestibule, 132 ft. wide, 22 ft. deep and 40 ft. high. At the end of this vestibule are broad granite staircases leading to the main waitingroom. The interior arrangement of the building was fully described in the Railway Age Gazette of August 14, 1908.

The train shed is of the Bush type, consisting of a connected series of arched girder spans, spanning two tracks and brought down close to the smoke stacks of the locomotives, with a smoke duct running the full length of the shed over each track. (Railway Age Gazette, July 16, 1909, and March 17, 1910).

The power station for light, heat and power is on a triangular piece of ground bounded by Lake street, Clinton street and Milwaukee avenue. It is of mottled gray brick, matching the train shed enclosing walls, with a granite base 6 feet high. The equipment in the power plant was described in the Railway Age Gazette of July 15, 1910.

A comprehensive system of electric lighting has been provided for the terminal, one feature of which includes a projector over the entrance to the Washington boulevard subway on the Canal street side, from which a vertical beam of light will be thrown into the air, making the terminal location conspicuous at night. Complete elevator, telephone and fire alarm systems have been provided and a special system for snow melting has been installed. A pneumatic tube system connecting the incoming and outgoing baggage rooms has been installed. The tubes are oval or elliptical in shape, 3 in. by 6 in., and the cartridges are 9 in. in length. in length.

The approaches to the terminal station and the terminal station tracks north of Lake street are laid on sand filling between concrete retaining walls, being carried across the street on concrete trough floor steel viaducts resting on concrete abutments and center piers.

Preliminary studies on the general plan were begun in December, 1905. Work was started on the detail plans in the following November and the wrecking of the buildings on the site was begun at the same time. The first construction work was started on October 27, 1908. Some difficulties were



New Chicago & North Western Station Building at Chicago.



Looking North Over Train Shed from Station Building.

met in sinking wells, when fine running sand and water were encountered, making it necessary to use compressed air and requiring the sinking of the wells to rock. These wells were filled with concrete, the last one being completed June 1, 1909. Cast base setting for the steel work was started in the latter part of March, 1909, and th work of setting the foundation girders commenced the first week of April, 1909. The last steel was placed in position on March 22, 1910. Granite setting commenced the second week in May, 1909, and was completed on April 16, 1910.

In the train shed, pile driving for the foundation was commenced on October 1, 1908. Thirty-six caissons, each 6 ft. in diameter, were sunk under the approach to the Washington boulevard subway and were completed June 18, 1909. Pile driving for the foundation of the powerhouse was started August 6, 1909, being completed October 4, 1909, and was followed immediately by the concrete capping and the construction of the retaining walls. Brick-laying commenced February 1, 1910.

At the present time almost all the work has been completed except the installation of signals and some finishing on the interior of the building. This work is being rushed as much as possible, and it is expected that the station will be open for service within a few months, although no definite date has as yet been set.

COMMITTEE ON SIGNALING OF THE AMERICAN ELECTRIC RAILWAY ASSOCIATION.

The committee appointed by the American Electric Railway Association to investigate and make a report on signaling systems for interurban railways met at the Congress Hotel at 9 o'clock Wednesday morning, March 22, 1911. Representatives of seven signal companies were present, and arrangements were made for them to present the claims of their various systems at stated times during the day. The committee asked for suggestions as to the best method of procedure in its study of the principles involved, and Frank Rhea, of the General Electric Co.; L. F. Howard, of the Union Switch and Signal Co., and W. K. Howe and M. R. Briney, of the General Railway Signal Co., offered some excellent ideas.

It was the consensus of opinion in the meeting, as it is elsewhere among engineers and railway officers who are interested in the subject, that the proper course for electric railways to pursue in signaling their lines is to cover the dangerous points first with apparatus so designed that it will form a basis for future extension and an ultimate complete and comprehensive system of protection. The committee occupies a peculiar position, and its work is going to be very important in the development of protective measures. The problems to be solved are in the main the same that have been so well handled by steam road signal engineers, but they differ in many minor particulars which only a thorough knowledge of operating requirements can reconcile with the technical necessities involved.

As was said in the meeting, the first thing to do is to prepare a plan of the situation to be signaled, and then the proper protection can be applied. The committee's "data sheets," which are being sent to all electric railways, are doing this in a general way, and will give the association information regarding practically all of the important conditions which will be dealt with in its work.

TWO-DAY MEETING OF SIGNAL ASSOCIATION.

The Railway Signal Association is planning to make the meeting which will be held in New York City during June this year a two-day meeting.

IMPACT TESTS ON REINFORCED CONCRETE TRESTLE.

By J. H. Prior, Assistant Engineer, C. M. & St. P.

Some tests to determine the amount of impact on a trestle of reinforced concrete under train loads have recently been completed by the Chicago, Milwaukee & St. Paul, under the direction of C. F. Loweth, chief engineer. The tests were made on the reinforced concrete trestle, shown in Fig. 2 and Fig. 4, by R. L. Stevens, assisted by an instructor from the University of Wisconsin, experienced in such work.

An examination of Fig. 4 shows the trestle to consist of two beams supporting the slab, forming a double T-beam. The total depth of this beam is 3 ft. 6 in., but if the parapets are considered as part of the beam this depth is increased to 5 ft. 4 in. As the span is only 16 ft. center to center of piers, the concrete beam has a large ratio of depth to span. Some unexpected difficulties were encountered in this work, due to this ratio of depth to span, and also to the fact that the girders are practically continuous over the supports.

The information mostly sought in these tests was the unit stress in the steel, due to the total loads on the structure, including impact, as this information is of fundamental importance in the design of similar structures. On account of the great depth of span compared with its length, and the partial continuity of the beam over the supports, which had been only partly relied on in the design, the unit stresses in the steel were low and the consequent distortions were so small that errors of the smallest magnitude affected the results by large percentages. On account of this, the results as a whole are somewhat unsatisfactory, but are thought worthy of publication in order to mark out a little progress in the subject and save others from traversing the same ground.

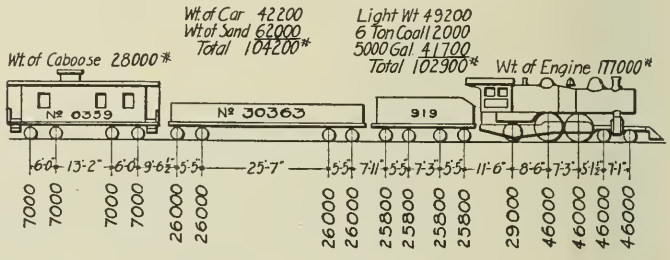


Fig. 1. Test Train.

Table 1 gives most of the important results of the tests. The following is a description of the manner in which these results were obtained: The test train, shown in Fig. 1, consisting of the railway company's class A-2 engine, one gondola car, loaded with sand, and a caboose, was used for making the test. The trestle spans were designed for an E-50 loading, but the above train was equivalent only to about E-35 loading. An engine class A-2 was selected because in this type, which is a four-cylinder compound, the unbalanced weights on the drivers are rather excessive and were expected to produce greater impact than other classes of locomotives. A marker was placed on one driver so that the location of the counter-weight might be determined for the various runs.

Table I. Summary of Results, Showing Percentage of Impact.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Extensometer No. 9.		Extensometer No. 10.		Extensometer No. 11.		Extensometer No. 12.	
Speed m. p. h.	Engine. Per Cent.	Car. Per Cent.	Engine. Per Cent.	Car. Per Cent.	Engine. Per Cent.	Car. Per Cent.	Engine. Per Cent.	Car. Per Cent.
8								
20	16	41	14	25	15	54	18	32
45	16	32	14	31	18	24	20	21
50	33	32	36	40	33	24	45	27
60	41	38	46	31	42	39	54	27
21	14	29	19		15	42	12	18
63.5	38	46	27	87	18	30	33	18

The four extensometers and the deflectometer used in the tests were loaned by the University of Wisconsin. The tests were conducted in a manner similar to those made by the American Railway Engineering and Maintenance of Way As-

sociation. (See Bulletin No. 125, American Railway Engineering and Maintenance of Way Association, July, 1910.) The four extensometers were attached to the bars, which had been built into the girder, so as to project a short distance, as shown in Fig. 2. One extensometer was located on the side of each girder. The projecting bars are located in the same plane as the lowest reinforcing steel in the girders, so that the deformations measured were the actual deformations of the steel reinforcement. The deflectometer was attached near the center of one of the girders. The deflections were so slight, however, that no records of any value were obtained from this instrument, consequently no results from it are mentioned in this report.

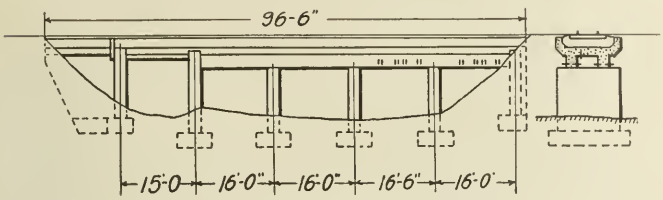


Fig. 2. American Plan of Bridge.

In Fig. 5 are shown some diagrams obtained from the extensometer to a scale enlarged two times. The "ordinates measured," which are shown in column 2 of table 2, were obtained from these diagrams by scaling on the diagram the distance between the curve and a base line drawn to connect the zero stress ends of the curves. An examination of these diagrams shows the presence of some lost motion, due either to the projecting bar, or to the imperfection of the extensometer. On account of the small amount of the distortions, this lost motion, if not corrected, would introduce a substantial error. The amount of this lost motion was determined as follows:

A theoretical investigation of the properties of the section of the spans tested, comprising the girders, floor slab and parapet, showed that if all were assumed to act together, the section has a resisting moment in inch-pounds of 1,081 times the unit stress in the steel in the lower portion of the beam. For the test train this gives a unit stress in the reinforcing steel of but 680 lbs. per square inch, and 65 lbs. per square inch tension in the concrete at the top of the parapet wall over the piers. On this same assumption, for a full E-50 loading, impact and dead load, the corresponding stresses are 3,960 lbs. per square inch in the steel and 344 lbs. in the concrete. Since this bridge has never in its lifetime been loaded to this amount, it seems justifiable to assume that the concrete on the tension side has never been ruptured, and therefore that the entire section acts effectively to resist bending.

Using the above assumptions, there is shown in the 4th and 5th columns of table 3 the calculated stress in the steel for the test train with its corresponding ordinates. These ordinates were assumed to be correct for static loads.

Table II.

		Extensometer No. 9.			
(1) Speed m. p. h.	(2) Ordinate Measured, Inches.	(3) Ordinate Corrected, Inches.	(4) Static Corrected, Inches.	(5) Excess Over Static, Inches.	(6) Excess Impact, Per Cent
8	0.012	0.073	0.073		
20	0.024	0.085	0.073	0.012	16
45	0.024	0.085	0.073	0.012	16
50	0.036	0.097	0.073	0.024	33
60	0.042	0.103	0.073	0.030	41
21	0.022	0.083	0.073	0.010	14
63.5	0.040	0.101	0.073	0.028	38

It is reasonable to assume that the error of lost motion mentioned is a constant, and that it affects all of the "ordinates measured," column 2, table 2, by the same amount.

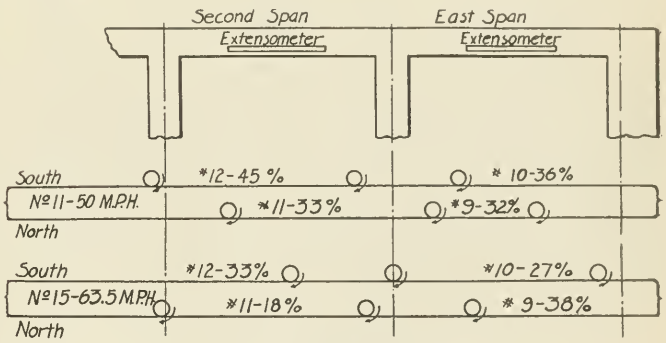
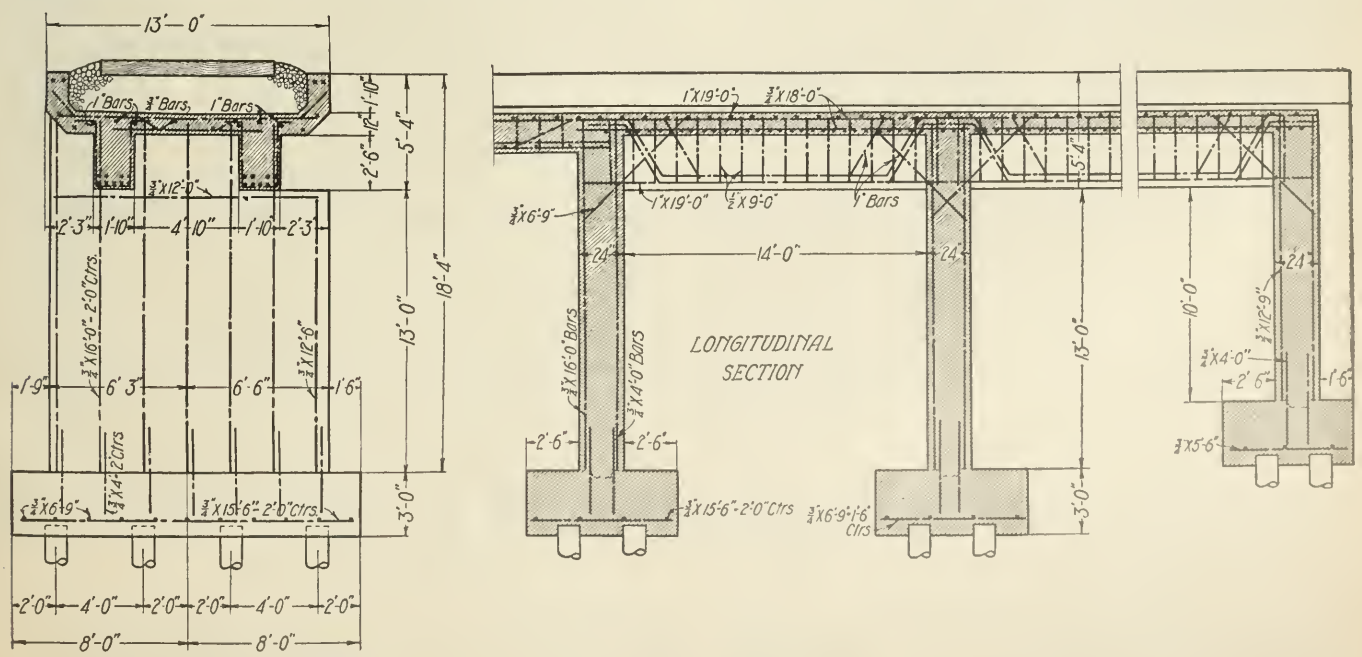


Fig. 3. Location of Extensometers and Position of Counterbalances.

If these "ordinates measured" contain a constant error, this constant error will be eliminated whenever we are considering the differences between two "measured ordinates." Now it is known that for speeds of 8 miles per hour the impact is practically nothing, and that the difference between "measured ordinate" for 8 miles per hour and the "measured ordinate" for 20 miles per hour gives the increase in ordinate, due to impact at 20 miles per hour. The difference between the "measured ordinates" for speed of 8 miles per hour and



the "measured ordinates" for speed of 20 miles per hour in table 2 is .012. This difference, divided by the total calculated ordinate for instrument No. 9 in column 5, table 3, is .2, which, if our assumptions are right, would show an impact of 20 per cent. for a speed of 20 miles per hour. The value of 20 per cent. just calculated was obtained from a reading of only one instrument, extensometer No. 9. The records of two other instruments, not shown, give values of 15 per cent. and 18 per cent. The values given by the 4th instrument are divergent, but can be accounted for by the irregular character of the quantity measured. Of these values, an impact of 15 per cent. was selected because it agrees in a reasonable way with the values obtained for a speed of 20 miles per hour in a large number of experiments on steel structures. (Bulletin No. 125, previously quoted.) When the impact for 20 miles per hour has been determined, it is an easy matter to make an approximation of the lost motion and to correct the "measured ordinate" by the calculated lost motion, so as to obtain the values in the third column of table 2, called "ordinate corrected." This "ordinate corrected" is obtained by the following equation, in which, in the first member of the equation, "a" is the corrected ordinate, and where values in the second member of the equation are the second, sixth and first items in column 2 of table 2:

Table III.

(1)	Extensometer. (2)	(3)	Calculated Stresses. (4)	(5)	Static Ordinates. "Corrected." (6)	(7)
No. of Extensometer.	Lever Ratio.	Length of Rod "L," Feet.	Stress, Pounds.	Ordinate, Inches.	Ordinate, Inches.	Stress, Pounds.
9	47.0	4.38	680	0.059	0.073	840
10	47.2	4.40	680	0.059	0.073	840
11	52.5	4.35	680	0.066	0.067	690
12	48.5	4.25	680	0.061	0.133	1,480

$$115 \text{ per cent. } a - 100 \text{ per cent. } a = \tfrac{1}{2}\ (.024 + .022) - .12$$

$$15 \text{ per cent. } a = .011$$

$$a = .073$$

From the above we get "calculated ordinate" for speed of 8 miles per hour, .073. "Measured ordinate" for speed of 8 miles per hour is .012, in the second column of table 2. Their difference is the constant error, $.073 - .012 = .061$. If the constant error thus determined is added to the "measured ordinates" in column 2, table 2, we obtain column 3, table 2, marked "ordinate corrected."

The difference between the ordinates corrected of column 3, table 2, and the "static corrected," column 4, is the "excess over static," column 5. The values in column 5, divided by the values in column 4, give the percentage of impact, column 6.

Column 6 of table 2 is the 2nd column of table 1. The other columns of the "Summary of Results," table 1, were obtained in same manner from tables similar to table 2, but not shown in this report. The "corrected static ordinates" for the extensometers 10, 11 and 12, obtained in a similar manner to extensometer No. 9 of table 2, are shown in the 6th column of table 3, where they are compared with the calculated ordinate shown in the 5th column of the same table. Considering the small quantities involved, the agreement is fair and seems to justify the assumptions made.

Incidentally table 3 shows that the structure does not receive anything like the stresses for which it was designed. The longitudinal joint "c," Fig. 4, between the slab and the parapet wall, which it was thought inadvisable to count in the design for transmitting longitudinal shear, seems to be entirely effective for that purpose, making the entire span a monolith, and suggests that possibly the design of the parapet walls of similar slabs might be modified so that there might be no doubt as to the ability to carry the stresses, which they unquestionably receive.

The location of the counter-balances on the locomotives in their lowest position with regard to the center of the span is shown by diagram in Fig. 3 for two runs. These runs are typical of the others, and from them it does not seem that the location of the counter-weight in its lowest position with regard to the center of the span had influenced particularly the amount of impact obtained. However, as the structure consists of five spans fully continuous and integral with the piers, it is hardly expected that the effect of the counter-weights would be as clearly defined as in simple spans, although the unbalanced weights may be just as effective in producing impact, especially if the span had been the ordinary shallow slab, not built in place.

As shown in table 1, the maximum impact obtained under the engine was between 50 and 60 per cent., although the number of observations made was hardly sufficient to warrant the conclusions that no higher values might be expected.

As a fund of definite information on this subject is of economic value in the design of reinforced concrete structures, the subject seems to be worthy of further study and investigation, and Mr. Loweth has at present in mind some further tests to be made on shallower and longer spans, if possible.

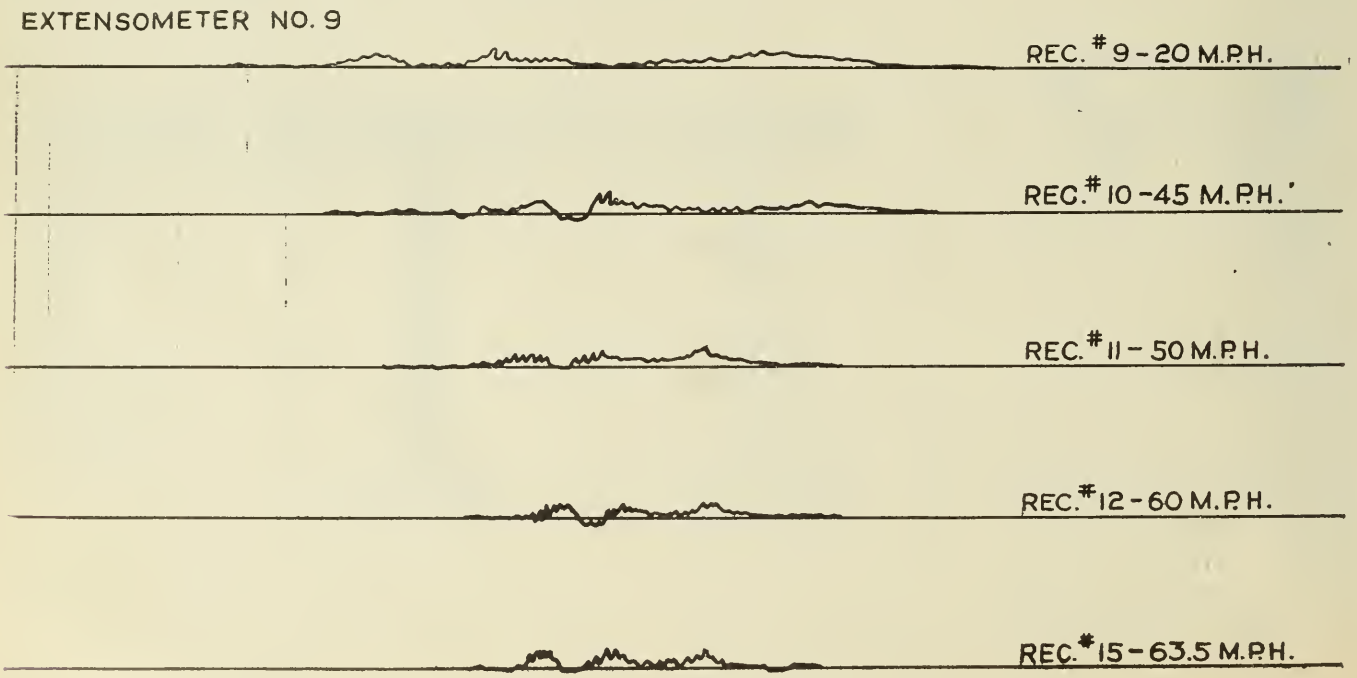


Fig. 5. Extensometer Diagrams.

REGISTRATION—MAINTENANCE OF WAY ASSOCIATION

ACTIVE MEMBERS

Abbott, F. E., Insp. Eng., Lackawanna Steel Co., Buffalo, N. Y.
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Bell, Gilbert J., Div. Eng., A. T. & S. F. Ry., Marceline, Mo.
Bonnyman, Alex., Gen. Mgr., A. B. & A., Atlanta, Ga.
Brumley, D. J., Eng. Const., I. C. R. R., Chicago, Ill.
Bremner, Geo. H., Eng. Ill. Dist., C., B. & Q. R. R., Chicago.
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Carothers, J. B., Supt. and Gen. Agt., B. & O. R. R., Philadelphia, Pa.
Clark, W. A., Ch. Eng., D. & I. R. R. R., Duluth, Minn.
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Connor, E. H., C. E., Mo. V. Br. & I. Co., Leavenworth, Kan.
Coon, C. J., Eng., Grand Cent. Ter., N. Y. C. & H. R. R., New York, N. Y.
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Gordon, H. L., Asst. Div. Eng., B. & O. R. R., Philadelphia, Pa.
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Greensfelder, A. P., Laclede Bldg., St. Louis, Mo.
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Hawk, A. T., Architect, Rock Island Lines, Chicago, Ill.
Hoyt, C. B., Supt. Tr., N. Y. C. & St. L. R. R., Bellevue, O.
Hynes, M. V., Div. Eng., C. H. & D. Ry., Dayton, Ohio.
Johnson, J. M., Prest., L. B. & I. Co., Louisville, Ky.
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Markley, A. S., Master Carpenter, C. & E. I. R. R., Danville, Ill.
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Palmer, G. P., Div. Eng., B. & O., Chicago Terminal R. R., Chicago, Ill.
Roach, J. H., Div. Eng., L. S. & M. S. Ry., Cleveland, O.
Sellew, W. H., Prin. Asst. Eng., M. C. R. R., Detroit, Mich.
Shillinger, J. G., Eng. M. of W., C., C., C. & St. L. Ry., Galion, O.
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Smith, F. W., Const. Eng., C., C., C. & St. L. Ry., Cincinnati.
Smith, J. E., Instr. C. E., University of Ill., Urbana, Ill.
Spell, W. A., Draft. and Eng. Tests, A., B. & A. R. R., Atlanta, Ga.
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Stone, A. H., Office Eng., Kansas City Term. Ry., Kansas City, Mo.
Storey, W. B., Jr., Vice-President, Santa Fe System, Chicago.
Tinker, G. H., Br. Eng., N. Y. C. & St. L. Ry., Cleveland, O.
Wadsworth, Geo. R., Cleveland, O.
Walker, G. M., Jr., Asst. Eng., K. C. T. Ry., Kansas City, Mo.
Webb, G. H., Ch. Eng., M. C. R. R., Detroit, Mich.
Young, E. C., Supv., N. Y., P. & N. R. R., Cape Charles, Va.

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Curtis, N. P., Inst. Ry. Eng., Univ. Wisconsin, Madison, Wis.
Entwisle, E. D., Ch. Eng., J. & S. C. R. R., Johnstown, Pa.

At the Coliseum

It has been decided that no space for the 1912 exhibit will be given out by the secretary or by the executive committee of the Railway Appliances Association before the first day of November, 1911.

One exhibit that is attracting attention from railway men are the four sample boards of lead covered "Okonite" signal cables. These boards show the 139 different styles of cable recently manufactured by The Okonite Company, New York, for a large railway terminal in Chicago.

Visitors to the exhibit of the Adams & Westlake Company, Chicago, have been much interested in the significance of the "flush" over the south entrance to the spaces. The "flush" appears on the face of one of the standard engine indicating lamps made by this company, which forms a small part of its exhibit of standard and special railway lamps and lanterns.

The exhibit of the Universal Metallic Tie Company, Salt Lake City, Utah, at Booth 207 in the Coliseum, in charge of J. W. Johnson, secretary, and B. S. Rupp, manager of contracts and construction, is attracting much attention from railway men. The features of the Universal Metallic include the absence of spikes, tie plates, rail anchors and rail braces. These ties are now in service in Chicago in the main line of the Santa Fe, near Twenty-first street, and in the line of the Chicago, Burlington & Quincy, near Western avenue, where they may be seen by visiting engineers.

Methods of instruction in signal departments are receiving the attention of signal engineers pretty generally throughout the country, especially since signaling has come to occupy such an important position in railway operation; and many signal engineers are turning their attention to improvements in the methods of instructing their signalmen, or to establishing systems of instruction where none has been in use before. One of the signal companies has anticipated this in a nice way by getting up sets of model signals which can be used for instruction purposes, and is showing these signals at the Coliseum.

The following completes the list of exhibits published in The Daily of March 21:

Andresen-Evans Company, Chicago, Ill.—Grab buckets. Represented by D. J. Evans, R. B. Randall, F. V. Carroll and F. E. Mather. Space 215A.

Columbia Nut & Bolt Company, Bridgeport, Conn.—Lock Nuts. Fred Atwater, H. N. Powers and J. N. Eipper. Space 19.

M. & S. Steel Company, Munhall, Pa.—Steel tie. Represented by W. W. Mechling. Space 171A.

Williams Company, G. H., Cleveland, Ohio.—Grab buckets. Represented by G. H. Williams. Space 112.

The Hobart-Allfree Company, Chicago, space 17, is showing its standard derailers, the Freeland mechanical-throw, and the Smyth hand-throw. These derailers are made with a lip which fits over the head of the rail, taking all the side thrusts caused by a derailment and relieving the supporting brackets of the strain which would otherwise be put upon them. The derailing blocks which fit over the rail are specially designed for effective work. The Smyth derailers, which are operated by hand, vary from four ft. to 20 in. in the length of the derailing block, while the type of Freeland derailers, which is for operation by hand, is made in one model only, 2 ft. 8 in. long. The Freeland types designed for mechanical throw are furnished in three models which have

the same general design, but vary in the lengths of the derailing blocks. The company has recently had its derailers tested on a number of Eastern lines, and reports that the tests have been successful in every case. One road in particular has tested these devices with a view to their adoption as standard; and it was announced to the members of the company in charge of the exhibit that the tests have been exceedingly satisfactory. The derailers also have many friends in the West, and their use in that part of the country is constantly on the increase. The Hobart-Allfree Company is represented in the East by the L. S. Brach Supply Company, New York, which reports a very satisfactory business in the derailers.

The question of securely anchoring rails so as to prevent their longitudinal creeping, especially at crossings, switches, and in and about interlocking plants, is one of great importance to both the maintenance of way engineer and the signal engineer, and inventors have been almost as prolific along this line as in devising nut locks. Many good rail anchors are now on the market, and it would seem that most of them are now on exhibition at the Coliseum. At any rate the "old reliables" which have been giving good service for a long time are there, and there are some others which are newer, perhaps, but nevertheless are built upon such good principles and are so ingenious in their construction that they would seem to be worthy competitors of the older types.

The development of the caustic soda primary battery is a matter of only a comparatively few years; but this type of cell has been brought up to such a high standard of efficiency and is now applicable to so many conditions that it can be considered as practically perfected. It is interesting to look back over the different stages through which the primary cell has passed in its very rapid growth. The Edison Manufacturing Company, Orange, N. J., has a very effective representation of this remarkable development in its exhibit, space 151, in which are shown sample plates of every type that this company has ever manufactured during the evolution of its cell, together with a full line of the latest types. The exhibit is in charge of E. E. Hudson, F. W. Brown, F. J. Lepreau and Phil. Garrity.

STYLE C ELECTRIC SWITCH-AND-LOCK MOVEMENT.

The style C electric switch and lock movement, made by the Union Switch & Signal Company, Swissvale, Pa., requires small space, is entirely enclosed in a cast-iron box, and can be secured to three ties of ordinary spacing. The slide bar and escapement crank are similar to the standard mechanical switch-and-lock movement, except that the escapement crank has arms of equal length. The movement is driven by a motor through a train of reduction gears and a screw shaft and floating nut. The signal circuit controller depends not alone upon the position of the movement, but also on the correct position of the points themselves, the lower contacts being mechanically connected to the switch point so that the opening of the switch one-eighth of an inch will break all of the signal circuits.

THE CRANE COMPANY'S EXHIBIT.

The exhibit of valves, which the Crane Company, Chicago, has in space 146 at the Coliseum, is something which every railway man engaged in work where such products are required should make it a point to see. There are valves for almost every conceivable purpose connected with railway operation, including locomotive blow-off valves, operable from the cab at any time whether the engine is runnig or standing still, hose valves warranted never to leak, hydraulic valves for pressures up to 2,500 lbs., locomotives pop valves, creosoting valves, motor-operated gate valves, improved pop safety valves for all kinds of steam boilers, and still other types for many different purposes. The exhibit also includes pipes and pipe-bends, and a working model of the Cranetilt direct-return and non-return steam traps. The exhibit is in charge of F. D. Fenn, manager of the railroad sales department; S. B. Sabin, manager of the specialty department, and J. V. Jordan.

WHARTON TRACK WORK.

The exhibit of Wm. Wharton Jr. & Co., Inc., Philadelphia, Pa., includes a solid manganese steel single frog, in addition to manganese steel center frogs of different types. One of the frogs of the latter type was in the track under service for a number of years and then restored to a condition as good as new. There is also a Wharton railway switch of improved type, besides a manganese steel-faced guard rail, switch stands, the company's new rail anchor, the Wharton guard rail clamp and models of movable point crossings, with manganese steel parts, etc.

One of the recent jobs made entirely out of manganese steel that the Wharton company has turned out is a solid manganese steel double crossover, which was made for the Central of New Jersey. Unfortunately, circumstances were such that it was necessary to install this piece of work immediately upon completion, making it impossible to exhibit even a part of it, but photographs and prints in the Wharton space will give an idea of the extent of the job and the size of the manganese steel castings. The company claims that this is the first job of the kind ever attempted by any manufacturer on account of the difficulty in making castings of the size required. The Wharton company occupies spaces 9, 10, 27, 28 and 29.

A STEEL TIE AND FASTENINGS.

The American Railway Steel Tie Company, Harrisburg, Pa., is showing, in spaces 220 and 221, a variety of improved fastenings for steel and wood ties, and a steel tie which is one of the most interesting, to say the least, of the many improved ties now on the market. The fastenings are designed to prevent the mechanical wear or abrasion of the ties under the rails, and they embody a plate which is placed between the rail and the tie, and adjustable clips or clamps which hold the plate to the base of the rail. These clips are held to the plates in such a way that there is no tendency for them to work loose. In other words, when they are once in place they "stay put." They furnish an adjustment by which it is possible to keep the rails to gauge at all times, and also to avoid the destructive effects of spikes when they are used with wooden ties. The steel tie made by this company consists of a steel shell with flanges so arranged that it is perfectly feasible to tamp the tie properly, as the round corners make it easy for the tamping bar to get underneath the body of the tie. The shell is filled with a mixture of asphalt and stone. These ties are provided with the adjustable clips and locking plates. They are made in the standard length, and the weight of the tie complete, when filled with this mixture, is about 600 lbs. Maintenance of way engineers cannot fail to be impressed with the fact that the type of construction offered by this tie gives many advantages of strength and solidity which cannot be secured with wooden ties. If it is desirable, however, to use wooden ties, the adjustable clips and locking plates furnish a way to do this and still make the ties last much longer than they

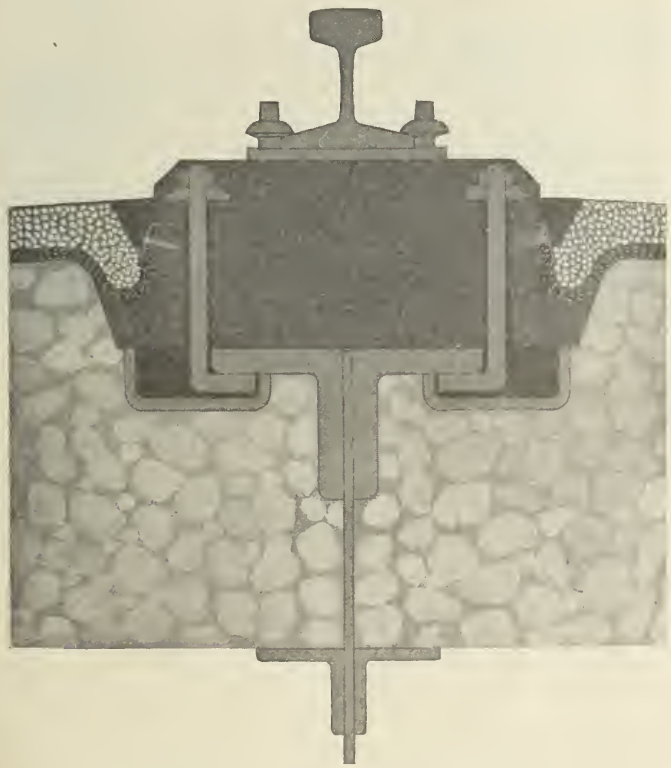
would if the ordinary spikes were used. The exhibit is being conducted under the direction of John G. Snyder, vice-president of the company.

WATERPROOFING WORK IN THE CHICAGO & NORTH WESTERN TRAIN SHED AT CHICAGO.

The accompanying cuts show the train shed of the Chicago & North Western at Chicago, while waterproofing work was in progress, and a cross section of the track construction and the method of waterproofing along the wooden stringer carrying the rail.

In the cut of the train shed, the rock asphalt layers are shown in the act of placing the mastic wearing surface on the concrete platforms. In a similar manner, mastic protection was placed over the waterproof membrane between rails, as defined in the cut of the cross-section. The mastic was carried up to within 1½ in. of the stringer and an opening provided by means of oiled strips which were removed after the mastic hardened and the opening them filled with Sarco No. 6 waterproofing, which provided a seal along the wood stringer.

The critical point in this waterproofing work was naturally along the edge of the stringer. While the stringer rested directly on a longtitudinal girder which was as solid a foundation as was possible, it was expected that there would be a slight weave throughout the length of the stringer from engine loads; so to provide against the slightest hair crack, it was deemed necessary to keep the mastic protection away from the wood and introduce an elastic and adhesive seal which would follow the slight movement in the stringer without opening up. As there



Track Construction and Method of Waterproofing.

were nearly 60,000 lineal feet all told, or nearly 12 miles of this construction involved, the possibility of leakage was enormous. Not satisfied even with this precaution, and to make assurance doubly sure, the waterproof membrane, which in this case consisted of Sarco No. 6 waterproofing reinforced with open mesh burlap in three-ply, was securely tied in to the stringer by means of metal flashing driven into the wood. This metal flashing was held firmly in position by the friction of the wood on the driven leg of the flashing, and still further secured by 1¾ in. wood drive-screws spaced 12 in. on centers. This provides an effec-



Waterproofing the Chicago & North Western Train Shed, Chicago.

tive mechanical seal and, along with the natural seal provided by the Sarco No. 6 waterproofing, effectively prevents any water working down along the sides of the stringer.

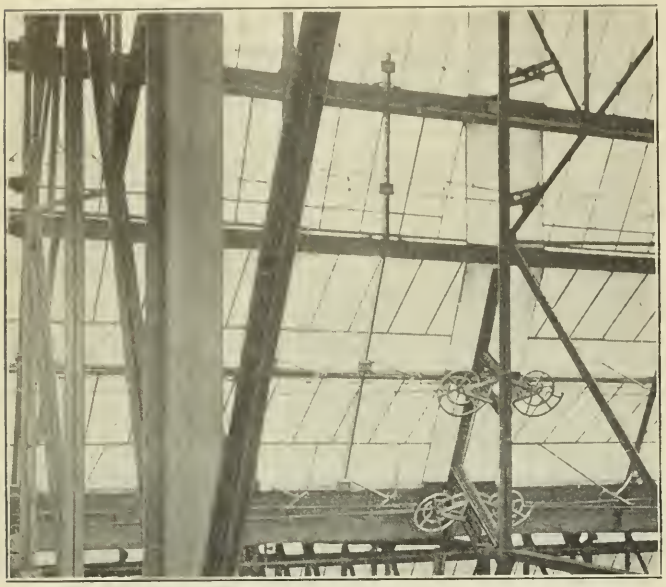
The cast iron pockets for the hook bolts which were set in the concrete flush with the top flange of the girder, were filled completely with Sarco No. 6 waterproofing, which was poured into the bolt holes and worked its way down along the bolts, thoroughly sealing up these openings and at the same time affording protection to the metal.

While the general method of waterproofing construction employed in this work is well known and practically standardized by its extensive use on many railways, the construction details were entirely new and original and were developed by the railway and waterproofing department of the Standard Asphalt & Rubber Co., Chicago, especially to meet the difficult conditions imposed.

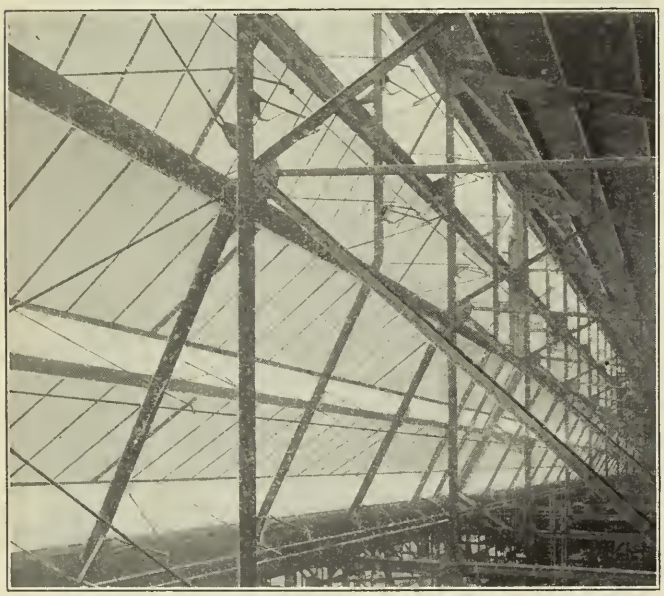
POND SASH OPERATING DEVICE.

The cuts illustrate the interior view of one side of the monitor on Deere & Co.'s forge shop at Moline, Ill., on which the Pond operating device and Pond continuous sash were used. The Pond truss is a new type, designed particularly for lighting and ventilating forge shops and foundry buildings. It is used on buildings 50 ft. to 170 ft. wide, of single monitor construction. Each side of the monitor is equipped with two lines of vertical and two lines of sash, inclined 30 degrees, as shown. As the center line of columns in the building and the roof of monitor slopes toward the center to down-spouts which attach to the main column, this form of construction deflects the gases toward the sash, and the height of the building provides better ventilation and ideal lighting conditions. On account of the heavy load of sash on the sloping section of the monitor, spirals are used to offset

the varying load, as illustrated, exactly counterbalancing the varying load of sash. Large photographs and complete details are shown in Space 54 at the Coliseum, fully illustrating the lifts and other installations of Lupton steel sash, Pond continuous sash, Pond operating device and Lupton



Pond Operating Device and Pond Continuous Sash.



Pond Continuous Sash and Operating Device.

rolled steel skylights, manufactured exclusively by David Lupton's Sons Company, Philadelphia, Pa.

AMERICAN INGOT IRON CULVERTS.

On the electric railway being built from Kansas City, Mo., to St. Louis one of the most serious problems confronting the engineers in charge was the culvert proposition. A series of exhaustive tests were made on all forms of culvert construction and the results obtained from these tests justified the engineers in recommending the use of American ingot iron corrugated culverts for the entire work.

The cuts herewith show one of the severe service tests made on this form of culvert construction. Fig. 1 shows a 36-in. pipe and a 48-in. pipe lying side by side and placed directly under the ties. This, of course, is a more severe condition than the culverts would encounter in actual service; but it proved conclusively the strength of this form of culvert construction. Fig. 2 shows a 90-ton engine placed directly over these culverts. The deflection was less than ¼ in. This test convinced the engineers of the strength of these culverts.

By carefully analyzing the plates used in the construction of these corrugated culverts, it was found they were



Fig. 1. American Ingot Iron Culverts in Loose Sand, for Test. St. Louis-Kansas City Electric Railroad.

made from iron which is almost chemically pure, the analysis being as follows: Sulphur, .019 per cent.; phosphorus, .005 per cent.; carbon, .015 per cent.; manganese, trace; silicon, trace. Material of that composition will last a lifetime.

In consideration of the excellent results obtained in both



Fig. 2. St. Louis-Kansas City Electric Railroad Test of American Ingot Iron Culverts.

the strength and chemical tests, the St. Louis-Kansas City Electric Railroad has decided to use American ingot iron culverts for all its culverts, ranging from 12 in. to 48 in., inclusive. The actual order placed amounted to over 30,000 ft. of culvert pipe. The engineers in charge highly recommended American ingot iron culverts because they are strong, durable and easy to install, and, last, but by no means least, they reduce the cost of construction.

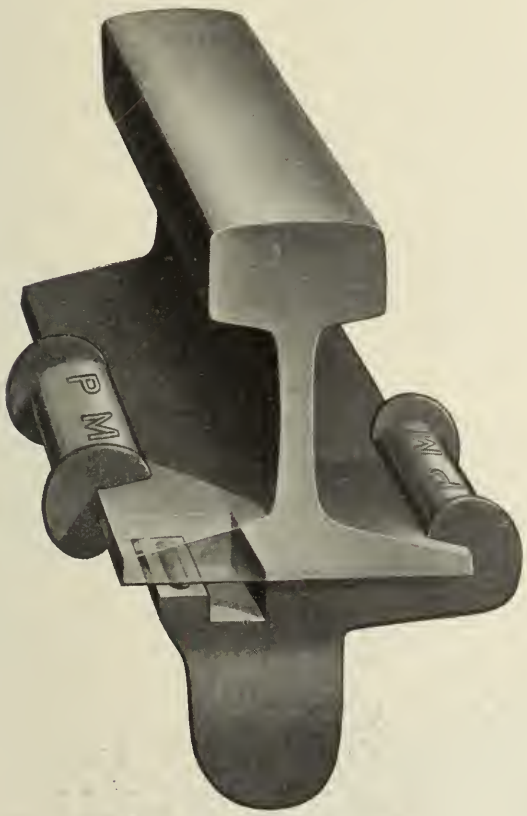
SOME CAUSES OF CREEPING RAILS AND ONE METHOD OF MEETING THEM.

Creeping rail, due to the constantly increasing weight of locomotives and rolling stock and the increasing speed and weight of trains out of proportion to the progress in roadbed and track construction, is met with in various forms. The most common instances are where heavy loads are running down grades of over 0.5 per cent. On these grades, heavy freights are constantly applying and reapplying brakes, which, in addition to the usual wave motion

of the rail, constantly grips the track and tends to drag it along with the train.

Curved track is another fertile source of creeping. Curves cannot be elevated to suit varying speeds, but must be adjusted for a speed between high and low. The result is that high speed trains grip the high rail tightly in taking the curve and have a tendency to draw the rail along with them. If a freight takes the curve at low speed, the tendency is to throw the weight on the low rail. Observation indicates that in most instances the high rail is affected a great deal more than the low.

Soft or swampy roadbed is probably the worst cause of creeping that a track man has to face. The train in passing over such a spot catches the excessive wave motion in the rail caused by the soft substructure at the highest point of the wave. This will force level and tangent track to slide more rapidly than on severe grades. Bridges and trestles often may also be considered in the same class as soft substructure, but here we have the added obstacle



Boltless P. & M. Anti-Rail Creeper in Position on Rail.

in the fact that the rail is very seldom spiked at the angle bars, which are left free to slide as they will. This, it is evident, is very troublesome in cases of draw bridges.

As soon as the track creeps, proper expansion spaces are lost, resulting later in kinks. With angle bars spiked in the slots and with broken joints, the joint ends of the joint ties are dragged off the tamped ballast, causing a low joint and even breaking a joint; the gage is distorted, spikes are sheared, and switches, frogs, crossings and interlocking connections are thrown completely out of line. Such a case of heavy creeping is shown in one of the accompanying illustrations.

Within the last four years there has been developed a two-piece boltless anti-rail creeper. This is the P. & M. The quantity of these anti-rail creepers applied varies with conditions; generally four to a rail is sufficient, and in some cases two to a rail. Extreme conditions, however, demand extreme remedies, and applications as high as 12 and 16 to a rail have been made in which the use of this device has saved its cost sometimes in six months and frequently in a year and a half.

The best practice in applying anchors where broken joints are used is to spike the angle bar in its slots and



Joints Driven Out of Place by Creeping Rails.

then apply the creepers on the opposite ends of the joint ties, which must then be forced bodily through the ballast. There can be no skewing and the tie moves with much more difficulty than if it were free at one end and spiked to the joint at the other. Where four anchors are desired, the other two are placed at quarters of the rail. Where



Two P. & M. Anti-Rail Creepers at the Quarters of the Rail.

additional quantities are desired per rail, they are distributed evenly along the rail length and the opposite ends of the ties are also anchored on the rail.

The P. & M. Company, Chicago, which markets this device, was formerly the Railway Specialty & Supply Company. Its interest in the device does not cease when the

sale is made. An efficient corps of instructors and inspectors is maintained at the company's expense, and these men are constantly on the road. It is their duty to see that the customers of the P. & M. Company get all possible benefit that they should get from the device. They instruct new men in its application, they see that the device fits properly and is manufactured of proper material and is the proper design. They see that the railway company applies the proper number of anti-rail creepers, not too many where the creeping is not severe and not too few where the creeping is too severe. The road may lose many of the benefits this device offers by trying to apply too few where conditions are severe. To put all the creeping pressure against one tie will cause that tie to move more easily than if the creeping pressure were distributed over several ties. Creeping pressure may even be severe enough to break the device where only one creeper is applied, whereas the application of two or four would do away with all breakage, properly distribute the creeping pressure and save the railway the cost of the device in a very short time.

The P. & M. Company has just issued Bulletin T-2111, describing the latest and most economical means of applying the P. & M. anti-rail creeper. This bulletin is issued annually and by a liberal use of half-tones shows in detail the proper way of handling the anchor. A complete exhibit of full size anchors on the rail, as well as many large photographs of the device in track at various points in this country, may be seen at Space 123 at the Coliseum.

SCHERZER ROLLING LIFT BRIDGE FOR BALTIMORE & OHIO AT CLEVELAND.

The Baltimore & Ohio has just finished and placed in service a long span bascule bridge of the Scherzer type at its crossing of the Cuyahoga river at Cleveland, known as bridge No. 402. The new bridge, which is a single leaf double track structure, replaces a single track center pier swing bridge.

Competitive designs and proposals were called for in the summer of 1909 and the contract was awarded to the Pennsylvania Steel Company in July of that year on the design submitted by the Scherzer Rolling Lift Bridge Company.

The outline of the structure is in accordance with the Scherzer standard design of single leaf through truss railroad bridge, having an inclined top chord from the counterweight box to the front end post. The moving span is 200 ft. long center to center of bearings, being the longest double track single leaf bascule bridge in the world. It is only exceeded in length by the 230 ft. span single track single leaf bridge of the Scherzer type built for the same railway at Cleveland in 1907. The trusses are spaced 30 ft. center to center, with a depth at the main post of 53 ft. and 30 ft. at the front post. In the third panel from the front end the depth of stringers is reduced 12 in. to provide that amount of additional underneath clearance for small water traffic. The moving span is counterweighted by plain concrete, with an average unit weight of 146 lbs. per cubic foot. The concrete is carried in a box of steel plates running across between the trusses and in wings in the plane of each truss. This method of counterweighting makes the counterweight an economical fixed part of the moving leaf and provides a very rigid bracing between the trusses, the entire leaf, both steel and counterweight, being one simple and substantial structure, without trunnions or flexible connections.

The bridge is operated by two alternating current electric motors, having a rated capacity of 75 h. p. each. The motors are placed on the moving leaf on a machinery platform in front of the counterweight box. The power of the motors is applied through simple gearing to shafts passing through each truss of the moving leaf at the center of roll, this point moving in the operation of the bridge



Scherzer Rolling Lift Bridge for the Baltimore & Ohio at Cleveland.

in a line parallel with the top surface of the track plates upon which the bridge rolls. Pinions attached to these shafts engage with racks placed on fixed rack supports outside of the plane of the trusses. The simplicity of this method of operation is one of the particular merits of the Scherzer type of construction. As the bridge is in balance in all positions, the power required for operation is slight, but a small part of the capacity of the motors being required under ordinary conditions. The machinery is designed so that the bridge can be operated by hand power, should the current be cut off or the electric equipment be out of service, by driving the pinons by means of chains passing over sprocket wheels on the shafts. The operating machinery is interlocked with the front lock holding the bridge in the closed position and with the railroad signals, so that the front lock cannot be withdrawn and the bridge operated until the proper railroad signals are set.

The operation of the bridge is controlled by a controller for each motor placed in the operator's house, the two controllers being so connected that they may be operated together. The operator's house, in addition to devices for the control of the electric operation of the bridge, contains indicators which show to the operator, both day and night, all positions of the bridge during operation.

The entire structure was designed and built under the supervision of W. S. Bouton, engineer of bridges of the railway. The design of the bascule span was prepared by the Scherzer Rolling Lift Bridge Company, Chicago, Albert H. Scherzer, president and chief engineer, the steel work being fabricated and erected by the Pennsylvania Steel Company, Steelton, Pa., Thomas Earle, superintendent.

ECONOMY CLAW BAR.

The Economy claw bar, illustrated herewith, is made by the Economy Separable Switch Point Company, Louisville, Ky. Fig. 1 shows the parts, and Fig. 2 the bar complete. This claw bar is made of a high grade of steel and the claws are forged separately, insuring a more perfect contour than

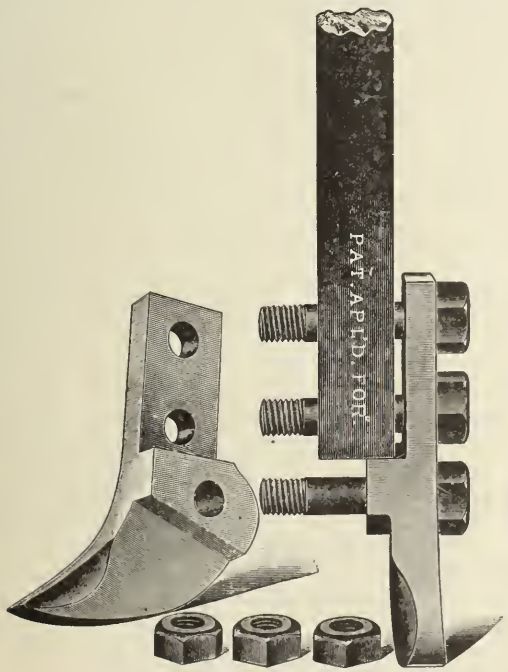


Fig. 1.

is possible when the bar is forged as a whole. The perfection of contour enables section men to fasten the claws to a spike head quickly and certainly, and the shape is such that the spike is pulled without bending, thereby saving it for use in redriving. The claws of the Economy bar come "rights and lefts," and are furnished in pairs. They weigh

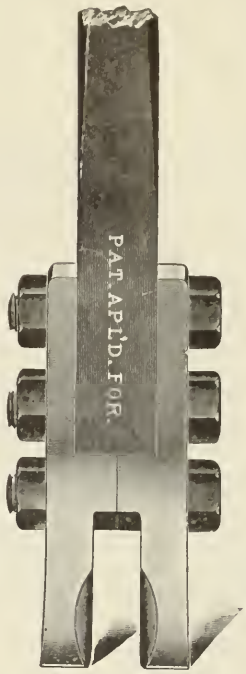


Fig. 2.

2½ lbs. each, so that they can be readily carried, and thus allow the section man to insert a new one if the bar is broken.

POSITIVE RAIL ANCHOR.

The Positive rail anchor and tie plate is here shown with the rail removed so as to illustrate more clearly the tie plate feature, Fig. 1 showing a top view and Fig. 2



Fig. 1.



Fig. 2.

the bottom view. Attention is directed to the wedging jaw, which utilizes the wedge shape of the base of the rail instead of gripping the edge of rail base, as is the usual method in other rail anchors or anti-creepers. It is made

to fit any rail section and combines in a single piece a positive rail anchor and tie plate for keeping rails from turning over, creeping or spreading, even on heavy curves. The plate is made by the Marion Malleable Iron Works, Marion, Ind. The office of secretary and treasurer of the Positive Rail Anchor Company is in the same city.

THE INFLUENCE OF STEEL CONSTRUCTION ON FACTORY COSTS.

By Henry W. Dakin.

[Mr. Dakin is secretary-treasurer of the Detroit Steel Products Company, Detroit, Mich., maker of Fenestra solid steel window sash.]

The influence of light and air on health is now well understood. No man can do his work efficiently in an ill-lighted and ill-ventilated shop. Accuracy and speed require, not only knowledge and skill, but proper conditions under which to labor. In practically all manufacturing institutions it is well known that the day shift turns out more work and better work than the night shift. In many parts of the country the heads of large manufacturing concerns are awakening to the fact that to get the most work out of their men they must provide working conditions under which they can get the full benefit of the life-giving rays of the sun, and several well-known factories have lately been rebuilt, changing the form of construction from brick walls and wooden sash to steel construction with steel sash.

Records relating to the efficiency of men working under the two kinds of construction show clearly the good effect of daylight construction and in every instance the factory costs have been lowered since the occupation of the new buildings. For example, under the old conditions the average number of parts turned out by a man for six months was 52, and in the new factory the average was 74 a day. This increase was made by the same man with the same machine making the same kind of parts, and the increased production was the result of working under new conditions. In daylight factories men can see over and under their work and all sides of it in its true light. This of itself has a tendency to increase the rate of production.

It is essential that steel-constructed factories with large window space, be fireproof, and the steel window sash has made this possible. Solid steel window sash properly made will resist fire until the wire glass has melted away from it, and it will stop the spread of fire in a group of factory buildings, where wooden sash would soon burn out, allowing the glass to fall and permitting the flames to penetrate the interior of the building. This fact was clearly demonstrated a short time ago at a fire of the Vera Chemical Works at Stoneham, Mass. The fire started in a wooden shed in which 2,000 barrels of rosin were stored. Adjacent to this shed was a small building fitted with solid steel window sash. Although the flames and smoke from the burning rosin completely enveloped this building for hours and all hope of saving it was abandoned, little damage was done excepting the melting of a few panes of glass. The contents of the building was not damaged in the least.

KALAMAZOO MOTOR CAR.

With the increase in attention being given to the use of motor cars for section forces by maintenance of way and operating men in general, the Kalamazoo motor car, shown by the Kalamazoo Railway Supply Company, Kalamazoo, Mich., at spaces 23, 24 and 25, in the Coliseum, is of particular interest.

The engine of this car is an air-cooled 2-cylinder horizontal engine of the reversible 4-cycle type. It is a long-stroke engine, with the resulting greater efficiency. The air-cooling is aided by the radiating flanges running lengthwise of the cylinders, increasing the cooling service three times, and also by the use of an auxiliary exhaust port, which relieves the cylinder of at least 60 per cent. of the heat left in the gases at the end of the firing stroke, and, in turn, relieves the main exhaust valves from the high temperature of these waste gases.

The engine is complete in itself and independent of the car body. The cylinders are bolted rigidly to a base containing the crank and cam shafts. All valve mechanism is part of this same unit. The transmission consists of cut steel gearing, the ratio of which can be changed to suit demands, enabling the purchaser to determine the speed at which his cars can be run. The car can be run at the same speed in both directions.

In designing this car special care was taken to see that



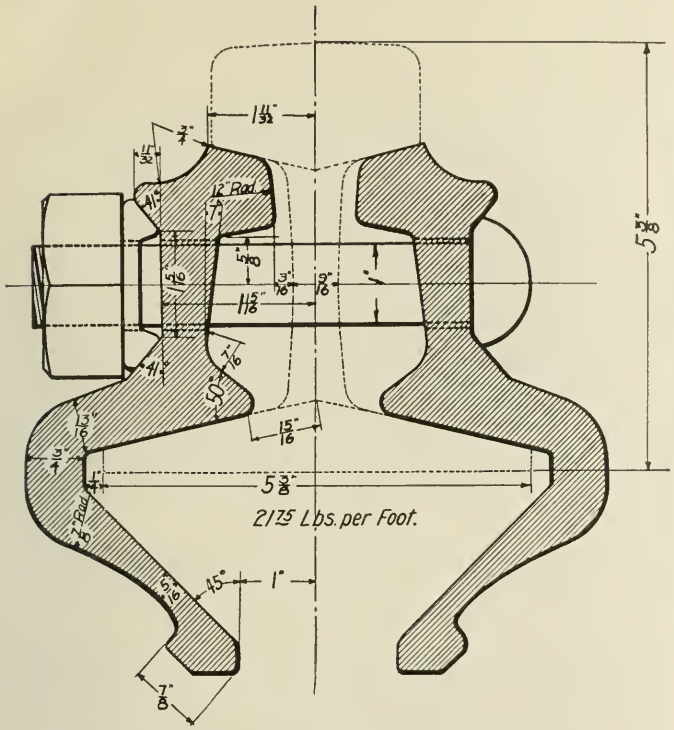
Kalamazoo Motor Car for Section Forces.

all parts requiring attention could be easily reached from the car platform. By the removal of four bolts the entire body of the car can be removed, leaving the engine and running gear exposed. The controlling levers, switch and battery box are so arranged that they can be locked when the car is not in service.

HUNDRED PER CENT. RAIL JOINT.

The Hundred Per Cent. joint is designed to provide a maximum area of section economically distributed and a depth of girder sufficient to bring its carrying capacity up to that of the rail it unites, in the belief that the weakness of the ordinary angle bar and the base plate joints is largely due to their limited girder depth. The girder depth of this joint is obtained by an inwardly inclined depending flange extending below the base of the rail at an angle of 45 deg., so as not to interfere with the tamping of the ties. The web of the joint is moved far enough from the web of the rail to permit the proper proportioning of the base member and to provide ample clearance for a square nut on a 1-in. bolt, in this way obtaining full value from this member, as well as transmitting the load to the depending flange and maintaining its position up to the full efficiency of the joint. The moving of the web of the joint from the web of the rail allows an increase in area in the head member, in addition to that of a laterally extending reinforcing rib, in this way providing metal where it is most needed to take care of the upward movement of the joint between wheel loads. This joint is equipped with a spring washer, and is made in the standard open-hearth steel and hot finish; in open-hearth steel from .45 to .55 carbon and hot finish; and in open-hearth steel from .45 to .55 carbon hot finish and oil treated. The high carbon steel increases the strength from 45 per cent. to 55 per cent., as well as retarding the cutting of the bars

under the head of the rail. The oil treatment increases the carrying capacity over the high carbon steel from 25 to 35 per cent., and also largely diminishes the corrosion of the bars.



Hundred Per Cent. Rail Joint.

The Hundred Per Cent. rail joint is manufactured by the Cambria Steel Company, Johnstown, Pa., and is on exhibition in space 177 at the Coliseum.

VELOCIPEDE MOTOR CAR.

The accompanying cut shows the velocipede car of Wm. D. Tilley, signal maintainer on the Philadelphia & Reading at Lees Cross Roads, Pa., equipped with a 2½ h. p. gas engine, manufactured by the Concrete Form & Engine Company, Detroit, Mich. Mr. Tilley says that he can make 30 miles an hour with his velocipede and has never dared open it up as far as it would go, for fear of the car leaving the track. The fuel consumption for this speed is one pint of gasolene per h. p. per hour, and the lubricating oil and grease required is a very small item. Mr. Tilley has hauled the signal foreman and two of his assistants with their tool bags, which would weigh nearly as much as a fifth man. Another owner of a velocipede similarly equipped is V. C. Burgner, Philadelphia & Reading, at Hummelstown, Pa. Mr. Burgner says that his engine has held its own summer and winter, and he would not sell it for



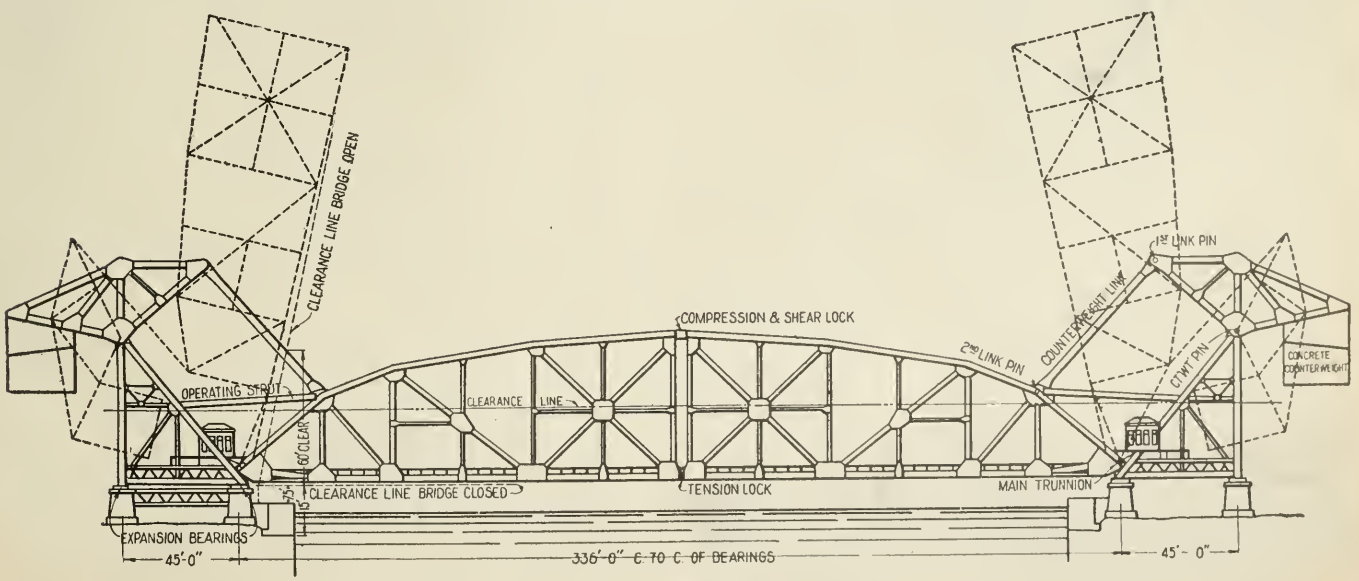
Velocipede Equipped with Gas Engine Carrying Two Passengers.

three times its original cost if he could not get another one. Mr. Burgner says that in installing the motor all he had to do was to cut a notch on the frame for the commutator. His experience has shown that one pint of gasolene lasts five miles and that 15 cents' worth of lubricating oil and pressure grease will be enough to last eight or ten months.

Blue prints are furnished with the engine, showing how to install it, and its operation is simple enough to allow any man on the road to handle the car.

SIMPLEX SPAN BASCULE BRIDGE.

The accompanying cut illustrates a Strauss double-leaf simple span railway bridge of 336 ft. span, the construction of which will shortly be begun. This bridge is the first practical example of a double-leaf simple span structure ever built, and should be particularly interesting



Strauss Simple Span Bascule Bridge.

to railway men, as it affords a satisfactory solution of the problem of the long span bascule bridge. It is applicable to two and four track structures of lengths up to 400 ft. The center lock is a positive device which couples automatically the moment the leaves come into position. A secondary lock, involving nothing more than the ordinary end lock of the single-leaf bridge, comes into play after engagement and acts with the main lock to convert the two leaves into a single or unitary structure. One tower is placed on rollers of the usual standard type, so that the entire structure is free to expand as a whole when the bridge is closed. During operation the tower is locked in position by means of a toggle, and the process of opening and closing is then completed in the ordinary way. The reactions on the piers are vertical and constant, and divided into the leaf load and the counterweight load, as in the Strauss heel trunnion type. The Strauss simple span bascule is economical, pleasing in outline, and is adapted to conditions and situations where it heretofore has been difficult to satisfactorily use the bascule. The above design was made by the Strauss Bascule Bridge Co., Chicago.

GRAIN ELEVATOR PROTECTION.

The Kansas City Southern has built a water tower to protect from fire the grain elevators at Port Arthur, Tex. The tank has a capacity of 100,000 gallons, and the height of the maximum water line is 214 ft., which gives sufficient head to throw a stream the entire height of the elevator. The water is in the tank, ready to use at the critical moment. This system does not depend on any pumps or compressors, and there is no danger that any machinery may fail at the wrong time. The certainty that the gravity tank will do that for which it is designed makes the water tower particularly adaptable to a fire protection system. The structure shown in the cut and described above was designed and built by the Chicago Bridge & Iron Works, Chicago.



Steel Water Tank for Fire Protection Service.

McKINLEY BRIDGE.

The accompanying view shows the traveler engaged in the erection of the 523-ft. span of the McKinley bridge of the Illinois Traction System across the Mississippi river at St. Louis, Mo. This structure includes three spans across the river, 521 ft., 523 ft. and 521 ft. long, respectively; two shorter river spans of 250 ft. in length each, and three shore spans of 150 ft. each, together with steel elevated approaches on each end. The entire length of the bridge and approaches is over 8,000 ft. The three main river spans are riveted through Pratt trusses, while the five shorter spans are riveted deck trusses. The total width over all is 65 ft., the clearance above high water 50 ft., and above low water 85 ft. The four large river piers are built of red granite and Bedford limestone backed with concrete. They are 150 ft. from the bedrock to capstone, 26 ft. thick and 76 ft. wide at the bottom. This structure was formally opened on November 10, 1910, and is now in regular service. This structure was erected by the Missouri Valley Bridge & Iron Company, Leavenworth, Kan.



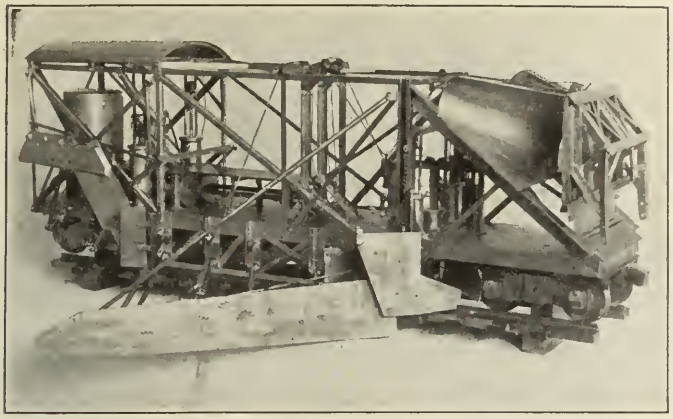
Erecting 523-ft. Span of McKinley Bridge at St. Louis.

KENNICOTT SPREADER.

The Kennicott Company, Chicago Heights, Ill., manufactures a combination machine that can be used as a bank shaper, snow plow, bank builder, ballast spreader, grain elevator, ditcher and flanger.

The accompanying cut shows the Kennicott spreader. The main spreader wings are operated by opening two air cocks. The wings lock down automatically and are released by the operator applying his foot to pedal and applying the air to cylinders. There are no struts or braces to put in or take out. The folding snow plow is built strong enough to stand the work and is carried in folded position when not needed. When required it can be lowered to position and secured ready for work in ten minutes. The 24-inch plows are built of cast steel thick enough to give the required strength, and the use of plow share, mold board and landslide,

makes a plow that will plow a furrow and not drag through the ground. The ingathering wings are used for taking filling ballast material from the sides of track for raising grades, ballasting track, etc. The bank shapers make it possible to shape up banks to a true surface, shoulder and bank slope, which is an expensive task for section men. The flanger blades attached to ingathering wings when lowered form a perfect flanger operated by air; to be used when snow plow is in service or separately as desired. The bank builder makes it possible to raise grades eight feet parallel with track, and also build up areas to that height without using piling to build tracks on. At a small additional cost the roof can be extended the entire length of the car and the sides closed up, furnishing a compartment for carrying tools which might be desirable in some instances. The ingathering wings form center dump ballast spreading wings when car is moved ahead, and set of wings immediately ahead perform same service when car is run in opposite direction. The complete machine weighs 94,000 lbs.

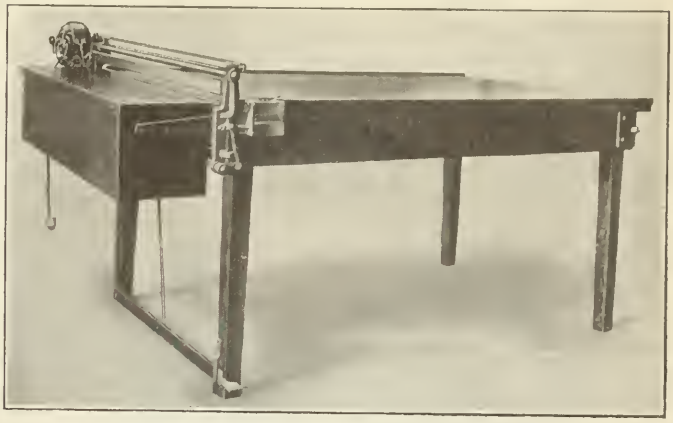


Kennicott Spreader.

PEASE MOTOR DRIVEN CUTTING AND TRIMMING TABLE.

The accompanying illustration shows the Pease motor driven cutting and trimming table, arranged with a light-proof box for blue print paper. This trimming table will be found a great convenience to all makers of blue prints, and it can also be used to excellent advantage for cutting tracing paper or cloth, detail paper, etc. The table is provided with a parallel clamp, operated with a foot treadle, which holds the paper, tracing cloth or print securely while the revolving cutting knife is used. This device is rapid and convenient in operation and will trim a very narrow strip from the paper or print. The revolving cutting knife is motor driven and is rotated positively by mechanical means not depending on friction against blade or paper, and therefore will cut the thinnest paper or will cut five to ten sheets at once. The knife is electrically operated in either direction at will, is stopped or started at any point by a specially designed wrist-controlled switch which leaves both hands of the operator free to handle the paper or prints. The table is of hardwood, with metal trimmings, arranged to be easily knocked down for shipment. Electric equipment is complete and is arranged so it can be connected to any incandescent light socket. The top of the table is scored in inches and is provided with figures along the front edge, so that any size sheet can be measured. A sizing diagram can also be provided for the top of the table, which gives at a glance the size of any tracing or print and the square foot measurement.

These tables are also furnished with a basket on the end in stead of a light-proof box, designed for cutting prints after they have been run in an automatic printing, washing and drying machine. The tables as regularly furnished are 4 ft. wide by 6 ft. long, but any width up to 8 ft. can be supplied. This table is also furnished in widths up to 42 in., arranged for operating the cutting knife by hand instead of with motor. The cutting machinery is all self-contained and can be furnished separately if desired, so it can be bolted on any table of appropriate width, and the cutting device can be used with or without the parallel clamp. This table can be seen in operation at the Coliseum at the exhibit of the C. F. Pease Company, Chicago, in sections 161-162.



Pease Cutting and Trimming Table.

WATER STATION APPARATUS.

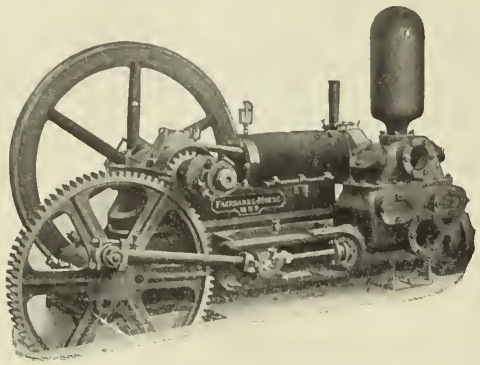
Fairbanks, Morse & Co., Chicago, have on exhibition at the Coliseum an Eclipse double-acting pump, a 10-in. and 7-in. x 12-in. duplex steam pump, and a 10-h.p. combined gasoline engine and pump as one unit on one solid base. These pumps are only a few of the complete line of pumping machinery carried by this firm in addition to the complete water stations which it builds.

The internal combustion engine has found a large field on account of economy in operation, and the makers say that the railways are rapidly adopting the combined pumper for water stations wherever possible. This pumper is made in sizes from 5 to 25-h.p., with capacities from 55 to 495 gallons per minute. The pump is rigidly attached to the engine frame, making a compact, self-contained unit requiring only an ordinary foundation and ordinary pipe connections. A pinion on the main crank shaft meshes with a large gear which operates the pump, this large gear being arranged to give three different lengths of stroke. A friction cone clutch is provided so that the engine may be started independently of pump and under no load. This clutch is operated by a long lever, permitting its use without possibility of danger to operator. The pump is so constructed as to permit a large range of capacity and use in handling different liquids. When desired an automatic stopping device can be furnished which will shut down the engine when tank or standpipe is full, open the drain cocks of water cylinder and cooling pipe connections, shut off fuel supply and disconnect batteries. This is one of the features that makes the gasoline pumper a desirable and economical proposition, as the station agent or section foreman can attend to it, simply starting the engine, which will stop when the tank is filled, or one waterworks man can easily take care of three or four stations.

For deep-well pumping, Fairbanks, Morse & Co. have designed a "geared base" engine. This is a standard internal combustion engine, made in sizes 5 to 15 h.p., with a large gearwheel to which is connected a pitman rod for operating

a deep well pump. This machine is also fitted with extended shaft and pillow blocks when desired to place it away from the well, and the large gear is also provided with suitable means whereby several lengths of stroke can be had to accommodate the requirements of the well. Both the combined pumper and the geared base engine can be furnished to operate on gasoline, gas, kerosene, alcohol, crude oil or distillate.

In connection with their pumping machinery, Fairbanks, Morse & Co. also have on exhibition a No. 10, 10-in. telescopic spout standpipe. This standpipe is equipped with a water-balanced valve, which means that the water is on both sides of the valve and at the same pressure as in the main, insuring no leakage and a minimum amount of wear. The pipe is regularly furnished with an automatic relief



Fairbanks-Morse Combined Gasoline Engine and Pump.

valve which prevents water hammer, which is so destructive to pipe lines and tanks. The telescopic spout feature will accommodate the largest or smallest engines, with no waste or dripping of water. This is an important factor if the water station is barely large enough for requirements, and it also prevents softening of track by dripping water. The No. 10 standpipe is a one-man standpipe and does not require the baggageman or head brakeman to unlock it from the ground and turn it around for the fireman. The pipe is securely locked parallel with the track and can be unlocked and turned by the fireman on the tender without help from the ground. When the engine is watered the pipe will automatically lock in position when swung back from the tender.

Catalogue No. 126-A, issued by Fairbanks, Morse & Co., describes their pumping machinery, water stations, etc., completely.

FRANKLIN GASOLINE-DRIVEN AIR COMPRESSORS.

The substitution of power-operated machinery for manual labor has not been carried as far in maintenance of way work as most other departments of railway engineering. This applies particularly to the use of compressed air tools, now considered indispensable in the shop, and is due largely to the fact that maintenance of way work at any particular point is usually of short duration, and the time required to set up and put in operation a steam-driven air compressor, with its accompanying boiler, is greater than the saving to be effected by the use of pneumatic tools will warrant. The Chicago Pneumatic Tool Company, Chicago, has recognized the need in this field and its Franklin gasoline-driven compressor is designed to supply the demand for a compressor for small installations.

This machine has many features which recommend it for this class of work. The absence of the boiler makes the first cost of plant and equipment much lower than with a steam plant, and perhaps an even greater advantage is the reduced weight and portability. The whole machine is extremely simple and compact, there being no gearing as found in the few gasoline outfits previously available, even that ordinarily required for the valve gear having been eliminated. The engine is of the two-cycle type, there being no valves to leak or adjustments to be tampered with. In addition, since with a two-cycle engine an impulse is received each revolution, the weight of fly-wheels necessary with the four-cycle type can be reduced. Since the impulses are received twice as often as in a four-cycle engine, and consequently the forces are correspondingly less, a reduction in the weight of various parts transmitting power to the shaft is possible.

The elimination of boiler, water and coal supply is a matter of considerable importance in a portable outfit, and in addition to this there is a further advantage in reduction of fuel expense, due not only to greater efficiency in the use of fuel, but also to the fact that there are no "stand-by" losses, the fuel consumption beginning with the work and ceasing immediately upon its completion.

CONCRETE MIXER LIFTING ATTACHMENT.

In constructing piers, abutments and walls in railway work it is often necessary to deposit the concrete at a considerable elevation above the ground. The accompanying illustration shows the way in which such a problem was solved by the use of equipment of the Municipal Engineering & Contracting Company, Chicago. A Chicago improved



Chicago Improved Cube Mixer, With Lifting Attachment.

cube mixer was placed on a platform built at such a height that it could discharge directly into the wall and a charging elevator was built to the ground. This elevator was filled in the usual way at the ground level and carried to the top, where it was discharged directly into the mixer. In this instance the material was delivered to the mixer at the rate of 1⅔ batches per minute, and the machine kept in constant operation ten hours a day for sixty days without a breakdown.

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THE differential made by the Pullman Company between its rates for upper and lower berths has thus far had little or no effect. The ticket agents report that, as before the change in rates was made, practically all passengers, in buying sleeping car tickets, ask for lower berths. It seems to us that this is as it should be. A bonus of 40 cents a night could hardly be expected to attract the average passenger into a place which he considered undesirable; while the sum serves very well as a nominal consolation to a passenger when, by force of circumstances and of his respect for the principles of economy in transportation, he is obliged to use an upper.

THE Interstate Commerce Commission has ordered a reduction in passenger fares frankly for the reason that the railway company is grossly over-capitalized. The reason is not stated baldly in just these words; it is said that besides considering the facts disclosed by the record, the commission has examined "other circumstances and conditions pertinent to the issues involved"; but the stock and bonds of the company aggregate $207,895, a mile, while by implication the commission finds (without giving any facts to support the finding) that about $50,000 a mile would be a reasonable figure; and a reduction of 33⅓ per cent. is ordered. The case is that of Beall vs. the Washington, Alexandria & Mount Vernon, an electric line from Washington, D. C., to Alexandria, Va. The distance from Washington to Alexandria is 7½ miles, and the single trip fare is 15 cents. To stations about two miles nearer Washington the fare is 15 cents also, and the complaint is from passengers at these stations, which are included in the Alexandria zone. Twenty-five tickets between Washington and the complaining stations are sold for $2.50, making a rate of about two cents a mile. The order of the commission requires that single trip tickets be sold at this rate (10 cents a ticket; two cents a mile). The line has been in operation 14 years, and apparently, says the commission, it has been economically and efficiently managed. Other suburban lines entering Washington charge 10 cents for similar distances. Ten cents to the complaining stations gives the same revenue per passenger mile as the 15-cent rate to Alexandria. The defense of the company was, first, that the travel from the complaining towns was light; second, that the dividends paid by the company have been very meagre; and, thirdly, that the company is not subject to the Interstate Commerce law. To the argument that the revenue derived from the business at these small stations does not pay for the service rendered, the commission replies that it may well be assumed that as the trains must be run, to accommodate Alexandria, this additional traffic is clear gain; and secondly, the financial condition of the company is not so distressing as is claimed. Of the capital, about 60 per cent. consists of bonds on which 5 per cent. has been paid, while for the last three years dividends have been paid on the stock of 1 per cent., 2 per cent., and 2 per cent., with a considerable surplus each year. If no money had been retained as surplus, 5 per cent. could have been paid on the stock; while if the stock and bonds together had amounted to only $50,000 a mile, the earnings in 1910 would have paid 16 per cent. on the investment. If the 20,000 trips between Washington and the complaining stations had brought in a revenue of only 10 cents each, the net loss to the road would have been $1,000, and it would still have been able to pay 2 per cent. on its stock and lay aside a good surplus. The claim that the road was not subject to the Interstate Commerce law was not seriously pressed.

MR. PARK, now vice-president of the Illinois Central and formerly for several years an officer of the Union Pacific, makes the positive statement, as refreshing as it is unusual, that the Union Pacific and other Harriman lines have abolished avoidable train accidents! He has adopted certain Union Pacific methods on the Illinois Central, and the statement comes out in connection with the announcement that the I. C. and its controlled lines during the past calendar year carried 30,728,211 passengers, of whom not one was killed in a train accident; and this includes passengers carried on freight trains. The passenger mileage was about 800 millions; passenger train mileage 15 millions, and freight train miles 22⅓ millions. The number of train accidents of all kinds was equal to 7.43 accidents per million locomotive miles, which he says is nearly 50 per cent. less than the number occurring in the preceding year. Mr. Park says that the improvement over former records is due largely or mainly to surprise checking. The division officers now report very few misunderstandings or violations of rules, showing that the natural prejudices of the men against surprise checking have been largely overcome in the short space of time since Mr. Park introduced the methods which he had found so successful on the Union Pacific. His reference to the Union Pacific's efficiency tests, which have now been conducted for several years, is to the effect that they "have practically eliminated avoidable accidents." He includes the company's policy of giving publicity to the causes of

train accidents as an important factor in improving the service. Presumptive evidence of the correctness of this declaration, as regards the Harriman lines, is found in the report of those lines, recently published, showing complete freedom from fatal train accidents to passengers during the past year. Both on these lines and on the Illinois Central the rules for surprise checking are systematic and rigid. One of them requires that when a passenger train is stopped by a flag or torpedo, or by an unusual signal, the conductor shall confer with the engineman before proceeding. For the last month (February, 1911) the surprise checking on the I. C. resulted in the following percentages of efficiency: Chicago division 77; St. Louis division 83; Springfield division 78; Peoria division 83; Freeport division 90; Dubuque division 67; and Cherokee-Omaha division 100. Mr. Park says that on the Harriman lines the efficiency of employees has been brought to that degree of perfection that on block-signaled lines a flagman is not required to go back if the signal can be seen at "stop" one half mile in the rear. No other road in this country has such a rule, and very few officers would be willing to put their efficiency to the test of an abolishment of flagging to the extent that the Harriman Lines have done. As Mr. Park well says, this degree of perfection could have been attained only after both officers and employees had undergone a very systematic and exhaustive drill in efficiency.

THE Pennsylvania also reports having killed no passengers in a train accident in 1910, and the number of passengers carried was 130 millions; and during the last *three* years when the number of passengers carried on the lines east of Pittsburgh and Erie was 372 million, only one was killed as a result of a collision or derailment of trains. These statistics include the traffic of the Cumberland Valley, the Baltimore, Chesapeake & Atlantic and the Long Island roads, as well as those more closely affiliated with the Pennsylvania. Attention very properly is called to the fact that the Pennsylvania has a heavier traffic per mile of road than any other large system in the country. The passenger train mileage was 124 millions and the freight train mileage was 113 millions. Passenger trains meet freight trains so frequently that the passengers' view of the scenery along the line is seriously interfered with! To maintain those thousands of freight cars, freight-car doors and trucks, in the high degree of perfection necessary to assure complete immunity to the passing passengers is one of the greatest achievements of the railway art. The number of passengers *injured* in train accidents on the Pennsylvania in 1910 was only 84, and this was but one half the number injured in the year 1909. These figures include every case requiring surgical or medical attention. There were no collisions affecting passenger trains on the Pennsylvania Railroad proper in 1910, and there were only two on the subsidiary lines. The total number of derailments on all of the lines in 1910 was 203, of which only 16 affected passenger trains. The number of collisions and derailments shows a decided decrease each year since 1907. Records like these may serve to remind us that the government accident bulletins do not constitute a complete picture.

THE Supreme Court of the United States, in a decision by Mr. Justice Holmes, has sustained the Atchison, Topeka & Santa Fe in its claim to legally keep a telegrapher at work from 6:30 a. m. to 6:30 p. m., with three hours off in the middle of the day; this in an office assumed to be kept open continuously night and day, which assumption seems to be endorsed by Judge Holmes, in spite of the 3-hour intermission. The suit had to do with the telegraph office at Corwith, Ill., near Chicago, which was kept closed from 12 o'clock to 3 o'clock by day and by night, but open the rest of the time. The government claimed that this was in violation of the law forbidding the confinement of operators to their work in day-and-night offices, over nine hours; and a verdict was secured in the district court; but the circuit court of appeals (which is now sustained by the supreme court) reversed the judgment. Judge Holmes says it is impossible to extract the requirement of fifteen hours' continuous leisure from the words of the statute by grammatical construction alone. The proviso does not say nine "consecutive" hours, as was said in the earlier part of the section [referring to trainmen], and if it had said so, or even "for a longer period than a period of nine consecutive hours," still the defendant's conduct would not have contravened the literal meaning of the words. A man employed for six hours and then, after an interval, for three, in the same twenty-four, is not employed for a longer period than nine consecutive hours. And the Court says that in order to accomplish the purpose contended for by the government it would have been necessary to add a provision requiring 15 consecutive hours off duty. As the word "consecutive" was used earlier in the statute and was not used here, the judge reaches the conclusion that there was no oversight in the choice of words. This is a fine example of how we make laws. The leaders of the telegraphers' brotherhood knew just what they wanted. They wanted to compel the employment in each office of three operators for eight consecutive hours each, three such tricks making a day of 24 hours. They made the clause read "nine hours," so as to allow for a little flexibility. They intended to make Congress see their view and adopt it. The congressmen, however, satisfied themselves, no doubt, that they had done their duty when they had given the telegraphers just what was asked for. Now comes Mr. Justice Holmes and gravely assumes that the congressmen really gave careful thought to the matter and intended to allow split tricks *ad libitum*. As this hours-of-labor law, in spite of some good in its purpose, and perhaps some beneficial results in its operation, is nevertheless crude and wasteful, anything that will mitigate its pressure is to be welcomed; but no one acquainted with the railway station service can interpret Judge Holmes' decision as other than a nullification of the well-understood purpose of the law. The judge thinks that Congress intended to allow split tricks aggregating nine hours. If any congressman did so intend he was trying to fool the telegraphers; and who ever heard of a congressman treating a labor leader other than with the highest respect? But to restore to the law its intended meaning it will only be necessary to pass an amendment, and that, of course, the brotherhood can have for the asking.

THE FRICTION OF FREIGHT TRUCKS.

WHEEL flange friction and wear, while always a matter of concern, is becoming one of large importance, because it calls for such heavy expense for car maintenance. A constant effort is being made to discover the principal causes of flange friction and the means by which it may be reduced. The subject is one which may be regarded as affecting expenses for car repairs in the renewal of wheels and of means by which the flange life may be prolonged by improvement in the quality of metal in the flange; or it may be considered as one of the principal causes of train resistance on curves, resulting in increased expense for fuel in hauling the train and for rail renewals. In the latter case, the whole truck structure may be taken as contributing more or less to this wear and resistance, and the controversy over the relative merits of the square truck and the loose truck in causing sharp flanges is one of long standing. The use of cast steel in the manufacture of freight trucks has led to the design of decided modifications and departures from the arch bar type of truck, which was the standard for many years, and there are now in service so many trucks which differ from it in essential particulars that it is important that their action on the track and especially on curves be accurately measured.

The experiments at Granite City, Ill., which were conducted by Professor Endsley under the auspices of the American Steel Foundries, are perhaps the most complete and accurate tests of the friction of freight trucks on curves which have ever been conducted, and we devote considerable space in this issue to

the publication of the principal part of the report which describes them. The testing of trucks separate from the car body is new, and we believe little or no work of this kind has been previously attempted. The methol of obtaining the desired velocity in the contracted space of a shop yard and without a locomotive is ingenious, but adequate. The loading of the truck with heavy masses of metal in the bolster and on top of it, so that the weight on the track was equal to that of half an empty car, was also an original method of testing, but we confess to sharing the doubts of those who question whether the results so obtained would be the same with loaded cars and trains. The center of gravity of the test truck is much nearer the track and the action of the load is through a more rigid mass directly to the wheel flange than in the case of a loaded car body resting on the truck, for in this case the load is concentrated probably 2 ft. higher from the rail, and its application is through a rolling motion which is more flexible than in the more compactly loaded truck. On the other hand, there are some advantages in testing flange friction by the use of the truck separately, for in this way differences in truck construction are alone responsible for differences in results, while with the loaded cars in a test train the results are complicated by the uncertainties due to the friction of the center plates and side bearings and to the lack of normal flexibility in the drawbars and draft rigging.

With steel cars having stiff body bolsters, the variable condition of side bearings may be largely eliminated and tests of loose or square trucks under the same car bodies should eliminate the principal disturbing factors. We trust, therefore, that the experimental work on freight trucks which has been so thoroughly commenced, may be continued with loaded cars in trains by a committee of the M. C. B. Association, so that results may have the sanction and authority of that body. The report states that such tests have been conducted with loaded cars, and that the results present a striking confirmation of those obtained at Granite City, and we hope to publish the facts relating to these road tests when they are available.

We have not included in our abstract any figures relating to the experiments with trucks on tangents, as the difference in square and loose trucks as revealed by these tests are so slight that they may be regarded as almost within the limits of error in testing. The important conclusion reached as a result of the experiments with a truck on curve is that the resistance increases as the trucks get out of square, and, therefore, that type of truck which is provided with means for preventing the truck sides from shifting with respect to each other will run with less resistance than that which allows the wheels to jam on the curve as a result of the shifting of the truck sides.

The diagrams bring out the fact that the resistance was not materially affected until the truck was at least 1 in. out of square. When this figure reached 1½ in. the increase in resistance was 10 lbs. per ton more than that offered when the trucks were out of square ½ in. or less, so that there seems to be a point somewhere near 1 in., beyond which the resistance per ton is materially increased. In view of this fact, the tests led to the classification of trucks into two general types—loose and square. Those which went out of square ½ in. or less in rounding the 22 deg. curve were classed as square trucks, and those which went out of square 1½ in. or more were classed as loose trucks. The method of measuring the degree of squareness is well illustrated by the photographs which accompany the report.

The main conclusion drawn from the experiments is that a truck which is constructed in such a way that it will remain square and hold the axles radially with the curve will cause less resistance than one which does not remain square and allows the axles to shift. This difference in favor of the truck which is held square increases with the curvature. On a 5 deg. curve it amounts to 3 lbs. per ton, or 22.8 per cent.; on a 10 deg. curve the difference is 6.2 lbs., or 29.7 per cent.; on a 15 deg. curve the difference is 9.3 lbs., or 33 per cent., and on a 20 deg. curve it is 12.4 lbs., or 35 per cent.

The wide publicity which is given to the results of these truck tests by the distribution of the elaborate and handsomely printed pamphlet, and by our own abstract, should serve to excite an unusual interest in the subject of truck design as materially affecting train resistance and the cost of wheel maintenance, and show it to be worthy of further investigation.

NEW YORK CENTRAL & HUDSON RIVER.

E. H. HARRIMAN and W. C. Brown, the latter at that time senior vice-president of the New York Central & Hudson River, were the men who first began the agitation for higher freight rates in 1907. Mr. Brown was one of the most active supporters of the railways' contentions during the entire campaign for higher rates, and, therefore, his attitude toward the commission's action in refusing to grant these higher rates is of unusual interest. It is all the more interesting because the Interstate Commerce Commission itself was free to acknowledge that the New York Central made a much stronger showing in its plea for higher rates than did either the Pennsylvania or the Baltimore & Ohio. We have Mr. Brown's view in the annual report of the New York Central & Hudson for the calendar year ended December 31, 1910, just issued:

"The decision has been accepted in good faith, and every method of economy that can be enforced without resulting deterioration of the property or impairment of the efficiency of the service is being adopted. . . . If the forecast of the Interstate Commerce Commission, that increased volume of business and such economies as can wisely be adopted will offset the large increase in cost of operation, is realized the railways will very gladly acknowledge that they were mistaken in their apprehensions.

"On the other hand, if the results of operation as they shall be developed month by month demonstrate that these apperhensions were not entirely groundless, further appeal will in due time be made to the commission, with full confidence that needed relief will be granted."

And President Willard, of the Baltimore & Ohio, when first told of the commission's decision in the rate cases, remarked that he hoped the commission was right.

The New York Central & Hudson River, which operates 3,785 miles of road, of which about 800 miles is owned, is peculiarly situated in regard to the cost of its service. It is a road that runs through a densely populated territory which demands a high class of service and where conditions of operation are more nearly akin to conditions in England than to conditions in the western part of the United States. Moreover, the New York Central has the departmental form of organization common on English roads, and the Central is the only large railway company in this country that has frankly adopted this form. During the last three years a great deal has been done to make this organization an effective machine for operating a railway, and, while there is still a good deal to be accomplished toward better team work, the progress that has been made since 1907 is very great.

In the calendar year 1910 the New York Central's expenses increased out of all proportion to the increases in gross. Last year total operating revenue amounted to $99,000,000, an increase of $6,700,000, while operating expenses totaled $74,100,000, an increase over 1909 of $9,500,000. If this heavy disproportionate increase in expenses were shown for the New York Central alone, it might with some justice be claimed that it was due to lack of operating efficiency, but since it is general for all roads, and especially so for roads operating in Official Classification territory, it is necessary to look to some more general cause than lack of efficiency in one particular organization.

The wage increases of the fiscal year 1907 were made toward the last of the year, so that only a small part of the effect of this increase was felt in that fiscal year, and early in 1908 the panic and its resulting depression had compelled the railways to

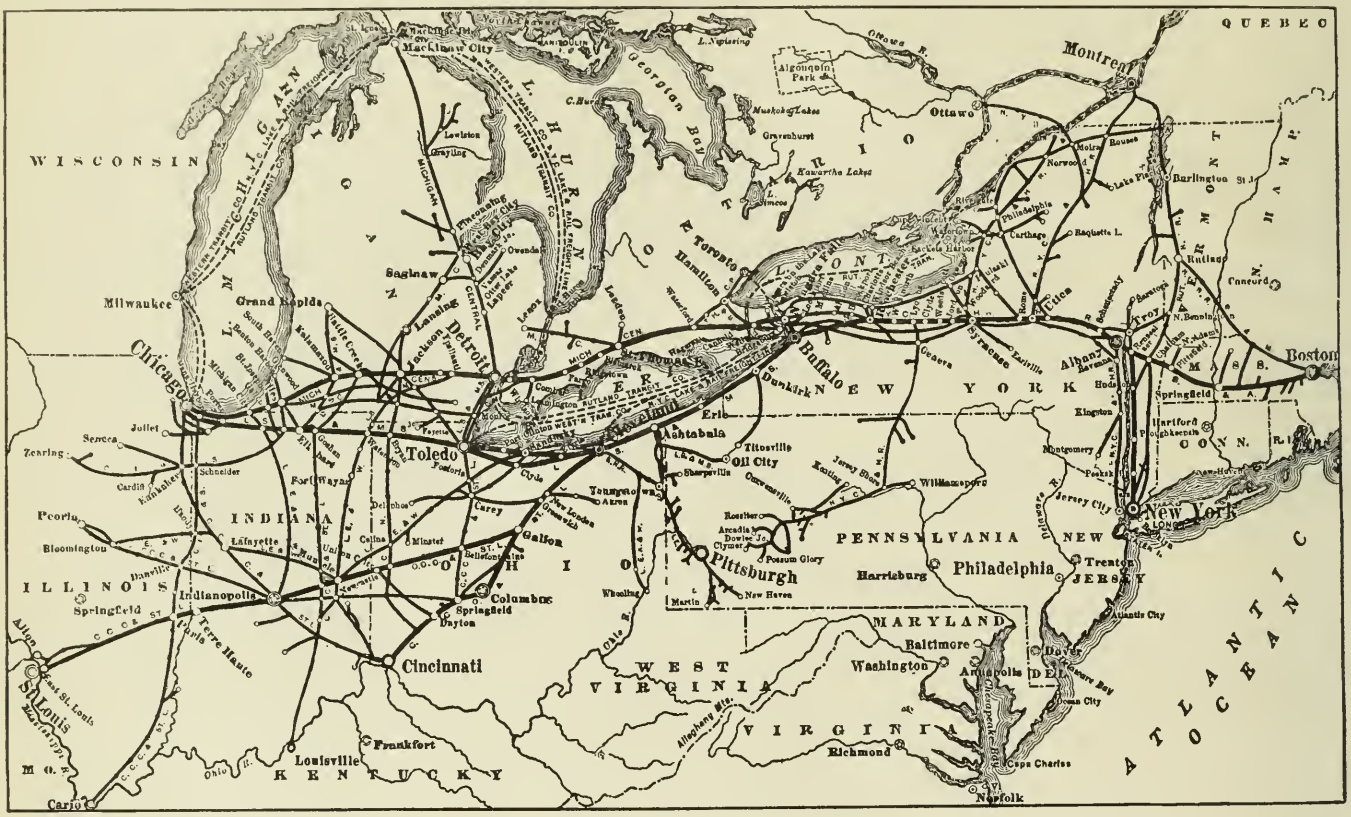
enforce the most rigid economy. A great number of employees were laid off early in 1908. There was no decrease in wages, but since the pay roll was so much smaller, the operating expenses as a whole never clearly reflected the effects of the raise in wages of 1907 until the end of 1909 and the beginning of 1910, when the roads found it necessary to largely add to their force of employees. These new men were hired at the increased wage rate, and, in addition to this, the railways were again forced to make a general increase in wages.

As a matter of fact, therefore, in 1910 for the first time railway expenses showed fully the effects of the wage increases of 1907, showed the wage increases of 1910, and showed the increase in expenses that was due to delayed maintenance and repair work which had been cumulative through 1908 and a good part of 1909. Now, the wage increases are a permanently added expense, but the cumulative repair work is temporary, and with a larger gross business it is fair to assume that each unit can be handled more economically.

The New York Central & Hudson River's operating ratio is high. The percentage of expenses to revenue was 74.15 in 1910 and 69.33 in 1909. An examination of the freight and passenger traffic statistics suggests one of the reasons for this high operating ratio. The total number of tons of freight carried one mile per mile of road, that is, the freight density, on the New York Central & Hudson River was 2,500,000 tons in 1910. This is a smaller freight density than that of either the Pennsylvania or the Baltimore & Ohio. On the other hand, the number of revenue passengers carried one mile per mile of road was 506,301 in 1910 on the New York Central. This is a very much greater passenger density than is shown by either the Pennsylvania or the Baltimore & Ohio. As the Pennsylvania has demonstrated in its accounts where passenger and freight expenses are separated, the margin of profit on passenger business is very much less than on freight business, and any economies that a road may wish to make in passenger service are always at once met by strong opposition from the traveling public.

In 1910 the total tons of revenue freight carried one mile on the New York Central & Hudson River was 9,277,000,000, an increase of 647,000,000 ton miles, or 7.5 per cent. This increased business was handled by 22,220,000 freight train miles, an increase over 1909 of 880,000 train miles, or 4.1 per cent. The total freight car miles amounted to 819,000,000 in 1910, an increase of 18,000,000 freight car miles, or but 2.3 per cent.

The total number of revenue passengers carried one mile amounted to 1,771,000,000, an increase of 112,000,000 passenger miles, or 6.8 per cent., while the passenger train mileage increased 5.4 per cent. In other words, the company found it possible to handle each unit of increased freight business considerably more economically, but this rule did not hold good with passengers. The average number of passengers per train mile was 66 in 1910, which is the same as in 1909. The average freight train load was 417.25 tons in 1910, an increase of 12.83 tons over 1909.


QUEBEC
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INDIANA
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Galion
Akron
Canton
Alliance
Orrville
Rochester
Arcadia
Dowler Jc.
Clymer
Possum Glory
New Haven
Martin
Wheeling
Williamsport
Jersey Shore
Montgomery
Patton
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Newark
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Raritan
Perth Amboy
Long Branch
Asbury Park
Red Bank
Lakewood
Toms River
Barnegat
Tuckerton
Beach Haven
Atlantic City
Ocean City
Sea Isle City
Avalon
Stone Harbor
Wildwood
Cape May
Cape May Point
Delaware Bay
Delaware R.
Chesapeake & Delaware Canal
Baltimore
Washington
Annapolis
Chesapeake Bay
Tolchester Beach
Claiborne
Easton
Cambridge
Crisfield
Somerset
Pocomoke City
Snow Hill
Berlin
Ocean City
Salisbury
Delmar
Seaford
Laurel
Georgetown
Lewes
Rehoboth
Dover
Milford
Harrington
Frederica
Smyrna
Middletown
Odessa
Townsend
Wilmington
Newport
Kennett Square
Oxford
Elkton
Perryville
Havre de Grace
Aberdeen
Bel Air
Edgewood
Gunpowder
Chase
Joppa
Magnolia
Perryman
Gwynn
Bush
Abingdon
Fallston
Jarrettsville
Whiteford
Forest Hill
Darlington
Rocks
Street Road
Bel Air
Conowingo
Peach Bottom
Delta
Cardiff
Quarryville
Lancaster
Columbia
Marietta
Mount Joy
Elizabethtown
Middletown
Harrisburg
Steelton
Enola
Mechanicsburg
Carlisle
Shippensburg
Chambersburg
Greencastle
Hagerstown
Martinsburg
Shepherdstown
Harpers Ferry
Brunswick
Point of Rocks
Frederick
Monocacy
Sabillasville
Thurmont
Emmitsburg
Gettysburg
Littlestown
Hanover
York
Wrightsville
Columbia
Lancaster
Reading
Pottsville
Tamaqua
Mauch Chunk
Bethlehem
Easton
Phillipsburg
Belvidere
Delaware
Trenton
Princeton
New Brunswick
Perth Amboy
Rahway
Elizabeth
Newark
Jersey City
Hoboken
Weehawken
Secaucus
Harrison
Kearny
Passaic
Paterson
Hackensack
Englewood
Fort Lee
Nyack
Tarrytown
Yonkers
Mount Vernon
New Rochelle
Port Chester
Greenwich
Stamford
Norwalk
Westport
Bridgeport
New Haven
Meriden
Wallingford
Hartford
Springfield
Worcester
Framingham
Boston
Lowell
Lawrence
Haverhill
Portland
Bangor
Rutland
Burlington
Plattsburg
Saranac Lake
Malone
Ogdensburg
Massena
Cornwall
Brockville
Prescott
Gananoque
Kingston
Belleville
Trenton
Napanee
Deseronto
Tweed
Bancroft
Coe Hill
Madoc
Eldorado
Marmora
Campbellford
Peterborough
Lindsay
Bobcaygeon
Fenelon Falls
Minden
Haliburton
Gravenhurst
Bracebridge
Huntsville
Parry Sound
Sudbury
Sault Ste. Marie
Algoma Mills
Michipicoten
Nipigon
Port Arthur
Fort William
Rainy River
Kenora
Winnipeg
Duluth
Superior
Minneapolis
St. Paul
Fargo
Grand Forks
Devils Lake
Minot
Portal
Regina
Moose Jaw
Medicine Hat
Calgary
Edmonton
Prince Albert
Saskatoon
Battleford
Yorkton
Brandon
Portage la Prairie
Dauphin
Swan River
The Pas
Hudson Bay
Port Nelson
Churchill
Fort Churchill
Fort Saskatchewan
Vermilion
Lloydminster
Wainwright
Camrose
Lacombe
Red Deer
Strathcona
Wetaskiwin
Ponoka
Innisfail
Banff
Lake Louise
Field
Revelstoke
Kamloops
Ashcroft
Lytton
Yale
Hope
Vancouver
New Westminster
Victoria
Nanaimo
Prince Rupert
Port Simpson
Skeena R.
Fraser R.
Thompson R.
Columbia R.
Kootenay R.
Kootenay Lake
Arrow Lakes
Slocan Lake
Nelson
Trail
Rossland
Grand Forks
Midway
Penticton
Kelowna
Vernon
Sicamous
Salmon Arm
Shuswap Lake
Kamloops Lake
Okanagan Lake
Okanagan Falls
Osoyoos
Oroville
Wenatchee
Ellensburg
Yakima
Pasco
Walla Walla
Lewiston
Spokane
Coeur d'Alene
Wallace
Kellogg
Mullan
Missoula
Butte
Anaconda
Helena
Great Falls
Havre
Glasgow
Wolf Point
Williston
Minot
Bismarck
Mandan
Dickinson
Glendive
Miles City
Billings
Livingston
Bozeman
Gallatin
Yellowstone Park
Cody
Sheridan
Buffalo
Gillette
Moorcroft
Newcastle
Hot Springs
Deadwood
Lead
Rapid City
Edgemont
Chadron
Alliance
Hemingford
Crawford
Harrison
Gering
Scottsbluff
Bridgeport
Sidney
Kimball
Julesburg
Sterling
Fort Morgan
Brush
Wiggins
Greeley
Longmont
Boulder
Denver
Colorado Springs
Pueblo
Trinidad
La Junta
Rocky Ford
Las Animas
Lamar
Holly
Granada
Walsh
Springfield
Limon
Hugo
Kit Carson
Cheyenne Wells
Burlington
Flagler
Seibert
Stratton
Arriba
Wray
Yuma
Akron
Brush
Fort Collins
Loveland

The usual unit costs appear for 1910 as follows:

	1910.	1909.
*Maintenance of way and structures per track mile	$1,792	$1,615
†Repairs of locomotives	2,363	1,963
†Repairs of passenger train cars	710	664
†Repairs of freight train cars	82	92

*According to the *Railway Age Gazette* formula, track mileage is obtained by adding together all first, second, third, etc., main and branch line tracks and one-half the mileage of switch tracks and sidings.
†Repairs only, and does not include renewals, overhead charges or depreciation.

Progress on the new Grand Central station at New York City is, of course, still one of the most interesting features of a New York Central annual report. During the entire year 1910 the work of rebuilding a great terminal station was carried on under traffic, and during the entire year operating costs were higher by just so much. There was spent and charged to capital account for the terminal improvements $4,300,000. As was mentioned in our comments on last year's report, the company is building over the tracks a series of large commercial office buildings. One of these buildings is now complete and will be the source of income from now on. This experiment of making the space above tracks leading out of a terminal earn revenue is unique in this country, although it has been successful in Europe. The New York Central & Hudson River will itself own the building and act as renting agent. The New York, New Haven & Hartford, however, also has an interest in the property.

There is one incident in connection with the New York, New Haven & Hartford which took place since the close of the calendar year, and, therefore, is not mentioned in the annual report, but is nevertheless of considerable interest. The New York Central & Hudson River has owned for a number of years a majority of the outstanding preferred stock of the Rutland Railroad. This investment has never been a profitable one. The preferred stock calls for cumulative dividends, and these dividends now amount to a very large percentage due. The company has been unable to mortgage the property in any way or sell any additional capital securities until these cumulative dividends have been paid. It was impossible, therefore, to improve the property through expenditures charged to capital account, and all improvement work has had to be paid for out of net earnings. The Rutland has an entrance into Montreal over the Canadian Pacific, and the New York, New Haven & Hartford, in its contest with the Grand Trunk, greatly desired to get an entrance of its own into Montreal, it having always depended on the Grand Trunk. The New Haven, therefore, offered to buy a half interest in the New York Central's majority stock of the Rutland, and this half interest the New York Central was willing to sell, at presumably a fair figure. The New York Central, therefore, has gotten rid of a part of a rather unprofitable stock holding, and has probably made the remainder of that holding more valuable. The Rutland is now in excellent physical condition, and it seems probable that with the new arrangement with the New Haven it will get a considerably increased traffic, giving it the prospect of resuming dividends on its preferred stock. It should be mentioned that the common stock was convertible into preferred, and there is now almost no common stock outstanding.

One large expenditure of the New York Central that ought to be appreciated by the traveling public, is that of nearly two millions on signaling. The company spent $428,000 for interlocking and automatic signal apparatus under the head of improvements to property, and also spent under the head of maintenance of way $1,527,000 on signals and interlocking plants. This is $500,000 more for maintenance of signals than was spent in 1909.

The balance sheet as of December 31, 1910, shows the company rather in need of additional working capital. Total working assets amounted to $83,200,000, with working liabilities of but $23,100,000, but of the working assets but $6,800,000 was cash, which is rather a small amount of cash for a road doing a business of $100,000,000 a year. During 1910 $44,997,300 stock was issued, and $5,000,000 of the debentures of 1904 were sold. Last year the New York Central paid dividends of 6 per cent., and, while these dividends were not earned from operation, they were provided for by an extra dividend on the Lake Shore & Michigan Southern stock, and after the payment of 6 per cent. the New York Central & Hudson River had a surplus of $900,000 comparing with a surplus of $4,800,000 in 1909. It must be borne in mind, however, that dividends in 1910 called for 6 per cent. on $222,729,300 stock, while in 1909 dividends called for but 5 per cent. on $178,632,000 stock. Since the close of the calendar year the directors of the company have decided to put the stock back on a 5 per cent. basis.

In the New York Central situation there are certain very hopeful features. For one thing, the Lake Shore & Michigan Southern is apparently quite capable of continuing to pay an extra dividend of 6 per cent. besides its regular 6 per cent. dividends. In regard to the New York Central & Hudson River itself, the fact that gross earnings are increasing so fast and that the road in 1910 handled almost as great a ton mileage as in 1907 should, as was pointed out at the beginning of these remarks, tend, in the long run considerably to increase net. The New York Central is in a quite different situation as regards handling increased business from that of the Pennsylvania Railroad. It is estimated by those who are in closest touch with the operation of the Central that in conection with its two tracks on the west shore of the Hudson river, it could handle 35 per cent. greater ton mileage than it is now handling without materially increasing any of its facilities except to add more cars and engines.

The following table shows the results of operation in 1910, as compared with 1909:

	1910.	1909.
Average mileage operated	3,785	3,782
Freight revenue	$58,411,234	$54,449,281
Passenger revenue	30,992,856	29,001,911
Total operating revenue	99,908,498	93,171,861
Maintenance of way and structures	14,060,178	11,494,023
Maintenance of equipment	16,936,253	15,421,648
Traffic	2,487,228	2,273,828
Transportation	37,938,527	33,309,315
Total operating expenses	74,079,087	64,593,826
Taxes	4,697,826	4,434,504
Operating income	21,012,787	24,349,498
Gross corporate income	36,459,120	35,742,357
Net corporate income	14,288,672	13,695,420
Dividends	13,363,758	8,931,600
Surplus	924,914	4,763,820

This surplus was appropriated for additions and betterments in 1910.

LAKE SHORE & MICHIGAN SOUTHERN.

MANY of the conditions which affected the operations and earnings of the New York Central & Hudson River, commented on elsewhere, also tended to increase the expenses of the Lake Shore & Michigan Southern out of proportion to the increased business handled, but the report for the calendar year ended December 31, 1910, shows two conditions that affect the Lake Shore individually. From a financial standpoint, the Lake Shore at the end of 1910 was in need of cash, which need has been supplied, since January 1, at least in part, by the sale of $15,000,000 bonds. From an operating point of view, the Lake Shore apparently did not get as much out of its motive power in 1910 as it did in 1909.

The Lake Shore & Michigan Southern, operating 1,663 miles of road, earned in 1910 $49,400,000, which is more by $4,300,000 than the gross in 1909. Expenses, however, totaled $34,900,000 last year, which is an increase of $6,900,000 over the year before, and makes the operating ratio 70.66 per cent. in 1910 as compared with 62.12 per cent. in 1909. After the payment of 18 per cent. dividends in 1910, which called for $8,900,000, the company had a surplus of $4,900,000. In 1909 12 per cent. dividends were paid, calling for $5,900,000, and leaving the company a surplus of $6,980,000.

The comment made above, that the Lake Shore was not getting as much out of its power last year as it did the year before is borne out by the fact that while the company handled 6,243,000 revenue ton miles in 1910, which is an increase of slightly less than 9 per cent. over the ton mileage of 1909, the locomotive mileage for freight service totaled 11,890,000, which

is an increase over 1909 of slightly over 14 per cent., and revenue freight train miles amounted to 10,500,000, or about 14 per cent. more than in 1909. The average train load was 593.6 tons, a decrease of 30.6 tons from the average for 1909. Even with this decrease, however, the Lake Shore's train load is an impressive figure. Car loading was better in 1910 than in 1909, but there were on an average fewer loaded cars per train and also fewer empty cars per train, which would seem to indicate quite clearly that the locomotives were hauling less on an average last year than the year before. The Lake Shore's freight density, was 3,803,178 in 1910. The average receipts per ton per mile last year were 5.23 mills and 5.18 mills the year before. The receipts per passenger per mile averaged 1.866 cents in 1910 and 1.818 cents in 1909.

A large proportion of the Lake Shore's tonnage is low grade commodities. Out of the total of 37,000,000 tons hauled in 1910, 9,700,000 tons was bituminous coal, which is an increase over the tonnage of this commodity in 1909 of 1,700,000 tons; and 6,400,000 tons was ore, which is an increase in the tonnage of this commodity over 1909 of 940,000 tons.

Attention has been called over and over again to the large sums the company has put back into its property from net earnings, and how high its standards of maintenance are, but it is only fair in any discussion of the operation of the property to repeat this comment. Last year $4,600,000 was spent for improvements and additions to roadway and bridges, and charged to capital account, and $1,700,000 was spent for stations and other structures, the principal item being $1,080,000 spent on the Ashtabula harbor and dock improvements. In addition, the company charged to income $1,400,000 for payments on the 1907 and 1910 trust equipment notes of the New York Central Lines.

Maintenance of way and structures cost $7,500,000, an increase over 1909 of $2,100,000. Maintenance of equipment cost $7,900,000, an increase of $1,100,000, and transportation expenses amounted to $17,400,000, an increase of $3,500,000. President Brown says: "In mantenance of way and structures there were included large expenditures for ballasting 315 miles of main line track with stone, changing traffic from left-hand to right-hand running, and general repairs and renewals of bridge structures, buildings and fixtures. There was also a large increase of maintenance of roadway and track expenses due to additional main track built and resulting greater mileage of main tracks to maintain. Maintenance of way employees were granted an increase in wages in the early part of the year, which added $297,761 to maintenance expenses."

The following table shows the unit costs of maintenance as worked out on the usual method used in these comments:

	1910.	1909.
*Maintenance of way and structures per mile of track	$2,276	$1,771
†Repairs per locomotive	2,429	1,895
†Repairs per passenger car	982	765
†Repairs per freight car	63	78

*According to the *Railway Age Gazette* formula, track mileage is obtained by adding together all first, second, third, etc., main and branch line tracks and one-half the mileage of switch tracks and sidings.
†Repairs only, and does not include renewals, overhead charges or depreciation.

The need for additional cash, previously mentioned, is very strikingly shown by an examination of the balance sheet as of December 31, 1910. While working assets are shown at the very impressive figure of $123,400,000, cash amounts to but $4,290,000, and the principal item under working assets is $97,600,000 marketable securities. The marketable securities of the Lake Shore are a very valuable asset, but it is hardly conceivable that the company would choose to raise money by the sale of these securities. In 1910 working liabilities amounted to $17,000,000, which included $10,200,000 loans and bills payable. In 1909 cash on hand amounted to $13,998,000, and working liabilities $8,300,000, of which $1,700,000 was loans and bills payable. During 1910 the company borrowed $8,500,000 on its notes payable March 15, 1911, and presumably the sale of $15,000,000 bonds since January 1, provided for the payment of these notes.

During the year the company bought a half interest in the Kanawha & Michigan, and all of the Toledo & Ohio Central outstanding stock, and sold its one-sixth interest in the Hocking Valley stock to the Chesapeake & Ohio. This gives the Lake Shore a line of its own from Toledo south to a connection with the Kanawha & Michigan, and a joint line from that point south to the Ohio river and to a connection with the Chesapeake & Ohio. Across the river from the terminus of the Kanawha & Michigan is the northern terminus of the Virginian, and there is a clause in the agreement between the Lake Shore & Michigan Southern and the Chesapeake & Ohio which provides that if either company desires it and the Virginian and the Kanawha & Michigan each pay one-half of the cost, a bridge may be built across the Ohio river to connect the Rogers road with the K. & M. During the year there have been various rumors of the Vanderbilt lines desiring to acquire roads south of the Ohio river, but so far as is generally known, nothing has actually been done with this in view.

The traffic agreement between the Pittsburgh & Lake Erie, a Lake Shore subsidiary, and the Western Maryland was commented on in our discussion of last year's Lake Shore report. During 1910 the 90-mile line connecting the Western Maryland and the Pittsburgh & Lake Erie has been built, and was described in the *Railway Age Gazette* of February 10 and 17.

The following table shows the results of operation in 1910 as compared with 1909:

	1910.	1909.
Average mileage operated	1,663	1,663
Freight revenue	$32,646,536	$29,735,277
Passenger revenue	11,130,125	10,154,220
Total operating revenue	49,420,211	45,110,997
Maintenance of way and structures	7,549,661	5,468,363
Maintenance of equipment	7,873,217	6,811,551
Traffic	1,153,165	1,101,596
Transportation	17,442,858	13,914,957
Total operating expenses	34,920,933	28,023,661
Taxes	1,720,182	1,458,905
Operating income	12,729,380	15,549,524
Gross corporate income	23,181,467	21,763,790
Net corporate income	13,787,035	12,917,548
Dividends	8,903,970	5,935,980
*Equipment	1,365,297	1,263,186
Surplus	3,517,768	5,718,382

*In 1909 this was for additional equipment, and in 1910 was for the installments due on 1907 and 1910 equipment trust certificates.

MICHIGAN CENTRAL.

In commenting elsewhere on the showing of the New York Central & Hudson River in 1910, mention is made of the increase in expenses being due to both the increase in the wage rate and the increase due to a larger number of names on the pay-roll. This is well illustrated by the report of the Michigan Central, which separates the increases in labor cost as between these two causes. For instance, under maintenance of way and structures, increased expenditures for labor amounted to $378,000, of which $213,000 was due to the increased *rates* of pay. Under maintenance of equipment the increased account of labor amounted to $171,000, of which $74,000 was due to increased rates of pay, and under transportation expenses, the increased account of labor amounted to $1,347,000, of which $459,000 was due to increased rates of pay.

In 1910 total operating revenues on the Michigan Central, from the operation of 1,803 miles, amounted to $29,700,000, an increase over 1909 of $2,300,000, and operating expenses of the year amounted to $21,600,000, an increase of $3,100,000. The operating ratio was 42.84 per cent. in 1910 and 67.48 per cent. in 1909. The Michigan Central, unlike the New York Central and the Lake Shore, does not own large amounts of stock in other companies, nor does it own a controlling interest in large subsidiaries. It was unable, therefore, to make up the loss in net through increased dividends received from subsidiaries or from other sources of income, so that after the payment of

its 6 per cent. dividends, which called for $1,124,280, its surplus in 1910 was $593,000, as against $2,300,000 in 1909.

The Detroit river tunnel was opened last year, and has been in operation for regular freight and passenger service since October 16, 1910. The total cost of this tunnel, including interest on money advanced for construction, was $8,900,000, this after the payment of an estimated $200,000 for additional work still to be completed. The acquisition of terminal freight and passenger yards, and station buildings by the tunnel company will require a considerable sum in addition to the amount above mentioned.

The Michigan Central's share of the equipment acquired under the New York Central Lines' equipment trust of 1910 was 67 locomotives, 13 passenger train cars and 3,298 freight train cars. The cost of maintenance of equipment in 1910 was $4,124,000, which was $368,000 more than maintenance of equipment cost in 1909. The following table shows the unit costs of maintenance:

	1910.	1909.
*Maintenance of way and structures per mile of track	$1,377	$1,179
†Repairs per locomotive	2,523	2,162
†Repairs per passenger car	573	549
†Repairs per freight car	105	100

*According to the *Railway Age Gazette* formula, track mileage is obtained by adding together all first, second, third, etc., main and branch line tracks and one-half of the mileage of switch tracks and sidings.
†Repairs only, and does not include renewals, overhead charges or depreciation.

Maintenance of way and structures cost $4,035,000, or $577,000 more than in 1909. Last year the company laid 12,246 tons of 100-lb. rail as against 20,975 tons in 1909; and placed in track 1,072,719 ties, mostly oak and chestnut. In 1909 there were placed in track 910,814 ties. The cost to Michigan Central of its ties is naturally comparatively light, but it is worth noting that the average price at distributing points last year was 69 cents, as against 61 cents the year before. It may be recalled that the Interstate Commerce Commission in its opinion in the Western Rate case brushed aside rather lightly the argument of the roads that the price of materials was continually increasing, but increases like the one just mentioned, while small in themselves, can foot up to an enormous sum when taken in the aggregate.

The Michigan Central has a light traffic density as compared with the three other New York Central lines whose reports we have reviewed. Last year the ton mileage was 3,261,000,000 tons one mile, an increase of 219,600,000 tons, or about 5 per cent., and the freight density last year was 1,700,000 tons one mile per mile of road. The average train load was 419 tons, as compared with 406 tons in 1909. The average receipts per ton per mile were 6.29 mills last year and 6.26 mills the year before. The better train loading is probably due to a greater proportion of low grade heavy commodities and also to a smaller empty freight car mileage. The mileage of locomotives in freight service was 8,400,000 in 1910, an increase of but about 2.4 per cent.

Passenger revenue on the Michigan Central furnishes a greater proportion of total than on the average road in the West. In 1910 passenger revenue amounted to $7,400,000, an increase of $749,000 over 1909, and express revenue amounted to $1,500,000, an increase of $275,000. The increase in passenger revenue, the report says, was due to a large excursion travel, and general improvement in both local and interline business. The total number of passenger carried one mile last year was 373,000,000, which is about 9.4 per cent. more than in 1909, the average receipts per passenger per mile being 1.983 cents in 1910 and 1.95 cents in 1909. Passenger locomotive miles totaled 6,600,000, or about 9.1 per cent. more than in 1909.

There was considerable curiosity at the time, some few months ago, when the Michigan Central placed a loan of $10,000,000 in France, as to what interest the company had to pay for its money. The only mention of this loan in the annual report is in the profit and loss account, which shows a debit of $240,355, "for discount, commission and expenses in connection with the New York Central Lines' equipment trust certificates of 1910, Michigan Central-Grand River Valley bonds and Michigan Central one-year francs notes."

The balance sheet shows loans and bills payable of $18,100,000 on December 31, 1910. This compares with the loans and bills payable of $4,450,000 at the end of 1909. Total working assets amounted to $10,173,000 at the end of 1910, with total working liabilities of $23,400,000, which included the bills payable mentioned above. Working assets at the end of 1909 amounted to $10,960,000, and working liabilities to $9,400,000.

During the year the company sold $1,500,000 Michigan Central Grand River Valley bonds, and assumed its share of the liability for the New York Central Lines' $30,000,000 equipment trust certificates, which in the case of the M. C. amounted to $8,500,000. The company retired at maturity on February 1, 1910, $10,000,000 3-year 5 per cent. notes.

The following table shows the operations of the company in 1910 compared with 1909:

	1910.	1909.
Average mileage operated	1,803	1,746
Freight revenue	$19,282,288	$18,267,530
Passenger revenue	7,404,476	6,655,699
Total operating revenue	29,694,816	27,415,467
Maintenance of way and structures	4,035,261	3,458,165
Maintenance of equipment	4,124,366	3,756,582
Traffic	882,151	777,668
Transportation	12,023,589	10,050,690
Total operating expenses	21,628,906	18,499,528
Taxes	1,357,020	1,121,532
Operating income	6,652,574	7,743,255
Gross corporate income	7,746,254	8,684,736
Net corporate income	1,717,331	3,421,422
Dividends	1,124,280	1,124,280
*Equipment	250,000	548,925
Surplus	343,051	1,748,217

*This was for additional equipment in 1909 and on account of 1910 proportion of New York Central Lines 1907 and 1910 equipment trust certificates in 1910.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.

THE lines of the Cleveland, Cincinnati, Chicago & St. Louis run through as highly competitive territory as any in the United States. They connect such cities as Cleveland, Cincinnati, Toledo, Indianapolis, St. Louis and Chicago, and the rates that this company and its competitors in this territory can charge have in the past been forced down to the lowest possible minimum through the keenness of the competition. In this territory the management of the railway and the character of the service is so largely dictated by competitive conditions that the management of any one individual road has little or no choice as to what shall be done. As President Brown points out in his letter accompanying the annual report of the C. C. C. & St. L., for the year ended December 31, 1910, the Interstate Commerce Commission in refusing to grant increase in rates, did not take into consideration such roads as the Big Four, and it is just such roads which more than any others clearly illustrate one point that the railway attorneys and witnesses strongly insisted on. This was that freight rates are now too low and have been too low in the past.

In 1910, operating 1,982 miles of road, the Big Four earned $30,400,000, but was able to save for net only $6,900,000, the operating ratio being 77.23 per cent., as against an operating ratio of 71.27 per cent. in 1909. Operating income, after the payment of taxes and the deficit from outside operations, amounted to $5,880,000 in 1910, and to $7,000,000 in 1909. After the payment of rentals, interest charges and 5 per cent. dividends on preferred stock, and 2 per cent. on common stock, the Big Four had a surplus of $34,371 in 1910, as against $1,335,000 in 1909.

The average revenue per ton per mile of the C. C. C. & St. L. is 5.46 mills, which is very slightly greater than the average in 1909. Since freight rates cannot be raised, the only way of

reducing operating costs is either to reduce maintenance and up-keep charges, or to make such changes in the method of handling freight and passengers as will effect economies. As has been pointed out, this is particularly difficult to do in the territory served by the C. C. C. & St. L., but at the present time there is an attempt being made by the roads operating in part of this territory to handle their freight in larger train loads and to move it slower. Naturally, this sort of a reform must be carried out by all the roads competing, and it is very likely to be strongly opposed by shippers.

It would seem that in a case like this one a function of the Interstate Commerce Commission, which that commission has heretofore never taken very seriously so far as we know, might well be exercised to great advantage. That is, to protect the roads against the shippers. We are not forgetting what the Interstate Commerce Commission claims it has done through the abolition of rebates, but there is some doubt as to how much credit the commission should have for this and how much credit rightfully belongs to certain strong railway presidents. In any case, here in the territory served by the C. C. C. & St. L., the commission might find a good opportunity to try its hand at something new in the way of regulation.

Maintenance charges on the C. C. C. & St. L., as a whole increased by $1,299,826 in 1910, while transportation expenses increased by $2,300,000. Transportation expenses totaled $12,700,000 in 1910, and consumed 41.82 per cent. of operating revenue. One reason why these expenses were so high in 1910 was that fuel cost 11 cents per ton less in 1909 than in 1910, and the handling and storing of coal was considerably more expensive during the coal miners' strike.

The following table shows the unit of maintenance prepared in accordance with the formula generally used in these comments:

	1910.	1909.
*Maintenance of way and structures per track mile	$1,427	$1,158
†Repairs per locomotive	3,615	2,787
†Repairs per passenger car	820	708
†Repairs per freight car	94	84

*Per mile of first, second and third track, two miles of switch tracks and sidings being taken as equal to one mile of main or branch line tracks.
†For repairs only; does not include renewals, depreciation or overhead charges.

Of the increase in maintenance of way expenditures, most of the additional money spent was for rails, ties and other track material. Twenty-one thousand tons of 90-lb. rail were laid in 1910, as against 5,000 tons of rail laid in 1909. There were 978,520 ties put in track in 1910, of which about two-thirds were treated and one-third were oak. In 1909 there were 887,323 ties put in track, about the same number of treated ties being used as in 1910, but fewer oak ties being used. The average price at distributing points was 76.80 cents in 1910 and 73.00 cents in 1909.

During the year the company sold $1,000,000 general mortgage bonds and 50,000,000 francs ($9,650,000) 20-year 4 per cent. debenture bonds of 1910-1930. The balance sheet at the end of 1910 shows total working assets of $9,046,000, of which $2,866,000 was cash; and working liabilities of $5,756,000, with no loans or bills payable. In 1909 there was on hand $2,630,000 cash and working liabilities of $7,273,000, which included $3,000,000 loans and bills payable.

The following table shows the results of operation in 1910 as compared with 1909:

	1910.	1909.
Average mileage operated	1,982	1,982
Freight revenue	$19,922,901	$17,975,363
Passenger revenue	7,812,012	7,169,670
Total operating revenue	30,423,005	27,657,741
Maintenance of way and structures	3,934,281	3,159,609
Maintenance of equipment	5,177,765	4,652,610
Traffic	998,697	914,505
Transportation	12,724,100	10,434,269
Total operating expenses	23,495,620	19,711,495
Taxes	949,548	878,328
Operating income	5,879,655	7,011,380
Gross corporate income	6,700,469	7,634,613
Net corporate income	1,475,497	2,776,372
Dividends	1,441,126	1,441,126
Surplus	34,371	1,335,246

NEW BOOKS.

Scientific Management. By Louis D. Brandeis. Published by the Engineering Magazine, New York. 92 pages, 6½ in. x 9¼ in. Cloth. Price, $2.

This volume reproduces that portion of Mr. Brandeis' brief which relates to scientific management and which was submitted to the Interstate Commerce Commission in the recent rate hearing at Washington. It is a digest of the testimony given by Harrington Emerson, H. L. Gantt, Frank B. Gilbreth, H. L. Hathaway, James M. Dodge, Henry R. Towne, H. V. Scheel, Charles B. Going and others, and relates largely to the profitable results from the use of efficiency methods, which are claimed to have been accomplished by manufacturing concerns, and which the above mentioned gentlemen believe can accomplish equally gratifying results if applied to the operation of railways.

Railroad Field Geometry. By Wm. G. Raymond, professor of civil engineering and dean of college of applied science, State University of Iowa. New York: John Wiley & Sons. Morocco, 255 pages and 136 figures, 4 in. x 6½ in. Price, $2.

This book is intended primarily for class room use, and embodies the results of Professor Raymond's 25 years' experience as an instructor. The author goes into the discussion of the various problems more fully than is customary in some works, to fix in the student's mind the connection between the theory and its application to practical problems. Problems most commonly met with in the field are discussed, and are illustrated in several cases by photographs to bring out the points the author is endeavoring to develop. The chapters covering the re-running of old lines and right of-way descriptions are new for books of this kind, filling an existing want of the student. More than usual space is given to the subject of earth work computations, mass diagrams and over-haul. None of the customary field tables are included.

The Earning Power of Railroads, 1911 edition. Edited by Floyd W. Mundy, of James H. Oliphant & Co., New York. Published by Moody's Magazine book department, 35 Nassau street. Cloth. Price $2.50.

The Earning Power of Railroads for 1911 covers 150 of the principal railway systems of the United States, Canada and Mexico. The mileage, capitalization, earnings over a period of years, operating expenses, maintenance costs, operating ratio, etc., are given, and earnings and expenses, etc., are also worked out on a mileage basis. In addition to the statistical tables the book includes 292 pages of classified notes giving information as to dividend and bond issues. The ten preliminary chapters explain the fundamental principles to be applied by investors in the study of the tables. The 1911 edition is considerably larger than the previous editions and gives figures for a number of roads not heretofore covered. The greatest usefulness of the book lies in the handiness with which the figures may be gotten at.

Electric Railway Transportation. The American Academy of Political and Social Science, Philadelphia, 1911. 200 pages; 7 in. x 10 in. Price, $1.00.

The January, 1911, number of the *Annals of the American Academy of Political and Social Science* is devoted almost entirely to Electric Railway Transportation. Part I considers traffic and financial problems, and Part II, the public regulation of electric railways. The various articles were written by experts in their respective fields, and include The Urban Transportation Problem, by Bion J. Arnold; The Decreasing Financial Returns Upon Urban Street Railway Properties, by Thomas Conway, Jr.; The Depreciation Problem, by Wm. B. Jackson; Methods of Increasing the Efficiency of Surface Lines in Large Cities, by Williston Fish; The Investigation of Traffic Possibilities of Proposed Subway Lines, by Wm. S. Twining; Possibilities of Freight Traffic on Interurban Lines, by Frank S. Cummins; Express Business on Interurban Lines, by A. Eastman; Economy Factors in the Selection of Cars for Urban Service, by Samuel M. Curwen; The Relations of the Electric Railway Company to Its Employees, by C. D. Emmons; The Strike Problem on Electric Railways, by Daniel T. Pierce;

Educating the Public to a Proper Appreciation of Urban Street Railway Problems, by A. W. Warnock; The Presentation of Interurban Problems to the Public, by A. D. M. Van Zandt. Under Part II public relations are treated as follows: Valuation of Intangible Street Railway Property, by Frank R. Ford; The Indeterminate Permit as a Satisfactory Franchise, by William Osgood Morgan; State Supervision of Electric Railways in Wisconsin, by B. H. Meyer; The Fruits of Public Regulation in New York, by Milo R. Maltbie; Supervising Engineers and Street Railway Service, by George Weston. While this volume is in paper cover and is part of the proceedings of an association, it will probably be so highly valued by those interested in either the financial or operating departments of electric street railways that they will find it worthy of a cloth binding and a place in their libraries.

Letters to the Editor.

EFFECT OF UNDULATING GRADES ON TRAIN VELOCITY.

New York, March 15, 1911.

To the Editor of the Railway Age Gazette:

The article On the Effect of Undulating Grades, by F. S. Foote, Jr., in your issue of March 10, is most interesting, but the inference which may be drawn from his opening statement, that writers on railway location and engineers generally accept unreservedly Mr. Wellington's theory on this matter, is hardly warranted. It was long ago recognized that Wellington's theory should only be applied with great caution; in fact the writer went so far as to advocate (Railroad Location, Surveys and Estimates, page 124) that not over 50 per cent. of the values given in Wellington's table of velocity heads should be used in calculating the operating cost of undulating grades, unless extremely good reasons could be shown for using higher values.

Mr. Foote adopts the results of Prof. Schmidt's experiments, which seem to show that resistance increases with the velocity. The American Railway Engineering & Maintenance of Way Association, together with many prominent engineers, seem inclined to favor the theory that resistance does *not* increase with the velocity at ordinary freight train speeds. It seems to the writer that the variations in operating conditions are so great, and there are so many factors which cannot be expressed in figures and which will vary with different roads and different conditions, that the slight theoretical difference shown by Mr. Foote should only be considered as a mathematical demonstration of one of these factors under certain conditions, and that to be on the safe side, it is advisable to have a great deal more leeway than is shown by Mr. Foote as necessary. FRED LAVIS.

TELEPHONES FOR TRAIN DESPATCHING.

Fort Scott, Kan., February 15, 1911.

To the Editor of the Railway Age Gazette:

Referring to an article in the *Railway Age Gazette* of January 13, under the caption, "A Despatcher Who Does Not Like the Telephone," I would like to offer my experience for the benefit of your readers who may have been prejudiced against the use of the telephone for train despatching by the article mentioned. I have been despatching trains for 22 years by telegraph and have been on many of the heavy tricks throughout the west. I looked upon the advent of the telephone into the train despatching field with many misgivings, but can now say enthusiastically, "Give me the 'phone." I have given the telephone a thorough try-out covering a period of 10 months, and my views seem to be in direct contradiction to the experience of the writer of that article. I will answer each of his objections in the order in which they appear.

I find that operators answer the 'phone bell much more promptly than they did the telegraph, for the logical reason that they can hear it at a much greater distance. They can hear it on the freight platform, or in the freight house, which is not true of the telegraph, and there are few operators who will deliberately refuse to answer with reasonable promptness when they hear the despatcher calling. Another factor in getting an operator to answer the 'phone is the fact that helpers, who may not be telegraphers, can hear the 'phone ring, and call the operator from distant places. This company has a circuit for the "train despatcher only," and when an operator hears the bell on this circuit ring (the message circuit bell having a different tone) he knows that the despatcher wants him, either for orders or messages pertinent to the movement of trains.

I find no difficulty whatever in "breaking" operators on the 'phone whenever necessary, and have not yet found it necessary to have an operator repeat "an entire order" on account of being unable to "break him." I have found it quite handy to be able to take "O S" and get other information from operators while the selector is working and find no trouble in holding the man called while I finish any other business that may have "come in on the line" while the selector was working, or in telling the operator who "came in" to "wait a minute" if that suits me better.

I am interrupted frequently throughout the day, and have had no trouble in holding either, or both operators, as the case demanded. I simply tell them to "wait a minute," adding what for, which takes but a few seconds, not nearly as long as it takes to "stand an operator off" on the telegraph.

Questions on my circuit are no more numerous now than they were on the telegraph, and I can certainly answer them more quickly, and more satisfactorily, and I can answer them while leaning back in my chair without moving.

I am always glad to give operators information regarding trains, and as they are required to keep their bulletin boards posted, I do not think any despatcher should consider such questions "troublesome."

It is true that "all telephone circuits are installed with a set of rules," ours being no exception. We enforce those rules, therefore the despatchers are not "troubled with roundhouse foremen, roadmasters, etc.," using their circuits for promiscuous service. This matter is entirely within the regulation of the despatcher himself, for no person but the despatcher can "call" or "ring" on his circuit, as he has the only "selector" on the circuit.

On an average, messages can be handled as rapidly on the 'phone as on the telegraph, and I have it from the manager of the telegraph office that they are handling as many messages on the "local 'phone circuit" as were handled on the local telegraph circuit, and in addition leaving plenty of time for long distance conversations between the division officers and general offices, thereby eliminating a vast amount of telegraphing that would otherwise go over the through telegraph lines.

With the installation of the 'phone, the despatcher's troubles with sleepy operators have become a thing of the past, and our records will show that not one operator has been reprimanded or dismissed for "sleeping on duty" since the 'phones were installed on this division. I would like to see the color of the operator's hair who would cut out the 'phone bell, admitting that he knew how, in order to sleep undisturbed.

My "halter" is long enough to allow me to reach the water cooler, the window or either of the other two despatchers without "cutting out," but should I desire to go further, it takes but a second to slip the plug from the "jack box" and go where I will, for while I am "cut out" if an operator wants me, he simply turns a crank on his generator a couple of turns, and rings my bell.

I have also found that the 'phone not only reduces the physical strain at least one half, but largely increases my capacity without adding to that strain. W. C. BARANGER,

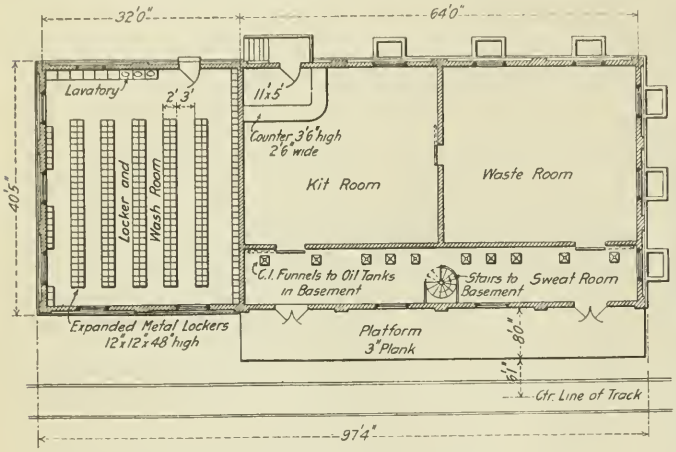
Despatcher, St. Louis & San Francisco.

STRUCTURES AT NORTHUMBERLAND YARD; PENNSYLVANIA RAILROAD.*

BY WILLIAM FORSYTH,
Associate Editor, *Railway Age Gazette.*

LOCOMOTIVE TERMINAL.

Near the center of the yard and directly south of the eastbound classification tracks is the large locomotive terminal with its ample storage yards, engine house, machine shop, power plant and other auxiliary structures. The storage yard is graded for 15 tracks, each 1,000 ft. long; 5 tracks will be laid for coal storage and 7 for locomotives. The two inspection pits are located 1,400 ft. from the engine house portal and the four ash pits 800 ft. from the same point. Both the inspection and the ash pits are similar to those previously constructed by the Pennsylvania Railroad, and already described in detail in articles on



Arrangement of the Oil House.

the East Altoona locomotive terminal in the *Railway Age* of January 19, 1906, page 86, and *The Railroad Gazette,* March 16, 1906, page 259. The inspection pits are 75 ft. long and 3 ft. 6 in. deep from the top of the rail; they are connected at the center by an underground passage 3 ft. wide. The ash pits, 230 ft. long, have concrete walls, with box ribbed cast iron caps for the rail supports. They are 4 ft. deep and have track rails at the bottom for small dump ash cars, which are hoisted by 10-in. air cylinders suspended from steel bridges. There are two of these bridges crossing each pair of pits.

The oil house is a substantial brick building with concrete floors and an asbestos shingle roof. It is 40 ft. x 97 ft., with a basement 11 ft. 5 in. high for the large cylindrical oil storage tanks. The main floor is divided into four compartments, as shown on the drawing; a space 30 ft. x 40 ft. for a locker room; a kit room, 31 ft. x 32 ft., for hand tools and oil cans; a waste room, also 31 ft. x 32 ft., and an oil room, 8½ ft. x 63 ft., where the measuring faucets and funnels are located. The oil is raised from the basement by air pressure. The eight large tanks have a capacity of 4,100 gal.

The coal wharf was designed and built by the Roberts & Schaefer Company, Chicago. It is equipped with duplicate hoisting equipment, consisting of two pairs of 2½-ton Holmen buckets with their operating mechanism. There are two receiving hoppers each 24 ft. in length, the coal being fed from the receiving hoppers to the Holmen buckets by means of Barrett re-

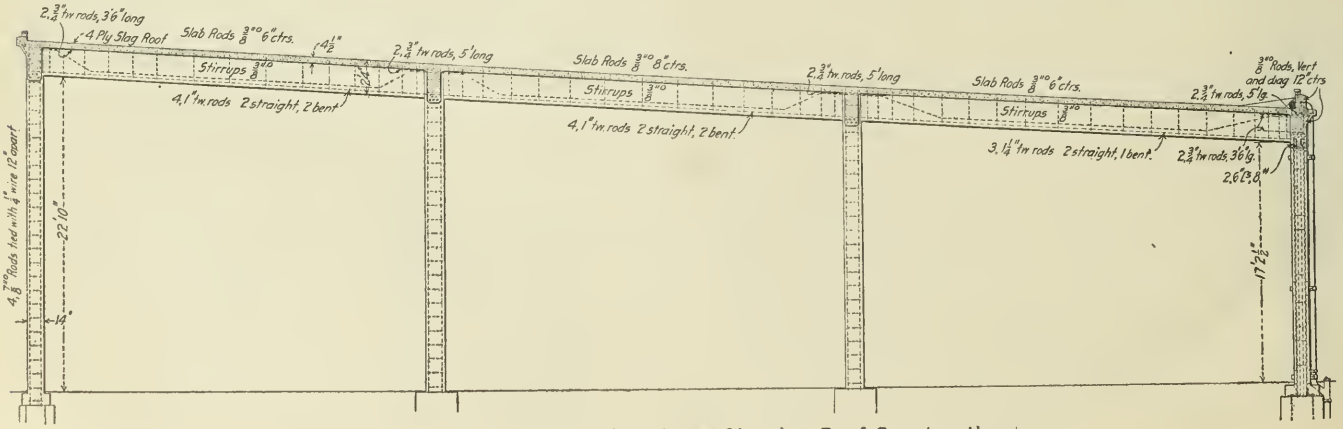


Coaling Station at Northumberland Yard.

volving feeders. The overhead storage pocket is divided into eight compartments for passenger coal, freight coal and wet sand. The bin has a total storage capacity for 1,000 tons of coal and 100 tons of wet sand. The hoisting equipment is so arranged and the bin is so divided that each pair of buckets handles and properly distributes freight coal and passenger coal, and in addition one pair of buckets handles the wet sand.

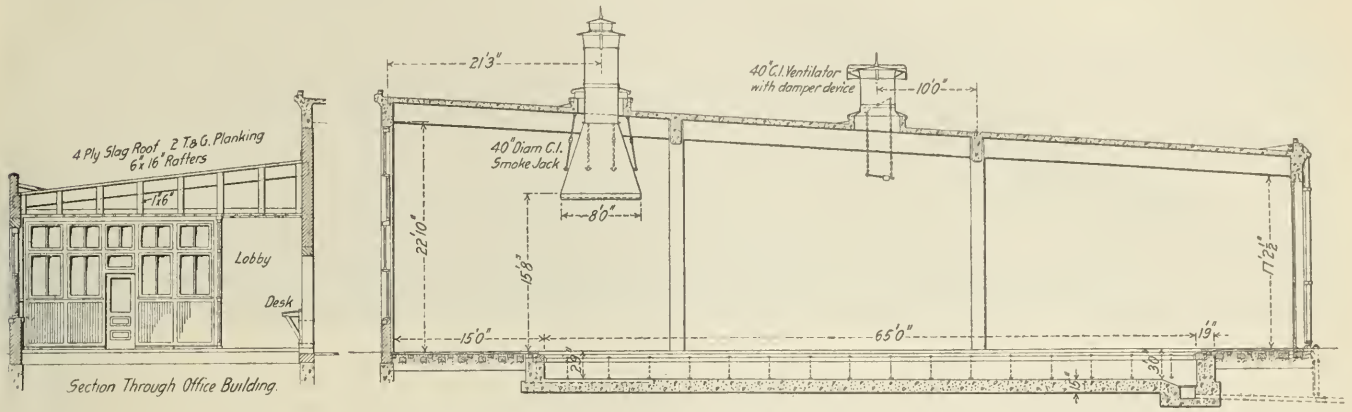
The overhead pocket delivers coal and sand to two tracks, one on either side of the pocket, and each side is provided with five

*A general description of this yard appeared in our issue of March 17.



Cross-Section Through Engine House Showing Roof Construction.

coaling aprons and one sand spout. Underneath the overhead wet sand pockets, which have concrete floors, are two sand dryers in fireproof compartments. The sand gravitates through the dryers over the screens, and into air drums, from which it is elevated to dry sand tanks overhead. From these tanks the dry sand is supplied to the locomotives as required. The hoisting equipment is operated by electric motors of a special type, provided with specially designed limit devices to prevent accidents to the machinery.

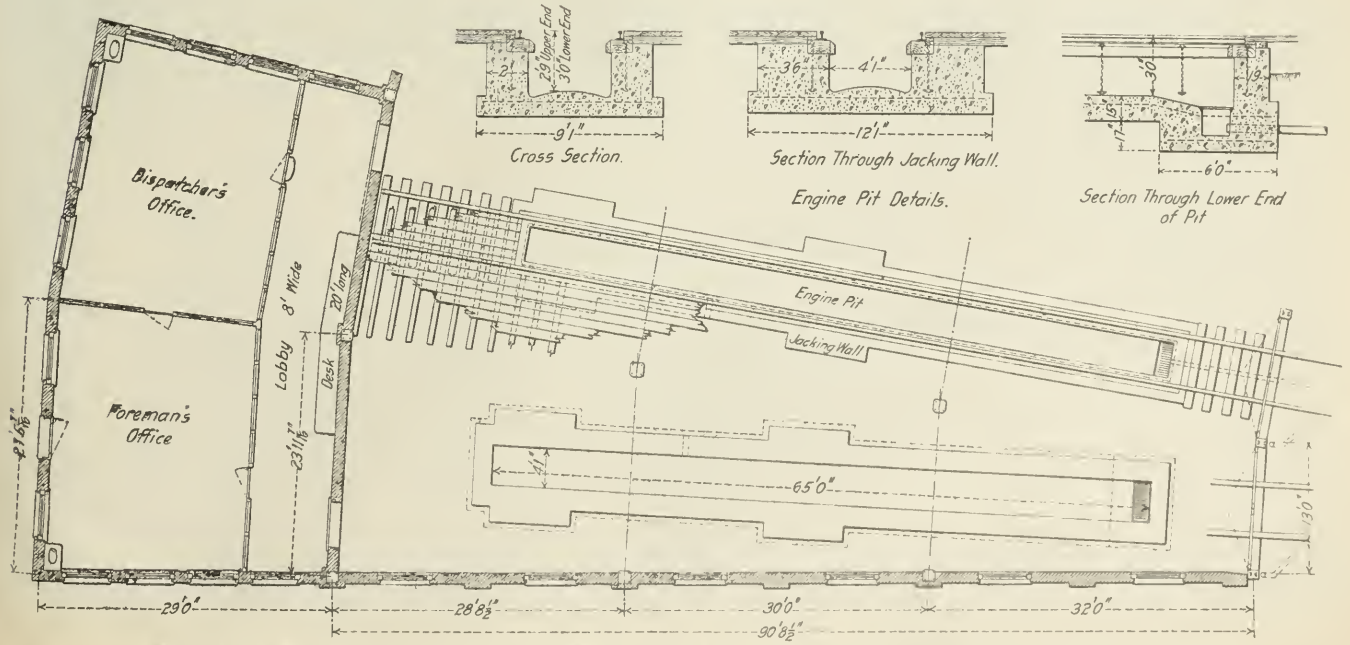


Engine House Construction Showing Arrangement of Smoke Jack and Ventilator.

ENGINE HOUSE.

The engine house has been designed for an ultimate capacity of 52 stalls; 36 stalls have been built. The turntable is 100 ft. in diameter; the distance from the center of the table to the inside wall is 107 ft. 7⅞ in., and the width of the house, center to center of walls is 90 ft. 8½ in. The contractors for the engine house, power house and machine shop were Brann, Stuart & Company, Philadelphia, Pa., and the cost of the engine house above the foundation piers was $84,000. The building is entirely fireproof and is constructed almost wholly of concrete. The spaces between the pilasters are filled in with brick, and the glazed sash are all steel. An unusual feature is the concrete roof, which is 4½ in. thick and is ribbed up box-shaped at the openings for the ventilators and smokejacks. The house is 22 ft. 10 in. high from the floor to the under side of roof beams at the outer circumference. There is a straight slope in the roof to the inner wall, where the height is 16 ft. 8 in. clear. The columns at the inner circle have a core of steel forming a built-up post, to which is attached the castings for the door hinges. These castings have holes at each edge of the column, so that although the doors are arranged to swing in they may be arranged to swing out in case more room is desired. This steel inner post is entirely covered with concrete, making a column 11 in. x 13 in. outside. The next intermediate column is 15 in. square, and the one next the outer wall is 16 in. square. These columns and the reinforced concrete roof beams, as well as the roof itself, are shown in detail on the drawings and are worthy of careful attention, as they represent the latest practice of the Pennsylvania Railroad in the construction of engine houses. The cast iron ventilators and jacks are also shown on one of the drawings. The jack is fixed and the lower portion of the hood is 8 ft. long and 40 in. wide; the diameter of the circular part above the roof is 40 in. In the central panel of the house there is a cast iron ventilator 40 in. in diameter over each pit with a damper operated by chains and a sliding weight on a bar. These jacks and ventilators were supplied by Paul Dickinson, Inc., Chicago.

The pits, which are shown in detail on the drawings, are entirely of concrete and are 3 ft. deep at the lower end. The pit rails rest on 8 in. x 12 in. white oak stringers, which are bolted to the wall and extend over the pit to protect the radiating pipes. The pit walls are widened at the outer end and at the center to provide additional support for jacking up the locomotives. One



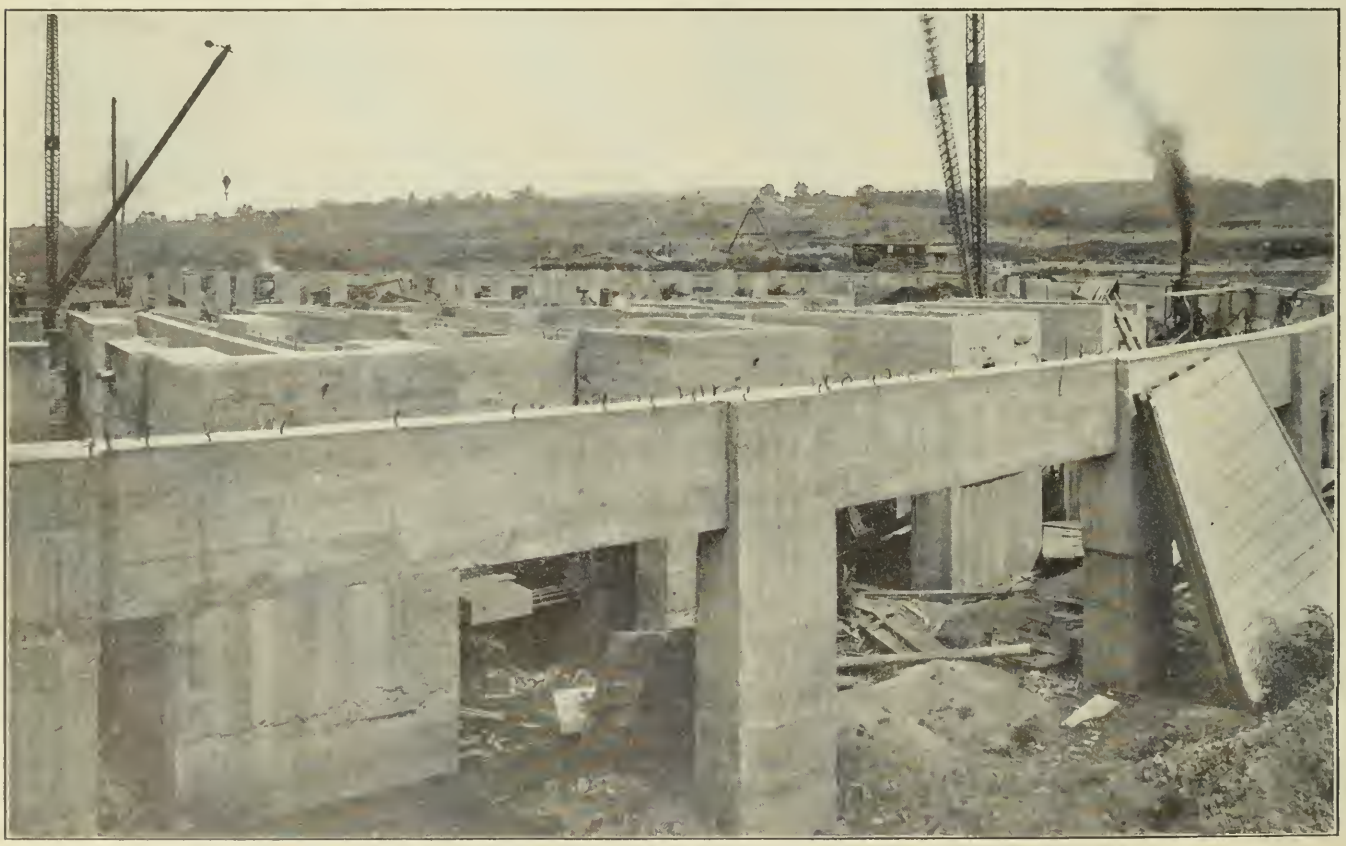
Engine House Pit Construction and Plan of Extension Containing Offices; Northumberland Yard.



Concrete Engine House Showing a Part of It Under Roof.

pit track passes through the outer wall to the machine shop. The drop wheel pits are grouped around this track. One large 80-in. drop wheel pit extends underneath it and the track on either side. On one side beyond this large pit is another pit for 62-in. wheels, extending under two tracks, and on the other side is a pit for 47-in. wheels under two tracks. This latter is intended for engine truck wheels. These pits are similar in construction and differ only in the size of the pneumatic jacks used. The arrangement of the jack and its truck for the 62-in. wheel pit is shown in detail. The pits for the jacks are circular, and, as may be seen, there is a separate jack for each three positions. After the wheels are dropped on the pit truck the jack disappears into its pit and the truck may then be rolled to other positions. When over the central jack the wheels can be raised to the shop floor. Next to the pit for the engine truck wheels is a large drop table 55 ft. long, which is operated by large screws and an electric motor similar to that at the East Altoona engine house.

The turntable is to be operated by a 22 h. p. electric motor, the mechanism for which was supplied by George P. Nichols & Bro., Chicago. The house will be heated by 2-in. coils in the pits and around the outer walls, and will be lighted by 37 arc lamps. An extension at one end of the engine house is used for the offices of the foreman and the despatcher. This is 29 ft. wide and extends along two stalls, making each office 23 ft. long. There is a lobby 8 ft. wide between the engine

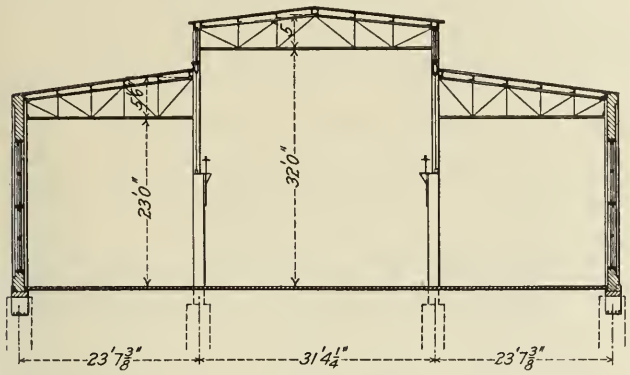


Concrete Foundations for Engine House; Northumberland Yard.

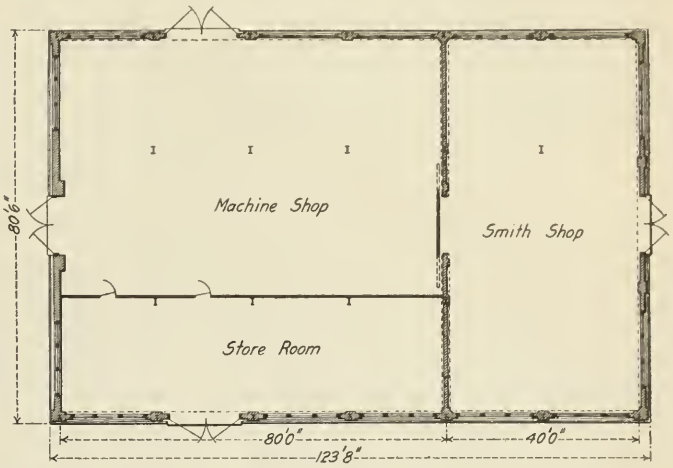
house and the offices. It has two doors, one into each office, and a desk 20 ft. long along the wall of the house. There is an opening in the office partition for engineers to register.

SHOP BUILDING.

The shop building is a brick and steel structure 123 ft. 8 in. x 80 ft. 6 in. outside. It is divided into three rooms. One of these is for the machine shop proper, 53 ft. x 79 ft. inside. The smith shop extends entirely across one end and is 40 ft. x 80 ft.; there is a storeroom 24 ft. x 79 ft. in the same building. The building has a raised roof at the center, in which will be a small traveling crane with a span of 29 ft. 3 in. The exterior



Cross-Section Through the Shop Building.

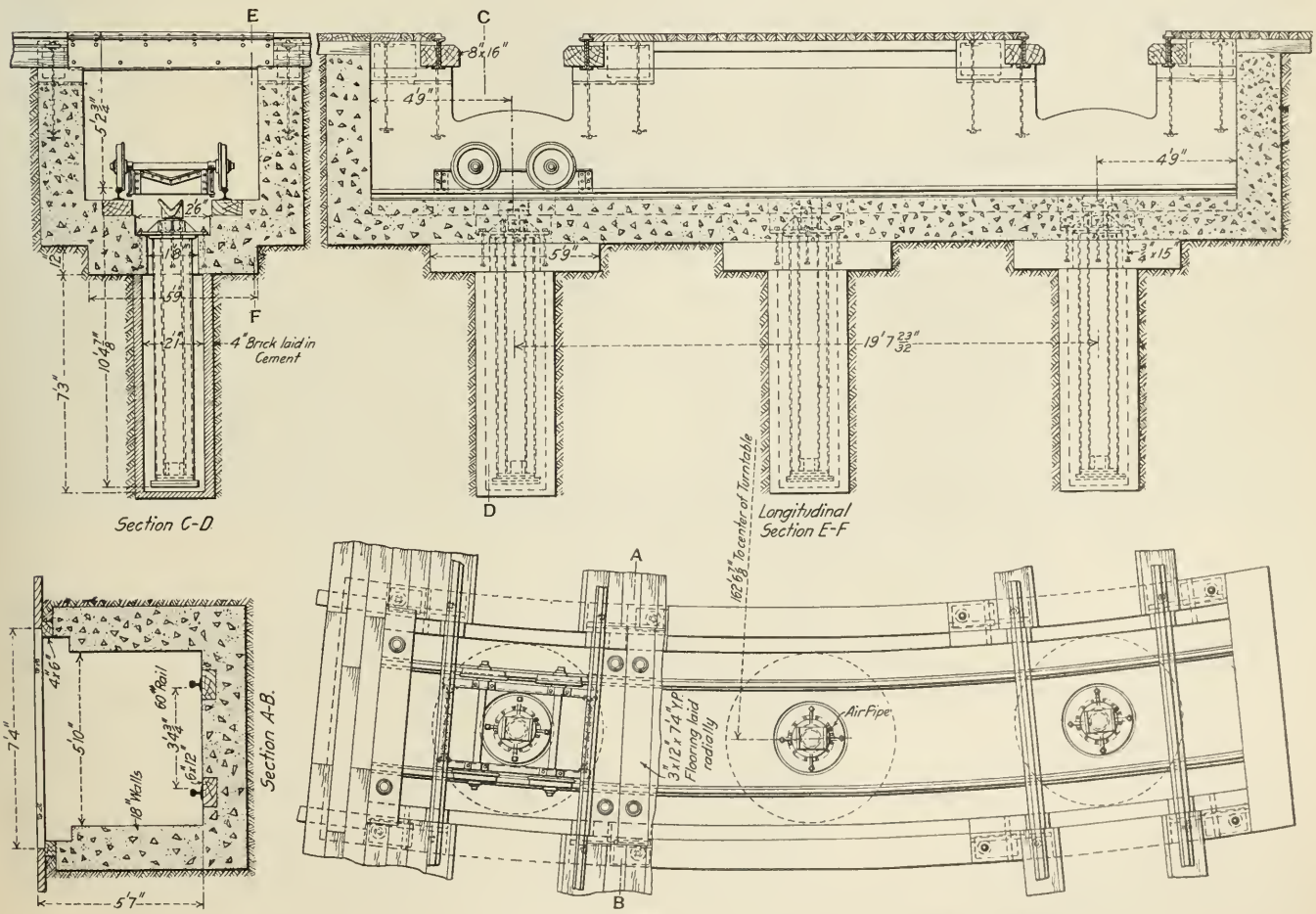


Plan of the Shop Building.

wall at the machine shop end has an opening, so that this crane may pass to the material yard outside, where the crane girders are supported on a steel structure. The side walls of the building are filled almost entirely with glazed sash and the end walls also have very large windows, so that the shop will be well lighted.

WATER SUPPLY.

The water supply for the shops and yards will be from two sources, one for drinking purposes from the Molly Bullion spring, which has a capacity of 225,000 gal. in 24 hours, the other for boilers and condensation from the Susquehanna river. The main water pipes extending through the yards will be supplied from the spring under normal conditions, but they are fitted with check valves so that in case of fire it will be possible to put on a higher pressure of 100 lbs. per sq. in. and supply a larger volume of water from the river. There are four steel tubs, each of 50,000 gal. capacity, on structural steel supports, all on the same level of 85 ft. At the center of the power house is a deep pit for the pumps which have their suction pipes be-



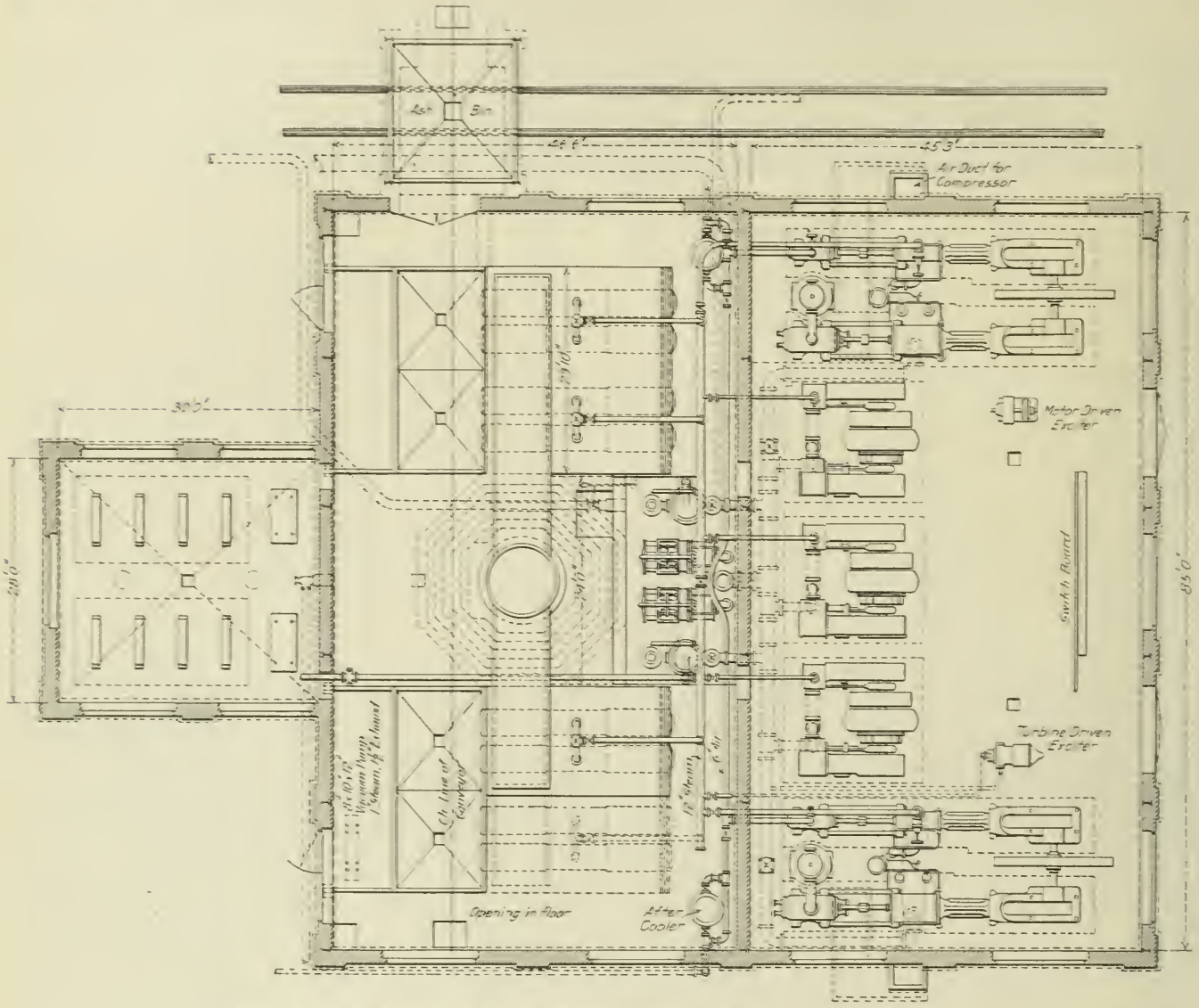
Drop Pit for Trailing Truck Wheels; Northumberland Engine House.

low the river level. The water flows by gravity from the river through a 20-in. cast iron pipe to a sump under the pumps.

POWER HOUSE.

The power house is a brick structure similar in architecture to the machine shop. It is 85 ft. x 92 ft. 9 in. inside with an extension on the engine house side 28 ft. x 30 ft. for the boiler washing plant. The engine room is 45 ft. 3 in. x 85 ft., and is 28 ft. 3 in. from the floor to the under side of the roof truss. The room is spanned by a hand power traveling crane with a capacity of 10 tons. The height from the floor to the top of the rail on the longitudinal crane girders is 21 ft. 6 in. There are three General Electric 250 k. v. a. 240-volt, 2-phase, 60-cycle generating sets. The engines have a capacity of 325 h. p. each and were supplied by the Harrisburg Machine Company. There are two Ingersoll-Rand air compressors, two-stage compound with automatically operated air valves and Corliss valve gear. Each of these has a capacity of 2,500 cu. ft. of free air per minute. This large provision of compressed air is principally for operating the switches at the hump tracks, and for pneumatic hoists in the engine house and shops. The brick-lined steel stack is 7 ft. in diameter inside and 185 ft. high. The boilers are of the Heine type, built by the Keeler Company, Williamsport, Pa. There are three of these, each with 4,000 sq. ft. of heating surface; floor space is provided for an additional boiler of the same size. Green chain grates are provided; the basement is arranged with partition walls, so that a large part of the drip of good coal from the grates will pass to the conveyor and be used again, while only the consumed coal dropping from the end of the chain grates will go to the ashpit proper. This arrangement is shown in the cross sectional view of the power house.

The pump pit is equipped with two 16 in. x 12 in. x 10 in. duplex Worthington pumps for fire purposes, and two Dean 16 in. x 26 in. x 18 in. vertical direct-acting pumps for the regular water service. There is a combined vacuum and jet condenser at each pump. The operation of the coal conveyor and the ash conveyor is also indicated on the drawing; these were supplied by the Link-Belt Company of Philadelphia.



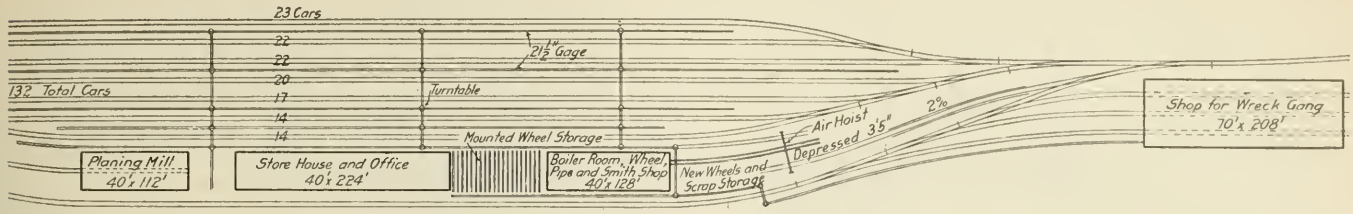
Plan of Power House at the Northumberland Yard; Pennsylvania Railroad.

The plant for boiler washing was supplied by the National Boiler Washing Company of Chicago. It is guaranteed to blow out two locomotive boilers, wash two boilers and fill two boilers at the same time, and is capable of washing 30 locomotive boilers in 24 hours. The storage capacity for this system is 24,000 gal., and the pump capacity 1,000 gal. per minute. This is one of the largest boiler washing plants installed by the National company, which also installed the vacuum steam heating system for the roundhouse, a steam blower line and compressed air line in the same house, and the complete pneumatic oil house system, including tanks and accessories.

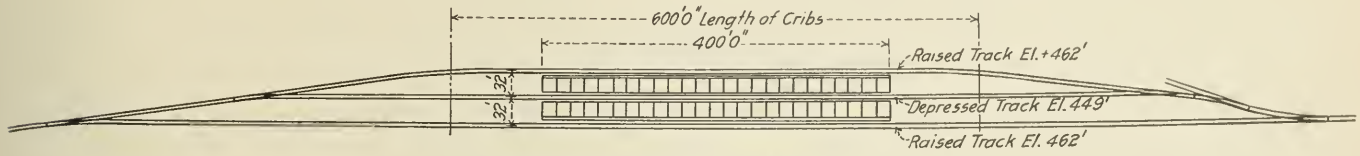
AUXILIARY STRUCTURES.

In addition to the larger permanent structures built of brick or concrete, which have just been described, there are a number of smaller auxiliary structures, most of them built of wood. These include the car repair shops, scrap bins, loaded car transfer, stock pens and the transfer sheds.

Car Repair Yards and Shops.—The car repair tracks and shops



Car Repair Yard at Northumberland; Pennsylvania Railroad.

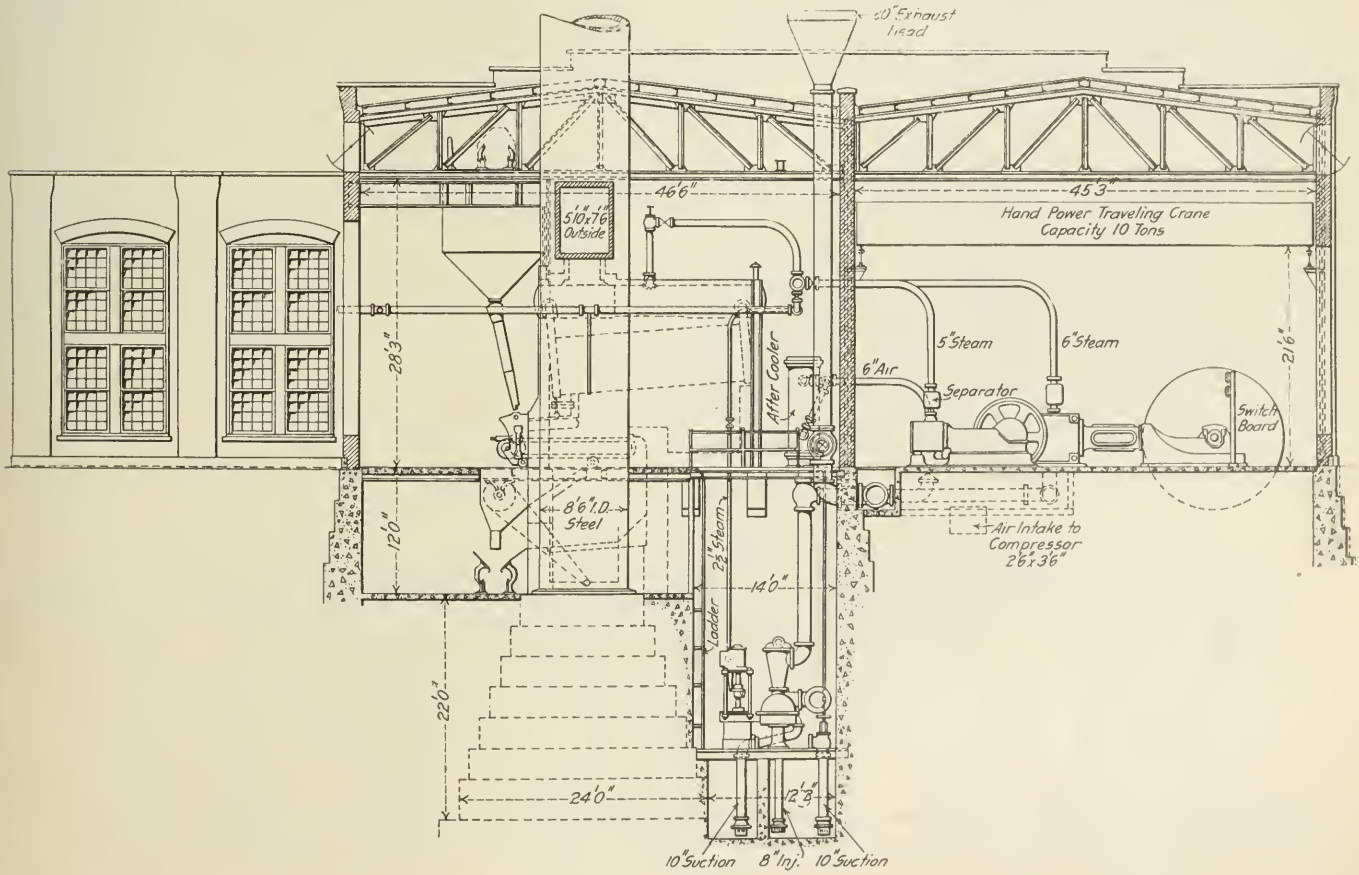


Arrangement of Tracks at the Scrap Bins.

are located between the westbound receiving tracks and the eastbound departure tracks; in this long space are also situated two yards for cripple cars and the large scrap bins. The general arrangement of the repair yard, showing the location of the car shops, is shown on one of the drawings. The tracks have a capacity for 132 cars, and are arranged on the south side of this yard. Between the alternate standard gage tracks are narrow gage tracks for the distribution of material to cars under repair, and there are two cross tracks leading to the shops with turntables at the intersections. The car shop buildings are all wooden structures 40 ft. wide. The planing mill is 112 ft. long; the storehouse and office, 224 ft. long; the boiler room, wheel, pipe and smith shop, 128 ft. long. A 100-ft. space between the storehouse and wheel shop is occupied by cross tracks for the storage of mounted wheels. The wheel shop will contain two axle lathes, one wheel press, two car wheel borers, and one steel-tired wheel lathe. New wheels and scrap are stored at the opposite end of the wheel shop where there is a depressed track and an overhead structure fitted with an air hoist for transferring the wheels from the cars to the track entering the wheel shop.

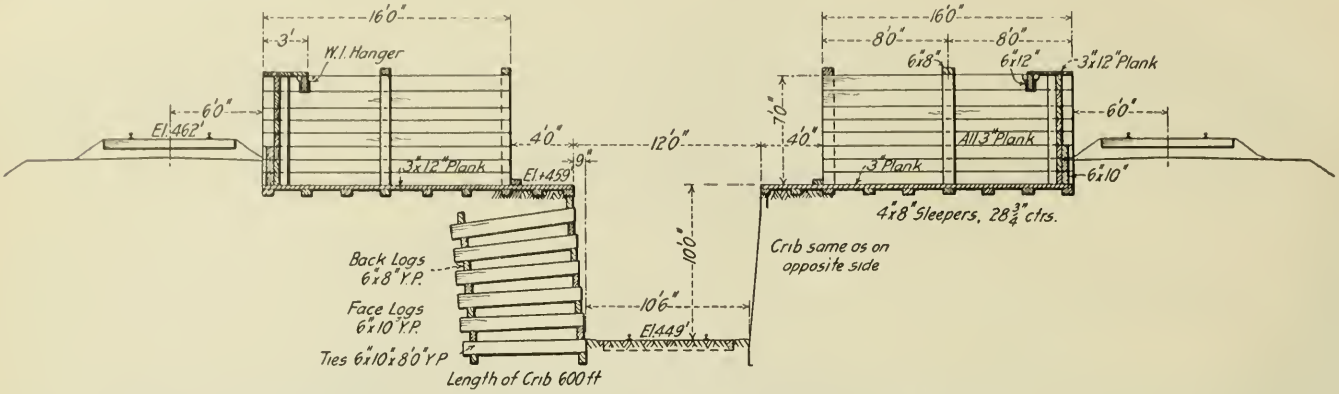
Conveniently located near the yard entrance and also adjacent to the car shops, is a large building, 70 ft. x 208 ft., which is intended as a shop for the wreck gang. This shop has three through standard gage tracks and one narrow gage track connecting it with the car shops.

Scrap Bins.—The scrap bins, which are directly north of the car shops, are unusually large for a place of this kind, as it is



Section Through the Boiler and Engine Rooms of the Power House; Northumberland Yard.

intended to concentrate scrap from several divisions at this point and have it classified and re-shipped; it will thus serve as a clearing house for that material from all lines west of Sunbury to Erie. The construction and arrangement of the scrap bin is shown on one of the drawings. The central portion has a pit 10 ft. deep with a track in the bottom so that high-side gondolas can be easily loaded. The bins are arranged on each side of this pit and are 400 ft. long, divided into 25 bins each 16 ft. long. They are 7 ft. high and are built up with 6 in. x 8 in. framing and 3-in. plank. Tracks for incoming scrap are arranged on the outside of the bin, and a running board made of 3 in. by 12 in. plank extends along the top of the bins for convenient access to either the cars or the bin.

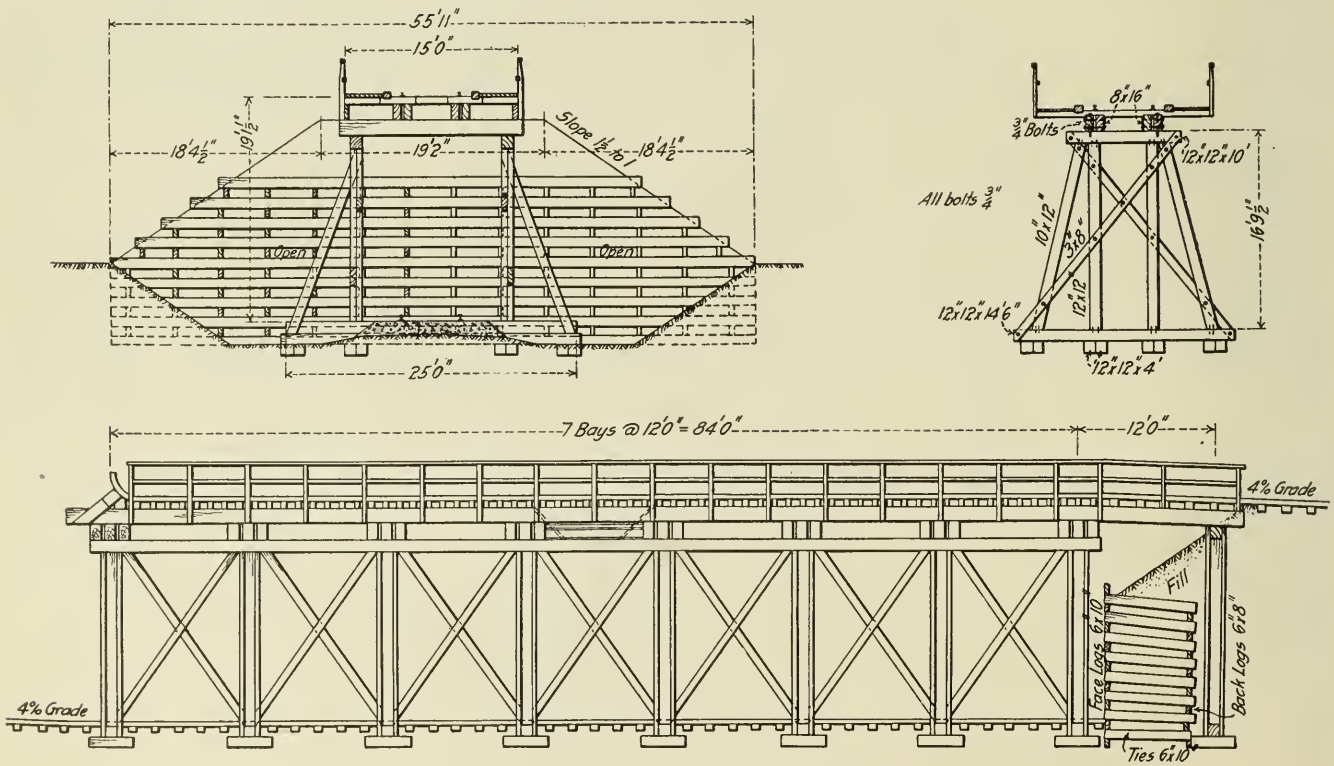


Section Through the Scrap Bins and Cribbing; Northumberland Yard.

Transfer Trestle.—Another wooden structure near by and convenient to the car shop is the loaded car transfer trestle. This is for the purpose of transferring crippled loaded coal cars, which are so badly damaged that they cannot be forwarded. The trestle consists of an elevated track 19 ft. above the lower track. It is made up of 7 bays, each 12 ft. long; at the center is a hopper over which the crippled car is placed, and the coal is allowed to run down into another car on the lower track. In the same group of auxiliary structures there will be noticed on the plan the stock pens, which are served by a siding.

Transfer Sheds and Platforms.—The transfer of freight from one car to another will be an important part of the work in the westbound departure yard. Here are located large transfer sheds and platforms. The platforms are supplied by 8 tracks and are 560 ft. long. They are arranged as main platforms and sub-platforms, with two tracks between. Instead of cars being in solid lines, they will be divided at intervals, and a temporary bridge will connect the main platform with the sub-platform, so that it will not be necessary to truck through from one car to another.

With ample room and the tracks arranged for the most direct movement of cars in making up trains, convenient outlets for crippled cars and good facilities for repairing them; with the best engine house equipment and free avenues for the movement of locomotives, the operation of the new yard at Northumberland should be effected at a much lower cost than at Sunbury. It should also be attended with fewer fatalities and personal injuries than unfortunately accompanied the operation of the two old yards at Sunbury.



Transfer Trestle in the Northumberland Yard; Pennsylvania Railroad.

ELECTRIFICATION OF STEAM ROADS.

The seventh annual electrical night of the New York Railroad Club was held last Friday evening and proved to be a big success. In contrast with the meetings of a few years ago, there was an almost entire absence of the controversal spirit, and one could not help but be impressed by the broader and more tolerant views which the electrical engineers are taking concerning the electrification of steam roads. W. J. Harahan, vice-president of the Erie, as chairman of the standing committee on electrification, stated that while much progress had been made in developing the details of the electrical equipment during the past year, there had been no important general development in the system of electrification. Several different systems have been in service on steam roads for a considerable time, and the committee invited a number of operating men to be present to tell of their experience.

James A. McCrea, general superintendent of the Long Island, was not able to be present but sent a communication. The traffic which had been developed on the western end of the road where the multiple system is in use had grown to such proportions that it could not possibly be handled in any other way. The multiple unit system is especially adapted for heavy suburban service. At the present time the Long Island has 62 miles of road operating electrically, including 164 miles of track. The system has proven thoroughly reliable. In five years there has been only one serious delay which could be charged to the electrical equipment. The motor troubles at the present time are slight, and the difficulties with the third rail are being overcome. Snow does not interfere with the operation of the road. Trains can be operated at a higher speed and on a shorter headway. It is, of course, necessary to make radical changes in the operation of the terminals from steam railway methods. The multiple unit system makes it possible to handle eight or ten trains per hour per track at the terminal, this good showing being largely due to the decreased amount of switching which is required. People who live in the suburbs do not want to spend more than 60 minutes in traveling to their work, and with steam operation this means that the suburbanites must live within a radius of 24 miles of their places of business. With the multiple unit operation it is possible to live at a 25 per cent. greater distance, or 30 miles away, and still keep within the time limit of one hour; or the time of going to and from the office may be shortened. In the operation of steam roads no special attention has been paid to the cost per car mile, but with the multiple unit system, where this cost is from six to eight cents, the operating men watch matters closely and do not use any more cars than necessary. With the multiple unit system the number of cars in a train may vary widely and is not limited by the capacity of a locomotive, as in the case of the steam roads.

Prof. George F. Swain, of Harvard University, who is a member of the Massachusetts Joint Board on Metropolitan Improvements, told in a most interesting way of how this board had considered the problem of electrification as applied to Boston and its suburbs. He treated the matter from the broad economic and financial standpoint and not as an electrical engineer. A summary of the conclusions of the Joint Board were published in the *Railway Age Gazette* of March 3 in connection with Mr. Seley's discussion of the paper on Locomotive Smoke in Chicago, presented before the Western Society of Engineers. Conditions in and about Boston are peculiar. Three main steam lines enter the city, but there are 21 lines or branches within a radius of from 10 to 15 miles from its center, which is as far as the suburban district extends. The public wants electrification because of the absence of smoke, the greater speed of trains and the improved values of real estate along the right of way due to the absence of smoke and noise. Electrification is of advantage to the railways in the saving of power; the reduction in locomotive repairs and the corrosion of overhead structures, which is quite a serious problem on steam roads because of the smoke and gases from the engine; the utilization of the space over the terminal tracks for buildings, which is largely a real estate problem; and the saving in switching where the multiple unit system is used. With these facts in mind, the majority of the committee, after careful investigation and study, reported that it was not wise to enforce electrification by compulsion, for the following reasons.

The railways reported that it would cost $40,000,000 to electrify for passenger traffic in the suburban district, which, as previously stated, covers an area from 10 to 15 minutes from the center of the city. In New York City the cost of electrifying two lines for a 30-mile radius was only half of this. It is difficult to electrify small branches or stubs as compared with longer lines Very little is saved in the cost of steam operation where the road is electrified for a short distance, and the electric locomotives have to be exchanged for steam locomotives for the rest of the run; the cost of the electrical operation is practically added to it. The problem is, of course, different where it is possible to electrify an entire division so that it is not necessary to change the locomotives. If the railways electrified for passenger traffic by an expenditure of $40,000,000 it would not remove the smoke nuisance, for it would still be necessary to handle the freight trains with steam locomotives. The New York Central and the New York, New Haven & Hartford report that the electrical operation, independent of the interest on capital, is not more economical than steam.

If by electrification the traffic could be greatly increased the rates would not be affected, but otherwise it would be necessary to increase them to bring a proper return on the investment. The conditions on the Long Island Railroad, where there is a heavy suburban service and the traffic is largely passenger, is very different from that at Boston, where the freight service is of much greater importance. If the state intends to compel the roads to electrify, then it should guarantee a return on the investment. The electrification would undoubtedly necessitate an increase in rates, and this would be hazardous in Boston because of the short length of the lines which it is proposed to electrify, and also because the same area is covered by competing electric street car lines and subway systems. An increase in rates would divert the traffic to the surface lines and the cost of electrification would therefore have to be charged against long distance traffic. Boston is an important port at the present time. It is much more expensive to take freight to Boston from the West than it is to take it to New York, for in the former case it has to be transported over mountain grades, while in the latter it follows the valley of the Hudson river. If this expense is increased, due to the cost of electrifying the lines at Boston, it will seriously affect the importance of Boston as a port. Professor Swain believes that the government regulation of railways is very good if not carried too far. It should control the issue of securities, insure the safe operation of the railways by the safety appliance laws, and control the freight and passenger trains. These are proper because they safeguard the interests of the public; but the electrification is a luxury. Can the public afford to pay for it?

Another reason which influenced the members of the Joint Board in making its majority report was the moral effect which its action would have. If one district or state demands electrification, others will be inclined to follow the example. This would require the expenditure of an enormous capital, but adequate returns on it would not be assured. The railways require a large amount of money annually to take care of their natural growth. If the states required electrification, it would be difficult to secure the necessary additional capital, because fair returns on it could not be promised. Another reason which actuated the joint board was the fact that the electrical engineers are not as yet agreed as to standards. Suppose the roads about Boston did electrify and each used a different system. There is no telling how soon certain combinations will take place which will make it extremely advisable to have all of the roads in that

district use the same system. Since the joint board made its report, a case of this kind has come up. The New Haven road has petitioned the Massachusetts state legislature to allow them to build a tunnel under the harbor in order to connect and operate its trains over a road which it previously had no direct connection, and until recently no one expected it ever would have. The minority report stated that the majority report would discourage electrification, but if the New Haven builds a tunnel underneath the harbor it will be absolutely necessary for them to operate it by electricity, and it would therefore seem that the minority report was wrong in its surmise. The question as to compulsory electrification is still before the legislature, but it is not to be hoped that it will decide against it.

H. Gilliam, electrical superintendent of the New York, New Haven & Hartford, said that in operating over the 33½ miles from the terminal, current was only used for 12 miles, or, during the 50 minutes required for covering the 33½ miles, current was only on for 17 minutes. He believed that by offering some special incentive, the engineers or motormen could reduce the amount of current used to a minimum, thereby decreasing the cost of operation. Heating the coaches by electricity had proven very satisfactory, as a uniform temperature could be maintained in each of the cars. Steam locomotive engineers can easily operate the electric locomotives by a few hours instruction a day for two weeks.

Wm. McClellan, another member of the committee on electrification, stated that very little progress had been made in electrification during the year from the standpoint of the electrical engineer. The side rod electric locomotives had been introduced on the Pennsylvania, but no data was as yet available concerning their performance. It had been his experience that the officers on steam operated roads which had electrified portions of the road were frank to admit that electrical operation was more reliable than steam. Three large systems are now operating electrically in and about New York City, and, in Mr. McClellan's opinion, the problem had passed beyond the experimental stage. Thus far no standards for the equipment or the system of electrification had been adopted. This matter should be thrashed out and a conclusion arrived at as soon as possible. It was useless for engineers to discuss the minor shortcomings of the systems which they were criticising, but in order to reach a proper conclusion it would be necessary for them to tell what they knew about the good and bad points of the system with which they were most familiar. In times past the advocates of the various systems had criticised the other systems because of complexity. The different systems had, however, all given successful service results and the argument of complexity was broken down. The engineers who had developed the different systems were enthusiastic about them. As they were equally reliable, the matter as to which system should be used should be decided entirely on the question of cost. This is not a local problem. It is impossible to tell when different roads will be combined, and the equipment of one may have to operate over the other. There will finally be one approved system, and the railways will eventually be put to an enormous expense if this question is decided in a haphazard manner. It cannot be decided until complete data for the various systems in operation is available. Thus far the railways have not thought it advisable to publish this data.

Frank J. Sprague stated that the electrification of steam roads was a private development and an economic problem, and the government should not interfere. The steam roads are not ready for electrification at the present time. There are other developments and improvements which must be attended to, and which are far more important than electrification. These developments will, however, all go to increase the efficiency of operation and to prepare for the final application of electrical operation. This will be some considerable time in the future, and at that time the electrical engineers will be far better prepared to decide what system is best fitted for the work. Mr. Sprague was a member of a committee which studied the advisability of electrifying a division of the Southern Pacific over the Sierra Nevada mountains. The committee, after an exhaustive study of the problem, decided that it was advisable to electrify, and drew up specifications for the equipment to be used. It had been impossible to secure equipment from the manufacturers to the specifications, although it was expected that it might be possible to do so in the near future. In considering the electrification in a large city, such as Chicago, the municipal authorities and the railways should get together and select a thoroughly competent commission to investigate and report. The questions which the commission should consider would be, "Is it practical under the conditions to electrify? What will the financial result be, and how can it be done at a minimum of expense?"

W. S. Murray, electrical engineer of the New York, New Haven & Hartford, thought that the single phase system would prove to be the most economical for operating trunk line service under any conditions. The New Haven now has 100 miles of single track electrified between Woodlawn and Stamford. The operation over this division has proven so successful that the directors have ratified the electrification of a six-track Harlem branch and yards, so that all trains west of Stamford, both freight and passenger, will be operated by electricity. In the immediate budget, the electrification of over 372 miles of track has been authorized, including the electrification of the Hoosac tunnel. The conditions in this territory are diversified. While Mr. Murray believes that direct current is good for use in and about large cities, the conditions of trunk line service are absolutely different and should be handled by the single phase system. This system has always been found best where it was necessary to transmit great quantities of power and over long distances. The first cost of the single phase system is considerably less than that for other systems. It has proven perfectly reliable. The average delays for all electrically operated trains on the New Haven were such that a train could cover a distance equal to that from the Grand Central station to San Francisco and back 11 times with a delay of one minute.

W. B. Potter, of the General Electric Company, thought that the electrification of steam roads was an economic problem, and must be settled on that basis. He spoke at considerable length on the advantages of the self-propelled car in which a gasolene engine was used for operating an electric generator, thus supplying current for the electric motors. This system provides a greater flexibility of operation than does one in which a gasolene engine is used in connection with mechanical transmission. Experience had shown that where the self-propelled cars were used on branch lines, thus making a more frequent service possible, the amount of travel had greatly increased.

Mr. Zimmerman, who had been connected with the Spokane & Inland Empire, as a consulting engineer, stated that unfortunately conditions were so different on that road that it was practically impossible to get a fair comparison of the cost of operation of the direct current system as compared with the single phase, and that it was equally impossible to compare either one of these to steam because of the great difference in conditions under which the different parts of the road were operated. He did not believe it was necessary to standardize the system of electrification which should be used for trunk line service. At the present time, on many roads, the class of steam power used on one division is radically different from that used on others, and in many cases a steam locomotive from one division would not give satisfactory results on another. If steam locomotives do not go off the division, why should it be necessary to have the electric locomotives do so?

A. H. Armstrong, of the General Electric Company, thought that there was no question but what it would be economical to operate electrically on mountain grades. For a considerable time last year he had made a study of steam road conditions and found that when a locomotive was in operation, about 8 lbs. of coal were required per brake horse-power hour. If the standby

losses were taken into consideration, including the time that the locomotive was standing on sidings or idle, but still burning coal in order to keep up the fires, this amount would increase to 12 lbs. of coal per actual horse-power hour. A steam locomotive must be cleaned after it has run over the division, and it requires considerable attendance in the roundhouse for both cleaning and repairs. On the New York Central the electric locomotives run from 1,200 to 1,300 miles between inspections.

FREIGHT CAR TRUCK EXPERIMENTS.

A preliminary account of the tests of the friction of freight trucks on curves, made by Professor L. E. Endsley, of Purdue University, at Granite City, Ill., for the American Steel Foundries, was published in the *Railway Age Gazette* of December 2, 1910, page 1058. The complete results of these tests are now available and have been published in a handsome pamphlet. The purpose of the tests was to determine the difference in frictional resistance of loose and square trucks, a loose truck being one in which the side frames are free to move forward and backward parallel to each other, allowing the wheels on one side to get ahead of the wheels on the other side of the truck in going around a curve. A square truck is one in which some



Fig. 1—Incline Used for Starting Trucks.

form of construction is employed to hold the side frame from moving forward and backward, not allowing the wheels on one side to get ahead of those on the other side, and in this manner holding the truck square. Some trucks which were found loose were tested in this condition, after which they were squared and again tested.

The tests were conducted on a piece of experimental track located at the plant of the American Steel Foundries, Granite City, Ill. The track consisted of an incline having a drop of 36 ft. This incline is shown in Fig. 1 and has a short tangent of about 30 ft.; a 22 deg. curve of 303.3 ft., having a radius of 262 ft., the outer rail being raised 4½ in. above the inner; a tangent of 257.2 ft.; and an incline having a vertical rise of about 20 ft. The gage of the track was 4 ft. 8½ in. on the tangent and was increased to 4 ft. 9 in. on the curve. The incline was equipped with an electric hoist for pulling the truck up. By means of a figure four trip and a dead line, the truck could be released at any desired point. Later a second piece of straight track was constructed consisting of a tangent of 600 ft. which ran directly out from the incline, at the end of which was an incline having a rise of approximately 25 ft.

TRUCKS TESTED.

Different types of freight car trucks and different modifications of the same type of truck were tested. The trucks tested were taken from under cars in regular service owned by 13 representative railways. Some 24 trucks were tested, including six specially constructed test trucks. All the trucks taken from cars, with the exception of one, were from cars of 100,000 lbs. capacity. All brake shoes and brake beams were removed prior

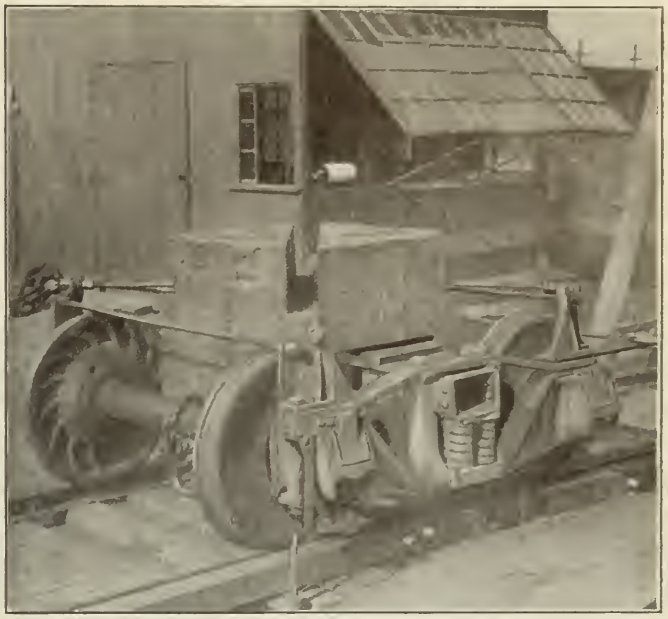


Fig. 2—Method of Holding Arch Bar Trucks Square.

to testing to eliminate any friction which might result from the contact of the shoe with the wheel. For convenience in recording data, the wheels were numbered 1, 2, 3 and 4. Wheels 1 and 2 were on one axle and 3 and 4 on the other axle. Nos. 1 and 2 were the wheels (when under the car) which were nearest the end of the car. By this method of numbering, wheels 1 and 3 were on the inner side of the curve when 1 and 2 were leading, and 2 and 4 were on the inside when 3 and 4

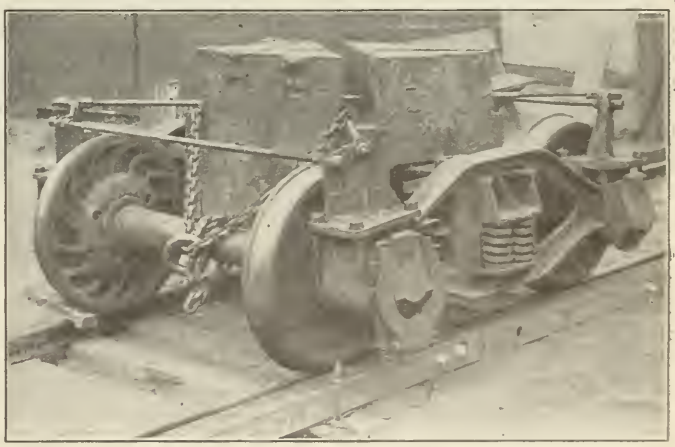


Fig. 3—Method of Holding Bettendorf Trucks Square.

were leading. It is, therefore, obvious that wheels 1 and 3 were on the same side of the track. In the further description of the trucks, the above notation of the wheels will be maintained. The 24 trucks tested on the curved track are designated by letters A to X, inclusive, and the three trucks tested on the 600-ft. tangent are designated by letters A, A_1 and A_2.

METHOD OF TESTING.

The truck was first weighed carefully, after which it was placed on the experimental track and pulled up the incline to the desired height, being released a number of times until the

distance the truck would run before stopping became constant. When the testing was on the curved track five record runs were then made. From these five record runs, the average velocity at the beginning and the end of the curve was determined. The same method was employed in obtaining the velocity on the tangent track at the end of the curve, with the exception that as this tangent was so short and the loss in velocity so small, the average of ten runs was used. The testing on the 600-ft. tangent track, which was level, was conducted by continuing the testing from four to six hours by alternately running the truck loose for two runs and square for two runs. The average distance of all the runs loose and all the runs square was taken as the performance of the truck in each condition.

All of the trucks tested on the curved track were tested with wheels 1 and 2 in front, and all but four were also tested with wheels 3 and 4 in front. Of the 18 trucks from railways tested on the curved track, 7 of those found loose were squared and again tested. All of the experimental trucks were tested both loose and square. The method of squaring arch bar trucks is shown in Fig. 2, and for Bettendorf trucks in Fig. 3. Most of the tests on the curved track were conducted by raising the truck to a height which, when released, would give it a velocity of approximately 19 mi. per hr. at the foot of the incline. All of the tests on the 600-ft. tangent track were conducted at an initial speed of approximately 23.5 mi. per h., the exact velocities being shown in tables that accompany the report.

The velocity at any point was determined by means of an electric chronograph, which is shown in Fig. 4. The apparatus consists of a drum which can be driven at any constant velocity by a properly geared centrifugal governor (two pens, which are mounted on a transfer table of the machine, are driven by means of a screw, and draw spiral lines around the drum as it rotates. One of these pens was connected to a clock, by means of an electric current, which caused it to beat half seconds. The other pen was connected up with a track circuit), and as the truck passed the contact points on the track, this pen recorded it on the drum. These contact points were placed exactly 20 ft. apart, and the time that it took the truck to go this distance was obtained from the record made on the drum; from this the velocity in feet per second was computed.

From the velocity obtained at different points along the track, in the method described above, the resistance in pounds per ton was obtained by the use of the following formulas:

$$K = \frac{V^2 W}{2g} + \frac{\left(V\frac{G}{R}\right)^2 W_1}{2g}$$

$$L = K_1 - K_2$$

$$F = \frac{L}{D}$$

$$P = \frac{F}{T}$$

Where

P = Force in pounds per ton.
V = Velocity of truck in feet per second.
W = Total weight of truck.

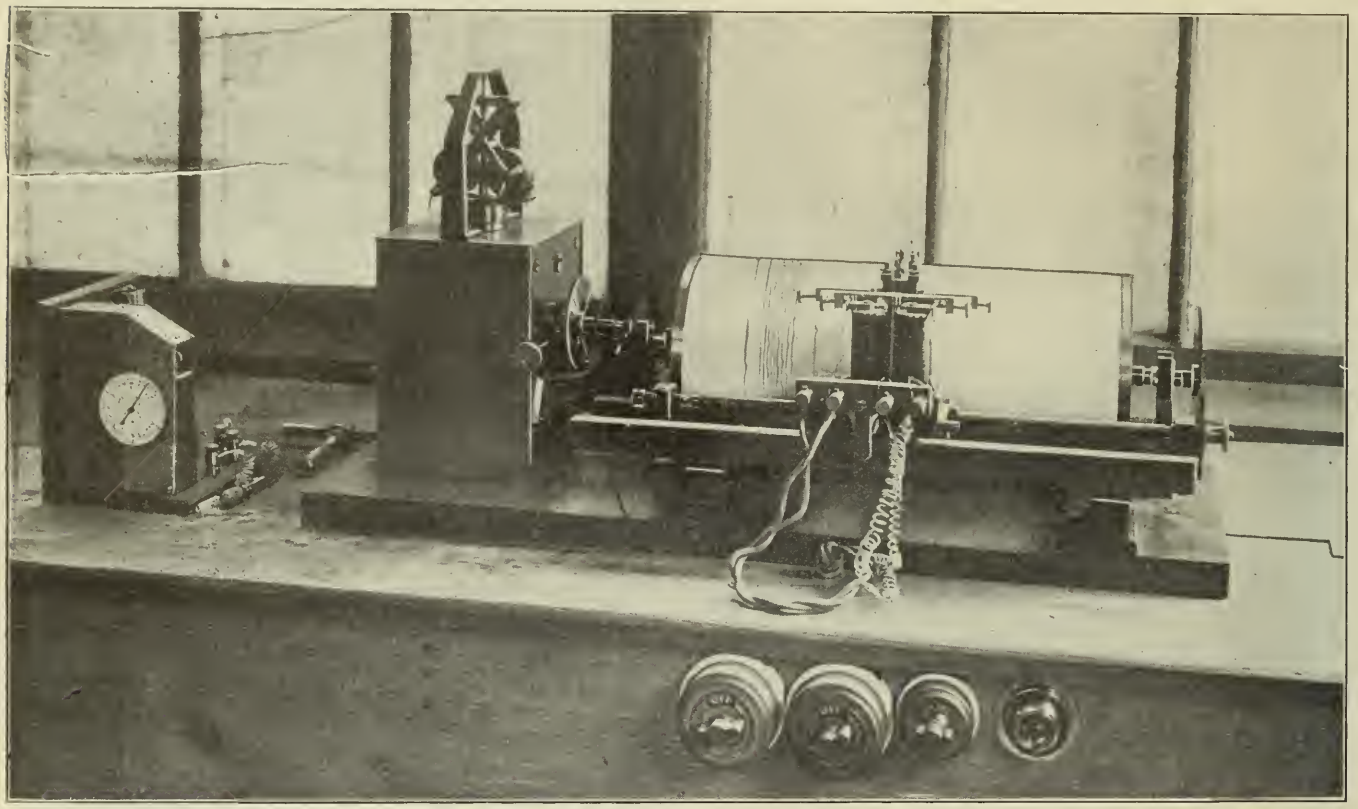


Fig. 4—Clock and Electric Chronograph for Measuring Speed; Freight Car Truck Experiments.

W_1 = Weight of wheels and axles.
T = Weight of truck in tons.
R = Radius of wheel in feet.
K = Total kinetic energy.
K_1 = Kinetic energy at any point of track.
K_2 = Kinetic energy at another point of track.
L = Loss of kinetic energy.
D = Length of track in feet for which the loss in kinetic energy was obtained.
F = Average force in pounds acting on the truck.
G = Radius of gyration in feet of a pair of wheels and axles about the center line of the axle. It was necessary to know this radius of gyration in order to determine the kinetic energy in the truck due to the rotation of the wheels and axles. This was done experimently by swinging a pair of wheels and axles as a pendulum and using the formulas,

$$t = \pi\sqrt{\frac{G_1^2}{g\,s}}$$

$$G^2 = G_1^2 - s^2 = \sqrt{\frac{t^2\,g\,s}{\pi^2}} - s^2$$

In which

t = Time of a single oscillation.
s = Distance in feet from center line of axle to the knife edge supports.
G_1 = Radius of gyration about the point of support.

The radius of gyration as obtained for a pair of 700 lb. 33-in. cast-iron wheels and their axle was .573 ft., and for a pair of 33-in. Davis cast-steel wheels and axle was .559 ft.

The two methods used in determining the movement of one side frame with respect to the other, are shown in Fig. 5. One of these methods consisted of measuring the increase and decrease in length of the diagonal from the top of one journal box to the top of the other. This was done by having a wooden arm, carrying a pencil at one end, pivoted to the corner casting on the truck, reaching diagonally across to the other corner, as shown. A suitable board was fastened on the corner to which a card was attached. When the truck was about to be started down the incline, the pencil was placed in contact with the paper and lightly held there by a rubber hand. As the truck ran around the curve, this pencil would record the increase or decrease in length of the diagonal. Whether the diagonal was lengthened or shortened depended on the direction in which the truck was running. The diagonal on which this measuring device was arranged was such that if the truck was going out from the incline, the distance would be increased, and if the truck was coming back towards the incline, the distance would be shortened. As the pencil was in contact with the paper during a complete run of the truck, that is, during the time of running out to the further incline and back to the first incline, the total movement of the pencil on the paper recorded the difference between the maximum and minimum length of the diagonal. This motion recorded is only 74 per cent. of the total movement of one side frame with respect to the other. The reading of 74 per cent. was obtained by taking cards simultaneously on the diagonal as described above and on another apparatus at the end of the truck as shown in the same illustration. This second arrangement consisted in having two bars of iron fastened on top of the journal boxes. One of these bars had a 90 deg. bend which caused it to reach across the track as shown. It carried a suitable board on which a card could be fastened. The other bar of iron constituted a support for the free end of the first bar and was also equipped with a suitable arrangement for holding a pencil, as shown. This arrangement recorded the exact motion of one side frame with respect to the other.

One-half the length of this line as drawn on the paper as the truck passed around the curve and back again gives the amount the truck went out of square in going around the curve.

It was found that as the trucks would go out of square the flanges of one wheel would not be in line with the flanges of the wheel in front of it. The arch bar truck in Fig. 6 is shown at rest about half way around the curve. A straight edge placed against the rim of the following wheel falls 2¼ in. away from the rim of the leading wheel. This indicates to what extent the loose truck may be out of alinement when passing around a curve.

Some of the results obtained on the curved track are given in Table I.* Column VIII gives the kinetic energy in foot-pounds that the truck had at the beginning of the curve. Column IX gives the kinetic energy at the end of the curve. Column X gives the loss in kinetic energy on the curve and is obtained by subtracting the values in Column IX from the values in Column VIII. Column XI gives the total average force in pounds on the truck. This was obtained by dividing the values in Column X by 303.3 ft., this being the length of the curve. Column XII gives the resistance in pounds per ton on the curved track. This was obtained by dividing the values in Column XI by the weight of the truck in tons. Column XIII gives the force in pounds on the truck, when on the curve, corrected for a level track. This was obtained by subtracting from the values in Column XII 25.7 lbs. This 25.7 lbs. is the force necessary to overcome the resistance due to the rise in grade. Column XIV gives the total movement of one side frame with respect to the other. These values were obtained by the methods described in a previous paragraph. One-half of the value given in this column is the amount that the truck gets out of square while going around the curve.

Truck A was an experimental arch bar truck, conforming closely to standard practice in its design and construction. This truck had a specially constructed cast-steel bolster which, being considerably heavier than commonly used, made the weight of the truck 12,520 lbs. No spring plank was used. The truck had 650 lbs. cast-iron wheels. The wheel base was 5 ft. 4 in.

*A number of tables are included in the report showing similar data for all the trucks tested on the curved track and on the tangent.

Table. I.

Test No.	Truck	Wheels Front	Average Speed in Feet Per Second		Average Speed in Miles Per Hour		Kinetic Energy in Foot-Pounds		Loss in Kinetic Energy on Curve Ft.-Lbs.	Total Force on Truck on Curve Pounds	Resistance on Curve Lbs.-Ton	Resistance on Curve Corrected to Level Track Lbs.-Ton	Total Movement of Side Frame Inches
			At Beginning of Curve	At End of Curve	At Beginning of Curve	At End of Curve	At Beginning of Curve	At End of Curve					
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1	A	1 and 2	33.84	26.80	23.07	18.27	246,442	154,556	91,886	302.95	48.39	22.69	None
2	A	1 and 2	34.33	24.92	23.40	16.99	251,268	132,384	118,884	391.93	63.21	37.51	3.78
3	A	1 and 2	27.83	15.66	18.97	10.68	165,115	52,280	112,835	372.00	60.00	34.30	3.78
4	A	1 and 2	27.87	18.55	19.00	12.64	167,137	74,039	93,098	306.95	49.03	23.33	None
5	A	1 and 2	24.69	13.74	16.83	9.37	131,533	40,613	90,920	297.69	47.65	21.85	None
6	A	1 and 2	24.53	9.32	16.73	6.34	128,280	18,516	109,762	361.69	58.36	32.66	3.78
7	A	1 and 2	22.98	11.01	15.67	7.50	113,532	26,087	87,475	288.31	46.05	20.35	None
8	A	1 and 2	22 98	4.17	15.67	2.84	112,476	3,701	108,775	358.63	57.84	32.14	3.76
9	B	1 and 2	23.80	11.84	16.25	8.08	213,254	52,773	160,481	529.11	46.25	20.85	None
10	B	1 and 2	23.66	5.30	16.15	3.62	210,786	10,572	200,214	660.11	57.70	32.00	3.78
11	B	1 and 2	25.51	10.80	17.42	7.37	245,001	43,906	201,093	663.01	57.95	32.25	3.78
12	B	1 and 2	25.31	14.74	17.25	10.05	241,183	81,796	158,388	525.51	45.95	20.23	None
13	B	1 and 2	28.44	19.39	19.39	13.22	312,656	141,654	171,002	563.80	49.28	23.58	None
14	B	1 and 2	28.24	16.46	19.25	11.22	300,257	102,004	198,253	653.65	57.13	31.43	3.78
15	B	1 and 2	34.90	27.51	23.79	18.75	458,594	284,993	173,661	572.57	50.49	24.79	None

Although the wheels were cast several years ago, they were not worn, never having been in service except on the experimental track. The treads and flanges were in good condition. The wheels taped larger than the standard 33-in. wheel by the following amounts: No. 1, 1/16 in.; No. 2, ¼ in.; No. 3, ⅛ in., and No. 4, 5/16 in. M. C. B. journal boxes and brasses were used. The boxes were freshly packed with cotton waste.



Fig. 5—Methods Used to Determine the Movement of the Side Frames with Respect to each Other.

Truck B was the same as truck A, previously described, with the exception that a casting weighing 10,366 lbs. was added, thus making its total weight 22,866 lbs. In no other manner did truck B differ from truck A.

DISCUSSION OF RESULTS.

In order to show more clearly the relation between the resistance in pounds per ton on a curve and the amount that the truck gets out of square, the results of all tests on the curve track were plotted. The values were obtained by dividing the values in Column XIV of Table I, by 2, the assumption being made that the amount that the truck went out of square is equal to one-half of the recorded movement of the side frames with respect to each other. During a number of tests an observer rode the truck and observed the movement of the recording pencil, which seemed to indicate that the amount that the truck went out of square was practically the same for both the outward and the inward trips around the curve. The results were plotted in the order in which the trucks went out of square and it is apparent that the friction in pounds per ton on the curve decreased in the same order. To more clearly show this, all of the results of tests have been separated into five groups. These groups were selected according to the amount that the trucks went out of square. The average resistance in pounds per ton for each group was plotted in Fig. 7. It will be seen that the average resistance in pounds per ton for all tests where the trucks went out of square more than 2 in. was 39.7 lbs.; the average resistance in pounds per ton for all tests where the trucks went out of square between 1½ in. and 2 in. was 36.8 lbs.; the average resistance in pounds per ton for all tests where the truck went out of square between 1 and 1½ in. was 34.7 lbs.; the average resistance in pounds per ton for all



Fig. 6—Showing How the Wheels on a Loose Truck Get Out of Line Going Around a Curve.

Table II.

1	DEGREE OF CURVE	1	2	3	4	5	6	7	8	9	10	11	12	13
2	Resistance, Pounds Per Ton, Loose Truck	7.83	9.28	10.73	12.18	13.64	15.09	16.54	17.99	19.45	20.90	22.35	23.80	25.25
3	Resistance, Pounds Per Ton, Square Truck	7.21	8.04	8.87	9.70	10.53	11.37	12.20	13.03	13.86	14.69	15.52	16.36	17.19
4	Pounds in Favor Square Truck	.62	1.24	1.86	2.48	3.11	3.72	4.34	4.96	5.59	6.21	6.83	7.44	8.06
5	Per Cent in Favor Square Truck	7.9	13.3	17.3	20.3	22.8	24.6	26.2	27.5	28.8	29.7	30.5	31.2	31.9

1	DEGREE OF CURVE	14	15	16	17	18	19	20	21	22	23	24	25	26
2	Resistance, Pounds Per Ton, Loose Truck	26.71	28.16	29.61	31.06	32.52	33.97	35.42	36.87	38.33	39.78	41.23	42.68	44.13
3	Resistance, Pounds Per Ton, Square Truck	18.02	18.85	19.68	20.52	21.35	22.18	23.01	23.84	24.68	25.51	26.34	27.17	28.00
4	Pounds in Favor Square Truck	8.69	9.31	9.93	10.54	11.17	11.79	12.41	13.03	13.65	14.27	14.89	15.51	16.13
5	Per Cent in Favor Square Truck	32.5	33.0	33.5	33.9	34.3	34.7	35.0	35.3	35.6	35.8	36.1	36.3	36.5

tests where the truck went out of square between ½ and 1 in. dropped to 26.7 lbs.; and the resistance in pounds per ton for all tests where the truck went out of square less than ½ in. was 24.6. It is evident that the amount that the truck went out of square had very little effect on the resistance in pounds per ton, until the truck was at least 1 in. out of square. The results obtained when the truck was out of square between 1 and 1½ in. showed the increase in resistance to be 10.06 lbs. over

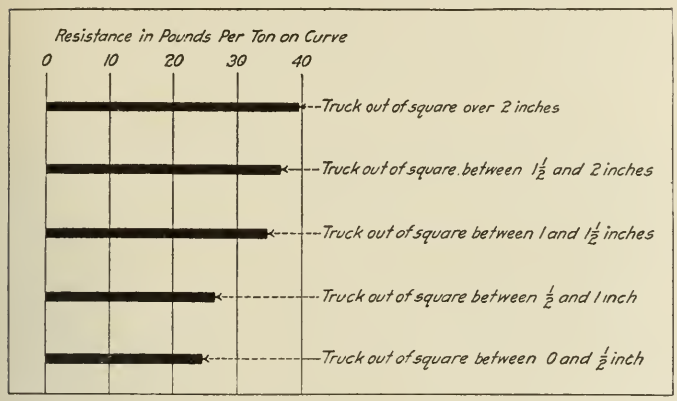


Fig. 7—Average Resistance of Trucks for all Tests on the Curved Track.

the resistance offered when the trucks were out of square less than ½ in.; so that there seems to be somewhere near 1 in. a point, such that if the truck gets out of square beyond it, the resistance in pounds per ton is materially increased. In order to distinguish between a square and loose truck, in view of the foregoing, it was assumed that all trucks tested that went out of square ½ in. or less would be classed as square trucks, and all of those that went out of square more than 1½ in. would be classed as loose trucks.

All of the values of the tests obtained for trucks that went out of square less than ½ in. were averaged and a resistance of 24.68 lbs. per ton obtained. Also the result for all tests of loose trucks were averaged and a resistance of 38.33 lbs. per ton was

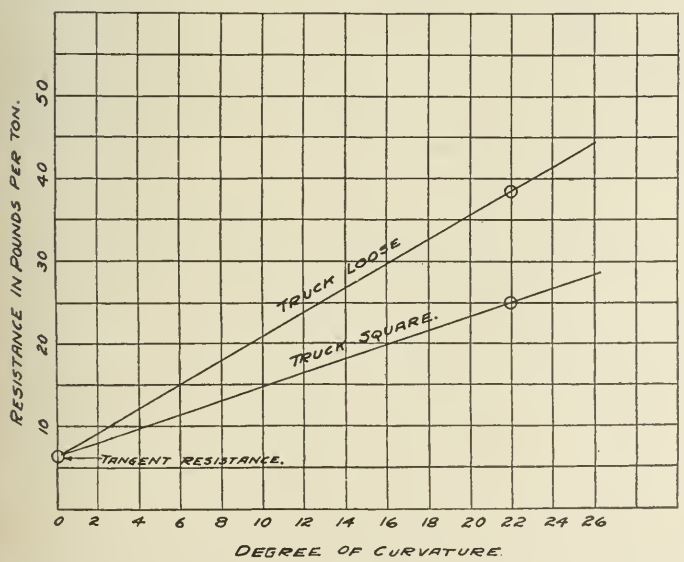


Fig. 8.—Resistance of Loose and Square Trucks for Different Degrees of Curvature.

obtained. These two average resistances for square and loose trucks have been plotted in Fig. 8, together with the average resistance on the short tangent, which resistance amounted to 6.38 lbs. per ton. With the tangent resistance as an origin, a straight line was drawn between the tangent resistance and the two curved resistances as shown, the upper line representing results for loose trucks or those getting out of square 1½ in. or more, and the lower line representing the square truck or those getting out of square ½ in. or less. These two lines were drawn straight because it is generally accepted that the resistance due to curves is in direct proportion to the degree of curvature. From these two lines the results in Table 2 have been computed and the resistance for any degree of curvature up to 26 deg. is given. It will be seen from the values in Table 2 that the per cent. of saving in favor of the truck squared varies from 7.9 per cent. on a 1 deg. curve to 36.5 per cent. on a 26 deg. curve, and taking 4 deg. as the average main line curve, the saving is 20.3 per cent. in favor of the truck squared.

Those who have read the preliminary account of these tests may detect that the values do not exactly check the values given in Table 2. This is due to the fact that the table in the preliminary statement was based on the results of 15 tests of trucks loose and 15 tests of trucks squared, while Table 2 is based on the results of 45 tests of trucks square and 28 tests of trucks loose.

CONCLUSIONS.

From the data obtained from the curved track it is obvious that a truck which is constructed in such a way that it will remain square and hold the axles radially with the curve, will go around the curve with considerably less resistance than a track otherwise constructed.

From the tests conducted on the 600 ft. tangent track it would seem that where the wheels of the truck are not well mated, a method of construction which will hold the axle perpendicular to the track will tend to slightly reduce the resistance. The tests so far conducted have suggested several interesting things, which could not be developed owing to the lateness of the time in the fall, so it has been decided to continue the tests next summer, at which time it is hoped that sufficient data will be obtained to clearly demonstrate several interesting as well as important matters. To this end three additional pieces of experimental track are being constructed, having a curvature of 3, 6 and 12 deg. respectively. After tests are run on these three curves, there will then be available data as obtained from four different degrees of curvature, whereby a more satisfactory comparison can be made between the resistance of square trucks and loose trucks on different degrees of curvature.

THE COURSE OF RAILWAY SECURITY PRICES.

BY WILLIAM Z. RIPLEY.

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The fluctuations of railway security prices are like the waters of the sea; they move in tides, waves and ripples.* The great tidal sweeps, both for railway and industrial security prices, are mainly defined in recent years by the panic of 1893 and its ensuing four years of industrial depression. Both before and after this event quotations attained high-tide levels, although in different degrees. The first great tide began just after the panic of 1884—distinctly a railway disturbance—in a great upward sweep culminating just before the Baring collapse in 1890. After this brief interruption the upward swing continued until the sharp break of 1893. At this point low tide prevailed for about four years; but by 1898 it would appear that recovery had just about reestablished the general level of prices of 1885-92. From the latter part of 1898 dates that second and more remarkable general uplift which has now lasted for a number of years. This second great movement is of compelling economic interest, because, by reason of its magnitude, it is evidently far beyond the control of any speculative clique, however powerful. It represents a great tide whose causes are fundamental. But in order fully to understand these, the minor influences on the surface must be briefly treated by themselves.

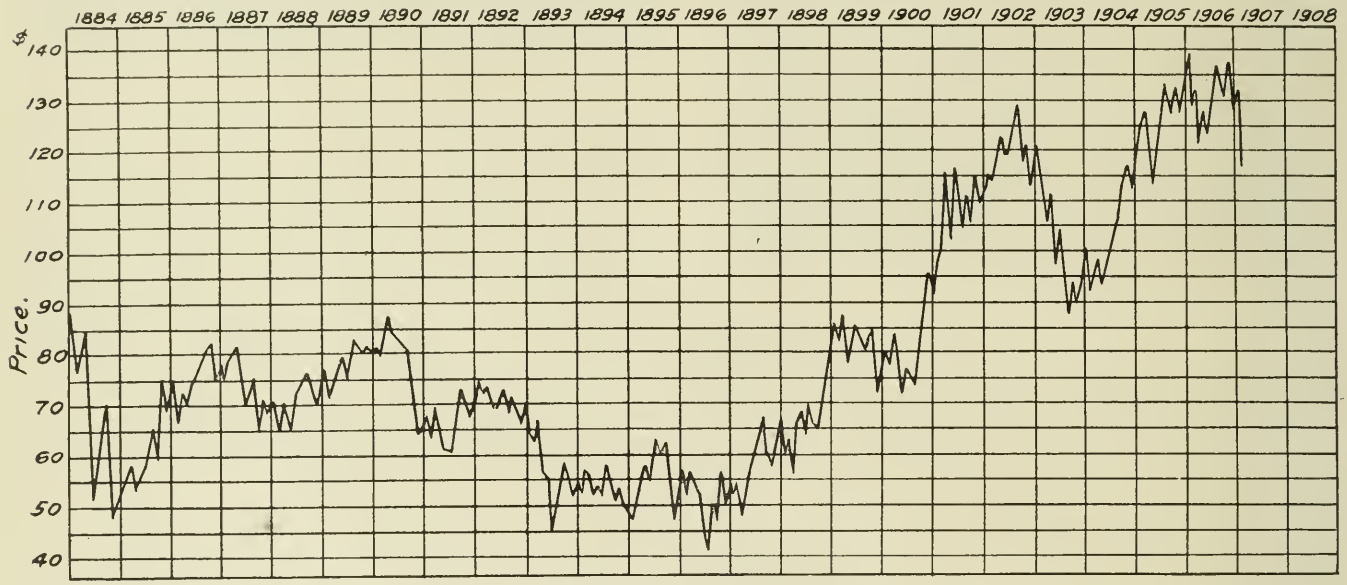
The great tidal sweeps, judging by these diagrams, are over-

*The diagram covering the period since 1884 is from a bulletin of the Statistical Department of Thomas Gibson of New York. James Brookmire of St. Louis has also published an excellent chart of stock exchange movements for about the same period. The larger diagram is based upon an index number carefully compiled for many years by the *Wall Street Journal*. This index comprises 20 railroads and 12 industrial companies, the curves for each group being separately shown upon the chart.

laid by a series of secondary movements, some of them extending over several years. Among the earlier ones, 1886-7, 1890 and 1892 stand forth; while on the surface of the last great tide the years 1901-2 and 1905-6 appear as secondary waves. These are more clearly the result of artificial influences; but the part played by organized speculation, as distinct from either Nature, politics or the world's business affairs, begins to be discernible. This is evidenced by certain differences between the curves for railways and industrials.

The year 1898 set the speculative marionettes dancing; but its interest lay principally in the fields of industrial promotion. Unparalleled credit balances against Europe, and keen recollection of the dire results of unrestrained industrial competition during the preceding four years of hard times, brought about an extraordinary activity in the promotion of trusts. The railways were little involved. Their time did not come until two years later, when the second eruption of speculative mania occurred. The year 1901 was the time of great industrial underwriting syndicates, often utilizing the unwieldy surpluses of the New York life insurance companies. It was the year of the formation of the United States Steel Corporation. More to our purpose, however, is the fact that 1901 witnessed the spread of the consolidation movement over into the field of railway mergers of the preceding years about as the ill-considered International Mercantile Marine combination did to the flotation of the United States Steel Corporation. By this time credits had become over-expanded; and the inevitable penalty was paid in the panic of 1903. But the railways were relatively little involved in this disturbance except speculatively. The collapse was more notably among industrial corporations. They were all tried by fire, and a number of them, such as the shipbuilding, asphalt and bicycle companies, paid the price of reckless or dishonest promotion and management in bankruptcy and reorganization. The value of railway shares suffered considerably less in proportion than those of the trusts. The absolute fall of their index number was of course greater. Railway shares fell during 1903 by approximately one-fourth. But the index of industrial quotations dropped from about 67 to 42, or nearly 40 per cent. Moreover the benefits derived by the suppresison of competition and of steadily advancing rates for transportation enabled the railways to recover more quickly whatever ground that they lost.

During the speculative wave of 1905-6 the tables were turned. This time the railways lagged behind the industrial companies. There was witnessed, to be sure, a culmination of quotations manifestly higher than in 1902 and prolonged over a greater



Fluctuations on New York Stock Market.

transportation. Great railway companies were bought and sold almost like eggs over the counter, the necessary funds being obtained by the issue of collateral trust bonds, secured by the deposit of the stocks thus purchased. The peculiar activity in railway consolidation, putting up market quotations unprecedently, is shown by the relatively great rise of the upper curve on the large diagram during 1900-1. The gap between railway and industrial index numbers, which formerly ranged from five to ten points, now becomes for several years 50 or more units. The widest separation between the two is in the late summer of 1902, when the index for industrials was about 67, while the peak of railway quotations carried them simultaneously almost to 130. The two indices stood for a season of ratios of almost one to two. A speculative pyramid was thus erected, finally embracing the general public on an unprecedented scale. On April 30, 1901, no less than 3,200,000 shares of industrial companies and railways exchanged hands. After a brief interruption, due to European interference based upon alarm at our financial excesses, the succeeding year 1902, was characterized by a renewal of speculation. But this time it fell into the hands of more reckless and financially irresponsible leaders. At this time the belated Rock Island plan was announced—chronologically related to the successful rail-

period of time. This could not be otherwise with the record of net earnings then being made, as will shortly be described. But the great campaign for the Federal and state regulation of common carriers was in full swing and operated to restrain an undue speculative enthusiasm. Whatever heights were attained by railway security prices were due to the phenomenal increase of business which the growth of the country had brought about. Prices could not well be "boosted" in the face of the political agitation then under way. Moreover the insistent pressure for funds for improvements and extensions, projected or actually under way, received little encouragement or satisfaction from a money market often drained of funds for purposes of speculation. No such positive legislative program concerned the "trusts." They likewise were prospering under their newly acquired earning powers. Their weaker members had been eliminated or been materially reorganized. So that in consequence the industrials, and mining and land promoters basked in a veritable sunshine of speculative favor. The railway financial sky, while moderately clear, was rendered hazy by the shadow of Congress. Matters thus went on for nearly two years, again with the inevitable result. Credit was overstrained, dishonesty developed, or rather was brought to light; and the panic year 1907 was the result. During this period, as the chart shows, the two

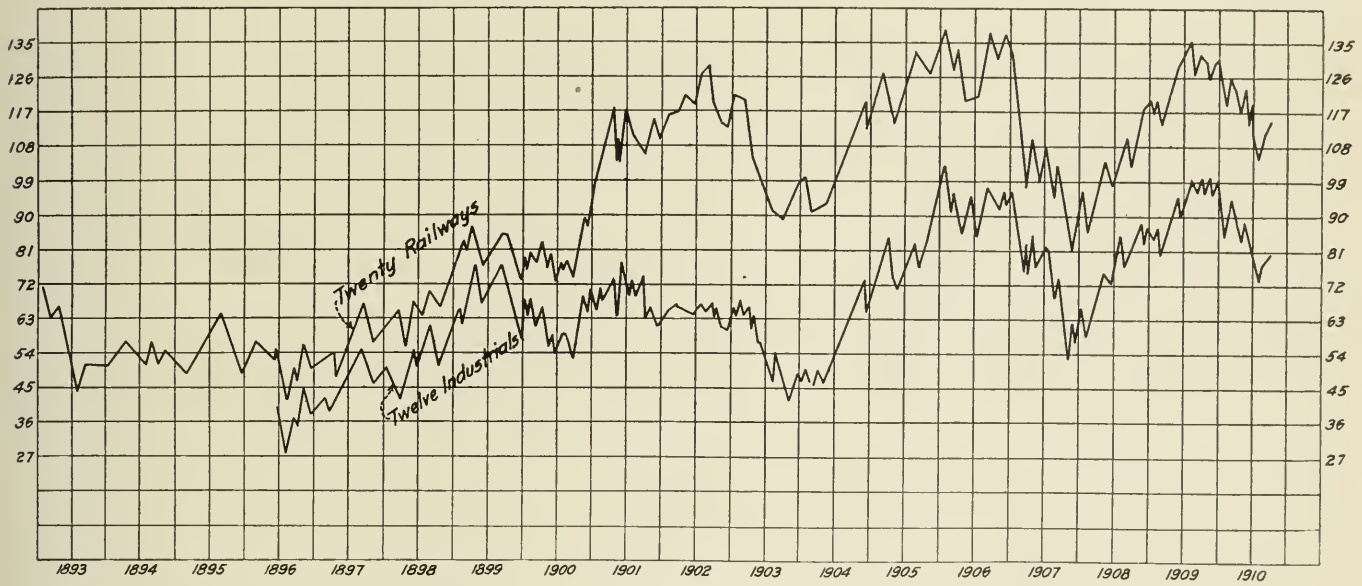
curves of index numbers were again becoming closer. The gap between them now narrows to about 30 or 40 points. So far as railways are concerned, recovery from this depression of 1907 was again retarded by a continuance of political agitation, finally leading up to the Federal act of 1910. And in the meantime the steadily increasing costs of operation, especially in so far as caused by widespread demand for higher wages, became more and more insistent. Despite these restraining influences, prices again rebounded after 1907, but scarcely attained the heights reached in 1905-6. On the other hand, they threatened in no wise to drop back to the levels of the preceding decade. Even the severe decline extending for over a year in 1909-10 does not bring the index numbers anywhere nearly as low as either in 1903 or 1907.

There yet remains for the briefest mention the speculative ripples upon the surface of the markets. These are for the most part seasonal, corresponding to the regular routine of crops, of the exigencies of banking and of general trade. Attentive consideration over a period of many years reveals what may be called a normal cycle. But the exceptions are so frequent that no confident prediction is ever possible.

Speculative campaigns "for the rise," so called, are usually favored by the periods of easy money in late winter and early fall. June and January "rises" are traditional, but are of course, when they occur, the periods during which professional speculators expect to dispose of their holdings, accumulated during the preceding dull months of easy money. Not infrequently also, plans are laid for uplifted prices, based upon advance crop news in August or early September. Such an advance enables the professional manipulator to dispose of any stocks on hand. He then prepares to buy again at such lower prices as are apt to prevail during the crop moving period when "money is tight," public speculation lags, and Congress and the state legislatures convene. But all of these fluctuations have little to teach in a large way. The cycle is as apt to occur in the hollow of a great wave, as at its crest. Such matters must be of daily importance to the banking community or the stock broker, but have little significance for the student of transportation in any large way.

Turning now to the general conclusions to be drawn from consideration of this evidence, a most important large question is raised by the relative heights of the great tidal waves before and after 1893-7. Has the general level, the mean tide, of prices reached an elevation permanently higher than that of 1885-92? Or may the downward movement now under way in 1910 carry us back to conditions substantially like those which then prevailed? Momentous issues, such as the reasonableness of present capitalization, and the fairness of increased rates for service in future, hinge upon it for their determination. A negative answer is alone possible. Whereas the "waves" of prices in the eighties fluctuated above and below 70, according to the *Wall Street Journal* scale, and dropped in 1893-7 to a general level of about 50; they now seem to rise and fall about a standard as high as 110. In other words, the mean tide is upwards of 50 per cent. higher than it was before the panic of 1893. The general level of the years before the panic seem to have been about reached by 1900. But the results of growth up to that year merely afforded a new base upon which to construct an enormous advance, which has been in the main held ever since. Whatever fluctuations occur, and, as we shall see, they appear to be wider than ever before, none of them drops to any figure comparable with the price levels of the close of the last century. Nor is there the slightest doubt that conditions have become permanently established upon a higher financial plane as a result of the changes which have occurred since the year 1900.

On the other hand, the price chart bears evidence of a certain fixity or rigidity of financial status, particularly since 1903. There is great activity, with wide fluctuations above and below what appears to be a more or less horizontal line. But there is less evidence of up-grade in the general range during the last five years than for the first half of the decade. Prices seem somehow to have reached a sticking point. This is so important a matter that it merits examination with the utmost precision. Fortunately a very careful study of the prices of railroad securities, as compared with those of commodities in general, has recently appeared.* It has the advantage moreover, of being entirely independent of the *Wall Street Journal* index, already charted. Thirty-five railways and five express and allied companies, all affording continuous records since 1890, are comprehended in the series. Roads like the Burlington, Lake Shore, and even the Rock Island, are omitted because of change of financial status within the period. Moreover, the list excludes preferred shares in the main as being less sensitive to changes of sentiment or conditions. In this regard the index differs widely from our former series. In short this is really a more scientific selection than that of the *Wall Street Journal*. It is probably more reliable than any other evidence to be had. The index numbers for commodities are the well-known ones of the United States Bureau of Labor, slightly modified for purposes



Comparative Prices of Railway and Industrial Securities.

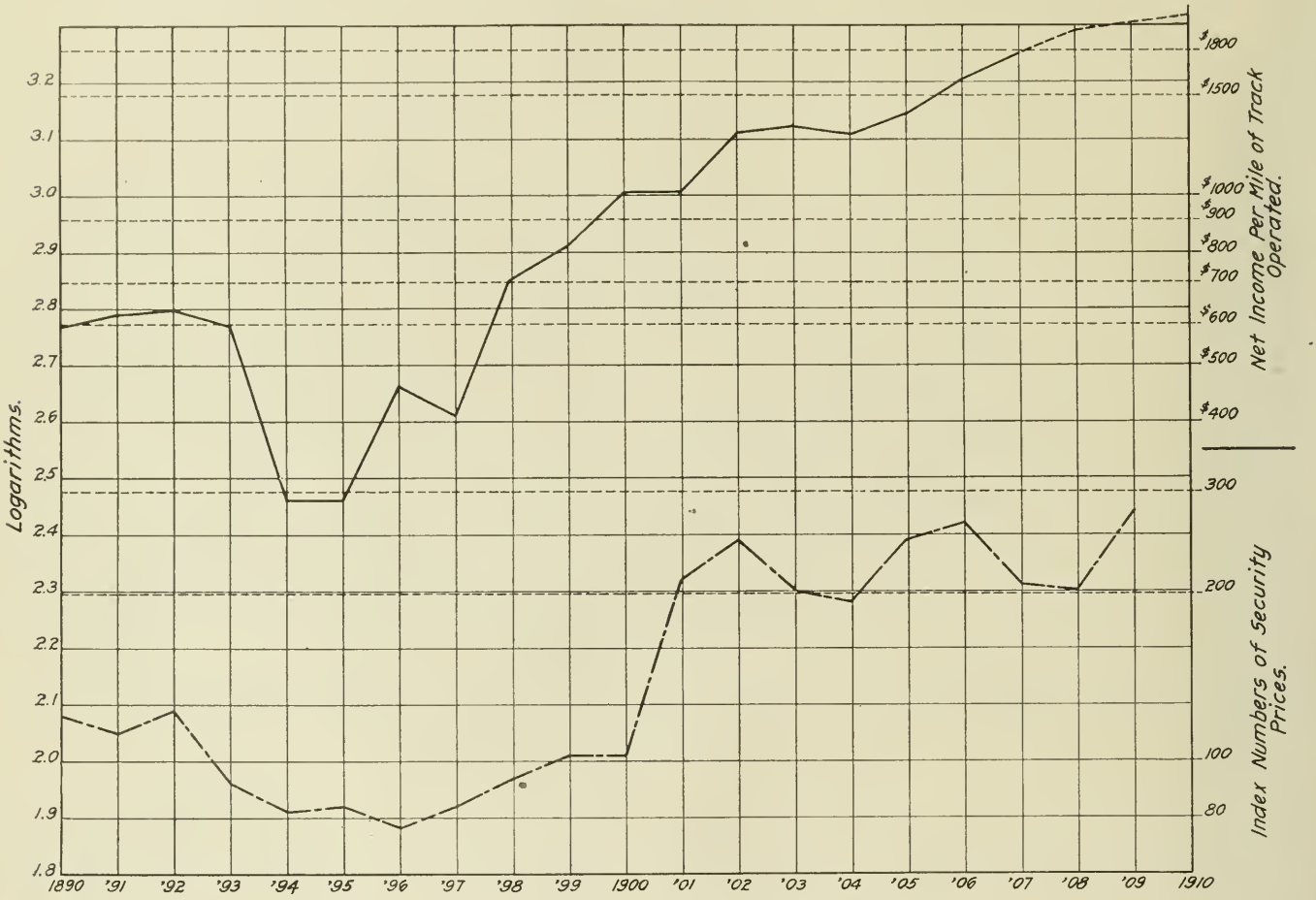
*Professor W. C. Mitchell, of the University of California, in the *Journal of Political Economy*, XVIII, 1910, pp. 345-380.

of precision. For both securities and general prices, the average for the decade 1890 99 is taken as 100; and the arithmetical mean for each year is based thereon.

In addition to the valuable data of Mitchell as to market quotations, the course of net income of American railroads, as a whole, is essential to know, This is afforded by the official Statistics of Railways of the Interstate Commerce Commisson. But instead of taking it by miles of line, it seemed best to reduce all income to a unit basis of trackage operated. Yards and sidings are excluded, but all the great improvements of double and even quadruple tracking of the last ten years are taken into account. And then, finally, in order to show with scientific precision the relative changes in each of the data compared, all the results have been plotted, not upon an absolute but a logarithmic scale. Such a scale, as is well known, indicates graphically by the slope of the curves the ratio of change in each case. It eliminates all differences of absolute magnitude. Everything is reduced to a matter of proportional change or rate of growth. The figures for interpretation as to absolute amounts are given on the right hand side of the chart. The lower half of the scale applies to the index numbers of price; those upon the upper half enable readings as to the net income per mile of track operated. But the really important features of the chart are not absolute amounts at all, but the relative slopes of the various curves for identical periods. Unless this point be firmly grasped, the real significance of logarithmic presentation is lost.

The first noticeable feature of this diagram is the rather close parallel between the movement of net income and prices of securities up to about 1902. Certain differences in individual years appear, as for 1896; but for the most part the two curves rise and fall together. They thus keep about the same distance apart. Between 1896 and 1902 growth of income seems to have anticipated stimulation of market prices; but the net result measured in percentage of growth is about the same for each.

It is the course of events since 1902 which has the most significance. The net income year by year has gone on increasing; but, on the other hand, security prices seem to be fluctuating up and down about a horizontal rather than an ascending line. This would be even plainer were precise results for 1910 to be added; for the curve turns sharply down again, as it did in both 1903 and 1907. Both years of notable depression, in security prices, have only entailed slight halts in the upward course of income. This result in general may be shown in another way: Compare the reasonably comparable periods, 1890-2, and 1907-9, for example. Brief calculation for each of these three-year periods shows that in this interval of eighteen years, while market quotations for railroads have about doubled, the net income per mile of operated track has increased more than threefold. Gross earnings per mile of line have during the same period only a little more than doubled. The surpassing rate of growth of income becomes even more striking if brought down to the latest date. While official data from Statistics of Railways for yearly periods are not yet available, a careful comparison by months covering the three years 1907-9 shows that operating income rose by about 20 per cent. The year 1910, so far as revealed, stands about 25 per cent. ahead of 1907—the last year included upon the chart. At this ratio, net income per mile of track operated in 1910 would be approximately three and one half times that in 1890-2, as compared with market prices enhanced at little more than half that rate. The latest indications for 1910-11 are for a distinct slackening of this rate of growth of net income.



Logarithmic Chart Comparing Income and Prices of Securities.

This remarkable record of income is not due alone to an increase in the volume of business. Density of freight traffic has only about doubled within the same period. It is the character of the business which has perceptibly improved. In the early nineties the crops were all-important, and directly so. But there has been no increase in the volume of American agricultural

production commensurate with this augmentation of market prices and of net earnings. There was raised in 1890-2 about three billion bushels of cereals. The normal average production at the present time is scarcely 50 per cent. greater, not 100 or 200 per cent. One cannot therefore correlate the rise of income with the growth of our agricultural production. The statistical phenomenon which most closely corresponds in advance to that of railroad security prices and net income is the aggregate of bank clearings for the United States. These have gone on their upward way in much the same fashion evinced by railway financial phenomena. This is as it should be. For careful analysis of railroad traffic shows that it is steadily rising in grade. That is to say, mere raw agricultural products have become relatively less and less important and the general conditions of trade more and more so. It goes without saying, of course, that trade depends to a considerable degree upon crops; but the relation to railroad finance is considerably less immediate than it was a generation ago. Hence it should follow that bank clearings, taken as an index of trade conditions, ought normally to follow much the same onward course as the earnings of railroads; much more so than mere cereal production. It would be of great interest, were there available data, to compare the course of these two generally reliable criteria of trade activity, the earnings of railways and bank clearings, with a third one, the percentage of unemployed labor. This again often clearly reflects the state of business; but statistical practice in the United States is not yet sufficiently advanced to afford data, except in a few commonwealths like New York and Massachusetts.

There appear to be a number of distinct explanations for this relative retardation of security prices. It may be caused by an undue increase in capitalization as compared with earning power. It may be because of new and large entirely unproductive investments demanded by the public. It may be because of heavy capital obligations, ultimately productive but not yet utilized profitably to a large extent. It may be due to the competition of other forms of investment for the available surplus funds of the country. And, finally, it may be influenced by a change in the general rate of interest. Each of these factors seems to have played a part in encompassing the general result. And several of them seem to have acted quite independently of such other coincident influences, as the rise of commodity prices, increasing costs of operation or rising rates for service rendered. Two variables, market prices and revenue power, which, according to all economic laws, ought to move in unison, have somehow failed to do so. Positive explanations for so unusual a phenomenon are certainly needed as an aid to elucidation of the impending issue of government supervision of capitalization.

As for the first factor, above named, it is certain that many railroads have vastly increased their outstanding issues of stocks and bonds within the last decade. Some of them have surely allowed this enhancement of capitalization to outrun the growth of earnings. The New Haven road is a conspicuous example of financial expansion of this sort. But in all such cases the conclusion is entirely untenable that such expansion has enriched individual investors at the expense of the community. Often the result has been just the reverse. Market quotations of shares have progressively declined because of doubt as to the ability of the companies to continue their regular dividend policies. The fact is that within the period under consideration enormous increases in railway capital per mile of line have been made for purposes of improvement. Double and even four tracking, steel in place of wooden bridges, heavier rails and rolling stock, and especially much enlarged terminal facilities, have necessitated vast expenditures. Average capital invested per mile of line has greatly increased, although unfortunately we have no exact means of knowing how much. Such an increase requires far heavier net income per mile for its reasonable support. Had net earnings trebled, and had nominal capitalization also trebled during the same period, prices, instead of responding to the advance of revenue power, would have remained just as before. Such, in fact, or even worse is the condition of affairs in England. So grievously have they erred in allowing their volume of security issues to expand, even faster than their increments of revenue, that prices of securities have actually declined in the face of a moderate expansion of traffic.

In the United States there is yet another feature of this increased capitalization which goes to explain in fact the relative inertness of quotations. Wherever such new capital has been obtained by extensive issues of shares at par or below the market price the effect, of course, is to reduce proportionately the market quotations. The value of "rights" comes off the price of the stock. On roads like the Great Northern or the Lackawanna such deductions for rights have been very great. Thus the relativity between income and quotations is disturbed in a twofold manner. It can scarcely be doubted that the relatively slow rise of our security prices tends to show that the enhancement of earning power has been appreciably outrun by the growth of capital obligations.

The second explanation offered is that large expenditures have been called for in recent years which are not in themselves directly productive of revenue. This is peculiarly true in the more densely settled districts east of the Mississippi and north of the Potomac and the Ohio rivers. Demands from the public have come thick and fast, both for better service and for safer service. The latter form of expense is, perhaps, financially, the more burdensome. Safety devices of all sorts, block and signal systems, air brakes and improved couplers for freight trains are becoming the rule. And, as involving still larger outlay, the growth of population brings an irresistible demand for abolition of grade crossings, not only in large cities, but all along the right of way. Larger and better stations and terminal facilities are also demanded. Many of these improvements, although entirely proper, add nothing to the revenue capacity of the roads. Nor are they ever expected to add to it directly. Nevertheless the funded capital investment which they entail becomes a direct charge upon earnings and takes priority over the capital stock. It is inevitable that any growth in this form of expenditures must operate to retard the rise of quotations. The recent statement of President McCrea of the Pennsylvania in the freight rate hearings was highly significant. He reported an outlay of $108,000,000 on the New York terminals, for a large part of which no additional return could reasonably be expected. Prestige and strategical position undoubtedly count for much; but, on the other hand, an improvement in public service for which the public in general may well congratulate itself follows as a matter of course. Yet such enormous outlay has directly affected the quotations for the shares.

Enormous outlays have been required in recent years, not only for public purposes quite unproductive of revenue, but also in order to lay a secure foundation for the traffic of future years. Such expenditure differs from the preceding sort in that while both may be for the moment unproductive, this latter class is intended ultimately to bring about a profitable use. Many companies, such as the Pennsylvania or the Chicago & North Western, have been forced by the growth of their traffic to make enormous actual investments of capital either from outside subscription or from reinvestment of surplus incomes, which capital has not as yet begun to yield a fair return. All over the United States a point seemed to have been reached a few years ago when the physical plant suddenly became outgrown.* Single track lines were swamped with traffic and terminals became congested beyond endurance. Great additions were made, in some cases sufficient to care for growth for many years ahead. Sometimes these additions were paid for by outside subscriptions of capital, sometimes by reinvestment of surplus earnings; but in either case the new increment of capital could not in the nature of things be utilized to its full capacity; that is to say made to yield immediately a normal rate of return in and of itself. The result was an apparent "watering" of capitalization. Only moderately increased revenues had to be distributed over a much wider capital base than before. Only gradually, as the growth of

*Fully discussed by the author in the *Railway Age Gazette* for September 4, 1908.

traffic "takes up the slack" of the new capital investment, will this apparent "watering" disappear. The present status of the Pennsylvania Company perfectly illustrates this point. Having now largely completed additions and improvements, adequate for the needs of years to come, its securities may with some confidence be expected to appreciate in value even more than commensurate with the growth of traffic or earnings from year to year. The present market price on its stock is not low because it has been unduly watered, but because it has to bear for a time a disproportionate burden of capital cost incurred to meet the need of future years.

The fourth factor, partially accountable for the laggard movement of market prices, is the competition of other forms of investment. There can be no doubt that the great and successful industrial combinations have heavily drawn upon the available supplies of capital for investment. And this tendency has been particularly potent since the panic of 1903. In this connection the divergences between the courses of the two index number curves in recent years, already commented upon, are significant. The closing up of the gap between the price indices of railways and industrials within the last five years has been due to the relatively greater rise for industrial securities. Their steadily expanding earnings, now that the weak ones have been eliminated; their immunity from price regulation by governmental authority, and the adoption of policies of financial publicity—all these influences have brought them into high favor. Moreover, the wonderful expansion of the world's copper consumption has necessitated great promotion of mining ventures. There is only about so much new capital available year by year for purposes of investment. And every share of the United States Steel Corporation, of American Tobacco or Sugar or of the Amalgamated Copper Company becomes a competitor with the securities of the railways. The potency of such competition cannot be doubted.

A factor finally to be reckoned with in comparing the general movement of prices is the possibility of a change in the general rate of return upon all capital investment. Any increase in the normal interest rate would necessarily bring down market quotations to a corresponding degree, even in the face of a constancy in the rate of net earning power. This intimate relation of the money market to prices was well exemplified in the fall of 1906 and the ensuing spring. Money was very "tight." First of all, this brought down the quotations for all classes of bonds; long-term securities were entirely unsalable at fair prices. The railways were compelled to issue notes as prices to yield nearly 6 per cent. This, in turn, induced the holders of stocks yielding less than this rate at going prices, to sell them down to an equilibrium. The drastic decline of the first quarter of 1907 was largely due to this cause. Imagine such a process, operating in either direction, to become chronic instead of acute, and permanent changes in price level must inevitably follow.

Taking into view all the complex factors set forth in the preceding paragraphs, one cannot entirely avoid the conclusion that one main reason for the retardation of market prices behind the advance of net market earnings has been a somewhat inordinate increase in merely nominal capitalization of our American railways. Almost every financial operation tending to an addition to capitalization; pure stock dividends following long continued reinvestment of surplus earnings in the property, or even offered without such warrant; additional subscriptions of new capital in order to increase facilities—nearly all of these operations offer in some form or another a bonus to stockholders or bond syndicates. There must be liberal "commissions" or stockholders' "rights" in order to encourage participation. And the result is that net earnings are to some degree distributed over a wider base than before. Were this not so, market prices of many roads—Lackawanna or Great Northern, for example—would unquestionably be far higher than they are to-day. Whether the new capital for expansion or improvement could have been obtained without such substantial encouragement must remain largely a matter of opinion. Similar "plums" by industrial combinations certainly tempt new capital away from railways. And such competition, of course, has to be counteracted in some way. On the other hand, for roads like the Pennsylvania, the gradual process of completer utilization of plant, built to accommodate years of growth ahead, will greatly lessen the apparent force of whatever indictment these comments may seem to imply. An entirely reasonable and proper explanation for the relatively retarded rise of market prices may be found within certain limits in the philosophy of railway finance herein contained.

Attention is drawn by the diagrams of security prices to yet another large issue. Can there be any question, after perusal of these charts, that the secondary waves of prices, as distinct from the great tidal sweeps, are more marked of late than they used to be? Are not the crests and hollows since 1898 much wider apart than they were prior to 1893? Shall we be content with the reply that inasmuch as the tidal depth is increased, the surface waves may properly be greater? A range of twenty units on our scale sufficed to define a "wave" in the earlier period. This was between one-third and one-quarter of the general elevation of the index number. Nowadays between crest and hollow forty units range is not unusual. This, to be sure, is still not far from one-third of the now substantially raised general level. But does that explanation suffice? One inevitably correlates this phenomenon with the great movements toward consolidation in operation, and concentration of control. This movement embraces, not railways and industrials alone; it comprehends within its sweep all manner of financial agencies. Banks and trust companies, especially in New York, are arrayed in great groups, with a resultant unprecedented power of domination. The great insurance companies, happily enough, have now been in a measure forced to stand somewhat apart. But all other agencies of importance in the game of organized speculation now co-operate to a common end as they never did before. And it is, of course, almost too well recognized to warrant mention that speculation creates or exaggerates; because it lives upon change, all of the normal fluctuations of prices determined from year to year by the weather, politics or fortuitous events.

Another matter, too technical to be fully treated at this time, but worth a passing comment, is the relation in time between changes of prices for railway securities and other commercial or industrial events. The stock market is very properly described as a barometer of trade conditions. It is its function to forecast the future. It is rarely concerned with happenings of the day, except they be sudden disaster. And, even then, it proceeds at once to consideration not of present status but of future effects. What then is the relation between the course of railway earnings and of the securities dependent upon them for returns? The answer may, of course, confidently follow that the security fluctuations regularly antedate the course of earnings. This is as it should be. It was well exemplified in the panic of 1903. Throughout most of that year security prices were crumbling away, and had actually begun to recover, according to our chart, before net earnings fell off. It was not in fact until January, 1904, that this occurred. Gross earnings might respond more quickly, owing to the ease with which expenditures may be postponed. But net earnings at this time were certainly very slow to respond to changes in general business. And much the same thing seems to have happened four years later, although the collapse was, if anything, more sudden.

But how about the course of railway earnings in relation to other commercial results of panic, such as changes in the volume of general business, the proportion of unemployment of labor, and more important still, the ups and downs of prices and of the costs of living? Is it indeed true, as has been confidently affirmed of Germany in 1900, "that the railroads are last to show the effects of depression and the first to recover? On the other hand, labor was the first to feel the depression and capital was the last to recover." If this be true of the United States as well, it has large importance for the owners of railway property. For it gives assurance of a stability of returns greater than that probable upon any other forms of investment. A most interesting and valuable vein of statistical research is uncovered extending over into fields hitherto not at all worked.

General News Section.

The Intercolonial—the government-operated railway of Canada—has made an increase of 10 per cent. in the wages of freight train men and of 20 per cent. in those of train men in the freight yards; all to take effect as of January 1 last.

The Highway Commission of the state of New York has opened bids for building 275 miles of wagon roads, and the contracts will soon be let. By these contracts nearly $4,000,000 is to be taken from the state treasury for the benefit of certain towns of the state.

W. J. Jackson, vice-president and general manager of the Chicago & Eastern Illinois and the Evansville & Terre Haute, has been appointed chairman of the General Managers' Association of Chicago, succeeding R. H. Aiston, vice-president of the Chicago & North Western.

Luis Jackson, industrial commissioner of the Erie railroad, says that on one division of the Erie, where the tracks have recently been relocated, so as to reduce the ruling grades, the number of locomotives required to move the freight of the division is now 27 less than formerly.

On Monday last all trains in the Interborough Subway, New York City, were stopped and held motionless for two minutes, as a mark of respect to the memory of John B. McDonald, the head of the company that built the subway, whose funeral took place on that day. The ticket offices at the stations in the subway are draped in mourning.

The government has entered suit in the Federal Court at Pittsburgh, Pa., against the Pennsylvania and its western connections, to recover penalties for 33 violations of the law governing the transportation of cattle. It is charged that the time limit of 28 hours for the confinement of cattle in cars was exceeded by more than 10 hours.

On complaints alleging violations of sixteen-hour law for freight train crews, in 55 separate instances, the Indiana Railroad Commission has directed the attorney general of the state to file as many suits against the Pennsylvania lines for violation of the law on the Richmond division. A like action is now pending against the Cleveland, Cincinnnati, Chicago & St. Louis.

Mrs. D. M. Tillotson, an operator in the office of the Western Union Telegraph Company at Chicago, has been retired on a pension after a service of 50 years. Mrs. Tillotson was born in New York state and was the first woman operator employed in the Chicago office. She has never used the typewriter, but in a test, eight years ago, she handled 60 messages an hour.

The legislature of the state of Washington has passed a bill for a full crew law. Besides requiring three brakemen on each freight train of 25 cars, it requires two brakemen on every passenger train of four cars or more and conductors on all engines running without trains. A press despatch of March 15 said that the governor had received a hundred telegrams asking him to veto the bill.

The legislature of Manitoba has sent a memorial to the Dominion Government at Ottawa asking that the Canadian railway law be so amended that railways may be compelled to put in telephones at all stations. Some of the farmers have complained that where there is no competition the railway companies refuse to install telephones, and that to the farmers this is a great inconvenience, especially in winter.

Charles R. Richards, chief of the college of engineering of the University of Nebraska, has been appointed professor of mechanical engineering, in charge of that department, at the University of Illinois, effective September 1, 1911. George A. Goodenough, who for many years has been associate professor of mechanical engineering at the University of Illinois, has been promoted to the grade of professor of thermodynamics.

The New York State Public Service Commission, Second district, calls attention to the fact that of the 9 persons killed and 307 injured in boiler accidents in the United States in the three months reported in the last government accident bulletin (bulletin No. 37), none of the deaths and only two of the injuries occurred in New York state, though New York has about one-seventh of the locomotives in the whole country. During the past year the number of boilers actually inspected by the two inspectors of the New York commission was 2,649; and they found 725 of these defective.

The general manager of the Lake Shore & Michigan Southern is quoted as saying that a number of retrenchment orders have been issued by this road and that probably some intended improvements will not be made. News items of this kind have been printed relating to affairs on the Chicago & Alton, the Illinois Central and the New York Central, but all of these items are brief and somewhat vague. The New York Central has dismissed considerable numbers of firemen; the Illinois Central has reduced office forces and the telegraph force and the Alton has laid off shop men at Bloomington.

The new railway law of California is already under discussion in the legislature for amendment, and the lower house has adopted almost unanimously a resolution looking to a constitutional amendment allowing the number of railway commissioners to be increased from three to five; the five to be appointed by the governor at large; but this proviso seems to be modified by a clause empowering the legislature to divide the state into districts. The increase in the number of members is a part of a movement to give the commission supervisory power over all public utilities. An Employers' Liability Bill, to apply to common carriers, has passed the lower house without opposition. This bill proposes to follow the federal law on the subject, doing away with the fellow-servant defense, etc.

The Indiana Railroad Commission announces that practically all of the interurban roads are observing the recent orders of the commission relative to discipline and other matters. The rule requiring a year's experience in the case of new motormen is being carried out without exception. The new law requiring a separate compartment for the motorman is being carried out as rapidly as the cars can be prepared. Only one company is disposed to question the necessity of such a rule. The expense to the companies in preparing separate compartments for motormen is from $25 to $75, according to the style of the car and kind of partition installed. The carrying out of the order of the commission to introduce the block system on interurban lines, now explicitly required by law, will be taken up by a committee with the commission on April 18.

When city or town authorities are too severe in the requirements which they impose on street railways, the New York State Public Service Commission (Second district), now and then takes a hand in behalf of the traveling public. In the village of Mamaroneck the trustees have been withholding their sanction to the construction of new turnouts (needed to facilitate the running of street cars more frequently), unless certain conditions, involving considerable expense to the company, shall be complied with; and the commission, having considered the situation has ordered the railway company, the New York & Stamford, to lay the turnouts before July 1, so that cars may be run at intervals of 10 minutes this coming summer; this frequency being held to be necessary to properly serve the public. The company is directed to secure municipal sanction; and what will happen if this sanction is refused remains to be seen.

The Ohio legislature has before it a bill to enlarge the powers of the state railroad commission. It is House Bill No. 325, introduced by Mr. Winters. It seeks to change the name of the commission to that of the Public Service Commission of Ohio. The bill was scheduled to be reported for action this week. The attitude of the shippers is non-committal, so long as the efficiency of the commission is not impaired, and at the meeting of the Ohio Shippers' Association in Columbus recently, this point was emphasized. The present commissioners are O. P. Gothlin, Oliver E. Hughes and J. L. Sullivan. Their tenure of office is six years, each governor having the appointing power of a representative thereon in each two year term. Commissioner E. E. Williamson of the Cincinnati Receivers' & Shippers' Association says: "We wish to recognize any and all good features of the proposed bill in so far as it operates for the public good, but we do not want to see the efficiency of our present commis-

sion undermined or weakened by having a load of additional work thrust upon it." The Joint Civic Committee of Cincinnati laid before the House Committee some criticisms. Under the new law the Cincinnati Traction Company would be exempt from supervision by the new Utilities Commission because a part of its lines are used for by an interurban railway. Also it was contended that the bill should provide for recording the true values of the corporations as nearly as could be determined, instead of the capital stock. Under the section which permits corporations to issue bonds for expenditures made within five years previous to the application of the law all the public service corporations of Ohio would be able to capitalize the money they have paid out in that period for wages. Wages not being an investment should not be capitalized. Another objection is that the law gives the commission no general grant of power to summon and compel the attendance of witnesses and to force them to testify.

Wages of Railway Machinists in Canada.

The wages of machinists in the railway shops of Canada average $2.98 a day, the same as in the United States. This statement is printed for the purpose of correcting an error which appeared in an account of Canadian railways, which was published in the *Railway Age Gazette* of January 6 last. The error arose from a mistake in copying the number of days worked by machinists, in the report of one of the prinicipal railways.

Safety Appliance Law Requirements.

The Interstate Commerce Commission has issued its formal order under the safety appliance act of April 14, 1910, extending the time to be allowed the railways to equip cars with uniform hand holds, hand brakes and other appliances required by the act. The commission adopts the recommendations made to it by the committee of railway officials and employees, namely, freight cars in service before July 1, 1911, to be equipped so as to conform to the law by July 1, 1916; passenger cars by July 1, 1914; road locomotives, July 1, 1913, and switching locomotives July 1, 1912.

The original order of the commission in this matter, issued last October, was noticed in the *Railway Age Gazette,* October 7, 14 and 21, and November 11. The law requires all cars to have sill-steps and efficient hand brakes; requires ladders and running-boards to be secure and suitable, and authorizes the commission to enforce uniformity in number, dimensions, location, etc. The order now issued contains the following exceptions in regard to freight train cars:

(a) Carriers are not required to change the brakes from right to left side on steel or steel-underframe cars with platform end sills, or to change the end ladders on such cars, except when such appliances are renewed, at which time they must be made to comply with the standards prescribed.

(b) Carriers are granted an extension of five years from July 1, 1911, to change the location of brakes on all cars other than those designated in paragraph a to comply with the standards prescribed.

(c) Carriers are granted an extension of five years from July 1, 1911, to comply with the standards prescribed in respect of all brake specifications contained therein, other than those designated in paragraphs a and b, on cars of all classes.

(d) Carriers are not required to make changes to secure additional end-ladder clearance on cars that have ten or more inches end-ladder clearance, within 30 in. of side of car, until car is shopped for work amounting to practically rebuilding body of car, at which time they must be made to comply with the standards prescribed.

(e) Carriers are granted an extension of five years from July 1, 1911, to change cars having less than 10-in. end-ladder clearance, within 30 in. of side of car, to comply with the standards prescribed.

(f) Carriers are granted an extension of five years from July 1, 1911, to change and apply all other appliances on freight train cars to comply with the standards prescribed, except that when a car is shopped for work amounting to practically rebuilding body of car, it must then be equipped according to the standards prescribed in respect to handholds, running-boards, ladders, sill-steps and brake staffs: Provided, That the extension of time herein granted is not to be construed as relieving carriers from complying with the provisions of Section 4 of the Act of March 2, 1893 [requiring hand-holds in ends and sides of all cars used in interstate commerce].

(g) Carriers are not required to change the location of handholds (except end-handholds under end-sills), ladders, sill-steps, brake wheels and brake staffs on freight train cars where the appliances are within 3 in. of the required location, except that when cars undergo regular repairs they must then be made to comply with the standards prescribed.

Buffalo, Rochester & Eastern Hearing.

The hearing before the New York Public Service Commission on the application of the Buffalo, Rochester & Eastern Company for authority to build a double-track railway from Buffalo to Troy was formally closed on Thursday. The attorney for the B. R. E. in summing up said:

"The control of the railway situation in this state by the New York Central is complete. It has its grip firmly fixed on everything, or nearly everything, in the neighborhood. Its ramifications are powerful and extensive. Six tracks and present facilities owned and controlled by the New York Central from Buffalo to the river should be the limit of their control, on broader ground, than the mere question of whether they are able to handle the transportation business naturally moving over such tracks or not.

"This case is a matter far reaching, bigger than delays, schedules, train service, estimates of tonnage and involves a fundamental consideration which strikes at the very root of the business prosperity of New York and New England and the territory served from the Niagara frontier and involves the prosperity of millions of people outside the territory directly served and the prosperity, comfort and happiness of hundreds of thousands of people in the territory directly to be served."

Electrification of Chicago Railways.

About a year and a half ago C. A. Seley, mechanical engineer of the Rock Island Lines, presented a paper on this subject before the Western Railway Club of Chicago. At a meeting of this club last Tuesday Mr. Seley presented another paper on the same subject, which was intended to cover the developments which had taken place since his first paper was prepared. He drew attention to the fact that the electrical engineers are not at all agreed as to the best method to be used for operating the roads electrically, and that there is at present no complete electrification of any railway or railway terminal comparable in size to the principal railways in Chicago. A considerable portion of his paper was devoted to the report of the Massachusetts Joint Board on Metropolitan Improvements, which was referred to in Mr. Seley's discussion of Paul P. Bird's paper on Locomotive Smoke in Chicago. Mr. Bird's paper was published in the *Railway Age Gazette* of February 17, page 321, and Mr. Seley's discussion of it appeared in the March 3 issue, page 385. A brief account of why the Massachusetts Joint Board decided against compelling the railways to electrify in and about Boston appears in another part of this issue in connection with the account of the electrical night of the New York Railroad Club. Mr. Seley also reproduced portions of the reports of officers of the New York, New Haven & Hartford and the Boston & Albany showing that the roads in the vicinity of Boston could not be electrified without greatly increasing the fixed charges and the operating expenses. Reference was also made to a paper by F. Darlington, chief engineer of the railway department of the Westinghouse Electric & Manufacturing Co., read before the Canadian Railway Club, in which it was shown that unless electrical power can be generated in very large plants and with a good load factor, the results will not be economical. The load factor in this case is defined as the ratio between the average load and the maximum or peak load. As the average load factor for principal plants generating power for railways is between 20 and 35 per cent., and as the fixed charges are necessarily based on the complete plant and the maximum output, it places a heavy burden on the actual production.

Chicago Electrification Studies.

A commission of railway officers, city officers, merchants and others has been appointed by the Chicago Association of Com-

merce to further investigate the electrification problem in that city; and this commission will appoint a chief engineer, who, with a staff of assistants, will make a systematic study of the engineering problems involved. The commission is made up largely of the same men appointed by the mayor a month ago to act as a railway terminal commission (see *Railway Age Gazette,* February 24, page 372). Among the railway officers on the commission are president Gardner of the Northwestern; president Miller of the Burlington, and vice-president Schaff of the New York Central. Dean Goss of the University of Illinois is also a member.

Chicago Track Elevation.

The officers of the city and the engineers of the railways have practically agreed on the plans for elevating about 15 miles of railway in Chicago during the next six years, most of the work to be completed in four years. The most important sections are the Illinois Central, Seventy-ninth street to Kensington avenue, five miles; New York, Chicago & St. Louis, Seventy-ninth street to Ninety-fifth street, two miles; Chicago, Rock Island & Pacific, South Chicago branch, two miles; and Chicago & Western Indiana, State street to Stoney Island avenue and on the Dolton branch, 3½ miles. Other sections are on the Belt railway, the Michigan Central and the Kensington & Eastern. The cost of the proposed work will be probably $4,500,000.

"Accounting Series" No. Z9999X.

"Conductor Zerbe, of Lock Haven, running a passenger train on the Pennsylvania Railroad, last Thursday collected what proved to be the oldest ticket picked up in many years. At Milesburg a lady got on board and presented a ticket dated March 25, 1871. The ticket was in a splendid state of preservation."

The foregoing, from a local newspaper, is reprinted here for two reasons; first, to congratulate the lady on the fact that her ticket was not one of a "reorganized" company unable to honor its outlawed obligations and, second, to call the attention of Professor Adams to the necessity of issuing a ruling to cover such cases. Think of the money, rightfully belonging to the public, which has accumulated in the railway's treasury, during those long years, in the shape of interest on the value of that ticket! Who knows but what thousands of such tickets are outstanding? One thousand sold at a dollar apiece in 1871 would represent today a large sum of money in the company's treasury —from $4,000 to $10,000, according to the rate of interest permitted or authorized by the government statistician. Let us have no more fussing with shadowy questions about obsolescence and suspense accounts, when such clear-cut issues as this remain unsettled!

Howard Elliott on Railway Efficiency.

Howard Elliott, president of the Northern Pacific, has given out the following statement, commenting on the remarks of the Interstate Commerce Commission in its opinions in the rate advance cases on the subject of scientific management:

"Railways have always kept pace with other American business institutions (and it is to be hoped they always will) in adopting better methods and ideas, as fast as their merit and practicability have been clearly established. Railway managers, officers and employees are banded together in numberless organizations, formed solely to study railway business, formulate new ideas and encourage better efficiency. These, with the many journals devoted to technical matters of railway business, are an indication that officers and men alike want the newest and best ideas and are striving for efficiency.

"The work of these men, coupled with a broad policy on the part of the owners of railways to give the public the best possible service, has made the railway of today hardly recognizable as compared with the railway of twenty or even ten years ago, and has placed the efficiency of the American railway far ahead of the railway in any other country in the world. The business man can reach farther with his goods, enjoys better and more prompt service than he formerly dreamed of, and the public never enjoyed the use of better, faster or more luxurious trains, and at rates so low that students of the subject of transportation who come here from other countries are amazed.

"The railways are constantly working to give the public better service and to make their methods of work more scientific, but if, in the face of rapidly growing expenses and diminishing net earnings, the public still insists on the increase of the already burdensome restrictions under which it has placed all of our railways, it will obviously have to do without what the railways would be glad to provide if they could. Railways must either earn or borrow money with which to meet the expense of improving old lines and the cost of new lines, and for furnishing better trains and better service. They are suffering, the same as do individuals, from the rising cost of living, yet they are paying a bill of $20,000,000 a year imposed by the people through board and commission control, much of which is very doubtful value. It might be better for all business to give the railways a breathing spell, eliminate much of the useless and unnecessary restriction under which they work, and give them a chance to work out their problem of giving the public the service it wants by friendly discussion with that public, rather than to have constant friction and bickering."

Firemen's Strike on the Queen & Crescent.

The movement of freight appears to be improving, but press despatches give very little reliable information. Press despatches in the past appear to have been highly sensational, as an officer of the road informs us that there has not been anyone killed and not more than six persons have been injured. "Most of the shooting and intimidation referred to in press reports emanated from sources other than persons living along the line." This officer says that passenger trains have been run regularly except one short-trip local passenger train, and that some freight has been moved every day. Embargo notices were sent to connecting lines in order to enable the public to take advantage of other railways, where possible. The only time that negro firemen have been employed north of Oakdale was during the first few days of this strike (March 10-14). An officer of the company in a letter to the citizens of Lexington, said that the reports that employees and special agents had been killed were absolutely false. The company offered a reward of $500 for the conviction of law breakers and applied to the governor of Kentucky for the appointment of 34 of its employees as special policemen. There is no serious accumulation of freight at any point on the line.

H. Baker, general manager, issued the following statement regarding the strike:

The white firemen left the service on March 9. The railway is divided into three operating districts. The third district is the one between Chattanooga, Tenn., and Oakdale, Tenn., a distance of 84 miles. In 1904, before the present management had charge of the road, it was not possible to secure enough white firemen to operate trains between Chattanooga and Oakdale, and because of this the company was forced to employ negroes as firemen and has had negroes in service constantly as firemen since 1904 on that part of the line. The agreement between the management and the firemen applies to all firemen. The committee representing the white firemen demanded that the company should, within 90 days, discharge from the position as firemen all colored men so employed and to agree that thereafter no negroes be employed as firemen. The company declined to grant this demand, and, thereupon, the committee representing the white firemen gave notice of their purpose to leave the service of the company. The committee gave this notice to take effect in less than 24 hours—in conflict with article 45 of the agreement dated July 1, 1910, which provides that 30 days' written notice shall be given of any purpose to revise or abrogate the agreement. The management immediately filed protest against this action, but, although an investigation was promised, no final answer has been given by the committee representing the firemen or by the officers of the firemen's organization. The Erdman Act provides for mediation between a railway and its employees, and at the last conference, on March 9, before the strike order took effect, the committee representing the firemen was urged to consent to mediation. This was declined, but, as the law provides that either party may make application to the mediators, a telegram was at once sent by the railway company to Judge Martin A. Knapp (appointed by President Taft as one of the Board of Mediation, Washington, D. C.), requesting him to immediately use his good offices with the firemen to bring about mediation. Although the management

of the railway has been always willing to accept the services of Judge Knapp as mediator, the officers of the firemen's organization and the committee representing the firemen have declined to accept his services.

The company has at all times faithfully carried out the provisions of the contract between the company and the firemen. Negroes are not employed as locomotive engineers, and the company will not employ negroes as engineers. Only white firemen are promoted to position of engineer. When the white firemen left the service of the company on March 9, on less than 24 hours' notice, it became necessary for the company to obtain such firemen as could be obtained to move the passenger and freight trains and meet the needs of the public. The company has always endeavored to give good service to its patrons and to meet in every way as a common carrier the needs of the public. It is recognized throughout the entire country as a high class railway, and the management will appreciate any assistance which can be rendered by the citizens in sections through which the railway runs in restoring the former satisfactory service. This statement of the situation is made so that all persons interested and the public generally may know the actual conditions.

Spokane Transportation Club.

The Spokane Transportation Club held its annual banquet and election of trustees on February 25, 1911. Covers were spread for 131 persons, every railway entering Spokane or doing business there being represented. Waldo G. Paine, vice-president and traffic manager of the Spokane & Inland Empire, acted as toastmaster. Among the speakers of the evening were J. B. Campbell, secretary of the Spokane Merchants' Association; Robert E. Strahorn, vice-president of the Oregon-Washington Railroad & Navigation Company, and H. G. Hawkins, of the Chicago Great Western. The following persons were elected as the executive committee: Waldo G. Paine, Spokane & Inland Empire; A. MacCorquodale, Oregon-Washington Railroad & Navigation Company; H. S. Collins, Chicago & North Western; E. C. Fleming, Great Northern; A. W. Doland, Spokane Drug Company. On March 2 the following officers were elected for 1911: Waldo G. Paine, president; A. W. Doland, first vice-president; H. S. Collins, second vice-president; J. W. MacIntosh, secretary; R. L. Ford, treasurer.

The Transportation Club of Detroit.

The officers of The Transportation Club of Detroit, Mich., are as follows: President, Walter G. Norvell, traffic manager, Parke, Davis & Co.; vice-president, L. M. White, commercial agent, Missouri Pacific; second vice-president, William Ferguson, traveling freight agent, Wabash; third vice-president, Frank E. Snow, agent, Lehigh Valley Despatch; secretary, W. R. Hurley, chief clerk, superintendent's office, Lake Shore & Michigan Southern; treasurer, Harry R. Ruse, ticket agent, Pere Marquette. The membership of the club is nearly 400.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering and Maintenance of Way Association.—E. H. Fritch, Monadnock building, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.; annual, November 6-10, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday, Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; next convention July 25-27, Chicago.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday, Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs., Jan., April, August and Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The census bureau has gathered statistics of the cotton crop for the past year and reports that, including linters, there will be over 12,000,000 bales. This is 500,000 bales more than the number estimated by the Agricultural Department last December.

In the first seven weeks of this year the station agents of the Southern Railway in Georgia reported the receipt of about 40 per cent. more commercial fertilizers than in the same period of 1910—35,712 tons this year and 25,607 tons last year. It is believed that this increase is due, not so much to an increase in acreage, as to the determination of the farmers to secure larger crops on each acre.

A man has complained to the Pennsylvania State Railroad Commission, because he could not get, for 25 cents, a seat in a sleeping car for a ride of about 50 miles, in the middle of the night. The Pullman conductor informed him that after 11 p. m. the charge would be the same as for a berth all night, $1.50. The Pullman Company holds that the ordinary hour for retiring should be 10:30 p. m., and, in its answer, so advised the commission.

The Interstate Commerce Commission has denied the request of western railways for a further hearing regarding the question of the readjustment of passenger rates under the fourth section of the Interstate Commerce act. The roads had appointed a committee composed of Gerrit Fort, passenger traffic manager of the Union Pacific; John Francis, general passenger agent of the Chicago, Burlington & Quincy; W. J. Cannon, assistant general passenger agent of the Chicago, Milwaukee & St. Paul, and B. H. Payne, general passenger agent of the Missouri Pacific, to present their case to the commission, but Commissioner Prouty notified the committee that the commission had finally decided to require the roads to conform strictly to the provisions of the fourth section and that they must get their tariffs revised by April 1, so that they will show the specific fares, and by July 1 must make all their tariffs conform to the long and short haul clause, except in cases covered by specific applications.

Traffic Club of New York.

The Traffic Club of New York will hold a meeting at the Waldorf-Astoria, Tuesday March 28, at 8 p. m. Alvin Hunsicker, general manager of the Standard Oilcloth Company, will speak on "Our Business and Our Relations to the Public and Carrier."

Traffic Club of Chicago.

William Ellis, commerce counsel of the Chicago, Milwaukee & St. Paul, was a speaker at the monthly luncheon of the Traffic Club of Chicago on March 14. Mr. Ellis's subject was Government Regulation. He said that regulation itself is so firmly established that the question of whether there ought or ought not to be regulation is beyond discussion. Continuing Mr. Ellis said in part:

"Today the different states by means of their commissions regulate part of the service, part of the rates and part of the operation of railways. The commerce commission regulates part of the service, part of the rates and part of the operation, and the several legislatures regulate part of the rates, service and operation. Out of all this mass of diverse regulation comes a conflict of interest costly to the railways and necessarily reflected in additional burden on the public.

"The real reason underlying this difficulty is that no practical railway man serves on any railway commission and no practical railway man could be elected to any legislature, so that these questions requiring for solution knowledge which can come only with experience, are decided by those who lack such experience. The remedy would seem to be in strengthening the power of the commissions and in enlarging their fields. There could be appointed to these bodies a minority of practical railway men, including both expert traffic men and expert operating officials. I would have the legislatures pass no laws whatever affecting the railways, and when in their judgments additional regulations are necessary they should proceed by resolution setting forth what they think should be done, to be referred to the commission with direction to investigate and, with proper delegation of power, to act.

"It would seem that such regulation as this would result in broader and more technically intelligent action. There probably would be little difficulty in finding for both state and federal positions railway officials to whom such service in the interest of both carriers and public—for their interest is a common one—would be a fitting conclusion to a career of railway service."

INTERSTATE COMMERCE COMMISSION.

The commission on March 20, issued a circular outlining its proposed course in regard to telegraph and telephone companies, which by the law of last June are included in the term "common carrier," and made subject to the Intertsate Commerce Law, as a regulation of interstate business. The commission holds that each and every telegraph and telephone company transmitting interstate messages is subject to the act; but that if an intrastate company transmits an interstate message to another company, it is not subject to the provisions of the act unless there be an arrangement between the two companies for through continuous transmission. If two or more lines connect and are used for an interstate conversation the transmission of that conversation is interstate commerce; companies thus participating must conform to the provisions of sections 1, 3, 15 and 20, requiring that charges shall be reasonable and just, limiting free service, forbidding undue preference and regulating the keeping of accounts and memoranda. The commission withholds its views regarding other questions.

Fares on Electric Line Reduced.

Beall v. Washington A. & M. V. Opinion by the commission: Single passenger fare of 15 cents, Washington, D. C., to Mount Ida and other points in Virginia, about 5 miles, found unreasonable and ordered reduced to 10 cents. (20 I. C. C. 406.)

Long and Short Haul Rules.

The commission has issued a circular regarding the questions arising under the fourth section of the act to regulate commerce as amended June 18, 1910, ordering in substance, as follows:

"1. The fourth section applies to all rates and fares, but in determining whether its provisions are contravened rates and fares of the same kind should be compared with one another, that is proportional rates should be compared with proportional rates; excursion fares with excursion fares, etc. It would not be in violation of the fourth section, for instance, if the commutation fare to or from a more distant point were lower than the regular fare to or from an intermediate point.

"A proportional rate is one which applies to part of a through transportation which is entirely within the jurisdiction of the act to regulate commerce; that is, the balance of the transportation to which the proportional rate applies must be under a rate filed with the commission. A rate to a port for shipment beyond by a water carrier not subject to the provisions of this act would not be a proportional rate.

"An excursion rate is one which provides for a return to the initial point or some corresponding point.

"2. . . . Owing to the very general practice of absorbing switching charges from competitive and not from non-competitive stations, and in view of the fact that much benefit and little complaint results, the commission will, by general order, permit a continuance of this practice, reserving for consideration and determination individual cases which may require special consideration.

"3. If a carrier has been given authority to maintain from or to non-competitive intermediate points rates higher than those from or to more distant competitive points and a new intermediate station is opened, rates from or to such intermediate station which are in harmony with those authorized may be established without special authority.

"4. If a carrier is authorized to maintain rates to or from a given point which are not in conformity with the fourth section it may establish rates upon branch lines connecting with the main line at these points which are higher than such intermediate rates by arbitraries or by the branch line locals, without special authority from the commission."

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1911. (SEE ALSO ISSUE MARCH 17.)

Name of road	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Buffalo, Rochester & Pittsburgh	577	$615,472	$75,138	$707,659	$53,838	$145,442	$10,066	$256,015	$12,982	$478,343	$229,316	$139	$16,000	$213,455	$350
Central of Georgia	1,915	726,141	275,971	1,105,471	143,420	182,975	30,579	392,927	36,563	786,464	319,007	5,804	46,081	278,730	45,361
Chicago & Alton	1,025*	731,539	323,924	1,144,504	102,759	246,952	37,052	479,110	34,491	900,364	244,140	—1,198	37,000	205,942	40,774
Chicago & Eastern Illinois	966	815,993	174,430	1,059,760	84,784	179,821	22,371	431,749	35,475	754,200	305,560	—747	28,500	276,313	41,501
Chicago & Northwestern	7,744†	3,550,178	1,370,357	5,436,588	449,635	811,571	111,656	2,740,414	138,030	4,251,306	1,185,283	—4,134	260,000	921,149	660,946
Chicago, Burlington & Quincy	9,091‡	4,334,342	1,629,922	6,621,904	521,542	1,277,095	132,903	2,487,326	196,803	4,615,669	2,006,235	—10,334	250,454	1,745,446	76,315
Chicago Great Western	1,496	672,035	201,627	949,490	101,928	162,127	46,427	460,387	34,714	805,583	143,907	748	32,823	111,832	53,275
Chicago, St. Paul, Minneapolis & Omaha	1,744	826,640	324,495	1,231,883	66,397	165,170	21,681	588,520	32,699	874,467	357,416	—1,484	60,180	295,752	—4,607
Cincinnati, Hamilton & Dayton	1,015§	575,067	113,658	756,517	64,132	147,649	23,062	395,209	21,385	651,437	105,080	.....	32,303	72,776	15,927
Colorado & Southern	1,181¶	623,449	99,113	766,727	71,418	145,877	12,740	255,554	21,334	506,923	259,804	—2,391	24,700	232,713	—35,754
El Paso & Southwestern Co	901*a*	530,492	81,075	638,380	74,620	82,786	10,694	200,046	22,395	390,541	247,839	—853	20,074	226,912	32,948
Elgin, Joliet & Eastern	832*b*	518,011	3	546,763	49,415	145,292	3,710	206,258	13,465	418,140	128,623	.....	15,400	113,223	—22,714
Galveston, Harrisburg & San Antonio	1,338	596,462	246,108	890,717	112,715	158,895	30,731	370,413	28,738	701,492	189,225	—1,630	29,697	157,898	—6,657
Gulf, Colorado & Santa Fe	1,518	697,533	238,487	1,004,012	216,732	168,022	24,536	487,076	33,482	929,848	74,164	.....	33,307	40,857	—18,828
Houston & Texas Central	789	336,843	131,940	505,661	91,783	69,329	18,545	247,140	21,362	448,159	57,502	—1,275	17,842	38,384	12,752
International & Great Northern	1,160	511,986	168,196	732,765	125,015	124,090	21,929	344,163	21,816	637,013	95,752	—416	22,000	73,336	—12,412
Iowa Central	559	244,897	38,596	297,608	28,633	47,735	7,924	142,110	8,420	234,822	62,786	.....	9,876	52,910	28,118
Kansas City Southern	827	603,576	134,784	823,136	78,295	120,242	24,389	306,105	35,973	565,004	258,132	.....	26,384	231,748	—2,862
Lake Erie & Western	886	363,826	63,978	450,609	69,165	86,117	11,563	197,527	12,462	376,834	73,775	.....	18,000	55,775	—28,232
Maine Central	932	464,411	163,630	672,016	74,730	119,925	5,835	300,626	26,046	527,162	144,854	1,267	38,280	107,841	—24,701
Minneapolis & St. Louis	1,027	293,926	78,679	402,004	32,809	59,975	11,595	182,709	21,320	308,408	93,596	—12	18,748	74,836	49,840
Missouri, Kansas & Texas	1,737	915,998	402,972	1,409,057	158,133	133,128	39,210	515,221	46,187	891,879	517,178	—1,313	58,548	457,317	107,666
Missouri, Kansas & Texas of Texas	1,348	497,410	290,426	849,434	70,276	80,042	22,785	503,762	38,980	715,845	133,589	—2,972	22,500	108,117	67,357
Mobile & Ohio	1,114	667,528	124,931	933,881	106,497	174,345	31,677	325,617	34,281	672,417	261,464	833	25,460	235,171	3,999
Nashville, Chattanooga & St. Louis	1,230	811,854	237,673	1,127,811	158,162	221,555	34,359	398,389	23,555	836,020	291,791	—1,730	22,287	267,774	657
New York, Chicago & St. Louis	561	759,169	99,651	891,009	92,501	117,350	48,802	436,636	17,343	712,632	178,377	—1,851	29,600	146,926	—175,530
New York, Ontario & Western	546	583,329	73,662	681,841	73,349	131,535	10,688	334,069	17,840	567,481	114,360	—5,572	17,500	91,288	1,839
Oregon Short Line	1,646*c*	962,994	307,406	1,386,747	123,210	198,384	28,576	387,329	41,807	779,306	607,441	—4,477	69,075	533,889	—76,299
Oregon-Washington R. R. & Nav. Co.	1,636‖	756,815	343,485	1,170,281	139,504	129,057	38,836	494,778	46,410	848,585	321,696	—6,719	63,535	251,442	—
Pere Marquette	2,334	836,262	262,731	1,196,750	164,927	230,264	38,256	675,244	35,495	1,144,186	52,564	—11,345	57,331	—16,112	—165,796
Philadelphia & Reading	1,024	2,924,538	542,604	3,632,037	232,090	665,976	47,755	1,269,670	68,866	2,284,357	1,347,680	—26,977	83,961	1,236,742	—122,461
San Antonio & Aransas Pass	727	209,460	86,323	316,755	86,667	57,163	4,974	151,915	11,453	312,172	4,583	.....	11,000	—6,416	—90,759
San Pedro, Los Angeles & Salt Lake	1,105*d*	398,379	208,628	647,421	91,970	135,350	34,049	280,142	19,540	561,051	86,370	—4,716	26,734	54,920	138,937
Southern Pacific Co	6,187*e*	3,643,360	2,397,786	6,539,083	860,244	962,892	179,473	2,139,321	230,060	4,371,990	2,167,093	—45,177	283,654	1,838,262	—666,954
Texas & Pacific	1,885	883,901	323,081	1,322,663	134,445	246,155	18,074	622,604	38,059	1,059,337	263,326	—818	38,874	223,634	—111,554
Vandalia	827	547,727	181,960	824,523	79,352	170,528	28,605	371,078	21,619	671,182	153,341	.....	26,700	126,641	—95,567
SEVEN MONTHS OF FISCAL YEAR 1911.															
Buffalo, Rochester & Pittsburgh	572	$4,760,966	$668,736	$5,644,899	$567,526	$1,031,622	$80,582	$1,773,740	$92,738	$3,546,208	$2,098,691	$664	$112,000	$1,987,355	—$4,344
Central of Georgia	1,915	5,035,362	2,155,317	7,869,255	1,072,359	1,252,154	228,489	2,452,057	292,068	5,297,127	2,572,128	46,444	323,943	2,294,629	40,100
Chicago & Alton	1,025*	5,654,738	2,665,226	8,939,814	1,236,999	1,514,895	266,247	3,308,967	243,169	6,570,277	2,369,537	—13,515	251,600	2,104,422	—717,725
Chicago & Eastern Illinois	966	5,899,668	1,297,529	7,649,709	733,473	1,349,714	167,531	2,759,330	231,700	5,241,748	2,407,961	—9,647	195,629	2,202,685	36,332
Chicago & Northwestern	7,744†	30,099,225	11,916,517	46,016,396	6,376,686	5,504,209	757,732	18,724,970	955,050	32,318,647	13,697,749	—10,591	1,880,000	11,807,158	438,901
Chicago, Burlington & Quincy	9,091‡	36,096,868	14,298,358	54,883,164	7,195,865	8,800,065	947,042	17,531,336	1,294,476	35,768,784	19,114,380	—52,564	1,753,212	17,308,604	3,296,760
Chicago Great Western	1,496	5,207,849	1,763,968	7,534,225	845,990	1,117,679	329,067	2,993,884	249,150	5,535,770	1,998,455	2,419	229,758	1,771,116	—
Chicago, St. Paul, Minneapolis & Omaha	1,744	6,619,709	2,857,757	10,120,565	1,153,013	1,181,759	167,263	3,767,799	204,317	6,474,151	3,646,414	—8,106	412,515	3,225,793	476,606
Cincinnati, Hamilton & Dayton	1,015§	4,115,884	1,059,441	5,761,402	434,307	993,364	170,671	2,620,487	153,085	4,371,914	1,389,489	.....	211,140	1,178,348	—61,618
Colorado & Southern	1,181¶	4,636,158	1,015,914	5,954,285	698,741	1,129,360	82,940	1,857,324	155,537	3,923,902	2,030,383	—9,654	172,900	1,847,829	—55,032
El Paso & Southwestern Co	901*a*	3,517,489	566,957	4,291,337	549,726	570,057	74,018	1,209,139	158,795	2,561,735	1,729,602	—8,597	129,175	1,591,830	58,813
Elgin, Joliet & Eastern	832*b*	4,546,467	51	4,816,544	647,934	991,795	28,425	1,529,035	124,415	3,321,604	1,494,940	.....	107,800	1,387,140	—620,573
Galveston, Harrisburg & San Antonio	1,338	4,688,019	1,613,648	6,631,120	850,306	1,013,008	185,336	2,399,329	197,461	4,645,440	1,985,680	—19,867	210,746	1,755,067	34,124
Gulf, Colorado & Santa Fe	1,518	5,364,529	1,957,542	7,806,508	1,329,531	1,113,548	171,720	2,887,430	222,922	5,725,151	2,081,357	.....	230,345	1,851,012	263,721
Houston & Texas Central	789	2,777,700	1,044,269	4,069,942	533,854	468,905	128,163	1,537,019	150,427	2,818,368	1,251,574	—1,857	129,476	1,120,241	11,042
International & Great Northern	1,160	4,099,321	1,302,938	5,757,691	817,535	810,637	138,340	2,288,053	150,527	4,205,092	1,552,599	—2,587	152,000	1,398,012	366,839
Iowa Central	559	1,660,975	344,729	2,098,115	248,434	363,249	49,972	863,790	61,676	1,587,121	510,994	.....	68,616	442,378	1,470
Kansas City Southern	827	4,509,132	1,013,016	6,134,744	619,795	783,381	187,044	2,051,435	208,619	3,850,274	2,284,470	.....	203,242	2,081,228	392,067
Lake Erie & Western	886	2,633,823	577,857	3,393,054	545,285	627,559	112,402	1,282,882	85,716	2,653,844	739,210	.....	131,762	607,448	—262,498
Main Central	932	3,153,881	1,907,158	5,399,137	904,397	764,885	52,504	2,024,850	181,426	3,928,062	1,471,075	15,309	253,887	1,232,497	—369,440
Minneapolis & St. Louis	1,027	2,204,814	771,231	3,181,927	345,597	401,212	77,587	1,239,472	108,966	2,172,834	1,009,093	—240	141,724	867,129	—26,507
Missouri, Kansas & Texas	1,737	7,026,060	2,948,464	10,613,657	1,414,238	1,458,745	257,354	3,531,227	305,624	6,967,188	3,646,469	—312	405,068	3,241,089	—79,747
Missouri, Kansas & Texas of Texas	1,348	4,300,205	2,317,436	7,012,498	990,768	464,399	160,112	3,128,375	250,521	4,994,175	2,018,323	—6,382	157,102	1,854,839	372,271
Mobile & Ohio	1,114	4,717,140	881,556	6,500,497	759,248	1,116,768	229,452	2,220,928	231,001	4,557,397	1,943,100	11,080	174,620	1,757,400	36,054
Nashville, Chattanooga & St. Louis	1,230	4,930,247	1,743,054	7,115,920	1,043,577	1,347,883	245,931	2,524,634	172,684	5,334,709	1,781,211	—4,556	156,009	1,620,646	—60,882
New York, Chicago & St. Louis	561	5,458,291	979,470	6,680,362	758,552	861,609	353,535	2,722,579	112,140	4,808,415	1,871,947	—11,160	216,920	1,643,866	—567,524
New York, Ontario & Western	546	4,308,730	1,133,728	5,659,242	673,252	858,855	82,673	2,155,807	124,227	3,894,814	1,764,428	—30,191	122,500	1,611,737	179,021
Oregon Short Line	1,646*c*	8,921,201	3,057,454	12,735,100	1,636,785	1,320,480	203,883	3,019,681	307,636	6,488,465	6,246,635	—9,141	499,096	5,738,398	—813,792
Oregon-Washington R. R. & Nav. Co.	1,636‖	1,014,571	446,661	1,553,489	181,051	160,010	51,396	645,969	59,411	1,097,837	455,652	—8,216	96,516	350,920	—
Pere Marquette	2,334	6,442,246	2,510,473	9,712,934	1,271,112	1,462,144	279,284	4,248,874	233,784	7,495,198	2,217,736	—5,361	412,694	1,799,681	—777,319
Philadelphia & Reading	1,024	20,640,321	4,258,160	26,042,864	2,252,845	4,783,958	310,221	8,353,492	467,683	16,168,199	9,874,665	94,652	589,021	9,380,297	—322,786
San Antonio & Aransas Pass	727	1,874,145	691,018	2,710,253	467,244	342,557	34,631	926,612	68,062	1,839,106	871,147	.....	67,000	804,147	35,261
San Pedro, Los Angeles & Salt Lake	1,105*d*	2,854,208	1,610,353	4,761,071	855,195	733,711	217,647	1,721,126	119,470	3,647,149	1,113,922	—34,673	187,392	891,857	—109,266
Southern Pacific Co	6,187*e*	32,718,397	19,101,793	55,509,232	6,767,126	7,007,785	1,168,863	14,743,490	1,603,913	31,291,177	24,218,055	250,425	1,933,977	22,534,503	—2,398,280
Texas & Pacific	1,885	6,959,621	2,559,563	10,267,792	1,126,877	1,835,363	146,326	3,981,669	253,840	7,344,075	2,923,717	—12,966	382,223	2,528,528	—386,596
Vandalia	827	4,360,688	1,479,872	6,476,970	848,683	1,167,038	196,614	2,560,563	139,573	4,912,471	1,564,499	.....	196,260	1,368,239	—114,474

* Mileage operated on January 31, 1910.—998 miles; † 7,638 miles; ‡ 9,021 miles; § 1,036 miles; ¶ 1,249 miles; *a* 867 miles; *b* 781 miles; *c* 1,509 miles; *d* 979 miles; *e* 6,061 miles.
‖ Began operations on December 24, 1910; — indicates deficits, losses and decreases.

COURT NEWS.

The decision of the Supreme Court of the United States in the suit against the Atchison, Topeka & Santa Fe, in relation to the working hours of telegraphers, is noticed on the editorial page.

In the Federal Court at Philadelphia last week, a fine of $1,000 and costs was imposed on a passenger who had ridden from New Brunswick, N. J., to Philadelphia, Pa., over the Pennsylvania railroad on a ticket which bore the name of another person. Subsequently the fine was reduced by the court to $100, in response to a plea for leniency.

The United States Supreme Court, in a decision by Justice Lamar, has decided the suit of the government against the Baltimore & Ohio Southwestern concerning the law forbidding the confinement of animals in cars more than 28 hours. The government contended that the number of offences for which a carrier should be punished should be measured by the number of shipments, while the railway contended that each train load should be considered as a unit, regardless of the number of shipments; in other words that there should be but one penalty for a whole train. The court accepts neither view. Justice Lamar says:

Penalties are to be fixed by reference to the times of loading and unloading. He held the road liable to nine penalties, because nine times it failed to unload live stock carried in a train more than the 28-hour period. The Government claimed eleven penalties because there were eleven shippers. The railway was willing to pay one penalty, all the stock having been carried in one train. A year ago the court was divided four to four and so affirmed a decision of the Ohio Federal Court that the shipment of the separate consignor should be the unit. The present decision is unanimous.

In the United States District Court at Savannah, Ga., March 17, the Atlantic Coast Line and the Seaboard Air Line each pleaded guilty to violation of the law in the transportation of grain from Philadelphia, Pa., to Jacksonville, Fla., and were fined $2,000 each; the decision being by Judge Emory Speer. The grain was carried at 10 cents per 100 lbs., when the tariff called for a rate of 15 cents. The Merchants & Miners' Transportation Company (a water line) had been convicted of the same offense, on 24 counts, and as a result of this decision the railways named pleaded guilty on one count of each indictment against them. The government's attorney decided, in view of this action of the railways, not to prosecute the other six counts, which he had presented against each company.

The United States Circuit Court of Appeals, third circuit, in a decision prepared by Judge Buffington, has confirmed the action of the lower court in the Sand Patch air-brake case. The lower court, after hearing the case for a week and examining a large number of witnesses, threw the suit out of court; and Judge Buffington confirms this action because the record is so mixed that it is impossible to tell just what the evidence was. The suit was that of the Government to impose penalties on the Baltimore & Ohio for violating the safety appliance law in using hand-brakes to control the speed of freight trains descending the steep Sand Patch grade, in Pennsylvania. The gist of the opinion of the lower court was that the law did not prohibit the use of hand-brakes, as an additional precaution, if the railway company had a sufficient number of cars in each train with the air-brake apparatus connected to the engine so that by means of the air brakes the engineman could control the train, within the meaning of the law. Judge Buffington says:

"Each of the judges of this court separately and all of them jointly have examined and discussed the voluminous testimony, and owing to the way in which it was taken we are unable to intelligently apply it to the cars mentioned in the numerous counts. Nor are we aided in that respect by the briefs in a specific reference to testimony applicable to particular cars or particular counts. Under such conditions we are unable to determine whether there was or was not evidence to go to the jury on particular counts, or indeed, to ascertain with certainty the actual facts involved and thus have an assured basis with reference to which the statute could be construed. In the absence, therefore, of any satisfactory showing that the Court below committed error in withdrawing the case from the jury and without expressing any opinion as to the construction placed by it on the statutes, we affirm its action in refusing to take off the non-suit."

Commission Reversed on Willamette Valley Lumber Rate.

The last of the decisions handed down by the Supreme Court of the United States on February 20, was that in the case of the Southern Pacific against the Interstate Commerce Commission to secure the annulment of the commission's order reducing rates on rough lumber from points in Oregon, south of Portland, to San Francisco. The decision, by Chief Justice White, is in favor of the railway company.

To make a market for the lumber of the Willamette Valley, the Southern Pacific about 1898 established a rate of $3.10 a ton to San Francisco. In 1907, concluding that the lumber interests had become prosperous, the rate was advanced to $5, the road declaring that the former rate was unreasonably low. Moreover, the shippers by this time had found an eastern market by way of Portland. The shippers complained to the Interstate Commerce Commission, and the commission ordered the $5 rate reduced to $3.40. Some of the towns embraced in the order were within a few miles of Portland, but Portland was not given the benefit of the reduction; the commission holding that Portland enjoyed the benefit of water competition, and therefore did not need the reduction. The road defended its $5 rate not only on the ground that $3.10 was abnormally low, but also because of a great increase in the cost of the operation of the road since 1898. Even if the $3.10 rate were to be found reasonable on an ordinary railway, it was unreasonably low here because of the mountainous country traversed, making the cost of train running much greater than the average. The circuit court, to which the commission's order was appealed, decided against the railway, holding that as the commission had found that a rate of $3.40 gave some remuneration above the cost of operation, there was no power to interfere.

Before the supreme court, the railway company admitted that where the commission finds a rate in and of itself unreasonable, its order making a reduction, should not be subject to be reviewed by the court; but it was argued that the order of the commission was in excess of the power conferred upon it by law. The question, therefore, is: What was the nature and character of the order made by the commission? Answering this, Chief Justice White says:

"The contention is, that although the order made by the commission may have been couched in a form which would cause it, superficially considered, to appear to be but the exercise of an authority to correct an unreasonable rate, yet if it plainly results from the record that the order of the commission was not the exercise of such an authority, but was based upon the assumption by that body of the possession of a power not conferred by law, the mere form given by the commission to its action does not relieve the courts from the duty of reviewing and correcting an abuse of power. Applying these propositions, the insistence is that both in form and in substance the order of the commission is void because it manifests that that body did not merely exert the power conferred by law to correct an unjust and unreasonable rate, but that it made the order which is complained of upon the theory that the power was possessed to set aside a just and reasonable rate lawfully fixed by a railway whenever the commission deemed it would be equitable to shippers in a particular district to put in force a reduced rate. That is to say, the contention is that the order entered by the commission shows on its face that that body assumed that it had power not merely to prevent the charging of unjust and unreasonable rates, but also to regulate and control the general policy of the owners of railways as to fixing rates, and consequently that there was authority to substitute for a just and reasonable rate one which in and of itself in a legal sense might be unjust and unreasonable, if the commission was satisfied that it was a wise policy to do so or because a railway had so conducted itself as to be estopped in the future from being entitled to receive a just and reasonable compensation for the service rendered. On the other hand, the commission in the argument at bar does not contend that it possessed the indeed abnormal and extraordinary power which the railways thus say was exerted in rendering the order complained of, a power which if it obtained would open a vast field for the exercise of discretion, to the destruction of rights of private property in railways, and

would in effect assert public ownership without any of the responsibilities which ownership would imply. While it is not denied on behalf of the commission that that body may have considered the prior rate prevailing in the Willamette Valley, the period during which it had been in force, and the effect upon the business situation in the valley of a change to a higher charge, all of these things it is insisted were not made the basis of the power exerted, but were simply taken into consideration as some of the elements proper to be considered in the ultimate exertion of the lawful power to forbid an unjust and unreasonable rate and fix a reasonable one."

The court concludes that the commission's order was void, because it was made in consequence of the assumption by the commission that it possessed the extreme powers described. The thing complained of was not the intrinsic unreasonableness of the $5 rate, but the injury it was thought would be suffered from not continuing the old rate in force.

Continuing, the court says:

"While it is true that the opinion of the commission may contain some sentences which, when segregated from their context, may give some support to the contention that the order was based upon a consideration merely of the intrinsic unreasonableness of the rate which was condemned, we think when the opinion is considered as a whole in the light of the condition of the record it clearly results that it was based upon the belief by the commission that it had the right under the law to protect the lumber interests of the Willamette Valley from the consequences which it was deemed would arise from a change of the rate, even if that change was from an unreasonably low rate which had prevailed for some time to a just and reasonable charge for the service rendered for the future. Manifestly, this was deemed by the commission to be the power which was being exerted, since Mr. Commissioner Harlan, joined by the chairman of the commission, dissented on the ground that the order was an exertion of a power not possessed to give effect to a supposed equitable estoppel, and no language was inserted in the opinion to indicate to the contrary."

The exclusion of Portland from the benefit of the reduced rate confirms the view that the commission was not merely exercising the right to correct an unreasonable rate.

It was further claimed that the suit should be dismissed, because the order of the commission had expired by the two-year statutory limitation, but the court rejects this argument on the same grounds as those set forth in the case of the Southern Pacific Terminal Company, reported in the *Railway Age Gazette* of March 17, page 519. Moreover, it is possible that the railways will be liable for reparation, because of the influence and effects of the existence of the order of the commission.

FOREIGN RAILWAY NOTES.

Plans are well under way for the construction of an 800-mile railway in Asia Minor. The line will start at Ymurtalik, on the gulf of Alexandretta in the eastern Mediterranean, and run westerly bisecting the Bagdad Railway at Urfi; thence to Lake Van on the confines of the Persian province of Azer Bidjan. It will be a single line, standard gage. It is said that the German opposition is confined to commercial circles. The enterprise is backed by a group of American financiers under the chairmanship of Charles A. Moore of New York.

The report for the whole German empire for 1909 shows that it then had 36,320 miles of railway, an increase of 19.2 per cent. in ten years. There was 1 mile for every 1,872 inhabitants in 1909 (against 1 mile to 380 inhabitants in the United States). The traffic in 1909 was equivalent to a movement of 789 passengers and 1,267 tons of freight each way daily over the entire system, an increase of 52 per cent. in the density of passenger traffic and 24.4 per cent. in the density of freight traffic in ten years. In the United States in 1909 the passenger traffic was equivalent to 174 passengers and the freight traffic to 1,320 tons each way daily. Thus the density of passenger traffic was 4½ times as great on the German roads; but the density of freight traffic was 4 per cent. less than in the United States. The average passenger rate was 0.904 cent per mile in Germany and the average freight rate 1.27 cents per ton-mile, against 1.928 cents per passenger mile and 0.763 cent per ton-mile in this country.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Stanley A. Beard has been appointed a general attorney of the Sabine & Northern, with office at Houston, Texas.

Kingdon Gould has been elected a vice-president of the Texas & Pacific, an additional vice-presidency having been created.

George J. Gould has resigned as president of the Missouri Pacific, and has been elected chairman of the board. The presidency has been left vacant with the expectation of filling it in the near future.

Operating Officers.

John C. Collins, general manager of the Bartlett-Florence Railway, with office at Bartlett, Texas, has resigned to accept service with another company.

J. F. Hickey has been appointed an assistant division superintendent of the Missouri, Kansas & Texas, with office at McAlester, Okla., succeeding R. L. Gardner, resigned.

J. W. Farrell, trainmaster of the Third district of Grand Trunk, at Richmond, Que., has been appointed trainmaster of the First district, with office at Island Pond, Vt. R. P. Smallhorn succeeds Mr. Farrell.

E. F. Potter, general superintendent of the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed assistant to the general manager, with office at Minneapolis, Minn., and his former position has been abolished.

E. S. Koller, division superintendent of the Chicago, Burlington & Quincy at McCook, Neb., has been appointed general superintendent of the Illinois district, with office at Galesburg, Ill., succeeding Hale D. Johnson, deceased. E. Flynn, superintendent of the Omaha division at Omaha, Neb., succeeds Mr. Koller, and A. G. Smart, trainmaster at McCook, succeeds Mr. Flynn.

Richard Lincoln O'Donnel, who has been appointed general superintendent of the Western Pennsylvania division of the Pennsylvania Railroad, with office at Pittsburgh, Pa., as has been announced in these columns, was born on November 5, 1860, at Philadelphia, Pa. He graduated from the Philadelphia High School in 1877, and from the Polytechnic College of Pennsylvania in 1882. Mr. O'Donnel began railway work in the same year as a rodman on the Cornwall & Lebanon, and in 1883 entered the engineering department of the Pennsylvania Railroad. From 1884, to November, 1886, he was draftsman in the assistant engineer's office of the West Penn division, and then became assistant engineer at Altoona. In March, 1887, he was appointed assistant supervisor at Hollidaysburg, and in February of the following year, was transferred in the same capacity to the Philadelphia division. In 1889 he was again transferred to the Pittsburgh division, and in November he was made supervisor in the Altoona yard. In April, 1891, he became assistant engineer of the Tyrone division. From December, 1894, to February, 1897, he was assistant engineer of the Pittsburgh division, and was then promoted to assistant superintendent, becoming superintendent in January, 1902, of the same division. Mr. O'Donnel was appointed general superintendent of the Buffalo & Allegheny



R. L. O'Donnel.

Valley division in January, 1903, which position he held at the time of his recent appointment.

C. B. Gorsuch, superintendent of the Wheeling division of the Baltimore & Ohio, at Wheeling, W. Va., has been appointed superintendent of the Pittsburgh division, with office at Pittsburgh, Pa., succeeding E. A. Peck, promoted. A portrait of Mr. Gorsuch and a sketch of his railway career were published in the *Railway Age Gazette* of May 13, 1910, page 1232. John F. Keegan, trainmaster of the Cumberland division, at Keyser, W. Va., succeeds Mr. Gorsuch.

Traffic Officers.

W. H. Bartlett has been appointed a commercial agent of the Illinois Central, with office at Owensboro, Ky.

G. N. Snyder has been appointed assistant coal traffic manager of the Pennsylvania Lines east of Buffalo, N. Y., with office at New York.

H. M. Tait has been appointed a general agent in the passenger department, Atlantic service of the Canadian Pacific, with office at Minneapolis, Minn., succeeding T. J. Burns, resigned.

Henry E. Jarman, traveling freight and passenger agent of the Delaware, Lackawanna & Western, at San Francisco, Cal., has been appointed Pacific coast agent, succeeding H. N. Butterfield, resigned.

T. H. Jones has been appointed a traveling immigration agent of the Southern Railway, with office at St. Louis, Mo., and J. B. Finster has been appointed a traveling immigration agent, with office at Washington, D. C.

C. H. Pugh, live stock agent of the Missouri Pacific at East St. Louis, Ill., has been appointed a traveling freight agent, with office at Houston, Texas, succeeding W. F. Bellairs, resigned to engage in other business.

R. Creelman, assistant general passenger agent of the Canadian Northern, at Winnipeg, Man., has been appointed general passenger agent of the lines west of Lake Superior; Osborne Scott succeeds Mr. Creelman, both with offices at Winnipeg.

David Northup, contracting freight agent of the Chicago Great Western at Omaha, Neb., has been appointed a commercial agent, with office at Omaha. Ralph G. Adams has been appointed a traveling freight agent, with office at Omaha, succeeding J. H. Cummings, resigned.

C. F. Smith, general agent of the Louisiana Railway & Navigation Company at Dallas, Texas, has been appointed a commercial agent, with office at Oklahoma City, Okla., and the office of traveling freight agent at Oklahoma City has been abolished. E. L. Whitney succeeds Mr. Smith at Dallas.

L. W. Landman, general passenger agent of the Lake Erie & Western at Indianapolis, Ind., has been appointed general passenger agent of the Michigan Central, with office at Chicago. J. S. Hall, assistant general passenger agent of the Michigan Central at Detroit, Mich., succeeds Mr. Landman at Indianapolis.

Daniel C. Fisk, Jr., traveling freight agent of the Union Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company, at Philadelphia, Pa., has been appointed contracting freight agent, with office at New York, succeeding F. A. Bradley, resigned. Roger B. Hollinger, soliciting agent at Philadelphia, Pa., succeeds Mr. Fisk, and Howard E. Ohl succeeds Mr. Hollinger.

B. F. Moffatt, general agent in the traffic department of the Minneapolis & St. Louis and the Iowa Central at St. Paul, Minn., has been appointed a commercial agent, with office at Omaha, Neb., succeeding Morell Law, assigned to other duties. W. E. Witherspoon, city passenger and ticket agent at St. Paul, Minn., succeeds Mr. Moffatt. G. W. Harris has been appointed a traveling freight agent, with office at Mason City, Iowa.

Malone Joyce, formerly general agent of the Colorado Midland, with office at Los Angeles, Cal., has been reappointed to that position, the company having reopened its office at that place. P. J. Murphy, formerly contracting agent at Denver, Colo., has been appointed a general agent, with office at Omaha, Neb., and C. L. Brown, traveling freight agent at San Francisco, Cal., has been appointed a general agent, with office at San Francisco.

F. A. Nancekevell has been appointed general agent of the Minneapolis, St. Paul & Sault Ste. Marie, at Toronto, Ont., a new agency. R. G. McCraw, traveling freight agent at Detroit, Mich., has been transferred to Toronto, Ont., and George C. Wilson, traveling freight agent of the Ontario district, has been appointed traveling freight agent of the New York territory, with office at Buffalo, N. Y., succeeding F. F. Johnson, who has been transferred to Boston, Mass.

E. J. Naylor, general agent in the traffic department of the Chicago & Alton, and the Toledo, St. Louis & Western at Los Angeles, Cal., has been appointed general agent in the traffic department, with office at San Francisco, Cal., succeeding C. B. Condon, resigned to engage in other business. J. A. Fitzpatrick, general agent in the traffic department at Buffalo, N. Y., succeeds Mr. Naylor, and C. F. Vigor, traveling freight agent at Pittsburgh, Pa., succeeds Mr. Fitzpatrick. John H. Walkmeyer, chief clerk to the general agent in the freight department at Pittsburgh, succeeds Mr. Vigor.

Engineering and Rolling Stock Officers.

M. H. Sheeley, roadmaster of the Iowa Central, with office at Marshalltown, Iowa, has resigned to engage in other business.

F. Hume has been appointed superintendent of machinery of the Fort Dodge, Des Moines & Southern, with office at Boone, Iowa.

P. H. Rephorn, general foreman in the motive power department of the Delaware, Lackawanna & Western, at Scranton, Pa., has resigned to go to E. L. Post & Co., New York.

Charles Nathan Page, whose appointment as master mechanic of the Lehigh Valley, with office at Auburn, N. Y., has been announced in these columns, was born on June 25, 1868, in Frederick county, Md., and was educated in the common schools. He began railway work in 1884, as a machinist's apprentice on the Baltimore & Ohio, resigning from that position in 1886. He was then for five years in the quartermaster's department of the United States Government. Mr. Page returned to railway work as a locomotive fireman on the Baltimore & Ohio, and was later promoted to engineer. In 1893, he went to the Lehigh Valley in the same capacity, and in 1902 was made road foreman of engines, with office at Buffalo, N. Y. He was appointed trainmaster in 1910, and was recently appointed master mechanic, in addition to his duties as trainmaster, with office at Auburn.



C. N. Page.

Frank H. Reagan, whose appointment as superintendent of shops of the Delaware, Lackawanna & Western, at Scranton, Pa., has been announced in these columns, was born August 13, 1872, at Corry, Pa. He was educated in the common schools and began railway work in 1892 as a machinist on the Lehigh Valley. The following year he went to the Lake Shore & Michigan Southern as a machinist at the Buffalo shops, and was later engine house foreman at that place. He was then appointed assistant engine house foreman at West Seneca, and later was made night engine house foreman at Collinwood, Ohio. His next position was engine house foreman at Youngstown, and he was later appointed general engine house foreman at Ashtabula. In May, 1907, he was appointed erecting shop foreman at the Collinwood shops, and in November of the same year was promoted to general foreman. He was appointed assistant superintendent of the Collinwood shops in May, 1909, and the following April was promoted to superintendent of the same shops. Mr. Reagan left the service of the Lake Shore in May, 1910, to

become master mechanic of the Lake Erie & Western, which position he held at the time of his recent appointment as superintendent of shops of the Delaware, Lackawanna & Western, at Scranton, Pa.

Purchasing Officers.

Sydney B. Wight, purchasing agent of the New York Central Lines, at New York City, has been appointed general purchasing agent, succeeding F. H. Greene, whose resignation has already been announced in these columns. W. C. Bower, chief clerk in the office of the president, succeeds Mr. Wight, with office at New York.

OBITUARY.

Nathaniel Thayer, a director in the New York, New Haven & Hartford, and many other railway companies, and also in the United States Steel Corporation and the American Telephone & Telegraph Company, died at his home in Boston on Tuesday of this week, at the age of 59. Mr. Thayer had taken an important part in the construction of a number of railways in the West.

F. H. Lord, formerly for 10 years (1891-1901) general passenger and ticket agent of the Chicago Great Western, died recently at his home in Oakland, Cal. Mr. Lord was born December 12, 1849, at Utica, N. Y., and entered the passenger department of the Detroit & Bay City, at Bay City, Mich., in 1873. He was later a traveling passenger agent of the Canada Southern and then went to Chicago as district passenger agent and land agent of the Northern Pacific. He went to the Chicago, St. Paul & Kansas City in 1889, remaining with that company and its successor, the Chicago Great Western, until 1901. In that year he resigned and was appointed district passenger agent of the Chicago, Rock Island & Pacific, at Des Moines, Iowa.

David H. Moffat, of Denver, Colo., president of the Denver, Northwestern & Pacific, died suddenly in New York City, March 18, the cause of death being given as heart disease. Mr. Moffat has been one of the most prominent capitalists in Colorado for many years, having been interested in real estate and railways. At one time he was said to have had extensive interests in 125 mining companies. He was born in Orange county, New York, in 1839, and went West at an early age. He organized the First National Bank of Denver, when that city was a mere settlement; and was prominent in the construction of the Denver & Rio Grande, the Denver Pacific, the Denver & New Orleans and the Florence & Cripple Creek. The D. N. W. & P. is Mr. Moffat's latest enterprise. The road is now in operation from Denver to Steamboat Springs, Colo., 214 miles.

John B. McDonald, the well-known railway contractor, and builder of the first New York subway, died at his home in New York City on March 17. Mr. McDonald was born in Ireland in 1844, and at the age of three years came with his parents to this country. He became a contractor at an early age, but for a time he was inspector of masonry on the Fourth avenue tunnel of the New York Central & Hudson River. Some of his important railway construction contracts were on the West Shore; in the Potomac valley; on an extension of the Illinois Central from Elgin to Wisconsin; the Trenton cut-off of the Pennsylvania; and the extension of the Baltimore & Ohio from Baltimore to Philadelphia. He was a subcontractor on the Boston, Hoosac Tunnel & Western; on the Canadian Pacific, and on the extension of the Delaware, Lackawanna & Western from Binghamton, to Buffalo. He first came into national prominence when he built the two-mile underground line of the Baltimore & Ohio through the city of Baltimore in 1890. This line, cut through a busy street for its whole length, involved many difficulties. In January, 1900, he took the contract to build the subways in New York City, for $35,000,000, and formed a company for the purpose. He had general oversight of the work up to the time of its completion, and it was finished within the stipulated time.

The number of passengers killed or injured in Germany per 1,000,000 carried was 0.58 in 1900 and 0.42 in 1909, which latter year was distinguished by the exceptionally fatal Mülheim disaster. The average number of passengers killed in the last ten years is 0.9 per million carried.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta Central.—Bids are now being asked, it is said, for building this line. The headquarters of the company are at Lethbridge, Alb.

Ardmore, Duncan & Lawton.—This company has not yet completed its organization. The plans call for a line from Lawton, Okla., southeast via Duncan and Ardmore, to Sherman, Texas, about 125 miles. It is expected that contracts will be let during the latter part of May. There will be about six steel bridges, a number of station buildings and shop buildings. R. L. Robertson, Lawton, may be addressed. (See Lawton, Duncan & Ardmore, March 10, p. 479.)

Arkansas City, Wellington & Northwestern.—This company was recently incorporated in Kansas to build from Arkansas City, Kan., northwest to Hutchinson, about 85 miles, and a construction company was organized to carry out the work. G. H. Hunter, president, Wellington.

Buffalo, Lockport & Rochester (Electric).—An officer writes that work is now under way laying second-track on 3.5 miles, and on another section of 1.5 miles on the eastern end of this road; also, on the elimination of a grade crossing at South Greece. All the work will be carried out by the company's men and is expected to be finished early in June. Grading for this second-track, with the exception of the elimination of grade crossing was done on the original construction.

Buffalo, Rochester & Pittsburgh.—An officer writes that the Miller Construction Company, Lock Haven, Pa., has a contract for work on two miles of line revision and double-tracking between Hutchins, Pa., and Midmont. (March 17, p. 525.)

Canadian Northern.—According to press reports, contracts have been given to the Cowan Construction Company and the Northern Construction Company, amounting to $8,000,000, to build new lines. The most important line to be finished during 1911 will be the one from a point near Red Deer, Alb., south to Calgary. The company expects to finish about 200 miles of main line west of Edmonton this year.

Canadian Pacific.—A contract has been given to J. D. McArthur, to build a branch from Estevan, Sask., to a point 55 miles west of that place.

Contracts are said to have been given recently by this company for building lines in western Canada as follows: Two lines out of Swift Current, Sask., 80 miles; from Moose Jaw, 35 miles, and from Lacombe, Alb., 60 miles, to Foley, Welch & Stewart, St. Paul, Minn.; three branch lines out of Wilkie, Sask., 82 miles to W. A. Dutton, Calgary, Ill., and for double-track work from Moose Jaw, Sask., west for 23 miles and east for 10 miles, to J. G. Hargrave & Co., Winnipeg, Man.

An officer writes that contracts have been let to Janse, McDowell & Co., Calgary, Alb., for building 42 miles of the Kootenay Central south of Golden, B. C. (March 10, p. 479.)

The line between Macklin, Sask., and Korrobert has been opened for traffic.

Chesapeake & Ohio.—This company is building a 10-mile branch into the property of the Cole & Crane Co., consisting of 90,000 acres of coal and timber lands in West Virginia. The line is being built to secure an outlet for the timber of the Cole & Crane Co., via the Chesapeake & Ohio, to Cincinnati, Ohio. It is expected that the line will be in operation by August. C. Crane is general manager of the C. & C. Co., Cincinnati.

Cleveland, Cincinnati, Chicago & St. Louis.—See report of this company elsewhere in this issue.

Crystal City & Uvalde.—An extension is to be built from Gardendale, Texas, east about 30 miles. Some of the right-of-way has been secured.

Durham & Danville.—Incorporated in North Carolina to build a 51-mile line. It is expected that the work will be finished during the next two years. The incorporators include: J. F. Wily, W. F. Carr, C. C. Thomas and W. B. Guthrie.

Eastern Maine.—A favorable report has been made by the committee on the application of this company for a charter in Maine, but neither branch of the state legislature has yet acted on the bill. The company asks permission to build 108 miles of line from a point at tidewater in Brewer, Me., opposite the city of Bangor, Penobscot county, easterly via Holden, Eddington, Clifton, thence northerly via Amherst, Great Pond, Lakeville Plantation, Springfield, Carroll and Prentiss, thence northerly via Bancroft, Haynesville and Hodgdon to Houlton, Aroostook county. The incorporators include: E. H. Blake, W. L. Miller, A. A. Merrill, C. P. Thomas, A. Warren and A. G. Chambers. (March 10, p. 478.)

Grand Trunk Pacific.—Considerable progress has been made on the construction of the mountain section, both westward from Wolf creek and eastward from Prince Rupert, B. C. There remains only about 400 miles of line not yet under contract, for which bids will be asked during the next two months. When these contracts are let, the entire line from Prince Rupert, east via Edmonton and Winnipeg to Fort William, at the head of Lake Superior, 2,188 miles, will be either under construction or completed.

Great Northern.—The branch from Bainville, Mont., north to Plentywood, 53.44 miles, was opened for business on March 13. (December 2, p. 1096.)

Kootenay Central.—See Canadian Pacific.

Lake Shore & Michigan Southern.—See report of this company elsewhere in this issue.

Lawton, Duncan & Ardmore.—See Ardmore, Duncan & Lawton.

Lehigh Valley.—According to press reports, this company has recently decided to make the single-track line, now under construction from Lumber Yard, Pa., to a connection with the main line at Hayes creek, 12 miles, a double-track line. The original cost, which was $1,500,000, including classification yard, engine house, shop for car repairs and fuel and water facilities, it is understood, will be increased to $2,200,000. Hyde, McFarland & Burke are the contractors. Grading work on the line is more than half finished. (August 19, p. 332.)

Michigan Central.—See report of this company elsewhere in this issue.

Milwaukee Northern (Electric).—This company contemplates double-tracking its lines in the near future from Milwaukee, Wis., north to Cedarburg. Also, building an extension from Cedarburg northwest, via West Bend, Barton, Kewaskum, Campbellsport and Eden to Fond du Lac.

Milwaukee, Peoria & St. Louis.—Incorporated in Illinois with $5,000 capital, to build from Peoria, Ill., north through the counties of Tazewell, Woodford, Marshall, Putnam, Bureau, Lee and Ogle to Rockford, in Winnebago county, about 120 miles. The headquarters of the company will be at Chicago. The incorporators include: E. C. Morton, F. C. Vehmeyer, J. H. O'Neil, F. B. Reed and F. Gardiner, Chicago.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer is quoted as saying that a line is to be built during 1911 from the Brooten-Duluth line, near Foxboro, Wis., south to Frederic, 65 miles; also, that a line from Fordville, N. D., west to Drake will be built when conditions warrant.

New York Central & Hudson River.—See report of this company elsewhere in this issue.

Oregon Electric.—An officer is quoted as saying that work is to be started soon on an extension from Salem, Ore., south to Eugene, about 65 miles.

Oregon Trunk Railway.—An officer writes that there is no immediate prospect of building this line south of Bend, Ore. Track has already been laid on 115 miles, from Fallbridge, Wash., to Metolius, Ore. No further contracts will be let at present. The grading work on the first 110 miles from Fallbridge was carried out by Porter Brothers, Portland, Ore., and from that point to Bend, 46 miles, by H. C. Henry & Co., Seattle, Wash. The first 110 miles follows the Des Chutes and Willow creek canyons; the work on this section was extremely heavy, being practically all through solid rock. The remaining 46 miles to Bend is through a scab rock country, requiring an even number of cuts and fills. The material handled was mostly rock. The roadbed has been graded to Bend. Maximum curvature, Fallbridge to Madras, Ore., 6 deg.; Madras to Bend, 3 deg. Maximum grade, Fallbridge to Metolius, 0.6 per cent., with 20 miles of 1.3 per cent. pusher grade from Mecca to Metolius. This grade is all ascending towards Metolius. Maximum grade from Metolius to Bend is 1 per cent. against southbound, and 0.5 per cent. against northbound trains. There will be a steel bridge over the Columbia river, 2,427 ft. 8 in. long, with approaches of 1,734 ft.; also one at the first clossing of the Des Chutes river, 465 ft. long, and another at the second crossing, 510 ft. long. Steel bridges will also be built over White river, Wapinitia creek, Nena creek, Eagle creek; third crossing of Des Chutes river, and over Trout creek, varying in length from 112 ft. to 175 ft. each, and a steel bridge over Crooked river, 460 ft. long. There is also a large amount of trestle work. The steel bridges, including substructures, have all been designed and are being constructed under the direction of Ralph Modjeski. A terminal yard, including fuel, oil and engine house facilities, is being built at Fallbridge, and a freight terminal is under construction at Metolius. The principal commodities to be carried on the line are: wheat, live stock and lumber, from central Oregon, and merchandise and manufactured goods into central Oregon.

Oregon-Washington Railroad & Navigation Company.—A contract has been given to the Twohy Brothers Construction Company, Pendleton, Ore., to build the Echo-Coyote cut-off in Oregon. (See Oregon Railroad & Navigation Company, September 10, p. 483.)

Paris & Mount Pleasant.—This company, which operates 23.6 miles of line from Paris, Texas, to Bogota, is planning to extend the line southeast to Mount Pleasant, 32 miles.

Payson Electric.—This company is planning to build a line from Salt Lake City, Utah, south to Payson, about 60 miles. The headquarters of the company are at Salt Lake City.

Pennsylvania Roads.—According to press reports, plans have been made by the Stony Brook Lumber Company, to build an eight-mile line to a connection with the Lehigh Valley, at Lopez, Sullivan county, Pa.

Quebec & Saguenay.—An officer writes that contracts are to be let at once to build from a point 30 miles northeast of Quebec, Que., on the north shore of the St. Lawrence river, at the present terminus of the Quebec Railway, northeast to Murray bay, 63 miles. Much of the work will be heavy rock work, involving the handling of about 30,000 cu. yds. a mile. There will be five steel bridges and probably two short tunnels. The line is being built to carry wood products, iron and other ores. R. Forget, president, and Arthur H. N. Bruce, chief engineer, Castle building, Ottawa, Ont., and Quebec, Que. (February 17, p. 334.)

Richmond & Urbanna.—An officer writes that the plans call for a line from Richmond, Va., east to Urbanna, about 55 miles. The company has secured seven miles of electric line now in operation, with terminals in Richmond. It has not yet been decided when work will be started on the line, or whether steam or electricity will be used for the motive power. J. C. Robinson, Richmond.

Sioux Falls & Sioux City (Electric).—An officer writes that the company plans to begin work at once from Sioux Falls, S. D., south via Canton, Beresford and Elk Point to Sioux City, Iowa, about 90 miles. The general contract has been given to O. F. Spaete, Sioux Falls, S. D. There will probably be two small steel bridges over Big Sioux river. The plans call for putting up car barns, stations, etc. J. Wolflin, superintendent, Sioux Falls.

Southern Pacific.—This company, it is said, will build the line through the Sacramento Valley, from Arbuckle, Cal., north to Hamilton. (July 22, p. 174.)

St. Louis & San Francisco.—An officer writes that work is now under way laying about eight miles of yard tracks at Belevue, Tenn., near Memphis, and making other improvements, to include one 175-ft. steel bridge, a six-stall roundhouse, a 120-ft. cinder pit, and a 75-ft. turntable. The grading contract has been given to J. H. Weatherford, Memphis, and for the buildings to

the Jarrett Construction Company, Springfield, Mo. Laying and surfacing tracks will be carried out by the company's men.

Sugarland & Arcola.—This company is building an extension from Arcola, Texas, south to the port of Velasco at the mouth of the Brazos river, and arrangements are being made for the early construction of a northern extension from Sugarland to Hempstead, about 55 miles. The proposed extensions will aggregate more than 100 miles. The road is at present only 14 miles long, running between Sugarland and Arcola. When finished these extensions will form a new north and south line through the rich valley of the Brazos river.

Tennessee, Alabama & Georgia.—According to press reports, work has been started on the extension between Rockmart, Ga., and Rome, 29 miles, and work will be started soon from Harrisburg, east to Gore, eight miles. (Jan. 20, p. 144.)

Texas Roads (Electric).—According to press reports, the Stone & Webster, Boston, Mass., interests, are planning to build a line from Waxahachie, Texas, north to a connection with the Northern Texas Traction at Oak Cliff, about 30 miles. Right-of-way will be secured at once, and it is expected to have the line in operation this year.

Trinity Valley Traction.—An officer writes that the company plans to build this year from Dallas, Texas, southeast via Waxahachie and Corsicana to Palestine, 118 miles. About three-quarters of the line will be over a level prairie and the remaining quarter will have some cuts and fills. There will be three small bridges, and two power plants. J. V. Watkins, 304 Scollard building, Dallas.

Utah Roads.—An officer of the Union Coal Company, Salt Lake City, Utah, writes that contracts will be let in April to build an eight-mile line from Helper, on the Denver & Rio Grande, north to coal fields in Carbon county. There will be one steel bridge, about 50 ft. long. A. N. Holdaway, vice-president and acting manager, 504 McIntyre building, Salt Lake City. (March 17, p. 526.)

Valdosta, Moultrie & Western.—An officer writes that contracts will be let at an early date to build an extension from Moultrie, Ga., west. The work includes building a drawbridge over the Flint river.

Vera Cruz, Tabasco & Campeche.—According to press reports, surveys are now being made from Santa Lucrecia, Mex., on the Tehuantepec National, east to Campeche, on the United Railways of Yucatan, 490 miles. Donato de Chapeaurogue, president, and A. L. Van Antwerp, secretary, Apartado 870, city of Mexico. (August 19, p. 332.)

Winnipeg Northern.—Surveys are now being made from Winnipeg, Man., northerly along the east shore of Lake Winnipeg. George Franklin, Selkirk, Man., is interested.

FOREIGN RAILWAY NOTES.

In New Zealand during 1910 ten new sections of railways were opened, aggregating 61 miles.

The Argentine congress has recently enacted a law authorizing the construction of a narrow-gage railway line which, starting at the village of Tinogasta, in Catamarca, will run as far as the Chilean frontier in San Francisco pass. The line will cover a distance of 147 miles, and is estimated to cost $8,122,000. At San Francisco it may connect with a branch line of the Copiapo or the Taltal Railway, thus forming another trans-Andean line.

In 1906 a tax on railway tickets was imposed throughout the German empire, only fourth class tickets being exempt. The most notable effect of this tax has been the diversion of travel from the higher to the lower classes. This has occurred especially in the first class. In 1905 there were 2,681,000 first-class tickets sold, in 1909 only 1,624,000. The first-class earnings, which normally would have increased in this period $1,200,000, actually decreased by $600,000. There has also been a diversion from the second to the third class; but this has in good part been due to improvement in the third-class service; most of the fast trains now having third-class cars. The tax is to be continued, but is to be modified.

Railway Financial News.

Cincinnati, Bluffton & Chicago.—The order of the court for the sale of this road on March 15 was not carried out, no bids having been received. The sale is now set for March 25.

Great Northern.—In the table of earnings and expenses of railways, page 298 of the *Railway Age Gazette* of February 10, net operating revenue for the Great Northern was shown as $2,646,558 for the month of December, 1910, whereas the correct figure is $2,011,558. The error was a typographical one and did not affect any of the other figures given.

Middletown, Unionville & Water Gap.—Suit has been begun in the supreme court of New York, in Orange county, to foreclose the second mortgage of $250,000, which was due on June 1 last, and which has not been paid. The bondholders' committee is represented by G. M. Cumming. The road is leased to and controlled by the New York, Susquehanna & Western.

Missouri, Kansas & Texas.—The 5 per cent. notes of this company, amounting to $10,000,000, which are to be paid on May 1, will be taken up by the issue of two-year notes at the same rate, and which have been sold to Speyer & Co. The bankers have offered the notes for sale at 99, deliverable on May 1, but it is said a large portion of the amount offered was taken up by buyers on the first day. The new issue amounts to $12,500,000, and 2½ millions will be used for making improvements and for buying new cars and engines.

Missouri Pacific.—The recently elected Board of Directors has chosen George J. Gould as chairman, leaving the presidency vacant, with the expectation that the place will soon be filled. F. T. Gates, George J. Gould, E. D. Adams, E. T. Jeffery, Edwin Gould and Cornelius Vanderbilt were elected to the executive committee. Messrs. Gould, Gates and Adams have been appointed a special committee to find a president. The directors of the St. Louis, Iron Mountain & Southern have appointed as executive committee George J. Gould, Kingdon Gould, E. T. Jeffery, E. L. Marston, E. D. Adams, Paul Warburg and R. M. Gallaway. The directors of the Texas & Pacific, which is classed as still a "Gould road," elected Kingdon Gould a vice-president, and E. L. Marston, of Blair & Co., a member of the executive committee to succeed J. J. Slocum, who, however, remains a member of the board. Henry Cooper was elected a director to succeed Alvin Krech, resigned.

Pennsylvania.—The Bedford & Hollidaysburg Railroad Company has increased its capital stock from $30,000 to $600,000.

The Pennsylvania has sold to Speyer & Co. first mortgage 4 per cent. gold bonds of the Philadelphia, Baltimore & Washington to the amount of $4,500,000. These bonds, due in 1943, are issued to retire 6 per cent. bonds of the Baltimore & Potomac falling due April 1 and July 1 next. It is understood that holders of the old bonds, wishing to exchange, will be given by the bankers the first opportunity to take the new bonds.

Pere Marquette.—Five year notes of this company, amounting to $8,000,000 and bearing interest at 6 per cent., have been sold in New York. The proposal to issue these notes was agreed upon by the dominant interests last month, when J. P. Morgan & Co. bought from the C. H. & D. an important interest in the P. M., as noted in this column March 3, page 434.

Tennessee, Alabama & Georgia.—The State Railroad Commission of Georgia has given authority for the issue of $8,100,000 in stock and bonds by this company. The bonds, amounting to $5,000,000, are to be used in part to pay the debts of the predecessor company, the Chattanooga Southern; and the remainder, together with the stock, will be used for new construction, principally the proposed line to make a direct connection with Atlanta, as noticed in the *Railway Age Gazette* December 23, page 1205, and January 20, page 144. The trustee of the bonds is the Empire Trust Company, New York City.

Washington, Baltimore & Annapolis.—This electric interurban railway was sold at Annapolis Junction, Md., last week by order of the United States Court to satisfy the first mortgage of $3,000,000, and the second mortgage of $1,000,000. The property was bid in for $2,501,000 by G. A. Craig, representing a re-organization committee.

Supply Trade Section.

P. H. Rephorn, general foreman of the Delaware, Lackawanna & Western at Scranton, Pa., has resigned and is now with E. L. Post & Co., New York.

The Pennsylvania Equipment Company is in the market for two secondhand standard gage, six-driver switching locomotives to weigh 50 to 75 tons on drivers, for prompt delivery.

The Link Belt Company, Chicago, announces the change in location of its Boston sales office from 84 State street to 131 State street. Lawrence Spillan will be in charge of the new office.

Clarence E. Delafield has been made a district manager of the Crocker-Wheeler Company, Ampere, N. J., succeeding R. N. C. Barnes, resigned. Mr. Delafield's headquarters will be in Boston, Mass.

The Willard Storage Battery Company, Cleveland, Ohio, started work on an addition to its plant during the first week of March. When completed this new building will add 8,000 sq. ft. of floor space to the present plant.

Theodore L. Condron, civil engineer, 1214-15 Monadnock Block, Chicago, announces that he will continue under his own name the engineering practice lately carried on by Condon & Sinks. Mr. Sinks has withdrawn to locate in Seattle, Wash.

A. Eugene Michel, advertising engineer, New York City, announces that Professor W. F. Schaphorst, of the mechanical engineering department of the New Mexico College of Mechanic Arts, has resigned to become a technical writer on his advertising staff.

The Okadee Company (not incorporated) has taken offices in the Old Colony building, Chicago. This company will make and sell the Okadee blow-off valve and other railway devices. A. G. Hollingshead is president and manager, and H. L. Winslow is vice-president and treasurer.

A. B. Saunders, formerly manager of the electrical department for John B. Watson, Philadelphia, Pa., has established a similar business, including steam railway and contractors' equipment, under the title of A. B. Saunders & Company, with offices at the Witherspoon building, Philadelphia, Pa.

The McIntosh Car Seal & Manufacturing Company, Greeley, Colo., expects to install considerable new machinery and enlarge its business several fold within the next thirty days. This company has been in existence for the last three years and has been operating on a rather small scale, its capacity being about 30,000 seals per day.

T. W. Williams, who has been associated with the General Electric Company, of Schenectady, N. Y., in the gear and pinion department for the past 18 years, has become associated with the Whipple Supply Company of New York, in the capacity of vice-president in charge of sales, and will devote the major portion of his time in the interests of the Tool Steel Gear and Pinion Company's products which this company represents.

The Railway Supply Company, Westfield, N. Y., manufacturers of automatic cylinder cocks, valves and injectors, have been granted one acre of land in Conneaut, Ohio, by the business men's association of that town. The conditions state that they shall start building their factory within 90 days and have it completed within six months. The company has placed some of the contract for a brick structure 100 ft. long and 60 ft. wide.

Tracy W. Guthrie has resigned as president of the Republic Iron & Steel Company, Pittsburgh, Pa., to engage in other business. Mr. Guthrie will continue to temporarily serve the company in a consulting capacity. The vacancy caused by his resignation has been filled by Thomas J. Bray, formerly vice-president. Henry L. Rownd, formerly secretary and treasurer, has been chosen vice-president and treasurer, and Richard Jones, Jr., the general attorney, will also act as secretary.

The annual report of the United States Steel Corporation for the year ended December 31, 1910, shows that the gross sales were $703,961,424, an increase of $57,579,173 over 1909. The net earnings in 1910 were $116,738,157, an increase of $8,965,057 over 1909. After deducting bond interest and bond sinking funds and $25,219,677 for preferred dividends, the balance earned for the $508,302,500 common stock was $62,187,508, or 12.23 per cent. as compared with $78,525,250, or 10.59 per cent. earned in

W. B. Dickson, vice-president of the United States Steel Corporation, has resigned, effective May 1. Judge Gary, referring to the resignation, said in part: "Mr. Dickson has tendered his resignation as vice-president, to take effect May 1, much to my regret, for he has been a most efficient and loyal officer. The resignation will, of course, be accepted. Mr. Dickson has the best wishes of all his associates for the future." Mr. Dickson has been associated with the United States Steel Corporation since its organization. At the time of the merger in 1901 he was assistant to Charles M. Schwab, president of the Carnegie Steel Corporation, Pittsburgh, Pa. He entered the Steel Corporation as one of the vice-presidents, and has held that position ever since. The vice-presidents of the corporation are not classified, but since the resignation of James Gayley about two years ago, Mr. Dickson has been called first vice-president. It is not yet known whether or not a successor will be appointed to fill the vacancy.

TRADE PUBLICATIONS.

Southern Pacific.—In four separate booklets the passenger department of the Southern Pacific illustrates and presents in a most effective way the many attractions and advantages that may be found at Eugene, Ore., Salem, Baker City and Attalia, Wash.

Vanadium Steel.—The American Vanadium Company, of Pittsburgh, Pa., has issued the first number of a publication, which will be issued periodically in the interests of "Amervan" ferro vanadium. It contains a description of the chemical element vanadium, its uses in steel forgings and castings, and gives the physical properties of the steel in which it is used.

Denver & Rio Grande.—The passenger department of the Denver & Rio Grande has published a schedule for the special agricultural demonstration train of the Colorado Agricultural College, which was run March 5 to 16. In addition to the train schedule, the pamphlet lists the exhibits in the different cars and the faculty of the College which had charge of the train.

Southern Railway.—This company has published an 85-page booklet, giving a full list of the fruit, vegetable and melon growers and dealers in the states tapped by the Southern. The information is arranged by states and towns, and includes the names of the growers and dealers, their addresses, the products which they grow or sell, and the number of acres or trees cultivated.

Lubrication.—McCord & Co., of Chicago, have recently published a 37-page booklet giving a short treatise on the subject of friction and showing the advantage of perfect lubrication. It fully describes the McCord system of force feed locomotive lubrication and gives the necessary information to obtain the best results with this lubricator. This company will gladly send a copy of the booklet to any one interested in the subject.

Georgia Southern & Florida.—The land and industrial department of this subsidiary of the Southern Railway has issued a pamphlet list of the fruit, vegetable and melon growers and shippers in the territory tributary to the Georgia, Southern & Florida. The list shows the shipping point, the name of the shipper, his post office address, whether he is a grower or dealer, kind of fruit or vegetable and the number of trees or acreage. The vegetable farms run from a half acre in potatoes and an acre in strawberries to 250 acres in various vegetables, while some of the fruit farms run as high as 60,000 trees.

Northern Pacific.—This company has published a novel little booklet whose pages are cut in the form of a large red apple. It is called "From Office to Orchard," and is the story of a man

who broke away from a city office with an assured salary and started an apple orchard in the Northwest. Briefly and clearly he tells what this change has done for him and what it will do for others. Two other illustrated booklets published by the same company, one on Southwestern Washington and the other on Kittitas Valley, Wash., tell of the moderate prices of land in that region and of the great productivity and diversity of resources.

RAILWAY STRUCTURES.

Bellevue, Tenn.—See St. Louis & San Francisco under Railway Construction.

Berkeley, Cal.—A contract has been given by the Southern Pacific to Robert Trost, San Francisco, at $17,000, for putting up the new power station at Berkeley. (March 3, p. 436.)

Brownville, Texas.—It is expected that work will be started at once by the Trinity & Brazos Valley on a new two-story brick warehouse. The cost of this structure will be about $60,000.

Calgary, Alb.—Work is to be started during April, by the Canadian Pacific, it is said, on two bridges to be built over the Elbow river, each to cost about $150,000. Also on new stations to be built at Calgary, Lacombe, High River and at Claresholm.

Chehalis, Wash.—The Northern Pacific will build a station at Chehalis.

Chester, Pa.—The Baltimore & Ohio and the Philadelphia Rapid Transit Company, it is said, will jointly construct a subway under the tracks of the Baltimore & Ohio at Prospect Park.

Claresholm, Alb.—See Calgary, Alb.

Dover, Del.—A contract has been given by the Pennsylvania Railroad, it is said, to Irwin & Leighton, Philadelphia, Pa., to build the new passenger station at Dover. (September 2, p. 442.)

Everett, Wash.—Announcement is said to have been made by the Columbia & Puget Sound that the company will at once complete its Everett extensions; terminal facilities and stations will be built, and the block system installed.

The Great Northern has given a contract to Caughren & Wilson for the foundation work on the steel fuel oil tanks at Everett. (December 23, p. 1208.)

Fallbridge, Wash.—See Oregon Trunk Railway under Railway Construction.

Fresno, Cal.—The Fresno, Hanford & Summit Lake is having plans made for building stations at Fresno, at Kingsburg and at Sanger. The general offices will be located in the station at Fresno, which is to cost $50,000. The plans are being made by Mathewson & Clark, architects, Fresno.

Garden City, Kan.—The roundhouse of the Garden City, Gulf & Northern was destroyed by fire on March 13. A locomotive was badly damaged, and the loss included a carload of lumber, tools, pumping engines and other equipment.

Granger, Wash.—See, Vale, Ore.

High River, Alb.—See Calgary, Alb.

Kingsburg, Cal.—See Fresno, Cal.

Kingsville, Texas.—Plans and specifications for the three-story brick general office building which the Trinity & Brazos Valley proposes to build have been accepted, and it is expected that work will be started at an early date on this structure, which will cost about $100,000.

Lacombe, Alb.—See Calgary, Alb.

Metolius, Ore.—A contract has been given by the Oregon Trunk to the Herrick Construction Company, for putting up a new station at Metolius. See Oregon Trunk Railway under Railway Construction.

Mertztown, Pa.—The Philadelphia & Reading, it is said, will construct a subway at a dangerous grade crossing in Mertztown.

New Haven, Conn.—The New York, New Haven & Hartford has decided to build the new passenger station on the site of the present station, fronting on the harbor, about half a mile from the business center of the city.

North Billercia, Mass.—The Boston & Maine has bought about 500 acres of land at this place, about 25 miles from Boston, on which it intends to build car shops. It is understood that the improvements will cost $3,000,000.

Orella, Cal.—The Southern Pacific will build a combined passenger station and freight house at Orella.

Sanger, Cal.—See Fresno, Cal.

Security, Texas.—The Gulf, Colorado & Santa Fe expects to build a station to cost between $3,000 and $4,000.

Shibley, Ark.—The Arkansas railway commission has ordered the St. Louis, Iron Mountain & Southern to build and equip an adequate freight and passenger station at Shibley, to extend its tracks 300 ft. at Newark, and to build a passenger station at Warren.

Vale, Ore.—The North Coast is planning to build a station at Vale, to cost $20,000. A station is to be built at Wapato, Wash., and a contract has already been let to Harry Boyer, Granger, for building a station at Granger.

Wapato, Wash.—See Vale, Ore.

Warren, Ark.—See Shibley, Ark.

Wichita, Kan.—At a conference between representatives of the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the St. Louis & San Francisco, and the Kansas City, Mexico & Orient and Mayor C. L. Davidson, it was agreed that work will be commenced within 90 days on the new union station, which is to cost $2,000,000.

Winnipeg, Man.—Bids are wanted by the division engineer of the Canadian Pacific at Winnipeg, Man., until March 27, for buliding the substructures of bridges and culverts on the Manitoba division, also for a culvert at Kenora, Ont.

FOREIGN RAILWAY NOTES.

Arrangements have been made for floating a loan of $19,300,000, to be taken up by French banks, for the construction of a railway in southern Asia, which will connect Saigon, Cochin China and Bangkok, Siam. The road is to be built from Battambong, a frontier city, peopled by Europeans, to Pnom Penh, and from the latter place conveyance will be by boat to Saigon.

The government of Brazil has approved a contract entered into with the Companhia Amparo Industrial for the construction of a line 62 miles in length from Villa Nova, on the Leopoldina Railway, to Santa Rosa, on the banks of the Muriahe river; and thence to Cardoso Moreira, on the same railway, together with a branch running along the Muriahe river as far as Campos, in the state of Rio de Janeiro.

A French syndicate has the contract for the construction of a railway in Ecuador from Bahia de Caraquez to Quito, work on which has already commenced. Formerly a number of American civil engineers were employed in connection with the building of the railway from Guayaquil to Quito, but as the road is completed, all with a few exceptions have left the country. It is possible that this road may be extended and other roads built in the next few years.

During 1910 considerable activity was shown in the initial construction of the Szechuen-Hupeh Railway, China. Early in the spring nearly 10,000 coolies were employed and in November no less than 15,000 were at work on the road. In the construction of this line the best engineering knowledge is necessary, the work being far more difficult than that of any other railway in China. In 15 miles from Ichang through to Wanhsien numerous tunnels through solid rock will have to be constructed. The longest tunnel is about 6,200 feet long, and is 50 miles distant from Ichang. The contract for this tunnel was let and construction commenced some months ago. Twenty-five miles from Ichang two tunnels of about 1,000 feet each have also been contracted for, and the work begun. The first tunnel of 700 feet on the second section, 15 miles from Ichang, has just been completed. All of the tunneling is done by hand-blasting.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Western Maryland, mentioned in *Railway Age Gazette* of March 10, has ordered five Pacific type locomotives from the Baldwin Locomotive Works.

The New York, Ontario & Western has ordered four 10-wheel passenger locomotives from the American Locomotive Company, with cylinders 20 in. x 26 in., driving wheels 69 in., and total weight in working order 178,000 lbs.

The New York, Chicago & St. Louis has ordered six consolidation freight locomotives and nine 10-wheel locomotives from the American Locomotive Company. The consolidation locomotives have cylinders 19 in. x 28 in., driving wheels 63 in., and total weight in working order 172,000 lbs. The 10-wheel locomotives have cylinders 19 in. x 24 in., driving wheels 63 in., and total weight in working order 145,000 lbs.

The Pere Marquette, mentioned in the *Railway Age Gazette* of March 10 as being in the market for 50 locomotives, has ordered 35 consolidation freight locomotives, 10 six-wheel switching locomotives and five Pacific type passenger locomotives from the American Locomotive Company. The consolidation locomotives have cylinders 22 in. x 30 in., driving wheels 61 in., and total weight in working order 215,000 lbs. The switching locomotives have cylinders 20 in. x 26 in., driving wheels 51 in., and total weight in working order 136,000 lbs. The Pacific type locomotives have cylinders 22 in. x 28 in., driving wheels 77 in., and total weight in working order 215,000 lbs.

The Illinois Central has ordered 40 Mikado locomotives from the Baldwin Locomotive Works, as mentioned in the *Railway Age Gazette* of March 10. These locomotives will have the following dimensions and special equipment:

Dimensions.

Gage	4 ft. 8½ in.
Weight on drivers	217,000 lbs.
Total weight	280,000 lbs.
Diameter of cylinders	27 in.
Stroke of pistons	30 in.
Diameter of drivers	63 in.
Type of boiler	Radial stay.
Working steam pressure	175 lbs.
Tubes, outside diameter	2 in. and 5¾ in.
Tubes, length	20 ft. 6 in.
Firebox, length	120⅝ in.
Firebox, width	84 in.
Firebox, material and maker	Otis steel.
Grate area	70 sq. ft.
Tank capacity for water	9,000 gal.
Coal capacity	15 tons.

Special Equipment.

Axles, main	Heat treated, Standard Steel Works.
Axles, others	Open hearth steel.
Bell ringer	Gollmar.
Brakes	New York.
Brake beams	Creco.
Brake shoes	American.
Couplers	Sharon.
Driving boxes	Cast steel.
Headlight	Commercial acetylene.
Injector	Simplex.
Piston and valve rod packings	Paxton-Mitchell.
Safety valve	Consolidated.
Sanding devices	Viloco.
Sight-feed lubricators	Nathan.
Springs	Railway Steel Spring Co.
Staybolts	Tate.
Steam gages	Ashcroft.
Superheater	Schmidt.
Tires	Latrobe.
Tubes	Shelby.
Valve gear	Walschaert.

CAR BUILDING.

The Pittsburgh & Lake Erie is said to be in the market for 1,000 hopper and 1,000 gondola cars. This item has not been confirmed.

The Atlantic Coast Line has ordered 1,400 box cars from the American Car & Foundry Company, and 50 steel underframe phosphate cars from the Standard Steel Car Company.

The Louisville & Nashville has placed orders for 500 steel underframes for gondola cars, which are equally divided between the Mount Vernon Car and the American Car & Foundry companies.

The Western Maryland is said to have ordered 15 vestibule passenger, 2 combination, 2 baggage and 4 mail and express cars from the Barney & Smith Car Company of Dayton, Ohio. This item has not been confirmed.

The St. Louis & San Francisco, reported in the *Railway Age Gazette* of March 17 as in the market for 11 postal cars, has ordered from the American Car & Foundry Company eleven 60-foot steel exterior and wood interior postal cars for the Kansas City, Ft. Scott & Memphis.

The Ann Arbor Railroad, as reported in the *Railway Age Gazette* of March 10, has ordered 50 refrigerator cars and 55 box cars from the Standard Steel Car Company. The refrigerator cars will have a capacity of 80,000 lbs. The inside measurements will be 39 ft. 1½ in. long, 8 ft. 4 in. wide and 7 ft. 7¾ in. high; the over-all measurements will be 40 ft 5⅛ in. long, 9 ft. 2 in. wide and 13 ft. 1 in. high. The box cars will have a capacity of 80,000 lbs. The inside measurements will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high; the over-all measurements will be 37 ft. 5½ in. long, 9 ft. 2 in. wide and 13 ft. 8¾ in. high. The bodies of both types will be of wood and the underframes of steel. The special equipment on both types will be identical except where indicated.

Axles	Open hearth steel (Carnegie Steel Co.).
Bolsters, body	Steel.
Bolsters, truck	Am. Steel Foundries.
Brakes	New York Air Brake Co.
Couplers	Simplex (Am. Steel Foundries).
Draft gear	Farlow; Symington.
Insulating and lining	Keystone & Neptune (refrigerator).
Journal boxes	McCord.
Roofs	} Hutchins—inside iron (box). } Hutchins plastic (refrigerator).
Side bearings	Susemihl (Am. Steel Foundries).
Springs	Railway Steel Spring Co.
Trucks	Andrews steel side frames.
Wheels	Standard Steel Car Co.

The Wabash-Pittsburg Terminal, as reported in the *Railway Age Gazette* of March 10, has ordered 500 steel hopper cars from the Pressed Steel Car Company, and 500 steel hopper cars from the Standard Steel Car Company. The first 500 will be built at McKees Rocks, Pa., and the second 500 will be built at Butler, Pa. The capacity of all the cars will be 100,000 lbs., and they will weigh 37,000 lbs. Their inside measurements will be 30 ft. long, 9 ft. 5½ in. wide and 7 ft. ¼ in. high. Their over-all measurements will be 31 ft. 6 in. long, 10 ft. wide and 10 ft. 3 in. high. They will be all-steel self-clearing hopper cars. The specifications on both makes will be identical, except where indicated.

Axles	Open hearth steel (Carnegie Steel Co.).
Bolsters, body	Car Co.
Bolsters, truck	Simplex (Am. Steel Fdries.) on Standard Steel cars.
Bolsters, truck	Cast steel (Scullin-Gallagher) on Pressed Steel cars.
Brakes	Vestinghouse.
Brake beams	Waycott.
Brake shoes	American Brake Shoe & Foundry Co.
Brasses	Climax Bearing Co.
Couplers	Am. Steel Foundries.
Doors	Center dump.
Door fastenings	Enterprise Ry. Eq. Co.
Draft gear	Miner tandem on Standard Steel cars.
Draft gear	T. H. Symington on Pressed Steel cars.
Journal boxes	Fort Pitt Mall. Iron Co. on Standard Steel cars.
Journal boxes	Included in truck frame on Pressed Steel cars.
Side bearings	Standard Car Truck Co.
Springs	Railway Steel-Spring Co.
Trucks	Am. Steel Fdries. on Standard Steel cars.
Trucks	Bettendorf Axle Co. on Pressed Steel cars.
Wheels	Car Co.

Other Special Equipment.

Imperial uncoupling device.....Andreon Mfg. Co.
Byers wrought iron pipe and Dart unions throughout.
Republic Rubber Co.'s air brake hose.

IRON AND STEEL.

The Queensland Government Railway is in the market for 25,000 tons of rails.

The Great Northern has ordered 10,000 tons of rails from the Illinois Steel Company.

The New Zealand Government Railway is in the market for 10,000 tons of 70-lb. rails.

The Chicago & Northwestern has ordered 5,000 tons of rails in addition to the 40,000 tons mentioned in the *Railway Age Gazette* of February 24.

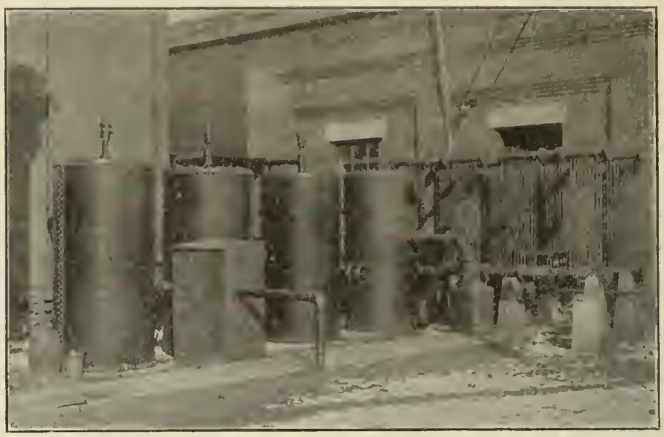
General Conditions in Steel.—Steel producers report a slight improvement in orders this week as compared with the corre-

sponding period of last week. There has been a better business in structural steel and plates. The heavy steel mills are operating about 50 per cent. of their capacity, although the United States Steel Corporation expects to be operating about 75 per cent. of its blast furnace capacity by the end of the current month.

Power Plant for Passenger Car Yard.

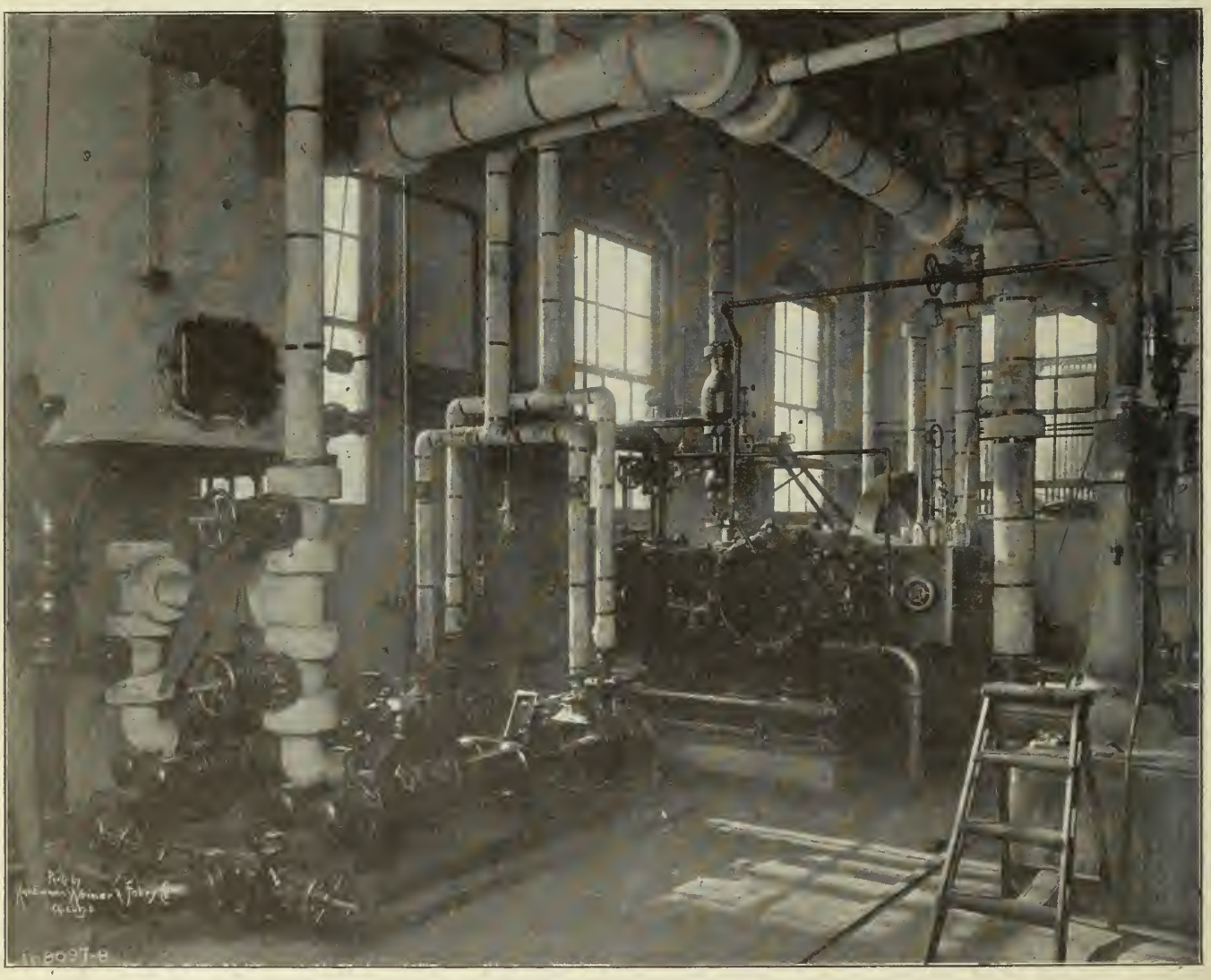
The new power plant of the Lake Shore & Michigan Southern, at Root and State streets, Chicago, is a good illustration of the substantial work now done by railways in their shop, roundhouse and yard improvements. The plant is intended to supply compressed air, steam heat and light for the passenger car yard in which the coaches, Pullman cars, dinging cars, etc., which come into the La Salle street station are cleaned and repaired. The power house is 44 ft. x 52 ft., and the brick chimney is 175 ft. high. There is space in the boiler room for four 207 h. p. Babcock & Wilcox boilers, making a total capacity of 828 h. p., but as yet only three boilers, having a total capacity of 621 h. p., have been installed. The power equipment consists of one Ingersoll air compressor with a capacity of 1,200 cu. ft., one small turbine engine for lighting, one vacuum pump and one wash-out pump. On the outside are four large tanks used as reservoirs for the compressed air and a system of small pipe condensers for cooling it.

All the piping in the power house, and that connecting the air tanks outside, including the high-pressure steam lines, exhaust steam lines and the feed and compressed air lines, was installed by the Horace L. Winslow Company, Chicago. The boilers are fitted with automatic stop checks and emergency valves. The main high pressure header is 8 ins. in diameter and is connected with curved connections, having a 5-ft. radius, to the automatic stop valves. These pipes are extra heavy and all valves and fittings over 2 ins. are flanged. The general design



Compressed Air Reservoirs and Coolers.

of the pipe work in this plant is of ample size, with full provision for expansion and contraction, and has ample area for the free flow of steam, air and water with minimum friction. Exceptionally strong hangers, clamps and anchors have been used, and, as a whole, it may be regarded as a good example of substantial and economical pipe installation.



Power Plant for Passenger Car Yard; Lake-Shore & Michigan Southern.

ANNUAL REPORTS

FORTY-SECOND ANNUAL REPORT, NEW YORK CENTRAL AND HUDSON RIVER RAILROAD COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1910.

To the Stockholders of
THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1910, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles.
Main line and branches owned	805.49
Proprietary lines	3.06
Lines leased*	2,621.11
Lines operated under contract	81.70
Trackage rights	273.67
Total road operated	3,785.03

The slight increase in road mileage operated is due to change of alinement and measurement at various points on the system and the extension of two branches of the Beech Creek Extension Railroad by 2.94 miles. A statement showing in detail miles of road and track operated will be found upon another page.

The capital stock authorized to December 31, 1910, is....$250,000,000.00

There was issued and outstanding on December 31, 1909....$178,632,000.00
There was issued during the year 1910..... 44,097,300.00

the amount outstanding on December 31, 1910, being.....$222,729,300.00
leaving a balance authorized but not issued of..... 27,270,700.00

The funded debt outstanding on December 31, 1909, was..$249,914,845.00
There has been issued and sold during the year a part of the issue of gold debentures of 1904 amounting to..... 5,000,000.00

making the total bonded debt outstanding on December 31, 1910 .....$254,914,845.00

There has also been placed upon the general books of the company its pro rata liability in connection with the certificates issued under the trust agreements, as follows:

Equipment trust certificates of 1907.....	$10,317,581.54	
Less payment in the month of November.....	793,660.12	
Net amount outstanding December 31, 1910.	$9,523,921.42	
Equipment trust certificates of 1910.....	6,509,466.30	16,033,387.72
Mortgage on real estate in the city of New York.....		150,000.00
bringing the total funded debt as shown on the balance sheet of December 31, 1910, to.....		$271,098,232.72

*The Dunkirk Allegheny Valley and Pittsburgh Railroad, 90.51 miles, is also leased by this company, but its mileage and operations are not included in this report. Separate accounts are kept and independent returns prepared in its behalf.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1910.	1909.	Increase or decrease.
OPERATING INCOME.	3,785.03	3,781.83	3.20
RAIL OPERATIONS.	*miles operated.*	*miles operated.*	*miles operated.*
Revenues	$99,908,478.17	$93,171,860.69	$6,736,617.48
Expenses	74,079,086.58	64,593,826.35	9,485,260.23
NET REVENUE FROM RAIL OPERATIONS	$25,829,391.59	$28,578,034.34	—$2,748,642.75
Percentage of expenses to revenues	(74.15%)	(69.33%)	(4.82%)
OUTSIDE OPERATIONS.			
Revenues	$4,791,030.30	$4,517,996.90	$273,033.40
Expenses	4,909,808.90	4,312,028.96	597,779.94
NET REVENUE FROM OUTSIDE OPERATIONS	.....	$205,967.94	.....
NET LOSS ON OUTSIDE OPERATIONS	$118,778.60	.....	—$324,746.54
NET REVENUE FROM ALL OPERATIONS	$25,710,612.99	$28,784,002.28	—$3,073,389.29
TAXES ACCRUED	4,697,826.30	4,434,504.32	263,321.98
OPERATING INCOME	$21,012,786.69	$24,349,497.96	—$3,336,711.27
OTHER INCOME.			
Joint facilities rents	$1,451,212.04	$1,274,627.35	$176,584.69
Miscellaneous rents	319,527.90	506,611.57	—187,083.67
Dividends on stocks owned or controlled	11,150,915.74	7,692,497.79	3,458,417.95
Interest on funded debt owned	573,754.67	577,901.13	—4,146.46
Interest on other securities, loans and accounts	1,595,601.41	1,080,595.14	515,006.27
Miscellaneous income	355,321.51	260,625.88	94,695.63
TOTAL OTHER INCOME	$15,446,333.27	$11,392,858.86	$4,053,474.41
GROSS CORPORATE INCOME	$36,459,119.96	$35,742,356.82	$716,763.14
DEDUCTIONS FROM GROSS CORPORATE INCOME.			
Rentals of leased lines	$10,058,290.85	$9,943,576.81	$114,714.04
Hire of equipment	972,557.08	959,684.09	12,872.99
Joint facilities rents	538,131.73	449,441.42	88,690.31
Miscellaneous rents	504,395.88	83,057.29	421,338.59
Interest on funded debt	9,162,019.59	8,913,651.53	248,368.06
Interest on equipment trust certificates	630,097.20	548,948.26	81,148.94
Other interest	80,848.89	940,970.39	—860,121.50
St. L. & A. Railway: interest, rental, etc.	$74,000.00	$74,000.00	.....
N. Y. & Ottawa Railway: interest on bonds	58,240.00	58,240.00	.....
Other deductions	91,866.67	75,366.67	$16,500.00
TOTAL DEDUCTIONS FROM GROSS CORPORATE INCOME	$22,170,447.89	$22,046,936.46	$123,511.43
NET CORPORATE INCOME	$14,288,672.07	$13,695,420.36	$593,251.71
DIVIDENDS, four each year*	13,363,758.00	8,931,600.00	4,432,158.00
SURPLUS FOR THE YEAR	$924,914.07	$4,763,820.36	—$3,838,906.29
APPROPRIATIONS FOR ADDITIONS AND BETTERMENTS	924,914.07	.....	924,914.07
BALANCE FOR YEAR CARRIED TO PROFIT AND LOSS	.....	$4,763,820.36	—$4,763,820.36

NOTE: Decrease designated by minus sign, —.
*Dividend in 1910, 6% on 2,227,293 shares of stock; in 1909, 5% on 1,786,320 shares.

Balance to credit of profit and loss December 31, 1909.....		$15,409,187.67
Against this there has been charged:		
Discount or loss on sundry securities.....	$35,352.33	
Uncollectible charges, sundry adjustments, etc. (net)	323,033.96	
Commissions, discounts and expenses account of Equipment Trust of 1910.....	141,376.76	
Abandoned property at various places.....	979,650.41	
Cash payments and 1910 installments on account New York Central Lines Equipment Trusts transferred to appropriated surplus	1,592,157.84	3,071,571.30
Balance December 31, 1910.....		$12,337,616.37

For the year covered by this report the revenue from transportation was $98,685,744.75, an increase of $6,447,221.47; revenue from operations other than transportation was $1,222,733.42, an increase of $289,396.01; revenue from outside operations (connected with, but in addition to transportation by rail) was $4,791,030.30, an increase of $273,033.40.

The total gross revenue from all operations was $104,699,508.47, an increase of $7,009,650,88. All sources of revenue from transportation have shown an increase with the exception of the mail service.

Freight revenue was $58,411,234.14, an increase of $3,961,952.67. The revenue freight carried amounted to 47,066,839 tons, an increase of 2,894,885 tons over last year, nearly reaching the tonnage of 1907 which still represents the highest level. Substantial increases show in all commodities with few exceptions, the largest increases occurring in coal and other minerals, metals and building material.

The revenue from passengers amounted to $30,992,855.71, an increase of $1,990,944.53. An increase in the number of local passengers carried of 1,317,999 and an increase of 967,489 in commutation passengers carried, with a slight increase in the average distance of travel and in the average receipts per mile, show that the passenger traffic over this company's lines continues in a satisfactory condition.

The revenue from express traffic was $4,122,283.51, an increase of $40,708.02 due to an enlarged volume of business. The expenses of rail operations amounted to $74,079,086.58, an increase of $9,485,260.23.

The operating expenses, by groups, were:

Maintenance of way and structures	$14,060,177.83
Maintenance of equipment	16,936,253.24
Traffic expenses	2,487,227.74
Transportation expenses	37,938,526.75
General expenses	2,656,901.02
Outside operations	4,909,808.90

In maintenance of way and structures the cost has increased largely in every item due to a greater amount of work being necessary than in the previous year; 12,094 tons of new rails, most of them of the 80 lb. size, at an increased average cost, having been laid in excess of the total of the year 1909 and approximately 300,000 additional new ties placed; these two items accounting for $578,072.29 of the increase. Signal and interlocking plants called for an outlay of $503,165.24 larger than in 1909; buildings, fixtures and grounds an additional $346,531.12, and repairs of bridges, trestles and culverts added $204,617.58 to the total increase.

In maintenance of equipment an increase of $1,514,605.03 is shown due mainly to a largely increased charge for repairs of steam locomotives and passenger cars. Traffic expenses, being those charges incurred in soliciting and procuring traffic outside of its actual movement by rail, amounted to $2,487,227.74, an increase of $213,400.06 mainly due to larger payments for outside agencies and expenses of fast freight lines.

To obtain the locomotives and cars necessary for immediate requirements, The New York Central & Hudson River Railroad Company, together with The Lake Shore & Michigan Southern Railway Company, The Michigan Central Railroad Company, The Cleveland Cincinnati Chicago & St. Louis Railway Company and the Chicago Indiana & Southern Railroad Company has become a party to an equipment trust agreement and lease dated January 1, 1910, known as the "New York Central Lines Equipment Trust of 1910." This agreement provides for an issue of $30,000,000 of equipment trust certificates, bearing interest at 4½% per annum, being 90% of the total cost of the equipment to be furnished under the terms of said agreement. These certificates are to be paid off in fifteen annual installments of $2,000,000 each, the first installment being payable January 1, 1911. The cost of the equipment to be leased under the terms of the agreement by this company will be $7,232,740.33, and its pro rata liability for certificates representing 90% of the cost is $6,509,466.30. Full particulars as to the character of the equipment acquired will be found upon another page.

The cost of transportation shows large increases in nearly all of the

accounts, the most noticeable being in fuel for locomotives, those engaged in yards being charged with $176,481.65 more than in 1909, and those in general service on the road $1,000,248.52 due to increased cost and to the greater amount of work performed, represented by an increase of 3,610,899 miles, each engine having averaged 1,486 more miles. The new rates of pay arranged in the early part of the year have been responsible for heavy increases in the cost of transportation. Enginemen have received $817,569.48 and trainmen $1,143,989.46 more than in the year 1909. Some of these increases are due to larger operations, indicated by the greater mileage of locomotives, an increase of 2,531,528 miles travelled by trains, and of 26,939,577 miles by cars, but the larger portion of them is caused by the increase in the rates of wages. The total increase in cost of transportation is $4,629,211.93, nearly 14%.

General expenses show an increase of $561,888.46, principally in the items of pensions and general office clerks and expenses. The increase in pensions is due to the development of the pension plan which was adopted on November 10, 1909, by which, effective January 1, 1910, employees who had reached seventy years of age, or were incapacitated for further work by reason of disabilities were, under certain restrictions, granted a life pension based on previous compensation and service, in lieu of the former rule of granting gratuities. The increase in the item of general office salaries and expenses was due to a great extent to the increasing exactions of the federal and state commissions, affecting the executive and accounting departments, together with the unusual number of elaborate and exhaustive studies, reports and data prepared during the year.

In outside operations a loss of $118,778.60 is shown. Deficits of $287,756.66 in harbor terminal transfers, $209,093.82 in the operation of dining and special cars, and $90,157.81 in ferry lines have been more than the profits from other outside operations could offset, although electric light and power plants, gas producing plants, grain elevators, stock yards, freight storage plants and the restaurant services have all produced fairly satisfactory profits.

Taxes have increased $263,321.98, in which is included $150,564.54 for the tax on the income of corporations levied by the Federal Government and paid by this company on behalf of itself and various leased lines.

In other income an increase of $3,458,417.95 is shown in dividends on stocks owned or controlled; and an increase of $515,006.27 in interest on other securities, loans and accounts. The increase in dividends is due principally to an extra dividend of six per cent. declared and paid by the Lake Shore and Michigan Southern Railway Company in March.

In deductions from gross corporate income rentals of leased lines increased $114,714.04 due principally to the charge for interest on improvement bonds issued in 1910 by the Boston and Albany Railroad Company and a full year's interest on similar bonds issued in 1909.

Interest on bonds of this company shows an increase of $248,368.06 due to the issue during 1910 of $5,000,000 additional Gold debentures of 1904 and the payment of a full year's interest upon the Spuyten Duyvil and Port Morris Railroad mortgage bonds. Interest on equipment trust certificates increased $81,148.94 due to the issue of certificates under the trust agreement of 1910. Other interest decreased $860,121.50 due principally to the retirement of the three year gold notes of 1907.

The surplus for the year, after paying a dividend of $13,363,758.00 representing six per cent. upon the capital stock, was $924,914.07, which amount was appropriated for improvements made upon the property.

Extraordinary expenditures during the year were as follows:

For additions to property, other than equipment		$4,960,177.90
For equipment, in excess of value of equipment retired		6,272,537.62
For construction work on leased lines and for Grand Central terminal improvement	$10,492,007.60	
Less amount refunded from proceeds of securities of lessor companies	2,000,000.00	8,492,007.60
		$19,724,723.12

In addition to the above, there has been added to the property, under the head of trust equipment, $16,873,001.65, to cover the value of the equipment delivered under the agreements of 1907 and 1910; the value of the remaining equipment, represented by outstanding certificates, is covered by a special deposit in the hands of the Guaranty Trust Company awaiting the delivery of the equipment, and appears in its proper place on the balance sheet.

Details of the above mentioned expenditures are shown on subsequent pages.

The operation of trains by electricity has been extended to Hastings on the Hudson River Division for trains equipped with the multiple unit system, and the extension of electric operation on the Harlem Division from Wakefield to North White Plains has been accomplished.

Satisfactory progress has been made in the work on the new Grand Central Terminal and increased facilities for the operation of trains have been provided.

The new office building on Lexington Avenue was occupied by the executive, financial and accounting departments early in the year and other departments followed as space was provided. The old Grand Central Station building was abandoned and is now almost entirely demolished. Work upon the street viaducts has been vigorously carried forward and this portion of the improvement is expected to be completed by the end of the year 1912. The new main station building is far advanced and the engineers in charge of the project estimate that it will be ready for use by the middle of the year 1912. The Merchants Loft Building, erected on a portion of the Terminal site as a joint investment of this company and the New York New Haven and Hartford Railroad Company, is nearing completion.

The company acquired in exchange for $5,000,000 gold debentures of 1904 the entire issue of preferred stock of the Geneva Corning and Southern Railroad Company, amounting to $5,000,000.

The Board of Directors has recorded the death of two of its active members and of two who had formerly been Directors.

Darius Ogden Mills, who was elected a member of the Board January 24, 1900, died on January 3, 1910.

Hamilton McKown Twombly, who was elected a member of the Board April 21, 1897, died on January 11, 1910.

Charles Cameron Clarke died on May 25, 1910. He entered the service of the Hudson River Railroad Company early in 1854 and was appointed Auditor on June 6 of that year, became Treasurer July 25, 1856, and on December 9, 1871, was appointed Treasurer of The New York Central and Hudson River Railroad Company. He was elected a Director May 4, 1883, and on the same day was appointed First Vice President. He resigned from the directorate January 27, 1909, and died at Briarcliffe Manor at the age of eighty-seven years. His life was a busy one, characterized by extraordinary energy and unswerving loyalty to the company during a period covering more than forty-five years.

Edward V. W. Rossiter, one of the oldest and most valued officers of the company, died December 11, 1910, and his loss was felt as a personal one by all who had been his associates or subordinates. He entered the service of the company as a boy of sixteen in the year 1860, became Cashier seven years later and Treasurer at the age of thirty-three. Able, faithful, hard-working and patient, he influenced all who came in contact with him, and fully deserved the promotions which he received. During the last period of his life he was Vice President, in charge of the finances of this company and nine allied companies, and from April 15, 1903, to November 10, 1903, was a member of the Board of Directors.

The results of the operation of the property for the fiscal year have not been as favorable as, at the beginning of the year, it was expected they would be.

Early in the year demands were made by employees in train, engine and yard service on the Baltimore and Ohio Railroad for an increase in pay. After prolonged negotiations, in order to avoid a strike, the question was, under the provisions of the Erdman Act, referred to the Chairman of the Interstate Commerce Commission and the Commissioner of Labor. The result substantially increased the wage scale of the employees involved. Reference is here made to this decision because it formed a basis for demands upon all other carriers in eastern territory.

Our employees in train and yard service immediately presented demands for the adoption of the Baltimore and Ohio schedule of pay. Conferences were held and every possible effort exerted to avoid making any increases. These conferences finally resulted in a deadlock, the organizations insisting on their full demands which the management felt could not be conceded.

A vote of employees was taken, resulting almost unanimously in favor of a strike. A further conference was then had and arbitration under the Erdman Act suggested, which was declined by the employees. It was then suggested that the matter be left to the New York Public Service Commission and this suggestion was also declined.

Finally, in order to avoid a strike, which would have been disastrous to the railroads, the employees and the communities served by our lines, an offer was made to submit the matter to Mr. E. E. Clark, a member of the Interstate Commerce Commission and formerly Grand Chief of the Order of Railway Conductors, and Mr. P. H. Morrissey, formerly President of the Brotherhood of Railroad Trainmen. After twenty-four hours' deliberation the proposition was accepted.

By this arbitration an increase of about $3,600,000 per annum in wages of employees was made and changed conditions of service included in the finding very materially increased this amount.

Similar increases were demanded and, by similar arbitration, enforced, on substantially all the lines between Chicago and the Atlantic seaboard.

After carefully measuring the effect of this increased cost of operation, it was felt that an increase in revenue must be provided, which could best be accomplished by an increase in class rates and certain commodity rates, on which little or no increase had been made in something like thirty years, during which time wages and the cost of materials used in railroad service had greatly increased. Tariffs were filed with the Interstate Commerce Commission on May 31, 1910, which would, under existing law, have become effective thirty days thereafter. A bill had been introduced in Congress very largely increasing the authority of the commission, including, among other things, the right to suspend the taking effect of any proposed increase in rates for a period not exceeding ten months, and it was feared that the filing of the tariffs might be construed as an effort to evade the provision of the proposed law. This company, therefore, in conjunction with other roads in interest, announced through the press, and subsequently advised the President of the United States and the Interstate Commerce Commission, that the rates filed would be subject to the provisions of any amendment to the Interstate Commerce Law that might be passed and that the commission could fix the date on which the increased rates should become effective.

Under this arrangement, successive suspensions of the proposed increases were made by the commission, the last one on January 30 to March 15, 1911.

On February 22, while this report was being compiled, the case was decided by the commission, denying all increases asked for, requiring the withdrawal of the proposed tariffs on or before March 10, 1911, and giving notice that if they were not so withdrawn, an order would be issued directing the maintenance of the present rates for a period of two years from that date.

The amendment to the Interstate Commerce Act above referred to, which was introduced and became effective after the filing of the tariffs, contained a provision that:

"At any hearing involving a rate increased after January 1, 1910, or of a rate sought to be increased after the passage of this act, the burden of proof to show that the increased rate or proposed increased rate is just and reasonable shall be upon the common carrier."

The increased expenses became effective April 1; the public hearings on the applications for increased rates began during the summer, and were concluded in November.

In deciding the case in the territory east of Chicago, the commission said in part: "Upon a view of the whole situation we hold that these defendants have not established such a need for additional revenue as justified, at this time, an increase in these rates.

"It has been several times stated in the course of this discussion, and should be repeated here, that in view of the complex character of this problem, nothing but an actual test can satisfactorily determine the financial results from the operations of these several carriers. There is no evidence before us which establishes the necessity for higher rates. The probability is that increased rates will not be necessary in the future. In view of the liberal returns received by these defendants in the past ten years, they should be required to show, with reasonable certainty, the necessity before the increase is allowed."

The earnings of the fiscal year ended June 30, 1910, were the largest in the history of the carriers in Official Classification Territory, reflecting the rebound from the depression of 1908-09, coupled with a full, normal crop of agricultural products; while the year previous, with which comparison was frequently made, showed the smallest gross earnings of any year in the five-year period, 1906 to 1910, inclusive. Furthermore, the fiscal year ended June 30, 1910, included but three months of the augmented expense of operation caused by the increase in wages, and the carriers felt that it could not be regarded as a normal year, or be accepted as a safe basis for judging the probable results of future operations upon the higher basis of expenses.

In presenting the case to the commission, the evidence adduced by the carriers, of necessity, consisted largely of expressions of opinion and estimates based upon the best judgment and experience of the witness. Under these circumstances, success was doubtful. Under the test exacted by the commission that "nothing but an actual test can satisfactorily determine the financial results from the operation of these several carriers," it was impossible, because the time available between the filing of the proposed tariffs and the decision of the case did not admit of the application of that test.

To apply a rule of this character to every appeal for relief on the part of the carriers might involve great injustice and it should be stated that the language of the decision indicates that it applies only to this particular case. The decision is qualified as follows:

"If actual results should determine that our forecast of the future is wrong, there might be grounds for asking a further consideration of the subject.

"But it should be further said that, before any general advance can be permitted, it must appear with reasonable certainty that carriers have exercised proper economy in the purchase of their supplies, in the payment of their wages and in the general conduct of their business."

This assurance of the commission of its willingness to give further consideration to this subject, if results shall demonstrate that the forecast upon which the decision is based was mistaken, is eminently fair, and no exception can be taken to the conditions imposed that the carriers must show that proper economy in the payment of wages, purchase of supplies, etc., is exercised. In this connection, however, it is due the management that the shareholders be advised that over the one item of wages, representing from sixty-three to sixty-five per cent. of the total operating expense, the railroads have been by statute deprived of very substantial control.

Under the Erdman Act passed by Congress in June, 1898, it is provided among other things:

"That whenever a controversy concerning wages, hours of labor or conditions of employment shall arise between a carrier subject to this act and the employees of such carrier, seriously interrupting or threatening to interrupt the business of said carrier, the Chairman of the Interstate Commerce Commission and the Commissioner of Labor shall, upon the request of either party to the controversy, with all practicable expedition, put themselves in communication with the parties to such controversy, and shall use their best efforts, by mediation and conciliation, to amicably settle the same, and if such efforts shall be unsuccessful, shall at once endeavor to bring about an arbitration of such controversy in accordance with the provisions of this act."

The act provides that one arbitrator shall be named by the carrier or employer, another by the labor organization to which the employees directly interested belong; the two thus chosen to name the third, and in the event of a failure to so name a third arbitrator, then the Chairman of the Interstate Commerce Commission and the Commissioner of Labor shall make the selection. Arbitration almost invariably means compromise, and this is especially true where labor is involved on one hand and an employing corporation on the other.

Labor is so thoroughly organized that a strike on one system would very rapidly spread to all roads in common territory, and the effect of such a struggle would be so wide-spread and so disastrous that no railroad would, even with the most ample justification, undertake it except as a last resort. With the aid of public opinion, inspired by a statement from the Chairman of the Interstate Commerce Commission and the Commissioner of Labor, that in their opinion a demand for an increase in wages was not justified, a railroad might enter upon a contest of this kind with hope for a favorable result; without this support, the struggle would be well nigh hopeless.

Without entering upon a discussion of the fairness of the general basis of wages paid employees of the carriers, it may be said that the present level is largely the result of successive mediations and arbitrations under the Erdman Act, and is higher than can, in the judgment of railroad managers of long experience, be continued by many of the roads upon the present basis of freight and passenger rates in the territory east of Chicago.

Increased cost of living, the rising cost of commodities of almost all kinds, has been a compelling argument in favor of advancing wages. In recognizing these conditions as affecting the employee, it is not unreasonable to hope the commission will realize that the same conditions apply to the employer, and that increases to the former made effective by mediation or arbitration involve some measure of responsibility for the effect of such increase upon the ability to pay, of the latter.

In regard to the purchase of the millions of dollars worth of supplies and materials bought by the railroads annually, while absolute honesty and the highest commercial ability may not be found in every transaction, it is doubtful if, taken as a whole, any other business of like magnitude will show a cleaner record.

Fuel represents nearly one-third of the cost of all material used by the roalroads, and investigation will show that the railroads buy coal at a substantially lower price than almost any other large consumer; as a rule, at a price that leaves an exceedingly slender margin above cost.

Fuel, rail, ties, lumber, locomotives, cars and other large items in the list of material and supplies, are purchased very largely on contracts, which are open to the inspection of agents and inspectors of the Interstate Commerce Commission, who have as full access to the books and records of the roalroads as National Bank examiners have to those of the national banks. In any investigation which the commission may find necessary or desirable, the responsible officers of the railroad in any department may be required to submit, under oath, to the most rigid examination.

Under these circumstances, substantially exact knowledge is possible, and any doubt that may exist in the minds of the commission may be confirmed or dissipated by such an investigation.

Pursuant to the suggestion of the commission, the advanced tariffs have been withdrawn.

The decision has been accepted in good faith, and every method of economy that can be enforced without resulting in deterioration of the property or impairment of the efficiency of the service is being adopted.

In March, 1910, it was the judgment of your Board of Directors that the financial results of the year ended December 31, 1909, and the outlook for the ensuing year, justified increasing the rate of dividend on the capital stock of the company from five to six per cent. per annum.

As a first measure of retrenchment, at a meeting of the Board held on March 8, 1911, the dividend was reduced to a five per cent. basis.

If the forecast of the Interstate Commerce Commission that increased volume of business and such economies as can wisely be adopted will offset the large increase in cost of operation is realized, then the railroads will very gladly acknowledge that they were mistaken in their apprehensions.

On the other hand, if the results of operation, as they shall be developed month by month, demonstrate that those apprehensions were not entirely groundless, further appeal will, in due time, be made to the commission with full confidence that needed relief will be granted.

The management is under renewed obligations to the Public Service Commissions of the State of New York and to the Massachusetts Board of Railroad Commissioners for helpful co-operation in improving the service and in fostering cordial relations between the road and its patrons.

The following appointments were made during the year: February 1, Richard A. White, General Auditor; July 15, William K. Vanderbilt, Jr., Assistant to the President; September 1, Loren F. Vosburgh, General Passenger Agent.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1910.

Assets.

Property owned as investment:		
Physical property owned		$255,315,444.49
Securities owned		131,557,710.90
Other permanent investments		49,674,553.05
Total property owned as investment		$436,547,708.44
Working assets:		
Cash	$6,777,901.21	
Treasury stock	300.00	
Marketable securities	27,681,683.42	
Loans and bills receivable	24,724,471.58	
Net traffic, car mileage and per diem balance	3,226,409.78	
Net balance due from agents and conductors	3,439,085.49	
Miscellaneous accounts receivable	8,171,738.05	
Materials and supplies	9,144,817.29	83,166,406.82
Deferred debit items		22,522,028.75
Total assets		$542,236,144.01

Liabilities.

Stock:		
Capital stock, common	$222,724,400.00	
Consolidation certificates	4,900.00	$222,729,300.00
Mortgage, bonded and secured debt		271,098,232.72
Working liabilities		23,098,687.42
Accrued liabilities not due		8,111,805.95
Deferred credit items		3,134.56
Additions to property through income since June 30, 1907		4,857,366.99
Profit and loss: Surplus		12,337,616.37
Total liabilities		$542,236,144.01

FORTY-FIRST ANNUAL REPORT, LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1910.

To the Stockholders of

THE LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31st, 1910, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles.
Main line and branches	871.03
Proprietary lines	289.32
Leased lines	414.73
Trackage rights	87.83
Total road operated	1,662.91

A statement, showing in detail the miles of road and track operated, will be found upon another page.

There was no change in capital stock during the year, the amount authorized and outstanding December 31st, 1910, being $50,000,000.00.

The funded debt outstanding on December 31st, 1909, was		$150,400,000.00
It has been increased during the year by the issue and sale of twenty-five year, four per cent. gold bonds of 1906, out of a remaining unissued balance of $15,000,000.00	$9,280,000.00	
There has also been placed upon the general books of the company, its pro-rata liability in connection with the certificates issued under the New York Central Lines equipment trust agreements of 1907 and 1910	19,585,005.97	28,865,005.97
Total		$179,265,005.97
It has been decreased during the year by the retirement of three year five per cent. gold notes issued by the company February 1st, 1907, aggregating	$15,000,000.00	
Also by the payment on November 1st, of the company's pro-rata of the third installment on the equipment trust certificates of 1907.	$447,226.18	$15,447,226.18
Total funded debt December 31st, 1910		$163,817,779.79

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1910.	1909.	Increase or decrease.
OPERATING INCOME.	1,662.91	1,662.79	.12
RAIL OPERATIONS.	*miles operated.*	*miles operated.*	*miles operated.*
Revenues	$49,420,210.99	$45,110,997.15	$4,309,213.84
Expenses	34,920,932.90	28,023,661.04	6,897,271.86
NET REVENUE FROM RAIL OPERATIONS	$14,499,278.09	$17,087,336.11	—$2,588,058.02
Percentage of expenses to revenues	(70.66%)	(62.12%)	(8.54%)
OUTSIDE OPERATIONS.			
Revenues	$559,376.73	$422,399.56	$136,977.17
Expenses	609,092.28	501,306.73	107,785.55
NET DEFICIT FROM OUTSIDE OPERATIONS	$49,715.55	$78,907.17	—$29,191.62
NET REVENUE FROM ALL OPERATIONS	$14,449,562.54	$17,008,428.94	—$2,558,866.40
TAXES ACCRUED	1,720,182.33	1,458,905.00	261,277.33
OPERATING INCOME	$12,729,380.21	$15,549,523.94	—$2,820,143.73
OTHER INCOME.			
Hire of equipment	$383,818.19	*$272,621.06	$656,439.25
Joint facilities rents	350,446.54	381,596.15	—31,149.61
Miscellaneous rents	70,209.43	43,070.37	27,139.06

*Debit.

Other Income. (Continued)	1910.	1909.	Increase or decrease.
Dividends on stocks owned or controlled	$7,755,013.50	$4,550,205.62	$3,204,807.88
Interest on funded debt owned	164,946.87	231,310.00	—66,363.13
Interest on other securities, loans and accounts	1,005,914.11	1,268,721.45	—262,807.34
Miscellaneous income	721,738.05	11,983.69	709,754.36
Total Other Income	$10,452,086.69	$6,214,266.22	$4,237,820.47
Gross Corporate Income	$23,181,466.90	$21,763,790.16	$1,417,676.74
Deductions from Gross Corporate Income.			
Rentals of leased lines	$2,268,573.56	$1,858,691.23	$409,882.33
Joint facilities rents	336,967.91	277,237.45	59,730.36
Miscellaneous rents	8,122.88	5,051.46	3,071.42
Interest on bonded debt	5,454,783.05	5,920,000.00	—465,216.95
Interest on equipment trust certificates	542,595.54	309,331.46	233,264.08
Other interest	410,222.83	75,181.93	335,040.90
Dividend on guaranteed stock	96,030.00	64,020.00	32,010.00
Other deductions	277,135.80	336,728.52	—59,592.72
Total Deductions from Gross Corporate Income	$9,394,431.47	$8,846,242.05	$548,189.42
Net Corporate Income	$13,787,035.43	$12,917,548.11	$869,487.32
Dividends (18% 1910, 12% 1909)	8,903,970.00	5,935,980.00	2,967,990.00
Surplus for the Year	$4,883,065.43	$6,981,568.11	—$2,098,502.68
Additional equipment	.....	1,263,186.28	—1,263,186.28
1910 installments on 1907 and 1910 trust equipment	1,365,297.22	.....	1,365,297.22
Balance to Credit of Profit and Loss	$3,517,768.21	$5,718,381.83	—$2,200,613.62

Note: Decrease designated by minus sign —.

Balance to credit of profit and loss for the year 1910		$3,517,768.21
Amount to credit of profit and loss, December 31, 1909		27,166,038.10
		$30,683,806.31
Add:		
Profit from sale of Jamestown, Franklin and Clearfield Railroad Company bonds	$1,430,000.00	
Profit from sale of Hocking Valley Railway Company stock	177,300.00	1,607,300.00
		$32,291,106.31
Deduct:		
Discount on $9,280,000.00 gold bonds of 1906	$741,321.25	
Discount, commission and expenses on account of New York Central Lines equipment trust certificates of 1910	299,565.71	
Commission and expenses on one year franc notes	11,920.40	
Initial payment of ten per cent. on New York Central Lines equipment trust of 1910, credited to appropriated surplus	1,481,957.25	
Net loss in adjustment of sundry accounts	35,122.65	2,569,887.26
Balance to credit of profit and loss, December 31, 1910		$29,721,219.05

The operating revenues for the year were $49,420,210.99, an increase of $4,309,213.84 as compared with the previous year. Revenue derived from transportation of freight amounted to $32,646,535.52, an increase of $2,911,258.90, due to the greater tonnage handled; the principal increases being in bituminous coal, ores, other mineral and manufactured products. Passenger revenue was $11,130,124,78, an increase of $975,904.61, due to a larger number of both interline and local passengers carried. The revenue from transportation of mails was $2,124,214.11, an increase of $27.41. Revenue from express traffic was $1,649,342.83, an increase of $147,320.75.

Other passenger train revenue, including excess baggage and milk, amounted to $689,425.30, an increase of $51,501.09. Switching and other transportation revenue amounted to $679,648.33, an increase of $75,466.34, due principally to larger receipts from switching service. Other than transportation revenues were $500,920.12, an increase of $147,734.74, due mainly to larger collections of car demurrage and additional revenue derived from the rental of buildings and other property. Operating expenses for the year amounted to $34,920,932.90, an increase of $6,897,271.86. Operating expenses and increases therein by groups were:

		Increase.
Maintenance of way and structures	$7,549,661.40	$2,081,298.22
Maintenance of equipment	7,873,217.06	1,061,666.40
Traffic expenses	1,153,165.10	51,568.63
Transportation expenses	17,442,857.80	3,527,900.82
General expenses	902,031.54	174,837.79

In maintenance of way and structures there were included large expenditures for ballasting 315 miles of main line track with stone, changing traffic from left-hand to right-hand running and general repairs and renewals of bridge structures, buildings and fixtures. There was also a large increase in maintenance of roadway and track expenses due to additional main track built and resulting greater mileage of main tracks to maintain. Maintenance of way employees were granted an increase in wages in the early part of the year, which added $297,761.00 to maintenance expenses.

Increases in maintenance of equipment expenses during the year were largely attributable to the following causes: advances in rates of pay granted to shopmen, aggregating $151,979.47; higher prices paid for materials purchased, representing an increased cost of $203,700.00; heavy charges in repairs due to equipping a large number of locomotives with improved devices, such as stokers, superheaters, etc. The remaining increases are principally due to additional mileage of equipment in service during the year.

Increased traffic expenses were principally due to large expense in printing tariffs.

Transportation expenses show an increase in all items affected by the movement of traffic, which is partially attributed to the substantial gain in freight and passenger business. Demands made upon the company by switchmen and trainmen for an increase in wages were submitted to arbitration and were followed by a general arbitration affecting the wages of practically all employees of the transportation department, resulting in increased wages to enginemen, conductors and other trainmen, yardmen, station forces and telegraph operators, creating an additional charge to transportation expenses within the year, through said increased rates of pay, of $644,467.27. The strike of bituminous coal miners in the Illinois fields during the greater part of the year forced the company to obtain fuel coal from other fields at a considerably advanced cost, which partially explains the large increase in the fuel for locomotive items.

In general expenses are included the payments made by the company during the year to aged and disabled employees who have been retired under the pension plan effective January 1, 1910, and the payment of a large premium due to placing fire insurance on practically all of the company's buildings and passenger equipment, effective January 1, 1910, it having been the policy in prior years to insure only a very small portion of the company's property.

Outside operations show a decreased loss for the year of $29,191.62, principally due to the company's commercial ice supply plants having been operated at a gain through the reduced price at which ice was obtained.

Taxes accrued amounted to $1,720,182.33, an increase of $261,277.33. Of this amount $137,739.75 is due to the income tax of one per cent. imposed by the federal government, the balance being distributed to all states in which the company operates.

Other income for the year was $10,452,086,69, an increase of $4,237,820.47 as compared with the previous year, due to additional amounts received by the company for use of its equipment on foreign lines, larger revenue received from dividends on stock owned and increase in miscellaneous income.

Deductions from gross corporate income were $9,394,431.47, an increase of $548,189.42 as compared with the previous year. This is attributable to the following causes:

Rental of Jamestown, Franklin and Clearfield Railroad increased $209,062.71, due to payment of interest for the full year on $11,000,000.00 bonds issued by that company as compared with a half year's interest paid in 1909 and rental of the Mahoning Coal Railroad increased $200,819.62, due to the larger volume of traffic handled over that road, a total increase of $409,882.33 in rental of leased lines.

Joint facilities and miscellaneous rents increased $62,801.78.

Interest on equipment trust certificates increased $233,264.08, through the participation of the company in the trust certificates of 1910 issued during the year.

Other interest increased $335,040.90, principally attributable to interest accrued on one year franc notes issued by the company March 17, 1910.

Interest on bonded debt decreased $465,216.95, largely due to the retirement of three year gold notes.

Other deductions decreased $59,592.72, due to reduction of the company's proportion of deficit of Indiana Harbor Belt Railroad Company.

From the net corporate income of the company for the year, of $13,787,035.43, three dividends, aggregating 18 per cent. amounting to $8,903,970.00, were paid, leaving a surplus for the year of $4,883,065.43, from which there was deducted installments for the year 1909, on trust equipment certificates of 1907 and 1910, amounting to $1,365,297.22. In 1909, the sum of $1,263,186.28 was deducted from income for additional equipment.

The work of changing the main line between Buffalo and Chicago, from left to right hand running, which commenced in 1909, was completed on December 27th, 1910, at a total expense to the company of approximately $1,150,000.00.

The company issued as of March 17, 1910, its notes payable March 15, 1911, to the extent of 44,000,000 francs, equivalent to $8,502,415.46.

To obtain the locomotives and cars necessary for immediate requirements, The Lake Shore and Michigan Southern Railway Company, together with The New York Central and Hudson River Railroad Company, The Michigan Central Railroad Company, The Cleveland, Cincinnati, Chicago and St. Louis Railway Company, and the Chicago, Indiana and Southern Railroad Company, has become a party to an equipment trust agreement and lease dated January 1, 1910, known as "New York Central Lines Equipment Trust of 1910." This agreement provides for an issue of $30,000,000 of equipment trust certificates, bearing interest at four and a half per cent. per annum, being ninety per cent. of the total cost of the equipment to be furnished under the terms of said agreement. These certificates are to be paid off in fifteen annual installments of $2,000,000 each, the first installment being payable January 1, 1911. The cost of the equipment to be leased under the terms of the agreement by this company, will be $15,301,184.00, and its pro-rata liability for certificates representing ninety per cent. of the cost is $13,771,065.60. Full particulars as to the character of the equipment acquired will be found upon another page.

During the year the company acquired by purchase 40,271 shares of stock of the Kanawha and Michigan Railway Company, 60,001 share of stock of the Pittsburgh and Lake Erie Railroad Company, all of the outstanding capital stock of the Toledo and Ohio Central Railway Company, being 37,014 shares of preferred stock and 58,463 shares of common stock, and $80,000.00 of Toledo and Ohio Central Railway Company, St. Mary's Division, first preference income bonds.

The company sold during the year 11,540 shares of stock of the Hocking Valley Railway Company and $11,000,000.00 of Jamestown, Franklin and Clearfield Railroad Company first mortgage bonds.

Cost of road and equipment on December 31, 1909, was		$101,322,482.58
It has been increased during the year as follows:		
Expenditures for additions and betterments to the property as shown in detail elsewhere	$6,371,015.98	
To show upon the company's books the cost of the equipment acquired under the New York Central Lines' Equipment Trusts of 1907 and 1910, viz.:		
Equipment trust of 1907	5,739,402.67	
Equipment trust of 1910	14,766,060.11	26,876,478.76
		$128,198,961.34
Amount credited to equipment replacement fund	$1,373,738.59	
To which fund there was charged the cost of additional equipment acquired consisting of 2 locomotives, 2 steel buffet cars, 132 caboose cars, 3 snow plows, 1 wrecking crane, 2 steam shovels and other miscellaneous equipment	386,914.08	986,824.51
Cost of road and equipment, December 31, 1910		$127,212,136.83

The Board records the death, on January 3, 1910, of Mr. Darius O. Mills, and on January 11, 1910, of Mr. Hamilton McK. Twombly, both directors of the company.

To fill these vacancies Messrs. James Stillman and Marvin Hughitt were elected directors.

The Board also records the death, on December 11, 1910, of Mr. Edward V. W. Rossiter, who had been a vice-president of the company since July 1, 1904.

The following appointments were made during the year:

January 1, Richard M. Huddleston, General Auditor; George M. Glazier, Auditor; Leroy V. Porter, Assistant Auditor; William A. Terry and James Webster, Assistant Freight Traffic Managers.
January 5, Frank H. Wilson, Assistant General Superintendent.
January 15, Wallace W. Ryder, General Superintendent of Telegraph.
February 1, John W. Daly, Assistant Passenger Traffic Manager, and Lester A. Robinson, General Passenger Agent.
April 18, Herbert J. Merrick, General Superintendent Freight Transportation, and Orin C. Smith, Superintendent Car Service.
May 16, Donald R. MacBain, Superintendent Motive Power.
June 1, Roscoe B. Kendig, General Mechanical Engineer.
July 15, William K. Vanderbilt, Jr., Assistant to President, and Samuel H. West, Assistant General Attorney, Cleveland district.
October 1, Edgar Freeman, Assistant Treasurer.
October 31, Joseph F. Farrell, General Tie Agent.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employes in every department of the service during the year.

WILLIAM C. BROWN,
President.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1910.

Assets.

Property investment		$134,380,847.20
Working assets:		
Cash	$4,290,339.07	
Securities issued or assumed—held in treasury:		
Lake Shore and Michigan Southern Ry. Co. stock	6,741.50	
Marketable securities	97,632,374.05	
Loans and bills receivable	6,627,000.17	
Traffic and car service balances due from other companies	2,663,283.04	
Net balance due from agents and conductors	971,022.23	
Miscellaneous accounts receivable	6,823,730.23	
Materials and supplies	4,250,202.82	
Other working assets	184,644.74	123,449,337.85
Accrued income not due:		
Unmatured interest, dividends and rents receivable		1,049,689.52
Deferred debit items		15,055,117.22
Total assets		$273,934,991.79

Liabilities.

Stock	$50,000,000.00
Mortgage, bonded and secured debt	163,817,779.79
Working liabilities	17,014,928.02
Accrued liabilities not due	4,171,607.49
Deferred credit items	364,134.39
Additions to property	8,845,323.05
Profit and loss	29,721,219.05
Total liabilities	$273,934,991.79

TWENTY-SECOND ANNUAL REPORT, CLEVELAND, CINCINNATI, CHICAGO AND ST. LOUIS RAILWAY COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1910.

To the stockholders of
The Cleveland, Cincinnati, Chicago & St. Louis Railway Company:

The Board of Directors herewith submits its report for the year ended December 31, 1910.

The mileage embraced in the operation of the road is as follows:

Main line	1,680.95
Branches	166.64
Trackage rights	134.62
Total length of road operated	1,982.21
Second track	378.10
Side tracks	1,074.94
Total mileage of track	3,435.25

The total mileage of track operated has been increased during the year as follows:

Second tracks: increased	39.47
Side tracks: decreased	9.33
Total additional tracks	30.14

A statement showing in detail the mileage of road operated will be found on another page.

The following is a statement of the capital stock authorized and outstanding on December 31, 1910:

Preferred stock authorized		$10,000,000.00
Common stock authorized		50,000,000.00
Total preferred and common stock authorized		$60,000,000.00
Preferred stock issued and outstanding	$10,000,000.00	
Common stock issued and outstanding	47,056,300.00	57,056,300.00
Balance common stock authorized but not issued, December 31, 1910		$2,943,700.00

The funded debt outstanding December 31, 1909, was $70,187,155.00

It has been increased during the year as follows:

C C C & St. L Ry general mortgage bonds; issued for additions, improvements, double tracking, equipment, etc.	$1,000,000.00	
C C C & St. L Ry 4% twenty-year debenture bonds, dated June 1, 1910, maturing June 1, 1930, issued for purpose of funding floating indebtedness, and for construction and improvements to an aggregate amount of 50,000,000 francs, equivalent at date of issue to	9,650,180.94	
C C C & St. L Ry general mortgage bonds issued for retirement of prior lien bonds	78,000.00	
There has also been placed upon the general books of the Company its pro rata liability in connection with the certificates issued under the New York Central Lines Equipment Trust Agreements of 1907 and 1910	6,201,354.84	16,929,535.78
		$87,116,690.78

Prior lien bonds and equipment trust certificates retired during the year:

Equipment trust certificates due November 1, 1910	$246,689.81	
C I St L & C Ry Co first mortgage bonds	6,000.00	
C I St L & C Ry Co general first mortgage bonds	72,000.00	324,689.81
Total funded debt outstanding December 31, 1910		$86,792,000.97

There was expended during the year for additions to the property, improvements, double tracking, equipment, etc., and charged to cost of road and equipment, the sum of $9,217,391.17, as follows:

Cleveland Division	$1,304,012.54
Cincinnati Division	879,560.25
St. Louis Division	$318,673.28
Chicago Division	629,269.56
Cairo Division	540,025.15
Michigan Division	27,617.56
Interest and commission	264,669.39
For new equipment	5,253,563.44
Total	$9,217,391.17

A detailed statement of the above will be found upon another page.

During the year there was advanced for construction of the Evansville, Mt. Carmel and Northern Railway, $1,341,931.50. This company was incorporated under the laws of the State of Indiana, and articles of association filed August 1, 1906, for the purpose of constructing a railroad from Evansville, Indiana, to the Illinois State Line, near Mt. Carmel. November 7, 1906, articles of association were also filed in the State of Illinois, for the incorporation of a railroad company named the Evansville, Mt. Carmel and Northern Railway Company, for the purpose of constructing a railroad from Mt. Carmel to the Indiana State Line, intersecting the railway of the Indiana company. On October 17, 1910, the Company so incorporated in Indiana acquired, by purchase, the property rights and franchises of said Company of Illinois. On November 1, 1910, the Indiana company entered into an agreement with the C. C. C. & St. L. Ry. Co., under which the latter is to operate the line of the former. It is expected that the road will be opened for traffic on June 1, 1911.

The Saline Valley Railway Company was organized under the laws of the State of Illinois, April 6, 1907, for the purpose of constructing a railroad from Harrisburg, Saline County, Illinois, to Marion, Williamson County, Illinois. There has been advanced on account of this property, during the year, $20,068.95.

There has been advanced on account of the St. Louis Short Line Division for construction during the year, $12,702.42.

This companys' proportion of the deficit in operation of the Central Indiana Railway for the year 1910, amounting to $62,465.00, has been charged of as a "Deduction from Income."

There have been purchased during the year by the Central Trust Company, Trustee for the sinking fund of the C. C. C. & St. L. Ry. Company's St. Louis Division first collateral trust bonds, 24 bonds, par value $24,000.00, making a total of 566 bonds at par value of $566,000.00, now held by the Trustee.

To obtain the locomotives and cars necessary for immediate requirements, The Cleveland, Cincinnati, Chicago & St. Louis Railway Company, together with The New York Central & Hudson River Railroad Company, The Lake Shore & Michigan Southern Railway Company, The Michigan Central Railroad Company and The Chicago, Indiana & Southern Railroad Company has become a party to an equipment trust agreement and lease dated January 1, 1910, known as the "New York Central Lines Equipment Trust of 1910." This agreement provides for an issue of $30,000,000 of equipment trust certificates, bearing interest at 4½% per annum, being 90% of the total cost of the equipment to be furnished under the terms of said agreement. These certificates are to be paid off in fifteen annual installments of $2,000,000 each, the first installment being payable January 1, 1911. The cost of the equipment to be leased under the terms of the agreement by this company will be $3,327,097.00, and its pro rata liability for certificates requiring 90% of the cost is $2,994,387.30. Full particulars as to the character of the equipment acquired will be found upon another page.

During the year there was expended and charged to capital account, for new equipment $5,253,563.44, including $3,168,832.18 account of the New York Central Lines Trust of 1907 and $2,589,139.00 account of Equipment Trust of 1910, less credit balance in equipment replacement fund at close of year, $504,407.74. This credit balance represents original cost of various classes of equipment retired during the year, amounting to $530,459.25 less $26,051.51 charged to the fund on account of additions to equipment during the year.

The annual installments on Equipment Trust certificates and cash payments on Trust Equipment, amounting to $705,229.53, have been charged to Profit and Loss and credited to Appropriated Surplus as additions to property through income.

All the principal sources of revenue have shown increases.

The increase in freight revenue of $1,947,547.94 (10.83%) is due to increased volume of business, as there was an increase of 2,266,303 tons carried (10.97%) over last year, and an increase in revenue tons carried one mile of 344,760,832 (10.43%), while the average receipts per ton per mile and average haul of revenue freight showed only insignificant variations.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

Operating Income. Rail Operations.	1910. 1,982.21 miles operated.	1909. 1,982.21 miles operated.	Increase or decrease.
Revenues	$30,423,004.78	$27,657,740.99	$2,765,263.79
Expenses	23,495,620.12	19,711,494.56	3,784,125.56
Net Revenue from Rail Operations	$6,927,384.66	$7,946,246.43	—$1,018,861.77
Percentage of expenses to revenue	(77.23%)	(71.27%)	(5.96%)
Outside Operations.			
Revenues	$335,702.20	$305,324.92	$30,377.28
Expenses	433,883.69	361,863.38	72.020.31
Net Deficit from Outside Operations	$98.181.49	$56,538.46	$41,643.03
Net Revenue from All Operations	$6,829,203.17	$7,889,707.97	—$1,060,504.80
Taxes Accrued	949,548.00	878,328.26	$71,219.74
Operating Income	$5,879,655.17	$7,011,379.71	—$1,131,724.54
Other Income.			
Joint facilities rents	$329,149.90	$309,155.40	$19,994.50
Miscellaneous rents	203,603.48	132,489.89	71,113.59
Dividends on stocks owned or controlled	141,503.90	98,274.90	43,229.00
Interest on funded debt owned	45,160.00	44,260.00	900.00
Interest on other securities, loans and accounts	91,689.56	36,177.43	55,512.13
Miscellaneous income	9,706.68	2,875.25	6,831.43
Total Other Income	$820,813.52	$623,232.87	$197,580.65
Gross Corporate Income	$6,700,468.69	$7,634,612.58	—$934,143.89
Deductions from Gross Corporate Income.			
Rentals of leased lines	$120,000.00	$120,000.00	.....
Hire of equipment, car mileage and per diem balances	680,209.94	482,156.54	$198,053.40
Interest on equipment trust certificates	215,931.68	170,627.10	45,304.58
Joint facilities rents	533,661.18	499,006.81	34,654.37
Miscellaneous rents	142,868.82	142,109.70	759.12
Interest on funded debt	3,187,574.66	2,925,848.00	261,726.66
Other interest	238,818.92	465,851.70	—227,032.78
Proportion loss operation Central Indiana Ry.	62,465.00	52,640.92	9,824.08
Discount on debenture bonds.	43,441.29	.....	43,441.29
Total Deductions from Gross Corporate Income	$5,224,971.49	$4,858,240.77	$366,730.72
Net Corporate Income	$1,475,497.20	$2,776,371.81	—$1,300,874.61
Dividends preferred, four, aggregating 5%	$500,000.00	$500,000.00	.....
Dividends common, one, 2%	941,126.00	941,126.00	.....
	$1,441,126.00	$1,441,126.00	.....
Surplus for the Year	$34,371.20	$1,335,245.81	—$1,300,874.61

Note: Minus sign (—) designates decrease.

Amount to credit of profit and loss December 31, 1909		$3,021,953.22
Surplus for the year 1910		34,371.20
Add:		
Adjustment of sundry accounts		52,082.44
		$3,108,406.86
Deduct:		
Cash payments 1910 trust equipment	$258,913.90	
1907 trust equipment installment	246,689.81	
1910 trust equipment installment	199,625.82	
Discount on C. C. C. & St. L. Ry Co. general mortgage bonds	74,815.00	
Expenses C. C. C. & St. L. Ry Co. debenture bonds	70,488.93	
Discount, commission and expenses N. Y. C. lines equipment trust 1910	65,137.72	915,671.18
Balance December 31, 1910		$2,192,735.68

The increase in passenger revenue of $642,342 (8.96%) is similarly due to increased business handled: $381,179.97 of the increase being in interline business and $261,162.09 in local business. There was an increase of 545,651 passengers carried (7.65%) and 33,758,388 passengers carried one mile (8.41%), with practically the same average receipts per passenger per mile as last year.

Express revenues showed an increase of $127,480.74 (16.25%) reflecting increased volume of business handled for express company.

The decrease in revenue from operations other than transportation of $27,688.57 is altogether attributable to change in distribution; the great majority of items appearing last year under "Rents of buildings and other property" being transferred this year to "Miscellaneous rents," under "Other income," the latter item this year showing an increase of $71,113.50.

Revenue from car service (demurrage) shows an increase of $37,125.47.

Details of operating expenses on another page show the various fluctuations in items of expenses. The increases and decreases by departments are as follows:

Maintenance of way and structures increased		$774,671.47
Maintenance of equipment repairs increased	$700,702.02	
Maintenance of equipment renewals decreased	175,547.06	525,154.96
Traffic expenses increased		84,192.37
Transportation expenses increased		2,289,830.87
General expenses increased		110.275.89

Of the increase in maintenance of way expenditures it will be noted that $400,308.70 was in the three items of rails, ties and other track material on account of the increased expenditures necessary to keep the track up to standard. There were 21,000 tons of new rail laid in 1910 as against less than 5,000 tons in 1909. The new standard of track material used is more expensive than old designs and a greater average of renewals was necessary on account of conditions existing at beginning of year.

The increase in ballast is due to extensive distribution of gravel necessary on Cleveland and Michigan Divisions.

Increases shown in grade crossings, signals and interlocking plants are of a general character due to necessary installation of crossing bells and crossing repairs and rebuilding and remodeling signals and interlocking plants on various divisions.

Of the increase shown for buildings, fixtures and grounds, amounting to $122,828.14, important items were: $65,400.00 for operating expense proportion of cost of new passenger station at Springfield, Ohio; $10,000.00 for similar proportion of new freight house at Columbus, Ohio; with extensive repairs to roundhouses at Indianapolis and Cincinnati, freight houses at East St. Louis, Cincinnati and Indianapolis and to shop buildings at Brightwood, aggregating about $25,000.00. A very important factor in this, as in other departments, was the increase necessary in all expenses of which labor was a component part; the increase in the maintenance of way department due to increased rate of wages paid employees amounting to $156,399.65, for the year.

Increase in maintenance of equipment was principally in locomotives and freight cars and due to increased train, locomotive and car mileage made necessary by increased traffic, also to increased rate of wages paid employees of various classes which, in this department, amounted to $169,131.86.

Increase in traffic expenses is explained by larger payments on account of expenses of fast freight lines and other agencies for soliciting and procuring traffic and the largely increased expenditures for tariffs, under present laws, reflected in the increase in stationery and printing expense of $38,564.80.

A very important factor in the increase in transportation expenses, is, as in other departments, the increased rates of wages paid various classes of labor. The increased expense in the transportation department from this source amounted for the year to $564,877.21. Fuel for locomotives increased $645,255.19, of which approximately $207,000.00 was due to increase in price of 11 cents per ton over 1909 and $438,000.00 due to increased consumption and increased cost of handling coal stored to operate the road during coal miners' strike effective April 1. The increase shown in personal injuries, $147,679.20, is due mainly to an unusual number of casualties in 1910. Except as above noted, the increased transportation expenses are due to increased business.

In general expenses the only item of increase calling for special mention is that of pensions, which shows an increase of $27,282.65 under the new plan for pensioning employees, effective January 1st, 1910.

Renewals of equipment decreased $175,547.06 due principally to the fact that in 1910 only 8 locomotives were retired from service, while 30 were retired in 1909, and 3 passenger cars in 1910, against 8 in 1909. The number of freight cars retired in 1910 was 666, as compared with 544 in 1909.

The effect of the increased ratio of operating expenses to revenue (5.96%) is shown in the fact that with an increase in operating revenues of $2,765,263.79, there is a decrease in net operating revenue of $1,018,861.77.

The increase in net deficit from outside operations, amounting to $41,643.03, is accounted for by the heavier loss from the operation of dining cars.

An important item in the increase in taxes, amount $71,219.74, was the Federal Income Tax, $31,613.12.

Other income increased $197,580.65, due to increase in rents, dividends, interest and miscellaneous minor items.

The increase in deductions from income of $366,730.72 is principally due to increased interest on funded debt, account of issue of debenture bonds and general mortgage bonds and larger payments for hire of equipment, the result of per diem charges increased, from 25 cents to 30 cents per day for five months of the year and to 35 cents per day for seven months of the year.

Out of the net income for the year of $1,475,497.20 there were paid dividends of 5% on the preferred stock and 2% on the common stock, leaving a surplus for the year of $34,371.20.

On the pages following will be found the general balance sheets and tabulated statements showing results of operation for the year.

Separate reports have been issued showing the financial condition and results from operation of the Peoria & Eastern Railway and the Cincinnati Northern Railroad for the year.

The operation of the Kankakee and Seneca Railroad (for which separate accounts are kept) shows earnings for the year $85,723.60, operating expenses and taxes $91,663.82, additions and betterments, $3,273.05, deficit, $9,213.27.

The Mt. Gilead Short Line (for which separate accounts are kept) shows earnings for the year $5,923.06, operating expenses and taxes $7,649.70, deficit $1,726.64.

The Board records the death, on January 11, 1910, of Mr. H. McK. Twombly, a director of this company since June 7, 1889.

To fill the vacancy caused by the death of Mr. Twombly, Mr. Lewis Cass Ledyard was elected a director.

The Board also records the death, on December 11, 1910, of Mr. Edward V. W. Rossiter, who had been vice-president of this company since January 31, 1905.

The following appointments were made during the year:

On January 1, 1910, Richard M. Huddleston was appointed General Auditor.

On January 1, 1910, Oatley B. Cockrum was appointed Assistant General Land and Tax Agent.

On January 1, 1910, Edwin E. Pettibone was appointed Assistant General Land and Tax Agent.

On January 1, 1910, Barrett B. Mitchell was appointed Assistant to Vice-President.

On January 1, 1910, William A. Terry was appointed Assistant Freight Traffic Manager.

On January 1, 1910, James Webster was appointed Assistant Freight Traffic Manager.

On January 15, 1910, Wallace W. Rider was appointed General Superintendent of Telegraph.

On February 1, 1910, William A. Wildhack was appointed Auditor.

On February 1, 1910, John W. Daly was appointed Assistant Passenger Traffic Manager.

On April 18, 1910, Herbert J. Merrick was appointed General Superintendent of Freight Transportation.

On July 15, 1910, William K. Vanderbilt, Jr., was appointed Assistant to President.

On October 1, 1910, Edgar Freeman was appointed Assistant Treasurer.

On October 31, 1910, Joseph F. Farrell was appointed General Tie Agent.

Early in the year, railroad companies generally were compelled to make heavy advances in the rates of wages of their employees. This increase amounted for your Company to something in excess of twelve hundred thousand dollars per annum, and changed conditions of service included in the findings of the arbitrators very materially increased this amount.

The United States has the lowest freight rates of any country in the

world, and it was thought that a moderate increase in those rates was justified in order to offset the larger labor cost and to make possible a reasonable return to shareholders. This Company, and many other lines east and west, filed with the Interstate Commerce Commission, in May last, tariffs, under which freight rates on certain classes and commodities were advanced and which would have increased its earnings in about the same amount as the increase in wages. The Interstate Commerce Commission, of its own motion, instituted an investigation as to these proposed advances, and, after extended hearings, declined to allow them to go into effect.

Among other things, the Commission said that the new wage scale had not been in force long enough to show what the actual result of operating under it would prove to be.

So far as this Company is concerned, it can hardly be said that there was any necessity to wait for experience to show what effect these added burdens would have upon its net revenue. The Commission took as typical roads, the Pennsylvania, the Baltimore & Ohio, and the New York Central (with the Lake Shore and the Michigan Central); and it was after analyzing their condition and necessities that it reached the conclusion that the proposed increase in freight rates was not justified. It is not to be expected that the power to regulate rates will be so exercised as to permanently prevent companies such as this, which serve large cities and a populous territory, from charging rates sufficiently high to insure a fair return on the money invested. Such a policy must, if continued, result in the gradual lowering of efficiency and character of service of the roads to which it is applied, with some measure of injury to the communities they serve. It is unfortunate, therefore, that the Commission found no practical way to give relief to this and other Companies similarly affected, where the need of larger net revenues was so clearly shown.

The Company for the present must carry the additional load of these increased wages without any corresponding advance in freight rates.

The present high level of wages in railway service is the result of successive mediations and arbitrations under the Federal Statute known as the Erdman Act; the practical effect of which has been to deprive the roads in very large measure of control over this most important item in cost of operation, representing as it does between sixty-three and sixty-five per cent. of the total.

Without entering upon a discussion as to the fairness of the present wage basis, it may be stated that, in the opinion of railroad managers of long experience, it is higher than can be maintained by many of the roads on the present basis of passenger and freight rates in the territory between Chicago and St. Louis, and the Atlantic Seaboard.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employees in every department of the service during the year.

WILLIAM C. BROWN,
President.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1910.

Assets.

Property owned as investment.		
Physical property owned		$135,894,782.72
Securities owned		$1,978,577.00
Other investments		1,126,555.22
Total		$138,999,914.94
Working assets.		
Cash		2,866,045.28
Securities issued or assumed held in treasury		86,555.00
Marketable securities		110,001.00
Loans and bills receivable		320,631.59
Traffic and car service balances due from other companies		963,688.15
Net balance due from agents and conductors		865,546.81
Miscellaneous accounts receivable		2,240,206.65
Materials and supplies		1,593,432.22
Total working assets		$9,046,106.70
Deferred debit items		5,733,613.54
Total assets		$153,779,635.18

Liabilities.

Stock.		
Capital stock:		
Common stock	$47,056,300.00	
Preferred stock	10,000,000.00	
Cincinnati, Sandusky & Cleveland Railway preferred stock	428,997.45	
Stock liability for conversion of outstanding securities of constituent companies	10,791.01	$57,496,088.46
Mortgage, bonded and secured debt.		
Funded debt:		
Mortgage bonds	$56,183,730.00	
Collateral trust bonds	10,000,000.00	
Plain bonds, debentures and notes	14,653,605.94	
Equipment trust certificates 1907	2,960,277.73	
Equipment trust certificates 1910	2,994,387.30	86,792,000.97
Working liabilities.		
Audited vouchers and wages unpaid	$4,947,662.72	
Miscellaneous accounts payable	10,909.80	
Matured dividends, interest and rents unpaid	678,905.22	
Working advances due to other companies	112,086.78	
Other working liabilities	6,561.78	5,756,126.30
Accrued liabilities not due		823,472.30
Deferred credit items		13,981.94
Appropriated surplus		705,229.53
Profit and loss—Surplus		2,192,735.68
Total liabilities		$153,779,635.18

SIXTY-FIFTH ANNUAL REPORT, MICHIGAN CENTRAL RAILROAD COMPANY: FOR THE YEAR ENDED DECEMBER 31, 1910.

To the Stockholders of
THE MICHIGAN CENTRAL RAILROAD COMPANY.

The Board of Directors herewith submits its report for the year ended December 31, 1910, with statements showing the results for the year and the financial condition of the company.

The report covers the operation of the following mileage:

	Miles.
Main line	270.07
Proprietary lines	345.05
Leased lines	1,091.66
Lines operated under trackage rights	92.01
Total road operated (as shown in detail on another page)	1,803.29

The total road operated as shown in the report for 1909 was 1,746.46 miles. The increase of 56.83 miles shown for this year is accounted for as follows:

Added:		
Detroit River Tunnel, opened during the year	2.42	
Operated under trackage rights, not heretofore shown in table of tracks	78.01	80.43
Deducted:		
Jackson, Lansing & Saginaw railway track (Saginaw Bay & Northwestern branch) taken up		23.60
Net increase		56.83

There was no change in capital stock during the year, the amount authorized and outstanding being		$18,738,000.00
The funded debt outstanding December 31, 1909, was		42,159,000.00
It has been increased during the year ended December 31, 1910, by the issue of this company's fifty-year four per cent. bonds out of an authorized total of $4,500,000.00 (secured by mortgage executed by this company and the Grand River Valley Railroad Company, dated September 1, 1909), for the purpose of refunding a like amount of Michigan Central-Grand River Valley six per cent. bonds, maturing September 1, 1909	$1,500,000.00	
There has also been placed upon the general books of the company its pro rata liability in connection with the certificates issued under the New York Central lines equipment trust agreements of 1907 and 1910	8,472,004.13	9,972,004.13
		$52,131,004.13
It has been decreased during the year ended December 31, 1910, as follows:		
Michigan Central three-year five per cent. gold notes, maturing February 1, 1910, surrendered and paid	$10,000,000.00	
Installment on New York Central lines equipment trust certificates of 1907, paid November 1, 1910	260,425.45	10,260,425.45
Total funded debt December 31, 1910 (detail on another page)		$41,870,578.68

The total amount charged to road and equipment on December 31, 1910, was $64,807,028.32, as follows:

Amount charged against main line to December 31, 1909		$37,960,988.29
There was charged for additions and betterments in 1910, as shown in detail on another page.		
Against capital account:		
For road	$489,688.42	
For equipment	8,246,527.10	$8,736,215.52
Against income account:		
For equipment	1,487,299.26	10,223,514.78
Total main line		$48,184,503.07
Amount charged account leased lines to December 31, 1909	$15,621,291.46	
There was charged for additions and betterments in 1910 against capital account for road, as shown in detail elsewhere	1,001,233.79	
Total leased lines		16,622,525.25
Total to December 31, 1910		$64,807,028.32

The construction of the double tube tunnel under and across the Detroit River, begun in October, 1906, by the Detroit River Tunnel Company, the entire capital stock of which is owned by this company, as referred to in a previous report, has been practically completed, and has proved an entire success. It was put into experimental use for through freight traffic October 9, 1910. The Chief Engineer of the Canadian Railway Commission inspected and approved the work and the Commission issued its order authorizing the use of the tunnel October 14, 1910. Regular freight and passenger service was inaugurated October 16, 1910. There still remains some work to be done, consisting principally of the interlocking system and additional equipment for the electrical sub-station, which it is estimated will cost $200,533.00, making the total cost, including interest on the money advanced from time to time by the Michigan Central, $8,922,165.00. The acquisition of terminal freight and passenger yards and station buildings by the Tunnel Company will require a considerable sum in addition to the amount above mentioned.

The important litigation pending for a number of years between this Company and the State of Michigan relative to this Company's claim against the State growing out of the repeal of its special charter, and the counter claim of the State against this Company for alleged non-payment of back taxes during the years 1855 to 1893, was adjusted in June, 1910, by the payment to the State of $125,000.00.

To obtain the locomotives and cars necessary for immediate requirements, The Michigan Central Railroad Company, together with The New York Central & Hudson River Railroad Company, The Lake Shore & Michigan Southern Railway Company, The Cleveland, Cincinnati, Chicago & St. Louis Railway Company and the Chicago, Indiana & Southern Railroad Company has become a party to an equipment trust agreement and lease dated January 1, 1910, known as the "New York Central Lines Equipment Trust of 1910." This agreement provides for an issue of $30,000,000 of equipment trust certificates, bearing interest at 4½% per

annum, being 90% of the total cost of the equipment to be furnished under the terms of said agreement. These certificates are to be paid off in fifteen annual installments of $2,000,000.00 each, the first installment being payable January 1, 1911. The cost of the equipment to be leased under the terms of the agreement by this company will be $5,651,637.00 and its pro rata liability for certificates representing 90% of the cost is $5,086,473.30. Full particulars as to the character of the equipment acquired will be found upon another page.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1910.	1909.	Increase or decrease.
Operating Income.	1,803.29	1,746.46	56.83
Rail Operations.	*miles operated.*	*miles operated.*	*miles operated.*
Revenues	$29,694,815.71	$27,415,467.20	$2,279,348.51
Expenses	21,628,906.26	18,499,528.24	3,129,378.02
Net Revenue from Rail Operations	$8,065,909.45	$8,915,938.96	—$850,029.51
Percentage of expenses to revenue	(72.84%)	(67.48%)	(5.36%)
Outside Operations:			
Revenues	$543,636.69	$489,927.04	$53,709.65
Expenses	599,951.82	541,079.10	58,872.72
Net Deficit from Outside Operations	$56,315.13	$51,152.06	$5,163.07
Net Revenue from all Operations	$8,009,594.32	$8,864,786.90	—$855,192.58
Taxes Accrued	1,357,019.92	1,121,531.99	235,487.93
Operating Income	$6,652,574.40	$7,743,254.91	—$1,090,680.51
Other Income.			
Joint facilities rents	$229,289.51	$185,157.79	$44,131.72
Miscellaneous rents	2,676.02	3,011.19	—$335.17
Dividends on stocks owned or controlled	287,241.50	248,153.85	39,087.65
Interest on funded debt owned	46,880.00	33,760.00	13,120.00
Interest on other securities, loans and accounts	440,969.02	471,397.82	—30,428.80
Miscellaneous income	86,623.87		86,623.87
Total Other Income	$1,093,679.92	$941,480.65	$152,199.27
Gross Corporate Income	$7,746,254.32	$8,684,735.56	—$938,481.24
Deductions from Gross Corporate Income.			
Rentals of leased lines	$585,310.00	$510,310.00	$75,000.00
Hire of equipment			
Car mileage and per diem balances	1,073,983.18	714,640.99	359,342.19
Interest on equipment trust certificates	261,523.99	180,127.61	81,396.38
Joint facilities rents	620,568.83	516,400.76	104,168.07
Miscellaneous rents	6,069.24	5,959.84	109.40
Interest on funded debt	2,535,398.33	2,451,584.32	83,814.01
Other interest	746,367.95	747,290.52	—922.57
Other deductions	199,701.96	137,000.00	62,701.96
Total Deductions from Gross Corporate Income	$6,028,923.48	$5,263,314.04	$765,609.44
Net Corporate Income	$1,717,330.84	$3,421,421.52	—$1,704,090.68
Dividends, Two, Aggregating 6%	1,124,280.00	1,124,280.00	
Surplus	$593,050.84	$2,297,141.52	—$1,704,090.68
Additional equipment		$548,924.72	—$548,924.72
On account 1910 proportion of New York Central Lines, 1907 and 1910 equipment trusts	$250,000.00		250,000.00
Balance to Profit and Loss.	$343,050.84	$1,748,216.80	—$1,405,165.96

Note.—Minus sign (—) designates decrease.

Balance to Profit and Loss for Year 1910		$343,050.84
Amount to Credit of Profit and Loss December 31, 1909		9,965,978.28
		$10,309,029.12
Deduct:		
Balance of 1910 proportion of New York Central Lines 1907 and 1910 equipment trust installments	$349,523.67	
Ten per cent. payments account of equipment trust of 1910	481,807.00	
Discount, commission and expenses in connection with New York Central Lines equipment trust certificates of 1910, Michigan Central-Grand River Valley Bonds and Michigan Central one year francs notes	240,356.38	
Payment to State of Michigan in consideration of discontinuance of pending litigation	125,000.00	
Deficit from operation Detroit Terminal Railroad prior to 1910, property abandoned and sundry uncollectible accounts	60,389.96	1,257,077.01
Balance to Credit of Profit and Loss, December 31, 1910		$9,051,952.11

The total operating revenues were $29,694,815.71, an increase of $2,279,348.51 as compared with the previous year. The freight revenue was $19,282,288.45, an increase of $1,014,758.01. This was due to increased movement of coal, stone, forest products and miscellaneous commodities. The passenger revenue was $7,404,475.66, an increase of $748,776.81, due to a large excursion travel and general improvement in both local and interline business. The express revenue was $1,519,949.67, an increase of $275,204.53, due to an enlarged volume of business. The revenue from the transportation of mails was $431,625.32, an increase of $22,413.09, due principally to additional compensation allowed by the United States Government, from July 1st, 1910, for carrying through mails. The operating revenue from all other sources increased to $18,196.07 over the previous year. The total expenses of operation were $21,628,906.26, an increase of $3,129,378.02, due very largely to increased cost of labor, cost of fuel consumed and material used.

Maintenance of way and structures increased $577,695.54, due to additional expenditures for repairs to roadway, track, bridges, buildings and separation of grades; increased expenditure for labor amounted to $377,640.46, of which $212,719.16 was due to increased rates of pay.

Maintenance of equipment increased $367,783.79, account of extensive repairs to and renewals of locomotives and cars of all classes. The increase account of labor amounted to $170,511.92, of which $74,081.46 was due to increased rates of pay. Traffic expenses increased $104,482.86, due largely to tentative changes in tariffs.

Transportation expenses increased $1,972,899.20, due to the heavy volume of traffic handled and the large increase in cost of labor and fuel. Increase account of labor amounted to $1,347,207.73, of which $458,816.94 was due to increased rates of pay. Increase account of fuel consumed amounted to $407,605.05, of which $99,719.13 was due to increase in price. General expenses increased $107,116.63, which includes an increase in pay roll expenditure of $23,498.53, of which $5,995.00 was due to increased rates of pay.

There was an increase in the deficit from outside operations of $5,163.07 over the previous year, due to additional expenditures in the operation of dining car service and grain elevators, offset by increased revenue from stock yards service and restaurant service. The operating income was $6,652,574.40, a decrease of $1,090,680.53. Other income was $1,093,679.92, an increase of $152,199.59, due to additional amount received from rentals, also interest and dividends from securities.

Total deductions from income amounted to $6,028,923.48, an increase of $765,609.44, due to interest on gold debentures and equipment trust certificates, additional rental paid Canada Southern Railway Company in accordance with the terms of the lease; increased amounts paid for hire of equipment and rentals of joint facilities; and proportionate share of deficits from operation of Indiana Harbor Belt and Detroit Terminal Railroads. The profit from operation for the year, after payment of 6% in dividends upon the capital stock, and proportion of 1907 and 1910 trust equipment installments chargeable to the current year, was $343,050.84, which has been carried to the credit of profit and loss.

Mr. Ashley Pond, Advisory Counsel of this Company, died January 12, 1910. Mr. Pond became a director of the company in 1878, and with the interval of the two years between 1883 and 1885, remained a director until 1906, when he retired from active work, but continued as Advisory Counsel until his death. He was also for a time General Counsel of the Lake Shore & Michigan Southern Railway Company. The great value of his services, the benefit of the wise and sound advice of so eminent a member of the profession, the kindly character of the man, and his loyalty to the company and its interests, cannot be too highly expressed. The Board records the death, on January 11, 1910, of Mr. Hamilton McK. Twombly, a director of this company since December 21, 1899. The Board also records the death, on December 11, 1910, of Mr. Edward V. W. Rossiter, a vice president of this company since June 23, 1904.

On March 1, 1910, Mr. Lewis Cass Ledyard was appointed a director to fill the vacancy caused by the death of Mr. Twombly.

The following appointments of officials were made during the year: January, Richard M. Huddleston, General Auditor; Barrett B. Mitchell, Assistant to Vice President C. F. Daly; Edwin E. Pettibone, Assistant General Land and Tax Agent; Otley P. Cockrum, Assistant General Land and Tax Agent; Malcolm T. Wright, Superintendent of Terminals, Detroit; William H. O'Keefe, Division Superintendent, Jackson; Wallace W. Ryder, General Superintendent of Telegraph; February, John W. Darly, Assistant Passenger Traffic Manager; March, Nathaniel E. Slaymaker, Real Estate Attorney; April, Herbert J. Merrick, General Superintendent of Freight Transportation; June, Roscoe B. Kendig, General Mechanical Engineer, succeeding Frederic M. White, resigned; July, Arthur C. Thomas, Car Accountant; William Hutchinson, Land and Tax Agent, succeeding Nathaniel E. Slaymaker, transferred; Sept., J. Walter Dohany, Attorney, succeeding George L. Nadolleck, retired; October, Edgar Freeman, Assistant Treasurer; October, Joseph F. Farrell, General Tie Agent, succeeding William F. Goltra, resigned.

Appreciative acknowledgment is made of the faithful, efficient performance of duty by employes in every department of the service during the year.

WILLIAM C. BROWN,
President.

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1910.

Assets.

Property investment, total cost of road and equipment		$64,807,028.32
Securities		7,039,191.50
Other investments		3,570,755.22
Total property owned as investment		$75,416,975.04
Working assets:		
Cash		10,173,066.46
Accrued income not due:		
Unmatured interest, dividends and rents receivable		1,024,493.81
Deferred debit items		11,545,748.65
Total		$98,160,283.96

Liabilities.

Capital stock—common		$18,738,000.00
Funded debt—		
Mortgage bonds:		
Michigan Central first mortgage	$14,000,000.00	
Grand River Valley first mortgage	1,500,000.00	
Detroit & Bay City first mortgage	4,000,000.00	
Kalamazoo & South Haven first mortgage	700,000.00	
Michigan Air Line first mortgage	2,600,000.00	
Jackson, Lansing and Saginaw first mtge.	1,725,000.00	
Joliet & Northern Indiana first mortgage	1,500,000.00	
Plain bonds, debentures and notes:		
Gold debentures	7,634,000.00	
Equipment trust certificates, 1907	3,125,105.38	
Equipment trust certificates, 1910	5,086,473.30	41,870,578.68
Total capitalization		$60,608,578.68
Working liabilities		23,402,006.57
Accrued liabilities not due		1,026,946.03
Deferred credit items		401,954.45
Appropriated surplus: Additions to property through income since June 30, 1907		3,668,846.12
Profit and loss: Surplus		9,051,952.11
Total		$98,160,283.96

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The report of the committee on buildings was of unusual value and interest. It dealt entirely with roofing, and may be regarded as almost a complete treatise on the subject. Naturally, a generous portion is occupied with bituminous materials, asphalt and the tars, as large quantities of these materials are used by the railways for roofing, and a good specification for built-up roof employing them is included. These, as well as the iron or steel roofings, must be regarded as temporary in a measure, and for more permanent construction slate and tile are to be preferred. Among the newer materials is reinforced concrete tile, and, while it has been extensively used, the extent of its endurance is regarded as largely experimental. The principal objection which may be offered to reinforced tiles is the fact that small cracks will allow moisture to penetrate to the expanded metal used for reinforcing, and as corrosion proceeds the metal expands or increases in volume, and a tendency to crack the tiles and open up larger spaces for leakage is the result. Fire protection was also fully considered, especially with respect to roofing, and two papers on this branch of the subject were included in the appendix. One relates to the tests at underwriters' laboratories in general, and the other illustrates a number of fire tests of roofing made by the Underwriters' Laboratory at Chicago. These tests must have an important influence on the development of fireproof roofings, as little work of real value has been done in this line heretofore.

The way committee reports are presented focuses attention on the conclusions of the committee. This is as it should be, so far as the association is an executive body which is to pass on recommendations for the manual. But it does not get out of the convention the informative discussion which should be aroused. The committee might direct attention in its report to the specific points on which there is disagreement, and especially those points on which more information is wanted. These could be made as prominent as are the conclusions, and, like them, be taken up seriatim for discussion. Also, more might be done by the members of the committee in getting hold of the men who should lead the discussion. Committee men might profitably spend more of their time after arriving at the scene of the convention in looking up the men with whom they have been in correspondence and others from whom they should expect valuable contributions. By getting personally in touch with these men, a committee can best get the discussion that it and the rest of the association need.

The "American Railway Engineering and Maintenance of Way Association" went out of existence yesterday and the "American Railway Engineering Association" was born. "The king is dead; long live the king!" The new name is a distinct improvement in one way: As President Fritch said at the annual dinner, it requires 50 per cent less time for utterance than the old one, which is economizing at a most exemplary rate. The captious might complain that the name is too comprehensive, as the mechanical department is also an engineering department; but the words "engineering" and "mechanical" have come to have clear and distinct meanings in the railway business. Maintenance of way and structures is so decidedly the most important part of the work ordinarily performed by the engineering department—at least in point of expenditures involved—that it was not inappropriate to emphasize it in the old name. But the word engineering embraces all the work done by the engineering department, including maintenance of way, and is therefore adequately indicative of the function of the association.

The discussion in the convention yesterday showed that the Daily Railway Age Gazette in its editorial on "The Manual and Current Practice," which was published yesterday morning, did not exaggerate the importance of more care being taken in future regarding the things that shall be adopted as recommended practice and, as such, put into the manual of the American Railway Engineering Association. The matter was one which evidently was in the minds of a large number of the leaders of the Association. It was brought squarely before the convention in the afternoon by a motion introduced by Hunter McDonald providing for the abolition of the manual. The remarks which this evoked showed that few, if any, of the members would like to see the manual abolished. Mr. McDonald frankly stated that he did not desire to see this done, but merely made the motion in order to get the entire question of what shall be put into it in future before the convention. No one who took part in the discussion controverted the contention that many things have been adopted as recommended practice in the past which ought not to have been adopted; all recognized the need for reform in this respect. The only question was as to how the reform should be effected. Mr.

McDonald's proposal that a board of review composed of men not on the board of direction should be created to pass on all committee suggestions regarding recommended practice before their submission to the association seemed to receive quite general approval. Probably the decision to refer the whole question to the board of direction for such action as it may deem proper, was the best that could be made. The sentiment of the Association that some action should be taken was made so clear that the board, no doubt, will take the question up for early disposition. Certainly nothing has yet occurred to indicate that the manual should be entirely abolished. Reform, not revolution, is what is needed. It should be made less bulky. Its contents should deal only with matters of real importance, it should include only widely accepted practice, which has been justified by experience; it should be in every case an expression of the "wisdom of the Association," as Mr. Wendt phrased it, and not a repository for expressions of the opinions of a comparatively small number of its members, even though they be those who, as committeemen, have given the most consideration of the particular subject dealt with. As Mr. Trimble of the Pennsylvania Lines said, there is often pressure to put things into the manual merely for the purpose of upholding the committee which has recommended such action, and often things are put into it when they are supported by only a small majority, or, perhaps, not even by a clear majority. Certainly the manual cannot properly be considered the "wisdom of the Association" unless its contents clearly express the results of the mature consideration of a very substantial majority of its members. It may be fortunate, or it may not be, that the time has come when every department of a railway must transact its business in the bright light of publicity, where it is subject to severe and often unfriendly scrutiny. But that this time has come is not open to controversy. Public men are constantly seeking new worlds of railway regulation to conquer. This is no reason why the Association should not incorporate in the manual as recommended practice anything which it believes all the railways should for their own good and for the good of the public adopt. But on the other hand, it is one of several very good reasons why the Association should not put into the manual anything that conditions may not make it entirely desirable for the roads to live up to in their actual practice.

RAIL SECTIONS.

The month of March is usually a convenient time for a review of the conditions surrounding the purchase of rails, as the report of the committee on rails of the American Railway Engineering Association is then published, and by this time most of the railways have placed their orders for their yearly requirements for rails. This year, however, while some of the eastern roads have placed liberal orders, the western lines apear to be ordering only about one-third their usual requirements. However, a sufficient number of rails have been ordered to indicate the general trend of opinion in regard to the sections. The prevailing types of rail sections may now be divided into two general classes which have characteristics corresponding with the A. R. A. sections A and B, the A section having a thin head and medium size flange and the B section having a thick head and a thick flange, and for a given weight the B section is shorter than the A. The section used by the Pennsylvania Railroad, while not exactly like the standard B type, has most of its characteristics, with the exception of the shape of the head.

The American Society of Civil Engineers section is similar to the A type, but with a thicker head and thinner flange. The New York Central section is quite similar to that recommended by the American Society of Civil Engineers, but with a thicker head. The 90 lb. A. R. A. rail is now used on a majority of the western prairie roads, with the exception of the Northwestern and the Northern Pacific, which use the B section. The B section is also used on the group of coal roads in Maryland and Virginia—the Baltimore & Ohio, the Chesapeake & Ohio and the Norfolk & Western. The Canadian Pacific uses the 85 lb. A section. While the B section is more perfectly balanced with regard to the areas of the head and base, experience in rolling the A section shows that these areas are sufficiently near alike to secure good work in the mills and little trouble from too much camber. The thickness of the flange in the A section is also sufficient to permit of proper temperatures at the last pass in the finished rail. The principal advantage of the A section is its greater stiffness, due to the height for a given weight of metal, and the proportion of the head area to other portions of the rail is such that the head obtains more working and compression under the rolls, thus consolidating the metal and making the steel a sounder structure. The B section is preferred by some roads because it is thought that a longer life will be obtained before the head is worn sufficient to condemn the rail. The heavy wear on the side of the rail is only found on curves, and the B section may, therefore, be best suited for roads having unusually heavy curvature. Other roads, like those on the prairies of the western states, do not need to provide for this wear, as the greater part of the track is straight or has comparatively light curvature. It is here possible to take advantage of the lighter head and the greater amount of work done on it in the rolls. On the straight roads the wear is principally on the top of the head, and the thin head of the A rail will permit of wear in this direction until the general surface is so uneven and wavy that the rails have to be condemned for that reason rather than for their lack of strength or irregular section. We have here then a good explanation of the reasons which have led to a preference for the A section on the prairie roads and the preference for the B section on the more crooked roads of the east, especially those in the mountains of Pennsylvania, Virginia and Maryland.

There are additional reasons for favoring one or the other section. Some regard the B rail best on account of its greater flexibility, not admitting that the extra stiffness of the A rail is a real advantage. This may also be a case where the rail section should have some relation to the character of the roadbed.

It is also claimed for the thick head of the B rail that it will not break down under the heavy wheel loads now imposed as easily as the thinner A head, even though there are no physical defects in the interior of the rail head. This is not sustained by the tests made by Mr. Wickhorst to determine this point. The A rail head is 1¼ in. thick at the edge for the 100 lb. rail. The 90 lb. section is almost as thick; and there is only $\frac{1}{32}$ in. difference in thickness of the heads of the A and B 80 lb. sections, which are over 1 in. thick. The Wickhorst tests showed that there was no sag of the 1 in. head under 60,000 lbs. rolling load (about double the weight on one driver of the heaviest locomotives), and there is no sag under 30,000 lbs. rolling load until the thickness of the head is reduced to ½ in. The tests show that the head of the A rail in sections 80 to 100 lbs. has sufficient thickness to sustain the heaviest rolling loads now imposed by regular service, and it permits of a margin of wear which would render the surface unfit for main track before it is so thin as to sag under heavy wheel loads.

The expense to the mills for a variety of rail sections must be paid eventually by the railways, and it is in the interest of economy that the number of sections be reduced to as few as possible. It ought to be possible for those railways which are using special sections to agree on either the A or B section, or on such modifications of those sections as will be acceptable to most railways, including those now using the A or B section.

ECONOMICS OF RAILWAY LOCATION.

The standing committee on the economics of railway location was organized about seven or eight years ago. It was understood that if it did the work outlined for it it would be among the most valuable of the association's important committees. The committee made its first report in 1907, before the eighth annual convention, and has reported regularly each year since. Its reports for 1907, where practically all that was known about train resistance was tabulated and discussed, and its report for 1910, where it attempted to lay out a foundation for computing the relative economic value of various line locations, were particularly valuable. During the past year, however, the committee has made very unsatisfactory progress, apparently through no fault of its members.

The committee for the current year received, among other instructions from the board of direction, the following:

"Continue the consideration of all questions connected with railway location, grades, lines and improvement of grades and lines affecting the economic operation with relation to traffic, tonnage, ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections."

Its answer by its chairman at the end of a year's work was in effect that in order to carry its work further it must have information of a special character from the various railways, which information the roads either hold as confidential or consider that the compiling of the same in the form that may be of use to the committee requires the expenditure of more time and expense than they are willing to bestow. And the chairman concluded his report by recommending that the committee be discharged from further study unless the board of direction considered the work of sufficient importance to furnish such information as the committee might require. The chairman said in so many words that the work of the committee "must cease if the railways represented in this association cannot furnish the required statistics."

It is earnestly to be hoped that the board of direction will not consider for a moment the idea of discontinuing the work of this committee. There is probably work of more permanent value to future engineers and railway operators yet to be investigated and standardized by this committee than by any other committee of the association, except possibly the committee on electricity. No one knows yet what it is worth to any road of a given character of traffic to take out a degree of curvature or to reduce its grades by a tenth of one per cent. We have Wellington's, Webb's, Raymond's and Berry's individual conclusions on the subject, but we need the consensus of opinions from educated, practical engineers and railway operators on the subject. We need the results of the best examples of this kind of work tabulated, and conclusions drawn therefrom by experts in this field, so that we will have something more on these subjects than mere judgments or opinions.

Engineers are all agreed that there is an inferior limit for a road of given character and volume of traffic, beyond which it does not pay to reduce grades. Mr. Berry, in Bulletin 49, placed this inferior limit as probably at 0.4 per cent. for any road, but certain large roads in quite recent years have spent large sums in bringing their grades as low as 0.2 per cent. Has this money been wasted? Let this committee be kept at work till it answers this question for us. Let this committee be continued until it has told us definitely how we can learn when it will pay a road of given character and volume of traffic to double track its line and when it has double tracked it, how much greater per mile of road under the same traffic the maintenance of a double track will be than the single track. There are many similar problems to be solved. The committee outlined in its 1907 and 1908 reports the many desirable things there were for it to do.

If the large roads of the country that have made improvements in adding main tracks, in grade reductions, curve eliminations, etc., are really reticent about giving out an account of the effect of the changes on the cost and facility in operation it might reasonably be inferred that such improvements have generally not resulted as favorably as had been anticipated. No doubt there are such cases, and such cases are just what are needed to render valuable the work of the committee. There ought to be no difficulty in devising a satisfactory means of publishing such data without at the same time furnishing means of identifying the road. Any conclusion that such improvements have generally been found unsatisfactory is probably untenable because many of the large roads that are operated by some of the best railroad men in the country have adhered for years to certain plans and policies of improvements, and such plans and policies would certainly have been altered or abandoned entirely if they had proven unsatisfactory or unremunerative.

The difficulty that the committee is experiencing in securing information is probably rather to be largely accounted for by the fact that the work of compilation of the information for the purposes of the committee is greater than the roads have as yet been able to undertake. This might easily be accounted for by the fact that in recent years in the offices of most of the roads the requirements of the various state and interstate commissions have kept every available spare man busy on accounts and reports for those regulating bodies.

In view of the difficulties the committee has encountered in getting information suitable for its use, it has been suggested, without any reflection whatever upon the members of the present committee, for that committee in the reports already made has earned the gratitude of the association, that the work be placed in charge of a smaller committee made up of a somewhat different personnel. A committee of from three to six members only, and composed of members occupying the highest railway positions on large systems in the East, the Central West, the South, the Southwest and the Northwest, together with one special engineer student connected with one of the larger universities, has been suggested. Such a committee could much more easily receive the confidential information necessary. If it is feared that such a committee would not be able to do the necessary work for lack of time, perhaps the association could devise some means of meeting the expense of having the bulk of the work done by one or more engineers employed by the committee. The railways contributed freely to have the work of the committee on iron and steel structures carried on, and there is good reason to believe that if it is necessary, funds could be similarly raised for the important work of this committee.

STUDIES ELECTRIFICATION OF AMERICAN RAILWAYS.

Knutt W. Bildt, mechanical and electrical engineer of the Luossavaara-Kiirunavaara Mining Company, Kiruna, Sweden, was in attendance at the convention yesterday. Mr. Bildt is concerned in plans that are being made by the Swedish government for the electrification of certain of its railways, and is seeking light on the subject of electrification from American railway engineers who have had practical experience in dealing with the matter.

The Delaware, Lackawanna & Western expects to install 40 miles of automatic block signals on single track on the Utica division, and 20 miles on the Phillipsburg branch. This road also expects to install electro-pneumatic interlocking machines at Scranton and Port Morris.

Proceedings.

The Thursday morning session of the American Railway Engineering and Maintenance of Way Association was called to order at 9:30 o'clock by President Fritch.

SIGNS, FENCES AND CROSSINGS.

The following subjects were assigned:

(1) Consider revision of Manual.

(2) Report on ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

(3) Continue investigation of the use of concrete fence posts and submit recommendation.

(4) Continue investigation as to the best form of track construction and flangeways in street crossings and paved streets.



W. D. Williams.

Chairman, Committee on Signs, Fences and Crossings.

REVISION OF MANUAL.

No changes are recommended further than those submitted in the report for 1909, which the committee recommends to be adopted and included in the manual.

PROPER QUALITY OF FENCE WIRE.

The committee has been energetic in pursuing its investigations, scrutinizing and testing out every new theory advanced pertaining to the preservation of wire and proving its merits or demerits. Thus far, however, no new process has been discovered which offers any advantage over the old, and it is the opinion of the committee that applied galvanized coating, by special treatment, is the best and only known economical process for protecting wire used in railway fences against corrosion.

Conclusion: The committee recommends the use of wire which has received a special galvanized coating to stand a test of four one-minute immersions in the standard copper sulphate solution, the galvanizing to be done preferably after weaving.

CONCRETE FENCE POSTS.

The tests, observations and use of concrete fence posts during the current year indicate:

(1) That concrete fence posts are practicable, durable and economical.

(2) The eight-foot post is recommended.

(3) Posts of cross-section approaching a square form are easiest made and most suitable for fencing.

(4) Spacing, same as recommended for wood posts.

(5) Stone or gravel used in mixing concrete for fence posts should pass a half-inch square mesh. Concrete should be mixed wet, in a batch mixer, and poured into the moulds. The poured posts are a little over 25 per cent. stronger than tamped posts of the same size, mixture and reinforcement; they are also better able to withstand the action of frost and alkali. Experience shows that extra precaution should be used in the selection of material, mixing of concrete and handling and curing the posts. For the best results, posts should be allowed to remain in the yard undisturbed for at least sixty days after coming from the moulds.

(6) Breakage in handling and transportation should not exceed three-tenths of one per cent.

Conclusion: Concrete fence posts are recommended for railway fences.

FLANGEWAYS IN STREET CROSSINGS.

On this subject the committee reports progress. The sub-committee having it in hand have worked hard to formulate plans and make recommendations, but the subject is of so much importance, the committee feel that more time should be given for their investigation.

The report is signed by: W. D. Williams (Cin. Nor.), chairman; K. J. C. Zinck (Gr. Tr. Pac.), vice-chairman; A. M. Funk (B. & O.), W. H. Hoyt (D. M. & N.), E. R. Lewis (Mich. Cent.), Joseph Mullen (C. C. C. & St. L.), W. J. Burton (Mo. Pac.), C. H. Stein (Cent. of N. J.), E. J. Steinbeck (Ill. Cent.).

Discussion on Signs, Fences and Crossings.

Mr. Zinck: The committee asks that the association refer this report back to them for further work during the coming year. I make a motion to that effect.

The President: You will note that the committee has made certain recommendations, but without further consideration, they think it is proper to refer the matter back to the committee in order that they may make a more complete report next year.

The motion was carried.

WATER SERVICE.

The following sub-committees were appointed:

Revision of the Manual: Robert Ferriday, A. D. Schermerhorn.

Water tank specifications: J. L. Campbell, G. H. Herrold, W. A. Parker, C. A. Morse.

Water stations for track pans: E. G. Lane, L. P. Rossiter, H. M. Church, James Burke, A. Mordecai.



C. L. Ransom.

Chairman, Committee on Water Service.

Recommendations for next year's work: C. L. Ransom, Robert Ferriday, J. L. Campbell, E. G. Lane.

REVISION OF MANUAL.

No further revision was suggested at this time.

WATER TANK SPECIFICATIONS.

The reinforced concrete tank was considered as rather a new departure, and the following specifications and design are submitted as a progress report only:

Specifications for a Reinforced Concrete Water Tank.

1. The tank shall be of reinforced concrete, as shown on the drawings.

2. The capacity of the tank shall be within the limits

of 50,000 and 106,000 gallons, exclusive of the lower 20 ft. of the tank. The height of the tank from bottom to top of shell shall be 40 ft. A diameter of 30 ft. is recommended. On this basis the drawings have been made. The latter shall be made to meet the requirements of the height and diameter selected by the engineer.

3. The tank is designed to deliver water to locomotives through water columns. The floor of the tank shall not be lower than the tracks served.

4. In earth, the excavations for the foundation and pipes shall be as deep as the lowest frost line, with a minimum depth of 4 ft. In rock, only the trenches for the pipes shall be carried below the action of frost. In earth, the bottom of excavations shall be thoroughly tamped to discover and compact any soft places. If the earth will not sustain the total load, including wind pressure, without material or unequal settlement, the foundation shall be supported on piles of the number, size and arrangement as determined by the engineer. Such piles shall conform to the specifications of this association for piling, as selected by the engineer.

5. The foundation shall consist of a disk of concrete, as shown. If the depth of frost is excessive, this disk may be carried on broken rock compacted in the bottom of the excavation, but the minimum vertical thickness of the concrete foundation, exclusive of the tank floor, shall be 42 in.

6. The valve box for the piping shall be constructed as a part of the foundation, as shown. The top and bottom of the box shall be reinforced by steel rods laid both ways and doubled around the pipes and the manhole. The manhole frame shall be in one piece of first-class cast-iron with a double seat and a double cover. The latter shall preferably be of wood. When low temperatures require to prevent freezing within the valve box, an air space shall be constructed in the middle of that portion of the box walls outside of the tank foundation. When the absence of low temperatures permit, the air space and the lower manhole cover may be omitted.

7. The reinforced concrete floor on the foundation shall be constructed, as shown, giving its surface a sidewalk finish without plastering.

8. The reinforced concrete shell shall be constructed, as shown, building in the concrete fillet in the angle at the bottom.

9. The reinforced concrete roof, including manhole and cover, shall be constructed, as shown, finishing top of roof as specified for the floor. Where ice will not form to an injurious or troublesome extent and sunlight will not cause vegetable growth in the water, this roof may be omitted at the discretion of the engineer.

10. The tank shall be equipped with cast-iron piping and standard gate valves, as shown. There shall be a tank supply pipe, a water column supply pipe, an overflow pipe and a washout pipe, the latter two being combined in the valve box beyond the valve closing the washout pipe. There shall be no valve in the overflow pipe. For a gravity supply, the tank supply pipe shall be carried to the top of the tank and be capped by a float valve. The washout pipe shall terminate flush with the tank bottom. The water column pipe shall extend several feet above the bottom but not higher than the top of the water column. All piping shall pass through the bottom of the tank, preferably in cast-iron stuffing boxes with lead joints, as shown, but other forms of stuffing box and joint may be used.

All pipes and castings, in quality, manufacture and inspection, shall fulfill the requirements of the specifications of the New England Water Works Association for cast-iron pipe.

The weights and diameters of the pipes shall be determined by the engineer. No pipe shall have an inside diameter less than 4 in.

11. The cast-iron sludge pipe shall be carefully constructed, enclosing in the concrete and doubling the reinforcing rods around it, as shown. When absence of sediment in the water justifies, this pipe may be omitted.

12. The tank shall be equipped with a gage, indicator



W. C. Cushing, President.



Chas. S. Churchill, First Vice-President.

and float, according to the design or selection of the engineer.

13. The steel ladder shall be constructed, as shown and as designed, or selected by the engineer. The ladder shall be carried by connecting straps or angles resting on the roof. It shall not be anchored to the tank shell. The steel shall conform to the specifications of this association for steel bridges.

14. The concrete in the tank foundation and the side walls of the valve box shall be a 1-3-5 mix, made and laid in accordance with the specifications of this association for Portland cement concrete.

15. The top and the bottom of the valve box and the tank floor, shell and roof shall be made of reinforced concrete.

16. Reinforced concrete shall be a thoroughly uniform mixture of cement, sand, stone and water completely enveloping the reinforcing rods.

17. The volume of the stand shall be 5 per cent. in excess of the volume of the voids in the stone. The volume of the cement, considering 100 lbs. of it as 1 cu. ft., shall be 25 per cent. in excess of the volume of the voids in the mixed sand and stone. The engineer shall determine the voids and proportions.

18. The volume of the water shall be sufficient to give the concrete a fluidity that will cause it to flow and mould itself in the forms without tamping.

19. The concrete shall preferably be mixed by mixing machines. The method used shall yield a complete and even mixture.

20. All dirt and foreign matter shall be excluded from all materials, concrete and stages of the work.

21. The concrete, after mixing, shall be poured and worked into final position in the forms before its initial set is complete, and it shall not thereafter be disturbed. As it is thus placed, it shall be thoroughly worked by long, flat, thin-bladed tools in a manner that will eliminate all voids and air pockets and produce unbroken mortar faces against all forms and secure perfect contact with every part of all reinforcing rods.

22. The surface of concrete shall be clean and wet when concrete is laid thereon. The surface, if hardened, shall also be mopped with cement grout immediately in advance of placing fresh concrete. Smooth or finished mortar surfaces shall be avoided where additional concrete is to be placed. If necessary, as in the joints between the tank floor, shell and fillet, old surfaces shall be tooled, cleaned and grouted before concrete is placed thereon.

23. A rapid drying out of concrete shall be prevented by regular, frequent and continued wetting until all danger of arrested setting and hardening is past, as the engineer shall direct.

24. Freezing of concrete before it has finally set shall be prevented.

25. Any concrete broken or displaced in any manner after having set shall be removed from the work.

26. The cement shall conform to the specifications of this association for Portland cement. It shall retain its original purity and qualities until it is incorporated into the work. Deteriorated or otherwise damaged cement shall not be used.

27. The sand shall be clean, sound and sharp and it shall be of graded sized grains giving a minimum of voids.

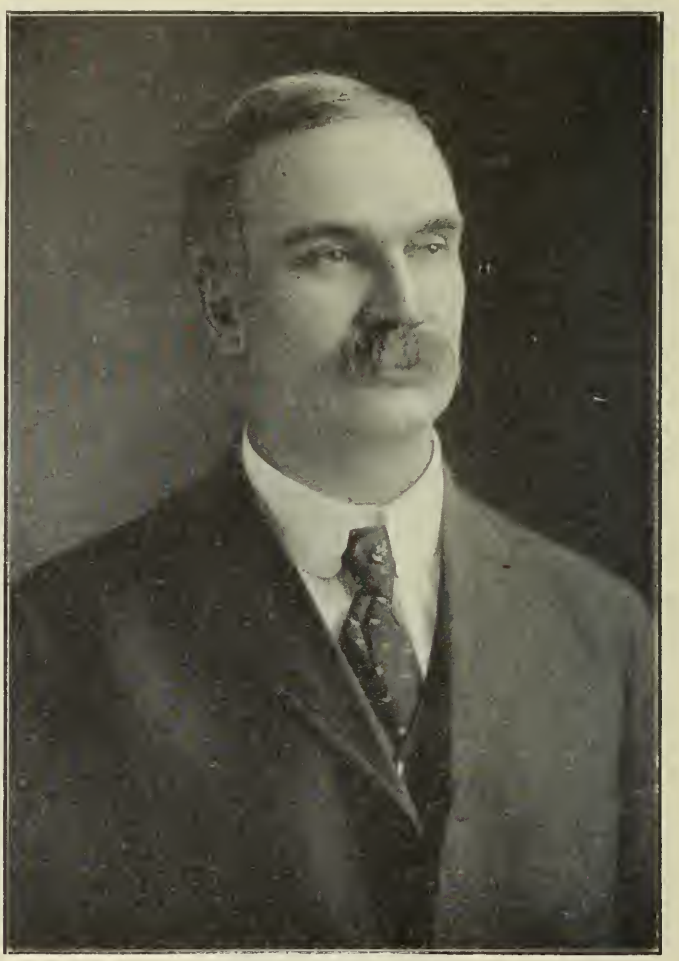
28. The stone shall be clean, sound and durable. The word "stone" includes broken rock and gravel. The stone shall be of graded sizes giving a minimum of voids. All of it shall be able to pass through a circular hole having a diameter of ¾ in.

29. The water shall be clean and free from anything injurious to the concrete.

30. The concrete forms shall be made of metal or of dressed and matched lumber. They shall be accurately made and erected, be water tight, and shall have ample strength and rigidity to prevent bending and warping under the load and action of the concrete. They shall be erected in such sections and courses as will permit the concrete to be poured and worked as above specified. No device for holding the forms that would leave a hole through the concrete shall be used. Wires passing through the concrete shall be nipped off beneath the concrete face.



Edwin F. Wendt, Second Vice-President.



G. H. Bremner, Treasurer.

31. Any break in the concrete surfaces not impairing the integrity of the structure shall be pointed with cement mortar, as the engineer shall direct. Any other imperfections in the concrete shall be treated and remedied as the engineer shall direct.

32. The concrete shall be reinforced by steel rods of the form, size, number and arrangement, as shown. They shall be wired at intersections with each other and be maintained in required position as they are buried in the concrete, at which time they shall be free from dirt and scale. Splices in rods shall be lapped 42 diameters or sides. No splice shall be opposite a splice in an adjacent line of rods. Throughout the splice the ends of the rods making it shall be 1½ diameters or sides apart in the clear. There shall be not more than four splices in the circumference of a tank 30 ft. in diameter. Unnecessary splicing shall be avoided.

33. The reinforcing rods shall be plain or deformed. Their tensile strength per sq. in. shall be between 60,000 and 90,000 lbs. Their elastic limit shall be not less than ½ of their tensile strength. They shall not be stressed more than one-third of their elastic limit. Any rod shall be capable of being bent cold on a radius of three diameters or sides through 180 degrees without sign of fracture.

34. A dense, even mixture of concrete as herein specified for reinforced concrete shall be the primary expedient to secure water-tight concrete. This may be supplemented by mixing with the cement some form of waterproofing compound of proved efficiency and now obtainable from manufacturers.

Where the concrete can be worked before it has set, the surface shall be thoroughly troweled until a dense mortar face is secured. Concrete surfaces already set may be plastered by rich cement mortar, but surfaces so treated shall first be cleaned and roughened by steel brushes or equivalent, and the plastering shall be applied on a fresh coat of cement grout mopped on the surface.

In addition, if necessary, separate and alternate washes of soap and alum in the order named shall be applied to the dried and hardened concrete surface. The number of washes should be not less than two of each, with a 24-hour interval between each. The proportion should be approximately ¾ lb. of soap and ⅛ lb. of alum per gallon of water. These proportions may be varied if better results are thereby secured. The soap wash shall be applied boiling hot, without causing frothing. The alum wash should have a temperature between 60 and 80 degrees Fahrenheit.

In lieu of these washes approximately 1 per cent., by weight, of powdered alum may be evenly mixed with the cement, in which case the same proportion of soap shall be dissolved in the water in making the concrete.

In lieu of soap and alum, waterproofing paint having an asphalt base to be applied hot or cold, and now obtainable from manufacturers, may be used. In all washing or painting the concrete surface treated shall be dry and clean and the temperature should be above the freezing point.

35. The weight of water shall be assumed to be 63 lbs. per cu. ft. Wind pressure, acting in any direction, shall be assumed to be, in pounds, thirty times the product of the height by two-thirds of the diameter of the tank, in feet.

Specifications for Wooden Water Tank.

1. The tank shall be a wooden tub carried on timber posts supported on concrete piers, as shown on the drawings. These specifications provide for an all-wood structure above the foundation, as shown.

2. A diameter of 24 ft. and a height of 16 ft. (outside measurement) are recommended for the tub of this tank. Other dimensions may be used, but the design shall conform to the requirements of these specifications.

3. The tank is designed to deliver water to locomotives through water columns. The bottom of the tub shall be not less than 20 ft. above the tracks served.

If water columns are not used, the location of the tank and the necessary tank fixtures shall be selected by the company.

4. Water shall be assumed to weigh 63 lbs. per cu. ft. Wind pressure in pounds acting in any direction on the tub shall be assumed to be thirty times the product of the height by two-thirds of the diameter of the tub. The wind pressure on the substructure shall be assumed at 30 lbs. per sq. ft. of its surface acted on.

5. Necessary anchorage shall be provided to the foundation on the basis of an empty tub, as the engineer shall design and require.

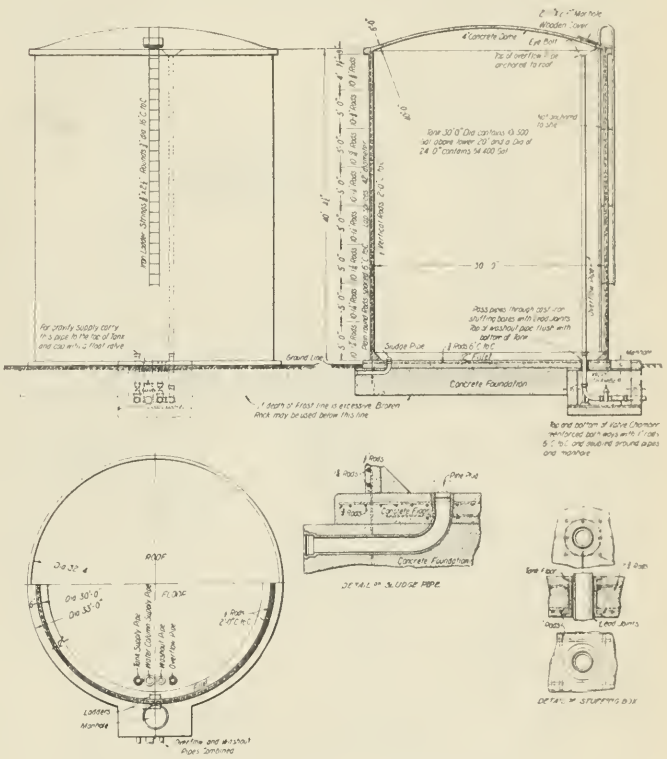
6. In earth, the excavation for the piers and frost pit shall be deep enough to permit the pipes to be laid below the frost line, with a minimum depth of 4 ft. In rock, only the excavations for the frost pit and the pipe trenches shall be carried below the action of frost.

On earth, the total load including wind stress shall not exceed the safe load for that earth. If the earth will not carry this load without material settlement, piling shall be put in as the engineer shall direct. Such piling shall conform to the specifications of this association for piling, as selected by the engineer. Earth foundations shall be thoroughly tamped to detect and compact any soft places therein.

7. The piers and frost pit shall be of concrete of a 1-3-5 mix, made and laid according to the specifications of this association for Portland cement concrete and to the forms and dimensions, as shown, including the proper setting of all anchor bolts.

8. The substructure shall be constructed, as shown. The timber shall be pine, oak, cypress or redwood, S 4 S for painting, and conforming to the specifications of this association for No. 1 R. R. bridge timber. It shall be accurately framed and erected, properly tightening all bolts and tie rods.

9. All rods and bolts shall be iron or steel of the quality hereinafter specified for tank hoops. O. G. washers shall be used under heads and nuts of bolts and tie rods.



Reinforced Concrete Water Tank.

10. The tub shall be made of pine, cypress or redwood, sound, seasoned, out of wind, free from shakes, sap, pitch pockets or streaks, unsound knots, loose knots, knots in clusters, and large knots extending through the material. Small, loose or unsound knots may be bored out if the holes are thoroughly plugged. Material having knots in its edges will not be accepted.

11. The bottom of the tub shall be made of 3-in. planks, S 4 S, and accurately cut and planed to uniform thickness and width. The ends shall be cut to the true circle of and shall fill the croze in the staves. Each plank shall be in one piece without joint or splice. The planks shall be joined by ¾-in. by 3-in. wood dowels on 30-in. centers along each joint. The bottom shall be laid directly on the floor joists.

12. The staves shall be of uniform width, end to end, and shall be made of 3-in. planks, S 4 S, with edges accurately planed on radial lines from center of tub. Each stave shall be in one piece, without joints or splice. The croze in each stave shall be accurately cut to uniform dimensions on one circle for all staves. The croze shall be 3 in. in the clear from the end of the stave.

13. The tub hoops shall be half oval, half round, or

round. They shall preferably be made of wrought-iron. They may be made of steel.

Wrought-iron shall be made of pure puddled iron having a tensile strength of 50,000 lbs. and containing of

Sulphur	not more than	.02	per cent.
Phosphorus	"	"	"	.005	"
Carbon	"	"	"	.02	"
Manganese	"	"	"	.00	"
Silicon	"	"	"	.00	"

Steel shall conform in physical and chemical properties to the specifications of this association for steel bridges.

Each hoop shall be in three equal sections.

14. Each hoop shall be cleaned (preferably at the factory) of dirt, rust and scale, and in that condition shall be heated to 300 degrees Fahrenheit and be dipped in pure asphalt having that temperature which shall be maintained during the immersion which shall continue not less than one minute.

15. Hoops shall have round threaded ends passing through lugs. The joint used shall be as designed or selected by the engineer. It shall be as strong as the hoop.

16. Hoops shall be of one size with the spacing varied, limiting the maximum space to 24 in. c. to c. of hoops.

17. Hoops shall be so spaced that, for wrought-iron, the stress per sq. in. on net section shall not exceed 10,000 lbs., and for steel 12,000 lbs. Threaded hoops shall preferably have upset ends, but a larger hoop giving the required area under thread without upsetting may be used.

18. The roof shall preferably be built in the form of a flat dome, as shown, but other forms may be used.

19. Each joist of the dome form shall preferably be in one piece of full-sized 2-in. lumber, but the longer joists may be built up to an equivalent section. The top of each joist shall be cut to a template having a radius of 84.5 ft., each end of the joist having a depth of 4 in. The length of each joist is determined by its position within the circle having a diameter of 25 ft. 6 in. and cutting the ends of the joists, as shown.

20. On the roof joists, 1-in. by 6-in. sheathing shall be laid solid and shall be cut to a circle having a diameter of 26 ft., as shown.

21. The roof eave shall be finished by 1-in. lumber and quarter rounds built on the ends of the joists, as shown.

22. The sheathing shall be covered by metal, bituminous felt or burlap roofing, tar and gravel, asphalt, mastic, or other prepared waterproof roofing, limiting the selection to brands of proved efficiency. If other than the dome form of roofing is used, shingles or barn boards may be used.

23. The manhole in the roof shall be constructed as shown.

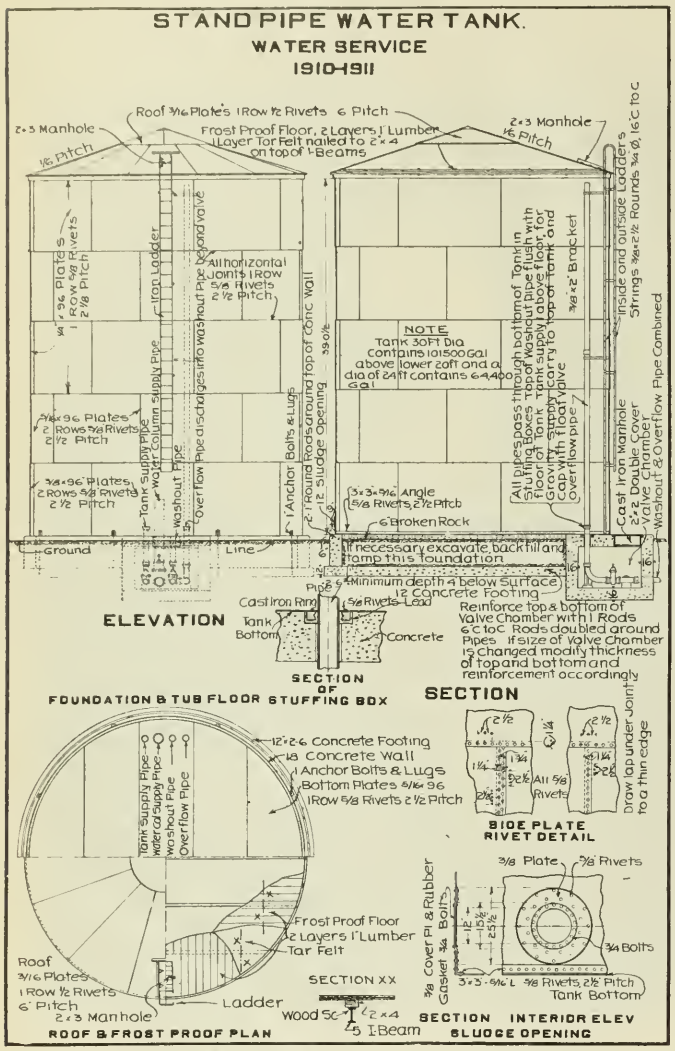
24. When required for frostproofing the roof shall be sealed, as shown. Where ice will not form to an injurious or troublesome degree and sunlight will not cause vegetable growth in the water, the entire roof and ceiling may be omitted.

25. The frost shaft, extending from the frost pit to the bottom of the tub, shall be constructed, as shown, enclosing it by multiple walls of 1-in. by 6-in. lumber, S 1 S and 2 E, separated by 2-in. by 4-in. studding on edge or side. Each wall shall have two courses of lumber separated by a layer of heavy tar felt. The outside course shall be tongued and grooved. The number of walls shall be sufficient to prevent water in the enclosed pipe from freezing. A frostproof door in one side of the shaft shall be constructed as designed by the engineer.

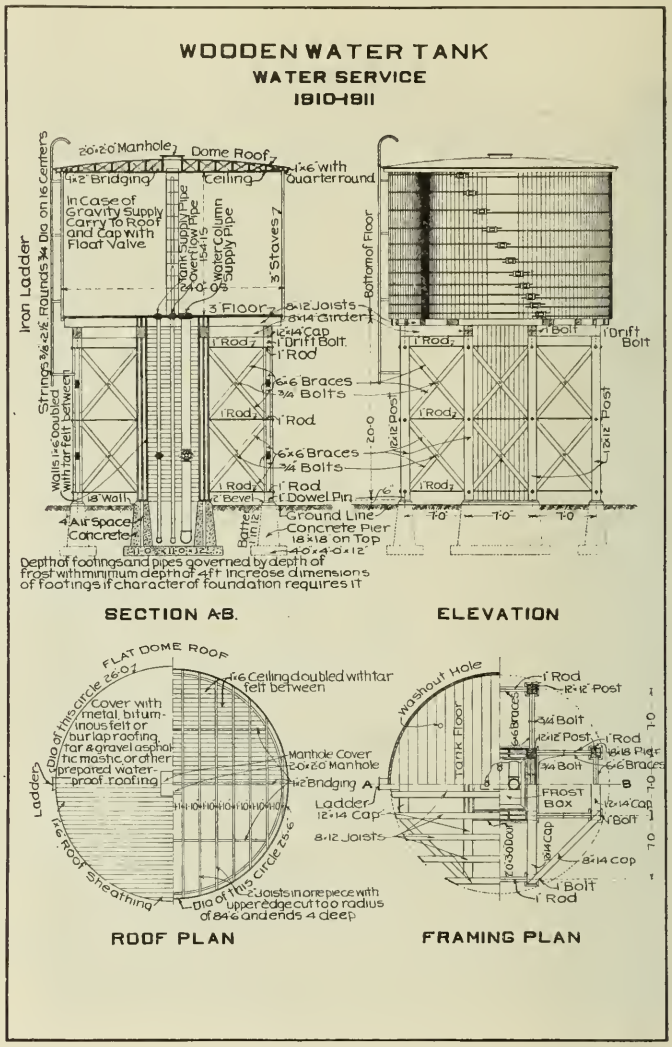
Where ice will not form, the entire frostproofing, including pit, may be omitted.

26. All lumber in the roof and frostproofing shall be No. 1 common, as rated by the Lumbermen's Association for the district supplying the material.

27. The tank shall be equipped with a tank supply pipe, a water-column supply pipe and an overflow pipe, as



Standpipe Water Tank.



Wooden Water Tank.

shown. The first two shall be provided with gate valves. For a gravity supply the tank supply pipe shall be carried to the top of the tank and capped by a float valve. The sizes of the pipe shall be determined by the engineer. No pipe shall have an inside diameter less than 4 in. All pipes shall pass through the bottom of the tank by two standard flanges full bolted with gaskets. For a pressure gravity supply, a stuffing box in lieu of flanges for the tank supply pipe may be used if necessary to prevent leakage. All pipes shall be enclosed in the frost shaft and pit and leave the latter below the frost line.

28. In the bottom of the tank outside of the frost shaft a sludge hole with plug shall be constructed as designed or selected by the engineer.

29. When the tank is finished, the hoops properly tightened and the wood saturated, the tub shall be water tight. No foreign material shall be used in making the joints in the tub.

30. The tank shall be equipped with a gage, indicator and float as designed or selected by the engineer. The clearance between the gage board and the tub shall not be less than 1 in.

31. The ladders shall be constructed, as shown, and as designed, or selected by the engineer.

32. All exposed woodwork shall be painted with one priming and two finishing coats, using the company's standard paint and colors for such work. All wood to be painted shall be dressed.

Specifications for an Iron or Steel Water Tank.

1. The tank shall be of iron or steel on a foundation, as shown on the drawings.

2. The capacity of the tank should be within the limits of 50,000 and 100,000 gallons, exclusive of the lower 20 ft. of the tank. The height of the tank from bottom to top of shell should be within 12 in. of 40 ft. A diameter of 30 ft. is recommended. On this basis the drawings have been made. The latter shall be made to meet the requirements of the height and diameter selected by the engineer.

3. The tank is designed to deliver water to locomotives through water columns. The floor of the tank shall not be lower than the tracks served. If water columns are not used, the location of the tank and the necessary tank fixtures shall be such as shall be selected by the company.

4. See specification No. 4 for reinforced concrete tank.

5. The foundation shall consist of a ring of concrete under the shell of the tank enclosing a broken rock foundation, as shown. Under the broken rock the earth shall be excavated, back filled and tamped to such depth and in such manner as may be necessary to secure proper support.

6. See specification No. 6 for reinforced concrete tank.

7. When wind pressure requires, the tank shall be anchored to the foundation by anchor bolts and lugs, as shown, and as designated or approved by the engineer.

8. The concrete in the foundation of the tank and the side walls of the valve box shall be a 1-3-5 mix, made and laid inaccordance with the specifications of this association for Portland cement concrete. In the top and bottom of the valve box the concrete shall be a 1-2-4 mix, made and laid in accordance with the specifications of this association for reinforced Portland cement concrete. The extreme fiber stress on concrete shall not exceed 600 lbs., and in steel shall not exceed 12,000 lbs. per sq. in. as given by the straight line formula.

9. These rods and bolts shall be of steel and in quality they shall fulfill the requirements of these specifications for the steel in this tank.

10. See specification No. 10 for reinforced concrete tank.

11. A sludge hole shall be constructed in the side of the tank at the bottom, as shown, and as designed or approved by the engineer. This opening shall preferably have a reinforcing ring and a cover plate, as shown, but other forms, including cast-iron, may be used.

If the absence of sediment in the water justifies, this opening may be omitted.

12. The tank roof shall be constructed of metal, including manhole, as shown. If necessary to prevent ice forming to an injurious or troublesome degree over the water in the tank, a ceiling shall be constructed under the roof of doubled 1-in. by 6-in. lumber, No. 1 common of the Lumbermen's Association for the district supplying the material, with a layer of heavy tar felt between. This ceiling shall be nailed to 2-in. by 4-in. nailing strips, bolted to the top of I-beams carrying the ceiling. The latter shall be standard beams of proper weight and spacing for the span and load and shall be carried by the shell of the tank through standard connections.

Where ice will not form, as specified above, and sunlight will not cause vegetable growth in the water, the entire roof and ceiling may be omitted, in which event finish top of tank shell by a ⅜-in. by 3-in. by 3-in. angle.

13. The ladder shall be constructed, as shown, and as designed or selected by the engineer. The metal in this ladder, in quality and manufacture, shall fulfill the requirements of these specifications for the metal in the tank.

14. Metal Specifications.—The metal in these tanks shall be wrought-iron or open-hearth steel.

The iron shall be manufactured from pure puddled iron having a tensile strength of 50,000 lbs. per sq. in. This iron shall contain of

Sulphur.....	not	more	than	.02 per cent.
Phosphorus.....	"	"	"	.005 "
Carbon.....	"	"	"	.02 "
Manganese.....	"	"	"	.00 "
Silicon.....	"	"	"	.00· "

The steel shall conform in physical and chemical properties to the specifications of this association for steel bridges.

The rivets shall be ⅝-in. in diameter.

15. The weight of water shall be assumed to be 63 lbs. Wind pressure, acting in any direction, shall be assumed to be, in pounds, thirty times the product of the height by two-thirds of the diameter of the tank in feet.

16. Unit stresses shall not exceed the following:

For Iron:

(a) Tension in plates, 10,000 lbs. per sq. in. on net section.
(b) Shear in plates, 8,500 lbs. per sq. in.
(c) Shear on rivets, 10,000 lbs. per sq. in.
(d) Bearing pressure on field rivets, 18,000 lbs. per sq. in.

For Steel:

(a) Tension in plates, 12,000 lbs. per sq. in. on net section.
(b) Shear in plates, 10,000 lbs. per sq. in.
(c) Shear on rivets, 10,000 lbs. per sq. in.
(d) Bearing pressure on field rivets, 18,000 lbs. per sq. in.

17. Plates forming the shell of the tank shall be cylindrical and of different diameters, in and out, from course to course.

18. All workmanship shall be first-class. All plates shall be beveled on all edges for caulking after being punched. The punching shall be from the surface to be in contact. The plates shall be formed cold to exact form after punching and beveling. All rivet holes shall be accurately spaced. Drift pins shall be used only for bringing the parts together. They shall not be driven with enough force to deform the metal about the holes. Power riveting and caulking should be used. A heavy yoke or pneumatic bucket shall be used for power-driven rivets. Riveting shall draw the joints to full and tight bearing.

19. The tank shall be made water tight by caulking only. No foreign substance shall be used in the joints. The caulking shall preferably be done on the inside of tank and joints only. No form of caulking tool or work that injures the abutting plate shall be used.

20. The minimum thickness of plates in the cylindrical part of tank shall be ¼-in. and in the bottoms $\frac{5}{16}$-in.

21. Lap joints shall be used for all horizontal joints and for vertical joints in plates not more than ⅜-in. thick. With thicker plates, double butt joints, with inside and outside straps, shall generally be used. The edge of the plate in contact at the intersection of horizontal and vertical lap joints shall be drawn out to a uniform taper and thin edge.

22. The diameter of rivet holes shall be $\frac{1}{16}$ in. larger than the diameter of the rivets used. The punching shall conform to the specifications of this association for such work on steel bridges. A close pitch, with due regard for thickness of plate and balanced stress between tension on plates and shear on rivets, is desirable for caulking.

23. The tank shall be equipped with a gage indicator and float, according to the design or selection of the engineer.

24. After being completely erected, caulked and cleaned of dirt, rust and scale, all exposed metal work shall be painted or treated with such coat or coats of paint or metal preservative as shall be selected by the railway company.

The report is signed by C. L. Ransom (C. & N. W.), chairman; Robert Ferriday (C. C. C. & St. L.), vice-chairman; James Burke (Erie); J. L. Campbell (E. P. & S. W.); H. M. Church (B. & O. S. W.); G. H. Herrold (C. G. W.); E. G. Lane (B. & O.); A. Mordecai, consulting engineer;

C. A. Morse (A. T. & S. F.); W. A. Parker (St. Jos. & Gd. Is.); L. P. Rossiter, Hazelwood, Pa.; A. D. Schermerhorn (Un. Pac.).

Discussion on Water Service.

(The secretary then read Par. 2, 3, 4 and 5.)

J. L. Campbell (E. P. S. W.): I would suggest that it would be better if we would transpose the phrase in paragraph 5, making it read: "Necessary anchorage to the foundation shall be provided."

The President: If there is no objection, that will be done.

J. P. Snow (B. & M.): I object to having the concrete so definitely specified in paragraph 7. The foundations might be made of stone masonry and be made all right. It says, "the piers and frost pit shall be of concrete." I think that is a bad word to put in the manual in that connection.

The President: The committee will accept Mr. Snow's suggestion, and will change that to "masonry."

Mr. Stephens: I think that the comma after "small" in paragraph 10 should be eliminated, so that it would read, "small loose or unsound knots."

Mr. Campbell: It is the intention of these specifications to distinguish between small knots and loose knots.

H. A. Lloyd (Erie): It seems to me the specification for the kind of wood is a little too general. The family of pine is very large, and in using Norway pine you might get bad results.

Mr. Campbell: In the word "pine" the committee intended to include any wood that would properly come under that general class of timber, which would include yellow pine, white pine, douglas fir, and possibly other classes of pine that would be entirely suitable.

G. D. Brooke (B. & O.): I hardly think it is the intention of the committee that a large loose knot should be bored out and the hole plugged.

W. H. Courtenay (L. & N.): It seems to me it would be better to omit the comma.

The President: The committee will accept that.

C. H. Stein (C. of N. J.): In reference to the first line of the paragraph, there should be something more specific in regard to the kind of pine. If we place a specification like this in the hands of the contractor, he might make a tank out of some species of pine which is very objectionable, and I would like to ask, for information, whether any kind of cypress would be suitable for a water tank?

Mr. Ranson: Quite a number of southern firms are making tanks out of cypress and many southern roads are using them.

Mr. Ranson: The committee would be glad to have suggestions as to changing this reading to make it plainer.

A. K. Shurtleff (C. R. I. & P.): My suggestion is that this be left blank, to be filled in by the company selecting the wood they desire the tank to be made of. The specification should be specific.

Mr. Campbell: This committee last year brought in a specification for tanks full of blanks, and the association wanted the blanks filled in. The idea in the preparation of these specifications was to cover the quality of the wood—to make it as general as the committee thought permissible, and then specify the quality. It is true that "pine" would admit any kind of pine, but the specification says it should be sound and seasoned. I believe it is the opinion of the committee that any sound and seasoned wood would be durable, provided it was kept saturated.

A. F. Robinson (Santa Fe): I would like to suggest that you make that first line read "the tub shall be made of suitable pine" or "the tub shall be made of acceptable pine."

The President: The committee will accept that.

Mr. Loweth: I should like cedar put in there for the staves and fir for the bottom.

The President: The committee will accept that.

Mr. Campbell: I suggest we add to the sentence in paragraph 11, in regard to the length of plank, these words, "for all tanks having a diameter not greater than 24 feet."

The President: The committee will accept that suggestion.

The chairman suggests that the word "each" be substituted for the word "the" in the first line of paragraph 12.

Walter Loring Webb: I notice that the stave shall be of uniform width end to end, etc. That practically limits these tubs to the cylindrical style rather than the conical. Is it the intention to cut out the use of conical tubs?

Mr. Ranson: Yes.

Mr. Webb: Is that not a distinct departure from common practice?

Mr. Ranson: It is a departure from common practice of twenty years ago, but not a departure from modern practice.

O. E. Selby (C. C. C. & St. L.): I see nothing in the specification to limit the width of the staves. The tendency of the manufacturers is to make the staves as wide as they consistently can, because it makes the job cheaper, and I suggest that the limiting width of ten inches be inserted.

Mr. Ranson: I think there is not much trouble to be anticipated on that score as it is difficult to get lumber of this quality that is wider than 8 inches.

Mr. Selby: We have found there is likely to be difficulty where the width is not limited, as the manufacturers will put in staves up to 10 and 11 inches wide, and they do not give satisfactory services. It is not hard to get timber of the quality demanded in fir and yellow pine, and in cypress, up to widths of 12 inches or more.

Mr. Robinson: There is an increased cost per thousand feet, board measure, for timber over 10 inches wide, and I do not think we need to worry about the manufacturers putting in many 12-inch planks, when they can use 10 inch, at $2 per thousand feet, board measure, less cost.

C. E. Lindsay (N. Y. C. & H.): While it may be true that the conical tub is a thing of the past, many railways are still using them, and as a conical tub has the merit of taking advantage of the force of gravity in keeping the hoops from falling off entirely in the event of shrinkage, I would like to endorse the conical tub.

W. M. Camp: The same question was up before the American Railway Bridge & Building Association last October, and the sentiment expressed in the discussion there seemed to conform to the committee's report, that cylindrical tubs are now preferable, since adjustable hoops have come into service. In former years, when solid hoops were used and had to be driven down, of course it was desirable to have the conical shape of tub.

(The secretary read Section 13, Tub Hoops.)

Mr. Brooke: I suggest that the last paragraph of Section 13, reading, "Each hoop shall be in three equal sections," be combined with the first paragraph, which would then read: "The tub hoops shall be half-oval, half-round, or round, and shall be in three equal sections."

Mr. Campbell: There has been some question raised as to the advisability of having three joints in the hoop. I suggest we change it to read: "Each hoop shall be in not more than three sections," and we will accept the suggestion and change the reading.

Mr. Courtenay: If this association is to go on record as abandoning the flat hoop, I think it would be desirable to go the whole length, to the round hoop. I am not able to see the advantage of a half oval or half round hoop as against a round hoop. The round has the simpler form of the three, it is generally easier to get, and I am unable to see any advantage which the half round has over the round. I think to some extent the half round would offer some of the disadvantages of the flat hoop; that is, it would rust speedily on the flat side in contact with the tub. That has been the overwhelming objection to the flat hoop. I have known of many cases of failures of the flat hoop, where the outside of the hoop appeared to be sound. If we are to change to some form of approximately round, it seems to me it would be better to adopt the round and leave out the half oval and half round.

Mr. Campbell: There is the objection to making one specification for round hoop that shall limit the recommendation to one thing. The committee believes the half oval or half round hoop is a decided improvement over the flat hoop, on account of the greater concentration of the metal and smaller surface exposed to corrosion, and in the preparation of the specifications the committee endeavored to avoid mentioning any one specific article, where we could avoid doing so, particularly where other equally good forms could be included.

Mr. Snow: I seriously object to limiting this to a round hoop on account of the trouble arising from dust and dirt collecting above the round hoop, and moisture on the outside of the stave. It might be supposed that you could keep the hoop filled with paint, but the hoop will drop away from the paint and you will have a groove there and it will rot the stave.

Mr. Lindsay: Is there anything about the round hoop or oval hoop that requires three adjusting points? We have been able to maintain tanks successfully and economically with one adjustment, both on round hoops and flat hoops.

Mr. Ranson: The only object in having a large number of joints is that we believe the tension can be more evenly distributed on the staves, giving a tighter and better tank.

Mr. Kittredge: I do not like to see flat hoops ruled out altogether. It is entirely possible that by getting a proper quality of metal, either pure iron or something that approaches it, we can get flat hoops that will give us good service. These specifications should be broad and cover all good practice. I thoroughly agree that if the hoop is made of steel, the flat hoops would probably better be ruled out, but I don't like to see them ruled out under all conditions.

Mr. Smith: I would like to know if any members of the association have had experience in the use of flat hoops of a sufficient thickness to indicate what would happen if a thick hoop were used. It seems to me the flat hoops have been condemned on account of failures that have occurred in hoops ⅛ in. and 3-16 in. thick.

Mr. Courtenay: We have used square hoops. One objection to a square hoop is that in putting it on it is hard to keep it from turning, so that one of the corners cuts into the wood. We have a round hoop on a tank that has been in since 1886. Our experience has been that staves do not rot any more quickly when in contact with round hoops than at other places. It is a bad proposition to make a good joint with a wide, thin, flat hoop. I have had tests made with several forms of friction joints in different ways, and none of them that we have tested will develop the strength of the hoop. It is an easy matter to make a good connection with a round hoop.

Mr. Ranson: The committee would like to quote from correspondence with the inspection department of the Associated Factory Mutual Fire Insurance Companies, who have made a specification for wooden tanks for use on tops of buildings in connection with fire protection.

"The strength of a tank depends chiefly on its hoops. Experience shows that flat hoops, especially those of steel, rust from the back side, where they bear against the staves, and serious accidents have happened by hoops bursting on account of this unobserved corrosion. Sometimes galvanizing or painting is depended upon to prevent rusting, but there is always the possibility that spots of the protective coating will be knocked off in handling, and one spot left unprotected may result in the failure of the hoop. Round hoops are, therefore, advised for all tanks, since, for a given cross section of metal, these hoops have the advantage of presenting the least surface to corrosion. Nearly the whole surface can, moreover, be examined or painted while the hoops are in place. In setting up a tank with round hoops there is little probability of tightening the hoops to such an extent that when the tank swells the hoops will burst; for the round hoops will simply indent the wood more as the tank swells, and the strain in the hoops is not likely to be increased to the breaking point."

Mr. Kittredge: I move that this article be so modified that it will permit the use of flat hoops.

Mr. Selby: Our road has had experience with flat hoops about twice the thickness of the average manufacturer's standard, running from ¼ in. to ⅜ in. and in width from 4 in. up to 6. Of course these hoops are stronger, and last longer, resist corrosion longer than the thin hoops ordinarily used, but we have abandoned them for round hoops. Mr. Kittredge suggests that the objection to flat hoops may be overcome by the use of some rust resisting material, ingot iron or some material of that kind. The rapid corrosion is only one of the objections to flat hoops; the other is the difficulty in making proper connection with the lug and the unsatisfactory performance of the connections after they are installed. There is a tendency to pull the hoop away from the tub at the heel of the lug. The connection to the lug is necessarily eccentric, and the pull on the draw bolts tends to pull the hoop away and bend it immediately at the heel of the lug. This makes a weak point in the hoop, and makes a point where decay can start in the staves under the hoop.

Mr. Kittredge: I objected to flat hoops exclusively a year or two ago, and I object just as much to-day to the round hoops or oval hoops exclusively. I am in favor of round hoops, but I do not want to see specifications of this association leave out flat hoops. I am sure the design and structure of a flat hoop can be so worked out that it will be efficacious. I have known flat hoops to last the life of a tank. If the flat hoops are included the clause which says they may be made of steel will probably have to be modified, as well as the remarks about the flat hoops. There is a large number of flat hoops in use in this country, and we don't want it to be understood that there are no good flat hoops.

Mr. Stephens: I have known flat hoops three-eighths inch thick protected by two coats of red lead and placed on the painted surface of the tub, to be corroded through and burst off in less than eight years.

F. H. Falkinburg (B. & O.): We have found that using the round hoops, the space at the bottom of the tub, between the hoops, being greater than the width of the hoops, it is possible to renew the hoops on an old tank by beginning at the bottom, which cannot be done where flat hoops are used, because flat hoops are wider than the spaces between them.

Mr. McDonald: I think the province and object of our association is to find out what is the best thing. Although I recall an instance of a red cedar tub with flat hoops that has stood forty years, I recall a great many other instances where flat hoops have failed that have been on only seven or eight years, and I think we ought to go on record as favoring round hoops.

Mr. Loweth: Although it is the practice of the St. Paul road, and has been for some time, to use round hoops, I think we ought not commit ourselves to one line of action. The committee has done its work with a great deal of painstaking care, and has turned in an admirable report, but I think in a measure we are putting the cart before the horse. It would be much better, I think, if this committee—and I use "this committee" as an illustration of a genral propositon—had come in with a report giving the reasons for and against these various things that are stated in these specifications, and this convention could very profitably have considered such a report. Let us have all the information in favor of the flat hoop, in favor of the other kinds of hoop, in favor of iron hoops, in favor of steel hoops, and all the other details that enter into a tank, and after that has been threshed out, perhaps we can agree on a specification. We have a great deal of discussion now because the committee asks—and properly, in view of our past practice—that these specifications be adopted. While it brings in a great deal of valuable discussion, it would be much better if these specifications were accepted as information. It seems to me this body of men can be relied on, if the information is furnished, to make their own specifications. We spend a great deal of time haggling over specifications that each one of us can settle for ourselves. Our committee work is largely in the nature of getting information, compiling it and getting data and the experience of others, and not in formulating hard and fast specifications. I think our work should stand for a great deal more than that.

The motion to include flat hoops was put to a vote and was defeated.

Mr. Snow: Will the committee agree to omit the specifications for iron? It is impossible to obtain this except from one or two concerns.

Mr. Ranson:,The committee is not willing to accept that, as iron of this character can be purchased at the present time.

Mr. Courtenay: As a matter of information, I would like the committee to inform the association who does manufacture this quality of iron.

Mr. Ranson: The American Rolling Mill Company, Middletown, Ohio.

Mr. Tinker: I would like to say that there are a great many mills in the country that manufacture that quality of iron.

Mr. Campbell: It seems as if it were entirely practicable to produce this quality of iron, and if the association calls for that quality of iron, we will get it. I fail to see the force of the objection to including this specification for iron in these specifications, provided the specification itself is all right.

Mr. Brooke: I would like to state that the Baltimore & Ohio purchased a number of tanks last spring and had no great difficulty in getting wrought iron hoops.

Mr. Loweth: Why is asphaltum better than paint for coating tank hoops? It is harder to get and much harder to apply, according to this specification. I am not satisfied that it will preserve the hoop any longer.

Mr. Campbell: Probably the specification might be improved in that particular. I believe the committee is not wedded to asphaltum. I think coal tar might be all right, and there are paints which might be good substitutes for the material specified here.

Mr. Coburn: Speaking about pure asphaltum, the nomenclature of asphalt is a rather indefinite matter. Pure asphalt, as I understand it, is an asphalt with a considerable portion of oil. That is rather misleading.

Mr. Ranson: The committee would accept the suggestion and add a sentence to the paragraph saying "or such other coating as the engineer shall approve," leaving it open to coat the hoop in any manner the engineer sees fit.

Mr. Loweth: If paint is added last, it would seem that asphalt coating is preferred to paint. We have a good many steel and iron structures that are painted, and if paint is good for those, why is not paint good for iron hoops on a tank? We don't want paint last, as though it were something we might use, but ought to use the other.

Mr. Campbell: It has been my experience that the coating that adheres most closely to the iron is the coating that is placed there when both the material and the iron are hot. By heating the steel and immersing it in a bath of asphalt it gives a coating that adheres tenaciously to the material, and in that way I believe it is much superior to applying cold paint to cold iron.

Mr. Steffens: In case of bridge iron or other structures, the surfaces are accessible very largely. The back of a hoop is inaccessible and protected from the air. The moisture conditions, and the hoop that is in contact with the wood, which is to a large extent porous, must eventually break down the oxygen from the linseed oil. The asphaltum recommended by the committee has been known to stand, under such circumstances, over forty years. I hope the recommendation of the committee will stand as to the asphaltum coating and that we will not permit the linseed oil paints to be introduced.

The President: The amendment to the clause is the insertion of the words, "or such other coating as the engineer shall approve."

Mr. Loweth: Will it be implied that any other coating will have to be applied to the hoop by dipping or immersion? There are two requirements in the specification. One is that coating shall be asphalt and the other is that it shall be applied by dipping into a hot mixture. What you add should not require it to be dipped in paint, but permit paint to be applied with a brush.

The President: The committee will accept that suggestion and insert the words, "the application of such other coating." The clause will then read: "Each hoop shall be cleaned (preferably at the factory) of dirt, rust and scale, and in that condition shall be heated to 300 degrees Fahrenheit, and be dipped in pure asphalt, or the application of such other coating as the engineer shall approve." The clause will be amended in that form.

Mr. Smith: Clause 13 says, "the tub hoops shall be half-oval or half-round," and Clause 15 says, "they shall have round thread ends." How does the committee propose to make the transition from the half-oval to half-round ends? It will conflict with our steel bridge specifications, which do not permit steel welding, if the hoops are of steel and the joint is welded.

Mr. Ranson: Paragraph 15 should be changed to read, "round hoops shall have round thread ends, passing through Jugs. The joints used on half-round hoops and all others shall be as designed or selected by the engineer."

(The secretary then read Par. 17.)

Mr. Loweth: Why is it preferable to require upset ends in paragraph 17?

Mr. Campbell: An unnecessary amount of metal would be used if the ends were not upset. The strength of the rod would be limited by the strength of the metai under the thread, and these hoops are quite long. It makes a very material difference in the weight of the metal.

Mr. Loweth: At the same time I contend that for these small rods, the upsetting would cost more than the extra metal.

Mr. Campbell: The specifications say the rods should be preferably upset, but it was left to the individuals of the association to use either one.

Mr. Loweth: I move that we omit the last two lines of article 17.

The President: The last two lines will be omitted.

Mr. Lindsay: I would like to know what particular virtue the dome roof has. It does not appeal to me from an esthetic standpoint, and I cannot see any economy in it. It is difficult to make and difficult to maintain.

Mr. Campbell: The committee believes that the form of roof shown is simple and economical, as much so as any other form of roof, and probably more easily constructed than the more ordinary forms of roof. The specifications leave the description of the form of roof optional.

Mr. Lindsay: Will the committee substitute the word "will" for "shall" in the first line?

The President: That is acceptable to the committee.

Mr. Loweth: I agree that this form of roof is quite satisfactory. I think it will look well, and cost but a trifle more than the ordinary cone roof, but I would like to know why we should say the dome roof is preferable to anything else. I move that the word "preferable" be stricken out.

The President: The committee suggests the use of the word "may" instead of "shall."

Mr. Shurtleff: It seems to me that instead of going into specifications, our specifications are going into designs which will be covered by plans. I move that the paragraph be stricken out entirely and that a new paragraph be provided specifying that the roof shall be according to standard plans, which will cover the details, but the plans should not be specified in the specifications.

Mr. Campbell: On that basis we could make our specifications very short. We could simply say: "The tanks should be built according to the plans."

Mr. Loweth: Has the committee any information as to the number of railways that have built this form of roof? The committee comes and asks the association to adopt specifications in which it is stated that this type of roof is preferable. I do not know of any considerable number of roads anywhere that have been using this type of roof.

Mr. Ranson: Two years ago we attempted to get standard plans of tanks from the railways of the country. We received many answers to our inquiry, which indicated that the bulk of the railways apparently have considered the question of tank design a secondary matter, and paid very little attention to it.

Robert Ferriday: If the consensus of opinion in the association is that this form is not desirable, we would like some pretty full discussion, so that some form may be decided on in the convention here, that could be shown in our plans.

Hunter McDonald: I believe we have reached a point in the conduct of the affairs of this association when we should lay down a principle on which our work should be prepared in the future. Every time plans are presented there is continual objection, and we have never succeeded in introducing a set of plans into our manual. If we are making a mistake in instructing our committees to bring in definite specifications and recommendations, then the association should so express itself. Last year, when this question came up, the committee presented detailed specifications, and the criticism was that they were not in sufficient detail, and it was instructed to again take up the subject and bring in specific recommendations. The committee has followed the instructions in the report it has presented at this convention. If this is wrong practice, our committees in the future, it seems to me, should be instructed to bring in only the underlying principles and leave the sketches out. I believe our convention should express itself on that theory so that our work may be properly arranged for the future, and we may not be called upon to consume the time of the convention in discussing this question of design, which is constantly meeting with opposition on account of varying standards on the different roads.

The President: Mr. McDonald's remarks are very opportune. I believe it is the province of the board of direction to lay down in its instructions to the committees some specific rules of procedure.

J. B. Jenkins (B. & O.): It seems to me it might be well for this convention to request the board of direction to draw up a preamble or preface to our manual, which would state in effect that the practice recommended in the manual is considered good practice, but that it does not exclude any other methods or plans or specifications which may arrive at the desired result.

The President: For the information of the association, I will state that the board has practically agreed on such a rule, which will appeal in the new manual.

The motion to strike out clause 18 was put to vote and lost.

The President: Paragraph 18 will be amended to read: "the roof may be built," etc. It will be necessary then to amend 19, 20, 21, 22 and 23 to conform to 18. These paragraphs will be referred to the committee for amendments.

Mr. Lindsay: Does paragraph 25 confine us to the particular type of frost proofing described? There are other forms much more economical in material and as satisfactory.

P. C. Newbegin: I do not think this frost proofing as shown, would answer for a very cold climate. Up in northeastern Maine, we have temperatures down to 40 degrees below zero, and the only way we found we can keep our tanks free from ice, is to enclose the entire bottom of the

tank and put in a stove, and run a pipe from the stove through the water in the tank and keep a fire continually in the stove.

Mr. Lloyd: I was brought up in the northwest, where they have as cold weather as in Maine, and we arranged our frost proofing in the same way as outlined in the report. We did not find it necessary to have a stove.

Mr. Loweth: I ask the committee if it is always necessary to have the water supply pipes and the discharge pipes separate? There are many cases where the two can be combined in one. This design is prefaced with the statement that the tank is designed to deliver water to locomotive through water columns. I think the practice is to separate the two pipes.

Mr. Lindsay: Our experience recently has been that the floating valve can be very much improved by the use of an automatic valve in the frost pit. The floating valve in places where you are troubled with considerable ice, is very often frozen up, and does not indicate the continuity of the supply. While I judge the specification does not prohibit the use of such a device, I call it to the attention of the association. There is also an improvement that can be made in the elbow in the frost pit, at the base of the supply pipe, where the supply pipe rises to supply the tank. If this is made a T instead of an elbow, and provided with a plug, the sediment which gathers at the foot of the supply pipe, and interferes with the supply can be blown out.

Mr. Loweth: I wish to take exception to the chairman's statement that the best practice involves the use of two pipes. That is not always true. There are times when money is saved by putting in one pipe, and letting it serve both purposes.

Mr. Lindsay: Referring to paragraph 28, a sludge hole in the bottom of the tank is a very dirty and uneconomical arrangement. When you open the hole and let the sludge out, it goes all over the substructure, and you must wash, or repaint it. There should be a pipe from the sludge hole to a suitable point on the ground. I think the sludge hole should be equipped with a better device than a plug of wood. There should be a recessed cast iron cap that could be put on the hole and tightened down so as to prevent leakage.

Mr. Lindsay: The definitions in paragraph 33, should appear in paragraph 1.

The President: The committee accepts the suggestion.

Mr. Wendt: The association is now twelve years old and there is a very sharp difference of opinion as to whether a manual should be published or not. There is also a very decided difference of opinion as to what should enter into the manual. I believe we have reached a point where the manual should contain less subject matter. The original purpose in publishing a manual probably has never been stated. I do not know what that original purpose was, except as we find on the index page of the manual, but it is my personal opinion that the greatest value of the manual should lie in the fact that it contains these general specifications, which will enable railways to obtain competition in the purchase of materials. It should contain well defined principles which could be followed by engineers generally.

It may or may not be desirable to introduce standard plans in the manual, but I think it is quite out of the question to introduce into the manual standard designs of structures. We have reached the point where it would be fair to lay down the general principles that committees may well prepare standard plans, not with the object of having them adopted as parts of the manual, but for the purpose of having them approved as information, as to best designs suitable to definitely prescribed conditions. I move that the report of this committee on specifications for wooden water tanks be received as information.

The motion was carried.

After some discussion as to the time available for considering the report of the committee, a motion that the report be received as information was carried.

WOOD PRESERVATION.

The following sub-committees were appointed:

Revision of Manual: Octave Chanute, chairman; V. K. Hendricks, G. M. Davidson, Walter Buehler.

On Specifications for New Processes: V. K. Hendricks, chairman; A. L. Kuehn, E. H. Bowser, G. E. Rex, W. Buehler, E. Stimson, H. F. Weiss.

On Grouping: H. F. Weiss, chairman; Octave Chanute, E. A. Sterling, A. L. Kuehn.

On Specifications for Timber and Piling: Hermann Von Schrenk, chairman; L. Bush, W. H. Courtenay, W. K. Hatt.

On Statistics: Octave Chanute, chairman; W. H. Courtenay, E. A. Sterling.

On Track Scales for Weighing Ties: Hermann Von Schrenk, chairman; Earl Stimson.

REVISION OF MANUAL.

Certain changes have been recommended in the specifications for creosote oil, which are summarized as follows:

Paragraph 1. The definition of creosote oil restricts its origin to coal tar, and allows an admixture of refined coal tar to the creosote oil.

Paragraph 2. Fixes the per cent. of insoluble matter at 2 per cent. This is necessary to control the amount of free carbon in the oil when coal tar is added thereto.

Paragraph 3. Places an upper limit of 1.10 on the specific gravity. This limit is placed arbitrarily, for as the gravity of oil for paving blocks has been fixed at from 1.10 to 1.15, it would seem that the oil for treatment of ties and timbers should not have any higher gravity than the paving block oil.

In paragraph 5 it is specified that the fraction between 210° and 255° C. shall deposit naphthalene salts on cooling, and the fraction between 315° and 355° C. shall yield solids on cooling. The demand that the oil shall not show any evidence of decomposition as indicated by the presence of dense white fumes in the condenser is intended to guard against adulteration from water-gas tar.

The committee recommends an additional paragraph to the recommended practice providing for accurate tests of



W. K. Hatt.

Chairman, Committee on Wood Preservation.

the life of ties, in an especially selected and carefully inspected test track. While it is thought that the use of the dating nail in each tie is justified by its educative value to trackmen and others, yet the accurate determination of the relative life of ties, and their behavior under service, demands a more careful supervision at the hands of trained assistants than is possible under the present system.

The sub-committee for piles and timber to be treated proposes an addition to recommended practice providing for the framing of timbers before treatment.

SPECIFICATIONS FOR NEW PROCESSES.

The sub-committee on specifications for new processes reports that it is impracticable to write specifications for patented processes. They have, therefore, obtained from the persons in control of such processes an accurate description of the method of conducting them.

GROUPING.

The sub-committee on grouping presents a progress report.

SPECIFICATIONS FOR PILES AND TIMBER TO BE TREATED.

The sub-committee presents a draft of such specifications for discussion. The present standard specifications of the association have been followed, as far as possible, except that sap restrictions have been removed. With the endeavor to call the attention of the mill men to the desire of the consumer to obtain material with a large amount of

sap, rather than all heart pieces, the statement is made in the specifications that sap wood is to be preferred. The reasonable exception is that this change would operate to reduce the cost of material.

TRACK SCALES FOR WEIGHING TIES.

The specifications adopted last year for tie treatment provided for the occasional weighing of buggy loads, in and out of the cylinder. The subject of track scales has been investigated by the sub-committee, which finds that track scales for weighing ties are now being used occasionally in treating plants in this country and quite generally in Europe. It recommends that a track scale be installed at every treating plant wherever possible.

STRENGTH OF TIES TREATED WITH CRUDE OIL.

Last year's report on Strength of Treated Timber mentioned certain tests of ties treated with crude oil. Subsequent tests on the same ties show that the temporary softening of the surface had disappeared upon exposure, but that the reduction of the spike-holding power in the treated ties still remains.

ELECTRICAL CONDUCTIVITY OF TREATED TIES.

The committee presented the results of investigation of the passage of electrical current through treated and untreated ties of various species.

CONCLUSIONS.

(1) That the revised specifications for creosote oil be adopted for publication in the Manual.

(2) That the two paragraphs recommending the selection of a section of track for testing the life of ties, and recommending the framing of timbers before treatment be added to the recommended practice of the association.

The report is signed by: W. K. Hatt, Purdue University, chairman; W. H. Courtenay, L. & N., vice-chairman; E. H. Bowser, I. C.; Walter Buehler, Kettle River Company; Lincoln Bush, Consulting Engineer; G. M. Davidson, C. & N. W.; George E. Rex, A. T. & S. F.; V. K. Hendricks, St. L. & S. F.; A. L. Kuehn, American Creosoting Company; E. A. Sterling, Pennsylvania; Earl Stimson, B. & O.; Hermann von Schrenk, R. I.; Howard F. Weiss, United States Department of Agriculture, committee.

APPENDIX H.

The Electrical Resistance of Timber as Affected by Treatment with Preservatives.

An investigation to determine the resistance of ties as affected by treatment with preservatives was made by Mr. J. T. Butterfield, of the School of Electrical Engineering at Purdue University, in the spring of 1910.

The material available for the tests consisted of four shipments of ties. The specimens tested vary in size from half a tie to a small section cut from half a tie.

The resistance was measured by the method commonly used for measuring the insulation resistance of electrical machinery, namely, by means of a direct current voltmeter of known resistance. This method was applied in two ways: (1) The contact surface for flow of current in the ties was a sawn surface as nearly plane as possible. Contact pressure of 250 lbs. per sq. in. was applied in a Riehle testing machine by means of sheet-iron pans, placed one above the other and filled between with dry sand, by which constant surface resistance was obtained. (2) After some of the fundamental laws were investigated, the resistance of the various ties was compared by measuring the current flowing between two spikes driven 20 in. apart in the face of each tie. Then the relation of these latter tests, between the two spikes, to the conditions obtaining in a full tie with rails spiked thereto was investigated.

In beginning the tests the principal elements which cause the resistance to vary were determined and investigated in the following order:

(1) Amount of moisture present. (2) Kind of wood. (3) Treatment. (4) Direction of grain. (5) Contact pressure. (6) Temperature. (7) Amount and time of current flowing. (8) Dimensions of specimen.

The results obtained tend to establish the following conclusions:

Timber is ordinarily classed with the non-conductors. When dry and well seasoned, it has a very high dielectric strength and practically infinite resistance. When green or moist, however, timber becomes a kind of electrolytic conductor of comparatively low resistance. The treatment with zinc preservatives has the simple effect of producing in the wood a stronger electrolyte and hence a better conductor of current.

(1) The resistance of timber varies directly with the length and inversely with the cross section.

(2) The resistance of timber varies almost inversely with the amount of moisture present, between the limits of 15 and 50 per cent.

(3) The resistance of timber is lowest when measured along the grain, and highest when measured tangentially to the growth rings.

(4) When treated with a soluble salt such as zinc chloride, the resistance varies approximately inversely as the amount of the salt present.

(5) Treatment with such a soluble salt does not change the behavior of the resistance with respect to the per cent. moisture present. Only the amount of the resistance is changed.

(6) The resistance of timber varies almost inversely with the temperature between the limits of zero and 30 degrees Centigrade.

(7) The resistance of non-porous woods, such as the pines, is higher than that of porous woods, such as the oaks and red gum.

(8) Treatment of timber by different creosote processes does not greatly change the natural resistance of the timber.

(9) Finally, all the data taken go to establish the view that the conductivity of wood is due primarily to the presence in the pores of an electrolyte formed by an aqueous solution of the salts found in the natural timber, or of these salts and others artificially introduced.

Assuming the worst condition for leakage covered by the test, i. e., red oak ties treated with zinc chloride laid in wet ballast and with wet rail bearings, the resistance between the rails of a block one mile in length would approximate 30 ohms. This would permit a leakage current of .05 ampere to flow with the battery voltage of 1.5 volts. The leakage loss would, therefore, be .075 watt, or about 30 per cent. of the power required to operate the relay. This should not seriously interfere with the operation of signals, as leakages up to 60 per cent. exist without such serious interference.

It is to be regretted that determinations of resistance were not made with wet ties or with ties and rails partially immersed in water, as is sometimes the case in practice, for it is believed that under such conditions the leakage current would probably be sufficiently large to interfere with the successful operation of relays.

As a final conclusion, it should be noted that since the above results show only a reduction in resistance of a tie of from 26 to 53 per cent. when treated with zinc chloride, depending upon the percentage of moisture, while a change of resistance by the ratio of 25 to 1 may be effected by varying the kind of wood, a change of 33 to 1 by varying the pressure upon the tie sufficiently, and of 3.7 to 1 by temperature changes, it follows that the treatment of ties with preservatives should not interfere with the operation of signal circuits, except possibly in exceptional cases in which the resistance of the leakage paths is abnormally low from other causes.

Discussion on Wood Preservation.

Mr. Courtenay: The committee requests that no consideration be given to conclusion (1), 'That the revised specification for creosote oil be adopted for publication in the manual," and that the association refer that conclusion back to the committee for future consideration. The committee would also desire to withdraw from the consideration of the association Appendix A.

The President: The committee is willing under conclusion (2) that the recommendation with reference to the selection of track for testing the life of ties be submitted to the board of direction for its action. The recommendation of the committee in conclusion No. 2 that the framing of timbers before treatment be added to the recommended practice of the association is open for discussion.

C. E. Smith (Mo. Pac.): It is not practicable in all cases to frame the timbers, including the boring of holes, before treatment. Take, for example, a cap on a pile. It would not be practicable to bore the hole in connection with the sway brace before it was put on. It would not be practicable to bore the holes for the chord bolt through the stringers. I think the committee should specify a treatment for such timber as must be worked in the field after the timbers have been treated.

Mr. Courtenay: The only thing that can be done is to mop

such surfaces with creosote oil, which is a very simple process.

Mr. McDonald: Where it is necessary to bore holes in timber after they have been treated, if the holes are vertical, they should be plugged, and filled with creosote, and the creosote allowed to soak in. Where it is necessary to frame small timbers which can be handled, it will be found the best treatment to immerse the frame end in hot creosote, permitting it to remain for about twenty minutes, taking it out, and immersing it in cold creosote, and permitting it to remain a similar length of time. That cannot be done where you saw off the end of piles, nor in the case of large timbers. Something better than mopping should be insisted upon, if it is possible to do so.

Mr. Courtenay: The Louisville and Nashville has been using creosoted timber in its trestle structures on a considerable scale since 1876. For that reason, our bridge supervisors have accumulated a great deal of experience with this material. We have adopted various expedients and endeavored so far as possible to frame creosoted material before it is creosoted, and have gone to the length of taking green timber, framing it, regularly erecting it in the structure, to insure a fit, and then taking it down to creosote it. After a long observation in the use of creosoted bridge timber, we find that with good hard yellow pine, it is almost impenetrable, that we can hardly get a penetration of the creosote of one quarter inch. We have creosoted timber in these structures which has been there since 1876, and is apparently very good today. We have tried mopping with hot creosote oil, and have endeavored to get information concerning it from our supervisors of bridges and buildings over about fifteen divisions. There is a difference of opinion as to whether it is effective. It is the best thing we have been able to devise at reasonable cost.

Mr. Smith: I do not think this association should express its approval of putting frame timbers in a structure and then taking them out and shipping them to some point for treatment, and I trust the committee will amplify this portion of the subject by giving some method of treatment in the field.

C. F. W. Felt, (Santa Fe): On the Galveston viaduct, we used a marine treatment. We have no trouble with decay on that bridge. We used the 24 pound per cubic foot treatment. It is our rule to mop the timbers with hot creosote, and also with asphalt on the ordinary ballast deck construction.

Mr. Courtenay: In 1882, a pier was constructed at Pensacola, Fla. Alongside of that pier, at every opening, there were a number of mooring piles standing high above the pier. The tops of the piles were exposed to the sun. They were necessarily cut off to the proper height above the top of the pier. The tops of the piles were mopped with creosote oil and in addition had a thick covering of hot pitch with some lime mixed with it. In 1887, the heart wood in the tops of a number of these mooring piles was so rotten that a man could pick out a conical shape plug with his fingers. Other piles lasted much better. Nearly all of them are exposed to the rays of the sun. When a pile is creosoted, and driven, and you cut off the top of the pile to get proper bearing for the cap, the top of the pile under these conditions does not rot. We had creosoted timber, heart pine, put in trestle structure between Mobile and New Orleans and covered with two feet of sand, put there in 1886, and the timber is good today, and as far as I know, they are the first ballast deck trusses of creosoted wood put in such a manner as to be protected from the action of the sun and to avoid the exposure of the creosoted portion. Our experience is that pick holes in the sides of the piles will not hurt them much, but if a man scrapes along the sides of the piles, in order to make the bracing fit better, he is ruining his material.

W. F. Goltra: The demand for a speedier and more efficient method of kiln drying or seasoning ties is well known to those who have given that subject any attention. The seasoning of ties in the open air is slow and unsatisfactory. They can be artificially dried at much less expense and very much quicker than they can by open air seasoning. Ties or timber have to be dry, before they can be treated, and it has been the custom of railways and some manufacturers who use wood for implements for furniture, etc., to stack the material in the open air. The ties can be dried artificially at an expense of only 1¼ cents each for fuel. That is less than the interest on the capital which is held up by ties stacked in the open air for seasoning, and is much less than the deterioration of the ties which takes place while they are seasoning. Should not this committee be instructed to investigate the kiln drying of ties or timber versus the open air seasoning?

BUILDINGS.

The following sub-committees were appointed:

Roof Coverings: Maurice Coburn, chairman, H. M. Cryder, C. H. Fake, P. F. Gentine, H. Rettinghouse, C. W. Richey.

Tool Houses: William T. Dorrance, chairman, George W. Andrews, J. P. Canty, D. R. Collin, M. A. Long.

Reinforced Concrete Coaling Stations: E. N. Layfield, chairman, John S. Metcalf, O. P. Chamberlain.

REVISION OF MANUAL.

The committee recommends no further revision.

REINFORCED CONCRETE COALING STATIONS.

A number of reinforced concrete coaling stations have been built since the report of last year, notably one by the Philadelphia & Reading at Philadelphia, with a capacity for handling 700 tons of coal per day of 10 hours and with a storage capacity of 2,000 tons.

The committee has no further report to make, but desires to have the subject referred back to it for the purpose of noting and reporting on the operation of the stations already built and the progress in designing new ones.

TOOL HOUSES.

The committee reports progress on the subject of tool houses.

BITUMINOUS ROOFING MATERIALS.

Information concerning the relative value of the bituminous materials for roofing is not easily available. The detailed knowledge held by the leading concerns preparing the materials has been acquired by expensive experience and is regarded as a valuable asset not to be shared by possible competitors and the ignorant purchaser.



O. P. Chamberlain.
Chairman, Committee on Buildings.

The bitumens are compounds of many different hydrocarbons with different chemical formulæ and widely-varying melting points. They are always accompanied by greater or less amounts of impurities, and are obtained either naturally or as the heavier distillates or residues of coal, petroleum or other organic substances. Their distinguishing characteristics are their elasticity and binding power or adhesiveness, their considerable immunity from action by water and their solubility in oils and certain other organic compounds.

Asphalt.—The term asphalt is ordinarily considered as referring to bitumens found naturally in the solid state and will be so used in this discussion.

The asphalts are generally stable in the atmosphere. As found naturally, they are not commercially available, even after the impurities are removed, being too hard and brittle for most purposes. This is ordinarily remedied by softening or fluxing with various oils, an operation requiring skill. The character of the fluxes has a most important effect upon the finished product. Petroleum products are ordinarily depended on for this purpose. The fluxes should be sufficiently stable to insure against too rapid hardening of the fluxed asphalt. They should be free from deleterious constituents and should be of such a character that they will combine with the asphalt to be fluxed so as to make a homogeneous and per-

fect solution. Certain fluxes which work well with certain asphalts are not at all suitable for use with other asphalts. Poor results are sometimes supposed to be due either to chemical action in the fluxes or to chemical action between the fluxes and the asphalts. Tars are sometimes employed for fluxing purposes, but they do not mix easily with the asphalt. As asphaltic compounds age they tend to become brittle and hard, losing their elasticity and binding power. Poor fluxes hasten this process.

TARS.

Coal Tar.—From the distillation of bituminous coal, either in a plant for the production of illuminating gas or in a by-product coke oven the products may be roughly divided into four classes, the gas, the ammoniacal liquor which is the scrubbing water with the materials which it has absorbed from the distillates and which it holds in solution, the coal-tar, a heavy liquid containing the distillates insoluble in water which have settled away from the ammoniacal liquor and the coke.

The coal-tar contains some water, various impurities, and free carbon which after the water has been removed, is ordinarily from five to thirty-five per cent of the total. This is carbon formed by the cracking of the hydrocarbons and is in a very finely divided condition. The percentage varies with the method of manufacture. The distillates or bitumen are composed of hydrocarbons which have widely-varying melting points, and degrees of volatility. These may be roughly classified into light oils, creosotes and pitches. The character of the tar varies with the coal used and the manner in which the process is carried on. The greater the heat, the more the hydrocarbons are cracked into their constituents and the greater the amount of free carbon and of gas found and the less the amount of coal-tar. The question of the relation between the free carbon and coal-tar is one of considerable importance. It is generally considered to be a valuable adjunct to roofing tars and pitches. Free carbon makes the material less affected by changes in temperature. Comparing two pitches of similar consistency at normal temperatures the one having the greater amount of free carbon must have to neutralize it a greater per cent of the lighter, more elastic and to some extent more volatile hydrocarbons and less of the heavy ditches. When it is cold the pitch is less brittle and when it is hot does not flow so readily because of the carbon present. Thus a tar of a given consistency may notwithstanding the fact that it contains large quantities of an inert material apparently have more life than another with less of the free carbon.

When coal-tar pitch is exposed to the weather there is found upon its surface a thin layer, hard and brittle, the residue after the drying out of the volatile oils. This acts as a sort of protective coating to what is underneath. As soon as it is disturbed, exposing fresh pitch, the process is repeated. High carbon tars seem to weather better than low carbon tars, the increased amounts of free carbon seeming to aid in the foundation of the skin or protective coating.

Watergas Tar.—Watergas is made by passing steam over hot coke or anthracite coal, which decomposing the steam, forms carbon monoxide and hydrogen. This does not possess sufficient illuminating power, and to enrich it, there is added a gas produced from petroleum which leaves a tar often used in place of coal-tar. In the process which it undergoes the oil residues are so changed by the high heat as to lose many of their characteristics and to acquire some of those of the compounds found in coal-tar. Compared with coal-tar, its oils have less antiseptic properties. As obtained from the gas manufacturers it is thinner, containing more water, more light oils and less of the pitches and no free carbon. It is distilled down and treated much as is coal-tar and its pitch is very similar in appearance to that of coal tar.

Watergas tar decomposes easier than coal-tar. It often contains some paraffine though ordinarily not in sufficient quantities to affect the product. The crude watergas tar is also much more affected by water and is capable to a considerable extent of forming an emulsion with it. Good coal-tar is practically unaffected by water, and it deteriorates from the surface only. Oil tar products like the oil fluxes used with asphalts are liable to undergo chemical changes which may tend to make the entire mass hard and brittle.

Not long since practically the only use of tar was for roofing and the entire supply came from the manufacture of illuminating gas from coal. The situation has been changed by the increasing supply from by-product ovens, by the manufacture of watergas in large quantities, by the great demand for creosote oils and other by-products, by the use of coal-tar for waterproofing masonry, by its use for briquetting coal slack and by its adoption for use as a road binder as a protection against the ravages of the automobile.

With skill in compounding, based on a thorough working knowledge of the materials used, asphaltic compounds can be prepared of natural asphalts and oil residuals with valuable qualities for many different roofing needs, whose durability under known conditions can be foretold with considerable accuracy. The same can be said, perhaps with more certainty as to results, of the different tars. Either can suffer from adulteration and poor preparation. Considering first-class materials the coal-tar is cheaper, more easily affected by temperature changes, and is not acted upon by water nor is it liable to internal chemical changes.

FELTS.

The felts used with almost all bituminous roofings play a very essential part in the final product.

The desirable qualities of the felt vary with the saturating material to be used. With asphalt, saturating power is the main desideratum. For coal-tar which under heat is much more liquid, this quality is not so necessary. All must be strong enough to avoid damage in handling before saturation. The strength of the finished product is due to a great extent to the saturation.

The felts are mainly made of rag stock which is chiefly cotton rags. The best felts for saturation by asphalt rarely contain more than 25 or 35 per cent of wool, and those for use with coal-tar contain much less. As ordinarily used the term wool-felt applies to a soft felt with very little wool in it.

The methods of manufacture have a considerable effect on the quality of the material. The felt must be well beaten to avoid large lumps, which are sources of weakness. The felt is made on a machine similar to that used for making ordinary paper and variations in its operation determine the quality of the finished products.

The dry felts are sold by weight. The standard is the amount which would lay 480 sq. ft If a felt weighs 28 lbs. to 480 sq. ft., it is known as No. 28. For this reason felts sometimes have their weight increased by the addition of a mineral filler. This is nothing more than an adulterant which intereferes with the saturating power.

Felts of asbestos are not used in one or two roofings. These are poor saturants and are more in the nature of protection to the asphalts. They will not burn or decay.

BUILT-UP ROOFS.

The main use of tar for roofing has been in the construction of built-up roofs where layers of felt saturated with tar are nailed down and by the use of a tar pitch protected and cemented together.

The following specification accompanied by the necessary diagrams give what is considered as good practice in the construction of a flat built-up roofing on wooden sheathing.

Specification for Felt, Pitch and Gravel or Slag Roofing Over Boards.

Incline.—This specification should not be used where roof incline exceeds three (3) in. to one foot. For steeper inclines modified specifications are required.

Specification.

Roofing.—First, lay one (1) thickness of sheathing paper, or unsaturated felt, weighing not less than five (5) lbs. per hundred (100) sq. ft., lapping the sheets at least one (1) in.

Second, lay two (2) plies of tarred felt, weighing fourteen (14) to sixteen (16) lbs. per hundred (100) sq. ft., lapping each seventeen (17) in. over the preceding one, and nail as often as is necessary to hold in place until remaining felt is laid.

Third, coat the entire surface uniformly with straight run coal-tar pitch.

Fourth, lay three (3) plies of tarred felt, lapping each sheet twenty-two (22) in. over the preceding one, mopping with pitch the full twenty-two (22) in. on each sheet, so that in no place shall felt touch felt. 2 Such nailing as is necessary shall be done so that all nails will be covered by not less than two (2) Plies of Felt.

Fifth, spread over the entire surface a uniform coating of pitch, into which, while hot, imbed not less than four hundred (400) lbs of gravel, or three hundred (300) lbs. of slag, to each one hundred (100) sq. ft. The gravel, or slag, shall be from one-quarter (¼) to five-eighths (⅝) in. in size, dry, and free from dirt.

Flashing.—Flashings shall be constructed as shown in detailed drawings.

Labels.—All felt and pitch shall bear the manufacturer's label.

Inspection.—The roof may be inspected before the gravel or slag is applied by cutting a slit not less than three (3) ft. long at right angles to the way the felt is laid.

N. B.—To comply with the above specifications, the ma-

terial necessary for each one hundred (100) sq. ft. of roof are approximately as follows: 100 sq. ft. sheathing paper, 80 to 90 lbs. tarred felt, 120 to 160 lbs. straight run coal-tar pitch, 400 lbs. gravel, or 300 lbs. slag.

In estimating felt, the average weight is practically fifteen (15) lbs., per one hundred (100) sq. ft., and about ten per cent (10 per cent) extra is required for laps.

In estimating pitch, the weather conditions and expertness of the workmen will affect the amount necessary for the moppings, and to properly bed gravel or slag.

In the final coating of a coal tar roof the effort is to get the maximum amount of pitch coating which can be kept in place. The flatter the roof the greater the amount of pitch that can be used and the better both pitch and gravel will stay where put. The best results are obtained when the slope of the roof is only enough to allow it to thoroughly drain. When it gets above two inches to the foot many object to its use, but the above specifications are considered by others as good practice up to three inches to the foot.

Where thorough inspection is not provided during construction the roof can be inspected by cutting a strip three feet long at right angles with the way the felt is laid before the gravel is applied. This can be readily repaired so that no damage is done to the roof.

As an indication of what can be done in territory adjacent to Chicago and St. Louis the following figures may be of interest. They show actual costs on a roof of about five hundred squares laid according to the specifications given above. The work was seventy-five miles from the gravel supply and one hundred and seventy-five miles from the headquarters of the contractor, who paid all freight and fare. This work was done close to a railroad track, so that nothing was necessary for hauling to the work. Nothing is included for overhead or fixed charges or for profit.

Cost per square:	
5 lbs. sheathing paper	$0.12
155 lbs. pitch at 60c per cwt.	.93
85 lbs. felt to square at $1.40 per cwt.	1.19
Nails and caps	.05
Cleats for flashing	.05
Gravel (about one-seventh of a yard	.23
Labor, including hauling, board and railroad fare	1.15
	$3.72

Plastic Roofing.—This is a sort of built-up roof used especially on steep slopes, where in place of using ordinary roofing pitch we have a compound of some fine inert substance with tar or some other bituminous material which is plastic when warm and which can be applied with a trowel. It is not extensively used and its application is mainly confined to the eastern part of the country. Except for steep slopes it has little value, as it lacks elasticity and because it requires considerable skill to get the proper proportions.

Built-Up Asphalt Roofing.—Built-up asphalt roofs have been used with considerable success. Asphalt is much less affected by temperature changes. For a roofing cement it must have considerable proportions of flux to make it easy of application. Coal-tar felts are often used with asphalt roofing cements. With asphalts, the dry sheet can ordinarily be avoided. Where first-class material is used it is ordinarily expensive and it is harder to handle. Except for steeper slopes than are suitable for coal-tar, its use is not recommended unless unusual conditions make it more economical.

Built-Up Asbestos Roofing.—There is on the market materials for a built-up asbestos and asphalt roof. The asbestos, besides its well-known fire-resisting value, has the advantage that, being mineral, it will not decay. It is not as absorbant as felt and acts more as a protection to the bitumens than as a saturant. This roofing is ordinarily applied only by the manufacturers. The fire-resisting value of the asbestos is perhaps overrated and the wearing qualities of the top layer are quetioned.

PREPARED OR READY ROOFINGS.

To compete with it and to meet some of the conditions where a built-up roof is not satisfactory or too expensive, innumerable prepared or ready roofings have been put on the market. These ordinarily come in rolls accompanied by the nails and cement necessary to apply them. They vary from a very light felt with the cheapest possible saturant and enough sand or soapstone coating to prevent sticking in the rolls, to a sheet so heavy that it cannot be rolled, built up of heavy felts and strengthening materials and saturated and protected by carefully prepartd compounds, possibly protected also by a coating of crushed stone.

The saturant should be liquid enough at workable temperatures to thoroughly impregnate the felt. The protective coating should be stable and not easily affected by the elements. The saturation of the felt is a very vital feature. This must retain its life and elasticity to keep the roofing efficient. A protective coating of material similar to the saturation is often used with the idea of helping to maintain the life of the saturating material.

The prepared roofings may be divided into two general classes—smooth and stone-surfaced. The stone-surfaced roofings are to a certain extent an adaptation of the built-uproofings. They frequently have at least two felts cemented together. The gravel or slag used must be uniform in size and finer than that available for built-up roof. The steeper the roof the more chance they have to lose their stone coating. The amount of material that can be used in the heavier brands is limited to the amount that can be successfully rolled. If the stone be too large, it may damage the felt in rolling; if too small, the amount of pitch is limited.

Tarred felts in which there are two or three plies of felts cemented together with pitch are sold ready to be laid. They must be covered with a tar coating upon laying and at frequent intervals to show any value at all.

The asbestos roofings are made to include one or more plies of asbestos felt, with possibly a jute center. They are cemented together by asphaltic cements. In the heavier brands they are expensive. The asbestos felts are poor saturants. These roofings have given promise of good results and are widely used. The asbestos will not burn, but the amount used is so small that its insulating value is not great, and the value of these roofings from the standpoint of fire protection is probably frequently over-estimated.

Burlap or jute canvas is used in ready roofings as a strengthening material. It is not a good saturant and must be kept thoroughly coated, as otherwise it goes to pieces readily. It is employed in conjunction with either felts or asbestos sheets. We question its value, feeling that better results can be obtained from a proper quantity of ordinary felt.

The use of tin caps under the head of nails to secure prepared roofing should be avoided. When used, they must be kept constantly coated to prevent the rapid disintegration of the steel plates of which they are composed. If this occurs the nail head stands clear of the roofing, which is then an easy prey to wind storms. Care should be taken in the flashing and around the edges of the roof to have it thoroughly fastened down. Nails of a No. 12 gage wire with a cap made of cold-rolled hoop steel welded on in the factory are used for this purpose. Some recommend nailing every two inches, but with large-headed nails every three inches is usually considered enough.

One of the chances for trouble with many of the ready roofings is their tendency to stretch and wrinkle and the difficulty in laying them absolutely tight and flat. As the roofing grows older and brittle the wrinkles become danger spots which are liable to crack if walked on. The roofing should be as thoroughly stretched as possible in laying. Knot holes should be covered before applying the roofing. In cold weather it is well to warm the rolls to avoid any chance of cracking.

The ready roofings usually commence to show deterioration after they have been kept in stock for three of four months. In purchasing care should be taken to avoid old material.

The ready roofings are of value for small and isolated buildings where the cost of laying a built-up roof would be excessive and for temporary structures where a roof of long life is not necessary. They can be laid without the expert help required for a built-up roof and most brands can be used on any slopes, although on flat slopes extra precautions must be taken to prevent leaking. They can be obtained at almost any desired price, but ordinarily cheaper than a good built-up coal-tar roof.

Most of the ready roofings are sold under a five or ten years' guarantee, and many contracts for built-up roofs are similarly prepared. To depend upon these guarantees alone does not give satisfactory results even though the manufacturer be financially responsible. He can expect more immediate profit by preparing a roof which he is sure will last six or seven years and selling it under a ten years' guarantee than by preparing a roof which he is sure will last for ten years. At best the life will be uncertain and with good luck a roof built for six or seven years or even less might last twice as long. If it should need extensive repairs before the guarantee runs out there is considerable chance that the manufacturer will not be called on to make the repairs, and if he is, the loss is not great. Guarantees are liable to be so worded as to afford various loopholes for avoiding expense and they should, if relied on, be carefully scrutinized. A good roofing should last much longer than any possible guarantee can provide for. If the guarantee is made good, there still may be nothing left at its expiration.

WOOD SHINGLES.

A wood shingle roof properly laid and of good material will last for many years. Good shingles can still be obtained from the Pacific Coast for a reasonable price, though not equal to the white pine formerly obtainable. The nails ordinarily corrode before good shingles have deteriorated noticeably, allowing the shingles to become loosened and displaced. If the shingles are dipped in linseed oil or creosote their life will be considerably increased. Painting after laying with a linseed oil paint induces decay and should be avoided. The main objection to shingles is their fire hazard. When the roof is old and a little out of shape, it is especially dangerous, providing a chance for the lodging of sparks. It must have a pitch of not less than six inches to the foot.

To avoid the chance of one joint coming over another, they should always be laid with at least three laps. With a 16-inch shingle not more than 4¾ inches should be exposed. There should be two and only two nails in each shingle.

SLATE.

Slate comes with considerably varying qualities. It should be hard and tough and have a well-defined vein which must not be too coarse. If too soft it will absorb moisture. If too brittle, it cannot be cut and punched without splitting, and it will easily be damaged by walking on the roof. Crystals are sometimes found which disintegrate on exposure to the weather. Acid gases in the air and freezing of absorbed water tend to cause a disintegration of the slate. A clear metallic ring when struck is an indication of soundness. A cracked or soft slate gives a muffled sound.

Slate should should not be laid on a roof having less than a one-quarter pitch, and a one-third pitch is better. When it is flatter than this it is liable to leak from capillary attraction. Finely powdered snow, driven under the slate by high winds and, later on, melting and freezing, is liable to cause damage to a slate roof. To be sure of the best results it should be laid on a good waterproof felt. In nailing slate each piece should be secured by two nails. Where exposed to gases the nails should be as far as possible non-corrosive, as they frequently determine the life of the roof.

In laying, care should be taken to avoid cracking the slate by driving nails carelessly or too tight.

TILE.

Clay roofing tile, unglazed without being hard burnt, is more or less porous and moisture is liable to cause damage in freezing weather. If glazed, the glaze, if improperly made, is liable to decompose on exposure to the elements. Properly made, good roofing tile cannot be excelled for durability. With tile, it is a little harder to get a tight roof than with slate. Interlocking shapes have been devised, giving very good results in this respect, although there is liable to be danger from driving rain or snow. Sometimes the tile is bedded in a plastic cement, but ordinarily, to be sure of the best results, it is laid on a good waterproof felt. When laid on a close wood sheathing it is held in place by battens nailed horizontally on top of the sheathing and is fastened down by wire. Copper wire, not less than No. 12 gage, could be used for this purpose. Steel wire or bands are liable to corrode.

Tiles should not be used on a roof having a pitch of less than six inches to the foot.

IRON OR STEEL ROOFINGS.

The further the material varies from pure iron the more liable it is to corrosion, and a great deal of the trouble in such roofing is due to the poor steel used, which will not last more than a few years, no matter how protected.

During the past few years a very pure iron, made by new processes has been put on the market. Laboratory tests would indicate that excellent results may be expected from this material. It is cheaper than charcoal iron, but more expensive than steel. We believe that its extensive use is justified but that it has not yet been tried in actual service long enough to warrant any positive recommendations.

Corrugated Iron or Steel.—Owing to the difficulty in getting good iron for this purpose this roofing is ordinarily avoided for railroad work. Galvanized, it does not give good results. If pure iron can be obtained, this material may be valuable for use in roofing certain buildings, such as some types of shop buildings and open umbrella shelter sheds.

Asbestos protected metal, lately introduced, is corrugated steel which is used with a bituminous coating covered with asbestos as a protection to the steel plate. This has not been in use long enough for any definite opinion to be given in regard to it.

Metal Shingles.—Metal shingles are used to some extent by different railroads. Of good material and properly protected, they have their uses.

Tin Plate.—Tin plate has a body of iron or steel. The coating is in most cases an alloy of lead and tin, with lead usually predominating. When tin is specified, the coating should consist of not less than 30 per cent. pure tin, nor more than 70 per cent. pure lead. Not less than 20 pounds of the coating should be used per box of 112 sheets 14 inches by 20 inches.

Where the coating is all of lead, it is called terne plate, and is used when cheapness is an object.

Good tin plate for roofing can still be had, and where it is desired to use this material for roof covering, one of the reliable brands of hand-dipped plate, not less than IX or No. 28 gage, should be selected. Rolled tin plate should not be used for roofing, guttering or valleys.

One method employed in the preparation of steel for roofing purposes is to pickle the steel in acid baths to cleanse the sheets of scale and dirt. Unless this process is most carefully followed by thorough cleansing, minute particles of acid remain to form within the plate itself an agent for its final destruction.

Tin roofing must be painted, and with a good paint, to preserve it. Tin roofings can be shown which have lasted twenty or thirty years on railroad structures, but the danger of securing poor material and the cost of maintenance have made conservative builders very cautious in its use. It has the great advantage of being available for all slopes and it is adaptable to special and difficult conditions.

Plates for tin roofing should be prepared in the shop, and one side for use next to the sheathing given a coat of good paint. In soldering these sheets rosin and not acid should be used, as the latter may find an opening in the tin coat and attack and destroy the body.

MISCELLANEOUS METALS.

Sheet Lead.—Sheet lead has been used abroad considerably. Its main value is due to its immunity from action by acid gases, but it is expensive. It has a tendency to cold flow from its own weight and it expands rapidly under heat.

Copper.—Good copper is not easily corroded, but it has a high rate of expansion and is expensive. It is not always possible to secure it of good quality, and impure it corrodes much more rapidly than it should. It is only desirable for railroad buildings in rare cases.

Copper and Nickel Alloy.—For expensive building an alloy of copper and nickel is sometimes used which is said to be practically non-corrosive. It works much like sheet copper, but is harder.

CONCRETE ROOFINGS.

Reinforced concrete tile, several square feet in area, have been used to a considerable extent on large sheds and factory buildings where the slight leakage from their somewhat open joints is not objectionable. They are usually placed directly on the purlins and kept in place by wire to the framework. They must be carefully made from good materials and made as dense as possible. Improved methods of forming under pressure may improve their quality. Their use as yet is largely experimental.

Small cement tile are in use to a limited extent and the criticism given concerning the reinforced tile also applies to them. They are less expensive than clay tile but are more absorbent and brittle. Improved methods of manufacture and further tests may later develop their merits for some purposes, but no economy has so far been shown by their use.

Asbestos shingles and corrugated sheets made of Portland cement and asbestos under pressure give promise of good results. They can be made in different colors and have some desirable advantages. They have not been in use long enough to prove their merit.

METHODS OF APPLICATION.

Sheathing.—Wooden sheating improperly laid, has caused the value of many good roofings to be underestimated. Green lumber should never be used for this purpose, as it will shrink in drying, with a resultant distortion of the covering material. With a prepared roofing the felt will be given a wavelike appearance and the seams or joints forced open. With a slate roof the slate will be liable to be broken or loosened. Tin or copper coverings may be subjected to open seams and on a tile roof the shoulders in an interlocking type will be broken off. Sheathing boards should be surfaced to a uniform thickness, and ordinarily a plain board will be satisfactory. The sheathing should be thick enough to prevent the roofing nail from going through it. On some types of buildings the building should be stiffened by running the sheathing diagonally to the rafters and purlins. The nailing should be reduced to a minimum.

Gutters.—The use of gutters on railway shops and on buildings close to the track should be discontinued where it can

be done without causing inconvenience. The cost of cleaning and maintenance are considerable because the sparks and shop dust that accumulate at such points contain injurious acids. The roof drainage can frequently be taken care of by a cement gutter on the ground to carry it to sewers or drains.

For railway purposes copper gutters are ordinarily the most economical when metal is used. Hand-dipped tin plate of the quality prescribed for roofing is better than galvanized iron.

For buildings covered with a prepared or built-up roofing the gutters can, if prepared with the proper care, give good results if formed in the roof and of the same material as the roofing.

Hanging gutters are frequently made of considerable length and must be strongly built, as otherwise they are liable to deflect from a uniform grade. They should be placed below the plane of the roof to avoid damage by sliding snow.

Flashing.—Saturated felt, properly coated with good asphalt or pitch preparations, will ordinarily give better results than metallic flashings for buildings subjected to gases and fumes. The metallic flashings are ordinarily suitable on a building not exposed to gases. The importance of the thorough construction of flashings and work around openings cannot be overestimated and the subject deserves a thorough discussion.

FIRE PROTECTION.

What should be one of the most important considerations in the selection of roofing is its fire-resisting qualities, especially if the building be where it can be exposed to fire from adjacent structures A roofing should, as far as possible, protect the structure from danger due to surrounding fires.

In congested districts a flat roof will have better fire-resisting value than a steeper one, as it is not so easily attacked by the flames and radiant heat, though it would afford a better resting place for flying brands. In large fires trouble frequently results with some types from the roofing being loosened about the edges, allowing it to curl up and the flames to get at the material underneath. Care should be taken to prevent this.

CONCLUSIONS.

The annoyance and indirect expense occasioned by leaky and short-lived roofs are rarely compensated for by any possible saving in first cost.

In selecting a roofing there should be considered:

(1) Chance of leaks due to character of construction.
(2) Probable life, including chance of damage by the elements and by wear from other causes.
(3) Fire-resisting value.
(4) Cost of maintenance.
(5) Cost of materials.
(6) Cost of laying.

The ordinary practice of depending merely upon guarantees in selecting roofings cannot be trusted to secure proper results.

Where proper materials and the requisite skill in application are available, built-up roofs of coal-tar felt, coal-tar pitch and gravel or slag are recommended for roofs with a pitch of two inches or less to the foot.

Where the roof is to be subjected to wear and where the character of the construction warrants the expense, flat tiles or brick should be used as a protective coating to the roofing instead of gravel or slag.

As a general proposition railroad buildings should be designed to accommodate this type to allow it to be used, and because of economy in construction and of decreased fire hazard. A pitch of from one-half to one inch to the foot is better than anything steeper. Nothing but straight-run pitch should be used.

No contracts should be made for a built-up roof without a complete and positive specification including flashings, and the contract prices should not be less than those of the materials specified, plus a reasonable amount to cover the cost of laying and profit. Thorough inspection of workmanship and material is recommended.

For slopes of from two to six inches to the foot fair results can be expected if the top coating of pitch be especially prepared. This can be successfully done only by skilled workmen, who are also necessary for its application. Especial care must also be taken in the selection and application of the stone or slag coating.

Asphaltic compounds have value for a built-up roof for the top coating on slopes of from two to six inches to the foot. They may also be desirable at points where good coal-tar cannot be obtained, except at a cost appreciably greater. They should not be used except where they can be obtained from reputable dealers with complete information as to their constituents and where they can be applied by men skilled in their use.

Ready or prepared roofings are recommended for use on small, temporary and other buildings, where the cost, considering maintenance, of more expensive buildings, is not justified. They are of value for steep slopes where a built-up coal-tar roof cannot be used, and for locations where the skilled labor necessary for a built-up roof is not available. The steeper the slope the greater their relative value and the wider their economical field. The heaviest varieties are, in general, the more desirable because of their chance for longer life and their greater fire-resisting value. In making selections the reliability of the manufacturer, service tests and the cost should be governing factors.

In the laying of built-up and prepared roofings thoroughness in the preparation of flashings and work around openings is of vital importance.

Slate and tile of suitable quality, properly protected and fastened, can be recommended on roofs with a pitch of six inches to the foot or over, where expense is not the governing feature, and where they aid in producing the desired architectural effect, except that where there is much chance of driving snow, eight inches to the foot should be the flattest slope allowed.

Wood shingles, except in isolated locations where there is small danger from sparks, should not be used.

Steel or impure iron materials should be avoided, no matter how protected.

The report is signed by O. P. Chamberlain, (C. & I. W.), chairman; Maurice Coburn, (Vandalia), vice-chairman; George W. Andrews, (B. & O), J. P. Canty, (B. &. M.), D. R. Collin, (N. Y. C.), H. M. Cryder, Wm. T. Dorrance, (N. Y. C.), C. H. Fake, (M. R. & B. T.),P. F. Gentine, (M. P.), E. N. Layfield, (B. & O. C. T.), M. A. Long, (B. & O.), John S. Metcalf, Civil Engineer, H. Rettinghouse, (C. & N-W.), C. W. Richey, (P. R. R.).

Discussion on Buildings.

Mr. Lindsay: The committee has recommended the built-up roof of coal tar for pitch of two inches or less to the foot, and has permitted the use of asphalt only for on outer covering, in pitches of more than two inches. Is this association prepared to limit itself to the use of coal tar exclusively for roofing?

Mr. Coburn: We say that asphaltum compounds are valuable on the steep slopes. "They may also be desirable at points where good coal tar cannot be obtained except at a cost appreciably greater." We don't say they are not good on flat slopes. We do say coal tar is better under ordinary conditions.

A motion to adopt the recommendations was carried.

ROADWAY.

Subjects assigned were as follows:

(1) Consider revision of the Manual.
(2) Collect all known formulae for determination of size of waterways and tabulate them in such manner that they may be intelligently compared. Also consider whether, by the introduction of factors suiting local conditions, a general formula for waterways could not be used in all cases.
(3) Unit pressures allowable on the roadbed of different materials.
(4) Tunnel construction and ventilation.
(5) Investigate and report on the question of agricultural drainage in levee and marsh districts as they affect railways: (a) Laws and assessments. (b) Methods of construction of drainage channels through railways.
(6) Make concise recommendations for next year's work.

Sub-committees were appointed as follows:

(1) Revision of Manual: S. B. Fisher, chairman; Duncan MacPherson, J. R. W. Ambrose, H. J. Slifer.
(2) Formula for Waterways: W. D. Pence, chairman; John C. Beye, J. A. Spielmann.
(3) Unit Pressures on Roadbed: W. M. Dawley, chairman; Moses Burpee, J. G. Sullivan, Walt Dennis.
(4) Tunnel Construction and Ventilation: J. E. Willoughby, chairman; D. J. Brumley, C. Dougherty, W. P. Wiltsee.
(5) Drainage Districts: W. C. Curd, chairman; R. C. Young, Paul Didier, J. C. Sesser.
(6) Recommendations for 1911: The entire roadway committee.

REVISION OF THE MANUAL.

The sub-committee has several changes to suggest for the Manual, more especially in the matter of revising definitions, and expects to make its recommendations in the future.

FORMULAE FOR WATERWAYS.

The sub-committee has made a very thorough investigation of all known formulae and reports as follows:

SIZE OF WATERWAYS.

Acting under substantially the same instructions during the previous year, the sub-committee charged with this matter compiled a large amount of valuable material much of it then freshly gathered from the members of the association, relating to current practice in connection with fixing the size of waterways. As a result of the studies made up to that time the roadway committee submitted to the annual convention in March, 1909, the following preliminary or tentative conclusions which were adopted by the association:

"(1) In determining the size of a given waterway, careful consideration should be given to local conditions, including flood height and flow, size and behavior of other openings in the vicinity carrying the same stream, characteristics of the channel and of the watershed area, climatic conditions, extent and character of traffic on the given line of road and probable consequences of interruptions to same, and any other elements likely to affect the safety or economy of the culvert or opening.

"(2) (a) The practice of using a formula to assist in fixing the proper size of the waterway in a given case is warranted to the extent that the formula and the values of the terms substituted are known to fit local conditions.

"(b) Waterway formulae are also useful as a guide in fixing



G. H. Bremner.

Chairman, Committee on Roadway.

or verifying culvert areas where only a general information as to the local conditions it at hand.

"(c) The use of such formulae should not displace careful field observation and the exercise of intelligent judgment on the part of the engineer.

"(d) No single waterway formula can be recommended as fitting all conditions of practice."

The concluding paragraph (d) of the foregoing conclusions represented the practically unanimous opinion of the members of the roadway committee, but it seemed desirable in view of the widespread interest displayed in the inquiry that the matter should be the subject of some further study. To this end it was suggested to the board that the topic should again be assigned, and this was done.

The studies during the past year have taken the form of an extended library search made for the purpose of bringing together "all known formulae for determining the size of waterways" as nearly as practicable in conformity with the board's instructions. After some discussion, approval was given to the plan of undertaking these further compilations through the medium of a thesis investigation under the direction of Prof. W. D. Pence, chairman of the sub-committee having the investigation in charge. The results of their investigations, in somewhat condensed form, are submitted as Appendix A to the present report. The inquiry began with a general survey of the literature of the subject, and this was supplemented among other features by a critical examination into the merits of the so-called "Dun Waterway Data" as a means of approach to the derivation of the general waterway formula contemplated in the board's instructions.

Although the matter thus brought together is lacking in completeness in certain of its aspects, the results were deemed worthy of preservation in permanent form as a progress report upon the subject, especially in view of the increasing interest displayed in this matter by engineers engaged both in the dimensioning of proposed new structures for carrying water through the roadbed and in defending their older structures under the fire of court attack.

The committee, after careful consideration of the results of its further investigations, although not prepared to modify the conclusions heretofore submitted to the Association that "no single waterway formula can be recommended as fitting all conditions of practice," nevertheless feels warranted in calling particular attention to certain relationships which give much promise in the direction of such general formula. The relationships referred to are best illustrated by introducing a graphical chart of the waterway data gathered by the late

Areas Drained in Square Miles.	AREAS OF WATERWAY.							Areas Drained in Square Miles.	AREAS OF WATERWAY.						
	Missouri and Kansas.	Cast Pipe. Banks over 15 ft. Use 80 per Cent.	Box and Arch Culverts. 1st Fig.—Diam. 2d Fig.—Bench	PERCENTAGE OF COLUMN 2.					Missouri and Kansas.	PERCENTAGE OF COLUMN 2.					
				Illinois.	Indian Territory.	Texas.	New Mexico.			Illinois.	Indian Territory.	Texas.	New Mexico.
1	2	3	4	5	6	7	8	1	2	5	6	7	8
.01	2.0	1-24 in.	2 x 1 B					24	1,060			110	94
.02	4.0	1-24 "	2 x 2 "					26	1,105			110	92
.03	6.0	1-30 "	2 x 3 "					28	1,140			110	92
.04	7.5	1-36 "	2½x3 "					30	1,180			110	92
.05	9.0	1-42 "	3 x3 "					32	1,220			110	92
.06	10.5	1-42 "	3½x3 "					34	1,255			110	92
.07	12.0	1-48 "	3 x4 "					36	1,290			110	91
.08	13.5	2-36 "	2½x3 " D					38	1,320			110	91
.09	15	2-36 "	2½x3 "					40	1,350			110	91
.10	16	2-36 "	3 x3 "					45	1,435			110	91
.15	25	2-48 "	3 x4 "					50	1,510			110	89½
.20	32	3-42 "	6 x4 A					55	1,580			115	89½
.25	38	3-48 "	6 x5					60	1,650			115	89½
.30	44	.....	6 x5½ "					65	1,720			115	88
.35	51	.....	8 x4½ "					70	1,780			115	88
.40	56	.....	8 x5 "					75	1,840			115	88
.45	62	.....	8 x6 "					80	1,900			115	86½
.50	66	.....	8 x6 "					85	1,960			115	86½
.55	70	.....	8 x6½ "					90	2,015			115	86½
.60	74	.....	10 x4½ "					95	2,065			115	86½
.65	78	.....	10 x5 "					100	2,120			120	85
.70	81	.....	10 x5½ "					110	2,220			120	85
.75	85	.....	10 x6 "					120	2,315			120	85
.80	88	.....	10 x6½ "					130	2,405			125	83½
.85	91	.....	10 x6½ "					140	2,500			125	83½
.90	94	.....	10 x6½ "					150	2,580			130	82
.95	97	.....	12 x5 "					160	2,665			130	82
1.0	100	.....	12 x5 "				98½	170	2,745			130	80½
1.1	110	.....	12 x6 "			105	98½	180	2,820			130	80½
1.2	120	.....	12 x7 "			105	98½	190	2,900			130	79
1.3	130	.....	12 x8 "			105	98½	200	2,970			130	79
1.4	140	.....	14 x6½ "			105	98½	220	3,115			130	77½
1.5	150	.....	14 x7 "			105	98½	240	3,245			130	77½
1.6	160	.....	16 x6½ "			105	98½	260	3,370			130	76
1.7	170	.....	16 x7 "			105	98½	280	3,495			130	76
1.8	180	.....	16 x7½ "			105	98½	300	3,615			130	74½
1.9	190	.....	16 x8 "			105	98½	325	3,770			130	74½
2.0	200	.....	18 x7 "			105	98½	350	3,900			130	73
2.2	220	.....	18 x8 "			105	98½	375	4,035			130	73
2.4	240	.....	18 x9½ "			105	98½	400	4,165			130	71½
2.6	260	.....	20 x8 "			105	98½	450	4,385			130	70
2.8	280	.....	20 x9 "			105	98½	500	4,610			130	68½
3.0	300	.....	20 x9½ "			105	98½	550	4,825			130	67
3.2	321	.....	22 x8½ "			105	98½	600	5,030			130	65½
3.4	340	.....	22 x9 "			105	98½	650	5,230			130	64
3.6	357	.....	24 x8½ "			105	98½	700	5,420			130	62½
3.8	373	.....	24 x9 "			105	98½	750	5,610			130	61
4.0	388	.....	28 x7 "			105	97	800	5,800			130	59½
4.2	403	.....	28 x7½ "			105	97	850	5,890			130	58
4.4	417	.....	28 x8 "			105	97	900	6,080			130	56½
4.6	430	.....	28 x8½ "			105	97	950	6,230			130	....
4.8	443	.....	28 x9 "			105	97	1,000	6,380			130	....
5.0	455	.....	28 x9½ "			105	97	1,100	6,705			130	....
5.5	483	.....	28 x10 "			105	97	1,200	6,960			130	....
6.0	509	.....	32 x7½ "			105	97	1,300	7,230			130	....
6.5	533	.....	32 x8 "			105	97	1,400	7,480			130	....
7.0	556	.....	32 x9 "			105	97	1,500	7,725			130	....
7.5	579	.....	32 x10 "			105	97	1,600	7,960			130	....
8.0	601	.....	32 x11 "			105	97	1,700	8,195			130	....
8.5	622	.....	32 x11½ "			105	97	1,800	8,390			130	....
9.0	641	.....	32 x12 "			105	93½	1,900	8,625			130	....
9.5	660	.....	32 x12½ "			105	93½	2,000	8,820			130	....
10	679	.....	32 x13 "			105	93½	2,200	9,240			130	....
11	710	.....	Bridges designed to provide area according to circumstances.			105	93½	2,400	9,605			130	....
12	740	.....				105	93½	2,600	9,970			130	....
13	775	.....				105	93½	2,800	10,320			130	....
14	805	.....				105	93½	3,000	10,640			130	....
15	835	.....				105	93½	3,500	11,445			130	....
16	865	.....				105	94	4,000	12,160			130	....
17	890	.....				105	94	4,500	12,825			130	....
18	920	.....				105	94	5,000	13,500			130	....
19	945	.....				105	94	5,500	14,080			130	....
20	970	.....				105	94	6,000	14,520			130	....
22	1,015	.....				105	94	6,500	15,140			130	....

Fig. 1. Dunn Drainage Table; Santa Fe System.

James Dun in his exhaustive analysis of the practice of the Santa Fe system, covering many years' observation of the behavior of actual waterway openings under the widest possible range of conditions. The Dun figures are reproduced in numerical form in Table 1, and graphically in Fig. 1, covering the remarkable sweep of watershed area ranging from 0.01 square mile (6.4 acres) to 6,500 square miles (4,000,000 acres), and of waterway areas from 2 square feet to upward of 15,000 square feet cross-section.

In attempting to reconcile the widely varying values of exponents applied to the values of watershed areas in the various formulæ proposed for calculating culvert areas, it has been suggested in a previous report of this committee that the various authorities may have been dealing with run-off data observed from watershed areas of widely varying characteristics and shapes.

It should be stated that the committee has not, as yet, given

more than casual consideration to the hydraulic features of the culvert proper. It is respectfully suggested that in the assignment of work for the coming year that phase of the subject be assigned to this committee for investigation, with liberty to report further progress, if any, with reference to the general waterway formula contemplated in the board's instructions for the past two years.

CONCLUSIONS.

(1) There is a general relationship between the best-known waterway and run-off formulae. This relationship may be expressed by two terms, a varying coefficient and a varying exponent.

(2) The extent of this relationship for large and small areas is indicated by the Dunn waterway data, given in Fig. 1, and shown graphically by Fig. 2.

UNIT PRESSURES ON ROADBED.

The sub-committee has compiled considerable data and will hold a joint meeting with the Ballast Committee to consider this subject on Monday, March 20, 1911.

TUNNEL CONSTRUCTION AND VENTILATION.

This sub-committee would report progress.

DRAINAGE DISTRICTS.

The sub-committee dealing with this subject has made an exhaustive study of the laws of the various States and has compiled a complete list of the laws of Arkansas, Alabama, Arizona, Florida, Georgia, Virginia, Kentucky, Idaho, Maine, Texas, New Mexico, Tennessee, Mississippi, New York, Michigan, South Carolina, and North Carolina.

The following States have no drainage laws in effect: Colorado, Connecticut, Massachusetts, New Hampshire, Rhode Island, Utah, Vermont and Wyoming.

As these laws are very voluminous, the committee decided not to publish them in the Proceedings until they have been abstracted, and the sub-committee is now making up a compilation with that portion of the laws which affects railroads. This we also hope to publish in a later bulletin.

RECOMMENDATIONS FOR 1911.

The committee would recommend continuing each of the subjects assigned for the past year, with the exception of sub-committee II—Formula for Waterways, and for this the committee would substitute the study of Hydraulic Features of Culverts and Waterways, to be continued as a supplement to the subject, Formula for Waterways.

The report is signed by: Geo. H. Bremner, C. B. & Q., chairman; S. B. Fisher, M. K. & T., vice-chairman; J. R. W. Ambrose, G. T.; John C. Beye, C. R. I. & P.; D. J. Brumley, I. C.; Moses Burpee, B. & A.; W. C. Curd, M. P.; W. M. Dawley E. R. R.; Walt Dennis, K. C. S.; Paul Didier, B. & O.; C. Dougherty, C., N. O. & T. P.; Duncan MacPherson, N. T.; W. D. Pence, University of Wisconsin; John C. Sesser, G. N.; H. J. Slifer, C. G. W.; J. A. Spielman, B. & O.; J. G. Sullivan, C. P.; J. E. Willoughby, L. & N.; W P. Wiltsee, N. & W.; R. C. Young, L. S. & I. & M.

APPENDIX A.

Waterway for Culverts.

This paper is a digest of the material compiled in the course of a thesis investigation by A. F. Gilman and G. W. Chamberlin in 1909-1910, under the direction of Prof. W. D. Pence, University of Wisconsin.

The following compilation of formulas for culvert areas and for the determination of run-off is believed to include all the better known formulas besides several not customarily used by American railroad engineers. The nomenclature is taken without change from the original sources.

The Myers Formula.

$$A = c\sqrt{M},$$

where A = the area of waterway required, in square feet.
M = the area drained, in acres.
c = 1 as a minimum for flat country.
c = 1.6 for hilly compact ground.
c = 4.0 as a maximum for mountains, rocky country.

Major Myers recommended this formula as applying well to the water courses which he had been able to examine, which lay chiefly on the line of the Richmond, Fredericksburg & Potomac Railroad.

The Talbot Formula.

$$A = c\sqrt[4]{M^3},$$

where A = the waterway area necessary, in square feet.
M = the area drained, in acres.

This formula is not intended for use for drainage areas of more than 400 square miles. It was derived with especial

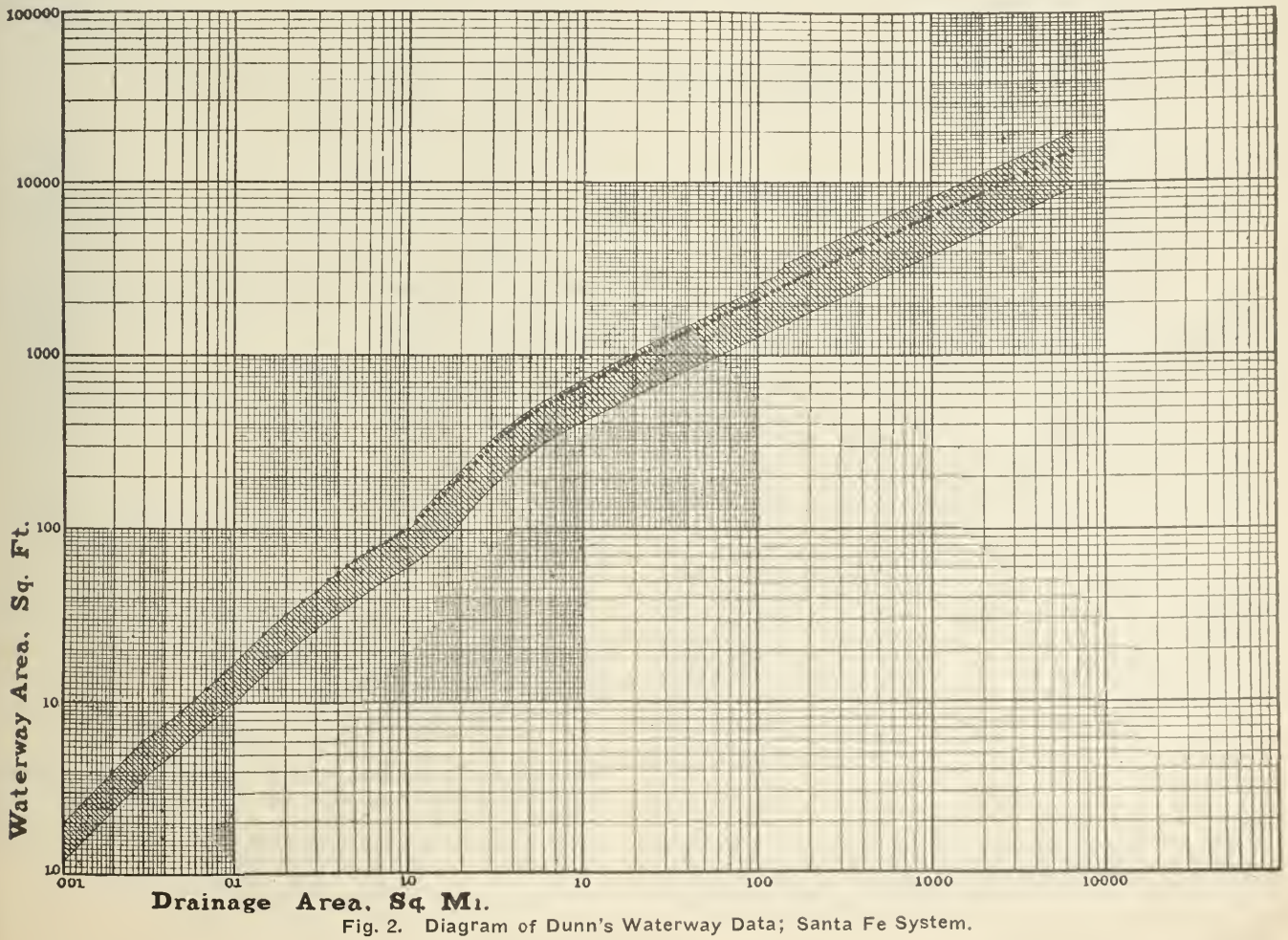


Fig. 2. Diagram of Dunn's Waterway Data; Santa Fe System.

reference to areas under 77 square miles in size: "For rolling country subject to floods at a time of melting snow, and with a length of valley three or four times the width, let c be one-third. For valleys with stream longer in proportion to the area, decrease c. In districts not affected by accumulated snow and where the length of the valley is several times the width, one-fifth or one-sixth or even less may be used. For steep side slopes, especially where the upper part of the valley has a much greater fall than the channel at the culvert, c should be increased."

This formula is used very generally in the southwestern and western portion of this country and appears to give excellent results for the smaller areas.

The Peck Formula (better known as the Missouri-Pacific formula.

$$\text{Area of waterway in square feet} = \frac{\text{Drainage area in acres}}{c}$$

c varies from 4 to 6, depending on the country.

In very mountainous country, where slopes of hills and mountains are steep and abrupt, c is equal to 4. In ordinary flat rolling country, such as is found in good agricultural sections, c is equal to 6.

The Wentworth Formula.

$$a = d^{\frac{2}{3}},$$

where a = the sectional area of the waterway, in square feet.
d = the drainage area, in acres.

This formula was derived in connection with work on the Norfolk & Western Railway and is especially fitted to the conditions along that line, and in general to the conditions in the Southeastern States. In cases of less rainfall, or if the ground be quite flat, the author states that the two-thirds power of the drainage area is too great for the square feet of area needed in the waterway. In the observations of Mr. Wentworth, 60 per cent. of the resulting area may be taken as the lower limit.

The Murphy Formula.

$$A = \frac{Q}{V} = \frac{Q}{C\sqrt{RS}}$$

where A = area of waterway, in square feet.
V = mean velocity, in feet, per second
R = hydraulic radius = range in stage in time of flood. (See explanation below.)

$$c = \frac{a + \frac{b}{n} + \frac{c}{S}}{1 + \left[a + \frac{c}{S}\right]\frac{n}{\sqrt{R}}}$$

where a, b and c are constants and n is the coefficient of roughness of the bed.

S = slope of surface.

"It can be shown that the hydraulic radius

$$R = \frac{A}{P} = \left[\frac{(I + 2d)X}{(I + 2d)\sqrt{(1 + X^2)}}\right]d \quad \ldots\ldots\ldots (3)$$

in which I is the bottom width of a trapezoidal section, d is the depth and X is the slope of the sides. It can be seen from equation (3) that for any given values of d and X, R approaches d as I increases; for the case of floods, therefore, it may be assumed that R = the difference in stage between high and ordinary low water."

"This method of finding the waterway at a given place on a stream consists in finding the drainage area in square miles above the place under consideration, the greatest change in stage of the stream at this place and the slope of the surface. By multiplying the drainage area M by q (the maximum discharge in second-feet per square mile that is to be expected in that portion of the country), we find Q; dividing Q by V, using for R the maximum range of stage, and for S the measured slope of surface of the stream, we have the necessary area of waterway. The greatest error in the use of this method will result from an incorrect measurement of the slope. The formula calls for the slope of surface, and surface slope of a stream is not necessarily the slope of the bed. The slope is not the same at all stages nor always the same for a given stage. If the place under consideration is near the mouth of a large tributary the slope of the main stream will be affected by the stage of the tributary. Overflow and flooding of lowlands is frequently the result of backwater, due to reduction of surface slope. The smaller the slope used the greater will be the computed waterway. If there is a possibility of the waterway becoming partly clogged with drift, logs or ice, or its being in the influence of backwater from a tributary, the computed area must be increased by a liberal amount."

The Dun Data.

A reproduction of the 1906 table may be found in the accompanying Table I. This data was derived principally from observations made along the lines of the Santa Fe Railway in Missouri, Kansas, Indian Territory and Texas.

The C., B. & Q. Formula.

$$Q = \frac{3000\,M}{3 + 2\sqrt{M}}, \text{ or using } V = 10 \text{ ft. per second,}$$

$$A = \frac{300\,M}{3 + 2\sqrt{M}}.$$

where Q = the total discharge from the area in cubic feet per second.
M = the drainage area, in square miles.
A = the waterway in square feet, using the velocity through the culvert as 10 ft. per second.

The Cooley Formula.

No. 1. $Q = 200\,M^{\frac{2}{3}}$, or $A = 20\,M^{\frac{2}{3}}$.
No. 2. $Q = 180\,M^{\frac{2}{3}}$, or $A = 18\,M^{\frac{2}{3}}$.

Notation is the same as for C., B. & Q. formula.

The Tidewater (Virginia) Railway Formula.

$$A = 0.62\,M^{\frac{7}{10}}$$

where M = area drained (watershed) in acres.
A = Neat area of waterways, in square feet.

"Where the stream has a flat fall, add 30 per cent.; where double openings are used, add 20 per cent. to total cross-section area."

The El Paso & South Western Railway Formula.

$$Q = 17\sqrt{\frac{8000}{A}}$$

where Q = the maximum run-off per square mile of drainage area.
A = the total drainage area in square miles.

This is practically the formula by Mr. Joseph P. Frizell, which he worked up from the records of flow over the Holyoke dam, Massachusetts, for a period of 50 years, and it appears in the original form in his book on hydraulics.

The Lauterberg Formula.

$$\text{Average discharge of a river} = \phi = \frac{1{,}000{,}000}{31{,}530{,}000}\,\text{ChF} = 0.03171\,\text{ChF}$$

where ϕ = average quantity discharged per second.
F = the area drained in square kilometers.
h = the total yearly rainfall in inches.
c = 0.20 for marshy soil.
= 0.25 for level plains.
= 0.30 for rolling ground.
= 0.35 for low hills.
= 0.45 for hilly country like the Ardennes, the Odenwald and the Eifel.
= 0.55 for the Black Forest and the Vosges.
= 0.70 for high rocky mountains.

Lauterberg endeavored to frame a rational estimate as to the probable discharge of streams by means of the above formula, which is based upon data collected in Switzerland.

The Fanning Formula.

$$Q = 200\,M^{\frac{5}{6}}$$

where M is the area of watershed in square miles and
Q is the volume of discharge in cubic feet per second.

The Dredge Formula.

$$Q = 1300\frac{M}{L^{\frac{2}{3}}}$$

Notation the same as in the Fanning formula.
L = the length of drainage area in miles.

The Dickens Formula.

$$Q = c \times 27\,M^{\frac{3}{4}}.$$

Q = 200 $M^{\frac{3}{4}}$, for Madras Presidency, India.
Q = 500 $M^{\frac{3}{4}}$, for Central Provinces, India.
Q = 825 $M^{\frac{3}{4}}$, for Bengal and Bahar, India.
Q = 1,200 $M^{\frac{3}{4}}$, for Upper Kaveri, India.
Q = 2,200 $M^{\frac{3}{4}}$, for Gadamatti, India.

The O'Connell Formula.

$$Q = 458\,[\sqrt{(640\,M + 4.58)} - 45.8].$$

This formula is best adapted to small districts.

The notation is the same as that of the Fanning formula.

The Kutter Formula (derived by Ganguillet and Kutter in 1869).

$$Q = \frac{1421\,M}{0.311 + \sqrt{M}}$$

This formula is adapted to Swiss streams. The notation is the same as that of the Fanning formula.

The Hering Formula.

$$Q = \frac{D\,M\,v}{L} \text{ or } \frac{D\,M\,v}{t_1}$$

where Q and M are the same as those of the Fanning formula and

L = the length of the river.
v = the mean velocity of the stream.
D = the entire depth of rain flowing off during a storm.
t_1 = the time taken for a drop of water falling near the periphery of watershed to reach the culvert.

The Possenti Formula.

$$Q = c_2 \frac{R}{L_1}\left(M_2 + \frac{M_1}{3}\right)$$

c_2 = a coefficient with an average value of 1,010.
R_2 = the depth of rainfall in inches for 24 hours.
M_2 = the area of hilly or mountainous part of watershed, in square miles.
M_1 = the area of level or flat part of watershed, in square miles.
L_1 = the length in miles of the stream from its source to the point of observation.

This formula applies especially to mountain streams of moderate size in the Apennines.

The Burkli-Ziegler Formula.

$$q = c\,r\,\sqrt[4]{s/a}$$

where q = the water reaching the sewer in cubic feet per acre per second.
r = the average intensity of rain during heaviest fall in cubic feet per acre per second.
s = the general grade of the drainage area in feet per hundred.
a = the area drained, in acres.
c = a coefficient, for average areas it equals 0.625.

The observations extended up to slopes of 10 ft. per 100, but were limited to small areas of less than 50 acres. This formula is especially applicable to sewer design.

The Coghland Formula.

$$P = t\,c\,R^{1.9}$$

where P = the inches of rainfall discharged by stream.
t = a coefficient for time, the value of which is governed by the length of time the freshet lasts.
c = a coefficient of rainfall varying with the quantity of rain.
R = the average daily rainfall in inches during the freshet.

This formula is applicable to drainage districts of moderate size in New South Wales.

The following values of t and c are given by the author:

Length of freshet in days..	350	Value of t in inches..	2.6
Length of freshet in days..	300	Value of t in inches..	2.5
Length of freshet in days..	250	Value of t in inches..	2.4
Length of freshet in days..	200	Value of t in inches..	2.2
Length of freshet in days..	150	Value of t in inches..	2.1
Length of freshet in days..	100	Value of t in inches..	2.0
Length of freshet in days..	50	Value of t in inches..	1.9
Length of freshet in days..	25	Value of t in inches..	1.8
Rainfall in inches.....	0.40	Value of c in inches..	0.95
Rainfall in inches.....	0.35	Value of c in inches..	0.90
Rainfall in inches.....	0.30	Value of c in inches..	0.85
Rainfall in inches.....	0.25	Value of c in inches..	0.80
Rainfall in inches.....	0.20	Value of c in inches..	0.75
Rainfall in inches.....	0.15	Value of c in inches..	0.70
Rainfall in inches.....	0.10	Value of c in inches..	0.65

The Craig Formula.

$$Q = 440 \times B \times N \text{ hyp. log } \frac{8\,L^2}{B}$$

where Q = the total discharge in cubic feet per second.
N = c v i, where v = the velocity toward the culvert in feet per second.
i = the number of inches of rainfall.
c = the coefficient of discharge.
L = the extreme length of the drainage area.
D = the mean width of the drainage area.

The McMath Formula.

$$Q = c\,v\,\sqrt[5]{S\,A^4} = A\,c\,v\,\sqrt[5]{s/A}$$

where c = the proportion of rainfall that reaches sewers.
v = the number of cubic feet of water falling upon an acre of surface per second during the period of greatest intensity of rain. It is practically the same as the rate in inches per hour.
s = the mean surface grade in feet per thousand.
A = the area drained in acres.
Q = the discharge in cubic feet per second.

This formula was derived with especial reference to St. Louis conditions.

The Chamier Formula.

$$Q = 640 \times R \times C \times M^{3/4}$$

where Q = the discharge in cubic feet per second.
R = the average rate of the greatest rainfall anticipated in inches per hour for such duration as will allow the flood water flowing to the outlet from the farthest extremity of the catchment area.
c = a coefficient of surface discharge, giving the proportion of rainfall that may be expected to flow off the surface.

The above formula has been tested by Mr. Chamier on streams in India having drainage areas of from 20 acres to 400 square miles.

The Cramer Formula.

$$Q = \frac{c_3\,R_3\,m\,M\,(S_2)^{1/3}}{9 + (0.0658\,m\,R_2\,M)^{1/3}}$$

where Q = the discharge in cubic feet per second.
R_2 = the mean annual rainfall in inches.
$S_2 = \frac{e_1 + e_2}{l}$ = the mean slope and declivity of the whole basin; e_1 being its average altitude in feet, e_2 being the altitude of the point of discharge, and l being the average distance in feet traveled by the water from the boundaries of the watershed to the point of measurement.
c_3 = a variable coefficient.
= 186 for rough natural basins of rivers.
= 697 for smooth, comparatively level and impervious areas like well-built cities.
m depends on the total area M, the flat area F, which is likely to be inundated in freshets, and the mean annual rainfall R_3, such relation being expressed by:

$$m = 1 - \sin\left(-\tan^{-1}\frac{709\,F}{M\,R_3}\right)$$ for the simple case when F is distributed in an approximately uniform manner throughout the whole basin, whereas if F is concentrated only at the lower end of the basin, we must place

$$m = 1 - \sin\left(-\tan^{-1}\frac{1418\,F}{M\,R_3}\right)$$

The Italian Formulas.

$$Q = \frac{1819\,M}{0.311 + \sqrt{M}} \quad (1)$$

$$Q = \frac{2600\,M}{0.311 + \sqrt{M}} \quad (2)$$

The notation in these formulas is the same as that of the Fanning formula. No. 1 is applicable to streams in northern Italy, and No. 2 to small brooks in the same region.

The Kuichling Formulas.

$$q = \frac{44{,}000}{M + 170} + 20 \quad (1)$$

$$q = \frac{127{,}000}{M + 370} + 7.4 \quad (2)$$

Here q = the discharge in second-feet per square mile, and M = the drainage area in square miles. These equations were derived from conditions similar to those in the valley of the Mohawk River. They were obtained from a great amount of flood data on both American and European streams. Equation No. 1 gives the discharge during floods which may occur occasionally. Equation No. 2 gives the discharge during floods that occur but rarely.

The Murphy Formula.

$$q = \frac{46{,}790}{M + 320} + 15$$

The notation here is the same as that of the Kuichling formulas. This equation was derived from a large amount of flood data on streams of the northeastern United States which Mr. Murphy had collected.

The Gray Formula.

$$Q = 5.89\ A^{\frac{5}{6}}$$

where Q = the discharge in second-feet per acre, and
A = the drainage area in square miles.

In his discussion of logarithmic diagram of the Dunn data, Prof. W. D. Pence found that by drawing tangents to the curve at various points the exponents of the equations of these tangents varied from unity for very small areas to one-half for the largest areas drained. This is a very interesting discovery, and it may be that it represents the law for which engineers have been continually looking, but without further verification of the Dun figures it is impossible to draw any final conclusion in regard to the matter.

Discussion on Roadway.

Mr. Churchill: I believe there should be an investigation all over the United States with a view to finding a general waterway formula by which a change in the coefficient will be applicable to the different sections, and I believe that this committee is in better shape to take up such a formula than any other body in the United States.

Prof. Pence: If the members of the association will support the committee by responding to the circular which the committee plans to send out, by platting a few points on the diagram, it is believed that considerable progress can be made.

A motion to receive the report as information was carried.

RECORDS AND ACCOUNTS.

The Board of Direction assigned the following work:

(1) Recommend a form and system for keeping sidetrack records.

(2) Continue the study of estimate forms for construction and maintenance work.

(3) Consider revision of the Manual.

(4) Make concise recommendations for next year's work.

The following sub-committees were appointed:

Sidetrack Records: M. C. Byers, chairman; C. W. Pifer, Thomas Maney.

Bridge Estimate Forms: Edward Gray, chairman; R. W. Willis, E. E. Hanna.

Building Estimate Forms: W. H. Sellew, chairman; J. H. Milburn.

Water Service Estimate Forms: C. H. Gerber, chairman; J. M. Brown.

Section Foreman's Material Report: Henry Lehn, chairman; J. E. Turk, T. H. Gatlin.

SIDETRACK RECORDS.

The work outlined for this sub-committee was as follows:

(1) To collect data in the nature of forms and methods used by railroads for keeping sidetrack records. (2) To formulate a definite recommendation for a method of preparing and keeping such records, with particular attention to the following features: (1) Reporting completion of sidetracks. (2) Keeping permanent record of same. (3) Periodically checking location and length to insure the record always being correct.

The information considered desirable for such a record generally consists of the following: Location of sidetrack by mile post and station; length; alinement; gradient; actual cost, and by whom assumed; character, age and weight of rail; character and size of ties; description of bridges and culverts; date of construction; memorandum of agreement, if any, covering construction and maintenance; title to property occupied.

The investigation developed that the railway companies have not as a general thing devised very complete systems for keeping sidetrack records, although the necessity for such is generally admitted but not fully appreciated. There would seem to be no reason why the same care should not be given to maintaining careful records of sidetracks as is given to keeping records of main tracks and other physical assets of a railroad company.

In the analysis of the subject the sub-committee came to the conclusion that a sidetrack record should be used for the following reasons:

(1) To provide data for compiling reports to state railway commissions and the Interstate Commerce Commission. (2) To provide data for annual reports. (3) Keep a record of ownership of sidetracks. (4) Keep records for taxation purposes. (5) Provide a convenient method by which the officers of a railway in direct charge of maintenance or changing of sidetracks may become familiar with the conditions under which the tracks are constructed and maintained. This is especially valuable in connection with sidetracks which are owned wholly or in part by private parties or corporations, the maintenance of which is performed by the railroad company and the cost charged against the owner.

Failure to keep accurate sidetrack records has resulted in much controversy between interested parties and oftentimes endless search through correspondence files in order to develop the information which ought to be readily found and for which there is constant call. In a large percentage of industrial tracks there are other than railway interests. The title to the track and property and maintenance of same makes it just as important to keep a complete and accurate record, which should supplement the written contracts, as to keep records of titled property. In addition, there is necessity for keeping better records on account of constantly increasing demands of local and national authorities for data in connection with physical condition of property, for which reliable records must be within easy reach. It is felt that the importance of this feature of railroad records cannot be too greatly emphasized and that it has not heretofore been given the prominence it deserves.

The committee presents to the association for adoption the form proposed for sidetrack records.

The general scheme of the form is to have a permanent record, which will be corrected annually, and which will, as far as possible, show accurately the track situation at all times, and it is so planned as to permit additions or reductions in length to be indicated immediately upon completion of the work without causing the form to be rewritten.

The form needs very little explanation, as the headings of the columns show exactly what information is to be recorded. In presenting this form the committee has in mind the neces-



H. R. Safford.

Chairman, Committee on Records and Accounts.

sity for a form that will fit all conditions, and this accounts for four or five columns which show in different methods the location of track, as the same method for indicating the location could not be used under all conditions.

It is proposed that this form be printed on tracing paper, so that as many copies as are desired can be taken from it by blueprinting, the original to be retained in the local office. At the end of the year or other prescribed period, the local officers should correct the report and send new prints to the office of the chief engineer or whatever general officers may require such information.

In detailed explanation of the use of the columns the following instructions are proposed to accompany this form:

Column No. 1. Show location of sidetracks referred to mile posts, which method would be used for tracks which are not a part of yards or within station limits. In such cases the mile post location will be the mile and plus of the switch nearest the mile post measured in the direction in which the mileage is carried.

Column No. 2. Give reference indicating that the sidetrack is on the right or left side of the main track.

Column No. 3. Give name of station at which track is located.

Column No. 4. Give name of county and state.

Column No. 5. Give name or number of township or school district.

Column No. 6. Give name or number of track, as it may be designated.

Column No. 7. Indicate whether the track is a spur or connected at both ends.

Column No. 8. Show construction authority number.

Column No. 9. Give number of contract, if any exists, covering construction, operation or maintenance.

Column No. 10. Show date sidetrack was completed.

Column No. 11. Give character, age and weight of rail.

Columns Nos. 12, 13, 14 and 15. Show actual length of track at the end of prescribed record year, dividing the ownership between the railway and outside interests.

Columns Nos. 16, 17, 18 and 19. Show changes which may be made to track during the record period. In these columns the plus sign should be used to indicate track length which is added, and the minus sign should be used for track length which is taken up.

Column No. 20. Show any miscellaneous information that has a bearing upon the track and which is not provided for by separate column.

A space should be provided between the various stations to permit of additional sidetracks being recorded without making a new sheet.

All totals and all figures indicating changes during the year should be shown on the tracing paper in pencil, also the last two figures of the year in which the report is made, but all other figures should be made with India ink. The local officers preparing the sidetrack record should retain the original form and at the end of the period for which the report is to be made, should, after correcting their previous reports to date, send the necessary sets of blue prints to the office of the chief engineer, one for use until a new report is made, and the others to be filed as a permanent record. The tracing paper form should not be used for reference but be filed in a dust-proof box until it is necessary to correct it or make necessary blue print copies.

All tracks should be reported on the sidetrack record in linear feet of track.

In reporting weight of rail with which the original track was constructed, this should be reported as linear feet of track.

The committee recommends to the association for adoption in the Manual of Recommended Practice the proposed form for sidetrack record shown as Exhibit A.

BRIDGE ESTIMATE FORMS.

This sub-committee was instructed to continue the study of this subject, which was begun but not completed in the 1909 report, following the general idea of having a form which would provide a uniform method for making such estimates and furnishing a guide to the estimator to avoid errors of omission. They very soon determined that it would not be practicable to attempt to follow in the preparation of this form the scheme of printing the various items that enter into general bridge work. The character of construction varies too much to make such a plan feasible, and it was therefore concluded by the sub-committee, which conclusion was indorsed by the general committee, that in the design of such a form the front page should be left blank as far as the list of items is concerned, but that on the reverse side of the sheet should appear a list of the principal items which enter into various kinds of bridge construction and which would be a guide to the estimator, and insure uniform arrangement of items in the estimates and prevent omission of important features.

In the preparation of this list of items it was found quite easy to include too much detail, and the committee has therefore not attempted to go beyond the principal items. The situation in regard to an estimate for bridge work which would fit all classes of structures is somewhat different from the preparation of a similar form for track estimates, but in the design of the face of this form an attempt has been made to make it consistent in arrangement with the form recommended and adopted for track estimates, with the exception of printing the details.

The instructions to sub-committees C and D were of the same general character as those given to sub-committee B, and forms of a similar design were presented.

SECTION FOREMAN'S MATERIAL REPORT AND REVISION OF THE MANUAL.

The committee does not offer any suggestion or changes with reference to the general subject of revision of the Manual. The committee has been unable to do much more than complete the work on estimate forms and preparing sidetrack record, and while some attempt was made to study several of the forms, particularly those applying to section foreman's material reports, adopted by the association, nothing conclusive was determined in this direction.

The report is signed by: H. R. Safford (Edgar Allen American Manganese Steel Company), chairman; H. J. Pfeifer (Terminal Railroad Association), vice-chairman; J. M. Brown (C. R. I. & P.), M. C. Byers (St. L. & S. F.), T. H. Gatlin (Southern), C. H. Gerber, consulting engineer; Edward Gray (Southern), E E. Hanna (M. P.), Henry Lehn (New York Central), Thos. Maney (L. &. N.), J. H. Milburn (B. & O.), C. W. Pifer (Ill. Cent.), W. H. Sellew (Mich. Cent.), J. E. Turk (P. & R.), R. W. Willis (C. B. & Q.).

Discussion on Records and Accounts.

Mr. McDonald: I would like to ask the committee whether they gave consideration to the question of large yard groups. Is it the intention that each track in a group shall be placed on this blank, or are they to be treated as groups?

Mr. Safford: The idea was that a condition of that kind cannot be handled as a group. You cannot individualize every track in a large yard.

Mr. Brooke: There is one omission that I would like to see taken care of. Nearly all private sidings are covered by an agreement, and this would be a convenient place for it.

Mr. Safford: Column 9 covers it. It should be contract number instead of "Construction number."

President: That will be corrected.

A motion to adopt the form was carried.

Mr. Kittredge: I would like to ask for some explanation of the item of "general expense," in the form for "water service estimated."

Mr. Safford: That was intended to mean a general heading for what might follow in the way of miscellaneous items that were not listed. The classification of the things that are ordinarily met in estimates of that kind appears in items 1 to 8. From that point on, it is miscellaneous that we did not feel like listing.

Mr. Kittredge: I was wondering why it did not appear in the other blanks.

Mr. Safford: It should have appeared in the others. That was an over-sight.

The President: The Committee will add that to the blanks in which it does not now appear.

Mr. Kittredge: Engineering and train service are grouped together in Article XIII, while in Article VI, the article "Train Service" is given again. Is there some special kind of engineering and train service covered?

Mr. Safford: That is another typographical error.

The President: "And train service" will be omitted.

Mr. Brooke: I suggest "Miscellaneous expense" be substituted for "General expense."

The President: That is acceptable to the committee.

A motion to adopt the form was carried.

UNIFORM GENERAL CONTRACT FORMS.

The committee was instructed to take up the following work:

(1) Review and revise uniform general contract forms presented at Tenth Annual Convention.

(2) Make concise recommendations for next year's work.

The committee has thoroughly considered the report made at the 1909 convention and published in Bulletin 108, and has made a study of the principal contracts in use. The plan of having an agreement form of two pages separate from the general contract conditions, is approved by the committee, and the agreement form presented in that report has been reconsidered and revised and is presented herewith with recommendations for adoption.

In small or unimportant contracts this agreement form, which is designated as Form A, may be used alone, but in larger contracts the "General Conditions" statement designated as Form B may be inserted, using the agreement form as a folder with the introductory page at the beginning of the contract and the signatures at the end.

Specifications relating to the particular work can either be included in the folder or attached to the back.

The committee has, in the agreement, made the "Contractor" the party of the first part, and the "Company" the party of the second part and has, therefore, in preparing the "General Conditions," placed the provisions relating especially to the duties and rights of the "Contractor" first and those relating to the duties and rights of the "Company" last.

The committee has outlined for future meetings the formation of the remaining sections, which, in general, will cover the following terms: Property and right of entry; temporary suspension of work; annulment; measurement and approval of work; estimates and payments.

CONCLUSIONS.

The committee especially presents for approval:

(1) The general scheme of having the two-page general agreement, Form A, as a folder within which the other por-

tions of the contract can be bound, thus permitting a concise contract form or a large contract form, according to the requirements of the case.

(2) The agreement—Form A—as presented herewith:

The committtee presents for discussion and suggestions:

(1) The scheme of arrangement of B—General Conditions.

(2) The composition of the 28 sections enumerated.

For next year's work it is recommended that preparation of a standard contract form be continued on the lines already begun.

The report is signed by: J. C. Irwin (R. Railroad), chairman; W. G. Brimson (Q., O. & K. C.), vice-chairman; E. F. Ackerman (L. V.); F. H. Alfred (C., H. & D.); Wm. Archer (B. & O. S.); William Ashton (O. S. L.); W. G. Atwood (L. E. & W.); W. L. Breckinridge (C., B. & Q.); E. H. Lee (C. & W. I.); F. W. Smith (C., C., C. & St. L.); W. F. Tye (Civil Engineer); C. A. Wilson (Consulting Engineer).

CONSTRUCTION CONTRACT.

Agreement.

This agreement, made this .....day of..... in the year .....by and between..... .....party of the first part, herinafter called the Contractor, and..... party of the second part, hereinafter called the Company.

WITNESSETH, That, in consideration of the covenants and agreements hereinafter mentioned, to be performed by the



J. C. Irwin.
Chairman, Committee on Uniform General Contract Forms.

parties hereto and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

The Contractor will furnish all the necessary transportation, materials, superintendence, labor and equipment and will execute, construct and finish in an expeditious, substantial and workmanlike manner to the satisfaction and acceptance of the Chief engineer of the Company.

....

in accordance with the plans hereto attached or as hereinafter described and the following general conditions, requirements and specifications, forming part of this agreement.

The work covered by this contract shall be commenced .....and be completed on or before the.....day of.....191..... .....

And in consideration of the completion of the work described herein, and the fulfillment of all the stipulations of this agreement to the satisfaction and acceptance of the Chief Engineer of the Company, the said Company, its successors or assigns hereby agree to well and truly pay, or cause to be paid, to said Contractor, the executors, administrators, successors or assigns of said Contractor, as the case may be, the amount due the Contractor, based on the following prices..... .....

IN WITNESS WHEREOF, The parties hereto have duly executed this instrument in duplicate the day and year first above written.

WITNESS:

....
....

CONSTRUCTION CONTRACT.

General Conditions.

1. Bond.—The Contractor agrees, at the time of the execution and delivery of this contract and before the taking effect of the same, to furnish and deliver to the Company a good and sufficient bond of indemnity to the amount of..... .....dollars, as security for the faithful performance, by the Contractor, of all the covenants and agreements on the part of the Contractor contained in this contract. The security in such bond of indemnity must be satisfactory and acceptable to the Company.

This bond shall remain in force and effect in such amount, not greater than that specified, as shall be determined by the Chief Engineer, until the final completion and acceptance of the work.

2. Contractor's Understanding.—It is understood and agreed that the Contractor has satisfied himself by careful personal examination as to the nature and location of the work, the form of the surface of the ground, the character, quality and quantity of the materials to be encountered, the character of the plant, structures, equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way influence this contract, and no information upon any such matters derived from the maps, plans, profiles, drawings or from any source whatever, shall in any way affect any risk or obligation, or relieve him from fulfilling any of the terms of this agreement. No verbal agreements or conversations with any officer, agent or employe of the Company, either before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.

3. Intent of Plans and Specifications.—All work that may be called for in the specifications and not shown on the plans, or shown on the plans and not called for in the specifications, is to be executed and furnished by the Contractor as if described in both these ways; and should any work or material be required which is not denoted in the specifications or plans, either directly or indirectly, but which is nevertheless necessary for the proper carrying out of the intentions thereof, the Contractor is to understand the same to be implied and required, and is to perform all such work and furnish any such material as fully as if they were particularly delineated or described.

4. Permits.—The Contractor shall, at his own cost and expense, except as specifically provided in this contract, secure the necessary permits for the work included in this contract and will be responsible for violations of any laws, rules or regulations.

5. Protection.—Whenever the local conditions, laws or ordinances require, the Contractor shall furnish and maintain, at his own cost and expense, necessary passageways, guard fences and lights and such other facilities and means of protection as may be required.

6. Rights of Various Interests.—Whenever work being done by Company forces or by other Contractors is contiguous to work covered by this contract, the respective rights of the various interests involved shall be determined by the Engineer, to secure the completion of the various portions of the work in general harmony.

7. Consent to Transfer.—The Contractor agrees not to let or transfer this contract or any part thereof (except for the delivery of material) without consent of the Chief Engineer, given in writing. Such consent does not release or relieve the Contractor from any or all of his obligations and liabilities under this contract.

8. Superintendence.—The Contractor agrees to constantly superintend all the work embraced in this contract in person or by a duly authorized manager acceptable to the company.

9. Timely Demand for Points and Instructions.—The Contractor shall not proceed until he has made previously timely demand upon the Engineer for, and received from him, such points and instructions as may be necessary as the work progresses. The work shall be done in strict conformity with such points and instructions.

10. Report Errors and Discrepancies.—If the Contractor, in the course of the work, finds any discrepancy between the plans and the physical conditions of the locality, or any errors in plans or in the layout as given by said points and instructions, it shall be his duty to immediately inform the Engineer. Any work done after such discovery, until verified, will be done at the Contractor's risk.

11. Preservation of Stakes.—The Contractor must carefully preserve bench marks, reference points and stakes, and in case of wilful or careless destruction he will be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

12. Inspection.—All work and mterials shall at all times be open to the inspection, acceptance or rejection of the Engineer

or his duly authorized representative. The Contractor shall at all times provide sufficient, safe and proper facilities for such inspection.

13. Defective Work or Material.—Any omission or failure on the part of the Engineer to disapprove or reject any work or material shall not be construed to be an acceptance of any defective work or material. The Contractor shall remove, at his own expense, any work or material condemned by the Engineer, and shall rebuild and replace any work or material so condemned without extra charge, and in default thereof the same shall be done by the Company at the Contractor's expense—or in case the Chief Engineer should not consider the defect of sufficient importance to require the Contractor to rebuild or replace any imperfect work or material, he shall have power, and is hereby authorized, to make any deduction from the stipulated price that he may see proper.

14. Indemnity.—The Contractor agrees to indemnify and save harmless the Company for and from all claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against it, for or on account of any injuries or damages received or sustained by any party or parties by reasons of any act or omission of the said Contractor, his agents or employes, in the construction of said work or by or in consequence of any negligence or carelessness in guarding the same.

15. Settlement for Wages.—Whenever, in the opinion of the Chief Engineer, it may be necessary or conducive to the progress of the work to secure to any of the employes of the Contractor any wages which may then be due them, the Company is hereby authorized to pay such laborers the amount due them or any lesser amount, and the amounts so paid them, as shown by their receipts, shall be deducted from any moneys that may be or become payable to said Contractor.

16. Liens.—If at any time anyone employed by the Contractor, either to perform work as a sub-contractor or laborer or otherwise, or to furnish any materials, shall file or give notice of any mechanic's or other liens therefor, the Company is hereby authorized to pay and discharge the same if it shall deem best so to do, and to deduct the amount so paid from any moneys which may be or become due and payable to the Contractor.

17. Work Adjacent to Railroad.—Whenever the work embraced in this contract is near the tracks, structures or buildings of this Company or of other railroads, the Contractor shall use extraordinary care and vigilance to avoid injury to persons or property. The work must be so conducted as not to interfere with the movement of trains or other operations of the railroad; and if in any case such interference be necessary, the Contractor shall not proceed until he has first obtained specific authority and directions therefor from the proper officer of the Railroad Company and has the approval of the Engineer.

18. Risk.—The work in every respect shall be at the risk of the Contractor until finished and accepted.

19. Order and Discipline.—The Contractor shall at all times enforce strict discipline and good order among his employes, and any employe of the Contractor who shall appear to be incompetent, disorderly or intemperate, or in any other way disqualified ofr or unfaithful to the work entrusted to him, shall be discharged immediately on the request of the Engineer, and he shall not again be employed on the work without the Engineer's written consent.

20. Contractor Not to Hire Company's Employes.—The Contractor shall not employ any of the Company's employes.

21. Intoxicating Liquors Prohibited.—The Contractor shall not permit the sale, distribution or use of any intoxicating liquors upon or adjacent to the work, or allow any such to be brought upon, to or near the line of the railway of the Company.

22. Cleaning Up.—The Contractor must, before the work is finally accepted, at his own expense, clear away from the Company's property and from all public and private property all temporary structures, rubbish and waste material resulting from his operations.

23. Engineer and Chief Engineer Defined.—Wherever in this contract the word Engineer is used, it shall be understood as referring to the Chief Engineer of the Company, acting personally or through an assistant duly authorized in writing for such act by the Chief Engineer, and wherever the words Chief Engineer are used it shall be understood as referring to the Chief Engineer in person, and not to any assistant engineer.

24. Power of Engineer.—The Engineer shall have full power to reject or condemn all work or material which, in his opinion, does not conform to this agreement; to direct the application of forces to any portion of the work which in his judgment requires it; to order the force increased or diminished, and to decide every question that may arise between the parties relative to the execution of the work.

25. Adjustment of Dispute.—All questions, differences or controversies which may arise between the Contractor and the Company, under or in reference to this agreement, or its performance or non-performance, or the work to which it relates or in any way whatever pertaining to or connected with said work, shall be subject to the decision of the Chief Engineer, and his decision shall be final and conclusive to both parties.

26. Order of Completion; Use of Completed Portions.—The Contractor shall complete any portion or portions of the work in such order of time as the Engineer may require. The Company shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions may not have expired; but such taking possession and use shall not be deemed an acceptance of the work so taken or used or any part thereof. If such prior use increases the cost of the work, the Contractor will be entitled to such extra compensation as the Chief Engineer may determine.

27. Changes.—The Company shall have the right to make any changes that may be hereafter determined upon, in the nature or dimensions of the work, either before or after its commencement, and such changes shall in no way affect or void this agreement, but the difference in the value of the work shall be adjusted by the Engineer. If such changes diminish the quantity or extent of the work to be done, they shall not, under any circumstances, be construed as constituting, and shall not constitute, a claim for damages or for anticipated profits on such work.

In case of any work being done under a lump-sum contract price, and the quantity of work actually furnished upon completion of the work should vary and prove more or less than the quantities shown on the original plans and provided for by the specifications, then the contract lump-sum price is to be adjusted in the final payment accordingly. If the contract provides a schedule of unit rates for variations in the work, then the adjustment is to be made on the basis of such unit rates, either adding or deducting the corresponding amounts according to whether the quantity of each class of work was increased or decreased over the amounts originally covered by the lump-sum bid; if the contract does not contain such a schedule of unit rates, then the value of all such additions or omissions is to be established by the Engineer, and the adjustment made accordingly.

28. Extra Work.—No bill or claim for extra work or material shall be allowed or paid unless the doing of such extra work or the furnishing of such extra material shall have been authorized in writing by the Engineer, and the price to be paid fixed by the Chief Engineer in writing before any part of such work was done or material furnished.

The Chief Engineer, in fixing the price for the doing of work or the furnishing of material not provided for in this agreement, may either fix a unit price or a lump-sum price or may, if he so elects, provide that the price shall be determined by the actual cost, to which shall be added.....per cent to cover general expense and superintendence, profits, contingencies, use of tools, Contractor's risk and liability. If the Contractor shall perform any work or furnish any material which is not provided for in this agreement, or which was not authorized in writing by the Engineer previous to the doing of the work or the furnishing of material, said Contractor shall receive no compensation for such work or material so furnished, and does hereby release and discharge the Company from any payment therefor.

If the Contractor shall proceed with such extra work or the furnishing of such extra materials after receiving the written authority therefor, as hereinbefore provided, then such work or material, stated in the written authority of the Engineer, shall be covered, governed and controlled by all the terms and provisions of this agreement, subject to such prices as may be agreed upon or determined by the Chief Engineer.

If the Contractor shall decline or fail to perform such work or furnish such extra material as authorized by the Engineer in writing, as aforesaid, the Company may then arrange for the performance of the work in any manner it may see fit, the same as if this agreement had not been executed, and the Contractor shall not interfere with such performance of the work.

Discussion on Uniform General Contract Forms.

The report was accepted as information without discussion.

GRADING AND INSPECTION OF MAINTENANCE OF WAY LUMBER.

In the classification of lumber the question of the absence or presence of defects is one of the greatest importance, and the various lumber associations of the country have adopted

standard grades for the kinds of lumber which they manufacture, according to which they grade their product by sizes and by the quality, as determined by the absence or presence of certain standard defects.

To insure uniformity, it is obviously desirable that in ordering and purchasing lumber, the railroads follow standard specifications which shall be considered as such by both the producer and consumer. This principle has been recognized in the association in the adoption of the standard specifications for Southern yellow pine bridge and trestle timbers, which are now the standard specifications of the Yellow Pine Manufacturers' Association and of the American Society for Testing Materials.

Since the adoption of these standard specifications, the Yellow Pine Manufacturers' Association and American Society for Testing Materials have issued these standard specifications in the form of a small pamphlet, and the manufacturers have attempted to live up to these specifications in the manufacture of grades of timbers applied to bridge and trestle construction. Apart from these specifications, comparatively little has been done in the way of formulating standard rules for the grading of maintenance of way lumber that are recognized both by the railways and manufacturers.

At the 1909 convention of the Master Car Builders' Association a committee was appointed to act in conjunction with similar committees from the American Railway Master Mechanics' Association, the Railway Storekeepers' Association and the lumber manufacturers' associations throughout the country and to prepare specifications and grading rules for car and locomotive lumber.

At the 1910 convention of the Master Car Builders' Association a report was submitted on this subject, which was subsequently adopted by the above referred to railway and lumber manufacturers' associations. This report consisted of a description of the various woods used by the railway companies for car and locomotive lumber, a list of standard defects, with appropriate photographs illustrating these, and the grading rules for each kind of lumber.

A great deal of the matter contained in these specifications is applicable to maintenance of way lumber, and several of the manufacturers' associations have submitted to this committee specifications for maintenance of way lumber, using the descriptions of woods and standard defects already adopted by these associations. These specifications are printed in full as an appendix to the report.

In submitting these specifications as a matter of information to members of this association, the committee wishes to emphasize that it is desirable to adopt a series of specifications of this character at the earliest possible date. The splendid results obtained from the joint adoption of such standard rules for bridge and trestle timbers has already been pointed out. The various lumber associations have indicated their readiness to co-operate with the members of this association for the purpose of having similar rules adopted for maintenance of way lumber.

The committee suggests that the work assigned to it for the next year consist in the preparation of similar specifications for classes and kinds of lumber not included in the specifications submitted in this year's report, and the consideration of those submitted with a view towards recommending the adoption of standard specifications for maintenance of way lumber.

The report is signed by: W. H. Sellew, M. C., chairman; F. H. Bainbridge, C. & N. W.; E. O. Faulkner, A. T. & S. F. Railway; R. Koehler, S. P.; Dr. Hermann Von Schrenk, St. L. & S. F.; B. A. Wood, M. & O.

Discussion on Grading Rules for Maintenance of Way Lumber.

Dr. Herman Von Schrenk, (R. I. Frisco): The idea of the committee was to request the various manufacturers' associations to present concrete rules for the various classes of railway material under which they would be able to furnish railway lumber. The chief criticism which the committee has found hitherto was that the lumber manufacturers generally criticized the railway specifications, saying that they were numerous and various; that what they would like to see was a standard specification for one class of material, adopted by the railway organizations. The committee therefore requested that the manufacturers' associations submit such specifications as they believed would be standard, and those have been printed preliminary to their general adoption, and the lumber manufacturers' associations have on their part agreed that unless they are very materially changed, they would issue those as standard specifications on their part.

J. H. Waterman (C. B. & Q.): The Railway Storekeepers' Association, at the sixth annual convention, 1909, passed the following resolution:

Resolved, That a committee of five be appointed by the president to confer with the Master Car Builders' and Master Mechanics' Associations, and request the adoption by them of the commercial grading rules as the standard of lumber specifications by the railways:

This committee went to Atlantic City in 1909 and attended the Master Car Builders' and Master Mechanics' conventions, presented the resolution, and succeeded in having a committee appointed from each association to act jointly with the committee from the Railway Storekeepers' association to draft standard specifications to cover all classes of lumber used in cars and locomotives.

The committee met several times and was assisted very materially by the manufacturers' associations north, south, east and west. The manufacturers were very glad to co-operate with the joint committee referred to above and change any of the established rules which they had to conform with the rules which the committee felt were best.

This enabled the committee to make a complete report to the convention of the Master Car Builders and Master Mechanics which met at Atlantic City in 1910 and present standard specifications for all classes of lumber used in cars and locomotives. This report was adopted unanimously by the Master Mechanics' Association and the Master Car Builders' Association.

In August, 1910, we learned that the American Railway Engineering and Maintenonce of Way Association had appointed a committee on rules for the grading and inspection of maintenance of way lumber.

We immediately wrote your president, Mr. Fritch, on August 23, and offered your committee, through him, any information which we had gathered in connection with our work in preparing the standard specifications which were adopted by the Master Mechanics' and Master Car Builders' associations.

On August 30 your president acknowledged receipt of the letter and advised:

"I wish to thank you for your letter and will instruct our committee to avail themselves of your kind offer." We have met with your committee during the past year and have given them what assistance we had at hand.

The question arises:

We ask you to take some action endorsing what your committee has done and continuing them with authority. We will co-operate with them if you think best.

We hope that in the very near future there may be a standard specification adopted which will be uniform. We do not want to be understood as advancing a proposition that all roads should use the same class of lumber in the same place. We would like the American Railway Engineering and Maintenance of Way Association in their own way to say that as the various lumbermen's manufacturing associations of the United States have adopted rules and specifications for the grading of all classes of lumber which we use, the railways will accept these grading rules as their standard for the inspection of all lumber which they buy, and designate the lowest grade inspected under the commercial grading rules, which will be acceptable to the railways of this country for each particular purpose.

Favorable action by this association can result in only one thing; greater ease, more uniformity, less frequent disputes in connection with the inspection of lumber, and a greater certainty of an adequate supply being promptly secured especially in busy times.

E. T. Brown, (B. & O.): The Baltimore & Ohio has repaired, during the past year, a good many miles of second and third class, and they have needed a good deal of maintenance of way lumber, switch timbers and bridge lumber for special or temporary work. I know that orders were placed for lumber, and at the end of six months that lumber was not furnished, and the railway company had to ship lumber from west of the Alleghenies to the east side of the Alleghenies to do the work at the time it had to be done. I think it would be a great saving in many ways to the railways to have a standard under which one road could buy the same lumber from a mill that the other would, and the stock would be the same.

A motion to receive the committee's report as information, was carried.

CONSERVATION OF NATURAL RESOURCES.

In pursuance of the request from President Baker of the National Conservation Congress, a report was transmitted to Thomas R. Shipp, executive secretary of that organization, on September 3, 1910, by the chairman, of which the following is a part:

"On May 13, 1909, an elaborate report was transmitted to

the committee by the National Conservation Commission, through its secretary, Mr. Shipp, containing valuable suggestions as to the possibilities of railway companies assisting the work of conservation by thorough methods of prevention and control of forest fires, and the cultivation of timber for railroad purposes, the use of sawed instead of hewed ties, the use of treated timber, and the necessities for the extension of the supply of creosote, and other features relating to timber resources. This report was transmitted by the committee, to the American Railway Engineering and Maintenance of Way Association, published by the association, and distributed throughout the country in one of its bulletins.

"Dealing directly, as it does, with those features of conservation that affect the railway companies and their patrons, and having a circulation among railway officers covering the United States, as well as large portions of Canada and Mexico, the results should be exceedingly beneficial to the cause of conservation.

"In March of this year the special committee was established as one of the standing committees of the association, at the same time the personnel was largely increased, bringing into membership a number of prominent railway officers of this country and Canada.

"The work of the committee has been divided into subcommittees for the purpose of specialization, with an outline for investigation as follows: (1) tree planting and general reforestation. (2) coal and fuel oil resources. (3) iron and steel resources.

A sub-division of the work, as per statement following, was recommended: (1) Tree Planting and General Reforestation, (a) extent of existing forests considered in connection with increase of growth and consumption. (b) judicious selection of tree varieties for planting, the locality and soil conditions considered. Possibility of value from growth on cut-over land. (c) methods of planting and cultivation, with cost of same, considering possibilities from cut-over lands. (d) anticipated results at maturity from trees so produced. (e) methods and cost of caring for and protecting existing forests. (2) Coal and Fuel Oil Resources. (a) extent of existing supplies, considered in connection with consumption. (b) extent of waste in production. (c) economic consumption, giving consideration to practical use of by-products. (3) Iron and Steel Resources. (a) supplies of raw material, considered in connection with consumption. (b) waste in production. (c) best methods of protecting finished products from destructive influences.

"The committee will continue on the lines of investigation as shown, and holds itself in readiness to co-operate with the National Conservation Commission and its kindred and subsidiary organizations, as well as other national societies for the furtherance of the great principles of conservation of the national resources."

The very serious forest fires that occurred in the fall of 1910 were the subject of thorough discussion at a meeting of the Lake States Forest Fire Conference, held in St. Paul under the auspices of the Minnesota State Forestry Board and Minnesota Forestry Association, December 6 and 7, at which meeting the following was included in the resolutions adopted:

"We further recommend that the burning of all debris on the rights of way of the various railways be under the control and direction of the State Forest Patrol. Further, That under special conditions directed by the State Forest Patrol, the railway companies maintain a patrol, properly equipped, following their trains; also that all railway and logging locomotives and traction engines must be equipped with the most practical spark-arresting devices (subject to inspection and approval of the commission)."

The report is signed by A. S. Baldwin (I. C. R.), chairman; E. O. Faulkner (A. T. & S. Fe.), vice-chairman; Moses Burpee (B. & A.), W. A. Bostwick (Carnegie Steel Company), F. F. Busteed (C. P. R.), E. B. Cushing (S. C. L.), W. F. H. Finke (S. R.), J. W. Kendrick (A., T. & S. Fe), A. L. Kuehn (American Creosoting Company), G. A. Mountain (Canadian Railway Commission), William McNab (G. T.), C. L. Ransom (C. & N. W.).

Discussion on Conservation of Natural Resources.

A motion to receive the report as a progress report was carried.

ELECTION OF OFFICERS.

The following were elected officers of the association for the ensuing year:

President, W. C. Cushing; vice-president, Edwin F. Wendt; secretary, E. H. Fritch; treasurer, G. H. Bremner; directors, three years each, A. S. Baldwin, C. F. Loweth.

PRACTICE REGARDING THE MANUAL.

The President: The subject of practice regarding the manual will be a fruitful topic for discussion. Before we proceed with that, I would like to read from our fourth annual proceedings the remarks made by Mr. Berg: "It is desirable for the board of direction to consider the question of appointing a standing committee on standard specifications and definitions, whose duty it shall be to prepare final standard specifications and definitions, based on the adopted reports of the various existing standing or special committees on investigation, presented heretofore, or to be presented hereafter to the association; the work of this committee to be in the nature of a board of review, or revision, so that it can present to the association uniform and complete specifications or lists of definitions, which, if adopted by the association, shall be known and published as the recommended standards of the association.

Mr. McDonald: Without any idea of casting doubt on what Mr. Berg did, I would say the manual, as shown by the minutes of the board of direction, was first suggested by A. W. Sullivan, our vice-president. It was done in the earlier days of the association, but was not put into effect until some time later. There seems to be quite a strong sentiment among a large number of our members that we should not publish a manual as representing the selected subjects and matters which this association has acted upon, and I think it is due to the board of directors that they should know it, so we can abandon the plan of adopting standard specifications, and create ourselves into a body for the purpose of eliciting information from its members, and publishing it broadcast. We must pursue one course or the other, and I think it should be our aim to endeavor to promulgate specifications which can be used in securing competitive prices by the purchasing agents. I believe that board of review should be appointed, and it should not be from the board of directors, but from the membership at large.

Mr. Kittredge: I should be very sorry indeed to see the manual done away with. I appreciate that it is very difficult for an association with such a large attendance to discuss thoroughly and put into final shape, the reports of more than one or two committees. I think the remarks by Mr. Berg in regard to the manual contain a good deal that is worth considering. The question of appointing a board of review, outside of the board of direction, is rather a new thought to me, but if such a board could be obtained—and I have no doubt it could—I believe it would be better than to have it made a part of the duty of the present board. The members of the board of direction, when they get together, have a great many things to discuss. The work of editing and collecting, comparing and adjusting the various recommendations so that there will be no two in conflict, will take an enormous amount of time and careful study. I think it is absolutely essential, now that our manual has reached the size it has, that it should be very carefully and closely edited in all its parts, so that there may not be discrepancies between the different parts.

Mr. McDonald: In order to get an expression and discussion on the question, I move that we discontinue the publication of the manual.

Motion seconded.

Mr. Brooke: It would be a great loss, not only to the association and all its members, but to the railway world in general, to discontinue the publication of our manual, which goes all over America and to foreign countries as a reference book. It would be a great advantage to have the matter thoroughly reviewed and edited before being published, and all unnecessary and conflicting matter eliminated or brought into conformity.

Mr. Byers: It seems to me the question of the desirability of publishing the manual is not entirely what some of us have in mind. The manual is a source of information, is a very desirable and useful thing and it is very desirable that we shall continue to collect information of the character that we are placing in the manual, and bring it together as it is brought together in the manual. It seems to me the question, is the degree of backing that this association shall give to what the manual states is recommended practice. There are several reasons why it is not entirely desirable that we shall give too much backing to these recommendations. I think most of us have occasion, at times, to deal with the courts, and sometimes I think there has been an experience that the manual can be used in the courts to increase the difficulties of the engineers in dealing with the problems that he must confront in that way. The manual is apt to be taken as being not a recommended practice, but the only recommended practice. That is certainly not the case.

Mr. Rose: The necessity for the manual is to bring disjointed reports together, where one can find easily the work of the association. If the manual were discontinued, it would be necessary to search through all the volumes of the association's proceedings to find out what the associa-

tion thought about different things. It has occurred to me that we might have two manuals, one called "The Manual of Recommended Practice" and the other, "The Digest of the Committees' Recommendations," or "Committees' Reports."

The President: "Manual for Railway Engineering and Maintenance of Way Work."

Mr. Trimble: The aim was to get a title for that book, which would not indicate that the practice embodied in the book was the only practice that might be acceptable.

Mr. Loweth: The manual is good or bad, depending upon what is put into it. It seems to me we might very well have just the discussions and the votes that we take here in the convention, and then before anything goes into the manual, have it voted upon by letter ballot, so that nothing will go into the manual, unless it is approved by a majority vote of the membership of the association.

Mr. Camp: If the manual was not to be used I would be in favor of some kind of an index which would refer the reader back to the volumes of the proceedings in which the subject might be found. The manual should aim to cover principally the fundamentals of the subject, the underlying principles. If it is attempted to go into detail as largely as has been the case heretofore, the manual will not be successful, because we will have to keep revising it every year or two. In regard to the responsibility of the association in recommending certain things, I think it would be a splendid thing to have on the title page of the proceedings of the association and of the manual a statement to this effect: "It is the desire of this association that it be distinctly understood that practice which does not conform to the recommendations herein is not necessarily bad or incorrect practice."

Mr. Trimble: May I ask for the reading of the notice which it is intended shall be published in the manual of recommended practice and in our publications. It might clear up some of this discussion.

The President: The extract from the constitution is as follows: "The object of this association is the advancement of knowledge pertaining to the scientific and economical location, construction, operation, and maintenance of railways. Its action is recommendatory and not binding upon its members.

F. S. Stevens: It appears to be generally conceded that the manual should be continued. It is also the general opinion, I think, that there should be a board of review or a committee on revision. I would offer, therefore, as a suggestion, that a board of review should include, ex-officio, the chairman of all committees, so that in the matter of review they would have an opportunity to be heard. I think also we should have all ex-presidents on such a board as these men have had the advtantage of knowing everything that has passed before, and possibly we should also add some of the other officers. A board constituted in this way would be able to review the manual in a very satisfactory manner, I think, and greatly improve the value of the publication.

Mr. Wendt: At the present time the next issue of the manual is in print, subject to the modifications that this convention will make. Therefore, the money has already been spent. I am strongly in favor of a continuation of the publication of the manual because it enables us to readily turn to the results of the work of the convention, without looking through the large number of volumes which are already on the shelves of the libraries. Furthermore, the proceedings of this year are going to mean three volumes instead of two last year and one volume in former years; so that the number of volumes of our proceedings issued each year is increasing very rapidly.

The manual ought to be an expression of the wisdom of this association. It is not such today. There are conclusions in the manual that do not represent the wisdom of the engineers of this country and they have gotten into the manual by virtue of a lack of consideration. The legal responsibility of the manual need hardly be considered except from this standpoint: If a lawyer undertook to introduce the manual into a court he would be immediately required by the rules of evidence approved by the courts to test the manual by evidence, and unless he could prove by competent evidence that the principles outlined in our manual were the common, ordinary and usual principles which govern railways in the district over which that court had jurisdiction, the manual would have no standing. This is simply an application of the rules of evidence of the courts. We do get into trouble today because some portions of our manual have not been thoroughly considered. For illustration: An attorney called me up some time ago and asked: "Will you come over to court and testify for our company in a damage case that the American Railway Engineering Association has decided that a certain clearance is required?" I said: "No, sir, I will not; firstly, because it has made no such decision; and secondly, if it has made any such decision, it would be unwise." The attorneys are being told by somebody that there is such a thing in existence as the manual, that is above reproach, that is infallible, that contains the wisdom of the engineers of the country. That is not the fact, because adequate consideration has not been given to this question.

I think we should continue the manual, but divest our minds of any thought of issuing it in a way to indicate that it represents that which is infallible, or that which does not admit of variable application. It does seem to me that we could well afford to have a manual that would contain standard specifications under which ballast can be purchased; standard specifications under which rails can be purchased; standard specifications for track bolts, track nut-locks, spikes, screw spikes, tie plates, frogs, switches, guard rails, etc., specifications which would enable railways to get competition in the matter of prices, and specifications that would enable the railways to reduce their stock piles.

In my judgment the specifications contained in our proceedings are just as binding from the standpoint of responsibility when published in the proceedings as when published in the manual, and the specifications submitted by the committee on frogs and switches this year, and the specifications submitted last year are the best specifications ever put out in this country at the present time. I have compared them with the New York Central and Pennsylvania Lines specifications and I make that statement. So far as the manual is concerned, we can well afford to delay the publication of certain standard specifications, using one illustration, until such time as we are confident that they are complete and that they represent the best practice under which railways could make purchases all over the country.

I hope, gentlemen, that there will be no decision to discontinue the manual, because the voluminous proceedings of this association require that there shall be a digest. We should divest our minds of the idea that the manual commits us in any further degree from the standpoint of legal responsibility than the proceedings.

M. C. Byers: I move as an amendment to the motion before the house, that the governing committee present to the association a letter ballot giving the members an opportunity to decide upon which one of the three following things they wish done:

First, the abolishment of the manual; second, the continuation of the manual as at present; third, the continuation of the manual in a modified form as suggested by the governing committee at the time of sending out these bulletins.

Motion seconded.

Mr. McDonald: My object in presenting the original motion was to draw out discussion on the matter, and I think the discussion has been quite illuminating. With the permission of the gentleman who seconded me, I now desire to withdraw the motion.

Motion withdrawn.

Mr. McDonald: My own opinion is, instead of taking any action it should be delegated to the board of direction for such action as they see fit.

The matter was referred to the board of direction for such action as it deems the interests of the association warrant.

CONCLUDING BUSINESS OF THE CONVENTION.

Resolutions were unanimously carried expressing appreciation of the efforts made and the results obtained by the Railway Age Gazette and the Railway and Engineering Review in publishing daily editions during the convention.

It was announced that the change in name of the association and amendments to the constitution, submitted to letter ballot, had both passed.

A resolution was passed expressing the thanks of the association to the committee on arrangements for its earnest efforts. The committee on arrangements presented the retiring president with the first pin bearing the new name of the association. The convention then passed a resolution expressing appreciation of the work of the retiring president, and the convention adjourned.

VISIT TO THE NEW NORTH WESTERN TERMINAL.

A party of members and guests of the association were taken yesterday afternoon by C. A. Lichty, inspector of purchases of the Chicago & North Western, for a tour of this road's new passenger terminal.

NOTICE TO EXHIBITORS.

The exhibition of the Railway Appliances Association will close Friday night at 10 o'clock. Boxes will be brought up immediately afterward and the exhibitors may begin to get exhibits ready for shipment. They may make arrangements for removal any time after the hour for closing.

THE VOTING CONTEST FOR THE MONO-RAIL CAR.

The voting contest to determine which of the technical schools in the United States shall receive the model of the mono-rail car being demonstrated by Mr. Brennan at the Coliseum furnishes a good chance for the railway officers visiting the Coliseum to do a good turn for their alma maters. This little car was built especially for the appliances exhibition, and it embodies all the features of the large car which has been in successful operation. The ballots may be secured at the bureau of information, space A, in the very center of the Coliseum. The award will be made after the exhibition closes.

REGISTRATION—AMERICAN RAILWAY ENGINEERING ASSOCIATION ACTIVE MEMBERS.

Blaess, A. F., Asst. Eng. M. W., I. C. R. R., Chicago, Ill.
Brimson, W. G., V.-P. and G. M., Q. O. & K. C., Kansas City, Mo.
Chamberlain, O. P., Ch. Eng., C. & I. W. R. R., Chicago, Ill.
Cowper, J. W., Worden-Allen Company, Chicago, Ill.
Hanlon, W. B., Civil and Mining Engineer, Cleveland, Ohio.
Kent, A. S., Eng. M. W., C. I. & L. Ry., Chicago, Ill.
Liggett, Thomas, Jr., Ch. Eng., Western Allegheny R. R., New Castle, Pa.
Pence, W. D. (Editor of Publications), Prof. R. R. Eng., Univ. of Wis., Madison, Wis.
Pfeifer, N. J., E. M. W., Ter. R. R. Assn., St. Louis, Mo.
Ringer, Frank, Pr. Asst. Eng., M. K. & T., Parsons, Kan.
Thorne, J. O., Master Carp., C. B. & Q. Ry., Beardstown, Ill.
Young, G. F., Asst. Div., B. & O. R. R., Cleveland, Ohio.
Young, R. C., Ch. Eng., L. S. & I. and Munising Rys., Marquette, Mich.

RAILWAY SIGNAL ASSOCIATION PUBLICATIONS.

C. C. Rosenberg, secretary of the Railway Signal Association, is distributing a circular to the members, giving a list of the publications printed by the association which are now available. These are as follows: Vols. I and II, Digest of Proceedings, 1895 to 1905, inclusive; Vol. IV, Proceedings of 1907; Vol. V, Proceedings of 1908; Vol. VI, Proceedings of 1909; Vol. VII, Proceedings of 1910, and The Index to Signal Literature. These are cloth-bound and all $1 per copy. The Index is complete to April, 1910, contains 185 pages, and gives alphabetical lists of books, pamphlets, catalogues, etc., and a list of articles relating to railway signaling that have appeared in periodicals, preceded by a list of these periodicals. Paper-covered pamphlets may also be had, as follows: Specifications for wires and cables; double-braided weatherproof hard-drawn copper line wire; rubber insulated signal wire for current of 660 volts or less; aerial braided cables for current of 660 volts or less; galvanized E. B. B. iron bond wires; double-braided weatherproof galvanized B. B. iron line wire; rubber insulated lead-covered armored submarine cable for 660 or lower voltage service; double-braided weatherproof hard-drawn copper-clad steel line wire; all at 25 cents per copy. The report of the committee on electric signaling for electric railways is also available at 25 cents per copy, and the standards (59), as approved by the association, size 10 in. by 14 in., in blue-print, Van Dyke positive, or Van Dyke negative form, may also be had. Prices of these will be given on application. The price of the membership certificates is $1.25 each.

AMENDMENTS TO CONSTITUTION.

After carefully considering a petition signed by ten active members, the board of direction of the association acted favorably on a proposition to amend the constitution, and the amendments proposed were submitted to letter ballot on January 18, 1911, which resulted in an affirmative vote. The important changes in the constitution include the following:

In article I, the name of the association was changed to the American Railway Engineering Association. This change was considered so important that it was voted on separately. The only other change in this article was the addition of a clause stating that the action of the association shall in all cases be recommendatory and not binding on its members.

In article II, on membership, the grade of "active member" is changed to simply "member." In the eligibility clause the word has been changed in several cases, without effecting any real change in the requirements for membership. Honorary members are to be exempt from the payment of dues. A clause has been added which defines the word "railway" as one "operated by steam or electricity as a common carrier dependent on transportation for its revenue." This clause provides that engineers of street railway systems and of railways which are used "primarily to transport materials or products of industries to and from a point on a railway which is a common carrier, or those which are merely adjuncts to such industries," shall be eligible only as associates. The clause referring to persons engaged in the sale or promotion of railway supplies is changed to read that "persons whose principal duties require them to be engaged" in such lines shall not be eligible for membership. It is further provided that any member who shall become subject to the operation of this clause shall, if he again becomes eligible, be admitted to membership without the payment of a second entrance fee.

In article III, on admissions and expulsions, the wording of the first clause was changed to take into account the fact that the charter membership is now completed. The provisions for election, reinstatement and expulsion remain practically the same.

No important change was made in article IV, on dues.

In article V, on officers, the number of directors is increased from 6 to 9, making it necessary to elect three directors at each annual convention instead of two as at present. The board of direction is made to include the last five instead of the last four living past presidents. A clause is added which requires candidates for president and vice-president to be selected from the members of the board of direction. It is provided that the office of president shall not be held twice by the same person, the former provision on this point being that a president should not be eligible for re-election to that office until a period of eight years had elapsed after the expiration of his previous term. Clauses were added which provide that a vice-presidency shall not be considered vacant when one of the vice-presidents is filling a vacancy in the presidency; that any vacancies for the unexpired term in the membership of the board of direction shall be filled by the board; that an incumbent of any office for an unexpired term shall be eligible for re-election to the office he is holding, with an exception applying to directors who were elected within six months after the term commenced; and that when an officer ceases to be a member of the association as otherwise provided his office shall be vacated and filled according to other provision.

In article VI, on nomination and election of officers, a nominating committee is created which shall consist of the five latest living past presidents and five members not officers who

are to be elected annually when the officers of the association are elected. It is the duty of this committee to nominate candidates to fill all offices and also vacancies in the nominating committee caused by expiration of term of service. The number of candidates to be nominated is specified, there being only one in the case of president, vice-president, treasurer and secretary; nine directors, of whom three are to be elected; and ten members of the nominating committee, of whom five are to be elected. It is further provided that the senior past president shall act as permanent chairman of the committee and issue calls for meetings. Nominees for offices are to be agreed on at a meeting held prior to December 1 of each year The names of these nominees are to be announced by the permanent chairman to the president and secretary not later than December 15, and the secretary is to report to the members of the association on a printed slip not later than January 1 following. At any time between January 1 and February 1, any ten or more members may send to the secretary additional nominations. Not less than 30 days prior to the convention the secretary shall issue ballots to all members in good standing, who may erase names from the printed ballot and substitute other names, the number voted for not exceeding the number to be elected. Ballots are to be returned in a sealed envelope endorsed with the name of the voter before 12 o'clock noon on the second day of the annual convention, at which time three tellers are appointed to count the ballots. The persons receiving the highest number of votes for the respective offices are declared elected. In case of a tie the members present at the convention are to elect the officer by ballot from the candidates so tied.

In article VII, on management, a clause is added providing for the auditing of the accounts of the secretary and treasurer by a public accountant under the direction of the finance committee of the board of direction. A provision is made for special meetings of the board of direction, which shall be called on the written request of five members of the board. The board quorum is increased from 5 to 7. To the list of board committees is added one on "outline of work of standing committees," which is to consist of five members. The duties of the library committee are made to include the direction of expenditures for books and other articles of permanent value to be used in the offices of the secretary. The new committee on outline of work of standing committees is to present a list of subjects for committee work during the ensuing year at the first meeting of the board of direction after each annual convention. A clause is added to this article providing that an act of the board of direction which receives the express or implied sanction of the membership at an annual convention shall be deemed an act of the association and shall not afterwards be impeached by any member.

In article VIII, on meetings, the principal change is a provision for special meetings of the association to be called by the board on request of 30 members, who shall state the purpose of such meetings. The call for a special meeting shall be issued not less than ten days in advance and shall state the purpose and place thereof, and no other business shall be taken up at such meeting.

No essential changes are made in article IX, on amendments.

ASPHALTIC OILS FOR TIE PRESERVATION.*

The results obtained in the asphaltic crude oil treatment of railway ties by the Santa Fe and the National of Mexico have shown that waterproofing asphaltic crude oils have a claim for serious consideration as successful wood preservatives.

An investigation of the asphaltic crude oils located in sections of the country other than California or Mexico discloses the fact that, in their natural condition, the crude asphaltic oils foreign to these two localities are too volatile, highly inflammable, and not sufficiently viscous to prove of value as a wood preservative; therefore it is necessary to refine oils having an asphaltic base in other localities, thereby securing preservative oils which are similar and in some instances superior to the western asphaltic oils.

The attached table shows a complete analysis of three asphaltic oils, viz., the Western Bakersfield (Cal.) asphaltic crude oil now in use by the Santa Fe at Albuquerque, N. M.; the Mexican Ebano asphaltic oil, and finally the refined product of an asphaltic crude oil found in the central United States.

COMPARATIVE TESTS OF PRESERVATIVE OILS.

	Mexican Ebano.	California Bakersfield.	Central U. S. Timber-asphalt.
Flashes in closed tester (deg. Fahr.)	176	256	410
Flashes in open tester (deg. Fahr.)	190	268	470
Degrees Beaumé at 60 deg. Fahr.	12.1	11.9	19.2
Specific gravity at 60 deg. Fahr.	.9849	.9867	.9388
Distilling tests, using a retort (per cent. coming over):			
0 deg. C. to 100 deg. C. per cent.	....	....	....
100 deg. C. to 150 deg. C. per cent.	1.0	....	....
150 deg. C. to 300 deg. C. per cent.	20.1	15.0	....
Distilling tests, using flash thermometer opposite take-off:			
0 deg. C. to 100 deg. C.	....	....	....
100 deg. C. to 150 deg. C.	1.1	....	....
150 deg. C. to 300 deg. C.	22.6	16.0	23.5
Evaporation tests, placed in open dishes in air oven at 140 deg. Fahr.; oil 1.4 in. deep:			
In 24 hours, per cent.	6.8	2.3	....
In 96 hours, per cent.	9.4	4.6	....
Evaporation tests, placed in open dishes in air oven at 200 deg. Fahr.; oil 1 in. deep:			
In 24 hours, per cent.	9.8	4.8	.033
In 96 hours, per cent.	11.4	11.5	.132

Fractional Distillation (Standard Method).

	Creosote.	California Bakersfield.	Central U. S Timber-asphalt.
Specific gravity at 38 deg. C.	1.04	0.965	0.928
Below 210 deg.	Not more than 5 per cent.	0.50 water	0.333
210 deg. to 235 deg.	Not more than 25 per cent.	0.60 naphtha and water	0.50
235 deg. to 270 deg.		1.50 light oil	
270 deg. to 315 deg.		6.70 gasoline	34.166
315 deg. to 355 deg.		14.50 kerosene	
Residue		75.00 asphaltum	65.00
Spec. grav. of residuum at 38 deg. C.		0.99	

Note.—Bakersfield oil has been exposed in an open pan for one year and so far has shown practically no loss by evaporation.

Viscosity tests, using Scott's viscosimeter in which 200 C. C. oil is put in the viscosimeter and the number of seconds required to pass 50 C. C. through a small artifice is recorded. The standard for this machine is 11 seconds for 50 C. C. distilled water at 60 deg. Fahr.

Oil Heated to—	Mexican Ebano.	California Bakersfield.	Timber-asphalt.	Creosote.
100 deg. Fahr.	3,000	1,565	595	18
150 deg. Fahr.	339	238	115	16
200 deg. Fahr.	110	44.5	32	15
220 deg. Fahr.	70	31.5	23	11
250 deg. Fahr.	40.5	22	20	11

(Water 60 deg. Fahr.—11 seconds.)

During the month of April, 1910, various tests were made at the C. B. & Q. experimental plant at Galesburg, Ill., to thoroughly investigate the properties of a refined grade of an asphaltic crude oil as a wood preservative. Tests were run to determine whether this more economical oil could be used as a substitute for creosote oil in the card process. In these tests a mixture of 23 per cent. asphaltic oil and 77 per cent. of a 5 per cent. zinc chloride solution was used. The results from this experiment proved that asphaltic oils could not be used in the card process, because of the formation of a viscous emulsion, or saponification, which permitted the zinc chloride to penetrate the wood in large quantities but prevented the entrance of the asphaltic oil into the wood. The fact that the zinc solution separated from the emulsion and penetrated the wood, leaving a thick mass of oil and emulsion distributed either irregularly through the wood or on the exterior of the timber, proved the futility of trying this process further, especially as the

*From a paper presented by F. W. Cherrington at the annual meeting of the Wood Preservers' Association.

mixture was exceedingly hard to handle in the pumps and valves.

After determining the fact that the asphaltic residual oil could not be successfully used in the card process, additional test runs were made to determine with what degree of success the straight asphaltic oils could be injected into the wood, and finally a mixture of 75 per cent. of asphaltic oil to 25 per cent. of creosote.

The experiments at Galesburg demonstrated that fairly good penetration could be secured on the various oaks, elm, beech, gum, etc., ties when injecting all the preservative the ties would absorb. This maximum amount was found to be about 7 lbs. per cubic foot. Pine trees (short leaf) were found to readily absorb the straight asphaltic oil in good quantities with thorough penetration.

The treatment with 25 per cent. creosote to 75 per cent. asphaltic oil proved that the viscosity of the oil was greatly reduced by the addition of creosote, and about the same penetration and absorption could be obtained as with straight creosote with a greatly reduced cost of treatment.

In order to determine whether the same proportion of 25 per cent. creosote to 75 per cent. asphaltic oil existed in the tie after its injection, a sample of the borings extracted from several ties injected with this mixture was taken and analyzed by a competent chemist, which proved that the mixture remained in a stable and homogeneous combination.

From the results secured in the comparative analyses of the oil extracted from the borings of the treated ties, the original creosote oil and the original mixture of 25 per cent. creosote to 75 per cent. asphaltic residual oil, it is safe to state that the mixture found in the treated ties approached the original proportions, and that the mixture injected into the ties contained about the same proportion as the original mixture before injection; hence, the mixture of creosote and asphaltic residual oil remained in homogeneous solution before, during and after its injection into the wood.

In the fall of 1909 a large tank car of heavy asphaltic residual oil was shipped to the low-pressure plant of the Indianapolis, Columbus & Southern Traction Company at Columbus, Ind. At that time a co-operative agreement was entered into between the refining company to furnish the oil, the traction company to furnish the plant and ties, and the United States Forest Service to supervise the tests and to record the experimental data. This initial test at Columbus, Ind., proved a failure because of the inability of the small capacity pressure pump at the treating plant to handle the thick, viscous asphaltic residual oil which was at that time a grade very much heavier than the product which has eventually been adopted by the refining company as a more satisfactory material. Before this test was completed, however, it was found that the asphaltic oil resisted the forcing of zinc chloride solution through an injection of 3 lbs. of asphaltic oil per cubic foot to a very much greater degree than the same quantity of creosote. This proved the superior waterproofing quality of the asphaltic oil, as it is safe to assume that a material which would resist the forcing of a water solution through such a limited injection of 3 lbs. per cubic foot would successfully resist the action of water even under abnormal conditions to which treated material is generally subjected.

One other test made at the laboratory of the above-mentioned refiner may prove of interest in showing the additional waterproofing quality of the asphaltic oil. A paving block of standard size was treated with residual asphaltic oil to the amount of 16 lbs. per cubic foot. It was then dried in an oven of a temperature of 120 deg. Fahr. for a period of 24 hours, weighed and then immersed in clear water for a period of 24 hours. The gain in weight was found to be 0.02 of 1 per cent. The same block, if treated with 20 lbs. per cubic foot of creosote, would have been allowed to absorb as high as 3 or 4 per cent. of the water by weight.

The most recent test on asphaltic oils occurred in November, 1910, when several tank cars of asphaltic residual oil was shipped to the Mount Union plant of the Pennsylvania Railroad for a trial in the large cylinder at that plant. At this test three charges were run with straight asphaltic oil and three with a mixture of 33⅓ per cent. creosote to 66⅔ per cent. asphaltic oil. When this proportion of asphaltic oil and creosote was exhausted, more creosote oil was added as required until the proportion again assumed 100 per cent. creosote.

Sections sawed out of the center of the pine ties showed complete penetration through the sap wood to the heart, this being an equivalent penetration to that secured by the use of creosote.

It was found that the red oak, beech, elm and gum ties varied in the penetration secured, being dependent upon the amount of sap and heart wood in each tie. The penetration was not equivalent to that secured by creosote in all cases, but approached very nearly the results secured through the use of creosote. When the difference in viscosity between the two oils is considered this result is not remarkable.

In each of the straight asphaltic runs, eight ties were marked and weighed before treatment, being selected as average samples from among the 500 ties composing each charge, and placed in various positions in the cylinder. After the process of treatment had been completed the ties were again weighed and the absorption results of two charges with straight asphaltic oil secured.

The results secured on the mixture of creosote and asphaltic oils proved in every instance, as far as absorption per tie and the element of time for treatment may be concerned, equivalent to the results secured by the use of straight creosote oil. It must be admitted, however, that the asphaltic oils when used alone require a larger period of time for injecting an equivalent quantity of creosote, which quantity has been observed to be, in most cases, on hard woods, the maximum quantity.

Following these tests in the large cylinder, tests were made in the experimental cylinder on the Rueping process in the treatment of mixed oak and pine ties with straight asphaltic oil. The absorption obtained in the limited number of tests made on the Rueping process were very satisfactory, as the same penetration was secured by a limited quantity of oil as was secured by a larger quantity of oil in the straight asphaltic oil pressure process. This experimental test merely proved the applicability of asphaltic oils for use on a large scale in the Rueping process, although it is readily admitted that there are no long-time practical tests to emphasize the theoretical deduction that the treatment would be a good one. It is also readily admitted that the only value of asphaltic oil obtained from the central United States, as a wood preservative, would be in using a parallel treatment to that in which the Santa Fe has obtained such excellent results, viz., the injection of maximum quantity of oil into the wood. The only object in citing the experiment on the Rueping process is to show that the asphaltic oils are at least applicable.

As the distillation data in the table demonstrates that the fractions of asphaltic residual oil possess high boiling points, comparing in this respect very favorably with good coal-tar creosote and at the same time comparing favorably with the analysis of the Bakersfield oil, it seems reasonable to assume that it has great value as a wood preservative.

It has been claimed that if the asphaltic oils were injected in maximum quantities into the various specie of red oak, beech, elm, gum, etc., the quantity which would be

absorbed per tie would be so great that there could be no economy in its use. The attached data and the cross-section samples taken from the ties in the several tests made on these specie of wood with asphaltic residual oil prove that this is not the case. Good penetration has been secured by not over an 8 lb. per cubic foot injection of asphaltic oil, which also proved to be the average amount the various timbers would absorb.

This proves the case with all except the short leaf pine ties, and even with that species the amount of oil necessary to secure a maximum injection was not found to be prohibitive from the standpoint of economy.

The Santa Fe and the National of Mexico have demonstrated by a practical test, under abnormal conditions of about nine years' duration, the value of asphaltic oils when injected into pine ties to refusal. Some of the ties which successfully withstood this test contained a small amount of oil, yet it was in all cases the maximum quantity which the ties would absorb.

The foregoing data is the result of observations and experiments extending over several years with the asphaltic base oil to be found in such immense quantities throughout the central part of the United States.

TRACK ELEVATION AT NINETY-FIFTH STREET AND SOUTH CHICAGO AVENUE, SOUTH CHICAGO

In connection with the elimination of highway grade crossings which has been so vigorously prosecuted by the railways in Chicago for the past 15 years, there has been a very marked tendency for the roads to do away with grade crossings with each other wherever possible. While making the heavy expenditures necessary to get above the streets, the roads have decided in most cases to spend enough more to avoid the steam road crossings, with their expensive delays to traffic, which delays are continually becoming more serious as the business increases. From the very nature of the conditions, such double elimination of crossings is very costly, and introduces many complications, not the least of which is the handling of all construction work without delay to traffic. At no other point has the work assumed such magnitude or become so general as at Chicago.

A very good example of the problems met with is presented at Ninety-fifth street and South Chicago avenue, South Chicago, where work has recently been started. At this point the double-track main line of the Pittsburgh, Fort Wayne & Chicago and the three-track main line of the Lake Shore & Michigan Southern, running northwest and southeast, cross the single-track lines of the South Chicago branch of the Chicago, Rock Island & Pacific and the Chicago & Western Indiana belt railway running east and west. The Baltimore & Ohio double-track main line parallels the Lake Shore from the southeast to the crossing where it connects with the Rock Island, passenger and time freight trains using these tracks west for about 6 miles in entering the city. Freight trains on the Baltimore & Ohio other than time freights turn north at the crossing instead of connecting with the Rock Island and proceed to the Baltiomre & Ohio yard at Ninety-second street, where they are arranged for distribution in the city. After classification, Baltimore & Ohio transfer engines take them to the city by way of Ninety-fifth street and the Rock Island tracks. Just south of the crossing the Cummings branch of the Fort Wayne turns off to the south and extends into the manufacturing district on the north bank of the Calumet River. A similar line owned jointly by the Rock Island and the Belt railways turns off from these roads a short distance west of the crossings and, crossing the Fort Wayne branch about 700 feet south, runs parallel to it for some distance, connecting with the Irondale branch of the Rock Island,

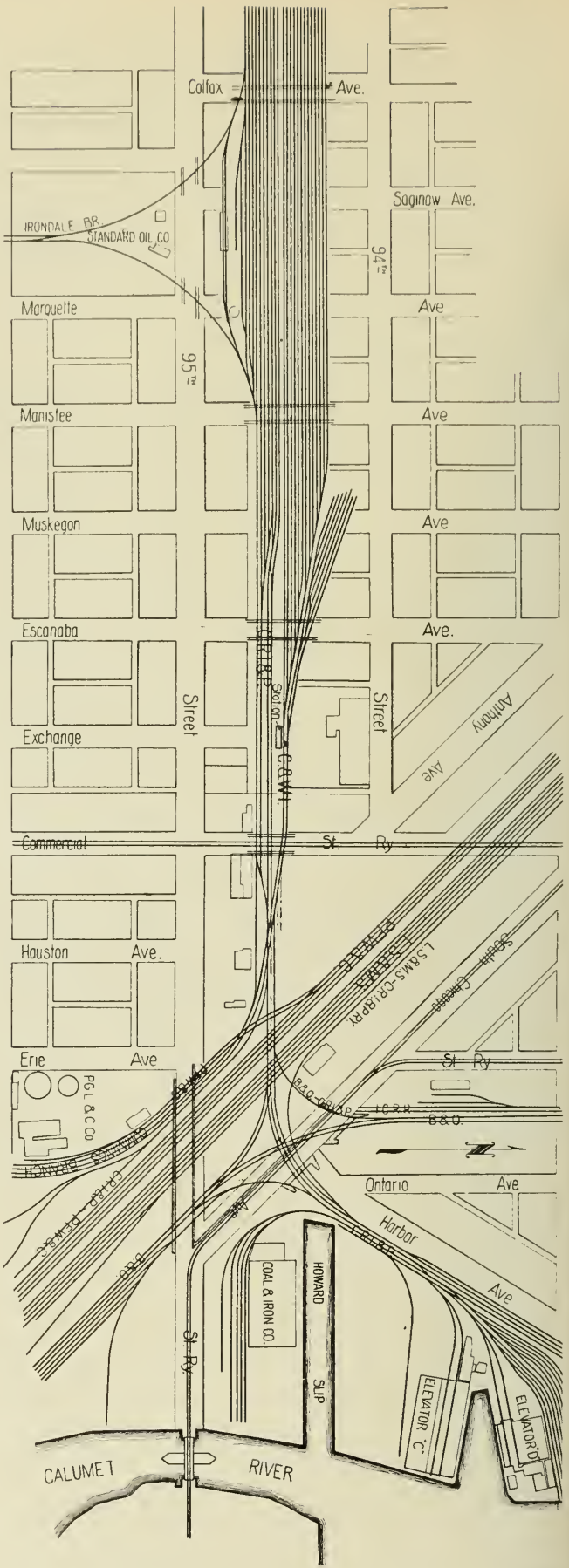


Fig. 1. Final Track Layout for Grade Separation at South Chicago.

which leaves that line about half a mile west of the crossings, and forming a loop. In addition, Y connections are maintained between the Rock Island and Fort Wayne, the Rock Island and Lake Shore and between the Baltimore & Ohio and the Rock Island on three sides.

All passenger and freight trains of the Fort Wayne and Lake Shore entering Chicago cross these crossings, as do all Baltimore & Ohio trains, freight trains passing over them twice, going to the Ninety-second street yard and then into the city. With the exception of the Baltimore & Ohio passenger trains, the Rock Island track is used for freight service only, this branch extending from a connection with the main line to the South Chicago industries, while the Belt railway is used exclusively for freight service. Both the Rock Island and Belt railways have transfer yards a short distance west of the crossing, that of the Belt containing 32 tracks. At these yards deliveries are received from eastern roads and the very heavy tonnage from the steel mills, elevators and other large industries of the Calumet district is classified. All business from this territory routed via the Rock Island is delivered directly to this road, which also receives that destined for the Illinois Central, delivering it to the latter road at Burnside, about three miles west of the crossing. An average of 20,000 cars per month is handled in this yard by the Rock Island. At certain seasons of the year traffic originating in this district equals that handled by the Rock Island in all the rest of Chicago combined. During the latter part of the month the grain business for the elevators is very heavy, often reaching 200 cars daily for its two elevators. The traffic handled by the Belt in its yard averages about 35,000 cars monthly, consisting almost entirely of transfer business.

Considering the amount of traffic handled in this territory, one would expect the number of train movements across this crossing to be very high. A record was kept for several days last Summer, and the total number of train movements of all kinds across these crossings reached over 500 during the daytime and nearly 400 at night, or a total of about 900 during the 24 hours. Of these there are 149 scheduled passenger trains, the maximum interval between the passenger trains during the daytime being 35 minutes, with a general average of about 7 minutes. As many of the freight trains are long and hold the crossings several minutes when passing, they are not permitted to proceed on the time of passenger trains, resulting in constant delays. These delays are especially heavy shortly before midnight, when the various roads are endeavoring to deliver their transfers to save the per diem charges.

The ordinance for this work was passed by the city council of Chicago on June 25, 1906, and required that all work should be completed before December 31, 1911, except that on the Rock Island and Belt railways west of Colfax avenue, which must be completed by December 31, 1916. In compliance with this and other ordinances the Fort Wayne and Lake Shore have already completed their elevation work from the city to the Indiana state line, with the exception of this one piece across the crossings and extending south about 2,000 feet across the Calumet River. The Baltimore & Ohio has also completed its work south of the river. Previous to last Fall neither the Rock Island nor the Belt railways had done anything on elevating their tracks. This ordinance provides for the elevation of their tracks from Jeffrey avenue east to include the crossings, or a distance of about 2 miles.

Preparation of plans for the entire project as far as it has effected the various roads at the crossings has been held up by the recent decision of the United States government to widen the Calumet River, necessitating a change in bridges

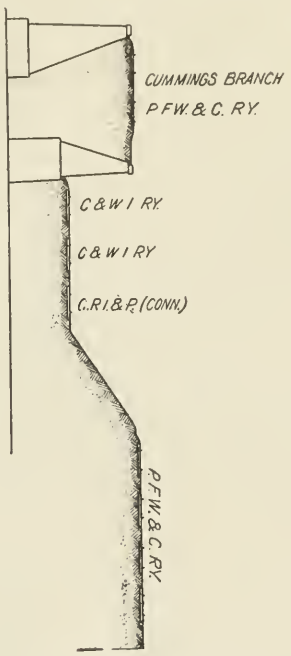


Fig. 3. Cross Section South of Crossing.

from those now in. Last December the government ordered the present bridges removed and submitted two options to the roads, defining the class of structures which would be satisfactory to it, one providing for two 90-foot clear openings with a center pier and the other for one 140-ft. clear opening. The roads have recently accepted the latter option and are now working on designs of these structures, but have not submitted plans to the government for approval.

While many of the detailed designs of walls and subways are not completed, the general plan has been definitely fixed by the ordinance and by agreement between the roads concerned. The Rock Island and Belt railways will start elevat-

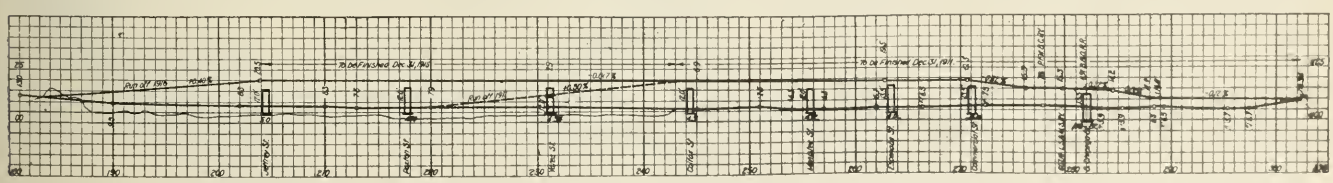


Fig. 2. Profiles of Chicago, Rock Island & Pacific and Chicago & Western Indiana Belt.

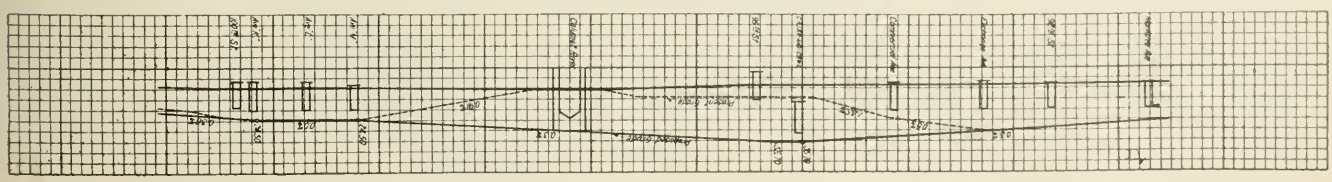


Fig. 2a. Profile of Pittsburg, Fort Wayne & Chicago and Lake Shore & Michigan Southern.

ing their tracks about 800 feet east of the crossing and rise to an elevation of 15.3 feet, Chicago City datum, at the crossings. Beyond this point they will rise to an elevation of 19.5 feet, about 15 feet above the old grade, and continue at this height to the limits of the work. The Baltimore & Ohio will cross the Calumet River at an elevation of 23.0 and Ninety-fifth street at an elevation of 17.8 feet and then descend on a 0.7 per cent. grade to the connection and crossings of the Rock Island. North of the crossing the grade will rise to an elevation of 20.5 feet at Ninety-third street subway. The Fort Wayne and the Lake Shore will cross the Rock Island and the Belt at an elevation of 35.7 feet, which, allowing for 3.4 foot depth of bridge floor, provides 17 feet clearance at the crossings. They will descend on each side on 0.3 per cent. grades, to connect with their previously completed work.

In planning for this work provision has been made for additional tracks. Five tracks in all are planned for the Lake Shore, while the Fort Wayne is providing for four. A double-track is to replace the present single-track of the Rock Island, while the Cummings branches of both the Fort Wayne and the Belt railways will be double-tracked. The Y connections between the various roads will be quite radically changed to fit the new conditions, the final layout being shown in Fig. 1. The present connection between the Lake Shore and the Rock Island (shown on Fig. 5) will be taken up and a new one built on a smaller radius and on a level grade until it crosess the Baltimore & Ohio-Rock Island connection, after which it will run parallel to the Lake Shore on a 1 per cent grade until it reaches the elevation of the main tracks. The three Baltimore & Ohio-Rock Island connections will be on nearly level grades. Due to the burning of a large elevator near the river on the east side of the Baltimore & Ohio tracks recently and the probability that it will not be rebuilt, the connection southeast of the crossing may not be built, as it was used only for this elevator business. Just west of the Fort Wayne tracks the most complications are introduced. The Rock Island-Fort Wayne connection will turn parallel to the Fort Wayne and then rise on an 0.8 per cent grade to the level of the Fort Wayne tracks. The double-track Fort Wayne Cummings branch will leave the main line just north of the crossings, instead of south as formerly, and continue at the main line elevation until it has crossed the Belt line Cummings branch as well as the main lines. In this way another grade crossing is entirely eliminated. Entrance to a boiler works and a gas plant a short distance south of the crossings complicate matters and tracks to these plants will be entirely rearranged. Just south of the crossing on the west side, the low tracks of the Rock Island-Fort Wayne connection and the Belt railway's double-track Cummings branch are between the high Fort Wayne main tracks and their Cummings branch tracks, presenting a cross section as shown in Fig. 3.

The agreement made by the roads provided that each road do the work under its own tracks except at the South Chicago avenue subway, where the Baltimore & Ohio will make the plans and do the work. The roads crossing at the lower level pay a proportion of the increased expenses incurred by the Fort Wayne and Lake Shore in crossing overhead.

Late last Fall the crossings were raised to the final grade of the lower tracks by the Rock Island and the Western Indiana, with temporary run-offs to the old grade. In raising these tracks across South Chicago avenue, the street had to be raised accordingly about 8 feet in order to maintain street

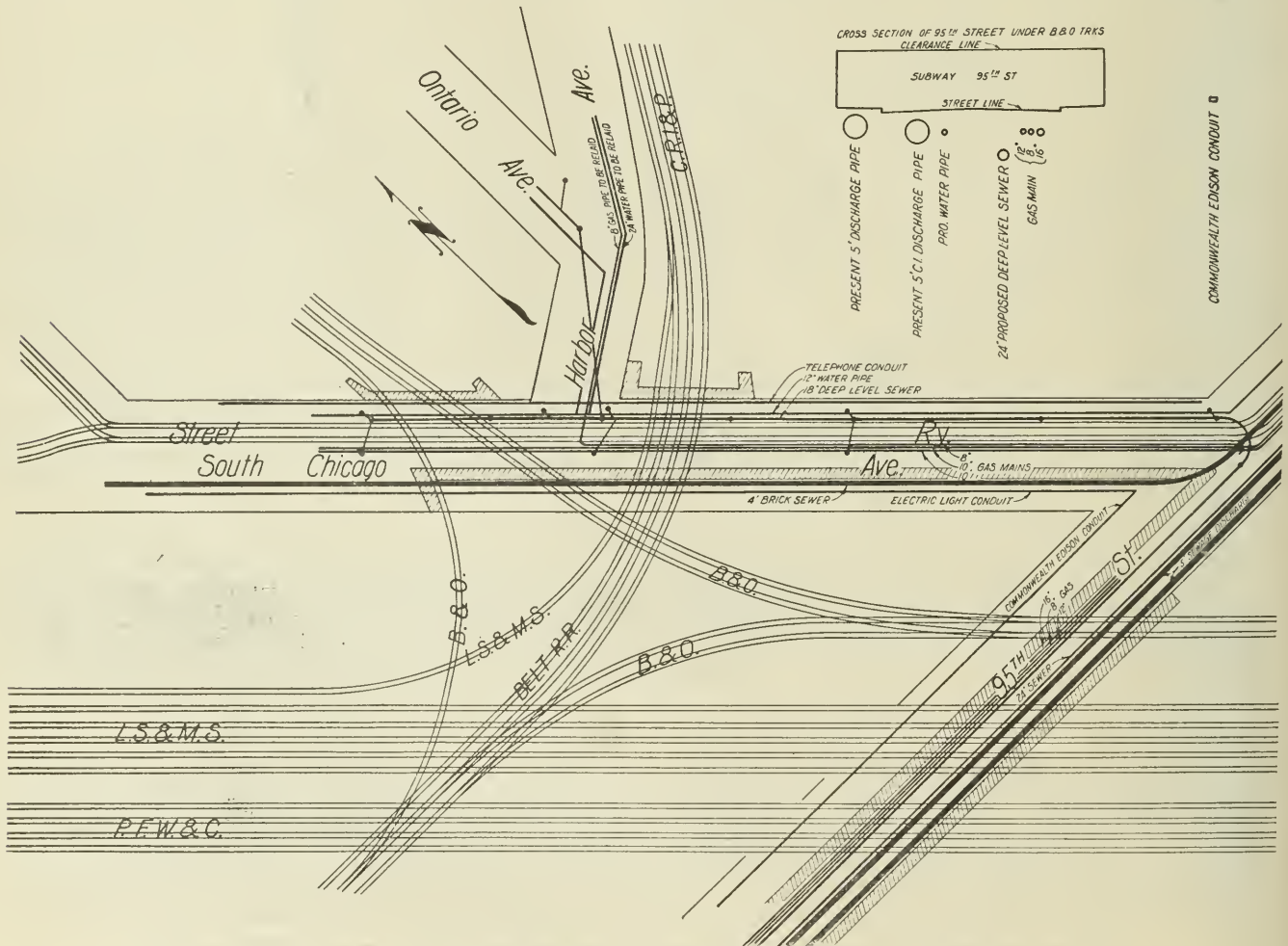


Fig. 4. Subways at Ninety-fifth Street.

car and team traffic. This year a subway will be built here and the street level lowered 7 feet below what it originally was.

The Rock Island has started work within the past month on their elevation west of the crossing. Six subways will be built with the standard clearance of 12 feet required by the city in all cases where there are no street cars, and 13½ feet where there are street cars. On several of these structures the subways will be of steel construction, with all the steel, including pillars, cross girders and I-beam floors, entirely encased in concrete.

The Rock Island will increase its present yard from 8 to 10 tracks this year and plans are made for 7 additional tracks. In elevating the yard the outside new tracks will be raised to grade, after which the other tracks will be raised by spreading from the adjacent high track. Temporary pile structures will be built across the streets, which will be left open and the permanent subways built after all the tracks are up. This year's work will require 350,000 cubic yards of filling, which will be brought in by contract. It is probable that the method followed last year, of bringing in sand over the Lake Shore from Dune park, the loading being done by contract and the unloading by company forces, will be followed. Because of the lightness of this sand, it will be covered with cinders as fast as the tracks are brought up to grade, to hold it down, except under the two main lines, where rock ballast will be used. In all, about 50,000 yards of cinders and 7,000 yards of crushed rock will be required for this work. For hauling

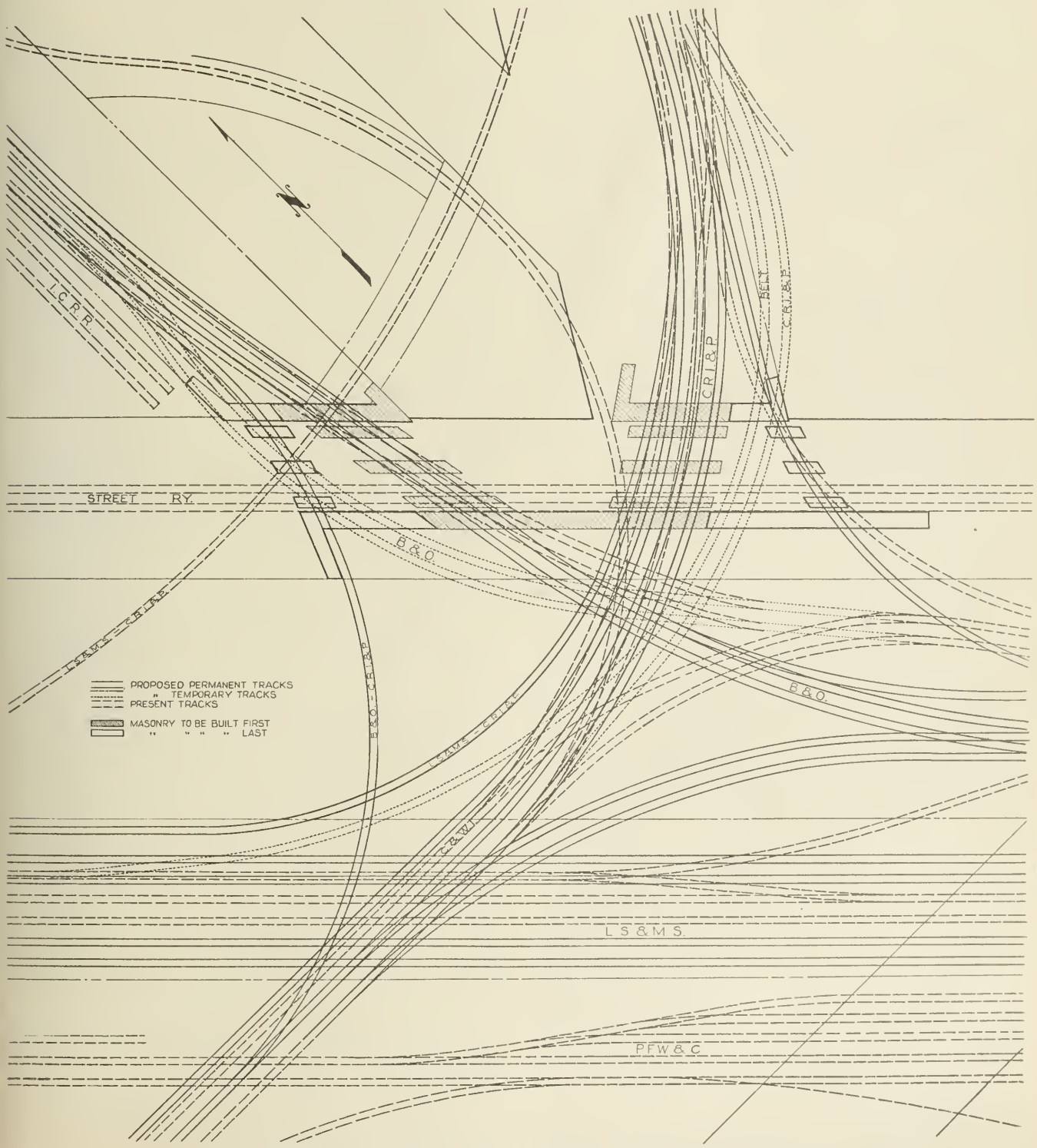


Fig. 5. Construction Track Layout at South Chicago Avenue Subway.

the sand 200 Hart convertible cars will be used. In addition, three freight locomotives, three switch engines, 40 flat cars and one spreader have been allotted to this work. One 10-ton locomotive crane with clam shell will be used to load cinders which have been stored during the winter.

The Rock Island's Irondale branch will be carried across Ninety-fifth street on the elevation, necessitating a subway under each leg of the Y. South of Ninety-fifth street the track will run down to the old level. In the Y and next to the yard tracks a four-stall frame engine house will be built for the use of the switch engines. An air hoist coaling plant, cinder pit, 115,000-gallon steel water tank, and three cranes will be installed. A new yardmasters' office will be built and a new depot is contemplated. East of the crossings the run-off built last year will be extended, requiring the raising of the tracks in the elevator yards to the doors of the elevators. In connection with this work the entire layout will be changed and rebuilt under traffic.

A very complicated problem is met with in the construction of the subways at Ninety-fifth street and South Chicago avenue, shown in Fig. 4. By agreement, the Baltimore & Ohio will construct all of the South Chicago avenue subway, while each road builds that part of the Ninety-fifth street subway under its own tracks. The opening at Ninety-fifth street is a new one, the street not having been used previously. A large part of the piling for the temporary structure at this street has already been driven and the excavation is well under way. The difficulties due to the various water and gas mains are indicated by Fig. 4. In driving piling under its tracks, the Baltimore & Ohio hit a gas main, emptying a large tank a short distance away in a few minutes. One 5-foot sewer had to be moved laterally 3½ feet to provide room for the base of a column and all the gas and water mains had to be lowered. The 48-inch sewer in South Chicago avenue, which turns into Ninety-fifth street, is so high that the oval top will have to be removed and a flat cover inserted to give the necessary clearance for a short distance in Ninety-fifth street.

In planning the construction of the subway on South Chicago avenue, estimates were prepared on two methods of handling the traffic during construction. One way was to follow the customary plan of driving piling and carrying the tracks on timber structures on their present location. The other was to lay temporary tracks on the bank to one side and then complete a part of the structure while the traffic was turned over to these temporary tracks. Estimates of the cost of the pile structures which would be necessary totaled $20,000, and of the temporary tracks, including seven new crossings, amounted to $7,000. In addition to the saving of $13,000 by using the latter plan, the interference with traffic would be very much less, and in driving piling there is the constant danger of hitting pipes and gas mains. The second plan was decided on. The temporary track arrangement, together with the order of building the subway, is shown in Fig. 5.

The ordinance provides that Harbor avenue be raised about 4 feet and paved for about 700 feet, descending into South Chicago avenue subway. As South Chicago avenue was raised about 8 feet last Fall, and now has to be lowered 7 feet the original level or to an elevation of minus 0.5, the excavation quantities will be large. It is planned to move the dirt with a steam shovel and small cars and use the material to fill Harbor avenue. After the first section of the subway is completed, the operation will be repeated on the balance. The floor of the subway being 0.5 feet below lake level, a new sewer must be built to drain it.

After the work is completed, grade crossings will still exist between the Rock Island and Belt and the Baltimore & Ohio freight tracks, and also between the two Y tracks northeast of the crossing. There will also be the junction of the Baltimore & Ohio tracks with the Rock Island. An interlocking plant is proposed for this, but no plans have been drawn.

We are indebted for the above information largely to the following officers, who are in charge of this work for their respective roads: J. B. Berry, chief engineer, and C. W. Petersen, engineer track elevation of the Chicago, Rock Island & Pacific; F. L. Stuart, chief engineer, L. G. Curtis, engineer maintenance of way, and F. G. Toeniges, engineer track elevation, Baltimore & Ohio; Thomas Rodd, chief engineer, R. Trimble, chief engineer maintenance of way, and D. M. Craig, engineer track elevation of the Pennsylvania's Northwest System.

WATER STATIONS FOR TRACK PANS.*

Track pans are primarily used to enable trains to take water while in motion. Their use up to the present time has been almost entirely confined to fast passenger trains making long runs between regular stops, but with increased efficiency from design of pans, methods of feeding and keeping water from freezing and improved scoops, the track pan is being adopted for freight trains, especially where it is desirable to keep trains moving, and in consideration of the excess cost of stopping and starting, the wear and tear of rolling equipment and the danger of breaking draft gear. The relative economy of the delivery of water to locomotives by the track pan and by the tank spout or standpipe is dependent from an operating standpoint upon: First cost, interest, depreciation, maintenance, operation, including cost of water, loss of energy expended in drawbar pull overcoming the dynamic pressure of water from pan or scoop, speed of trains, ruling grade, loss of time and cost of stopping and starting, including wear and tear on rolling equipment, etc. These factors will have a wide variance for different location and designs; hence each particular case should be figured separately.

The track pan should preferably be located on tangent, although it is possible to place same on curves up to three degrees and obtain fair results. The Pennsylvania and the Philadelphia & Reading have pans on two-degree curves which have proven satisfactory. The disadvantage of placing pans on curves, besides some additional first cost and cost of maintenance, are the difficulty of keeping pans in surface and some additional waste of water from spray and water washing over sides.

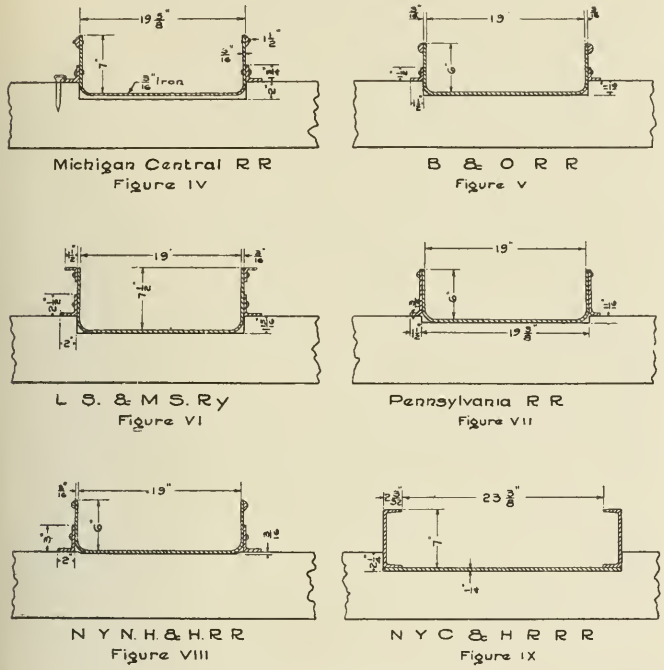
The pan should be laid on a level grade with grade of approaches such as to allow minimum speed required over pan to properly take water, and for this reason track pans should be away from stations, yards, railroad crossings, drawbridges, etc.

Pans are set directly on ties, the ties being dapped out about two inches and width of pan to form seat and allow top of pan to be the same elevation as top of rail. The pan is held in position and anchored by side lugs fastened to ties by ordinary or special form of spike or bolt with proper allowance for expansion and contraction of the material. The section of tie should be larger than ordinary and of white oak or other hard wood. On account of the large amount of waste water thrown over sides of pans, special attention should be given to drainage. The length of pan is one of the factors which determines the capacity. The economical length is dependent on the width of pan, size and adjustment of scoop, quantity of water to be taken into locomotive tanks during a given time and speed and time taken to fill pan. The length of the pan varies from 1,200 ft. on the Baltimore & Ohio to 2,000 ft. on the Lake Shore & Michigan Southern, with a width varying from 19 in. on the Baltimore & Ohio, New York, New Haven & Hartford and Lake Shore & Michigan Southern, to 23⅜ in. on the New York Central and 29 in. on the Pennsylvania. The depth varies from 6 to 7½ in.

*Appendix A, report of Committee on Water Service, presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

The accompanying table shows the average number of gallons of water taken into locomotive tank with the corresponding number of gallons removed from tank and wasted per foot of length of pan by a scoop of cross-section 6½ in. by 12 in. and pans 19 in. and 29 in. wide for speeds of from 20 to 60 miles per hour.

The different pans in use at the present time are almost exclusively of built-up steel sections, although pans of cast-iron and wood have been used with less success. The type



Sections of Standard Track Pans.

of section is a matter of structural detail. The important considerations are rigidity, life and first cost. The depth should be 7 in. to 7½ in. so as to allow top of pan to be at same elevation as top of rail with a maximum dap in tie of not more than 2 in. to 2½ in. A width of 19 in. has been found to be the most efficient and economical for the operation of fast-speed trains and combined fast and slow-speed trains. The larger width of 29 in. has some advantage in the quantity water

Width of Pan (Inches)	Speed—M. P. H.	Number of Gallons Taken Into Locomotive Tank			Number of Gallons Taken Out of Track Pan = 100%			Per Cent of Waste
		Per Ft of Length of Pan	For Length of Pan= 1200 Ft	For Length of Pan= 2000 Ft.	Per Ft. of Length of Pan	For Length of Pan= 1200 Ft	For Length of Pan= 2000 Ft.	
19	20	1 70	2040	3400	2 10	2520	4200	.19
19	30	1.90	2280	3800	2 20	2640	4400	.14
19	40	2.00	2400	4000	2.20	2640	4400	.09
19	50	1 85	2220	3700	2.35	2820	4700	.21
19	60	1 70	2040	3400	2 80	3360	5600	39
29	20	2 20	2640	4400	2.90	3480	5800	24
29	30	2.30	2760	4600	2.90	3480	5800	21
29	40	1.90	2280	3800	2.65	3180	5300	.28
29	50	1.70	2040	3400	2.70	3240	5400	.37
29	60	1.50	1800	3000	3.00	3600	6000	.50

Performance of Track Pans.

taken into locomotive tank per foot of length of pan for slow speeds, but this is partly offset by the additional waste. Figs. 4, 5, 6, 7, 8 and 9 show different sections of pans that have been found to meet the requirements. The end inclines should be substantially built to resist the larger amount of impact to which they are at times subjected by badly adjusted scoop, hanging under gear, etc. They should be built as a part of the body of pan forming ends. The rate of incline in direction of travel, in and out of pan, should not be more than ¾-in. to 1 ft. 0 in. of length and of perfectly smooth surface.

The size and number of supply pipes should be determined from the pressure, number of openings and minimum time required to fill pan. For expansion and contraction proper provision should be made in the form of corrugated or rubber hose, or by packed or special joints. The placing of pipes in cross tunnels at inlets allows the taking care of water run off from broken pipes, assists in drainage and facilitates repairs. There are two methods of regulating the filling of pans, viz.: (1) by man operation; (2) automatic valve. The latter method is generally the more dependable, and under average conditions should give the more economical and satisfactory result. The inlet should be so designed as to allow the minimum disturbance by flow of water into pan with corresponding minimum loss from friction. The deflector, enlargement of section of pipe at inlet and perforated plates are used at the present time.

To keep the temperature of water in pan below the freezing point or to raise the freezing point to avoid or remove the formation of ice at top of pan so that water can be taken during freezing temperature, the following methods are used:

(1) Blowing steam in water through nozzles in sides of pans spaced at intervals of 20 ft. to 30 ft. along length of pan.

(2) Circulating the water in pan by means of a pump and heater or an injector.

The results obtained by the steam heating method have been mostly satisfactory, but on account of the large amount

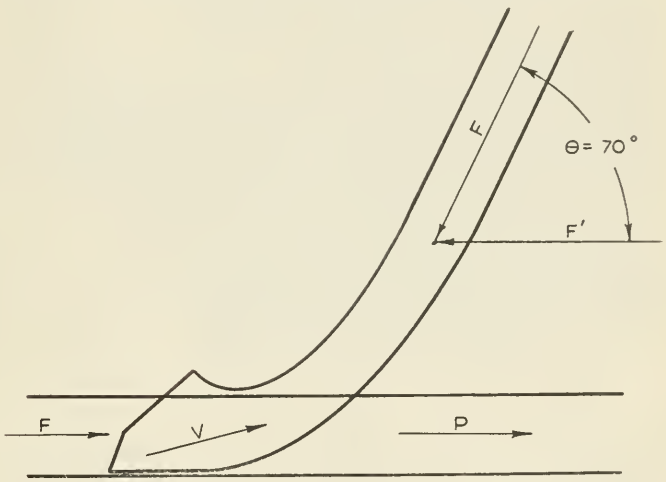


Fig. 1.

of energy expended and the number of connections, etc., to keep up there is a general tendency towards the use of the circulating method, although results obtained up to the present time have not been entirely satisfactory.

The action of the scoop while taking water from the pan is more or less as a blunt plow. At speeds above thirty miles per hour it is very apparent that the velocity of the water entering into the scoop is less than the velocity of the tender; this has the effect of throwing out of the pan, especially at higher speeds, the water on either side of the point of the scoop and between it and the sides of the pan. As the speed diminishes below thirty miles per hour a wave action is set up in front of the dipper, the water being piled up until it falls over the sides. This wave increases in size up to the point where the velocity imparted to it is less than that necessary to overcome the resistance due to gravity and friction, when, of course, no more water is lifted.

The dynamic pressure exerted by a surface moving in still water is equal to that produced by a stream flowing with the same velocity against a surface at rest. By the action of the scoop in the pan a dynamic pressure is produced in the oppo-

site direction to the motion of scoop, the resultant, of which, is counteracted by the drawbar pull.

Let F = Force of impulse in pounds.

Let F' = Component of F in direction of initial motion.

Let P = Dynamic pressure in pounds produced in direction of initial motion = Drawbar Pull.

Let W = Weight of water removed from pan per second.

Let V = Velocity of scoop in pan in feet per second.

Let G = Acceleration due to gravity = 32.2.

$$F = W \frac{v}{g} \quad \ldots\ldots (1)$$

The water from pan entering the inside surface of scoop and the impact produced, by water coming in contact with the outside surfaces of scoop, develops the dynamic pressure and drawbar pull. The dynamic pressure produced by the water entering the inside surface of scoop depends upon its change of direction from Fig. (1).

$$P = F - F' = F\ (1 - \cos\theta) \quad \ldots\ldots (2)$$

Substituting for F its value as given in ..... (1)

$$P = (1 - \cos\theta)\ W \frac{v}{g} \quad \ldots\ldots (3)$$

Assuming ($\theta = 70$ deg., which is a very fair approximation for the scoops used at the present time, and substituting in (3) the values for $(1 - \cos\theta)$ and g.

$$P = .02043\ W.V. \quad \ldots\ldots (4)$$

The quantity of water which enters the inside surface of scoop is equal to the quantity of water taken into tank and the difference between this quantity and the total quantity removed from pan is the waste which produces the impact by coming in contact with outside surfaces of scoop. The effect of this impact cannot be determined, but a fair assumption is that it will produce the same dynamic pressure as the same quantity of water entering scoop. Neglecting friction and other minor disturbance which are practically negligible the value of P as given in (4), in which W = weight of water removed from pan per second, is a fair approximation of the drawbar pull.

Drawbar pull = P = .02043. W.V.

Using the values of W and V for 19 in. pans as derived from table 2—the drawbar pull is found to be:

Speed in Miles per Hour.	Drawbar Pull in Pounds.	Developed Horse Power.
20	308	16.00
30	727	58.00
40	1292	137.00
50	2156	287.00
60	3698	592.00

These values of the drawbar pull are in close approximation with values as found in actual tests. It will be noted that the drawbar and corresponding developed horsepower, for high speeds, would consume a large part of the available horsepower of the locomotive, but as the increase in the kinetic energy of the moving train is in much greater proportion, for the higher speeds, the retardation effect of the scoop in water will not be very apparent, although it will effect some slowing up of the train.

In considering the efficiency of a particular scoop and pan, the two important considerations are:

(1) The total amount of water taken into the locomotive tank from the pan.

(2) The total amount of water wasted from the pan.

The Chicago, Milwaukee & St. Paul is planning considerable signal work on the lines of the Chicago, Milwaukee & Puget Sound. This work includes 50 miles of automatic train staff between Haugen, Mont., and Avery, Idaho, which will be installed by the signal department forces. The staff installation will control the tracks over the Bitter Root mountains. Two-arm approach signals will be used at each station, one at each end of the passing track.

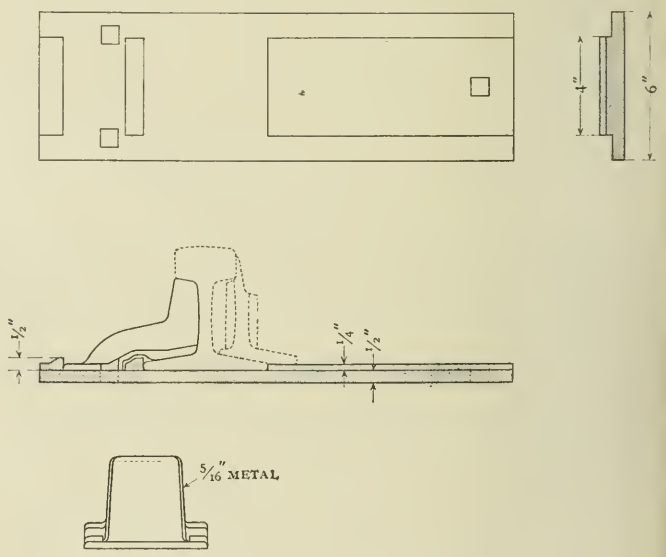
At the Coliseum

The Union Switch & Signal Company, Swissvale, Pa., has adopted the plan of furnishing visitors to its very extensive and complete exhibition with a permanent record of the occasion in the shape of one of its standard Bulletins No. 54. The bulletin contains 100 pages and describes the entire exhibit, which represents nearly all of the devices made by the Union Switch & Signal Company. Among these are several improvements which have only recently being introduced, including the Style "E" signal, the Style "T" signal, the dwarf and light signals for electric traction, the automatic "no-operator" type of train staff, the new universal switch circuit controllers, the radial contact and galvanometer type relays, the spiral detector bar, and a full line of forgings of mechanical parts.

RAMAPO SHOULDER SWITCH PLATE.

The Ramapo 6-inch switch plate is a new pattern of shoulder tie plate for switch slides, with solid rolled shoulder and riser. It is exhibited by the Ramapo Iron Works, Hillburn, N. Y., at spaces 91 and 110, at the Coliseum.

This switch plate gives the same advantage to the switch that the standard shoulder tie plate provides for regular



Ramapo Switch Plate and Rail Brace.

track. The solid rolled plate, shown by the illustration, gives a shoulder for each side of the stock rail; where braces are used there is another shoulder back of the rail brace. A shoulder one-half inch high under the rail brace holds the rail effectively to gage. The principal office left for the rail brace is to afford greater support for the rail, fitting closely under the rail head and against the one-half inch solid shoulder on the plate.

This plate is recommended for every tie under a switch with one-quarter inch elevation, so that the plates may all be interchangeable. This makes the base of the switch rail level throughout its entire length, and the elevation may be run off in the lead rails by graduated riser plates back of the heel of the switch. Switches installed in this way will carry wheels with worn tires or doubled flanges over the stock rail without permitting them to strike against the side of the head, leaving no tendency for the stock rail to overturn.

There has never been as much attention paid to switch tie plates as to tie plates on common track, and it is com-

mon to see a much lighter plate used under the switch than in the track adjacent. Light switch plates are now most commonly used, and but few of them; also, many roads have pressed-up risers in these light plates which more than half cut the plate in two right at a critical point under inner edge of the base of the stock rail, where light plates in any case soon become bent and broken. This is all wrong; the switch, especially on account of the moving rails, requires better support than the adjacent track, and there is more necessity for a solid shoulder tie plate under the switches than under the regular track.

Stock and switch rails having bearings on the heavy Ramapo riser plates throughout the length of the switch make an easy riding turnout and one that is easy to maintain in surface, while switch rails having vertical bends and light plates are not apt to get a bearing on every tie and may be found constantly working up and down excessively under every wheel on some of the ties, resulting in considerable wear on the plates and in all the fastenings.

LIGHT AND VENTILATION.

Light and ventilation in machine shops, power houses and factories are recognized industrial necessities. Artificial light is an important item in operating expenses; but work done under poor or insufficient daylight is extravagant. Naturally the more daylight we can utilize, the better both from the point of view of economy and efficiency.

The Detroit Fenestra solid steel window sash is an illustration of the tendency of the age to utilize every natural advantage. It is designed to provide sufficient strength to support the large area of glass that modern work shops require, and, by doing away with all heavy mullions and substituting the smallest steel sash, to increase immensely the light



Installation of Detroit Fenestra Solid Steel Sash.

space of the interior. With this type of structure, ventilation is easy and sufficient and may be arranged to suit almost any requirements by the use of the desired single unit or by a combination of unventilated sashes with those provided with ventilations.

Other strong features of the Fenestra installation are that it is fireproof and that the appearance of the sash is attractive, the natural curve at each joint relieving the monotony.

An exhibition at space 180 explains the construction of the Fenestra joint. W. F. Schmeltz, Detroit Steel Products Company, Detroit, Mich., is there with a display of lantern slides and photographs of recent railway installations, including the roundhouse at Frankfort and the shops at Galestown, Md., of the Pennsylvania Railroad and 17 views of the new Chicago & North Western buildings in Chicago.

HAYES DERAILS.

The Hayes Track Appliance Company is now building a new factory at Richmond, Ind., and expects to move from Geneva, N. Y., where it has been located, to the new headquarters in a short time. The rapidly growing business of this company, which is due directly to the excellent results that over 300 railways of the country are obtaining from the Hayes derails, requires a more centrally located distributing point and much larger manufacturing facilities than have heretofore been available. Both of these are going to be obtained in the new location.

Hayes derails are meeting with considerable favor in several foreign countries, where quite a number are being used particularly in South Africa and South America. This device has also recently been adopted as standard on a number of the leading railways of the United States.

The Hayes Track Appliance Company is exhibiting in space 140 at the Coliseum, and the exhibit is in charge of S. W. Hayes, W. Harding Davis, Wellington B. Lee, Arthur Gemunder, E. L. Ruby and S. W. Wallace.

INDIANAPOLIS MANGANESE PRODUCTS.

The same physical tests of manganese shown a year ago at the Coliseum by the Indianapolis Switch & Frog Company, were in evidence this week at spaces 12 and 13, but on a more elaborate scale, including not only their R-N-R type of solid manganese frogs, but also crossings.

The accompanying cut shows the distorting of one of their solid manganese pieces after having been subjected to 165 blows of a 1,200 lb. to 2,500 lb. weight dropped from heights varying from 3 ft. to 23 ft., aggregating 1,679,375 foot pounds.



Indianapolis Manganese Products.

The showing of an installation of R-N-R crossings and frogs in miniature demonstrated the riding of worn wheels over the entire layout without impact or pounding at joints or intersections and demonstrated the efficiency of this construction, which, together with its general line of manganese, is now in use on over 50 of the largest railway systems.

The general offices of the Indianapolis Switch & Frog Company are located at Springfield, Ohio, with sales offices at New York, Chicago, Richmond, Va., Kansas City, Spokane and San Francisco.

ALLITH HARDWARE DOOR EQUIPMENT.

Among the devices of the Allith Manufacturing Company, Chicago, which are meeting with favor is the Allith parallel door equipment, which has been in service at freight stations and warehouses for a number of years and has recently been successfully applied to engine-house doors.

The Allith fire and warehouse door hardware for inside or outside sliding doors or shutters, for fire wall or other openings, are also meeting with favor. They are simple and easy to install, and service tests of long duration have proved that they and their attachments are strong and durable. This fire door hardware is regularly inspected and

labeled under the supervision of the Underwriters' Laboratories, Inc., under the direction of the National Board of Fire Underwriters.

The Allith Manufacturing Company is planning the moving of its factories from Chicago to Albion, Mich. This company has just recently bought the plant, equipment, business and good-will of the T. C. Prouty Company of Albion, Mich.

The Allith exhibit, space 116, is in charge of W. D. Jameson, who for the past eight years has been at the head of the railway department.

D. & A. CEMENT POSTS ON THE C. & N. W.

One of the first railways to manufacture and use reinforced concrete fence posts was the Chicago & North-Western, which purchased equipment for the manufacture of these posts in quantities in the fall of 1908. Posts made at Dunlap, Iowa, have been set along the lines in western Iowa, and, after being in the ground with fences attached, are reported in perfect condition.

The D. & A. machine, which is in use at this point, consists of ten individual U-shaped steel molds, grouped on a frame called a "shaker," which holds the molds up from the ground about two feet, making them readily accessible for filling. The insides of the molds are greased slightly with some thin oil, and the concrete is then shoveled, or dropped from a mixer, filling the ten molds level full at one time.

For the reinforcement, hoop steel is recommended, as it has large surfaces for bonding with the concrete and is easily and quickly placed in definite positions by the use of a placing device, furnished with the outfits. For line posts, four of these reinforcing strips are used, placed about ¼ in. from the surface of the concrete. Concrete of about the consistency of mortar for plastering houses is used, and when the lower two reinforcements are placed the bed of molds is vibrated horizontally on the springs of the supporting frame, or shaker, for ten to fifteen seconds. This settles the concrete in all ten molds at one time evenly and thoroughly, in less time than one post could be tamped. This shaking not only settles the concretee, but gives a better bond to the reinforcement, so that no deformed or corrugated or twisted reinforcement is necessary. As the shaking continues, bubbles of air and the surplus water rise to the top or face of the post, making the initial set of the cement take place more quickly than if a surplus of water remained in the concrete. After shaking, the upper reinforcements are placed just beneath the surface of the post, and the molds refilled if necessary, owing to the steeling of the concrete. The flat faces of the posts are troweled level.

The filled molds are then transferred individually from the frame to soft, level ground, the square ends holding them upright, where they are allowed to remain to take the initial setting, which takes from 6 to 24 hours, according to weather conditions. Then the molds are rolled half over, the large ends removed, allowing the sides of the mold to spring slightly away from the post, and the molds lifted off. The posts ar allowed to remain with the flat side on the ground to season for several days, when they may be piled on end if desired, to economize space. It is preferable to sprinkle the posts while lying on the ground, and also after standing on end, and in many instances they are covered for a couple of weeks so that they will not dry out.

Being heavier than wooden posts, the cost of setting concrete posts is about 25 per cent higher than for wooden posts, but, once set, they are permanent and require less attention and repairs. They are all of uniform size, shape, color and length, and make a neat and sanitary fence.

Steam curing may be employed if desired, and instead of transferring the filled molds from the shaker to the ground, they can be transferred to curing cars. The molds can be racked one layer over another on cars holding from 30 to 50 posts each, and run into steam curing chambers, similar to dry kilns for wood. In one week, or less, they are sufficiently seasoned for setting in fencing.

The D. & A. machine used by the C. & N. W. at this point is manufactured by the D. & A. Post Mold Company, Three Rivers, Mich. One of these 10-mold machines is on exhibition at the Railway Appliances exhibition. The company also shows a steam curing unit consisting of steam car and 30 molds, manufactured posts, reinforcements, anchor posts, anchor molds, etc.

The mold for telephone and telegraph poles is being shown for the first time, and the method of reinforcement is worth considerable attention, owing to its simplicity and durability. The first cost of concrete poles does not exceed that of wooden poles of the same lengths, and in the larger sizes and lengths there is a saving in favor of the concrete poles. The company has recently made up whistling post molds, suitable also for mile posts, for one of the leading railways, using the regular fence-post molds.

In addition to the C. & N. W., the following companies are now using D. & A. molds and machines: P. C. C. & St. L., Mo. Pac., Mich. Cent., Clev., Ak. & Col., M. R. & B. T., D. L. & W., E. & P. and P. F. W. & C.

The D. & A. company is putting out a neat illustrated catalog entitled, Concrete Posts and How to Make Them, which quite fully describes and illustrates the shaking system, accompanied by quotations and estimates of the cost of concrete posts.

CONSTRUCTION WORK ON THE OREGON TRUNK.

An officer of the Oregon Trunk Railway writes that there is no immediate prospect of building this line south of Bend, Ore. Track already has been laid on 115 miles, from Fallbridge, Wash., to Metolius, Ore. No further contracts will be let at present. The grading work on the first 110 miles from Fallbridge was carried out by Porter Brothers, Portland, Ore., and from that point to Bend, 46 miles, by H. C. Henry & Co., Seattle, Wash. The first 110 miles follows the Des Chutes and Willow creek canyons; the work on this section was extremely heavy, being practically all through solid rock. The remaining 46 miles to Bend is through a scab rock country, requiring an even number of cuts and fills. The material handled was mostly rock. The roadbed has been graded to Bend. Maximum curvature, Fallbridge to Madras, Ore., 6 degrees; Madras to Bend, 3 degrees. Maximum grade, Fallbridge to Metolius, 0.6 per cent., with 20 miles of 1.3 per cent. pusher grade from Mecca to Metolius. This grade is all ascending toward Metolius. Maximum grade from Metolius to Bend is 1 per cent. against southbound and 0.5 per cent. against northbound trains.

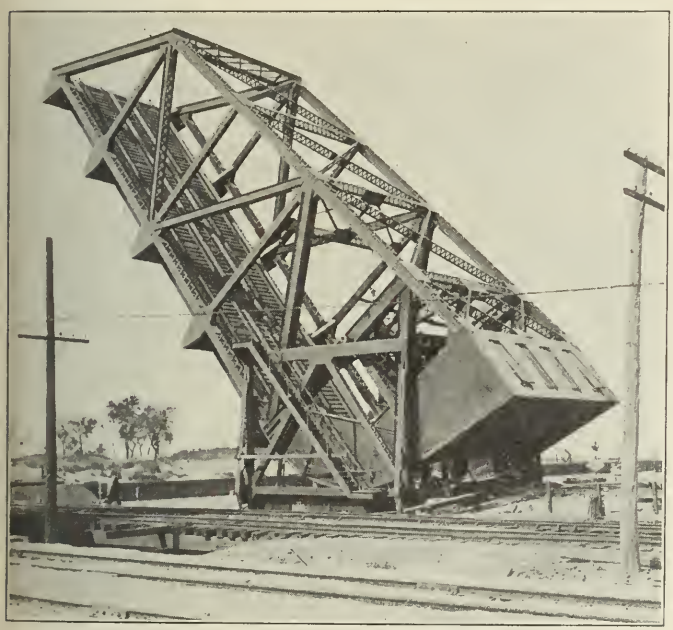
There will be a steel bridge over the Columbia river 2,427 ft. 8 in. long with approaches of 1,734 ft.; also one at the first crossing of the Des Chutes river, 465 ft. long, and another at the second crossing, 510 ft. long. Steel bridges will also be built over the White river, Wapinitia creek, Nena creek, Eagle creek, third crossing of the Des Chutes river, and over Trout creek, varying in length from 112 ft. to 175 ft., also a steel bridge over Crooked river, 460 ft. long. There is also a large amount of trestle work. The steel bridges, including substructures, have all been designed and are being constructed under the direction of Ralph Modjeski. A terminal yard, including fuel, oil and engine house facilities, is being built at Fallbridge, and a freight terminal is under construction at Metolius. The principal commodities to be carried on the line are: wheat, live stock and lumber from central Oregon, and merchandise and manufactured goods to that territory.

SCHERZER ROLLING LIFT BRIDGE AT INDIANA HARBOR.

In order to develop the industrial and manufacturing possibilities of the vacant lands between South Chicago and Gary, the East Chicago Canal Company was organized to build a canal from Lake Michigan, at Indiana Harbor, extending inland to a junction with the Calumet river at Hammond, Ind. The canal company negotiated with the railways entering Chicago from the southeast for building movable bridges to accommodate the passage of large lake vessels in the canal.

During the past three years a number of movable bridges have been completed across this canal, including three Scherzer rolling lift bridges, as follows: One double-track bridge for the Chicago, Lake Shore & Eastern, one double-track bridge for the Lake Shore & Michigan Southern, and a single-track bridge for the Elgin, Joliet & Eastern. The accompanying illustration shows the Chicago, Lake Shore & Eastern bridge, being the first structure crossing the canal adjacent to the lake.

This bridge, which is a single-leaf through-truss standard railway bridge of the Scherzer type, has a span length



Scherzer Rolling Lift Bridge at Indiana Harbor.

of 86 ft. 6 in. center to center of bearings, with a width of 30 ft. center to center of trusses. The counterweight is concrete, placed in a steel box running across between the trusses, to which it is rigidly attached, forming a substantial and economical bracing and making the entire moving leaf one simple, rigid and self-contained structure. This combination of steel and counterweight in one piece without links and flexible connections is one of the special advantages of the Scherzer rolling lift bridge, and makes possible its economical adaptation to many varying conditions.

The operating machinery and equipment is also simple and effective. Power for operation is obtained from two 25 h. p. direct current electric motors located on the moving leaf in front of the counterweight box, the motors driving pinions which engage with fixed racks outside of the plane of each truss. Only a small part of the capacity of the motors is required in operating the bridge under ordinary conditions, as the moving leaf is in balance in all positions. Hand power may be used for operation should the current be cut off, or the operating equipment be out of service. The operator's house contains, in addition to the motor control, a simple but complete arrangement to enable the operator to know the position of the bridge at all times during operation, both day and night. The operating equipment is interlocked with the front lock holding the bridge in its closed position and with the railway signals, so that the lock cannot be drawn and the bridge operated until the railway signals are set.

The bridge was designed and built under the direction of Arthur Montzheimer, chief engineer of the Chicago, Lake Shore & Eastern, the design of the bascule span being prepared by the Scherzer Rolling Lift Bridge Company, Chicago. The steel work was fabricated by the Lassig plant of the American Bridge Company, F. W. Denser, engineer, and erected by the Pittsburgh Construction Company.

WATER TANKS.

The exhibit of the Kennicott Company of Chicago Heights, Ill., in Booth 16 contains, in addition to the model water softener, photographs of steel storage tanks for railways and cities. A recent installation is an elliptical bottom tank for the Northern Pacific at Brainerd, Minn., a photo-



Kennicott Steel Water Tank at Brainerd, Minn.

graph of which is shown herewith. The Harriman Lines have sixty-five Kennicott tanks on their system.

WHARTON GUARD RAIL CLAMP.

The clamp in the exhibit of Wm. Wharton Jr. & Co., Inc., Philadelphia, Pa., is one that was brought out a number of years ago by this company. The yoke is the same as was used in the original clamp, but improvements have



Wharton Guard Rail Clamp.

been made in both the fillers and the wedge. The clamp has been found to be most effective.

SPIRAL SWITCH GUARD.

The general construction of the spiral switch guard, or bar, is the same as the motion-plate detector bar in general use, but its motion in operation is that of a spiral instead of an inclined plane. The form of the motion plate is such that the guard or bar is caused to advance along the side of the rail and at the same time and by the same movement pass upward and over the top of the rail. If an attempt is made to move the bar at the time there is on the rail a wheel whose flange projects beyond the head of the rail, the motion of the guard or bar will be arrested as soon as it comes in contact with the wheel tread. If, however, owing to excessive width of gage on account of worn wheels and rails, the outer face of the wheel does not project beyond the rail, the spiral motion of the guard or bar will bring it in contact with the face of the wheel and the further motion of the bar will be prevented. This guard is made by the Union Switch & Signal Company, Swissvale, Pa.

WATERPROOFING CONCRETE SLAB BRIDGE FLOORS.

Concrete slab subways are rapidly coming into more general use in track elevation work. This form of construction is at present more extensively used in those cities where the regulations do not absolutely require a clear span over the entire street and sidewalks.

This type of subway possesses many advantages in the way of permanence and low maintenance charges, and calls for permanent protection in the way of waterproofing at the time of original construction. The requirements for waterproofing are usually twofold, the city regulations generally demanding this protection for users of the subway, and railway engineers being fully alive to the necessity of protecting the structure itself by the exclusion of moisture. Unless the structure is waterproofed, the reinforcing steel is liable to corrosion; and the presence of moisture in the concrete under the action of frost, causing the concrete to cap and shell on the underside of the slab, will in turn expose the reinforcing rods.

The accompanying cut shows clearly the Sarco method of waterproofing this type of structure. The work illustrated is that on the Sixteenth street, Chicago, track elevation of the Chicago, Burlington & Quincy. The mastic layers are shown in the act of placing the mastic protection over the waterproof membrane on the slope at the juncture of the deep, or street, slabs and the shallow slabs over the sidewalk. The concrete slope is placed after the street and sidewalk slabs are set and should have a system of anchorage to one or the other of these slabs and a grade of not less than 1 to 3. The work in this case consists of Sarco No. 6 waterproofing, reinforced with open mesh burlap in five-ply, and protected with a 1¼ in. coating of sand mastic, consisting of Sarco No. 6 waterproofing and sand in the proportion of 1 to 4 by volume. A general specification for this class of work is as follows:

On the clean and dry surface of the concrete floor, fascia walls and end walls of the bridge there shall first be applied, with brushes, a coating of Sarco concrete primer, which coating as applied shall be thin enough to penetrate the recesses of the concrete, forming an anchorage for the subsequent waterproof coating.

After this priming coat has been allowed to dry there shall then be applied, with mops, a heavy coating of Sarco No. 6 waterproofing, which has been heated to a temperature of 400 deg. Fahr., and while the material is still hot there shall be introduced a layer of 8-oz. open mesh burlap, all carefully laid down and free from folds and pockets. The surface of this burlap shall then be heavily swabbed with Sarco No. 6 waterproofing and two more ply of 8-oz. open mesh burlap laid in the same manner, making a 3-ply burlap mat, all thoroughly saturated, cemented and bonded together and to the concrete with Sarco No. 6 waterproofing.

On this waterproof mat there shall then be laid one layer of Sarco asphalt felt and the edges lapped at least 3 in. and sealed with Sarco No. 6 waterproofing.

The surface of the felt shall then be covered with 1½ in. thickness of Sarco mastic laid in 2-ply with lapped joints, and the



Sarco Method of Waterproofing Concrete Slab Bridge Floors.

same carried up the side walls to the ballast line to protect the waterproof mat from puncture by the rock ballast. The surface of this mastic shall then be heavily swabbed with Sarco No. 6 waterproofing and given a sand finish while the material is still hot.

The Sarco mastic as laid shall be worked evenly in convenient widths, and the two layers lapped at least 12 in. It shall be spread to the required thickness with wooden spreaders and floats, the thickness being gauged by ⅝ in. strips held in position by proper weights, and enough pressure applied to the mastic to eliminate all voids and blow holes, making a homogeneous mass throughout.

Before the Sarco mastic has been applied on the bridge floor there shall be laid over the concrete end walls a burlap curtain in 3-ply, which shall extend down over the black walls for 3 ft. This burlap curtain shall be thoroughly saturated, cemented and bonded together, and to the concrete with Sarco No. 6 waterproofing.

At the bottom of this burlap curtain there shall then be laid a

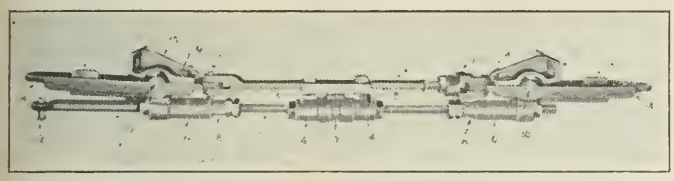
line of 6-in. farm tile, and back filled with cinders or quarry chips to provide a drain for the water from the bridge floor and the fill, and to prevent seepage through the concrete back walls on to the bridge seats.

The critical points in this waterproofing work are the handling of the membrane over the slope and the tying in of the same with the adjoining track work. These subways are sometimes 10 and 15 tracks wide; and the waterproofing must of necessity be made continuous, or fail entirely in its purpose. Great care must be exercised in handling the work at these points, and a special system of tying be adopted.

This membrane method of waterproofing has already shown in service its adaptability to this type of permanent subway construction, and is an example of one of the successful methods developed by the railway and waterproofing department of the Standard Asphalt & Rubber Company, Chicago.

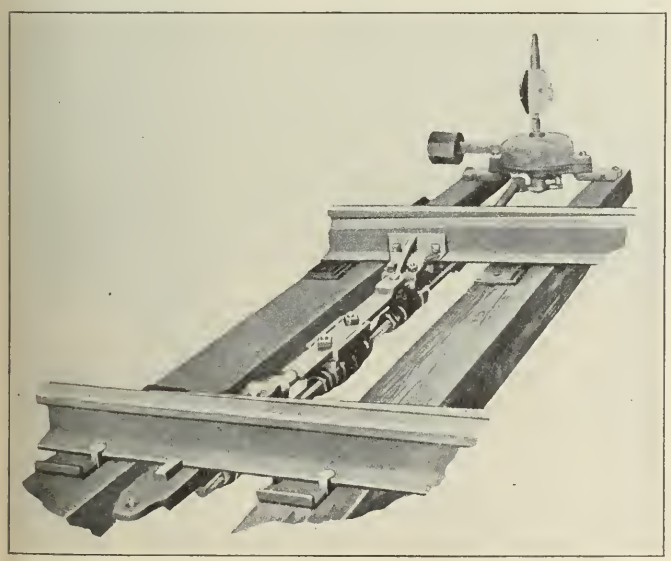
NICKERSON SINGLE-LEVER SAFETY SWITCH LOCK.

The Nickerson single-lever safety switch lock, made by the W. F. Bossert Manufacturing Company, Utica, N. Y., is designed to solve the problem, which every signal and maintenance of way engineer has found a troublesome one, of locking switch points at noninterlocked switches. This



Nickerson Adjustable Head Rod.

is a difficult matter, and many attempts have been made to devise a lock which would hold the points. The Nickerson device is designed to take advantage of the slight loss of motion which exists between the switch lever and the switch points. In this apparatus a locking bar is arranged to project upward through a slot in the base plate outside

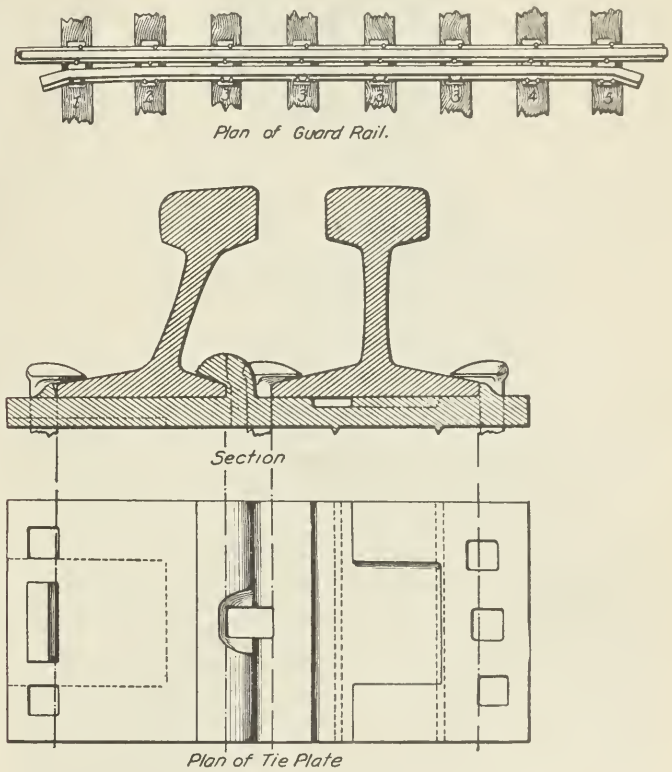


Nickerson Single Lever Safety Switch Lock.

of each stock-rail, thereby holding the switch point firmly to the stock rail. The arrangement is such that the locking bar locks only the point that is in the closed position against the stock rail. The switch lever and an adjusting rod give motion to the locking bar, which depresses it and unlocks the switch-point just an instant before the points begin to move. Then when the points are in the reverse position the last part of the movement of the switch lever and adjusting rod operates to push the locking bar upward through the slot in the base plate and locks the other point against the stock-rail. This device is extremely simple. It can be put on any switch and furnishes an effective lock which holds the points at the one place where effective protection is necessary. The safety switch lock can be attached to any ordinary switch-stand, and at a slight increase of cost can be connected with either the target of the switch-stand or with the home or distant signal, so that these will indicate when the points are unlocked.

MORRISON GUARD RAIL.

The Cambria Steel Company, Johnstown, Pa., is exhibiting in space 177 at the Coliseum its Morrison guard rail. The theory underlying the design of this guard rail is the same as that which accounts for the outer rail of a curve not overturning under a fast-moving train; that is, the wheel load on the main rail is greater than the centrifugal force or lateral thrust of this same load. This was demonstrated in practice by an accident on an eastern road, where a large freight engine with a loose driving wheel entered a yard lead from the main track. The loose



Morrison Guard Rail.

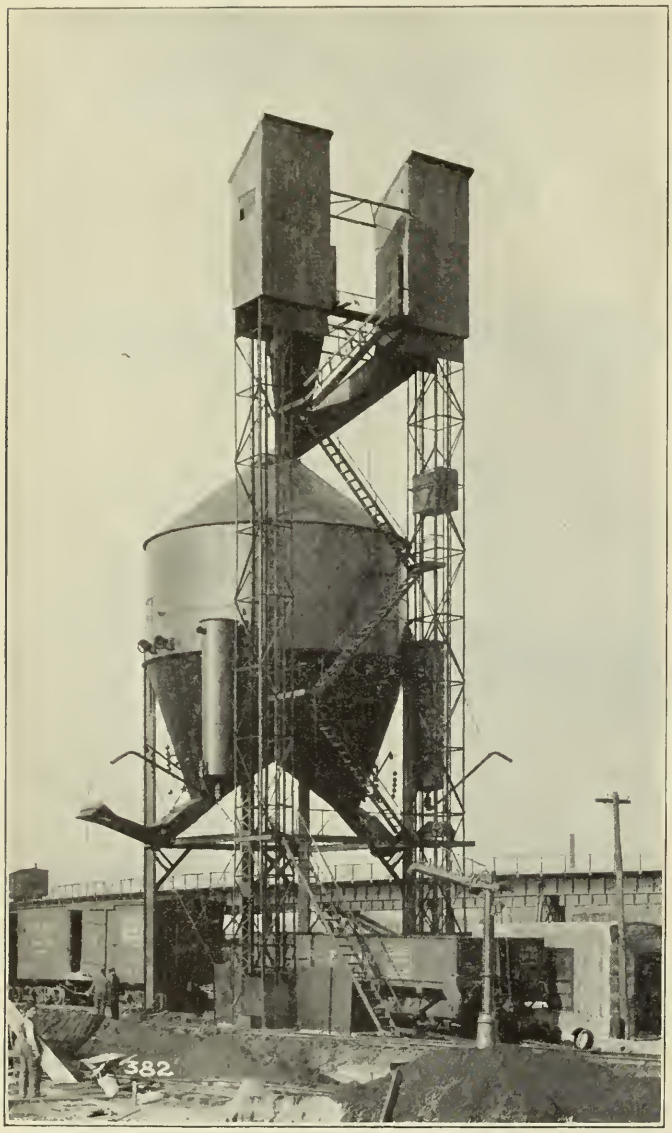
wheel dropped inside the rail and ran over four common guard rails, which alternated with three Morrison guard rails. The common guard rails were forced over on their sides, while the Morrison guard rails were not disturbed, and no damage was done further than the cutting of a groove in the rail where the driver struck it and mounted. The wheel load exerted no controlling influence on the common guard rail, but it gave stability to the whole Morrison guard rail structure.

There are two forces acting on a guard rail—vertical or overturning and horizontal. The former is controlled by the 6-in. lug on the tie plate, which engages the guard rail at a point farthest removed from the fulcrum point, and the latter by a shoulder on the plate engaging the outer base

of the guard rail. The spikes merely hold the outer base of the guard rail down to place. The guard rail is adjustable for wear by moving it and the plates closer to the main rail and spiking in one of the staggered holes at the outer edge of the main rail, in this way obtaining several times longer service than obtained from a common guard rail.

STEEL COALING STATIONS.

The 300-ton all-steel coaling station recently built at Gary, Ind., by the Elgin, Joliet & Eastern, is of interest since it shows the present tendency toward the use of steel in the building of coaling stations. When wood is



Steel Coaling Station at Gary, Ind.

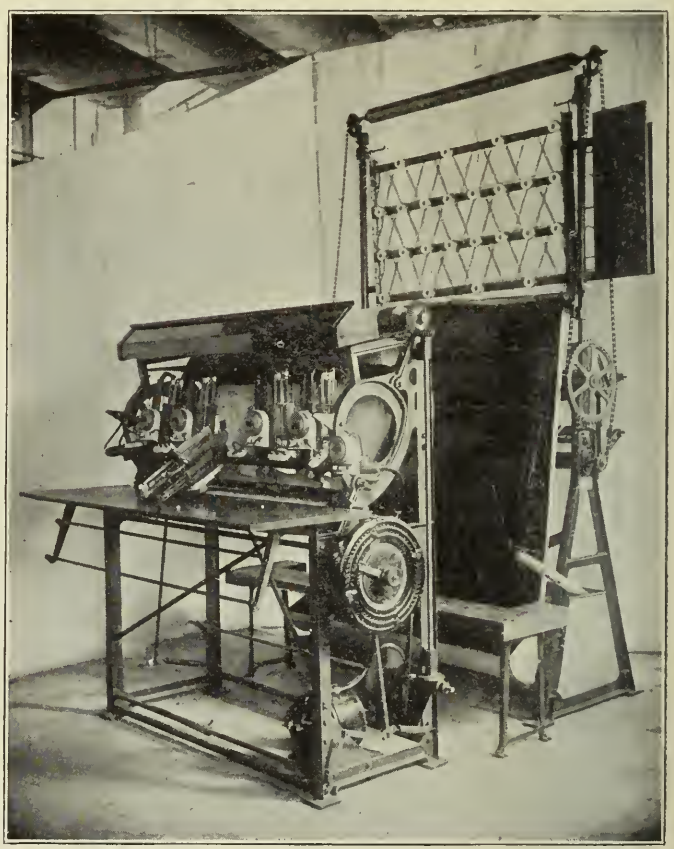
used for such a purpose there is great danger of fire from both engine sparks and spontaneous combustion. While for stations or less than 200 tons capacity wood has the advantage of lower first cost, yet for stations of larger capacity even this temporary advantage is largely lost. The station shown serves the two outside tracks, while the hopper track runs between the posts which support the tank.

This station is one of the number which have been recently designed by the Otto Gas Engine Works, Chicago, and for which the steel has been furnished by the Chicago Bridge & Iron Works, Chicago.

WHITE PRINTS vs. BLUE PRINTS.

The advantages of white prints, or prints with sharp blue lines on clear white background, are apparent, but up to quite recently white prints had to be made by the negative process, and the uncertainty of the results and the time and expense involved, have prevented their use in any considerable quantity.

The C. F. Pease Company, Chicago, recently invented a process and apparatus for making white prints direct from the tracing automatically, without the use of a negative. These white prints are regularly made on high-grade parchment paper, but it is possible to use paper of the same grade as that used for ordinary blue prints, and by the Pease automatic process the original whiteness of the paper is retained, while the blue lines produced are sharp and clear. These prints can be made up to 54 in. wide, and any length, in one piece. The prints as they come from the automatic machine are almost without



Pease Printing, Washing and Drying Machine, with Electric Dryer.

shrinkage, and have fast color, the strongest sunlight having no effect on them.

The company furnishes a special eradicator and a special blue ink by the use of which alterations and additions can be made on white prints without defacing the print. For reproducing proposals, reports, contracts, tabulations, etc., satisfactory copy for this machine can be made by typewriting the material on transparent paper, using a black ribbon and backing up the sheet with a fresh black carbon. In this manner any number of clear and distinct copies on white paper can be made.

The C. F. Pease Company operates a large plant in Chicago, where they receive tracings from all over the United States for printing. The company also manufactures and sells the machines with which the direct white prints are made, and a number are now in use by railways and

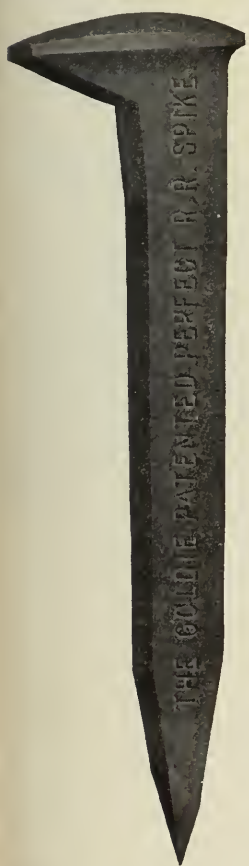
manufacturers. The accompanying illustration shows the Pease peerless printer, coupled up with the Pease automatic washing and drying machine.

This company is also making a combination machine with which direct white prints or blue prints may be made with equal facility, the operator being enabled to change from one to the other without stopping the machine. The equipment is automatic throughout, the paper being printed, washed and dried continuously, and delivered at the end of the dryer, automatically rolled up, ready for use. The entire equipment, which occupies a space only about 6½ ft. square, can be handled by one man, and it is possible to print, wash and dry from 50 to 100 yards of either the Pease direct white print paper or electric blue print paper per hour. One hundred and twenty changes of speed can be made directly through the motor with one gear change, thus enabling the operator to obtain great accuracy in exposure. No belts or friction devices are used; all parts are readily accessible for cleaning and trimming, without the use of screw driver or wrench. The white print apparatus is placed between the printer and washer, and is independent of either. It is so arranged that the time of development can be changed to suit varying conditions.

This company has just issued a 100-page catalogue, fully describing its line. Its exhibit during the week of the convention is in sections 161-162, at the Coliseum.

GOLDIE TIE PLATES AND SPIKES.

In the exhibit of Dilworth, Porter & Company, Limited, Pittsburgh, Pa., in space 26 at the Coliseum, are shown several types of Goldie tie plates, including the Dilworth shoulder flange plate and the Harriman type plate. Standard track spikes and the Goldie Perfect spikes are also being shown.



Goldie Standard Spike.

The Goldie tie plates are designed to unite with the tie and furnish the necessary resistance to spreading rails on curves. The four claws on the base of the plate serve as additional spikes, so that it is claimed that it is never necessary to use more than the usual two spikes to hold the gage on the sharpest curves and under the heaviest traffic. These plates are being used on the Park Street loop of the Boston subway, where no tie rods or rail braces have been found necessary, although the track is on a 50-degree curve.

The Glendon flange and Dilworth shoulder plates are alike except that the former has no shoulder on the top side. The Glendon flange plate is adapted for use on treated ties on tangent track (where the top shoulder is not as necessary as on curves), on account of its combination of strength and light weight. In designing the flange and Dilworth shoulder plates, special attention was given to the shape of the flanges, and these are so proportioned that a maximum holding power of a flange plate is obtained at a minimum damage to the grain of the wood.

The Harriman type of tie plate, as manufactured by Dilworth, Porter & Co., is in use on some of the largest roads in the country, being used on treated and soft-wood ties on tangent track, where it is not so necessary to have a gage-holding plate. This type of plate is the standard on all the Harriman Lines. This plate combines the necessary strength with lightness.

Dilworth, Porter & Co. have been manufacturing track spikes for over 50 years, and the spikes are now in use all over the United States. Every size of spike in general use is made by this company, the sizes ranging


Goldie Tie Plate.

from 2½ in. by $\frac{5}{16}$ in. to 6½ in. by ⅝ in. All sizes of bolt and drift spikes are also made. The sharp-pointed spike, commonly known as the Goldie point, has greater adhesion in all kinds of wood than spikes of equal cross-section and length, since the sharp point affords easier penetration of the tie and destroys less fibre than does a chisel pointed spike.

WEED KILLING.

Weed destruction and elimination has been a permanent item of considerable size in the upkeep of the roadbed. The Atlas Preservative Company, London, has been for years meeting successfully the demand for a process which deals economically with this evil. Its experiences have been largely in the tropics where weeds and grasses grow in a very prolific manner. Many of the best known rail-


Flying Grass, on the Great Southern Railway.

ways in India, Argentine Republic, Borneo, Cape Colony, New Zealand and Brazil have tested this method for a number of years and have found it most successful. This process of weed killing consists of spraying the roadbed with water in which a solution of Atlas "A" has been mixed. Sprinkling cars of different types may be used to make the application. The active principle of Atlas "A" is the same which gives the preservative effect to Atlas boiler

compound, Atlas paints and Atlas wood preservative. Thus this means of killing vegetation is designed to happily combine this effect with the quality of preserving wooden ties from decay and keeping rails, bolts and plates free from corrosion. Some of the results obtained show remarkable economies. Thus, on one of the leading railways in the Argentine Republic the use of the preservative over a 50-mile section (distributed by means of an engine hauling a sprinkling tank, and accompanied by three men to mix the solution and watch over the distribution) has resulted in saving at the rate of $117 per mile per year, after allowing 10 per cent. for depreciation of the tank. In another case, on a New Zealand line, the action on the rails and ties themselves is declared to have been very beneficial. The disappearance of rust makes the bolts easy to tighten without risk of fracture, and the ties are kept clean and hard.

The first system to carry out practical tests on a sufficient scale and for a sufficient time positively to demonstrate results was the Buenos Aires Great Southern, which, after experimenting with preservative "A" from 1898 to 1901, steadily increased the mileage to which it has been applied, until in 1906 it was close to 800 miles.

The illustration shown herewith of a cut on the Great Southern of Argentina indicates clearly the nature of the difficulties with which railway engineers in that part of the world have to contend. The grass shown across the railway track is not growing on the line, but it has been blown there. At certain seasons of the year this grass becomes detached from its roots, and, the country being very flat, is blown long distances and becomes arrested in railway cuts, exactly in the same manner as snow. Being at the same time dry and full of seed, the latter is naturally deposited on the track in great quantities and there germinates unless preventive sterilization by Atlas preservative "A" has been resorted to.

The point of particular interest to American railway men is that the Atlas Preservative Company is now beginning active work in the United States through its American company, the Atlas Preservative Company of America. The company confidently expects that the success it has had in other countries will be duplicated here. This company's office is at 95 Liberty street, New York, with agencies in the principal cities of the United States.

FROGS AND CROSSINGS.

The Pennsylvania Steel Company, Steelton, Pa., is exhibiting at the Coliseum in spaces 45-48, inclusive, and 64-67, inclusive, its line of rails, Manard steel frogs, switches, crossings and staple track appliances.

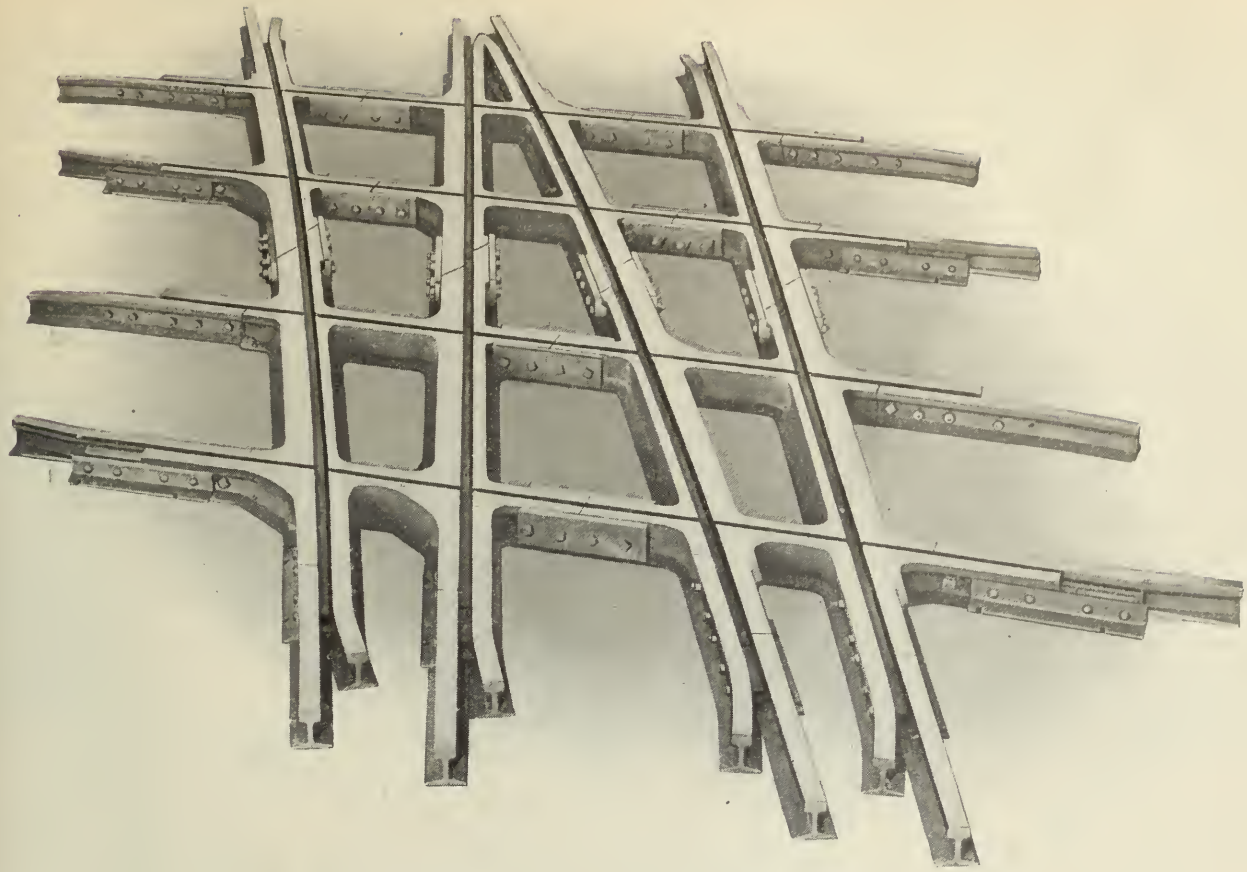
This company's plant occupies an extended area along the banks of the Susquehanna River east of Harrisburg, Pa. Its coal and ore mines, blast furnaces, Bessemer and open-hearth furnaces, rail mills, merchant steel mills, steel foundry, bridge and structural works and frog and switch works enable the company to keep every process of manufacture in its own hands.

The Pennsylvania Steel Company manufactures rails of all standard patterns, girder rails, including Trilby, half-groove, full-groove and girder guard types, high tee or Shanghai, flat or tram rails for bridges, slot and conductor rails for underground trolley construction. Its open-hearth furnaces have a capacity of 45,000 tons per month.

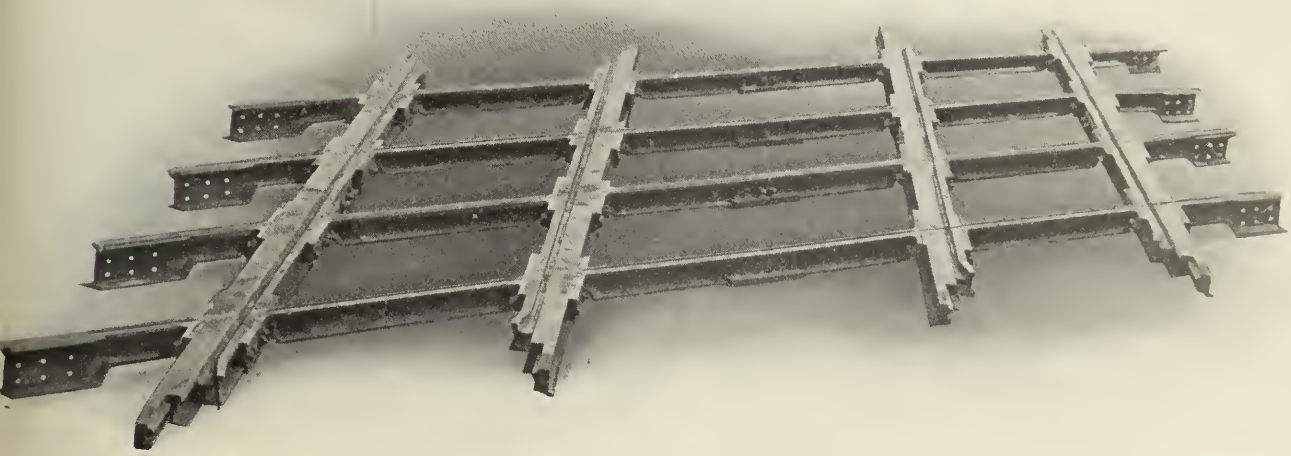
The bridge and construction department of the company built the Queensboro and Williamsburg bridges across the East River, New York, the Niagara arch bridge, the Gok-



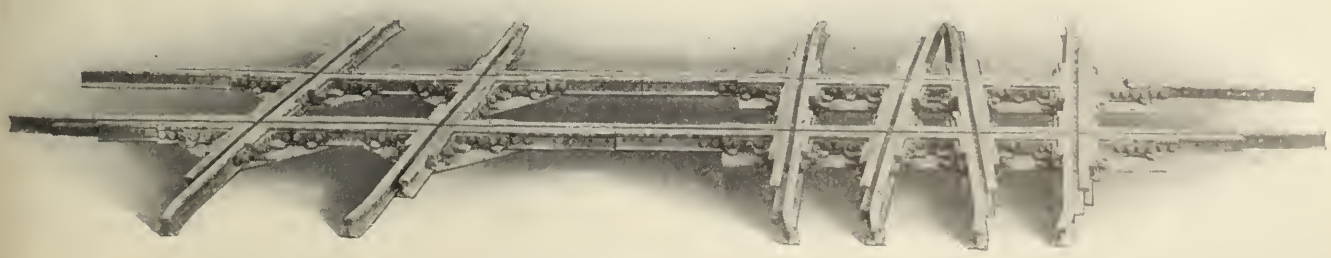
Manard Crossings on Pennsylvania Railroad at Sunbury, Pa.



Solid Manard Crossings for Ontario Construction Company.



Manard Crossings on Baltimore & Ohio.



Manard Crossings on Pennsylvania Lines West at Bucyrus, Ohio.

telk viaduct in Burmah, British India, and numerous steel structures in the larger cities of the country.

The frog and switch department covers 25 acres and the output of track work is said to be larger than that of any similar establishment.

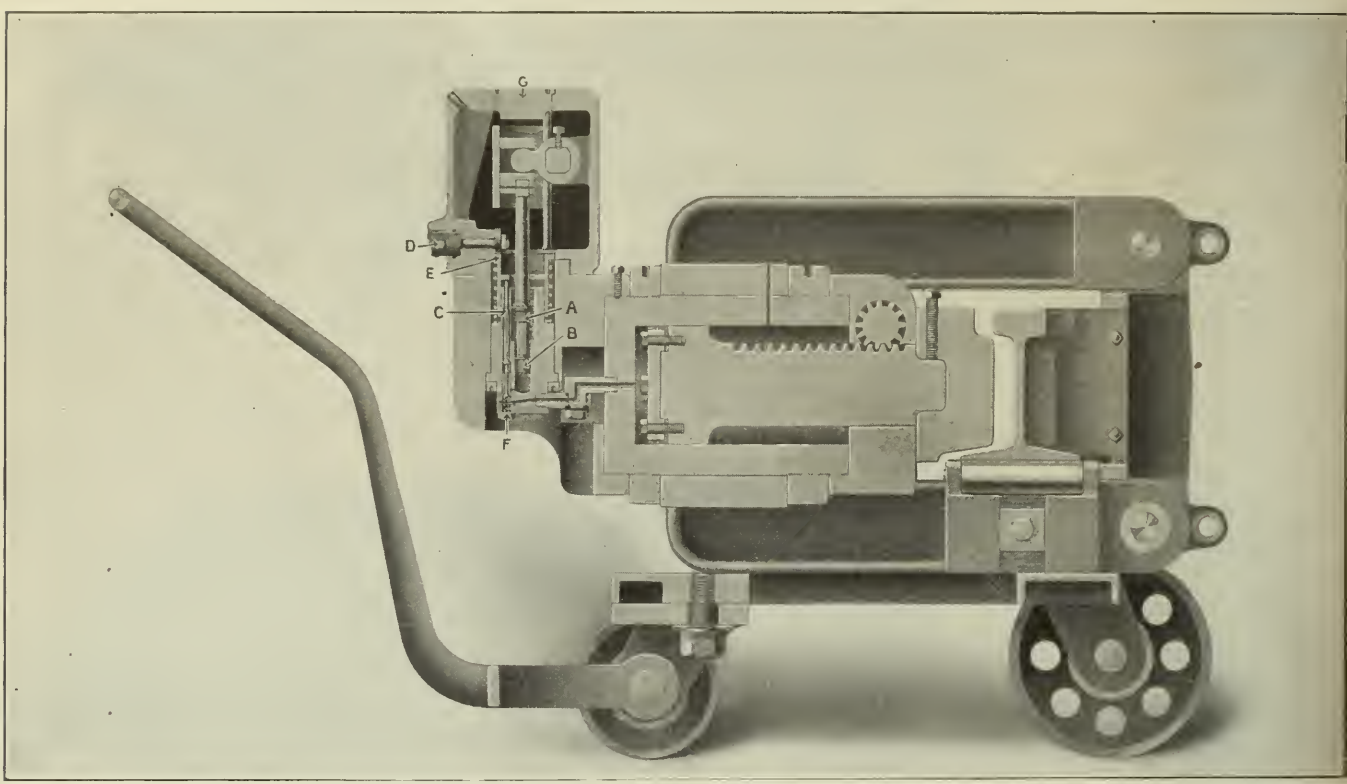
The Manard anvil face frog, design 160, is a hard centre frog for main line traffic. The centre is made of Manard steel, a high quality of manganese steel. Solid Manard frogs, switches, mates, crossings and special work layouts for all conditions of service are specialties. Switch stands of all approved designs are manufactured. The switches for steam roads made under the Vaughn patents are also manufactured in the frog and switch department.

The Never-slip interlock switch plate, rolled from the finest steel blooms, with solid riser and a turned shoulder to hold the brace tightly against the stock rail, forms a practical rail lock and has met with favor, superseding in many cases the forged plate with struck-up, hot-pressed riser.

HYDRAULIC RAIL BENDER.

The new portable rail bender shown in the accompanying illustration has been put on the market by Richard Dudgeon, New York. It is different from the usual hydraulic rail bender in that it is made on the principle of the Universal jack and uses a pressure of 6,000 lbs. per sq. in., which is somewhat less than ordinarily used in rail benders. Where possible its parts are made the same as those in the Universal jack, which make repairs less difficult and reduces the number of necessary repair parts where both these machines are used.

The frame of the bender is made of high-grade steel castings and the cylinder, ram and similar parts are made of steel forgings. The ram is fitted with a rack and pinion by which it may be run out against the rail, thus eliminating the labor of pumping it out, the chamber behind the ram being filled with the fluid by suction so that the first stroke of the lever is against pressure. The pump is



Dudgeon Hydraulic Rail Bender.

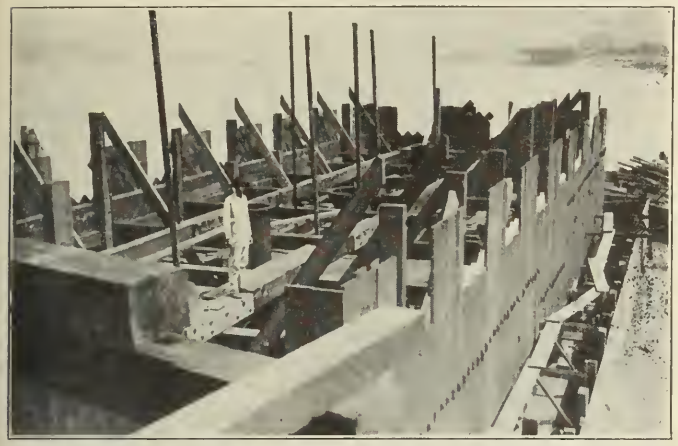
The Never-turn bolt has a head forged to fit the head and flange of the rail, set at an angle to make the lateral fit to the web of the rail. To further provide against the loosening of the nut, the bolt is split before being threaded and a long nut is furnished. After the nut is tightened the split is spread to engage the threads of bolt and nut firmly, thus obviating the use of a nut lock. As the bolt stretches under strain the nut may be removed and again placed on the bolt, which is split as before, and this operation may be repeated as often as necessary. Tests have shown that the Never-turn bolt has many times the resistance to vibration of the ordinary bolt.

Among the many recent installations secured by this department are the track work for the New York terminal of the Pennsylvania Railroad and that of the Vera Cruz terminal in Mexico. These consisted of an entire equipment in each case of frogs, switches, slips, crossings and all connections, and an innovation in frog construction was introduced for the Vera Cruz terminal in that a solid base plate was a integral part of a solid cast Manard frog.

equipped with two plungers, A and B, so arranged that A may be thrown out of service when the final pressure is applied. This feature saves time and labor. To throw plunger A out of service, the handle D is turned so that it extends downward. This handle operates a cam which pushes the bushing E down on the stem of the stop valve C, forcing it from its seat and thus by-passing the fluid under plunger A back to the reservoir. By turning the handle D another quarter turn to the right the bushing E is forced still further down, forcing all the valves from their seats. The pressure is thus released from behind the plunger, which may then be pulled back by the pinion and rack. By this arrangement the valve seats may easily be kept clean, as the fluid can be made to pass both ways over them, washing away any grit that should by chance collect there. The valves are easily removed by unscrewing the bonnet F in the bottom of the pump, and the piston and plungers by unscrewing the plate G. The other parts are as conveniently removed, making the machine as simple in repairs as in operation.

ST. LOUIS MUNICIPAL BRIDGE.

The municipal bridge which is now being built across the Mississippi River at St. Louis, Mo., is a double deck structure with a highway on the upper level and railway tracks on the lower, being designed to carry two railway tracks, two trolley tracks on a 30-ft. roadway, and two 6-ft. sidewalks. The bridge is carried on piers sunk to rock by the use of pneumatic caissons. The contract for the four river piers was let to the Missouri Valley Bridge & Iron



Pier Being Launched From Barge.

Company, Leavenworth, Kan., and work on them began in the latter part of 1909. The caissons were built inside pontoons or barges and launched from them into the river. Fig. 1 shows one of the caissons about ready for launching. Fig. 2 shows the masonry complete above the water level with the barge lying back of the pier. At present pier No. 1 is completed and piers 2, 3 and 4 are completed



Pier Completed to Water Level.

below the water line. Piers 3 and 4 will be completed first in order to allow the building of the east span as soon as the high water subsides.

THE ANTI-PLUVIUS SKYLIGHTS.

Sometime ago it became necessary to renew the roof of the train shed at the Grand Central station, Chicago, which includes 24,600 square feet of skylight surface. The roof as completed is shown in the two photographs reproduced herewith. The skylights are fitted with "Anti-Pluvius" metal frames and wire glass. These skylight frames are built in units, making their direction easy and allowing the removal of any pane of glass without difficulty.

The frame is composed of a supporting bar made of a high carbon steel, containing inverted stirrups at intervals of 16 to 20 inches. Flat plates covered with strips of hair felt rest on these stirrups and support the skylight glass. A similar strip of felt is placed on the upper side of the



End View of Train Shed.

glass and is held in place by a metal cap. Brass studs are screwed into the stirrups and project up through the plates between the panes of glass. They are equipped with phosphor bronze springs which bear on the upper side of the metal cap and on the under side of a shoulder provided near the upper end of the stud. This spring furnishes an



Side View of Train Shed, Showing Skylights.

elastic pressure to hold the skylight glass securely in place. The stirrups in the steel supporting bar hold the glass above the lips of the bar so that in locations where condensation on the skylights is common a large part of the trouble is eliminated since the glass is not in contact with any of the metal in the frame. The hair felt used is a non-rotting material which has been produced after considerable experimenting. Inverted "U" bars are carried on the upper shoulder of the brass studs at a distance of a few inches from the glass. These bridges are easily able to bear a man's weight and provide a means of ready access to all parts of the skylight. All the exterior metal trim-

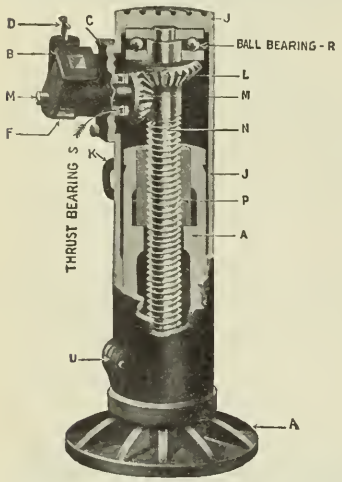
minings of these frames are of Toucan metal, which has exceptional rust and corrosion resisting properties.

These skylight frames have been used in many train shed installations throughout the country and are also being extensively used for street railway car barns. Two of the large car barns of the Chicago Street Railways Company are equipped with them and two bays have recently been added to the barn at Thirty-eighth street and Archer avenue, requiring a large quantity of these puttyless frames.

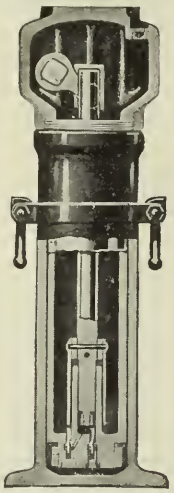
The Anti-Pluvius frames are made by the G. Drouve Company, Bridgeport, Conn., and models are on exhibit in Booth 163 at the Coliseum.

JACKS.

All railway men interested in lifting jacks will appreciate the large display of ratchet, geared, ball-bearing and hydraulic jacks by Fairbanks, Morse & Co., Chicago, at the Railway Appliances Exhibition, spaces 73, 74, 75, 76 and 92, 93, 94 and 95, at the north end of Coliseum. The different departments of railways require different types of jacks. The quick acting ratchet lever jack has been adapted to track work, and is now an absolute necessity to many track men. The standard No. 1 track jack has a capacity of 10 tons. Next comes the 15-ton capacity jack used for heavier track work, and also for light car repairs in the mechanical department, but as 15 tons is about the limit of



Fairbanks-Morse Ball Bearing Jack, Sectional View.



Duff-Bethlehem Hydraulic Jack, Sectional View.

easy operation with a ratchet jack, the geared jack has been brought out, having from 20 to 40 tons capacity, and has displaced, to a certain extent, the slow moving screw and hydraulic jacks. Until a short time ago the heaviest geared jack was of 35 tons capacity. However, with the advent of heavier rolling stock, particularly the steel gondolas and large steel frame box cars, the necessity arose for a heavier jack, which has been perfected by the Duff Manufacturing Co., and styled "No. 400," of 40 tons capacity. Special features distinguished this jack from the lighter ones and all parts have been worked out with the idea in view of having a well proportioned, safe jack, exceptionally large bearings, and an independent set of raising and lowering parts outside of the gear and pinion.

The distinguishing features of the ball-bearing jacks sold by Fairbanks, Morse & Co. are clearly shown in the sectionalized jack they have on display. In these jacks, the balls are made very large and are separated from each other by a brass cage, each ball being free from the other, minimizing the friction. The balls do not run on a flat surface, but in a groove, which gives a greater bearing and results in the balls standing a heavier load without crushing than if on a flat plate. Another distinctive feature is the roller thrust bearing back of the bevel gear, to reduce wear on the gears and make operation of the jack easier by reduction of friction at that point.

The new Duff-Bethlehem hydraulic jacks exhibited by Fairbanks, Morse & Co. are made of forged steel, thereby reducing the weight about one-third without reducing the capacity. Another important feature of this jack, probably the most important and one that appeals instantly to railway men experienced in handling hydraulic jacks, is the absence of any joint and packing at the base. The base and cylinder are in one solid forging, giving no opportunity whatever for leakage, which is the most common trouble. The head is cast steel and the ram is forged integrally with the pump, having no threads. The valves are only two in number, parallel system, working independently of each other. These jacks can be used at any angle.

HOLMEN COALING STATION AT DELMAR, IND.

The coaling station illustrated herewith is a 500-ton Holmen plant, built at Delmar, Ind., for the Cleveland, Cincinnati, Chicago & St. Louis by the Roberts & Schaefer Company, Chicago, under the jurisdiction of O. E. Selby, Cincinnati, Ohio, engineer of bridges and buildings of the railway.

The railway now has under construction at Mattoon, Ill., a Holmen plant of this general design but with a storage capacity of 800 tons of coal, and at Greensburg, Ind., it is having built by the same contractors a 500-ton Holmen plant, similar to the Delmar station, with the exception that in the latter case the entire sub-structure and bin trusses are structural steel encased in concrete.

The station at Delmar consists of a frame superstructure, with steel bin trusses supporting a 500-ton bin for coal, which is elevated on posts high enough to let the coal flow from a storage bin by gravity into the tenders, this being accomplished by the installation of standard undercut gates with hooded aprons over the two main line tracks.

At the right of the bucket tower is a 36-ft. concrete receiving hopper under the unloading track on which loaded cars are run in. This hopper is covered with a canopy roof with side enclosure to protect men from the weather when unloading coal. The coal from the track hopper passes into two Barrett patent revolving measuring feeders, which measure a given quantity of coal and automatically discharge this load into the two 1½-ton Holmen buckets. It is not necessary for the operator to watch the loading of the buckets, as this is accomplished automatically. The two Holmen buckets are located alongside each other and are elevated alternately. When one bucket is in the bottom of the pit being filled, the other is at the top of the plant discharging its load of coal into the storage bin.

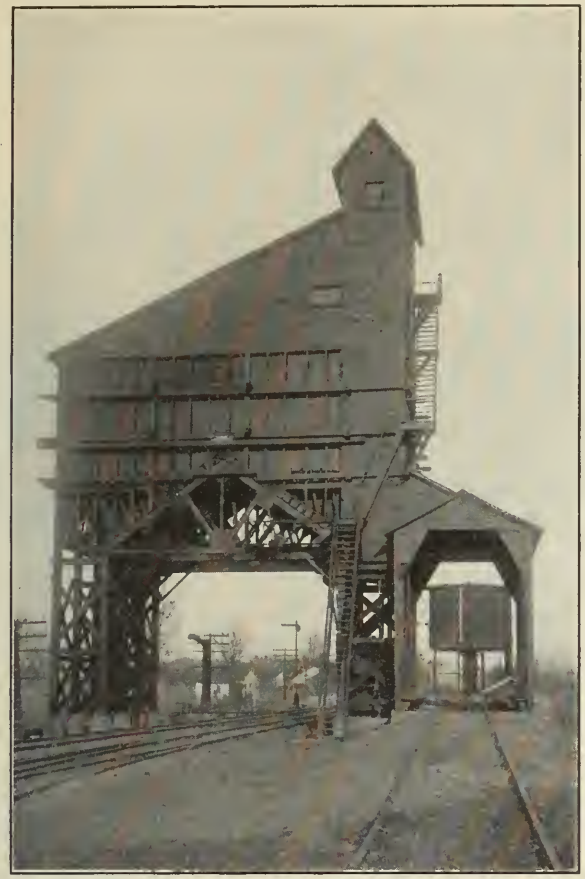
Each bucket is attached to a ⅞-in. crucible steel wire cable connected to a reversible steam hoist. The sheaves at the top of the tower are of liberal size to insure long life and easy movement of the cable. The small amount of machinery necessary in a Holmen station insures a minimum expense for up-keep.

The bucket elevating the coal is opened at the top automatically at the proper elevation to deliver the coal to the pocket with a minimum amount of breakage and is also closed automatically after being emptied. As the bucket descends, it is immediately filled at the bottom with coal by the revolving feeder in the pit.

The operation of filling the buckets and hoisting the coal and delivering it to the storage bin is under the control of one man, who merely operates the lever on the hoisting engine to put in operation the feeders and elevating machinery.

The average time required to fill and elevate a bucket of

coal is usually about one minute, and with two 2½-ton Holmen buckets an elevating capacity of 125 tons per hour can readily be attained. This machinery is also designed to elevate 40, 60 or 75 tons per hour, according to the requirements of the station, the plant built at Delmar being designed with a 60-ton elevator.



Holmen Coaling Station at Delmar, Ind.

CHICAGO IMPROVED CUBE MIXER.

In drawing up plans and specifications for work the engineer usually insists that none but the best material shall be used and that the manipulation of the material shall be such as will result in a finished product which will be the best that can be obtained by the most modern methods. In doing this work the contractor looks for means to comply with these specifications with the minimum of cost to himself. In selecting a mixer he investigates carefully the speed of charging, speed of mixing, speed of discharging, strength and uniformity of concrete and cost of maintenance. A large number of important public and private works, among them the Panama canal and the Michigan Central tunnel under the Detroit River, on which the Chicago improved cube mixers, made by the Municipal Engineering & Contracting Company, Chicago, were used exclusively, testify to the way in which they fulfil these requirements. The accompanying view shows a cube mixer mounted on skids in connection with a steam engine and boiler. It is equipped with a charging elevator and a boom attachment for delivering concrete at some distance.



Chicago Improved Cube Mixer, With Boom.

A MODERN FORM OF LIGHTNING ARRESTER.

The lightning arrester problem has always been a difficult one for the signal department to solve. It has been no less difficult for the manufacturer who went into the problem with sincere intention of aiding the signalman in his troubles. At first glance, the problem seems simple. An alternating current in one line will induce similar currents in a parallel line, and, to a less extent, in its own line. Prior to the great demand for arresters for signal material there had developed a large field for arresters in telephone, telegraph and power circuits. Arresters designed for each of these types of service have given quite satisfactory results, but a careful study shows that they have been designed by men thoroughly familiar with the subject and that they are incapable of transfer from one branch of service to another. Arresters for the three types of service just mentioned, each have one prime function, namely, to save the apparatus which they protect by immediately destroying the use of the circuit for the time being.



Arc Damp Lightning Arrester.

Arresters for signal service must fill just the opposite requirement in this regard. They are not located at convenient points in power houses or sub-stations, but are scattered out along the line at the different signals and relay boxes, and they must not put the line out of business, but must immediately restore it to working order as soon as the abnormal conditions in the atmosphere disappear. It was on this point that the ordinary choke coil with saw teeth, discharge gap and ground plate, early developments in the making of an arrester for signal service, ultimately failed to fill the requirement. Practically all such arresters were designed with a fuse in series, and it was not uncommon to have a discharge blow the fuse and put the signal entirely out of service until the fuse was replaced.

Careful labcratory study revealed another serious defect in the usual open-gap choke coil arrester. None of these arresters would arc to ground at less than 2,000 or, possibly, 3,500 volts. If the easiest path to ground was between two saw teeth, it is apparent that with each discharge the gap between the teeth was widened by burning off the point and the ordinary breaking down voltage was raised with each successive discharge.

Insulation tests of coils, relays and other apparatus indicated that they could be punctured by 3,000 volts, and in some cases less than this, and that the insulation around the binding posts would also break down at about the same pressure. Taken at the best it was a question whether the lightning arrester would protect the relay, or the relay would

protect the lightning arrester, and it soon became apparent that the arrester must have a low point of break down relative to the instrument it protected.

Other features of failure were common in early types of arrester. It became permanently grounded by fusing of metal across the air gap, or lodgment of foreign particles, such as small pieces of coke or bugs, or, drops of water in the air gap. Sometimes the arrester was structurally weak and broke, allowing the choke coils to fall against the ground plate. Occasionally after the arc was established by the lightning, it was continued by the normal circuit after the charge had ceased. All these failures were common enough to make it plain that they must be avoided in a satisfactory design of arrester.

About five years ago some interesting experiments were made by engineers high up in the signaling profession, and from these experiments, a type of arrester at that time considered novel, was developed and placed on the market as the Arc-Damp lightning arrester. This device had no choke coil and no fuse. It was not part of the line proper, but was a multiple between the line and ground. It consisted of a spark gap, many times smaller than anything that had been attempted in the usual open gap arrester.

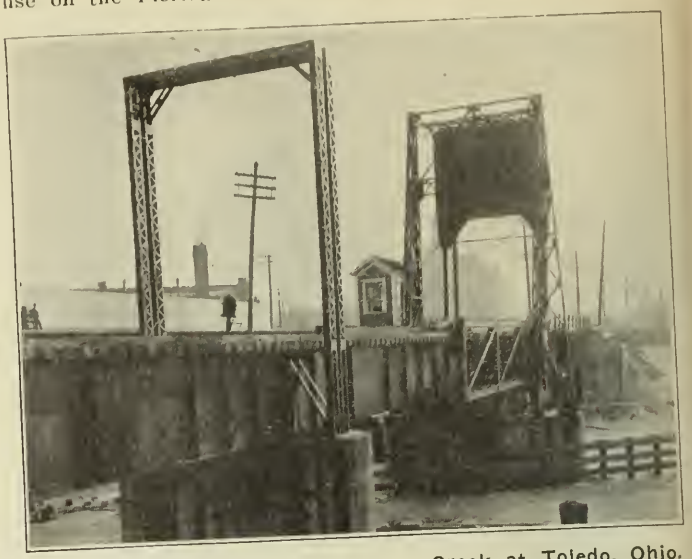
In series with this gap was a block of high resistance material. This material was practically a non-conductor to the usual low-voltage working circuit, but to the high-frequency discharge it was a satisfactory conductor. Repeated discharges would raise its temperature and lower its resistance, thereby increasing the capacity of the arrester under severe conditions. No matter, however, how low its resistance might fall under strenuous service, it was capable of restoring the line to normal and preventing the discharge of working circuit to ground as soon as the abnormal condition ceased. The gap was so protected that foreign particles could not enter, and even should the metal faces of the gap fuse across, there was enough resistance in the block in series with the gap to prevent the working circuit becoming grounded. The total internal resistance of the device was very much lower than that of the usual choke coil, and its relation to the point of break down in relays and other apparatus was very much more satisfactory.

The Arc Damp lightning arrester was well received from the start. It was somewhat more expensive than the usual choke coil, but was much more effective, and when tried on a road, its use was very generally continued. As is natural in all new devices, extended service showed that certain structural corrections would improve the device and these have been made.

To-day what may be called the Arc Damp type of arrester is the only type that receives serious consideration in the signal department. The usual number of imitations have naturally followed, but the Arc Damp stands preeminent in the field. Since it was first marketed, it has been handled by the Railway Specialty & Supply Co., whose name is now The P. & M. Co., Chicago. The company has an exhibit of several of the devices in booth 123 at the Coliseum.

PLATE GIRDER BASCULE SPAN.

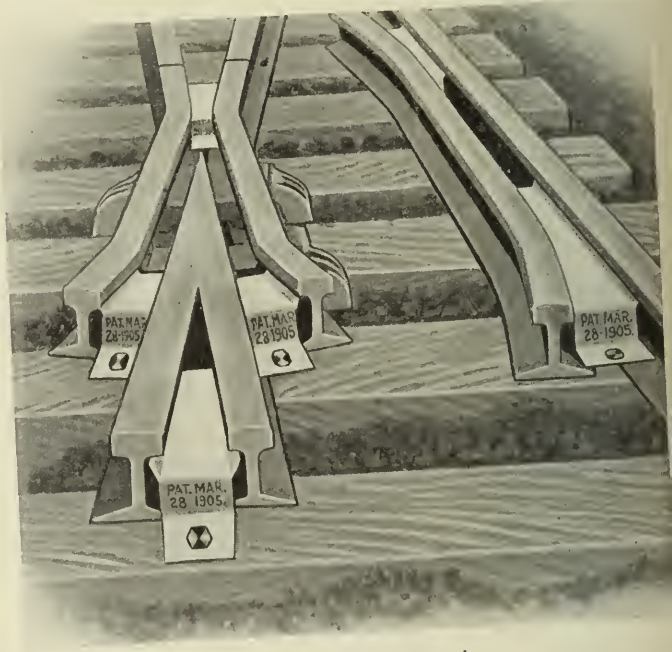
A particularly interesting adaptation of a Strauss bascule bridge is shown herewith. It consists of a pair of standard deck plate girders of the shortest possible length for the required clear opening, connected to a pair of lifting trusses provided with the Strauss counterbalancing arrangement. The result is an economical structure, the component parts being reduced to simple terms. Any standard deck girder may be converted into a movable span in this manner, the economical length limit being about 100 ft. The illustration shows a 70-ft. single-track span for the Ohio Electric Railway at Toledo, Ohio, the approach spans also being 70 ft., and interchangeable with the bascule span. There is now nearing completion a double-track bridge of this type for the Canadian Northern at Winnipeg, Man., the span length being 100 ft. Two bridges of the same type are also in use on the Florida East Coast, and others are under construction for the New York, New Haven & Hartford and the Toronto Hamilton Railway. These bridges are made by the Strauss Bascule Bridge Co., Chicago.



Strauss Bascule Bridge Over Swan Creek at Toledo, Ohio.

ECONOMY FOOT GUARD.

The Economy foot guard is made of No. 10 sheet steel, and is secured in place with an ordinary bolt or track spike, as shown in the accompanying cut. In many states the law requires the use of some protection in frogs and switches, wooden blocks being used in many cases for this purpose. The decaying of such blocks makes their renewal necessary at intervals and the metal guard is made to overcome this difficulty.



Economy Foot Guard.

The Economy guard requires no renewal and always presents a neat appearance in the track.

The Economy guard is made by the Economy Separable Switch Point Company, Louisville, Ky.

Railway Age Gazette

Including the Railroad Gazette and The Railway Age

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CLASSIFIED returns to the Connecticut Railway Commission of the freight tonnage in the fiscal year 1910 of the New York, New Haven & Hartford, give figures bearing on Canadian reciprocity, which we have already analyzed in the case of the "border system,"—the Boston & Maine. The total tonnage of the New Haven for the year was 22,738,981. Of this—excluding lumber—hay, fruit and vegetables, poultry, game, and fish and "other products of agriculture," represent practically the only commodities which by any strain of imagination can be lowered in price to the producer by the Canadian agreement. They comprise together only 796,628 tons or about 3½ per cent. of the total tonnage. Lumber formed a little more than 5 per cent. But the benefits of cheaper lumber, on the one hand, and the value of the fast expiring lumber forests of northern New England, on the other, need only be stated as facts to be an argument for reciprocity. Moreover, of the lumber freight only about one-fifth originated on the New Haven system; and of the agricultural products cited only 199,579 tons, or considerably less than 1 per cent. of the total tonnage. Contrasted with such relative trifles we find manufacturing merchandise and miscellaneous freight making up approximately 44 per cent. of the New Haven's total freight, and owing to its high rate obviously a much higher proportion of its freight receipts. Taking the New Haven and the Boston & Maine freight tonnage together, it is 45,554,509, of which nearly one-half is made up of manufactures and merchandise, a very large part of the remainder being commodities entirely exotic to New England and possibly 1 per cent. local farm products liable to be affected by lower prices due to reciprocity.

FOR many years there has been acute public agitation at New Haven, Conn., over the subject of a new railway passenger station to replace the somewhat antiquated and outlived structure fronting on the harbor and about half a mile from the business center of the city. After years of delay the railway company became responsive to the public sentiment. It bought some additional land near the old station site, had the plans for a station drawn, planned also for a street railway subway under the track and for an outlying steamboat wharf—the whole to cost not less than $3,000,000. But a better approach was needed and the whole plan was held up by exhorbitant demands of land speculators and an alternative project of a smaller station proposed near the center of the city. The result has been a kind of referendum of an unofficial but expressive character, and which may be generalized thus: Do the residents of a city of 133,000 inhabitants prefer a minor station central or a major station at the municipal outskirts with marine annex? Or, stating the case a little differently, does accessibility alone in the matter of such an improvement outweigh all other conveniences? There has been, as we have said, no regular local referendum on the question. But, strangely enough and quite to the amazement of President Mellen, with whom the decision rested, there has been a decided preponderance of New Haven sentiment in favor of the central station, where the company already has the land—or most of it—and a big sum would be saved in construction. It is perhaps illogical to reason from New Haven to other cities. They differ in local conditions and in municipal temperament and taste. Yet the New Haven case is at least suggestive as a measure of popular feeling on the distance factor in location of a railway station—and, incidentally, is somewhat unique as an instance in these days where public approval is on the side of a railway economy. President Mellen has begun condemnation proceedings for the outskirt station, and appears to have decided pretty positively against the central station plan, on such grounds as undue congestion, difficulty of handling large crowds, and the smoke trouble. But the public agitation in the city for "centrality" and nearness as against other conveniences—and a much more esthetic station—has continued.

IN 1877, when the Erie and the Lake Shore & Michigan Southern were building south from the lakes into Pittsburgh territory and the Pittsburgh & Lake Erie was building north from Pittsburgh territory towards the lakes, an agreement was entered into whereby an east and west line was drawn about 70 miles north of Pittsburgh extending across the entire country and the business of the country from and to the Pittsburgh territory was partitioned out between the Erie and the Lake Shore. The Erie was given all the territory south of this line, the Lake Shore was given the territory north. With changes in conditions, and especially since the passage of the Mann-Elkins Act, which gives the shipper the right to prescribe, as between two competing carriers on any part of a route, which railway his shipment shall move over, this old agreement of 1877 has become unsatisfactory in working and impossible to enforce, in so far as the dividing line feature is concerned. A new agreement has been made between the New York Central Lines and the Erie, by which the restrictions both as to the New York Central traffic men compet-

ing for traffic south of this line and Erie traffic men competing for business north of the line, have been entirely removed. The Erie can today compete in Pittsburgh with the Lake Shore for traffic for Chicago, and the Lake Shore can compete with the Erie for traffic for the territory southwest of Pittsburgh. The Pittsburgh & Lake Erie, therefore, between Youngstown, Ohio (the southern terminus of the Erie) and Pittsburgh is in a certain sense the common agent of both the Erie and the Lake Shore. Sharon, Pa., is about 60 miles south of Lake Erie, and south of it about 20 miles is New Castle, while Youngstown lies southwest of Sharon. Now, the Sharon branch of the Erie, which runs from New Castle to Sharon, and forms the base of an equilateral triangle whose apex is Youngstown, connects the P. & L. E. at New Castle with the Lake Shore at Sharon. The P. & L. E. and the Lake Shore form the two legs of the triangle connecting at Youngstown. The Erie has agreed to give the P. & L. E. trackage rights over this Sharon branch, continuing, of course, to operate its own trains also over this branch. The advantages of this arrangement to the Pittsburgh & Lake Erie are obvious. It gets into that territory with its coke as well as with other business. The advantages to the Erie lie largely in the development of the business on this branch. Heretofore, for instance, the Erie could not take Chicago business off its own Sharon line. The present agreement was under consideration before negotiations began for the 99-year traffic agreement between the Western Maryland and the Pittsburgh & Lake Erie, in connection with which the Western Maryland is building its new line from Cumberland north to a connection with the P. & L. E. at Connellsville.

THE correspondent in Albany, whose letter we print in this issue, sets forth a sober fact of which we need frequently to remind ourselves—the fact that neglect or inefficiency in railway offices has been the cause of much of the success of the employees' brotherhoods. Possibly this is past history; but it suggests another fact, equally sobering, which must be looked upon as important both for the present and the future; the fact that in so far as the success of the brotherhoods has been in violation of economy, good practice or fair dealing, it needs to be combated and destroyed, and that the only way to accomplish this is by a reversal of the official tactics and policy (or want of policy) which have produced unhappy results in the past. Our correspondent is a trifle too severe on the superintendents, for many of them have worked hard to improve discipline, and, even where unsuccessful in this, they do not always whine about the oppressiveness of the brotherhoods. In his abundance of courtesy, he speaks of the employees' action as a demand for equitable wage scales; but the cold fact is that their leaders have sought the highest possible scale. Possibly railway managers have ignored equity also, making two wrongs; but the error of the labor leaders was the one that succeeded. Our correspondent says that the employees did not aim to secure contracts which would tend to encourage insubordination; they wanted a reign of laws, not of men. This statement, however, only serves to throw into strong light the ugly fact that in most of the cases where there has been trouble between a railway and its employees the "contract" was only a frame work; the real contest did not hinge on what should or should not go into a written contract; rather it was a measuring of the rival personal forces; the railway officers on one side and the brotherhood leaders on the other. The fact that for a long time all the prominent railway labor disputes have been settled in favor of the employees has been due not entirely to the increase in the cost of living or to the dangers of riding on a double-header, or in a four-wheel caboose, not by any means; but largely to the fact that on one side were expert negotiators, fully posted concerning every labor fact in the United States, and devoting their lives to this one object, while on the other was a superintendent or manager hampered by having constantly to refer to higher authority, by the demands of numerous other important duties and (often) by insufficient experience in such strenuous fighting—or, in euphonious phrase, "diplomacy." Labor troubles will not be got rid of so long as this inequality continues. And labor troubles are not going to cure themselves, or die out for lack of fuel to feed their fires, so long as a considerable percentage of employees on trains are receiving 50 to 75 per cent. more pay than similar ability receives in other common employments.

A PROBLEM PESSIMISM WILL NOT SOLVE.

THE five-minute speech made by John Barton Payne, general counsel of the Chicago Great Western, at the annual dinner of the American Railway Engineering Association in Chicago, on March 22, was one of the sanest of recent utterances about the railway situation. Mr. Payne represented the Great Western in the western rate advance case. It might be expected that the result of that case would make him pessimistic. But he was formerly a judge. The judicial temper which nature gave him has been developed by experience. He is, therefore, able to be judicial even in defeat—a rare accomplishment. Surveying the field with an eye that can see the tendencies working to benefit as well as those working to harm the railways, he said, in substance:

"I do not think we should be disturbed by the phase of legal difficulties through which we are now passing. You know the history of the past in dealing with railway construction. We were simply leading the van of civilization through the West; and, now that civilization has settled down in some sort, difficulties which confronted railway construction and operation are exemplified by the 46 or more state commissions and the great commission of the United States. We must be wise enough to adjust ourselves to these conditions. After awhile, the United States commission, by the addition of power given by Congress and by the construction of the Constitution, which the Supreme Court of the United States must ultimately make, will assert and exercise the power of dominating rate-making and railway regulation to such an extent as to dwarf the power of the state commissions, and when we reach that condition we shall so have impressed ourselves upon the power of Congress and upon its wisdom that Congress will give to the railways of this country that power and encouragement which will enable the railways to take the place which the ways of the world have always taken and held. And the only word from the legal department of our road is that we shall be wise and patient, and that we shall not beat ourselves against the pricks, but deal with these conditions wisely, because it is a phase of civilization through which we must pass."

No man can forecast the future of American railways with an approach to accuracy who does not recognize the present as distinctly a period of transition. Until a comparatively few years ago each railway was an isolated unit. Its manager's two principal functions were to run his own road and to carry on war or negotiate with competing roads. Railway consolidation and an aroused and antagonistic public sentiment giving effect to itself in government regulation have created new conditions. The tendency of consolidation, of course, was to produce monopoly. Such a tendency, if not accompanied by, was bound to call forth, government regulation. Government regulation was bound to restrict the railway manager's freedom of action and his authority. Railway managers are human. Being human, it was inevitable they should resent and resist—often unreasonably—attempts to restrict their freedom of action and curtail their authority. Railway regulating authorities are human. Being human, it was inevitable they should seek constantly—often unreasonably—to extend their sphere of action and authority. Hence, to a large extent, the wide differences of opinion regarding government regulation and the struggles about it, resulting in the "phase of legal difficulties" which Mr. Payne mentioned.

Government regulation has come to stay. The sequel of the present controversy and struggle will be either a form of regulation satisfactory both to the public and the owners, managers and employees of the railways, or public ownership. Which it shall be will depend mainly on the railway men of America—including not merely the owners and the officers of the roads but their more than a million and a half of employees. There already has been much government regulating which is regretable, and which should be undone. But there has been nothing done which is irremediable. Take, for example, the recent decisions of the Interstate Commerce Commission in the rate advance cases. They

are regarded by most railway officers and employees as unjust. But if they shall prompt managers and men to deal with the present situation as they ought to it may develop that this loss of a battle was the beginning of the winning of a campaign.

The general discussion of the question of rate advances had convinced the public that the railways were not rolling in wealth as it had thought. Public sentiment was in a condition of unstable equilibrium. If the commission had allowed any advances, the public would have said that the roads had got all that —or, perhaps, a little more than—they were entitled to receive. The unqualifiedly adverse decisions, if we may judge by the comments on them, both of individuals and the daily and periodical press, caused a feeling that the roads are being rather hardly dealt with. No other important decision of the commission was ever received by the public with so much doubt as to its justice or with so much sympathy for the roads. If the decisions had been favorable to the roads, employees probably would have been encouraged to make demands for further advances in wages which would have exceeded the resulting increases in earnings; and as the increased rates were asked for largely on the ground that they were needed to make it practicable to pay high wages, public sentiment would have sympathized with the employees. The commission having denied any increases in rates, both the owners and employees must look to increased efficiency for a higher return on their investment and for higher wages for their labor. The wages of labor constitute 62 per cent. of the total operating expenses of the railways. Obviously, therefore, the sort of increased efficiency which will tend most powerfully to increase the incomes of the security holder and of the worker is increase in the efficiency of labor. Surely there is enough sense and justice among the managers and the employees to work out a plan or plans by which increase in efficiency and a fair division of its fruits can be obtained. One does not have to accept the Munchausen estimates of efficiency engineers as to the possibilities of efficiency methods to see that by better co-operation between managers and men substantial improvements in operating results can be obtained.

The conditions created by the rate advance decisions are typical of all the conditions created by government regulation. These conditions make it of constantly more pressing importance for them, on the one hand, to deal judiciously with public sentiment, and, on the other, to labor harder to so operate the properties as, while meeting all the reasonable and many of the unreasonable demands of the public, to produce net earnings which will adequately reward and attract capital. Almost every one of the many struggles over the question of regulation in recent years has gone against the railways. No wonder, then, that railway officers in general have become temporarily the champion pessimists. But pessimism does not win victories. One of our most popular contemporary philosophers has defined an optimist as "a man who takes the lemons that are handed to him and makes lemonade out of them." It has been by years of exercise of that sort of optimism that hundreds of individual railway men have risen from switchmen, firemen and telegraph operators to general managers, vice-presidents and presidents. They dealt with conditions as they were, troubling themselves not over much with conditions as they wished them. They would have been untrue to themselves if they had done otherwise. They need to display the same spirit now—as many of them are doing—in dealing with the difficulties that confront the great enterprises with the duty and responsibility of whose management they have been charged. They must learn to make lemonade as well out of the lemons that are handed to their railways as out of those handed to themselves. If they do learn this the problem of government regulation will be satisfactorily solved. If they do not we shall go from one extreme of regulation to another until both the owners of the railways and the public will welcome government ownership as the only avenue of escape from the intolerable condition that must result from attempts at public management of private property.

RAILWAY HISTORY VERSUS STOCKHOLDERS' RIGHTS.

In its recent finding against the raising of railway rates, the Interstate Commerce Commission harked back in one case 42 years ago for an argument. It cited the New York Central-Hudson River consolidation of 1869 and the carrying by the company of $57,000,000 of capital stock unpaid for. This refers, or, at least, refers mainly, to the old 80 per cent. stock dividend of the times of Commodore Vanderbilt. It is true the commission does not cite the case very emphatically. But it does say that it is a bit of history to which it cannot entirely close its eyes. By the strongest of implication the commission says that in the fixing of new rates old annals and old acts of capitalization are to be taken into account, and, if the metaphor may be allowed, a kind of ancestral charge raised against original sin and levied on the present railway generation. In other words the stock waterings of the fathers are to be used to drown the profits of posterity.

In the last ethical and financial analysis it may be that the term "original sin" may be applied to the old time railway hydraulics. Yet, if so, it must be applied with qualification. Every error, even unto direct offense against the Decalogue, must be measured by its times. The Puritan fathers, stiff in their theology and, at many points, in their morals, did not hesitate to raise funds for public purposes by the lottery against which our generation aims the penal code. So with the capitalization of the railway. At its early and through its middle stages the capitalization of the railway was done with a free hand. There was, it is true, a charter limit. But the limit was technical and within it the ratios of cash and concrete values on the one hand to book and stock capitalization on the other were ignored both by authority and by public sentiment. Few railway commissions existed and where they did exist they were phantom bodies. Capitalization rested mainly on earning power, and large allowance was made not only in the mind of the public but of the investor for the initial risks of new railway enterprise—this in times, too, when the natural return on extremely conservative investment was 7 per cent., or higher. It would have been safer and better for posterity, no doubt, if stock capitalization had paid closer attention to plant and to the future rather than to mere earning power—a matter upon which New York Central's present stockholders in the shade of their recent reduction of dividend will agree. But free capitalization was elemental in the times. There was, for example, a New England railway company which, besides its 12 per cent. regular dividends, declared stock dividends over and over again in the decade 1860-70. And if the Interstate Commerce Commission is to refer to the New York Central's $57,000,000, might it not also refer to that company's two-cent-a-mile charter restriction of the passenger rate which the public has enjoyed ever since?

Stress may also, in the line of economic reasonings, be laid on railway changes since the times of those successful stock waterings. One may cite justly the generally lowered passenger and everywhere lowered freight rates, the costly terminals, the higher standards of public necessity and convenience to which the railways have conformed, the offsets to original water in the increased valuation of plant, and the other and very large offsets represented by reorganizations which have snuffed out original capital paid in. But these are secondary to a final and vital consideration that lies at the root of the case.

That consideration is the transfer from an old generation to a second and third generation of stockholders. Even assuming that the first generation was guilty or, at least, careless and lacking in foresight, the later generations stand absolutely innocent of the past. There has been no breach of law in their own case or, for that matter, of their fathers before them. Their shares are legal, bought in the open market, or inherited under conditions where executors in distribution have set railway shares at market price against bonds, against realty or other forms of value not of a railway character—or they may hold such shares as trustees after repeated settlements of an estate. Again, in their utilitarian

relation are such stockholders to be set down on a plane lower than the outside investor? Is the railway a minor public beneficence as compared to the factory or the farm? Yet, apparently, from the viewpoint of the commission, the railway stockholder must be the victim. He must stand sponsor for the remote and ancestral act, shoulder the responsibility of $57,000,000 injected into New York Central capital four decades ago, by parity of reasoning carry the sins of the Credit Mobilier scandal in the first Pacific roads or bear the burden of undue profits of a contractor in building an early pioneer line. That is the *reductio ad absurdum* to which historical responsibility for antique railway financing inexorably leads—as though the logical economic sequels of earlier misdoing in such instances as the Erie were not enough.

The reference of the commission to ancient capitalization of the New York Central would be unpleasant as a bit of unjust reasoning if limited to itself. But, unfortunately, it is but part of that greater visual defect of the public which sees the railway only from one side. It views it almost solely as a great chartered organization. Its mental vision pauses upon the outward expression in thousands of miles of track, great stations, its central office of huge structure, its functions as carrier of men and goods. Unseen or not seen at all in the background is the stockholder who is *the* real corporation with rights, so far as pertains to his *investment,* identical with those of the man who builds a factory or owns a shop. That analogy now so strangely confused cannot be too soon clarified. It will not be clarified by official allusion to original and far away acts for which a posterity of railway shareholders are as blameless as for the error in Eden.

Letters to the Editor.

GENESIS OF RAILWAY BROTHERHOODS.

Albany, March 11, 1911.

To the Editor of the Railway Age Gazette:

The communication published in your issue of February 7 wherein your correspondent administers a mild rebuke to the exponents of "efficiency methods" for their seeming disregard of the variable nature of the human factor is particularly interesting when viewed in connection with the circumstance that of all organizations for the conduct of business within the limits of the United States there are none that have paid so little attention to this same principle as the transportation companies and their managers. In the work of loading and transferring freight personality counts for something, in office work it counts for a little more; and in shop work it is of still greater value; but in the business of train operation it at present constitutes almost the entire problem. Constructors and mechanical engineers, aided that greater public strabismus which sees the railway corporation by cheap steel, have succeeded in at least partially solving their share of the problem connected with safe train operation, but the managers and operating officers who are directly responsible for the human factor, have left their part just as they found it twenty or more years ago—unsolved. The stock excuse advanced by operating officers for their failure to improve the quality of the human element, is, that they are and have been hampered in this direction by the malign influence of the labor organizations. But, it may be asked, who is responsible for the existence and power of these dangerous combinations? They did not leap forth full armed like Athene from the head of Zeus, any more than did "efficiency methods"; they are the result of conditions that it should have been somebody's business to note and inquire into, with the idea of forestalling so threatening a movement as labor combinations are generally alleged to be, by eliminating those conditions.

The forces that have operated to energize the railway labor union into life and activity are quite dissimilar from those that have brought the trade unions into existence and sustained them in their activities. In the trades the forcing process resulting from the "closed shop," and long association during the formative period of youth with union journeymen which operates on the apprentice in such a way that he comes to regard his entrance into the union on becoming a journeyman as a natural and necessary step, both combine to add to the strenght of trade unionism, and to furnish an explanation for it; but in railway operation neither of these conditions obtains.

Railway men were not compelled by the economic menace contained in the law of the closed shop, nor by an impulse arising from association to become unionized; but rather by circumstances wholly within the power of the railways to eliminate; desire for a more equitable wage scale and determination to nullify the petty tyrannies of under officers. And of these two factors the latter was the more powerful. It is this factor that has frequently produced a situation quite inexplicable from the viewpoint of the general public, who have often witnessed with astonishment that railway unions were more anxious and determined to secure the ratification of certain seemingly unimportant articles in their "agreements" than they were for increases in pay. These articles would probably be intended to protect them from the "snap judgments" of officers who would consider it prejudicial to discipline to reopen the case even when entirely convinced of their error, and to eliminate unnecessary hardships resulting from carelessness and inattention on the part of minor bosses.

To illustrate the extent to which the management's neglect of the human factor aided in the establishment of railway unions let me cite a case. Not many years ago the freight crews located at a certain terminal of one of our great trunk lines were called by two half grown boys, who instead of being required to keep in touch with the "run" of freight and to call men within a reasonable time of their being required for service, were permitted to simplify the matter by calling a certain number of crews at stated intervals whether they were required for immediate service or not; so that a man called at 9 p. m. would often remain about all night, and frequently would not be needed for service until late the following day. No one will deny that this was an unnecessary hardship, and could have been avoided if the caller's office had been conducted in a businesslike manner and with some thought of the welfare, to say nothing of the operating efficiency of the men; yet the practice remained in vogue until the labor unions on that particular road became strong enough to compel the management to agree that the men should be paid for every hour they were called and not put in service. Of course little overtime was paid, but the crews were not called until they were needed, which was the end desired.

It was not the aim of the railway labor unions to formulate "agreements" that would enable their members to escape from the control of their superiors, but with the instinctive desire for justice which seems to form part of the mental equipment of the average Anglo-Saxon they desired to make the subject a matter of law and not an affair of men; and it is to the fact that railway managers were not watchful enough nor acute enough to detect this tendency and forestall it that the railway labor unions owe their present vitality and energy. And the real problem that confronts the average railway management today is to direct this energy and vitality into channels where it will operate to the mutual advantage of the public, the railways, and the men. To think of turning back is mere Bourbonism, and to speak of "handling men" is an anachronism. Officers are compelled by the very force of circumstances to deal with men, and as a consequence to study them, and to come to know their weaknesses and their strength. With this study of the human factors will come a better appreciation of the conditions under which that factor is required to operate, and when they have reached that point railway managers have taken the first long step towards the solution of all the operating problems which involve the element of personality.

ONE OF THE COGS.

TRAFFIC AND OPERATION OF THE VIRGINIAN RAILWAY.

BY GEORGE L. FOWLER,
Associate Editor, *Railway Age Gazette.*

An article was published in the *Railroad Gazette* of March 15, 1907, dealing with the location, construction and adopted standards of the Tidewater and the Deepwater railways, now combined and operated as the Virginian Railway. At that time the road was under construction, the arrangements of the Norfolk terminal were up for consideration, but had not even reached the paper stage of its development, and the energies of the officers were being directed solely towards the completion of the grading, the erection of the viaducts and the laying of the rails. Attention was, however, called to the very substantial manner in which all work was being done, and the high grade of engineering that was manifested in the location and construction.

Briefly summarized, the road started from Deepwater on the Kanawha river, and ran south through an exceedingly rough and totally undeveloped country for 96 miles to Princeton, near the summit of Stone Ridge mountain. From Princeton there is a pusher grade of 0.6 per cent. for 2 miles and then there is a run down the eastern slope of the mountain to the valley of the New river, where the crossing is made over the spectacular piece of location described in the previous article and of which the high New river bridge and viaduct form a part. Here, east of Glen Lyn, after following the New river for 30 miles, the climb of the Alleghenies begins. This is done with a maximum grade of 0.6 per cent., which involves a pusher grade 8.5 miles long. The run down the eastern slope of the Alleghenies is on a 1.5 per cent. grade, beyond which is the valley between the Alleghenies and the Blue Ridge, then through a gap in the Blue Ridge and across the coast plains of Virginia to the sea, with a maximum grade of 0.2 per cent. against eastbound traffic. It is quite apparent what this meant in the way of heavy work, even in so easy a country as that through which the road passes, in its last hundred miles to the coast.

It was laid out essentially as a coal road, without any intention of attempting to develop a large passenger traffic, though its scenic attractions are very great, but with the expectation that mines would be opened along its route to such an extent and of sufficient capacity to supply a paying traffic to the line, which, when handled with proper terminal facilities, would put the property on a firm financial basis. With a low-grade line of the character described, the calculations were to run trains averaging 80 cars, each of 50 tons capacity with a possible 10 per cent. overload, so that the net tonnage from Princeton to the sea would be about 4,000 tons of paying load.

To care for this at Norfolk, a terminal was built capable of handling 30 car loads an hour into the holds of vessels alongside, and to keep this up day in and day out, if it were required. This gave a terminal facility of 15,000 tons for 10 hours' work, a condition that has been met in the one pier already built, the details of which will be given in a separate article. The main points to be considered here are the development of traffic that has followed the construction of the road, the growth of the towns along the route, the mines that have been opened and the possibilities of future expansion, each of which has a bearing in emphasizing the soundness of the judgment that financed the road and stood by the enterprise to its completion.

The road could not be opened for traffic until the Norfolk terminal was completed, and this had its first efficiency test in April, 1909, so that it is only fair to assume the first month of real operation to have been that of July, 1909. At that time there were three mines in operation along the line of the road; their daily output was about 2,350 tons, and, with them, the total tonnage handled by the road was 85,661 tons. Since that time (up to December 1, 1910) the number of operations on the line of the road has increased to 14, with the result that the tonnage hauled during November, 1910, was 240,909 tons, which was an increase of 106.95 per cent. as compared with the same month of the previous year. This gave an increase of 89 per cent. in gross revenue and of 264 per cent. in net revenue for that month.

In handling this traffic no changes have been made from the plan originally laid down. With the undeveloped resources that will be seen to exist, coupled with the high character of the product, it is evident that there is likely to be a western movement as well as the one towards the seaboard, and that there should be such a movement has been assumed in the calculations from the first; also, that this movement should reach the lake ports.

These lake ports, such as Cleveland, Sandusky, Conneaut and Ashtabula, are equipped with facilities for rapidly handling heavy bulk cargoes. There are rapid unloaders for the ore and car dumping machines for coaling and loading vessels. Where the car dumping machines are located, the gondola car is the one that is used. The hopper bottom car has been practically discarded for this trade. For eastern and tidewater delivery, on the other hand, the hopper bottom car is in use. It is pushed up a high trestle, dumps its load into a pocket or chute and returns to grade by gravity. To meet these two methods of operation, two types of cars are required. From the operating and maintenance standpoints the handling of two classes of equipment is objectionable, and it was, therefore, decided by the management of the Virginian Railway that it would have but one. Furthermore, for ordinary purposes where but few cars are handled the hopper bottom car serves its purpose well, but where it is to be handled rapidly and in large numbers it often gives trouble in spotting accurately over a chute and quite frequently fails to clear when dumped, especially if the load has been wet and afterwards frozen. Taking this in connection with the methods of handling lading on the lakes, the hopper-bottom car was practically debarred, and the gondola was the one adopted. It had to be adapted for use in a car-dumping machine, and such a machine had to be installed for taking care of the tidewater traffic. As to how this has been done will appear later from the description of the plant at Sewell's Point. Briefly, the tidewater traffic from the West Virginia mines is handled exclusively in flat bottom gondola cars, delivered to a Hewlett car dumping machine. These cars were described in the *Railway Age Gazette* of June 12, 1908, and their service performance will be taken up elsewhere. The locomotives used for hauling this traffic are of the mikado (2-8-2) type with some Mallets (2-6-6-0) for pushing service. The general dimensions of these engines are as follows:

	Mikado.	Mallet.
Cylinder, diameter, H. P.	24 in.	24 in.
Cylinder, diameter, L. P.	.....	36 in.
Piston stroke	32 in.	32 in.
Steam pressure	190 lbs.	210 lbs.
Heating surface, tubes	4,277 sq. ft.	5,377 sq. ft.
Heating surface, firebox	164 sq. ft.	234 sq. ft.
Heating surface, arch tubes	25 sq. ft.	30 sq. ft.
Heating surface, total	4,466 sq. ft.	5,641 sq. ft.
Grate area	51 sq. ft.	78 sq. ft.
Driving wheels, diameter	56 in.	56 in.
Weight on drivers	207,450 lbs.	356,780 lbs.
Weight on truck (front)	20,850 lbs.	31,540 lbs.
Weight on truck (rear)	25,700 lbs.	.....
Weight, total	254,000 lbs.	388,320 lbs.
Tractive effort	53,157 lbs.	92,000 lbs.

Of these engines it has been found that the mikado is the most satisfactory for road service. It can haul 40 cars of 50 tons capacity each at an average speed of 15 miles an hour on the mountain grades. On the more level sections of eastern Virginia it can handle 80 cars and give no trouble with steaming.

It was thought that Mallet engines might be used for road service, but they have not been found to be as well adapted for this as was expected, especially because of their inability to drift, so that they have been confined to pusher work. It is in this service that they are needed the most. All of the tonnage offered can be handled with comparative ease after it has been delivered in the Princeton yard. It is the assembling

of the loads and getting them over the hills that now occupies the attention of the traffic department. Elmore, at the foot of the summit north of Princeton, is the throat of the road, and it is toward preventing congestion and delay here that the energies of the officers are directed. On this hill, from Elmore to Clark's Gap, the Mallets are doing their most efficient work.

While the coal traffic is the main reliance of the road, and will form the basis of its prosperity, the construction of a railway through a new and hitherto untouched territory cannot fail to bring out other latent possibilities. So, in the district of southern Virginia, through which the road passes, new towns have sprung into existence. Altavista, at the crossing of the Southern Railway, is a case in point. Two years ago the site of the town was a corn field. Today it has a population of 1,400; the streets have asphalt pavements and there is a good hotel that cost $25,000. Victoria, a division terminal 120 miles west of Norfolk, is a thriving village of 1,200 inhabitants that has sprung from the same cornfield condition. Princeton, the headquarters of the mechanical department, is an old town, the county seat of Mercer county, but the location of the yards and shops here has given it an onward impetus until now it has a population of 6,000. The same holds true for other places, one of which shipped 2,000,000 lbs. of tobacco last year where none had originated before. These indications of what is following in the train of the operation of the road are but repeating the history of other pioneer enterprises. Still, it is not on this growth that the prosperity of the road depends, although it may prove a strong contributing element.

The possibilities of the future must be judged by studying the coal fields. The road starts, as we have seen at Deepwater, W. Va., and runs for 87 miles through one of the richest coal countries of the world, rich not only in the thickness of the beds but in the quality of the coal. For 20 miles south of Deepwater station, the road runs through the Kanawha gas and splint coals, and then passes into the New River and Pocahontas measures. It is of an exceedingly uniform character and is found in beds ranging from 4 ft. 3 in. to 6 ft. thick. In some of these thicker veins there is only a trace of bone, while in others it is nearly a foot thick. The average of five analyses taken haphazard from one of these mines is as follows:

Moisture	.88 per cent.
Volatile matter	18.72 "
Fixed carbon	77.26 "
Ash	3.31 "
Sulphur	.657 "
British thermal units	15366

In these analyses the ranges are for:

Volatile matter, from	17.93 to 19.86 per cent.
Fixed carbon, from	76.18 to 77.97 "
Ash from	2.98 to 3.76 "

There is thus a variation of less than 2 per cent. for any of these fundamentals.

Some other mines will show even better results, the fixed carbon running over 78 per cent., the volatile matter about 16 per cent., the ash about 4.75 per cent., the sulphur .75 per cent., and the moisture .5 per cent., developing nearly 15,000 B. t. u. This coal is equal to the best of the Pocahontas, which will average 17.27 per cent. volatile matter, 77.77 per cent. fixed carbon, and 4.71 per cent. ash.

With the steaming qualities of the Pocahontas and New river coals, so well known, the market for the output of the fresh field has grown naturally and rapidly to the figures given. In addition to the 70 miles of this coal territory traversed by the main line, there are already about 37 miles of branches, so that, all told, the road has nearly 120 miles of track, every inch of which is in position to originate traffic. Besides this, spurs have been run out to old workings to the east, so that in the near future two groups of mines of 13 each, will be added to those contributing to the traffic; it is expected that about 40 carloads a day will be received from each of these groups.

The Kanawha gas coal is also of a high grade, an average analysis being about as follows:

Moisture	0.47 per cent.
Volatile matter	35.41 "
Fixed carbon	58.47 "
Ash	5.65 "
Phosphorus	0.004 "
Sulphur	1.06 "
British thermal units	14650

As for the quantities in sight immediately tributary to the railway, it is only possible to make a roughly approximate estimate. This area of the New river coal field may be placed at about 1,000 sq. miles, and of the Pocahontas at about 250 sq. miles, while the probable contained tonnage of New river would be about 3,000,000,000 tons, and of the Pocahontas 1,000,000,000 tons. It is in assisting in the development of this property and then in the transportation of it to market, that the owners of the road are counting, for the road itself owns no coal land.

In considering this as a mining proposition the topography of the West Virginia mountains must be taken into account. It is to be borne in mind that they are very steep, that they are formed of a series of narrow ridges and deep ravines ("hollows" in the vernacular). The coal seams are generally outcropping and come to the surface far up the sides of the mountains, so that drift mining is the almost universal practice. The coal, when brought to the surface, is easily sent down to the tipple and loaded into the cars, very little sorting being required, though a rigid inspection is maintained for the removal of the bone, which is a low grade coal containing about 32 per cent. of ash and occurs in thin veins in the best of the Pocahontas mines. The mining and delivery of this coal to the tipples is, therefore, comparatively easy, and there is little danger from gas.

In handling the traffic the Virginian Railway follows closely the methods of the older roads of the district. In the Pocahontas field the original rating of the operations for car distribution was based on the number of coke ovens at work. But no such basis was possible on the Deepwater division of the Virginian, because the mines were newly opened and there were no ovens. Up to the present the equipment of the road, consisting of 3,000 gondolas and 1,000 hopper bottom cars, has been quite sufficient to take care of all of the traffic offered and to give to each mine operator as many cars as he asked for. But while the emergency has not yet arisen, it is possible that this condition of affairs may not always obtain, and it is to guard against any contingency in the way of a shortage that a provisional arrangement has been made, the fairness of which the mine owners have recognized.

The output of each mine for the month of its maximum was taken, and an average struck from this of the number of cars loaded per day. The number of cars owned by the road was then divided by the total of these averages of cars loaded, and each individual average multiplied by the quotient, the result of which gave the number of cars that each owner was entitled to have under load, and he can draw on the supply until his quota is reached. In fact, it is not until this is exceeded by a hundred or more cars that it has been found to be necessary to put an embargo on empty car deliveries to any one mine.

The delivery of empties and the removal of the loads is done, for the most part at night. The loads are hauled out on the main line in strings of from 10 to 20 cars, and taken down as far as Elmore, about 30 miles from Princeton, where they are brought together in trains of about 45 cars and sent up to Clark's Gap with three locomotives. At Princeton the assembled cars are run in on an eastbound receiving yard, where they are weighed and distributed over a hump into an eastbound classification yard. Here they are made up in trains of from 60 to 80 cars each, pushed up over the summit and hauled to Sewell's Point with one engine as already described.

It must not be understood from this that the road is com-

pleted, that all things are done and that "finished" can be written on all of the original plans. The yards and passing sidings are still in process of development, the stations are not all built, and the road is not completely ballasted with rock, though three crushers are kept at work. Some of the cuts are still a little soft and the fills have not yet done with their settling. But all of these things are receiving attention according to the pressure of their demands. Roundhouses of approved design are being erected, some of the details of which will be dealt with elsewhere, and yard work is being pushed so as to keep abreast of the demands of the traffic. At Princeton the main assembling yard has been laid out with a full appreciation of the demands of a heavy traffic, but all of the rails are not yet down or the grading done. The plans call for a yard that, when finished, will have a length of about two miles and a capacity for 1,400 cars. And when it is considered that this yard will be straight from end to end, and that the location was secured in a country of steep ridges and narrow, crooked valleys, the skill of the engineers who laid it out may be appreciated. The yard lies on one side of the main line, so that it is not crossed by either the entering or leaving traffic.

So at Sewell's Point, the yard there is called upon to work under peculiar conditions. The mines are not pooled, and each has its own selling agent. These agents order ships to the pier, to carry away the particular carloads that their mines have shipped, so that these cars are first held back in the classification yard, where they are lined up according to owners, of which there are seventeen. They cannot be moved from this point until the vessel that is to receive their contents is actually docked. They are, then, pushed over the hump and dropped down into the barney yard, whence they are run by gravity to the dump, as will be described elsewhere.

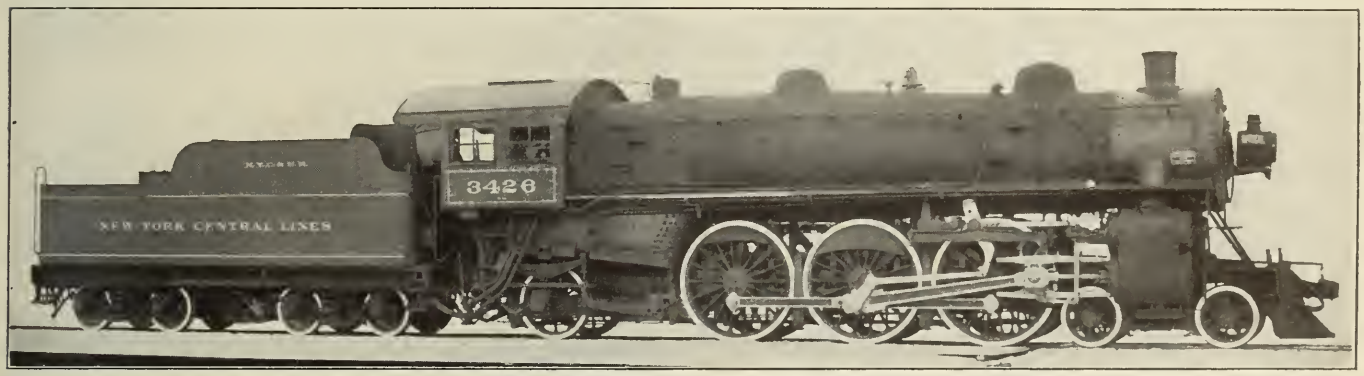
Again in the case of the shops. A clear-cut definite plan of construction has been devised, and this is being followed in the construction as it progresses, but up to the present the whole is far from complete.

And finally the work of organization is in the transition stage of development. It has been necessary to start with a long line of rails and no traffic, and keep building up an organization to take care of an exceedingly rapid growth, and this, too, without the possibility of offering any great inducement to skilled men to come from outside. The country in the mountains is rough, might even be called uncivilized, it contains none of the comforts and conveniences to which men living in the older communities are accustomed, and these disadvantages could not fail to have an influence in keeping out men who were obliged to consider their families. Even the inducement of a probable promotion to passenger service could not be held out to the train men. It has, therefore, been necessary for the management to build up its organization out of its own raw material and to pick out that material, hew it into shape and place it with great rapidity in order to keep pace with a traffic that more than doubled in the last twelve of its first eighteen months of existence.

HEAVY PACIFIC TYPE LOCOMOTIVES; NEW YORK CENTRAL LINES.

The Pacific type locomotive has for the past few years been the object of considerable study by the officers of the New York Central Lines, who have regarded it as the type of locomotive best suited to meet the demands of modern heavy through passenger traffic. In the early part of 1907 the American Locomotive Company built several heavy passenger locomotives of this type for service on the Lake Shore & Michigan Southern. These engines were at that time the heaviest passenger locomotives in actual service, and were so successful in the operation of heavy trains that thereafter they became the standard heavy passenger locomotives for the New York Central Lines. Although these locomotives met the conditions in 1907, it has since been found necessary to seek for still greater power, to meet the requirements of improved modern passenger service. As the boilers of the previous locomotives had nearly reached the maximum size permitted on engines of this type, the use of superheated steam was considered as a possible means of increasing the boiler capacity.

In May and October of 1910, tests of a Pacific type superheater locomotive, which are described elsewhere in this issue, were made on the Lake Shore & Michigan Southern. The results of these tests were such that fire-tube superheaters of a little greater capacity than generally used were decided on for an order of 20 Pacific type locomotives recently built by the American Locomotive Company. The general design of these engines presents no unusual features, except in the application of the steam pipe, the design of the cylinders, and a new type of Walschaert valve gear crosshead and guide.



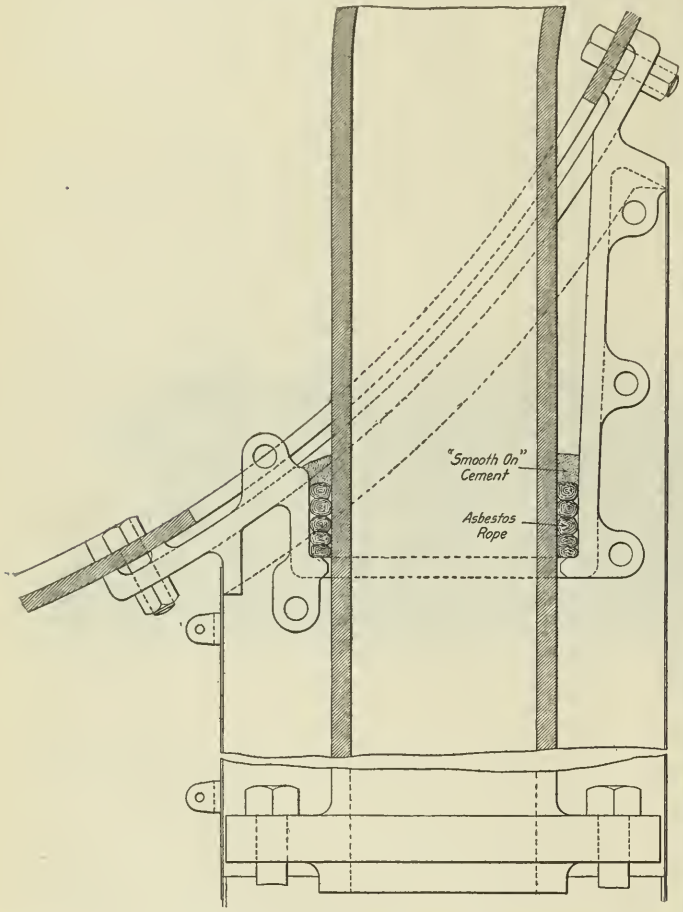
Pacific Type Superheater Passenger Locomotive; New York Central Lines.

The superheater is of the top header type, and is made of 32 sections. The steam pipes pass from the header through the side of the smoke-box directly to the steam chest, as shown on the accompanying illustration. This arrangement was used in order to obtain a maximum free area for the waste gases under the diaphragm. It provides an open smoke-box, with easy access to the superheater connections and also greatly simplifies the cylinder casting, allowing the walls of the cylinder to be made stronger and more uniform in thickness. The cores are larger and the whole casting is much easier made. The cylinder dimensions were changed to 23½ in. x 26 in. from 22 in. x 28 in., used on the earlier locomotives, as the tests, above mentioned, demonstrated that better results were obtained with these dimensions. By the use of the Walschaert valve gear crosshead and guide, the crosshead and valve are sure of absolute alinement, and are convenient for inspection and repairs. The guide is secured to the valve head and is centered by the bore of the valve chamber. The other details of the valve gear, however, are substantially the same as on the original design.

The builder's latest type of radial outside bearing trailing truck with single bar frame construction, substantially the same as applied to many recent Pacific type engines, is used because

of its lightness and accessibility for repairs. The double bar frame construction was used on the previous engines. Another feature, which while common abroad, is a novelty in American practice, is the use of a single U shaped heavy pressed steel plate bumper instead of the conventional steel casting or heavy wooden beam with plate backing.

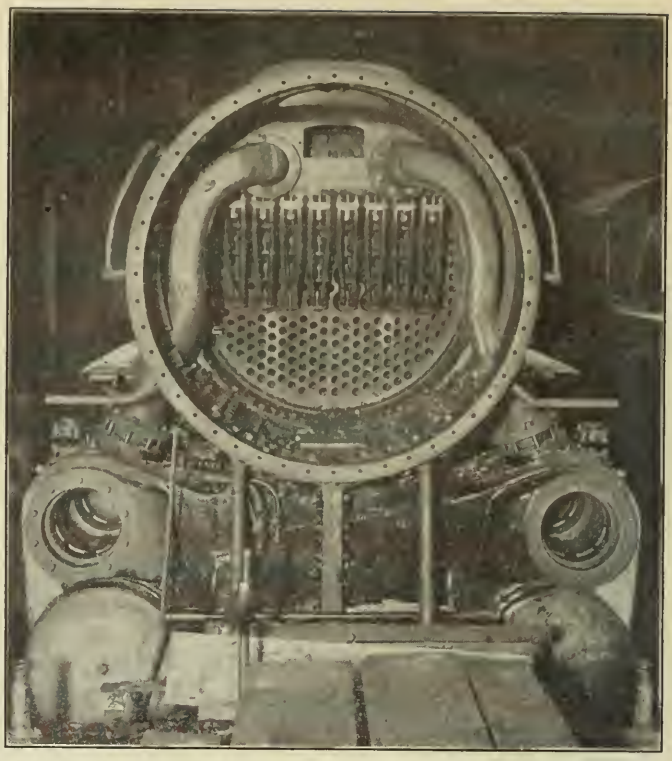
In the same order were 60 Pacific type locomotives for fast freight service, 10 of which were equipped with superheaters. They are of the same general design, the only changes being those necessary to adapt them to their special service. The drivers were decreased 10 in. in diameter, and the cylinders were made larger, increasing the tractive effort. The size of these orders shows the faith the railway has in the ability of this type of locomotive to handle heavy passenger and fast freight service. The following general dimensions and ratios are given for all three classes of locomotives, and by comparing them with



Steam Pipe Connection on Superheater Locomotive; New York Central Lines.

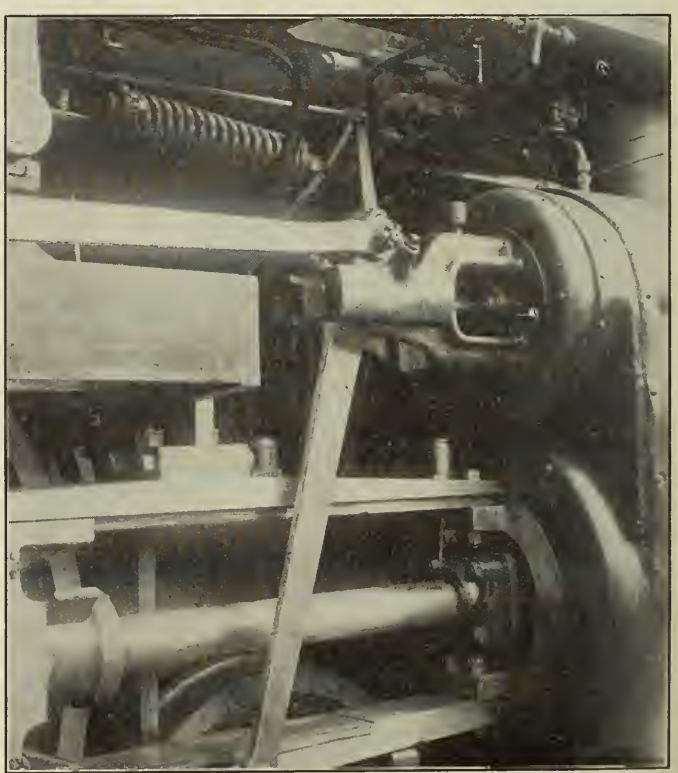
those given in the article on Tests on a Pacific Type Locomotive, contained in this issue, the development of this type of locomotive in the past four years may be noted.

	General Data.		
Type	4-6-2	4-6-2	4-6-2
Service	Pass.	Freight	Freight
Fuel	Bit. coal	Bit. coal	Bit coal
Tractive effort, lbs.	30,900	36,890	38,970
Wt. in working order, lbs.	269,000	263,000	266,000
Wt. on drivers, lbs.	171,500	172,000	170,700
Wt. of engine and tender, lbs.	424,000	410,000	413,050
Wheel base, driving	14 ft.	12 ft. 6 in.	12 ft. 6 in.
Wheel base, total	36 ft. 6 in.	33 ft. 7 in.	33 ft. 7 in.
Wheel base, engine and tender	67 ft. 11 in.	66 ft. 3½ in.	66 ft. 3½ in.
	Ratios.		
Total wt. ÷ tractive eff.	8.71	7.13	6.83
Wt. on driv. ÷ tractive eff.	5.55	4.66	4.38
Tractive eff. × diam. driv. ÷ htg. surf.	712	546	713
Tractive eff. × diam. driv. ÷ equiv. htg. surf.*	535	.....	545
Total htg. surf. ÷ grate area	60.6	83.5	66.9
Total equiv. htg. surf.* ÷ grate area	80.6	.....	87.3



Smoke-box Arrangement of the Superheater Locomotive.

	Ratios.		
Firebox htg. surf. ÷ total htg. surf., per cent.	5.96	4.38	5.36
Firebox htg. surf. ÷ total equiv. htg. surf.,* per cent.	4.48	.....	4.09
Wt. on driv. ÷ total htg. surf.	50.1	37	45.3
Wt. on driv. ÷ total equiv. htg. surf.*	37.6	.....	34.6
Total wt. ÷ total htg. surf.	78.5	56.5	70.6
Total wt. ÷ total equiv. htg. surf.*	59.0	.....	54.0
Volume both cyl., cu. ft.	13.05	16.0	13.6
Total htg. surf. ÷ vol. cyl.	262	291	277
Total equiv. htg. surf.* ÷ vol. cyl.	349	.....	363
Grate area ÷ vol. cyl.	4.33	3.53	4.15



Walschaert Valve Gear Crosshead and Guide.

Cylinders.			
Kind	Simple	Simple	Simple
Diameter, in.	23½	24	26
Stroke, in.	26	26	26
Valves.			
Kind	Piston	Piston	Piston
Diameter, in.	14	14	14
Travel, in.	7	6½	6½
Steam lap, in.	1⅛	1	1
Lead, constant, in.	¼	¼	¼
Wheels.			
Driving, diam. over tire, in.	79	69	69
Driving, tire, in.	3½	3½	3½
Driving, jour., main, diam., in.	10½ x 12	10½ x 12	10½ x 12
Driving, jour, others, diam., in.	10½ x 12	10½ x 12	10½ x 12
Engine truck, diam., in.	36	33	33
Engine truck, jour., in.	6½ x 12	6½ x 12	6½ x 12
Trailing truck, diam., in.	50½	45	45
Trailing truck, jour., in.	8 x 14	8 x 14	8 x 14
Boiler.			
Style	Conical	Conical	Conical
Working pressure, lbs.	200	200	180
O. D. of first ring, in.	72	74½	74½
Firebox, width and length, in.	75¼ x 108⅛	75¼ x 108⅛	75¼ x 108⅛
Firebox, plates, in.	⅜	⅜	⅜
Firebox, water space, in.	4½	4½	4½
Tubes, number and diam.	175—2¼ in.	424—2 in.	248—2 in.
Tubes, number and diam. (super.).	32—5½ in.	.....	34—5⅜ in.
Tubes, length	21 ft. 6 in.	20 ft.	20 ft.
H't'g surf., tubes, sq. ft.	3,193	4,422	3,539
H't'g surf., firebox, sq. ft.	204	204	202
H't'g surf., arch tubes, sq. ft.	27	28	28
H't'g surf., total, sq. ft.	3,424	4,654	3,769
H't'g surf., superheating, sq. ft.	755	.....	775
H't'g surf., total equiv.,* sq. ft.	4,556.5	.....	4,931.5
Grate area, sq. ft.	56.5	56.5	56.5
Tender.			
Tank, style	Wat. bott.	Wat. bott.	Wat. bott.
Frame	13 in. Ch.	13 in. Ch.	13 in. Ch.
Wheels, diameter	36 in.	33 in.	33 in.
Journals, in.	5½ x 10	5½ x 10	5½ x 10
Water capacity	7,500 gal.	7,500 gal.	7,500 gal.
Coal capacity	12 tons	10 tons	10 tons

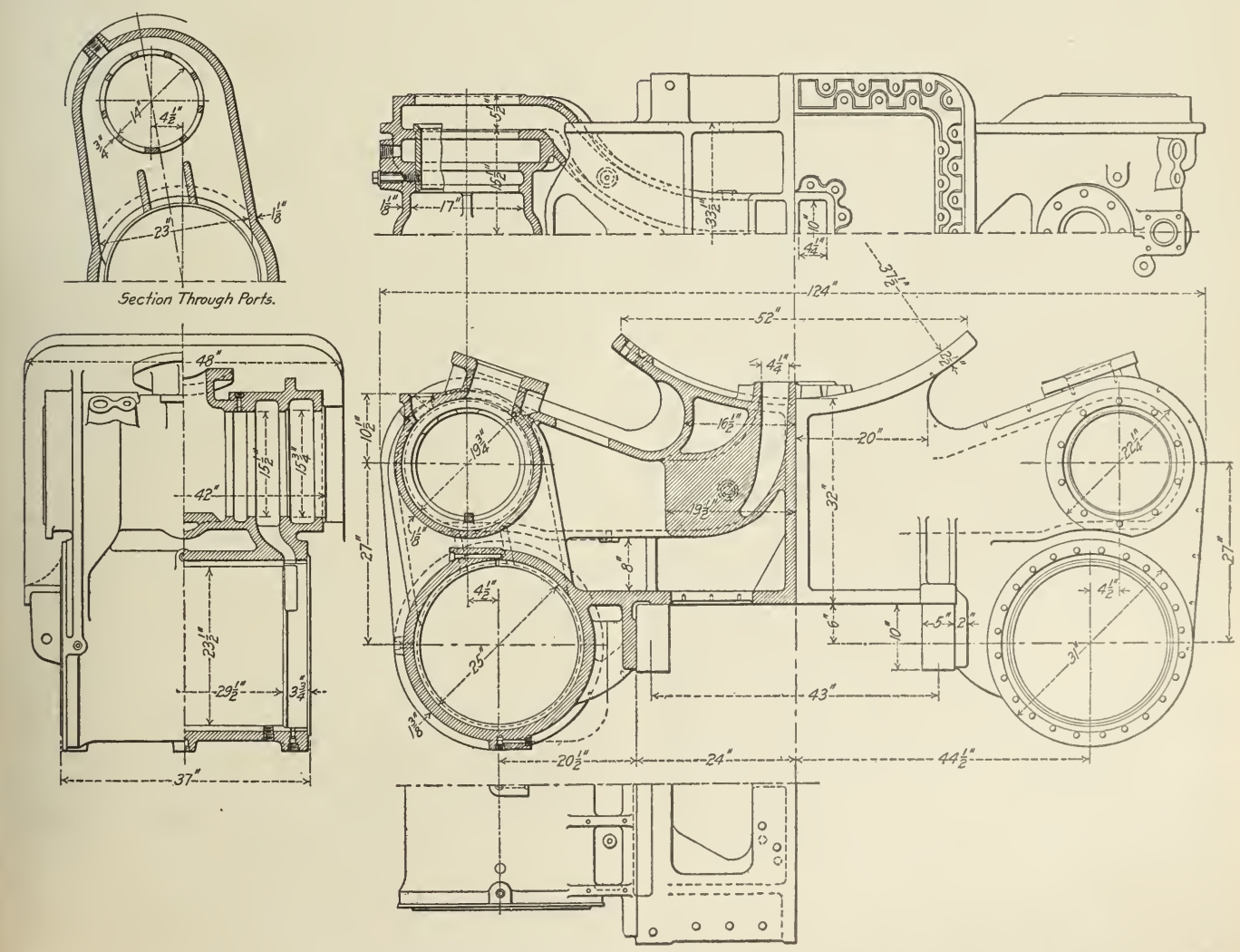
*Total equivalent heating surface equals total heating surface plus 1½ times superheating surface.

RAILWAY RATE MAKING IN THE SOUTH.*

The South is divided into two main groups for the purpose of rate making, known as the Southeastern Freight Association territory and the Southwestern territory. The first embraces all that territory lying south of the Ohio to the Gulf, and east of the Mississippi to the Atlantic Ocean. The second comprises Oklahoma, Louisiana, Arkansas and Texas. The rates to the Southeastern Territory were originally made to South Atlantic and Gulf Ports, first by sailing vessel, steamships latterly coming into use from North Atlantic Manufacturing points.

First among the factors that have influenced rates in the Southeastern states must be placed the physical geography of that section, and the consequent influence of water transportation, the eastern and southern boundaries of this section being the Atlantic Ocean and the Gulf of Mexico, the western boundary the Mississippi River, the northern boundary from the Atlantic ocean to Cairo, Ill., by way of Ohio and Potomac rivers. Numerous streams leading south from the Ohio and north from the Gulf, made possible a certain amount of water transportation to the interior. When the railways were first built, they found certain commercial and transportation conditions already established, which it was impossible to disregard. As a result of these conditions, there are several classes of what are known as basing points in the South. First, there are the seaports from Norfolk to New Orleans, through which the products of the interior are

*From an address by Charles S. Fay before the Tulane Society of Economics.



Cylinder Casting; Pacific Type Superheater Locomotive.

shipped, and through which goods from North Atlantic Coast ports and foreign countries were brought in. Then came the development of distributing centers along the Ohio and Mississippi rivers from Cincinnati to New Orleans, and of a secondary series of distributing points at the head of navigation of the principal rivers flowing into the Atlantic and the Gulf. Examples of these interior trade centers at the head of navigation were such points as Richmond, Va.; Columbia, S. C.; Macon, Augusta, Columbus, Ga.; and Montgomery, Ala.; all of which were in existence before the building of railways, and were points at which products of the surrounding territory were collected, and from which goods were distributed by wagons. Where railways were built, these trade centers already having been established, the railways necessarily adjusted their business to existing and controlling trade conditions. Still another class of basing points grew up with the development of railway systems, at gateways, such as Atlanta and Birmingham, Ala., where railway competition without water transportation, had the effect of creating distributing points. The only practical means of distribution was to ship to these trade centers. Subsequently, of course, other distributing points grew up as the result of additional railway building, bringing about more competition. Economic conditions in the South aided the perpetuation of that system. The planters bought their supplies in bulk, in order to supply their labor, and the practice which later grew up of giving credit to planters until the crop was harvested also tended to concentrate trade in the hands of dealers at the larger and financially stronger centers. On account of its long coast line, and its numerous rivers, there is scarcely a locality in the South, the rates to which do not feel the influence of water rates to a greater or less degree. It is apparent, of course, that the rail rates between the cities of the Atlantic and the Gulf coasts are necessarily controlled by water rates, which makes it necessary for the railways to make the same rates as charged for water service, in addition to any value that might attach to service by rail being somewhat more prompt, due to the fact that shipments can be made daily by rail, which is seldom the case by water, and moreover, to the railway rate can be added the cost of insurance that would apply on goods moving by water. Through rates to interior southeastern points are, of course, controlled by the water rate to the port, plus the rate by river to the interior. As an example, the rail rate from New York to Augusta, Ga., has for its controlling factor the ocean rate from New York to Savannah, plus the river rate Savannah to Augusta; likewise, the rates from St. Louis to Memphis and New Orleans are controlled by steamship rates on the Mississippi River. This condition is further complicated by the influence of an all-rail rate from the port to the interior, resulting in a control of all-rail rates between the points involved. As an example of this, take the rate from North Atlantic ports by water to Charleston or Jacksonville, plus the railroad rate to an inland point like Atlanta. This combined rate controls the all-rail rate from New York to Atlanta, and incidentally this same combined rate from New York to Atlanta exerts a controlling influence on traffic from Cincinnati, Chicago and St. Louis to Atlanta, in order to enable merchants and manufacturers of these cities to, in a measure, compete with the merchants and manufacturers of New York. It was largely this competition between the East and the West which resulted in Atlanta being made a basing point, and this is only an illustration of a number of such points in the Southeast. It will be seen, therefore, that the controlling influence of water competition is not confined to that traffic having origin and destination on the water, as here the competition of markets comes in that makes it necessary to, in a measure, equalize these water rates between points having no water service. This influence can also be seen in competition between the interior base points served only by rail, as against basing points having the advantage of water routes, making necessary a depression of rail rates from such interior cities to those points having direct water service. To illustrate: Chicago could not compete with St. Louis or New York for the trade of New Orleans, unless its rates bore some reasonable relation to the water rate from St. Louis and New York to New Orleans. Cincinnati could not market goods in Savannah, Charleston or Jacksonville, unless consideration was given to Baltimore and other Eastern Cities enjoying direct water communication with those ports. In order to equalize these conditions, the railways have found it necessary to make lower rates to these basing points than they could afford to make to points directly intermediate, for if compelled to make these low rates at all intermediate points, it could only be done with such consequent loss as would make the total business unprofitable and lead to bankruptcy.

The above outline, explaining how the rates to the basing points have been evolved, it will be sufficient to say that the rates to the interior local points are usually made by adding the local rail rates from such basing points to the local points, in order to make through rates.

The rates to Louisiana are made in a very similar manner to those in the Southeast, the controlling factor first being the water rate from New York and Atlantic Ports to New Orleans, with the local railroad rate added to the interior point in Louisiana, thus fixing the adjustment from the Atlantic Seaboard makes it necessary that the rates so established be considered in making rates from St. Louis, Chicago and other interior cities, the Mississippi and Ohio Rivers, of course, being controlling factors from St. Louis, Cairo, Louisville and Cincinnati, for while there is no actual water transportation at present from those cities by way of the rivers, the potential competition afforded by them is just as effective as if the boats were in actual operation, as the moment the rail rates were advanced beyond the figure that was previously created by the River Route, it would be an immediate incentive for the establishment of boat lines. There is scarcely a through rate in use today for which water competition, either actual or potential, is not in a measure responsible.

On account of the public nature of the railway transportation business, the Government has thought wise to take a hand in its regulation, and to this end almost every state in the Union is provided with a railway commission, with greater or less power given it in the exercise of such control. Most of the commissions have been established by legislative act. Our own commission, in the state of Louisiana, as brought into being by a constitutional amendment. The Louisiana commission is composed of three commissioners, the state being divided into three railway commission districts, each represented by a commissioner. This is undoubtedly a mistake, and it would be better if the commissioners each represented the state at large, for, under the present system, it is possible for the commissioners to agree to let the representative of each district decide those cases involved in his particular territory, which would result in a one-man commission, although its creator said it was to be composed of three members.

The powers of the Louisiana commission in the regulation of railways are almost absolute, except for the limits that may be placed upon them by the courts, to whom the railways have the right of appeal. However, this does not always prove effective, as many courts take the view that the commissioners have been elected by the people for the purpose of rate-making, and have not interfered except in some of the most aggravated cases. One of the principal objections to railway commissions as now constituted is the short period for which they are elected, this period usually being four years, and railroad men of experience know that a bright young man in the railroad business does not often become a competent rate clerk within that period. It generally happens, therefore, that before one of the Commissioners has an opportunity to become more or less expert in

rate matters, his term of office expires, and he is succeeded by some one who has been more active in politics, perhaps, and the process of education begins all over again. This brings about a condition involving the rights of millions of dollars worth of property, and the rights of millions of stockholders, by those whom, though they may have the best intentions, do not have the proper time to gain the necessary knowledge and experience to properly administer with equal justice to all, so great a trust.

In the state of Texas there is a commission similar to our own, composed of three members; but they are representatives of the state at large, which is one improvement upon our own commission. Since the inauguration of the Texas commission, it has been their policy to hold Texas for Texans, and through the enaction of the emergency rate law by the Texas legislature some few years ago, the commission of Texas has been able to exercise a controlling influence on interstate traffic, this emergency law giving them the right, when they deem it advisable, to put in what is known as an emergency rate, without a hearing on the part of the railroads, and without giving any explanation of their actions. In one instance, a rate on canned goods was established from Baltimore to Galveston, by sailing vessels, which was even lower than the cost of transportation by a steam vessel, and the railways leading out of St. Louis, in order to protect, in a measure, the canning establishments in Illinois, made a reduction in the interstate rate on canned goods from St. Louis to Texas points. To offset this, the commission, under the emergency rate law, published a rate of 3 cents per 100 pounds on canned goods, in carloads, from Galveston to every point in the State of Texas, and required the railroads to haul them, some times as much as five or six hundred miles, at $6.00 per car of 20,000 pounds. Of course, the railroads could not stand this, and were forced to advance the rates from St. Louis to Texas points, regardless of the cheap sailing vessel rate to Galveston. On another occasion, rates into Shreveport from Eastern Texas had been arranged so as to concentrate cotton at Shreveport, which was afterwards shipped to New Orleans for export. In order to hold this cotton to the Texas ports, the railway commission of Texas notified the lines serving Shreveport with these rates that unless they were withdrawn, the rates to Galveston would be reduced fifty per cent., and if that did not have the desired effect, they would reduce them still further; but it had the desired effect, and the rate to Shreveport was cancelled, and this cotton, contrary to the desire of the railroads serving Shreveport, was forced to Texas ports, to the detriment of Shreveport and New Orleans. Thus it will be seen that the Texas railway commission is in position to put a rate barrier around the commerce of that state, that is just as effective as would be an import tariff.

All of the other southern states are provided with commissions similar to those in Louisiana and Texas, and from all of them a plaintiff usually gets what he asks for, and generally without regard to the merits of the case. In this way, the Government has more effective control, than it would by ownership, as in this manner it controls the earning power of the roads, without assuming any responsibility for their expenses.

The original Interstate Commerce Act, Fourth Section, known as the long and short haul clause, contained the words "Under substantially similar circumstances and conditions."

Under the old law, the railways had depended upon those words for their right to continue the commercial relations in this country along the lines upon which they had been built up, but the removal of these words from the act prevents them from doing so, except they first make application to the Interstate Commerce Commission and gain the necessary authority. Now, I will attempt a little nearby illustration, which will, I think, make clear to you what this prohibition means:

The M. L. & T. R. R. & S. S. is building and expects to have in operation on January 1, a line from Lafayette, La., to Baton Rouge, which will be fifty-two miles in length, the distance from New Orleans to Lafayette is one hundred and fourty-four miles, which will make the total distance from New Orleans, by way of Lafayette, to Baton Rouge, one hundred and ninety-six miles. The distance from New Orleans to Baton Rouge, by the Y. & M. V. is eighty-nine miles. Baton Rouge, as you know, is situated on the Mississippi River, where there is actual water competition, making the rates exceedingly low, the distance by way of the L. R. & N. is only seventy-eight miles. Now it might happen that the M. L. & T. would like to participate in the carriage of merchandise from New Orleans to Baton Rouge, when it has a line with which to do so; but, if Baton Rouge were an interstate point, the fourth section of the long and short haul clause would prevent the M. L. & T. from engaging in the transportation of merchandise to Baton Rouge, unless the same rates were applied at all intermediate points, including, say, Lafayette, which is one hundred and forty-four miles from New Orleans, and not subject to water transportation. The conditions are entirely dissimilar; Baton Rouge has the same rate today that it will have after the line is completed from Lafayette to Baton Rouge. Some of the brightest lawyers of this country hold that it is beyond the constitutional competency of the United States, as well as of the states, to prevent the legitimate use of property, and if in order to meet conditions already in effect, the M. L. & T. makes lower rates, say, to Baton Rouge than to intermediate points, it has the right to do so, the conditions beng entirely dissimilar.

In others words, it is the view that this road would have the right to use its railways in handling traffic to Baton Rouge, without any bearing on the rate to Lafayette, so long as the rate to Lafayette was in itself reasonable; but, in granting that it is so, as a matter of fact, it is not within the constitutional competency of Congress to say that it is not so, contrary to the fact, and it is not within the constitutional authority to forbid it, and Congress has no power to do so.

There might be thousands of similar cases cited in the United States, where a rate to an intermediate point was justifiably higher than to a more distant point. Naturally, the shortest line between two points make the rate, and where there is a longer line between the two points, it must meet the rate of the short line in order to do any business at all, but it cannot do this at its intermediate points, without severe loss. If it did not meet the rate to competitive points, the intermediate points would not be affected, and conditions would not be changed; the rate to the competitive point would still apply via the short line, and the only effect would be to deprive the longer line from engaging in that traffic, and it would likewise deprive the shipper located, say, at New Orleans on the M. L. & T from reaching Baton Rouge in competition with a like industry located on the Yazoo & Mississippi Valley, as he would have to pay a shipping charge to get his goods from the M. L. & T. to the Y. & M. V., in order to take advantage of the short line rate. Of course, this is all on the supposition that the traffic to Baton Rouge were an interstate proposition, and it is simply used as an illustration; but, being an intrastate proposition, the Interstate Commerce Commission has no control.

Interstate rates being regulated by the Interstate Commerce Commission, and the different state rates being controlled by local State Commissions, there is constantly a conflict of interests between these bodies that will, in the opinion of the best posted traffic men, ultimately bring about a demand that all rates, both State and Interstate, be controlled by a single Government body, without which chaotic conditions in rate-making will be bound to result, from the multiplicity of agents interested in making them from purely local or selfish considerations.

The new extension from Nanowmine, New South Wales, to Peak Hill, was opened on December 10, 1910. The extension is 37 miles long and cost about $605,000.

TESTS OF PACIFIC TYPE SUPERHEATER LOCOMOTIVE.

The use of high degree superheated steam in high speed locomotives for heavy passenger service has proved of such value that tests made by the Lake Shore & Michigan Southern on a large Pacific type locomotive hauling the Twentieth Century Limited, between Toledo, Ohio, and Elkhart, Ind., are of special interest. The first series of tests was made May 12-14, 1910, with engine 4,821, which was equipped with a fire-tube superheater of the side header type having 24 elements. The cylinders were 24½ in. in diameter, with a 28-in. stroke; the steam pressure was 180 lbs. The trains on each of the three trips consisted of seven Pullman cars, weighing 443 tons, which with the engine and tender made a total of 643 tons. The boiler of the locomotive has a combustion chamber 4 ft. long, and its heating surface is as follows:

Firebox and arch tubes	290.3 sq. ft.
217—2 in. tubes, 18 ft. long	2,034.6 sq. ft.
24—5¼ in. tubes, 18 ft. long	590.7 sq. ft.
Total	2,915.6 sq. ft.
96—1½ in. superheater tubes	493.0 sq. ft.

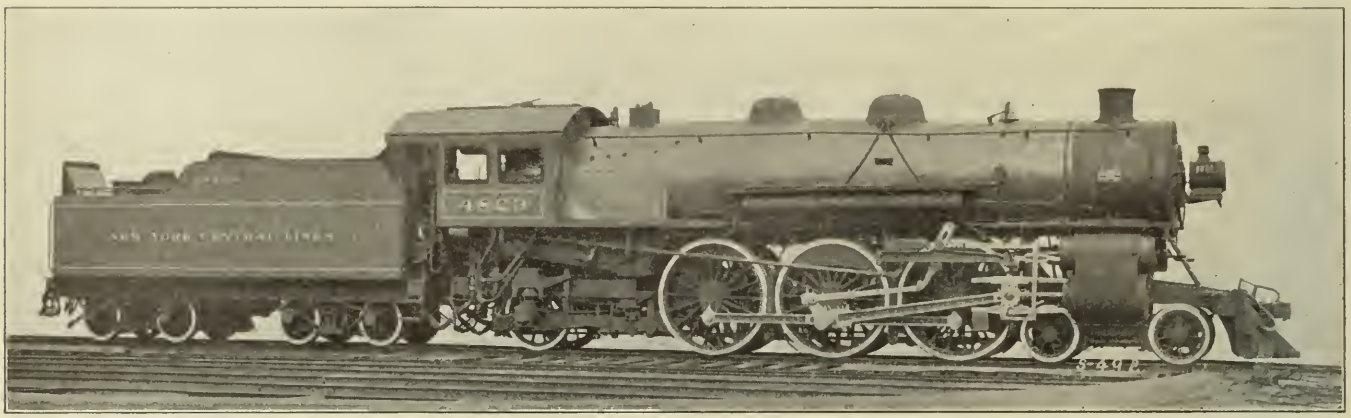
The general results of the first tests are given herewith and may be regarded as preliminary to the later tests which show improved conditions due to changes in the locomotive. In order to show the results graphically all readings taken during the three tests under varying conditions are plotted, these readings being taken regularly at five-minute intervals throughout the runs. These runs were made at a time when all the test apparatus was in such condition as to cause no doubt as to the reliability of the figures obtained. Locomotive 4,821 was used on all three tests, and each trip was made with seven cars. The working conditions were as follows: May 12, on train No. 26, was an average run; May 13, on train No. 26, was a hard run, the train was behind time all the way; May 14, on train No. 25, two engines were used, the other one being 4,823. This record represents a light run.

The curves shown on the charts are as follows: Temperature of superheated steam in steam chest, degrees Fahr. (taken by means of thermocouple and indicating pyrometer); temperature of steam in steam chest if it were in the saturated instead of superheated condition (the difference between these curves gives the degree superheat); speed in miles per hour; steam pressure in boiler; steam pressure in dry pipe; steam pressure in steam chest (all pressure readings were taken by gage); lift of throttle valve in inches; and inches cut-off in cylinder at which engine was working. At the completion of the test the indicating pyrometer used in obtaining the steam temperature was calibrated by testing it with a standard thermometer in an oil bath, the oil being heated by means of Bunsen burners. In this way the proper correction on the pyrometer was obtained throughout the entire range of temperatures met with on the test.

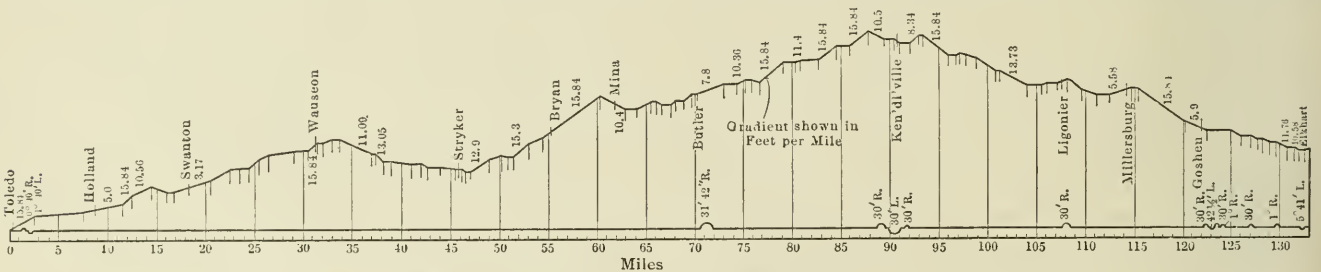
In general, the results were as follows: The degree of superheat was found to have held fairly constant throughout all the runs. Making the proper corrections on pyrometer readings, the superheat was found to have been at all times between the limits of 160 deg. and 199 deg. Fahr. An average shows approximately 177 deg. Fahr. for all conditions. On the run with train No. 26, May 12, the superheat temperature reached 562 deg., giving 197 deg. superheat, considering 144 lbs. as the steam chest pressure. This was due to the fact that after working the engine hard and getting a hot fire the engineer reduced the throttle opening for a short time. In this way a comparatively small volume of steam passed through an exceptionally hot boiler, giving a high temperature reading.

The test showed, as might be expected, that there was some drop in pressure caused by the steam passing through the superheater. This locomotive has 24 superheater elements, but as a result of the tests engines now being built for this company will have more elements. From the measurements of coal during the tests, compared with a test of an engine without a superheater on the same runs, the superheater engine shows an economy of 15 to 20 per cent. over other engines of the same class. The most remarkable difference was in the water consumption, for in comparing figures for the water cunsumption of a superheater engine with those obtained from an engine without a superheater running on the same trains, it was found that the superheater engine showed a saving of over 25 per cent.

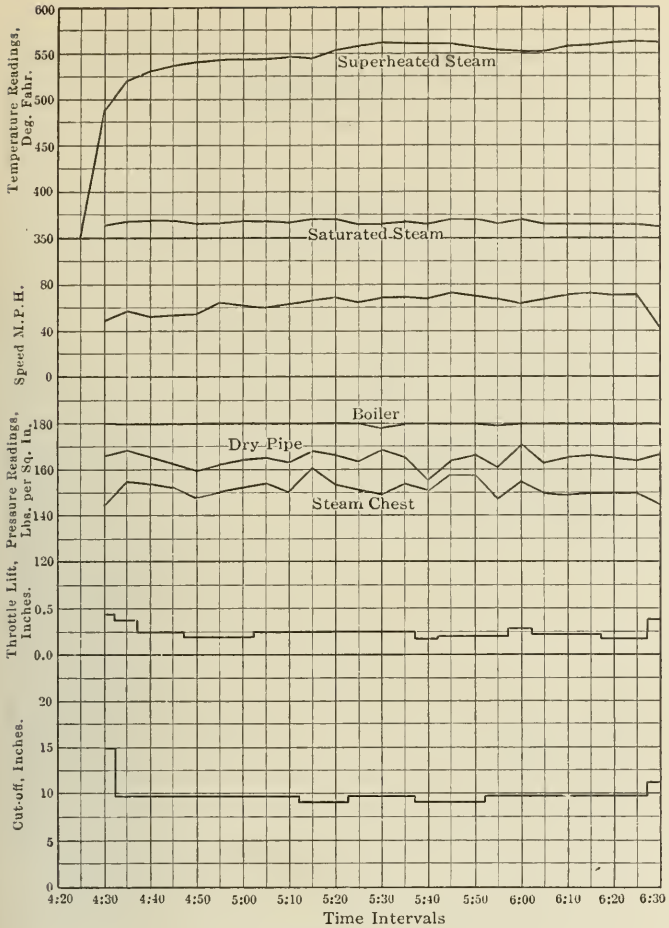
Summing up, the average superheat for these tests was 177 deg. based on 150 lbs. steam chest pressure. The coal consumption was 15 to 20 per cent. less than with similar engine without



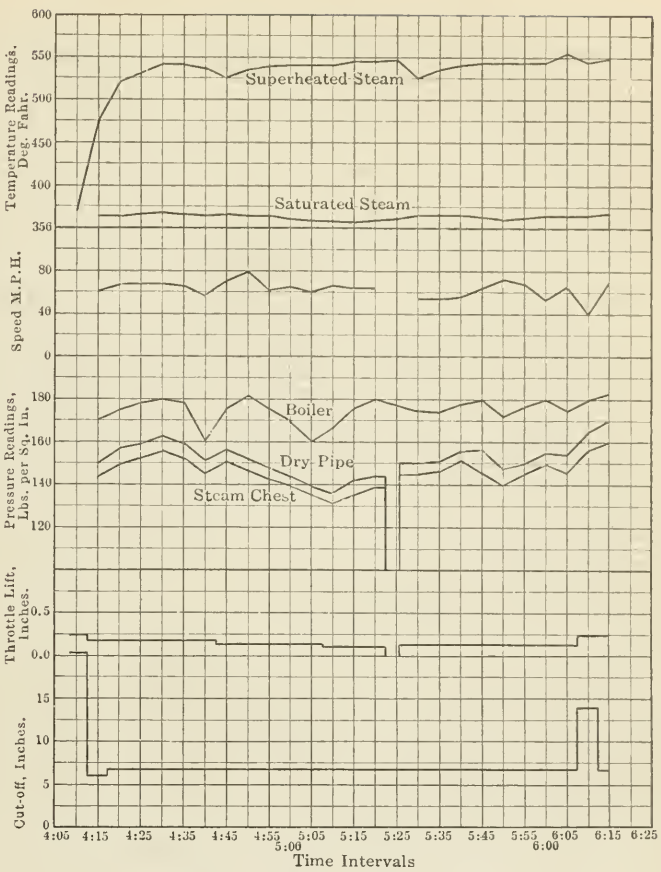
Pacific Type Superheater Locomotive; Lake Shore & Michigan Southern.



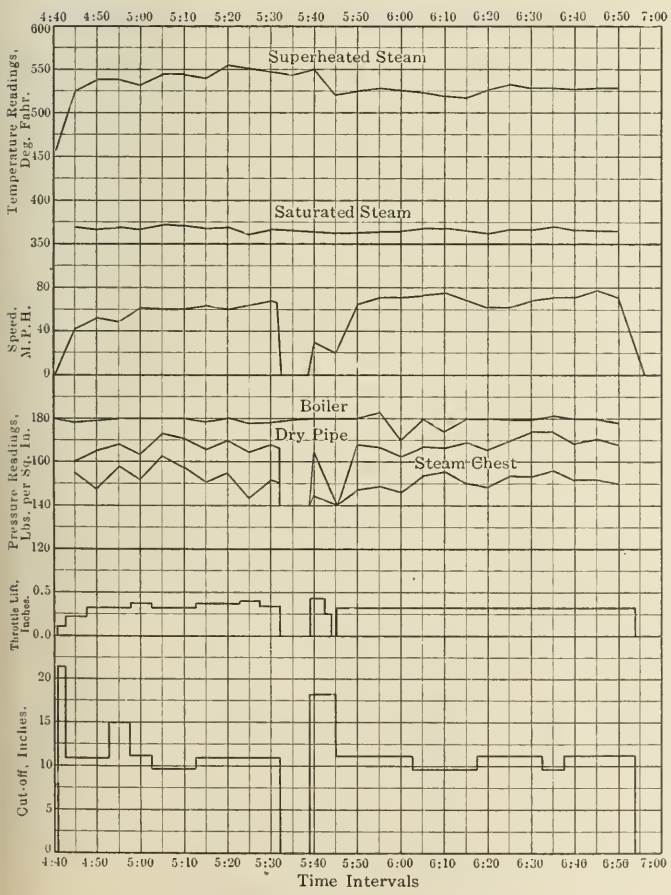
Profile, Between Toledo, Ohio and Elkhart, Ind.; Lake Shore & Michigan Southern.



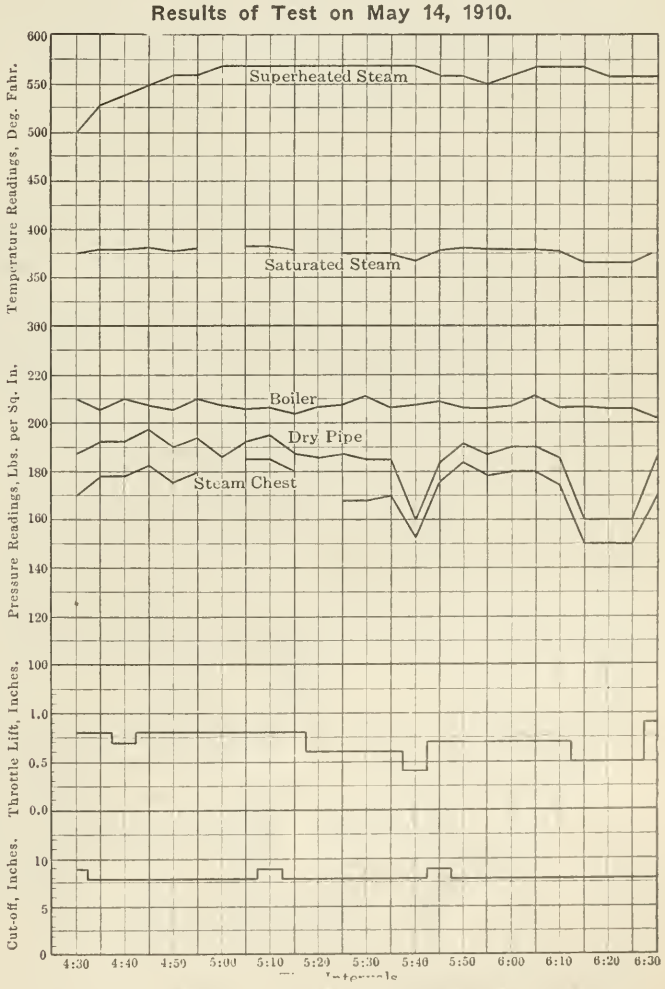
Results of Test on May 12, 1910.



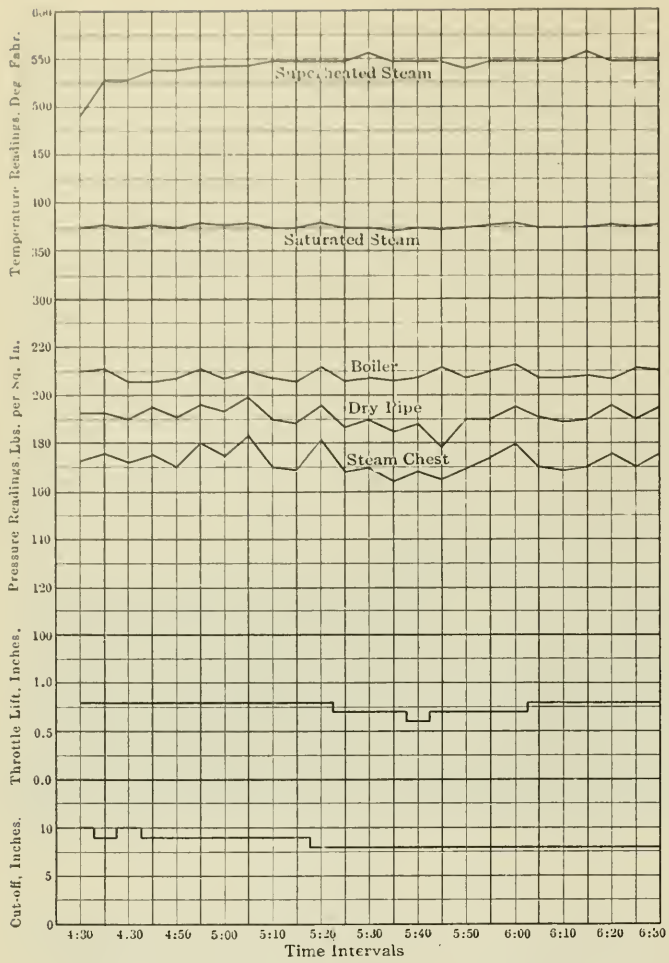
Results of Test on May 14, 1910.



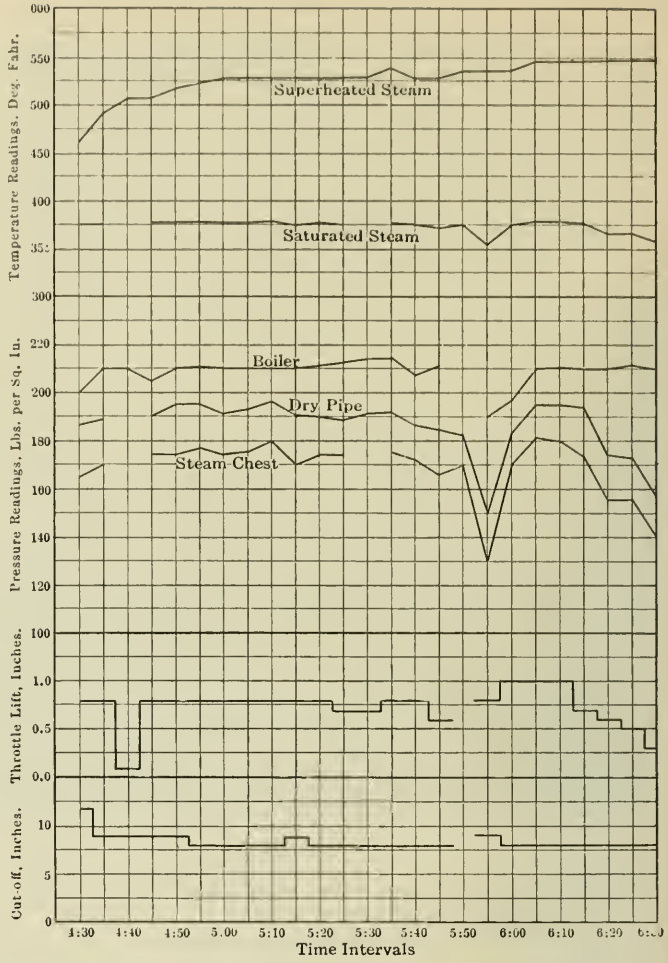
Results of Test on May 13, 1910.



Results of Test on October 15; Cross-Over Pipe In.



Results of Test on October 17; Cross-Over Pipe Out.



Results of Test on October 19; Cross-Over Pipe Out.

superheater. The water economy was about 25 per cent. greater.

The flash point of the valve oil when carefully warmed was 590 deg. Fahr. The engine used on an average 5 pints of valve oil over the division, as compared with 3½ pints for the non-superheater engines. This includes the oil used in the valve chest, cylinders and air pump. Considerable trouble was experienced with the lubrication of the engine until a valve was applied, here illustrated, which admitted steam to two Y fittings located at the lubricator in the oil pipes leading to the steam chests. The steam chest choke plugs were drilled out, so there was a ⅜-in. clear opening from the lubricator choke plug clear into the steam chest. The auxiliary valve is mounted in such a position that the stem comes in contact with the throttle lever and it commences to open after the throttle has been opened two or three notches. The action of this device is to keep a continual current of oil and saturated steam flowing into the steam chest. It will be noted that the auxiliary valve is supplied with steam direct from the boiler so that the pressure available is always greater than the pressure in the steam chest, consequently, the flow of oil is continuous. The drawing shows a separate dry pipe to supply this valve, but later designs take steam for the valve from the right hand steam turret. The Y fittings should be applied with the branches pointing up so that the oil will not flow back into the auxiliary valve. The locomotive is lubricated by two bull's-eye lubricators; the one on the fireman's side has one feed running to each cylinder, being tapped into the cylinder at the middle and as close to the top as possible. The middle feed is not used. The lubricator on the engineer's side has a feed running to each steam chest and the third feed supplies the air pump. The Y fittings for the auxiliary valve are screwed on the lubricator. The oil pipes leading to the steam chest are branched at the steam chest, one feed going into each end just inside of the bushing. Practically no difficulty has been experienced in lubricating the engine since the above device was applied. New locomotives are being equipped with a single 5-feed lubricator instead of two triple feeds.

SECOND SERIES OF TESTS.

The second series of tests with the same locomotive, 4,821,

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY SUPERHEATER TEST OF ENGINE 4821.

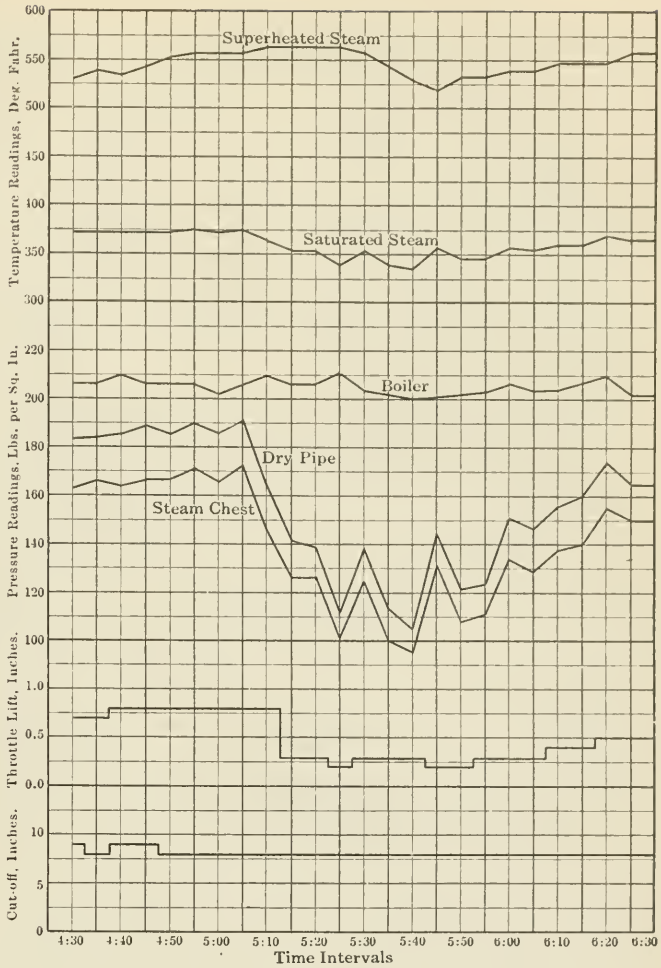
Showing effect of crossover pipe joining steam pipes in smokebox.

Date—1910	Train.	Tons wt. train including Locomotive.	No. Cars.	Was Crossover pipe in place?	Av. speed, M. P. H.	Av. rev. lever notches from center.	Av. throttle lever notches from zero.	Av. boiler press.	Av. dry pipe press.	Av. st. chest press.	Av. press. drop through super-heater.	Av. press. drop in steam chest (during admission).	Av. degrees super-heat.
Oct. 15.....	26	706	8	Yes	62.8	8.12	6.92	207	184.3	172.6	11.7	14	181.5
Oct. 23.....	26	643	7	Yes	61.6	8.12	4.92	205.1	156.5	140.0	16.5	15.5	184.5
Oct. 25.....	26	833	10	Yes	60.0	8.25	7.97	206.7	189.3	170.4	18.9	17.5	174.0
Oct. 17.....	26	833	10	No	61.8	8.48	7.64	208	191.1	172.5	18.6	30.3	161.8
Oct. 19.....	26	833	10	No	59.8	8.40	7.20	208	186.4	169.0	17.4	27.5	153.9
Oct. 21.....	26	770	9	No	60.3	8.04	5.65	203.8	177.0	162.0	15.0	28.5	.....

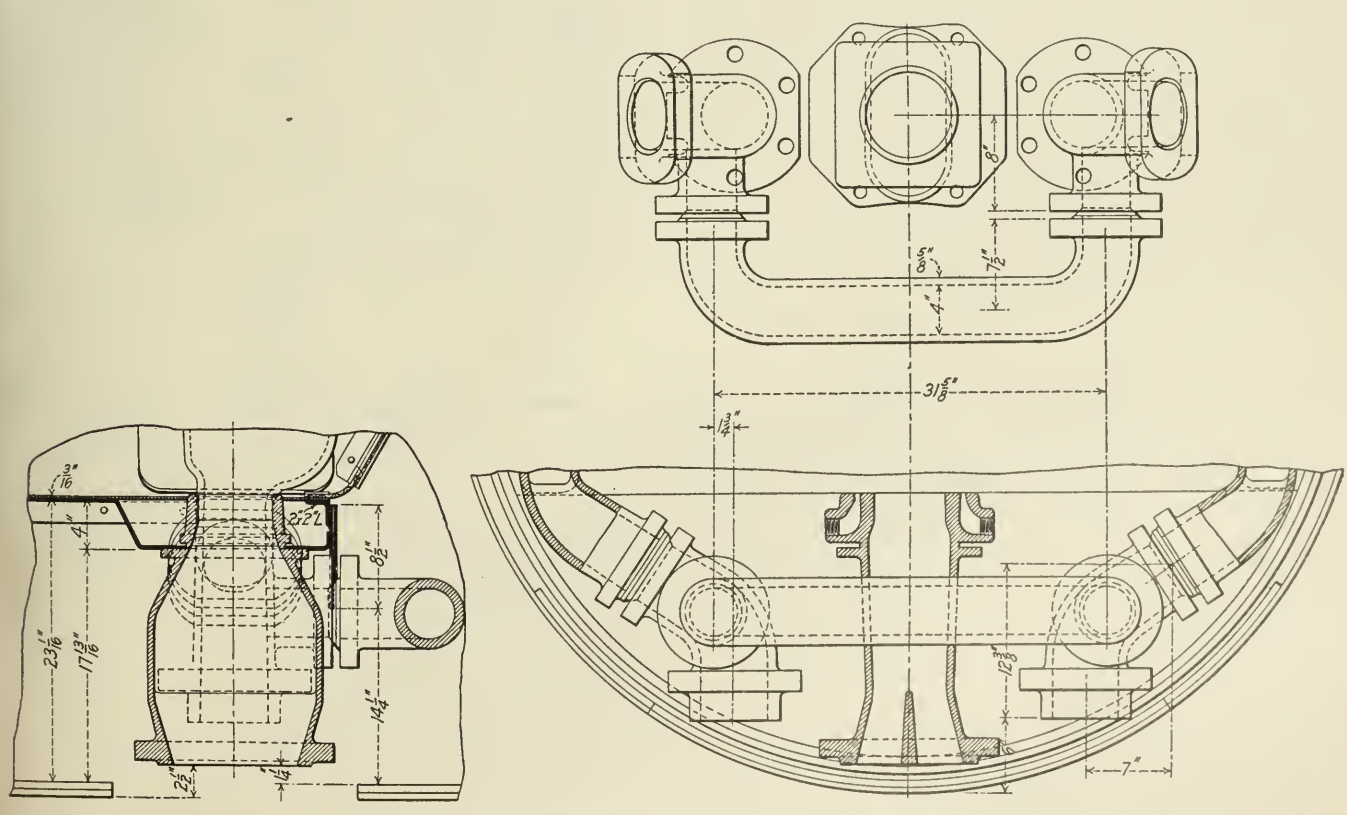
*NOTE.—Diameter of cylinders, 22 in. Engine should carry 200 lbs. boiler pressure. Same engine crew throughout tests. All tests run over Air Line Division.



Results of Test on October 21; Cross-Over Pipe Out.

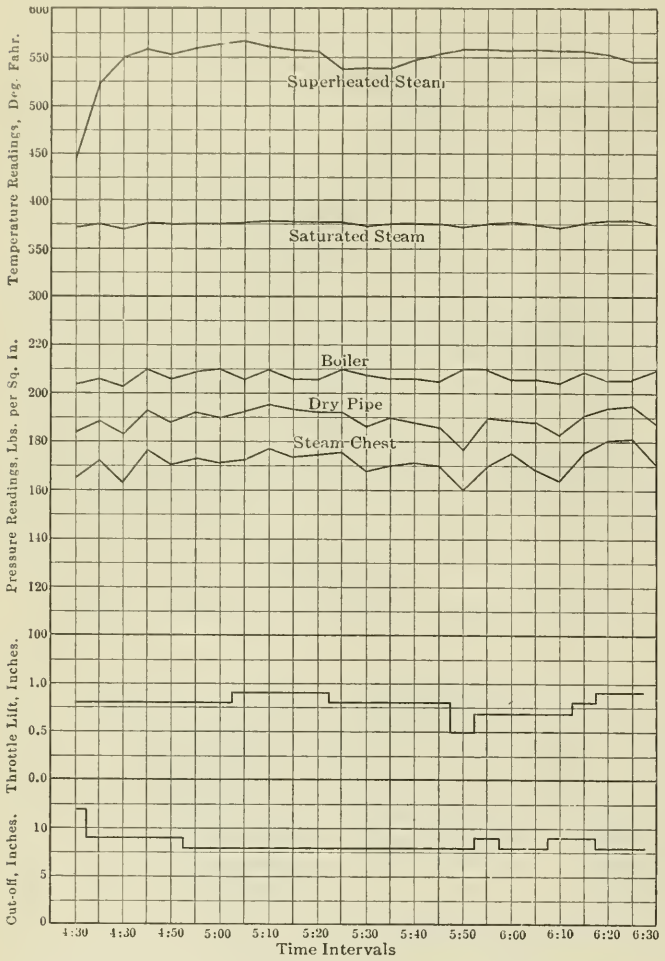


Results of Test on October 23; Cross-Over Pipe In.



Cross-Over Pipe as Applied to Superheater Locomotive; Lake Shore & Michigan Southern.

was made October 15 to 25, 1910, on train No. 26. During the preceding test the engine was run with 180 lbs. boiler pressure, and the cylinders were enlarged to correspond. The performance of the engine under these conditions was economical as regards coal and water consumption, but in the handling of the train there was very little difference between it and any of the other similar engines without superheaters. It was felt that if the steam pressure was raised to the normal working pressure of 200 lbs., the cylinders reduced to the regular diameter of 22 in., and an equalizing pipe applied to connect the two sides of the superheater just above the cylinders, the performance of the engine would be improved, and the second test was made to determine these points. In these tests the number of cars in

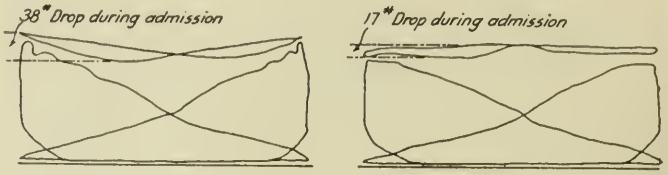


Results of Test on October 25; Cross-Over Pipe In.

the train varied from 7 to 10, and the total weight carried, including the locomotive, was from 643 to 833 tons.

The results of the tests, as shown by the accompanying tables and indicator cards, verified the conclusion that the effect of the equalizing pipe was to maintain a much more uniform pressure in the steam chest during the admission period than was obtained without this pipe. This test also showed that there was still a considerable drop in pressure through the superheater, and, as stated previously, the new locomotives are being furnished with a greater number of superheater elements which it is expected will reduce the drop in pressure to a reasonable amount, and at the same time will increase the degree of superheat obtained.

The degree of superheat on days when the cross-over pipe was in place shows higher than on days when it was removed. This was true of all three runs, indicating that the figures may be taken as reliable. The difference may be partly due to the fact that on the three days with the cross-over pipe in place the engine was worked slightly lighter, as shown by the columns headed "average throttle" and "average steam chest pressure." The charts show graphically data similar to that obtained in previous tests and at intervals of five minutes throughout each test run. The speeds obtained on this second test, considering the number of cars and weight of train, show an excellent en-



Cross-over pipe out.
October 17, 1910.
Time—4.45.
Speed—52.4 m.p.h.
Boiler press.—208 lbs.

Cross-over pipe in.
October 23, 1910.
Time—4.40.
Speed—48.3 m.p.h.
Boiler press.—206 lbs.

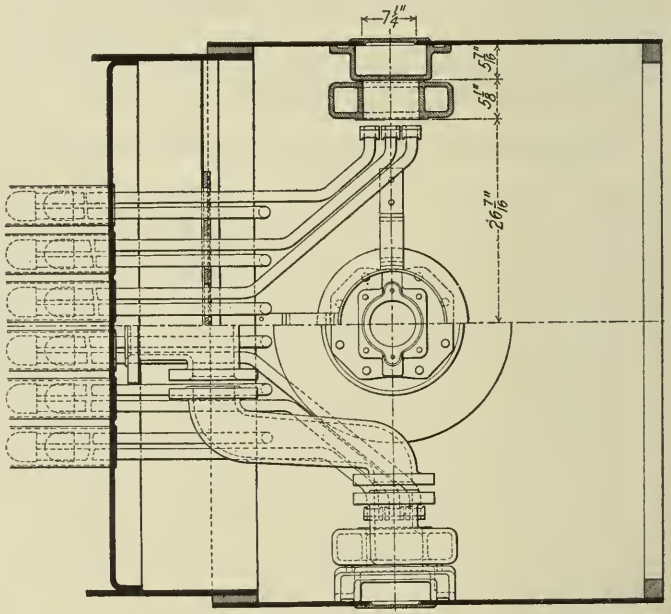
Indicator Cards Showing Effect of Cross-Over Pipe.

gine performance, and completely justify increasing the boiler pressure and reducing the diameter of the cylinders.

The general dimensions of these locomotives, which were built by the American Locomotive Company, are as follows:

General Data.

	Pacific
Type	
Tractive effort	29,200 lbs.
Weight in working order	262,000 lbs.
Weight on drivers	170,700 lbs.
Weight of engine and tender in working order	424,000 lbs.
Wheel base, driving	14 ft.
Wheel base, front truck	6 ft. 8 in.
Wheel base, rear driver to trailing truck	10 ft. 11 in.
Wheel base, total	36 ft. 6 in.
Wheel base, engine and tender	67 ft. 10 in.

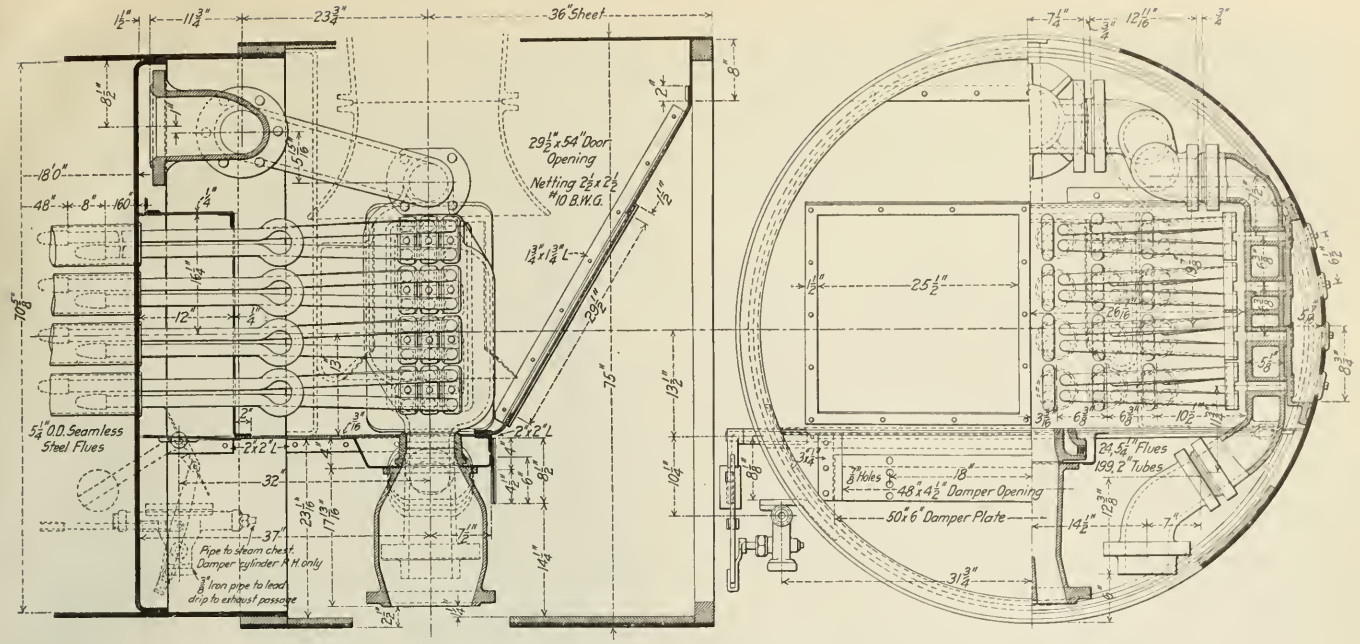


Top View of Superheater for Pacific Type Locomotive.

Ratios.

Total weight ÷ tractive effort	8.98
Weight on drivers ÷ tractive effort	5.85
Tractive effort × diam. drivers ÷ heating surface	792
*Tractive effort × diam. drivers ÷ equivalent h't'g surf.	631
Total heating surface ÷ grate area	518
*Total equivalent heating surface ÷ grate area	649
Firebox heating surface ÷ total heating surface, per cent.	9.5
*Firebox heating surface ÷ total equivalent heating surface, per cent.	7.94
Weight on drivers ÷ total heating surface	586
*Weight on drivers ÷ total equivalent heating surface	467
Total weight ÷ total heating surface	899
*Total weight ÷ total equivalent heating surface	717
Volume both cylinders, cu. ft.	12.35
Total heating surface ÷ vol. cylinders	236
*Total equivalent heating surface ÷ vol. cylinders	296
Grate area ÷ vol. cylinders	4.56

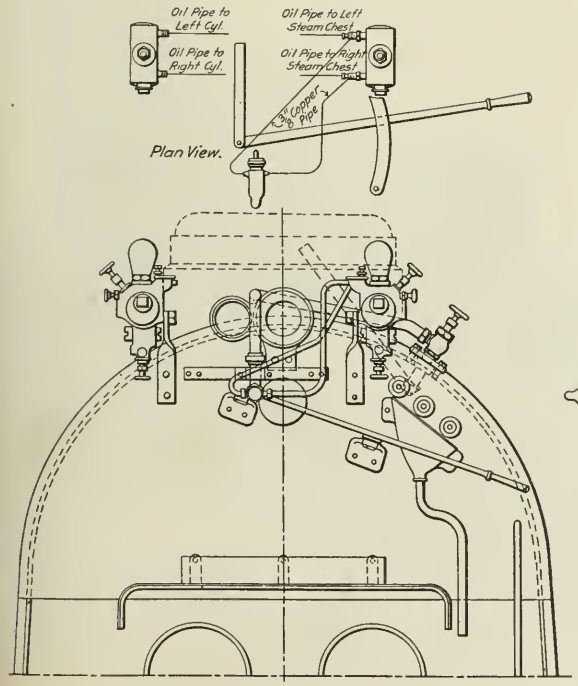
*Total equivalent heating surface equals total heating surface (2,915.6 sq. ft.) plus 1½ times superheating surface = 3,655.1 sq. ft.

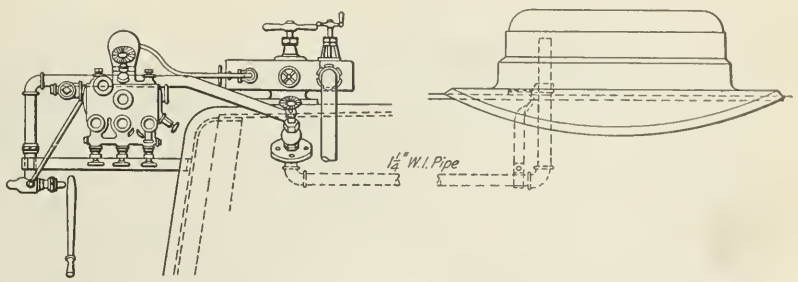


Superheater for Pacific Type Locomotive; Lake Shore & Michigan Southern.

Cylinders.	
Diameter	22 in.
Stroke	28 in.
Valves.	
Kind	Piston
Wheels.	
Driving, diameter over tire	79 in.
Engine truck, diameter	36 in.
Trailing truck, diameter	50 in.
Boiler.	
Style	Conical
Working pressure	200 lbs.
Outside diameter of first ring	72 in.
Firebox, width and length	75 in. x 108 in.
Tubes, number and diameter	217—2 in.
Tubes, number and diameter (superheater)	24—5¼ in.
Tubes, length	18 ft.
Heating surface, tubes	2,625.3 sq. ft.
Heating surface, firebox and arch tubes	290.3 sq. ft.
Heating surface, total	2,915.6 sq. ft.
Heating surface, superheating	493 sq. ft.
*Heating surface, total equivalent	3,655.1 sq. ft.
Grate area	56.3 sq. ft.
Center boiler, above rail	9 ft. 9 in.
Top smokestack, above rail	14 ft. 7⅞ in.
Tender.	
Tank, style	Water bottom
Wheels, diameter	36 in.
Water capacity	8,000 gal.
Coal capacity	14 tons

*Total equivalent heating surface equals total heating surface (2,915.6 sq. ft.) plus 1½ times superheating surface = 3,655.1 sq. ft.





Lubricating Arrangement on Superheater Locomotive; Lake Shore & Michigan Southern.

PENNSYLVANIA CLEARANCE CAR.

The Pennsylvania has just put in service a new clearance car designed in the office of the Engineer of Maintenance of Way and built at the Altoona shops. It is now being run over all divisions to secure correct measurements of the distances from the track to projecting portions of station buildings, tunnels, bridges and other objects. The car has an apparatus for indicating automatically while moving on curves the elevation of the outer rail and the degree of curvature.

The car is 54 ft. 8¾ ins. long over all, and 30 ft. between truck centers. It is built entirely of steel, and is equipped with air brakes, steam fittings and electric lights. The main floor is 4 ft. 5¼ ins. above the top of the rail and at the front end of the car where the templets are located is a second floor at an elevation of 9 ft. 8 ins. above the rail. Both floors are for use in taking measurements from the templets. The second floor is reached by steel stairways on each side of the main templet.

All measurements are taken at the center of the front truck, from which clearances are computed. The main templet, which is erected directly over the center of the truck, has a width of 10 ft. between elevations 2 ft. and 12 ft. above the top of the rail, exclusive of the fingers or feelers attached to the sides. From an elevation of 12 ft. above top of rail, the templet recedes towards the middle of the car at an angle of 45 degs., reducing the width of the templet to 4 ft. at the top, at an elevation of 15 ft. above top of rail.

Immediately in front of the main templet there is an auxiliary templet, designed to measure overhead bridges, tunnels and other objects between elevations 17 ft. and 20 ft. above the top of the rail. This auxiliary templet has the same dimensions as that part of the main templet between elevations 12 ft. and 15 ft. It is supported on a center shaft enclosed in an upright cylinder and is capable of being raised by a crank and ratchet to a height of 18 ft.

Enclosed in steel cylindrical boxes with translucent glass fronts facing the templets is a series of electric lights which extend from the floor of the car on each side to a height of 15 ft. above top of rail. The well-diffused light thus obtained makes it possible to take measurements at night, as well as in dark tunnels.

The fingers or feelers attached to the sides and the top of the templets are 2 ft. long and are spaced 6 ins. apart. They are hinged to the templets and are held in the different positions by friction. Attached to the feelers and the sides of the templet are graduated scales which indicate automatically the distance from the rim of the templet to a side or overhead object. In addition, a small board equipped with a set of feelers spaced one inch apart has been provided to measure cornices of roofs, of shelter sheds, or other irregular objects close to the track. This board is detachable and can be fastened to the side of the templet at any point desired. It is shown in Fig. 2 just above "9."

As the car passes over a curve, an attachment on the rear truck of the car indicates the degree of curvature on a scale inside of a cabinet which has been erected in the middle of the car. In this cabinet there is suspended a long pendulum which indicates automatically the elevation of one rail of the track over the other.

With all of the attachments working automatically, it is possible to take clearance measurements while the car is running at a speed of four miles an hour. Two men can operate the car, one taking the readings of the scales and the other recording them; but where clearances are close and irregular three men are required.

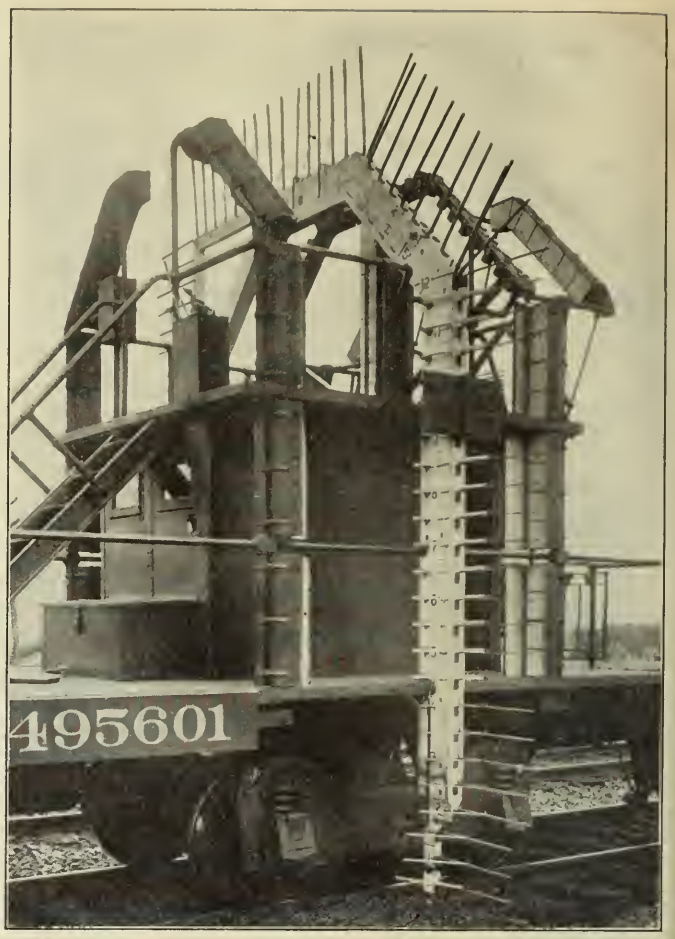


Fig. 2—Pennsylvania Clearance Car; Main Templet.

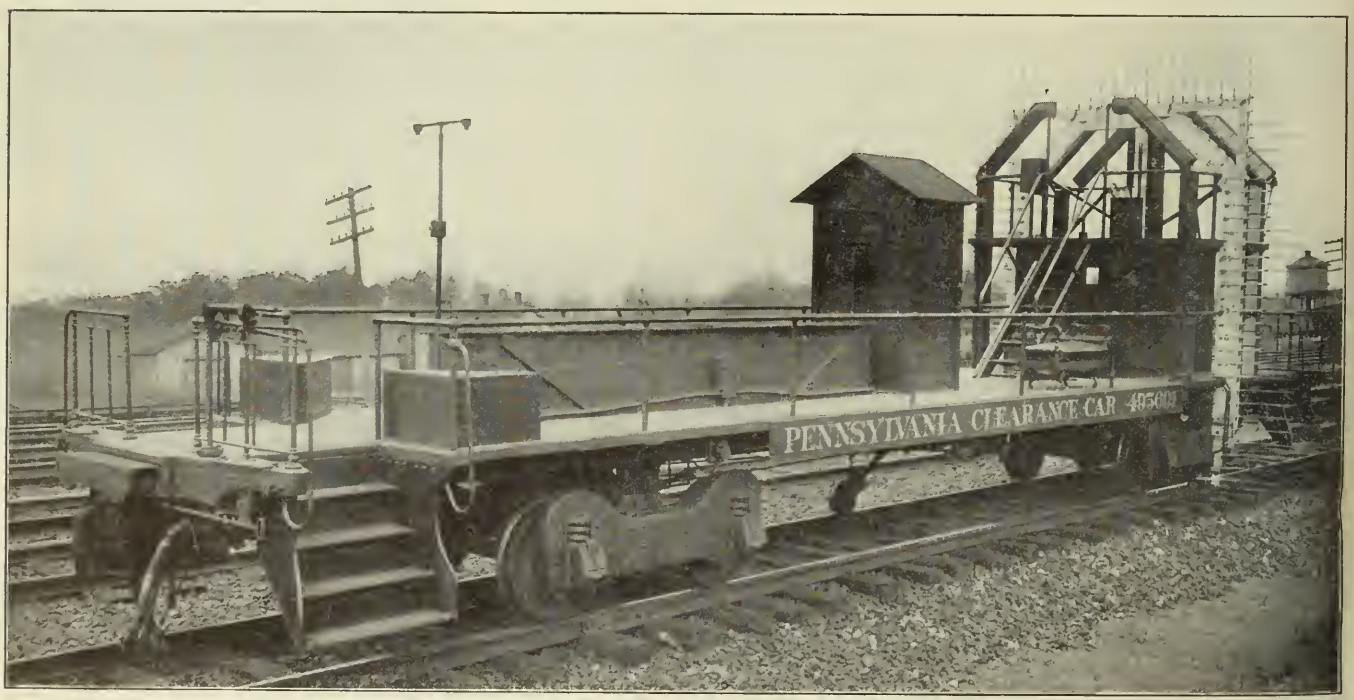


Fig. 1—Pennsylvania Railroad Clearance Car.

JOHN M. FORBES IN ILLINOIS.*

The possibility of getting a European market for the grain of the West was another matter that engaged Forbes' thoughts. He was full of schemes for articles in American magazines and for letters in the London *Times* showing how much lower the price of grain would be when the West was provided with adequate railway transportation. Nothing came of these plans, but curiously enough, toward the end of the Crimean war, Forbes was employed as agent in the purchase of large supplies of breadstuffs to be sent to France. Though the orders came through Baring Brothers, it was known that the buyer was Louis Napoleon.

Forbes was deeply interested in the project for a railway from the Mississippi to the Pacific. Ever since the beginning of the gold fever in California he had made ventures with clipper ships, "practically yachts from 1,500 to 3,000 tons measurement, racing day and night around the Horn, making wonderful passages and getting wonderful prices for their goods," and his brother-in-law, Robert S. Watson, had established a commission house in San Francisco. From Forbes' knowledge of conditions in California he felt strongly the political and military, as well as the economic importance of a railway to the Pacific; and he repeatedly urged upon members of Congress the necessity of federal aid for it.

Illinois, like her sister states, failed in her early efforts at "internal improvements," the panic of 1837 dashing all hopes. Even as late as 1850, all that she had to her credit were a canal connecting the Illinois river with Lake Michigan, a few miles of isolated railway in the middle of the state, and a number of unused railway charters. In 1850, however, the first waves of the returning tide bearing both population and capital, reached Illinois, and the Thirty-first Congress reversed the policy of its predecessors, and in September, 1850, passed the first of the acts granting public lands to aid railway development.

By the terms of this act the Illinois Central was to receive a right of way two hundred feet in width, and on each side of it every other square mile or "section" of land for a distance of six miles. The wealth granted to the Illinois Central by the government and the state gave it credit in Europe and building was at once begun. The men of the Michigan Central were naturally on the alert. Here was a means by which they could secure entrance to Chicago. The first construction done by the Illinois Central was to lay a dozen miles of track out of Chicago to connect with the Michigan Central, and, in return, the older road stood ready to supply as much as $2,000,000 in ready money; but a $5,000,000 loan which was presently secured by the Illinois Central through Baring Brothers made it unnecessary for the Michigan Central to furnish more than $800,000.

The Illinois Central, however, although it was sure to bring a large amount of business to the older road, could not be an adequate outlet for the expanding energies of the Boston capitalists, since it was under New York control. Yet go ahead the Michigan Central must, for the Michigan Southern had no sooner reached Chicago than its owners began the construction of the Chicago & Rock Island Railroad, and, building with incredible rapidity for those days, accomplished the distance of 181 miles to the Mississippi river in twenty-two and a half months. True gamblers, they borrowed recklessly and built lightly, at the same time forcing men more prudent and more honest to enter into their game.

Thus it came to pass that, early in 1852, the Michigan Central men began to look into Illinois railway charters. There were plenty such in the hands of local capitalists, who, having been unable to make use of them, were ready to sell out. Of the Chicago & Aurora 13 miles had been built; beyond that, stretching to the southwest, and touching the Mississippi at two points, had been planned the Central Military Tract Road, the Northern Cross Road, and the Peoria & Oquaqua, or Oquawka—"Phoebus, what a name!" exclaimed Forbes as he wrote it. In order to make the charters acceptable to eastern capitalists, amendments were secured at a special session of the Illinois legislature in June, 1852, which permitted the extension of the lines to make necessary connections, and which put the roads on an equal footing with the Illinois Central as regards the clear possession of rights to establish rates for passengers and freights.

Forbes' work now began. . . . Forbes went from one man to another, confident in the validity of his large vision of the future, and yet never losing his sense of precisely what could be attempted and accomplished at any given moment, men and things being what they were. By his aid the first amounts were raised without much trouble—for the Chicago & Aurora was an undoubted bargain; but in the next few years, as it became plain that the road was destined to be, not a local feeder of the Michigan Central but part of a trunk line between Chicago and the Mississippi, he was drafted for heavier work than that of "following the lead" of others. It was the story of the Michigan Central over again, only the pace was more rapid. The Chicago & Aurora and the connecting road to the West—the Central Military Tract—were soon combined under the name of the Chicago, Burlington & Quincy, the western management being in the hands of James F. Joy, the shrewd and enterprising Detroit lawyer. It presently became clear that the roads further West, building from Galesburg towards Burlington and towards Quincy, could not, with local management, command the necessary resources to enable them to reach the Mississippi in any sort of season. The C. B. & Q. directors, therefore, in order to hold their own against the Rock Island, which had already crossed the state, voted money to complete the construction of the two roads. The whole thing was so much in the future, and to outsiders appeared so vast and so uncertain, that the additional sums had to come chiefly from the men who were already involved. Thus, in order to take his director's share in one of these loans, Forbes sold at 70 $100,000 of manufacturing stock which he had bought at par. At another time he had to endorse alone notes to the amount of $60,000 to pay for the first ten locomotives needed by the Peoria & Oquawka and the Northern Cross.

Fortunately the return on this heavy investment was both large and immediate. Plenty of business was waiting for the new road at the Mississippi river, and it also commanded for a time all the traffic from the South over the main line of the Illinois Central. It is small wonder, then, that in six months of 1856 the Central Military Tract paid 15 per cent. dividends in cash and stock, or that Forbes was able to write of the C. B. & Q.: "Their earnings are so large that if they accumulate them and then divide largely, it may have a bad effect among the country people who pay them freight."

This, indeed, was the time of glad, confident morning, never again to occur in the history of railway building in the United States. No one exceeded Forbes in faith in the future of western railways; yet the loose management invited by such rapid building constituted a danger which few saw so clearly as he.

. . . A final obstacle to the orderly upbuilding of a system of western railways was the lavish extension of federal aid; for with the land grants in 1850 to the Illinois Central and the Mobile & Ohio, Congress had let down the bars. The local need of insignificant towns on the west bank of the Mississippi in Iowa and Missouri with plans for "Pacific" railways, was indubitably as great as it had been in Illinois, and, with the acceleration of western expansion since 1849, the importance of these roads to the country at large could also be plausibly urged. On all such applications Congress was now almost certain to act favorably.

These prospects of railway building made easy portended serious things to the men interested in the Michigan Central and the C. B. & Q. Having built roads successfully with their own

* From a forthcoming biography of John M. Forbes, who, at his death in 1898, was chairman of the board of directors of the Chicago, Burlington & Quincy. His service with that company and with the Michigan Central made him a prominent railway man for fifty years. Previous articles dealing with Mr. Forbes' activities as a pioneer appeared in our issues of December 2, page 1039, and December 23, page 1188.

resources, they could not but object to a scheme which would force them into a ruinous competition with roads having the advantage of government aid. . . . Yielding to clamor, Congress passed land grant acts in 1852, 1853, 1856 and 1857, on an increasing scale of lavishness. Clear as had been the interest of Forbes and his friends in preventing, if possible, these donations, they could not afford to bend over backwards by refusing to have anything to do with the lines thus favored. Since roads were now sure to be built across Missouri and Iowa which would connect with their roads at Quincy and at Burlington, it would be folly to let these enterprises fall into rival hands. The first of the roads for which Boston capitalists were thus forced to find money was the Hannibal & St. Joseph, a line some 200 miles long, planned to cross the northern part of Missouri from the Mississippi to the Missouri river. Besides having a land grant of over 600,000 acres, it possessed the guarantee of the state for its bonds to the amount of $1,500,000. In spite of its auspicious beginning, however, the road for some years made little progress in construction. Its local management was ineffective, its eastern interests were in the charge of Forbes, who, overloaded with railway work, was beginning to break down; finally, the contract under which the work of construction was to be done was a preposterous agreement which enabled the contractor to have his own way about everything all the time. For a number of years all that this costly investment meant was that Missouri was safe from the control of any rival of the C. B. & Q.

Again in 1856 the bounty of Congress compelled the men in the Chicago, Burlington & Quincy to scurry for capital. Stretching westward from their terminus at Burlington, Iowa, was the Burlington & Missouri River, a little road for building which bonds bearing 10 per cent. interest had been sold at 60 cents on the dollar, and which, after four years of effort, had succeeded in struggling 12 miles toward the goal of its ambition, the western boundary of the state. Now it leaped to fame by being one of four railways in Iowa to receive land grants, its allotment, the smallest of them all, being 359,000 acres. With this dowry it awaited the overtures of the East.

Early in 1857 James F. Joy appeared in Boston eager to demonstrate to the C. B. & Q. directors the importance of this Iowa road as a feeder to their line. Forbes himself needed no convincing. As far back as the summer of 1853, only a year after the Michigan Central had entered Chicago, his railway-building imagination, leaping westward a state at a time, had seen the value to the Michigan road of this route across Iowa, and at a considerable expense he had had preliminary surveys made over the whole line. Now, after four years of feverish "development" in Illinois, Iowa's turn had come. But however great the opportunity here, in the East, Forbes' prophesy of evil days was beginning to be fulfilled. The market was glutted with railway securities, and the Boston banking house of John E. Thayer & Brother, on which he had always relied, failed him. Discouragement and opposition, however, always the most effective stimuli to Forbes, spurred him to put the thing through with a rush.

Beyond question, the financing of western railways in the fifties was to be classed among occupations as "extra hazardous." Not only were these undertakings on a larger scale than had been known in this country and in a field of industry the laws of which were imperfectly worked out; but the greed of the people had not permitted for them a normal and even development. The clamor for national aid had increased in inverse proportion to the justifiable need of the district which made the demand; and at last Congress, misguidedly enacting the will of a misguided people, had committed the supreme act of demoralization in its lavish gifts of land.

In connection with the Hannibal & St. Joseph, however, Forbes' power as a railway reorganizer was brilliantly shown. When after the panic of 1857 he was called upon to set things going again, he found himself engaged in a contest with a "self-made man, shrewd, hard, and rich," "the very type of a railway contractor," who wished to build a "cheap contractor's road to sell," while Forbes was determined to have "a solid one, adapted to being held and used for business purposes." Finally, in desperation, after a "four-months' nightmare," Forbes threatened to throw over the enterprise altogether, under which pressure the contractor gave in.

The consequence of this success was the obligation to raise the million and a half of money necessary to complete the road. This task Forbes set about after much the same fashion in which he had achieved the sale of Michigan Central bonds six months before.

With the help of Baring Brothers, and of his ever reliable Quaker friends in New Bedford, sure to have money to invest in a good thing at a low price which he might have to offer, Forbes' list was made up. The bonds were taken at 60, and under the strong management which he had provided, with John W. Brooks at the head, Forbes felt that the road could now be left to take care of itself. Early in 1859 it was successfully completed; the other railway in Missouri aided at the same time by a land grant was ten years longer in getting across the state.

These long labors for the rehabilitation and reorganization of the Hannibal & St. Joseph, and the Burlington & Missouri River, after the panic of 1857 constitute the best commentary on the values of Forbes' warning in 1853 concerning the evil of land grants. It is true that the grants accelerated the development of certain states; and if acceleration of development is in itself a benefit, that much is to be put to their credit. As for the aid to the railways, the need of which was so plausibly urged, whatever accrued there was confined chiefly to those systems that were large and powerful enough to have done without it. The many local roads that the grants brought into existence or maintained in a semblance of life could not command men of sufficient ability, honesty, and financial resources to avail themselves of the advantage thus given them. Even the Illinois Central, with its auspicious beginning, met disaster twice in the first seven years of its life. When, on the other hand, as in the case of the roads dominated by the C. B. & Q. interests, the land grants were managed with care and foresight, they ultimately sold at prices averaging nearly ten times the original value of the land. Thus in the end the result was exactly the opposite of what Congress had intended.

With his success in putting into good condition the roads which constituted western extensions of the C. B. & Q. systems, the first period of John M. Forbes' career as a railway builder came to an end. Covering the years from 1846 to 1860, it was, in its general limits, co-incident both in time and in place with an important epoch in the development of the railway system of the country. The western roads built in these years were in the nature of things speculative undertakings, and money would not be risked in them except by men hoping for large profits. Sometimes these profits came through participation in generously estimated construction contracts, sometimes in ways still less creditable, even to downright dishonesty. On the other hand, when men of integrity were in charge their returns must come from high rates of interest on money lent, and from the earnings of the road. Consequently it was their policy to build in regions where competing lines were not for some years likely to be constructed, and where the tariffs could be kept at a remunerative figure. In this latter class, John M. Forbes was among the few foremost.

Successful as speculations though Forbes' railway undertakings were, this fact should not so occupy the foreground that his great qualities of imagination and leadership are not seen in their true proportion. Filled with the vision of a land made populous and rich through a means of transportation, as yet in its infancy, he was also endowed with the personal qualities which could help largely to bring that vision to pass. Furthermore, in the excitement of that era, he was among the few men who, by their coolness and resoluteness could command the confidence of others; thus, when the crash came and the land was strewn with wrecks of railways, his undertakings stood out, not only undamaged, but sounder than ever before.

RAILWAYS IN INDIA.

ARTHUR R. S. ROY, PH.D.*

They say in the Orient, "First comes the Bible, then the British and then the railways." All three generally come to stay. In India the three are working admirably.

India now possesses a vast railway system that stretches from Trichinopoly on the sea coast in the extreme south to the Khyber Pass in the further northern frontier among the high Himalayas; from Indus in the west to Brahmaputra in the east. And now the railway lines are penetrating the mountain fastnesses of Beluchistan to Quetta. They are also going down through wild country, through forests and over hills, southward beyond the Brahmaputra to meet the lines from Rangoon and Mandalay in Burmah. Between these furthest points the system has shot out many trunks and innumerable branches all over the great plains, connecting remote cities and industrial centers. All the chief cities of India are connected by railways. In fact they would not rank among the principal cities if they did not possess a railway station. Every year more towns and cities are entering the zone of the locomotive whistle, and the lines are breaking into new fields. The development is rapid.

The immense system is composed of six separate parts or nuclei working in harmony. They are: (1), the East Indian Railway (E. I. R.); (2), the Great Western Railway (G. W. R.); (3), the Great Indian Peninsular Railway (G. I. P. R.); (4), the Bengal Nagpur Railway (B. N. R.); (5), the North Western Railway (N. W. R.); (6), the Southern Indian Peninsular Railway (S. I. P. R.). Beside these six distinct branches, which cover practically all India, there are many smaller systems that serve the districts in the interiors and parts far away from the main trunk lines. The E. I. R., the oldest of the systems, covers the eastern parts with its terminus at Hawrah, a suburb of Calcutta. The G. W. R. has its headquarters in Bombay, which is the terminus of other lines as well. Nagpur is the central station of the B. N. R., which accommodates the public of the central provinces. The S. I. P. R. is focused at Madras on the east coast of the southern Indian peninsular. The names are a good guide to the regions each system supplies.

All these systems, forming one great unit, although nominally the enterprise of private companies, are heavily subsidized by the Indian government and are more or less under its control. This is almost a necessity, for the rails were primarily laid for the easier transportation of troops. Under such conditions there is no competition, and though the service is efficient it lacks the stimulus of competition.

In the native independent states, the railways are built, maintained and managed by the state treasuries. The officers and higher employees, even of the independent native states, railways are nearly all Europeans. The station master, the engine driver, and the guards are Europeans. The guards or conductors on some lines are Parois and Hindus, but only a very small number occupy this position. Perhaps in all India there is not one engine driver who is a native of the land, though there are many Indian station masters in small, out-of-the-way places, where, perhaps, only one passenger train stops in twenty-four hours. The clerks and telegraphers are mostly Indians. It is of course British policy to maintain such a personnel, for there are many efficient natives, well able to perform the duties of the various departments.

Each train for passenger service is made up of four classes: First class, second class, intermediate class and third class. The first and second classes are used by government officials and the wealthy. The intermediate is used by middle class Indians and the poorer Europeans. The third class is used almost exclusively by the Indian traveling public. In both the intermediate and third classes separate compartments are provided for Europeans and women.

The first and second classes are well furnished. The long seats are covered with leather and are soft and springy. At night they are used as sleeping bunks. In each compartment, and there are two in each car, are hung two hammocks for sleeping purposes. In the day time they are pushed up out of sight. Sometimes the inner walls of the compartments are fitted with folding bunks, such as one finds in the cabins of old-fashioned steamers. The first and second classes are invariably supplied with bathrooms, so that the traveler can enjoy the luxury of the tub. The water which is carried on the roof is replenished frequently at the larger stations. In summer the windows are fitted with rotating fans, that force moist, cooled air through dripping khus khus (a species of tall grass) mats. These luxuries are a necessity in the burning sun of the Indian plains. The intermediate and third classes are fitted with long bare wooden benches that stretch across the width of the car. Each compartment contains two such benches facing each other. The compartments, of which there are six in a car, are divided by long iron bars, and look for all the world like a traveling circus cage. Sometimes even the windows are barred. There is no kind of sleeping accommodation, and absolutely no pretense of comfort. The poor unfortunates, who are obliged to ride in these cages are huddled together like wild beasts. No Siberian transport carrying exiles could be much worse. Yes, the passengers do complain, but——

The track is broad gage; that is, 5 ft. gage. That is one reason why Indian cars look so heavy and cumbersome. But plenty of elbow room is required in that hot climate. The subway and Brooklyn Rapid Transit crushes would mean apoplexy and sudden death. It cannot be said, for all that, that Indian cars are luxurious and up to date. There is no competition, therefore the railway companies do not find themselves called on to furnish anything more than bare necessities. They still use those antediluvian gas lamps, dropped in at sunset from the roof. It is impossible to regulate their glare, generally the weary traveler pulls a green shade over it when he wants to sleep. Or just at the exciting part of a railway penny dreadful the gas gives out and the compartment is left in darkness. These are some of the inconveniences that the Indian traveler suffers. Yet, one must be thankful that there is a train at all.

Although there is not much fear of accidents, on the busiest lines, every train is fitted with vacuum brakes. A collision in India must partake of the nature of a phenomenon. Except at about a score of points not four trains run through in an hour. There are countless numbers of stations through which only one passenger train passes in twelve hours. However, the service is sufficient. It is not so very long ago that railway trains were regarded with fear, as something preternatural, by the ignorant peasantry of outlying districts. Today the fear is gone, still the train is viewed with much curiosity. To travel in a train is still a great achievement with untold thousands. The traveler will return to his village and, as the people gossip at the noon hour under the spreading banyan tree in the middle of the village, will relate his experiences as something of surpassing wonder; and his fellows will look up to him as one who has entered a field outside the realms of human labor and invention, and straightway he gains a prestige in the community; even a reputation for wisdom, as one who has ridden in a train and seen something of the vast world beyond the shades of the village roofs. These simple villagers call trains "howah garry," meaning "air carriages." How near they are to the truth these innocent hamleteers do not imagine!

The railway is undoubtedly one of the greatest blessings that has followed in the wake of the British occupation of India. Great cities have grown greater, and scores of insignificant towns have developed into centers of immense industries. Fertile lands difficult of access have been brought within the scope of profitable commerce. The farmers can sell their products more easily, and buy the conveniences the cities supply without much trouble. Employment is offered to thousands, who would other-

* Dr. Roy is not a practical American railway man, but he is a good observer, and makes a clear picture of what he has seen.

wise find it harder to live. Large tracts of country, hidden in oblivion for centuries are opened up for improvement. Bombay has been brought near to Calcutta and Delhi to Madras. That in itself is a great achievement, in a country where people seldom travel beyond the limits of their landlord's territory; where the next village, a few miles away, is too far to reach in a lifetime. Good government is made possible, something utterly beyond the imagination in India without easy and rapid modes of transit, for it is a country half the size of America with a population nearly three times as great. But above all, the railway has helped to circulate common ideas, new ones, from village to village, from city to city, from east to west and north to south. What that means to and for India no one who has not lived in India and studied Indian life will be able to realize. No country in the world, not even China, has such a heterogeneous population, with heterogeneous creeds, beliefs, ideas, ideals and languages as India. The railway has made possible a common standard of civilization in India, and is knitting together three hundred million individuals into one compact mass of humanity with a potential energy for good or bad that no imagination has yet dreamed of calculating. What greater work can any human invention do in any clime?

A TALE OF TWO RAILWAYS.

In Connecticut more than 60 years ago there were opened for operation two railways that were almost the pioneer lines of the state. The Housatonic was chartered in 1836 and opened in 1840. The Naugatuck was chartered in 1845 and opened in 1849. Each line had its southern terminal at tide water at Bridgeport, Conn., now the second largest city in the state. The Housatonic line reached northward to the Massachusetts border, 74 miles as referred to in the old railway reports; the Naugatuck to Winsted, Conn., 57 miles. The Housatonic, in days when water power was the fundamental unit of factory growth, ran through the valley of the same name, drained by a large, swift river, navigable near its mouth and, in its mid and upper waters, supplying almost unlimited water power not seriously affected by summer drouth in those days of the unshaven forests. The Naugatuck had its water power valley too, but shorter, drained by a much smaller stream, sometimes running almost dry in hot weather. The two parallel valleys are much alike in situation. But the Housatonic railway line, in its priority of time, its larger distance, its later extension northward to Pittsfield, Mass., and its superior water power, had by far the best outlook for prosperity.

Both these sub-pioneer lines of New England and Connecticut are now merged in the New Haven system and, save locally, have lost even their names. They have no separate reports, so it is impossible to point out in dollars and cents the strange disparity in their annals of success and the reverse. It is a subject to which, in these columns, we called attention some seven years ago, using necessarily a test based on the Federal census of 1900, showing the remarkable difference in the growth of the two valleys and the townships in them tapped by the two lines. The new Federal census (1910) for Connecticut towns enabled us now to show that difference in fresh and more vivid colors.

The Housatonic line was opened, as stated, in 1840. Using the census of that year the annexed table shows the change during 70 years in the population of the intersected towns of the state, leaving out Bridgeport, the terminal of both lines:

TOWNS SERVED BY THE HOUSATONIC.

	Population. 1840.	*Population.* 1910.
Trumbull	1,204	1,642
Monroe	1,351	1,002
Newtown	3,189	3,012
Brookfield	1,255	1,101
New Milford	3,974	5,010
Kent	1,759	1,122
Cornwall	1,703	1,016
Canaan	2,166	2,873
Total	16,601	16,778

In the table the town of Canaan includes North Canaan, set off from the parent township in 1858. The table, which happens to be made up of country towns, indicates how a railway in itself may not develop a rural region.

Contrast with the Housatonic valley in the state the development of the contiguous Naugatuck, opened in 1849, during a period ten years less:

TOWNS SERVED BY THE NAUGATUCK.

	Population. 1850.	*Population.* 1910.
Stratford	2,040	3,657
Milford	2,465	4,366
Orange	1,476	11,272
Derby	3,824	24,143
Seymour	1,677	4,786
Naugatuck	1,720	12,722
Waterbury	5,137	73,141
Litchfield	3,953	3,686
Torrington	1,916	16,840
Winchester	2,179	8,679
Plymouth	2,568	8,554
Total	28,955	171,846

In this table the township of Derby is credited with the population of the urban township of Ansonia, set off from her in 1889; Litchfield with the town of Morris, set off in 1859; and Plymouth with the town of Thomaston, set off in 1875. The census return for Stratford in 1910 is missing, and that for the census of 1900 is substituted; moreover, its increase of population, as well as those of Milford and Orange, has been connected with the New Haven rather than the Naugatuck railway. But the contrast between the Housatonic and the Naugatuck railway annals remains amazing in its disparities. Taking the returns as they stand with both time and original physical advantages in favor of the Housatonic valley, it continues stationary; while the Naugatuck has waxed about fivefold, or 494 per cent. Again, in the case of the Naugatuck such increments as those of the towns of Waterbury, Naugatuck, Plymouth, Torrington and Winchester—from 13,520 to 119,936—are remote from that tidewater toward which New England factory enterprise is commonly assumed to drift.

In the case of the two valley regions, each with its early railway and peopled by similar races, the causes of the contrasted degrees of development are, in a measure, involved in mystery. But there are some clues. The Housatonic line in its early days was the victim of narrow and unenterprising management. Its rates were inordinately high, almost prohibitory, its equipment of the poorest, its road bed and rails likewise, its improvements slow. By comparison, while not absolutely exalted in the railway scale, the Naugatuck started better and was managed better. It was paying dividends when the Housatonic line was on the verge of bankruptcy. But it and its region owed their prosperity and growth more to what seems to have been the good fortune that took to the Naugatuck valley a small but able body of manufacturers, pioneers in metallic industries. From their first ventures others sprung, reached from one township to another on the line and built up centres of population that begot diversified industries. The lesson reaches the original values of good railway management at its beginning; a certain specific value in railway policy of that element prized in mercantile life as "good will," throws a shadow on the "tidewater" argument, and shows how the first factory on a line may be the starting point and nucleus of many. In the story of the two roads it may also be worth remark that while public regulation had nothing to do with the backwardness of the one, the high prosperity of the other (and of its patrons) was built up without it—and, lastly, that we may learn things from the history of short lines as well as from big railway systems.

The construction of another link in the proposed Pan-American Transcontinental Railroad has been commenced in Uruguay. This part of the road is known as the Durazno-Trinidad branch. It will run from Durazno, which is the center of a rich agricultural district of Uruguay, to Conolia, on the River Plate, and from thence about 350 miles to San Luis in the province of Rivera on the Brazilian frontier. From that point the road will continue to Bage, Brazil, which already is connected with the railway that eventually will reach Rio de Janeiro.

General News Section.

The Denver & Rio Grande has increased the pay of its locomotive enginemen about 9 per cent., and has also issued revised working rules more satisfactory to the employees.

The new ore handling plant of the Erie Railroad at North Randall, near Cleveland, was damaged by dynamite on the night of March 25 to the extent of $100,000. There is no clue to the persons who did the deed.

At Douai, France, March 23, Louis Breguet carried in his aeroplane 12 passengers; and at Mouzan on the following day, Roger Sommers carried 13 persons, weighing 1,430 lbs. Breguet flew two miles, and Sommer two-thirds of a mile.

The Northern Pacific and the Spokane, Portland & Seattle have given their despatchers, trainmasters and roadmasters an advance of 10 per cent. in their wages, effective March 1. It is expected that the other railways in the northwest will do likewise, and that about 2,000 men will be affected. Despatchers formerly receiving $140 are raised to $175; chief despatchers from $175 to $190; night chiefs from $150 to $165; trainmasters from $175 to $190, and district roadmaster from $140 to $155.

The largest locomotive in the world has recently been built by the Atchison, Topeka & Santa Fe in its Topeka shops. This locomotive is a Mallet compound, with a rigid boiler, and is equipped with superheater, reheater and feed water heater. It is of the 2-10-10-2 type, the tender having two six-wheel trucks. The over-all length of the engine and tender is 121 ft. 7 in., and it weighs approximately 750,000 lbs. It carries a boiler pressure of 225 lbs., and will be put in service on the mountain grades in Arizona.

A northbound passenger train on the St. Louis, Iron Mountain & Southern was stopped by six robbers near Coffeyville, Kan., March 25, and the safe in the express car was blown open. It is thought that the amount of money taken was about $500. The place where the train was stopped was about three miles from any habitation and the robbers spent nearly an hour in assorting the packages found in the safe. The passengers were not disturbed, but bullets were fired along the sides of the train to intimidate them.

The Lehigh Valley has increased the pay of between 2,500 and 3,000 trainmen, the increase to go into effect on April 1. Freight flagmen's pay will be increased from $2.30 to $2.52½ a day, and freight trainmen's from $2.30 to $2.42. In passenger service trainmen will be advanced from $2.35 to $2.45, and baggage men from $2.45 to $2.65. In yard service day conductors who now get $3.30 will receive $3.50, and night conductors who get $3.40 will receive $3.70. The day yard trainmen will be advanced from $2.90 to $3.20, and the night men from $3 to $3.40. The increase averages from 6 to 10 per cent.

The working time of most of the men in the shops of the Pennsylvania has been reduced from 55 hours a week to 45. This order affects about 12,000 men. At Pittsburgh some of the shopmen are temporarily laid off. The shops of the Missouri, Kansas & Texas at Sedalia were closed for the last five days in March because the month's appropriation had been used up. At the shops of the Southern Pacific in Sacramento, the working time has been reduced to eight hours a day and five days a week. The shops of the Chicago & Alton at Bloomington, closed a short time ago, were re-opened this week.

The assertion that the United States has no merchant marine is false. We have no ships in foreign trade, but in our domestic trade we have great fleets. The merchant marine fleets of Germany, France and Norway, Continental Europe's three great maritime nations, aggregate in gross tonnage only 6,829,496, whereas the fleet of the United States has a gross tonnage of 7,508,082 tons, or 678,586 tons more. The merchant marine fleets of ten other countries of Continental Europe—Russia, Sweden, Denmark, Holland, Belgium, Greece, Spain, Portugal, Italy and Austria-Hungary—put into one fleet, aggregate only 6,514,155 tons, nearly one million tons less than the merchant marine of the United States.—*International Marine Engineering.*

B. F. Yoakum, of the St. Louis & San Francisco, finds that in the southwest the legislatures have shown a better spirit toward railways. In Texas the legislature has adjourned without passing a single railway bill, for the first time in fifteen years. The Missouri legislature passed only one railway bill of importance, and that one not so injurious that it cannot be endured. The Arkansas legislature so far has done nothing antagonistic to the railways and does not seem disposed to do so at this session. The only railway legislation of importance in Oklahoma was a joint resolution to submit to the people of the state the question of changing their constitution, which now forbids any railway outside of Oklahoma to build or acquire a road in the state.

C. S. Clarke, first vice-president of the Missouri Pacific, says that repeated rumors as to his ill-health and intended retirement are misleading and without foundation, and he has given publicity to a memorandum of what he said to the board of directors at New York on March 21, on the occasion of his re-election as first vice-president. He told the directors that as it was their wish that for the present he should continue as resident executive at St. Louis he felt it to be his duty to comply, and until such time as they could perfect an executive organization he would give his best efforts to holding the present organization together. He said that for more than six months his resignation had been in the hands of the chairman of the executive committee, as George J. Gould knew, and that he had hoped to be relieved so that he could give time and consideration to important personal business which had had but little of his attention during the last six years.

Tipping the Conductor.

On the street railways of Prague, Austria, the conductors expect and usually receive from each passenger a tip of two hellers, which amounts to one-fifth of a cent. The amount realized in this manner doubtless amounts to about as much as the conductor's regular compensation.—*Consular Report.*

Products of Wood Distillation.

The value of wood distilled in the United States in the year 1909, according to a bulletin issued by the Department of Commerce and Labor, was $4,000,000, and the products of distillation were valued at $8,328,484. More than nine-tenths of the wood used was hard wood, and the products were charcoal, crude alcohol and gray acetate; charcoal, 53,075,102 bushels; alcohol, 8,468,083 gallons; gray acetate, 149 million pounds. The products of the soft wood were turpentine, 682,702 gallons; charcoal, 2,403,401 bushels, and tar, 1,364,984 gallons.

Valuation of Harriman Lines.

A thorough investigation of the probable cost of reproducing the Harriman Lines is being made under the direction of E. Holbrook, formerly chief engineer of the Central of Georgia. This action was suggested by the widespread agitation for physical valuation of railways and by the fact that in numerous rate cases the Harriman Lines and other roads have been called on to give estimates of the value of their physical properties. The work has been under way for some time and it will take several months more before it is finished. The valuation will include all of the railway properties.

Governors as Traffic Solicitors.

No G. P. A. ever missed a good thing because he was so modest that he did not dare to ask for it. A new illustration of this trite truth has been brought to our attention in the shape of two proclamations which have been issued, one by Governor Oswald West of Oregon, and the other by Governor M. E. Hay of Washington, each setting apart a day to be called Colonist Day, and each exhorting all citizens to write to their friends in the East and remind them that ticket agents throughout the United States would, for a short time, sell them reduced rate tickets to enable them to visit that highly favored section of the country. We are informed by an officer of one of the Oregon roads that as a result of the proclamation, hundreds of thousands of letters were written to eastern friends. One of

the proclamations says that by virtue of the reduced rates offered by the railways it is possible for home seekers to get out there "at a trifling cost." To farmers who seldom see a ten-dollar bill this may seem rather an extreme statement. However, there can be no question that any farmer who accepted the invitation of one or both of these governors found himself amply repaid for his expenditure of time and money.

Six Passengers Killed at Alapaha, Ga.

By the derailment of train No. 95, the Dixie Flyer, of the Atlantic Coast Line, southbound, on a trestle bridge near Alapaha, Ga., on the morning of March 25, about 7 o'clock, six passengers and four trainmen were killed, and nine passengers and one express messenger were injured. Some of the victims were drowned, the first and second-class coaches and one sleeping car falling through the bridge into the Alapaha river. A statement from the office of the general superintendent of the road says that the derailment was caused by the breaking of a driving wheel axle. The trestle was destroyed for a length of about 400 ft. Alapaha is between Albany and Waycross. The Dixie Flyer runs through from Chicago to Jacksonville.

Mine Rescue Car.

The Mine Rescue Station Commission of Illinois, organized last August, has made its first report to the governor of the state. The chairman of the commission is J. A. Holmes, of Washington, D. C., representing the Federal Bureau of Mines, but all the other six members are Illinois men, representatives of the mine workers, the mine operators and the mine inspectors; and the seventh member, H. H. Stoek, who is the secretary, represents the mining department of the University of Illinois.

The commission is going to establish three rescue stations, and it will have three rescue cars One of these cars is described in the report. It is a converted sleeping car, having been bought from the Pullman Company for $750. About half of the car is occupied by six sleeping sections and the rest by a kitchen, an office and a general room containing the apparatus, the principal features of which are oxygen tanks and other first-aid supplies. The second of the three cars was contributed by the Chicago, Milwaukee & St. Paul, and the third by the Chicago & North Western.

Extension of University of Illinois Commercial Courses.

The trustees of the University of Illinois have recommended the appropriation of $150,000 for a building to be used by the department of business administration, and the legislature has also been asked to increase the appropriation for business courses from $25,000 to $50,000 a year. The railway officers who visited the University last November (See *Railway Age Gazette,* November 18, 1910,) expressed their approval of the scope of the training and the quality of work that is being accomplished in the course in railway administration. The business courses have gained steadily in number of students since 1901, when they were first offered. There are now 774 registrations in this department and 180 are enrolled for the four-year courses. The facilities offered for these classes are wholly inadequate for present needs. In the work in railway administration additional library equipment is needed, and space should be provided for the filing of railway tariffs and reports.

The Grand Trunk Pacific.

The Grand Trunk Pacific has let contracts for the construction of 885 miles of line to be built this year. These contracts provide that the main line, which is now in operation to Edson, Alberta, 130 miles west of Edmonton, shall be extended west 265 miles farther; and for the building of branch lines aggregating 620 miles. The total estimated expenditures, aggregating $17,000,000, will also include the grading of additional branch lines to the extent of 200 miles. The company now has in operation west of Fort William, 1,217 miles of main line and about 500 miles of branches. The Canadian Government officers estimate that the Grand Trunk Pacific has spent $18,765,000 on its mountain section, of which $11,765,000 was advanced by the government on its guarantee. On the prairie section the expenditure to date is $34,463,000, the government guarantee being $10,735,000 of that amount, and government loan, $10,000,000, making total sums advanced to the company, $32,496,000. The company has expended $14,744,000 on rolling stock.

Meals Served in "Family Style."

The *Northwestern Employees' Magazine* for March describes a combined dining and observation car, which has been in use on the Chicago & North Western, on the Sioux City division, for the last 16 months, and which is operated by C. W. Garnier and his wife. This car is run on Chicago trains Nos. 17 and 20. From 30 to 40 persons take meals in it daily. Mrs. Garnier is the waitress, and Mr. Garnier is conductor and assistant waiter. Eighteen persons can be seated at one time. The chief cook had served six years in that position on the Canadian Pacific before going to the North Western.

According to a press despatch the Copper River & Northwestern is now running a dining car between Cordova and interior points in Alaska—the first dining car ever run in that northern region. The car was converted from a passenger car. Like the car on the Chicago & North Western, this one is managed by a man and his wife, with a cook and an assistant cook; a fashion which would seem to justify the title which we have put at the head of this item.

Easy Passes in Texas.

The anti-pass act passed by the Texas legislature at its recent session will be permitted by Governor Colquitt to go into effect without his formal approval. The governor objected to the measure, because it is so worded as to permit free transportation to be given to a wide variety of persons. In fact, the legislators might very properly be charged by the "common people" with unfair discrimination, inasmuch as it has authorized free transportation to be given to almost all classes of persons except the "common people." A list of the classes of persons to whom under this "anti-pass" law transportation may be given fills a newspaper column and includes such persons as state railway commissioners, peace officers, representatives of industrial fairs, farmers' congresses and farmers' unions, deputy sheriffs, United States marshals, deputy United States marshals, volunteer firemen and confederate veterans, the state game, fish and oyster commissioner and his two chief deputies, state and county health officers, government representatives accompanying fish for free distribution in the streams of the state, the pure food commissioner and two chief deputies, persons who have been instrumental in securing the passage by the United States Congress of statutes providing for the equipment of railway trains with safety appliances, constables, members of the state militia in uniform when called into service, and members of the live stock sanitary commission, or other inspectors in Texas, not exceeding 25 in number. The act specifically provides for the exchange of free transportation and for advertising in newspapers and magazines, the said exchange to be on the basis of value received in all cases and the contracts to be approved by the railway commission. The Texas legislature has for some years been very stringent in restricting the amount of revenue that the railways might receive for the services that they rendered, but it has no conscientious scruples at all, apparently, about allowing them to give their services free to all classes of persons except the aforesaid "common people."

I. C. C. and Funerals.

Give the efficiency engineers half a chance and they will simply overwhelm you with facts and figures, the truth and practical utility of which no man in his senses will attempt to gainsay. The real problem for the manager today is not how to run his business upon the most economical and scientific principles, but how to run it at all. Some people have an idea that the government can regulate the other side of the problem, collective labor, in the same way that the manager and capital can be regulated. A greater delusion never existed. The levelling process in modern industry, the blocking of individual initiative and the elimination of personal responsibility are beyond the reach of human laws.

Every railway in the country is honey-combed with illustrations of the impediments that are thrown in the way of any management at all by the schedule and the government regulator. Take the regulations in regard to the hours of labor. Time was when

if I wanted to get off duty for some urgent personal reason I could, with the permission of the superintendent, call upon one of the other men to help me out. For twenty-five years I watched this method of handling the men in a human and scientific manner and never knew it to be abused.

Today if you want to change shifts with another man in order to go to a funeral you will be referred to the Interstate Commerce Commission; no man can exceed his time limit of nine hours except in case of emergency, and according to the ruling you cannot plead emergency for anything that you can foresee. When a man is dead you can easily foresee the funeral. Therefore the only funeral a towerman can go to is his own. Of course if there happens to be a spare man handy you can get away by losing a day's pay; but what becomes of scientific management and economy in such cases from the employee's point of view?—*J. O. Fagan.*

Q. & C. Firemen's Strike Settled.

The Cincinnati, New Orleans & Texas Pacific (Queen & Crescent route) raised its freight embargo March 23, having succeeded in doing away with most or all of the congestion, and on March 25 an agreement was reached with the strikers, through the mediation of Judge Knapp, and the strike was declared off. Following is the agreement, which was signed by General Manager Baker of the railway company and Messrs. Teat, Payne and others for the firemen:

(1) The pending strike to be declared off at once.

(2) The employees in the service of the C., N., O. & T. P. Railway Company on March 9, 1911, who struck on that day, to be reinstated within fifteen days under the provisions of the schedule of July 1, 1910, governing rates of pay and conditions of service, which schedule shall continue in effect, with their former seniority standing and rights and without prejudice on the part of the company, except that the company shall not be obliged to retain in service any fireman or other employee against whom charges shall be made within thirty days from the date hereof, and who shall be found, upon investigation, to have committed acts of violence or been guilty of misconduct during or in connection with the strike which would justify his discharge or suspension.

(3) Negro firemen not to be employed on any part of the company's line north of Oakdale, provided a sufficient number of competent white men can be secured.

(4) On the district between Oakdale and Chattanooga, known as the third district, the percentage of colored firemen hereafter employed not to exceed the percentage in service on January 1, 1911, provided a sufficient number of competent white men can be secured.

(5) Negro firemen on this district not to be assigned to more than one-half of the passenger runs, nor to more than one-half of the preferred freight runs, and in no case to be assigned to passenger or preferred freight runs unless entitled thereto by seniority and fitness for such service.

(6) In case any question shall arise as to the meaning or application of this agreement which the parties cannot settle among themselves, either party may appeal to Judge Martin A. Knapp, of Washington, and his decision shall be final and binding upon both parties.

Railway Regulation and Efficiency.

The Interstate Commerce Commission has handed down its decisions on the proposed increases in freight rates. I think three things may be affirmed about these decisions:

First.—They have put at least one brake upon higher costs in this country.

Second.—They have put another brake upon voluntary reductions of rates because, under the new law and these decisions, the burden of proof for future increases or restorations is upon railways.

Third.—The present law amply protects the shippers of this country against extortionate rates. America has already the lowest rates and the highest wages in the world and apparently is to retain both.

I made no predictions before the decisions were rendered; I make none now as to their ultimate effect. There is one bright and shining sentence in them, to wit: "Our railway management should have wide latitude for experiment; it should have such encouragement as will attract the imagination of both the engineer and the investor." The response which the country will, in the long run, give to this sentiment is the important and far-reaching answer. The crop of short-term railway notes now coming out would indicate that the country's "imagination" is still a little near-sighted, but it may get over that and we hope it will. We hope the Interstate Commerce Commission is right. Some phases of the decisions might have been appealed to the newly created Interstate Commerce Court, but the railways have accepted the verdict of the commission and are going ahead to do the best they can. They look forward, not backward.

During the discussion a new slogan—*Efficiency*—has captured the country. . . . I read in the *Sun* one day last week that the average cost of a cold in the head is $44.34. What a railway official wants to know is this: If his company can reduce the cost of the cold in its head from $44.34 to $37.34, *who will get the seven dollars?* . . .

It is particularly appropriate at a Canadian club dinner that we look at Canada. As I understand it, your form of government is in one respect just the opposite of ours, viz., your Dominion government has all the powers not granted to the provinces, while our states have all the powers not ceded to the federal government. What has that to do, you say, with railways? This: When our United States roads fall ill from their own indiscretions or otherwise, 47 doctors step in—that is, 46 states and the federal government—whereas under your form of government a railway chartered by the Dominion is regulated by the federal government only. See the enormous loss in efficiency and the great strain on the patient under our methods as compared with yours. This winter there have been introduced in the state legislatures of the United States 469 bills affecting the mere operating questions of railways, besides scores of other bills affecting railways in a multitude of ways. Of the 469 bills, 56 are so-called "full crew" bills, each of which, if enforced, will add to the railways' cost of living. . . .

Railways in England are permitted to work out *joint* economies. France is districted off and wasteful duplication of railway service is absolutely eliminated. Each company has a monopoly in its district. One French railway corporation pays dividends of 18 per cent. a year on its stock; the others pay 7 per cent. or more. And out of their revenues an amortization or sinking fund is also paid to the owners under which the republic will become the proprietor of the railways about the middle of this century. . . .

If any of your methods as to government, or banking, or labor questions, or railways, are better than ours, perhaps we will be wise enough to borrow some of them. While we are depending upon the imagination of the investor for railway development, you are right now engaged in what is practically a profit-sharing arrangement with the investors in your railways. If the option to take out a federal charter for a railway is good for you, perhaps such an option will be good for us. Maximum efficiency will require us, sooner or later, to eliminate all burdens on interstate commerce. We will learn to say, "The United States *is* a nation," not "The United States *are* a nation." The Brandeis idea is right. What we need is more efficiency. Let every man apply it in the activities of his own life, and let all of us together adopt it on a wider and wider scale—and incidentally use it to augment international trade. The more we study efficiency, the more we will discover that the Interstate Commerce Law amply protects the country against extortionate rates and discriminations. The anti-trust laws, at least so far as railways are concerned, involve an appalling waste of energy. We do not need both laws for the railways any more than a state needs two governors. Maximum efficiency entitles the people to have the commerce of this great country sent over the lines of least resistance. Duplication of train service, wasteful car supply, unnecessary hauls of empty cars, duplication of capital, and all that sort of thing ought to be cut out. If this could be done I have no doubt that one hundred million dollars a year could be saved in the operation of American railways with which to tempt "the imagination of both the engineer and of the investor."

In efficiency, American railways have been pioneers, not laggards. All things considered, they already are the most efficient in the world, and if "scientific management" of the anti-trust laws could be adopted, our railways would excite the admiration of even our own countrymen. Let us drop the old quo-

tation: "In time of peace prepare for war," and in its stead say to our neighbors, "In time of friendship let us prepare for more friendship." In time of efficiency prepare for *more* efficiency. More abundance for the many. Let *things* be cheaper—and men, women, and children more valuable. The welfare of our race, and therefore the welfare of all races, is bound up in the one word, *Efficiency.—Frank Trumbull,* before the Canadian Club of New York.

Foundrymen's Conventions.

The annual conventions of the American Foundrymen's Association, the American Brass Founders' Association and the Associated Foundry Foremen, will take place May 23-26, 1911, at Pittsburgh, Pa. The secretary and treasurer of the American Foundrymen's Association is Dr. Richard Moldenke, Watchung, N. J.; the secretary and treasurer of the American Brass Founders' Association is W. M. Corse, care Lumen Bearing Company, Buffalo, N. Y., and the secretary and treasurer of the Associated Foundry Foremen is Hugh McPhee, Tarrytown, N. Y. At the joint session at 10 a. m. on May 23 papers will be read on Production, Cost and Economy Foundry Insurance. At the session of the American Foundrymen's Association at 2 p. m. on May 23, papers will be read on the Use of Borings in Cupolas and the Effect of Alloys in Cast Iron. At the session of the American Brass Founders' Association at 2 p. m. on the same day papers will be read an Vanadium in Non-Ferrous Alloys and on the Determination of Nickel in Bronzes. At the joint session at 9:30 a. m. on May 24, papers will be read on Rotary Blowers and on Pattern Making. At the session of American Foundrymen's Association at 2 p. m. on May 24 papers will be read on Acid and Basic Open Hearth Pressures; on Electric and Converter Furnaces for Steel Castings, and on the Effect of Vanadium and Titanium on Steel. At the session of the American Brass Founders' Association at 2 p. m. on the same day papers will be read on the Corrosion of Brass Foundry Products and on Non-Ferrous Foundry Economies. At the joint session at 9.30 a. m. on May 25 papers will be read on the Use of Alloys and on Shot in Castings.

Chicago Signal Club.

The Chicago Signal Club held a meeting on Monday, March 27, at Room 402 Plymouth building, Chicago. E. F. Bliss of the signal department of the General Electric Company, gave an illustrated talk on alternating current signaling with special reference to the General Electric wireless controlled system. Leon S. Brach of the L. S. Brach Supply Company gave a talk on lightning arresters, explaining the theory of the air-gap and non-air gap types as applied to the operation of signal circuits. The club has been studying electric interlocking during the past few months, and at the next meeting, which will be held on April 10, various indication schemes will be taken up.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Local Freight Agents.—R. O. Wells, East St. Louis, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock building, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May, 1911, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.; annual, November 6-10, Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, New York; June 20-21, 1911, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; annual, October 9, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday, Chicago; annual, July 29, Chicago.

Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; next convention July 25-27, Chicago.

International Railway Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P.; 4th Saturday, Richmond, Va.; 20th annual, June 21, 1911, St. Paul, Minn.

Omaha Railway Club.—A. H. Christiansen, Barker Blk.; second Wed.

Railway Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis; annual, Oct. 20, Atlanta.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs., Jan., April, August and Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday; annual, May 6, 1911, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 11, 1911.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S. Ry., Detroit, Mich.; annual, Feb. 10, 1912.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August, 1911, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; annual, May 8, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The railway men and industrial traffic managers of Dallas, Texas, are planning to organize a traffic club.

The Lehigh Valley has offered to the farmers along its lines in New York state, the use of land on its right-of-way, where available, for the cultivation of alfalfa.

At the annual meeting on March 28 of the Traffic Club of Chicago, the officers named by nominating committee were elected for ensuing year, as published in these columns March 10, page 471.

The Norfolk & Western has notified the Interstate Commerce Commission that, beginning April 1, it proposes to base its rates for carrying bituminous coal on tons of 2,000 lbs. each, instead of 2,240 lbs. as at present; in effect, an increase of 12 per cent. in the rates.

The North German Lloyd steamship "George Washington," which sailed from New York this week, took to Europe 2,710 passengers; all of the cabin accommodations having been engaged several weeks ago. New York steamship men say that the number of passengers booked for Europe to sail in the month of April indicates that the eastward movement across the Atlantic in that month will exceed any previous record.

Representatives of railways carrying coke from Pennsylvania and Virginia to western states, met in New York this week and discussed a proposed revision of tariffs. At present the rate to Chicago is $2.35 a ton on coke to be used in blast furnaces and $2.65 on coke for other uses. Following the rule laid down in a recent decision of the Interstate Commerce Commission, that differences in rates based on the uses to which goods are to be applied are illegal, it is proposed to make a single rate for all coke of $2.50.

Edgar J. Rich, general solicitor of the Boston & Maine Railroad, appearing before the Senate Committee on Judiciary of New Hampshire, asked, because of the lack of action on the part of the special committee which has been investigating railway rates in the state, that the present rates be legalized until July 1, 1913, and that in the meantime the Public Service Commission be instructed to make a full investigation of the subject and report to the next legislature. During this investigation he would give shippers the right to appeal to the commission for a determination of the reasonableness of their rates and give the railway the right to appeal to the courts if not satisfied with the findings of the commission.

The following have been chosen to represent their respective clubs at the meeting, to be held in Cincinnati, Ohio, on April 3, for the purpose of forming a national organization of traffic and transportation clubs: G. C. Brown and C. H. Chevee, Buffalo Transportation Club; Carl K. Landes and C. C. Spalding, Cincinnati Transportation Club; W. R. Hurley and Walter G. Norvell, Detroit Transportation Club; Wallace A. McGowan and James L. Marens, Kansas City Railroad Club; W. H. Simmons and B. T. Breckenridge, Indianapolis Transportation Club; Charles Milbauer and B. R. Price, Newark (N. J.) Traffic Club; F. A. Bedford and V. C. Williams, Philadelphia Traffic Club; Thomas Conlon and L. G. Macomber, Toledo Transportation Club; Odell S. Smith and S. L. Heacock, Washington (D. C.) Traffic Club.

Railway Legislation in Missouri.

Laws containing the following provisions affecting railways were passed by the legislature of Missouri at its recent session:

Making it unlawful for any railway to charge a higher rate for transporting passengers between any two points on its lines than it charges between any other two points.

Giving the right to sue a railway company and its responsible employee jointly for damages in any accident, the purpose being to keep damage suit cases in the state courts.

Authorizing the railway commission to fix the maximum rates for passenger travel within the state. The commission is authorized to divide the state's railways into three classes, those whose gross passenger earnings are more than $1,500 a mile a year, those which earn more than $750 a mile, and those which earn less than that sum. The maximum rates may be varied according to this classification.

Requiring railways to install local exchange telephones and answer inquiries as to trains.

Permitting the railway commission to compel railways to place gates, automatic alarm bells or other mechanical devices, or a flagman at any grade crossing where it thinks it necessary.

Preventing railway or express companies from limiting liability by any contract whatsoever with a shipper.

Making it unlawful for any railway to obstruct any road, street or highway with cars for more than five minutes at a time.

Authorizing the railway commission to require a sufficient number of passenger cars on any train to seat all passengers.

Authorizing the railway commission to require cuspidors in waiting rooms and on trains.

Empowering the railway commission to fix switching charges.

Requiring one passenger train to be run each day each way on all railways more than 30 miles in length, where for six months the earnings were at the rate of $1,000 a year.

Giving the railway commission power to regulate train schedules and the number of trains on all roads more than 25 miles in length.

Giving the railway commission control over all express rates, the proportion to be paid to the railways, and to fix free delivery zones in all cities of over 1,000 inhabitants.

Regulating the size of caboose cars, and requiring them to have platforms, toilet rooms and bunks, the railway commission to be allowed to excuse any violation of the law in its discretion.

Authorizing the railway commission to regulate the crossings of railways with each other.

Increasing the tax on express companies from $1.25 to $4 per $100 of gross earnings per year.

Making it a misdemeanor to interfere with train signals, the crime to be punishable by fine of $25 to $500, imprisonment for one to twelve months, or both.

Empowering the railway commission to require railways to furnish sufficient depot storage and platform facilities at every incorporated town.

Requiring every railway train, including fast mails and express trains, to stop at all country seats.

Requiring private steam or electric railways over three miles in length to carry freight for the public.

Hearing Regarding Pacific Coast Rate Cases.

Hearings were held by the Interstate Commerce Commission in Washington last week regarding the proposed readjustment of rates both from the East and from the Pacific coast to Spokane, Wash., Salt Lake City, Utah, and other western intermountain points. The officers of the railways reported to the commission the results of the check made to ascertain what reductions in earnings would be caused by the reductions in rates which the commission proposed in its decisions in these cases. It was stated that the reductions in earnings on the Northern Pacific in four typical months would have amounted to $374,459, or at the rate of $1,040,000 a year; that the reductions on the Great Northern would have amounted to $700,000 a year, and on the Denver & Rio Grande to $156,000 a year.

It having been suggested in the arguments that water competition to the Pacific coast does not amount to much, Charles Donnelly, assistant general counsel of the Northern Pacific, showed that the value of the commodities moving to the Pacific coast via the Tehuantepec and Panama routes increased from $27,500,000 in 1909 to $40,000,000 in 1910.

W. W. Cotton, general attorney of the Oregon-Washington Railroad & Navigation Company, protested against the commission calling the rates it proposed to fix to Spokane just and reasonable. He said that if the commission called the tentative Spokane scale reasonable there was nothing to prevent the state commissions of Washington and Oregon from fixing the same rates on state business. He said that his road's rates are lower than rates once held by the commission to be just and reasonable; that its competition is increasing; that its earnings are practically stationary and that its operating expenses are increasing. E. C. Lindley, general solicitor of the Great Northern, said that the various valuations which had been made of this road by the state commissions of Washington, South Dakota and Minnesota, and the master in chancery in the Minnesota rate case, indicated that its value is in the neighborhood of

$450,000,000, and he said that if the Great Northern is entitled to earn as high a percentage on its value as the Supreme Court of the United States said the Consolidated Gas Company ought to be permitted to earn, there could be no just reduction in its rates. Louis T. Brandeis appeared for the Atlantic seaboard shippers and contended that they should continue to be given the same rates to the Pacific coast and to interior points as are made from Chicago.

C. W. Durborow of the Southern Pacific, Gardiner Lathrop of the Santa Fe, and J. C. Jeffery of the Gould Lines, all appeared to present arguments against the reductions in rates proposed by the commission to various points in Utah, Nevada and Arizona.

Mr. Donnelly suggested, as a proper basis for fixing the rates to Spokane, that they be made 75 per cent. of the rate from the Atlantic seaboard to Seattle plus the local rate from Seattle back to Spokane. H. E. D. Jackson, secretary of the American-Hawaiian Steamship Company, was the first witness called by the railways when the hearing on the long and short haul question proper was begun on March 23. His evidence showed that his ships carry about everything that a land carrier ever handles. He said that his line can carry from two to three times as much freight when the Panama canal is finished as it does now via the Tehuantepec route, and that the cost of the service will be reduced no matter what the tolls through the canal may be, because he assumes that the tolls will be reasonable. He said his line carried 239,000 tons westbound last year, an increase of about 75,000 tons, and estimated that when the canal is completed its present ships can carry 700,000 tons westbound. He based his estimate on the belief that the opening of the canal will reduce the running time between the two coasts from 30 to 20 days. While the route through the Panama canal will be 1,100 miles longer than the Tehuantepec route, the relieving of the ships of the necessity of docking at the port of Mexico and Salina Cruz will offset the longer distance that they must go. He said that the engaging of the California & Atlantic Line in the coast to coast business has reduced the maximum rate that the steamship lines get from about $10 per ton to about $6 per ton.

Car Surpluses and Shortages.

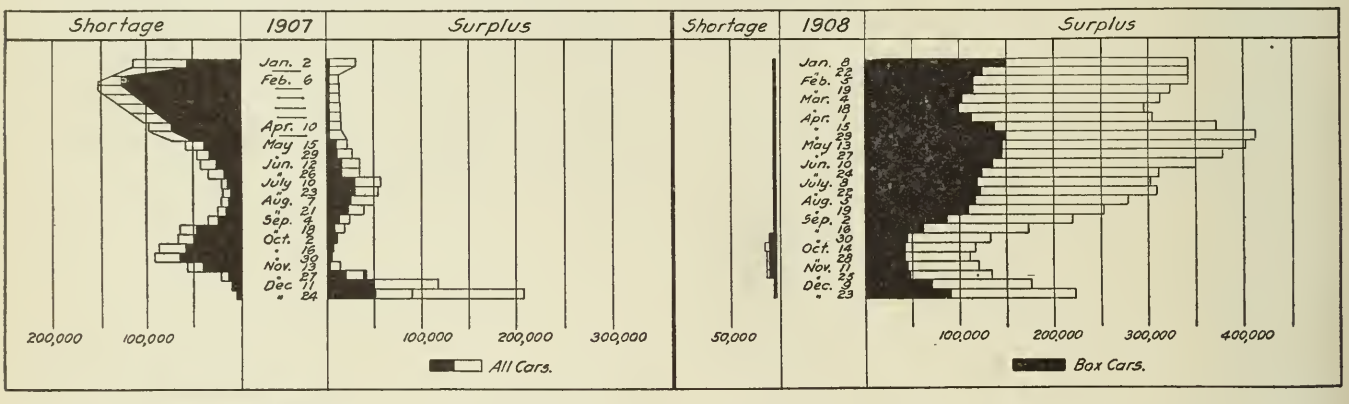
Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, presenting statistical bulletin No. 91-A, giving a summary of car shortages and surpluses by groups from November 27, 1909, to March 15, 1911, says:

"The total surplus for this report is 208,527, an increase over last report of 15,854 cars. This increase is principally in the East and South, the western, northwestern and Pacific territory

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses Box.	Surpluses Flat.	Surpluses Coal, gondola and hopper.	Surpluses Other kinds.	Surpluses Total.	Shortages Box.	Shortages Flat.	Shortages Coal, gondola and hopper.	Shortages Other kinds.	Shortages Total.
Group *1.—March 15, 1911	8	1,047	1,411	4,032	196	6,686	0	20	0	7	27
" 2.— " 15, 1911	24	3,377	1,149	29,412	10,171	44,109	5	0	1	6	12
" 3.— " 15, 1911	25	4,379	1,924	53,478	4,649	64,430	0	0	0	294	294
" 4.— " 15, 1911	10	2,299	133	7,893	1,597	11,922	25	312	0	0	337
" 5.— " 15, 1911	19	1,916	634	7,022	1,543	11,115	23	50	50	0	123
" 6.— " 15, 1911	22	9,480	1,193	4,907	4,908	20,488	55	8	27	152	242
" 7.— " 15, 1911	4	1,021	186	1,779	518	3,504	0	0	0	0	0
" 8.— " 15, 1911	15	7,708	585	3,243	3,626	15,162	0	0	0	0	0
" 9.— " 15, 1911	11	4,295	466	214	929	5,904	50	0	0	0	50
" 10.— " 15, 1911	20	5,758	2,821	2,914	10,272	21,765	6	2	9	9	26
" 11.— " 15, 1911	5	1,834	722	25	861	3,442	126	0	0	29	155
Total	163	43,114	11,224	114,919	39,270	208,527	290	392	87	497	1,266

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages from 1907 to 1911 Inclusive.

showing little change. The increase in coal car surplus continues, groups 2 (eastern), and 5 (southern), contributing the principal part of the increase of 11,177 cars shown in this bulletin. There is also an increase of 4,233 in the box car surplus, due principally to large increases reported from groups 1 (New England), 2 (eastern), and 11 (Canadian). The surplus is over four times as great as that reported for the corresponding date in 1910, and even allowing for the increase in equipment since that time, the reports indicate that there are twice as many idle cars at the present time as there were in March, 1910.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 20, proposed advances in freight rates by the principal lines from points in Oklahoma to points in Texas.

The commission has suspended until June 29 proposed advance in rates for transportation of cement in Central Freight Association territory which were to have become effective April 1; also proposed advances in rates and new tariffs affecting transit privileges on starch, filed by the Illinois Central, which were to have gone into effect April 1.

Reparation Awarded.

Gamble-Robinson Fruit Co. v. Northern Pacific et al. Opinion by the commission:

Rates $1.79, $1.75½, and $1.35 per 100 lbs. on citrus fruits in carloads from Redlands, Prenda, Pachappa, Arlington, and Porterville, Cal., to Miles City, Mont., found unreasonable so far as they exceeded rate of $1.15 subsequently established. (20 I. C. C. 421.)

H. Rosenblatt & Sons v. Chicago & North Western et al. Opinion by Commissioner Harlan:

The fabric known to the trade as "triplex cloth," frequently made up of woolen or silk materials, but consisting in this instance of a layer of cotton goods and a cotton shoddy lining with an intermediate layer of reclaimed rubber, is not cotton piece goods and therefore is not entitled to the cotton-piece-goods rate. Generally speaking it may properly take the rate applied to dry goods n. o. s. (20 I. C. C. 447.)

A. Geo. Schultz Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Prouty:

Complainant's shipment of wood-pulp cartons from Milwaukee, Wis., to Spokane, Wash., was properly classified, and defendants wrongly charged an additional sum at destination on a higher classification. Reparation awarded for such additional sum and for demurrage charges which had in the meantime accrued; but it does not appear in this case that reparation should be awarded for an outlay in telegraphic charges.

After the car was partly unloaded the delivering carrier notified the consignee that, owing to a mistake in classification, additional charges must be paid, and, when the consignee declined to pay such additional charges, insisted that the portion of the carload which had been already removed should be returned to the car, which the consignee did. The expenditure due to removing and restoring a part of the carload was the direct consequence of the unlawful act of the delivering carrier in declining to deliver this carload, for which reparation should be awarded. (20 I. C. C. 403.)

Complaint Dismissed.

Browne Grain Co. v. Fort Worth & Rio Grande et al. Opinion by the commission:

Class rate of 56 cents per 100 lbs. corn shucks from Alexandria, La., to Brownwood, Texas, via a route 911 miles long, not found to be unjust or unreasonable. (20 I. C. C. 410.)

Riverside Mills v. Georgia Railroad et al. Opinion by the commission:

An informal complaint showing date of shipment, weight, and rate charged, coupled with an allegation that the rate was unreasonable, is sufficient presentation of a claim to come within section 16 of the act. *Memphis Freight Bureau* v. *St. L. W. Ry Co.*, 18 I. C. C. Rep., 67, reaffirmed. For reasons stated in the report. (20 I. C. C. 423.)

Clinton Bridge & Iron Works v. Chicago, Burlington & Quincy. Opinion by the commission:

Where a shipper, without disclosing to a carrier the character or size of its shipment, orders a particular kind of equipment, loads its traffic thereon, and directs transportation of the shipment as loaded, it must pay the rate lawfully applicable to the class of equipment used, although a lower rate would have been available had the freight been loaded in another kind of car. (20 I. C. C. 416.)

Dells Paper & Pulp Co. v. Chicago & North Western et al. Opinion by the commission:

Where a tariff provides different rates for property dependent on the value thereof and requires that the invoice value shall be stated and receipted for in order to secure the lower rate, the complainant must show that the requirements of the tariff were complied with, or that they were unreasonable, before reparation will be awarded on account of application of higher rate to a shipment the value of which did not exceed that on which a lower rate would have applied had the value been disclosed to the carrier. (20 I. C. C. 419.)

Change of Classification Denied.

W. E. Caldwell v. Chicago, Indianapolis & Louisville et al. Opinion by the commission:

1. Joint rates on tank material, Louisville, Ky., to Shawano, Wis., Combined Locks, Wis., and West Port Arthur, Tex., found unreasonable so far as they exceeded combination of intermediate rates contemporaneously in force.

2. Differences in value of articles offered for transportation cannot be precisely reflected in the comparatively small number of classes now used for rate-making purposes; and in the absence of a showing that the rate resulting from the classification is unreasonable or otherwise unlawful, it must be proved that a particular article is not rated with other articles similar in value, weight, and other essential transportation qualities, before the commission will require a change in the classification. Application of fifth class rates to wooden tank material (in the white) in official classification territory not found unreasonable. (20 I. C. C. 412.)

A Plant Facility.

Kaul Lumber Company v. Central of Georgia et al. Opinion by Commissioner Clements:

A lumber company doing business in Alabama had a railway which was constructed under its general incorporation and connected its mill, on the line of the Central of Georgia, with its timber. In 1901 the lumber company made a contract with the Central of Georgia under which it received a division of 2 cents per 100 lbs. of all rates on lumber shipped by it from its mill, which 2 cents was supposed to represent the portion of the through rate to which the lumber company was entitled for the haul from the timber to the mill, through rates being made from the timber, called "Wildwood," to various destinations. Between June 22, 1903, and February 4, 1908, the rates on yellow-pine lumber from the points of origin in Alabama to the Ohio river and related points were advanced 2 cents per 100 lbs. In the *Central Yellow Pine* and *Tift cases*, 10. I. C. C. Rep., pages 505 and 548, the commission condemned similar advances from competing and contiguous territory.

1. Without deciding whether this railway, owned and operated by the lumber company, is a common carrier or not, on the facts appearing in its operations in hauling company material for the Kaul Lumber Company it can be considered by this commission only as a plant facility.

2. That, conceding for the purposes of this case that the advance of 2 cents per 100 lbs. on yellow-pine lumber was unreasonable and unjust, the complainant lumber company is not entitled to any reparation thereon for the reason that it has never paid the advance. If the railway of the lumber company should be held to be a common carrier, as the complainant contends it should, in such case it can not be heard to complain of the advance in rates because it had concurred tacitly and explicitly in such advance. (20 I. C. C. 450.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1911. (SEE ALSO ISSUES MARCH 17 AND 24.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$271,135	$89,346	$392,947	$46,756	$91,548	$11,219	$121,138	$9,212	$279,873	$113,074	—$671	$16,370	$96,033	—$16,336
Ann Arbor	301	120,880	32,118	162,401	20,532	22,323	4,046	64,937	11,406	123,244	39,157	—3,719	11,874	23,564	—3,569
Arizona Eastern	364*	91,390	32,551	131,633	21,980	12,393	1,813	35,292	3,131	74,609	57,024	—114	6,944	49,966	36,224
Atlanta, Birmingham & Atlantic	662	176,299	48,498	238,109	31,324	33,324	15,576	91,971	9,060	181,255	56,854	.....	10,500	46,354	18,016
Bangor & Aroostook	627†	223,655	35,868	278,255	43,669	32,007	4,273	95,684	10,483	186,116	92,139	.....	2,525	89,614	1,910
Central Vermont	411	210,034	67,360	301,251	24,886	45,796	5,606	150,274	9,271	235,833	65,418	385	10,750	55,053	18,519
Charleston & Western Carolina	341	132,356	27,851	167,569	29,883	17,875	2,835	62,212	3,569	116,374	51,195	.....	4,475	46,720	21,961
Chicago & Erie	270	323,273	53,114	417,426	38,391	92,560	22,609	220,971	9,097	383,628	33,798	.....	11,387	22,411	—28,409
Chicago, Indiana & Southern	329	283,270	19,521	310,642	38,525	61,241	8,277	131,159	8,824	248,027	62,615	—43	13,900	48,672	—38,739
Chicago, Indianapolis & Louisville	617	275,276	109,337	432,953	55,876	72,501	17,365	179,467	13,844	339,053	93,900	.....	22,500	71,400	6,214
Cincinnati, New Orleans & Texas Pacific	337	593,134	154,893	786,337	65,003	167,896	21,215	253,784	17,705	525,603	260,734	—1,899	22,616	236,219	—21,235
Detroit, Toledo & Ironton	441	115,932	11,073	141,341	38,567	15,909	2,495	93,172	6,172	156,315	—14,974	.....	6,712	—21,686	15,970
Duluth, South Shore & Atlantic	611	131,067	56,743	200,508	33,636	31,054	8,550	97,486	6,148	176,874	23,634	—288	18,000	5,346	—21,272
Florida East Coast	583	169,165	166,683	383,580	44,468	56,342	10,065	130,419	7,276	248,570	135,010	.....	13,731	121,279	21,289
Fort Worth & Denver City	454	292,811	128,190	442,900	40,722	81,897	5,983	152,321	15,009	295,932	146,968	—1,079	10,522	135,367	—4,558
Georgia	307	212,813	70,609	302,390	27,416	48,213	10,926	127,858	7,179	221,592	80,798	.....	1,613	79,185	7,648
Georgia Southern & Florida	395	99,799	69,488	197,533	21,844	43,384	5,976	78,897	9,131	159,232	38,301	.....	8,858	29,443	509
Grand Rapids & Indiana	587	263,786	104,430	395,476	49,987	67,469	12,005	200,776	14,372	344,609	50,867	—403	24,077	26,387	6,608
Grand Trunk Western	347	368,991	142,742	541,988	40,860	81,622	18,257	248,157	12,925	401,821	140,167	—1,073	31,697	107,397	—5,783
Hocking Valley	350	378,601	64,939	464,794	53,697	113,929	8,404	191,164	19,326	386,520	78,274	.....	25,630	52,644	—117,126
Long Island	395	223,113	374,598	637,068	91,507	107,393	15,987	384,916	30,877	630,680	6,388	22,065	53,333	—24,880	—2,219
Norfolk Southern	608	153,364	56,946	225,960	23,755	31,472	4,791	76,092	14,641	150,751	75,209	—13	5,900	69,296	—
Northern Central	469	795,685	170,116	1,034,673	190,819	214,477	15,017	542,682	23,568	986,563	48,110	464	36,740	11,834	—91,474
Peoria & Eastern	352	231,019	55,360	306,128	35,205	50,756	5,686	153,120	5,974	250,741	55,387	.....	9,500	45,887	—25,414
Pittsburgh & Lake Erie	191	860,625	114,935	1,014,696	111,668	107,098	15,820	313,896	24,582	573,064	441,632	—424	30,000	411,208	—290,456
Rutland	468	129,634	70,793	228,841	25,018	48,765	6,051	113,279	6,421	199,534	29,307	.....	9,780	19,527	—16,371
St. Louis, Brownsville & Mexico	501‡	104,965	60,194	178,313	44,475	12,829	2,322	59,602	7,846	127,074	51,239	.....	4,500	46,739	14,067
St. Louis Southwestern	797§	556,144	117,386	706,947	69,913	110,992	25,155	178,346	25,961	410,367	296,580	—1,072	21,574	273,934	48,541
St. Louis Southwestern of Texas	703	247,259	80,217	349,129	96,114	86,867	10,128	175,254	20,040	388,403	—39,273	—202	10,000	49,475	8,488
Spokane, Portland & Seattle	433	166,735	70,508	255,481	55,124	19,446	4,029	92,775	9,891	181,265	74,216	—1,622	25,000	47,594	63,471
Texas & New Orleans	458	223,725	92,946	337,088	53,459	70,514	7,317	142,187	9,452	282,929	54,159	838	12,257	42,740	—13,937
Toledo & Ohio Central	444	277,044	49,776	338,879	48,531	55,586	6,794	155,467	8,113	274,491	64,388	—474	20,347	43,567	—75,785
Toledo, St. Louis & Western	451	228,020	34,884	281,696	30,977	60,299	8,152	115,673	8,506	223,607	58,089	.....	14,550	43,539	—20,515
Trinity & Brazos Valley	463	146,918	28,005	181,097	35,156	26,221	7,791	84,881	11,847	165,896	15,201	.....	3,500	11,701	20,085
Virginian	474¶	288,367	18,042	316,233	37,809	53,613	4,438	86,798	7,207	189,865	126,368	5,220	17,600	113,988	81,214
Wheeling & Lake Erie	457	381,416	47,481	462,754	36,433	106,810	7,761	186,004	14,032	351,040	111,714	339	19,627	92,426	—33,122
SEVEN MONTHS OF FISCAL YEAR, 1911.															
Alabama Great Southern	309	$1,801,818	$690,144	$2,712,264	$326,415	$612,731	$72,180	$815,031	$63,895	$1,890,252	$822,012	—$5,217	$95,834	$720,960	$72,260
Ann Arbor	301	789,502	310,652	1,173,699	160,805	138,495	27,799	401,390	51,501	779,990	393,709	4,158	97,465	300,402	20,164
Arizona Eastern	364*	659,880	231,648	956,687	173,582	87,494	13,709	268,734	28,148	571,667	385,020	266	41,932	342,822	29,127
Atlanta, Birmingham & Atlantic	662	1,179,691	379,212	1,660,851	198,169	259,970	103,303	605,050	62,161	1,228,653	432,198	.....	78,645	353,553	59,291
Bangor & Aroostook	627†	1,265,053	407,547	1,776,760	303,216	215,024	24,067	551,606	75,418	1,169,331	607,429	.....	15,625	591,804	—38,546
Central Vermont	411	1,488,598	681,795	2,345,823	289,636	351,082	50,831	1,017,889	53,417	1,762,855	582,968	4,361	74,616	512,713	19,326
Charleston & Western Carolina	341	820,756	226,909	1,096,644	199,540	135,209	22,052	367,567	26,801	751,169	345,475	.....	31,325	314,150	102,039
Chicago & Erie	270	2,343,041	496,152	3,103,127	363,856	643,763	143,289	1,377,327	66,636	2,594,871	508,256	.....	79,263	428,993	—73,166
Chicago, Indiana & Southern	329	1,887,836	178,017	2,124,552	303,350	411,068	64,294	836,798	63,112	1,678,622	445,930	1,418	94,593	352,755	—169,803
Chicago, Indianapolis & Louisville	617	2,392,641	947,094	3,651,327	473,847	516,543	116,655	1,291,630	102,381	2,501,056	1,150,271	.....	157,500	992,771	—116,177
Cincinnati, New Orleans & Texas Pacific	337	4,303,671	1,022,494	5,596,449	580,457	1,039,575	145,438	1,554,909	124,731	3,445,110	2,151,339	—8,268	151,616	1,991,455	198,710
Detroit, Toledo & Ironton	441	985,969	105,276	1,185,953	234,372	193,459	19,871	621,046	40,134	1,108,882	77,071	—73	46,984	30,014	1,665
Duluth, South Shore & Atlantic	611	1,222,340	612,422	1,935,456	264,131	206,728	69,246	719,547	50,419	1,310,071	625,385	7,909	123,871	509,423	20,370
Florida East Coast	583	950,184	614,273	1,785,753	305,171	296,819	39,454	653,126	55,073	1,349,643	436,110	.....	96,141	339,969	101,136
Fort Worth & Denver City	454	2,204,916	1,069,790	3,418,312	324,022	519,188	42,372	1,040,917	102,721	2,029,220	1,389,092	—9,724	70,522	1,308,846	—37,312
Georgia	307	1,274,545	554,312	1,946,118	250,560	294,841	73,937	758,933	50,440	1,428,711	517,407	.....	14,713	502,694	—8,873
Georgia Southern & Florida	395	760,124	478,885	1,428,535	155,976	290,771	42,268	528,688	63,347	1,081,050	347,485	.....	66,161	281,324	—30,080
Grand Rapids & Indiana	587	1,796,099	1,103,474	3,121,447	402,162	498,306	88,601	1,368,027	103,858	2,460,954	660,493	—267	169,480	490,746	—214,315
Grand Trunk Western	347	2,216,884	1,200,876	3,660,540	376,131	523,200	127,881	1,538,207	91,542	2,656,961	1,003,579	—7,958	221,881	773,740	—154,103
Hocking Valley	350	3,829,221	551,979	4,669,405	597,583	728,469	62,447	1,462,309	116,681	2,967,489	1,701,916	.....	203,965	1,497,951	—149,181
Long Island	395	1,815,854	3,995,693	6,102,182	667,066	840,822	126,569	2,806,627	159,752	4,600,836	1,501,346	478,361	314,755	1,664,952	—392,729
Norfolk Southern	608	1,065,412	472,552	1,658,311	185,504	202,341	34,155	512,909	96,378	1,031,287	627,024	3,855	42,100	588,779	—
Northern Central	469	5,838,111	1,406,155	7,695,031	1,342,591	1,445,234	121,596	3,571,200	174,357	6,654,978	1,040,053	4,747	224,132	820,668	—819,107
Peoria & Eastern	352	1,647,443	447,336	2,250,437	286,186	358,822	42,828	919,537	39,869	1,647,242	603,195	.....	67,378	535,817	—61,184
Pittsburgh & Lake Erie	191	8,507,239	988,751	9,783,774	1,194,298	926,387	100,698	2,318,575	165,356	4,705,314	5,078,460	—2,429	186,576	4,889,455	—1,233,405
Rutland	468	1,120,320	729,068	2,092,332	283,574	306,246	49,651	783,402	48,390	1,471,263	621,069	.....	75,063	546,006	—7,792
St. Louis, Brownsville & Mexico	501‡	664,987	338,207	1,083,296	315,380	90,552	16,060	385,915	55,091	862,998	220,298	.....	34,000	186,298	12,758
St. Louis Southwestern	797§	3,709,664	869,468	4,783,910	503,507	741,508	191,068	1,179,983	156,770	2,772,836	2,011,074	—5,289	136,940	1,868,845	72,971
St. Louis Southwestern of Texas	703	1,913,755	660,045	2,728,868	642,345	508,864	74,744	1,146,050	117,094	2,489,097	239,771	—1,530	65,726	172,515	81,608
Spokane, Portland & Seattle	433	1,935,079	596,102	2,667,316	323,154	166,673	27,253	721,302	67,731	1,306,113	1,361,203	—6,989	222,600	1,131,614	668,603
Texas & New Orleans	458	1,542,887	636,575	2,315,558	411,588	404,579	49,825	915,552	67,378	1,848,922	466,636	3,252	86,254	383,634	—167,163
Toledo & Ohio Central	444	2,683,345	415,825	3,263,179	424,467	431,141	47,101	1,063,888	54,691	2,021,288	1,241,891	—474	130,159	1,111,259	198,589
Toledo, St. Louis & Western	451	1,842,183	291,802	2,272,862	302,306	320,848	61,151	785,114	66,823	1,536,242	736,620	.....	98,600	638,020	—130,639
Trinity & Brazos Valley	463	1,063,561	233,622	1,349,481	237,572	220,954	55,735	585,320	77,636	1,177,217	172,264	.....	25,685	146,579	24,547
Virginian	474¶	1,873,433	159,237	2,090,867	234,201	329,117	36,132	568,230	53,063	1,220,743	870,124	33,134	96,556	806,702	590,248
Wheeling & Lake Erie	457	3,482,763	388,276	4,148,555	467,086	809,387	59,759	1,467,783	96,635	2,900,650	1,247,905	20,677	146,485	1,122,097	—49,539

Mileage operated on January 31, 1910.—* 312 miles; † 546 miles; ‡ 456 miles; § 773 miles; ¶ 444 miles; — indicates Deficits, Losses and Decreases.

Following the Common Law.

Southwestern Produce Distributers et al. v. Wabash Railroad. Opinion by Commissioner Harlan:

The public stations, depots, and grounds of carriers to a certain extent are also their private property subject to their own control with respect to any private business carried on in them, provided the use so made of the property is in itself reasonable and contributes to the public convenience or to the advantage of the carrier without creating preferences or discriminations as between shippers or travelers. Station restaurants, news stands, barber shops, and similar private enterprises at railway terminals, ordinarily conducted by outside interests, add to the convenience of the public before the transportation by the carrier has commenced or after it has been completed, and are no part of the service undertaken by the carrier for the public under its published tariffs. Complaint is by a rival auction company demanding at the St. Louis terminals of the defendant the same facilities for conducting its business as an auctioneer of fruits and vegetables that are accorded exclusively to another auction company. The complaint is without merit, the proof showing that the latter company offers its services to all shippers at a uniform rate and without preference or discrimination.

Formal Order on Railway Fuel Coal Rates.

In re Restricted Rates. Opinion by Commissioner Clark:

The commission adheres to its ruling that "a tariff providing for reduced rates on coal used for steam purposes, or that the carrier will refund part of the regular tariff charges on presentation of evidence that the coal was so used, is improper and unlawful—that is to say, that the carrier has no right to attempt to dictate the uses to which commodities transported by it shall be put in order to enjoy a transportation rate."

It also adheres to its ruling that "a carrier, or a person or corporation operating a railway or other transportation line may not, as a shipper over the lines of another carrier, be given any preference in the application of tariff rates on interstate shipments, but it may lawfully and properly take advantage of legal tariff joint rates applying to a convenient junction or other point on its own line, provided such shipments are consigned through to such point from point of origin and are, in good faith, sent to such billed destination."

Carriers ordered to cease maintaining tariffs which contain rates applicable only on shipments for a particular consignee or when the commodity transported is for a particular use, or rates that are restricted to the use of certain shippers and not open to all shippers alike.

Commissioner Prouty, dissenting:

I agree that the rate cannot be varied according to the use to which an article is put.

All traffic must move under some published rate, and this applies to property owned by a railway when moving over another railway. Ordinarily, a railway does not consume its coal at the junction point where it receives it from its connection, but hauls it to some other point upon its line, where it is taken from the cars for use upon its locomotives or for other consumption. If a private individual shipped coal from the mine to this consuming point, the rate charged would usually be a joint through rate materially less than the same rates up to the junction point plus the local rate of the consuming road to the point of consumption. Now, the commission holds that a railway may bill its coal to the consuming point at the rate which a private shipper would pay. Since the joint through rate is usually so divided between the producing road and the consuming road that the amount received out of it by the producing road is less than the local rate from the mine up to the junction point it results that by this process the consuming road obtains its freight for less than it would had the traffic been billed to the junction point and received by it at that point. Otherwise stated, the rate upon which this coal moves to the rails of the consuming road is the division of the producing road.

To this system, in practical operation, the defendants urged several objections:

The railway generally buys its fuel f. o. b. the mine. The rate which it pays from the mine to the junction point is the division of the joint rate. That division is a matter of contract between the two roads. It is not published and is not, therefore, necessarily known. It may be changed from day to day without notice to anyone. Coal operators who desire to sell for fuel supply complain that under this system they do not know, and can not know, what the rate is, nor whether that rate will be maintained, nor, if the rate is an unfair one, can they apply to this commission for its correction. It is further urged that there frequently has been and that there always will be more or less manipulation in these divisions, with the result that certain mines or certain lines of railway will be preferred.

The answer of the commission to this objection is that it may require from the carrier a statement of its division. We may undoubtedly require carriers to inform us of their divisions and to state from time to time any changes in those divisions, but the divisions themselves are not a part of the rate which carriers are required to publish. If they were published there is no requirement which will prevent their change at the will of the carrier. This commission has no jurisdiction to fix these divisions except in case of a joint rate established by it where the carriers have failed to agree between themselves upon the division.

It seems clear to me that under the system which the commission says must be followed the actual rate upon which this traffic moves never can be known; that this rate may be changed from day to day, and that it is entirely beyond the power of the commission to correct it, if wrong. All this follows, of necessity, from the fact that whatever the theory of the case may be, in actual practice the rate on which this traffic moves is the division of the producing carrier up to the junction point.

The system which the railways now have in effect was first established at the request of the operators, but is now approved by all parties concerned, the operators, the producing road, and the consuming road. It is universally recognized that in no other way can the actual rate of transportation be known. In no other way can its maintenance be assured, and in no other way could it, if wrong, be corrected by public authority.

The purpose of the act to regulate commerce is to facilitate, not to impede, commercial operations. When shippers and railways unite in asking that a particular thing be done; when that thing is manifestly for the interest and convenience of all parties; when no harm can result, but when, upon the contrary, the fundamental purposes of the act will be promoted, I think we should, if possible, put such a construction upon this statute as will permit it.

It does not seem to be seriously claimed by the majority that the present method of publishing these fuel-supply rates is attended with any practical wrong, but it is said that the second section of the act peremptorily forbids it and that it is therefore unlawful and must be so declared by us.

The second section provides that where the service is like and contemporaneous, the traffic of a like kind, and the circumstances and conditions under which the transportation occurs substantially similar, the rate shall be the same. The majority hold that a railway stands like any other shipper and that to accord one rate when the shipment is for a railway and another rate when it is for a private individual is to violate that section. I concede this to be so if the only difference in the transaction be that the freight money is in one case paid by a railway company and in the other case by a private party, but I think that there are other incidents of the transaction arising out of the circumstance that this fuel is for railway supply and is received at the junction point by a railway, which excepts the case from the operation of the second section.

If our court holds, as it apparently has indicated in the *Wight case*, that difference of circumstances and conditions may be shown by showing difference in cost of service, it is difficult to see how it can avoid the conclusion that, when the cost of service for any reason is less in transporting the freight of one person than in transporting that of another, the second section does not apply. It should be borne in mind that the third section may prevent the making of the lower rate, even though it be lawful under the second. The prohibition of the second section is absolute within the sphere of its operation. If the service is like and contemporaneous, the kind of traffic like, and the circumstances and conditions of the transportation the same, then the rate must also be the same. The third section is more elastic. It forbids *undue* discrimination or advantage, and it is for us to say, upon a consideration of all the facts, whether that section has been violated.

It seems to me, therefore, that the circumstances and conditions attending the transportation and delivery of this fuel coal are different from those under which private coal is handled, and that for this reason the second section does not forbid the making of different rates for the different services, and if this be so then the second section has no application whatever. I think, however, that there is a broader and more fundamental ground upon which the operation of that section can be distinguished. This fuel coal is not, to my mind, a like kind of traffic with private coal nor is its carriage a like service within the meaning of that section. Even though the physical service performed be exactly the same it is not a violation of the second section, upon the part of the carrier, to demand and receive a different compensation for that service. (20 I. C. C. 443.)

STATE COMMISSIONS.

The Minnesota Railway Commission has again postponed its investigation into the reasonableness of express rates in that state. The hearing will be held at St. Paul on April 13 instead of April 5.

The Railroad Commissioners of California have revised the car demurrage rules of that state. The rate is reduced from $6 to $3 per car per day; free time is made 48 hours, instead of one day, except in the case of oil tank cars where it remains at 24 hours; and there are detailed rules as to when the railways are required to furnish cars on the request of shippers.

A bill has passed the house of the Iowa legislature, providing for the establishment of the office of state commerce counsel. The measure provides that the commerce counsel, who will receive $5,000 a year, will be appointed by the members of the state railway commission. It will be his duty to investigate the reasonableness of rates charged by all companies and individuals under the jurisdiction of the commission and to assist the commission in presenting cases before the Interstate Commerce Commission.

The Public Service Commission of Maryland, to carry out the requirements of the law of last year under which the commission was established, has ordered a thorough inspection of the physical properties of the railways of the state; this to be done with reference to the condition of track, bridges, cars and engines, safety appliances and everything related directly to the comfort and safety of passengers; and similar inspection is to be made of steamboat lines, electric railways and gas, electric and water companies. The chief engineer of the commission, Charles E. Phelps, Jr., is directed to make preparations for this inspection and also to organize the necessary force to do the work.

COURT NEWS.

The Oklahoma supreme court has rendered a decision upholding an order of the corporation commission requiring all railways operating in Oklahoma to establish general offices in that state.

The federal court at Oklahoma City, Okla., has issued a perpetual injunction forbidding the enforcement of the Oklahoma law which forbids foreign corporations to transfer cases from the state to the federal courts.

The Supreme Court of Kansas has declared unconstitutional the law of that state requiring the railways to carry state militia at 1 cent a mile, holding that it discriminates against the public and is a confiscation of the railways' property.

The United States Circuit Court of Appeals has held the temporary injunction granted against the corporation commission of Oklahoma by United States Circuit Judge Hook nearly a year ago, enjoining Oklahoma from enforcing the two-cent passenger fare law and a reduction in freight rates.

In the United States Circuit Court at Savannah, Ga., March 24, Judge Speer fined the Merchants' & Miners' Transportation Company $20,000 for giving preferences in freight rates. It was the conviction in this case that led to the making of pleas of guilty by two of the railway companies in the same court last week.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Peter F. Dunne, general attorney of the Southern Pacific, with office at San Francisco, Cal., has resigned to engage in private practice.

In regard to the resignation of C. S. Clarke from the first vice-presidency of the Missouri Pacific, see a statement made by Mr. Clarke on page 801.

E. J. Perry, superintendent and freight and passenger agent of the Kansas City, Clinton & Springfield, with office at Springfield, Mo., has been elected vice-president.

J. C. Campbell has been appointed auditor of the Lehigh & New England, with office at Philadelphia, succeeding Edward Hughes, who has been appointed purchasing agent.

W. G. Evans, president of the Denver City Tramway, has been elected president of the Denver, Northwestern & Pacific, succeeding David H. Moffat deceased. F. G. Moffat was elected vice-president.

Henry Tatnall, third vice-president of the Pennsylvania Railroad, has been elected also president of the Erie & Western Transportation Company, with office at Philadelphia, Pa. J. C. Evans, manager of the Erie & Western Transportation Company, has been elected vice-president and general manager, with office at Buffalo, N. Y.

The officers of the Montpelier & Wells River Railroad and the Barre Railroad are as follows: T. E. Byrnes, president, Boston, Mass.; H. E. Folsom, vice-president, Lyndonville, Vt.; W. J. Hobbs, comptroller, Boston, Mass.; W. A. Stowell, clerk and treasurer, Montpelier, Vt.; H. E. Fisher, assistant treasurer; W. T. Rodden, auditor disbursements; W. H. Young, auditor passenger accounts, and J. F. Turner, auditor freight accounts, with offices at Boston, Mass.

Operating Officers.

George Brophy has been appointed an assistant division superintendent of the Union Pacific, with office at Ogden, Utah.

T. A. Sweeney, trainmaster of the Chicago Great Western, at Des Moines, Iowa, has been appointed assistant superintendent, with office at Chicago.

M. Dailey, formerly superintendent of the Chicago Great Western at Clarion, Iowa, has been appointed a trainmaster of the Northern Pacific, with office at Seattle, Wash.

E. A. Gould, formerly assistant to the president of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed assistant to the general manager, with office at Cincinnati.

F. J. Evans has been appointed a trainmaster on the Pecos division of the Atchison, Topeka & Santa Fe and of the Eastern Railway of New Mexico, with office at Clovis, N. Mex., succeeding R. J. Woodward.

L. C. Badgley, trainmaster of the Chicago & Alton, with office at Peoria, Ill., having resigned, the jurisdiction of S. P. Henderson, trainmaster at Bloomington, Ill., will be extended over the Dwight and Rutland branches, succeeding Mr. Badgley.

Ernest Stenger, whose appointment as general manager of the St. Joseph & Grand Island, with office at St. Joseph, Mo., has been announced in these columns, was born in 1865 in Alsace, and graduated from the University of Michigan in 1886. In the same year he began railway work for the Chicago, Burlington & Quincy as a rodman. In 1888 he went with the Atchison, Topeka & Santa Fe as a draftsman, and two years later became an assistant engineer on the Missouri Pacific. He was appointed division engineer of the Union Pacific in 1900, and was afterwards promoted to assistant superintendent and then to superintendent. He was appointed general superintendent of the Rio Grande Western in 1907. Mr. Stenger's headquarters will be at St. Joseph, Mo., instead of at St. Louis, as was previously announced.

William C. Loree, whose appointment as general manager of the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio, has been announced in these columns, was born in October, 1860, at Newark, N. J. He received a common school education and began railway work in May, 1883, on the Pennsylvania Lines West of Pittsburgh. In 1889 he was appointed engineer of maintenance of way on the Chicago division, and then to a similar place on the Indianapolis division. He was appointed superintendent of the Indianapolis division in March, 1899, and in December, 1902, was appointed superintendent of the Chicago division of the Baltimore & Ohio. In May of the following year he was promoted to general superintendent of the Pittsburgh system of the Baltimore & Ohio, and was transferred to the Wheeling system in January, 1905, where he remained until May, 1910, when he returned to the Pittsburgh system, which office he resigned to become general manager as above.

John G. Rodgers, whose appointment as general superintendent of the Buffalo & Allegheny Valley division of the Pennsylvania Railroad, with office at Buffalo, N. Y., has been announced in these columns was born November 14, 1862. He was educated at Lehigh University and entered the service of the Pennsylvania Railroad on July, 20, 1882. Mr. Rodgers served through the various grades in the engineering department until he reached the position of assistant engineer of construction, from which he was transferred in January, 1888, to the maintenance of way office at Altoona. He held various positions in that department until January, 1900, when he resigned as supervisor of the Philadelphia division to become superintendent of the New York, Philadelphia & Norfolk. In March, 1909, Mr. Rodgers was appointed assistant to the general manager of the Pennsylvania Railroad, which position he held at the time of his recent appointment as general superintendent of the Buffalo & Allegheny Valley division.



J. G. Rodgers.

Traffic Officers.

E. Copland has been appointed a general agent in the freight department of the Chicago, Burlington & Quincy, with office at Milwaukee, Wis., succeeding F. K. Kelley, deceased.

Jarvis S. McCrea, commercial agent of the Lehigh Valley, at Buffalo, N. Y., has been appointed division freight agent, with office at Ithaca, N. Y., succeeding Charles W. Williams, resigned.

James E. Cummins has been appointed a traveling freight agent of the Norfolk & Western, with office at Toledo, Ohio, succeeding Frank J. Howell, resigned, to accept service with another company.

O. F. Spindler, commercial agent of the Chicago & Alton and the Toledo, St. Louis & Western at Cleveland, Ohio, has been appointed agent of the Lackawanna Fast Freight Line, with office at St. Louis, Mo.

H. W. Jackson has been appointed a general agent of the Colorado Midland, with office in Chicago. Frank M. Townsend has been appointed a general agent, with office at Pittsburgh, Pa., where the agency has been re-established.

F. B. Rowley has been appointed a commercial agent of the Lake Erie & Western, with office at Minneapolis, Minn., succeeding George C. Knoche, deceased. E. J. Lewis has been appointed a soliciting freight agent, with office at Minneapolis.

F. J. Balch, general freight agent of the New York & Ottawa, a subsidiary line of the New York Central & Hudson River, has been appointed also general passenger agent, with office at Ottawa, Ont., succeeding to the duties of Harry K. Gays.

W. G. Howard, commercial agent of the Chicago & Alton and the Toledo, St. Louis & Western at Cincinnati, Ohio, has been appointed commercial agent, with office at Cleveland, Ohio, succeeding O. F. Spindler, resigned, to accept service with another company. C. D. Fortney, commercial agent of the Minneapolis & St. Louis and the Iowa Central at Cleveland, succeeds Mr. Howard at Cincinnati.

Incident to the consolidation of the traffic departments of the Baltimore & Ohio Southwestern and the Cincinnati, Hamilton & Dayton, C. L. Thomas, general traffic manager of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed freight traffic manager of both roads, with office at Cincinnati. O. P. McCarthy, general passenger agent of the Baltimore & Ohio Southwestern, has had his jurisdiction extended over the Cincinnati, Hamilton & Dayton, succeeding W. B. Calloway, who has been appointed assistant general passenger agent of both roads. S. T. McLaughlin, general freight agent of the Baltimore & Ohio Southwestern, has had his jurisdiction extended over the Cincinnati, Hamilton & Dayton, succeeding J. W. Allison, who has been appointed freight tariff agent of both roads. Archibald Fries, assistant general freight agent of the Baltimore & Ohio Southwestern, has had his jurisdiction extended over the Cincinnati, Hamilton & Dayton, succeeding Stuart Allen, who has been appointed general agent in the freight department of both roads; all with offices at Cincinnati.

Engineering and Rolling Stock Officers.

George W. Trout has been appointed signal engineer of the Pere Marquette, with office at Detroit, Mich., succeeding W. J. McWain, deceased.

F. J. Smith has been appointed a master mechanic of the Chicago Great Western, with office at Stockton, Ill., succeeding J. M. Robb, resigned.

J. C. Pratt, roadmaster of the Minneapolis & St. Louis at Watertown, S. D., has been appointed roadmaster of the Iowa Central, with office at Marshalltown, Iowa, succeeding M. H. Sheeley, resigned.

R. J. McQuaid has been appointed a foreman in charge of locomotive and car departments of the Rock Island Lines, with office at Rock Island, Ill., succeeding V. W. Ellet, resigned, to go to the Hunt-Spiller Manufacturing Corporation, Boston, Mass.

C. J. Stewart, master mechanic of the Western division of the New York, New Haven & Hartford, at Waterbury, Conn., has been appointed master mechanic of the Boston division, with office at South Boston, Mass., succeeding James Hocking, resigned. J. N. Mowery, master mechanic of the Lehigh Valley, succeeds Mr. Stewart.

C. E. Gossett, who was appointed master mechanic of the Minneapolis & St. Louis some months ago, requests us to announce that his correct address is "Cedar Lake Shops, Minneapolis, Minn.," and not Cedar Lake, Minn. Owing to an error made in framing the circular announcing his appointment, much of his mail is incorrectly addressed to Cedar Lake, Minn.

W. H. Kirkbride, division engineer on the Coast division of the Southern Pacific at San Francisco, Cal., has been appointed division engineer on the Sacramento division, with office at Sacramento, Cal., succeeding G. B. Herington, resigned, to accept service elsewhere. E. C. Morrison, division engineer on the Shasta division at Dunsmuir, Cal., succeeds Mr. Kirkbride, and F. M. Siefer succeeds Mr. Morrison.

C. I. Leiper, who was recently appointed division engineer of the New York division of the Pennsylvania Railroad, with office at Jersey City, N. J., as has been announced in these columns, was born October 28, 1874, at Wallingford, Pa., and was educated at Swarthmore College. He entered the service of the Pennsylvania Railroad in September, 1897, in the engineering department, and in March, 1901, was appointed an assistant supervisor. In September, 1903, he was promoted to supervisor,

and in August, 1909, was appointed division engineer of the New York Terminal division, which position he held at the time of his recent appointment as division engineer of the New York division.

J. H. Harris, whose appointment as division engineer of the New York Terminal division of the Pennsylvania Railroad, has been announced in these columns, was born December 8, 1867, at Aldershot, Eng., and was educated at the University of Virginia. He began railway work in the engineering department of the Norfolk & Western, on the Ohio extension through West Virginia, and in December, 1894, entered the engineering department of the Pennsylvania Railroad on the New York division. In June, 1899, he was transferred to Altoona, Pa., and the following year he was appointed assistant supervisor. He was promoted to supervisor of the Belvidere division, in November, 1901, and was transferred to the Maryland division in December, 1905. Mr. Harris was appointed division engineer of the Delaware division in April, 1909, and is now transferred to the New York Terminal division.

A. C. Adams, who was recently appointed superintendent of motive power of the Spokane, Portland & Seattle, the Oregon Electric and the United Railways Company, with office at Portland, Ore., as has been announced in these columns, was born on February 6, 1866, at Everett, Kan. Mr. Adams was educated in the public schools and completed the mechanical course of the Scranton International Correspondence School in 1890. He began railway work in August, 1884, as a machinist's apprentice on the Missouri Pacific, and in October, 1887, went to the Chicago, Rock Island & Pacific as a machinist, and was later, consecutively, pit foreman, roundhouse foreman, general foreman and master mechanic. He left the service of that company in September, 1906, and in November of the same year went to the Chicago, Burlington & Quincy as master mechanic. One year later he went to the Delaware, Lackawanna & Western as master mechanic, and since November, 1908, until his recent appointment, was master mechanic of the New York, New Haven & Hartford.



A. C. Adams.

Purchasing Officers.

T. Moore has been appointed general storekeeper of the Virginian Railway, with office at Princeton, W. Va.

Edward Hughes has been appointed purchasing agent of the Lehigh & New England, with office at Lansford, Pa., succeeding J. B. Whitehead, resigned.

Sydney B. Wight, whose appointment as general purchasing agent of the New York Central Lines, with office at New York City, has been announced in these columns, is a graduate of the University of Michigan. In June, 1891, Mr. Wight was appointed secretary to the president of the Michigan Central Railroad. He remained in that position until July, 1896, when he was appointed assistant purchasing agent, and in August, 1903, was promoted to purchasing agent of the same company, with office at Detroit, Mich. In October, 1907, he was appointed purchasing agent of the New York Central Lines, with office at New York, remaining in that position until his recent appointment as general purchasing agent.

William C. Bower, who was recently appointed purchasing agent of the New York Central & Hudson River, the West Shore, the Boston & Albany and the New York & Ottawa, with office at New York, was born September 20, 1878, at Clarkston, Mich., and was educated in the high school of his native town and at Ferris Institute, Big Rapids. Mr. Bower began railway work in December, 1897, as a stenographer in the trainmaster's office of the Grand Trunk, at Battle Creek and was later stenographer and clerk in the offices of the superintendent and the general counsel of the Grand Trunk, at Detroit. From December, 1901, to September, 1903, he was out of railway work. He was then appointed stenographer to the president and vice-president of the New York Central & Hudson River, and since April, 1905, has been secretary and chief clerk to W. C. Brown, president of the New York Central Lines.

FOREIGN RAILWAY NOTES.

The total open mileage of the South African railways is now 7,045, of which Cape Colony has 3,328 miles, Natal 995 miles, Orange River Colony 992 miles, and the Transvaal 1,730 miles. With lines authorized and those under construction the mileage will be increased nearly 1,000 miles.

The Union of South Africa now has, roughly, 7,000 miles of railway, which earn $50,000,000 a year. Half of this sum is paid out in working costs, the staff being 40,000, while nearly $10,000,000 goes for interest. With a further deduction of $8,325,000 for betterment and depreciation and other charges, there is a balance of about $5,625,000 as a clear revenue to the government, by which owns and operates the railways.

An Asuncion, Paraguay, paper reports that in order to provide the San Pablo-Rio Grande with resources for the reconstruction of the lines connecting Asuncion with San Francisco, on the Atlantic coast of Brazil, the Brazil Railway Co., the parent concern, with headquarters in New York, floated a loan in Paris of $16,694,500, represented by 173,000 4½ per cent. bonds of the par value of $100 each. The demand for the new securities so far exceeded the offer that only 60 per cent. of the subscriptions could be satisfied.

The *Frankfurter Zeitung* reports that the project of an Ibero-Afro-American railway is being pushed by a Spanish committee, after having been brought up by the Spanish representatives at the Algeciras conference. In order to make the proposed railway clearly international in character and avoid possible conflicts between interested powers, the committee has suggested that the Swiss government take the initiative of calling a conference to study the subject and eventually lead to the organization of an international company to undertake the building of the road. The Ibero-Afro-American railway, as proposed, will run along the western coast of Africa from the Straits of Gibraltar to Goree-Dakar or Bathurst—that is, to the point which is nearest South America. The crossing from Goree-Dakar or Bathurst to Pernambuco occupies only three days on the quietest part of the Atlantic ocean, always free from fog and ice. The crossing from Gibraltar to Africa, about 10 miles, can be made in less than half an hour and cars will probably be ferried across to avoid transshipment. The building of the projected railway will reduce the journey from Europe to South America to five days.

The total expense of building the road is estimated at $135,100,000. The cost of a double track, including the right of way for two additional tracks which is believed will prove necessary later on, is placed at $68,000 per mile. The distance from Gibraltar to Goree-Dakar is 1,740 miles. In case Bathurst is chosen as terminus, the distance would be 1,864 miles. As the line will follow the coast, work can be commenced at several points at the same time. Cost of right of way will be insignificant. Labor will be cheap, it is believed, judging from experience with native labor in building harbor improvements in Morocco. Material and transportation of same, as well as supplies for laborers, will be expensive items. Certain stretches will have to be supplied with fresh water and a permanent water supply will have to be insured all along the line. Otherwise, there are practically no natural difficulties to be contended with. In addition to the great impetus given to European-South American relations by the new railway, it will open up Morocco as well as French and English colonies in western Africa, besides considerably reducing distance to South Africa.

Railway Construction.

New Incorporations, Surveys, Etc.

Alaska Northern.—According to press reports a new survey is to be made from Cook Inlet, Alaska, to the coal fields at Tanana, and it is expected to carry out some of the construction work this year. The company has track laid on 71 miles from Seward north. O. G. Laberee, president and general manager, Seattle, Wash. A. W. Swanitz, chief engineer, Alameda, Cal., and Seward, Alaska. (June 24, p. 1812.)

Alberta Central.—A contract for building 100 miles from Stettler, Alb., westward to the Brazeau coal fields, has been given to Janse, MacDonald & Co., Calgary. It is estimated that the contract is worth $2,500,000. J. T. Moore, president and J. G. McGregor, chief engineer, Red Deer.

Baltimore & Ohio.—An officer writes that, although reports have been made by the engineers it has not yet been definitely determined what improvement work is to be carried out between Callery Junction, Pa., and Kane.

Canadian Northern.—The contracts recently let by this company are as follows: Westward from Edmonton, Alb., 200 miles, Alsack to Calgary, on the Marysville extension, 200 miles, Moose Jaw, Sask., to Redville, on the Marysville extension, 90 miles; North Battleford towards the Peace river country, on the Jack Fish extension, 35 miles, and Shell Brook to Battleford, 80 miles, to the Cowan Construction Company, Winnipeg, Man. From Red Deer, Alb., to Calgary, 100 miles, and on the main line, from Vancouver, B. C., eastward 200 miles, to the Northern Construction Company. (March 24, p. 710.)

The Manitoba government has granted a subsidy of $13,000 a mile to the Canadian Northern for building branch lines in Manitoba, as follows: Oak Point extension, 50 miles; Deloraine branch extension, 60 miles; Ste. Rose du Lac to Winnipegosis, 53 miles.

Chehalis & Cowlitz River.—Financial arrangements are said to have been made, which insures the construction of this line. The projected route is from Chehalis, Wash., southeast to a point on the Cowlitz river, about 20 miles, with a number of branch lines. G. Robinson and H. C. Hoffman, Chehalis, are interested. (January 20, p. 143.)

Chicago, St. Paul, Minneapolis & Omaha.—The terminal facilities at Altoona, Wis., are to be enlarged this year, it is said, to relieve the congestion at Eau Claire. The improvements will include laying about 20 miles of new track, putting up a repair shop, 65 ft. x 100 ft., and extensions to the east yards.

Citrus Southern (Electric).—An officer writes that the company expects to let contracts this year for building a line from Sanford, Orange county, Fla., south via Orlando to Kissimmee, Osceola county, about 45 miles. T. K. Miller, president, Orlando, and J. J. Brophy, vice-president and engineer, Winter Park.

Cullman Coal & Coke Line.—An officer writes that this company intends to build during the coming summer southwest from Cullman, Ala., via Trimble and Bremen to Julianna. Track has been laid on 6.5 miles. The work will be difficult and involves a total excavation of 213,483 cu. yds.; total borrow work, 157,433 cu. yds. Maximum grades will be 0.99 per cent., and maximum curvature, 9 deg. Steel bridges, requiring 578 tons of steel, will be put up, and 5,718 cu. yds. of concrete for piers and abutments, of which 1,551 cu. yds. are now in place. The Virginia Bridge & Iron Company, Roanoke, Va., has the contract for the bridge work, and Arnott & Co., Birmingham, Ala., has the contract for the concrete work. The line is being built to carry coal, timber and agricultural products. G. H. Tenbroek, president, and J. W. Jones, chief engineer, Cullman.

Eastern Indiana Traction.—Plans are being made to organize this company with a capital of $1,000,000, to build from Union City, Ind., south to Cincinnati, Ohio. Residents of Richmond, Harrison, Ohio City, Liberty and Brookville are back of the project.

Ephrata & Lebanon.—Organized in Pennsylvania to build from Ephrata, Pa., northwest, to Lebanon, 23 miles. All the right-of-way has been secured. It is expected that it will cost about $425,000 to build and equip the line. Residents of Schaefferstown are back of the project.

Farmington, Albuquerque & Gulf.—An officer writes that the plans call for a line from Farmington, N. Mex., southeast via Jemez Hot Springs to Albuquerque, 190 miles. It has not yet been decided when bids will be asked for the work. There will be a plate girder bridge, 1,000 ft. long and another 500 ft. long. The line will be built to carry coal, lumber, coke, fruit and agricultural products. F. B. Fergusson, president, Albuquerque. F. P. Hall, chief engineer, Farmington.

Genesee & Wyoming.—See Halite & Northern.

Grand Trunk Pacific.—An officer is quoted as saying that the work to be undertaken this year calls for an expenditure of $17,000,000. This includes 645 miles of branch lines, 265 miles of main track, 200 miles of grading and 140 station buildings. It is expected that the line from Tofield, Alb., to Calgary, will be finished this year—80 miles of track has been laid between Tofield and the Red Deer river, and 143 miles additional will be laid during the year. On the Battleford branch, 59 miles is to be built from Oban, Sask., north to Battleford, and the branch line from Melville, Sask., southwest to Regina, 68 miles, will be built. On a line from Bickerdike, on the main line, through the Pacific Pass coal fields, as well as those of Yellow Head, to be known as the Liberty coal branch, it is expected that 69 miles will be finished this year, and a branch will be built to the Mountain Park coal fields. In Saskatchewan 110 miles will be built from the Regina boundary branch, from Regina to a point south of Griffin, also between Regina and Moose Jaw, 49 miles. On the Prince Albert branch 72 miles is to be built; a contract for a 50 mile section between Biggar, Sask., and Calgary, Alb., has been let. A large amount of grading work along the Regina boundary will also be carried out. Foley, Welch & Stewart have contracts for work on the main line, also from Biggar, Sask., to Calgary, Alb., and nearly all branch work has been let to J. D. MacArthur, with the exception of the Moose Jaw branch, which has been let to Rigby & Hyland. Work is now under way on two large bridges over the Red Deer river on the Tofield-Calgary branch, to be 200 ft. high; another bridge west of Prairie Creek on the same line is to be built, also one over the Skeena river, which will be the largest bridge on the line.

Halite & Northern.—Application has been made to the New York Public Service Commission, Second district, for a certificate of convenience and necessity to build a line in the towns of Leicester and York in Livingston county, N. Y., 3.18 miles. The plans calls for putting up a station. The line is to be leased to the Genesee & Wyoming. W. A. Hazard, E. W. Brown and A. Bigelow, New York, are incorporators. (December 9, p. 1129.)

Illinois Central Electric.—An officer writes that the company will be ready to receive bids within 30 days for building an extension of 6.25 miles to Farrington, Ill. It is estimated that the work will cost $100,000.

Indianapolis & Delphi Traction.—An officer writes that contracts will probably be let within 90 days to build from Indianapolis, Ind., northwest via Carmel, Westfield, Sheridan, Burlington and Flora to Delphi, about 75 miles. Henry L. Smith, general manager, and H. A. Mansfield, chief engineer, Indianapolis. (March 17, p. 525.)

Iowa City—Ottumwa Interurban.—A contract is said to have been given to the Arnold Construction Company, Chicago, at $2,196,000 for work on this line. The company, which was organized to build from Iowa City, Iowa, southwest to Ottumwa, 70 miles, has decided to build the first half of the line to Keota or Sigourney this coming summer, and the other half of the line to Ottumwa is to be built in 1912. F. Tanner, vice-president, Iowa City.

Kansas City & Memphis.—A contract has been given to the W. R. Felker Construction Company to build from Rogers, Ark., south to Fayetteville, about 30 miles. The line is to be extended east eventually to Memphis, Tenn. Col. W. R. Felker, former president of the company, will be in charge of the construction. G. D. Locke, president; R. G. Hobbs, secretary, and W. B. Felker, treasurer, Rogers, Ark. (December 23, p. 120.)

Kansas City, Mexico & Orient.—Announcement has been made by this company that the extension from San Angelo, Texas, to Mertzen, 28 miles, will be opened for traffic March 31. This will open a large stock shipping country. With that line in operation the main line of the Orient will be in operation between Wichita, Kan., an San Angelo, Texas, 510 miles, also between Marquez, Mexico, and Sanchez, 287 miles, and Fuerte and Topolobambo, 62 miles. The main line will eventually be 1,659 miles long.

Kansas City Southern.—This company, which recently completed plans for extensive improvements to include track revision, grade reduction and general improvements to roadbed, as well as putting in heavier rail and other betterment work, is said to have given a contract to Porter Brothers, Seattle, Wash., for revision work between Kansas City, Mo., and Neosho. (February 17, p. 334.)

An officer is quoted as saying that the proceeds of a recent bond issue are to be used for the general rehabilitation of the line. The section from Shreveport, La., south to Beaumont, Texas, is to be relaid with heavier rail and a large general repair shop is to be built at Shreveport. Grading work will be continued from Kansas City, Mo., south.

Kettle Valley Lines.—Work will soon be started, it is said, on a line through the Similkameen and Aspen Grove district, connecting with the Columbia branch at Midway, B. C. (March 10, p. 479.)

Memphis, Dallas & Gulf.—An officer writes that this company has projected extensions to complete a through line from Memphis, Tenn., southwest to Fort Worth, Texas, with a branch from McLeod, Ark., north to Hot Springs. Contracts for grading most of the 45 miles from Murfreesboro, northeast to Arkadelphia, will be let in sections of from one to five miles each. The company will carry out the track laying work with its own men. There will be eight steel bridges, each 60 ft. long; eight each 100 ft. long, and one 200 ft. long, on this section. There will be about 16,000 cu. yds. of embankment work and 7,000 cu. yds. of excavation a mile.

Michigan United Railways.—Work has recently been finished by William E. Tench & Co., Detroit, Mich., contractors, on 30 miles of line between Lansing and Owosso.

Nashville, Chattanooga & St. Louis.—A grading contract is said to have been given to Dunavant & Co., Knoxville, Tenn., for work between Lookout Mountain, Tenn., and Wauhatchie. It is understood that the work will cost about $250,000.

National Railways of Mexico.—An officer writes that the company has started work on the line from Canitas, Zacatecas, Mex., west to Durango, in the state of Durango. Contracts for the grading and bridge work were let in the general contract to the Campania Constructora de Ferrocarriles for work on 100 miles, and contracts for the remaining section to complete the line will be let by April 15. Maximum grades eastbound will be 3 per cent., and westbound 1.2 per cent. There will be two steel bridges, each 250 ft. long, and two each 150 ft. long. The line, which is being built to carry ore, lumber and wheat, was first projected from Gutierrez, Zacatecas to Durango, and afterwards changed to connect with the old Central Line at Canitas. (March 17, p. 526.)

This company is said to be assembling large quantities of material at Tamos, Vera Cruz, which is 25 miles west of Tampico, preparatory to resuming construction work on the Tampico—City of Mexico short line, on which work was started by the Mexican Central about five years ago. Grading had been finished and track laid on 25 miles at the time work was suspended. It is said that the new line will be 270 miles shorter than the existing line between Tampico and the City of Mexico. Surveys have been made from Tamos, south through Ozuluama to a point within 24 miles of the port of Tuxpam, thence east to that place. From the point where the line diverges to Tuxpam, the main line will continue southwest to Anita, Hidalgo, where connection is to be made with the existing line to the City of Mexico. From Tuxpam a branch is to be built southeast, following the coast of the gulf of Mexico to a connection with the existing line at Salmoral. This branch will pass through the gulfport of Nautla, at present undeveloped, where it is understood the government has adopted plans for extensive harbor and port improvements.

Nevada Roads.—The Yellow Pine Lumber Company is building a narrow gage line from Goodsprings, Nev., to Yellow Pine, eight miles.

Oklahoma & Golden City.—A contract has been given to W. Love, Indianapolis, Ind., it is said, to build this line. The first station to be built will be from Golden City, Mo., northeast to Stockton, about 30 miles. The plans call for extensions southwest to Oklahoma and northeast intocentral Missouri. The general offices of the company are at Golden City.

Oregon Short Line.—An officer writes regarding the reports that a number of short lines are to be built in the Brigham City district, Utah, that the company is now negotiating for the right-of-way, but the proposition is in an indefinite state at the present time, and definite plans have not yet been made. If any work is to be carried out in that section it will consist of short spurs into the fruit producing sections to facilitate the handling of the crop and assembling it in trainload lots at Brigham station.

According to press reports, bids are being asked for double-tracking work on 22 miles between Farmington, Utah, and Ogden; also for seven miles both east and west from Montpelier, Idaho. Contracts are to be let soon and the work will probably be under way early in April. It is estimated that the improvements will cost about $1,000,000.

Pacific & Peace River.—The bill incorporating this company has not yet been passed. The plans call for a line from Bella Coola, B. C., north via Fort Fraser, Port St. James, Fort Laclede and Pine River Pass to Dunvegan, on Peace river, 480 miles. The line is to be built to carry wheat, timber, live stock, ores and general merchandise. J. A. Ritchie, Ottawa, Ont., is the solicitor.

Panama-David.—Bids are wanted until June 30, 1911, by the Minister of Public Works of the Republic of Panama, for building the line from the city of Panama, west to David, about 361 miles, with branches to the province of Los Santos and the town of Anton. Copy of the announcement can be secured from the Bureau of Manufactures, Washington, D. C. (March 10, p. 479.)

Pere Marquette.—A contract has been given to W. E. Tench & Co., Detroit, Mich., for 40 miles of double-tracking work between Detroit and Toledo, Ohio. A large force of men and teams will be put to work at once, between Romulus, Mich., and Alexis, Ohio.

Quebec & Saguenay.—Construction is to be begun next month and completed this year. The contract has been let to M. J. O'Brien, of Ottawa. The road will run from St. Joachim, Quebec, to Murray Bay, along the north shore of the St. Lawrence.

Richmond, Magog & Stanstead.—An incorporator writes that the plans call for building a line from Rock Island, Que., and Derby Line, Vt., on the United States border, north 50 miles, via Smiths Falls, Fitch Bay and Georgeville, thence along the shore of Lake Memphremagog to Magog, then through heavy timber lands for about 20 miles to Kingsboro and via Melbourne, to Richmond. The line will be built through a rich mining district. The company expects to have about 25 miles finished this coming summer. R. H. Fletcher, general manager of the Fletcher Pulp & Lumber Company, Sherbrooke, may be addressed. (February 17, p. 334.)

Springdale & Long Lake.—Application has been made for a charter in Oregon to build from Springdale, Stevens county, Wash., northwesterly to a point four miles west of Kerby, Spokane county, on the Spokane river, 23 miles. It is expected that construction work will be started soon. The headquarters of the company are at Portland, Ore. F. T. Griffith, F. J. Lonergan and J. F. Phelan, are incorporators.

Union Pacific.—This company will start train service over the new line between Denver, Colo., and Ft. Collins within 90 days, it is said. The Ft. Collins branch, 66 miles long, will cost $2,500,000, including $500,000 for terminals. The construction of the line is estimated at $25,000 a mile.

Wisconsin & Northern.—Surveyors are now at work on the extension to be built from Shawano, Wis., south to Appleton, about 40 miles. Nearly all the right-of-way has been bought. (November 11, p. 942.)

Railway Financial News.

Atchison, Topeka & Santa Fe.—The Paris correspondent of the *Journal of Commerce* says "on excellent authority" that negotiations for listing Atchison, Topeka & Santa Fe receipts for stock on the Parquet of the Paris Bourse have made active progress during the last few days.

Boston & Maine.—The absorption by the Maine Central of three subsidiary lines—the Somerset, the Washington County and the Sebasticook & Moosehead has been approved by the Maine legislature.

Canadian Northern.—Last week the remaining £358,888 ($1,794,440) of an issue of £1,622,586 ($8,112,930) 3½ per cent. guaranteed first mortgage debenture stock of the Canadian Northern was offered in London at 94½. There was offered at the same time and at the same price the entire issue of £647,260 ($3,236,300) 3½ per cent. first mortgage debenture stock of the Canadian Northern Alberta. Both stocks are guaranteed principal and interest by the government of the Dominion of Canada.

Chesapeake & Ohio.—Directors have asked the stockholders to vote at a special meeting on April 29 on the question of making a new mortgage to secure $125,000,000 5 per cent. 20-year bonds, of which sufficient bonds are to be reserved to retire the outstanding $11,000,000 general funding and improvement bonds, due during the life of the new bonds; the remainder of the new issue to be available for new construction, improvements and the acquisition of new lines. The outstanding convertible bonds, it is understood, will have an equal lien on the Chesapeake & Ohio property with the new bonds, but new bonds will have in addition a lien on the property acquired by the Chesapeake & Ohio since the convertible bonds were issued. This includes the controlling stock of the Hocking Valley and the securities of the Chesapeake & Ohio of Indiana (the Chicago line).

Chicago & North Western.—The $2,977,500 Madison extension first mortgage 7 per cent. bonds, maturing April 1, 1911, are to be paid in cash on presentation.

Detroit, Toledo & Ironton.—The New York Trust Company mortgage trustee and the protective committee of the general lien bonds, Otto T. Bannard, chairman, have told the United States circuit court that they were dissatisfied with the operation of the D. T. & I. by three receivers, and asked that Thomas Rhodes be made sole receiver.

Georgia Railroad & Banking.—A quarterly dividend of 3 per cent. has been declared on the $4,200,000 stock, payable April 15. This compares with 2¾ per cent. paid quarterly since 1888, and puts the stock on an annual dividend basis of 12 per cent. as compared with 11 per cent., the annual rate heretofore.

Grand Trunk Western.—The Michigan State Railroad Commission has given authority to the company to make a new mortgage for $40,000,000 to extend and improve the road and provide for the purchase of the Pontiac, Oxford & Northern, which has been controlled by the Grand Trunk.

Green Bay & Western.—The calendar year 1910 of this company, which operates 239 miles of railway between Green Bay, Wis., and La Crosse, shows total operating revenue amounting to $659,561. Operating expenses last year amounted to $441,115; and after the payment of taxes and operating expenses, the company had an operating income of $177,100. Dividends of 5 per cent. were paid on the $600,000 debenture A's, and 5 per cent. on $2,500,000 stock, and half of 1 per cent. on $7,000,000 debenture B's, calling for a total of $190,000. The company ended the year 1909 with a surplus of $107,075, so that after the payment of dividends in 1910 the surplus was $94,174.

Kansas City Southern.—The New York Stock Exchange has listed the $5,000,000 additional refunding and improvement mortgage 5 per cent. bonds, due 1950, which were recently sold by the company. Of the proceeds of these bonds $2,500,000 was spent for the removal of the district terminal from Stillwell, Okla.; $2,500,000 for reduction of grade and for additional equipment, and $2,250,000 for heavier rail, ballasting, etc.

Lake Shore & Michigan Southern.—The one year notes of this company, largely held in France, amounting to 44,000,000 francs, and due March 15, have been retired by the issue of new notes due March 4, 1912, which have been sold through J. P. Morgan & Co. The new notes aggregate 60,000,000 francs, and the balance (16,000,000 francs—$3,200,000) not required for refunding will be used for improvements.

Macon, Dublin & Savannah.—This company asked the Georgia railway commission for authority to issue $225,000 first mortgage bonds for new construction and improvements.

New York Central & Hudson River.—See Lake Shore & Michigan Southern.

New York, New Haven & Hartford.—President Mellen has given out the following statement:

"The New York, New Haven & Hartford has not bought, nor sought to buy, the Boston & Albany, and has no control over its operations.

"The New Haven, however, has entered into arrangements with the New York Central looking to an increased traffic by way of Boston & Albany junctions, and will probably, in the near future, perfect arrangements by which it will run its own trains with its own power over portions of the Boston & Albany lines, notably between South Framingham and Boston, between Ashland and South Framingham, between Ludlow and Springfield in connection with the projected Hampden Railroad extension of the Central Massachusetts division, and between Pittsfield and North Adams.

"These arrangements are so obviously in the public interest, it is unnecessary to enlarge upon beneficial results that are bound to follow."

Pennsylvania Railroad.—Stockholders have voted to authorize the directors to increase the capital stock from $500,000,000 to $600,000,000; and, as was previously announced, the directors will issue in the near future $40,000,000 stock, $18,000,000 of which will be new stock and $22,000,000 authorized stock in the treasury.

Pontiac, Oxford & Northern.—See Grand Trunk Western.

Southern.—Potter, Choate & Prentice, White, Weld & Co., and Kissel, Kinnicut & Co. are offering on a 4⅝ per cent. basis the balance of $2,000,000 first consolidated 5 per cent. bonds of the Southern Railway, maturing in 1994. This is the last block of this issue which the railway can sell except to retire underlying securities. Future financing will probably be arranged through sales of the development and general mortgage bonds.

The New York Stock Exchange has listed $1,500,000 additional first consolidated mortgage bonds, which were issued to retire a like amount of underlying bonds.

St. Louis & San Francisco.—Of a bond issue of $85,000,000 in 1901, $67,719,000 bonds have been certified by the trustee, but of that amount the Trust company was to hold $51,540,000 to retire two underlying issues. The railway company has found that $1,997,000 underlying bonds will not become due until the new bonds have all matured, and therefore asks the Trust company to release $1,997,000 of the new bonds to be used for other purposes by the railway. An order of the Appellate division of the supreme court has been asked for.

Wabash-Pittsburgh Terminal.—The Wabash Railroad has sold the remaining $3,218,000 Wabash-Pittsburgh Terminal bonds which it held. Originally the Wabash bought $6,600,000 of these bonds from the Terminal company, but it is claimed that the only payment that was made was a payment to the Wabash-Toledo syndicate. The money received from the present sale of bonds by the Wabash will have to be deposited in place of the Terminal company bonds, which were part of the collateral securing a loan.

Wabash Railroad.—See Wabash-Pittsburgh Terminal.

A line is proposed to run from Techou, China, to Chengting, to connect the Peking-Hankow and the Shantung lines when the northern section of the Tientsin Pukow Railway has been completed.

Supply Trade Section.

Victor W. Ellet, general foreman of the Chicago, Rock Island & Pacific, at Rock Island, Ill., has resigned to go to the Hunt-Spiller Manufacturing Corporation, Boston, Mass.

The Isthmian Canal Commission will receive bids until April 14, on miscellaneous supplies, including dynamite, blasting caps, detonators, safety fuse, insulating tape, etc. Circular No. 626.

Owen Leibert, who helped develop the Bessemer steel process with John Fritz and several others, died at his home in Bethlehem, Pa., on March 26. Mr. Leibert was with the Bethlehem Steel Company, South Bethlehem, Pa., for 38 years, resigning as chief engineer in 1891.

E. J. Caldwell, for 12 years with the Illinois Central, and for six years private secretary to the president, has accepted a position with the Barrett Manufacturing Company, Chicago, as railway representative, with office at Chicago. This position was created by the company especially for Mr. Caldwell.

Seely Dunn of New Orleans, La., has been appointed sales agent of the Bullard Car Door Equipment Company, Birmingham, Ala., and will represent that company throughout the country in introducing its fixtures for freight car doors. Mr. Dunn was for several years a division superintendent on the Louisville & Nashville; later connected with several railways in the West, and subsequently became manager of the Southern Car Service Association at New Orleans.

The Allen & Garcia Co., McCormick building, Chicago, has been incorporated by Andrews Allen and John A. Garcia. The company will specialize in steel, concrete and timber structures, including coal tipples, bank-heads, coal storage, screening and power plants, bridges and foundations and drawbridges. Mr. Allen is a graduate of the University of Wisconsin, class of 1891, where he took the degree of C. E. in 1895. For the last ten years he has specialized in the design and construction of coal mining, screening and storage plants. Mr. Garcia is a graduate of the St. Louis University, class of 1896, and received the degree of mining engineer at the University of Missouri School of Mines in 1900. Since entering professional work he has been employed in developing mining properties and in the construction of mining plants.

The 1911 M. M. and M. C. B. Convention.

The total number of square feet of exhibit space to be occupied at this year's Atlantic City convention of the American Railway Master Mechanics' and Master Car Builders' Associations is 76,000, or 5,000 sq. ft. more than in 1910; and all of this space has been taken.

The Railway Supply Manufacturers' Association, J. D. Conway, Oliver building, Pittsburgh, Pa., secretary, will issue circular No. 2 on or about May 1, which circular will give full particulars about the concerns designated by the association to provide furniture for the booths, floral decorations, special electric work and shipping instructions, and such other details as the exhibitors will need to complete their arrangements.

TRADE PUBLICATIONS.

Motor Drive.—The General Electric Company, Schenectady, N. Y., has published a 25-page illustrated booklet setting forth the advantages of the motor drive for metal working machinery.

Air Tools.—The Independent Pneumatic Tool Company, Chicago, has recently issued circular N, describing Thor air tools, their uses and advantages. The capacities of Thor drills, pneumatic grinders, reversible wood-boring machines and pneumatic hammers are given in detail.

Headlights.—The Lacy Headlight Company, Houston, Texas, has published a small booklet on the Anderson-Lacy electric headlight. The descriptions of the lamp, the dynamos and the turbine are clear and concise, and a diagram is included to supplement these descriptions.

Boiler Room Tactics.—The Heine Safety Boiler Co., St. Louis, Mo., in a small pamphlet gives a complete set of rules for caring for boilers and superheaters. A full description of the Heine boiler is also included, for the first rule for caring for any boiler is to be thoroughly familiar with its construction.

RAILWAY STRUCTURES.

Bloomington, Ind.—The Chicago, Indianapolis & Louisville has submitted plans for a new passenger station and freight depot to the local commercial club. The plans call for a station of stone with a tile roof. It will be 105 ft. x 30 ft., and is estimated to cost $100,000.

Bonners Ferry, Idaho.—The Kootenai Valley Railway has prepared plans for a new steel bridge over the Kootenai river. The bridge will be 800 ft. long and will replace a wooden structure that has been standing for about 12 years.

Campbellton, N. B.—An officer of the Intercolonial writes that the proposed new station will be of red brick with pressed brick and stone trimmings, on concrete foundations, 32 ft. wide, with the main building 112 ft. long, and wings at each end of 44½ ft., making a total length of 201 ft. Contracts were let March 25, and work is expected to be started about May 1. The offices for the division headquarters will be located in the second floor of the building.

Cleveland, Ohio.—The Pennsylvania Railroad has let a contract for an ore unloading plant on the lake front to consist of four 17-ton unloaders and a 15-ton ore-bridge.

Council Bluffs, Iowa.—The Chicago, Rock Island & Pacific freight house was burned on March 23. The loss included the contents of the building and 12 loaded cars standing on an adjacent track.

Edmonton, Alb.—The Canadian Northern will spend $140,000, it is said, on yard improvements at Edmonton, to include a roundhouse to cost $40,000.

The Canadian Northern will ask for bids soon, it is said, for building a bridge on the main line west of Edmonton, to cost $250,000.

Graham Station, Ont.—The Canadian Pacific is to receive bids at an early date for building a concrete trestle about 500 ft. long.

Greenwich, N. Y.—An officer of the Greenwich & Johnsonville is quoted as saying that improvements will be made at a cost of $30,000. The work includes putting up a passenger station, a freight house and improving the freight handling facilities in the yards at Greenwich.

Hintonburg, Ont.—The Canadian Pacific will build a 16-stall roundhouse estimated to cost $60,000. The building will be of reinforced concrete with fireproof roof. Work will begin at an early date.

Memphis, Tenn.—Plans are being made by the Illinois Central for putting up a new passenger station at Memphis. An officer writes, however, that bids have not yet been asked for the work.

Missouri Valley, Iowa.—The Chicago & North Western shops are to be enlarged during the coming summer at an estimated cost of about $300,000.

Murray, Utah.—The Oregon Short Line has completed plans for a new passenger station. It is announced that work will be begun within 90 days. The site is south of the present station on an extension of Fifth avenue. The building is to cost between $11,000 and $12,000.

Oakland, Cal.—Plans are being made by Jarvis Hunt, a Chicago architect, it is said, for a new station for the Southern Pacific at Oakland. The estimated cost of the building is $250,000.

Red Deer, Alb.—The contract for a steel bridge over the Red river, for the Alberta Central, has been given to Goolie & Jackson, Montreal, Que., and a contract for a bridge over the Saskatchewan river has been given to Armstrong & Son, Red Deer, Alb.

Shreveport, La.—See Kansas City Southern under Railway Construction.

South Fork, B. C.—The Canadian Pacific has let a contract to Digby & Grenier, Fernie, B. C., for building a bridge over the Old Man river. The bridge will be 860 ft. long, 137 ft. high, and will require 1,000 yds. of concrete, 500 piles and 2,000 yds. of excavation.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Missouri, Kansas & Texas is said to be in the market for 16 locomotives.

The Georgia Railroad has ordered 6 ten-wheel locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 20 in. x 24 in., the diameter of the driving wheels will be 66 in., and the total weight in working order will be 173,000 lbs.

The Illinois Central has ordered 5 Pacific type locomotives from the American Locomotive Company. The dimensions of the cylinders will be 25 in. x 26 in., the diameter of the driving wheels will be 75 in., and the total weight in working order will be 239,000 lbs. These locomotives will be equipped with superheaters.

The Delaware, Lackawanna & Western, as mentioned in the *Railway Age Gazette* of March 10, has ordered 35 locomotives from the American Locomotive Company. The dimensions and special equipment of these locomotives will be as follows:

Dimensions.

Type	*Consolidation*	*Mogul*
Number ordered	15	7
Gage	4 ft. 8½ in.	4 ft. 8½ in.
Simple or compound	Simple	Simple
Weight on drivers	206,000 lbs.	150,500 lbs.
Total weight	233,000 lbs.	171,500 lbs.
Cylinders	26 in. x 30 in.	20½ in. x 26 in.
Diameter of drivers	57 in.	63 in.
Type of boiler	Straight top type	Straight top type
Working steam pressure	170 lbs.	200 lbs.
Heating surface, tubes	3,523 sq. ft.	2,148 sq. ft.
Heating surface, firebox	205 sq. ft.	209 sq. ft.
Heating surface, total	3,728 sq. ft.	2,358 sq. ft.
Tubes, number	446	304
Tubes, outside diameter	2 in.	2 in.
Tubes, length	15 ft. 2 in.	13 ft. 6 in.
Firebox, type	Semi-wide	Semi-wide
Firebox, length	9 ft. 3 in.	8 ft. 6 in.
Firebox, width	6 ft. 3 in.	6 ft. 3 in.
Firebox, material and maker	Worth Bros.	Worth Bros.
Grate area	58 sq. ft.	53.4 sq. ft.
Tank capacity for water	8,000 gals.	6,500 gals.
Coal capacity	14 tons	10 tons
Type	*American*	*Six-wheel Switching*
Number ordered	6	7
Gage	4 ft. 8½ in.	4 ft. 8½ in.
Simple or compound	Simple	Simple
Weight on drivers	104,500 lbs.	133,000 lbs.
Total weight	156,000 lbs.	133,000 lbs.
Cylinders	20 in. x 26 in.	19 in. x 24 in.
Diameter of drivers	69 in.	51 in.
Type of boiler	Straight top type	Straight top type
Working steam pressure	185 lbs.	180 lbs.
Heating surface, tubes	1,961 sq. ft.	1,690 sq. ft.
Heating surface, firebox	179 sq. ft.	164 sq. ft.
Heating surface, total	2,140 sq. ft.	1,854 sq. ft.
Tubes, number	280	269
Tubes, outside diameter	2 in.	2 in.
Tubes, length	13 ft. 4½ in.	12 ft.
Firebox, type	Wide	Semi-wide
Firebox, length	10 ft. 6 in.	7 ft. 6 in.
Firebox, width	8 ft. 4 in.	6 ft. 3 in.
Firebox, material and maker	Worth Bros.	Worth Bros.
Grate area	87.6 sq. ft.	46.3 sq. ft.
Tank capacity for water	5,500 gals.	3,300 gals.
Coal capacity	10 tons	6 tons

Special Equipment.

Axles	Cambria steel.
Bell ringer	Gollmar.
Boiler lagging	Sectional magnesia.
Brakes	Westinghouse—American—Schedule—E—T—6
Brake beams	Westinghouse.
Brake shoes	Improved Perfecto type on drivers.
Brick arch	None.
Couplers	Sharon.
Driving boxes	Cast steel.
Headlight	Dressel.
Injector	Hancock composite.
Journal bearings	Magnus bearing.
Piston and valve rod packings	United States.
Safety valve	Consolidated.
Sanding devices	Leach air and hand sander.
Sight-feed lubricators	Nathan.
Springs	Cast steel, D. L. & W. specification.
Staying	Tate flexible bolts in breaking zone.
Steam gages	Ashcroft.
Tires	3½ thick Latrobe flanged tires, all 5½ wide.
Tubes	No. 11 B. W. G. spellerized steel.
Valve gear	Stephenson on American and switching locomotives.
Valve gear	Walschaert on mogul and consolidation locomotives.
Wheel centers	Cast steel.

CAR BUILDING.

The Chicago, Burlington & Quincy is in the market for 1,000 all steel gondola cars.

The Richmond, Fredericksburg & Potomac is said to be in the market for 4 passenger cars.

The Bingham & Garfield has ordered 120 sixty-ton dump cars from the Pressed Steel Car Company.

The Minnesota, Dakota & Western has ordered 50 flat cars from the Haskell & Barker Car Company.

The Chino Copper Company is said to be in the market for 50 hopper cars. This item is not confirmed.

The Atchison, Topeka & Santa Fe is said to have ordered 20 coaches from the Pullman Company. This item is not confirmed.

The Chicago, Rock Island & Pacific has ordered 11 seventy-foot all steel combination cars and 30 sixty-foot all steel postal cars from the Pullman Company.

The Bethlehem Steel Company, South Bethlehem, Pa., has ordered 100 fifty-ton steel coke cars from the American Car & Foundry Company, to be built at the Berwick, Pa., plant.

The Pittsburgh & Lake Erie mentioned in an unconfirmed item in the *Railway Age Gazette* of March 24 as being in the market for 1,000 gondola cars and 1,000 hopper cars, is in the market for this equipment.

The Pennsylvania Equipment Company, mentioned in the *Railway Age Gazette* of February 24 as being in the market for freight cars, is in the market for a number of 30-ton box cars, some 70-ft. vestibule passenger cars and some 36-ft. cabooses.

The Western Maryland, mentioned in an unconfirmed item in the *Railway Age Gazette* of March 24 as having ordered 15 vestibule passenger cars, 4 mail and express cars, 2 combination cars and 2 baggage cars from the Barney & Smith Car Company, has ordered this equipment from this company.

IRON AND STEEL.

The Missouri, Kansas & Texas is said to be in the market for 14,000 tons of rails.

The Havana Electric has ordered 2,000 tons of rails from the Lorain Steel Company.

The Pan-American of Uruguay is said to be in the market for 4,500 tons of rails.

The Lehigh & New England has ordered 4,000 tons of rails from the Bethlehem Steel Company.

The Harriman Lines are said to have ordered 1,200 tons of rails from the Pennsylvania Steel Company.

The Central of New Jersey is said to have ordered 2,500 tons of structural steel from the American Bridge Company.

The Western Maryland is said to have ordered 6,550 tons of rails from the Bethlehem Steel Company and 4,050 tons of rails from the Pennsylvania Steel Company.

General Conditions in Steel.—Orders have fallen off between 10 and 15 per cent. with the approach of the Supreme Court decisions in the Oil and Tobacco cases. Production, however, has increased. The Steel Corporation is now operating at 73 per cent. of its capacity, and the Bethlehem Steel Company is operating at its full capacity for the first time in two years. The increase in structural steel orders for other than railway use has been very large. While the buying of the railways is exceptionally low, some large inquiries are expected next week. The average daily orders of the United States Steel Corporation for March are expected to be between 37,000 and 40,000 tons.

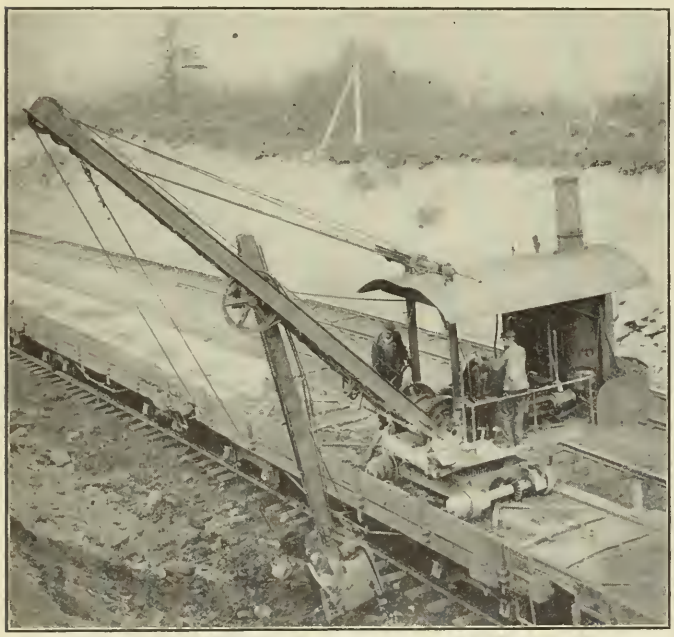
SIGNALING.

The Grand Trunk Western, which is the Michigan section of the main line of the Grand Trunk Railway, in applying to the state railroad commission of Michigan for authority to issue new bonds, includes in the proposed expenditures from the proceeds of the bonds an item of $850,000 for the installation of block signals.

Browning Railway Ditcher.

During the past year a new machine, known as the Browning railway ditcher, has been introduced by the Browning Engineering Company of Cleveland, Ohio. It is a revolving steam shovel used in widening cuts, opening ditches, and for light gravel pit work or for handling rails and ties. It was originally intended to be used on the top of a flat car, loading material on the car, but by means of a portable track it may be moved from car to car loading a whole train of flat cars. The portable track consists of two sections, lightly but securely tied together, which may be handled with a chain-sling by the ditcher itself. The ditcher was developed to meet the need of a machine to open drainage ditches on either side of the roadbed and works on either side of the cars, loading them behind as it travels toward the locomotive.

The traveling base of the ditcher is a single casting, mounted on hammered steel axles and steel wheels. The axles extend through the wheels far enough to provide means for securing the machine to the car during transit. It is propelled by a horizontal shaft driven by a vertical shaft through the center pin by means of bevel gears. On top of the base casting is fastened the steel rotating gear, on which the rotating base rests. The pinion which meshes with a gear fastened on the top of the traveling base is carried on the lower end of a vertical shaft,



Browning Railway Ditcher.

whose journal is a cast iron sleeve set in the rotating base. When desired, this sleeve, with the shaft and pinion, may be removed without disturbing the other machinery. All motions, except raising and lowering the boom, are controlled by the Browning patent steel friction clutches, which require little attention if they are kept well oiled. Double clutches are provided for both the traveling and the rotating motion, so that it is not necessary to reverse the engine while operating. The boom hoist drum is controlled by a combination wood V friction and ratchet, with an independent brake hand to allow for rapid hoisting and lowering of the boom for changing radii and handling track sections. The main hoist and backing-up drums are independently driven, each being controlled by a large brake wheel operated by a foot lever. The clutches and reverse link motion are controlled by a set of levers located near the front and on one side of the rotating base where they are convenient to the operator and allow him to have the necessary view of his work. The vertical boiler, 42 in. in diameter, has 84 two-in. drawn steel tubes and is jacketed with asbestos and galvanized steel. A water tank, having 350 gal. capacity, is located near the boiler, using short piping, which eliminates the danger of freezing in cold weather. The engine cylinders are 8 in. in diameter and have an 8 in. stroke. The operator and machinery are protected by a steel canopy of ample size and when desired a complete steel house can be furnished. The boom is built up of plates and angles, and is usually 25 ft. long. The dipper is made of steel plates and holds about three-quarters of a cubic yard of material. The complete machine, with a half tank of water, two gages of water in the boiler, a half ton of coal, a dipper full of dirt and one operator, will weigh approximately 45,000 lbs.

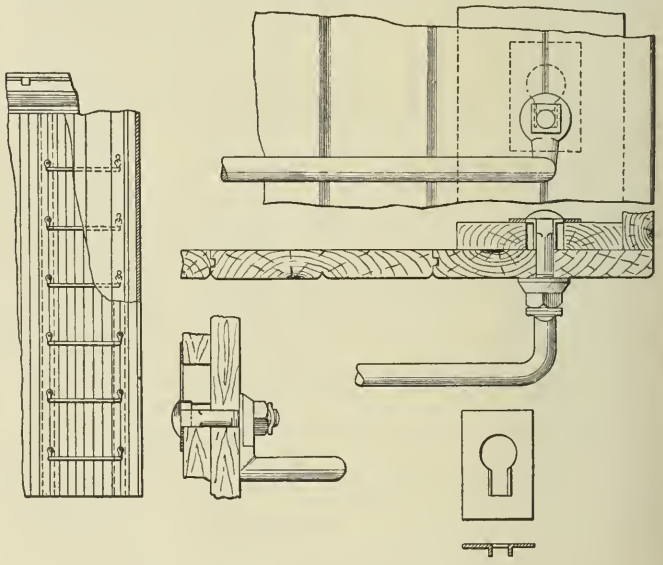
When desired, the dipper may be converted into a locomotive crane for handling rails and ties, by removing the dipper and the dipper stick and using a hook on the end of the hoisting rope. On a standard gage track without track clamps or locking, the machine will lift the following maximum loads:

On 10-ft. radius	15,000 lbs.
On 20-ft. radius	9,000 lbs.
On 30-ft. radius	5,000 lbs.

By using both the hoisting and backing drums, a clam shell, orange peel or scraper bucket may be used. A pile-driving attachment with a 2,000-lb. hammer which will drive an 18-in. pile at 17 ft. from the center of the machine may also be used. This machine is being used by the Erie, Lehigh Valley, San Pedro, Los Angeles & Salt Lake, the Longville Lumber Company and other large lumber interests. Its details and uses are well described and illustrated in a booklet recently issued by the Browning Company.

Bolt Lock for Ladders on Freight Cars.

A new and ingenious method of securely fastening ladders to freight cars is shown on the accompanying illustration. It is accomplished by the use of the Monogram bolt lock, which is made by the Grip Nut Company, Chicago. This bolt lock may be applied by taking off a few boards of the outside sheathing; it holds the shanks of the short carriage bolts used to fasten the ladder to the car. It is so arranged that the same sheathing



Monogram Bolt Lock for Car Ladders.

boards may be reapplied, the bolt lock being fastened to a strip laid directly inside the sheathing. This arrangement is supplied from the outside of the car, thus making no difference whether it is loaded or empty, and making it of special value on refrigerator and other lined cars where it is undesirable to use long through bolts which would interfere with the proper application of the insulation. It also gives a secure ladder as required by the safety appliances laws, and is an improvement over the insecure ladders fastened by common lag screws.

In German East Africa the Central Railway, which will extend from the coast at Dar-es-Salam west by north to Lake Tanganyika at Ujiji, has reached Saranda, 237 miles from the coast. This place is on the western side of "the Rift," the great depression which extends from Lake Nyassa north, between which and Tanganyika and Victoria there is a high plateau. From Sananda to Tabora the distance is 170 miles, and this is as far as the railway has been surveyed. Thence to Ujiji is about 200 miles.

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WHEN the Supreme Court passed on the commodities clause of the Interstate Commerce Commission two years ago, it said that ownership of stock in a coal company did not give a railway such an interest in the coal produced as to prevent it from lawfully carrying it. In its decision in the Lehigh Valley case just handed down, it goes farther. The principle laid down is clear so far as it goes. The court says that when the railway directs the management of the coal company to such an extent that the entity of the coal company as a corporation is in effect lost, it cannot carry its coal. It would seem to be a question of judgment as to just when the "entity" of the coal corporation is lost; the court says it is when the affairs of the coal company are commingled in administration with the affairs of the railway company so as to make the two corporations virtually one. It is evidently at least lost when the higher officers of the coal company and of the railway company are the same individuals, and when the railway company is supplying the money by which the coal company meets current expenses. In general, its principle is the same as that promulgated in the Galveston Terminal case, where Justice McKenna drew the line between a "holding company which was content to hold," and the condition in which the powers of management given by stock ownership were carried further. Probably this latest decision, which allows the government to bring in an amended suit against the Lehigh Valley, will also leave the way clear for proceeding against other anthracite carriers. They can escape these actions by doing what the Lackawanna has done, that is, distribute the stock of its subsidiary coal company to its own shareholders, who will select their own board of directors and officers, so that the railway as such ceases to have any direct interest in the coal company. This is not desirable from the railway's point of view, because the coal company's stock will not necessarily remain in the hands of the railway's shareholders. In the case of the Lackawanna the stock is more closely held, so that there is less danger of this than there would be with most of the other coal roads.

THE Rock Island recently announced that it will inaugurate a system of giving cash prizes to roadmasters for the purpose of stimulating efficiency in track work. Probably in no other branch of the railway service does the inefficiency of labor cost so much as in the track department. It is universally conceded that the quality of track labor has been steadly deteriorating in intelligence and efficiency for many years; and the railways, generally speaking, have done but little to combat the tendency. The time is quickly coming when some radical measures will have to be adopted to better conditions. While the track structure has developed with the demands of the traffic, the same methods of maintenance are in vogue that were used 20 years ago. The time has come when precedent and custom, or, as it might be called, the "fixed policy" regarding track work, will have to be cast aside. New methods are necessary to meet the new conditions. Means must be devised for increasing efficiency. The system of awarding prizes to the individual foremen whose work shows the greatest improvement for a given period is perhaps the best known and most widely adopted method yet tried. The Pennsylvania and the New York Central have followed this policy for many years. Among other roads following the same general policy are the Queen & Crescent and the Union Pacific, medals being awarded by the latter road. The Santa Fe began an experiment a year ago with the bonus system for roadmasters, foremen and laborers, whereby the saving in maintenance charges is shared with these men. The Union Pacific has established educational courses for track laborers, foreign as well as native, a special course having been prepared for its large number of Japanese laborers. Such plans tend to stimulate efficiency by appealing to the men themselves. Another method is that for providing tools or equipment to reduce the unproductive part of track labor to a minimum. The motor car for section forces is an important device, being widely

employed for this purpose. It enables greater efficiency to be obtained by reducing the unproductive labor used in going to and from work to a minimum; by increasing the length of time employees actually are at work on the track; and by attracting a better class of men. These developments are but indications of the general demand for improvements in this field and of the attention now being paid to the subject. There is scarcely another field of railway endeavor which has so long been allowed to lie fallow or will so richly repay intelligent cultivation.

On the Union Pacific and allied lines enginemen are trusted to see semaphores; at least to the extent that the flagman at the rear end of a train is allowed to omit the use of torpedoes and fusees in certain circumstances, provided he can see the protecting semaphore and thus be able to testify personally to ocular evidence that the signal was in the stop position in case an engineman should be found to have run past it. This statement, printed in our issue of March 24, has brought out the information from Vice-president Melcher of the Rock Island, and from General Manager Goodell of the Northern Pacific, that "there are others." Both of these roads have substantially the same rule that is in force on the U. P. The rule of the Rock Island reads:

"When a train requires protection within a block controlled by an automatic block signal, and such signal is not less than one-half mile to the rear of the train, the flagman need not go back beyond where the block signal is plainly seen to display 'stop' and he must know that it continues to display 'stop' while the train requires protection."

We are glad to see this rule. Our statement that the Harriman Lines were the only roads having such a rule was given verbatim from a source believed to be authoritative, though we did not use quotation marks. Even with correct knowledge of facts a query sometimes remains. How is it that a brakeman can be trusted to watch an automatic block signal, and be ready effectively to jump in and take the place of it in case it wrongfully changes to clear, while he cannot be so trusted in the case of a signal controlled by a signal man? The real difference between this practice and that prescribed by the ordinary rule seems to be (as we have said) the omission of torpedoes and fusees, for the flag signal given by the brakeman would for all practical purposes be scarcely more than a duplicate of the semaphore indication. To omit the flag is simply to omit an absurdity. A flag can be waved, while the semaphore indication is motionless, but it is doubtful whether the flag, even with that advantage is as good a signal as the post and arm. But perhaps the most interesting question as to this matter of reinforcing the automatic block signal (by having a brakeman watch it) is that suggested by the fact that in hundreds of instances every day trainloads of lives are trusted to unwatched semaphores, following trains being so close together that there is no time to send out a brakeman in case of a sudden and unexpected stop.

In another column we publish an article by a railway president criticising the opinion written by Commissioner Lane, and rendered by the Interstate Commerce Commission, in the western rate advance case. The strictures passed are severe; but the article accurately reflects the views of most executives of western railways. No doubt this is partly because railway officers are partisans, and are not apt to relish the opinion in any case that goes against them. But it is notable that when the courts decide cases against either the shippers or the railways, the defeated litigants, while they may question the correctness of the conclusions reached, seldom attribute bias to the court that arrived at them There is one important point about this matter, however, which we think most persons overlook. This is that with the laws as they are, and the commission appointed as it is, it is a practical impossibility for it to be impartial. It is not a court, although its procedure has the similitude of court procedure. It is an adminstrative body. It owes its existence primarily to the provision of the federal constitution which gives Congress the power to *regulate* commerce among the states and with foreign nations, and secondarily to a statute entitled "An Act to *Regulate* Commerce"; and its business is to *regulate* railways and not merely, like that of a court, to apply the law to cases which may come before it. A court does not institute proceedings; but the commission is authorized and required to institute proceedings on its own motion. It must not merely apply, but it must also enforce, the laws under which it acts. In these respects it differs entirely from the English railway commission, which is a court in the strictest sense of the word; which is presided over by judges assigned from the regular courts; and which has not the duty of enforcing the laws at all. Railway officers had just as well reconcile themselves to the fact that, under existing laws, it is improbable that the commission will ever be an entirely impartial body, no matter how much its members may desire, or how strongly they may believe, it to be so. Usually, no doubt, its rulings and decisions are fair; but it is perhaps significant that the number of cases of first-rate importance which it has decided in favor of the railways is small as compared with the number of such cases in which the courts have overruled it. The fault is not that of the commission; a man cannot be at once an efficient prosecutor and an unbiased judge. The fault is with the laws creating the commission, prescribing its duties, fixing its authority and specifying for what terms its members shall be appointed; and we probably shall not have—and perhaps cannot possibly have—entirely fair federal regulation of railways until we shall have a complete revision of these laws.

PRESIDENT DELANO ON ARBITRATION OF RAILWAY LABOR DISPUTES.

We present elsewhere an interesting and thoughful letter from President Delano of the Wabash, about the arbitration of differences between railway managers and employees over wages and conditions of employment. The discontent he expresses regarding recent settlements is shared by most railway operating officers. As he says the various arbitrations have proved to be "compromises which rarely go deeply into the matter of the principle involved. Unlike decisions of a court, they furnish no useful precedent for future action and are of practically no educational value." An unexpected development is the attitude that railway labor is assuming. Formerly it was the managers who said that they had nothing to arbitrate and the men who insisted on arbitration. Now the managers have become converts to arbitration; and on the other hand, in spite of the fact that every recent arbitration has resulted in an increase of wages, the men refrain from proposing it, and commonly seek to avoid it when it is proposed by the managers. The change raises the query whether they feel that their cause is less just and justifiable than it used to be, or think that the ability of their representatives as negotiators has so increased that they have more to gain by dealing with railway officers directly than indirectly through boards of arbitration.

Mr. Delano's suggestion for a permanent court of arbitration, composed of men largely freed from other responsibilities and chosen for a reasonably long term, is extremely interesting. Certainly, no effort should be spared to prevent strikes on railways in future. Now, serious disputes between employees and managers are certain to continue to arise. Strikes recently have been repeatedly threatened because the managers would not concede as large wage advances as labor demanded. The demand by the railways for more and better work in return for each dollar in wages is going on—and should—grow constantly stronger; and strained relations are apt to result and even lockouts to be threatened, owing to efforts to secure greater efficiency. If serious consequences are to be avoided, means to that end must be provided. Whether the creation of a permanent court of arbitration is the best means available merits serious consideration. It would seem that such a court would be better

adapted to its purpose than are the boards of arbitration which are now formed to settle each of them a different controversy, and which are usually composed of one man representing one side, another representing the opposing side and a third who may be neutral, but who usually has no expert knowledge of the matters in controversy and the surrounding conditions. The great danger is that the proposed court of arbitration might not be a court in fact as well as in name. If it were merely an administrative body with a constantly changing membership and an insatiable appetite of power, it would be susceptible to political influence and popular clamor. In that case, as the railway brotherhoods command more votes than the railway companies, it is easy to foresee what the general tenor of its decisions would be.

The entire subject is one of great importance, and we are glad a discussion of it has been started by Mr. Delano. There can be no question in the mind of any man familiar with existing conditions that the public interest requires that some action shall be taken to bring the railway brotherhoods to the same sense of their duty and responsibility to the public to which government regulation has brought the railways. Time was, not long ago, when as Mr. Delano says, the railway employer exercised an excessive authority with little responsibility. That condition is reversed, and now the railway brotherhood exercises much too great an influence over railway affairs and over the service railways render in proportion to its responsibility. The railway brotherhood has become morally as much a public service institution as the railway corporation; and the public cannot effectively, salutarily or justly regulate the corporation without also extending a firm and controlling hand over the brotherhood.

AN UNSEEN FACTOR IN RAILWAY VALUATION.

IT is not amiss to point out one factor in valuation almost if not quite unseen. It is that element which represents investment extinct and destroyed in the various railway reorganizations. It is unfortunately a branch of the subject where statistics are defective and vague. Certain general facts appear in figures but they cannot be analyzed in detail. The base line of natural computation is the record of bonds and stocks of railways involved in foreclosure sales for 35 years since 1875. These are returned at the enormous sum of $7,240,162,000. But it affords almost no clue to the actual extinction of investment values except so far as one may say that a moderate fraction of so vast an amount must be a great absolute sum. It is also incomplete in time. It does not antedate a point midway in the long and successful period which began with the panic of the autumn of 1873 and which did not fully end until seven years later. Foreclosure sales during the last three years of that period included roads with stocks and bonds amounting to $828,801,000. During the next three years the total was but $250,449,000. For the half dozen years preceding 1876 and including nearly one-half of the long panic period, foreclosures and extinction of investment must have been very large, especially in proportion to the total railway investment of the country at the time.

How large has been the ratio of the total amount in stocks and bonds eliminated in reorganizations is obviously a question that cannot be answered in exact terms but on which some sidelights can be thrown. The case of the railways of the State of Connecticut may be cited as bearing on the point. It is a populous commonwealth with intensive factory industries. It has not been a State where a railway once built has ultimately been reduced, in the old phrase, to "two streaks of iron rust and the right of way," and nearly every line once built has continued in operation. Yet of its eleven original lines of importance four have gone through reorganizations that have involved large loss of original investment. In one case, that of the old Boston, Hartford & Erie, afterward The New York & New England, the extinct securities run far up into the millions. In "town aid" subscriptions to new railway lines—that is to say, municipal subscriptions to stock of projected lines—several millions of hard cash went to the bad in the State; and the "town aid" fever rose to a temperature that had to be lowered by a constitutional amendment absolutely prohibiting aid of the kind. In the case of one minor town aid road after two reorganizations there were three dollars lost by municipalities and private investors to one dollar that survived. The experience of such a commonwealth as Connecticut gives a suggestion of the extinct railway investment in other regions of the country where the rage for railway building that followed the Civil War went to greater extremes and where in many cases State aid was joined to municipal and private subscriptions for new lines which were unduly rated as pledges of immediate prosperity. The reorganized railways, or most of them, remain and have had their share in the upbuilding of localities, particularly when absorbed in great railway systems. But much of the original cash that constructed them survives only in the time-faded stock certificate and as mere relics in the shape of bonds with their dismal appendices of coupons uncashed.

The $7,240,162,000 involved in the railway foreclosures of 35 years has also its historical suggestion. The earlier reorganizations were drastic, and junior securities were snuffed out remorsely. But during the last two or three decades there has come in a "live and let live" theory, not only recognized by reorganizers but by the courts acting through their receivers. Sometimes original stock has been left far outside of new inside liens; but more often reorganization has rested on a stock assessment. Now and then the plan has worked out with unlooked for success. The Union Pacific case, for example, where stock has beaten bonds in prosperity and profit is a conspicuous instance But in reorganized railways as a whole a great volume of original losses remain.

Where are those losses in the present theory and practice of revaluation? Theoretically they operate to solidify capitalization. The line originally and actually costing say $5,000,000, and honestly capitalized at that amount in stock and bonds, but after a period of adversity bought in at a half or quarter of the first investment and made a subsidiary of a large railway system becomes an important, if unseen and remote, factor in valuation which an estimate of replacement cost should disclose. Practically, however, it is hidden in the general valuation and in the ratio of that valuation to new capitalization in stock and bonds often based on the whole system. It is there, but disguised and covered; and the disguise is complete if the valuation is based on earning power rather than replacement. The unseen factor obviously varies also with different railway systems. One railway system built up rapidly has paid relatively high prices for subsidiaries; another system, slowly expanding, has been more conservative and has waited for weak connecting lines or branches to fall in. One system may adopt the practice of leaseholds; another of purchase; and, finally, subsidiary and component lines acquired far below original cost are partly offset by prosperous lines acquired far above original cost. The margin that remains of "solidification" in favor of the "bedrock" reorganized lines is thus indeterminate. In the case of the four Connecticut roads foreclosed, the reduction on original cost—including equipment—would probably amount to not less than 25 per cent., even allowing for subsequent mortgages and other capitalization. Such a ratio applied to the $7,240,162,000 of stock and bonds of lines included in the foreclosures of the last 35 years would imply an unseen factor of about $1,800,000,000 in a valuation of American railways. Stated in different form, that amount would be a coefficient in raising the valuation of all the steam roads of the country based on replacement. The ratio is probably somewhat too high. It would not allow for duplicate foreclosures and would have to be diminished by the amount of original water in capitalization. On the other hand, the absolute sum would be increased by foreclosures previous to 1876. But whatever its amount and its ratio to actual value, both, as having a real existence, are an interesting subject of speculation. And,

if any general valuation of our railways comes to pass and extinctions of first investment are sought out and aggregated, the now unseen factor will become visible.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

THE average capacity of freight cars and the average tractive power of locomotives have been greatly increased in recent years. Has the work done by equipment increased as much as it should in proportion to the increase in its capacity to do work?

At a time when the railways have just been told by the Interstate Commerce Commission that they must add to their net earnings—if at all—by augmenting the efficiency of their operations, and not by advancing their rates, this is a question both interesting and important. The difficulty of getting a satisfactory answer is great. It cannot be got merely by study of statistics; one must know thoroughly the conditions under which the operations represented by statistics have been carried on before he can safely say that the statistics clearly show one thing or another; if more statisticians always bore this in mind there would be more good statistics and fewer poor statisticians. But, nevertheless a comparison of the increase in the potential ability of equipment to do work with the increase in the work that it has been doing, based on statistics, is interesting and may be instructive. Certainly it will disclose some facts of the existence of which many railway men are unaware.

The following table has been worked out to show the relative increases in the tractive power of locomotives and in the traffic handled by them. The comparisons have been made between the years 1902, 1907 and 1909, because 1902 is the first year for which some of the necessary figures are available; 1907 was the year of largest traffic movement, and 1909 is the last year for which complete statistics of the Interstate Commerce Commission are available.

		1907.		1909.	
	1902.		Per cent. inc. (or dec.) over 1902.		Per cent. inc. (or dec.) over 1902.
Average tractive power per locomotive, lbs.	20,485	25,823	26	26,601	29.9
Average passengers per train	45	51	13	54	20.0
Average tons per train	296.47	357.35	20	362.57	22.0
Ton miles per freight locomotive per year	6,666,499	7,375,585	11	6,447,708	—3.3*
Passengers hauled one mile per passenger locomotive per year	1,908,309	2,163,146	13	2,185,877	14.5
Ton miles per lb. freight locomotive tractive power per year	357.6	289.9	—18*	245.5	—31.3*
Passengers hauled one mile per lb. passenger locomotive tractive power per year	102.4	85.0	—17*	81.9	—20.0*
Locomotive tractive power per mile of line	3,839.5	6,194.7	61	6,388.9	66.4
Tons moved one mile per mile of line per year	793,351	1,052,119	33	953,986	20.2

*Decrease.

The Interstate Commerce Commission gives the numbers of different kinds of locomotives, but it does not give the average tractive powers of the different kinds. It was, therefore, arbitrarily assumed in making the calculations on which certain of the above figures are based that the average tractive power of freight and passenger locomotives is the same. It will be seen that while the increase in the average tractive power of *all* engines between 1902 and 1909 was almost 30 per cent., the increase in the average number of passengers per train was only 20 per cent., and the increase in the average number of tons per train only 22 per cent. To be valuable indices to transportation efficiency, statistics must represent not merely quantities hauled, but also average movement. While the average tractive power of locomotives increased 26 per cent. between 1902 and 1907, the ton miles per freight locomotive per year increased only 11 per cent. While the average tractive power per locomotive increased 30 per cent. between 1902 and 1909, the ton miles per freight locomotive per year decreased 3.3 per cent. Still more striking are the figures showing the number of tons hauled one mile *per pound* of freight locomotive tractive power per year, and the number of passengers hauled one mile *per pound* of passenger locomotive tractive power per year. The ton miles per pound of power decreased from 357.6 in 1902 to 289.9 in 1907, or 18 per cent., and to 245.5 in 1909, a reduction as compared with 1902 of 31.3 per cent. The number of passenger per pound of power in 1902 was 102.4, and in 1907 it was 85, a decrease of 17 per cent., and in 1909 it was 81.9 per cent., a decrease as compared with 1902 of 20 per cent. Locomotive tractive power per mile of line increased 61 per cent. between 1902 and 1907, and 66.4 per cent. between 1902 and 1909. Tons moved one mile per mile of line increased only 33 per cent. between 1902 and 1907, and only 22.2 per cent. between 1902 and 1909. That the increase in the average tractive power of locomotives has taken place faster than the increase in the average traffic moved by them is quite clear.

The following table shows the increases in the capacity of freight cars and in the amount of traffic handled by these freight cars:

		1907.		1909.	
	1902.		Per cent. inc. (or dec.) over 1902.		Per cent. inc. (or dec.) over 1902.
Average capacity per freight car, tons	28	34	21.4	35	25.0
Average ton miles per car mile	11.8	13.82	17.1	12.7	7.97
Average tons moved per loaded car mile	16.9	19.68	16.0	19.3	13.8
Ton miles moved per car per year	101,732	118,801	16.7	105,518	3.7
Ton miles moved per year per ton of car capacity	3,719	3,527	—5.0*	2,992	—19.5*
Average capacity freight cars per mile of line, tons	211.3	294.7	40.0	310.7	47.0
Tons hauled one mile per mile of line	793,351	1,052,119	33.0	953,986	20.2

*Decrease.

It will be seen that the average capacity of freight cars increased 21.4 per cent. between 1902 and 1907, and 25 per cent. between 1902 and 1909. The average ton miles per car mile—including both empty and loaded cars—increased over 17 per cent. between 1902 and 1907, but less than 8 per cent. between 1902 and 1909. These figures reflect the heavy decline in traffic following the panic, resulting in a large increase in empty mileage.

The average tons per loaded car mile increased 16 per cent. between 1902 and 1907, and less than 14 per cent. between 1902 and 1909. The ton miles per car per year increased almost 17 per cent. between 1902 and 1907, but less than 4 per cent. between 1902 and 1909. The ton miles per year per ton of car capacity, which is the unit that really represents the capacity of cars to do work and the work that they do, decreased 5 per cent. between 1902 and 1907, and decreased almost 20 per cent. between 1902 and 1909. This shows that the railways have increased the ability of cars to do work, as well as the ability of engines to do work, faster than they have increased the work done by them.

Perhaps we should exclude from consideration the figures for 1909 as abnormal, because they are the resultant of abnormal conditions. Comparing, then, 1907 with 1902, the total capacity of freight cars increased 58½ per cent., and the ton miles of freight increased only 50.42 per cent. A failure to utilize fully the increased capacity of cars might be due to any or all of the following causes: (1) decrease in the percentage of loaded movement; (2) slower average movement of cars (including the time they are idle from lack of traffic); (3) decrease in the proportion of commodities producing a large ton mileage per car mile; or (4) decrease in average loading efficiency.

The decline in work done as compared with working capacity was not due to the first cause mentioned. The statistics of the commission show that the percentage of loaded car mileage to total car mileage increased from 69.7 per cent. in 1902 to 70.2 per cent. in 1907. It is natural that with an increase in the density of traffic the percentage of loaded mileage should increase, unless there is a greater increase in the

kinds of commodities that use classes of cars which cannot generally be used for return loading. There was a slight increase in commodities of this kind, but it was not sufficient materially to affect the result.

As to the second possible cause referred to, it is probable that there was little difference between the average daily movement of cars in 1902 and in 1907. The statistics of the Interstate Commerce Commission indicate that the average miles per car per day in 1902 were 24.3, and in 1907, 24.5. The statistics of the American Railway Association indicate that the average miles per day in 1902 were 24.1, and in 1907, 24.0.

The third possible cause mentioned—decrease in the proportion handled of commodities producing a large ton mileage per ton of car capacity—also was not operative, for the statistics of the commission show that the percentage of products of mines hauled—which load the heaviest—to the total traffic hauled, increased from 52.36 per cent. in 1902 to 53.39 per cent. in 1907.

The conclusion inevitable is that the increase in the traffic hauled per ton of car capacity was due entirely to a relative decrease in loading efficiency. The percentage of car capacity utilized in loading decreased from 60.36 per cent. in 1902 to 57.94 per cent. in 1907. If the percentage of capacity utilized had been as great in 1907 as in 1902, the load per car in 1907 would have been 20.5, instead of 19.68 tons, and the ton mileage produced by the loaded car miles made would have shown an increase over 1902 of 56.07 per cent., instead of only 52.4 per cent.; or, rather, the car miles necessary to produce the ton miles which actually were produced, would have been less in this proportion.

It might be thought that this relative decrease in loading efficiency has been due mainly to the fact that the cubic capacity of cars has not been increased in proportion to their tonnage capacity, and that, in consequence, there are many commodities of comparatively little weight in proportion to their bulk which cannot be loaded to the marked capacity of the car. But there is strong, although perhaps not conclusive, evidence that the decrease in the relative loading efficiency has taken place in the handling of commodities which easily can be loaded to the marked capacity of the largest cars. The total capacity of coal cars, including gondolas, increased from 16,432,314 tons in 1902 to 28,468,524 tons in 1907, 73.25 per cent. The total capacity of other cars increased from 25,860,663 tons to 38,564,800 tons, or 49.12 per cent. Meantime, the tonnage of products of mines originated increased from 304,634,808 tons to 476,899,638 tons, or 56.54 per cent., and the tonnage of other products originated increased from 277,197,633 tons to 416,285,334 tons, or 50.17 per cent. In other words, the tonnage of products of mines originated per ton of coal car capacity was 18.53 tons in 1902, and but 16.75 tons in 1907, while the tonnage of other traffic originated per ton of the capacity of other cars was 10.72 tons in 1902 and 10.8 tons in 1907. While figures for tons are not as satisfactory as figures for ton mileage, the former are the only data available, and, anyway, experience shows that the tonnage and ton mileage of coal traffic usually increase in about the same proportion. The figures given show that the increase in tonnage of "other products" kept pace with, and, in fact, slightly exceeded, the increase in the capacity of "other cars," while the increase in coal tonnage did not keep pace with the increase in the capacity of coal cars, which forces us to the conclusion that the decline in loading efficiency was confined to the latter class of cars.

Such data as the foregoing does not necessarily prove that the railways have not profited by the increase in the capacity of their cars and the power of their engines Engines and cars must be built. Their maximum capacity may often be used, and the use of the additional units of capacity when they are needed and available may, and no doubt does, more than pay for the increase in the initial cost of equipment that they cause, and the increased dead weight which they make it necessary to haul. But, on the other hand, the figures seem clearly to indicate that the railways have not benefited by the increased power and capacity of their equipment to the extent that it is desirable they should in their own interest and in that of the public, whose welfare is promoted by every reasonable reduction in the economic cost of transportation. In order that the maximum practicable benefit may be derived by both the railways and the public, it is essential that the average movement, and the average load, of cars and trains shall be increased, and that the amount of empty mileage shall be reduced. The more powerful an engine is, or the more capacious a car, the greater is the economic waste involved in having it run with a light load or stand idle on the side track.

The railways cannot secure these desirable results without the co-operation of shippers and railway regulating authorities. The shippers opposed advances in freight rates on the ground that the railways should secure such increases in net earnings as they require by increasing the efficiency of their operations. The Interstate Commerce Commission in its decisions in the rate advance cases practically endorsed this view. The shippers and the commission, therefore, can hardly consistently refuse to co-operate with the railways in making the increases in minimum carload weights, the modifications in demurrage rules and the other changes which seem essential to enable the roads to get the maximum reasonable results from the use of their equipment.

DELAWARE & HUDSON.

THE Delaware & Hudson is one of the two most important anthracite coal carrying roads whose main source of traffic is coal. It is a short road, operating but 843 miles of railway, but it is a company with a long history. The annual report for the calendar year ended December 31, 1910, is the eighty-first report of the Delaware & Hudson Company. The D. & H. Company both operates a railway and owns extensive coal mines. After the commodities clause was upheld by the supreme court and interpreted in such a way as to permit stock ownership by a railway company in a coal sales company, which shipped coal over the railway, the D. & H., which had hitherto transported its own coal and acted as a selling company, began on June 1 to sell the coal from its mines at the pit's mouth.

In 1910 the railway department earned $20,400,000 gross, an increase of $900,000 over the gross of 1909. Operating expenses, excluding taxes, last year amounted to $12,200,000 as against $11,400,000 the year before. Net operating revenue, therefore, in 1910 was $8,200,000, and in 1909, $8,100,000.

The coal department last year produced 6,647,659 tons of coal, and produced and purchased in 1909, 6,238,653 tons. Last year the revenue from the coal department amounted to $11,800,000, with $11,760,000 expenses, while in 1909 revenue totaled $16,300,000, and expenses $16,100,000. It must be borne in mind that up to June 1, 1909, the coal department revenues and expenses both included the results of the operation of the Delaware & Hudson as a coal selling company as well as a coal producing company. During the whole of 1910 the D. & H. sold its coal at the pit's mouth to the Hudson Coal Company, controlled by the D. & H., or to other companies.

The increase in revenues of the railway department are due to a more prosperous year in the anthracite coal trade; 1909 was a bad year in this trade, and in consequence a comparatively small tonnage of coal was shipped over the D. & H. Last year the company earned $8,700,000 from coal freight traffic. This is an increase of $400,000 over the earnings from this traffic in 1909. Merchandise traffic, which furnished $8,100,000 revenue in 1910, showed an increase of $360,000 over 1909.

As was previously mentioned, operating expenses last year amounted to $12,200,000, which is an increase over 1909 of

$740,000; but out of this increase only $245,000 was increased cost of conducting transportation, while $223,000 was an increase in the cost of maintenance of way and structures and $245,000 an increase in the cost of maintenance of equipment. With the increases in wages that have been put in effect during the last year, this comparatively small increase in transportation expenses, taken in connection with the more liberal expenditures for upkeep of the property, makes a rather exceptionally good showing. After the payment of rentals, taxes and interest charges, the company had a net corporate income of $5,300,000 in 1910 as against $5,200,000 in 1909. This is 12.54 per cent. earned on the stock last year as against 12.22 per cent. earned on the stock outstanding in 1909. Nine per cent. dividends were declared from the earnings of last year, which were the same as declared from the earnings of 1909.

Of the total tonnage of freight—18,800,000 tons—carried in 1910, 64.79 per cent. was products of mines; anthracite coal alone furnishing 8,300,000 tons of traffic, and bituminous coal 2,100,000 tons. Manufactures are the next most important source of revenue tonnage, furnishing in 1910, 2,600,000 tons, or 13.89 per cent. of the total tonnage. The tonnage of products of mines was greater in 1910 than in 1909 by 1,000,000 tons, while the tonnage of manufactures was only very slightly more last year than the year before, and the tonnage of lumber, live stock and animal products, products of agriculture and merchandise was all less in 1910 than in 1909.

The total number of tons of revenue freight carried one mile in 1910 was 2,457,000,000, an increase over 1909 of 66,000,000 ton-miles. The revenue freight density was 2,900,000 tons per mile of road. The average haul per ton was 131 miles, which is slightly less than the average haul in 1909. The average amount received for each ton of freight was 88.647 cents, and the average receipt per ton per mile amounted to 6.8 mills. This is more than the average ton-mile rate of 1909 by one-tenth mill.

Train loading last year was considerably better than the year before. The average revenue train load in 1910 was 432.06 tons, an increase of 17.40 tons. There was on an average 18.10 loaded cars to each train and 7.68 empty cars. This is on an average of a little more than one loaded car more in a train in 1910 than in 1909, and a little less than one empty car less in a train last year than the year before.

The balance sheet of December 31 shows cash on hand amounting to $1,782,372, as against $1,850,765 cash on hand at the end of 1909. There was loans payable at the end of 1910 of $4,494,320, this account having been increased during the year by $169,320. Since the close of the fiscal year the company sold $7,000,000 first and refunding mortgage 4 per cent. bonds, and has paid off this entire loans and bills payable. The annual report says that in addition to the payment of this floating debt, the proceeds of the bond sale are to be used to acquire a branch line from Greenwich, N. Y., to Salem Junction, and to pay for expenditures for additions and betterments to the property, the total estimated cost being $2,208,640.

The following table compares the results of operation of the railway department and of the Delaware & Hudson Company for 1910 with the corresponding figures for 1909:

	1910.	1909.
Average mileage operated	843	843
Coal freight traffic revenue	$8,724,581	$8,311,479
Merchandise freight traffic revenue.	8,052,705	7,691,617
Passenger revenue	2,910,026	2,834,628
Total operating revenue	20,431,800	19,525,859
Maintenance of way and structures	1,557,913	1,334,546
Maintenance of equipment	2,842,069	2,598,566
Traffic	249,933	227,347
Transportation	7,066,049	6,821,392
Total operating expenses	12,198,287	11,458,480
Taxes	316,739	301,421
Net operating income	7,916,774	7,765,958
Gross corporate income	10,664,875	10,391,999
Net corporate income	5,330,189	5,194,840
Dividends	3,825,180	3,825,090

UNITED STATES STEEL CORPORATION.

THE sales and earnings of all companies of the United States Steel Corporation during the calendar year 1910 amounted to $703,960,000. This compares with total sales of $646,380,000 in 1909. Earnings, that is, the net figure after the payment of operating expenses, ordinary repairs and maintenance, and interest on fixed charges of subsidiary companies, totaled $141,000,000 in 1910 and $131,000,000 in 1909. In both years the earnings were about 20 per cent. of the gross business. Last year $22,140,000 was subtracted from earnings for depreciation and extraordinary replacement fund, and in 1909 $21,990,000. After the payment of interest on outstanding bonds of the Steel Corporation, and the deduction for replacement, etc., as above, there was a balance of $87,400,000 in 1910; and after the payment of 7 per cent. on the preferred and 5 per cent. on the common there was a surplus net income of $36,770,000. In 1909 but 4 per cent. dividends were paid by the common, and there was a surplus net income of $33,500,000. Last year there was set aside for new plants and construction $15,000,000, as against $10,000,000 the year before, and in addition there was specifically set aside for expenditures at Gary, Ind., $10,000,000, as against $5,000,000 the year before. The balance carried to profit and loss in 1910 was $10,770,000; in 1909, $15,320,000.

As is the case with the railways, the Steel Corporation's wage costs were considerably higher last year than the year before. The entire United States army is about 80,000 men. The average number of employees in the service of the United States Steel Corporation and subsidiaries during 1910 was 218,435, an increase of 11.7 per cent. over the 1909 average. The increase in the amount of the pay rolls in 1910 over the year before was 15.3 per cent. Judge Gary says: "A general increase was made during the year in the salaries and wages of a large portion of the employees of the subsidiary companies, such advances extending to about 83 per cent. of the total number of employees. Advances were made January 16, 1910, in the case of coke companies, and May 1, 1910, in the case of the other companies. The advances averaged, for all employees affected, an increase of 6.23 per cent. . . ."

Beside laying aside more for extraordinary repairs and replacements in 1910 than in 1909, more was spent for ordinary maintenance and repairs last year than the year before. The increase amounted to 20 per cent.

The iron ore mined last year totaled 25,250,000 tons, as against 23,430,000 tons in 1909. The coke manufactured was only slightly more in 1910 than in 1909, totaling last year 13,650,000 tons; while the coal mined amounted to 4,850,000 tons in 1910 and 3,090,000 tons in 1909. The tonnage of rolled and other finished steel products for sale was greater last year by about 1,000,000 tons than the year before, and amounted in 1910 to 10,700,000 tons. It is rather interesting to note that the production of steel car wheels, which is carried on principally by the Schoen Steel Wheel Company, amounted to 98,105 tons in 1910 as compared with 67,985 tons in 1909.

It is quite impossible to make a full analysis of the figures of such a company as the United States Steel Corporation in the space that can be devoted to it in these columns, but certain general lines of development of the company can be traced. For instance, the development of the export business is of very great importance. The aggregate tonnage of rolled steel and other finished products shipped to both domestic and export trade was 10,730,000 tons in 1910, an increase of 10.7 per cent. Of the total in 1910, 1,216,000 was for export. This is an increase of 21.5 per cent. over the export shipments of these products in 1909. The company shipped 6,680,000 barrels of cement in 1910, an increase of 17.4 per cent. over the cement shipments of 1909. The cement plant at Buffington, Ind., has been extended during the year and work on this plant will be completed some time during the summer of 1911. Originally the addition was to have produced 2,000,000 barrels of cement annually, but later it was decided to double the size of the extension and increase

the capacity to 4,000,000 barrels annually. When this extension is finished, the plant of the Universal Portland Cement Company will have a capacity of 40,000 barrels per working day, or a total of 12,000,000 annually.

Another development of the Steel Corporation that has been described and commented on quite fully at different times in these columns is the development of the Gary plant on Lake Michigan. The total expenditure for land development and construction work at Gary up to December 31, 1910, was $69,980,000. The output of the plant in 1910 was 729,072 tons of pig iron; 1,006,252 tons of open hearth ingots; 435,142 tons of open hearth rails, and 340,993 tons of shapes, merchant bars and miscellaneous steel products. To take care of the needs of the subsidiary companies in the Chicago district, a number of coal properties in Illinois and Indiana have been acquired. By the end of 1910 55,624 acres of coal rights and 742 acres of surface had been bought by the Steel Corporation, and the subsidiary company already owned 3,742 acres of coal; so that the total coal territory owned in the Illinois and Indiana fields amounts to 59,366 acres.

The voluntary accident relief plan, by which employees have the privilege of receiving a fixed percentage of their wages when injured, and also the old-age pension plan, have been previously described in these columns. Judge Gary says in regard to the accident relief plan that it has been well received by the employees, and it is considered entirely successful. During the year employees were given the chance to subscribe to preferred stock at 114, and common stock at 70. Subscriptions were received from 26,363 employees for an aggregate of 19,229 shares ($1,922,900 par value) of preferred, and 29,119 shares ($2,911,900 par value) of common.

The balance sheet of the company shows $56,950,000 cash on hand or subject to check, while total current liabilities amounted to $52,830,000. Inventories under current assets are valued at $176,500,000.

NEW BOOKS.

The How and Why of Freight Rates. A defense of American rate-making on value of service plan. By F. H. Plaisted, assistant general freight agent, Oregon Short Line, Salt Lake City, Utah; *The Desert News.* Second edition. 1,000 copies, $51; 5,000, $160.40; 50,000, $1,343.

Mr. Plaisted has had years of experience as a railway traffic officer. He has studied railway economics until he has become a master of the theory of railway freight rates as well as of the practice of making them. He also has a gift for writing clearly and interestingly. Possessing this combination of experience and ability, he has produced in The How and Why of Freight Rates a book which may without exaggeration be called the "Coin's Financial School" of the discussion of railway freight rate matters. The book consists chiefly of an imaginary colloquy between Mr. Shipper and Mr. Railroader, in which Mr. Shipper asks questions and Mr. Railroader answers them. This second edition contains a supplement consisting of some interesting correspondence between Mr. Shipper and Mr. Railroader. Mr. Railroader succeeds completely in vindicating the value of service method of making rates. No pamphlet better adapted to general circulation for the purpose of educating public sentiment regarding railway rates has been written.

Letters to the Editor.

PRESIDENT DELANO ON THE RAILWAY LABOR SITUATION.

Chicago, March 29, 1911.

To the Editor of the Railway Age Gazette:

The controversies and arbitrations about wages and conditions of employment that the railways of the United States have been going through recently afford some exceedingly interesting food for thought. They demonstrate to my mind that some different method of dealing with the question of the conditions of employment and wages of employees of public service corporations must be adopted.

The officials of the labor organizations are, as a whole, pretty able men, and men who realize to a considerable extent their moral responsibility; still they also realize that they cannot maintain their positions as leaders unless they accept the will of those who are in the position of leadership below them. There is a good deal of similarity in the position of the labor leader and that of the politician. Regardless of his own views, he must be a man of very extraordinary qualities of leadership to resist what is called "public opinion." And public opinion in the labor union, like public opinion of the *proletariat,* is largely a manufactured public opinion. The paid committeemen of the various organizations on the railways, like the walking delegates in the ordinary trade union, are men who hold their positions by convincing their constituents of their own importance.

From the standpoint of the railway executive, the situation is pretty bad. Railway labor organizations have a practical monopoly of the employees of the engine and train service. The railway manager recognizes that he will have scant sympathy from the public and little or no protection in case of a strike. There is no such thing as shutting down the factory and letting things "cool off" a little until the men come to their senses. The charter requirements of the railway, the necessities of the public, railway expenses for maintenance and fixed charges going on whether much business or no business is done, all require an immediate resumption of traffic. Under all the conditions, it seems to me the only thing a railway executive can do is to show firmness and patience. Even though he may realize that he has to yield in the end, there is a great deal to be gained by firm, courteous and patient consideration of every demand. When I say there is a great deal to be gained, I do not mean necessarily in concessions, but in compelling the members of the committees to understand the employers' point of view. Furthermore, firmness and patience will give the public time to get around to seeing that they are vitally interested in these questions. Even if it were possible for railway corporations, as it is in some cases with other employers, to advance wages and to put the resultant added expense upon the consumer, it would certainly be undesirable to do so; for I firmly believe that nothing is more important for American railways than to maintain their rates on as low a basis as the most efficient methods and a fair return for capital invested will permit. But at present the great public, upon whom the burden of increased wages and of strikes and lockouts must largely fall, takes only a small amount of interest and has, as a practical matter, little or no voice in the settlement.

Most enlightened people concede that arbitration is far better than actual hand-to-hand conflict. The whole judicial system of civilized nations is built upon this theory; but the arbitration of labor disputes is a comparatively new thing and, as thus far worked out in this country, is unsatisfactory both to the employer and to the employee. I think this is due largely to the prevailing method employed. Instead of arbitration of disputes by a standing court which, by reason of experience and special training, is well fitted to settle such matters, in labor disputes the arbitrating body is selected on the spur of the moment when feeling is running high, with one man representing and advocating one side of the controversy; with another man representing and advocating the other side; and with a third man chosen by the other two representatives, on account of his known or supposed neutrality—or chosen by the court for the same reason—and he is the man who finally has to decide. In the nature of things, these arbitrations have proved to be compromises which rarely go deeply into the matter of the principle involved. Unlike decisions of a court, they furnish no useful precedent for future action, and are of practically no educational value.

As a matter of fact, the decision of these questions involves a great deal of special study. The man or men who should decide them should be largely freed from other responsibilities and

chosen for a reasonably long term. A single able man, as has been demonstrated in the experience of Canada, giving his whole time and thought to the adjustment of controversies between employers and employed, can do an immense amount of good; and where a law exists, such as the Lemieux act of Canada, which provides for mediation and uses the authority of the government to compel both sides to a dispute to desist from open hostilities until the matter has been fully ventilated and carefully investigated, it is an excellent thing. The element of time is in itself of great importance.

My opinion is that in the forming of a court there is a great deal to be said in favor of having an even-numbered court. It seems to me that the tendency of an odd-numbered court is to throw the responsibility entirely on one man; and it was this which our forefathers must have had in mind when they made the jury twelve men. An even-numbered jury or court is more likely to consider the matter in an entirely judicial way than an odd-numbered body—or, at least, so it seems to me—and the fact that a decision carries with it a majority of two is better than having a decision by only one majority.

Of course, in labor disputes that would mean that in some cases there would be a deadlock and no decision arrived at, and in this event the *status quo ante* would have to be maintained. But isn't this a protection to which the public is entitled? A fine example of an arbitration by an even-numbered board is the Alaskan boundary dispute which was decided by a court of six men and a decision rendered four to two in favor of most of the American contentions.

I feel the greatest sympathy and have the greatest consideration for the laboring man. I do not find fault with him for having his labor unions or for trying to get all he can. At the same time there must not be any foolish sentimentality in considering these problems. It is not to be expected that the laboring man, rank-and-file, is any less selfish than men in other walks of life; and even if this were so, it seems very clear to me that the position of the labor leader or the paid committee man compels him to adopt a purely selfish attitude. He is chosen for his position as a paid advocate of favorable labor legislation, increased pay, better working conditions, and reduced hours of labor; and his ability to retain this position depends wholly on his success in accomplishing these things.

Can the public leave this immense force entirely without an acknowledged responsibility to the public, especially considering the fact that public opinion has, little by little, taken away from the employers the weapons of defense which they used to have? Take it at the present time in the United States: Every employer of labor connected with public service corporations is compelled to show his exact financial status and is compelled by charter requirements, as well as by state and federal laws, to render certain specified service. How is it with the labor organization? No public statements of their financial conditions or the earnings of their organizations are required. We know in a general way, from hearsay, that some of these organizations have become very powerful and have accumulated large funds. We know that they are able to keep in their exclusive employ able leaders, good counsel, and a great multitude of paid committeemen. It is very evident that they have great power and very little real responsibility to the community at large, and while, in all fairness, it must be admitted that the time was when the conditions were reversed and the employer exercised an excessive authority with too little responsibility, a medial position between these extremes must now be sought. We have seen the pendulum swing from the extreme of one side to the extreme of the opposite position; but the time is not far distant when the public will recognize the importance of having a voice in settling these great labor disputes, because it is the public, after all, who must pay the bill, either in the form of higher rates and higher prices, or by submitting to a poorer quality of service.

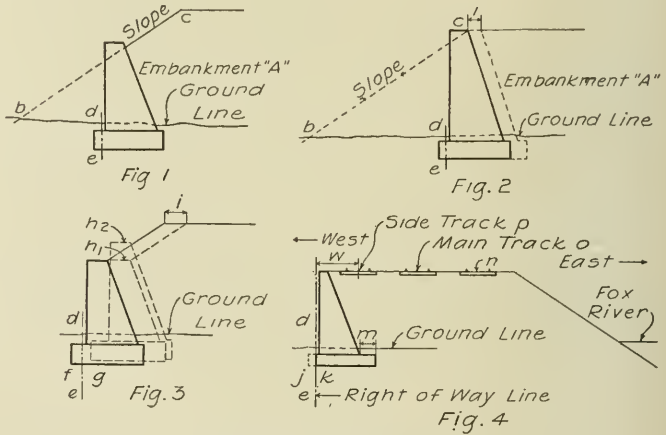
FREDERIC A. DELANO,
President, Wabash Railroad.

RETAINING WALL FOR THE MILWAUKEE AT ELGIN.

BY J. H. PRIOR,
Assistant Engineer, C. M. & St. P.

The Chicago, Milwaukee & St. Paul has just completed, at Elgin, Ill., the construction of a long retaining wall of somewhat unusual design. This wall was designed and constructed under the direction of C. F. Loweth, chief engineer, and the circumstances which led to the selection of this particular type are described below:

A retaining wall can be usually described as a structure such as is shown in Fig. 1 and Fig. 2, which prevents the embankment "A" from spilling forward to whatever point "b" at which the natural slope, "b-c," intersects the ground line. Where it is necessary to build a retaining wall to keep the embankment from encroaching on the ground to the left of the line "d-e," it will also be often necessary to keep the footings from encroaching on the land to the left of the same line, especially in centers of population or industry, where land values are high.



Embankment Conditions.

Where the embankment which the retaining wall restrains is surcharged, as shown in Fig. 1, the location of the toe of the footing of the retaining wall can be moved from the point "f" to the point "g," Fig. 3. The toe of the footing, having been thus moved so as to be entirely on the land of its owner, the designer has the choice of building the wall the height of "h-1," and losing the use of the land of the width "i," or of building the wall to the height of "h-2," and obtaining the use of the land "i," the value of the land represented by the dimension "i" being compared with the additional cost of the retaining wall "h-2" over the retaining wall "h-1," in making a decision.

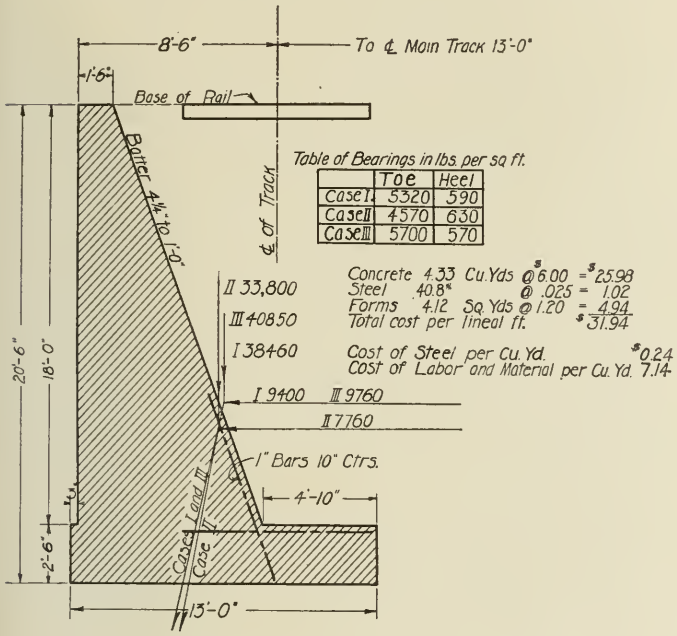
If, however, the top of the embankment is flat, as shown in Fig. 2 and Fig. 4, and it is required that the footings should not project beyond the line "d-e," the full use of the right of way can only be obtained by removing in the design the front projection of the footing, "j-k" in Fig. 4, and by extending the footing beyond the rear of the wall whatever distance "n" is required to give a stable retaining wall of plain concrete, or else by using some special design in reinforced concrete.

The situation represented by Figs. 2 and 4 recurs often enough in railway work to give the matter considerable general importance, especially where the allowable bearing of the toe of the footing upon the foundation is low. The same circumstances which make it necessary to build a retaining wall to keep the railway company's embankment within its own right of way tend to make it also necessary to keep the footings of the retaining wall itself within the railway company's right of way.

Such a situation occurs at Elgin, as shown in Fig. 4; the right of way of the railway company at this point occupies

a narrow strip of the west bank of the Fox river. The ground to the left of the line "d-e" is occupied by a row of mills and factories which abut on the right of way line, and so the footing could not project to the left of that line. The wall could not be moved to the right, as shown in Fig. 2, in order to keep the footings from projecting beyond the right of way line, as it was necessary to maintain the present distance "w" of the side-track "p" from the right of way line "d-e," the distance "w" being determined by the use made of the side-track "p." Test pits showed the allowable bearing on foundation to be about two tons. Piles could not be driven, as their driving would interrupt the use of the sidetrack and disturb the foundations of the adjoining buildings.

To meet the above conditions, all the following types, shown



TYPE "A" FIG. 5

Plain Gravity Wall.

in Figs. 5 to 9, inclusive, were designed. The five different types are roughly as follows:

Type "A," Fig. 5, plain gravity wall with footing projecting on the rear of the wall.

Type "B," Fig. 6, reinforced retaining wall, cantilever type.

Type "C," Fig. 7, reinforced wall, buttress type.

Type "D," Fig. 8, cellular retaining wall filled with earth.

Type "E," Fig. 9, a longitudinal wall "t" supported on the outside by buttress "u" with slabs "v" on top, the whole forming a hollow retaining wall.

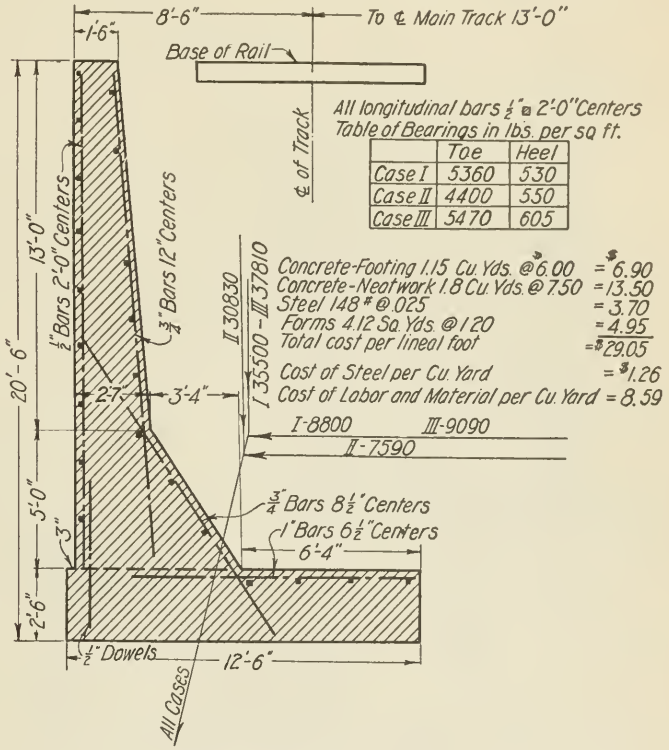
Each of the above walls was investigated for three conditions of loading, namely:

Case I. Live load on sidetrack "P" only.

Case II. Live load on main track "O" only.

Case III. Live load on both tracks.

The type "A," plain concrete retaining wall, requires no explanation. The drawing shows that the differences which are developed between the loading of Case I and Case III are so small for this design that they could have been neglected. The different cases of loading are retained, however, both to show the slight difference which exists between them and to show the same information throughout all designs, instead of omitting information which proved unimportant as the design was worked up. This design has a maximum bearing on the toe of footing of 5,700 lbs. per sq. ft., and its cost per lineal foot of wall is $31.94. Notice that this cost covers only the items tabulated, and does not include such special items as excavation, falsework, etc., since they are subject to such wide variations that it was thought best to omit them in this comparison, as their insertion would introduce a large amount of guesswork. The items shown are those which must be taken account of in

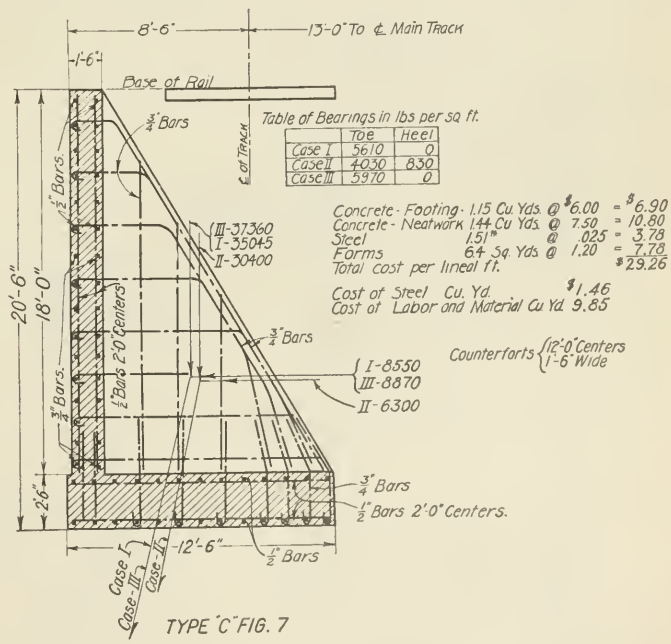


TYPE "B" FIG. 6.

Cantilever Type Reinforced Wall.

every situation, and the reader is left to add whatever special items are required to cover conditions in other places.

The unit prices of concrete per cubic yard, steel per pound in place, forms per square yard, which were selected, were



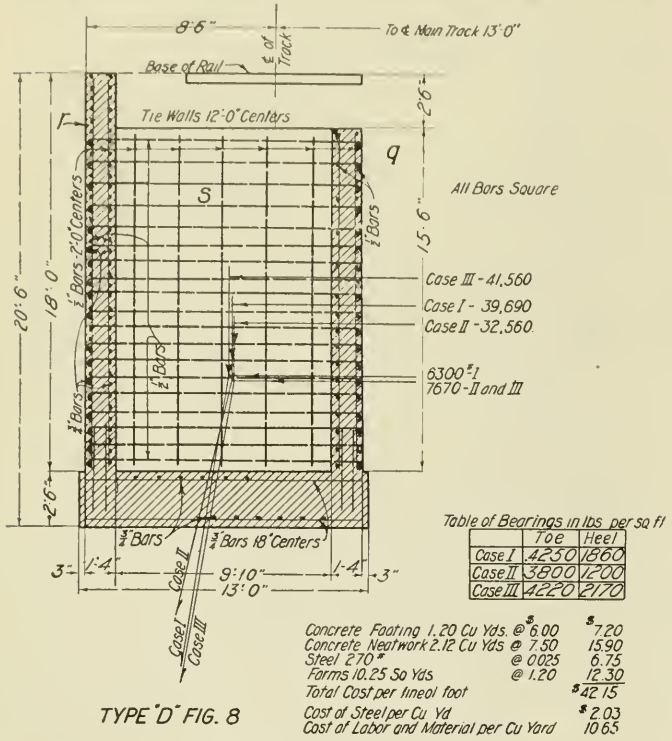
TYPE "C" FIG. 7

Buttress Type Reinforced Wall.

given values which would make them as general as possible. The quantities being given, other unit prices can be substituted by the reader, if he desires. The maximum bearing of

5,700 lbs. on the toe of footing was greater than the foundation would carry, causing the rejection of design "A."

All the essentials of the type "B," cantilever retaining wall, reinforced concrete, are shown in the drawing. This wall has a bearing at toe of footing of 5,470 lbs., and cost $29 per lineal foot; it was found unsuited for the situation for the same reason as type "A:" excessive bearing on toe of footing.



TYPE "D" FIG. 8

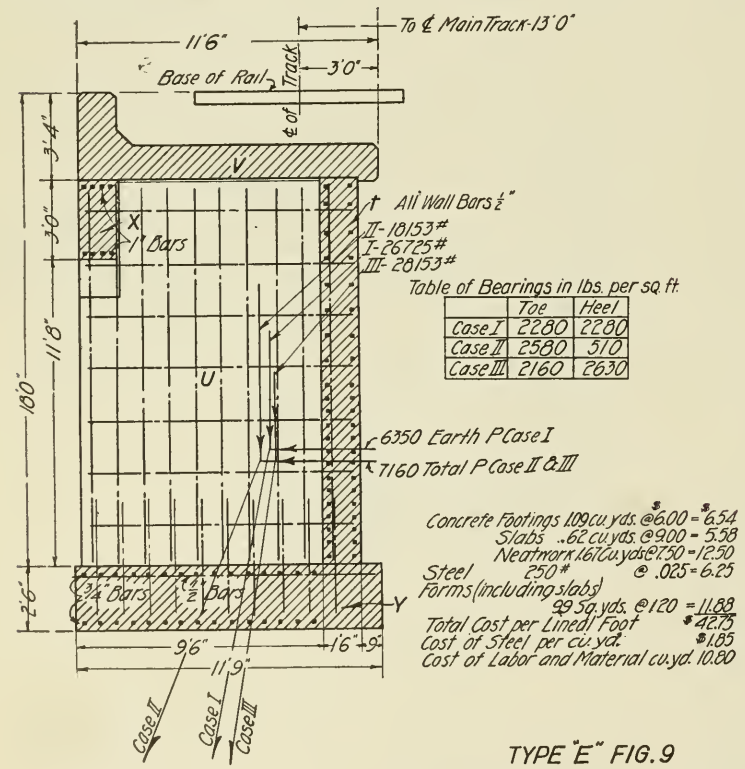
Cellular Retaining Wall.

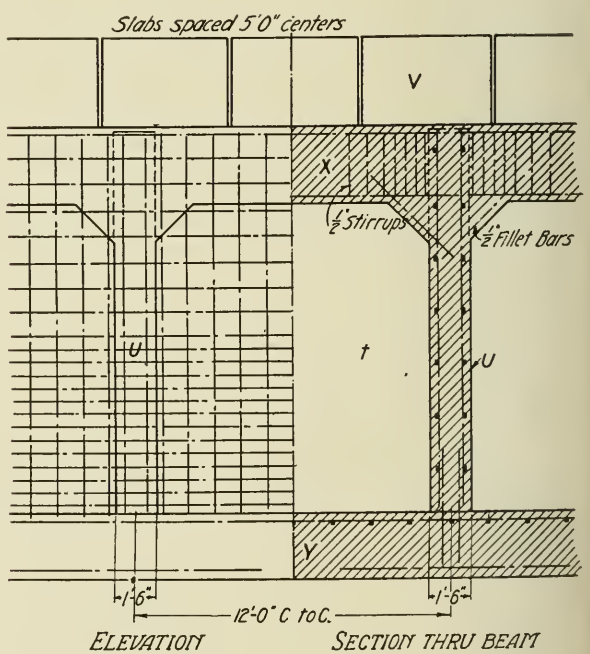
The type "C," buttressed retaining wall, reinforced concrete, is the ordinary buttressed retaining wall. The bearing on toe wall was 5,970 lbs. per sq. ft., and the cost per lineal foot, $29.26. It was rejected for the same reason as the types before.

The type "D," cellular retaining wall filled with earth, is formed of two longitudinal curtain walls "q" and "r," connected by transverse diaphragms "S." The vertical space between the parallel longitudinal walls "q" and "r" and the transverse diaphragms "s" is filled with earth. The maximum pressure on toe of footing for this type is 4,250 lbs. Its cost per lineal foot is $42.15. The design was also rejected on account of high pressure on toe of footing.

The type "E," design of W. S. Lacher, which is a new type in reinforced concrete, as far as the knowledge of the writer goes, is an old type in stone masonry, having been illustrated in Benjamin Baker's Actual Lateral Pressure of Earthwork (see pages 67 and 69, The Actual Lateral Pressure of Earthwork, Benjamin Baker; D. Van Nostrand, New York, 1881) 30 years ago. The wall called type "E" consists of a footing "y," which supports as longitudinal wall "t" and the cross walls "u." The cross walls "u," which are spaced about 12 ft. on centers, connect at one end to the longitudinal wall "t" and at the other end support the girder which spans from one cross wall to another. Above the girder, the slabs "v" are supported at one end by the girder and at the other by the longitudinal wall "t." The drawings show the design in sufficient detail. It will be noticed in this design the maximum pressure on the toe of footing is only 2,580 lbs., which is only 61 per cent. of the next lowest bearing, type "D," and 43 per cent. of the highest bearing, type "C." The cost per lineal foot of this wall is $42.75. As this cost is greater than that of any other type, this design is only suitable to the situations described in the opening paragraphs, namely: where the retaining wall must give full use of the right of way, and have low bearings on the toe of the footing. As this was the situation at Elgin, the design type "E" was adopted and built.

In the retaining wall type "E" the greatest reduction in toe pressure is brought about by eliminating the weight of the earth directly above the footings, the space between the sidewalls "u" being an open and empty space in this design. As the vertical loads on the footings are thus diminished and as the horizontal loads are not much altered, the inclination of the resultant of the vertical and horizontal loads is increased. In





TYPE "E" FIG. 9

Hollow Retaining Wall; Chicago, Milwaukee & St. Paul.

the resultant, marked Case II, Fig. 9, the ratio of the horizontal to the vertical components is .41, and as this ratio of .41 might exceed the co-efficient of friction of the wall on a slippery foundation, this wall is somewhat unstable if built on such a foundation, and its tendency to slide is the principal weakness in the design. This weakness, of course, is partly remedied by the depth and compactness of the back filling in front of the wall.

In making these comparisons, it was not thought practical to find the cost of the walls of different types having exactly the same toe pressure, but, instead, each type was proportioned in the manner which it was thought would show it in the most favorable way as a whole.

INDIANA RAILWAY LAWS OF 1911.

The law requiring the use of the block system after the first of next January and giving the railway commission extensive powers in this matter has already been noticed in the *Railway Age Gazette*. Following is a list of other railway laws passed:

The caboose law requires eight-wheel cabooses 24 ft. long, exclusive of the platforms, by June 1, 1914, but the commission may grant extensions of time. Cabooses sent to the shops after April 1, 1911, for general repairs must be remodeled to conform to the law. In the case of unusual demands of traffic, the commission may give temporary permission to use cabooses not conforming to the law. The commission is directed to investigate at once the condition of cabooses now in use in the state. The law contains a long list of details of construction.

Senate bill 207 regulates signs at public highway crossings. These signs must bear the word "danger," and where there are two railways, the word "two" must appear prominently on the sign.

The "depot law" requires a new building to be put up within six months if an existing building is destroyed, and forbids the use of box cars "for depot purposes" for a longer time than six months; but the commission may extend the time.

House bill 170 requires railway officers to give "character" letters to employees leaving the service, and such employees must be paid their wages within three days after leaving.

Senate bill 44 makes railways responsible for fires set by their locomotives. The railway may procure insurance on property along its line.

Senate bill 275 forbids any railway to permit any section foreman to put his men to work on track outside of yard limits, unless two of the men in his gang are competent flag men.

Senate bill 365 provides for the condemnation of land for the widening of a railway.

Senate bill 251 requiring Interurban lines to maintain suitable waiting rooms, with separate water closets for men and women, is made to apply to all cities having a population of 4,800 or over.

Senate bill 272 allows car trust agreements to run for 15 years instead of 10 years as formerly.

Senate bill 328 requires storm windows on the cabs of locomotives. This law requires the windows to be so equipped and adjusted that the man in the cab can see through them *when open*, under all climatic conditions; but as mention is made also of trouble from rain, snow or ice adhering to the windows it seems likely that what the law really aims to do is to provide a double window, with a hot air connection to melt ice in cold weather.

Senate bill 217 amends slightly the law of 1907 requiring automatic bell ringers.

Senate bill 113 creates the office of locomotive inspector with a salary of $2,000 a year, the inspector to look after defective boilers. This law contains a long list of details. Enginemen and firemen who report defects and do not get them remedied shall then report to the railway commission. This act, like all of the laws mentioned in the foregoing paragraphs, contains a clause imposing penalties, but this one differs from the rest in making the penalty apply to any director, manager or superintendent.

House bill 32 requires mixed trains on certain classes of roads to proceed to the station and discharge passengers before attending to freight, unless the train arrives ahead of schedule. If the company lands the passengers at the station by the time they are due, that is sufficient.

Senate bill 195 modifies the law regulating the running of street cars across steam railway tracks. The conductor, in going ahead to look for a clear road must watch for trains (with no exception) and look not simply for trains which are in sight. This crossing law does not apply to tracks leading to industries, etc., provided these tracks have gates or other protection approved by the railway commission. A section of the law forbids making false reports that no car is approaching. Section 670 makes this law apply to enginemen, conductors and brakemen of trains on steam railways.

Senate bill 385 amends the safety appliance laws. Seventy-five per cent. of the cars in every train on a steam road, and 50 per cent. in the trains on interurban lines must have "approved" hand-brakes in addition to the power brakes already required. The hand-brakes must be kept at all times of sufficient capacity to control the speed of the train.

House bill 6 requires four trains to be stopped each way daily at county seats of 10,000 or more population, except where there is interurban service which accommodates the public. This bill was passed for the specific purpose of compelling the Wabash to stop its afternoon trains at Williamsport for passengers.

House bill 359 amends the law requiring the use of switch lights by requiring such lights to be maintained close to every main track derail.

Senate bill 70 requires a full crew on switching engines on all lines having 25 miles or more of track. The foreman must have two helpers, and he and one of the helpers must have had at least one year's experience as conductor or brakeman.

Senate bill 209 authorizes a railway with a terminus near the state line to acquire stock in a terminal company organized in the adjacent state.

Senate bill 299 regulates the arrangement of electric light and other wire lines which may be strung across a railway.

Senate bill 208 amends the railway commission act so as to require accidents to be reported to the commission by telegraph or telephone. Heretofore, these reports were accepted at any time within five days after the accident.

Senate bill 213 amends three sections of the railway law passed in 1907, and enlarges the authority of the commission to secure evidence.

House bill 279 enlarges the power of the commission to correct unjust transportation rates, and the law limiting to two years the time during which an order of the commission shall be in force is cut out. Heretofore the commission has only had power to recommend new rates and to proceed in the court to enforce them; the new law seems to be designed to give the commission powers similar to those exercised by the Interstate Commerce Commission.

House bill 292 empowers the commission to suspend new rates 30 days, and, if necessary for investigation, 60 days; and the law puts on the carrier the burden of proving that an increased rate will be just.

Two employer's liability bills are drawn in drastic terms, and the Indiana Manufacturers' Bureau is preparing a criticism of them, which will be published.

The Japanese government proposes the construction of various narrow-gage railways in rural districts with an aggregate length of approximately 150 miles. The consent of the Japanese parliament for the construction of these railways has already been given, so the work will probably be taken in hand without delay.

SOUTHERN PACIFIC THROUGH-TRAIN CHART.

The chart shown on the opposite page is a facsimile, reduced about one-half, of one prepared by G. F. Richardson, superintendent of transportation of the Southern Pacific, at San Francisco, for the convenience of those officers of the road who have occasion to make frequent reference to the schedules and connections of the principal through trains. The chart has no scale and is only approximately correct geographically; but, as will be readily understood by any one who has memorized a general idea of the location of the different Southern Pacific lines, this is not a fault. To sit in San Francisco and keep a good mental grasp on this one feature of the Southern Pacific's business one would find it necessary, no doubt, to distort his geography quite materially. Only thus can the image in the mind's eye be brought within the ordinary man's—or any man's—capacity.

TRAIN ACCIDENTS IN FEBRUARY.*

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of February, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
3.	C., C., C. & St. L....	Fern Bank.	xc.	F. & F.	1	2
*7.	Grand Trunk	Gorham, N. H.	rc.	F. & F.	1	0
8.	Southern	McDonald.	rc.	P. & F.	0	10
17.	C., C., C. & St. L....	Springf'd, Ohio.	xc.	P. & F.	0	0
27.	N. Y., N. H. & H...	Putnam.	xc.	P. & F.	0	3

Derailments.

Date.	Road.	Place.	Cause of derailmt.	Kind of Train.	Kil'd.	Inj'd.
†4.	Boston & M.....	E. Jaffrey.	unx.	P.	1	3
5,	St. Louis & S. F.....	Nettleton, Miss.	unx.	P.	0	3
8.	Southern	Chattanooga.	unx.	P.	0	3
13.	Southern Pac.....	Martinez.	d. track.	P.	0	5
16.	Atlantic C. L.....	Clopton, Va.	ms.	P.	0	2
18.	Phila. & R'd'g.....	Lofty.	malice.	P.	1	0
20.	Balt. & Ohio.....	Randolph.	boiler.	F.	3	3
20.	Southern Pac.....	Palisade.	b. rail.	P.	..	20
20.	Kanawha & M.....	Charleston.	unx.	P.	0	12
†20.	Atchison, T. & S. F..	Stillwater.	d. track.	P.	3	10
22.	Atchison, T. & S. F..	Garcia, N. M.	unx.	P.	0	15
26.	El Paso & S. W.....	Pastura.	unx.	P.	0	4
†27.	Chi., R. I. & P.....	Jennings. Kan.	unx.	P.	1	..

The derailment at Lofty, Pa., on the 18th occurred at a switch which had been blocked with a piece of iron so that the wheels of the engine could not pass over it safely. The engine was overturned and fell down a bank and the engineman was killed. In the derailment at Palisade, Nev., on the 20th the engine and first two cars passed over the broken rail in safety, but all of the coaches but one were thrown off the track, and three of them fell down a bank 30 ft. high. It was reported that the injuries of several of the 20 passengers who went down in these cars would prove fatal.

At Smithville, Texas, on the 8th, there was a boiler explosion (not a train accident), in which, according to reports, 10 employees of the Missouri, Kansas & Texas were killed and 7 others injured. The boiler was that of a locomotive which had just come out of the repair shop. The roundhouse was badly damaged.

In a butting collision between a passenger train and a freight engine on the Grand Trunk near Paris, Ont., on the 4th, five persons were killed and one seriously injured. Both engines were demolished and the wreck, which quickly took fire, was mostly burnt up. An express messenger pinned under the wreckage and badly injured, finding that he could not be rescued from the flames, is said to have killed himself with a pistol. The cause of this collision was the forgetfulness of the engineman of the freight train. At the coroner's inquest he said that the annoyances attendant upon difficulties with his engine, which was a new one, had so absorbed his mind that he forgot the schedule of the passenger train.

Of the nine electric car accidents reported as having occurred in the United States in the month of February, one, a derailment at an open draw-bridge at Sheboygan, Wis., resulted in the death of five persons, three of whom were drowned.

* Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

ROCK ISLAND PREMIUMS FOR EFFICIENCY OF ROADMASTERS AND SECTION FOREMEN.

Announcement has been made from the second vice-president's office of the Rock Island Lines that beginning with the calendar year premiums will be awarded to roadmasters and section foremen on certain main line districts and sections in order to stimulate and reward individual effort and efficiency. The roadmaster of the sub-division on a division or group of divisions whose sub-division shows the greatest improvement in condition during the year will be given a premium of $100, while a premium of $50 will be given the foreman of the section of each roadmaster's sub-division whose section shows the greatest improvement. The award of premiums will be based upon the improvement in condition of the following points:

1. Line and surface, maximum value of 65 marks.
2. Ditches, drainage and roadbed, maximum value of 15 marks.
3. Frogs, switches and joints, maximum value of 10 marks.
4. Spacing ties, maximum value of 5 marks.
5. Right of way, fences and station grounds, maximum value of 5 marks.

The inspection and award will be made by three committees, one for each general manager's district. These committees will be composed of the engineer of maintenance of way and four superintendents. Two inspections will be made annually, one before the season for track work opens, and the second at its close. In measuring the improvements due regard will be given to the force allowed, the material furnished and the weather conditions obtaining during the period under consideration.

This plan will be put into operation at once on fifteen different groups of sub-divisions, and will be extended to other parts of the system as fast as conditions warrant.

A new route is projected for the Midland Railway, Eng., involving the construction of a line through Bradford which would give a shorter and more convenient route for the traffic on the main line going north. At present the main line runs through Leeds. Parliament has already granted powers to the company to construct a line from Royston Junction to the main line near Bradford, *via* Dewsbury. At Bradford it was to run through a tunnel under the center of the city. The company has now abandoned this scheme, but under the powers conferred by the previous bill it has already built a line to Thorn Hill. It now proposes to connect that line with the Lancashire and Yorkshire system, and to run over that company's line to Oakenshaw, from which place a new line would be built by the Midland company in such a manner that instead of tunneling under Bradford the railway would be carried across the city by a viaduct. The existing station at Bradford would be converted into a two-deck station, the new line, of course, running on the higher level. The company considered that this new route would be much more convenient and shorter for the Scotch traffic than the existing route through Leeds.

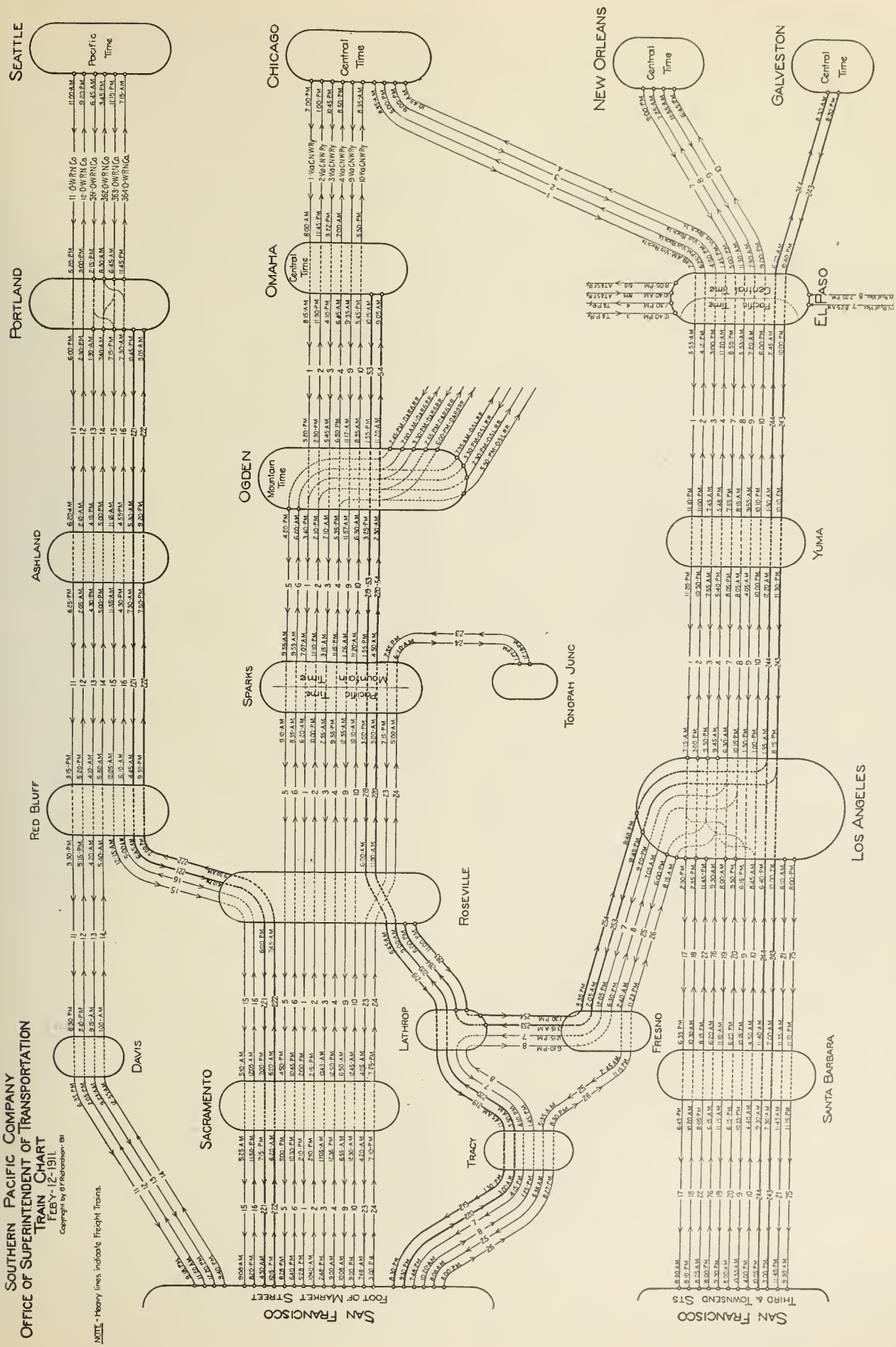


Chart of Through Trains; Southern Pacific Company.

NEW RAILWAY LAWS IN CALIFORNIA.

The 39th legislature of California, recently adjourned, was favored by its members during a session of 85 days with 2,876 bills. Close to 800 passed both houses, and about 225 were signed by the governor; and there were also 105 constitutional amendments presented, 13 being adopted by both houses. These latter go to the people for ratification at a special election to be held Oct. 10 next. Seven bills and six constitutional amendments affect railways, as follows:

Boynton bill; required "full crews" on roads running four or more trains each way each 24 hours. On passenger trains there must be a conductor, an engineer, a brakeman and a baggageman; and if more than four coaches, there must be two brakemen. On freight trains of fifty cars or less the same crew, minus baggageman, and with two brakemen; on more than fifty cars, three brakemen.

Boynton bill; provides that personal injury suits shall be tried in the county in which injury occurred.

Roseberry bill; provides for the creation of an industrial accident board, abolishing the "assumption of risk" and "fellow servant" pleas as grounds for defense; allowing indemnity equal to 65 per cent. of average wages. Employers are given option of liability or of coming under terms of bill.

Kehoe bill; adopts the federal statute in regard to liability of common carriers to employees in personal injury cases. It is identical with the federal law covering liability of interstate carriers. It abolishes the three defenses—assumption of risk, fellow-servant plea and contributory negligence. It is more stringent than the Roseberry employers' liability bill.

Williams bill; provides for the limiting of labor of trainmen and train telegraphers to sixteen hours per day.

Beatty bill; provides that railways shall not discriminate against commercial travelers' sample trunks or catalogs in baggage allowance.

Thompson bill; makes the penalty for wrecking trains life imprisonment instead of death, as heretofore.

Constitutional Amendments

1.—Enlarging the constitutional definition of eminent domain, so that logging railways are included as common carriers.

2.—Giving the state railroad commission control over all public utilities, with power to regulate and establish rates; declaring the right of the legislature to confer powers upon the railroad commission respecting public utilities to be plenary, and to be unlimited by any provision of the constitution. It is provided that the amendment shall not affect such powers of control over any public utility, vested in any city, county or incorporated town as, at the time of the special election, a majority of the electors of any such municipality or county shall vote to retain.

3.—Increasing the number of railroad commissioners from three to five; these to be appointed at large by the governor for terms of six years (instead of elective, as now), the legislature having the power to divide the State into districts for such appointment. The amendment also gives the commission plenary power over all transportation companies.

4.—Commission to have the power to require one railway company to switch to private tracks of shippers upon its own line, the cars of a connecting railway, and to regulate compensation for such service.

5.—Prohibiting advances in rates without permission of commission; prohibiting discrimination and providing that except by commission's permission the charge for a long haul shall not exceed the charge for the aggregate short hauls over the same distance; further that the commission may authorize a lesser charge for a long than for a shorter haul. This power to fix absolute rates is not to be subject to review by the courts, except on a question of confiscation.

6.—The list of persons who may be granted passes is enlarged to include traveling secretaries of Y. M. C. A.'s, and executive officers of mercantile organizations traveling for the advancement of trade or development of industry.

7.—Stockholders of newspapers, wives and children of owners, stockholders or employes, officers of railway men's religious associations, officers of mutual fire insurance companies and agents of season resort hotels may use passes.

All these amendments will be presented to the people at a special election.

COMMISSIONER LANE'S OPINION IN THE RATE CASE.

BY A RAILWAY PRESIDENT.

The opening paragraphs are devoted to showing the assumed duties of the commission and its construction of the "burden of proof" as defined by the law.

The opinion then proceeds to review the position of the carriers and states this to be primarily that "we need the money"; that the effort of the carriers was wholly directed to the effort of securing from the commission a commitment to a "policy which should give the carriers a loose rein."

As to this it may be said that the needs of the carriers for money were, while very real, only incidental to their case, which was mainly that existing rates were too low per se, judged by any known standard of reasonableness.

The opinion says that the government has not undertaken to become the directing mind in railway management, and the commission cannot control expenditures, or direct improvements, or enforce economies. This is a half-truth only. The commission has forced on the railways large expenditures, as well as methods, which in many cases do not commend themselves to railway experts as being necessary, or desirable, or economical, and has constantly reduced their revenues.

The opinion then proceeds to deal specifically with the case made by the Atchison company. It says that President Ripley of the Atchison admitted that operating railways without regulation had not resulted in proper earnings and claimed that under government regulation rates should be put on a paying basis; that the railways had conducted a literary campaign to create the impression that regulation had been injurious, and that it is unreasonable to cry out against regulation and yet ask for benefits which admittedly are not and could not be won in the open field of competition.

Here is another half-truth which tends to create a wholly false impression. Mr. Ripley said that rates were too low. He was not asked *why*, or he would no doubt have stated that it was because of the prohibition of legal and binding agreements between the carriers which is a part of our scheme of legal regulation and which renders it possible for powerful combinations or individuals to work upon the least responsible among the carriers and renders it impossible for the latter to resist. The commission itself is not responsible for this condition, having on various occasions protested against it, yet this absurd application of the Sherman law still prevails and cannot be regarded other than as a part of the plan of regulation which the commission denominates as so beneficent. The "literary campaign" referred to consisted simply of an effort to get the facts in the case before the people—an effort doubtless reprehensible, but made necessary because the statistics published by the commission have been generally incomplete and misleading.

Continuing, the opinion, after saying that the "investment" in American roads is not represented by their capitalization—at the time the carriers were taking action to obtain these advances they were filing annual statements showing that they had never before prospered as a whole as they did in 1910, and quoting from the London *Statist* on the stability of railway securities—refers to the "awkward dilemma" of the American railway man who demands higher rates in order to sustain his credit while his English stockholders demand larger dividends because of increasing profits. To all of this it may be replied that the advances were asked for the present and future and not for the

past; that the railway men saw clearly what was in front of them, which was certain depletion of revenue and that it is small consolation to be told of former prosperity in the face of their belief that it has gone.

Proceeding, the opinion gives various figures showing the past prosperity of certain western roads and the increases in the gross amount of dividends between 1901 and 1910 (without mention, however, of the increase in mileage or investment), and quotes as illustrating the policy that has been pursued, Mr. Ripley's testimony to the effect that he had relined with concrete a tunnel at an expense of $700,000, all of which had been charged to operating expenses in one year. It also states that the Atchison on a "capitalization of $84,000 per mile had earned 4 per cent. on $44,000 per mile of bonds, 5 per cent. on $20,000 of preferred stock and 9 per cent. on $20,000 of common stock." The opinion overstates the Atchison capitalization by about 50 per cent., for which there would seem to be no reasonable excuse, as the commission's own statistics, if properly kept, would refute the statement. As to the relining of the tunnel, it transpired later in the evidence that Mr. Ripley, speaking from memory, had overstated the amount of the charge; also that a portion of its cost had been actually charged to capital account. But it is questionable if such a charge is proper. The tunnel was originally lined with wood, but it proved to be not strong enough and it became necessary to substitute concrete. This added nothing to earnings and probably would not save enough in operating expenses to pay interest on its cost. Why, then, should it not be treated as an operating charge?

The opinion then proceeds to discuss the question of the credit of the roads and seems to find that because large amounts have been borrowed in the past it will be equally easy to borrow in the future. It is a novel theory that the credit of a commercial concern increases with its debt and that the more it has borrowed the more it may borrow. At first blush (if not later, also), the contrary would seem to be the case.

In dealing generally with questions of capital and surplus the opinion says that the six typical western roads increased their surplus from $108,000,000 in 1901 to $242,000,000 in 1910; that there is merit in the argument for the accumulation of a surplus which shall be in a sense a public fund out of which the carrier may draw to create facilities for better service; that rates cannot be increased with each new demand of labor or decreased with each improvement in method, and that society should not take from the wisely managed road the benefits of foresight, skill and organization; that it is doubted if there can be applied a plan of automatically increasing capitalization as rates decrease; that one of the problems of the future is to discover a method whereby the roads may receive adequate return on investment and share with the public the advantages of the surplus; that this cannot be done by the commission undertaking to favor a certain return on the investment and additional return to go into surplus and remain uncapitalized, because the commission has no control over capitalization.

It is mentioned that Mr. Ripley advocated a return of 6 per cent. on stock and a like amount for uncapitalized surplus, but that this dostrine would be quite impracticable because of the divergent methods of capitalization as between stocks and bonds.

Continuing, the commission denies that established carriers should be permitted to amass surpluses so as to bolster their credit and thus be able to extend their lines into territory now insufficiently supplied, and says that this policy tends to create a monopoly of new construction in favor of the stronger lines and that it is doubtful if burdens should be laid on the shipper for that purpose; but that a railway is justified in maintaining a surplus for the meeting of obsolescence and to pay for those facilities which cannot be made to pay any return on the investment; and says this is as broad a definition of legitimate surplus as is required "when we consider that the maintenance accounts of these carriers practically rebuild the roads every ten years." The commission finally sums up by saying that the roads say they need more money, but fail to show that their credit is not good; that they have been unable to secure more money on current rates, or that they cannot make needed extensions or improvements because of lack of faith in their solvency on the part of the investing public.

To all of which it is replied:

That the increased "surplus" of the "six typical western roads" (why typical, and why were only the most successful taken for illustration?) has practically all been put into property mainly for betterment and mainly without adding anything to the capitalization and is in reality a "surplus" only in a book-keeping sense; that while it may be true that "rates cannot be increased with every demand of labor" or "decreased with each improvement in method" the whole history of the commission is one of arbitrarily decreasing rates based on the assumption that the carriers were able to afford it; and that it is a poor rule that does not work both ways.

It is agreed that one of the problems of the future is how the roads may receive adequate returns on investment and share with the general public the advantages of the surplus; that is what the roads want and what we think they have been according.

Mr. Ripley said he thought Atchison ought to be permitted to earn as surplus at least 6 per cent., but he did not lay this down as a rule applicable to all roads, nor did he attempt to announce any "doctrine" on the subject.

Whether it is desirable that surplus should be such as to furnish the older and more stable lines with credit sufficient to enable them to raise money for extensions is perhaps open to argument. Commissioner Lane says such a policy tends to monopoly and that shippers should not be expected to pay for it. Does he realize that these extensions must be built? That if built by independent corporations the public must furnish the money and that those who live along their route must pay for it? Does he also realize that local enterprise must pay higher rates of interest and be content with inferior service; and that such a policy would greatly retard the development of those sections that most need it?

Perhaps the railways "failed to show that their credit was not good," though the price of first mortgage bonds at the time of the hearing and since should be an indication, but the railways were dealing with the future as they saw it; they did not think the outlook for raising the necessary money at reasonable rates was good and they do not think so now. If they are mistaken it will be a source of rejoicing to them and doubtless they will be glad to admit their error in this regard.

The statement contained in the opinion to the effect that the maintenance accounts of the railways "practically rebuilds the railways every ten years" is a remarkable one, and it is difficult to understand what is meant. In any case it has no bearing whatever on the case. The money spent on maintenance is irrevocably gone; it adds nothing to assets except so far as betterments may be included in maintenance, which is not likely to occur to any extent under the book-keeping methods prescribed by the commission.

In the Burlington case the opinion lays down some novel principles, as, for instance, that if a carrier earns a net revenue of $25,000,000 and its stockholders elect to take one-half that sum in dividends and put the other $12,500,000 into the property it may not increase its rates so as to yield return on that investment; that when double tracks or new terminals are needed that fact "cannot justify adding burden on those already receiving service adequate to their needs"; and further, that "investment in additional property must be at the risk of stockholders and not at the risk of the shippers on the old property."

Presumably investment for additional facilities is quite as much in the interest of the present users of the property as of new ones. There are few roads that have facilities "adequate to the needs" of those who now use them. In the case of block signals, for instance, should not the present traveler and shipper

be called on to pay for additional safety and celerity? The Tift case quoted in the opinion is not in point. But accepting the viewpoint of the commission the question still arises, Why does it continually *reduce* rates notwithstanding the flood of advancing expenses and increased investment? In particular, the writer of this opinion has to his credit a long list of opinions justifying reductions, largely on the ground that the carriers are earning too much.

In discussing the value of various railways the opinion quotes the Wisconsin, South Dakota and Minnesota commissions on the value of the Burlington and the St. Paul, and Governor Stubbs of Kansas on the value of the Atchison in Kansas. The Minnesota valuation has been already discredited by the federal courts, and of Stubbs it is only necessary to say that he is in no sense a "practical railway contractor." The estimate so far as regards Atchison is absurd on its face.

The opinion devotes much space to the danger of permitting the carriers to fix their rates on the theory of the "value of the service"; it admits that to have been the theory which has governed heretofore and under which the country has prospered as no other country ever prospered, but it says that to base rates solely on the ability of the shipper to pay is pernicious. Of course, they have never been so based, and the remark that this theory entitled the carrier to examine the books of the shipper is purely gratuitous.

Much credit is taken for the abolition of rebating, which it is stated, formerly absorbed from 3 per cent. to 5 per cent. of the earnings. Without going into details the accuracy of this statement may well be questioned. It is our belief that it would amount to less than half that amount. But the fact that as soon as rebating stopped the larger shippers demanded and received (in most cases) commodity rates quite as low as the net rates they had formerly paid, is wholly ignored.

The opinion deals at length, and most unfairly, with Atchison "cost of service" figures: It says the Atchison average earnings were 10 mills per ton mile and that its "transportation costs" for July, August and September, 1910, were 3.29 mills on the Illinois and Missouri divisions. It is characteristic of the writer of this opinion that out of a mass of figures he selects those that best suit his purpose. In this case he takes the average *earnings* on the entire system, including the far western and desert lines where rates are necessarily high, and compares them with the costs on the divisons of greatest density during the busy months of the busiest year the property has ever known. But this is not the worst of it—in making up these figures he has left out everything except bare transportation costs. In a previous paragraph he says: "cost . . . includes all operating expenses including taxes, not merely the cost of running a train over a track," but he has disregarded his own rule. Had he included all the costs according to his formula he would have stated it as 6.75 mills instead of 3.29. And, similarly, he quotes the six months ending December 31, 1910, as typical notwithstanding the well-known fact that the six months January to June are invariably less favorable. Incidentally, the opinion states that the increase in cost of ties is "almost negligible" it being estimated that it amounts to less than $50 per mile. Assuming these figures to be correct, this "negligible amount" would cost the six typical roads something over $5,000,000 a year.

In fact, the whole opinion is the argument of a man who starts with a preconceived opinion and then seeks justification for it, and so seeking distorts the facts to suit his needs. It is notice to the best of the railways that they will not be permitted to earn much, if anything, more than legal interest rates, and to those less fortunate that they cannot hope for any amelioration of their woes; it tends to kill enterprise and take away all incentive to economy: it is notice to all concerned that if the business increases the rates will be further reduced. And it further demonstrates conclusively what railway men have all along known, viz.: that the Interstate Commission is not fair or judicial or impartial.

CAR ROUTING ON THE NEW HAVEN.

The chart printed herewith was adopted March 1, 1911, by the New York, New Haven & Hartford as a key for station agents in routing carload freight between the New Haven proper and the Boston & Maine. Accompanying it is the following explanation:

In order to obtain proper and uniform routing of all carload freight each freight station on both roads has been given a reference number, which is shown opposite the station name in the alphabetical lists; also a routing chart and a list of routes have been prepared.

Example: If Lenox, Mass., on the New Haven, had a car for East Lexington, Mass., on the Boston & Maine, the alphabetical lists should be referred to and it will be found that Lenox is given reference number 23 and East Lexington reference number 5. Then refer to chart showing the different route numbers, follow line opposite number 23 across to intersection with column 5 and the number 37 will be found which is the route number. Route 37 shown on the list of routes is via Northampton, East Deerfield and Lowell.

Routing of cars from Boston & Maine points to New Haven points will be shown on manifests in reverse order to that given in the list of routes. East Lexington to Lenox, for instance, will route via Lowell, East Deerfield and Northampton.

The full routing must be shown on all manifests which are to be continued through to destination with car.

By the use of 50 index numbers as pointers, the chart shows quickly the carload routings between more than 1,200 stations on the two systems.

CHART SHOWING ROUTE NUMBERS APPLYING BETWEEN STATIONS ON THE BOSTON & MAINE, THE ST. JOHNSBURY & LAKE CHAMPLAIN AND THE NEW YORK, NEW HAVEN & HARTFORD.

N. Y., N. H. & H. R. R. Reference Numbers.	Boston & Maine R. R. Reference Numbers.																									N. Y., N. H. & H. R. R. Reference Numbers.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1	42	49	48	50	47	46	41	12	41	41	41	41	42	45	42	42	46	50	50	46	43	44	43	43	41	44	1
2	3	10	9	11	8	7	2	1	2	2	2	2	3	6	3	3	7	11	11	7	4	5	4	4	1	5	2
3	72	76	75	77	74	73	77	13	13	13	13	78	72	78	71	71	71	77	77	73	73	78	78	71	13	79	3
4	32	39	38	40	37	36	31	30	31	31	31	31	32	35	32	32	36	40	40	36	33	34	33	33	30	34	4
5	52	59	58	60	57	56	53	30	30	53	53	53	30	55	56	56	56	60	54	56	51	54	51	55	51	54	5
6	90	94	93	95	92	91	95	25	25	25	25	96	90	96	89	89	89	95	95	91	91	96	96	89	25	97	6
7	90	94	93	95	92	91	95	25	90	98	96	96	90	96	89	89	89	95	95	91	91	96	96	89	96	97	7
8	90	94	93	95	92	91	95	28	90	98	96	96	90	96	89	89	89	95	95	91	91	96	96	89	96	97	8
9	129	159	158	144	152	152	144	28	116	116	117	117	129	115	101	101	101	139	144	139	115	115	115	115	115	117	9
10	166	166	166	166	166	166	166	26	166	167	168	168	166	166	166	166	166	166	166	166	166	166	166	166	166	168	10
11	130	161	160	145	153	153	145	27	119	119	120	120	130	118	102	102	102	140	145	140	118	118	118	118	118	120	11
12	131	162	162	146	154	154	146	24	122	122	123	123	131	121	103	103	103	141	146	141	121	121	121	121	121	123	12
13	132	165	164	147	155	155	147	29	125	125	126	126	132	124	104	104	104	142	147	142	124	124	124	124	124	126	13
14	130	161	160	145	153	153	145	27	119	119	120	120	130	118	102	102	102	140	145	140	118	118	118	118	118	120	14
15	128	157	156	143	151	151	143	24	113	113	114	114	128	112	100	100	100	138	143	138	112	112	112	112	112	114	15
16	166	166	166	166	166	166	166	26	166	167	168	168	166	166	166	166	166	166	166	166	166	166	166	166	166	168	16
17	133	150	149	134	148	148	134	127	127	136	137	137	127	134	135	135	135	133	134	133	133	133	133	133	133	137	17
18	105	108	107	109	106	105	109	105	105	110	111	111	99	105	99	99	99	99	105	105	105	105	105	105	105	111	18
19	15	22	21	23	20	19	14	13	14	14	14	14	15	18	15	15	19	23	23	19	16	17	16	16	13	17	19
20	81	85	84	86	83	82	86	13	13	13	13	87	81	87	80	80	80	86	86	82	82	87	87	80	13	88	20
21	62	66	65	67	64	63	67	13	68	69	70	70	62	61	61	61	61	67	67	63	63	61	61	61	61	70	21
22	131	163	162	146	154	154	146	13	122	122	123	123	131	121	103	103	103	141	146	141	121	121	121	121	121	123	22
23	32	39	38	40	37	36	31	13	31	31	31	31	32	35	32	32	36	40	40	36	33	34	33	33	30	34	23
24	15	22	21	23	20	19	14	13	14	14	14	14	15	18	15	15	19	23	23	19	16	17	16	16	13	17	24

Shop Section.

C. C. LEECH, foreman of the Pennsylvania Railroad at Buffalo, N. Y., has been awarded the first prize of $35 in the engine house kink competition which closed March 15. Mr. Leech also had the largest collection, but it should be distinctly understood that the judges awarded the prize on what they considered to be the best two kinks in the collection. The second prize of $20 was awarded to H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa. The other contestants, all of whose collection have been accepted for publication, were Robert G. Bennett, motive power inspector, South Pittsburgh shops, Pennsylvania Railroad, Pittsburgh, Pa.; B. N. Lewis, roundhouse foreman, Minneapolis, St. Paul & Sault Ste. Marie, Enderline, N. Dak.; Thos. Naylor, roundhouse foreman, Chicago, St. Paul, Minneapolis & Omaha, St. James, Minn.; H. S. Rauch, apprentice instructor, New York Central & Hudson River, Oswego, N. Y., and F. Rattek, Brighton, Mass. The major portion of Mr. Leech's collection appears in this number. The others will be published in future issues.

THE competition on the instruction of apprentices and workmen, extended announcements of which were made in the February and March Shop Numbers, will close April 15. The articles should contain from 500 to 1,500 words. A prize of $35 will be given for the best article, and a prize of $20 for the second best. Articles not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

SHOP kinks will be the subject of the competition to close May 15. Shop kinks or handy devices of all kinds used in connection with the maintenance and repair of the rolling stock and equipment in charge of the mechanical department will be eligible for entry. A first prize of $50 and a second prize of $25 will be awarded for the two best collections of three kinks. A greater number of kinks may be submitted, if desired, allowing the judges to base their decision on what they consider the best three kinks in each collection. Kinks accepted for publication, but not awarded a prize, will be paid for at our regular space rates.

RECLAIMING scrap material will be the subject of the competition to close June 15. For the benefit of those who are doing very little or nothing in this matter we want to know of the various methods that are being used in the mechanical departments on other roads. For instance, a second-hand material platform is used at a car repair shop and yard on which material that is found on the scrap platform and is still suitable for service is stored and is reused for freight car repairs. Some of it does not even require straightening after it is taken from the scrap pile; other parts are repaired in a small smith shop at the end of the platform. A description of such a plant and just how it is operated would be of interest. One road scraps all old nuts and bolts; another runs a tap through the old nuts and cuts the battered ends off of long bolts and makes them into shorter standard lengths. Does it pay and how is it done? One road makes all its own bolts from old rods. We want to know the details and as to whether the bolts are satisfactory and if much of a saving is made. It is claimed that the smith shop can utilize a considerable amount of certain classes of scrap to splendid advantage. How, and with what saving? How can the method of oxy-acetylene welding be used to advantage in reclaiming damaged material? Does it really pay to use it for this class of work? One shop is said to carefully sweep up all scrap pieces of lagging from the floor about the locomotive, grind it up, remix it and use it over again. What are the details and what saving results? Is it worth while? There is undoubtedly a point in each case beyond which it is impossible to go without spending more in reclaiming the material than it is worth. How is this point to be determined? What sort of an organization should be formed for developing the proper methods of reclaiming the scrap to advantage? These are only a few suggestions as to subjects which might profitably be considered in preparing an article for this competition. Make it as long or as short as may be necessary to clearly tell your story. The best article will be awarded a prize of $35 and the second best a prize of $20. Other articles that are suitable for publication will be paid for at our regular rates.

SHORTLY after the rate hearing at Washington, at which the efficiency engineers were so much in evidence, the *Railway Age Gazette,* realizing that although the efficiency men had made some pretty serious mistakes, and that, generally speaking, they were not properly equipped to be of much assistance in railway mechanical departments, but also knowing, as all railway men do, that much inefficiency does exist, attempted with the aid of its friends to pick out one of the mechanical officers who gave the greatest promise of effecting a reasonable solution of the problem. That is, who being a good executive with a large amount of practical experience, was of such a temperament and training that he could analyze the claims of the efficiency engineers and, selecting what was good and really worth while, could apply it properly. It did not prove a very difficult problem to find such a man, but it was something of a proposition to get him to go on record. He simply refused to, and for a long time could not be budged. Fortunately for our readers he finally relented and said he would tell us exactly what he thought in the matter if we would not use his name. That explains why the article in this issue on What Is Scientific Management? appears under such an unpronounceable name. It is well worth reading and studying.

REFERENCE is made in the article on What is Scientific Management to certain improvements which have been made in the operation of the machine shops of the Canadian Pacific at Montreal. The time study work, which was the basis of these improvements, was carried on under the direction of H. L. Gantt, who has been known for many years as an engineer who has made an exhaustive study of the science of management and has obtained good results in the application of his theories to certain classes of work. In his book on "Work, Wages and Profits,"* which is a collection of several addresses and lectures which Mr. Gantt has presented at various times before different societies, he tells of the results of his study. Mr. Gantt believes that men suited to any particular kind of labor, if supplied with the proper implements and intelligently directed, can do on the average at least three times as much as the average workman does, if the limiting factor is physical exertion. The ratio would be even greater in work requiring skill and planning. While these results may be possible on such work as shoveling, or in operations where manual dexterity is required and the operations are repeated steadily many times a day, it is extremely doubtful as to it being applicable to any great amount of work in a locomotive or car repair plant. According to Mr. Gantt the following four conditions must be fulfilled to achieve the best results. *First,* complete and exact knowledge of the best way of doing the work, proper appliances and materials. This is obtainable only as the result of a complete scientific investigation of the problem. *Second,* an instructor competent and willing to teach the workman how to make use of this information. *Third,* wages for efficient work high enough

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to make a competent man feel that they are worth striving for. *Fourth*, no increase in wages over day rate unless a certain degree of efficiency is maintained. To get the men to do the desired amount of work and to maintain this output from day to day the manner of performing each job is specified and the workman is paid a bonus for doing it in the standard time. In a shop operated on this system, where each workman has his task, one man, known as the gang boss, usually tends a group of workmen, supplying them with work and appliances and removing the work when finished. He is paid a bonus for each workman who earns a bonus and an extra bonus if all of his men earn their bonuses.

THE EFFICIENCY ENGINEER.

WHILE we have taken great pains to advise our readers frankly of the mistakes that have been made by the efficiency engineers we have taken equal pains to reiterate time and again our belief in the importance of giving more thought to the principles which underly efficient work. The successful man unconsciously follows these principles to a greater or less extent, but ordinarily does not realize the importance of formulating them and using them as a guide, or as a measuring stick of his own efficiency. The recent discussion of so-called scientific management will undoubtedly be the cause of an immense stride in improved efficiency, not because of the advertising it has given the efficiency engineer, for his value as such is questionable, but because it has forcibly directed the attention of thoughful and practical men to a study of the principles which underly efficiency. The danger of this discussion, as we have said before, is that some managers may be deluded into thinking that the efficiency engineer or some of the features commonly connected with scientific management, will be the panacea for all his troubles and will jump from the frying pan into the fire.

When the system craze spread over the country a number of years ago many concerns who rushed into the introduction of it on a large scale, overdid it and not a few of them were forced into bankruptcy. A certain amount of it proved to be a good thing, but the employment of some of the system engineers, who sprang up like mushrooms in a night, proved to be anything but advantageous. It is curious to watch the rapid development in a similar manner of the crop of efficiency engineers—at least they call themselves such—many of whom have had no practical experience in the application of the principles of efficiency and can lay little more claim to the title than that they have read a book or two on the subject.

We smile in a superior sort of way when we read of Ponce de Leon in his search for the fountain of youth and yet we are almost as credulous in these days. The fads and fancies that have been adopted in the average manufacturing shop or on a railway and then dropped like hot cakes bear witness to this. What a scrap heap some of them have made! Let us hope that the principles of scientific management will not be adopted in this way, but that each individual situation will be carefully studied and receive the treatment it deserves. F. W. Taylor, commonly known as the father of scientific management, can be forgiven, if in his enthusiasm he goes beyond all reasonable bounds in his expressions, of the value of his methods and the possible range of their application, for if he had done nothing more than to develop the study of the principles of efficiency, he would have earned a high place in the regard of his fellows. It is unfortunate, indeed, that he has not realized the limitations of some of his methods and that they have not proved more practical, but nevertheless practical men seeing these limitations can modify the methods to suit the special conditions with which they are confronted.

Just as the electrical engineers disagree among themselves as to the best method of electrifying trunk lines—although many good engineers believe it will never be accomplished—so the efficiency engineers each seem to distrust his fellows methods, We are accustomed to class Taylor, Gantt, Emerson, Barth, Morrison and others together, but they do not interpret the doctrine of efficiency at all alike and in many instances they actually contradict each other. Taylor himself has said that: "Scientific management fundamentally consists of certain broad general principles, a certain philosophy, which can be applied in many ways, and a description of what any man or men may believe to be the best mechanism for applying these general principles should in no way be confused with the principles themselves." Let us study the work under our care thoughtfully with the idea of scientifically improving its efficiency, but let us go slow in making any radical change which we may have cause to regret in the future.

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The article on The Mistakes of Efficiency Men in this number suggests that some of them, who have placed themselves in the lime light during the past few months, have been extremely careless in their statements. A railway officer, who is a keen student of men, in speaking of one of these efficiency engineers said recently: "As an expert statistician and a dreamer of lofty ideals he has few, if any, equals. Those who know him best regard him as one possessed of a born gambler's instinct; not necessarily with faro, roulette, or poker, but in taking long chances on making statements that neither he nor anyone else can substantiate, and trusting in Providence that they will be accepted without verification." From the examples cited in the above mentioned article, this statement is at least true of one of them.

Judging from the newspaper reports the leading exponents of scientific management seem to be spending a great part of their time in addressing men's clubs and various other organizations. This is all well enough, but occasionally they find that when it comes to open debate they meet a different type of men from the lawyers they encountered at the rate hearings at Washington. For instance, it is reported that at a dinner of the Boston Economic Club, William J. Cunningham, assistant professor of transportation of the Graduate School of Business Administration of Harvard University, and formerly statistician of the Boston & Maine, dissected "the pretensions of Mr. Brandeis in respect to scientific management saving $365,000,000 a year in railway administration." Frank B. Gilbreth, of New York, followed Prof. Cunningham and took up the cudgels in Mr. Brandeis behalf. We like Mr. Gilbreth, who as a contractor has had such wonderful success in improving the efficiency in the bricklayers' trade, but in his zeal his vision has apparently become somewhat distorted. Repairing cars and locomotives is quite a different proposition from laying bricks. The following report of his talk with Prof. Cunningham is taken from the *Wall Street Journal:*

> Mr. Gilbreth declared: "I don't believe anything Professor Cunningham says. I only wish I had Mr. Brandeis here tonight to refute it. Professor Cunningham never could have made the assertions he does, had he visited the Plymouth Press at Norwood or the Canadian Pacific shops at Montreal. I would like to ask Professor Cunningham if he has ever visited the Canadian Pacific shops at Montreal." And quietly Professor Cunningham responded, "I have." "Have you," said Mr. Gilbreth, "ever visited the Tabor Manufacturing Co. of Philadelphia?" The professor modestly admitted that he had. "How much time did you spend there?" said Mr. Gilbreth, and when the professor quietly responded, "forty-eight hours," Mr. Gilbreth was flabbergasted and proceeded to talk of Frederick W. Taylor of Philadelphia and his stopwatch system. But Brandeis and his "system" rested upon ice where Professor Cunningham had dissected it and laid it out.

Very few people have realized that the Canadian Pacific was doing anything along scientific management lines—that is as the efficiency engineers would like to have us define the term—although by many Mr. Vaughan is considered to be one of the best mechanical department managers on the continent. From the testimony at Washington and the frequent but general references that have been made to it from time to time, as at the above mentioned meeting, one would imagine that so called scientific management reigned supreme at the Angus shops and that wonderful results were being obtained. It is true that the Canadian Pacific did retain Mr. Gantt, but only for about three days a month for a year or less and strictly in an advisory capacity. Some good results have followed—it could hardly be otherwise with Mr. Vaughan at the throttle—but apparently not nearly what the efficiency engineers would like to have us believe.

A considerable amount of time study work has been done, but it has been restricted to the machine shops and it is doubtful whether its use can be extended to other departments to any considerable advantage. Mr. Gantt's system as far it was adopted has been modified as explained in the article in this issue on What Is Scientific Management and a saving has been made *in the machine shops* of not more than 5 per cent. of 25 per cent. of the machine shops pay rolls. This is good, but hardly to be classed with the extravagant claims that have so persistently assailed us for the past few months. It would undoubtedly fade away into nothingness alongside an "assay" of the same shop by that other well-known apostle of efficiency who has specialized in railway work.

STRENGTH OF OXY-ACETYLENE WELDS IN STEEL.

A MOST interesting study of the strength of oxy-acetylene welds in steel* was recently made at the Engineering Experiment Station of the University of Illinois by Herbert L. Whittemore. Mr. Whittemore had had no previous experience in this work and started the investigation by making and testing 50 welds of band iron, 0.135 in. x 1.344 in. In handling the blowpipe and making the welds he followed the directions given in the manufacturer's circular. A series of tests was then made to provide practice in the use of the blowpipe and to determine, if possible, the variables affecting the strength of the welds. The efficiency of the welds, in general, proved to be low. However, certain improvements were developed in the method of making them which are described in the Bulletin as follows:

"Some workmen have found it preferable to work toward the operator rather than away from him, as was done in these welds. In working away from the operator, almost necessarily the blowpipe flame is directed toward the unwelded portion of the plates, making, perhaps, an angle of 60 deg. with the completed weld. The blast from the furnace tends to force melted metal from the end of the weld over upon the colder metal, with which it does not unite, and to make it difficult to build up the filling material to the required thickness. If, instead, the work progresses toward the operator, the blowpipe being held as described above, except that the blowpipe head makes an angle of about 120 deg. with the finished portion of the weld, the flame strikes the sloping surface of the molten metal at the end of the weld more nearly perpendicularly and has less tendency to displace this metal.

"Instead of welding in the bottom of the groove for a short distance, then forming a pool of molten metal of the required depth above it, it seems preferable to add constantly very small portions of the filling wire to the advancing surface of melted metal in the groove. If the work is done toward the operator, this procedure is comparatively easy. The sides and bottom of the groove become melted by the time the weld reaches them and the filling wire can be added uniformly to the comparatively small area of molten metal forming the end of the weld. This area advances, gradually, parallel to itself at all times, which was not the case when pools were formed. To assist in keeping the molten metal in place, the plates may be inclined upward in the direction in which the weld is advancing. A rise of about an inch to the foot is sufficient. Instead of keeping the tip of the flame constantly in contact with the molten metal it is advisable to increase the distance. If removed too far, the metal will not melt rapidly, and satisfactory work is impossible, so that experience shows that it is desirable to bring the flame in contact with the metal when working on cool metal, then gradually to withdraw the flame as long as satisfactory progress is being made."

In the last series of tests the welds were made as described above. In one case the weld was hammered during the blow-pipe operation but this proved to be laborious and, if anything, decreased the strength of the weld. Preheating increased the welding rate and thus lowered the cost, but seemed to have little effect on the strength of the weld. Forging the weld apparently increased the efficiency about 10 per cent. Improper flame regulation effected the efficiency only slightly. The welding rate seemed to be very nearly constant, or 17.5 sq. in. of weld section per hour. The cost of operation increases rapidly with the thickness of the plates; for a ¾-in. plate the cost of gas and labor would probably reach $4.00 per hr., assuming oxygen at about three cents per cu. ft., acetylene at one cent per cu. ft., and labor at 30 cents per hr. Mr. Whittemore concludes that skill in handling the blowpipe may readily be acquired by an ordinary workman; that it is important to have thorough fusion of the material in the weld; that too much emphasis has been laid on the effect of flame regulation, pure oxygen and acetylene, preheating, and hammering the weld on the efficiency of the weld; and that an efficiency of 85 per cent. is as high as can be expected in practice if the weld is the same thickness as the plate.

*Bulletin No. 45, Engineering Experiment Station, Urbana, Ill.

THE LIGHTING OF RAILWAY REPAIR SHOPS.

ONE of the principal advantages of new shop buildings for repairs to railway equipment is the change in construction which provides large spaces in the sides and roof for the admission of light, and on dark days and at night this is supplemented by artificial lighting by improved methods which are not usually found in the old shops. An increase in production under the new conditions has been observed in many instances, and good lighting of shops and factories is now recognized as one of the prime necessities for efficient operation. The construction features of shop lighting have developed rapidly in recent years, and this has materially affected shop architecture. These changes relate to the side and end walls which have a large proportion of glazed sash, and to the roof construction, which tends more and more toward the saw tooth type.

The monitor ventilator or upper deck, which has been used so generally for the lighting and ventilation of railway shops, is an expensive and inefficient construction which still persists, but its existence, except in the case of foundry or smith shop, cannot be justified by satisfactory results either in allowing the escape of gases and hot air, or the admission of light to the proper place. The glazed sash in monitor decks are an extra expense in the first cost of the roof, expensive to maintain, difficult to operate and they increase the roof load and are wholly inefficient for lighting purposes. The direct light from the sky which passes through them only serves to light up some other portion of the roof and scarcely reaches the floor in a diffused form. As a ventilator the monitor deck is not required in summer when the side windows and doors are open, and in winter it is so exposed to high winds that it is more apt to leak cold air into the building than to provide an exit for warm foul air.

During the past year the use of metal sash in new shops and factories has become quite general, and it is also used extensively for roundhouses and railway repair shops. The superior strength of the metal sash makes it possible to use very large window openings, which are unobstructed by the heavy mullions required for wooden sash, and the spaces between the glass panes in the metal sash are so small that a large increase in the amount of light admitted is obtained for a given opening. The strength of the metal sash also makes possible improved forms of saw tooth roofs, where the maximum effect for illumination is obtained and improved methods of operating the sash for ventilation are made possible.

To obtain the benefits of large windows in the sides and ends of shop buildings, it is necessary to locate the buildings with sufficient space between to allow the light from the sky to penetrate the windows in a direct line, and when such space cannot be obtained it is useless to provide large windows in the shop walls, and necessary lighting should be obtained by skylights in the roof. This may be regarded as obvious and elementary, but the simple principle involved is being constantly ignored, and some new railway repair shops, scarcely completed, have large windows in the side or end walls which are so close to other buildings that the direct rays from the sky cannot penetrate them, and they are almost useless except for ventilation in summer.

It is unfortunate that the term "skylight" is usually associated with glass in the roof, and windows in the side walls are not always considered as dependent on the light from the sky for the illumination of the interior, but they are of little use unless they are so exposed. The Luxfer prism for lighting stores and offices on narrow streets causes the direct light from the sky to be refracted at an angle so that it can enter the interior, but plain glass will not do it, and unless this valuable light from the sky passes through plain glass its efficiency for lighting even on

the brightest days is very low. Two-story shops are objectionable because the first floor is dark, and the best way to obtain a well lighted shop with two floors is to make the second one in the form of a gallery with a large skylight over the well. In this way the outside portion of the first floor is lighted from the side windows and the interior portion of the same floor is exposed to the skylight.

It is not sufficient to provide a large area of glazed sash for the side walls and roof, even for day work, for on dull days and in the winter the early morning and late afternoon hours in the best shops are too dark for efficient work and artificial lighting must be the resort. There is often a loss of one or two hours per man per day due to insufficient lighting. The ordinary method is to install arc lamps for general lighting and carbon filament lamps for machine tools and special work benches where fine work is performed, but this is no longer considered a satisfactory arrangement. The development of the metal filament lamps with an efficiency three times that of the carbon filament and with capacity up to 500 candle power per lamp, the vapor lamp, and the flaming arc lamp, have so changed the possibilities for efficient shop lighting that for the same expense, almost the equivalent of bright day light may now be obtained.

The choice and arrangement of these new lamps for railway shops and roundhouses is a matter which should be referred to the illuminating engineer, and most electric companies and lamp makers are satisfied to accept his advice. Under the new conditions ample light should be provided at all parts of the working zone. The illumination should be uniform and the lamps mounted overhead. Individual lamps should seldom be necessary, and the location and size of the larger units should be such as to prevent the glare due to light from an intense source striking the eye. In machine shops with low ceilings, 100-watt metal filament lamps mounted overhead have been found a vast improvement over carbon filament lamps at each machine. For higher ceilings the 250 watt lamp of the same type makes a satisfactory illumination, and very few drop lamps are necessary. For still higher mountings, such as are required by the crane-ways in erecting shops, the arc lamps and the mercury vapor lamps become available, the constant aim being to obtain general illumination from an overhead source.

Having provided a good system of electric lighting, it should be systematically maintained by daily inspection and necessary renewals of filament lamps, the cleaning of reflectors and shades, and repairs. Lamps should be installed with this end in view, so as to be easily accessible for the purpose, although they are often not so placed. The lighting of shops by day or night has a close relation to the quality and quantity of work performed, and the adequate provision made for it under modern conditions will contribute to larger output as well as to brighter and more cheerful surroundings for the workmen.

MECHANICAL ARTICLES DURING MARCH.

The following articles of special interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of March 3:

Steel Frame Box Car. Detail description of a Canadian Pacific 80,000 lbs. capacity box car with a steel frame throughout. March 10, page 455.

Performance of Pacific Type Locomotive. The Pennsylvania Lines West has thoroughly tried out the Pacific type for heavy passenger traffic and as a result of the performance of one of these engines during the past few years this type will be used for this class of service on the lines both East and West. Details of its performance are given on page 462 of the issue of March 10.

Mallet Articulated Locomotive for the Chicago Great Western. Ten of these locomotives, which are described in the issue of March 17, page 495, will be used between Oelwein, Iowa, and Stockton, Ill.

Heavy Locomotives for the Natal Government Railways. M. Mallet originally intended his design for light railways but we are familiar with the extremely heavy designs used in this country. The Mallets for the Natal Government Railways, which are described in the issue of March 17, page 509, weigh only 196,000 lbs. and are to be used on a 3 ft. 6 in. gage.

The Friction of Freight Trucks. Editorial comment on the American Steel Foundries experiments which show that a truck constructed in such a way that it will remain square while going around a curve will cause much less resistance. March 24, page 675.

Structures at the Northumberland Yard of the Pennsylvania Railroad. The locomotive terminal and car repair facilities at this important yard represent the latest practice of the Pennsylvania Railroad. They are described in a 7-page article in the issue of March 24, page 682.

Electrification of Steam Roads. The electrical engineers are beginning to take a saner and broader view of the electrification problem, realizing that the electrification of steam roads, except under special conditions, will be decided from an economic and financial standpoint and that we still have much to learn about the comparative costs of steam and electrical service under trunk line conditions. An account of the "electrical night" of the New York Railroad Club was published in the issue of March 24, page 689.

Freight Car Truck Experiments. Prof. L. E. Endsley of Purdue University has made extensive experiments at the Granite City, Ill., plant of the American Steel Foundries, which show conclusively that trucks which are built so that they will not get out of square in going around a curve offer much less resistance than those which do. A complete account of these experiments is contained in the issue of March 24, page 691.

Heavy Pacific Type Locomotives for the New York Central Lines. The requirements of through passenger service demand a larger boiler capacity than heretofore furnished on the standard Pacific type locomotive on the New York Central Lines. To obtain this superheaters are being used on the latest order of these locomotives for heavy passenger service. The arrangement of the steam pipes and cylinders and certain details of the Walschaert valve gear have been improved. Sixty Pacific type locomotives have also been built for fast freight service, ten of which are equipped with superheaters. March 31, page 787.

Tests of Pacific Type Superheater Locomotive. During the past year the Lake Shore & Michigan Southern made several series of tests of a Pacific type locomotive with a superheater hauling the Twentieth Century Limited between Toledo, Ohio, and Elkhart, Ind. As a result certain changes have been made including an increase in the boiler pressure and the reduction in the diameter of the cylinders from that originally used. The use of a cross-over pipe between the steam pipes was also found advantageous. March 31, page 790.

NEW BOOKS.

Elements of Machine Work. By Robert H. Smith, Instructor in Machine Work, Massachusetts Institute of Technology, Boston, Mass. Published by the Industrial Education Book Company, Boston, Mass. Cloth; 192 pages, 204 illustrations; 5 in. x 8 in. Price, $2.00.

This volume has been written with the desire of filling a long needed want in the instruction of the student or apprentice who is beginning the study of machine work. It is the first of three volumes on the subject and starts with a few principal definitions which the student must know in order to carry on the work intelligently. It instructs him in the use of the necessary instruments and their application. The elementary work, such as laying out, chipping, filing, scraping, hardening and tempering, pipe fitting, soldering, brazing and elementary millwright work is presented in this volume in considerable detail. The book contains many illustrations showing the method of performing the different operations, which with the complete instructions in the text will enable the most awkward mechanic to obtain fair results.

Principles of Machine Work. By Robert H. Smith, Instructor in Machine Work, Massachusetts Institute of Technology, Boston, Mass. Published by the Industrial Education Book Company, Boston, Mass. Cloth, 388 pages, 434 illustrations; 5 in. x 8 in. Price, $3.00.

This book is the second in a series of three on machine work written with the desire of placing a text book at the service of the student taking up this subject, either in the trade schools or colleges. It is, however, of value to both the student and apprentice. The former will find it more of a necessity, as his study of the work is usually limited to a comparatively short time. The volume contains detailed descriptions of lathes, grinding machines and drills, with the necessary instructions for their operation. It also describes in detail how different work is performed on these machines, the numerous illustrations adding greatly to value of the text. Here, as in the previous volume, the instructions are so complete and minute that the unskilled mechanic may by close application to the book obtain a fair degree of accuracy in his work. An appendix contains tables and other useful data pertaining to the text.

WHAT IS SCIENTIFIC MANAGEMENT?

BY EXYL.

From reading the articles and discussions on scientific shop management in the *Railway Age Gazette,* one cannot avoid forming the impression that a definite claim is made that a large majority of the railway shops are operated in an inefficient manner, a state of affairs that might readily be rectified if the railways would engage the services of a body of men, known as efficiency engineers, and allow them to apply certain systems of scientific management. The question naturally arises, What is this scientific shop management that these engineers employ? Is it a definite system that the efficiency engineers are acquainted with, but unknown to the majority of the railway shop managers; a system that if thoroughly understood might be applied by the latter and result in considerable economies? Or is it simply a case of substituting a man of extraordinary executive and operating ability—the efficiency engineer—for a man of ordinary ability in those lines—the railway shop manager? It can hardly be the latter, for, apart from this reducing the whole proposition to the single claim that the efficiency engineers are men of such superior ability that their substitution for the men at present employed would result in enormous improvements, if there were only enough of them to go around, it would be most unscientific to advocate a system of shop operation that can only be successful under the charge of an extraordinarily able man.

Surely it must be admitted that unless a shop is operated by a system that can be administered by an able, intelligent, painstaking man, such as is to be found in charge of the majority of railway and manufacturing shops, it is in an unstable condition and could not in any way be considered as scientifically managed. In addition, the number of men whose successful operation of railway shops and mechanical departments has led to their selection for important positions in commercial concerns, certainly precludes the possibility of any such invidious comparisons, as it must be admitted that there are plenty of "good fish in the sea." We are therefore forced to conclude that the first supposition is correct, and that the reason for the inefficiency that is claimed to exist in railway shops is not on the whole so much that they are managed by inefficient men as that these men are operating without knowledge of a system or method of shop management, by the use of which millions of dollars could be saved annually. We are then led to our original question, but slightly changed, "What is this system of scientific shop management?" To answer this, one must necessarily turn to the writings and doings of those making the claims as to the improvements that are obtainable.

As Mr. Emerson has taken such a leading part in this work, he can hardly object to being considered as its exponent. Apart from his interesting discussions of the effect of inefficiency upon inefficiency, which closely resembles a demonstration of the fact that 90 per cent. of 90 per cent. is 81 per cent., etc., it would appear, although the statement is, of course, based on the writer's attempted analysis of what this scientific shop management really is, that Mr. Emerson's system really consists of the following methods:

First.—The bonus system.
Second.—The time study system.
Third.—The schedule system.
Fourth.—The work routing system.
Fifth.—Improved shop methods.
Sixth.—A thorough and logical investigation of the possibility of economies in minor matters, such as belts, tools, etc.

Of these it may be considered that 1 is practically original with Mr. Emerson; 2, 3 and 4 are included in the Taylor system of shop management, and 5 and 6 are matters that are constantly in the minds of most shop managers, although, perhaps, not clearly defined by them in a scientific way. However, let us look into these methods a little more closely.

BONUS SYSTEM.

The bonus system is evidently very nearly our old friend, piece-work, with a guaranteed day rate. Suppose a time is set for any job at, say, one hour; then when a workman performs this work in 1½ hours his efficiency is 66 2-3 per cent., and he simply receives his day rate. If he does it in one hour he receives a bonus of 20 per cent.; if he does it in less than one hour he receives an additional bonus of 1 per cent. for each increase of 1 per cent. in his efficiency. In other words, if his efficiency is greater than 100 per cent., he receives a slowly decreasing piecework rate. For instance, if the standard time was five hours, he would receive six hours' pay if the work was done in five hours, and 5½ hours' pay if done in 2½ hours. If this is compared with a man paid by piece-work on the basis of six hours for the same job, we find that the piece worker receives his day rate only, unless he does the work in six hours. He receives the same amount as under the bonus system, or six hours, if he does it in five hours. If he does it in 2½ hours he receives pay for six hours against 5½ hours under the bonus system. Comparing it with piece-work, the bonus system rewards the slow worker more and the fast worker less. *In view of the advocacy, by some of the more advanced of Mr. Taylor's followers, of an increasing piece-work system—one paying more and more per piece as the time is reduced in order to spur the worker to the maximum output—the bonus system cannot be considered as efficient as the piece-work system.*

During the past few years, with increase in wages and improved output, the piece-work system with a guaranteed day rate has possessed some important advantages, as will be recognized by those who have operated under it; advantages not common to straight piece-work or any system based on day rates. It is a well-known system, as is also the ordinary piece-work used in many shops for years past, and they certainly should not be described as less scientific than the bonus system, nor could any material saving be looked for on account of their being superseded by the latter.

The bonus system may be of great value in inducing men to work under a system very similar to piece work, who would be unwilling to do so if it were called by another name, but it does not reward labor as scientifically as does the piece-work system. It does not have the advantage of the premium plan in minimizing the effect of improper prices, as the reduction in pay is too small to be of value if the time is unreasonably reduced. It has the disadvantage, as explained by a committeeman to a manager of one of the large industrial concerns who introduced its use, that "the trouble is when we go home we don't know whether we owe you something or you owe us something." How, then, can this factor of scientific management lead to any hope for economy over the piece-work and guaranteed piece-work systems that have been used so successfully for years in many of our railway shops?

TIME STUDIES.

The time study, which is closely connected with a standardization of work schedules, is without question an important evolution from the older and less definite methods of determining prices and times. Its use in railway shops, even in those which are best operated, is very limited, and there is little doubt that much good will come from the publicity that it has recently enjoyed. Standardization of work schedules is a development that naturally follows the operation of several shops of a railway under any of the various piece-work systems in which costs have been compared for years. The difficulty has usually been that while certain operations are easily compared, others, on account of local differences in the method of handling the work and the class of machines employed, present considerable difficulty. It has frequently been decided that it would not pay to change the method for the purpose of making a comparison, but the possibility of the course has always been recognized. By the use of the time study the relative value of different

methods and the comparative efficiency with which the work is performed may be determined with reasonable accuracy without necessarily disturbing convenient practices. *The standardization of work schedules and the time study are then not supplementary, but the latter largely avoids the necessity for the former, if comparisons are desired.* The former has been used and its extension is a matter of judgment; the latter has been little used in the railway shops and the question is one of the saving that it may accomplish.

The time study is wholly the invention of F. W. Taylor. The reasons leading up to its introduction are described in the masterly paper on shop management read by him before the American Society of Mechanical Engineers in 1903. This paper was more than a mere description or discussion—it was a presentation to the world of the methods used by Mr. Taylor in the analysis of manufacturing operations and the operation of manufacturing plants, and the system that he had devised for insuring work being performed in the quickest time and most efficient manner. These methods were the result of a life's work of a man who practically revolutionized the previous ways of looking at this problem, and are just as far reaching in the line of shop management as the discovery of high speed tool steel has proved in connection with machine work—a discovery that was really only an incident of Mr. Taylor's work. His use of the time study dated from 1883, when he employed it in order to more easily fix new piece rates. It was soon applied to split operations into unit times, from which there came the careful examination of the possible rates at which these elementary operations could be performed.

Herein lies at once the strength and the weakness of the system. Where the total time consists chiefly of machine work or of frequently repeated manual movements, the unit times may be compared with similar operations or known data; where the total time is largely composed of manual movements that vary from time to time, or are not repeated in the same way each time, it may be questionable whether the results obtained justify the complications that are introduced. For instance, in machining different sizes of axles the unit times may be closely compared and the machine times checked up, not only from similar axles, but from data obtained by experiment, or from cutting similar material. This is a case where the total time consists largely of machine work. In the examples of handling pig iron, laying brick and the inspection of balls, given in Mr. Taylor's paper, and in which wonderful results were obtained, the work consisted in manual movements constantly repeated. Now, even in these simple matters the compilation of a time study is a fairly complicated matter, requiring for the operation of loading pig iron no less than six unit times; two were variable depending on the distance the pig was carried, and two were alternate, dependent on whether it was thrown down or placed in a pile. This illustrates another requirement of time study work, namely, the standardization of conditions.

Now, consider the application of this method to many of the jobs in a railway repair shop, such as stripping engines or facing shoe and wedge faces. No doubt the time study system can be applied, but the question is: Would it pay? And before it was really worked out, would it not be necessary to compromise by letting a unit price go through that was not properly corrected for every possible condition, or else get up a system so complicated that an inspector would have to stand over each man to keep a record of the variable conditions he encountered? For instance, the man may be taking down an air pipe clamp. One time the nut comes off in his fingers; another time he tries a wrench, and finally has to chip it off. Of course it can easily be arranged to adjust prices to conditions, but a shop may handle 60 or 70 different classes of engines, some to be stripped down and some to be partially stripped; in one case a bolt falls out, while in another it has to be drilled out; in one case one bolt has to be removed and in another six. Illustrations of this kind could be multiplied indefinitely, but the gist of the matter is that *in a great majority of repair shop operations, the price paid for the job is not based on the time required to do an accurately defined amount of work, but is practically a contract with the workman by which he accepts the variations in the amount of the work to be done in consideration of an average price.* That this is the case on the Santa Fe is clearly shown by an inspection of its schedules, even though a closer account is taken of the variation in the work to be done than in most railway piece-work shops. It may, therefore, be assumed that Mr. Emerson encountered the difficulty that is almost obvious with regard to the application of the time study system to the work on which the manual operations are varied, or in which the standardization of conditions is too complicated, namely, that it was more cumbersome and therefore less efficient than the ordinary method.

By the latter is meant the setting of a price or time by a practical man who judges the proper allowance by timing the job as a whole and determining from general observation a price which will reward the men when they are working intelligently and under average conditions and maintaining what a shop man would call a good gait. This might be called the aggregate system as opposed to the unit system, which is what is meant when time study work is referred to. It must be acknowledged that whether applied to small operations or large ones, it has been the general one in use in determining repair shop times and prices. It is no doubt not as scientific as the time study. *Neither are many short cuts scientific, but if they are sufficiently accurate and avoid the expense entailed by more detailed but complicated systems, nothing can be gained by going to the latter.* There is no doubt, however, that, as previously stated, time study will be far more used in the future and with considerable benefit. It is, however, doubtful whether in the average well-run shop the saving to be obtained from its introduction will be sufficiently large to greatly lower the cost of maintenance.

Scientific Management at the Angus Shops.—If you inquire at the Angus shops of the Canadian Pacific Railway, where considerable time study work has been carried on under the direction of H. L. Gantt, you will find that so far its use has practically been restricted to the machine shops, and that its extension to the remainder of the plant is hardly considered practical for reasons very similar to those outlined above. In addition, it is being used at those shops in a somewhat different way from that usually outlined. *The demonstrator, who in Mr. Gantt's system is the pacemaker for the shop, is used as an educator and devotes his time to getting the machine operators to obtain the desired results and in devising better methods of performing the work.* With this modification, the Canadian Pacific officials are exceedingly pleased with the system which has reduced the costs and increased the men's earnings—a most satisfactory condition. The reduction in cost has not, however, thus far exceeded about 5 per cent. on 25 per cent. of the shop pay roll; so that while the work is going on steadily and energetically, it certainly has not led to any enormous reduction in expenses. Such a thing would hardly have been expected. The shop has been operated under a good piece-work system for years, and while an improved method of studying prices is a distinct step in advance, and its benefits will probably increase as time goes on, yet the system is not going to revolutionize matters. Neither will it do so in the average railway shop, unless other conditions can be introduced. There are many shops whose prices and costs are higher than those in charge would like them to be, and if the time study system were installed and prices reduced, quite a substantial saving would result. If the time study system were not installed and prices were reduced, where this is already known to be possible, there would also be a good saving; not quite so much, perhaps, but fairly close. But the gentlemen who are trying to operate a complicated proposition for the good of the whole road have to balance the cost of fighting the matter out against the results

that would be obtained from a small section of the combination under their control, and understand their conditions sufficiently well to be competent judges. *Let us give the scientific time study lots of credit; it has any amount of good points, but it is not a panacea for all our troubles.*

SCHEDULE AND WORK ORDER SYSTEMS.

The schedule and work order systems are also part of the scientific management scheme. The schedule system is no doubt good where it can be used, and it could no doubt be of considerable advantage on the Santa Fe on account of their using a 15-day schedule for repairing locomotives. At Altoona, where an eight to ten-day schedule is in effect, the usual planning system would be too slow. It would not be much use informing a foreman that he was two or three days late with his work; if he were he would upset the entire shop. The fact is that the schedule system in various forms has been operated in railway shops for years. Probably the first shop to repair engines in a minimum number of days was the Chicago & North Western at Chicago under Robert Quayle. The Altoona shop has, if anything, gone Chicago one better, and the Roanoke shop of the Norfolk & Western is doing practically as well. *It is doubtful if any manufacturing plant in the country does smarter work than that of turning engines out of these shops.* They have been led to it by their conditions, viz., ability to increase their machine shop facilities and difficulty in increasing the size of the erecting shop. Now they regard it as an economical proposition; other railway shop managers do not. An engine costing $15,000 is only worth about $2 a day for interest, and a week more in the shop, costing $14 per engine, is easily lost in the labor and material costs if the work has to be hurried. Evidently this is a case of conditions and judgments.

The whole question of the schedule system is one as to the length to which it is advisable to go. It may vary all the way from the complete planning department advocated by Mr. Taylor, which, however, was advocated by him for plants which were not railway repair shops, down to a single statement of the dates engines are to be turned out. It is a great question whether close scheduling is advisable in the average plant, and it will in general be found that in a shop doing straight repair work, with a minimum number of days allowed in the shop, the schedule is simple. If a variety of repairs, light and heavy, together with a quantity of manufacturing work, is handled, a more thorough scheduling is advisable. There is one principle in this work that must be admitted, namely, that a system should never be carried any further than is found advantageous. *The moment we begin to run a shop for a system instead of a system for the shop we begin to lose money.* Too much scheduling may easily result in making work harder to handle instead of easier, and the work order system has yet to prove its merit under conditions as variable and complicated as those in the ordinary railway shop. Let the system of scheduling work be given full credit as an important adjunct of shop management, but it is absolutely inaccurate to claim that its introduction would be an important reform in the average well-run railway repair shop. It has been used in them in a practical and successful form for years.

LABOR SAVING DEVICES.

If there was one thing more annoying than another to the railway shop man during the recent discussion it has been the inference from the illustrations of the various labor saving devices used on the Santa Fe that the idea of developing appliances of that kind was broadly new. All must admire several of the ingenious machines and methods that have been so freely illustrated not only in the technical journals and pamphlets describing the work accomplished, but in the popular magazines. Many no doubt have enjoyed seeing the product of their inventive efforts given so much publicity, even though their names were not attached. Of course, any shop man knows of the large amount of ingenuity that has been expended in railway shops all over the country, and the shop columns of the *Railway Age Gazette* have brought out a collection of shop kinks which would reflect credit on any branch of manufacturing work. There is any amount of this work to be done, but it has never been a neglected side of railway shop work, and it does appear as though credit has hardly been given where it is due, when we find a man in Mr. Going's* position illustrating in his examples of betterment work on the Santa Fe the machine forging board, the scrap reclaiming machines, the oil spray for trucks, air hoists on tools, knock down truck for engines, car wheel drop pit, a home-made bolt cutter, oil tire heaters, and a few other familiar old stand-bys. Surely if he wished to be of value to the benighted railway men he ought to have picked out a few new ones. *The fact is that most roads have paid pretty good attention to this class of work.*

Sometimes a just criticism might be made that devices have been made up that will never pay for the time and expense devoted to their development. That, however, is almost a necessary evil in any business. The *Railway Age Gazette* should publish its collection of shop devices in a properly edited book form, and then ask any unprejudiced engineer—efficiency or otherwise—if he does not consider that this detail of management has received good attention.

MINOR ECONOMIES.

The investigation of the possibility of economies in minor matters is another thing that will certainly do good by giving it publicity. Railway shops, as a rule, do not have sufficient supervision to take up these less important details as carefully as they should. At the same time these minor economies, while well worth following closely for their own sake, are not able to effect seriously the total cost of maintenance. Mr. Emerson has made a good deal out of the question of belt repairs. Most shops have men especially in charge of this, although not, as a rule, college graduates, as they have usually been considered of more value in other work. After reading Mr. Emerson's statement of the improvement made in this respect, and that the cost of belt maintenance should not exceed 15 per cent., the writer obtained figures as to the cost of maintenance and the value of the belting in a large railway plant, in which both iron working and wood working machinery were used. The annual cost was about 20 per cent. of the total value, so that allowing for the fact that during the year prior to the cost being reduced on the Santa Fe a very large expenditure had been made for belting—and it was presumably pretty nearly all new—the railway shop, with a good belt man in charge, does not show up so badly. One cannot help feeling that Mr. Emerson was very unfortunate—or shall we say fortunate—to strike a road on which conditions in that particular respect were so bad.

There are, of course, numerous other items which deserve closer attention than they receive in many cases. Conditions in this respect are similar in both railway and manufacturing plants. One manager gets after the little things better than another, and yet they may both be good men in many ways. Most shops, however, are careful about small things that cost money. They soon get called down by their superiors if the supply requisitions go up; and while, perhaps, economies may be effected in this as in other lines, they are not great or anything like those claimed. Railway shops are just like other shops in this respect. Some have adopted a standard tool system; others have not. Some are up-to-date; others are behind. But it is reasonably safe to say that *the average efficiency engineer will spend more money than the railway man does in the maintenance of minor items, and that plenty of railway men would spend more if they could.*

CONCLUSIONS.

In conclusion, without explaining that comparatively few shops in the country, whether railway or commercial, have adopted the Taylor system, Mr. Emerson has made the assertion

* In his book on Methods of the Santa Fe, published a couple of years ago by *The Engineering Magazine.*

that by introducing the modified form of it which he advocates, enormous savings might be obtained. The results of his work on the Santa Fe are quoted as an illustration of the economies that are available. Without discussing what saving was actually made there, no one would expect Mr. Emerson with his well-known ability to fail to introduce substantial improvements. There can be little question of his having been of great service to the road. A well-posted up-to-date efficiency engineer would in almost all cases be so in any railway shop. But it certainly is unsafe to make sweeping assertions based on a comparatively short experience on one road. It is well known that maintenance costs cannot be judged on the results of a short period. It has been a common saying that anyone can make a record for a year or two, and on a railway in a normal condition this has been done more than once. The conditions on the Santa Fe must also have been favorable from some of the illustrations in Mr. Going's book, showing Japanese and other men doing work previously handled by machinists. Reductions in cost due to the introduction of cheaper labor can hardly be credited to a system. In many other ways conditions apparently existed which afforded a good opportunity at the time to a capable shop manager.

This is not, however, the question. Efficiency engineers, whoever they may be, cannot stand on the claim of their superior ability. They must effect their economies by the introduction of systems of management by which the present shop forces may obtain improved results, not by a change in the force, unless it is found incapable. They should therefore be able to explain their system, just as F. W. Taylor explained his. Some people believe that the Taylor system of management might introduce great economies in every machine shop in the country, whether railway or commercial. Others consider that under special conditions the system may be applied in its entirety, but that in general practice its application is limited. Mr. Emerson is one of the latter, for in his work on the Santa Fe he has adopted certain features of it and discarded others. Probably Mr. Taylor would consider a shop operated under Mr. Emerson's system inefficient, and with almost as much reason as the latter has for stating that railway shops are inefficient.

We have, however, examined Mr. Emerson's system, and wherein is the reason for the saving claimed? He advocates several methods of shop management that are excellent things in their way. The bonus system, time study and work schedules are all important adjuncts to the general proposition of efficiently running a shop. They are not, however, radically new discoveries, and the fact is that each must be used to the extent that it is advantageous. *To advocate any particular system by which to operate a shop, having such varied problems as a locomotive repair shop, is like advising that all plane surfaces should be finished by milling.* No doubt the introduction of milling machines effected improvement reductions in the time required to do certain classes of work, but the good shop manager is not the man who therefore insists on its universal use. Systems are like machines, they should be used for the purpose they are adapted to, and the best results are going to be obtained not by the Taylor system or the Emerson system, or the Gantt system, but by using what is good and useful in each, combined with good common sense management.

Mr. Emerson must know that there have been efficiently and inefficiently managed railway shops just as much as in other lines of work and that this has been largely a question of the quality of their superintendence, or the restrictions placed on them by the management. They are manufacturing plants run by an institution that is not in the business of running manufacturing plants. In many cases they have not been granted the necessary appropriations to keep their equipment up; they have not been allowed the proper supervision to watch their expenditures; and the management has not, and in some cases does not, realize the requirements of efficient shop operation and sees little difference between the organization required for a large repair shop and that for a section gang. In spite of that, one general foreman after another has been faithfully doing his best to get along with the facilities he had and turn out his work as cheaply as possible; making machines when he could not buy them, and doing many things that were not strictly efficient, but were the most efficient things to do under the circumstances.

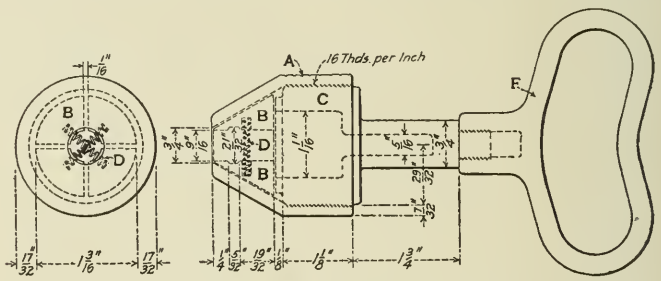
Luckily this state of affairs has pretty well passed away, especially on the larger roads. Shops are now recognized as important factors, and their proper equipment and superintendence is given reasonable attention. There may still be some inefficiency, but it is going to be cured by better men and better management, and not by the use of a specific system. Mr. Emerson's idea that the best sort of management is none too good for a railway shop is all right. It is a pity to see a railway man handling a shop with a $75,000 pay roll leave because a commercial concern can pay him double the salary a railway can. If he can induce the men in charge of railways to realize the importance of retaining their able men, he will have done some more good work; but it was unjust and misleading to make claims that reacted on the efficiency of the good shops and poor shops alike, and to prophesy such wonderful results for a new system that is not new, and which many employ in whole or in part.

TRIPLE VALVE PISTON PACKING RING GRINDING TOOL.

BY FRANK J. BORER,

Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.

The grinding of triple valve piston packing rings was formerly done at the Elizabethport shops by a tool made of a piece of ¾-in round steel, a hole being drilled in one end to receive the piston stem and a handle being placed on the other end, similar to the one shown on the accompanying sketch. The piston stem was secured to the tool by a set screw; this arrangement was unsatisfactory because of the set screw slightly damaging the end of the piston stem. We are still grinding most of our triple valve piston packing rings by hand, as it is doubt-



Triple Valve Piston Packing Ring Grinding Tool.

ful if any time can be saved, or better work be done, by the use of a machine unless a number of men are engaged in this class of work and a machine is provided that will grind at least eight triple valves at one time. Experience has taught us that it is much more important to have the triple valve piston cylinder bushing and the triple valve piston packing ring groove put in good condition, so that the triple valve piston packing ring is a perfect fit in the groove and in the cylinder bushing. The grinding of the ring is then a simple operation. If the triple valve cylinder bushing is not in good condition, we roll it with a special triple valve roller and also true up the triple valve piston packing ring groove if it is necessary. The improved tool for grinding the piston packing ring is shown in the illustration. The adjusting nut A contains four jaws B, which are held apart by the coiled springs D. In using the tool, the piston stem is placed between the four jaws, and the adjusting nut A is held in one hand while the stud C is revolved and moved inward by means of the handle F, thus closing the jaws B.

Engine House Kinks.

FIRST PRIZE.

PENNSYLVANIA RAILROAD, BUFFALO.

BY C. C. LEECH,
Foreman, Buffalo, N. Y.

CLAMP FOR EXHAUST NOZZLE WHEN TESTING STEAM PIPES.

A clamp for exhaust nozzles, when the steam pipes are being tested, is shown in Fig. 1. The cap A fits in the top of the nozzle after the tip has been removed. A steam tight joint is secured by placing a rubber gasket over the top of the nozzle. The clamps B are moved inward along the bar C and fit under

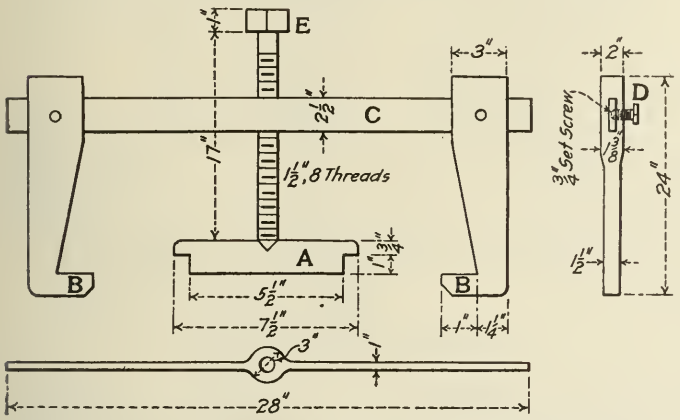


Fig. 1—Clamp for Exhaust Nozzle When Testing Steam Pipes.

the edges of the flange of the nozzle casting. When these have been properly adjusted they are secured by the ¾-in. set screws, and the cap A is forced securely over the top of the nozzle by turning the screw E.

REMOVING ECCENTRIC CRANK ARM OF WALSCHAERT VALVE GEAR.

A device for quickly removing the eccentric crank arms of the Walschaert valve gear is a necessity in the engine house. A

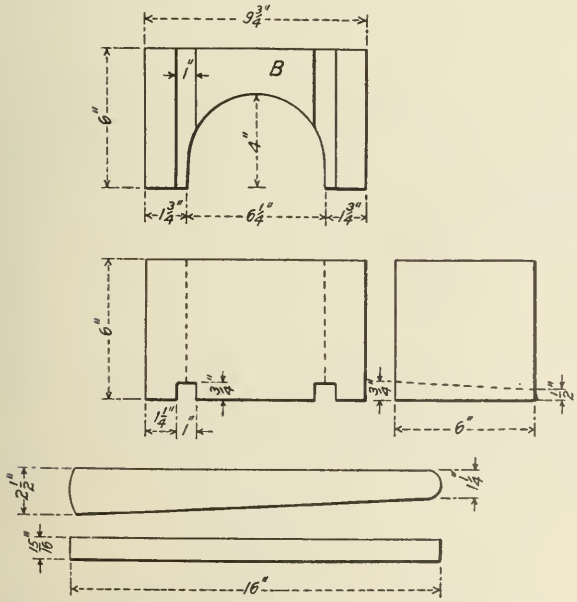


Fig. 2—Block and Wedges for Removing Eccentric Crank Arm of Walschaert Valve Gear.

block and wedges for doing this are shown in Fig. 2. The block B is of wrought iron 9¾ in. long, 6 in. wide and 6 in. high, and is cut out to fit over the main rod bearing on the crank pin. After the main rod strap and the rear brass have been removed, and the rod has been pushed forward out of the way, the block is slipped in in its place and fits easily between the inside of the crank arm and the side rod bearing. The keyways in the block have a taper of ¼ in. in 6 in., and the crank arm is wedged off by driving the two soft steel keys in them. This kink will easily start the most obstinate crank arm without defacing it.

OIL BURNER.

A simple and convenient portable crude oil burner is shown in Fig. 3. The oil tank was made from a 16-in. x 33-in. air reser-

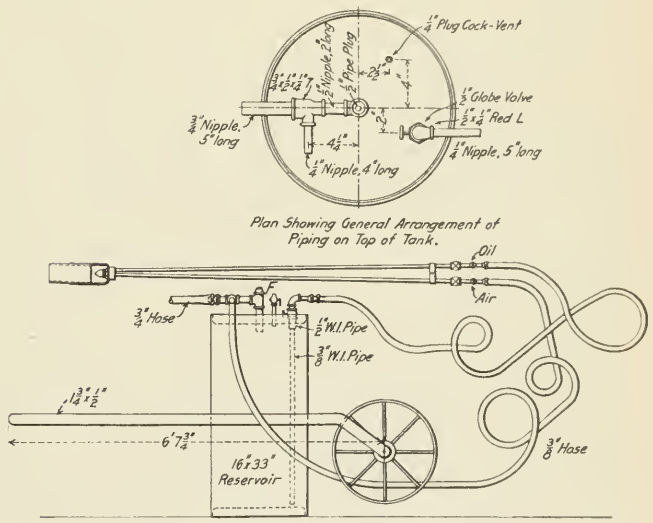


Fig. 3—Portable Crude Oil Burner.

voir. Air is admitted to the tank through the connection at F, the pressure forcing the oil out through the ⅜-in. pipe and hose. The construction of the burner is clearly shown in Fig. 4. The supply of oil and air to the burner is controlled by the globe valves. The oil tank may be refilled by removing the

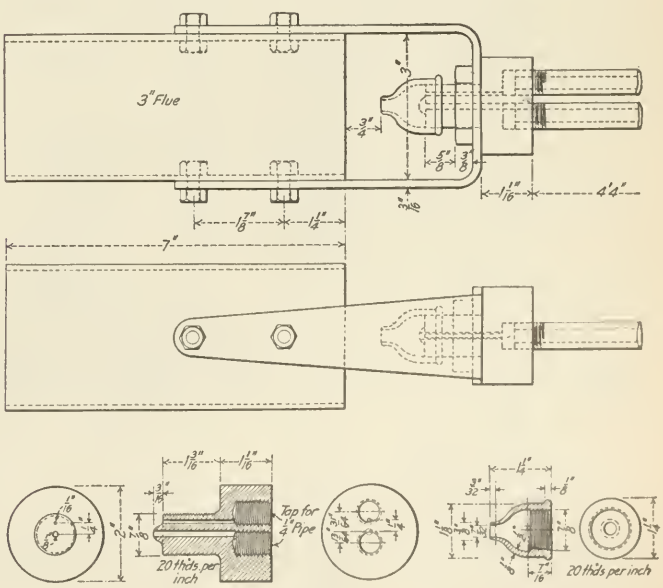


Fig. 4—Details of Torch on Crude Oil Burner.

plug at F. Air pressure is used at from 75 to 100 lbs. per sq. in. The handles of the truck are made of ½-in. x 1¾-in.

wrought iron, and are tied to each other by two ⅜-in. bolts on either side of the tank, the arms being properly spaced apart by 6-in. lengths of pipe through which the bolts pass.

SAFETY CLAMP FOR BOILER TEST HOSE.

A strong safety clamp for the hose which is used for testing locomotive boilers in the engine house, is shown in Fig. 5. The large end of the clamp, which is made of wrought iron, fits over the hose, while the small end clamps over the nipple. Two

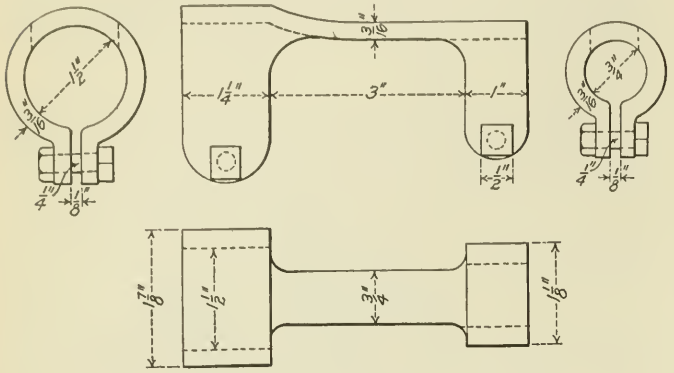


Fig. 5—Safety Clamp for Boiler Test Hose.

of these double clamps are used—one where the hose is connected to the engine house test line, and the other where it is connected to the boiler.

PAINT SPRAYER.

A simple and efficient paint spraying apparatus is shown in Fig. 6. The can is made of heavy galvanized iron, and the paint is introduced through the opening A, which when the can is in use is securely covered by the cap C. The cap has a rubber disk on the inside at the top, making the joint air tight. A hose from the shop air line is connected at B. By opening the valve, which is controlled by the lever H, air is allowed to escape through the nozzle G, which is an ordinary ¼-in. tee. As it rushes out it syphons the paint through the pipe, which is connected to the bottom of the oil can. The paint should be mixed sufficiently thin to flow freely. A handle E is attached to the side of the can for convenience in handling.

WAGON FOR MOUNTED WHEELS.

An important advantage of the wagon for mounted wheels, which is shown in Fig. 7, is the fact that it will turn in its own length, and can thus be used successfully in getting around sharp corners in a crowded roundhouse. It is made of a 2-in. x 12-in. oak plank, 6 ft. long, which is hung from its center on the wrought iron axle. The wheels are 10 in. in diameter and have 3-in. treads. The oak plank is stiffened and strengthened by the two trusses of ½-in. x 2-in. iron, which lip over the plank

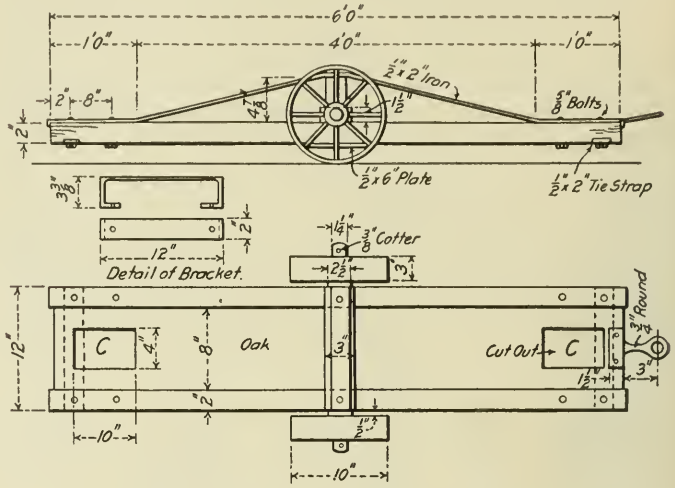


Fig. 7—Wagon for Mounted Wheels.

at its ends and are securely bolted to it by the ⅝-in. bolts. A bracket of ½-in. x 2-in. iron over which the truss straps extend is bolted over the axle. A ½-in. x 2-in. strap is also placed across the plank on the under side at each end. The top of the wagon is only a few inches above the floor, and the wheels can readily be rolled on it by using a set of iron, or iron faced wooden wedges, which may easily be carried on the wagon. These are usually made 6 in. wide and 18 in. long, and of the proper height to suit the wagon. As the wheels are rolled on the wagon they drop into the recessed parts C, which prevent them from rolling off. The wagon may easily be moved about by placing a rope through the eye-strap at the end.

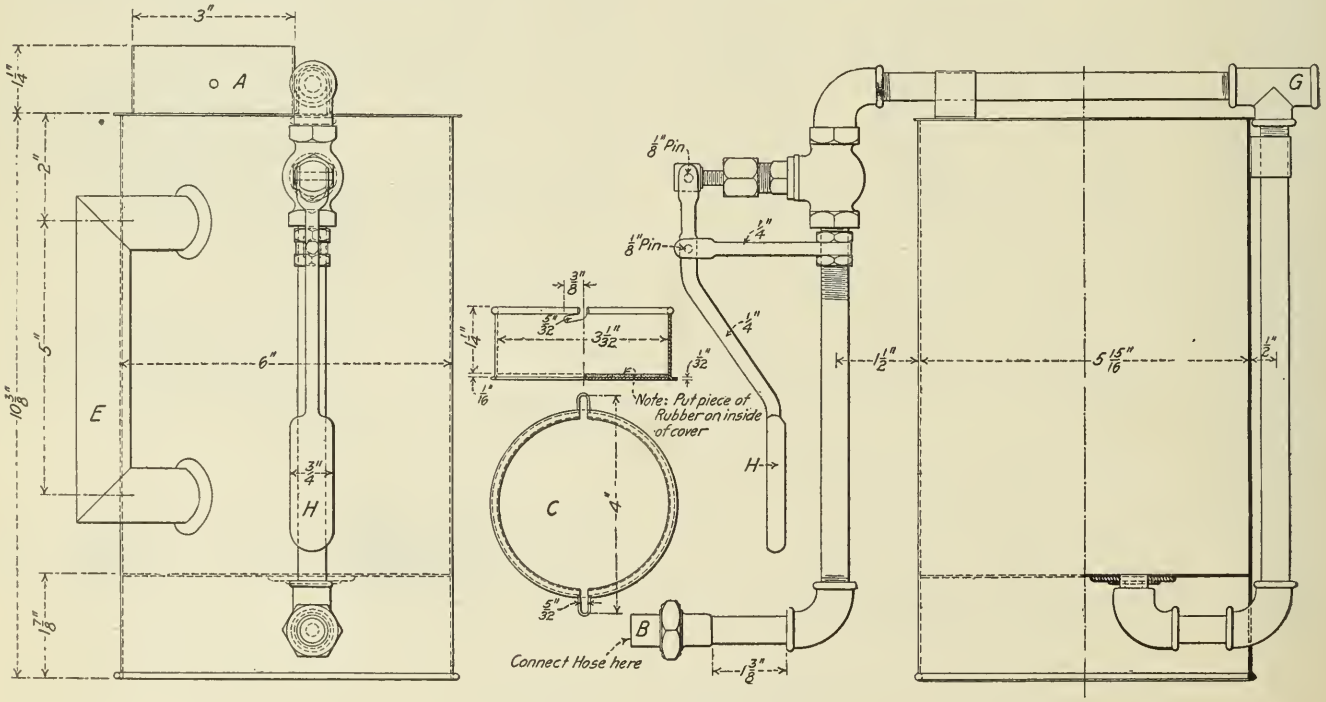


Fig. 6—Pneumatic Paint Sprayer.

PNEUMATIC HOIST.

A pneumatic hoist with a trolley and an overhead track is a most convenient means of handling heavy material about the pits in an engine house. If the trolley tracks are arranged in U shape, the legs of the U extending along each side of a pit, each one of them will serve three pits, thus requiring a minimum number of hoists. An air hose extending from above the center

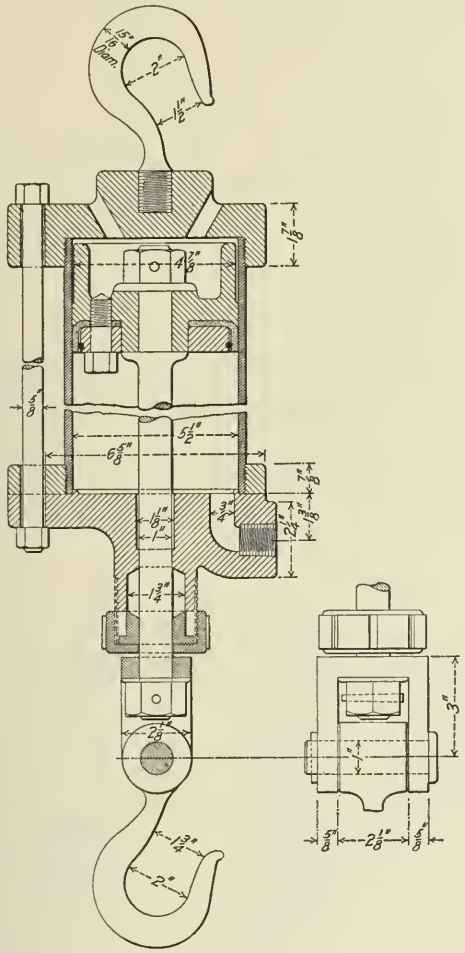


Fig. 8—Pneumatic Hoist.

of the middle pit can be made to follow either leg of the U. The hoist which is shown in detail in Fig. 8 has a capacity of from 1,200 to 1,500 lbs., and can be made any desired length. The cylindrical portion is made of brass, but heavy iron pipe may be used after it has been properly smoothed inside, or cast iron may be used. In the latter case, the wall should be not less than ½ in. thick. The construction of the hoist is clearly shown on the drawing.

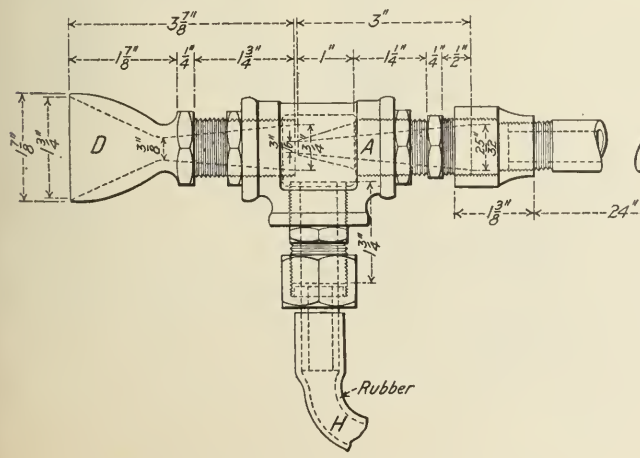


Fig. 9—Pneumatic Whitewash Machine.

PNEUMATIC WHITEWASH MACHINE.

Large areas of wall space and roof in a roundhouse or shop can be quickly whitewashed by the use of the pneumatic machine shown in Fig. 9. It is made of an ordinary ¾-in. tee, having an air nozzle, A, connected with an air line, projecting into one end. At the opposite end of the tee is a discharge nozzle, D, which is flared out in order to spread the whitewash

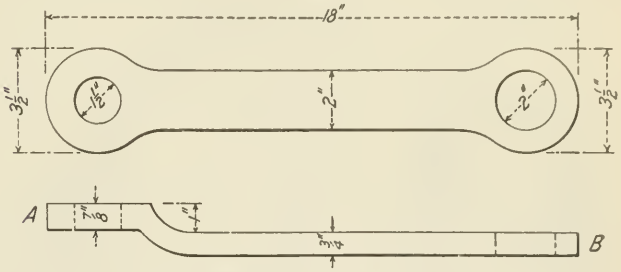


Fig. 10—Cylinder Head Lifter.

to the best advantage. The globe valve G has its construction modified so that the admisison of air from the pipe B to the nozzle A may be controlled by means of the handle E. Air from the supply line is used at a pressure of from 75 to 100 lbs. per sq. in. The whitewash is syphoned up through the

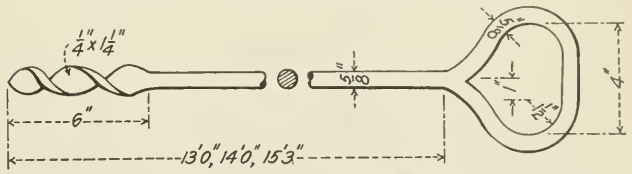
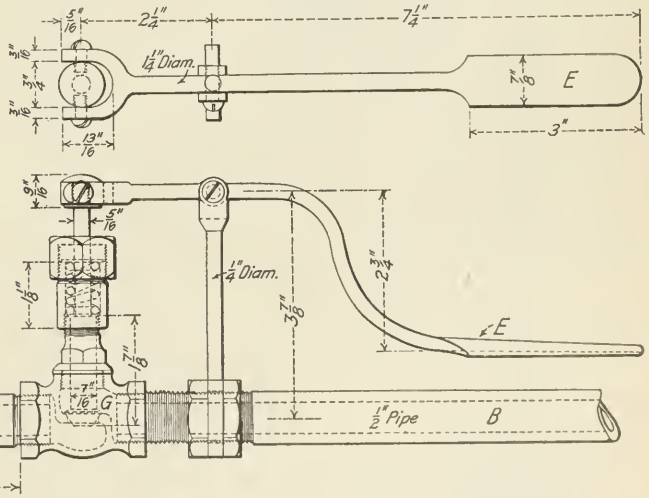


Fig. 11—Flue Auger.

rubber hose, H, and is sprayed out through the nozzle, D. It is usually prepared in a barrel and is made quite thin, so as not to clog the hose. The air pipes are standard ½-in. pipe, and the various connections are of brass. An ordinary garden hose will answer for handling the whitewash.

CYLINDER HEAD LIFTER.

A simple device for handling cylinder heads when they are



removed or replaced with the aid of a portable crane, or by one suspended from the smoke stack, is shown in Fig. 10. It is made of soft steel, the end A fitting over the stud at the center of the cylinder head. The other end is formed into a 2-in. eye to fit in the crane hook.

FLUE AUGER.

A simple flue auger is shown in Fig. 11. The handle is made of ⅝-in. round iron, to which is welded the flat twisted ¼-in.

x 1¼-in. soft steel stock. This auger may be made in any length, the three lengths used in our engine house being shown on the drawing.

PORTABLE 1½-TON CRANE.

A portable 3,000-lb. crane, which may be used to advantage in either the engine house or the erecting shop, for such work as handling steam chests and covers, cylinder heads, guides, crossheads and bumper beams, is shown in Fig. 12. The base of the crane, which is mounted on the wheels, is a heavy iron casting, the general design of which is shown in Fig. 13. The front axle is pivoted at the center and is offset; the handle is rigidly fastened to this axle and when it is raised the front of the bed drops until the lug A rests on the floor, thus steadying the crane. The upper frames, B, of cast iron, are securely bolted to the base and are reinforced by the ½-in. x

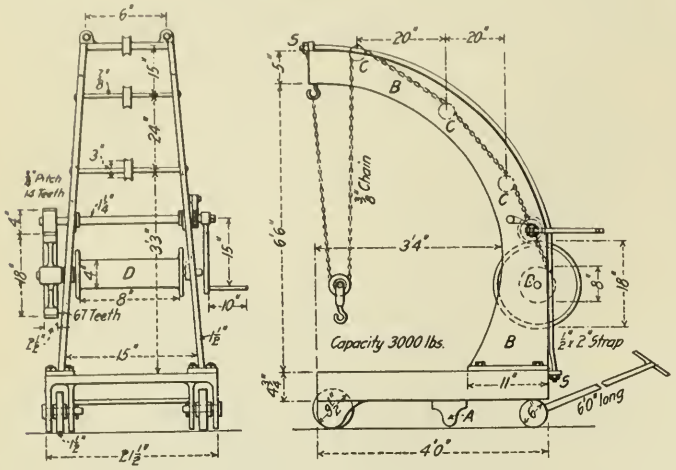


Fig. 12—Portable 1½-Ton Crane.

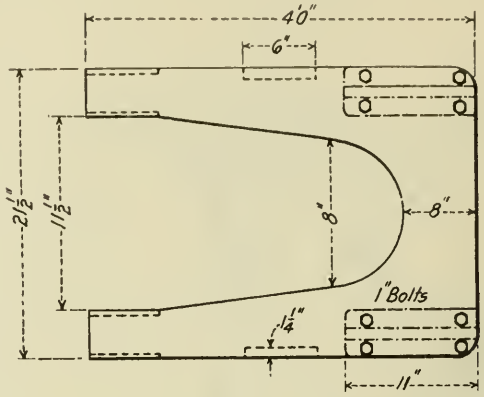


Fig. 13—Cast Iron Base of Portable 1½-Ton Crane.

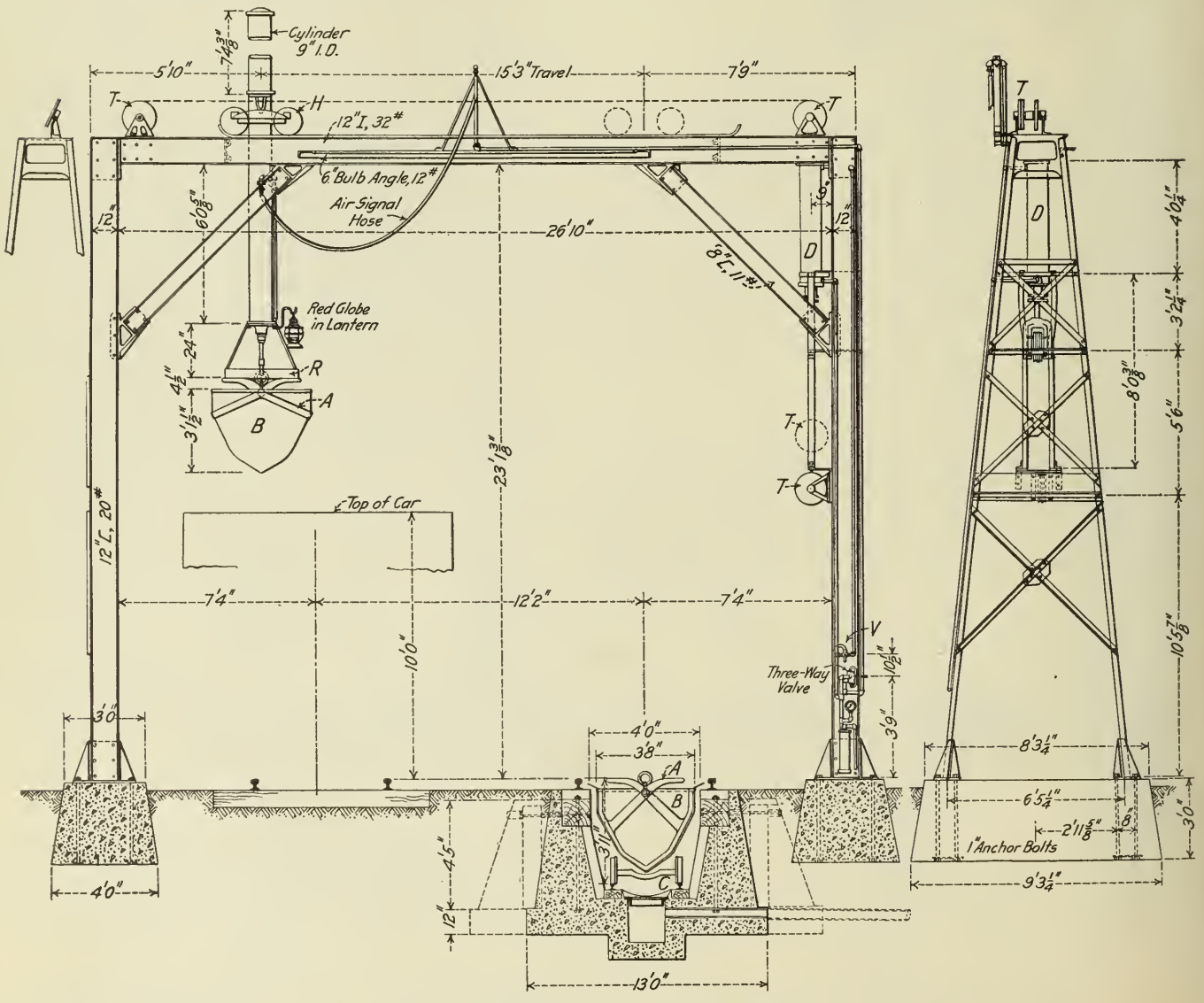


Fig. 14—Pneumatic Hoist at Cinder Pit.

2-in. iron straps which pass through the lugs, S, at the upper and lower part of the frame. The chain runs on the drum, D, and passes over the sheave C. A ratchet and pawl are provided for locking the drum and thus holding the load at any height.

PNEUMATIC HOIST FOR CINDER PIT.

The efficient operation of an engine house depends to quite an extent on the facilities that are provided for handling ashes and cinders at the ash pits. An admirable arrangement for doing this is shown in Fig. 14. The framework for the hoist is supported on a substantial concrete foundation, and consists of 12-in. channels, 20 lbs. per foot, at the sides, securely braced by angle irons and straps as shown. The top cross members of the framework are 12-in. channels, 32 lbs. per foot. The framework extends over two tracks; one at the ash pit and one for the cinder cars. The construction of the ash pit is clearly shown on the drawing. The number of ash buckets, B, which are supported on the four-wheel trucks, C, depends on the length of the ash pit and the service which is required of it. When

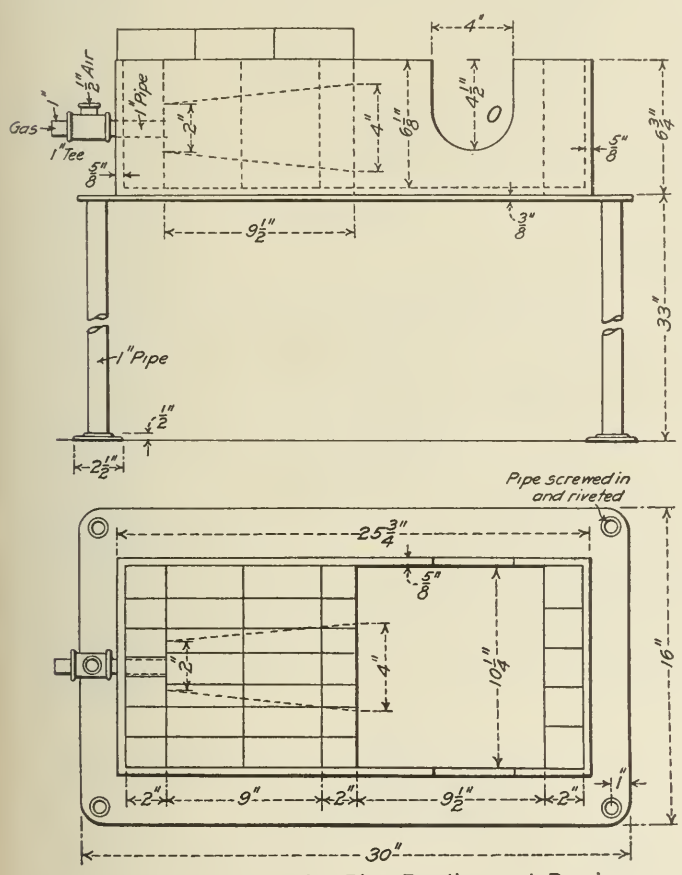


Fig. 15—Gas Furnace for Pipe Bending and Brazing.

one of the buckets, B, has been filled and run underneath the framework the overhead hoist, which is supported from the small truck which operates on top of the 12-in. eye beams, is placed directly over the ash pit by manipulating the handle of the valve on the column at the side of the pit. Valve V controls the admission of air into the cylinder D, which is fastened to the side of the framework. By the system of pulley-wheels T, one of which is fastened to the end of the piston rod of cylinder D, and by means of a wire cable which passes over these pulleys, and which is fastened to the truck, H, the latter may readily be moved back and forth over the two tracks at will. To steady the piston rod it has a crosshead at the end which runs in guides fastened to the side of the framework.

The 9-in. hoisting cylinder which is supported by the truck, H, is operated by the three-way valve, and the piston rod may be allowed to drop to such a position that a hook at its end may be engaged with a link on the ash pit bucket. The bucket may then be lifted from the truck, and by operating the valve which controls the cylinder, D, may be transferred directly over the ash car. Then by raising and lowering the bucket slightly and allowing the upper end of arm A to strike the heavy iron ring R, which is rigidly fastened to the bottom of the cylinder head, the two halves of the bucket may be made to open outward, allowing the ashes to fall in the car. Allowing the piston to drop slightly, closes the bucket again and it may then be moved over and dropped onto its truck, and another truck with a full bucket may be run under the hoist, and be dumped in a similar manner. The carriage of the truck, H, is fitted with a cast iron yoke which allows the cylinder to swing a considerable distance in any direction. The ash bucket trucks are constructed of 2½-in. x 2½-in. angle iron, and have heavy forged axles with cast iron flanged wheels.

GAS FURNACE.

A simple and durable gas furnace used for pipe bending and brazing in the engine house is shown in Fig. 15. The box, which is 6¾ in. high and about 24 in. x 10 in. inside, may be made either of cast iron or of iron plates. It is partially lined with fire bricks as shown. The gas which enters the 1-in. tee through the 1-in. pipe is mixed with air, which enters through the ½-in. pipe; this mixture is forced into the furnace through the 1-in. pipe, the opening in the fire brick increasing in diameter from 2 in., where the gas enters, to 4 in., where the fire brick ends near the center of the furnace. That part of the pipe which is to be heated is laid across the furnace in the depression O, where the heat is intense. Fire bricks protect the back wall of the furnace. The gas is used at a pressure of about 6 oz., and the air at about 70 lbs. per sq. in. The furnace is placed on an iron plate ⅜ in. thick, 16 in. wide and 30 in. long, which is supported on four legs of 1-in. pipe. The device is comparatively light and if desired may be moved about the engine house if suitable air and gas connections are provided.

OXY-ACETYLENE WELDING.*

BY R. W. CLARK,
Foreman Boilermaker, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

A number of service tests of welds in fireboxes of locomotives indicates that the oxy-acetylene welding method is a success. On one of our large passenger engines, steam pressure 210 lbs., we applied two large patches on the side sheets. The engine then went into service for nine months. When it came back to the shop, we removed the side sheets because of cracks in different places, such as the horizontal seams in the firebox and cracking of the sheets above and below the stay bolts; the patches also cracked in different places, but the weld was in good condition. To apply any kind of a satisfactory patch at this place is a very difficult job, and the oxy-acetylene weld was far superior to any other that might have been made. The patch cracked within one inch of the weld, but the weld stood.

We also have two other patches in the firebox of a smaller boiler, carrying 160 lbs. pressure, which have made quite a record. After making 65,000 miles the engine is now in the shop for general overhauling and the patches are in good condition. It is hoped that they will make double this mileage. These patches are 5 ins. x 24 ins. and are directly under the brick arch. There is also a small patch welded in over the fire door on the flanges. This engine would otherwise have had to have received two new side sheets twelve months ago. Patches applied at this place with patch bolts will give no end of trouble in the round house and will possibly have to be renewed once or twice.

We have two patches, 70 ins. x 24 ins., in one of our large freight engines on both side sheets, just above the grate bars. This boiler carries 195 lbs. pressure. These patches have been

*An extensive article on the methods of oxy-acetylene welding and cutting, used in the Nashville, Tenn., shops of the Nashville, Chattanooga & St. Louis, and prepared by William G. Reyer, general foreman, and Mr. Clark, appeared in the *Railway Age Gazette* of August 5, 1910, page 243.

in service for five months and have given no trouble whatever. This engine also has a flange welded at the fire door. When the engine arrived in the shop, it would have been necessary to apply two new side sheets and a half door sheet had it not been for the oxy-acetylene welding. The repairs were made at a very small expense compared with what it would have cost to remove the side and door sheets.

We have had several sets of half side sheets welded in. Two of them have made their mileage and have gone through the back shop for a general overhauling. On examination the welds were found to be O. K. We have welded hundreds of small patches in low-pressure boilers which have given no trouble whatever.

There are some places which cannot be welded successfully. However, the method is only in its infancy, and there is apparently no end to the work which can be successfully done, if handled in the proper way. We have more than sixty locomotives with oxy-acetylene welds in different parts of the boiler. This method of welding is also used for a great variety of work in the erecting and machine shops.

For cutting purposes in the boiler shop it is invaluable. I have often sent the operator in on a big job, and in three hours or less he has done as much work as would have been done by three or four boilermakers and helpers in several days of hard work, and the operator used only one and one-half tanks of oxygen. There is nothing better for cutting up old material.

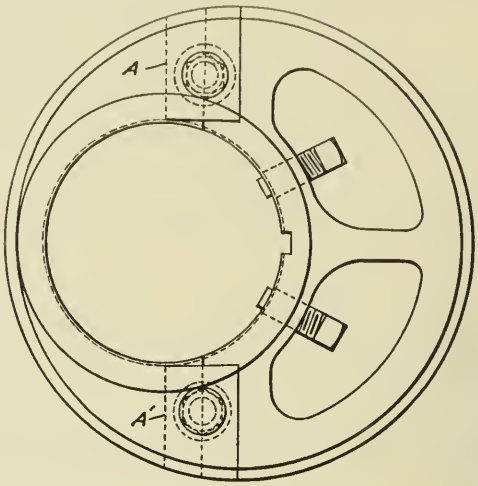
CAST IRON WHEEL FOR 60-TON CARS.

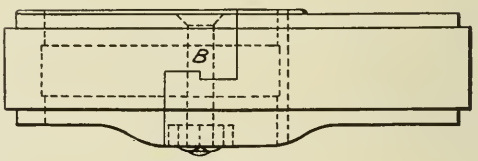
The Utah Copper Company has received some steel hopper cars from the Pullman Company having a capacity of 120,000 lbs., and the wheel and axle used under them are here illustrated. The heaviest M. C. B. standard wheel for 50-ton cars with a gross load of 152,000 lbs. weighs 725 lbs., and this may be compared in its proportions with the 800-lb. wheel for the 60-ton cars, which was designed and made by the Griffin Wheel Company, Chicago. The gross load for the 60-ton car is 170,000 lbs. The thickness of the tread in the heavier wheel is 2 in., the same as the M. C. B. 725-lb. wheel. The thickness of the double plates has been slightly increased, the outer plate to 1¾ in., the inner plate to 1⅛ in. and the single plate to 1 3/16 in. The principal change is in the inner projection beyond the flange, which makes the total width of tread and flange very nearly 6 in., as compared with 5⅝ in. in the M. C. B. standard section for 50-ton cars. This makes a novel shape for the flange and increases the thickness in the direction where needed for greater strength; it has been found to make a proper blending of the white and gray iron at this critical point. The increase in the total width at the tread will also add materially to the strength of the wheel. The thickness of the bracket has been increased from 1⅛ to 1¼ in., and the height from 2 in. to 3 in. The increase in the height of bracket is due to the fact that the single plate in the new heavy pattern is located farther out on the rim, so that the curve joining the plate and the rim increases the thickness of the rim rapidly.

The large axle required for the 60-ton cars is shown on the drawing, and it may also be compared with the M. C. B. axle for 50-ton cars designed to carry 38,000 lbs. The new axle should carry 42,000 to 45,000 lbs. The length over all and the length of the journal is the same for each axle. The diameters are increased 1 in. all through, the journal being 6½ in., wheel seat 8 in., and center 6⅞ in. These are convenient figures to remember and to work to, but they may be larger than necessary, and it seems desirable for the M. C. B. Association to adopt another standard axle suitable for cars with a nominal loading of 60 to 65 tons.

SPLIT ECCENTRIC.

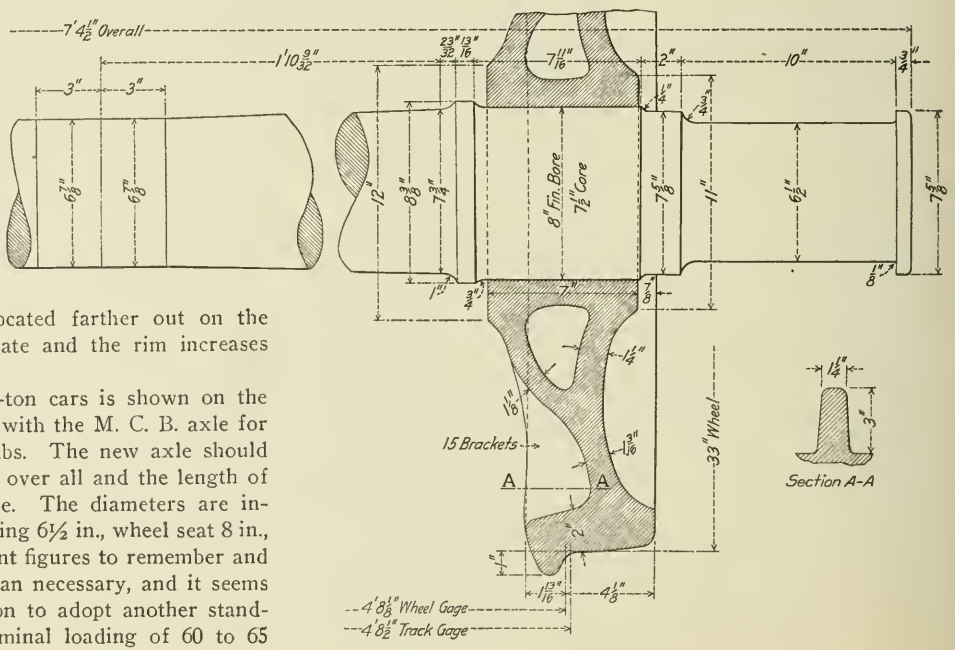
It is frequently necessary to use split eccentrics on locomotives, and in some places it is preferred to the solid type. The accompanying illustration shows a strong construction for a split eccentric that has been used on the Baltimore & Ohio, which does not require that the division line shall be central with the axle, and with which the bolts are relieved of all stress. The main parting line A A¹ is on the center line of the axle, but the small side





Split Eccentric.

of the eccentric has an overhang, B, with a lip engaging in a recess in the larger portion. The two parts are held together by a single bolt on each side with countersunk head and nut. With this arrangement the bolts carry none of the stress of the eccentrics, this being taken by the lips and serve merely to hold the two parts together. No hub is required and the eccentric is held in place on the axle with a key and set screws in the usual manner.



Wheel and Axle for 60-ton Freight Car.

THE MISTAKES OF THE EFFICIENCY MEN.*

BY ONE WHO HAS WORKED WITH THEM.

IV.

Unscientific.

The efficiency men are rightly to be judged both by their utterances and by their success or failure to work out in a practical way the theories they stand for. In the case of the former, much has been said and written to which as thoughtful men as they have taken exception; as to the latter it will doubtless be admitted even by the efficiency men themselves that their success has in many, if not most, cases been questionable. The attempts that have been made to establish their systems on railways have been so few that railway men are necessarily led to investigate the claims that have been made of what has been accomplished in manufacturing plants. Railway men are not opposed to scientific management, although they have been so represented. They do object, however, to the manner in which so many of the efficiency engineers have exploited as a new and wonderful departure in the field of industrial and railway operation, many of the methods that have been recognized as fundamental and have been worked out to a successful conclusion in most of the representative railway shops of the country. The same may as properly be said of manufacturing plants, in many of which efficiency men have found it impossible to make sufficient progress to warrant the cost of the introduction and establishment of their systems.

Much of what they have said and written has been allowed to go unanswered. The popular publications have welcomed them as the bringers of good news, who are to save us from the slough of inefficiency. Their statements appear to be accepted as scientific deductions which require no further proof. But merely to discuss scientific questions does not make one a scientist, and one of the fundamental weaknesses of their position lies in the fact that, posing as scientists, they have made statements and set up claims in disregard of the actual conditions. In what respects then are many of the efficiency men unscientific in their attitude and methods with reference to scientific management?

First, in basing their conclusions on incorrect, insufficient, or immaterial data and in applying them to conditions which were absent in the initial investigation.

Second, in criticizing methods of operation without a full recognition of what they have accomplished and in substituting therefor a system which experience has shown to be impracticable.

Third, in their impatience for results.

UNSCIENTIFIC METHODS OF DRAWING CONCLUSIONS.

What is more common in their utterances than an imposing array of examples of extremely low efficiency, submitted as evidence that conditions call for heroic treatment, or of examples of high efficiency as a proof that their methods can alone bring order out of the chaos? A mere citation of disjointed facts, however, proves nothing. They are at best but half-truths, and as such are not only out of place in a scientific discussion of the questions under consideration, but are misleading. A disinterested seeker after the truth asks: "If the unsatisfactory conditions that have been described actually exist, are they due to a *wrong* system or to the *absence* of system; do they correctly represent average conditions, or are they only exceptional instances due to factors which are but local and transitory?"

Efficiency men claim to be scientific, as contrasted with practical men, who they say, follow the rule of thumb. But a scientist publishes his conclusions only when, after extended experiments and observations, he has found the evidence sufficient to warrant giving them publicity. He is no scientist who hastens into the limelight with evidence based on scattered examples, found amid varying conditions, and risks the odium of his co-workers by announcing premature conclusions. Among reputable physicians, chemists, biologists and other scientists, it is customary to delay the announcement of important discoveries even far beyond the time which would seem under all the laws of logic to be required. The result is that when such an announcement is made it is backed up by a series of facts so closely related and so strongly fortified by innumerable examples bearing distinctly upon the question, that it is unusual, indeed, for it to require alteration.

Is it scientific to use as evidence cases of low efficiency and consequent high costs and unsatisfactory service, or of improvements that have followed the introduction of efficiency methods, without an equally fair statement of all the conditions that surround the operations? Or to search through the records for an especially poor performance to set alongside an especially good one, irrespective of the causes and the general tendency in either case? All thoughtful accountants appreciate how misleading statistical data may be unless all the concurrent factors are taken into consideration and proper allowances made for them. Whatever the unit of measurement, it is unsafe and improper to draw definite conclusions from too narrow a range of data.

A good record of one month may really be a poor one when all the facts are known. For example, in an industry where the different operations that precede the completion of a certain unit are scattered over a period of several months, the output during a particular month may, and usually does, bear no direct relation to the cost of operations during the month in question. In a shop building steam engines, machine tools, passenger cars, or similar equipment, requiring perhaps two months or more to assemble complete, it is the height of folly to assume that the cost of the operations in a given month divided by the output represents the cost per unit, and indicates whether the results are satisfactory or otherwise. Yet this has been done and has been submitted as evidence in proof of the alleged phenomenal results that have followed the introduction of a certain system of shop operation.

We can judge of the value of claims of this nature—disjointed statistics that in themselves ought not to be accepted as proving anything—only from those with which we are familiar. In an article explaining the gospel of efficiency, written by one of the chief of its apostles, an example is cited which if accepted at its face value and as representative of average conditions, is certainly a strong endorsement of a new system which is claimed to be "as different from the old as the rifle is from the bow." The example given is that of a large industrial plant, the owners of which desired to increase the output from 13 to 23 units per month. It is said that the manager recommended an expenditure of a large sum of money for the purpose. The efficiency engineers, young lochinvars out from the West, however, after making their usual investigation reported not only that *no* expenditures for extensions were required, but that the output could be increased 60 per cent. within a very short period, without adding either to the equipment or the force, or increasing the payroll more than 10 per cent. (the increase that was anticipated undoubtedly represented bonus). Evidence is then submitted for the purpose of proving that the results were even greater than had been forecast. It is claimed that within the time allotted the output had increased 69 per cent., and that the payroll, far from increasing, had been reduced 15 per cent. Nothing is said about the expenditures for equipment, but the conclusion is that the suggestions of the efficiency engineers having been followed in other respects, were followed as well with reference to property expenditures.

The writer has received authoritative information regarding this particular case that throws a different light on the subject. Bearing in mind that disjointed statistics cannot be relied upon, what facts were ignored in citing this example as a proof of the

*The first article, which considered the extravagant statements and claims made by efficiency engineers, appeared in the January 6 issue. The second article, on the failure of many of their theories when put to the test of practical application, was published in the February 3 issue and the third, on their neglect of the human element, appeared in the March 3 issue.

results achieved by the efficiency men? It was true that the output for one month had been 22 units as compared with an average during the previous year of 13. But one robin does not make the spring. The actual results were: 1, For a period of six months immediately preceding the introduction of the new system, the average output had been 14. 2, For the next nine months the average output was 15½, an increase of 1½, or 9 per cent. 3, For the month immediately *preceding* that in which it was 22 (the ideal to be reached), it was 14. 4, During the month immediately *following* the output was 7, and the plant then closed down for want of work. It should also be stated that a large amount of money was expended for improvements, although the "assay" of the efficiency engineers indicated that none was required, and that the reduction in cost of operations *per unit* was almost negligible. It is apparent from even a cursory examination of these figures that the "evidence" was to say the least, misleading. The output had not increased as stated. There were local reasons why in the particular month mentioned it was larger than previously. That it was not due to any revolutionary change in the methods of operation is apparent from the fact that during the month immediately preceding it, the output had been *less* than the previous average. That the pay roll had been reduced, was due only to the fact that many of the shops had been closed down, only the assembling shop, where output is counted, running full. Further interesting facts in connection with this particular case, which were omitted in the article using it as evidence, are that the system as introduced by the efficiency engineers was afterwards discontinued, and that much better results are being secured. From whatever point of view the example cited by the efficiency engineer may be considered, the conclusions reached were certainly not arrived at *scientifically*.

Another instance, based on insufficient data, is the following: In a recent discussion in one of the leading New York dailies the statement was made by a prominent efficiency engineer that "the losses occurring in many items of railway operation have been checked on a large scale," and it is asserted that, based on such extensive checking, the conclusion is justified that they mount into the hundreds of millions. This alleged loss has been used as head-line material for many months and has served as a text for numerous articles in current publications by men who have accepted it as gospel. They have, however, overlooked a still more pregnant statement in another article by the same authority as follows: "The net earnings of the railways in 1909 were only $1,078,132,735, but sympathy is not so great as it would be if it were not so evident that wastes were annually occurring, a very large part of them preventable and *aggregating a sum larger than the net earnings*" (the italics are ours). Evidently an error was made when it was stated that the losses amount to a paltry $1,000,000 a day; they are actually $3,000,000 a day, "a very large part preventable." Are these the conclusions of a scientist? Where and when have efficiency engineers checked railway operations on a large scale? Have 20 per cent., 10 per cent. or even 5 per cent. of the multiplicity of factors that affect railway economics been analyzed by them? Is it not a fact that they have been checked only on a few roads and that even where the conditions were subjected to their scientific treatment, such treatment has failed? The evidence of economies effected on the Santa Fe has already been shown in the *Railway Age Gazette* to be such that it can not be seriously accepted. As already stated, such statistics are valuable only when covering a period of time sufficient to represent average conditions.

In a pamphlet going the rounds among railway and industrial managers, an instance is cited of work being done by 40 men through the introduction of a system of planning and routing, on which 120 had previously been used. Another efficiency engineer refers to a locomotive being repaired at a cost of over $600, which should have cost $27. Without questioning the accuracy of such statements we submit that their recital does not prove that these unsatisfactory results are due to the failure of systems of operation which are well established in most representative shops. They are the result of mismanagement and the absence of system, over which almost any definite plan, however crude, would be an improvement. If an investigation were made of conditions in the shops where marked reductions in cost have been made by the introduction of the methods employed by efficiency engineers, it would doubtless be found that in many cases they had previously been allowed to run themselves. It is, therefore, unscientific to make use of such cases in a wholesale denunciation of the methods prevailing in the average railway shop.

But the reader, left in such cases to his own resources to separate the real from the unreal, is either the willing and unsuspecting neophyte, accepting with wonderment the "evidence" which has no established basis, or is obliged to reject it all as unreal. It is unfair to those among the efficiency engineers who are scientists in the true meaning of the term. There is danger that their reputations will suffer and that their usefulness will be limited because of the unscientific deductions and absurd claims of the pseudo-scientists who ransack heaven and earth for comparisons that only serve to mislead those who are not in position to answer their arguments.

IMPRACTICABLE METHODS.

Efficiency men as a rule are opposed to piece-work as being unscientific, expensive and tending toward too great effort on the part of the men. As to the first, it may be admitted without question that there have been, and are now, piece-work prices in use which are unscientific in that they have not been determined correctly. This, however, is a condition, not a principle, and can be corrected as easily as similar conditions can be rectified in connection with the standard time and bonus system which is offered as a substitute. The prices paid for the various jobs in shops which are recognized as having successfully introduced the piece-work system are determined only after a careful investigation of all the factors that affect them. In certain shops, as in the case of the Canadian Pacific, time studies are made; in others, the equivalent of the time study, observation by a trained observer, although without resource to the stop watch, is sufficient. In others, the prices now in use have been the result of an evolution, which has involved extensive checking and comparisons, and are therefore accepted as satisfactory. Whatever may be the actual situation in this respect, however, the conclusion is inevitable that any method that may be considered practicable in the determination of standard times may be used as well in establishing piece-work prices.

As to the expense, this can refer only to the amounts paid for the work done. It cannot refer to the cost of introducing the system, for the reason that in many plants the standard time and similar systems have been found impracticable, if for no other reason, because of the high cost involved in their introduction and maintenance. Why piece-work should be more expensive in so far as the cost of output is concerned is difficult to understand. If it be said that high prices are necessary in order to interest the workmen, it may be replied that equally high guaranteed day rates are demanded as an incentive to accept standard time. And there are many successful managers, who know from bitter experience that the latter is much more objectionable than the former.

It is one of the theories of the efficiency men that the acceptance of their various systems of shop operation carries with it greater comfort to the worker. To quote from one of them: "It is the belief of scientific managers that men find more pleasure in working quickly and well than in working slowly and poorly, and especially would scientific management object to automaton specialization and the exhausting strain so often induced by piece rates." As to the first, "'tis a consummation devoutly to be wished," in the search for which as much may be done, and is being done, under a properly established piece-

work system as under newer, but less practicable plans. As to the second, it may be said that so long as competition remains there will be those who choose, in spite of all that may be done, to work rapidly in order to earn more. It is not the universal testimony of managers of railway or industrial shops where piecework has been established that there is the "exhaustive strain," which is feared. As a matter of fact, it is seriously to be doubted that such conditions exist to a marked extent anywhere except in the shops usually known as "sweat shops." In any event, such an objection holds with equal force against the standard time and bonus system, for in any extensive effort to establish it, if a pacemaker can be found to lead the shop, every use is made of him. In practical operation, therefore, there is no difference, so far as the pace is concerned, between working for a high efficiency in order to earn a large bonus, and putting forth extra effort toward completing a greater number of pieces in order to increase one's earnings. The objections to piece-work are for the most part academic and theoretical. Is not the opposition to it on the part of the efficiency men due largely to their general attitude of criticism of the "old ways," and their desire to introduce something new to justify their position?

The impracticability of the standard time and bonus system, as it is usually known, has been proved in scores of attempts to introduce it. Under like conditions it has shown no economy over a successful piecework system; on the contrary, in many plants it has increased the cost of production. The expense incident to its introduction and maintenance is usually prohibitive; especially is this true when a shop is running at materially less than full output. It has led to prolonged and bitter labor disputes, and even in quarters where piecework is opposed, the opposition to the standard time system and bonus system is even greater. Its chief appeal to serious consideration lies in the stress it lays upon the necessity for a scientific study of all the conditions in determining shop methods, and for an accurate measurement of the time required in specific operations. These factors, however, are taken into account in all well-established piecework systems, which, in fact, have all the virtues of the standard time system without its objectionable features.

IMPATIENCE FOR RESULTS.

Perhaps next to the failure of the efficiency men to appreciate the importance of the human element, the most certainly fatal mistake they have made is their impatience for results. This comes often after many of the obstacles to their success have been removed. It is not confined alone to them; many practical managers have failed for the same reason. But in introducing a system of work that involves features, which while the principles underlying them may not be new, are strange to the men who are most vitally affected, impatience can undo in short order what it has taken much time and expense to build up. If it is true that man is a suspicious animal, the average workman has his full share when a new system is introduced. If it has merit, its success should not be risked by premature announcements or by assuming an uncompromising attitude toward the men. If there is great waste in shop operation, and this has been going on many years, why the impatience to change it all in six months or a year?

Instead of establishing the system in one department, and proving its worth so unequivocally that it is demanded in other departments, certain efficiency men have urged its speedy extension to other departments, for the reason that unless it is introduced into all and recognized as the established system, there is danger that it will fail in the department in which it was initially instituted. Such a necessity for its general extension is unworthy of any system which merits it. One of the most unfortunate results of the impatience that has caused shipwreck of so many well intentioned plans, is the opportunity that is given to labor to organize and present a solid front of opposition to their establishment. It is both unnecessary and unscientific to demand or expect permanently satisfactory results in introducing scientific management without giving it time to grow in favor. If the efficiency men have profited by this mistake, which has been the direct cause of many of their failures, they have gained much.

Just now scientific management is receiving consideration, either favorable or otherwise, in many quarters. There are those who believe that it offers nothing toward a solution of the problems that confront the industrial world. There are others who consider it a panacea for all our economic ills. Perhaps midway between these classes are those thoughtful men, some trained in the hard school of practical experience and possessing that true genius which is "an infinite capacity for taking pains," and others, with equal genius and with the instinct and training of the scientist, who are to be depended upon to extend the establishment of its principles. The purpose of scientific management is not to displace existing institutions. It is to perfect them. It has already been established on a much larger scale, although it may not bear the name, than many of the efficiency engineers are willing to admit. It is being further extended through patient study of existing conditions and a recognition of those factors which make for permanency. And while it is to be regretted that it is being retarded through misrepresentation and unfair criticism, it is an encouraging sign that there is a growing number of industrial and railway men of all ranks who are not blinded to its merits by the fulminations of the school of philosophers who may for the time being occupy the stage.

A CURIOUS CASE OF A WORN JOURNAL.

On October 22, 1910, a hot box was noticed on L. S. & M. S. car 72071 at York, about 25 miles from Youngstown, Ohio. The car was loaded with ore and was in a slow train. A Cook cooler was applied. On arrival at Youngstown the standard 5½-

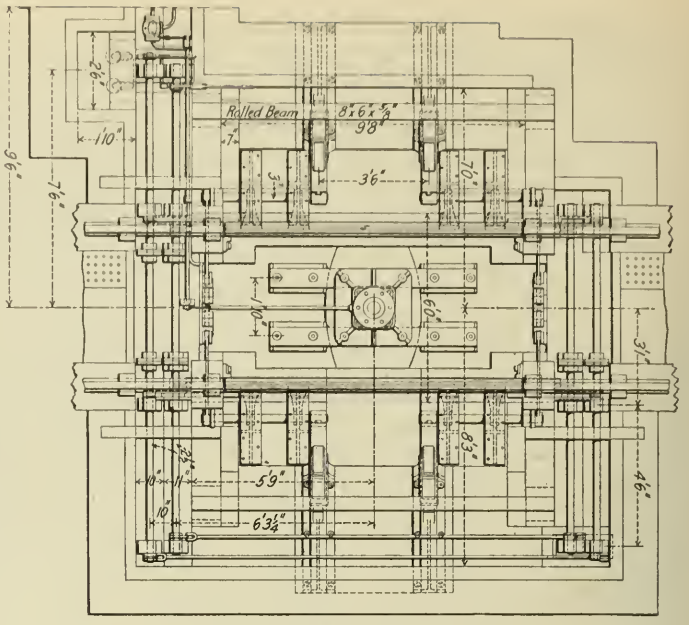


Curious Case of a Worn Journal.

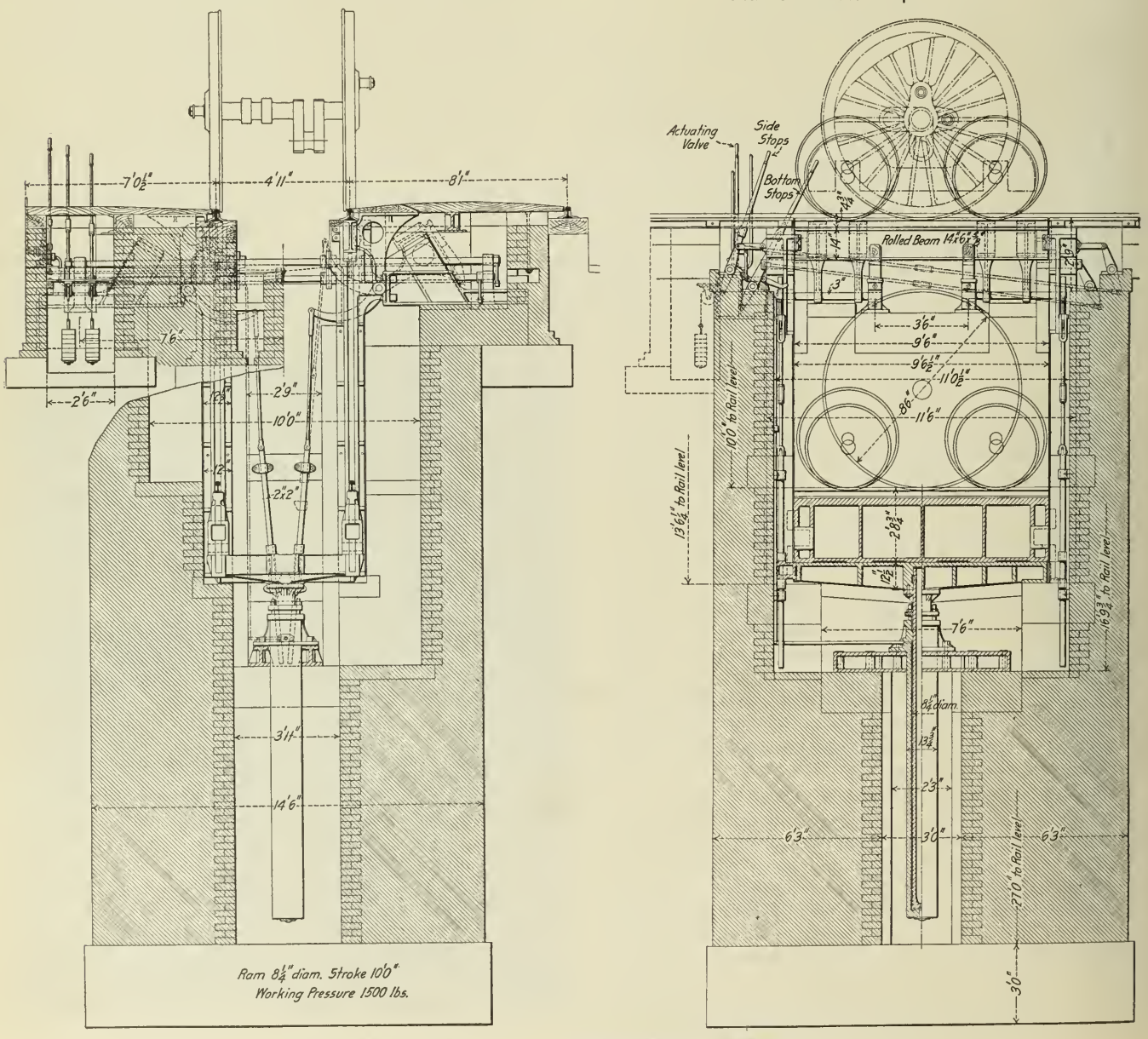
in. x 10 in. journal was found in the condition shown on the accompanying photograph. The axle was not bent, but the journal had been spun out and elongated from 10 ins. to 12¼ ins. The journal bearing was found to be badly cut and conformed to the shape of the journal. Why the journal, which must have been quite hot in order to spin out as it did, did not bend under the heavy load which it was carrying is a mystery. I. S. Downing, master car builder of the Lake Shore & Michigan Southern, to whom we are indebted for this information, has never seen anything like it in his experience.

TWENTY-TON HYDRAULIC WHEEL DROP; LANCASHIRE & YORKSHIRE.

At the joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers of Great Britain, Birmingham, England, a number of papers were presented on the subject of engine house practice. In the discussion John A. F. Aspinall, general manager of the Lancashire & Yorkshire, referred to the general practice in England by using shear legs for removing driving wheels from locomotives, but he thought that the drop pit was a much better method and described the one used on his line in the engine house at Bolton.



Plan of Wheel Drop at Bolton.



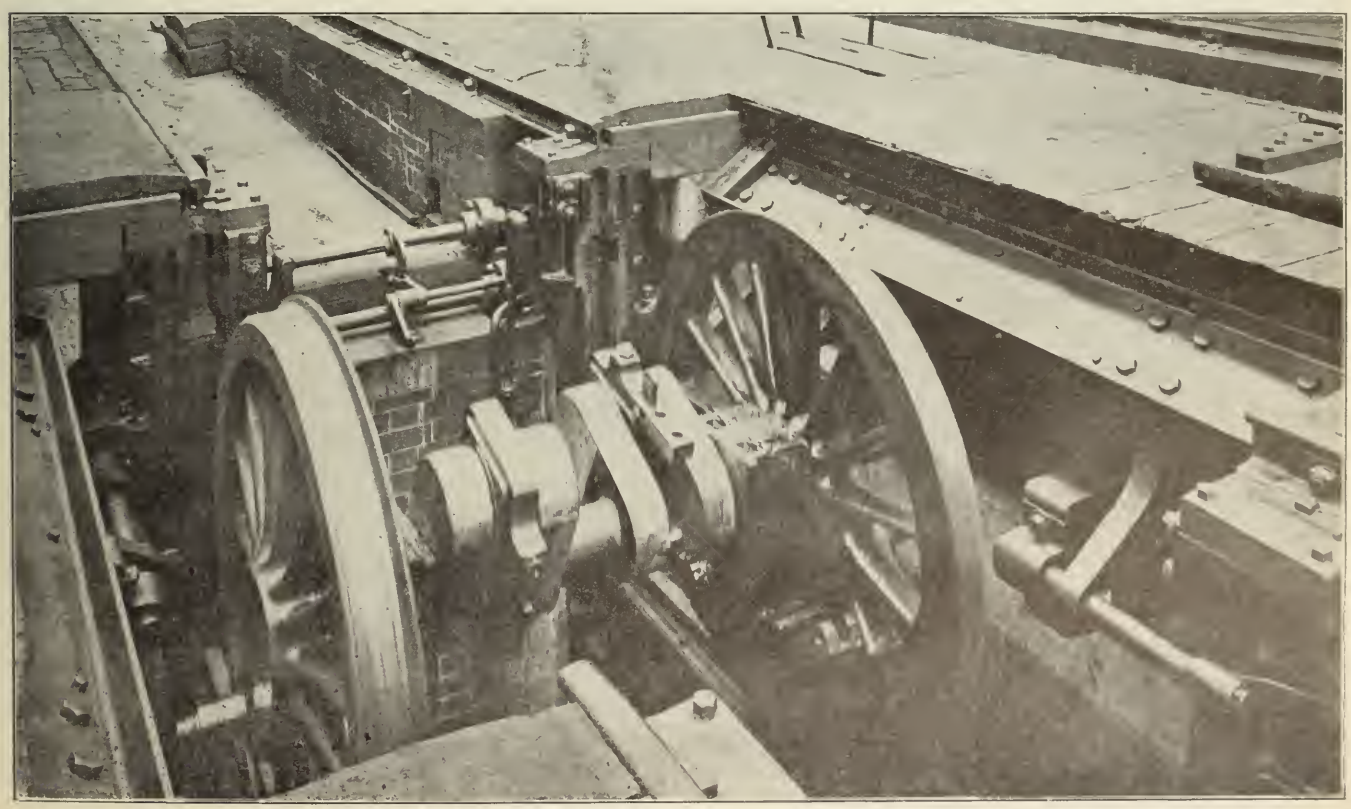
Hydraulic Wheel Drop, Lancashire & Yorkshire Railway.



Wheel Drop in Normal Position with a Pair of Wheels About to be Dropped.

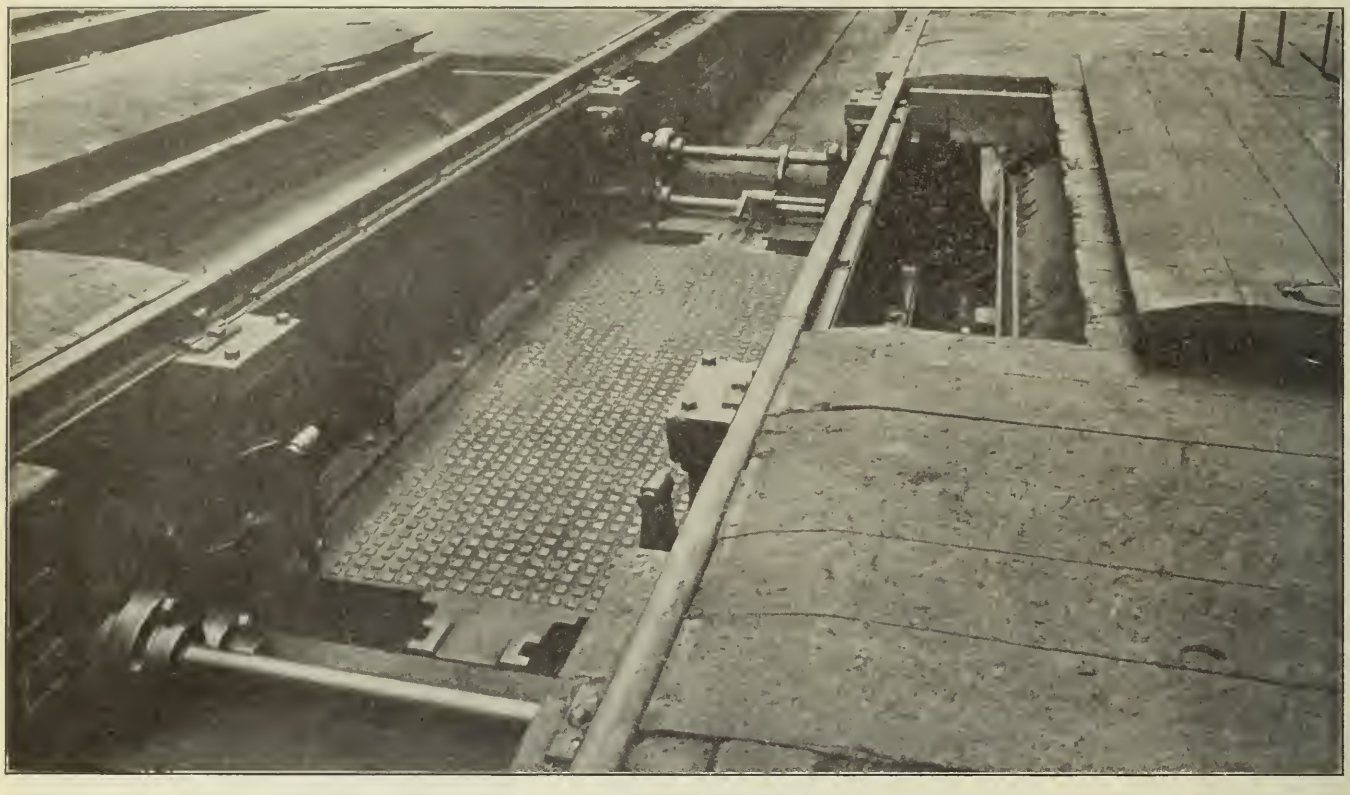
The accompanying drawings and photographs illustrate this wheel drop.

The cast iron drop-table is 9 ft. 6 in. long, and is operated by a hydraulic plunger 8¼ in. in diameter with 10-ft. stroke, under a working pressure of 1,500 lbs. per square inch. The drop rails are supported on cast iron ribbed girders 28 in. deep, and these are bolted to the plunger platform and guided by cast plates secured to the end walls of the pit. A peculiar feature of this wheel drop is the provision for two sets of supporting rails. These are made necessary from the fact that the



Pair of Driving Wheels Partially Lowered.

engine house is of the type known in England as the through running shed, and after the wheels are dropped and remain on the table rails in the pit, another set of rails must cover the gap in order to allow other engines to pass through the house. These rails are supported on a hinged structure and are thrown in or out of position by means of levers and rods which are operated by the motion of the hydraulic lift. The rails are secured to rolled I-beams, 14 by 6 by 5/8 in., an dthese are bolted to cast iron brackets which have bearings on their lower ends and are keyed to 3-in. round shafts. These shafts are connected by curved levers to rods which extend down to the plunger platform. When the platform is raised the hinged rails are thrown back so they can be covered by a hatch forming a portion of the floor. When the table rails descend the hinged rails are automatically thrown into position as a part of the through track. The hydraulic valves for the control of the plunger are operated by counter-weighted levers, and their location is shown in the photographs as well as in the drawings.



Wheel Drop in Normal Position, Except that Hatches at Side Are Removed.

APPRENTICE SCHOOL AT ALTOONA.

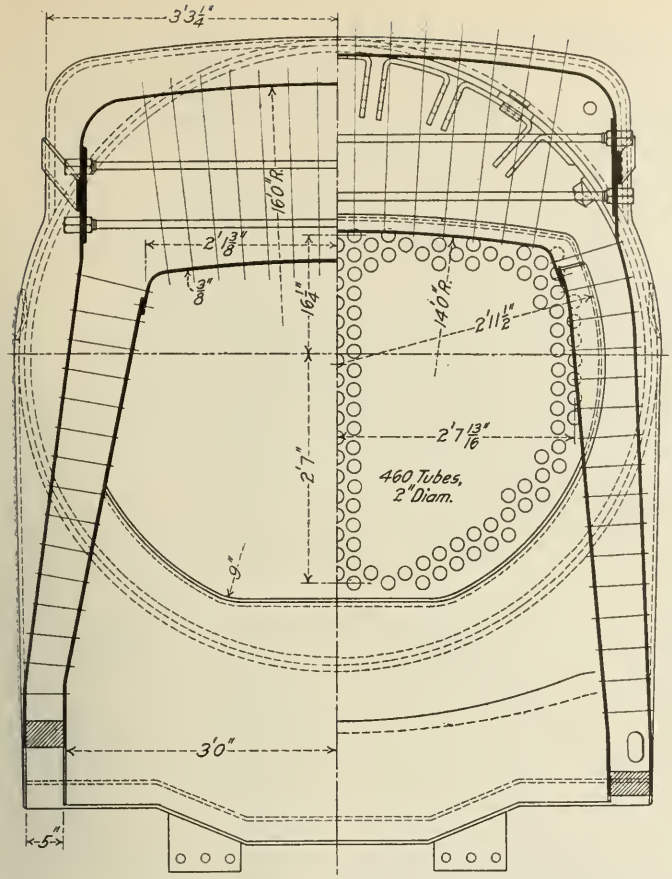
An apprentice school has been established at Altoona, Pennsylvania, by the Pennsylvania Railroad, co-operating with the engineering school of the Pennsylvania State College. It is for the benefit of the regular apprentices in the shops at Altoona. Its object is to give to apprentices a knowledge of the fundamentals of mathematics, mechanics and drawing, thereby making them better artisans. The large attendance shows that the men are eager to make the most of the opportunities open to them, and the company is more than repaid by the actual increase in the efficiency of its workmen, and by the assurance of unswerving loyalty for the men who have received all their training in its service. English is taught with special reference to writing business letters, filling out order blanks, time cards, and other details. The work is arranged to cover three scholastic years of forty-two weeks. Each appentice receives four hours of instruction a week, or a total of 504 hours for the three years. The subjects given include mathematics, physics, mechanical drawing, mechanics, mechanism, strength of materials, machine design, experimental tests and shop management. A monthly report is made by the head instructor and submitted to the general office of the company and to the Pennsylvania State College. These monthly reports, with the annual reports concerning each member of the classes, when taken in connection with the regular records of the shop foreman, form an accurate basis on which to select and use the men to the best advantage.

ATLANTIC TYPE CLASS E 6 LOCOMOTIVE; PENNSYLVANIA RAILROAD.

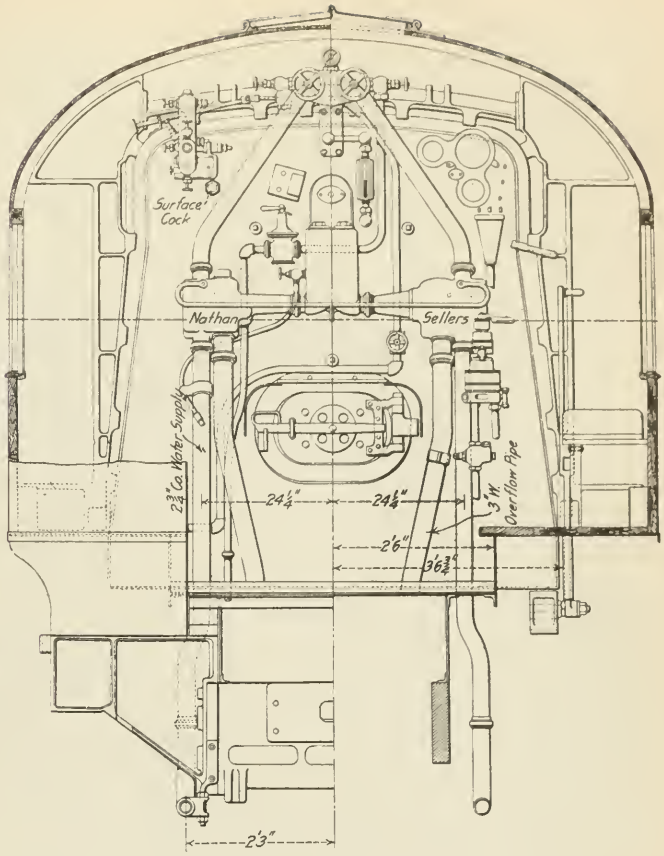
The large Atlantic type locomotive here illustrated was built at the Juniata shops of the Pennsylvania Railroad in December, 1910, and since that time has rendered very satisfactory service in hauling high speed trains on the Middle division of that road. Its best performance was shown by the making up of time on the schedule of the "Pennsylvania Special" from Harrisburg to Altoona with eight steel Pullman cars weighing 600 net tons. It is usually found necessary to double-head this train when it consists of more than six steel sleepers, even with locomotives weighing more than the new class E 6. A profile of this portion of the line with the schedule of the "Pennsylvania Special," or train 29, is shown on one of the illustrations.

On February 28, this locomotive broke all speed records between Altoona, Pa., and Philadelphia. The train consisted of two coaches and the private car of G. W. Creighton, general superintendent. It left Altoona at 8 a. m., and made the run to Harrisburg, 131.1 miles, in 112 minutes, or six minutes less than the best previous record. A large part of the run was made at a speed of more than 70 miles per hour. The run from Harrisburg to Philadelphia, 105 miles, was made in 97 minutes, of 5 minutes better than previous records. The train stopped only 3 minutes in Harrisburg.

The locomotive is remarkable for its large boiler and the great weight on drivers. With present track conditions, the limit for size, weight and hauling capacity of the Atlantic type loco-



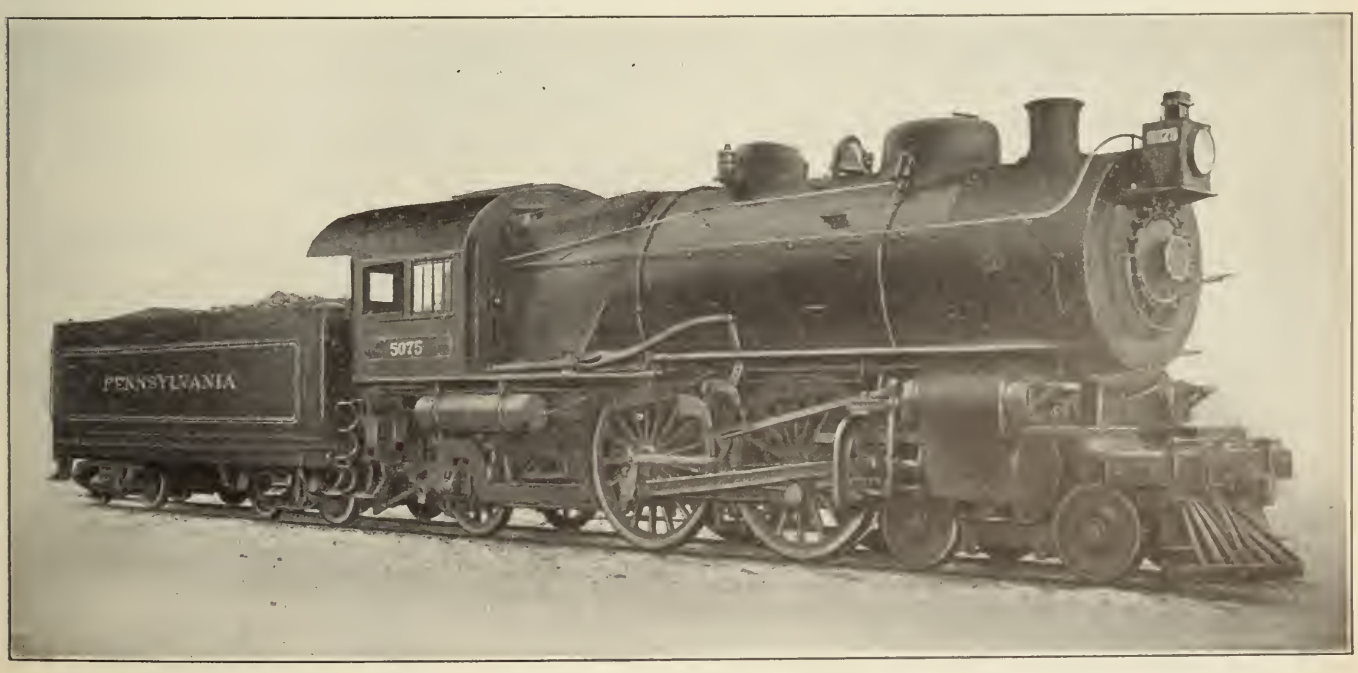
Cross-Section Through Firebox of Atlantic Type Locomotive.



Arrangement of Fittings in Cab; Atlantic Type Locomotive.

motive has apparently been reached in this design. With the introduction of the all-steel passenger equipment now used on all through New York trains on the Pennsylvania, it became necessary to provide high speed locomotives of an increased hauling capacity. The Atlantic type having previously been found satisfactory for high speed service, it was decided to ascertain what results could be obtained with a locomotive of that type somewhat heavier than those in use, the belief being that with no greater tractive effort than that of the previous standard Atlantic type locomotive the larger locomotive would increase the sustained hauling capacity at high speeds.

The general design follows closely that of other Atlantic type locomotives on the Pennsylvania, the principal difference being in the boiler, where increased heating surface was provided. To avoid the trouble experienced with long tubes, the



Class E-6 Atlantic Type Locomotive; Pennsylvania Railroad.

diameter of the boiler was increased so as to provide space for 460 2-in. tubes, 13 ft. 11⅝ in. long. The firebox has a combustion chamber of medium length and to avoid leaky joints in this chamber, the number of joints has been reduced to a minimum by flanging.

The boiler is 83½ in. in diameter outside at the dome sheet, and the two shell sheets are ⅞ in. thick. The dome is pressed from a sheet 1 in. thick and has a wide flange, which permits three rows of rivets. The combustion chamber has the tube sheet set 42 in. from the firebox sheet at the mud ring, and the gusset portion is flanged with a large radius. The water space between the parallel sheets at the bottom of the combustion chamber is 8 in. deep, and this, with the wide sweep of the sheets toward the mud ring, allows a free circulation of water to the side sheets. The Belpaire firebox is 72 in. wide and 110¼ in. long, with a grate area of 55.13 sq. ft. The water spaces around it are unusually large, the mud ring being 5 in. wide at the sides and the ends; the staybolts at the upper end of the firebox are 9 in. long between the sheets.

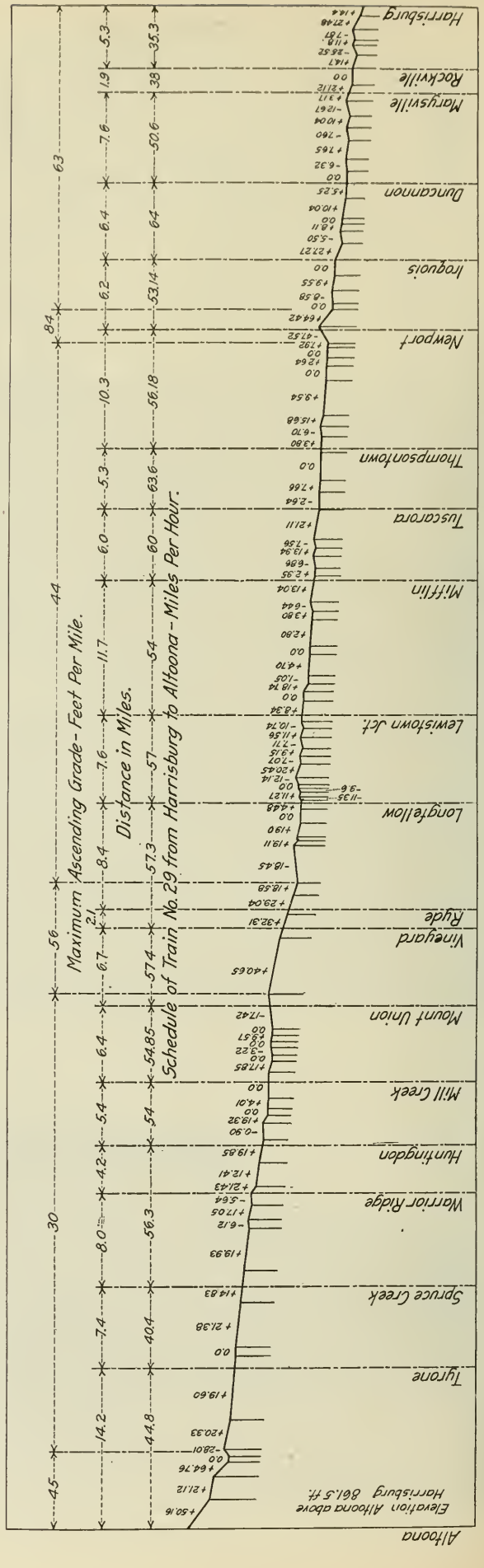
The boiler drawing shows the injector pipe carried through the boiler to within 30 in. of the front tube sheet and with an outlet at the boiler head. The drawing of the back head fixtures in the cab shows the arrangement of the injectors which lead into this feed pipe. There is one No. 11 Nathan injector on the left and a No. 11½ Sellers on the right. Water is supplied to these injectors through 2¾ in. pipes, and the overflow is conducted through 3 in. pipes. The injector steam pipes are led directly from the steam box on top of the boiler by short lines. The drawing also shows the cast iron front of the cab with the portions which fit against the sides of the firebox; also the cab ventilator, which consists of two shutters opening upward.

The ash pan, which is of the self-dumping type, is also shown in detail. The hinged bottoms are supported on heavy shafts extending along the outside of the ashpan, and these are connected by cranks and levers to the drop lever at the side. This type of ash pan has been used in large numbers by the Pennsylvania, and while meeting the requirements of the law has been found fairly satisfactory and comparatively free from the difficulties from warping and burning out which are usually found in most self-cleaning ash pans. It will be noticed that the connection of the lower portion to the upper part of the pan is provided with a large area of netting, so that the air supply to the grate cannot be restricted by dampers. The pan is made of ¼ in. tank steel and 2½ in. x 2½ in. wire netting.

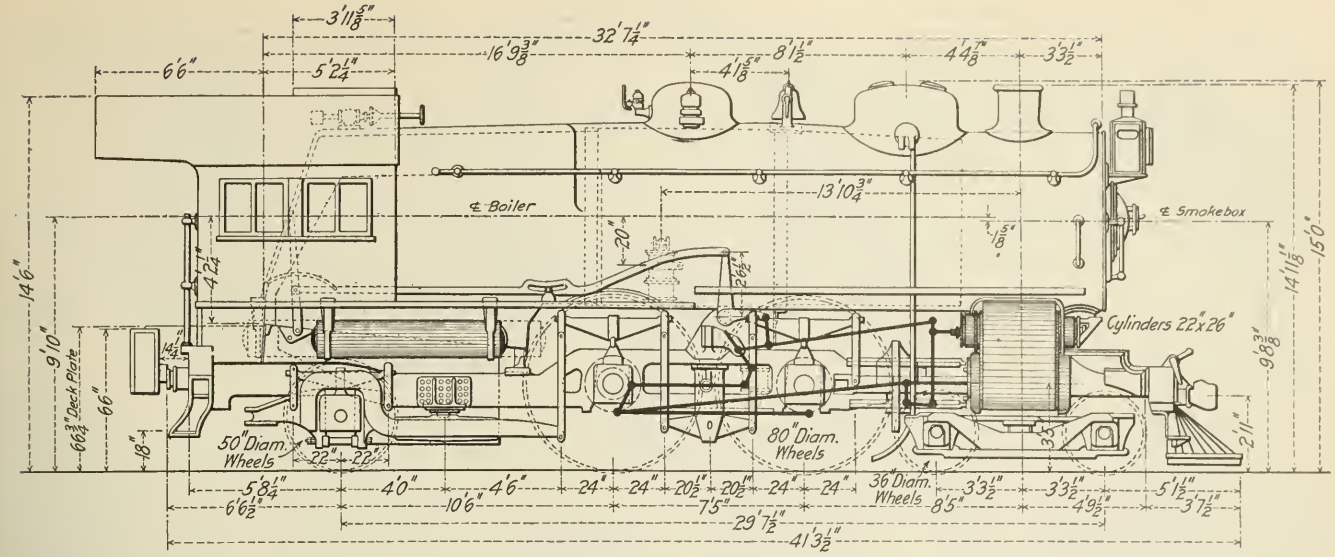
The weights of the engine ready for service are as follows: On engine truck, 51,270 lbs.; front drivers, 64,530 lbs.; main drivers, 68,770 lbs.; trailer trucks, 46,930 lbs.; total, 231,500 lbs.; weight of tender fully loaded, 158,000 lbs.; total locomotive and tender, 389,500 lbs. The total weight on drivers is 133,300 lbs., and we believe the weights on the individual driving axles are higher than those on any other locomotive in the world. In spite of this extreme weight on the rail and the load per square inch of journal, there have been no hot driving journals or pins, although the engine has made a large mileage on high speed trains; it is evident that it has been properly designed and carefully constructed.

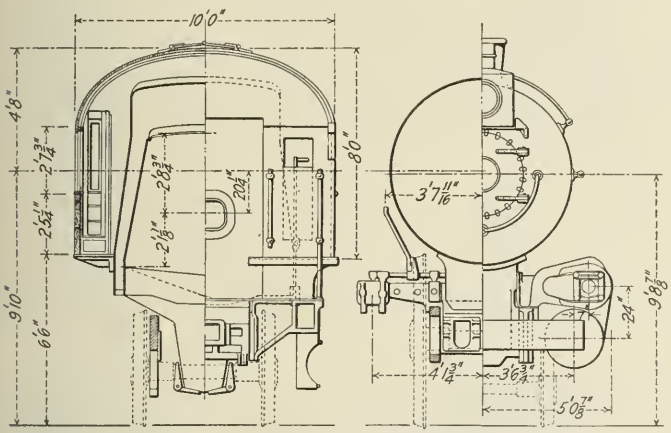
The cylinders are 22 in. x 26 in., and the driving wheels are 80 in. in diameter. The boiler pressure is 205 lbs. The tractive effort per pound of mean effective pressure is 157.3 lbs., and the maximum tractive effort with a mean effective pressure of 80 per cent. of the boiler pressure is 25,797 lbs. The total heating surface is 3,582 sq. ft., and the grate surface 55.13 sq. ft., the ratio of these being 65 to 1.

The valve gear is of the Walschaert type and has been worked out with unusual care. It is different from that usually supplied by the locomotive builders, especially in the size and weight of the moving parts which appear to be considerably lighter than those generally used on locomotives of this size in the United States. The careful provision for lubrication will



Profile of the Pennsylvania Railroad Between Altoona, Pa., and Harrisburg; also Schedule of the Pennsylvania Special.



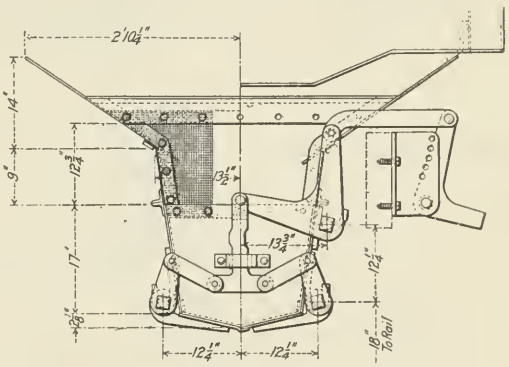


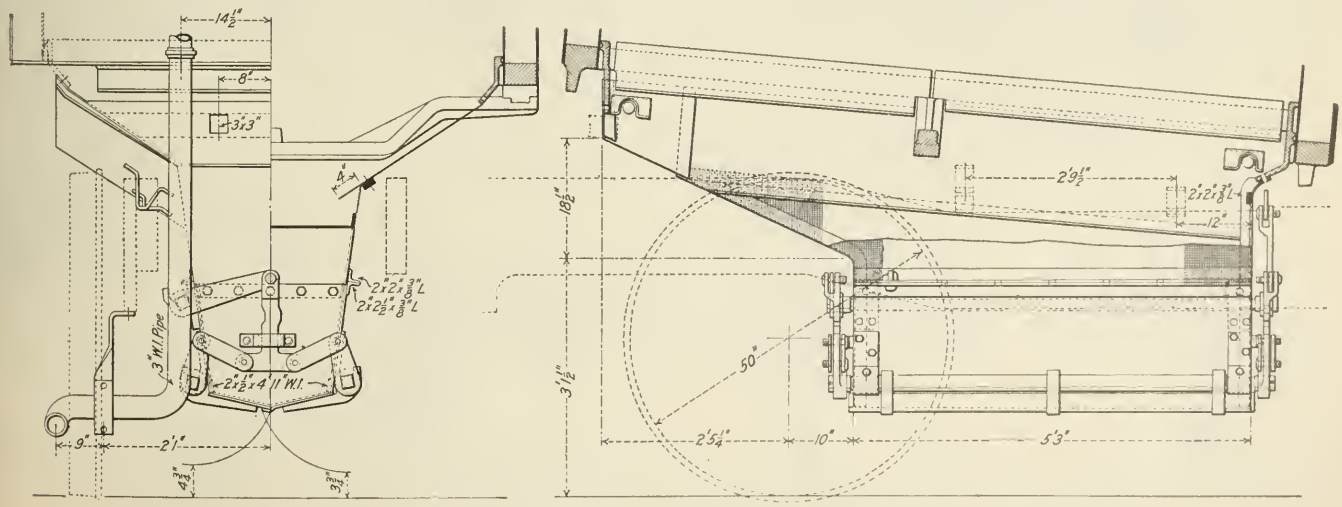
Heavy Atlantic Type Locomotive; Pennsylvania Railroad.

be noticed on the drawings; solid forged oil cups are used at nearly every pin connection in the valve motion.

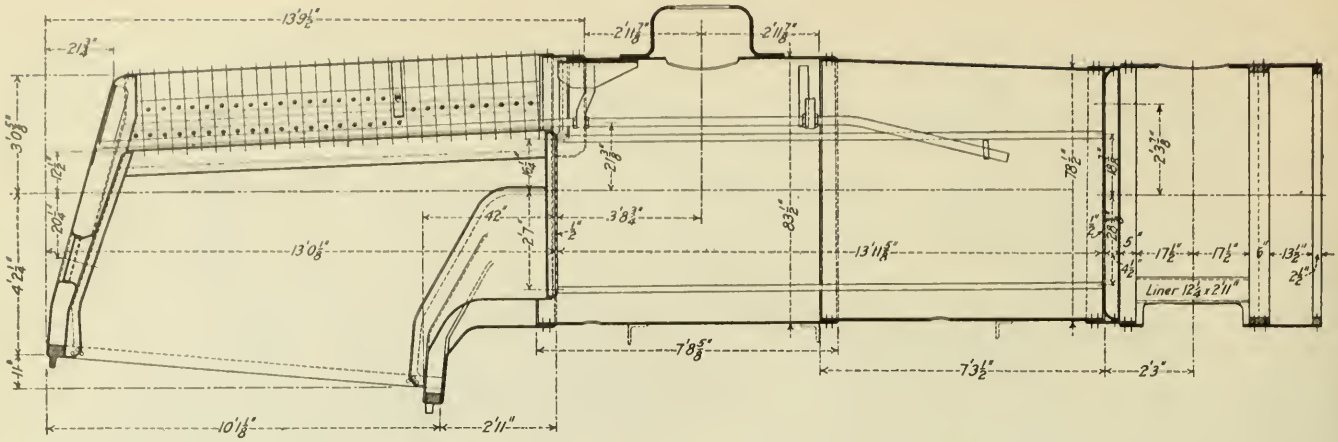
The trailing truck is one of the most difficult subjects for satisfactory design found in the Atlantic and Pacific types. The requirement for an outside journal box equalized with the inside driving box almost always produces an awkward construction. In the present design the large equalizers are very compact and are provided with a large ball bearing directly at the side of the joint in the back frames, the bearing bracket being secured by the same bolts which secure the two portions of the frame. The trailing truck is held in normal position by long helical springs which are placed in a pocket at the extreme rear end of the truck frame. Directly below this is a special brake cylinder for the brake shoes of this truck alone, and as the movement of the truck frame is normal to the truck wheels the brake shoes always have the proper position with respect to the wheel tread.

The main frames have slab sections, both front and rear, and while the bar portion is only 4 in. wide, it is increased to 7⅞ in. at the pedestals, making it unusually strong at these places and providing a wide bearing for the driving boxes. The design of the frame is adapted to either wrought iron or cast steel, but when cast steel is used not less than ¼ in. is allowed for finish, and most of the corners are rounded with ¼ in. radii.





Self-Cleaning Ash Pan for Atlantic Type Locomotive; Pennsylvania Railroad.



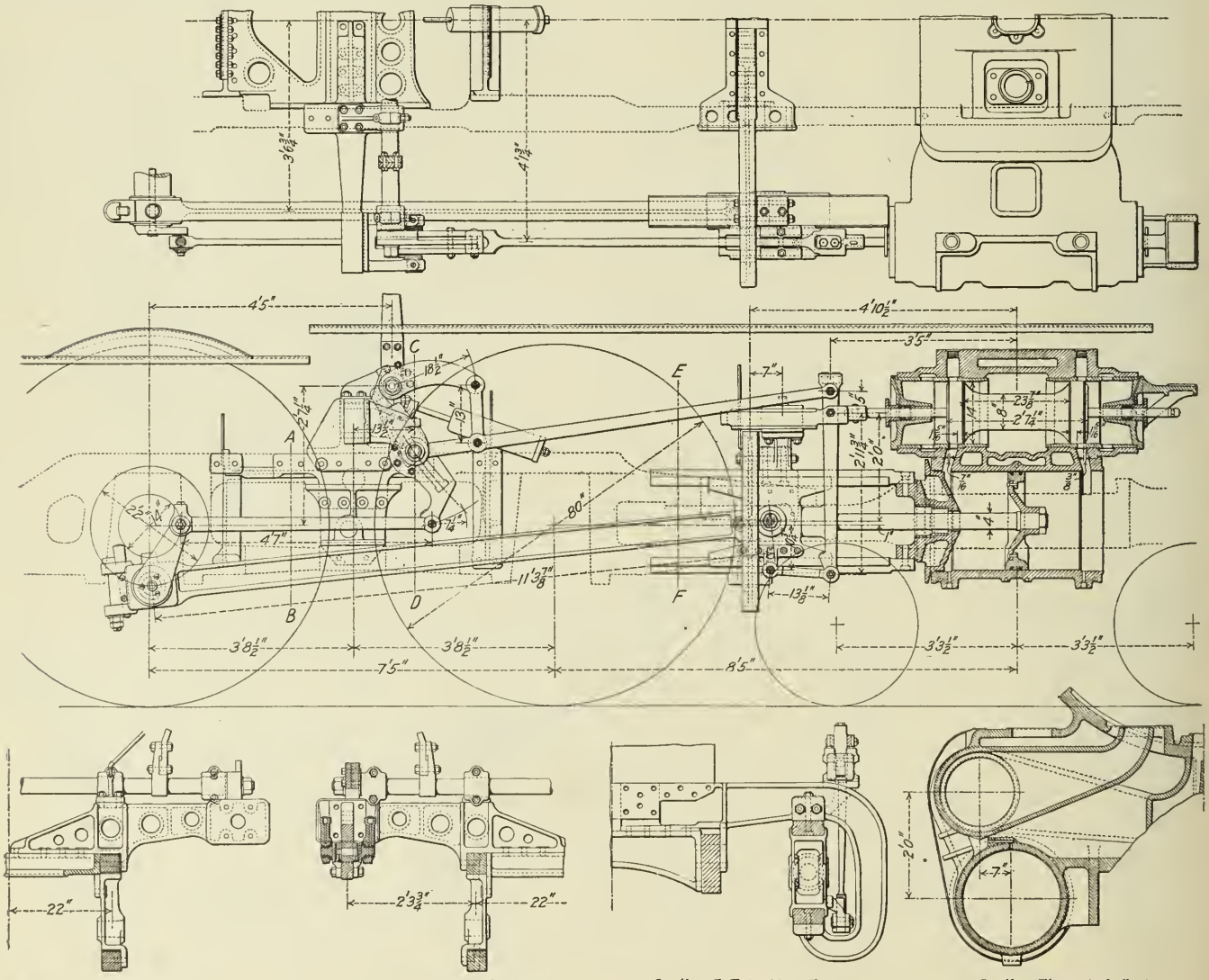
Longitudinal Section Through the Boiler of Atlantic Type Locomotive; Pennsylvania Railroad.

It will be noticed also that the corners of the wrought iron frames are chamfered in many places.

With the thoroughness characteristic of Pennsylvania Railroad methods, this new engine has been sent to the locomotive laboratory at Altoona for a series of tests to measure its performance and to determine on minor changes before any large number of locomotives of this class are built. The principal dimensions of the engine are given in the table below:

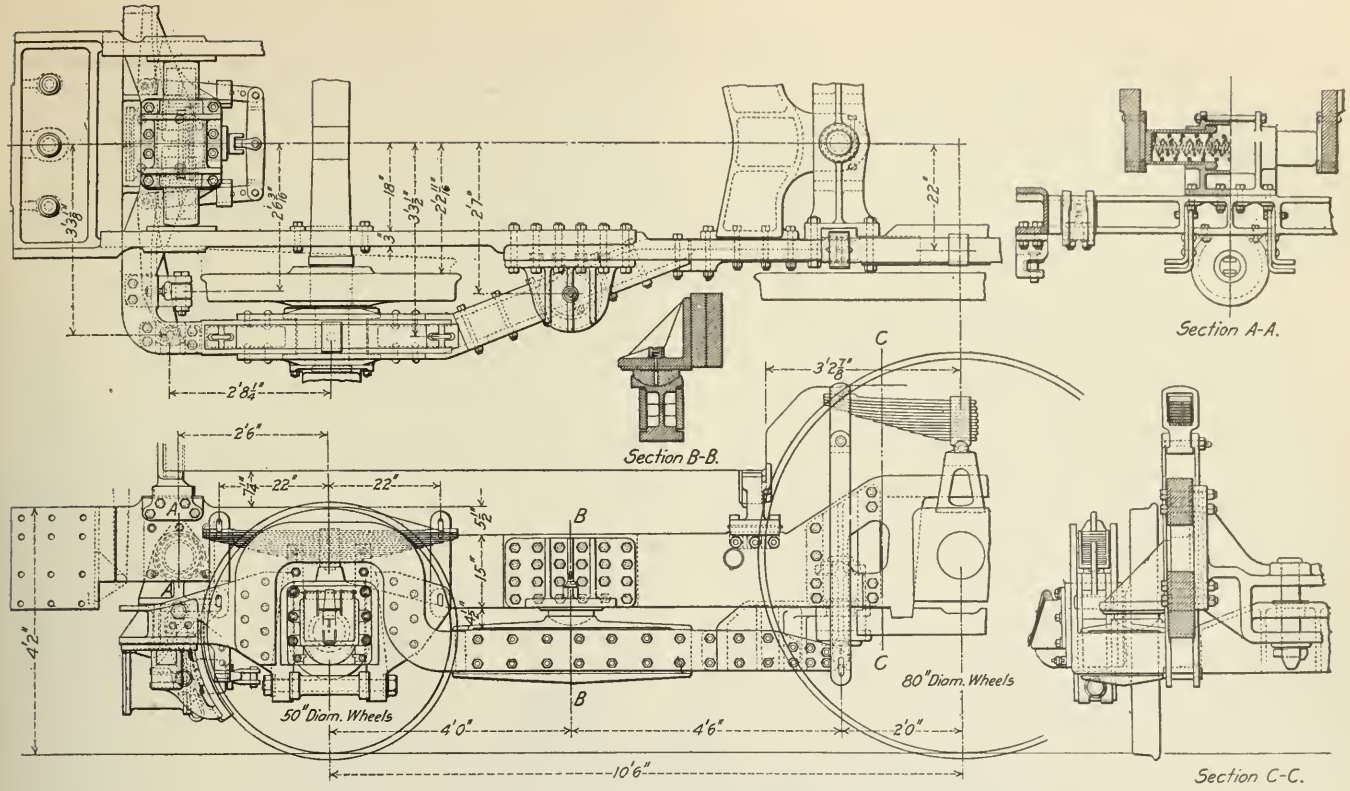
General Data.

Type	4-4-2
Service	Passenger
Fuel	Bituminous coal
Tractive effort	25,797 lbs.
Weight in working order	231,500 lbs.
Weight on drivers	133,300 lbs.
Weight on leading truck	51,270 lbs.
Weight on trailing truck	46,930 lbs.
Weight of engine and tender in working order	389,500 lbs.
Wheel base, driving	7 ft. 5 in.
Wheel base, total	29 ft. 7½ in.



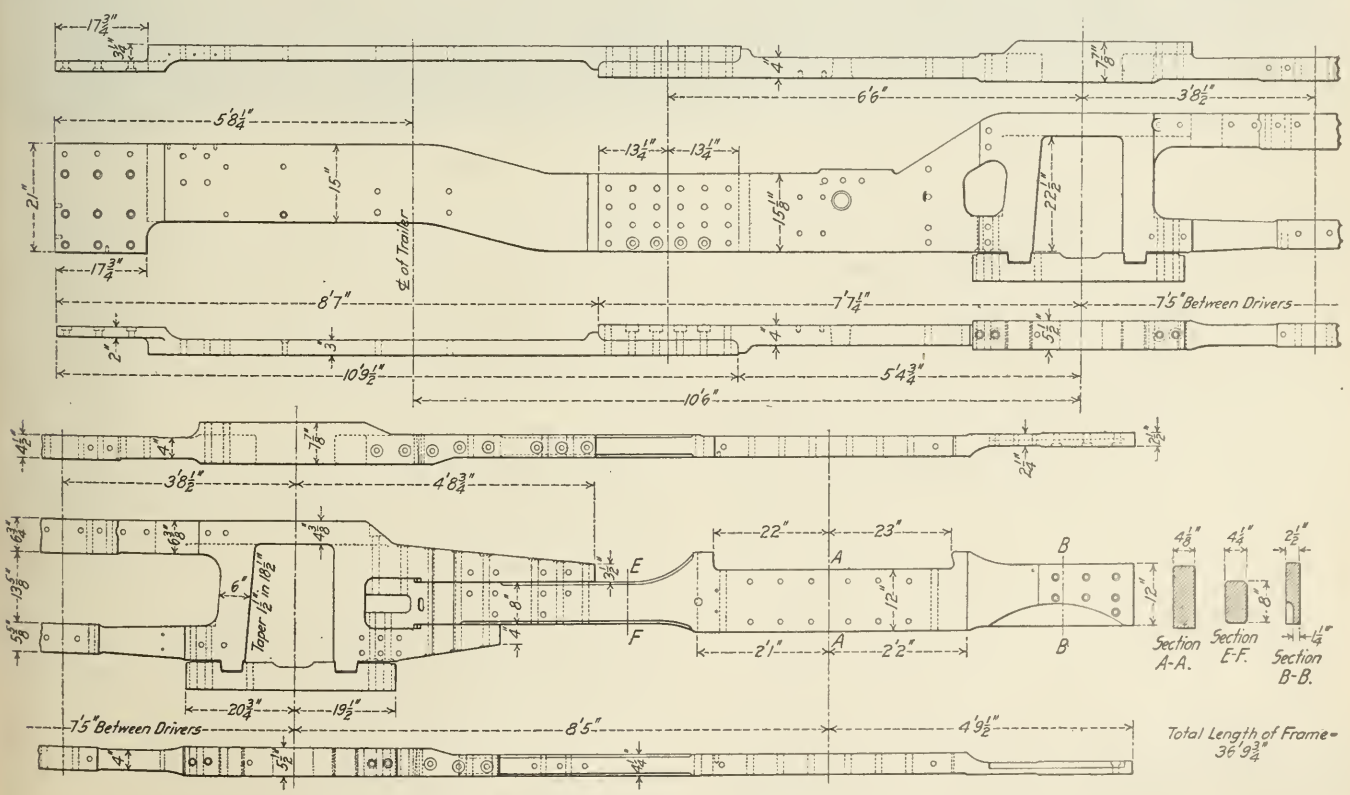
Section A-B Looking Forward. Section C-D Looking Backward. Section E-F Looking Forward. Section Through Cylinder.

Walschaert Valve Gear as Used on Atlantic Type Locomotive; Pennsylvania Railroad.



Trailer Truck for Atlantic Type Locomotive; Pennsylvania Railroad.

Cylinders.	
Kind	Simple
Diameter	22 in.
Stroke	26 in.
Ratios.	
Total weight ÷ tractive effort	8.97
Weight on drivers ÷ tractive effort	5.16
Tractive effort × diameter drivers ÷ heating surface	576
Total heating surface ÷ grate area	64.97
Firebox heating surface ÷ total heating surface, per cent.	6.08
Weight on drivers ÷ total heating surface	37.2
Total weight ÷ total heating surface	64.6
Volume both cylinders, cu. ft.	11.40
Total heating surface ÷ volume cylinders	314
Grate area ÷ volume cylinders	4.8
Wheels.	
Driving, diameter	80 in.
Driving, journals	9½ in. x 13 in.
Engine truck, diameter	36 in.
Engine truck, journals	5½ in. x 10 in.
Trailing truck, diameter	50 in.
Trailing truck, journals	6½ in. x 12 in.



Frames for Atlantic Type Locomotive; Pennsylvania Railroad.

Valves.

Type	14 in. Piston
Travel	7 in.
Lap	1 5/16 in.

Boiler.

Working pressure	205 lbs.
Firebox, width and length	72 in. x 110¼ in.
Tubes, number and diameter	460—2 in.
Tubes, length	13 ft. 11⅝ in.
Heating surface, tubes	3,364 sq. ft.
Heating surface, firebox	218 sq. ft.
Heating surface, total	3.582 sq. ft.
Grate area	55.13 sq. ft.
Center of boiler above rail	118 in.
Height from rail to top of dome	15 ft.

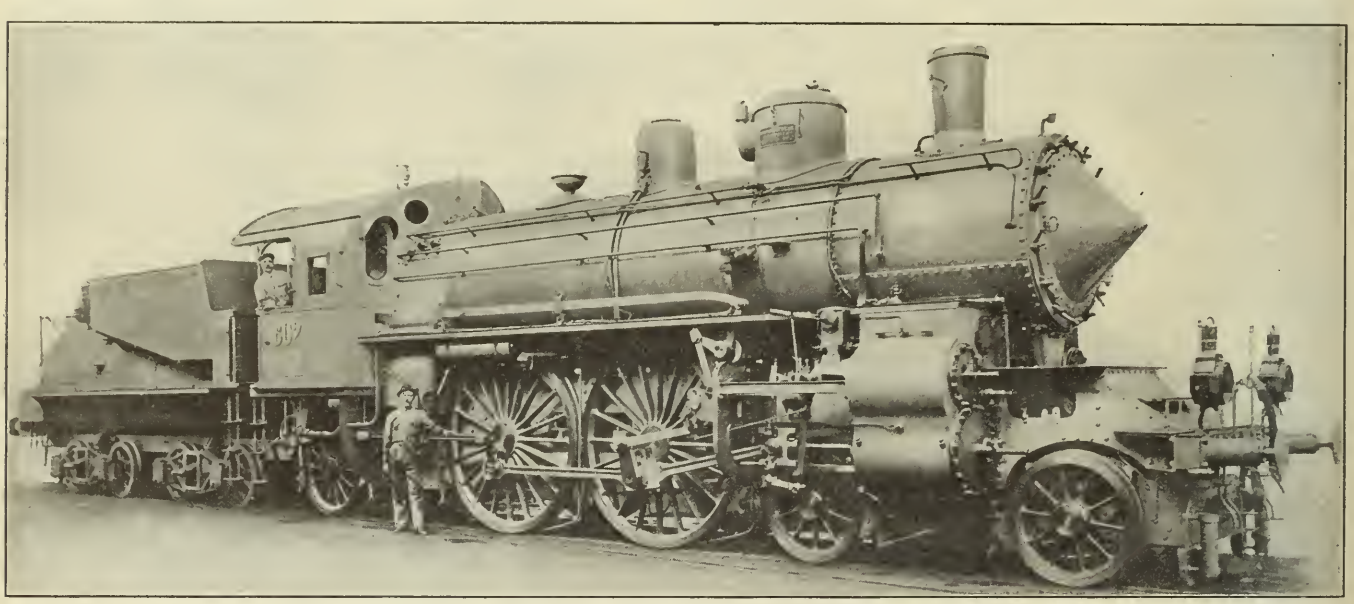
LOCOMOTIVE BUILDING IN EUROPE.

BY CAPTAIN GODFREY L. CARDEN, U.S.R.C.S.*

II.

FLORIDSDORF LOCOMOTIVE WORKS.

Locomotive building in Austria-Hungary is highly developed. There are no better locomotives in Europe than those turned out from the Floridsdorf Locomotive Works and the Budapest Locomotive Shops. The former plant is located on the outskirts of Vienna, and the latter in the city of Budapest. The Floridsdorf works have recently brought out a type of locomotive known as "Series 210." This locomotive is the design of Charles Gölsdorf, who is a member of the State Railways' staff, and is regarded as one of the leading authorities on locomotive design in Europe today.



Series "210" Locomotive; Built at the Floridsdorf Locomotive Works.

Series 210 is a superb machine. The total length of the boiler barrel is 4,280 (168½ in.) plus 1,450 millimeters (57 in.), the latter representing the length of superheating space. The length of the firebox is 2,700 millimeters (106 5/16 in.). The total heating surface is 292.4 sq. meters (3,147 sq. ft.) and the grate area is 4.62 sq. meters (49.73 sq. ft.). This locomotive is a four-cylinder machine with diameters for the high and low pressure cylinders of 390 (15⅜ in.) and 660 millimeters (26 in.) respectively, and a stroke of 728 millimeters (28⅝ in.). The driving wheels are of 2,140 millimeters (84 in.) in diameter, and the trailers and truck wheels are 1,034 millimeters (40¾ in.) in diameter. The fixed wheel base is 2,200 millimeters (85½ in.). The total wheel base is 10,450 millimeters (34 ft. 3 in.). The total weight in working order is 84.5 tons (186,200 lbs.). This engine is capable of hauling 440 tons on a 1 per cent. grade at a speed of over 60 kilometers (37.3 miles) per hour, and on a straight road 440 tons at a speed of 100 to 105 kilometers (62.1 to 65.2 miles) per hour. It develops about 1,800 h. p.

The Floridsdorf Works employ about 2,400 men. The shops actually cover about 21 acres, and about the same amount of adjoining land is occupied by homes and gardens of the workmen. It was at these works that the first 10-wheel freight engine was brought out for the Austrian State Railways. It was also designed by Charles Gölsdorf. A specialty of the Floridsdorf shops is rack railway locomotives, which include the Abt. type. The heaviest of these engines weighs about 163,000 lbs. in working order. Still another specialty is crane or industrial locomotives, which are specially designed for handling castings in steel works.

The machine tool installation at the Floridsdorf shops is a splendid one. A Cincinnati milling machine of the new vertical type (No. 4), which was probably the first one of its kind installed in Europe, was observed. This fact is mentioned to indicate the readiness of the Floridsdorf management to purchase the latest in shop equipment. Many American machines were at work, but the majority of the heavy tools were of Austrian origin. The firm of "Vulkan," located in Vienna, is supplying most of the heavy tools to Austrian machinery houses. There are a few small machine tool works in Austria, but their outputs are limited. German and American tools are imported to a large extent, especially of the medium sizes. For the year 1909, Germany exported more machine tools to Austria-Hungary than to any other country.

The Floridsdorf shops build, on an average, 120 locomotives per year. From an American viewpoint this is not a large number, but Floridsdorf is only one of the several locomotive plants in Austria-Hungary. There are no less than three locomotive plants in or near Vienna.

Many Sellers tools are in use in these shops. These machines were purchased direct from William Sellers & Co., of Philadelphia, Pa., and Director Hermann Gussenbauer of Floridsdorf, declared that he would buy more American machines if he could treat with the manufacturers at first hand, as with Sellers. This view is a general one regarding American machine tool sales in Europe. The Continental users of machines find that they must deal through foreign importers in order, in most cases, to secure American equipment. The general impression

*Captain Carden was detailed for two years in Europe as special agent for the Department of Commerce and Labor. His duties required him to report on the general machinery situation, especially with reference to machine tools. During this service he visited several hundred plants. The reports covering these visits are on file in the Bureau of Manufactures at Washington. Captain Carden's first article on Locomotive Building in Europe appeared in the *Railway Age Gazette* of March 3, 1911, page 399.

prevails that the prices charged for American tools by importers are greatly in excess of the standard American prices. According to the statements of many directors of foreign plants, they ask for nothing better when buying American machine tools than to be charged the prices asked in America plus the freight, insurance, and tariff.

There is much heavy milling work in the Floridsdorf shops, and here again it was noticed that European machine tool builders have furnished most of the tools. Reinecker of Chemnitz, Grafenstaden, and Collett & Engelhard—all German firms—are in evidence with heavy milling equipment. The Collett & Engelhard heavy millers are probably used more in European locomotive shops than any other one make.

Böhler tool-steel is used almost exclusively at Floridsdorf. All shaft bearings are treated under roller presses for the final finishing-off, or smoothing-up. Grafenstaden tools were doing all the milling work on boxes and connecting rods. A motor-driven Vulkan 3-frame slotting, boring, drilling and milling machine was in use. This tool was designed for working locomotive frames in sets and is capable of handling frames having maximum dimensions of 12 meters (39 ft. 4½ in.) long, 1,600 millimeters (63 in.) wide, and 350 millimeters (13¾ in.) high. It was sold to Floridsdorf for 60,000 crowns ($12,180).

Good machinists at Floridsdorf receive on an average 65 hellers (13.2 cents) per hour. A week's work is 54 hours, or 9 hours a day.

WIERNER-NEUSTADT LOCOMOTIVE WORKS.

The Wierner-Neustadt Locomotive Works are in the outskirts of Wierner-Neustadt, a city of 28,000 inhabitants, and distant about 1 hour by fast train from Vienna. It lies to the south of Vienna. Ordinarily, the force employed in the Wierner-Neustadt shops approximates 2,200. Locomotive output is about the same as at Floridsdorf, or 120 locomotives per year. An examination of the equipment record indicates that these shops have not undertaken to build as heavy and powerful engines as are built at Floridsdorf. The statement was made that 1,200 h. p. represented the heaviest locomotives, in point of power, so far built. All locomotive work at Wierner-Neustadt is of the plate-frame type. The plate frames are cut out by oxygen-gas after the manner followed at Borsig.

Not a few American machine tools are in service here, but there are many old foreign tools which might well be replaced. The policy of the new management is to replace these old tools as rapidly as possible with up-to-date ones. The boiler shops are the most modern of the various departments. There is a Vulkan machine in use on boiler work for drilling plates 15 meters (49 ft. 3 in.) long. There is also a special 5-spindle machine made by the locomotive builder, J. A. Maffei of Munich. Among the American tools in use were those of the following houses: Prentice Bros. Company, Worcester, Mass.; Bullard Machine Tool Company, Bridgeport, Conn.; Bement, Miles & Co., Philadelphia, Pa.; American Tool Works Company; S. A. Gray Company, Lodge & Shipley, and the Bickford Machine Tool Company, all of Cincinnati, Ohio, and Gisholt, of Madison, Wis.

The power for the shops is supplied by two Parsons' turbines representing about 1,600 h. p. There are tools in the Wierner-Neustadt shops that have been in service for 40 years. One machinist stated that he had been working steadily at the same machine for 28 years. This was a Sigl (Austrian) lathe for turning crank shafts. This man received between 8 and 9 kronen per day (1 krone = 20.3 cents).

A day's work at Wierner-Neustadt is 9½ hours. Work commences at 7 a. m. and stops at 6 p. m., with an interval of 1½ hours at midday. On Saturdays the shops close at 5 p. m. The men are paid on the basis of a fixed valuation for the work assigned. If the work is not completed by the week end, the workmen are paid advances on the final price. The better class of machinists at Wierner-Neustadt receive sums varying from 8 to 9 kronen ($1.62 to $1.83) per day. In a few instances as high as 12 kronen ($2.44) are earned per day.

STATE RAILWAY LOCOMOTIVE WORKS.

The State Railway Locomotive Works is located in the city of Vienna, and is one of the oldest locomotive shops in Austria. It was here that the old locomotive "Philadelphia" served as a prototype in the early history of Austrian locomotive building. These are the shops which were developed by the Scotchman, John Haswell, and to him the credit is given for the impetus early imparted to locomotive building in Austria.

The general design of the locomotives built at the State Railway Works follow the ideas of Charles Gölsdorf. In addition, these works build both Atlantic and Prairie type locomotives. The finished machines are marked examples of care and painstaking efforts. Here, as in the case of Floridsdorf, Austrian machine tools are much in evidence for the heavier class of work. Collett & Engelhard have supplied a four-spindle drill for boilerhead work, and Vulkan has built a tool for milling the edges of boiler shells. There was one heavy slotter in service, the make of Fairbairn, Naylor & Co., which was working up to 12 layers of locomotive frames, each of 30 millimeters (1.18 in.) thickness. One Austrian miller (Dania) was milling the sides of connecting rods, the steel in the rods having a tensile strength of 70 kilos per square millimeter (99,563 lbs. per. sq. in.). Many Sellers' tools are in use, which were purchased direct from the Philadelphia house. There was one Sellers' boring mill at work (No. 276), which was referred to by an official as truly a mystery, never having required any repairs. He added that he knew none better. A Sellers' cylinder borer (No. 731) came in for much praise. The same official declared that he could finish up all boring work on one locomotive cylinder in 8 hours' time with the Sellers' tool. This includes, he said, face cutting, reaming and boring. Attention was called to a Sellers' planer (No. 1,057), planing off locomotive cylinder bearings. This Sellers' tool was equipped with Sellers' patent spiral gear, having six return speeds and a single belt. The shop's director declared that he regarded the working of this Sellers' planer as little short of wonderful. Other American machine tools in service were from the following houses: Gisholt; Gould & Eberhardt; Hilles & Jones; Brown & Sharpe; G. A. Gray & Co., and Pratt & Whitney.

BUDAPEST LOCOMOTIVE WORKS.

The Budapest Locomotive Works, essentially a state railway's organization, is owned by the Hungarian state and controlled by the Ministry of Finance. It may properly be referred to as the Machinery Works of the Royal Hungarian State Railways. The number of men employed approximates 4,200, and the machine tool installation comprises 2,000 machines of a great variety of designs and makes. The most exacting work is done at these shops in the building of not only locomotives, but gas engines, engines for motor cars and locomobiles. In the entire lot of 2,000 machine tools, the writer was able to observe only 16 machines of American origin. It was apparent that this fine plant had been overlooked by the makers of American machine tools. Why this should be is inexplicable. There is undoubtedly a strong pro-American sentiment in Hungary, and American machine tools should find a ready market in that territory.

It is the writer's opinion that the Budapest Locomotive Works are turning out several types of locomotives more nearly approaching American standards than will be found, probably, in any other European shops. This statement is made after personal visits to the leading locomotive plants of Germany, Switzerland, Belgium and Austria. It may be said further that the Prairie and Atlantic type locomotives built at Budapest are unexcelled on the continent. These are complete American locomotives, but in a highly finished garb. Imagine one of our standard size Prairie type locomotives, equipped with copper fireboxes and copper staybolts, the valve gear of the highest efficiency, with a machine finish on all engine parts fit for an

exposition display, and one has a picture of every Prairie type locomotive turned out at Budapest. These Hungarian locomotives are designed and built to last 20 years and more.

It is not to be taken for granted that the high finish on these locomotives is a part of the builder's scheme. The state designs call for this elaborate attention, and as the work is under state inspection there is no gainsaying or going behind the specifications. Several of the Budapest locomotive officials have advocated that copper fireboxes and copper staybolts be done away with, and that the American type of steel firebox be substituted, thereby saving much expense. It is said that the question has been discussed unofficially with the state railways authorities, and with a view to taking action in the event of the price of copper advancing materially.

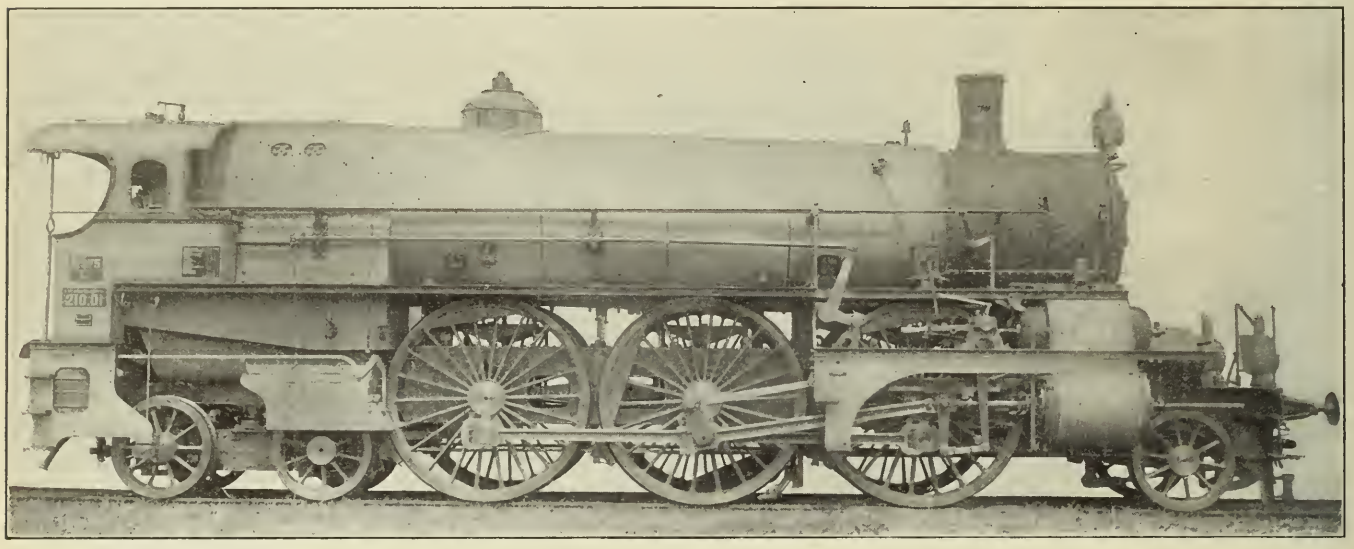
Attention has been previously directed to the exacting demands of the European locomotive market, due to the fact that the standards are largely fixed by the designs emanating from government sources. The government-issued designs have a marked influence on locomotive building and largely affect the private orders; that is to say, the private orders are apt to specify elements and demand exactions called for by the State Railways engineers. The pace has apparently been set in Europe which admits of competition only on the part of engines of the highest design and finish, and for these reasons American locomotives of everyday knock-about type are apt to compare unfavorably when judged in the light of finish and form. This does not imply that our own builders cannot reach European requirements. We have doubtless not thought it worth while, due perhaps to the extraordinary demands in the home market. The distinction between the European and the American locomotive is largely one of environment and accompanying shop conditions, for most assuredly the requirements of the foreign and the home market are not the same.

There can be little doubt, based on actual knowledge of shop conditions abroad, that European locomotives can be built cheaper and quicker in the United States than in Europe, notwithstanding the difference in wages. The advanced shop efficiency so apparent in many of our works over the average European shop makes this result possible. It is largely a question of seeing fit to assign to some one shop the building, exclusively, of the European type of locomotive. The desired result can hardly be secured if it is attempted to build the European locomotive in a shop where standard American engines are being turned out. The job is a specializing one, and calls for gangs trained to the particular line of work in hand, and always with the one object in view, namely, to meet the foreign requirements. That can best be done by building the European locomotive *per se*.

There are many English tools in these works from the firm of Alfred Herbert, of Coventry. The Herbert firm has induced the locomotive works management to send five of the leading workmen to Coventry for the purpose of familiarizing the men with the various Herbert tools, and arrangements exist whereby an inspector from Coventry goes to Budapest at varied intervals and personally advises relative to the running of the machines.

There is probably no field in Europe today which lends itself more readily to the purchase of American tools than Hungary. The sentiment is favorable to American advances, and it is the fault of the manufacturers of the United States if they do not take advantage of the situation. The Hungarians frequently ask why it is that Americans do not come to them in person.

The Budapest output for 1909 was, it is understood, 208 locomotives. These works are building four-cylinder compound engines designed for working pressures of 16 atmospheres (235 lbs.). Schmidt superheaters are employed whenever the designs call for superheaters. The valve gear is of the Hensinger type, modified for a four-cylinder engine. The practice is followed of casting in one piece the pair of cylinders required for a compound engine, and then boring out the two cylinders simultaneously. In the boiler shop a special type boiler head drilling tool, manufactured by Maffei of Munich, was observed.



High Speed Locomotive, Type In, Built by the Budapest Locomotive Works.

The State Railways credit the Locomotive Works with 1.8 crowns per kilo (16.6 cents per lb.) on all new locomotive construction. The gage of the Hungarian railways is 1.435 meters (4 ft. 8½ in.). The Prairie type locomotive, as built by the Budapest shop, has nearly reached the limit of height permissible on the Hungarian railways, and whatever further increase is found possible must necessarily be slight.

The principal features of the high-speed locomotive, type In, are as follows:

General Data.

Gage	4 ft. 8½ in.
Length	42 ft. 5 in.
Width	10 ft. 2 in.
Height	15 ft. 0 in.
Wheel base, engine truck	8 ft. 0 in.
Wheel base, rear truck wheel to driver	6 ft. 1 in.
Wheel base, driving	7 ft. 3 in.
Wheel base, rear driver to trailer	10 ft. 10 in.
Wheel base, total	32 ft. 2 in.
Weight in working order	164,000 lbs.
Maximum tractive effort	17,204 lbs.

Cylinders.

Diameter of high and low pressure cylinders	14 3/16 in. and 24⅜ in.
Piston stroke	26 in.

Wheels.	
Driving, diameter	82¾ in.
Engine truck, diameter	41 in.
Trailer truck, diameter	48 in.
Boiler.	
Working pressure	227 lbs.
Length of boiler	31 ft. 2 in.
Diameter of boiler	63 in.
Tubes, number	291
Length of tubes over tube sheets	17 ft. 2½ in.
Diameter of tubes outside	2 1/16 in.
Heating surface, tubes	2,687 sq. ft.
Heating surface, firebox	139 sq. ft.
Heating surface, total	2,826 sq. ft.
Grate surface	42 sq. ft.
Tender.	
Water capacity	4,750 gals.
Coal capacity	8 tons
Diameter of wheels	34½ in.
Wheel base	16 ft. 7 in.

GANZ WORKS.

The Ganz Electrical Works are located in Budapest. It was Ganz who brought out the electric locomotives for the Italian railways, which were later loaned for service in the Simplon tunnel. These Ganz electric locomotives have a total rated output of 2,000 to 2,800 effective horse-power. According to Ganz they would give a maximum draw bar-pull of 42 tons, a rating which is regarded as theoretical, as the adhesive weight is not sufficient for hauling more than the 9 to 10 tons under favorable conditions. Ganz early installed the three-phase current system for heavy traction on main railway lines. The first railway on which three-phase traction was employed is known as the Valtellina line, in the north of Italy. The electrical equipment for this road was built in 1902, and consisted of 10 motor cars, each supplied with four 250-h. p. motors, and nine locomotives. Five of these locomotives were of the power above mentioned, and three of them were assigned for some time to duty at the Simplon tunnel.

FOREIGN RAILWAY NOTES.

An important section, from Rayado to Papudo, of the Longitudinal Railway, Chile, has been opened to traffic.

A survey is now in hand for a proposed 150-mile railway from Tzaneen to Messina in the Zoutpansberg district, South Africa, primarily to serve the Messina and adjacent copper mines and to afford a short and direct line between the northeastern part of the Transvaal and Rhodesia. It will also materially assist in developing the agricultural and mineral resources of the area between the Zoutpansburg range and the Limpopo river.

An underground railway has been built in Munich, Germany, solely to carry mails from the main station to the post-office. The tunnel has a rectangular section 7 ft. 9 in. wide and 5 ft. 11 in. high, with a troughlike depression in the center for employees to walk in, and a narrow gage railway on either side. It is 1,148 ft. long. Part of the line is below water level, and the whole structure is water-tight. The little trains are run by electricity.

It is argued in favor of a railway extending from the Asiatic midland in Ferghana northeastward to a connection with the Siberian Railway, that it would enable the province north of Ferghana to supply Ferghana with grain, and enable the latter to devote most of its land to cotton, which is already produced there in considerable quantities. In Ferghana wheat costs more than a dollar a bushel; in the province north, perhaps 300 miles distant, 17 cents.

By a decree of recent date, the government of Brazil grants to the Sao Paulo-Goyaz Railway Company or to a company which it may organize, the right to build 75 miles of railway line from Monte Azul, in the municipal district of Bebedouro, state of Sao Paulo, to the banks of the Rio Grande, which divides this state from Minas Geraes. The line will benefit especially the colonies Cresciuma, Portao do Ceo, and Corrego Rico. The company will receive a subsidy of about $8,000 for each mile of line built.

Shop Kinks.

The following shop kinks are among those that were submitted in the competition which closed January 15. Three of the 18 collections which were entered in that competition, including the first and second prize collections, were published in our issue of February 3. Five collections were reproduced in the issue of March 3.

SIOUX CITY SHOPS; CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.

BY T. E. FREEMAN.

General Foreman, Sioux City, Iowa.

Credit also due to A. G. Wright, Master Mechanic; J. L. Riley, Machine Foreman; and M. J. Tiernay, Blacksmith Foreman.

AIR HOIST FOR CAR WHEEL BORING MILL.

A hoist for handling car wheels to and from a boring mill is shown in Fig. 79. The hand crane attached to the boring mill bed has been displaced by an air hoist of rather novel design. The cylinder, which is 5 in. in diameter and has an 18-in. piston stroke, is mounted directly on the crane arm and swings with it. The overhang of the crane arm is 4 ft. The air cylinder is supported by the wrought iron braces.

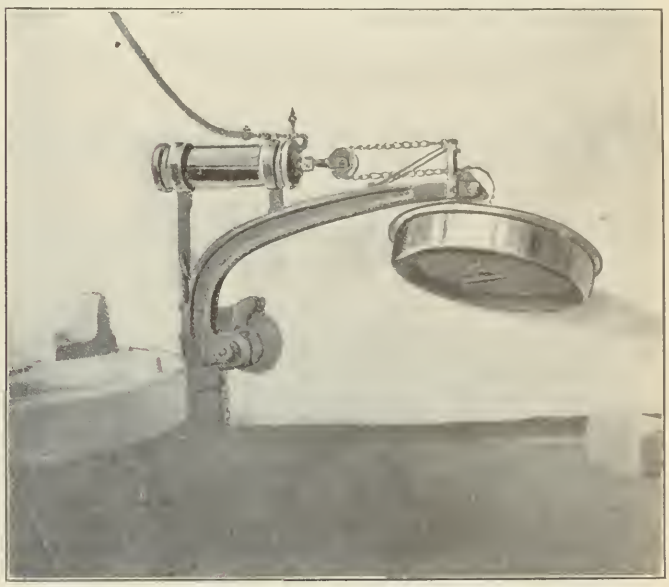


Fig. 79—Air Hoist for Car Wheel Boring Mill.

TIRE WAGON.

A simple tire carrying wagon is partially shown in Fig. 81. The wagon is pushed over the tire, straddling it, and the handle is elevated, thus lowering the upright and allowing a pin to be passed through the two parts of the upright and below the inner side of the tire. By lowering the handle the tire is raised a short distance above the floor. The wheels of the wagon are 56 in. in diameter. The upright is constructed of 4 by 1 in. iron; the handle bars are 3 in. by ¾ in., and are forged round at the outer ends as shown. The uprights are braced to the handle bars by the ¾ in. iron rods.

AIR JACK FOR TURNING MOUNTED DRIVING WHEELS AT TRACK INTERSECTIONS.

An air jack for raising and turning mounted driving wheels at track intersection is shown in Fig. 80. It is simple and inexpensive. The top section of the ram and the fork on which the axle rests may be removed when the jack is not in use, so as not to obstruct the floor or track. The air cylinder has an

inside diameter of 14 in. The stroke of the piston is 16 in., although the admission of air to the cylinder may be regulated

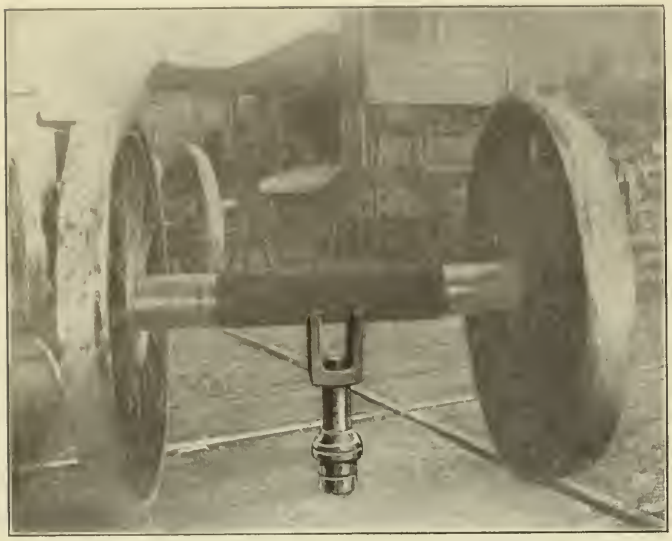


Fig. 80—Air Jack for Turning Mounted Driving Wheels at Track Intersections.

by the air valve so that the wheels are only lifted a short distance above the floor. The piston rod is made of 5-in. pipe.

PORTABLE AIR JACK.

A portable air jack is shown in Fig. 83. It is supported on two pairs of wheels through two springs, in such a way that when no load is on the jack the springs lift it from the floor,



Fig. 82—Jack for Loading Car Wheels.

making it portable. When the load is applied the springs compress, allowing the jack to rest on the floor. The advantage of this provision is apparent. The cylinder is 14 in. in diameter and the piston has a 16-in. stroke. The springs are 2 in. in diameter and 8 in. high and are made of ¼-in. steel.

JACK FOR LOADING CAR WHEELS.

A novel method of loading and unloading car wheels to and from flat cars is shown in Fig. 82. The cylinder of the



Fig. 81—Driving Wheel Tire Wagon.

air jack has an inside diameter of 8 in., and the piston a stroke of 5 ft., or sufficient to raise the wheel to the level of the floor of a flat car. The wheel is kept in an upright position by the two

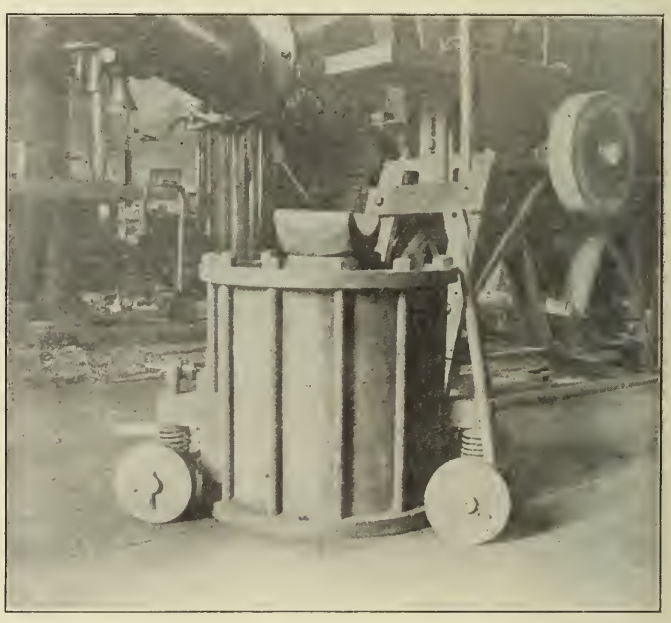


Fig. 83—Portable Air Jack.

pieces of 3/16 in. boiler plate through which a bolt is placed, as shown, to prevent the wheel from rolling off endwise. The piston rod is made of 5-in. pipe. The cylinder is set in a bed of concrete.

GARRETT SHOPS; BALTIMORE & OHIO.

BY JOHN V. LE COMPTE.
Foreman, Garrett, Ind.

LUBRICATING HOLES IN HUB LINERS OF DRIVING BOXES.

It is generally accepted as necessary that the hub bearings of driving boxes should be lubricated. Holes are drilled in the box casting from the oil cavity to the bearing, but to maintain these holes after a new bearing has been cast on, although it seems a simple proposition, is really a difficult task, for with

the hole covered with the liner and plugged up with the brass the machinist has no means of locating exactly where it should be, and when he attempts to drill it the chances are that he will hit the hole in the casting a little off the center, which usually breaks the drill. This operation of drilling through the liner and redrilling the holes in the box requires, on the average, about one hour. A device shown in Fig. 84 has been provided to do away with this difficulty. After the old brass has been stripped off and the box is ready for its new bearing, a small piece of round iron about 5/16 in. diameter

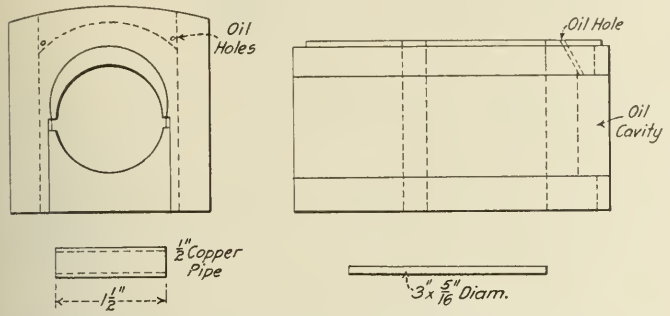


Fig. 84—Device for Preserving Lubricating Holes When Pouring New Hub Liners on Driving Boxes.

and 3 in. long is placed in the holes previously drilled in the box, and over these pieces are placed ⅜-in. copper pipes, about 1½ in. long, resting squarely against the face of the box. The brass liner may then be poured on and when it has cooled the round iron may be withdrawn, leaving the lubricating holes clear. Care must be taken when pouring the brass to make sure that the copper pipe is of sufficient length so that the brass will not pour over the top, thereby preventing the removing of the round iron. This device costs about one cent per box and save about 25 cents per box when the cost of broken drills is considered.

ADJUSTABLE CHUCK FOR HORIZONTAL BORING MILL.

In boring oil cellars, grease lubricators, trailer cellars, bearings, etc., in a horizontal boring mill, the wrought iron chuck shown in Fig. 85 has proved valuable in the saving of both time and labor. Two of these chucks are adjusted suitable to the length of the work to be bored, and are clamped to the table of the machine with bolts in the holes provided for that purpose. The tongue in the bottom of the chuck fits snugly in the slot of the table, thus holding the two chucks parallel to

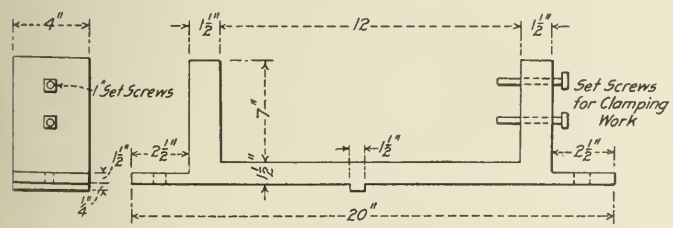


Fig. 85—Adjustable Chuck for Horizontal Boring Mill.

each other. The work is clamped in the chuck by the set screws, which are set at an angle, so as to hold the work securely in place. After once adjusting the chuck and the table for a given job, any number of similar pieces may be adjusted by simply loosening and tightening the set screws in the chuck as the pieces are removed and replaced.

OIL GROOVES IN DRIVING BOX SHOE AND WEDGE FACES.

The usual method of chipping oil grooves in driving box shoe and wedge faces with a pneumatic hammer takes considerable time and makes unsatisfactory grooves. By the method illustrated much better grooves are made in a shorter time. The tool shown in Fig. 86 is applied to a drill press and is made so that a small drill may be placed in the pocket in the center of the bar and be adjusted to project the proper distance. It is clamped in this position by a set screw. This drills a hole and holds the bar rigidly in place, while the grooving tool, after being adjusted to the desired radius and clamped in place by the

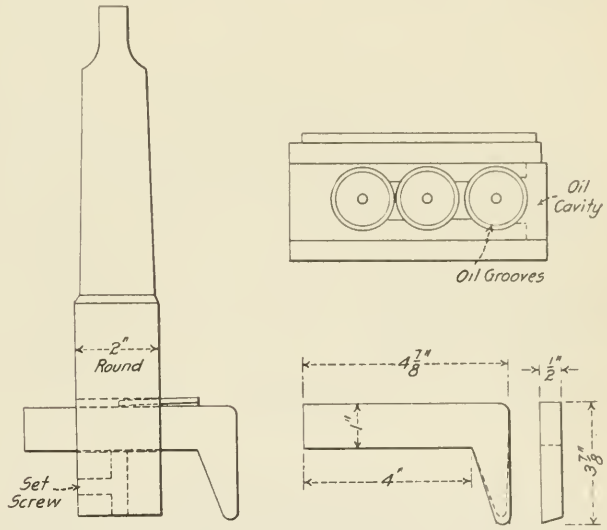


Fig. 86—Tool for Making Oil Grooves in Driving Box Shoe and Wedge Faces.

taper key, makes the oil groove. Grooves may thus be made in 40 per cent. less time than if the center hole and groove were made in two operations, and in 75 per cent. less time than required for chipping with a pneumatic hammer.

CYLINDER AND VALVE PACKING RINGS.

We make cylinder packing rings with the tools shown in Fig. 87 in the following manner: A vertical boring mill with two heads on the cross rail is used, and is operated at a cutting speed of about 30 ft. per minute. The left head is used for the roughing cut at a feed of ⅛ in. per revolution, and then for a finishing cut at a speed of ⅜ to ½ in. per revolution. The right head is used for cutting the rings to the desired width

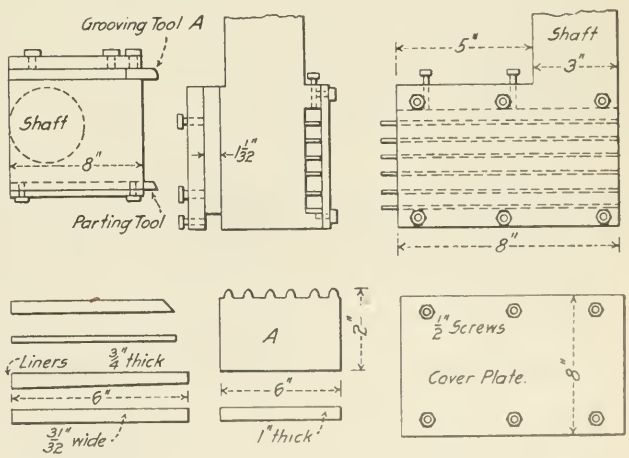


Fig. 87—Tools for Making Cylinder Packing Rings.

with the special tool shown in the upper right hand corner of the drawing. It is made up of six ¼ in. x 1 in. high speed steel tools, separated from each other by strips of steel, whose width is the width of the rings, plus the thickness of tissue paper, this extra thickness being allowed for finish, which is accomplished by slightly raising and lowering the head with the parting tool after it has cut to the proper depth. The pocket in the tool, which contains the six tools, should be 1/32

in. less in depth than the thickness of the tools, so that the cover plate when placed over the tools will hold them firmly. The set screws at the top of the head also clamp the tools and spacing strips firmly in place. After the first six rings are finished, if it is desired to groove them so that the bearing on the cylinder walls may be reduced, another tool, A, should be inserted in the other side of the head. Very little time is thus required for separating and finishing the rings, for while the left hand head is roughing and finishing the outside of the casting, the right hand head is separating and grooving the rings. In boring off these rings it is not necessary to raise the head to remove each ring separately, as they will ride in place and time is saved by taking them off four or six at a time. With this device we have been able to reduce the cost per ring 33 per cent. Forty-five rings from 20 in. to 22 in. in diameter are finished in 10 hours. That part of the tool, or head, which holds the grooving tool may be used for a variety of other purposes, often making it possible to do odd jobs on the machine without removing the tool from the head.

ATLANTIC CITY ENGINE HOUSE; WEST JERSEY & SEASHORE.

BY CHARLES MAIER.
Engine House Foreman, Atlantic City, N. J.

SPONGING TRACK AND PIT.

An arrangement for sponging journal boxes and removing brasses is shown in Fig. 88. The track is equipped with air jacks in a pit and the necessary tools and blocking are kept in a tool chest near by. Two air cylinders are used for removing tender truck brasses and two for removing trailer and engine truck brasses. These cylinders are 14 in. in diameter and have a 12 in. lift, using air pressure from 100 to 135 lbs. per sq. in. Two chains are provided with each pair of cylinders, which go under an iron bar, that passes under both rails, and over the axle, holding the wheel to the rail while the journal box is raised to remove the bearing. Two water valves are located on each side of the pit to which a hose is attached for cooling off hot journals. The cylinders are piped together, but are so arranged that they may be used independently if desired; the piping may be connected either

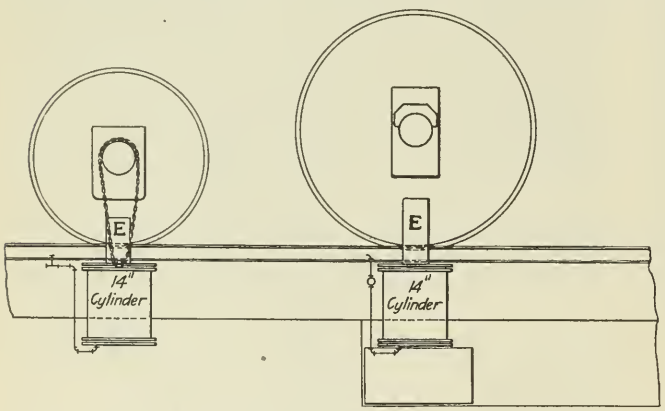


Fig. 88—Pits and Jacks for Removing Journal Bearings.

to the shop air line or to the train line hose back of the tank. The plungers of the cylinders are provided with removable pieces E, which fit between the top of the cylinder and the under side of the journal boxes.

LOCKING NUTS ON BOLTS.

A good scheme for locking nuts on bolts is shown in Fig. 89. All nuts are drilled in jigs so that the outside edge of the hole will just cut to the bottom of the thread. The nut is then screwed on the bolt, and after it is tight, or is in the desired position, the cutter C, which fits the hole in the nut, is driven into the hole cutting off the exposed thread of the bolt. A piece of round iron is then driven through the hole and is bent over on each end. This positively locks the nut on the bolt and does

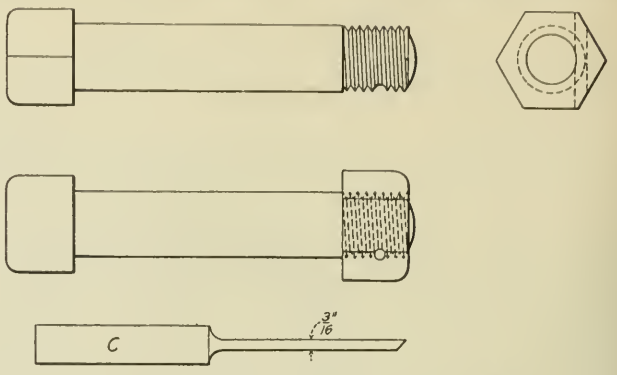


Fig. 89—Device for Locking a Nut on a Bolt.

not damage the bolt appreciably. The diameter of the hole is 3/16 in. for ¾ in., ⅞ in. and 1 in. nuts and ¼ in. for larger ones.

HANDLING CYLINDER HEADS.

Cylinder heads of locomotives equipped with a footboard extending over the steam chest are difficult to handle. The jib crane used for removing steam chest lids, cylinder heads, etc., cannot be used unless the foot plate is taken off. To overcome

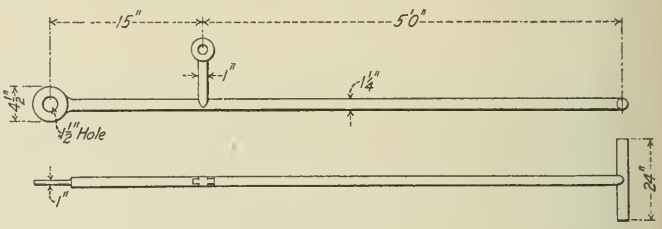


Fig. 90—Device for Handling Cylinder Heads on Locomotives.

the difficulty the bar shown in Fig. 90 is used. One end of it is put over the cylinder head casing stud, the hanger near the end is hooked into the jib crane chain and a man handles the tee handle on the long end. This device, while exceedingly simple, is a great convenience.

FOREIGN RAILWAY NOTES.

A German locomotive engineer says that the trains are doing much to destroy the birds. He has picked numbers of various kinds from an engine which runs about dawn, when the birds first seek food, and he estimates that this one engine kills some hundreds every month.

The Saxon state railways reward workmen who have been in their service 25 years and more with small sums of money, and at the same time distinguish them with marks of honor. Recently, on this small system, 30 men had served for 25 years, 22 for 30, 57 for 35, and 7 for 40 years.

The German lines had cost $109,054, per mile in 1909, which was 14.4 per cent. more than in 1899, and they earned $18,754 gross and $5,740 net per mile. In the United States the average capital was $59,259, gross earnings $10,356 and net earnings $3,505 per mile. The capital invested is about $60 per inhabitant in Germany, and $156 here.

The Cuban Railroad Company is soon to begin work on a new road from Manicaragua to Fomento, in Santa Clara Province, which will open up tranportation facilities to the cane growers in that country. The franchise for building the road has recently been granted by the government, and the terms stipulate that the work must begin within two years.

General News Section.

The Legislature of the State of Washington has adopted a full-crew law.

The Gulf, Colorado & Santa Fe has made increases amounting to about $10 a month in the pay of yardmasters and their assistants.

The Legislature of New Jersey has passed an employers' liability law, abolishing the fellow servant doctrine, and abolishing or modifying the rule that an employee assumes the risks of his employment.

At Pablo Beach, Fla., March 31, an automobile was run 50 miles in 37 min. 34 sec.; 70 miles in 52 min. 46 sec.; 100 miles in 74 min. 59 sec.; 130 miles in 99 min. 30 sec.; and 150 miles in 115 min. 18 sec.

The Mackinac Transportation Co. has ordered a new car ferry steamer to cost $500,000. With this boat, the company will have three vessels for carrying cars across the Straits of Mackinaw.

At Dallas, Tex., the Government has entered suits against the Atchison, Topeka & Sante Fe and the Southern Kansas Railway of Texas, charging violations of the 16-hour law, relative to the working time of trainmen.

The Supreme Court of Arizona has enforced a fine of $45,000. imposed by a lower court, on the Grant Brothers Construction Company, for violating the contract labor law in importing 45 aliens from Mexico to do common labor on railway grading.

The postmaster general has made a sweeping change in the management of the railway mail service, appointing Theodore Ingalls general superintendent, and sending the former general superintendent, Alexander Grant, to St. Paul to be superintendent of a division.

A press despatch from Kansas City says that the Atchison, Topeka & Sante Fe has dismissed 62 conductors, brakemen and porters, many of them long in the service; and that some of these men are to be prosecuted in the courts for irregularities in the collection of fares.

The Twentieth Century Limited Express of the New York Central eastbound, now has a regular sleeping car from Buffalo to New York. The train leaves Buffalo at 12.15 a. m. It does not run into the station at Buffalo, and heretofore has taken no passengers from that city.

A bill for a public utilities commission has been passed by the lower house of the Iowa Legislature by a large majority. The bill provides for a commission of five men and extends and amplifies the railway law as has been done in New York and as is proposed in Pennsylvania.

Two electric furnaces have been installed at the University of Illinois for the purpose of investigating the changes in the mechanical and physical characteristics of cast iron during a "soaking" process. One is a Hoskins resistance furnace and the other a Colby induction furnace. Both are of 20 k. w. capacity.

Train service was inaugurated on the North Coast Railway (the new line of the Oregon-Washington Railroad & Navigation Company) on March 24, when a gasolene car left North Yakima, Wash, for Grandview, and a steam train left the same place for Walla Walla, Wash. The train dispatching is done by telephone.

The Oklahoma corporation commission has extended to September 1 the time in which the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri, Kansas & Texas, the St. Louis, Iron Mountain & Southern, the St. Louis & San Francisco and the Fort Smith & Western are required to establish general offices in that state.

At Issy-Les-Moulineaux, France, March 31, Pierre Vedriene in an aeroplane descended at 8:30 a. m., after having made a flight of 208 miles in 132 minutes, or at the rate of about 90 miles an hour. The aviator was favored with a light breeze, but he says that his machine will go 81 miles an hour in a calm. He used a 50 h. p. Morane monoplane.

The Chicago, Milwaukee & St. Paul, and the Chicago, Milwaukee & Puget Sound will begin running through passenger trains between Chicago and Puget Sound on May 28. One through train will leave Chicago every morning and another every evening. The same will be true of the service eastbound. One of the trains will be called the "Olympian" and the other the "Columbian."

The river section of the La Salle street tunnel under the Chicago river at Chicago, was sunk into place on April 2. The tunnel section was built in a plant near Halsted and Twenty-second streets, and was towed up the river to its place by tugboats. The section that was so built is 278 ft. long, 41 ft. wide and 24 ft. high. The methods of building and placing this tunnel are practically identical with those used in placing the Detroit river tunnel.

The Chicago & North Western, co-operating with the Iowa State Agricultural College, will run a special train over its lines in Iowa from March 27 to April 15, to carry lecturers on live-stock subjects. The train will consist of three cars, in one of which lectures will be given on hog-raising; in another lectures will be given to women on cooking meat, and in the third talks will be given to boys and girls on poultry, cows and packing-house processes.

An increase of about 8 per cent. in wages was granted to the 1,300 telegraphers of the Illinois Central on March 31, the increase to date from March 1. The men asked for an increase of 25 per cent., and demanded that 300 telegraphers who were discharged within the last ten days be reinstated, but when advised that the retrenchments were made to cut down expenses the settlement offered was accepted as satisfactory. This advance will add about $80,000 a year to the expenses of the Illinois Central.

The Missouri Pacific, in connection with the Pennsylvania Lines, now runs a fast mail train between New York and Kansas City, by which eastern mail will reach Kansas City. The Pennsylvania train, which is composed of six mail cars, leaves New York at 6.30 in the evening and arrives in St. Louis at 5.25 p. m. of the next day, making the same time as the "24-hour St. Louis." The Missouri Pacific train, which is also composed of six mail cars, leaves St. Louis at 6 p. m. and arrives in Kansas City seven hours later.

The Railway Benevolent Institution of England proposes to perpetuate the memory of King Edward VII by raising a fund to be used to provide annuities for poor widows of railway employees. It is to be called The King Edward VII Memorial Fund, for relieving distressed widows of railway employees, anywhere in the United Kingdom. A circular asking for subscriptions has been issued by the president of the institution, Chairman Claud J. Hamilton, of the Great Eastern Railway and Mr. Butterworth (N. E. Railway), chairman of the board of management.

The Legislature of Pennsylvania has now before it a bill known as the Public Service Company Law, presented by representative Alter, which, if passed, will create a public service commission of five members, and abolish the present railroad commission. The bill fills 63 pages, and, like the existing law of New York, provides for complete control by the State of railways and all public service corporations or companies. Full power is given to the commission to change rates, regulate facilities, establish standards, etc. The yearly salaries named in the bill are: For commissioners, $8,000 each; secretary, $4,000; counsel, $7,500 and $4 000, and marshal, $3,000.

Counsel for the so-called "beef trust" in proceedings in the Federal Court at Chicago, have attacked the constitutionality of the Sherman anti-trust act. The case is that growing out of the indictment of various packing companies and their principal officers for alleged violations of this law. The ground of attack is stated as follows: "Section 2 of the act, with the violation of which these defendants are charged, does not create any crime, as it does not define any offense against the United States with sufficient certainty to inform these defendants of the nature of the offense or crime, with which they are charged, and in so far as it undertakes to create a crime, is invalid, void and contrary to the constitution of the United States."

Carl R. Gray, senior vice president of the St. Louis & San Francisco, went to Jefferson City, the capital of Missouri, on March 29, as a representative of the Missouri railways' legislative committee, and set forth objections which the roads have to a number of bills now in the hands of Governor Hadley. The measures opposed are: That prohibiting a railway from charging a higher passenger rate between any two points on its line than it does between any other two points; that giving the State Railway Commission power to fix passenger rates within the maximum established by law; that requiring railways and other corporations to pay their employees weekly or bi-monthly, and that making it unlawful for a railway or street car company to obstruct a street or crossing more than five minutes. Governor Hadley promised to give the railway officers a hearing on these bills.

The reports of the relief departments of the Pennsylvania Railroad system show that since these departments were established 25 years ago more than 30 million dollars in benefits have been paid to members or their families. During the month of February the benefits amounted to $230,338. The Long Island Railroad, now a subsidiary of the Pennsylvania, established an Employees Mutual Relief Association in the same year that the Pennsylvania established its fund, and since that time $797,671 has been distributed in benefits to Long Island employees or their families. Out of a total of 7,959 employees on the Long Island on March 1, 6,499 were members of the Mutual Relief Association. On the Pennsylvania lines east of Pittsburgh on March 1 the membership was 114,968 out of a total of 130,144 employees, and on the lines west out of a total of 53,911 employees 46,523 were members of the fund.

The report of Paul P. Bird, chief smoke inspector of the City of Chicago, made to Mayor Busse, covering the administration that is now closing, says that the railways are the chief contributors to the city's smoke nuisance, and recommends the early provision of measures forcing the roads to electrify their terminal lines. The new Association of Commerce Commission that is to investigate the problem of electrification was organized at a meeting of the members April 1. Jesse Holdom was made chairman, T. E. Donnelly vice-chairman, and Frederick W. Rawson secretary. A committee composed of Milton J. Foreman, Harrison D. Riley, and W. A. Gardner reported that in their opinion the investigation of the commission should include "First, the necessity for the proposed change; second, the mechanical practicability of such change; and, third, the commercial feasibility thereof." The committee's report was accepted and it was decided to take up the three portions of the investigation simultaneously. Meetings of the commission are to be held on alternate Fridays.

The appellate term of the New York Supreme Court has decided in a case prosecuted by Gimbel Brothers against persistent loan sharks, who had lent money to employees of Gimbel Brothers at from 175 to 390 per cent. per annum, that the loan company has no valid right to the wages of the employees. The law of New York provides that in order to obtain a valid claim on the paymaster the claimant must have given proper notice to the employer within three days after making a loan on account of wages. It appears that, in order to carry out their promise of secrecy, lenders of this class have delayed notifying the employer until the borrower has defaulted in a payment. The court holds that in such a case the loan company cannot sustain its claim. Mr. Ham, agent for the Russell Sage Foundation, reporting this decision, says that prominent drygoods firms in New York have abandoned the rule forbidding employees to borrow money, and have established departments to lend money to deserving employees when in temporary pressing need; and he says also that two railway companies and a large telegraph company are among the concerns which recently have taken action of this kind, looking to the benefit of the employees.

The Loetschberg Tunnel.

The Loetschberg tunnel, described in the *Railway Age Gazette* of July 2, 1909, through the Bernese Alps, Switzerland, was holed through on March 31, after four and a half years' work and an expenditure of about $20,000,000. This tunnel, which is the third longest in Europe, is about nine miles long, as compared with the nine and a quarter miles of the St. Gothard tunnel and the 12½ miles of the Simplon tunnel. When the Loetschberg tunnel is completed, there will be a direct route from Milan, Italy, to Berne, Switzerland, and thence to Calais, France, and Boulogne. The distance from Milan to Calais by this route will be nearly 80 miles shorter than the existing route. The tunnel will be double-tracked throughout. At its highest point the tunnel is about 4,054 ft. above sea level. It has an average grade of 0.7 per cent. and a maximum grade of 2.7 per cent. The gage is standard. The tunnel is 36 ft. wide and 19½ ft. high. The contract for the tunnel, signed in August, 1906, called for its completion in five years, the projector securing a 99-year franchise. Fifty lives were reported lost during the work, and several hundred laborers were injured.

Freight Car Demurrage in California.

The fact that the California State Railroad Commission had ordered a reduction in the rate of demurrage on freight cars in that state from $6 a day to $3, was noticed in the *Railway Age Gazette* last week. In view of the marked success of the $6 rate in reducing delays to freight cars, it will be interesting to watch the result of this reduction of 50 per cent. For the month of February last, Mr. Mote, manager of the Pacific Car Demurrage Bureau, reports that six times as many one dollar cars (those which are not subject to the California law, because engaged in interstate commerce), were held overtime as six-dollar cars. Will the proportion be the same when the higher penalty is reduced one-half? These percentages, which have been reported by Mr. Mote for 19 months, have been quite uniform, showing unquestionably that a high rate does accomplish its purpose. In February, in Mr. Mote's territory, the number of six-dollar cars held longer than the free time was .84 per cent., or less than one car in a hundred. This is the lowest percentage ever reported, notwithstanding the fact that the rainfall throughout California during the month of February was the heaviest for years past. The percentage of one-dollar cars was 5.04. Continuing the comparison which he has been making of conditions in California with those in other states, Mr. Mote says:

Does it not seem strange that, except in California, practically every public movement toward the prevention of car shortages, blocked terminals, delayed and irregular movement of frieght, has had a direct tendency to promote instead of prevent such conditions? How can the situation possibly be bettered by lengthening the free time limit to release cars; to lower the demurrage rate to a point below the value of the car for storage or speculative purposes, making it possible for gamblers in certain commodities to block, corner and control not only the terminals but the markets as well; to allow extra time for stops in transit; for diversion, reconsignment, inspection, grading, milling, surrender of bills of lading, payment of freight charges, etc?

It has been charged that the California railways favor the $6 rate purely because their revenues from demurrage have been increased sixfold over the period in which the $1 rate was charged. The fatal defect in this charge lies in the assumption that demurrage accrues at the $6 rate on the same number of cars as at the $1 rate, while as a matter of fact, in proportion to the number subject to each rate, there are practically six $1 cars held overtime to each $6 car, and as the average delay is one day longer on $1 cars than on $6 cars, and notwithstanding an increase of 40 per cent. in the number of cars handled, the demurrage charged during the seventeen months after the adoption of the $6 rate was approximately $30,000 less than during the same period before its adoption; and had all cars been subject to the same rate the reduction would have been approximately $46,000.

Head of Correspondence School Arrested.

George H. Baker, president and general manager of the Railway Educational Association, Paul J. Gallagher, secretary, and John A. Jenkins, a member of the board of directors of the association, were arrested in Brooklyn, N. Y., on March 31, by post office inspectors on the charge of misusing the mails in obtaining money under fraudulent pretenses.

Chief Inspector Dickson says that Baker and his associates carried on a railway correspondence school for brakemen and

firemen, with branches in every important city in the country. Complaints were received that the association advertised that it would procure employment for those registered on its books within thirty days or refund the tuition fees. It is alleged that the men chosen and recommended for positions were rejected because the association made no discrimination in accepting students (accepting those physically disqualified for railway service) and that fees paid in were never returned. Baker said that a year ago, in Washington, before Judge Goodwin, assistant attorney general for the post office department, the school was thoroughly investigated, every detail of it being discussed without a single feature of the work being criticised.

Bills Affecting Railway Operation Introduced in the State Legislatures.

The accompanying table showing the number of bills affecting railway operation introduced in the various state legislatures during the sessions of 1911 was prepared by the Special Committee on Relations of Railway operation to Legislation. It will be noted that the bills referred to do not include those dealing with traffic, accounting, etc., but relate entirely to operation.

The state in which the largest number of bills was introduced was Missouri, where there were 64. It is an interesting fact that one of the most active agitators against the railways in the legislature of that state was William H. Phelps. Mr. Phelps was formerly better known as the principal lobbyist of the Missouri Pacific at Jefferson City, the capital of Missouri. When the lobby was abolished, Mr. Phelps got himself elected to the legislature, and during the last session he was as active inside the legislature in promoting bills to regulate railways as he formerly was outside of the legislature in opposing bills to regulate railways.

The state where the second largest number of bills was introduced was Indiana, with a total of 34. One is surprised to find that the state in which the third largest number of bills was introduced is Wisconsin, where it would naturally be supposed that after so many years of anti-railway legislation laws to regulate almost everything regulatable had been enacted. The next state in the number of bills introduced is Kansas. The railway regulating fever seems to be subsiding in some states where it has in the past waged most fiercely. Only nine bills for the regulation of railway operation were introduced in Texas and only 11 in Oklahoma.

It will be noted that the largest number of bills introduced was for the purpose of regulating the experience and number of employees serving in train crews, and the second largest for the regulation of the equipment of passenger trains.

Legislative Proposals Affecting Railway Operation.

Subjects.	Alabama	Arkansas	California	Colorado	Connecticut	Delaware	Idaho	Illinois	Indiana	Iowa	Kansas	Massachusetts	Michigan	Minnesota	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Texas	Utah	Vermont	Washington	West Virginia	Wisconsin	Wyoming	Total
1. *Employees—*																																						
a. Full crews and experience	3	1	2	1	1	1	3	1	.	1	2	3	1	5	2	.	2	3	2	4	2	1	3	2	1	1	.	1	.	1	.	2	2	1	1	1	57
b. Hours of service	.	2	.	1	1	.	.	.	.	.	1	.	.	1	2	2	.	1	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.	.	.	5	.	19
c. Service Letters and time of payment	.	.	.	.	.	2	.	2	.	2	.	1	.	2	2	.	4	1	1	.	.	.	1	1	.	1	.	1	.	2	.	.	1	.	2	.	26
d. Terms of employment	2	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	3	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	9
e. Uniforms	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
2. *Arbitration—*																																						
a. Compulsory	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	3
b. Voluntary	1	.	1	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	7
3. *Train Rules—*																																						
a. Uniform	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	3
4. *Equipment—*																																						
a. Caboose	.	2	.	.	.	.	.	1	2	.	.	.	1	.	1	1	1	.	.	.	1	.	1	.	1	.	.	.	.	1	.	.	.	.	.	2	1	.	16
b. Boiler Inspection	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	4
c. Headlights	1	.	.	1	.	.	1	.	.	.	2	.	.	.	2	.	1	.	.	.	.	.	1	1	.	.	.	.	4	1	.	.	.	.	.	1	.	16
d. Safety Appliances	.	.	.	.	.	.	.	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	1	.	.	.	.	6
e. Repair of	.	1	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
f. Appliances required	.	.	.	.	.	.	1	.	3	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	7
g. Examination of	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
h. Specifications	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
5. *Passenger Trains—*																																						
a. To be run	.	.	.	1	1	.	.	.	1	.	1	.	.	.	3	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	2	.	11
b. Stops	.	.	.	.	.	.	1	.	2	.	.	.	.	.	4	.	.	.	.	.	.	1	2	.	.	.	.	.	3	1	.	.	.	.	.	1	.	15
c. Equipment of	1	.	4	.	1	2	1	1	1	.	.	4	.	1	7	.	2	.	2	1	4	.	3	.	.	.	1	2	1	2	.	.	2	2	1	.	46
d. Baggage	.	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	4
e. Drinking on	.	.	.	.	.	.	.	2	.	.	.	1	.	1	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	7
f. Ejection from	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
6. *Freight Trains—*																																						
a. Speed of Live Stock	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	1	.	.	.	.	.	.	.	1	.	2	.	.	.	.	.	.	.	.	.	.	2	.	8
b. Sunday Trains	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1
c. Speed of Dead Freight	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	2
d. Handling of Explosives	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	2
7. *Cars—*																																						
a. To be Furnished	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	6
b. Demurrage	.	1	1	.	.	.	.	1	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	1	8
8. *Block and Other Signals—*																																						
a. Block and Interlocking	.	.	.	3	.	.	1	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7
b. Switch Lights	.	1	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
9. *Clearances—*																																						
a. Required	.	.	.	.	.	.	.	.	2	.	1	.	1	2	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	1	.	.	1	.	.	1	.	10
10. *Crossings—*																																						
a. Required	.	.	.	.	.	.	.	.	1	.	2	.	.	.	3	.	2	.	.	2	.	.	.	.	2	.	.	.	.	1	.	.	.	.	.	2	.	15
b. Protection	.	.	.	.	.	.	.	.	1	.	.	.	.	1	4	.	2	.	.	.	.	.	1	.	.	.	1	.	.	1	.	1	1	1	.	.	14
c. Separation of Grades	.	.	.	.	.	.	.	1	2	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	8
11. *Maint. of Way—General—*																																						
a. Track Scales and Weighing	.	.	.	.	.	.	.	.	1	.	.	.	.	1	2	.	.	.	.	.	.	1	1	1	.	1	.	.	1	.	.	.	.	.	.	.	.	9
b. Burning Weeds	.	.	1	.	.	.	.	.	1	.	1	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	6
c. Fencing	.	.	1	2	.	.	1	1	.	.	.	.	.	1	3	1	3	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	1	17
d. Drainage	.	.	.	.	.	.	.	.	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
e. Inspection	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
f. Double Track	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
12. *Stations—*																																						
a. Required	.	.	1	.	1	.	.	.	1	.	.	.	.	.	4	.	.	.	.	.	2	.	1	.	1	.	.	.	1	.	.	.	1	.	.	.	.	13
b. Equipment of	.	.	.	.	.	.	1	.	1	.	3	.	.	.	8	.	1	.	.	.	.	.	2	.	.	.	.	.	.	1	.	.	1	.	.	2	.	20
c. Stock Yards	.	.	.	.	1	.	.	.	.	.	3	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	9
d. Shop Equipment	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	4
e. Track Connections	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	2	.	.	.	.	.	.	1	.	.	1	.	1	.	.	7
13. *Hospitals and Relief Depts.—*																																						
a.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	1	.	1	.	.	.	.	.	.	5
14. *Claims—*																																						
a. When to be paid	.	1	.	1	.	.	.	.	1	.	.	2	.	1	4	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	2	.	17
15. *Trespassers—*																																						
a.	.	.	1	.	1	1	.	1	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	7
16. *Reports—*																																						
a. Accidents	.	.	.	.	.	.	.	.	.	.	1	.	.	.	2	.	.	1	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	1	.	.	.	7
b. Delays	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Total	3	14	16	10	7	5	12	13	34	.	23	13	7	10	64	13	22	10	8	7	12	5	17	11	11	11	3	2	24	11	9	1	10	10	12	29	5	474

Pittsburgh Traffic Club.

The Traffic Club of Pittsburgh at its ninth annual dinner, held at the Fort Pitt Hotel on the evening of March 30, entertained a large number of prominent railway officers from Pittsburgh, Chicago, Philadelphia, New York and other places. Two prominent speakers were George F. Baer, president of the Philadelphia & Reading, and ex-Governor F. S. Black of New York. Mr. Baer said, in part:

"No greater evil can befall a people than the uncertainty of the law. Unintentional violation of it is followed by government persecution and prosecution, and the thing becomes intolerable. Just now there seems to be a system of government spies watching the details of operation, and when there is slight unintentional violation of the law the railways are criminally proceeded against.

"In the wise system of laws instituted by our ancestors, in order to constitute a man guilty of crime, criminal intention must be shown; but that wise ruling seems to have been lost for the time being. Was it not Cicero who said: 'The rigor of the law was the sum of injustice'?

"I think it is generally true, that whatever judgment one may have on the wisdom of a ruling, if its meaning is made clear you can, with more or less sacrifice, obey the ruling. And it is necessary that you should obey it, otherwise organized society becomes a rope of sand. I have always admired the stoical philosophy of the Philadelphia German soldier, as told by former Governor Pennypacker.

"In the West Virginia campaign one of Mosby's men captured a Pennsylvania Dutchman. In taking him to their camp they said to him, 'You may prepare to be shot in the morning.' He replied, 'Well, if that's your rule, it's all right.'"

I believe, as a lawyer, that to the extent that the Interstate Commerce Commission is given power, on its own initiative, to make rates and thereby control property which the nation does not own, it is a delegation of legislative power which—if it existed at all in Congress—cannot be delegated. The power will fall by its own excessive weight. The Interstate Commerce Commission, as a mere physical problem, cannot fix rates of transportation for the railways of the United States.

Mr. Black said:

"The problems we deal with now are too large to be hurried. The tariff, control of corporations, the rights of labor and money in their joint results, amendments to the Constitution, questions so vital and far-reaching that they involve both our progress and stability—all these are on the table now and being settled offhand by Solomons whose wisdom, unborn five years ago, is now in full flower. These wise men are as much like the old statesmen as the Rough Riders are like the old guard of Napoleon. We shall keep going for a long time yet, but is it not worth while to look around? . . . I protest against the spirit of suspicion and unrest that so distorts our views and puts hostility in the place of friendship. I protest against those who live on the credulity of their fellow men and would for their own gain substitute revenge for hope.

"If I could reach all the people on all the railways out of Pittsburgh I would say, stop the constant nursing of your wrongs, which have been proclaimed and magnified until they are almost a National lamentation.

"Change these lonesome sons for National beautitudes; blessed are they who are willing to shoulder part of the blame for their own failure, and who know that to disagree is not always to be dishonest; blessed are they who know that cheating in labor is as bad as cheating in money, and that a 30-minute hour is as dishonest as a 50-cent dollar; blessed are they whose vision is clear enough to tell a real from a fancied wrong, and who dwell rather upon the blessings they see than upon the hardships they imagine."

International Association of Navigation Congresses.

The International Association of Navigation Congresses will hold its twelfth international congress in Philadelphia, Pa., some time during the year 1912. A circular has been published by the executive committee giving general information on the association, such as its history, methods, etc., then describing the exact nature of the next congress, and ending with the regulations and a list of membership. The subjects which will be discussed at this congress are under the two main heads, Inland Navigation and Ocean Navigation. Under Inland Navigation, among others, papers will be presented on Improvement of Inland Waterways, Dimensions of Canals and Equipment, Best Methods for Facilitating the Transfer of Freight Between the Waterway and Railway. Under Ocean Navigation, among others, papers will be presented on Mechanical Equipment of Ports and Bridges and Tunnels Under Waterways Used for Ocean Navigation. All correspondence should be addressed to the general secretary of the congress, Room 344, The Bourse, Philadelphia.

International Railway Fuel Association.

At the third annual convention of the International Railway Fuel Association, to be held at the Hotel Patten, Chattanooga, Tenn., May 15 to 18, the following papers will be presented for discussion: Fuel Investigations Under the Bureau of Mines, by Dr. J. A. Holmes, director of the Bureau of Mines; How to Organize a Railway Fuel Department and Its Relation to Other Departments, by T. Duff Smith, fuel agent of the Grand Trunk Pacific; Testing of Locomotive Fuel, by F. O. Bunnell, engineer of tests, Rock Island Lines; Standard Locomotive Fuel Performance, by F. C. Pickard, assistant master mechanic of the Cincinnati, Hamilton & Dayton; The Railway Fuel Problem in Relation to Railway Operation, by R. Emerson, engineer track economics, Atchison, Topeka & Sante Fe; Petroleum, Its Origin, Production and Use as Locomotive Fuel, by E. McAuliffe, general fuel agent of the Frisco Lines.

American Railway Industrial Association.

The annual meeting of the American Railway Industrial Association will be held at the Hotel Cadillac, Detroit, Mich., May 9 and 10. The program, as now made up, includes talks from Dr. J. L. Snyder, president of the Michigan Agricultural College, and Walter L. Moore, secretary of the National Association of Commercial Executives. Arrangements are being made for other speakers.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers on April 5, a paper entitled The Going Value of Water Works, by Leonard Metcalf and John W. Alvord, members of the American Society of Civil Engineers, was presented for discussion. This paper was printed in the *Proceedings* for February, 1911.

International Master Boiler Makers' Association.

The fifth annual convention of the International Master Boiler Makers' Association will be held at the Rome Hotel, Omaha, Neb., May 23-26.

American Society for Testing Materials.

The annual meeting of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, N. J., June 27-July 1.

Traveling Engineers' Association.

The annual convention of the Traveling Engineers' Association will be held at the Hotel Sherman, Chicago, August 29-September 1.

Association of Railway Claim Agents.

The annual convention of the Association of Railway Claim Agents will be held in Montreal, Que., May 24-26.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association. C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9-10, 1911, Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Omaha Railway Club.—A. H. Christiansen, Barker Block, Omaha, Neb.; second Wednesday.
Railroad Club of Kansas City.—C. Maalove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept. Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Wells-Fargo Express Company has purchased the business of the Alaska Pacific Express Company of Seattle, the pioneer express company of the northern district.

The Lehigh Valley has followed the Lackawanna in withdrawing from the Trunk Line agreement for the distribution of the west bound emigrant traffic from New York City.

The Atchison, Topeka & Sante Fe has been indicted by the United States District Court at Los Angeles, on a charge of granting rebates to the Grand Canyon Lime and Cement Company.

Judge Smith McPherson, of the Circuit Court of Appeals at Council Bluffs, Iowa, on March 29 temporarily enjoined the Iowa railway commission from putting into effect the reduced express rates which were ordered some time ago to become effective on March 30.

The Chamber of Commerce and other commercial bodies of New York City have again presented to the Interstate Commerce Commission their complaint against the differential system under which freight rates between New York and the West are higher than the rates to and from Philadelphia, Baltimore and Newport News.

The National Wool Growers' Association has filed with the Interstate Commerce Commission a petition for a general reduction in the rates on wool from the Pacific coast and Rocky Mountain states to Boston, New York, Chicago and other eastern markets. It is complained that wool in any quantity is charged at the second-class rate, whereas textile fibres similar in weight and value are given fourth-class rating in carloads and are frequently moved on commodity rates at much less than fourth-class rates.

The Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago & St. Louis have petitioned the Pennsylvania courts at Pittsburgh to annul the 2-cents-a-mile passenger fare law. Co-incident with this news comes the statement from the State Railroad Commission of Michigan, that the Michigan Central Railroad, whose passenger receipts in 1906 averaged $3,639 a mile, earned in 1910, with a 2-cent fare, $4,306 a mile. Similar increases in gross receipts, under reduced fares, are reported from other Michigan roads.

The railways have asked the Interstate Commerce Commission to postpone indefinitely hearings on the proposed increases in class and commodity rates between St. Louis, Ohio river crossings and southern points. The roads last August filed tariffs providing for increases of 10 per cent. The Business Men's League of St. Louis filed a complaint regarding the advance and the proposed rates were suspended. The action of the roads in asking for an indefinite postponement of hearings means that the proposed advances will not be put into effect.

The Pacific Coast Steamship Company has announced heavy reductions in its rates between San Francisco, San Pedro and San Diego. This action has been taken to meet the competition of the Pacific Coast Navigation Company, which is operating two boats, the Yale and the Harvard. The rates between San Francisco and Portland also have been reduced. The passenger rate from San Francisco to San Pedro is reduced from $11.50 to $8.35; from San Francisco to Santa Barbara from $8.50 to $7, and from San Francisco to San Diego from $14.50 to $10.

The Texas railway commission has ordered that suit be brought against the Galveston, Harrisburg & San Antonio, the Gulf, Colorado & Santa Fe, the Missouri, Kansas & Texas, the International & Great Northern, the Trinity & Brazos Valley, the Texas City Terminal and the Galveston, Houston & Henderson, for failure to absorb loading charges, in accordance with a ruling of the commission. The order for the suits states that the roads absorbed the charges before the commission made its ruling and that they must now continue to do so.

Total January Earnings and Expenses.

Logan G. McPherson, director of the Bureau of Railway Economics in Bulletin Number 10 giving a summary of revenues and expenses of steam roads in the United States for

the month of January, 1911, says for the month of January, 1911, there was an increase in total operating revenue, over the same month of 1910, of $4,500,000 which, however, was almost wholly accounted for by the fact that the report covers 3,700 more miles than in 1910. The increase per mile of line was only $3.95 or 0.4 per cent. For this trifling increase, passenger revenue was almost entirely responsible, freight revenue per mile actually declining 1.7 per cent. Operating expenses increased per mile over the same month of the previous year 3.2 per cent., the largest increase being in transportation expenses. There was a decline of 4.4 per cent. in the per mile expenditures for maintenance of way. With this showing it was to be expected that net operating revenue would show a falling off. On the per-mile basis the decrease was 7 per cent. Operating income, which is net revenue with taxes and outside operations included, shows a decrease of 9 per cent.

Increase in operating revenues was almost wholly confined to the southern group, where an increase per mile of 7.4 per cent. is shown, the western group showing an actual decline, and the eastern a nominal increase. This increase in the South is present in both freight and passenger business, while in both the other groups freight revenue decreased. In the matter of expenses, the South shows the largest increase per mile, nearly 10 per cent., while an actual decrease occurred in the West of 2.1 per cent. In the East, the most significant increase was in transportation expenses, 8.5 per cent.; the South in maintenance of equipment, 11.8 per cent. The statistics for the western roads should be especially noticed, for they show a decrease per mile of 15.8 per cent. in maintenance of way and nearly 2 per cent. in transportation expenses. The results of this policy are revealed in the statistics of net earnings. While the East shows a decrease per mile of 16 per cent. in net revenue, and while the South, in spite of its increased gross, shows an increase of only 2.2 per cent. in net, the West with a decrease in gross, shows an increase of 2.1 per cent. in net revenue. In other words, western roads in contrast with roads of the other two groups, were able to make heavy reductions in operating expenses, even in transportation expenses, where labor is the principal item, and were able in consequence to make practically as good a showing in net revenue as the southern roads with their increased gross earnings.

For the seven months of the fiscal year 1911, there is an increase of operating revenues per mile for all roads of 2.4 per cent. over the corresponding period of 1910. However, expenses increased 7.5 per cent., with the result that net revenue shows a decrease of 6.7 per cent. This decrease runs as high as 12 per cent. in the eastern group. In the southern group there is a slight increase amounting to 1 per cent. It is plain that the decrease for all roads is due to increased expenses rather than declining revenues, the greatest advance in expenses being found in the transportation account where the wage increases are mostly reflected.

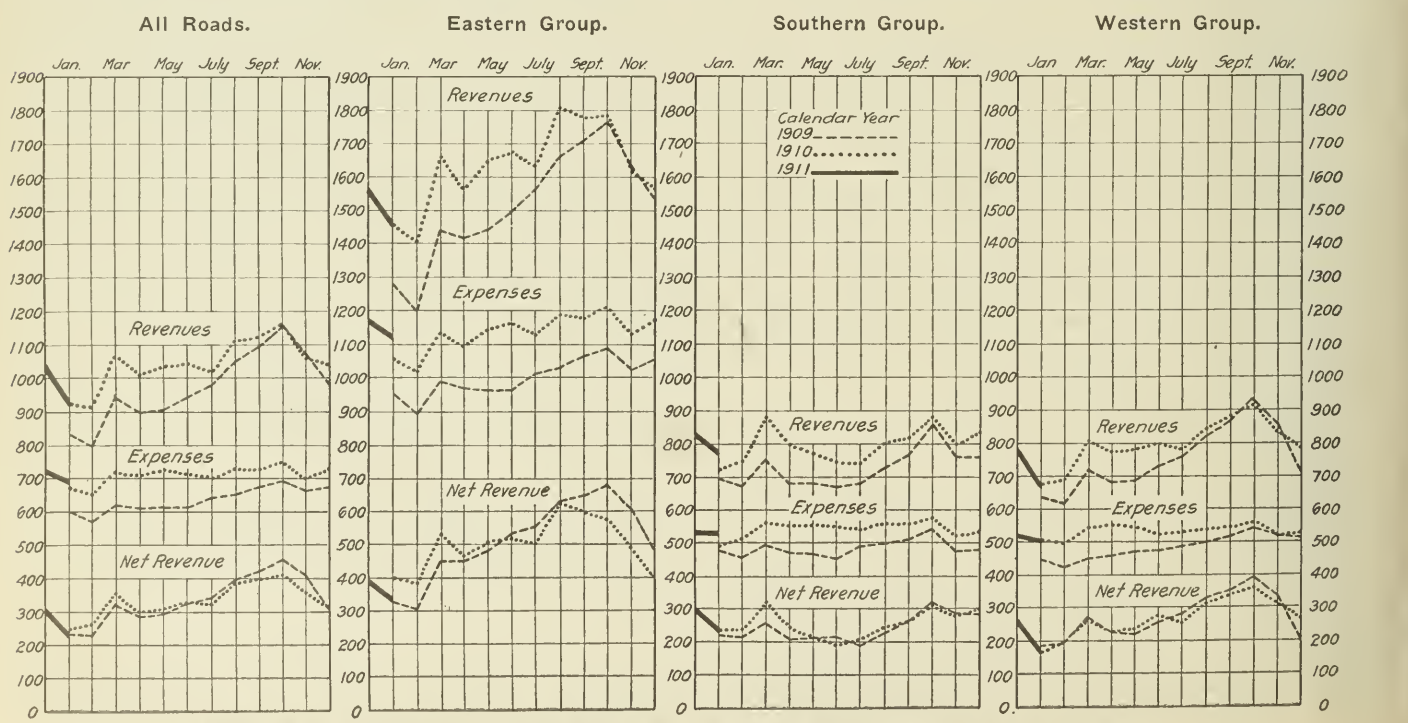
The accompanying chart shows the variation in revenues, expenses and net revenue for the separate months of the calendar years 1909 and 1910, and for January, 1911. It is of particular importance to note that there has been no improvement in January as compared with December, but rather a decline. For all roads there is a decline in net revenue as compared with December, 1910, of $76 per mile. This decline amounts to $55 per mile for the eastern roads, $56 for the southern roads and $91 for the western roads.

Ratio of Expenses to Total Operating Revenues.

	January, 1911.	January, 1910.	Fiscal year ended June 30, 1910.
Per cent. of total operating revenues:			
Maint. of way and structures	11.6	12.2	13.4
Maint. of equipment	17.2	16.9	15.0
Traffic expenses	2.3	2.2	2.0
Transportation expenses	40.9	38.9	33.4
General expenses	2.8	2.7	2.5
Total operating expenses	74.9	72.9	66.3

Hearing Regarding Pacific Coast Rate Cases.

Testifying before the Interstate Commerce Commission at Washington, D. C., last week, H. E. D. Jackson, secretary and traffic manager of the American Line Steamship Company, detailed at length facts regarding water competition between the Atlantic and Pacific coasts. He stated that there is both potential and actual water competition for transcontinental traffic and that there is competition among the water carriers. His company, operating in connection with the Tehuantepec Railway, competes with German, Japanese and other foreign lines. He predicted that water competition would become much more important when the Panama canal is open. Regarding the relations between the railways and the water lines, he said that the roads made rates of 30 cents per 100 lbs. from New York and New England across the continent to drive the clipper sailing ships around the Horn out of the business. They succeeded after a war raging from 1893 to 1900. Rates would be made a great deal higher across the country were it not for the water lines. The tonnage moved westward by the transcontinental roads between Atlantic coast and Pacific coast terminals is about 3,000,000 tons annually. About 250,000 tons are carried by water and by the Isthmian routes between the two seaboards every year, the water rates ranging from 20 to 50



Earnings and Expenses by Groups and of all Railways Showing a Three-Year Comparison.

per cent. less than those of the railways. The rates via the Tehuantepec Railway are divided into three parts, one-third going to the steamship line on the Atlantic, another third to the Pacific line and the last third to the Tehuantepec Railway.

Mr. Jackson denied that the railways dictate what rates his company shall charge. He testified that his line could not continue in business if it were not for its contracts to transport the Hawaiian sugar crop, amounting to 250,000 tons annually, to eastern ports of the United States. On this traffic it gets $9.50 a ton. On westbound shipments the company does business at Los Angeles, San Francisco, Sacramento, Stockton, Portland, Seattle, Tacoma and some other ports. There are 84 points in California which enjoy terminal rates.

The meaning and constitutionality of the fourth section of the Act to Regulate Commerce as amended by the Mann-Elkins Act were discussed by a number of lawyers, including Gardner Lathrop (Santa Fe); W. W. Cotton (O.-W. R. R. & N. Co.); C. W. Durbrow (Southern Pacific); H. M. Stephens, representing the shippers of Spokane; Byron Waters, representing the Counties Freight Bureau of Southern California. Mr. Lathrop said that while the wording of the law has been changed, the only change in its meaning is that, whereas formerly the roads could on their own initiative apply rates disregarding the long and short haul principle, now they must first get the consent of the commission. Any departure from the long and short haul principle which was legal under the old law is legal under the law as amended by the Mann-Elkins Act. Regarding the provision authorizing the commission to determine the extent of the differential allowable between the long haul and the short haul rates, Mr. Lathrop said that the commission could not exercise arbitrary descretion, but must fix a reasonable differential.

W. W. Cotton (Oregon-Washington Railway & Navigation Company) and Mr. Stephens of Spokane, agreed that in authorizing the commission to determine what differentials should be made. Congress had delegated legislative authority, which is unconstitutional. Mr. Stephens contended that eliminating this provision, which he regarded as unconstitutional, left a law absolutely prohibiting a greater charge for a short haul than for a long haul and that therefore the only way the roads can get authority to disregard the long and short haul principle in any case is to get the amended fourth section held confiscatory in its entirety.

Testimony was given to the effect that the Southern Pacific would suffer a direct loss of $800,000 and an indirect loss of $3,700,000 yearly if Pacific coast terminal rates were applied to intermediate points. George W. Luce, assistant to the vice-president of the Southern Pacific, and Edward Chambers, assistant freight traffic manager of the Santa Fe, were examined at great length regarding rates to intermountain and Pacific points. Much of the ground covered had been covered already in the hearings which preceded the rendering of the commission's opinion in the Pacific coast cases.

INTERSTATE COMMERCE COMMISSION.

The commission has issued revised regulations to govern the construction and filing of freight and passenger tariffs. One paragraph of the order reads: "Tariffs should not contain volumes of unnecessary rates, and it is undesirable to require the posting of large numbers of tariffs at points from which no shipments are likely to move. Therefore, until further ordered, carriers may file tariffs containing commodity rates applicable from known points of production without making such rates applicable from all intermediate points." The regulations also provide that hereafter reductions as well as increases in rates in a new tariff must be indicated.

Reparation Awarded.

Hartman Furniture & Carpet Co. v. Chicago, Rock Island & Pacific et al. Opinion by Chairman Clements.

Through rate of 49 cents per 100 lbs. on shipment of chairs from Malvern, Ark., via Thebes, Ill., to Milwaukee, Wis., found unjust in so far as it exceeded 39 cents.

Connection with Competing Electric Line Ordered.

Cincinnati & Columbus Traction v. Baltimore & Ohio Southwestern et al. Opinion by Commissioner Harlan.

A local law under which an electrically operated interurban line has no right to demand a switch connection and interchange of traffic with a steam railway is controlling only in so far as it relates to local traffic; it can not be permitted to operate as an impediment to the movement of interstate traffic after the Congress has legislated on the subject by requiring such connection and interchange under certain conditions which in this proceeding are shown to exist.

The commission ordinarily will not lend its aid to an effort by one carrier to secure traffic that is reasonably tributary to another line by compelling the latter to join with it in through routes and rates; but the theory as to what traffic is tributary to a particular railway must not be carried to such an extreme as to impose on shippers the burden of an unduly long wagon haul.

Through routes and through billing denied to points on the complainant's line where it parallels and closely approaches the tracks of the defendants, but required, on the special facts of the case, in the interest of shippers at other points from five to ten miles distant by the wagon roads. (20 I. C. C., 486.)

COURT NEWS.

The Supreme Court of the United States, in a decision by Chief Justice White, has decided against the Delaware, Lackawanna & Western in the suit brought by that road to enjoin the I. C. C. from enforcing its order requiring the road to give carload rates on freight consisting of equipment of shipments from different shippers, and made up by shipping agents.

The new Court of Commerce held its first public session at Washington, April 3, numbers of railway men who were in Washington on other business being present as spectators. The first cases before the court were those concerning switching changes in California, and the arguments of the first day were on the question whether the court could hear testimony, or should confine itself to an examination of the records of the cases as made up by the Interstate Commerce Commission.

The Supreme Court of the United States, in an opinion by Justice Lurton, has sustained the statute of Virginia prescribing a penalty upon telegraph companies for failure to transmit promptly messages filed with it. The case came to the Supreme Court on a writ of error to the Supreme Court of Virginia, which fined the Western Union $200 for failure to forward promptly a message handed in for transmission to Brooklyn, N. Y. The opinion was brief, and held that the fact that the transaction was interstate did not deprive the state of Virginia, in the absence of a Federal statute, from legislating regarding it.

The United States circuit court of appeals, at St. Louis, March 29, upheld a temporary injunction against the corporation commission of Oklahoma granted by United States Judge Hook nearly a year ago, by which the state of Oklahoma is enjoined from enforcing the 2-cent passenger fare laws and a law reducing freight rates. The court upholds the law to be confiscatory and holds that section of the Oklahoma constitution establishing the corporation commission is invalid under the constitution of the United States. The decision was rendered on the interlocutory injunction which the railways had obtained and the petition for a permanent injunction will now be carried to the highest court. The decision says that the corporation commission of Oklahoma has no power to make rates, but it has power to exempt railways from confiscatory rates.

The New York State Court of Appeals has handed down a decision holding unconstitutional one of the two Employers' Liability Acts passed in 1910; that one under which employers of men in occupations defined in the law as dangerous, are required to make compensation to or in behalf of such employees in case of death or injury caused by or incident to their work, without regard to whether or not the employer is blameworthy. The court observes that on economical, philosophical or moral theories a law of this kind may be desirable; but to make an employer pay for injuries which are not due to any act or neglect on his part, and when he has disobeyed no law, violated no contract, and done no wrong, is a taking of property without due process of law, and therefore repugnant to both the federal and New York state constitutions. The other law, that abolishing the fellow-servant doctrine and modifying the rule of contribu-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1911. (SEE ALSO ISSUES MARCH 17, 24 AND 31.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$97,570	$42,254	$152,284	$23,238	$27,425	$3,767	$53,269	$5,526	$113,225	$39,059	$286	$4,490	$34,855	—$1,718
Buffalo & Susquehanna R. R.	265	124,820	7,951	139,275	26,303	36,266	1,980	57,800	6,043	128,391	10,884	.....	2,600	8,284	—
Buffalo & Susquehanna Ry	91	31,614	6,298	39,696	3,449	31,028	612	19,336	2,278	56,703	—17,007	—24	1,400	—18,431	—
Carolina, Clinchfield & Ohio	236	156,501	11,358	170,654	16,190	23,812	6,594	37,377	8,841	92,814	77,840	.....	5,500	72,340	34,638
Carolina, Clinchfield & Ohio of S. C.	18	9,629	2,090	11,898	615	148	894	2,464	720	4,841	7,057	.....	200	6,857	—
Central New England	277	214,169	23,475	252,506	37,701	27,856	2,396	88,641	3,547	160,141	92,365	.....	19,000	73,365	14,251
Chesapeake & Ohio of Indiana	285	104,865	13,214	124,806	35,865	36,702	4,872	86,401	5,607	169,447	—44,641	.....	3,790	—48,431	—
Chicago, Peoria & St. Louis	255	111,170	18,975	136,820	21,160	37,192	8,538	70,762	6,278	143,930	—7,110	.....	4,500	—11,610	—34,999
Chicago, Rock Island & Gulf	471*	178,381	60,462	255,198	21,608	26,261	11,716	101,594	8,681	169,860	85,338	—396	9,501	75,441	2,865
Cleveland, Akron & Columbus	212	137,645	41,932	196,321	31,130	45,152	2,599	76,053	5,007	159,941	36,380	.....	8,500	27,880	—10,335
Colorado Midland	338	99,406	22,771	139,995	15,498	32,649	4,742	72,427	5,534	130,850	9,145	—784	8,500	—139	—6,116
Cumberland Valley	162	175,205	46,857	232,944	22,043	30,568	4,584	83,541	6,382	147,118	85,826	199	5,141	80,884	4,174
Detroit, Grand Haven & Milwaukee	190	101,718	34,202	157,353	12,517	23,796	6,460	97,851	4,829	145,453	11,900	—67	3,009	8,824	—5,623
Evansville & Terre Haute	310	118,882	60,016	199,163	24,595	35,533	5,371	76,277	6,111	147,887	51,276	—593	9,410	41,273	—1,338
Gulf & Ship Island	307	132,325	30,896	176,675	23,206	30,758	1,652	48,670	8,798	113,084	63,591	.....	3,399	60,192	17,842
Kansas City, Mexico & Orient	740	114,228	29,014	154,343	31,531	34,975	7,824	74,413	7,751	156,494	—2,151	.....	6,750	—8,901	3,870
Louisiana & Arkansas	255	101,804	14,748	121,394	18,111	16,131	2,393	32,255	4,460	73,350	48,044	.....	2,825	45,219	12,479
Louisiana Ry. & Nav. Co	350	120,481	18,590	151,165	22,414	18,481	4,798	60,334	6,286	112,313	38,852	.....	4,400	34,452	17,708
Louisiana Western	207	113,827	62,738	184,909	50,655	26,915	5,895	59,138	7,832	150,435	34,474	—1,363	6,577	26,534	—27,917
Midland Valley	324	66,548	32,526	105,515	18,275	16,597	2,144	36,157	10,139	83,312	22,203	890	5,476	17,617	—393
Minneapolis, St. Paul & S. S. Marie	3,764†	1,098,396	369,497	1,587,743	154,823	267,966	42,555	716,594	44,175	1,226,113	361,630	—473	77,949	283,208	—425,812
Morgan's La. & Texas R. R. & S. S. Co.	405‡	323,822	110,753	467,047	61,560	57,067	10,252	154,529	13,275	296,683	170,364	—1,691	18,756	149,917	—2,839
Nevada Northern	165	111,539	9,534	124,177	5,524	15,740	605	29,928	3,051	54,848	69,329	.....	4,300	65,029	11,837
New Orleans & North Eastern	196	229,310	51,188	303,998	30,917	50,162	9,261	112,165	13,991	216,496	87,502	149	8,550	79,101	—7,080
New Orleans Great Northern	282	99,206	26,939	136,987	24,065	13,162	3,066	43,210	6,544	90,047	46,940	—103	2,200	44,637	—11,168
New Orleans, Mobile & Chicago	404	130,396	28,317	170,630	21,838	16,793	2,427	49,015	8,614	98,687	71,943	.....	4,256	67,687	12,641
New York, Philadelphia & Norfolk	112	186,338	30,112	239,611	29,840	42,553	3,483	101,016	11,377	188,269	51,342	.....	7,500	43,842	—9,140
New York, Susquehanna & Western	152	163,620	43,286	233,767	21,527	22,231	1,694	94,343	3,423	143,218	90,549	—739	11,771	78,039	31,505
Northwestern Pacific	376	75,507	96,738	192,957	48,494	39,404	3,109	91,725	9,431	192,164	793	.....	10,700	—9,906	—8,198
Pittsburg, Shawmut & Northern	240	111,150	7,673	120,903	11,957	35,236	1,039	48,830	4,339	101,401	19,502	.....	1,552	17,950	3,388
St. Joseph & Grand Island	319	93,445	32,270	137,761	19,848	21,751	6,517	63,312	7,041	118,469	19,292	—2	5,712	13,579	9,814
Santa Fe, Prescott & Phoenix	364§	93,768	35,555	137,142	25,416	14,146	2,831	45,415	5,375	93,184	43,959	.....	103	43,856	—8,954
Tennessee Central	294	79,116	27,517	113,339	15,083	13,199	4,622	40,981	10,080	83,965	29,374	.....	3,980	25,394	4,392
Vicksburg, Shreveport & Pacific	171	79,195	39,904	130,011	24,128	20,724	3,289	40,114	4,321	92,576	37,435	—96	6,175	31,164	9,417
West Jersey & Seashore	353	117,248	174,295	316,926	80,856	56,542	9,568	198,914	9,794	355,674	—38,748	—3,650	23,228	—65,626	9,168
Western Maryland	543	490,988	55,981	568,617	37,112	73,398	7,578	225,473	17,509	361,070	207,547	—729	19,500	187,318	—46,021
SEVEN MONTHS OF FISCAL YEAR 1911.															
Alabama & Vicksburg	143	$698,386	$312,512	$1,089,794	$142,281	$175,406	$26,309	$363,123	$37,221	$744,340	$345,454	$5	$32,936	$312,523	$20,106
Buffalo & Susquehanna R. R.	265	823,324	57,650	930,624	186,022	183,524	11,727	332,245	36,817	750,335	180,289	.....	16,271	164,019	—
Buffalo & Susquehanna Ry	91	351,316	73,449	443,335	52,130	199,785	5,615	182,118	21,635	461,283	—17,948	—24	11,729	—29,701	—
Carolina, Clinchfield & Ohio	236	824,850	99,369	951,659	92,681	132,636	38,456	210,199	57,712	531,684	419,975	549	38,500	382,024	200,511
Carolina, Clinchfield & Ohio of S. C.	18	45,709	10,749	58,269	4,277	456	6,388	16,457	3,801	31,379	26,890	.....	1,400	25,490	—
Central New England	277	1,549,306	218,001	1,862,987	379,802	162,202	14,194	546,984	21,278	1,124,460	738,527	.....	73,000	665,527	—15,235
Chesapeake & Ohio of Indiana	285	723,732	179,498	951,044	220,817	175,117	42,714	498,074	34,371	971,093	—20,049	.....	26,530	—46,579	—
Chicago, Peoria & St. Louis	255	836,285	195,578	1,083,403	164,622	229,222	51,276	487,860	40,564	973,544	109,859	.....	31,500	78,359	—121,988
Chicago, Rock Island & Gulf	471*	1,257,282	435,364	1,804,983	277,166	127,761	64,486	641,193	57,835	1,168,441	636,542	—2,236	39,174	595,132	—31,687
Cleveland, Akron & Columbus	212	1,164,573	358,942	1,628,540	296,261	261,536	21,639	541,038	28,665	1,149,139	479,401	.....	62,500	416,901	78,728
Colorado Midland	338	895,486	217,396	1,256,563	161,833	262,348	34,995	537,250	39,245	1,035,671	220,892	—2,686	57,883	160,323	—89,136
Cumberland Valley	162	1,385,946	399,892	1,869,460	216,126	247,603	34,406	582,496	46,673	1,127,304	742,156	2,111	39,024	705,243	—13,735
Detroit, Grand Haven & Milwaukee	190	687,822	353,731	1,206,124	171,090	146,409	44,077	581,111	31,617	974,304	231,820	—240	21,063	210,517	—98,462
Evansville & Terre Haute	310	1,046,469	440,807	1,638,234	204,124	229,294	38,890	524,387	45,207	1,041,902	596,332	—5,430	65,870	525,032	4,793
Gulf & Ship Island	307	853,595	254,370	1,189,251	145,320	203,862	11,950	332,522	55,867	749,521	439,730	.....	34,764	404,966	53,190
Kansas City, Mexico & Orient	740	834,777	274,426	1,174,005	226,668	234,466	54,292	526,717	54,458	1,096,601	77,404	.....	32,026	45,378	—49,790
Louisiana & Arkansas	255	694,974	116,358	844,429	136,915	116,968	17,294	224,012	31,392	526,581	317,848	.....	18,575	299,273	35,515
Louisiana Ry. & Nav. Co	350	786,163	144,714	1,021,896	179,179	119,909	34,692	415,029	43,575	792,384	229,512	.....	30,800	198,712	79,300
Louisiana Western	207	792,920	384,774	1,235,722	163,886	174,208	43,252	363,618	51,921	796,885	438,837	—832	49,949	388,056	—56,268
Midland Valley	324	499,401	239,753	783,295	140,875	120,499	15,135	224,509	51,488	552,506	230,789	7,789	38,328	200,230	10,237
Minneapolis, St. Paul & S. S. Marie	3,764†	9,238,517	3,109,949	13,202,819	1,349,962	1,825,993	304,782	4,766,959	284,899	8,532,595	4,670,224	92,682	727,531	4,035,375	—1,988,351
Morgan's La. & Texas R. R. & S. S. Co.	405‡	2,304,339	706,615	3,196,374	404,700	358,830	76,867	1,070,239	93,971	2,004,607	1,191,767	—12,209	137,989	1,041,569	27,463
Nevada Northern	165	769,214	82,927	879,802	47,468	91,967	2,539	185,999	25,397	353,370	526,432	.....	30,307	496,125	—10,883
New Orleans & North Eastern	196	1,615,201	370,713	2,119,353	211,715	318,108	64,636	746,971	81,037	1,422,467	696,886	—311	61,337	635,238	33,279
New Orleans Great Northern	282	667,297	223,341	973,952	150,556	134,569	21,702	271,511	34,899	613,237	360,715	—582	13,150	346,983	66,726
New Orleans, Mobile & Chicago	404	804,986	205,768	1,083,460	147,434	89,447	19,951	316,804	56,103	629,739	453,721	.....	30,832	422,889	83,340
New York, Philadelphia & Norfolk	112	1,603,021	260,222	2,013,649	217,590	329,583	32,323	764,085	77,779	1,421,360	592,289	.....	54,150	538,139	—61,735
New York, Susquehanna & Western	152	1,156,194	362,574	1,707,314	207,456	159,391	14,385	631,228	30,239	1,042,699	664,615	2,750	81,944	585,421	109,202
Northwestern Pacific	376	883,580	1,041,560	2,076,498	357,633	289,699	19,892	746,682	64,389	1,478,295	598,203	.....	73,900	524,303	—20,908
Pittsburg, Shawmut & Northern	240	777,485	65,712	856,595	132,726	216,762	8,503	309,977	32,171	700,139	156,457	.....	10,979	145,477	—2,098
St. Joseph & Grand Island	319	689,185	283,879	1,057,313	231,253	141,908	45,803	447,079	43,256	909,299	148,014	273	41,902	106,385	—47,738
Santa Fe, Prescott & Phoenix	364§	671,033	254,684	988,208	173,616	94,170	19,240	313,044	39,708	639,778	348,430	.....	741	347,689	—24,340
Tennessee Central	294	590,515	242,873	883,975	126,430	89,413	34,279	268,673	57,644	576,440	307,534	.....	27,861	279,674	13,807
Vicksburg, Shreveport & Pacific	171	552,945	305,842	927,508	134,032	152,298	23,618	277,236	31,713	618,897	308,611	—375	41,025	267,211	60,524
West Jersey & Seashore	353	1,098,006	2,532,807	3,874,107	582,647	469,506	120,003	1,561,472	75,449	2,809,077	1,065,029	—43,198	159,865	861,966	30,231
Western Maryland	543	3,525,377	635,770	4,344,708	512,960	516,018	67,010	1,500,943	93,050	2,689,981	1,654,727	—2,450	136,500	1,515,777	—

Mileage on January 31, 1910—* 530 miles; † 3,525 miles; ‡ 3,525 miles; § 257 miles; — indicates Deficits, Losses and Decreases.

tory negligence, and otherwise favoring the employee, is not touched by this decision. The court says that the legislature has the power to make these changes. It is proper also to classify certain occupations as dangerous; but the law now condemned goes farther. The right of property does not rest on philosophical speculations or benevolence; nor on charity, or even upon the dictates of natural justice, but rather in the written constitution and laws; and these can be changed only by changing the constitution (which in this case would mean the constitutions of both the state of New York and of the United States). Their other law passed at the same time, not confined to dangerous occupations, provides for the voluntary payment of compensation by employers to employees; the matter to be arranged by contract; but from the operation of this contract clause of the law railways are excepted.

Commodities Clause Decision.

The "commodities clause" of the rate law of 1906, which was the subject of a decision by the Supreme Court of the United States two years ago has been further considered by that court, and this week, in a decision by Chief Justice White, it is held that the lower court had erred in refusing to allow the government to amend its original petition Justice White referred to the refusal as "an absolute abuse of discretion." He said, however, that the abuse was "obviously occasioned by a misconception of the character of the action of this court and the scope of the mandate."

"While that decision expressly held," said the chief justice, in referring to the holding of the Supreme Court two years ago, "that stock ownership by a railroad company in a bona fide corporation, irrespective of the extent of such ownership, did not preclude a railroad company from transporting the commodity manufactured, mined, produced or owned by such corporation, nothing in that conclusion foreclosed the right of the government to question the power of the railroad company to transport in interstate commerce a commodity manufactured, mined, owned or produced by a corporation in which the railroad held stock and where the power of the railroad company as a stockholder was used to obliterate all distinctions between the two corporations. That is to say, where the power was exerted so as to commingle the affairs of both, as by necessary effect to make such affairs practically undistinguishable, and therefore to cause both corporations to be one for all purposes.

"It must be held that while the right of a railroad company as a stockholder to use its stock ownership for the purpose of a bona fide separate administration of the affairs of a corporation in which it has a stock interest may not be denied, the use of such stock ownership in substance for the purpose of destroying the entity of a producing, etc., corporation and of commingling its affairs in administration with the affairs of the railroad company so as to make the two corporations virtually one, brings the railroad company so voluntarily acting as to such producing, etc., corporation within the prohibition of the commodities clause. In other words, that by operation and effect of the commodities clause, there is a duty cast upon a railroad company purposing to carry in interstate commerce a product of the producing, etc., corporation in which it has a stock interest, not to abuse such power so as virtually to do by indirection that which the commodities clause prohibits, a duty which plainly would be violated by the unnecessary commingling of the affairs of the producing company with its own so as to cause them to be one and inseparable."

The opinion reverses the decree of the Circuit Court for the Eastern district of Pennsylvania in the case of the United States, appellant, against the Lehigh Valley Railroad Company. The lower court erred in refusing to permit the Government to file an amended bill.

As the result of the present opinion it is expected that the Government will at once file its amended bill against the Lehigh Valley alleging that the ownership by the carriers of the Lehigh Valley Coal Company is a violation of the commodities clause and that the cause will proceed to a hearing on this issue. Furthermore it is believed that the Department of Justice will promptly enter upon a searching investigation of the relations of all the anthracite railroads to determine just how far their relations with coal producing companies are in violation of laws.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

F. D. Blue has been appointed claim agent of the New Orleans Great Northern, with office at Bogalusa, La.

W. G. Brimson, formerly vice-president of the Quincy, Omaha & Kansas City, at Kansas City, Mo., has been elected president of the Texas City Terminal, with office at Texas City, Mex.

W. O. Wall, freight claim agent of the Macon, Dublin & Savannah, at Macon, Ga., has been appointed general claim agent, and the positions of freight claim agent and claim agent have been abolished.

E. A. Weber, cashier and office manager of Peabody, Houghteling & Company, Chicago, has been appointed treasurer and auditor of the National Railroad of Hayti, with office at Port Au-Prince, Hayti.

C. C. Barry has been appointed auditor of the Houston & Texas Central and the Houston East & West Texas, with office at Houston, Tex., succeeding W. C. Parker, resigned to take a position in the office of the general auditor of the Harriman Lines at Chicago.

Carl R. Gray, senior vice-president of the St. Louis & San Francisco, and vice-president of the St. Louis, Brownsville & Mexico and other Frisco lines, at St. Louis, Mo., has been elected president of the Spokane, Portland & Seattle, the Oregon Trunk Railway, the Oregon Electric Railway, the Astoria & Columbia River, the Pacific & Eastern and the United Railways Company, with office at Portland, Ore., succeeding John F. Stevens, resigned.

Frank V. Whiting, general claim agent of the New York Central & Hudson River, has been appointed general claims attorney of the New York Central Lines, except the Boston & Albany. Harry H. Downs has been appointed chief claim agent and Willis H. Failing, assistant chief claim agent of the New York Central & Hudson River, and leased and operated lines east of Buffalo, N. Y., except the Boston & Albany, all with offices at New York. The following chief claim agents have been appointed on various New York Central Lines west of Buffalo: Frank A. Hruska, Cleveland, Ohio; Charles H. Myers, Indianapolis, Ind.; William H. McGarr, Detroit, Mich., and Charles A. Theiss, Chicago.

W. C. Nixon, vice-president and general manager of the St. Louis & San Francisco, and vice-president of other Frisco Lines at St. Louis, Mo., has been elected vice-president, in charge of maintenance and operation, with office at St. Louis, succeeding Carl R. Gray, resigned to become president of the Spokane, Portland & Seattle. W. T. Tyler, general superintendent of the First district at Springfield, Mo., has been appointed general manager, with office at Springfield, succeeding Mr. Nixon. J. A. Frates, superintendent of the Third district, at Chaffee, Mo., has been appointed general superintendent of the First district, with office at Springfield, succeeding W. T. Tyler, and E. D. Levy, superintendent of transportation, at Springfield, has been appointed assistant general manager, with office at Springfield.

Operating Officers.

W. E. Becker has been appointed a trainmaster of the Chicago, Milwaukee & Gary, with office at Rockford, Ill.

A. B. Kearsey, auditor of the Atlanta & St. Andrews Bay, at Dothan, Ala., has been appointed trainmaster. W. T. Steger succeeds Mr. Kearsey.

J. F. Carten, assistant superintendent of the Pullman Company, at Salt Lake City, Utah, has been appointed assistant district superintendent, at St. Louis, Mo.

Frank M. Gates has been appointed car accountant of the Minneapolis, St. Paul & Sault Ste. Marie, with office at Minneapolis, Minn., succeeding B. R. Lewis, resigned.

John Ryan has been appointed superintendent of the fuel department of the Missouri, Kansas & Texas, with office at Pittsburgh, Kan., succeeding John Jopling, deceased.

The jurisdiction of J. E. Hutchinson, general superintendent of the Second district of the St. Louis & San Francisco, will be extended to cover the Third district, effective May 1.

J. H. Franke has been appointed superintendent of the Peoria Railway Terminal Company, with office at South Bartonville, Ill., and the offices of trainmaster and master mechanic have been abolished.

W. H. Wright, superintendent of the Central of Georgia, at Savannah, Ga., having been granted 90 days' leave of absence, D. F. Kirkland has been appointed acting superintendent, with office at Savannah.

E. Thomason, general manager of the Durham & Charlotte, at Durham, N. C., having resigned to go to another company, his position has been abolished, and all correspondence should in future be addressed to J. E. Stagg, vice-president, at Durham.

C. E. McMullin, superintendent of the terminal division of the Northern Pacific at Seattle, Wash., has been appointed superintendent of terminals at Tacoma, Wash., a new office, the yards at Tacoma having been taken out of the Tacoma division to form a separate terminal division.

The statement made in our issue of March 31, that L. C. Badgley, trainmaster of the Chicago & Alton at Peoria, Ill., had resigned and that the jurisdiction of S. P. Henderson, trainmaster at Bloomington, Ill., had been extended to include the Dwight and Rutland branches, was incorrect.

Thomas P. McMahon, who was appointed assistant superintendent of the Buffalo, Rochester & Pittsburgh, at Du Bois, Pa., was born May 18, 1870, at St. Mary's, Pa. He began railway work on the Buffalo, Rochester & Pittsburgh September 8, 1888, as a telegraph operator, and in February, 1891, was promoted to copier in the despatcher's office at Bradford, Pa. In January of the following year he was appointed despatcher and in April, 1901, he was made chief despatcher. Mr. McMahon was promoted to trainmaster in October, 1906, which position he held at the time of his recent appointment as assistant superintendent.

C. J. Phillips, superintendent of the Buffalo division of the Delaware, Lackawanna & Western, at Buffalo, N. Y., has been appointed superintendent of the Morris & Essex division, with office at Hoboken, N. J., succeeding to the duties of S. S. Stone, acting superintendent, resigned. George A. Poore, superintendent of the Syracuse and Utica divisions, at Syracuse, N. Y., succeeds Mr. Phillips. Frank Cizek, superintendent of the Bangor & Portland division, at Easton, Pa., succeeds Mr. Poore. J. J. McCann, trainmaster at Scranton, has been appointed superintendent of the Scranton division, with temporary jurisdiction over the Bangor & Portland division, with office at Scranton.

P. Fraser, assistant superintendent of the Buffalo, Rochester & Pittsburgh, at Du Bois, Pa., has been appointed superintendent of the Middle and Pittsburgh divisions, with office at Du Bois, succeeding A. J. Johnson, assigned to special duties. A. B. White, trainmaster at Punxsutawney, has been appointed assistant superintendent, with office at Punxsutawney. T. P. McMahon, trainmaster at Du Bois, succeeds Mr. Fraser, and G. W. Bennett succeeds Mr. McMahon. M. G. McInerney, trainmaster at East Salamanca, N. Y., has been appointed assistant superintendent of the Buffalo and Rochester divisions, with office at East Salamanca, and R. G. Matthews has been appointed terminal superintendent at Rochester.

Miles Bronson, superintendent of the Mohawk division of the New York Central & Hudson River, at Albany, N. Y., has been appointed superintendent of the Electric division, at New York, succeeding C. L. Bardo, whose resignation has already been announced in these columns. A portrait of Mr. Bronson and a sketch of his railway career were published in the *Railway Age Gazette* of January 14, 1910, page 110. D. W. Dinan, superintendent of the Pennsylvania division, at Corning, succeeds Mr. Bronson, and F. E. McCormack, superintendent of the Rochester division, at Rochester, succeeds Mr. Dinan. A portrait of Mr. McCormack and a sketch of his railway career were published in the *Railway Age Gazette* of June 24, 1910, page 1811. S. J. Kearns, superintendent of the Ontario division at Oswego, succeeds Mr. McCormack, and J. W. Evans, assistant superintendent at Jersey Shore, Pa., succeeds Mr. Kearns.

R. G. Stanfield, whose appointment as superintendent of the Macon & Birmingham, has been announced in these columns, was born October 4, 1864, at Americus, Ga., and was educated in the common schools. He began railway work October 8, 1882, as a telegraph operator on the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, and was appointed train despatcher at Atlanta in November, 1884. The following July, he was appointed agent at Jackson, resigning from that position in August, 1898, to go to the auditor's office of the Georgia, Southern & Florida, at Macon. For a short time in 1899 he was acting traveling auditor, and on January 1, 1900, was made chief clerk to the local agent at Macon. In April of the following year he was appointed local agent at Cordele, which position he held at the time of his recent appointment as superintendent of the Macon & Birmingham, at Macon.

Traffic Officers.

C. W. Browder has been appointed a traveling freight agent of the Illinois Southern, with office at St. Louis, Mo.

J. C. Kimes has been appointed commercial freight agent of the Baltimore & Ohio, with office at Pittsburgh, Pa.

A. W. Northrup has been appointed a soliciting freight agent of the Northern Pacific, with office at Winnipeg, Man.

Charles Hamilton has been appointed a traveling passenger agent of the Wabash Railroad, with office at Pittsburgh, Pa.

W. D. Nelson has been appointed a commercial agent of the Macon, Dublin & Savannah, with office at Jacksonville, Fla.

L. J. Blaker, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Indianapolis, Ind., has resigned to engage in other business.

Frank N. Dowler, city freight agent of the Delaware, Lackawanna & Western, at New York, has been appointed general eastern agent of the Colorado Midland, with office at New York.

Edward J. Sawyer has been appointed division passenger agent of the Northern division and branches of the Chicago Great Western, with office at St. Paul, Minn., succeeding Charles A. Doherty, resigned.

A. L. Armstrong has been appointed a commercial agent of the Minneapolis & St. Louis and the Iowa Central, with office at Cleveland, Ohio, succeeding C. D. Fortney, resigned to accept service with another company.

Frank J. Howell, traveling freight agent of the Norfolk & Western at Toledo, Ohio, has been appointed a freight solicitor of the Union Line of the Pennsylvania Lines west of Pittsburgh, with office at Detroit, Mich.

Lewis Snodgrass, traveling freight agent of the Delaware & Hudson at Pittsburgh, Pa., has been appointed a commercial agent, with office at St. Louis, Mo., where an agency was established on April 1. J. P. Stewart succeeds Mr. Snodgrass at Pittsburgh.

C. A. Talley, soliciting freight agent of the St. Louis & San Francisco, at Oklahoma City, Okla., has been appointed traveling freight agent, with office at Oklahoma City, succeeding M. G. Buffington, promoted. L. E. Moeller succeeds Mr. Talley.

John R. Brophy has been appointed a commercial agent of the Carolina Despatch, operating over the Atlantic Coast Line, the Norfolk & Western and the Winston-Salem Southbound, with office at Cincinnati, Ohio, and W. A. Cooper has been appointed commercial agent, with office at Charleston, S. C.

Perritt A. Marr, traveling passenger agent of the Illinois Central, at Cleveland, Ohio, has been appointed district passenger agent, with office at Pittsburgh, Pa. J. F. Merry has been appointed general agent, with office at Manchester, Iowa. John C. Clair, industrial commissioner of the Illinois Central, Indianapolis Southern and Yazoo & Mississippi Valley, has been appointed industrial and immigration commissioner, with office at Chicago.

J. P. McBride, traveling freight agent of the Louisville & Nashville, at Knoxville, Tenn., has been appointed general agent, at Knoxville, succeeding G. W. Fuget, resigned. B. W. Strain succeeds Mr. McBride. L. A. Dwelle, traveling freight agent at Louisville, Ky., has been transferred to Jacksonville, Fla., succeeding Willis Calloway, resigned, and F. A. McHale succeeds Mr. Dwelle. William G. Marshall has been appointed a traveling claim agent, with office at Montgomery, Ala., succeeding B. W. Strain, promoted.

L. D. Heusner, general western passenger agent of the Lake Shore & Michigan Southern, the Dunkirk, Allegheny Valley & Pittsburgh and the Lake Erie, Alliance & Wheeling at Chicago, has been appointed assistant general passenger agent of the Michigan Central, with office at Detroit, Mich., succeeding J. S. Hall promoted. I. P. Spining, general agent of the Cleveland, Cincinnati, Chicago & St. Louis and the Michigan Central at Chicago, has been appointed also general western passenger agent of the Lake Shore and the other lines mentioned above, succeeding Mr. Heusner.

Engineering and Rolling Stock Officers.

George Worling has been appointed master mechanic of the Gainesville Midland, with office at Gainesville, Ga.

N. Kirby has been appointed master mechanic of the Alabama, Tennessee & Northern, with office at Panola, Ala., succeeding D. D. Briggs.

A. C. Everham has been appointed assistant chief engineer of the Kansas City Terminal Railway, with office at Kansas City, Mo., a new office.

C. E. Knickerbocker, superintendent of maintenance of way of the New York, Ontario & Western, at Middletown, N. Y., has been appointed chief engineer, in charge of the road department, reporting to the general superintendent.

G. T. Hand, terminal engineer of the Delaware, Lackawanna & Western, at Hoboken, N. J., has been appointed division engineer, in addition to his former duties, he will assume the duties of E. I. Cantine, division engineer, at Hoboken, resigned. D. Harley, roadmaster of the Utica division, at Utica, N. Y., has been transferred to the Syracuse division, with office at Syracuse, succeeding R. C. Scofield, who succeeds Mr. Harley on the Utica division.

Purchasing Officers.

J. L. White, purchasing and supply agent of the St. Louis, Brownsville & Mexico at Kingsville, Tex., has had his headquarters removed to Houston, Tex., and his jurisdiction has been extended to include the St. Louis & San Francisco lines in Texas.

OBITUARY.

J. C. Bailey, general superintendent of the Utah lines of the Denver & Rio Grande, with office at Salt Lake City, Utah, died at Salt Lake City on April 4.

John A. Scott, general passenger agent of the Southern lines of the Illinois Central, with office at Memphis, Tenn., died at Memphis on April 1. Photograph of Mr. Scott and a sketch of his railway life were published in the *Railway Age Gazette* of March 17, page 523, shortly after his appointment to the above office.

David Brown, assistant superintendent of motive power and equipment of the Delaware, Lackawanna & Western, at Scranton, Pa., died on April 2. Mr. Brown was born May 17, 1838, in Canada, and began railway work in 1851 as messenger boy on the Monmouthshire Railway & Canal Co., at Newport, Monmouthshire, England. From August, 1870, to January, 1872, he was a machinist on the Delaware, Lackawanna & Western, at Scranton, Pa., and was then appointed gang foreman. In 1886 he was appointed general foreman and four years later was appointed assistant master mechanic. He was promoted to master mechanic in 1891, and was later made assistant superintendent motive power of the same road.

Spencer Meade, superintendent of the Pennsylvania Railroad Voluntary Relief Department, died April 4 at his home in Philadelphia, Pa. Mr. Meade was born in Philadelphia January 19, 1850. He was graduated as civil engineer from the Polytechnic College, state of Pennsylvania in the class of '69, and began railway work in the engineering department of the Allegheny Valley in August of the same year. He held various positions in the engineering department of the Pennsylvania Railroad and at the time of his appointment as superintendent of the relief department in July, 1900, he was superintendent of the Elmira and Canandaigua divisions of the Northern Central.

Railway Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—According to press reports, surveys are being made to build a line around Pueblo, Colo. The new line is to carry freight around the city instead of passing through the business section.

Beaumont & Great Northern.—Announcement is made that the Weldon extension will be opened for freight and passenger traffic from Trinity, Tex., to Weldon, 15.2 miles, on April 10.

Boston & Maine.—The House of Representatives of the New Hampshire legislature has passed the bill permitting the Connecticut River Railroad, which is leased by the Boston & Maine, to extend its line from Hinsdale, N. H., to Walpole, on the New Hampshire side of the Connecticut river.

California Roads.—W. F. Holt, Redlands, Cal., is said to have bought land in the Palo Verde valley, and a company will be organized at once to build an 85-mile railway to connect with the main line of the Southern Pacific in Imperial Valley, Cal. Surveys are now being made.

G. D. Armstead, Escondido, Cal., is said to be back of a project to build a line from San Bernardino, south to San Diego, about 100 miles. Right-of-way has been secured from San Bernardino to Fall Brook.

The Afterthought Copper Company, Ingot, Shasta county, Cal., will soon start work on a line from Ingot, southwest to Bella Vista, 14 miles.

California Roads (Electric).—The Monterey County Gas & Electric Company, Salinas, Cal., has applied for a franchise to build from Monterey, northeast to Castroville, about 20 miles.

Canadian Northern.—A contract is said to have been given to Foley, Welch & Stewart, St. Paul, Minn., for building from Port Arthur, Ont., east.

Connecticut River Railroad.—See Boston & Maine.

Deering Southwestern.—Trains are now in operation between Caruthersville, Mo., and Converse.

Fore River Shore Line.—Organized in Maine to build from a point near Deering Junction, Me., to and along the South Portland water front of Portland harbor. W. F. Spear, president, South Portland; W. W. Thomas, treasurer, Portland.

Gary & Southern Traction.—It is understood that this company can now build its line from Gary, Ind., south about 15 miles to Crown Point, a suit having recently been decided by the courts in its favor regarding the right-of-way. It is expected to have the line ready for operation in July of this year.

Georgia & Florida.—This company has absorbed the Sparks Western, which has been extended from Pineboro, Ga., to Moultrie, 7 miles. A branch line is under construction from Sparks to Adel, and it is expected that this work will be finished about May 1. (March 10, p. 478.)

Georgia, Midland & Gulf.—Plans are being made to build from Athens, Ga., south via Milledgeville to Dublin, about 120 miles, thence south to the gulf of Mexico. J. R. Crandall, Midville, and J. O. Hall, Toomsboro, are interested.

Glendale-Eagle Rock (Electric).—This company, it is said, will extend its line through the La Crescenta (Cal.) and Sunland districts to Monte Vista, seven miles.

Grand Trunk Pacific.—Surveys are being made for a line from Lethbridge, Alb., south to the international boundary at Coutts. It is understood that the line is to be extended eventually to Minneapolis, Minn.

Great Northern.—According to press reports, work is to be started in June on the Midland of Manitoba, from Winnipeg, Man., south to the international boundary; also on terminals to be built at Winnipeg.

Greenville, Spartanburg & Anderson.—See Piedmont & Northern (Electric).

Henderson Interurban.—Surveys are being made by H. U. Wallace & Co., Marquette building, Chicago, for interurban lines

to be built by this company, connecting Henderson, Ky., with Owensboro, Uniontown, Morganfield, Sebree, Dixon and Providence.

Lock Haven & Jersey Shore (Electric).—An officer writes that contracts will be let in about two months to build from Lock Haven, Pa., northeast to Jersey Shore. There will be one steel bridge, 500 ft. long on the line, also a large power plant at North Fork. L. M. Patterson, president and George Roberts, chief engineer, both of Lock Haven. (March 10, p. 479.)

Maine Central.—The Maine railway commissioners have authorized the construction of seven miles of new line from a point two miles east of Cumberland Junction, Me., to a point about eight miles northeast of Cumberland Junction. The new line is to have double-track, and is being built to avoid the Walnut Hill grade. It is expected to have the improvements finished by June. (February 17, p. 334.)

Manistique & Lake Superior.—The McNeill branch has been opened for business from Scott's, Mich., to Doyle.

Mexican Union.—An officer writes that this company's plans call for a line from Torres, Sonora, Mexico, via La Colorado, Represo, Tecolote, Pueblo, Diezo and San Raphael to Ures, a total of about 65 miles. Contracts for the work have been let to Henrique Cubillas, Hermosillo, and track has been laid for over six miles. The work will be easy, the approximate cut and fill per mile will be 5,000 cu. yds. The line is to have maximum grades of 2.5 per cent., and maximum curvature of 6 deg. The company now owns and operates the Torres, Prietas & Represo, and has 12 miles in operation from Torres, east to Minas Prietas.

Midland of Manitoba.—See Great Northern.

Midland Valley.—An officer writes that a contract has been given to M. Tansey, San Saba, Texas, to build the Wichita & Midland Valley from Arkansas City, Kan., northwest to Wichita, 55 miles, and work is now under way. (February 24, p. 368.)

Muscatine North & South.—Train service has been extended from Oakville, Iowa, to Kingston, 10 miles.

New Brunswick Coal & Railway.—This company, which operates a line from Norton, N. B., to Minto, 58 miles through the coal fields of Queen county, is seeking permission to build an extension from Minto to Frederickton, 31 miles.

North Carolina Roads.—Boston, Mass., and other northern capitalists are back of a project to build from Winston-Salem, N. C., southeast to Cameron, about 75 miles.

Ohio Roads (Electric).—Plans are being made to build a line from Warren, Trumbull county, Ohio, north to the Ashtabula county line, about 20 miles. Henry Orth has applied to the county commissioners at Warren for a franchise to build the line.

Oregon Short Line.—On the Montana division the Aberdeen branch has been opened for business from Moreland Junction, Idaho, southwest to Aberdeen, 28.2 miles.

Oregon-Washington Railroad & Navigation Co.—The Yakima division has been opened for traffic from Attalia, Wash., northwest to North Yakima, 98 miles.

Pacific Coast Railway.—Trains are now being operated over the Suey branch between Suey Junction, Cal., and Sisquoc.

Pennsylvania Railroad.—The Hillman branch of the Bellwood division from Hillman, Pa., to Madeira, 6 miles, is now open for passenger service.

People's Electric.—An officer writes that contracts are now being let to build from Muskogee, Okla., via Fort Gibson, Wagoner, Claremore, Tulsa, Bartlesville, Sapulpa and Shawnee, to Oklahoma City. G. W. Risser, president, Oklahoma City.

Piedmont & Northern (Electric).—According to press reports a contract has been given to W. J. Oliver, Knoxville, Tenn., to build the Greenville, Spartanburg & Anderson, which was organized to build a line to connect Greenwood, S. C., and Charlotte, N. C. J. B. Duke, Somerville, N. J., and B. N. Duke, Fifth avenue, New York, are interested. (February 10, p. 301.)

Rock Island, Texas & Gulf.—An officer writes that this company has not yet been chartered. Contracts will be let in about 30 days to build from a connection with the Atchison, Topeka & Santa Fe in Parmer county, Texas, south via Knowles, N. M., thence southeast to Midland, Texas, about 200 miles. The line is eventually to be extended to Kerrville, and will be built to carry lumber, coal, live stock and merchandise. The company would like to hear from contractors in a position to carry out the work, which will be light. M. J. Healy, president, Amarillo.

San Benito & Rio Grande Valley.—An officer writes that this line is to be built to Santa Maria, Texas, which is about 25 miles from San Benito. Track has been laid on 10 miles, and rails have been bought for 13 miles additional. The Hidalgo Construction Company, San Benito, has the general contract. The work is light, involving the handling of about 8,000 cu. yds. a mile. The line is being built to develop the lands of the San Benito Land & Water Company and adjacent properties. Steam will be used as the motive power for handling freight, which will consist of sugar cane, cotton, winter vegetables and fruit, and gasolene motor cars will be used for passenger service. S. A. Robertson, trustee, and C. E. Ensminger, chief engineer, San Benito.

Shelby Northwestern.—Incorporated in Missouri with $225,000 capital, to build from Shelbyville, Mo., to the northern part of Shelby county, 15 miles. The incorporators include: H. M. Houck, J. A. Hope, J. H. Byrd, G. L. Houck, G. Houck and J. A. Flapek.

Sierra Railway Company of California.—The Southern Pacific is said to have secured control of this company, and it is understood will rebuild the road which is now in operation between Oakdale, Cal., and Angels, 60 miles.

Southern Pacific.—See Sierra Railway Company of California.

Southern Railway.—Extensive improvements on the line between Atlanta, Ga., and Macon, involving the laying of about 20 miles of passing tracks and revision of grades are to be made at once by this company. The passing tracks will be of the lap-sidings design, which greatly facilitates the movement of trains. These tracks will be placed at intervals of about five miles, and each will be long enough to accommodate four trains. During the last few months the Southern has completed the work of strengthening the bridges on this line and is now operating its heaviest locomotives over it.

Southwestern Railway.—This company, which now operates a 30-mile line from Henrietta, Texas, to Archer City, will probably start work within the next 90 days on an extension.

Southern Traction.—Organized in Texas with office at Dallas, Texas, to build from Dallas, south to Waco, 100 miles, with a branch from Waxahachie, via Ennis to Corsicana, 30 miles. Contract for making the surveys and other engineering work has been let to the Fred A. Jones Engineering Company, Dallas. J. F. Strickland, president, Dallas, is also president of the Texas Traction Company.

Sparks Western.—See Georgia & Florida.

St. Louis, Iron Mountain & Southern.—The Cairo branch of the Illinois division has been opened for business from Thebes Junction, Ill., south to Cairo, 24 miles.

Texas Central.—According to press reports, this company has amended its charter so that it can build an extension to complete the line from De Leon, Comanche county, Texas, northwest to Nolan. The line is now in operation from De Leon to Cross Plains, 40 miles.

Texas Roads (Electric).—The Commercial Club of Belton, Texas, is back of a project to build an interurban line from Belton to Holland, 16 miles.

Torres, Prietas & Represo.—See Mexican Union.

Vera Cruz, Tabasco & Campeche.—An officer writes that preliminary surveys have just been started on this line. The projected route is from Santa Lucrecia, Mexico, on the Tehuantepec National, east to Campeche, on the United Railways of Yucatan, 490 miles. Donato de Chapeaurouge, president; A. L. Van Antwerp, secretary, and David Coe, chief engineer, Mexico City.

Wichita & Midland Valley.—See Midland Valley.

Railway Financial News.

Arkansas, Oklahoma & Western.—See Kansas City & Memphis.

Bartlett & Florence.—This property is to be sold at public auction at Georgetown, Texas, on May 29 under order of the district court. The road runs from Bartlett, Texas, to Jarral, 12 miles.

Canadian Pacific Railway.—Directors of the company have formulated a plan whereby shareholders in the future may receive greater advantages from the extraneous assets of the company. Among the securities held by the company are bonds and stocks of a face value of $46,000,000, on which the company receives interest or dividends; that land mortgages and cash proceeds of land sales total $50,000,000; that there are other land values conservatively estimated at $6,500,000, consisting of land obtained by the company in connection with the acquisition of branch line railways; and that besides these there are the unsold lands in the agricultural district, approximating 7,300,000 acres.

It is proposed in view of the practice heretofore observed by the company in separating in the annual report the revenue from land sales from the other income, to adopt the same policy with reference to interest on investments, dividends, rentals and other sources of income other than from railway and steamship operations, incorporating the income from these items in one fund from which the directors will make such periodical distribution as may be warranted by circumstances, in addition to the regular dividends that may be declared on the common stock of the company.

It is estimated that interest and dividend return from these sources will be about $4,500,000 during the current year. The above, with a comparatively small contribution from the land funds, represents 3 per cent. on the common stock, and therefore it was decided to make a distribution on that basis.

Chesapeake & Ohio.—Frank Trumbull, chairman of the board of directors, in a circular in regard to the new $125,000,000 bonds to be authorized by the stockholders, says in part:

"In considering their duty to you and to the public, in connection with future requirements, the directors think it best to avoid further divisional mortgages, and to provide a comprehensive mortgage which will furnish a unified and convenient medium for financing; one which will enable the company from time to time to take advantage promptly of favorable money market conditions.

"In order to provide the means to pay for additional yards, terminals, equipment and other additions, improvements, and betterments, and to acquire or construct branch or connecting lines, also to retire certain equipment and other obligations (including $11,000,000 general funding and improvement mortgage bonds, which mature prior to the maturity of the proposed mortgage, and may be redeemed upon due notice at any time in the discretion of the directors), and for other corporate purposes, the directors recommend the creation of a mortgage under which bonds may be issued, limited to $125,000,000, to mature in twenty years, and to bear such rate of interest, not exceeding 5 per cent., as the directors or executive committee may from time to time determine. It is proposed that the mortgage be made a first lien upon certain securities now held in the treasury of your company, including all bonds and stock of the Chesapeake & Ohio Railway Company of Indiana, which owns 261.7 miles of road; a general lien (subject to prior liens and upon a parity, respecting lines of railway owned on April 28, 1910, with the convertible bonds under the company's trust indenture of that date) upon the railways, equipment, and franchises now owned by your company; and become a lien upon any property acquired by the use of bonds issued thereunder."

Chicago, St. Paul, Minneapolis & Omaha.—Rhoades & Co., New York, are offering $1,500,000 Superior Short Line first mortgage 5 per cent. bonds of 1895-1930 at 109⅛, yielding about 4.30 per cent. income.

Cincinnati, Chicago & Louisville.—The receiver of this company, whose property was sold under foreclosure to the Chesapeake & Ohio, has been finally discharged.

Delaware & Eastern.—The trustee of the $1,000,000 mortgage made in 1906 asks that the property of the D. & E. be sold under foreclosure, the revenue for the last 11 months not having been more than sufficient to meet operating expenses. The Delaware & Eastern runs from Arkville, N. Y., to East Branch, 35 miles.

Houston Belt & Terminal.—This company has applied to the Texas Railroad Commission for authority to issue $2,200,000 bonds.

Kansas City & Memphis.—This company is to take over the Arkansas, Oklahoma & Western and the Monte Ne Railway about April 10. The lines completed are run from Rodgers, Ark., to Siloam Springs, 31 miles, and from Freeman, Ark., to Monte Ne, six miles. The roads is standard gage 60-lb. rail.

Kansas City, Mexico & Orient.—This company has applied to the Texas Railroad Commission for authority to issue $469,000 bonds, to be secured on 13 miles of road between San Angelo and Mertzon, against which no bonds have as yet been issued.

Missouri, Kansas & Texas.—The $10,000,000 one-year 5 per cent. notes of August 1, 1910, have been called for redemption at par on May 1, 1911.

Monte Ne Railway.—See Kansas City & Memphis.

National Railways of Mexico.—The earnings and expenses for February of the National Railways of Mexico, which earnings are not shown in our weekly table of roads reporting to the Interstate Commerce Commission, were as follows: Gross in 1911, $5,025,832, comparing with gross in 1910 of $4,952,359; operating expenses in 1911, $3,308,694, and in 1910, $3,021,887; net earnings in 1911 $1,717,138, and in 1910, $1,930,473.

New York, New Haven & Hartford.—A bill has been introduced in the Massachusetts legislature providing for the purchase by the Berkshire Street Railway, a subsidiary of the New Haven, of the Springfield Street Railway property.

Pere Marquette.—The Bankers' Trust Company, the Guaranty Trust Company, and White, Weld & Co., all of New York, have bought from the railway and are offering to the public an issue of $1,088,000 equipment trust 5 per cent. bonds of series B, and also an issue of $1,024,000 equipment trust 5 per cent. bonds of series A. Series A mature $64,000 semi-annually, beginning October 1, 1912, and are secured on 2,000 standard box cars purchased under an agreement dated April 2, 1906, and delivered in the ensuing six months, and in addition by the pledge of $375,000 Pere Marquette refunding 4 per cent. bonds. Series B are secured by 2,000 standard box cars delivered in 1906, and the early part of 1907, and by the pledge of $375,000 refunding 4 per cent. bonds. Series B mature $68,000 semi-annually, beginning October 1, 1912. Both series are offered at prices which yield 5¼ per cent. income for all bonds except those maturing in 1912 which are offered on a 5 per cent. basis.

Spokane, Portland & Seattle.—The *Commercial & Financial Chronicle* says that this company, controlled jointly by the Great Northern and the Northern Pacific, voted on January 28 to increase its capital stock from $25,000,000 to $62,500,000, and has now made a new $125,000,000 mortgage, securing 5 per cent. first mortgage bonds of March 1, 1911-1961. The new bonds are to be issued as follows: For corporate purposes, $80,000,000; reserved to acquire stocks and bonds of other companies and interest in terminal and transfer companies, $25,000,000; reserved for improvements, not to exceed $1,000,000 a year, $20,000,000.

Springfield Street Railway.—See New York, New Haven & Hartford.

Wrightsville & Tennille Railroad.—This company, which is controlled by the Central of Georgia, has sold to Jas. H. Oliphant & Co., New York, $100,000 first mortgage 5 per cent. bonds, due 1958. The bonds were subsequently resold. This is part of an authorized issue of $250,000, of which $200,000 are now outstanding, and the sale was made to provide funds to purchase heavier rail, equipment, etc.

Supply Trade Section.

The Chicago offices of the American Locomotive Company, New York, and of the Atlantic Equipment Company, New York, will on April 8 be moved from the Railway Exchange to the McCormick building.

Plans for the reorganization of the Southern Car Company, High Point, N. C., have been completed. J. B. Duke, president of the American Tobacco Company, Jersey City, N. J., and W. G. Brokaw, of New York, have taken the lead in the reorganization.

At the annual meeting of the Bethlehem Steel Corporation, Newark, N. J., the following directors were added to the board: Harry Bronner, of Hallgarten & Company, New York; B. H. Jones and E. C. Grace. The last two directors are associated with the Bethlehem Steel Corporation in an official capacity.

John Langan, of the Okonite Company, New York, has resigned. His retirement from active business to take a much needed rest is due to a recent illness. Mr. Langan is an associate member of the Railway Signal Association, and the standard specification of that association for 30 per cent. compound rubber covered wire was the outcome of a movement started by him.

The annual report of the Western Electric Company, Chicago, shows that the gross sales for the 13 months ended December 31, 1910, were $68,375,150. The cost of production was $63,442,286. Dividends were $1,700,000, and the amount carried to surplus was $1,684,276. The number of orders received in America during this period was 896,000, as compared with 695,000 for the 12 months ended November 30, 1909, an increase of 19 per cent. The value of an order in 1910 was $72 as compared with $62 in 1909.

The United States Metal Products Company, 203-205 West Fortieth street, New York, whose organization was mentioned in the *Railway Age Gazette* of February 17, has plans under way for an addition to its Rapp plant at College Point, L. I., which will involve the erection of a shop, 250 ft. x 600 ft., a dock, 75 ft. x 600 ft., and an employees' bath house, 50 ft. x 60 ft. The officers of the company are as follows: President, John W. Rapp; vice-presidents, H. C. Randall, C. J. Hale and A. J. Connell; treasurer, E. B. Wires, and secretary, C. A. Leonardi.

The Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., has just received an order from the Georgia Railway & Electric Company, Atlanta, Ga., for six additional double equipments of No. 112B-2 motors with type K-35 control. The Toledo, Bowling Green & Southern Railway of Findlay, Ohio, has recently placed an order with this company for four quadruple equipments of No. 304 interpole railway motors with latest type HL (hand operated) unit switch control. An order for five double equipments of No. 93-A motors with type K-11-A control has also been placed with this company by the Johnstown Passenger Railway Company, Johnstown, Pa. This company has recently received an order from the Fairmount & Clarksburg Railway Company, Fairmount, W. Va., calling for four additional quadruple equipments of No. 306 interpole motors with HL (hand-operated) unit switch control. The City Railway Company, of Dayton, Ohio, has just placed an order with the Westinghouse Company for ten double equipments of No. 306 interpole motors with type K-36 control. An order for four double equipments of No. 307 interploe motors and type K-35 control has recently been received by this company from the Nashville Railway & Light Company, Nashville, Tenn. The Cincinnati Traction Company has recently placed with the Westinghouse company an order which calls for nine quadruple equipments of No. 303-A interpole railway motors and HL (hand operated) unit switch control. This company has just received a contract from the British Columbia Electric R. R., of British Columbia, for two 45-ton locomotives with quadruple equipments of No. 301 interpole railway motors and automatic unit switch control.

Suffern & Son, certified public accountants, 165 Broadway, New York, have established a department of "effective organization" which will be operated under the direction of Clarke J. Morrison. Its object will be to obtain the most effective organization in manufacturing and other business through the elimination of unnecessary work, expenses or investments and through turning unproductive into productive factors. Mr. Morrison received his early education in the public and high schools at Washington, D. C., and his technical education at Johns Hopkins University and Cornell University, from the latter of which he was graduated with the degree of mechanical engineer in 1901. During the four years intervening between high school and college and during the summer vacations, practical experience was obtained with the Richmond Locomotive Works, Shelbyville Electric Light and Power Company, Buffalo Traction Company, and the Delaware, Lackawanna & Western, as machinist, engineer, and assistant engineer of tests. After graduation he was employed by the Northern Pacific as special apprentice, assistant engineer of tests and material inspector. From December 4, 1903 to June 30, 1909, he was variously employed by the Atchison, Topeka & Sante Fe as machinist, belt foreman, assistant to counseling engineer (Harrington Emerson), material supervisor, general erecting foreman, bonus supervisor and standardizing engineer. From June 30, 1909, to January 1, 1910, he was associated with The Emerson Company as mechanical engineer and from January 1, 1910. to March 17, 1911, worked independently as a consulting engineer in New York.

TRADE PUBLICATIONS.

Frogs.—The Continuous Frog and Crossing Company, St. Louis, Mo., has devoted an unusually well-illustrated catalog to the description and many advantages of the Roach continuous frog. Diagrams are included.

Window Fixtures.—The O. M. Edwards Company, Syracuse, N. Y., has published catalog E on its full line of window fixtures, which are especially adapted to railway use. This catalog contains 60 pages and includes detailed descriptions and minute diagrams.

Metal Culverts.—The Canton Culvert Company, Canton, Ohio, has published the 1911 edition of its catalog on Acme corrugated metal culverts, giving full information on this product and including photographs of installations and also of some strength tests to which these culverts have been submitted.

Derailers.—The Hobart-Allfree Company has just issued catalog No. 110, describing the Smyth and Freeland derailers for hand and mechanical throw. In addition to the descriptions of the various models, instructions for installing the derailers and a number of good photographs of these devices in actual installation are included.

Lighting.—The Cooper Hewitt Electric Company, Hoboken, N. J., has devoted a small booklet to the advantages of the Cooper Hewitt lamp when used in industrial establishments. Bulletin No. 36 was published to supersede bulletin No. 23, and describes the Cooper Hewitt electric lamp, type P, for direct-current automatic lighting.

Motor Car.—Burton W. Mudge & Co., Chicago, recently issued a leaflet on the Adams motor car. This car may be used in track and signal work and will carry three men with the necessary supplies. It weighs less than 300 lbs., and is readily handled by one man. The leaflet describes its construction and service, giving its principal dimensions.

The Cause of Hot Boxes.—McCord & Company, Chicago, printed in its advertisement in the *Railway Age Gazette* of February 10, 1911, a diagram showing the cause of hot boxes. This diagram has been reproduced on a card of convenient size for distribution among railway employees, and the company is offering to supply any quantity to any railway upon request of the proper official.

Titanium Steel.—The Titanium Alloy Manufacturing Company, of Pittsburgh, Pa., has published a 44-page booklet on the subject of Titanium in Steel. Its value as a steel alloy is discussed and acknowledged by various authorities in the iron and steel trade. Its chemical action on the slag and steel and its effect on the physical properties of the steel are described in detail. The book also contains reports of numerous physical and chemical comparative tests made with steels of different

manufacture with and without the titanium alloy. The method of manufacturing the steel from open hearth, bessemer or crucible steels is also given in detail, as well as Rossi's method of securing a titanium content.

RAILWAY STRUCTURES.

Atchison, Kan.—The McKinley syndicate which controls a number of interurban electric lines is promoting a new bridge over the Missouri river in which several steam railways have become interested on account of the excessive toll charged on the present bridge. Plans for the new structure have been completed, and its cost is estimated at $400,000.

Cascade, Iowa.—The Chicago, Milwaukee & St. Paul bridge over the Maquoketa river was burned on March 28. The fire started from sparks dropped by a work train engine.

Centralia, Wash.—The Oregon-Washington Railroad & Navigation Company is having plans made for a station, it is said, to be built at Centralia, at a cost of $25,000. The same company has been ordered by the Washington state railway commission to build a station in Pomeroy, on which work must be started within 90 days, and completed within nine months.

Cleveland, Ohio.—The Pennsylvania and the Wheeling & Lake Erie have agreed with the county commissioners to pay $90,000 of the total cost of $110,000, which it is estimated will be required for building a viaduct to carry Dunham road over the railway companies' tracks. The structure will be 48 ft. wide and will have a span of about 800 ft.

Greenwich, N. Y.—An officer of the Delaware & Hudson writes regarding the reports that improvements are to be made in Greenwich at a cost of $30,000, including a new passenger station, freight house and improving the freight facilities in the yards of the Greenwich & Johnsonville, that details and plans of this work have not yet been made. It is probable that the work will be carried out by the company's men.

Marysville, Cal.—The Northern Electric is having plans made for a new passenger station, freight sheds and yards, it is said, to be built at Marysville. (November 11, p. 944.)

Mount Vernon, Wash.—The Great Northern, it is said, will build a station at Mount Vernon.

North Fork, Pa.—See Lock Haven & Jersey Shore (Electric) under Railway Construction.

Portland, Ore.—The Oregon-Washington Railroad & Navigation Company, it is said, is planning to put up a new freight house at Portland.

Quebec, Que.—A press despatch says that the contract for the new Quebec bridge across the St. Lawrence, to replace the partly built bridge which collapsed in August, 1907, has been let to the St. Lawrence Bridge Company by the Minister of Railways and Canals. The contract price is $8,650,000, 15 per cent. of which, or $1,279,500, was deposited with the Canadian government in cash by the bridge company as security. The bridge is to be completed before December 31, 1915. It is to be primarily a railway bridge, but it will have two four foot sidewalks. The St. Lawrence Bridge Company is a combination of the Dominion Bridge Company of Montreal and the Canadian Bridge Company of Walkerville, Ont., both of which guarantee the contract. The St. Lawrence Bridge Company will erect a plant costing $1,000,000 near Montreal to carry on the work.

Salem, Ore.—The Salem, Falls City & Western is planning to build a bridge over the Willamette river at Salem, at a cost of $100,000. (March 3, p. 436.)

Shelburn, Ore.—The Southern Pacific, it is said, will enlarge its station at Shelburn.

Toppenish, Wash.—The Northern Pacific is planning to build a station and increase its yard and trackage facilities at Toppenish. It is understood that the improvements will cost about $80,000.

Vancouver, B. C.—The Canadian Pacific, it is understood, will replace 13 wooden bridges with steel and concrete structures, and will put up 30 new bridges between Vancouver and North Bend.

Winnipeg, Man.—Bids are wanted until April 10, by F. Lee, division engineer of the Canadian Pacific, Winnipeg, for building a boiler shop and transfer table at Winnipeg.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Charlotte Harbor & Northern is in the market for 1 passenger locomotive.

The Intercolonial has ordered 4 switching locomotives and 3 passenger locomotives from the Canadian Locomotive Company.

The Salt Lake & Ogden has ordered one 30-ton electric locomotive from the McGuire-Cummings Manufacturing Company, to handle heavy freight traffic. The equipment will include four 100 h. p., 700-volt, d. c., General Electric inter-pole motors with forced ventilation, double and multiple unit control and Westinghouse combined straight and automatic air brakes. The locomotive is designed to handle 400 tons trailing load at 17½ miles an hour on a 0.7 per cent. grade.

The Dominion Iron & Steel Corporation, Sydney, C. B., has ordered 1 mogul locomotive and 1 consolidation locomotive from the Montreal Locomotive Works. The dimensions of the cylinders of the mogul locomotive will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 129,000 lbs. The dimensions of the cylinders of the consolidation locomotive will be 21 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 178,000 lbs.

CAR BUILDING.

The Buffalo Creek & Gauley is in the market for 20 hopper cars.

The Chicago, Burlington & Quincy is in the market for 1,000 gondola cars.

The New Jersey Zinc Company, New York, is in the market for 8 gondola cars.

The Mather Horse & Stock Car Company, Chicago, is in the market for from 200 to 300 gondola cars.

The Seaboard Air Line is in the market for 1,000 steel underframe box cars and 200 phosphate cars.

The Canadian Northern has ordered 200 steel underframe flat cars from the Canadian Car & Foundry Company.

The Birmingham & Southern has ordered 55 flat cars, 25 gondola cars and 20 box cars from the Pressed Steel Car Company.

The Intercolonial has ordered 70 thirty-ton box cars and 21 Hart-Otis steel dump cars from the Canadian Car & Foundry Company.

The Charlotte Harbor & Northern is in the market for 25 forty-ton steel phosphate cars and 25 thirty- to forty-ton hopper bottom gondola cars.

The Great Northern, mentioned in the *Railway Age Gazette* of February 24 as being in the market for 15 baggage cars, 10 coaches and 10 combination cars, has ordered this equipment from the Barney & Smith Car Company.

IRON AND STEEL.

The Chicago, Rock Island & Pacific is in the market for 1,700 tons of bridge steel.

The Western Maryland has ordered 4,000 tons of rails from the Maryland Steel Company.

The Harriman Lines have ordered 1,200 tons of rails from the Pennsylvania Steel Company.

The Chicago, Milwaukee & St. Paul has ordered 5,000 tons of rails from the Illinois Steel Company.

The George's Creek & Cumberland has ordered 6,500 tons of rails from the Bethlehem Steel Company.

The Pere Marquette has ordered 700 tons of structural steel from the American Bridge Company, and 500 tons divided be-

tween the King Bridge Company, the Lackawanna Bridge Company and the Wisconsin Bridge Company.

General Conditions in Steel.—The average daily orders of the United States Steel Corporation in the month of March were 35,000 tons. This is a much better showing than was anticipated and brings new bookings in March several thousand tons a day above actual shipments. Based on shipments and new orders, a gain of something like 100,000 tons in unfilled tonnage is expected in March. This is in contrast with the estimates made over a week ago that there would be a decrease of from 100,000 to 150,000 tons. The daily average in the first quarter of the year was at the rate of more than 11,000,000 tons a year. When it is considered that the annual production of the Steel Corporation has never exceeded 11,000,000 tons, these figures will be found satisfactory. The falling off in daily orders in March as compared with February is attributed in large measure to hesitancy among buyers because of the impending Supreme Court decisions.

SIGNALING.

The Warthen automatic train stop is being tried on the Buffalo, Rochester & Pittsburg, near Rochester, N. Y. Two locomotives have been equipped for the purpose, and fixtures have been installed on about five miles of the line of the road. The proprietors expect soon to have tests made by the Block Signal & Train Control Board of the Interstate Commerce Commission. The contacting apparatus in this system is arranged above the tops of the cars and engines.

FOREIGN RAILWAY NOTES.

One hundred and fifty-two miles of the government railway lines in Victoria, Australia, have been relaid during the years 1908-1910 with American rails, 142 miles of 80-pound rails and 10 miles of 100-pound rails.

A group of engineers have petitioned the municipal government of Rio de Janeiro, Brazil, for a concession to build and operate an electric subway, connecting the center of the city with the suburbs, similar to those of New York, London and Paris.

An American company will soon undertake the construction of a wharf in the port of Sal, on the Atlantic coast of Honduras; also a railway, which will start from the banana plantations in the northern zone of the republic and terminate at the said wharf.

It is reported that the often-suggested railway between Wuchow, China, and Nanning in Kwang-si is already underway. About $1,000,000 has been subscribed by Chinese born in the United States. The line has already been surveyed and will be about 250 miles long.

Complete electrification of the entire Prussian state system of railways was made certain by the action of the Reichstag at Berlin, when it adopted the railway budget March 28. In the appropriation is an item of $10,000,000 for changing the steam railway line between Magdeburg and Leipzig to electric power. In all 360 miles of railway is affected and this is only the first step in the plans of the Prussian government.

The board of control of the Swiss Federal Railways has approved the construction of a short line of railway between Muenster and Legnan, a station on the line to Biel. The proposed line, the object of which is to pierce the Jura mountains, is to leave Muenster, 1,730 ft. above the sea, and is to run for a great part of its course under the Grenchenberg by means of a tunnel which will be over four miles long, or about half of the total length of the line. The highest point to be attained will be about 1,787 ft. No unusual difficulties are expected, but it is probable that a large amount of water will be encountered. The tunnel will take about four years to complete.

Metallic Doors and Trimmings.

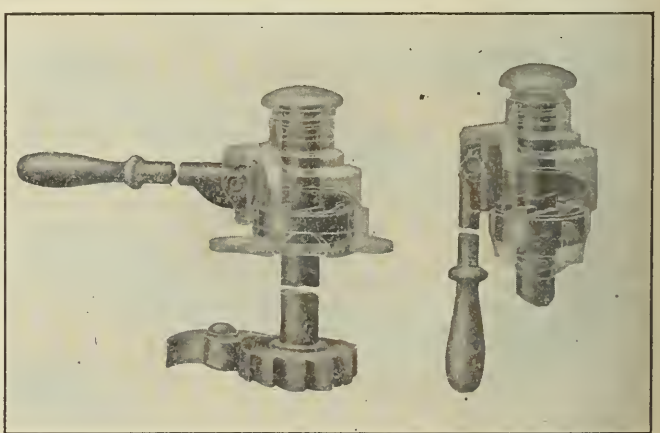
Within the past two weeks the question of fire protection has been brought vividly before the public eye due to the loss of life and loss of millions of dollars by fires in so-called fireproof buildings. There is on record, however, a fire that was held in check by simply closing certain fireproof doors which kept it within the rooms in which it started, thus saving considerable loss of property. This fire took place on September 16 of last year on the twenty-sixth story of the Singer building in New York. The fire-proof doors were made by the Dahlstrom Metallic Door Company of Jamestown, N. Y., and included that company's metallic trimmings, such as sills, etc.

There are so-called fireproof doors which are made of wood covered with tin, but these have proved to be of little protection in a severe fire. Where the sills are made of wood they give no protection whatever, as the sills will quickly burn away and allow the door to fall from its position. In the Dahlstrom metallic door and trim there is absolutely nothing that will burn. They are made of the best sheet steel, of not more than ⅛ in. in thickness and are so well built and neatly finished that it would be hard to tell them from a door made of the wood they imitate. The finish is of special importance and the company will imitate any wood the purchaser may desire. Over one-half the cost of making the door is put into its finish as it takes from 19 to 25 separate operations to give the doors their final finish. That these doors would have proved of great value in the fires on Washington Place, New York, and at the capitol at Albany, N. Y., had they been installed, is without question. The Fire Department's official report on the Washington Place fire stated: "There were two enclosed fireproof stairs with wooden doors and jambs. These doors were consumed by the fire and left the stairs open to the flames."

At present these doors and trimmings are installed in the Singer building; the Grand Central post office, which contains the offices of the New York Central Lines; the United States Express Company building, New York, and many other buildings in which absolute fire protection is of prime importance.

Ratchet Brake Lever.

The H-R ratchet brake lever was designed to provide a device that will double the power exerted at the brake shaft and thus do away with the necessity of using any form of multiplying devices. This arrangement is for use on both freight and passenger cars. It is of special interest to the railway world at this time for two reasons; it provides a much more efficient hand brake, and a very simple means of complying with the rulings of the Interstate Commerce Com-

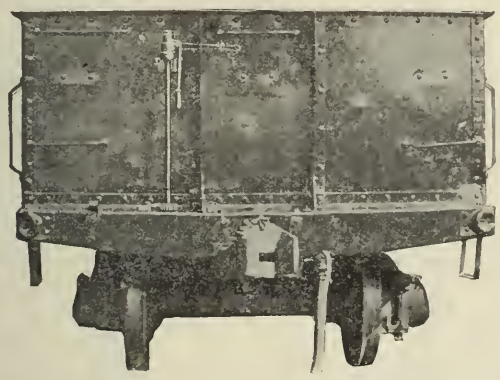


H-R Ratchet Brake Lever.

mission which require that on freight cars the clearance between the edge of the brake wheel and the inside face of the knuckle be not less than 4 in. when the horn of the coupler is in its extreme backward travel. The minimum outside diameter of the brake wheel which can be used is 15 in. There are a great many cars in service today on which this clearance does not exist and on which it can not be made to exist without a considerable expenditure. The use of this device, which has an outside diameter of 5½ in., will not only give an efficient brake but will also permit of the cars coming within the rulings referred to in this respect, as it affords ample clearance.

On gondola cars the foot board is eliminated, since by using a shorter brake shaft the trainman can stand on the end sill to apply the brake. The free revolving cap at the top, which is grasped with the left hand while operating, is a safety device which gives the trainman a handhold in case the chain should break while the hand brake is being applied. A modification of the device for flat cars gives a mechanism that is entirely out of the way and protected whether the car is empty or loaded. It cannot be put out of commission by a shifting load and the brake is also available when cars are loaded with twin loads. The operation of applying or releasing the brake is simple and there are no intricate parts or springs to get out of order. The illustration shows the device attached to a brake shaft in the application position with the teeth in mesh and also in the release position with the teeth out of mesh. The only part attached to the shaft is the lower gear, which is fastened with a pin. The top part of the device is kept from slipping off by a pin through the top of the shaft. The cap is held by a rivet extending through its side and a groove in the top gear casting which allows it to revolve at all times independent of the shaft.

To apply the device it is only necessary to remove the brake wheel, cut off the shaft, drill two holes in the shaft and two in the end of the car, slip the device over the shaft and attach it to the shaft and the end of the car. Any power desired may be obtained by using a length of operating lever to suit. With the usual leverage of 18 in. employed on freight cars a pull on the brake chain of about 2,000 lbs. is obtained, whereas with the 16 in. brake wheel commonly



H-R Ratchet Brake Lever Applied to Gondola Car.

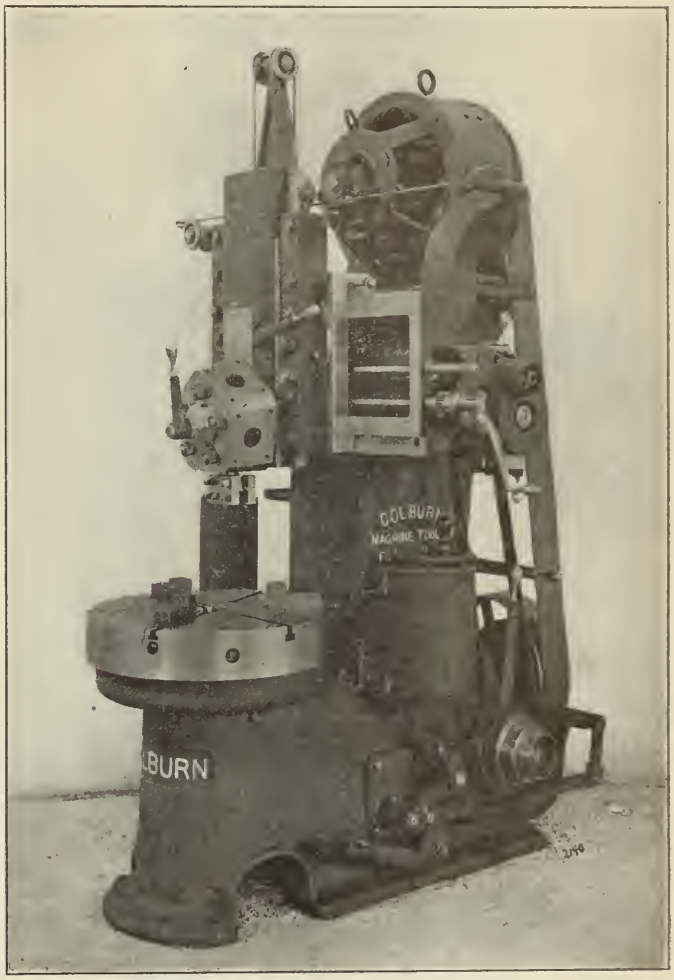
in use a pull of only about 1,000 lbs. can be obtained. By using this ratchet lever the multiplying devices may be dispensed with and we can obtain as much braking power as we obtain theoretically, but not practically, when employing the sheave wheel to double the power. With the sheave wheel eliminated it is only necessary to wind up half the amount of chain and the chance for the chain to foul is reduced to a minimum.

At present the brake shaft must be extended above the top of the car in most cases so that the brake wheel can overlap the car. With this device the top is usually placed below the top of the car, making it impossible for anything to strike the handle or bend the shaft. When the operating handle is lifted the upper gears drop in mesh with the gear attached to the shaft. The brake can then be ratchetted on by moving the operating lever back and forth, the brake pawl at the bottom being operated with the foot as usual. As long as this pawl is in, the brake cannot release regardless of the position of the operating lever. When it is desired to release the brake the operating handle is lifted and a strain is put on the lever so that the brake pawl may be released. The brake chain is allowed to unwind until the lug on the upper ratchet casting engages with that on the bracket casting; the shaft can then unwind no more. The operating lever is then forced down to a vertical position. In doing this the cam on the operating lever strikes the bracket casting, disengages the gears, and allows the shaft to revolve and unwind the chain. This device is in successful operation and is handled by Robert H. Blackall, Farmers Bank building, Pittsburgh, Pa.

Shop Equipment.

Motor Drive for Small Boring Mill.

Manufacturers of machine tools, in many cases, are modifying their designs to include the individual electric motor as an integral part of the machine. Radical changes have been made to secure the best results from the use of the motor. One of the latest designs is illustrated herewith. It is a 30 in. vertical boring mill with a Westinghouse adjustable speed direct current motor. The motor is mounted on a bracket at the top of the machine thus raising it out of the way of the metal chips that fall from the work. It is belted to a friction clutch pulley which replaces the cone pulley used with the belt drive. This clutch is controlled by a lever so that the machine itself may be shut down without



Motor Driven Boring Mill.

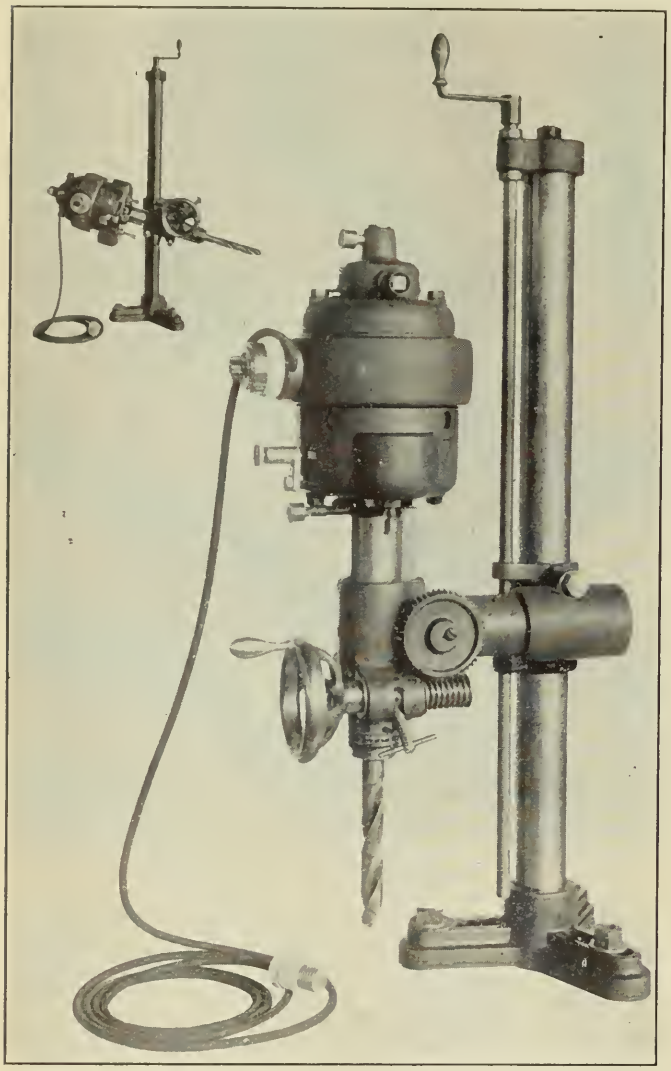
stopping the motor, if but a short stop is to be made. A 4 h. p. adjustable speed Westinghouse type SA direct current motor with a speed range of 400 to 1,600 r. p. m. is used, and its speed is controlled by a Westinghouse drum type machine tool controller with sixteen speed notches. The machine can take work 32 in. in diameter and 16 in. in height, where a chuck is used, and 17 in. with the plain table. There are 16 table speeds ranging from 3 to 106 r. p. m. The turret slide has a vertical travel of 21 in., and may be set at any angle up to 30 degs. on either side of the vertical. A graduated scale attached to the slide is provided to indicate the depth of the holes. The five sided turret has holes 2¼ in. in diameter and also ⅝ in. tapped holes for attaching special tools. In addition to the regular clamping device for the tool holder shanks, special provision is made to keep the tool holders from twisting under heavy cuts. The lock bolt is of hardened steel ground perfectly true, and works

in a hardened and ground steel index ring. Taper gibs of special design allow any wear in the lock nut to be easily and quickly taken up, thus keeping the turret holes in perfect alinement with the main spindle. A friction brake operated by foot power permits the ready stopping of the machine with the table in any desired position. The mill is made by the Colburn Machine Tool Company, Franklin, Pa.

Portable Electric Radial Drill.

A portable electrically driven radial drill has been placed on the market by the Lamb Electric Company of Grand Rapids, Mich. The service of this drill is apparent and its universitality is shown in the accompanying illustration. It will save considerable time on large heavy work that cannot be conveniently handled by large radial drills. It may be clamped to the work as is the ordinary "old-man" and when once clamped is ready for use, the adjustments necessary being the raising or lowering of the drill by the handle at the top, rotating about the steel column or rotating about the drill arm.

The machine will bore holes up to 1 in. in diameter in any postion. Its extreme height is 40 in., the greatest distance

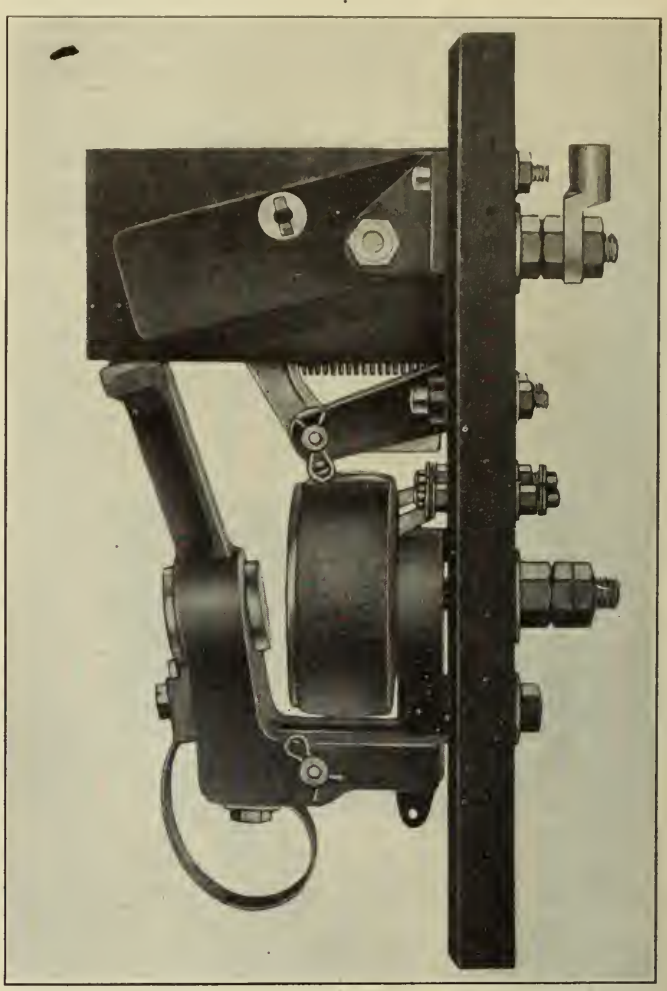


Portable Electric Radial Drill.

from the spindle to the base being 28 in. The largest drilling radius is 8½ in., but any of these limitations may be made greater to suit special conditons. The column is made of steel tubing 2½ in. in diameter. The spindle has a socket for a No. 3 Morse taper and has a travel of 5 in. by means of a rack and pinion which may be operated by the hand wheel or by power through the worm and wheel as shown. The machine may be equipped with a quick return when so ordered. Two speeds will be furnished if desired and the change from one to the other may be made instantly by shifting a knob. The total weight of the machine is between 130 lbs. and 150 lbs. according to the kind of motor used.

Magnetic Switch for Motor Control.

The Electric Controller & Manufacturing Co., of Cleveland, Ohio, has developed a magnetic switch that is new

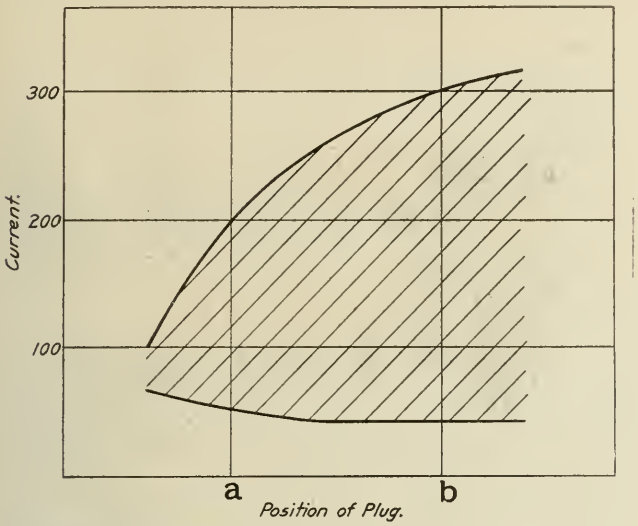


Type S Magnetic Switch.

in principle and operation. It has an operating coil which is connected in series with the motor to be started, the coil being composed of a few turns of heavy wire of fireproof insulation. The switch automatically closes its contacts only when the motor current is below a predetermined value. This controlling feature makes it a combined magnetic switch and current limiting relay; that is, if the motor current exceeds the predetermined value the switch will lock out and will not close until the current has been reduced by the speeding up of the motor. A series of these switches cutting out starting resistance step by step provides a method of motor acceleration which is automatic and protective, and the apparatus is so simple that its expense will not prohibit its application for the starting of any electric motor.

The operating coil is enclosed and protected by a cylindrical iron shell mounted on a slate panel; at the top there are two copper laminated brushes which, when the switch operates, are short circuited, thereby cutting out a section of resistance; at the bottom, a movable plug is provided for adjusting the amount to which current must fall before the switch operates. Screwing in this plug will increase the lockout value and, of course, screwing out the plug will reduce its value. The accompanying chart shows the operating characteristics of the switch. The vertical distances

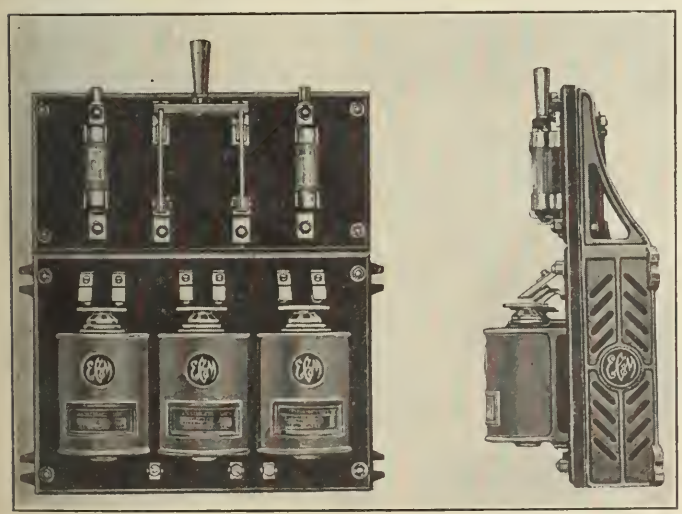
represent the current flowing through the operating coil and the horizontal distances the positions of the adjusting plug. The shaded area indicates the operating limits of the switch. For example if the plug is at position a, the switch will lock out at any current above 200 amperes, but will definitely close as soon as the current falls to 200 amperes. Similarly, with the plug at position b, the switch will lock out at any current value above 300 amperes, but will operate when the current falls to 300 amperes. The bottom of the shaded area



Operating Characteristic of the Automatic Motor Starter.

indicates the minumum current at which the switch is operative although, of course, after it has once closed it will remain closed until the current has dropped to practically zero.

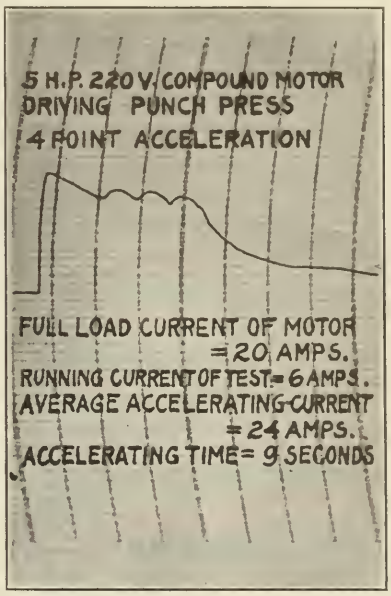
This company has developed a complete line of motor starters embodying the use of this switch. They have been standardized for 110, 220 and 550 volts direct current and over a wide range of horse powers. In order to make them as universally applicable as possible, the starters have been laid out in six different forms, and with various numbers of the accelerating switches. The simplest form consists merely



Series of Magnetic Switches Arranged as a Motor Starter.

of a series of these switches suitably mounted and connected with the starting resistance. These are intended to be used in connection with a knife switch exterior to the starter, but if it is desired, the knife switch may be placed on the starting panel as shown in the illustration. Where the push button or automatic control is desired a shunt-wound magnetically operated switch is used as shown. This starter includes the type S magnetic switch and may also be equipped with an overload cut-out giving complete circuit breaker features; either of these modifications can be furnished with or without knife switches.

The simplest form of these automatic motor starters inherently provides no-voltage protection, for if the voltage fails, all of the switches at once drop out inserting all of the starting resistance in series with the motor and on the return of voltage the motor is automatically accelerated in the normal method. With such a starter it is merely necessary to close the knife switch to start the motor, and to open the knife switch to stop the motor. The acceleration is entirely automatic and will be accomplished in the shortest safe time. A diagram of the starting current, as indicated by a recording ammeter, of a 5 h. p. motor, con-



Ammeter Chart Showing Accelerating Current with an Automatic Motor Starter.

trolled by an automatic motor starter equipped with three accelerating switches, is shown. It will be noticed that the current input during acceleration is uniform and does not at any time exceed a safe value. This type of switch, of course, also finds a large application in controller work and the Electric Controller & Manufacturing Company is prepared to furnish it in connection with either reversing or non-reversing controllers for motors of practically any horse power and of the common voltages.

FOREIGN RAILWAY NOTES.

The five "tube" railway systems of London showed total gross receipts of $4,574,043 for last year, the net receipts being $2,306,448. After meeting prior charges, one line continued its dividend of 3 per cent., another its 1¾ per cent., another again skipped a dividend, a fourth paid three-fourths of 1 per cent. against none for 1909, and a fifth line, which paid nothing for 1909, paid 3⅓ per cent. for 1910. The total dividends aggregated $1,182,236.

The board of control of the Swiss Federal Railways has decided to have a second line constructed through the Simplon tunnel. So far traffic has not been sufficiently heavy to warrant the construction of a second line, but the Lötschberg tunnel, with its two lines, is now approaching completion, and the international trains running through it from eastern France and from Germany will connect with the Simplon, with a consequent increase of traffic. The Swiss Federal Railways voted the money necessary to finish the second Simplon gallery as long ago as 1907, and it was expected that Brandt, Brandau & Co., the contractors for the tunnel, would carry out the work; but this has not been done, and tenders are now to be invited for the completion of the second gallery and the laying of the second line.

ANNUAL REPORT

The Delaware and Hudson Company.

GENERAL OFFICE.

NEW YORK, N. Y., March 31, 1911.

To the Stockholders of
THE DELAWARE AND HUDSON COMPANY:

The President and the Board of Managers submit the following statements of the affairs of the company for the year ended December 31, 1910:

The results from operation of the Coal Department were:

Year.	Coal produced and purchased.	Revenue.	‡Expenses.	Net Revenue.
1910	†6,647,659 tons.	$11,806,887.89	$11,764,965.16	$41,922.73
1909	6,238,653 "	16,340,290.43	16,133,836.38	206,454.05
Decrease	*409,006 tons.	$4,533,402.54	$4,368,871.22	$164,531.32

‡ Including taxes.
* Increase.
† Produced only.

The results from operation of the Railroad Department were:

Year.	Miles operated.	Operating revenue.	*Operating expenses.	Net operating revenue.	Percentage of expenses to revenue.
1910	843.46	$20,431,800.43	$12,198,287.13	$8,233,513.30	59.70
1909	843.46	19,525,859.46	11,458,479.58	8,067,379.88	58.68
Increase..		$905,940.97	$739,807.55	$166,133.42	1.02

* Excluding taxes.

RAILROAD DEPARTMENT.

REVENUE AND EXPENSES.

The general distribution of the Operating Revenue and of the Operating Expenses of the Railroad Department was as follows:

REVENUE:	1910.	1909.	Increase or Decrease.
From Coal Freight Traffic.....	$8,724,580.82	$8,311,478.85	$413,101.97
" Merchandise Freight Traffic (including switching).....	8,052,704.99	7,691,617.44	361,087.55
" Passenger Traffic	2,910,025.98	2,834,628.48	75,397.50
REVENUE:			
From Express Traffic	$209,210.11	$205,909.51	$3,300.60
" Transportation of Mails....	119,378.67	125,947.74	—6,569.07
" Miscellaneous Sources.....	415,899.86	356,277.44	59,622.42
Total Operating Revenue..	$20,431,800.43	$19,525,859.46	$905,940.97
EXPENSES:			
For Maintenance of Way and Structures	$1,557,912.63	$1,334,546.21	$223,366.42
" Maintenance of Equipment..	2,842,069.20	2,598,566.26	243,502.94
" Traffic Expenses	249,932.55	227,346.94	22,585.61
" Conducting Transportation...	7,066,049.09	6,821,392.37	244,656.72
" General Expenses	482,323.66	476,627.80	5,695.86
Total Expenses	$12,198,287.13	$11,458,479.58	$739,807.55
Net Revenue from Operation.....	$8,233,513.30	$8,067,379.88	$166,133.42
Percentage of Expenses to Revenue	59.70	58.68	1.02

— Decrease.

Capital Stock and Funded Debt.

Additional Capital Stock of The Delaware and Hudson Company to the amount of $1,000 was issued during the year, in exchange for $2,000 of The Delaware and Hudson Company's Debenture Bonds of 1916.

The amount of Debentures of 1916 shows a reduction of $2,000, two bonds having been exchanged for Capital Stock of The Delaware and Hudson Company.

The outstanding Debentures of 1914 were reduced $200,000, the bonds maturing January 1, 1910, having been paid off and cancelled.

The amount of First Lien Equipment Bonds of 1922, outstanding December 31, 1910, was $9,707,000, bonds aggregating $293,000 having been retired during the year through the operation of the Sinking Fund established in connection with their issue.

The Board of Managers have authorized, subject to the approval of the Public Service Commission, Second District, State of New York, the issue of $7,000,000 of this Company's First and Refunding Mortgage 4 Per Cent. Gold Bonds. The proceeds of these bonds will be applied in payment of the $4,494,320 Floating Debt outstanding on December 31, 1910; in the acquisition of a branch line from Greenwich, N. Y., to Salem Junction, N. Y., and in payment of expenditures which the Board

GENERAL INCOME ACCOUNT OF THE DELAWARE AND HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1910, IN COMPARISON WITH YEAR ENDED DECEMBER 31, 1909.

	1910.		1909.		Increase.	Decrease.
COAL DEPARTMENT:						
Gross Revenue	$11,806,887.89	.....	$16,340,290.43	.....	.....	$4,533,402.45
Gross Expenses (excluding taxes of $316,739.00)...	11,448,226.16	.....	15,832,415.16	.....	.....	4,384,189.00
Net Revenue	.....	$358,661.73	.....	$507,875.27	.....	149,213.54
RAILROAD DEPARTMENT:						
Operating Revenue	$20,431,800.43	.....	$19,525,859.46	.....	$905,940.97	
Operating Expenses (excluding taxes of $497,408.19)..	12,198,287.13	.....	11,458,479.58	.....	739,807.55	
Net Revenue from Operation.....	.....	$8,233,513.30	.....	$8,067,379.88	166,133.42	
OTHER INCOME:						
Hire of Equipment	$196,168.29	.....	$100,611.50	.....	95,556.79	
Outside Operations	Cr. 1,163.08	.....	Dr. 2,684.51	.....	3,847.59	
Dividends and Interest on Securities Owned.....	1,200,565.09	.....	1,088,013.71	.....	112,551.38	
General Interest and Discount.....	563,929.41	.....	504,519.36	.....	59,410.05	
Miscellaneous Items	110,873.81	.....	126,283.67	.....	.....	15,409.86
Total Other Income	.....	$2,072,699.68	.....	$1,816,743.73	255,955.95	
Gross Income	.....	$10,664,874.71	.....	$10,391,998.88	272,875.83	
DEDUCTIONS FROM INCOME:						
Rentals	$2,045,083.70	.....	$2,076,265.96	.....	.....	31,182.26
Taxes	814,147.19	.....	712,889.84	.....	101,257.35	
Interest on 1st and Refunding Mortgage Bonds (1943).	828,160.00	.....	542,253.89	.....	285,906.11	
Interest on 1st Mortgage Bonds (1917).....	350,000.00	.....	350,000.00			
Interest on Debenture Bonds (1916).....	559,001.11	.....	559,061.67	.....	.....	60.56
Interest on 1st Lien Equipment Bonds (1922).....	443,621.25	.....	450,000.00	.....	.....	6,378.75
Interest on Car Trust Bonds (1909).....	.....	.....	2,625.00	.....	.....	2,625.00
Interest on Equipment Debenture Bonds (1914).....	28,000.00	.....	36,000.00	.....	.....	8,000.00
Interest on Divisional Bonds.....	75,000.00	.....	75,000.00			
General Interest and Discount.....	191,672.42	.....	392,678.44	.....	.....	201,006.02
Miscellaneous Items	.....	.....	384.14	.....	.....	384.14
Total Deductions	.....	$5,334,685.67	.....	$5,197,158.94	137,526.73	
Net Income Carried to General Profit and Loss.....	.....	$5,330,189.04	.....	$5,194,839.94	$135.349.10	
Percentage to Capital Stock.....	.....	12.54% on $42,502,000.00	.....	12.22% on $42,501,000.00		

of Managers have authorized to be made on the Company's mortgaged railroad property, at a total estimated cost of $2,208,640.

Sinking Funds.

During the year there was paid into the Sinking Fund under the First and Refunding Mortgage the sum of $207,040, being 1 per cent. of the par value of First and Refunding Mortgage Gold Bonds outstanding on December 31, 1910, making the total paid in to December 31, 1910, $342,430. In accordance with the terms of the trust agreement, this money has been expended in additions and betterments to the property coming under the mortgage.

A Summary of the operations of the Sinking Fund under the First Lien Equipment Trust Indenture, from the date of its creation to December 31, 1910, follows:

Receipts:		
Annual payment to Trustees, years 1908, 1909, and 1910, $650,000 per year	$1,950,000.00	
Interest on cash balances and investments	26,748.26	
Total		$1,976,748.26
Disbursements:		
Thirty-six (36) locomotives purchased	$860,260.32	
Two hundred ninety-three (293) D. & H. First Lien Equipment Bonds purchased and retired (including accrued interest)	298,921.25	
Securities and Cash in hands of Trustees	817,566.69	
Total		$1,976,748.26

At the Annual Meeting of the Stockholders held on May 10, 1910, the ordinance passed on May 9, 1899, authorizing a Sinking Fund, was amended and enlarged so that all amounts or accumulations standing to the credit of the Sinking Fund shall be applied to the cost to the Company of acquiring additional coal lands, either directly or through its subsidiary companies, or to the acquisition of other property needed in the Company's business, or to other capital purposes.

Pending any application of the Sinking Fund, any accumulations thereof and any additions thereto may be invested in the securities of the Company or of any corporation whose railroad the Company may have leased, or upon whose securities the Company may have become liable to pay interest or dividends.

Accordingly, the unappropriated accumulations in the Sinking Fund, amounting to $1,201,538.87 on December 31, 1909, and which were increased during the year 1910 to $1,631,957.96, were appropriated toward defraying the advances to The Schuylkill Coal and Iron Company and the Shanferoke Coal Company for the acquisition of anthracite coal lands in Pennsylvania.

Dividends.

On December 28, 1910, a dividend for the year 1911, upon the outstanding $42,502,000 of Capital Stock of the Company, at the rate of nine (9) per cent. upon the par value thereof, was declared out of the earnings for the current and preceding years amounting in the aggregate to $3,825,180, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon February 25, 1911, and payable upon March 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon May 27, 1911, and payable upon June 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon August 28, 1911, and payable upon September 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of stockholders of record upon November 27, 1911, and payable upon December 20, 1911.

Taxes Accrued.

Taxes accrued, but not paid, show an increase of $203,969.14, largely due to appeals being taken from the assessments levied by the Tax Assessors, which appeals were still pending on December 31, 1910. The payments of these taxes are held in abeyance pending decisions on the appeals.

GENERAL REMARKS.

Coal Department Operations.

The collieries and washeries of this and subsidiary companies produced 6,647,659 tons of anthracite coal out of a total of 64,905,786 tons produced in the region.

Increase in production of this and subsidiary companies was 448,617 tons and the increase in production of the entire region was 2,935,901 tons.

The Coal Department Expenses include Construction and Betterments amounting to $766,673.73, as follows:

New Engines, New Boilers, Boiler Houses and Fittings	$241,149.37
Sinking Shafts and Shaft Improvements	130,524.87
Rope Haulage, Slopes, Planes and Ropes	112,331.23
Electric Plants and Machinery	44,922.72
New Pumps and New Pump Rooms	40,177.36
Tracks, Locomotives and Compressors	15,774.07
Improvements to Breakers and Washeries	46,347.90
Tunnels and New Openings	51,224.22
Conveyors	21,150.65
Other New Buildings	12,915.09
Miscellaneous	50,156.25
Total	$766,673.73

Taxes of the Coal Department for the year 1910 increased $15,317.78. From June 1, 1909, all coal produced by The Delaware and Hudson Company has been sold to The Hudson Coal Company.

Railroad Department Operations.

The total increase in Revenue from operation was $905,940.97.

The Revenue from Coal Freight traffic increased $413,101.97. The Revenue from Merchandise traffic increased $361,087.55 and from Passenger traffic increased $75,397.50, and that from other miscellaneous traffic increased $56,353.95.

These increases were largely due to the business recovery following the general depression that existed in the anthracite coal business in the latter part of the year 1909 and early part of 1910.

The total increase in Operating Expenses was $739,807.55.

Maintenance of Way and Structures Expenses increased $223,366.42; Maintenance of Equipment Expenses increased $243,502.94; Traffic Expenses increased $22,585.61; Transportation Expenses increased $244,656.72, and General Expenses increased $5,695.86.

At the beginning of the year, the employees of practically every branch of the service, other than those engaged in a clerical capacity, made a general demand on the railways of the United States for an increase in wages, alleging an increased cost of living.

A number of the roads submitted the matter for arbitration under the Erdman Act, approved June 1, 1898, the Hon. Martin A. Knapp, then Chairman of the Interstate Commerce Commission, and the Hon. Charles P. Neill, Commissioner of Labor, acting as arbitrators. In every case an increase in pay was awarded the employees, thus making it necessary for other railways to make similar increases.

The increases granted by this Company averaged about 8 per cent., and became effective about April 1, 1910. The total annual increased wages of employees is estimated at $400,000.

The ratio of Operating Expenses to Operating Revenue for the year 1910 shows an increase of 1-02/100ths per cent. over 1909.

The expenditures during the year on account of Additions and Betterments to the Company's railroad amounted to $697,746.14, details of which are as follows:

Right of Way and Station Grounds	$407,075.03
Real Estate	1,186.27
Grade Reductions and Changes of Line	1,987.46
Bridges, Trestles and Culverts	12,628.73
Increased Weight of Rail	73,470.51
Track Fastenings and Appurtenances	6,317.38
Additional Main Tracks	40,795.67
Sidings and Spur Tracks	43,515.98
Terminal Yards	24,212.82
Improvements of Crossings Under or Over Grade	886.24
Elimination of Grade Crossings	2,532.89
Interlocking Apparatus	4,719.42
Block and Other Signal Apparatus	1,752.36
Telegraph and Telephone Lines	1,335.43
Station Buildings and Fixtures	27,448.97
Roadway Machinery and Tools	510.00
Shops, Engine Houses and Turntables	15,110.21
Shop Machinery and Tools	25,867.27
Water and Fuel Stations (Cr.)	4,912.00
Other Additions and Betterments	11,305.50
Total	$697,746.14

A large portion of the right of way occupied by the Company's railroad in Pennsylvania was originally acquired in connection with purchases of its coal lands, and the cost thereof has heretofore been carried in the balance sheet under Real Estate. To conform with the rules of the Interstate Commerce Commission relative to balance sheet, which were recently promulgated, there has been transferred from the Real Estate account to Road and Equipment account $388,688.50, being the appraised value of that portion of the said lands which are now occupied solely by the Company's railroad.

A contract has been entered into with the American Locomotive Company for the purchase of four (4) Mallet Articulated Compound Locomotives for use on the Pennsylvania Division; also for six (6) ten-wheel locomotives and one (1) Consolidated Locomotive for use on the Chateaugay Branch. The locomotives for the Chateaugay Branch are designed to use either coal or oil as fuel, to comply with the orders of the Public Service Commission, Second District, State of New York, requiring the Company to use oil as fuel on this Branch from April 1st to November 1st in each year.

These locomotives will be paid for from funds accumulated under the First Lien Equipment Trust Indenture.

The Board of Managers have authorized the construction of:

Classified locomotive repair shops, freight car repair shops, coach cleaning and classification yard, and roundhouse terminal at Watervliet, N. Y.

New coal storage facilities, and a plant for transferring coal from open to box cars; and construction of gravity yard at Glenville, N. Y. Forty stall roundhouse, small electric and steam power plant to handle shops and roundhouse, and change in location of ash pit and coaling facilities at Carbondale, Pa.

Purchase of property for available yard use at Carbondale, Pa.

The estimated cost of the above work is $2,208,640, which will be paid for from the proceeds of the additional $7,000,000 First and Refunding Mortgage 4% Gold Bonds which the Board of Managers have authorized to be issued

During the past four years, the freight car equipment of the Company has about doubled in numbers and capacity and 79 locomotives have been purchased or contracted for, of which ten are of the Mallet Articulated Compound type, and the contemplated additions to the shop facilities of the Company are necessary to take care of the increased maintenance work caused thereby.

Additional yard facilities at Carbondale are needed to facilitate the movement, while the proposed improvements for storing and transferring coal will permit of more economical handling of the freight car supply.

Operation of Allied Steam Railways.

The Greenwich and Johnsonville Railway Company shows an increase in Operating Revenues of $2,310.69 for the year 1910, as compared with

previous year. The Operating Expenses show a decrease of $5,826.88, making an increase in Net Operating Revenues of $8,137.57. The Net Income for the year was $15,289.18, an increase of $3,760.10 over 1909, and is 6.79% on the Capital Stock outstanding.

The Quebec, Montreal and Southern Railway Company shows an increase in Operating Revenues for the year 1910 of $42,611.90 as compared with previous year. The Operating Expenses show an increase of $11,683.95, making an increase in Net Operating Revenues of $30,927.95. The Net Income, independent of interest charges due The Delaware and Hudson Company, amounted to $178,556.74, an increase of $72,697.48.

The Quebec, Montreal and Southern Railway Company (whose entire Capital Stock is owned by The Delaware and Hudson Company) has received from the Canadian Federal Government a cash subsidy of $287,734.55, and from the Quebec Provincial Government a land subsidy of 105,876 acres for that portion of its line between Pierreville and Fortierville recently constructed and which was completed in 1909, $28,265.45 additional will be received upon the settlement of some claims which are now pending.

A portion of the subsidies are alloted to each continuous and uninterrupted ten mile section of railway, in proportion to the cost of construction of the whole line to be completed. In accordance with this policy, The Quebec, Montreal and Southern Railway Company has received subsidies for the completion of five ten mile sections, but as there have been built 55.14 miles, the subsidy on the sixth section has been partly earned but is not due until the completion of an additional 4.86 miles of line.

The Napierville Junction Railway Company shows an increase in Operating Revenues of $8,905.21 for the year 1910 as compared with 1909. The Operating Expenses show an increase of $289.19, making an increase in Net Operating Revenues of $8,616.02. The Net Income amounted to $28,648.52, an increase of $10,867.87, and is 4.77% on the Capital Stock outstanding.

Operations of Boat Lines.

The Champlain Transportation Company shows an increase in Revenue from the operation of steamers on Lake Champlain and Lake George of $13,530.69 for the year 1910 as compared with the previous year. The Operating Expenses show a decrease of $1,064.14. The Net Income amounted to $18,377.63, an increase of $14,300.49.

Hotels.

On May 25, 1910, fire, caused by lightning, totally destroyed the Hotel Champlain, located at Bluff Point, N. Y., on Lake Champlain. The loss was covered by insurance. Both this hotel and the Fort William Henry Hotel, located at Lake George, N. Y., which was destroyed by fire in 1909, are being rebuilt and will be opened for the tourist business during the summer season of 1911.

The new buildings will be constructed of fireproof material, will be steam heated throughout, and practically every sleeping room will be accessible to a private bath. The hotels will be modern in all particulars and will be comfortably, though modestly, furnished.

Electric Railway Revenues.

Increases in Net Operating Revenues were as follows: Hudson Valley Railway Company, $31,874.13; Schenectady Railway Company (including electric express), $94,564.93; Plattsburgh Traction Company, $268.70.

The United Traction Company shows a decrease in Net Operating Revenues of $47,661.22, the Troy and New England Railway Company a decrease of $566.29, and the Mechanicville Power Plant a decrease of $20,424.04. The decrease in the net return of the United Traction Company is mainly due to increase in pay of all employees, and to the unusually heavy fall of snow in 1910, which increased the charges for removal of snow and the cost of Maintenance of Equipment.

Dividends of 4 per cent. for the year 1910 were declared on the Capital Stock of the United Traction Company; 6½ per cent. on that of the Schenectady Railway Company; 4 per cent. on the Capital Stock of the Troy & New England Railway Company, and 5 per cent. on that of the Plattsburgh Traction Company.

Litigation.

In the litigation in respect to the contract under which this Company is operating the Ticonderoga Railroad, the judgment by the Referee, adverse to this Company, has been reversed upon appeal and judgment directed in favor of this Company. The opposing parties have taken a further appeal to the Court of Appeals which has not yet been reached for argument.

After a long trial, the suit brought by Messrs. George M. Hull and others (lessors to this Company of certain coal lands in Pennsylvania), on account of alleged deficiencies in payments of rentals made, is now before the Pennsylvania Court for decision.

Two suits have been instituted against the Company, based on alleged irregularities in the issue of bills of lading and the deliveries of the shipments covered thereby, which suits are being contested by the Company under advice of counsel.

The State of New York has begun suits against this Company and other Railroad Companies operating in the Adirondack Mountain Region for damages alleged to have been suffered by the State Forest from fires caused by the escape of sparks from locomotives, which suits are still pending.

On December 28, 1910, Mr. Archibald D. Russell was elected a Member of your Board to fill vacancy caused by the death of Mr. J. Rogers Maxwell.

By order of the Board of Managers,

L. F. LOREE,
President.

BALANCE SHEET.

Assets.

Items.	1910.	1909.	Increase.	Decrease.
Unmined Coal Owned and Controlled	$16,828,496.90	$18,462,664.86	.....	$1,634,167.96
Advances on Unmined Coal	598,125.72	542,425.78	$55,699.94	
Real Estate	4,730,624.12	5,150,124.36	.....	419,500.24
Road and Equipment—The D. & H. Co.	48,838,359.29	47,839,824.94	998,534.35	
Road and Equipment—Canadian Lines	6,287,591.80	6,271,702.56	15,889.24	
Floating Equipment	9,880.00	9,880.00		
Coal Department Equipment, Cars, Motors, Mules, Horses, etc.	1,179,953.82	1,074,724.82	105,229.00	
Coal Handling and Storage Plants	270,309.76	267,476.43	2,833.33	
Stocks and Bonds	23,967,687.46	23,588,805.57	378,881.89	
Cash	1,782,372.47	1,850,765.48	.....	68,393.01
Fire Insurance Fund	316,762.85	286,536.26	30,226.59	
Equipment Trust Fund	817,566.69	673,404.79	144,161.90	
Supplies on Hand	2,395,259.85	2,481,726.84	.....	86,466.99
Bills and Accounts Receivable	5,778,401.10	5,803,757.70	.....	25,356.60
Advances for Construction and Acquisition of New Lines	2,020,799.58	1,306,218.85	714,580.73	
TOTAL	$115,822,191.41	$115,610,039.24	$212,152.17	

Liabilities.

Items.	1910.	1909.	Increase.	Decrease.
Capital Stock	$42,502,000.00	$42,501,000.00	$1,000.00	
Bonds as follows:				
1st and Refunding Mortgage Bonds, 1943, 4% $20,704,000				
1st Mortgage Bonds, 1917, 7% 5,000,000				
The Adirondack Railway Co. 1st Mortgage Bonds, 1942, 4½% 1,000,000				
Schenectady & Duanesburgh Railway 1st Mortgage Bonds, 1924, 6% 500,000				
Debentures, 1916, 4% 13,974,000				
1st Lien Equipment Bonds, 1922, 4½% 9,707,000				
Equipment Debentures, 1914, 4% 700,000				
	51,585,000.00	52,080,000.00	.....	$495,000.00
Loans Payable	4,494,320.00	4,325,000.00	169,320.00	
Interest, Dividends, etc., Accrued	1,066,359.17	1,076,951.67	.....	10,592.50
Interest, Dividends and Bonds due and not yet collected	196,848.10	178,554.60	18,293.50	
Taxes Accrued	310,242.66	106,273.52	203,969.14	
Sinking Fund	.....	1,201,538.87	.....	1,201,538.87
Audited Vouchers and Pay Rolls	3,088,773.52	2,840,346.86	248,426.66	
Other Accounts Payable	181,807.92	220,888.22	.....	39,080.30
TOTAL LIABILITIES	$103,425,351.37	$104,530,553.74	.....	$1,105,202.37
General Profit and Loss, being excess of Assets over Liabilities	12,396,840.04	11,079,485.50	$1,317,354.54	
TOTAL	$115,822,191.41	$115,610,039.24	$212,152.17	

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THE relations of the New York, New Haven & Hartford to the Pennsylvania and the New York Central, have long been a subject of comment and speculation. They are especially worth watching now. It will not escape attention that there have recently been three progressive steps in New York Central—New Haven affiliation. The two companies have joined forces in equal ownership and control of the Rutland Railroad; they have arranged for New Haven train service on subsidiary lines of the Boston & Albany; and now comes the announcement that the New Haven is to withdraw three of its heavy passenger trains each way between New York, Portland and Bar Harbor from the New London—Worcester route and shift them to the Boston & Albany route via Springfield and Worcester—the New Haven thus surrendering its own long haul for the benefit of the Boston & Albany, which is leased by the New York Central and has of late years been burdened by a deficit. As to the Pennsylvania, it may be noted that the long deferred ground breaking has begun for the line connecting with the New Haven via Hell Gate and its prospective big bridge, a plan presumably not heretofore viewed by the New York Central interests with unalloyed satisfaction. We may also note the representation of the two other companies in the New Haven's directorate, and considerable direct and indirect holdings by them of its shares. While general tendencies have of late years been toward an equalization of New York Central-Pennsylvania relations with the New Haven in recent affiliations the New York Central is visibly ahead.

THE legislature of Indiana has decreed that old freight cars shall not be used for passenger station purposes. This is a bit of thoughtful consideration of the wishes of a long suffering public that almost warrants one in forgiving the legislature for some of its other activities during the past winter. However, it takes a whole newspaper broadside to print, in fine type, those new laws which affect railways, so that if we were to try to strike a balance we should be forced to conclude that the abolition of the freight car waiting room had been bought at a costly figure. The numerous new laws affecting carriers were abstracted in our issue of April 7, page 829. Three of them have to do with the elevation of tracks and the abolition of grade crossings in particular cities—Indianapolis, Ft. Wayne and South Bend; two are employers' liability bills affecting other employers, as well as railways, and one or two are aimed particularly at electric lines, but all the rest in the long list are aimed at the steam railways alone. These railways employ thousands of trainmen, enginemen, firemen, conductors and telegraphers; these employees are banded in brotherhoods which have the attentive ear of every legislator, night and day, and the brotherhood leaders think that one of the most useful works to which they can devote their time is to tell the legislature how to run the railways; and so we have laws on any and every subject concerning which a freight brakeman happens to think that there ought to be a change in practice. As shown last week (page 869), almost 500 bills to regulate operating matters have been introduced in the various legislatures this year. The first impression made on the reader by an examination of these Indiana statutes which were abstracted by us last week, page 829, is that some one person drafted at least three-quarters of them, and that he got them adopted without any serious discussion of their merits. In many cases the requirements are in line with good practice, and the requirement itself is not subject to criticism; but the question of the ultimate effect of this kind of legislation is one which should be seriously considered. If the best way to settle the question of the number of water closets needed in a station which accommodates 4,800 inhabitants is to refer it to a hundred legislators who have never studied that branch of railway economics and sociology, it is time to inquire whether the railway profession is fulfilling its proper function—or whether, indeed, it any longer has any proper function.

JUDGE COOLEY, the first chairman of the Interstate Commerce Commission, in his work on Torts, remarked that Anglo-Saxon peoples had always left a large amount of freedom of action to all classes of persons, "justly considering"—as he said—"that *it is safer to allow too much liberty than to impose too much restraint.*" (The italics are ours.) Such legislation as that in Indiana, Missouri and other states shows that we are rapidly drifting away from that Anglo-Saxon notion of good government. How far in the opposite direction are we going? Are we going to keep on until all the details of business activity are regulated as they were in France just

before the revolution? The conditions in that country at that time the German historian, von Holst, has described in the following striking language: "As the government charged itself with attending to everything it was, of course, held responsible for everything. Commanding, instructing, or at least advising, in regard to everything, was it not also its duty to foresee everything up to the fancies of fashion, the whims of trade, the freaks of the weather? The government became the terrestrial Providence. One of the attributes of Providence is omnipresence. If we merely look at the intendants and their subordinates, who did nearly all the real governing, we get but a very inadequate idea of how far government under the ancient régime came up to this requirement. There was such an innumerable host of all sorts of public officials that one is tempted to say that whatever a man did he was almost as sure to have some kind of a public functionary at his side as he was to be followed by his own shadow. If the peasant brought an ox to market the inspector of cattle presented himself; the inspector of calves looked after the calves; the inspector of swine took care of the pigs; and if it happened to be a sow with young he was joined by the inspector of sucking pigs." Robert Mather, on one occasion, after quoting this passage from von Holst in a speech, concluded with the words: "God save us from the inspector of sucking pigs!" Present indications are that this prayer will not be answered.

THAT the attitude of the federal government and of the states toward the railway corporations has had an adverse influence on the value of railway securities it would be idle to deny. But practically one would expect that railway stocks rather than bonds would reflect the attack. One might even go further and reason theoretically that bonds—referring of course, to the bonds of solvent and dividend paying roads—would be positively benefited by the transfer of investment from shares to the senior and underlying securities. Railway bonds, under the continuous "baiting" have not, for obvious reasons connected with their higher security, suffered like railway shares. But they have suffered considerably and to an amount which may be estimated at from a quarter to one-half per cent. in their interest return. That is to say the average railway corporation borrowing must pay that increased rate annually for its money, and that too during a period of very low rates for money on call. Three causes appear most prominent in what may justly be called this unnatural depression of the railway bond of good security. One cause is psychological and lies in the idea that the distrustful investor has probably let his timidity as to railway shares extend to bonds also. The second cause is to some extent a corollary of the first, namely the expansion of the investment field outside of railways, notably to tractions, power, electric light and water companies, corporations much less subject to attack than the large interstate railway systems; and the third cause is the influence of federal and state action on the foreign demand for the American railway security. In the order of importance very likely these three causes might be inverted in their order of statement. Certainly no fact is writ larger before the foreign investor than governmental policy toward investment. He seeks a place for his funds in the countries outside his own where not only are law and order dominant, but the policy of public authority as to the vested private fund conservative, restrained, *definite*. How far does our national policy and procedure during the last few years square with those basic conditions of our foreign railway credit?

THE controversy among signal engineers on the subject of signal aspects, which has been a general annoyance for the last two years, seems now on the road to settlement. The failure to settle it long before now must have been due to the confused or incomplete presentation of the facts and arguments, and this fault is now mainly or wholly cured by the paper of Mr. Clausen, printed in our issue of March 10, and that of Mr. Rudd, printed today. For the issue has been simple, after all. Messrs. Stevens and Clausen have been fighting for the minimum of signaling, while Mr. Rudd and his backers demand all the signaling that can be *profitably used*. Probably the critics of the majority would assert that we are wrong in italicizing that adverb; that the idealists have ignored economy and do not deserve that degree of commendation. But the cold facts of experience may be depended on to settle that point. However this may be, the fact remains that the less information the signals give to the enginemen the more must he use his "judgment," or guess, *unless* he reduces speed. No signal engineer is going to admit the propriety of guessing, and when fixed signals are introduced the exercise of "judgment" is abolished. It is very distasteful to the "old guard" to admit that fixed signals make this radical change; but they do make it, all the same. So the real controversy is on the question, Shall we expand our signal system so as to admit of the highest speeds and eliminate all unnecessary stops? Mr. Rudd aims to do this. Mr. Clausen holds that it is unnecessary. Again, it is to be observed that the question of economy will take care of itself. Mr. Rudd says that his system is already in successful use. If it does not provide what the railways want its use will not extend. On the question whether a poor road may omit parts of the elaborate system, and still be consistent with the big roads, the committee seems also to have made good. Unfortunately men's minds seem to be incapable of settling questions like this—and questions far less obscure—by logic alone, so we must wait for the slow process of trial; but, as we have intimated, the essential issue should now be clear enough to enable any one who wishes to decide it for himself to do so readily.

ONE point in which we think the minority is weak has not been sufficiently emphasized in any of the discussions, and not even by Mr. Rudd. He touches on it where he says "there is no doubt that they all mean stop." Not only this; those stop aspects mean nothing else. The three aspects may fairly be called one single aspect. The stop signal is always the same; a horizontal arm or a red light; "the same kind you have always bought," as the patent medicine man says. The alleged differences may be correctly described as minor modifications; for they are not only minor, but are entirely negligible, *until speed has been reduced*. After the speed of a train has been brought under control all questions of signal aspects become simple, for the runner can then take time to think. It cannot be too often reiterated that the signal problem is the problem of providing for high speeds. The present controversy should be a controversy between superintendents rather than between signal engineers, for the main question ought to be settled by those men (controlled by the superintendent) who use the aspects, not by those who make them. A dozen superintendents ought to take an active hand in the discussion, and present the testimony of a hundred of the best enginemen. The Pennsylvania some time ago published the testimony of its enginemen in favor of the three-position signal; but a single exhibit is not enough. Moreover, the testimony of enginemen ought to be scientifically prepared and collated. It would be the easiest thing in the world to gather a lot of such testimony and on analysis find it worthless. If the superintendents do not come to the front the Railway Signal Association should encourage enginemen to tell their views. A prize of $200 would bring to light one or more enginemen who would illuminate the aspect question in a way different from any yet seen. We have had a great deal of talk about the complication of the engineman's task; perhaps we might hear something about its simplicity. The terrors of the night have been expatiated on at length, and yet night signals in some respects are simpler than day signals. The problem with which the runner of a fast train has to deal at night is called complicated, but it is not; it is simple, namely—

To run at unlimited speed, I must see a green light at the top of the signal post.

To simplify the task of instructing enginemen, this might be amplified into three paragraphs, as follows:

1. To run at unlimited speed, I must see a green light at the top of the post.
2. Anything else must limit my speed.
3. If I am in doubt whether or not it is the top of the post that I see, I must reduce speed until the doubt is removed.

Notwithstanding the interminable discussions of difficulties the fact remains that large numbers of enginemen are running at high speeds every night in the year, and making, so far as the public can see, very fine records. It is not safe to assume that these fine records are in all cases due to favoring circumstances, and it is greatly to be desired that the art or knack by which they are accomplished be made public.

MINNESOTA RATE CASE DECISION.

WE give elsewhere an abstract of the decision rendered by Judge Sanborn of the United States circuit court on April 8 in the Minnesota rate case. There were involved both passenger rates and class and commodity freight rates, which had been fixed some by the state legislature, and some by the commission. Charles E. Otis, the master in chancery who took the evidence, made a report a few months ago in which he held the rates unconstitutional, both because they interfered with interstate commerce and because they were confiscatory. His report was regarded even by railway men as so favorable to the road that it might not be upheld. The circuit court has completely upheld it. The case will go to the Supreme Court. Its decision, if it sustains the circuit court, will mark an epoch in the history of railway regulation.

The vital points involved are whether the rates fixed by the state unconstitutionally interfere with interstate commerce, and whether they are confiscatory. The evidence showed that both the freight and passenger rates prescribed were lower than corresponding interstate rates, and that their direct and necessary effect was to make the railways reduce the latter. Otherwise they would unfairly discriminate against interstate commerce. The state of Minnesota contended that this did not necessarily make its action an unconstitutional interference with interstate commerce. It said it had a right to prescribe reasonable state rates, and that it could not be forbidden to exercise the power because this might force a reduction of interstate rates. The railways replied that the power of the federal government to regulate interstate commerce was supreme; that whatever interstate rate is permitted to be charged it must be presumed to deem reasonable; and that the inferior authority of the state can not be used to nullify the superior authority of the nation. Judge Sanborn upholds the contention that any reduction of state rates which has the direct and necessary effect of reducing interstate rates is unconstitutional. This does not entirely deprive the states of the rate-making power. "To the extent that it does not substantially burden or regulate interstate commerce," says Judge Sanborn, "a state may regulate intrastate commerce and the fares and rates therein within its border, but no further. It may enforce regulations of intrastate commerce and its fares and rates which only incidentally or remotely affect interstate commerce, but state laws, orders and regulations concerning intrastate commerce or the fares or rates thereon which substantially burden or regulate interstate commerce or the fares or rates therein beyond the powers of the state are unconstitutional and void."

The decision passes most directly on the basis on which the "fair return" to which the railway is entitled must be computed and the percentage of this return. The Minnesota Railway Commission finished a valuation of railways in 1908. (See *Railway Age Gazette,* February 5, 1909.) It made practically four appraisals: estimate A, cost of reproduction new; estimate A, present value; estimate B, cost of reproduction new; and estimate B, present value. The main difference between estimates A and B was that in the former the appraisal of land was based on what it would now cost railways to get it for railway purposes, while in estimate B it was based on the so-called market value of the land—that is, its value for other than railway purposes. The commission regarded estimate B as the correct valuation. The *Railway Age Gazette* contended then, and the court now holds, that the valuation must be based on the cost of reproduction for railway purposes. Commissioner Lane of the Interstate Commerce Commission, in the western rate advance case, seems to contend that the valuation of a railway should not include its so-called unearned increment. Judge Sanborn holds the cost of reproduction new as the proper basis of valuation. This means that the unearned increment must be included. That the Supreme Court will sustain him is indicated by the following language used by it in the case of Wilcox vs. Consolidated Gas Company (212 U. S. 19, 41, 52): "And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding rates. If the property which legally enters into the consideration of the question of rates has increased in value since it was acquired the company is entitled to the benefit of such increase."

The percentage of return to which Judge Sanborn held the railways of Minnesota are entitled on their valuation is 7 per cent. The Supreme Court in the Consolidated Gas Company case said the risk in the investment in a gas company is reduced almost to a minimum, and that the court regarded this as the most favorable gas situation in America. Six per cent. was the return ordinarily sought and obtained on investments of that degree of safety in the city of New York. "Taking all the facts into consideration, we concur with the court below on this question and think complainant is entitled to 6 per cent. on the fair value of its property devoted to the public use." Now, the risk of investment in railways is greater than in gas companies. The average rate of return on investments in Minnesota, where the railways in question operate, is higher than it is in New York. Therefore, 7 per cent. on the cost of reproducing the railways of Minnesota would be no more, and probably would be less, than 6 per cent. on the cost of reproducing the plant of the Consolidated Gas Company.

The purpose of the people and legislature of Minnesota was to reduce the profits of the railways. They were egged on to the assault by a lot of politicians seeking thereby to further their own ambitions. The result, if the decision of the circuit court is upheld, will be not to reduce the earnings or the rates of the railways, but to give them the authority of the courts to increase both. Neither their rates nor their earnings were as high when the state sought to reduce them as the decision in this case will permit them to be made. This is not the first time that attempts to confiscate private property in the United States have proved boomerangs, nor will it be the last.

The decision has a lesson not only for the state legislatures and commissions, but for Congress and the Interstate Commerce Commission. If the principles laid down by Judge Sanborn in this case are correct, then the principles on which the Interstate Commerce Commission decided the rate advance cases are wrong and the railways, beyond any question, had and have, a right to make the advances which the commission forbade.

The full import of the ruling that a railway is entitled to 7 per cent. of its valuation can be realized only when it is considered that, on the average, over half of the capitalization of the railways of the United States is represented by bonds, and less than half by stock. Their total capitalization is almost $60,000 a mile, which probably is somewhat less than their cost of reproduction new. Suppose a railway whose valuation and capitalization are $60,000 a mile, $30,000 of the latter being stock and $30,000 bonds. Seven per cent. net earnings on the total valuation would be $4,200 a mile. Suppose the interest on its bonds is 4 per cent., or $1,200 a mile. This would leave this railway, having a capitalization almost typical of that of the

railways of the United States as a whole, $3,000 a mile, or 10 per cent., for its stock. If it should pay dividends of only 7 per cent. it would have 3 per cent. left to apply to permanent improvements. This would not make practicable the carrying out of the policy advocated by various railway executives, of putting one dollar into permanent improvements for every dollar paid in dividends, but it would permit much closer approximation to it than the Interstate Commerce Commission in the rate advance decisions indicated it was disposed to allow.

EFFICIENCY COMMITTEES ON THE CHICAGO & NORTH WESTERN.

THE operating and maintenance department of the Chicago & North Western is adopting a very interesting plan for increasing efficiency.

This paper has described in its issues of September 2, 1910 (page 391), and February 24, 1911 (page 349), the organization formed and the methods being used by the North Western to reduce accidents. A safety committee composed of officers and employees has been organized on each division, and there is a central safety committee for the entire system, composed of general officers, to which the division committees report. During the first six months of the campaign for safety waged by these committees the number of personal injuries was reduced 20 or 30 per cent. This is not credited entirely to their work, for traffic was not so heavy as during the same period of last year. But that the improvement was mainly due to the work of the safety committees is beyond question. The success of these efforts for increasing safety has suggested and brought about the formation of a similar organization and the adoption of similar methods for increasing efficiency. There is an efficiency committee composed of officers and employees on every division, 15 such committees having been formed already. The employee members are chosen from all branches of the operating, mechanical and maintenance of way departments, and it will be the object of the division committees to study and adopt means leading to greater efficiency in operation and maintenance, and particularly adapted to the needs of each division. There is also a central efficiency committee to which reports and recommendations will be made by the division committees, and which will work out and adopt policies for the entire system. The North Western has two grand divisions—that west of the Missouri river, and that east of it. The central efficiency committee will consist of the general manager or the assistant general manager and the general superintendent of each grand division, and of the following: Superintendent of motive power, superintendent of the car department, superintendent of transportation, engineer maintenance of way and superintendent of telegraph.

It is not the purpose to seek to apply the principles of so-called "scientific management." The object is to bring about *co-operation* between the employees and the officers that will increase the efficiency of (1) men, (2) materials, and (3) machinery. It is felt that as railway systems grow larger the avenues of communication between the rank and file and the general—and even the division—officers are being closed. The effect is to cause employees to lose sight of the very direct interest they have in the successful operation of the railway from which they receive their compensation, and to keep them from giving to their superiors the benefit of suggestions for improvements growing out of their own experience and observation. Probably no one fully appreciates the amount that railway managements might gain annually by drawing on the great reservoir of knowledge and ideas possessed by their thousands of employees.

The many shop kinks which have been published month after month in the shop section of the *Railway Age Gazette* show how innumerable are the labor-saving methods and devices which have been contrived by shop officers and employees. Many similar methods and devices have been contrived by subordinate officers in the track department. Who can estimate how many similar improvements could be suggested by the million and a half employees of American railways if opportunity and incentive to do so were afforded? The plan adopted by the North Western will give all employees opportunity to communicate suggestions for improvements to fellow employees belonging to the division committees, and will provide a channel for transmitting them to the division officers and the general officers. The results may be very interesting. However, even if the plan merely increases the zeal of the employees in their work and stimulates them to exercise more care and exertion it will in the long run be of much value to both employees and employers.

One would think from some things recently said about railway efficiency that it is entirely a matter of economy. This is far from true. The public demands, and has a right to require, good service. Efficiency, therefore, is operating only as economically as may be consistent with the rendering of good service. The management of the North Western clearly recognizes this, and has specially instructed officers and men that one of the main purposes of the campaign for efficiency is to improve the service to the public in every practicable way, as well as to increase the economy with which it is rendered. More civility in the treatment of patrons; more pains to keep stations clean and sanitary; greater attention to preventing the unnecessary smoking of engines; greater efforts to reduce loss and damage to freight; more strenuous endeavor to make passenger trains and fast freight trains conform to their schedules; these and other means to the improvement of the service are to be particularly insisted on.

The managements of the railways believed when they gave general advances in wages last year that they would be permitted to offset them with increases in rates. They were not allowed to do so. The increases in wages and the denial of increases in rates have been followed by a decline not merely in net, but, in many cases, in gross earnings. It seems clear that if the roads in general are to be able to make needed extensions and improvements and to continue to pay the present high wages they must increase the efficiency of their operations. Greater economy could be secured by reducing the quantity and quality of the service, but this might incense public sentiment and cause a renewal of recent attacks on the roads which would hurt both them and their employees more than the economies introduced would benefit them. The needed economies ought to be, and most of them must be, obtained by greater efficiency in the use of materials and in the working of the plants.

The efficiency engineers favor seeking to attain these ends by "scientific management," including the time study, the bonus system, etc. The leaders of the railway brotherhoods have expressed themselves as opposed to such methods. Many have contended that greater efficiency must be secured by the enforcement of sterner discipline. The power of the unions is so great, however, that attempts to enforce more rigorous discipline, like attempts to introduce so-called "efficiency methods," are apt to lead to serious struggles, and neither method best brings about that most desirable and necessary spirit of cordial co-operation so helpful in getting successful results.

There seems but one alternative to these methods. That is to bring about by some such means as the North Western has adopted, better co-operation between managements and men. The piece work and bonus systems speed up the employee by giving him the direct incentive of the prospect of larger individual earnings. They involve comparatively small increases in the pay of the less capable workman, and comparatively large increases in the pay of the more capable. The system of co-operation does not offer to the individual the stimulating prospect of an immediate increase in wages for every increase in *his* efficiency. But as the only source from which the wages of labor and return to capital can be derived is railway earnings; as the more efficiently the railway is operated the more there will be for capital and labor to divide; and as past experience has

shown that labor is quite capable of getting its share of increased earnings, it would seem it should be obvious to employees that every increase in efficiency which is secured by co-operative methods is bound to inure in greater or less degree to the advantage of employees in general. And, from the brotherhoods' standpoint, the co-operative method, which tends rather to maintain the high standard wage than to increase the incomes of individuals according to their special efforts and capabilities, should be the most attractive way to effect the desired increase of efficiency.

NEW BOOKS.

American Civil Engineers' Pocket Book. Mansfield Merriman, editor-in-chief. New York: John Wiley & Sons. Morocco, 1,388 pages, 944 figures and 495 tables, 4¼ in. x 7 in. Price, $5.

In getting out this pocket book the authors have kept in mind the object of selecting the topics to which engineers desire to refer, and then of so condensing the matter that the greatest amount might be put in the assigned space. The great advantage of such a book is that information on a wide variety of subjects may be secured from it more readily than from the standard text books or from treatises on the various topics. The subject matter has been divided into 13 sections, each in charge of a separate author who is an authority in his line, in this way securing a book much stronger and more complete than would be possible otherwise. All material was newly written and embodies the latest approved practice in the various lines, the more recent developments being treated especially full. The chapters on "Railroad Location," by Professor Charles B. Breed, and "Roads and Railroads," by Walter Loring Webb, give much data of especial interest and value to railway engineers, the latter chapter dealing especially with maintenance and operation.

The subjects of economics of location, truck standards and locomotive and equipment maintenance and operation, are all treated, while especially valuable data is given in the form of statistics of costs of operation, traffic density, earnings and valuation of American railways. The special features relating to electric railways are also carefully taken up. A valuable feature of the book is the cost data which is scattered through it.

Block Signal and Train Control Board, Interstate Commerce Commission; Third Annual Report. W. P. Borland, Secretary. Washington, 1911.

The Block Signal Board, M. E. Cooley, Azel Ames, B. B. Adams and F. G. Ewald, sent its third annual report to the commission November 22 last, and the principal parts of the report proper were reprinted in the *Railway Age Gazette* of January 20 and 27. The full report, a pamphlet of 250 pages, has just been issued. Besides the report itself, this thick pamphlet is made up of the following five appendices: A History of the Air Brake, by W. V. Turner and S. W. Dudley, 100 pages; The Car Wheel, by George L. Fowler, 38 pages; The Track Circuit, by J. P. Coleman, 17 pages; The Harrington Automatic Train Stop (report of tests by the board), 25 pages; and Reports of Inspection of Train Despatching, Signaling and Other Practices on Various Railways. There is also an account, similar to that which has been published in the *Railway Age Gazette,* of the automatic stop in use on the electric railway of the Washington Water Power Company.

The paper on the air brake is a very thorough and lucid sketch of the history of power brakes from the earliest days down to the latest developments in brake apparatus for high speeds and for variable loads.

The paper on the car wheel gives the history of the manufacture of cast iron wheels in this country and describes in much detail the practice in the wheel foundries of the Pennsylvania, the Chicago, Milwaukee & St. Paul, the Norfolk & Western and the Canadian Pacific.

Mr. Coleman's essay on the track circuit goes very thoroughly into the theory and practice of this vital feature of automatic block signaling.

Letters to the Editor.

SIGNAL ASPECTS—A REPLY TO MR. CLAUSEN.*

Philadelphia, April 8, 1911.

To the Editor of the Railway Age Gazette:

The minority has at last definitely set forth its proposition. "The indications, *Stop, Caution* and *Proceed,* given by the three positions of a one-arm signal, are entirely practical, sufficient and adequate to safely control the movement of trains at interlockings as they will elsewhere." Are they? Only two questions are involved. We all want simplicity; we all concede the simplicity of a one-arm signal, but (1), can we safely use it in connection with signals already installed? and (2), can we handle or facilitate traffic with it?

Records show that some railways in this country have operated for years safely and fairly expeditiously, under normal conditions, without any signals. It would be puerile to claim that they could not operate in the same way if, at established and well known locations, signals were substituted for flagmen; and that is exactly what Mr. Clausen proposes, without, however, supplying any substitute for the verbal information so frequently vouchsafed to the engineman by an intelligent flagman, leaving him with even less knowledge of conditions than was supplied by the traditional section man. "Why did you stop us?" "I don't know why, the boss told me to." "Where is he?" "Down below about half a mile, where the bridge is washed out." While this procedure might be permissible on a road having no other signals in service, it is questionable whether it would be advisable on one already well signaled with separate arms for diverging routes at interlockings. A practical demonstration would be the most satisfactory means of settling the question.

The second phase, however, is the important one, viz., could we handle or facilitate our present traffic by its use? To operate safely with such a system, giving only one caution indication, only one degree of caution would be permissible, and that is the degree requisite for safe operation under the most unfavorable conditions for which caution would be displayed. Any exercise of "common sense" or good judgment (?) on the part of the runner might lead to disastrous results.

In view of the change in operating methods in the twelve years since Mr. Rhea first promulgated the proposal the minority is now advocating, while granting for the sake of argument that the proposal was sound and adequate for our needs twelve years ago, some of us feel that it is not sufficient for present day requirements. To cite examples: First: Given a dense, slow, heavy freight traffic interspersed with a number of high class high speed passenger trains scheduled for a stretch of perhaps 15 miles at 75 to 80 miles per hour. A safe braking distance, allowing for all foreseen contingencies is, say, 1½ miles, but blocks of this length are too long for the operation of the freights, as it would certainly tie up traffic to require the slow freight to reduce speed to the rate required if it were to take a No. 10 crossover and move into an occupied yard at the signal 1½ miles from the point of obstruction; but if the first signal indicated "Pass next signal at medium speed," and the second signal indicated "Prepare to stop at next

*Mr. Rudd's opening paragraphs, which we must omit for lack of space, reply to certain points in Mr. Clausen's historical review. As to the charge that the recommendations of the signal practice committees were changed from year to year, he shows that the changes were in non-essentials; and he observes that the minority also modified its proposals a number of times. A clean cut proposition to employ a one-arm three-position signal for everything was not presented by the minority until Mr. Clausen read his paper at Montreal six weeks ago. And this proposition is not new; Mr. Rudd quotes from a paper by Frank Rhea, read at Boston in November, 1899, who proposed a one-arm one-light three-position signal for interlocking as well as for automatic block signaling. The discussion on Mr. Rhea's paper is found in the Railway Signal Association Digest, vol. 2, pages 33-43 inclusive. But during these 12 years since 1899 operating conditions have greatly changed and Mr. Rhea has progressed. The minority are resting their arguments on a theory that is out of date. Cross-overs are now made long enough to be traversed at 40 miles an hour; automatic signals are much more common and must be distinguished from interlocking signals; and permissive block working is recognized, so that more than one caution indication is necessary.

signal," the requisite information would be given and the blockade avoided. Second: Given a road in which permissive block is used for freights and absolute for passenger trains, either class of trains may accept, as per rule, the caution (distant) indication, but the passenger train cannot pass the caution (permissive) signal and enter an occupied block. Should the engineman be required to remember all the points at which the caution signal is located which he cannot accept, or is it preferable to designate it so that he can tell what it is by looking at it? Which practice lends itself better to the enforcement of discipline and which to the promotion of misunderstanding?

Further, with the minority scheme, if the interlocking plant is in permissive manual block territory, advance signals are compulsory, as otherwise the caution position may indicate either block occupied, on one or two tracks; a movement against traffic; into a yard; or to a branch, and while a passenger train would be permitted to accept it for the latter purposes, it could not accept it for the former. How would the engineer differentiate without stopping and examining the position of switches, etc.? Is this a good way to facilitate traffic?

Third: Given a four track railway handling all classes of traffic and the problem of weaving fast expresses in and out to pass local passenger and freight trains on the outside tracks and tonnage trains on the inside tracks, these expresses scheduled 77 miles in 89 minutes, with two or three slow-downs for water and one and sometimes two station stops. Place interlockings about five miles apart with No. 20 crossovers maintained for a speed of at least 50 miles an hour without danger or discomfort to passengers. Is it good signaling or good railroading to give no advance information to the engineer of the conditions at the interlocking, but to require him, when he comes in sight of a signal located perhaps a mile from the home signal, to immediately reduce speed, watch his track for obstruction ahead, misplaced switch, train in block or bad track, moving at this rate to the interlocking signal, passing it prepared to stop if he is diverted over against traffic or into a yard, and to crawl along at this rate for 2,000 ft. more until he reaches the advance signal, if there is one, and in its absence, so run clear through the next block? Or is it better to tell him definitely the condition of the interlocking signals and switches and let him run, especially when he may be crossed in and out three or four times on the 77 mile run?

If the minority standpoint is correct, why make a distinction between the main or high speed and the low speed, when you make no distinction between the medium speed route (good for 45 m. p. h.) and the low speed?

Is the providing of these long crossovers a waste of money? If it is bad practice to so signal that they may be taken at speed, why put them in? They certainly cost more than the shorter ones, No. 8 or No. 10. Or is it intended that the engineman shall "use his judgment," and having received the low speed signal, run then at medium speed, having decided that, because that is usually the route set up, it always will be right, and having good luck until some day he is sent into a yard by mistake?

This method of signaling, necessitating the use of "judgment," has been used in the past, with the result outlined above; and its popularity is on the wane.

Many conditions of similar nature might be cited did space permit.

If I made any unfair statements in my address, they were due to ignorance of the exact position of the minority. I judge none was serious, however, as none is pointed out. Mr. Clausen, with the advantage of a full exposition of both sides, has been eminently fair to us, and I can take exception to only one of his statements. He says that, because of the several proceed indications (proposed by the majority) it is necessary to use three stop aspects, etc., "These aspects are called:

1. Stop until authorized to proceed.
2. Stop and proceed.
3. Stop and investigate."

From our view-point the reverse is the case: these three stop indications are necessary in themselves and providing aspects for them increases the number of proceed and caution aspects.

The Standard Code, Rule No. 504, provides that, when a train on double track is stopped by an automatic block signal, it may "proceed at once with caution." It is not considered good practice to permit it to pass an interlocking signal in this manner. As some interlockings now cover as much as a mile between home signal limits or three miles between distant signals, it is considered a safer practice to indicate the difference between these two classes of signals at the signals themselves, rather than to mark them by a signal cabin half a mile away.

Further, in manual block territory, it has until now been considered desirable to differentiate between a block signal which a train may not pass without a card, and a switch set for siding, for instance, which it may pass without written authority. This distinction is especially desirable where high switch lights are located close to block signal lights. The manual block and interlocking signals come under the first class noted; automatic block signals under the second, and switch-stands, railway grade crossing signs, stop boards, etc., under the third. The tremendous mental effort necessary to remember these distinctions is about as burdensome as that required by a fair reader to recognize A, B and C. Further, there is no doubt that they all mean stop.

TEN FUNDAMENTALS.

There are ten principles or fundamentals which succinctly set forth the position of the minority, and a claim is made that the system proposed conform to these principles, and is in perfect harmony with the Standard Code. Let us examine them in the light of actual experience and in connection with the code:

1. "It is impracticable to provide a separate signal for each of the conditions on a road requiring cautious running and to maintain the fine haired distinctions necessary to their interpretation." The majority concedes this, or at least feels that it is inadvisable to attempt it. We claim, however, that the various causes may be so grouped, that we may, by a few simple aspects, give definite information as to the position of the next signal, condition of the track ahead, etc., so that the engineman, required to exercise good judgment and common sense, may have something tangible on which to base the decision governing his action. This being far preferable, in our judgment, to telling him in the majority of cases to reduce to low speed, when he knows perfectly well that actual conditions do not require or warrant such reduction. Human nature is a good deal the same all the world over and a rule is more easily enforced when the occasion for its observance is obvious.

2. "It is unnecessary, *and in fact dangerous* to tell the engineman by fixed signal how he shall control his train at some point in advance." This statement is correct, barring the italics, provided each signal is so located that it may be seen far enough for the fastest train to stop in the space between it and the first point of view, and requires action not at the signal, but *approaching it.* Such locations are impossible if heavy curvature and natural or artificial obstructions perforce reduce this view distance to a few hundred feet. To carry out the minority theory, either trains must, under such conditions, reduce speed approaching such signals, or the signals themselves must be located at some distance from the danger point. This would mean overlaps on automatic signals, and interlocking signals two or three thousand feet from the crossovers and switches they protect, and no discipline could fairly be imposed if they were overrun.

The majority theory is that, unless operating conditions are such that low speeds only are required, approach information should be furnished, so that speed may be maintained.

The minority would require low speed approaching each caution signal. The majority would require low speed only when it is necessary, and holds broadly that the distant signal as used in common practice today is the key to the situation, and is in

effect the *Stop* signal; the home signal is a marker to show the danger point. Or, stated in another way, we provide a distant signal at proper distance from the danger point. In the caution position it says; "you must stop (not here, for you are running so fast that it is impossible, but) at a certain point beyond, marked by another signal. Of course, if you find that signal at caution or proceed you may pass it, but, in any event, you must so control your train that you can stop if necessary. If that point is a mile away and you have a train with high braking efficiency, and you are running at medium speed, it is not necessary for you to slow down to 6 or 8 miles an hour here, but you must stop at the danger point. If you are running at high speed, you must slow down at once and you must know your road sufficiently to be familiar with the approximate distance you have to run." Which is the safer? Which lends itself better to the enforcement of rules? Which facilitates traffic and cuts out unnecessary stops? Which reduces the use of the emergency application, and finally which credits the engineman with more intelligence?

3. "Advance information so given is misleading and unreliable, as it is subject to change without notice and, therefore, the engineman cannot safely use it. If he does so use it, it is done at the expense of safety." Is it safer to give the stop indication without any preliminary warning, so that the runner is unable to stop before passing it, or is it safer to give preliminary warning a sufficient distance away, so that he may know what to expect at each signal?

Granting that, in the absence of approach locking, routes are sometimes changed after a train has passed the distant signal and that false clear failures sometimes occur, is one practice safer than the other under such conditions? Would men, operating under the minority scheme, reduce speed immediately on seeing a clear interlocked signal, so that, if it were changed to stop, they could stop before passing it, or on receiving the proceed signal at an automatic (not indicating block clear, but that there was no caution signal displayed) immediately reduce speed so as not to overrun the next signal? Would they reduce speed at each clear signal for fear the next might be at stop?

It seems to me that the rules governing the proceed indication, as outlined by Mr. Clausen, would bear a close resemblance to the instructions reported to have been issued by a superintendent on a road having a ferry connection, in the good old times when signals were a novelty. His two verbal orders are reported to have been as follows:

"Don't you fellows race the Pennsy trains, but don't let them beat you," and, "I want you to stop at these new signals, but *don't miss your boat!*"

Great stress is laid on the claim that the proposed scheme is in "harmony with the Standard Code," and yet the Standard Code especially provides for giving this "dangerous" and "misleading" advance information. Under Rule No. 501 appears the name—Caution Signal; occasion for use—block is clear, second block in advance is not clear. Indication for enginemen and trainmen—approach next home signal prepared to stop.

4. "The conditions of modern railway operation do not require trains to run at full speed past caution signals; time gained by this practice is gained at the expense of safety." What is full speed? What is a caution signal? If the distance between a distant (caution) signal and its home is full normal braking distance of the highest speed trains, modern conditions require that such trains must reduce speed *in passing the signal,* but do not require such reduction for trains of slower speed and higher braking power. Is it more dangerous to say "prepare to stop at the home signal," as the Standard Code says, or to say nothing in regard to the next signal?

5. "Each signal should indicate stop, caution or proceed, and have no relation to signals in advance or in the rear." This statement, fundamental in its nature is one of the severest strictures ever passed upon the Standard Code, and stamps our present railway practice as basically wrong. It is almost incredible that any intelligent operating officer has the temerity to preach it in this year of our Lord, one thousand nine hundred and eleven.

The Standard Code of the American Railway Association, authorized edition, February, 1911, page 326, says:

Distant Block Signals.

Indication for Enginemen and Trainmen.	Occasion for Use.
Proceed with caution to the home or advance signal.	Home or advance signal at stop.
Proceed	Home (and advance) signal at *Proceed.*

The minority, if it had its way, would wipe the distant signal off the map and give no approach information of the condition of the block signal.

The majority has held and still holds that the code is incomplete and that it should provide indications covering divergence from main tracks at interlockings, differentiating between those over long crossovers and over short crossovers and between a caution signal indicating block clear and one indicating block occupied; but it also claims that the code, as far as it goes, is founded upon absolutely correct basic principles, and that the American Railway Association has legislated conservatively and safely rather than recklessly and ignorantly.

6. "That each signal should be observed in turn as the train comes to it, and not at some point in advance at the option of the engineer." The majority endorses this proposition, but differs with the minority on the interpretation of the word "observe." The minority interpretation of "observe" carries with it immediate action, in fact action in many cases before the train comes to it. The majority interpretation is that, if the signal is observed—that is, if its indication is properly conveyed to the engineman's mind, the action may be immediate or it may be deferred, depending upon the running conditions.

If all caution signals are to be alike, it is necessary to reduce speed, not on passing them, but *approaching* them, for there may be a short crossover just ahead leading into a crowded yard; there may be a train a few hundred feet ahead (if permissive blocking is in force) or there may be bad track ahead. If, on the other hand, distinctive signals are provided for:

(a) Diverge at low speed,
(b) Prepare to stop at next signal,
(c) Block occupied,

the action required is different. With the majority scheme, a train would receive first *b* and reduce speed so as to stop at the home signal, and then *a,* and proceed at low speed. On the other hand, having received the proper distant indication for *c,* and given a view of the track for a mile ahead, such reduction is unnecessary, and the train may run prepared to stop within the visible stretch of track, slowing down approaching curves and really running on sight. Assuming, however (if all caution signals have the same aspect) that the engineman takes the signal to mean block occupied some distance ahead, when, as a matter of fact, it means cross over, the results would be serious. Therefore, the use of all caution signals interchangeably, requires always a very slow movement and decreases the capacity of the road. If the function of signals is to impede traffic, the minority has the scheme par-excellence to accomplish it. If it is to facilitate as well as safeguard traffic, it is a dismal failure.

7. "That, with signals properly located, it is time a train should be run with caution if it has reached a point so close to trains or stop signals in advance that a caution signal is received." This, I judge, also applies with signals improperly located. This proposition appears, however, to be out of place, as with the minority scheme no caution signal would be received, for proposition No. 5 says: "Each signal . . . should have no relation to signals in advance or in the rear." Can it be possible that there still lingers in the author's mind a feeling that perhaps (although No. 5 is necessary to make the scheme workable) it is a good thing to have the signal in the rear bear some relation to the signal in advance, but that the fact should be kept a secret from the operating officers and the engineman?

Can the intelligence and common sense of the engineman be trusted to determine the meaning of each caution signal and to know why he is stopped at each stop signal, while at the same time he cannot be trusted to use judgment under the indication "prepare to stop at next signal," and must be required to

run at five or six miles an hour for a mile for fear he will pass that signal? This may not be the feeling, but it is a reasonable explanation of clause 8.

9. "That no proceed or caution indication should imply or assure clear track to a point in advance. That railway signaling devices and our methods of communication have not reached the perfection that will admit of this being done. We cannot know positively if the track is clear, and further it may not stay clear. We are under a moral obligation not to give such misleading information." Nothing could more plainly discredit the Standard Code than this proposition. Page No. 327 of the revised Code, previously referred to, shows, Rule 301:

HOME BLOCK SIGNALS.

Name of Signal as Used in Rules.	Indication for Enginemen and Trainmen.	Occasion for Use.
Clear Signal	Proceed	*Block is Clear*

According to the first sentence of this proposition there should be no "occasion for use" of such a signal. The proceed signal should, therefore, in the interest of simplicity, be eliminated. And, certainly, in the light of the other propositions, it should be eliminated for safe operation under the minority scheme, and the indications should be reduced to stop and caution. Then what becomes of our block system? Are we ready to give it up? The statement that signal devices are so unreliable that they cannot properly indicate clear block requires proof; a bald assertion will not suffice. The statement is not justified by the experience of most of us.

It is true that accidents occur on the most fully protected roads, and they always will. None of us is perfect, and none of our works will ever be perfect, but actual experience has shown that, on single track, by the use of complete manual controlled block with outlying switches electrically locked, with approach locking at interlockings, and the additional safeguards at our disposal, the integrity of a block may be secured and preserved, and that, therefore, the engineman may properly be assured of it; and further, that the same safety may be assured on double track, four track, etc. What moral right has the public or any management to ask an engineman to proceed at the high speeds now prevalent without such reasonable assurance? This does not imply that he is to shut his eyes as soon as he passes a signal, and open them only on approaching the next; nor does it imply that he is to relax his vigilance in watching for the results of sudden storms or obstructions, such as landslides, etc., and as a matter of fact it does not so result in general practice.

10. "That it is difficult, if not impossible, to maintain discipline and proper observance of the great variety of caution indications proposed by the majority, because of the fine distinctions involved." What are these caution indications? They are the ordinary distant signal for the main track; a signal for divergence at limited speed (to be used when desired for passage over long crossovers), combined with a distant for the next signal; a distant signal for the medium speed route; a signal for diverging at low speed, combined with a distant for the next signal; a slow sign, and a distinctive mark to indicate "permissive block" or proceed, track occupied. The fact that all these indications, and all the aspects, except the permissive, are being successfully used, not only as a separate system but introduced in connection with the old methods, on some of the greatest trunk lines in the country, as well as on a number of thin lines; with magnificent results, and with the approval of the men most concerned in their use, the enginemen, is sufficient refutation of proposition No. 10.

A system conveying no indications other than stop, caution and clear must of necessity be predicted on the principles enunciated by the minority, and the proceed indication serves no purpose except to announce that the caution or stop indication, which might be expected, is not displayed—"absence of restricting signal," as the majority terms it. This indication would be the same in all fixed signals—"slow-boards, stop-boards, yard limits, switch, train order, block, interlocking, semaphore, disk, ball or other means for indicating stop, caution or proceed," and continuous advance or block information would be impossible. While our enginemen can intelligently grasp but three aspects, they can guess at the meaning of all these enumerated. They must do this, or else must remember the information each is to convey by associating it with some land-mark near at hand.

The time has passed in this country when the block system, as outlined in the Standard Code, can be abandoned for the cow-path principles of running on sight, with stationary mechanical herders, giving two indications—stop and caution—covering conditions only at these particular locations "and not at some point in advance." Progressive managements will not advocate such a scheme, public sentiment would not tolerate it, and the government would not permit it.

As W. H. Elliott aptly puts it, "Signal indications should not be 'simplified' to a point where definite information is not given to the engineman. It is a good thing to have a simple signal system, but it should not be made so simple that to insure safety of operation an engineman will have to reduce speed to a point where trains are run so slowly that full advantage cannot be taken of the track facilities provided. The economy proposed by Mr. Clausen in simplifying the signal system is at the expense of efficiency and capacity."

MR. CLAUSEN'S THREE LETTERS.

Finally, Mr. Clausen, to bolster up his position, quotes three letters, which somewhat becloud the issue.

The first letter begins: "The very elaborate signaling recommended by some is founded upon the idea that engine-runners, on account of their mental incapacity, must be instructed, by the language of signals, the precise manner in which their trains shall be handled under every circumstance, etc.," and claims that this premise is unsupported by facts, and that their enginemen are intelligent and reliable.

The portion in quotation marks might be criticised were it not begotten in ignorance. Instead of publishing this letter, Mr. Clausen should have advised its author that the majority has always held that the enginemen have at least ordinary intelligence and that, as a class, they are far above the average, and that it is the minority who has always claimed that they were incapable of instantaneous reading of the various "complicated aspects" involved. It is the minority that is belittling their mental equipment, by saying slow down because you haven't brains or skill enough to stop a mile away unless you do so—nor intelligence enough to carry in your heads 15 or 20 aspects, though we grant you have learned the characters of the alphabet.

The second letter is a complaint of the increased cost of complicated interlockings and two-thirds of it is a plea for the abolishing of derails. Of course, the cost of derails has a bearing on the cost of the interlocking plant. It has no more bearing on the question of signal indications and aspects than the frieze of the Parthenon on the price of butter in Oshkosh. It may add to the gayety of nations, but is not a cogent argument for a one-arm signal. The actual difference in the installation of a plant would be the difference in cost of the high signals only, and those who know anything about signaling can easily figure out at any given plant what the percentage difference would be.

The third letter is a plea for simplicity and (probably unintentionally) a very strong argument for the majority claims. It says "When a man is running a train at a speed of 60 miles an hour, perhaps on a down grade, a 'stop' signal may mean a very different thing to him from what it means to a man going perhaps 10 miles an hour on a level or an up grade pulling a heavy train. In other words, the signal may *say* the same thing in both cases, but what it will mean in practice to the man who receives it is a very different thing. Then why confuse the situation by all sorts of absurd requirements?"

The majority says, tell the man the truth, simply and plainly; and if the same signal means different things, tell him which it means. Why risk misleading him when you can guide him right?

A paragraph is devoted to the instance of a distant signal being habitually left at caution with the home at clear, and it is asked whether it had not better be removed entirely. We reply, yes; but, still better, it should be made to give accurate information and not be left to indicate stop at next signal when the medium speed route is made and next signal may be passed at 45 miles an hour.

Finally, we agree with the writer that every device must be made as nearly foolproof and as simple as possible, and that, if signaling by any means leads to the abolition of grade crossings, it is a blessing, even if in disguise.

It is generally conceded that the signaling fraternity is as conscientious and as hard-working as any in the railroad world. Whether its members are broad gage or narrow gage is perhaps debatable. They are on trial. It is to be hoped that they may prove equal to the task of harmonizing their differences and recommend, without division, a comprehensive system which, while meeting the most exacting and complicated conditions of the trunk lines, will at the same time supply the simple needs of the smallest and weakest roads safely and economically, and which consequently will be worthy of adoption by all the roads of the country. If they can do this, their recognition as among the most important operating officers, a recognition long striven for and so far generally denied, is bound to come through the logic of events and the value of their work. A. H. RUDD.

A DEFENSE OF THE COMMITTEE WORK OF THE ENGINEERING ASSOCIATION.

El Paso, Tex., April 3, 1911.

To the Editor of the Railway Age Gazette:

The editorials in your issues of March 23, page 628, and March 24, page 725, about the manual of the American Railway Engineering Association reflect on the work of some of the committees of that association. With due respect to the leaders of the association, I wish to say a word from the committeeman's standpoint.

Criticism of committee work should be fundamental and complete. It should not be offhand, hypercritical, superficial and inconsistent as it sometimes is even when coming from men whose expression carries weight quite apart from the quality of the criticism. This frequently results in impromptu action by the association whereby well considered and valuable work of a committee is impaired. Revisions of the manual became necessary from that cause. The association needs protection against its leaders quite as much as against its committees.

During the last convention, a leader on the floor opposed the specifications for water tanks because he alleged them to be too definite and exclusive. But in the detailed discussion he insisted on one method only for threading the tank hoops, whereas the committee admitted two standard and approved threaded ends. By an unsupported and questionable declaration that upset rods would cost the more, the association was led into hasty and ill-advised action limiting it to one thing when another equally good or better is available.

This is typical of the inconsistency and superficiality of much of the criticism which comes from the floor and, owing to the prestige of the critic, is accepted to the detriment of well considered committee work. The admirable specifications for frogs and switches received much of the same kind of mutilation. Your own criticism of the form of roof for wood water tanks preferred by the committee is equally vulnerable. A thorough analysis shows that form to be the simplest and most economical. Responsibility for imperfections in the manual by no means rests exclusively with the committees.

If a committee cannot reach sound conclusions on one subject in one year, it is hopeless to expect that the suggested general revision committee could pass conclusive judgment on the entire annual work of the association.

Committee work should be considered in the light of the instructions governing it. Sometimes the association reverses itself. In 1910 the work of the water service committee was rejected on the ground that it was too general in character. In 1911 it was rejected because it was considered too specific. In each case the committee worked under explicit instructions. Such a policy is not favorable to a continuation of the conscientious care which has marked committee work.

The exceptional value of this association is due primarily to the comprehensive and democratic character of its membership and to the fact that its work is done by the rank and file of the men who build and maintain the way structures of the railways. It is up to the association to find out what it wants its committees to do.

I believe the anxiety about the manual is largely without foundation in fact. I believe our only concern in connection therewith should be to see that it represents good, sound practice only. J. L. CAMPBELL.

Engineer Maintenance of Way, El Paso & Southwestern.

SOME GROUNDS FOR ENCOURAGEMENT IN THE RAILWAY SITUATION.*

BY FAIRFAX HARRISON,

President, Chicago, Indianapolis & Louisville.

It is with some hesitation that I venture to avow that there are cheerful views on the railway situation to-day, because there are so many difficulties surrounding the management of railway property as almost to justify a railway officer in becoming a confirmed pessimist. But leaving for the moment to others the rehearsal of the difficulties, it may be well to look for portents of good omen. Fortunately, the railway horizon is not altogether black. Even in the decision of the great rate case, which brought bitter disappointment to many railway managers who, with confidence, had expected from it some measure of relief from their immediate responsibility—even in that disappointment there are grounds for encouragement.

In one vital respect that great controversy has accomplished something for the railways which has never before been possible. The very importance of the questions involved and the theory on which the case was presented required the Interstate Commerce Commission to make a thorough examination of the financial condition of all the railways of the United States. The result was impressive. With opportunity such as no one ever has had before, not even the great banking houses, and after months of careful and serious investigation, the accredited experts of the government in railway matters—the Interstate Commerce Commission—came to the conclusion and certified to the world that under existing conditions the American railways are financially sound. Think what this means to the doubtful investor. No industry seeking capital, with the single exception of the national banks, has ever had such a certificate. One could now almost endorse on a new issue of bonds, "Security approved by the United States."

Furthermore, because responsible and harried officers of the railways, doubtful of the solution of their immediate and pressing problem of prolonging successful management, had testified that the railways should have additional revenue if they are to grow and prosper, the Interstate Commerce Commission added the assurance that, if the time shall come when such a view shall be demonstrated to be immediately apparent, they (the commission) will exercise the power which the law vests in them and permit such advances of rates as may be necessary to maintain the sound financial condition which they certify now exists. Let us consider for a moment what is the import of this declaration and solemn covenant. Every successful railway in the country must continue to grow. A railway which is not a progressive railway is a dead railway. The American people

*From an address before the Transportation Club of Indianapolis, March 31, 1911.

have been wont to look to the railways to lead in promoting and encouraging new industry, for there is no industry in which they are not partners. As the volume of the business grows the railways must expand and in our Jack's bean-stalk civilization such expansion will always be too rapid to admit of providing the necessary money out of the accumulated railway income, be it never so conservatively administered. The railways must, therefore, be forever calling for new capital, and that they can now do and point to a definite assurance that the national government will foster and protect the capital so invested. It was almost worth the disappointment over the adverse decision in the rate case to realize this.

The railways of the United States are not ruined by the rate decision, but it has in truth called on them for a tremendous new effort.

The most important ground for encouragement to-day is the fresh stimulus which has been given to the study and practice of efficiency in railway operation, for we still hope to overcome our difficulties by self-help rather than through enfeebling dependence upon a government guaranty.

I do not now refer to or advocate the theory or the application to the railways of the so-called "scientific management" which has lately been bruited over the land. Whatever may be accomplished by such means in individual industrial functions, we may safely assume that "scientific management," as the term is currently used, will never be practiced in the broad and complicated problem of railway operation. The representatives of organized labor at the recent hearings before the Interstate Commerce Commission spoke the final word of impossibility to any such expectation when they said that American labor would never submit to the mechanical limitations of those methods.

Nevertheless, there is an increased efficiency of method which can be practiced and which will go far to accomplish the salvation of the American railways which are to-day operating on a narrow, and hitherto ever narrowing, margin between the lowest rates in the world and the highest wages in the world.

It may be admitted that many of the methods of current railway operation are wasteful, but the railways do not stand alone convicted of this serious indictment. As a people we are the most wasteful civilization has ever seen. It is an evidence of our youth. We use our natural resources as a child plays with his Christmas toys, with hectic attention now to this, now to that, and so little care or forethought that at the end of Christmas Day many of the gew-gaws are broken and destroyed. It has been so with our forests. The state of Indiana, once almost entirely forest, stands, scarcely a century since the first considerable immigration, practically denuded of native lumber supply, so that her railways are buying their crossties in northern Michigan and in Mississippi. We still see rotting fences of walnut rails to testify to the exuberance of the original timber and the waste of the pioneers.

What has become of the reservoir of natural gas which so short a time ago was one of the glories of Indiana? It would be merely painful to ask if it has been efficiently conserved and distributed.

Waste is the characteristic, also, of our agriculture. Rejoicing in a soil than which there is no richer in the world—the deep, black humus filled area of the corn belt—many Indiana farmers go on robbing the land of its fertility with crop after crop, and little thought for the future. They have always believed that if the incredible should become the actual and their land should no longer yield, they could pull up and go west, as their fathers came to Indiana, to a promised land, where virgin soil forever awaits the plough. Even to-day, when the census tells us how many farmers have so emigrated, and there appear to be limits even to the hospitality of the West, we see too few Indiana farmers conserving what they have by keeping cattle and feeding on their land at least a part of the abundant corn crop; and at this season of the year we even see the farmer burning in the field the fodder which might have carried some young cattle over the winter.

We are wasteful, too, in our personal habits of extravagance. Senator McCumber, of North Dakota, put this very well and forcibly in congress the other day when he rehearsed what the farmer, so frugal at home, spends for a day in New York. Here is his list of expenses measured by farm produce:

Cab to hotel	6 bushels of oats.
Tip to driver	15 cabbages.
Tip to elevator boy	2 dozen eggs.
Tip to bell boy	1½ bushels of barley.
Breakfast	½ ton of hay.
Tip to waiter	2 bushels potatoes.
Luncheon	1 sheep.
Tip to waiter	1½ bushels of carrots.
Dinner	4 bushels of rye.
Tip to waiter	1 bushel of onions.
Room	Half a car of turnips.

So in confessing that American railway practice has been wasteful the railway man simply takes his place beside his fellow citizens in other walks of life. But there is an economic pressure on him which no other class of the community has yet felt, and this has been teaching us since the panic of 1907 that we must learn to practice efficient economy in railway operation. Mr. Brandeis has undoubtedly quickened this study by quoting so publicly and so dramatically as to arrest the attention of the nation, the extravagant claim of one of the efficiency engineers that the railways might save a million dollars a day by adopting his particular panacea. While little serious consideration has been given to this claim, it is a fact that since Mr. Brandeis sounded his clarion, many responsible railway managers, who had some difficulty in restraining their immediate indignation at the impertinence of the assertion, have been looking about with renewed energy to see where they can institute greater efficiency of operation. Men who have reached the top because they have been more efficient than their fellows are now taking up their belts another hole and asking questions which have set many a subordinate forward to a realization that he is spending money unnecessarily to accomplish his particular stint of work.

If the operating offices are studying more closely their unit costs to-day, it may not be considered inopportune to question whether the traffic officers may not with profit study the efficiency of their methods also. One can fairly ask whether rate making as practiced to-day is as efficient or as systematic as it might be. It has been well said, in explanation of the apparent lack of system, that railway rate making is not a science, but, like any other price making, is an art. But this statement will not justify beyond criticism our present methods of making rates. Artists are notoriously given to vagaries, and, yielding to no one in admiration for what is perhaps the best equipped set of men in the railway service—the traffic managers—it must be admitted that there has not been much technique in their practice of the art of rate making in the past. They have seldom based their rates on principle; they have sought chiefly to secure tonnage and move it, and they have, out of very human necessity and temptation, made many compromises under the exigencies of competition, which have resulted in the present low basis of rates. Every shipper knows that he has secured the reduction of more rates from the traffic manager than from the railway commissioner. It is doubtful whether any current rate between competitive points can be analyzed to principles; usually it is the result of transportation and commercial history, and as little represents the "value of the service" as it does the theory of "what the traffic will bear."

But hereafter under government regulation the rate maker must base his work upon principle, and while probably he can never, under our American conditions, create a strict science of rate making, he can promote the art into a profession. A profession is the practice of individual initiative under established rules; the lawyer shapes and weaves the settled rules of the law to meet new facts and conditions under the regulation of the courts. The surgeon adjusts his every operation to the sudden emergency, but always within the limitation of the binding etiquette of his profession. Both lawyer and doctor draw on

science, the recorded theory of the philosopher, and both use art in the particular application, but always they can cite a principle for everything they do; and it is in this that a profession differs from an art. The great painter is little bound by rules and philosophy; the musician even less; their individual genius flowers differently in every generation. The nightingale cannot tell why he gushes melody.

It is possible that the rate maker in the past has modeled himself more on the nightingale than on the lawyer and the doctor, but it is a cheering promise for the future of American railway practice that the necessity of constantly justifying his rates upon the witness stand is forcing the traffic office to study, for example, the cost of service as an element of the basis for a rate.

It is fair to say that the traffic officer has had peculiar handicaps not of his own making. One of the greatest difficulties he has met in adjusting himself to regulation has been the unfortunate ease with which the lawyers have defended what is sometimes bungling rate making by the terrible plea of confiscation. When, in the case of Smyth v. Ames, the Supreme Court of the United States laid down the principle that there is a minimum below which regulation may not reduce railway revenue, and restrained, on the ground that they were confiscatory, the maximum rates which the state of Nebraska had sought to impose on the railways, a swarm of injunctions was let loose, like locusts upon the land. Every time governmental authority regulated a rate or a system of rates, the railway officers, under the advice of counsel, pulled long faces and pleaded poverty. While in some cases of a general attack upon a whole system of rates it was a sound plea and well taken, in other cases, involving a single rate alone, it was Pickwickian.

As a result of the analysis by the Interstate Commerce Commission of the financial condition of the railways as a whole, confiscation, as a working hypothesis in practical rate making, is likely to be relegated to the limbo of history, to be there reserved for invocation in those rare cases where sudden popular fury seeks to overthrow all constitutional limitation and the very bulwark of property.

The study of systematic rate making has been confused also by the will-o'-the-wisp of the physical valuation theory. At first it was the popular advocate, the shrewd politician, who seized upon physical valuation as a slogan because he had heard so much of watered securities that he believed that a valuation of railway property would afford an automatic excuse for compelling a reduction of rates. But after the first few valuations had been made the shrewd politician dropped that theory like a hot potato. The practice of the railways in the past of putting back into the property so large a proportion of their revenues through maintenance expenses, and the increment of real estate values which the railways claimed equally with the owner of the corner lot, were demonstrated to have run up the physical value of most of the railways, when ascertained by any fair system of appraisal, to a figure which was dangerous to the theory that rates were too high if based solely on physical value. So some railways themselves who at first had opposed physical valuation, seized upon the discard of the politician and promoted it into a ground for an injunction. But probably this plea must now be abandoned also by the railways. The implacable logic of the suggestion that on this theory as values are constantly increasing, rates must also constantly increase, would seem to put an end to rate making on the simple arithmetic of physical valuation, for every student of political economy knows that railway rates in the United States, taken by and large, have, through the operation of general economic laws, gradually and steadily decreased.

I believe that most traffic officers will be glad to be put to the necessity of justifying their rates by the more difficult appeal to the merits of their handiwork, and so to become practitioners of what will be recognized as a learned profession.

It is a cheerful sign of the times also to observe new evidences of increasing efficiency in the practice of the government function of regulation. A jury empanelled from the general body of citizens is doubtless as well qualified to judge the merits of facts in controversy as any human agency; they represent what the poet terms the common sense of most. But when it comes to passing upon the merits of the technical activities of highly organized and sensitive functions like those involved in the operation of a railway, it is not too much to ask that at least a special panel should be drawn for the jury in such cases. Whatever may have been the case in the past, when regulation was in its infancy, to-day the government officers who administer the powers of regulation which the state has assumed to exercise, are becoming daily better qualified and more expert in their duties, and as they appreciate the problems of the railway officer and learn from personal contact that, like themselves, he is usually a very human man trying to do his duty to those who employ him, and very little of an octopus, they have grown tolerant and, while alert to perform the full measure of their public duty, are increasingly willing to be fair, even when there are strong evidences of momentary popularity to be derived from doing the thing which is unfair.

While discussing regulation, I venture to suggest to some of you who are engaged in other industry than railroading, that regulation is not likely to be forever limited to railways. The railways have perhaps been through the worst of their experience, and are now almost ready to take their place in the safe and strictly supervised rank of the national banks. In the next few years they will probably be able to view with sympathy the similar subjugation of other branches of industry. The recent decision of the Supreme Court upholding the corporation income tax law has firmly driven in the entering wedge of effective and implacable governmental control of all corporate forms of activity.

The system of the social democratic state which regulation of industry involves may thus be enabled to fasten upon all our commercial life. It will perhaps next manifest itself in respect of our manufacturers, and it will not be confined to the trusts. The small railway has been included with the great system and is regulated equally with them; so the logic of regulation will involve the small manufacturer with the great. Perhaps not even the press will escape regulation. Ferdinand Lasalle, who in the middle of the nineteeth century was preaching in Germany advanced social doctrine, much of which has now matured into political commonplace, included the press in his programme of state regulation of business activities. He maintained that the press could be debauched only by the tendency to become not a pulpit of light and learning, but a commercial venture, deriving its principal revenue and even some inspiration from paid advertisements, and to preserve the freedom of the press he proposed that by law the publication of advertisements should be limited to a government gazette. Recent events in the post office department at Washington imply that this is not impossible, even in the United States. We can then imagine the rural free delivery carrier of the future leaving daily at every vine-clad cottage a pound of *Congressional Record* encompassed and illustrated by five pounds of advertisement, while the contemporary muckraking magazine will be clad in the consciousness of the rectitude of its intentions and will bear on the modest cover of its slender proportions the image of a fig leaf.

The day of the Manchester school and *laissez faire* is gone. The day of the social democratic state is dawning. Personally, I do not repine at the change, although I have been educated in the school which thrilled with the achievements of unregulated capital. I do not mean to laud the mere sudden acquisition of great and vulgar wealth by individuals, but, regarding that as an incident to the national increment of strength and power through the development of the national domain, the period through which we have lived and which is now drawing to a close has witnessed superb daring and skill and courage on the part of our captains of industry. It is they who have made our vast country blossom where it was wilderness. It is they who have accomplished for the United States what every nation in the world

seeks ardently as an assurance of existence—a steady increase of population—by providing through their activities the compelling allure for immigrant labor. In fine, they must be chiefly credited with those industrial triumphs which brought our country in the brief period between the civil war and the Spanish war to a commercial position which has challenged the political and military respect of the entire civilized world. Perhaps we grew too fast, but we grew nevertheless, and that growth was due in no small measure to the methods of the men who dared and in daring did, as most adventurers do, things which a subsequent and more intense civilization cannot approve.

The railways of the United States are part of the achievement of these men and they have suffered a terrific economic upheaval to pay for their sins. Though the consequent struggle for the continued existence of the regime of private ownership and initiative is not yet finished, I venture to believe that the railways may still work out their salvation, but only if they will bend their energies more to increasing the efficiency of their methods—to intensive cultivation of their opportunities—than to resistance of decrees which organized society has determined to enforce upon them.

Facing, then, the inevitable and changing front, as the world did after the battle of Waterloo, it is the duty of railway officers of every rank to-day to adjust themselves to the new conditions and accomplish in their profession a new achievement of which hereafter the American people can be as proud as they now are of the marvel of the construction of the railways in the generation which is dead.

It is no time to lament the past or recriminate the inevitable. If it is a time of adversity it is the more a time for courage and cheerfulness, like that of Paul Jones on the *Bonhomme Richard*, when his ship riddled and his masts shot away, his flag at last fell to the bloody deck. "Have you struck?" called the English captain, and Paul Jones replied with a voice of thunder: "Sir, I have just begun to fight!"

Every schoolboy knows what was the result, and every schoolboy will know what the American railways can do in similar plight.

THE BURLINGTON'S ENTRANCE INTO THE SOUTHERN ILLINOIS COAL FIELDS.

The officers of the Chicago, Burlington & Quincy began, about nine years ago, investigating the possibility of entering the southern Illinois coal fields and building up a large coal traffic from the mines northward to St. Paul and the northwest, where the winters are severe and the demand for fuel great. At that time most of the fuel supply for this territory was brought from the Pennsylvania and other eastern fields by water to Duluth, and the competition from this source would have to be met by the Illinois coal. Also, as the eastern coal was of a somewhat better quality than the Illinois coal, the latter would not command the same price in the common market. Therefore to develop a northbound movement it would be necessary to fix a freight rate which would enable the Illinois operator to sell his coal for less than that from the east.

After study of the cost of production at the mines, it was found that the highest rate possible to St. Paul was $2.10 per ton, or 3.2 mills per ton mile, the distance from Herrin, Ill., to St. Paul being 648 miles. Such a rate could be made possible only by operating full trains on a low grade line, especially as the return movement would consist of empty cars.

At that time the Burlington had a line from St. Louis north through Beardstown, Ill., Galesburg and Savanna to St. Paul. That part of the line north of Savanna had originally been built to a 0.3 per cent. grade, but south of Savanna it had been built, in common with most roads in this part of the country, on a 1 per cent. grade. The point on the line nearest the coal fields then was St. Louis, about 85 miles distant. The question was whether the road could reduce grades and extend into the coal fields at a cost that would make it practicable to haul the coal at

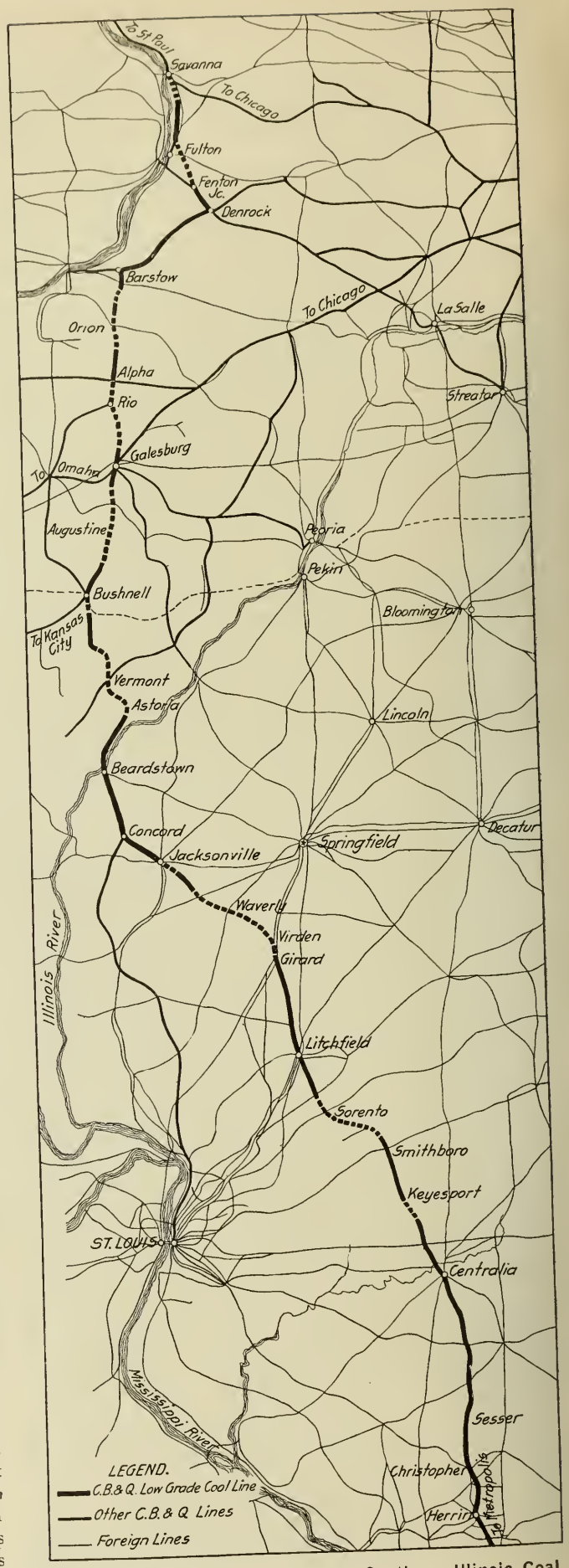


Fig. 1—Burlington Extension into Southern Illinois Coal Fields.

the necessarily low rate. Careful surveys and estimates were made of the work necessary, and the entrance into the coal fields was decided on. A maximum grade line of .3 per cent. against northbound and .5 per cent. against southbound traffic, compensated for curvature, was decided on, slightly heavier grades being allowed in a few cases, where they could be operated as momentum grades.

The first move was made in 1903, when the Jacksonville & St. Louis Railroad, extending from Jacksonville, Ill., southeast 111 miles to Centralia, was bought. This road had been built originally from Jacksonville to Waverly in 1871 by local capital, and had been gradually extended until it reached Centralia about 1885. It had been constructed as cheaply as possible, being aided largely by grants of right-of-way and bonuses from the towns along the route. For several years it had been bankrupt, and had been allowed to run down, so that it was in very poor physical condition. The track was laid with 56-lb. rail on poor ties with no ballast. All bridges were of timber, with the exception of one steel truss over the Kaskaskia river near Keyesport. It followed closely the surface of the ground, the many grades ranging from 1 per cent. to 1.4 per cent. Going generally southeast, it ran across the direction of traffic and developed but a small local business. The only towns of any importance it reached were Jacksonville, Litchfield and Centralia, all highly competitive.

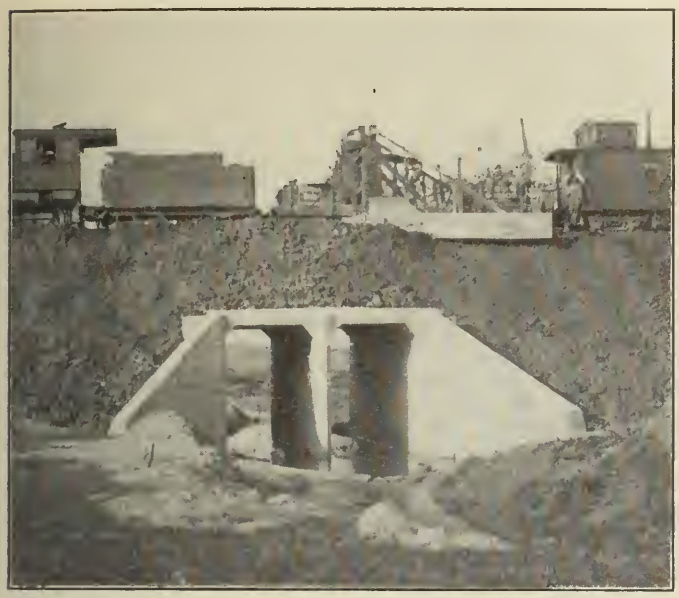


Fig. 2—Double 10 Ft. x 16 Ft. Concrete Box South of Jacksonville.

During the winter of 1903-04 the Jacksonville & St. Louis was extended north 10 miles to a connection with the Burlington's St. Louis-St. Paul line at Concord, 13 miles south of Beardstown, and surveys were made for reduction of grades to the standard above referred to from Concord north through Galesburg to Savanna; also from Jacksonville south to Centralia. During 1905 the Jacksonville & St. Louis was extended south from Centralia 53 miles to Herrin, and connections were made at once with several mines. On the reconstruction south of Jacksonville it was necessary practically to rebuild the entire line. Out of a total of 111 miles re-alinement or grade reduction work was done on over 42 miles, and on the rest of the line it was necessary to rebuild the bridges, widen cuts and fills, and renew the rail and ties. In accordance with the general policy of the road, all steam shovel work along the main line was handled by company forces and equipment, and the only work contracted for was that on part of the cut-offs and light team work along the main line. The regular equipment of 65-ton steam shovels, side dump 80,000-lb. capacity cars, unloaders and plows, and spreaders was used on all main line work, regular train crews from the freight pool handling all work trains. No tracks were built for the temporary diversion of main line traffic while construction work was going on, as many of the cuts and fills were short and interference to traffic lasted but a short time at the one point. Although the coal business began to increase rapidly as soon as the extension south of Centralia was opened, traffic fell off very much during the summer of 1906, owing to a strike in the coal fields, but late in the fall it was unusually heavy and interfered seriously with the construction work. All sags along the old line were brought up under traffic, and in reducing grades the existing main track was also used as a loading track until the first cut was completed alongside, when the track was thrown over into the hole and used as before; while the second cut was taken out under the old main track, after which the track was thrown back to the original line. Since there was only one passenger train each way it was not difficult to arrange the track throwing so as not to interfere with passenger traffic.

As practically all the cut-offs were at stream crossings, where heavy curvature and grades had been introduced on the original line to lower the first cost, the re-alinement at these points included very heavy work, and the banks were built by dumping from construction trestles. Two of the heaviest pieces of work were at Big Shoal and Little Shoal cut-offs, near Ayers, crossing streams of the same names. At Big Shoal two trestles with a total length of 2,961 ft. and an average height of 40 ft. were erected, while at Little Shoal a trestle 2,142 ft. long and averag-



Fig. 3—Routt Street Subway, Jacksonville.

ing 35 ft. in height was built. On this work, as well as on some cut-offs which were contracted, five-yard cars were used, but the other cut-offs, as at Waverly, were built with standard ballast cars working from a trestle.

At Jacksonville the cut-off, extending south from the depot a little over a mile, required over 275,000 yards for the fill. College avenue and Routt street, two important thoroughfares, were carried under the tracks through concrete subways, at both of which hollow abutments were built over the sidewalks, reducing the lengths of the girder spans about 15 feet in each case. This feature is clearly shown in Figure 3. At College avenue additional complications were introduced by the crossing of the Burlington and the Chicago & Alton main tracks over the subway. Figures 4 and 5 being views of this structure. To gain the necessary clearance here the tracks of both roads were raised about 5 ft., at the same time benefitting the grades of both.

As the reconstruction work progressed, timber openings were replaced by reinforced concrete boxes for pipe; the roadbed was brought to the standard of 18 ft. on fills and 22 ft. in cuts; new ties and 75-lb. rail were laid, and 12 in. of gravel ballast was put under the ties. A new gravel pit was opened near Keyesport to furnish ballast for this work. As this was in the clay and hard pan country, special attention was given to drainage and the construction of surface ditches in the cuts, in most cases tiling being resorted to. Four thousand-foot passing tracks were built at intervals of 5 miles and water stations every 20 miles.

Six new water stations were built, the construction in each case being similar. Reservoirs averaging 75,000,000 gal. capacity were formed by earth dams across ravines, these dams being built by contractors with team forces. They were built with a crown of 14 ft. and slopes of 3 to 1 and 2 to 1 on the upstream and downstream faces, respectively. A timber core wall was built through the center, sunk 2 ft. into a muck ditch and extending within 2 ft. of the top of the dam, as a protection against muskrats. Old car sills and timber cut on the reservoir were used as uprights, and second-hand 3-in. plank nailed horizontally to them. The face of the dam was riprapped from 2 ft. above the high water line to the estimated low water line as a protection against wave action. The spill-way was built some distance away from the dam with its outlet entirely free from the toe. The average width was about 40 ft., depending on the drainage area. Three rows of sheet piling were driven across the spill-way at right angles to its axis, one at each end and one in the center, and an apron of riprap was provided at each end, as a precaution against scouring. Figure 6 shows a view of the dam at Concord with the spill-way in the background. All timber below the high water line was removed and the brush burned, and the contractor was required to secure all dirt necessary for the dam in excess of that furnished by the spill-way from the inside of the reservoir and below high water line. The intake was placed on the bottom of the reservoir about 6 ft. above the lowest point and was surrounded by a timber crib. A vitrified pipe line laid on a descending grade led to a circular brick well 6 ft. in diameter located at the edge of the reservoir, the pipe line entering the well about 18 in. above the bottom. The pump house was located near the well, and an 8-in. cast iron pipe line led from here to the tank, in some cases over a mile distant. The power



Fig. 5—College Avenue Subway, from Above.

was furnished by a gasoline engine, the size varying with the head and length of pipe line pumped against. The tank was a 30-foot wooden tub of 100,000 gal. capacity and was erected on a steel sub-structure resting on concrete pedestals. Electric connections with the tank float were installed, which automatically shut off the pump when the tank was filled. By means of this latter arrangement, with ordinary traffic one pumper is able to pump for two tanks.

North of Concord the reconstruction was carried on in the same manner as south. This line was built in the early 70's as the Rockford, Rock Island & St. Louis, but acquired by the Burlington many years ago, and it had been maintained in much



Fig. 4—College Avenue Subway, Jacksonville; Chicago, Burlington & Quincy.

better condition than the Jacksonville & St. Louis, although the grade line was very similar. The grades were reduced to the same standard as south of Concord, new and enlarged water stations were provided, and the entire line gotten in shape for heavy tonnage trains. Especially heavy reconstruction work was done at Astoria, Abingdon to Avon, at Orion and at Fulton, where a 13-mile cut-off was built. At Savanna a 2-mile cut-off was constructed to enable trains to head directly into the yard without a reverse movement. A new terminal with complete facilities, including coal chute, engine house, water station and 700-car yard, was built at Centralia, while the yards at Beardstown and Savanna were doubled in capacity. At Galesburg an entirely new hump yard was built to handle this increased coal business in addition to that collected from the lines west and southwest.

This work is now practically all completed at an expenditure of over $10,000,000, and an operating grade line of .3 per cent. against northbound traffic is now in service from Herrin to St. Paul, with the exception of two points, where the cost of grade reduction is so excessive that it has been decided that it will be more economical to maintain helper engines. Heavier locomotives and cars were purchased, and where the tonnage



Fig. 6—Dam and Spillway at Concord.

rating south of Savanna with the engines in service before the work began was less than 800 tons, the present rating is 3,600, which rating is maintained the entire distance to St. Paul with the assistance of helper engines at the two points mentioned.

That this expenditure has been amply justified is shown by the heavy business developed. Seventeen mines are now directly connected with spur tracks, while other spurs are planned to be built in the immediate future, and much coal is turned over to the road from mines not reached directly. During the past fall over 35,000 tons were handled daily on this branch, and the traffic has become so heavy that a second track is now being seriously considered, the reconstruction work on which was started but five years ago.

During the past year this line has been extended south from Herrin to Metropolis on the Ohio river, and through freight service recently has been inaugurated to the southeast in connection with the Nashville, Chattanooga & St. Louis. Thus, it eventually will form one link of an important line from the north to the gulf ports, in accordance with the general development of the Hill lines along that direction.

This work has been done under the direction of T. E. Calvert, chief engineer, W. L. Breckinridge, engineer maintenance of way of the lines east.

MANNHEIM (CHICAGO) YARD; CHICAGO, MILWAUKEE & ST. PAUL.

During the winter of 1909-10 the Chicago terminals became very much congested, causing great delay to freight in transit, and consequent loss. It has been estimated that the losses sustained by the railways from this congestion from December 1, 1909, to April 1, 1910, amounted to $3,000,000, one prominent railway official estimating that the losses of the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern and Chicago, Burlington & Quincy reached $500,000 each. While this congestion was largely due to a lack of power on the lines west of Chicago, much of it was attributable to lack of adequate yard facilities on several of the roads, resulting in blocking the belt lines, and finally the other lines which were unable to deliver to the belt railways.

While the roads have been making increases in their yard facilities continually, these have not kept pace with the development of the traffic, and the rapid upbuilding of the city has made it impracticable for them to extend their present terminals. As a result, any increase in these facilities must be made further out of the city. The statistics show that the traffic being received at Chicago approximates 4,000,000 loaded cars a year, of which about 775,000 are destined to points beyond Chicago; and about an equal amount is interchange business for points within the city. To avoid congestion this interchange business should be separated from the local business and turned over to the connecting lines as quickly as possible.

Keeping these points in mind, the Chicago, Milwaukee & St. Paul has taken steps to avoid a recurrence of last year's experience by the construction of a new yard at Mannheim, Ill., 14 miles west of Chicago, on its Chicago & Council Bluffs division, to relieve the Galewood yard, 5 miles further in towards the city, where all classification has been previously done. A smaller yard is located at Western avenue, but this is largely used for storage purposes. The St. Paul enters the city by two double-tracked lines, excluding an unimportant branch which extends only to Evanston. The line coming from the north handles the business from Milwaukee, St. Paul and northwest points, while that from the West carries the traffic from Iowa and Dakota points. These two lines come together at Pacific Junction, five miles from the city. All trains in or out on the northern division must come to Pacific Junction and then turn west to the Galewood yards.

The new yard was located at Mannheim largely because of the possibility of securing enough land for a large terminal at this point, and also because of its location with reference to the Indiana Harbor Belt Railway, 20 per cent. of whose stock has recently been acquired by the Milwaukee. This railway has northern termini at Manheim and Franklin Park, one mile east, and extends around the city southeasterly to Lake Michigan, at South Chicago, Indiana Harbor and Gary. By the use of this line a large proportion of the interchange business destined for points east of Chicago can be kept outside the city, enabling the inner belt railway to handle the city interchange business to better advantage.

While only the inbound yard is now being built, it has been so arranged that it will eventually be a part of a complete terminal layout. A similar yard of equal size is planned for outbound traffic, and space has been reserved for complete terminal facilities, including engine house, coal chutes, repair yards, etc., in order to relieve Galewood and Western avenue yards. When this layout is complete it is expected that a cut-off will be built to the Milwaukee division, affording trains from that line a direct entrance into the yard without coming into the city. At the present time the handling of this northern traffic is very inconvenient, for a train from the north coming into Pacific Junction has to go west to Mannheim. The engine and waycar must be returned to Galewood, while

the train is classified at Mannheim, being brought back into the city by transfer engines, the result being a back haul.

The yard is designed as a hump or gravity yard and is unusual in that 44 tracks will lead from one hump, this being one of the largest, if not the largest, yards in that respect in the country. The receiving yard at the west end consists of 16 tracks, averaging 3,600 ft. in length, with a total capacity of 1,360 cars. Entrance from the west is from a third track which connects with the main tracks at Bensenville, about a mile west. A highway crosses this yard at grade near the center, negotiations to move it having not yet been completed. The tracks are built at 13-ft. centers, with the first track 20 ft. from the nearest main line. The grade of the receiving yard is the same as that of the adjacent main tracks. A transverse grade of one-tenth ft. per track sloping away from the main line was introduced to provide for drainage.

At the east end of the receiving yard the Desplaines Valley Railway, the double-track outer belt line which the Chicago & Northwestern is now building, crosses overhead on a pile structure which will later be replaced by a permanent structure with two openings of 100 ft. and 59 ft. at the tracks and 22-ft. clearance above top of rail. As the Northwestern began its improvements first, the Chicago, Milwaukee & St. Paul had to adjust its yard grades to this crossing, limiting the beginning of the approach grade over the hump to this point. This caused some difficulty in working out the plans. The profile over the hump is shown in Fig. 2, the maximum fill being 17 ft. The approach grade from the receiving yard starting from the under crossing of the Chicago & Northwestern is 1 per cent., while that on the other side starts with 30 ft. of 3 per cent., then 105 ft. of .076 per cent., across the scales, followed by a 3 per cent. grade to beyond the first switches on the ladders, after which a 1 per cent. grade extends to the end of the ladders. From this point the grade corresponds with that of the main line, being practically level. In the two months' operation of the yard early in the winter no difficulty was found in handling the cars over the hump, except that for a short time during the construction of the scales, when the cars were run over the south track and through the cross-over, they would occasionally stick on the cross-over. An extra pair of switch points was inserted just above the scale to take care of the creeping of the track and prevent any strain on the scales. A set of 100-ton automatic scales was installed on a concrete base, which in turn, was supported on a foundation of creosoted piles. Electric lights on high poles have been placed along the ladders and a high semaphore has been put at the top of the hump to give signals to the engineer of the hump engine. In riding cars over the hump the rule is to stop each car in the yard a few feet before reaching the next car. Before returning to the hump the rider opens the coupler pocket, and at night he advances the light to the end of the string of cars he rode down. In this way the heavy damage to the cars as well as injury to the employees so common in gravity yards is largely eliminated.

The classification yard consists of 44 tracks leading from the one hump, of which 34 are for general classification purposes and 10 for sorting and storage of grain. It has a capacity of 3,100 cars, of which a capacity of 500 cars is on the grain tracks. In addition, two running tracks from the receiving yard extend around the yard on the south, while another main track starts from this same yard, making in all four main tracks to the city, affording engines a direct outlet for the Galewood terminal after leaving their trains here. The 34 classification tracks lead from two ladders, handling 17 tracks each, with a track between the two groups, upon which a trolley car or engine runs back and forth, returning the riders to the hump. This track runs directly into the main hump track and also connects with the second track on the hump, through a cross-over, so that the trolley can bring the men directly to the top if the switching is being delayed for riders. During the early winter a small locomotive was used on this track, but a gasoline car will be substituted as soon as the yard is completed. A line of double slip switches extends entirely across the north group of 17 tracks to a connection with

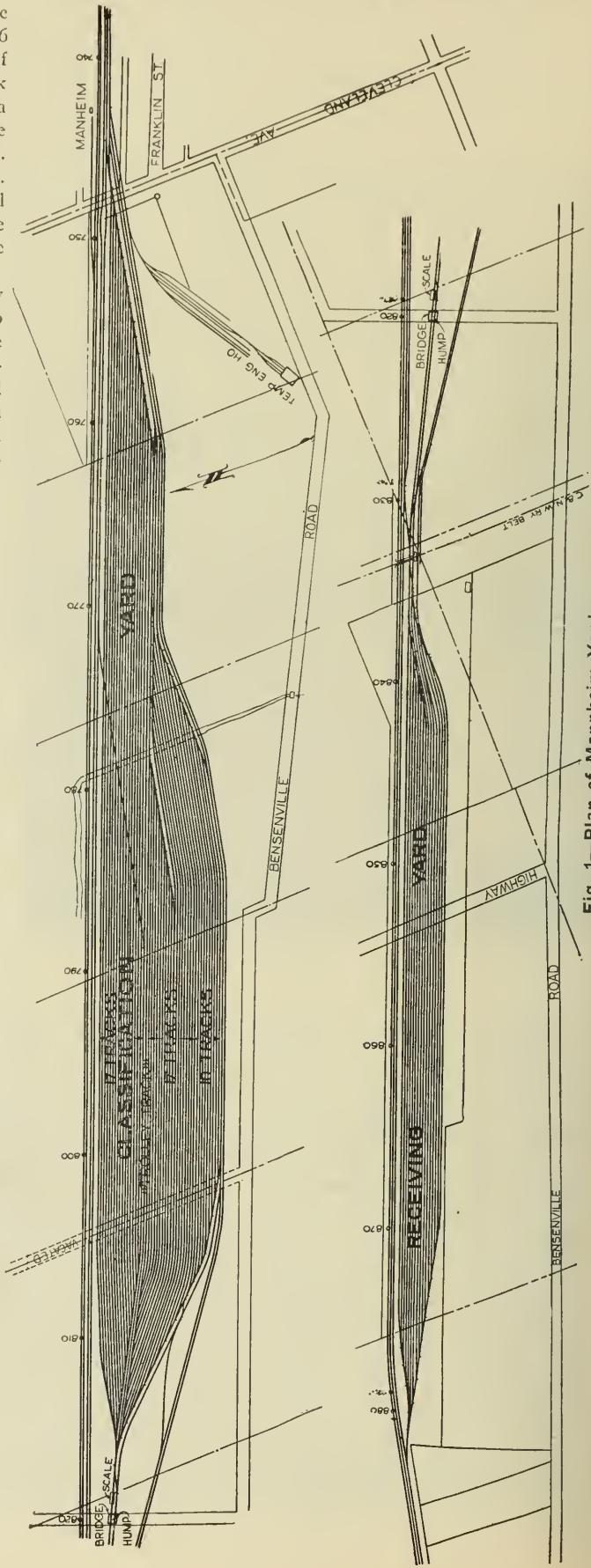


Fig. 1—Plan of Mannheim Yard.

the south main track, dividing this yard into two yards with tracks averaging 2,700 ft. in length. All grain will be placed on the 10 grain storage tracks awaiting shipping instructions. Cross-overs connecting with tracks running around the hump enables strings of cars to be put over the hump again readily when these shipping instructions are received. All tracks in the sorting yard are built to 13-ft. centers, with the first track 33 ft. from the adjacent main track. Along the ladders 20-ft. centers are used except in one case where the trolley track is built 15 ft. from the adjacent ladder on the north. The tracks are built level transversely, drainage being provided by inlets into a double 3½-ft. by 14-ft. concrete box built under the yard near the foot of the grade from the hump. Manholes were built into the top of the box at irregular intervals, and between every third track, and 8-in. vitrified sewers lead into the box on both sides, concrete basins surrounding the top of the sewers being built about one foot below ground level and the basins then being filled to the level of the top of the tie with gravel.

An agreement was made to vacate a highway crossing the classification yard near the west end, and a new road was opened crossing the tracks at the hump, the two elevated tracks being carried over the highway on a reinforced concrete structure of three spans, the roadway span being 20 ft. with two side spans of 13 ft. each. The elevation of the hump was sufficient to provide the required head room with no depression of the highway. The bridge is 40 ft. wide and carries two tracks at 20-ft. centers, with space for a walk for the switchmen on each side. This width of roadway, together with the slopes of the embankment, necessitated abutments 91 ft. long, which were divided into four sections by expansion joints. The piers are of reinforced concrete 2 ft. thick, with stepped footings, the upper step serving also as a hub guard for the protection of the neatwork. The superstructure of the bridge was of slab construction, four slabs of 10 ft. width being required for each span, and all being built in place. The parapets of the slabs were built considerably higher than was necessary to maintain a standard depth of ballast in order to provide for a possible future variation in the grade of the hump tracks.

Temporary facilities are provided at the east end of the yard for the coaling and housing of switch engines only, all road engines going to Galewood. A four-stall frame engine house has been built, together with two 22-ft. clinker pits and an air hoist coaling platform. Three tracks have been provided for a repair yard, where light car repairs can be made. A 6-in. well is now being driven to provide water for engine use. A 70,000-gal. wooden tank will be erected and two cranes installed at the east end of the yard.

Practically the entire yard was built on a fill ranging up to 6 ft. in height, but averaging about 3 ft. Over 500,000 yards of material were required in the filling, this material being brought by train from a large gravel pit near Spaulding, about 20 miles west. Owing to a scarcity of equipment during the early part of the work, flat cars were used, and the unloading was done largely by hand, but as soon as the equipment could be diverted from other construction work, Haskell & Barker cars and Lidgerwood unloaders were used. Every alternate track was laid on the ground and raised to grade, the spaces between being filled by spreading from these tracks. All ladders and turn-outs are laid with 85-lb. rail. No. 10 frogs being used. About half the yard tracks were laid with second-hand 85-lb. rail. The rest is mainly 75-lb. rail, a little 66-lb. rail being used. Creosoted ties were largely used, tieplates being placed on all switch ties and on all soft ties on curves. Two additional main tracks for freight service were built from Galewood to Mannheim, and one from Mannheim to Bensenville.

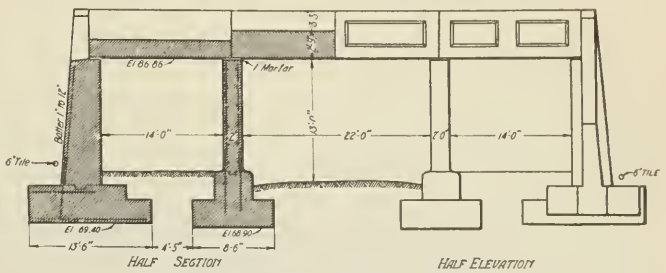


Fig. 3—Section of Bridge Under Hump.

On these tracks new 90-lb. and 100-lb. rails are used on hardwood ties.

While but 28 tracks were completed in the classification yard last fall, the yard was put in service and operated for about two months to handle the heavy business. When the traffic fell off so that the Galewood yard could handle it, operation was stopped until the yard could be completed this spring.

This work was done under the direction of D. J. Whittemore, consulting engineer; C. F. Loweth, chief engineer, and W. L. Webb, district engineer, to whom we are indebted for the foregoing information.

The first sod of the Hodeisa-Sanaa Railway, Arabia, was cut on March 2 by Gen. Izzet Pasha in the presence of several high officials, the foreign consuls, Arab and European residents, and an assemblage of prominent Arab sheikhs and seyds from the neighboring districts. The new railway will form an outlet for Mocha coffee and the hides and skins of the Sanaa region, and may be expected to stimulate both the export of these products and the import of foreign goods.

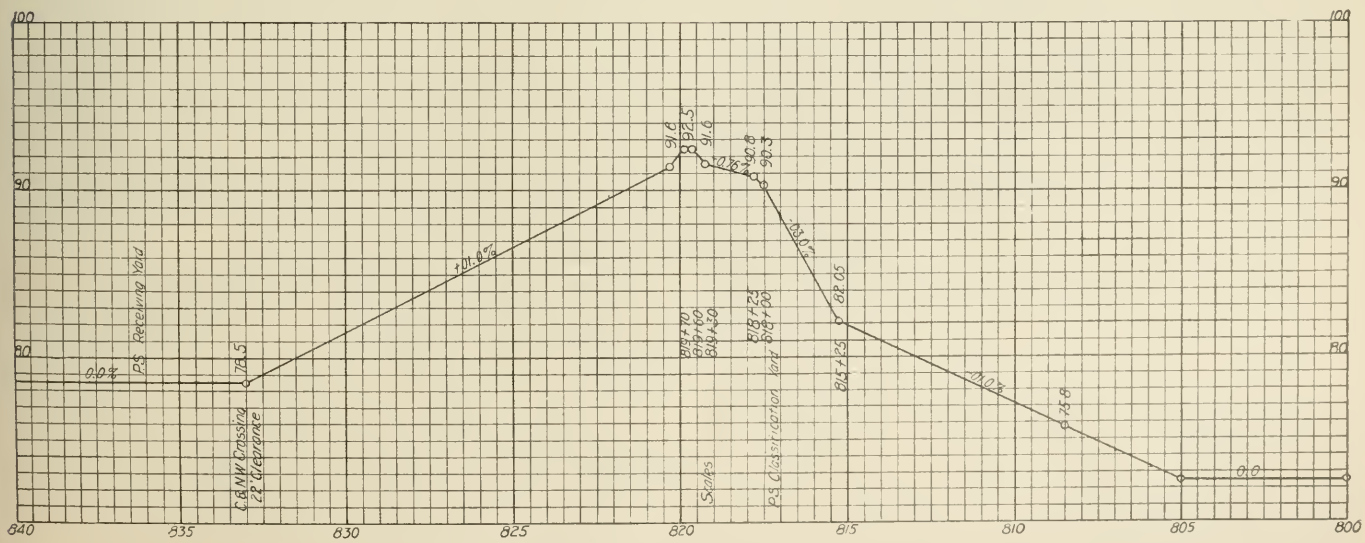
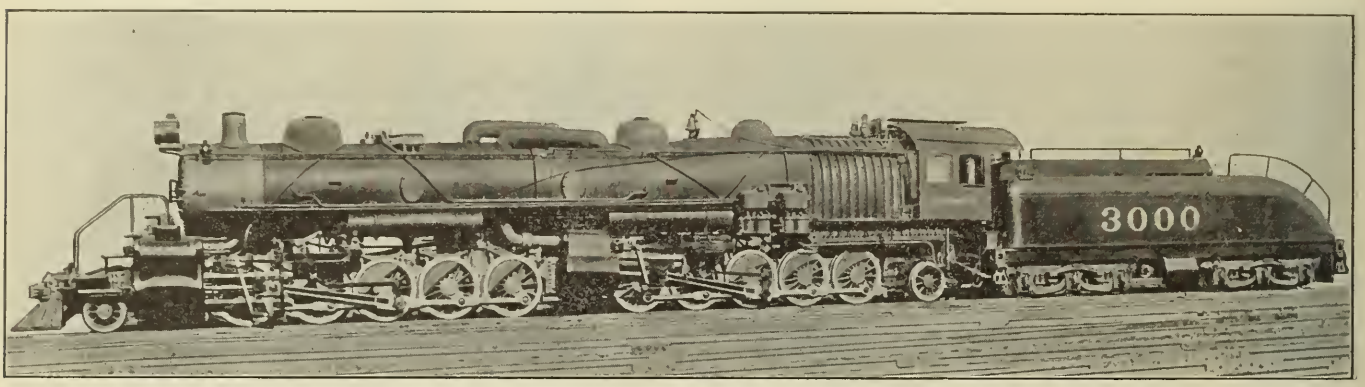


Fig. 2—Profile Over Hump; Mannheim Yard.

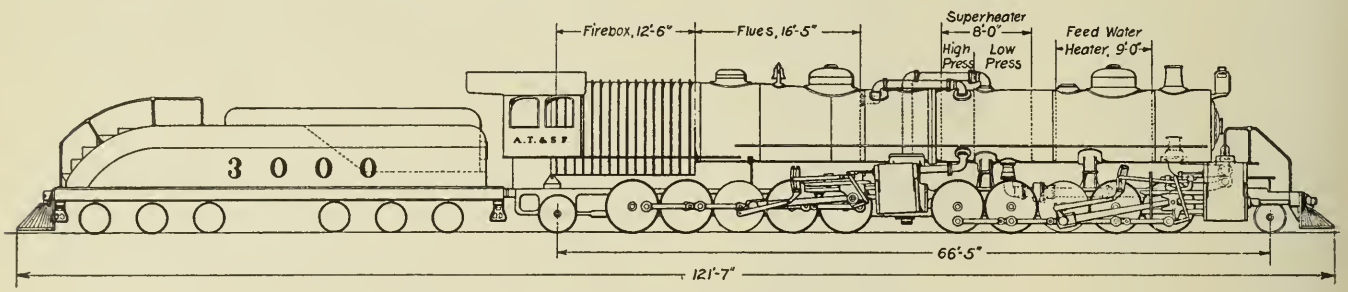
THE LARGEST LOCOMOTIVE.

The largest locomotive in the world, converted from two decapods by the Atchison, Topeka & Santa Fe, as mentioned in the *Railway Age Gazette* of March 31, page 801, is shown in the accompanying illustrations.

It is a Mallet, with the 2-10-10-2 wheel arrangement, and was rebuilt at the Topeka shops of the Santa Fe. The boiler is of the rigid separable type and is equipped with the Jacobs-Shupert firebox, arranged for burning oil, a feed-water heater, superheater and reheater. The total heating surface of 8,466 sq. ft., is proportioned as follows: The evaporating or steam generating surface has 3,920 sq. ft.; the superheater, 580 sq. ft.; the reheater, 1,307 sq. ft., and the feed-water heater, 2,659 sq. ft. The high pressure cylinders are 28 in. x 32 in., and the low pressure 38 in. x 32 in. With a working boiler pressure of 225 lbs. the locomotive will develop 110,000 lbs. tractive effort, which is 1,700 lbs. greater than the 2-8-8-2 Mallet built for the Santa Fe by the Baldwin Locomotive Works in the latter part of 1909. The total weight of the engine is 500,000 lbs., of which 440,000 lbs. is on the drivers. The total length of engine and tender is 121 ft. 7 in., and the rigid wheel base of the locomotive is 19 ft. 9 in. The tender weighs approximately 250,000 lbs. It has two six-wheel trucks, a water capacity of 12,000 gals., and an oil capacity of 4,000 gals. The tender is not exceptionally high and is curved at the back. The latter feature is to reduce the wind resistance and the former to allow the engineer to look over the tender, for the engine is so long that it is necessary to run it backward to permit the engineer to have the necessary view of the track. Three of these locomotives have been rebuilt at the Topeka shops, and are in service on the mountain grades in Arizona.



Mallet Locomotive Converted from Two Decapods; Atchison, Topeka & Santa Fe.



Dimensions of Converted Mallet; Atchison, Topeka & Santa Fe.

The Chilean government has 1,491 miles of railway under construction at an estimated cost of $74,933,300. The work already done on these lines has cost $24,645,790. In addition to the foregoing, there are 694 miles of railway under consideration. When these lines are completed the government will control about 3,600 miles of railway. Parties desiring to get in touch with this work should correspond with the Director General de Industrias y Obras Publicas, Santiago, Chile.

NEW RAILWAY LAWS IN MAINE.

The Maine legislature, which adjourned on March 31, passed a considerable amount of railway legislation, but the most important events of that kind were the omissions, the bills rejected; notably the proposed law for a public utilities commission to take the work of the present railway commission and have supervisory authority over other forms of public service corporations. Among other measures that failed were several labor bills, including further restrictions on the trustee process and the repeal of the fellow-servant, contributory-negligence and assumption-of-risk doctrines. Still other defeated measures include the proposition to tax railways on a valuation basis, to make preferred stock of the Boston Holding Company a legal investment for Maine savings banks, and a bill for a state income tax.

The laws enacted included the following:

For a commission to investigate the question of savings bank investments.

Favoring a federal constitutional amendment for an income tax.

For the state to maintain a fire patrol along the railways in unorganized townships during times of drought, the cost to be collected from the railways.

To require granting of licenses by fish and game commission before live fish or game may be transported from the state, and another law for tightening of the similar restrictions on dead fish and game, and limiting the amount.

For compulsory weekly payment of wages.

To make a holiday of Columbus day, October 12.

To forbid removing packing or waste from locomotive or car journal boxes; penalty $500 fine or three years imprisonment, or both.

To allow free transportation of policemen and firemen.

To authorize street railway locations on private lands when "it appears that the public service of said corporation would thereby be better performed," an act granted for the benefit of electric railways which wish to handle freight.

To require shop accidents to be reported to the state labor commissioner.

To authorize courts to appoint directors of corporations when election at a stockholders' meeting fails.

For slight increases in the excise taxes on railway, express and telegraph companies.

To add breaking the seal of a car to the list of offenses included in malicious mischief.

To provide for decreasing stock of corporations by first cancelling unissued stock.

To add secretary and assistant treasurer to list of officers authorized to issue stock certificates.

To make it a misdemeanor to fail to pay fare to a common carrier of passengers, even if the fare is not demanded.

A more stringent fire escape law, so drawn that it applies to offices in the second story of a building.

To provide that a real-estate agent's contract for sales of property shall be void after one year, the law being so drawn that it would include bargains for rights of way or yard or station room.

To authorize one member of the railway commission to make physical examinations of railways.

To exempt mortgages from taxation except a recording tax.

To regulate transportation of corpses of persons who died of infectious diseases.

For advertisement of corporations delinquent in payment of annual franchise taxes.

To require foreign corporations to pay an annual license fee for doing business in Maine.

The Bangor & Aroostook was granted the right of eminent domain for the proposed 157-mile extension through the woods from West Seboois via Nahmakanta, Chesuncook dam, Chamberlain lake, Pokumkeswawgamokesis lake and the east bank of the Allegash river to St. Francis.

A charter was refused for a bridge to allow Canadian railways to enter the town of Van Buren.

A charter was granted the Eastern Maine Railroad to build a nearly direct line from Brewer via Bancroft to Houlton, thus invading Bangor & Aroostook territory. At the committee hearing it was asserted that this would violate Bangor & Aroostook prescriptive rights, and the answer was that that was a question for the courts.

Charter rights were granted the Aroostook Valley Railroad, an electric line, for the acquirement of the Presque Isle branch of the Canadian Pacific and electrifying the same; for building an extension from Washburn via Woodland to New Sweden, and another extension from Woodland to Caribou; also for an extension from Washburn to the west line of the state adjoining L'Islet county, P. Q., which would give a short line from Quebec to the salt water at St. John, N. B. These were opposed by the Bangor & Aroostook.

The name of Portland Union Station Company was changed to Portland Terminal Company, and rights confirmed, including equal ownership by the Boston & Maine and Maine Central. Eminent domain powers were granted for enlargement of yard and for land for erection of shops, and also right of electrification.

The Wiscasset, Waterville & Farmington (narrow-gage) was granted the right to abandon its line between Weeks' Mills and Winslow, where it has electric competition, and an alternative bill was passed for reviving the charter of Waterville & Winslow Bridge Company, to build a bridge by which the W. W. & F. may enter Waterville.

A charter was granted to the Lubec, East Machias & Machias, and similar charters to the Farmington & Augusta and Knox County Central (from Friendship via Union to Belfast), all of which charters allow option of steam or electric power.

Authority was granted to the Maine Central Railroad for absorption of its subsidiary roads, the Washington County, the Sebasticook & Moosehead and the Somerset. An attempt was made to couple with this a provision for a compulsory perpetual two-cent passenger fare, but it was defeated. Charter rights were renewed for the Rangeley Lakes & Megantic, a Maine Central subsidiary which proposes to build from Oquossoc, Me., to Megantic, P. Q.

Charter renewals were granted three companies which propose to use either steam or electric power—Ocean & Northern to build from Gouldsboro, Lincoln County to build from Wiscasset or Damariscotta to Boothbay Harbor, and Winter Harbor & Eastern, and Penobscot Bay to build from Castine.

Charter renewal was granted the Bethel & Rumford Street Railway Company, and to a large number of other electric railway companies.

ELECTRIC VS. STEAM LOCOMOTIVES ON THE NEW HAVEN.*

BY WILLIAM S. MURRAY.†

The religion of this article is to preach the doctrine of universal use of single-phase current on trunk line roads inclusive of suburban and terminal territory, as applied to freight and passenger operation, and I offer for consideration the standardization of 11,000 volts on the contact wire and a system frequency of 25 cycles. The 11,000 volts on the contact wire is advocated for application on railway right-of-way which may be adjacent to foreign road territory to permit of one company's equipment operating on the right-of-way of another. This voltage is recommended as a minimum potential; it being recognized that there is no objection to a higher voltage on other lines individual to themselves where transmission economy can be obtained by the use of the higher voltage.

Recommending 25 cycles as standard for single-phase electrification is not so much based on the successful use of this frequency on the New Haven road as on my belief that the future will undoubtedly see single-phase locomotive induction motors and probably single-phase current received at the terminals of the locomotive and transformed into direct current without the use of any rotating element within the locomotive. If 15 cycles, as some have been prone to recommend of late years, be elected as a standard frequency, it would handicap, if not eliminate, the oportunity of obtaining one of these two highly desirable alternatives entirely within reach by the use of 25 cycles.

The whole problem of electrification, if viewed from the point of whether it is to pay, settles down to how much it costs to produce the necessary tractive effort required in the passenger express locomotive, the passenger local locomotive, the freight road engine, and the freight switch engine, together with such other costs incident to the electrical system. The writer, during the past four years, has had the opportunity of studying these four classes of steam locomotives. The electrical man must realize that to make his electrification pay he must be able to reproduce the four classes of steam tractive efforts by electricity, with a total investment, the interest on which must be carried by the economies to be effected over steam operation. Numerous steam locomotive tests were made between New Haven, Conn., and New York for the purpose of obtaining data as the power required. Incidentally it was shown that it takes 0.169 lbs. of coal, 0.194 lbs. of coal and 0.335 lbs. of coal to produce a ton-mile in freight, express passenger and express local passenger service respectively.

The data obtained which were most interesting to the writer were the indication of the size of locomotive required to accomplish express and local schedule between New Haven and New York. The horse-power per ton of train movement immediately afforded a check on the capacity of the engine required, showing the normal size of unit to be elected, which, under an arrangement of multiple unit control, permitted the proper amount of engine power to apply to trains of varying weight; the other data most interesting and important to the writer was the water

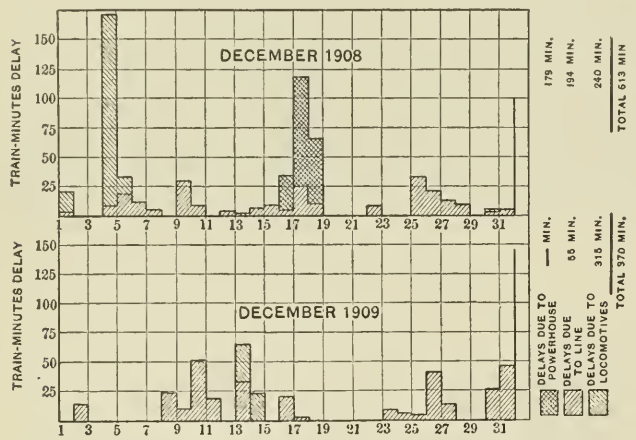
* Abstract of a paper read before the American Institute of Electrical Engineers at Toronto, Can., April 9, 1911.

† Electrical engineer of the New York, New Haven & Hartford.

consumption, giving a close check on the relative energy requirements between express and local service. This analysis of the steam engine under operation for trunk line conditions incident to the New Haven, caused us to choose for our passenger unit a locomotive, the normal capacity of which was 1,000 h. p. at the rim of the locomotive wheels, and this size in practice has borne out our estimate of the capacity required.

Studying the freight engine requirements of a trunk line, from a steam locomotive point of view, I had a series of tests made on typical freight engines, the runs being over a distance of 55½ miles, and in this case trains varying in weights between 720 and 1,500 tons, including weight of engine, were used. The figures obtained show that the average evaporation of water per pound of coal is 6.9; that the average indicated horsepower varied from 655 minimum to 892 maximum and the average speed varied from 23.5 miles per hour minimum to 31.5 miles per hour maximum.

The electrical locomotive which we have designed to handle our general class of freight service, or what could be correctly called our electric freight road engine, has a normal horsepower rating of approximately 1,400 h. p. This capacity provides a margin above the requirements indicated by the tests. The excess capacity, however, is highly desirable in virtue of its affording the electric locomotive an opportunity to operate heavier trains and at a higher schedule speed than the steam

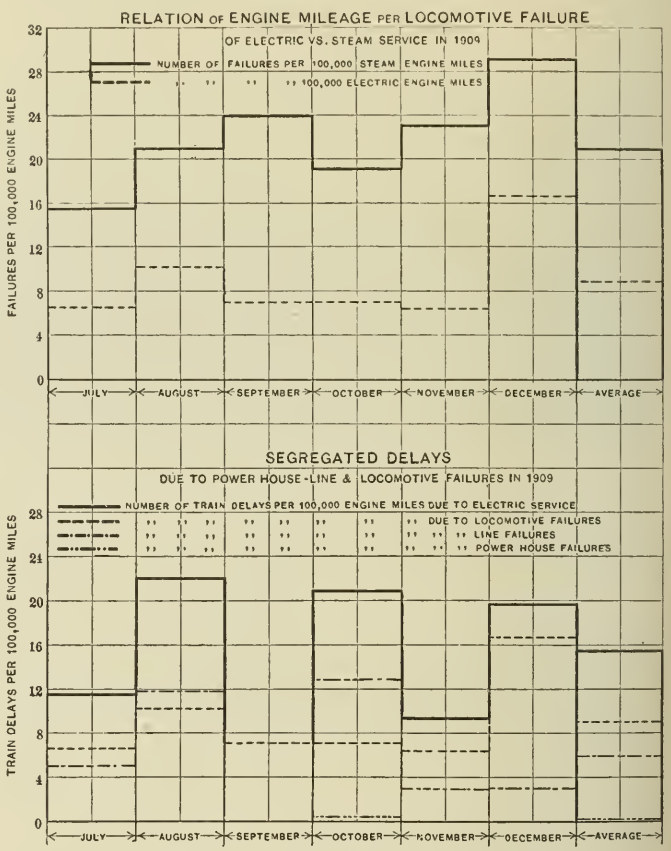


Train Minute Delays, December 1908-1909.

locomotive it replaces. A series of tests were made on electric freight locomotive 071 operating between Stamford, Conn., and New Rochelle, N. Y., hauling a dead steam locomotive with 37 freight cars and a caboose, the total weight of the train being 1,438 tons. The average speed over a distance of 1,675 miles was 36.5 miles per hour, the average kilowatt input being 1,487 k. w.. with an average rim horse-power at the drivers of 1,650 h. p.; notwithstanding the locomotive was dragging a dead engine throughout this run, it accomplished the work at an average energy rate of 25.9 watt-hours per ton-mile. Not uninteresting is the flexibility offered by the electric over a steam locomotive, in noting that its limitation of service is not absolutely confined to one class.

By far the most interesting investigation of the four types of steam engines employed in trunk line service was that of the steam switching locomotive. In the many yards of the New Haven lines none afforded a better opportunity to study this type of engine than at Harlem River, where the duty imposed on the switching locomotive, beside that of classification, included also float work, calling into account the necessity of heavy drafts of power and sustained for periods longer than usual to other switching yards; but even with this additional duty to perform, the relatively small amount of energy required for this work was a great surprise. From April 8 to April 29, 1910, careful observations for twelve days of switching movements were made on our switch engine 2,392, nine days of which were in the Harlem River yard and three in the Oak Point yard.

Careful measurements of coal weights were made, in order to secure the resulting rate of evaporation which was noted to approximate seven pounds of water per pound of coal. As an interesting record of the practical method of coaling a switching locomotive for an eight-hour shift, the words of the engineer are quoted in his report with reference to these tests: "About a half-hour before going to work each morning the tank was loaded with 8,000 lbs. of hard coal. The engine was then taken to the pit and the fire cleaned, and a new fire of coal built. To build this first fire required about 2,500 lbs. of coal, and the engine worked on it for about three hours. At the end of three hours the grates were shaken and the fire dressed and built up with about 1,500 lbs. more coal. This second fire lasted about two hours, and at the end of that time the grates were again shaked, fire dressed and the third and last fire built. This required about 1,500 lbs. and lasted until the finish of the eight hours' work. After the day's work was completed the engine was taken to the house and enough coal left in the tank to keep the fire until the next morning when the engine went to the pit to have fire cleaned and built up for the day's work."

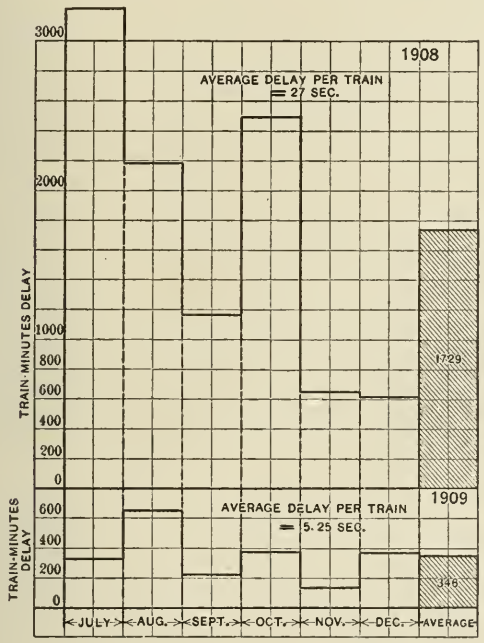


Relation of Engine Mileage to Failure.

It would be to go ahead of our story to speak of an electric switcher here, but does not the above described operation suggest it? Again, space does not offer the opportunity to discuss the hourly movement of the engine in the yard. One brief paragraph from the testing engineer's report will suffice: "When not pulling and loading floats the engine was employed making up trains to load floats, and doing other miscellaneous work." Not uninteresting, too, is the closing paragraph of his report, which is as follows: "On following the work of engines, one is forced to the conclusion that the ratio of weight to tractive effort is too low. This may be due to poor trackage, road-bed, etc., but even with sanded rails and all other conditions available the engines are inclined to slip, thus losing time in accelerating. This is a bad fault in a switching locomotive,

and especially bad in such yards as Harlem River and Oak Point, for since the speed is limited and the coupling, uncoupling, connecting air, etc., can be only done so rapidly, the only method of increasing the amount of work done is to increase the accelerating power of the engine used." There is, of course, this much to be taken into consideration—that the more constant torque of an electric locomotive accelerating a drawbar pull would have less tendency to slip than a steam locomotive accelerating that same pull.

It was shown that the average horse-power during the time the throttle was open was approximately 313; but it was noted that the engine was developing power for only 36.7 per cent. of the time, and thus the average energy developed during the hour was approximately 115 h. p. The reduction of the energy developed by a switching engine to an average of 115 h. p. has been something of a revelation to the writer, and the two most important things it suggests are: That in switching, yard speeds can be greatly increased by the use of an electric switcher of very much less engine capacity than that used in the steam switcher. On account of the low average rate of energy required for their operation, a central power station will deliver



Tabular Summation of Train Delays.

at far higher efficiency the power necessary to the electric switching engine, than that obtained from the power plant individual to the steam switching engine itself. Immediate application of this statement is seen in the ratio of the pounds of coal burned to the number of horse-power-hours developed, which is seen to be 6.4. Increasing this by the coal burned during the idle hours of the engine, this ratio approximates 8. It has been demonstrated that the ratio between the coal burned for operating passenger trains by electric, rather than steam locomotives, is 1 to 2. In the case of switching engines this rate is much greater, a figure of 1 to 3 being conservative.

In the paper entitled The Log of the New Haven Electrification, presented before the A. I. E. E., by the writer in December, 1908, there was given a table of train minute delays with their causes and a set of graphical charts supplementing them, which gave a fair idea of the general character of the service resulting in the early days of operation shortly after the construction had been sufficiently advanced to permit a trial of full operation between Stamford and New York City. For comparison a table and chart for the month of December, 1908 and 1909, is shown herewith. The most interesting thing to note in this table of more recent operation is the disappearance of delays. The total train minute delays for the six months' consecutive operation in 1908 were 10,373 train minutes; and summing up the train minute delays for the corresponding six months' consecutive operation in 1909 we find the train minute delays to be 2,076. Thus, the train minute delays for the six months of 1909 were one-fifth of the train minute delays for 1908.

In the summation sheet it is interesting to note as a more intimate acquaintance with the system's characteristics and a better knowledge of the details that needed correction or change were impressed upon us in the regular log of operation, the train minute delays steadily decreased, with the exception of one month (October, 1908,) in which, as brought out in the author's previous paper, there was a serious power house delay, due to the explosion of an oil switch. The delays as shown for the six months of the year following show the system's stability of operation, and this was anticipated by those who had not composed its obituary in the early days of its first trial.

A comparison of the 1909 to the 1908 train minute delays is immediately indicative of the fact that even in this short time the disturbing factors of the system had disclosed themselves and had been eliminated. Eighteen months after commercial service was inaugurated our electrical failure report shows a record of over 15,700 miles per engine failure. Between November 2 and 23, 1909, 66,000 electric locomotive miles were run, and this mileage, which is approximately eleven round-trips from New York to San Francisco, was accomplished with a total of three minutes' delay.

These same eighteen months have yielded an abundance of new information concerning the characteristics of the system, inclusive of power house, line and locomotives. Though all of these departments contributed their share of train delays in our initial operation, the unlooked for troubles, which while not in any way fundamentally attacking the principles of the system, reflected upon it, for traffic delays are always a good factor in the public estimate and have sometimes been misapplied as arguments against the system by those who should have discriminated between the incidental and the fundamental.

An interesting relation between failures for trunk line service of electric vs. steam operation, is shown in the accompanying chart. As is to be noted in the lower diagram of the figure, the power house failures in its effect on engine mileage is almost nothing. On account of the severe handicap that has been placed on the overhead wire by steam locomotive stack discharges directly beneath it, a number of failures per 100,000 engine miles are recorded. An elimination of the steam service under the electrified wires will greatly reduce, if not entirely eliminate, failures due to this part of the electrical system. In the upper diagram of the figure is shown the relation of electric engine mileage per failure vs. steam mileage. It is to be noted in this that the electric locomotive failures are nine per 100,000 electric engine miles, while the steam, which is an average figure for all of the divisions of the New Haven, is 21. Thus, it would seem that the electric locomotive service is 133 per cent. better than the steam.

FOREIGN RAILWAY NOTES.

The plans submitted by the Southern Railway for the construction of an industrial branch to the Tandil quarries have been approved by the Argentine government.

The plans, details and descriptive report, submitted by the Southern Railway, covering the northern section of the branch which it will build from Olavarria to Vela, have been approved by the Argentine government.

The president of the Argentine republic has approved the report made on the construction of the section of the branch line of the San Antonio Railway comprised between Corral Chico and Maquinchao. The total cost of this branch is estimated at $3,799,050.

General News Section.

The small shops of the Boston & Maine, at Sanbornville, N. H., were destroyed by fire April 8. Loss, $50,000.

Frederick A. Delano, president of the Wabash, has been elected president of the Commercial Club of Chicago.

The Canadian Pacific intends to start 50 new towns on its line in western Canada this year; the Grank Trunk Pacific 24 towns; and the Canadian Northern 96.

In the Federal court at Indianapolis the Baltimore & Ohio Southwestern has been fined $225 for violations, in 1909, of the law forbidding trainmen to be kept on duty more than 16 hours.

The legislature of New Jersey has appropriated $500,000 for the purchase of a right-of-way, which it is proposed to present to the federal government, for a ship canal across that state from Bordentown to Raritan bay.

The legislature of Ohio has passed the Winters' Public Utility Bill, enlarging the powers of the state railway commission and giving it control over all public utilities except those which receive their franchises from city authorities.

The Vandalia Railroad during the past three years has had no passenger killed in a train accident. The number of passengers carried was 9,800,030. The number of passengers injured in train accidents during the three years was 67.

The Canadian Railway Commission, according to a press despatch, asks the attorney general to prosecute the Canadian Northern for operating a branch line in Manitoba before being authorized to do so. The penalty for this offense is $200 a day.

The government has filed suit in the Federal Court at St. Joseph, Mo., against the Chicago, Rock Island & Pacific to recover $30,000 for alleged violations of the nine-hour law governing employees engaged in operating and despatching trains.

Suit has been filed in the United States district court at Guthrie, Okla., by United States Attorney Embry against the Atchison, Topeka & Santa Fe for violation of the hours of service law. A total of $29,500 in penalties is demanded by the government from the Santa Fe.

The Atchison, Topeka & Santa Fe has notified its employees that they must not assign their wages or execute powers of attorney to others to collect for them. Violation of the rule will be sufficient cause for dismissal. Employees must not accept assignment from other employees.

The Reading-Central of New Jersey line last week ran a special train of 10 cars, carrying the musicians of the Metropolitan Opera House, from Philadelphia to Jersey City, 90 miles, in 102 minutes. This is only four minutes longer than the time of the regular four-car and five-car trains.

Local newspapers report that the Empire state express of the New York Central one day last week was run from Syracuse to Buffalo, 149 miles, in 140 minutes. Train No. 11, the Southwestern Limited, recently traversed this distance in 137 minutes. Train No. 11 leaves Syracuse at 8.26 p. m.

The number of bills affecting railway operation which have been introduced in the legislature of Iowa this year is 10. This item is given by way of supplement to the tabular statement printed in our last issue, showing bills introduced in 36 states. With Iowa included, the total number of bills introduced in all the states is 484.

The Chicago Engineers' Club has leased the property at 318 Federal street, Chicago, for a term of ninety-nine years. It is stated that the three-story building now on this property is to be enlarged by the addition of four stories and that the lower three floors will be sub-let to a restaurant company, the fourth and fifth floors to be used for the Engineers' Club, the next floor for bedrooms for visiting members, and the top floor to be rented.

The Washington State Chapter of the American Institute of Architects, at its meeting in Seattle April 5, elected as an honorary member of the chapter, Virgil G. Bogue, C. E., of New York. Mr. Bogue has been advisor to the Municipal Plans Commission, which has under consideration an elaborate scheme for the development of Seattle, and the action of the architects is in recognition of what he has done in connection with that work.

The Brennan monorail car which was on exhibition at the Coliseum in Chicago during the recent convention of the American Railway Engineering Association is to be given to Cornell University, Ithaca, N. Y. This is in accordance with the vote of the railway officers who visited the exhibit. Ernest Merritt, dean of the graduate college of the university, has written to the secretary of the Railway Appliances Association, accepting the gift and saying that it will be a welcome addition to the gyroscopic appliances of the university.

Supplementing the recent announcement by the New York, New Haven & Hartford, that some of its passenger trains would be run, with New Haven engines, over parts of the Boston & Albany, it is now announced that during the coming summer the through trains between New York City and Portland, Me., will be run by way of Springfield and over the Boston & Albany between Springfield and Worcester, 54 miles. Whether New Haven engines and men will run over this section of the Boston & Albany is not stated.

The Western Electric Company has sent to the Seaboard Air Line a supply of telephone equipment for new lines aggregating over 600 miles; namely, Hamlet, N. C., to Wilmington; Hamlet to Columbia; Hamlet to Rutherfordton; and Jacksonville, Fal., to Tampa, Orlando and Venice. Orlando and Venice are on branches and the branch lines will be connected to the office of the despatcher at Jacksonville only when a communication is to be sent, and the selectors on the branches will not be operated when the despatcher calls stations on the main line. The Seaboard Air Line was the first road in the southern states to use telephones extensively in train despatching.

The Central Safety Committee of the Chicago & North Western in summing up the work of the safety committees for the nine months since the organization of the committees, which ended April 9, reports a total of 228 persons killed on the North Western lines, as against 275 for the same period of the previous year, a decrease of 17 per cent. The number of persons injured decreased 15 per cent. Of the persons killed, 75 were employees, and in this item there is a diminution of 17 per cent. The number of passengers killed increased from 5 to 14. "Other persons" killed decreased from 180 to 139, or 23 per cent.; employees injured decreased 13 per cent.; and passengers injured decreased 33 per cent. "Other persons" injured decreased from 470 to 441.

W. D. Williams, a member of the Texas railway commission, has written a letter to Senator LaFollette of Wisconsin giving his ideas of what the bill relating to the valuation of the railways of the United States should provide for. The bill now provides for a "fair" valuation and Mr. Williams thinks that term too indefinite; that it might mean market value, commercial value, reproduction value or several other things. He hopes the bill will be changed to provide for an "investment valuation," which would show the amount of money originally put into the property, and as the amounts spent for betterments and additions from time to time could be added to the first value, the actual value could be known at all times. He thinks this would be the real value and would afford an absolute basis for rate-making if the Interstate Commerce Commission decided to use it for that purpose.

On the evening of April 5, about 8 o'clock, passengers in train No. 27 of the Cleveland, Cincinnati, Chicago & St. Louis, were robbed of about $300 as the train was entering Muncie, Ind. The robber suddenly appeared in the passenger car,

intimidated the passengers with a pistol and jumped off the train within five minutes. A passenger fired at the robber as he got off, and the conductor of the train was shot at by the robber. A robber boarded a passenger train on the Iron Mountain road within the city of St. Louis on the night of April 7 and robbed the steward of the dining-car of $40. An express messenger was robbed on the same section of the road on the night of February 28. An interurban electric car was stopped by two robbers at Ivanhoe, near Los Angeles, Cal., on the night of April 4, and its 30 passengers were robbed of about $500. After the passengers had been robbed they were ordered out of the car, and the motorman was compelled to carry the robbers forward about one mile, to a point within the city limits, where they left it and fled.

The Pennsylvania State College. State College, Pa., offers an option in railway mechanical engineering to the fourth year students in the mechanical engineering course which aims to prepare them for the engineering and operating departments of railways. It provides considerable theory and practice in locomotive design and operation. The college has exceptional opportunities for carrying on this work, in that it has access to the Altoona shops of the Pennsylvania Railroad, which are only 60 miles from the college. The Pennsylvania testing plant and dynamometer car have been used for tests in the past two years. The special locomotive equipment at the college includes a locomotive completely fitted for tests, operating on 20 miles of track; Westinghouse and New York air-brake test racks; switch and signal apparatus, and locomotive detail drawings. Special lectures have been given by F. H. Parke of the Westinghouse Air Brake Company, by Geo. R. Henderson of the Baldwin Locomotive Works, and by others prominent in the railway world. The course is under the direction of Prof. Arthur J. Wood, who has had a broad experience in both teaching and railway engineering practice. The students taking this work are required to spend a summer vacation or its equivalent with some railway or locomotive company.

An Exhortation to Efficiency.

Edmund Pennington, president of the Minneapolis, St. Paul & Sault Ste Marie, has issued a circular to employees asking closer application, attention to detail, courtesy and the cultivation of the good will of the people. The circular reads in part as follows:

"The constant reduction in rates and the increased cost of labor and material have made it necessary to reduce our transportation expenses as much as possible. To do this we have made large expenditures in the last few years in reducing grades, securing heavier and more improved power and equipping shops with modern tools, until the limit has about been reached. The earnest request by the railways for an increase in rates having been denied, an effort must be made to further reduce the cost of operating the road, and as I look at it the only thing left is to increase the efficiency of each and every department. No doubt considerable saving can be made by the head of each department in studying his department thoroughly to see if greater efficiency cannot be obtained."

Smooth the Passenger's Way with a Thoughtful Suggestion.

J. M. Connell, general passenger agent of the Atchison, Topeka & Santa Fe, has sent to all passenger employees the following letter on courteous treatment of the public:

"Let none of us seek opportunity to humiliate a passenger through an assumption of superior knowledge or an exacting or sarcastic attitude; as for illustration: A passenger rushes up to the window and demands to know the time of the next train west. Don't draw his attention to the vast area located to the westward, and point out the impossibility of your anticipating to what particular point he is destined; or, being technically inclined, give him the time of departure of the next train west, regardless of conditions whether it is a local train or a limited. This attitude is not clever.

"Place yourself in the passenger's position; realize that the apparent thoughtlessness of his question is not intended to annoy you, or to give you an opportunity to enjoy your humor at his expense. Endeavor to consider his questions intelligently, and appreciate their true import. Answer him courteously and patiently. Perhaps your hurried passenger is destined upon an unpleasant or sorrowful journey; do not make his discomfort more poignant by the unfriendly and hostile attitude, but be glad to smooth his way a bit with a kindly word or thoughtful suggestion.

"We often have inexperienced passengers whose journey makes it necessary to change cars one or more times. Take pains to show them their route, and explain what time their train leaves the junction point, how long they will have to wait at such point, etc.

"It is a good plan, especially in the case of aged people, to take a timetable and mark with pencil each train the passenger is to use, also junction point. This information, with the assistance of our conductors, will give the passengers the experience of traveling without worry. * * *

"Never allow any personal feeling toward a prospective passenger or inquirer for information to enter into business, but bear in mind that you are not acting for self individuality, but as the representative of the company, the principal motive being to maintain good will between the company and its patrons."

Bureau of Explosives.

The Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, 24 Park Place, New York City, has issued the annual report of chief inspector B. W. Dunn, giving a review of the work of the bureau for the past year, and statistics for the past three years. The membership of the bureau now includes 194 railways, 11 steamship lines and two express companies. The total number of inspections made by the bureau in the year ending December 31 was 18,615, made up as follows: Inspections of stations, 15,986; of factories, 315; of magazines, 1,528; of steamship piers, 139, and of cars in transit, 647. The most significant item in the statistical table, that showing the total number of boxes of high explosives condemned as unsafe for transportation, remains large; 10,902 this year and 10,029 in the preceding year. One thousand two hundred and ninety-one kegs of black powder were condemned (1,468 kegs in the year preceding). The total number of persons killed by explosions in transit has been as follows: In 1907, 52; 1908, 26; 1909, 6; 1910, 1.

Colonel Dunn says that practically all storage magazines have now been discovered and have been brought under the supervision of the bureau, so that he expects to see a decrease in the number of defective packages offered for transportation. Much work has been done during the past year in improving the regulations for the transportation of inflammable articles and acids. There is much difficulty in this work because of loose practice in describing shipments. It is hoped to get the Interstate Commerce Commission to approve strict rules for the description of dangerous articles, and if such a rule is thus approved, it will have the force of law.

Colonel Dunn recommends the use of metal barrels for the transportation of gasolene, benzine and naphtha and metal cans for inflammable liquids. He finds that many breakages of carboys are due to the poor quality of the glass of which they are made.

After making extensive inquiries covering many countries, Colonel Dunn has prepared a schedule of minimum distances which should be maintained between magazines used to store explosives, and inhabited buildings or public railways. For example, a magazine containing 1,500 pounds of explosives should be not less than 600 ft. from inhabited buildings, or 360 ft. from a railway; but these distances are for cases where there is either a natural or an artificial barrier between the magazine and the house or railway. If there is no barrier the distances should be at least doubled. Many magazines are improperly located, and where the owner does not willingly remove them, application should be made to the courts to declare the magazine a nuisance.

The bureau is slowly getting into touch with the express business, where it is found there is much need for improvement. Regulations were issued by the express companies last summer, but they have not been well carried out.

Rough treatment of cars containing explosives is declared to be the most serious menace to safe transportation at the present time. Trainmen see that rough handling does not produce any visible injury to cars and so they do not reform their practice.

Disaster is certain to ensue if trainmen are not made more careful. A single explosion would quickly reverse the favorable records of the past two years. If no other means are successful, careless trainmen ought to be prosecuted criminally under section 235 of the act of March 4, 1909. Notes are given of seven serious cases of rough treatment of explosives in cars during the past year. Several shippers have been prosecuted criminally during the past year for clandestinely transporting explosives on passenger trains. Colonel Dunn and his assistants have continued to give lectures to railway employees throughout the country, and he has issued an illustrated pamphlet, showing how to load explosives properly. This pamphlet costs 20 cents a copy; 15 cents each for 100 copies; 10 cents each for 1,000 copies; 5 cents each for more than 1,000. The report has 120 pages of appendices, containing instructions for loading, geographical information, etc.

New Railways in Texas.

Reports made to the engineering department of the state Railroad Commission of Texas show that there is a large amount of railway construction in progress in Texas at this time, and the prospects are favorable for starting work on a number of new lines within the next few months. It is said that the failure of the legislature at its recent session to enact any law hostile to railway and other corporation interests has created a favorable impression in financial circles, and that this improved condition is reflected in the increased activity in railway construction. Several of the larger railways are making important extensions, of which a correspondent sends us the following summary:

The Atchison, Topeka & Santa Fe inaugurated a vigorous construction campaign in Texas more than two years ago and is still keeping up the work with no indications of an early cessation. In addition to the 310-mile cut-off between Coleman, Texas, and Texico, branch lines are being built which include the following: From Lometa west to Eden, about 100 miles, along the rich valleys of the San Saba river and Brady creek; from San Angelo, northwest to Sterling City, 40 miles, following the valley of the Concho river; from Plainview, south to Post City, about 100 miles, through a productive part of the western Panhandle; from a point on the Plainview-Post City line, southwest to La Mesa, 55 miles; from Plainview, east to Floydada, about 30 miles. More than one-half of the Coleman-Texico cut-off line is now finished and in operation. The Atchison, Topeka & Santa Fe interests are also back of the Port Bolivar Iron Ore Railroad which is building a 30-mile line from Longview to the iron ore fields in Cass county, in northeastern Texas.

The Kansas City, Mexico & Orient is pushing construction work on the main line and the Del Rio branch in Texas. Grading and track laying forces are at work between San Angelo and Fort Stockton, and between El Dorado and Del Rio. The company expects to finish more than 200 miles of new track during the present year.

The Texas Central, which is now owned by the Missouri, Kansas & Texas, is preparing to begin the construction of important extensions. It recently amended its charter to provide for extending the new branch, that was recently finished to Cross Plains west to Nolan, 100 miles. The main line of the Texas Central will be extended from Rotan west to Roswell, N. M., about 300 miles. The Missouri, Kansas & Texas will also obtain a southeastern outlet by connecting up its isolated line that now runs between Trinity and Colmesneil, 67 miles, in eastern Texas, with its main line and the Houston & Texas Central at Waco, and by building an extension of about 75 miles from Colmesneil southeast to Beaumont. From Trinity to Waco is about 150 miles. All of these construction plans have been definitely decided upon and the work will be started during the present year.

The Southern Pacific is preparing to carry out considerable new construction in Texas during the year. It has already made public its plans for constructing a cut-off of about 50 miles between Giddings and Stone City in the central part of the state. It is reported that it will extend the Llano branch of the Houston & Texas Central from Llano west to Menardville, about 75 miles.

The St. Louis & San Francisco recently finished work on a branch from Brady to Menardville, about 50 miles, and this line, is said will be continued south to a connection with the Southern Pacific, the Kansas City, Mexico & Orient and the National Railways of Mexico at Del Rio, about 175 miles. It will give the St. Louis & San Francisco a new outlet to Mexico and establish a new north and south line in Texas. It is reported that the work of constructing the long contemplated extension of the Fort Worth & Rio Grande division of the St. Louis & San Francisco from Brady to San Antonio, about 175 miles, will be started during the present year. The construction of the proposed extension of the Quanah, Acme & Pacific from Paducah southwest to El Paso, over 400 miles, will be resumed during the present year if the plans that are now being made do not miscarry. This road is a St. Louis & San Francisco project. The St. Louis, Brownsville & Mexico, which belongs to the same interests will be extended up the valley of the Rio Grande from Sam Fordyce to Roma, 43 miles.

Several of the smaller independent companies are now constructing extensions or have such work in view. The Crystal City & Uvalde is to be extended east from Gardendale to Beeville, more than 100 miles.

An extension of the Asherton & Gulf from Asherton northwest to Eagle Pass, about 50 miles is contemplated. The route of this extension is through a former ranch territory in south Texas that is rapidly being converted into farms.

The Paris & Mt. Pleasant is extending its line from Bogata southeast to Mt. Pleasant, about 30 miles, in northeastern Texas. This road is now finished from Paris to Bogata.

An independent construction company is being organized to build a railway between San Antonio and Brownsville, about 275 miles. Stock to the amount of $500,000 has been subscribed to the proposed company by people of San Antonio, and arrangements for constructing the proposed road are being perfected as rapidly as possible. George W. West, a wealthy ranchman of San Antonio, is at the head of the project.

The St. Louis Southwestern is constructing an extension of the line that runs from Waco to Gatesville, from the latter place to Comanche, about 75 miles. This line is already finished to Hamilton, about one-half the distance.

Many railway projects, involving the construction of several thousand miles of new track in Texas, are still on paper.

Freight in Small Packages.

The tendency of British railways to compete in facilities and quality of service is as marked in the goods as in the passenger service. Its greatest development, perhaps, has been its free cartage system, by which merchandise (with certain exceptions in coarse or so-called dead freight) is taken from the door of the shipper's warehouse or shop, moved to destination and delivered to the door of the consignee with despatch equal to that of our own companies. On five railways the aggregate number of horses in this service is close to 18,000, with a corresponding number of drays and vans, and a smaller number of automobiles and steam lurries.

The records of two important goods stations in London showed for an average day that 12 per cent. of shipments weighed 38 lbs. or less, 46 per cent. less than 100 lbs., and 88 per cent. less than 450 lbs. Only 12 per cent. averaged over 450 lbs. J. A. Droege reports a similar count taken at Camden Station, London, which indicated that 90 per cent. of the shipments weighed less than 560 lbs., and to the English statistics he has added similar figures for Providence. These with the same information for an important freight station in Boston show for one average day's business the following (excluding goods loaded or unloaded at team tracks):

Item.	Broad Street, London.	Providence.	Boston.
Consignments	985	1,622	2,325
Packages	4,427	12,831	17,085
Total weight, tons of 2,000 lbs.	123	821	833
Average weight per shipment (lbs.)	250	1,013	715
Average weight per package (lbs.)	62	128	98

From these figures it is evident that the average British shipment weighs about one-quarter or one-third that of the average shipment handled through the freight houses of Providence and Boston. The average weight per package appears to be about one-half.—*W. J. Cunningham, before New England Railroad Club.*

Telephones on the Pennsylvania Railroad.

The use of the telegraph has been entirely done away with in the way station towers of the Middle Division of the Pennsylvania Railroad, which extends from Harrisburg to Altoona, 132 miles, and only through messages between division points are now sent by telegraph. Telephone equipment is now in successful operation also over the Philadelphia Division, from Philadelphia to Harrisburg. The telephone is now being used for despatching, for messages and for block signaling.

Between Harrisburg and Philadelphia standard time is now sent out over the telephone wires. The system in use is one developed by the Western Electric Company, which has supplied the telephone equipment of these two divisions. It consists essentially of the installation at each way station of 1,000-ohm ringers, in series with the selector, and a transformer at the despatcher's office. The transformer is arranged so that the telegraph relay which receives the time from the observatory makes and breaks the primary. This causes alternating kicks to be generated in the secondary, which operates all the time bells, reproducing the taps which were formerly given by the telegraph sounder.

In block towers interrupters are used for signaling on all the radiating lines which require code ringing. These interrupters are operated by push buttons, which close the local battery and send alternating current on the lines. The Pennsylvania was the first to use this type of interrupter. By its use the operators save both time and energy in ringing on the lines.

In the Harrisburg telephone office of the Pennsylvania there is a central battery, multiple switchboard of the newest type, with four positions, and connected with the lines of the Bell Telephone Company of Pennsylvania. Extensions reach all the offices and departments in the station at Harrisburg and the residences in that city of many of the officers and employees. Trunk lines from this board go to Altoona and Philadelphia and to small switchboards located at important points both east and west on the railway's telephone system. Altoona also uses a multiple exchange equipment. The fact that over 4,000 trunk calls were recorded every 24 hours recently led to an order for the equipment of additional trunk facilities for this exchange. The telephone is used in Altoona for calling trainmen. This is a task which formerly occasioned the employment of many messenger boys. Today each engineman, conductor, etc., has a telephone in his home, connected to the central in the railway office.

Each way station is equipped with a special switchboard of the Pennsylvania Railroad Company's own design. This board contains ten combined jacks and signals, which are equipped with local contacts for code ringing. Two telephone sets are placed in each way station tower, one mounted on a special transmitter arm, the other an emergency desk stand telephone with head receiver.

Organization of a Railway Division.

Rates over all lines are now substantially the same, and the only way remaining to attract business is service, efficiency, courteous treatment, and the qualities which any business house relies upon in establishing a market. This is as it should be, and these things are largely in control of the operating department, and, therefore, I say that the operating department is a stronger soliciting arm of the service, under present conditions, than the traffic department, to which such functions are usually ascribed. Needless to say, this condition emphasizes the necessity of a complete and active spirit of co-operation and harmony between the two departments. This feeling no doubt exists on almost every railway in a sense, but it will have to be very much more intimate in the future to meet changed conditions.

In this connection, I am of the opinion that our large railway systems, at least, where there is great density of traffic, should be districted in accordance with geographical and traffic conditions. A manager should be placed in entire charge of each district. The officer should be solely and exclusively responsible for everything, of any character whatsoever, which relates to the business of his company in his territory, traffic, operation and otherwise. His staff should consist of a chief mechanical officer, a chief engineering officer, a superintendent of transportation, who should be charged with the handling of the business, or the operations of the conducting-transportation department; also, a superintendent of traffic, who should be charged with the details of all matters relating to what we now term the traffic department; a chief counsel, to advise with respect to legal matters, and such other staff officers as a suitable representation of subordinate departments may require. The manager should report to the general manager with respect to operating matters, and to the freight traffic manager with respect to traffic matters. The criticism that is at once advanced is the difficulty in finding officers to fill the position of manager who would be equally competent to administer the operating and commercial features of the business. I cannot but regard this as a detail, for the development of a system which has produced as many brilliant minds as our American railways certainly should find no unsurmountable obstacle in educating men to fill such a position as I have described. The point of fundamental importance is that there is secured the advantages of both centralization and decentralization.

After all, the higher railway officer of the future can no longer be exclusively a skillful traffic officer, a brilliant engineer, or an ingenious operating man. He will have to be all of these in a degree, though an analyst primarily. There must be a call for men of better general education, men of studious and scholarly habits of mind and judicial tendencies of thought. The day of the railway officer who follows precedent merely because it is such, and is complacent in established practice, or who dwells within the narrow confines of the department in which he was educated, is past.—*H. W. Thornton, superintendent, Pennsylvania Lines, New Castle, Pa., before the Railway Club of Pittsburgh.*

London to Paris Flight.

Prier, 25 years old, a Frenchman, and one of Blériot's assistants, left Hendon, England, six miles from London, on April 12, and made a non-stop flight to Paris. He crossed the Channel successfully in the afternoon from Dover to Calais, flying at a height of 2,000 ft. At 5:45 o'clock in the afternoon it was reported from Issy les Moulineaux, five miles from Paris, that he had landed there, making the trip of practically 290 miles without a stop.

This establishes a record distance for a non-stop flight over water and land. The best previous record for a continuous air trip was set by Olieslaegers at Reims last July when he circled the course for a total of 244.44 miles.

The machine used in the record breaking flight was the Blériot monoplane used by Leblanc in the *Matin's* eastern circuit race.

British Passenger Service.

English passenger trains are favored by confining the greater part of goods trains to night hours, thus leaving a clear line for passenger trains during the day time, when nearly all their passenger trains are run. Except in the case of the night boat trains and the through trains to Scotland, there is no such demand for night trains and sleeping-car lines as exists in this country. Here, it obviously would be impracticable either to confine passenger trains to daylight hours or freight trains to night hours, even if it were considered advisable. All through the English service it is evident that an effort is made to foster the passenger service. It brings in nearly one-half of gross revenue, and the natural result is that the passenger service there is more highly developed than here, where freight traffic is predominant.

In caring for the comfort of their passengers, English railways are quite generous, and this attitude is supplemented by a noticeable degree of courtesy and helpfulness on the part of the staff. Railway employees there are known as "company servants" and they seem to realize that their function is to serve. Among porters and men of similar grade, gratuities are expected and given, but custom has set the amount so low as not to be burdensome. At the same time any service rendered or information given is marked by a cheerfulness which is independent of the size of the tip.

The extent and quality of the British dining-car and luncheon facilities on trains and in stations seem to give little thought of returns. Nearly every important train has one or more dining cars, separate cars being provided usually for first and third-class passengers. In the first-class diner a good table d'hote dinner is served for sixty-three to seventy-five cents. One detail

of operation might be profitably copied here on certain trains. A short time before the meal is to be served, the dining-car steward goes through the train and ascertains how many passengers wish to dine. Each is assigned a time and a seat number, thus avoiding confusion and waiting in vestibule, as well as enabling the dining-car staff more accurately to anticipate the demand to be made upon their facilities and supplies.

The station facilities generally are ample and have due regard for the comfort of passengers. Some of them have lounging and writing rooms, with free stationery. As a rule, the waiting rooms and toilet rooms are scrupulously clean, but the appearance of the walls on the track side is seriously marred by advertisements which are displayed on every available inch of space. When on a moving train and straining one's eyes to catch the name of the station, it is exasperating to lose it in the medley of advertising signs, Oxo, Bovril and Colman's Mustard.—*W. J. Cunningham, before New England Railroad Club.*

Slipping Coaches.

Before leaving the discussion of British passenger service, a few words should be said about the practice of slipping coaches, that is, cutting off one or more passenger cars from the rear of the train while it is in motion, the detached portion being allowed to coast into the station, where it is stopped by the guard who remains with it, while the train continues at practically undiminished speed. The object is to serve the stations where slips are made without delaying the train by a stop. When the slipped coach or coaches are unloaded, they are taken from the main track by a switch engine or by the branch line train, if at a junction point. It will be apparent that the practice entails considerable expense and trouble in avoiding the few minutes' detention of a regular stop, but it indicates the extent of the pressure of competition in speed. Moreover, the operation is one-sided, since no one has discovered how to attach the car on the return trip without stopping the train. But the most serious objection to slipping is the added risk of accident. Two accidents have occurred, and there is always the possibility of a broken air-hose, or some other unforeseen cause, stopping the train suddenly just after the slip is made. Under such circumstances it would be difficult for the guard to control the slip coach in time to prevent collision with the train. In a country where governmental regulation in the matter of safety is so strict, one wonders why the Board of Trade countenances a practice that would not be allowed here. Something of the kind was once practiced here, but abandoned as unsafe, as has been also the flying switch with loaded passenger cars. It is said that the Board of Trade frowns on any extension of slipping, and hints that it may be abolished. Last year's time tables show that 160 coaches are slipped daily, nearly half of them on the Great Western Railway.—*W. J. Cunningham, before New England Railroad Club.*

Transporting Household Goods in England.

The British solution of the problem of transporting household goods is interesting. They have a special van, fitted with a detachable body, which may be loaded at the residence and fastened to a freight car body. The goods are, therefore, moved to destination without reloading into the car at the freight station, and at destination the detachable car body is transferred to a van frame and moved to the door of the house. The number of handlings is reduced from four to two, with a proportional reduction in risk of damage. The same principle is applied to the transportation of perishable commodities, such as fresh fish. —*W. J. Cunningham.*

American Association of Refrigeration.

The second regular annual meeting of the American Association of Refrigeration will be held at the La Salle Hotel, Chicago, on May 9 and 10, 1911. Matters of great importance to the association will be presented; among these are the annual reports of the chairmen of the various committees and commissions, detailing the activities of these bodies during the past year, as well as their recommendations for future efforts. Reports by the official delegates to the second international congress of refrigeration in Vienna, Austria, in 1910 and of the committee appointed to investigate the claims and proposals of the several cities desirous of securing the third international congress which is to convene in the United States in 1913, will be received and acted on. It will also devolve upon this meeting to determine what steps shall be taken in preparation for the third congress, to obtain national and international recognition and co-operation for it, and if possible to formulate a code of procedure for its control and management; as well as to create a complete American congress organization and subsidiary bodies. Questions pertaining to restrictive cold storage legislation both by the national and the various state legislatures will also be brought up. J. F. Nickerson, Chicago, is secretary.

Railway Special Agents.

The International Association of Railway Special Agents and Police will hold its fifteenth annual convention at Chattanooga, Tenn., April 18-21. Following are to be the principal speakers: Tuesday afternoon, A. J. Barthell (N. C. & St. L.); C. W. Burke (Southern). Wednesday afternoon, J. M. Powell (B. & O.); R. S. Mitchell (T. R. R. of St. L.); M. B. Earle (Southern); George Distler (B. & O.), and J. F. Penn (G. S. & F.). Thursday forenoon, C. C. Hodges (Southern); A. W. Worthington (D. M. & N.); T. N. Skeen (Southern); W. A. Humphrey (N. Y. C. & H. R.), and N. V. Tiernan (B. & O.). On Wednesday afternoon there will be an excursion to Lookout mountain; on Thursday afternoon an excursion to battlefields around the city, and on Friday morning an all-day excursion on the Tennessee river. The president of the association is H. H. Germain (A. T. & S. F.), and the secretary is W. C. Pannell (Southern Railway and Chesapeake Steamship Company), Baltimore, Md. The chairman of the committee of arrangements at Chattanooga is F. H. Schlapbach (C. of Ga.).

National League of Transportation Clubs.

The organization of the National League of Transportation Clubs was completed at Cincinnati, Ohio, on April 3, when the following officers were elected: President, J. V. Zartman, Indianapolis, Ind.; first vice-president, Thomas Conlon, Toledo, Ohio; second vice-president, Walter G. Norvell, Detroit, Mich.; secretary and treasurer, Carl K. Landes, Cincinnati.

New York Railroad Club.

At the meeting of the New York Railroad Club on April 21, the Hon. Chauncey M. Depew, the club's only honorary member, will make a brief address. J. P. H. Perry, of the Turner Construction Company, will read a paper on Reinforced Concrete Work for Railway Work.

Canadian Society of Civil Engineers.

At a meeting of the electrical section of the Canadian Society of Civil Engineers, held on April 13, a paper on The Operation, Construction, Application, and Characteristics of Induction Motors, was read by A. M. Gray.

American Society of Engineer Draftsmen.

A meeting of the American Society of Engineer Draftsmen will be held on April 19, in New York.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9-10, 1911, Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
Indianapolis Railway and Mechanical Club.—B. S. Downey, C., H. & D., Indianapolis, Ind.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Omaha Railway Club.—A. H. Christiansen, Barker Block, Omaha, Neb.; second Wednesday.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept. Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in montb except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Morgan and the Mallory steamship lines have announced new tariffs, to go into effect May 15, showing reductions in certain freight rates from New York to Texas points, these being made necessary by the reductions made in rail rates in consequence of the recent decision of the Interstate Commerce Commission.

The Illinois Central has filed suit in the federal court for the northern district of Iowa, attacking the 2-cent fare law of that state. The petition states that the road is not able to realize more than 4½ per cent. on its investment under the law. The freight rate schedules of the state commission are also attacked as being unremunerative.

The Erie, having secured additional advantages in the movement of traffic over the Pittsburg & Lake Erie, proposes now to make a reduction in the passenger fare between Pittsburgh and Chicago, reducing the rate to $9.50, which is the same as that over the Pan Handle and the Baltimore & Ohio, but is $1 less than over the Fort Wayne route.

The Corporation Commission of Oklahoma has complained to the Interstate Commerce Commission that rates on many kinds of freight from towns in Oklahoma to Texas are too high compared with rates on similiar commodities from Texas to Oklahoma, producing a discrimination against Oklahoma wholesale merchants. Seventy railways are named as defendants.

It appears that the validation scheme agreed upon between the railways and the bankers last autumn for cotton bills of lading, to do away with the difficulties revealed by the fraudulent bills issued in Alabama, is not entirely satisfactory, and conferences are being held in New York, in which the bankers and the traffic officers of some of the southern railways are trying to devise a better plan.

In the United States District court at Pittsburgh last Tuesday the grand jury returned indictments against the Pennsylvania Railroad and the Pittsburgh & Lake Erie, charging the granting of unlawful allowances in the matter of demurrage charges. The Pittsburgh & Lake Erie is accused of holding carloads of iron for the Carnegie Steel Co. for 24 days without collecting demurrage, and against the Pennsylvania a similar charge is made in connection with shipments of ore from Lake Erie.

It is expected that the first new steel barge of the Mississippi Valley Transportation Company will arrive in St. Louis, Mo., on May 1, and that three other barges will be ready for service some time in July. An officer of the company states that it has taken out a $50,000 "block-covered" insurance policy for a year, which will cover all the freight carried. This arrangement will make it unnecessary for each cargo to be insured. The mayor of St. Louis has signed an ordinance permitting the company to build a transfer house 200 ft. x 53 ft. on the improved wharf between Market and Walnut streets, and it is said that work will soon be started on this structure.

According to figures compiled by Col. C. McD. Townsend, of the engineer corps of the United States Army in charge of the Detroit district, the total freight traffic which passed through the American and Canadian canals at Sault Ste. Marie, Mich., in 1910 reached 62,363,218 tons, an increase of 4,468,069 tons, or 8 per cent., over 1909. The total number of passengers carried in 1910 was 66,933, or an increase over 1909 of 6,985. Of the total tonnage, 40 per cent. passed through the American canal and 50 per cent. of the passengers were handled through it. The value of the freight carried through the canals is estimated at $654,010,844. The American canal was open from May 5 to December 14, and the Canadian canal from April 12 to December 15.

The Western Passenger Association has announced that stopovers will be allowed on all summer tourist tickets to Colorado and Utah points this year. The round trip rate will be $30 from Chicago; $25 from St. Louis, and $17.50 from Missouri river points, to Denver, Colorado Springs and Pueblo, and the Denver & Rio Grande is making special rates from these cities, as well as from Trinidad and Manitou, to interior points in

Colorado, Utah and New Mexico. On each Tuesday from June 20 to September 12 a lower special rate of one fare for the round trip will be made to points where the one-way rate is $6 or more, and a rate of a fare and a third to points where the one-way rate is less than $6. The stop-over privilege may be taken advantage of until October 31.

The International & Great Northern and the Missouri, Kansas & Texas have filed answers to a complaint recently made by the Louisiana railway commission in behalf of the merchants of Shreveport. The complaint alleges that certain interstate rates out of Texas have the effect of shutting merchants at Shreveport and other Louisiana points out of east Texas points. The roads say it is not fair to compare the rates from Shreveport to east Texas points with the rates between points in Texas, as the latter are enforced by the Texas railway commission, and the roads do not admit that such rates are just and fair. They also say that the rates from Shreveport to east Texas points were fixed with relation to rates on interstate business from New Orleans, Vicksburg, Memphis, St. Louis and other Mississippi river crossings.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of The American Railway Association, in presenting statistical bulletin No. 91-B, giving a summary of shortages and surpluses by groups from December 10, 1909, to March 29, 1911, says:

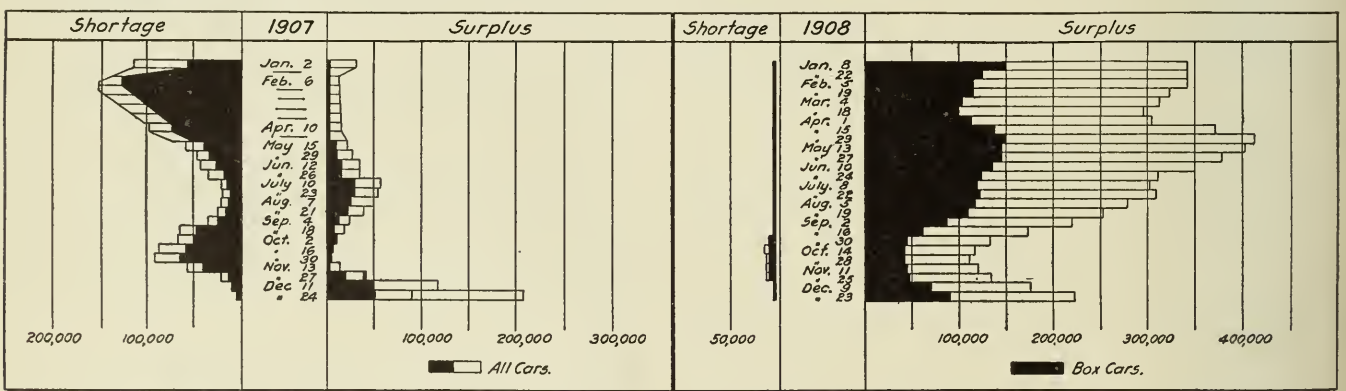
"There is a decrease of 12,310 in surplus, bringing the total down to 196,217. Of this decrease, 2,568 are box, 3,992 coal and gondola, 2,444 flat and 3,306 miscellaneous. The decrease in miscellaneous cars is principally in coke cars in group 2 (Eastern), and stock cars in group 6 (Northwestern), 8 (Middle Western), and 10 (Pacific). Territorially, the reports are somewhat varied. In the eastern and middle sections, as well as in the South, there are substantial decreases in the total surplus cars. In New England and in Canada, there are increases in the box car surplus, with partially offsetting decreases in the surplus of other classes. In the northwest, the decrease in stock cars is just about balanced by an increase in box cars, while in the West, Southwest and Pacific sections there are general decreases, although they are not so marked as in the eastern and middle sections. The reports indicate that there is practically no change in the number of shop cars since our last report, from which it follows that the decrease in surplus denotes an increase in the number of cars in service. It should also be noted that since the present increase began, the surplus of box cars has been comparatively small, indicating that the general traffic of the country is keeping up well."

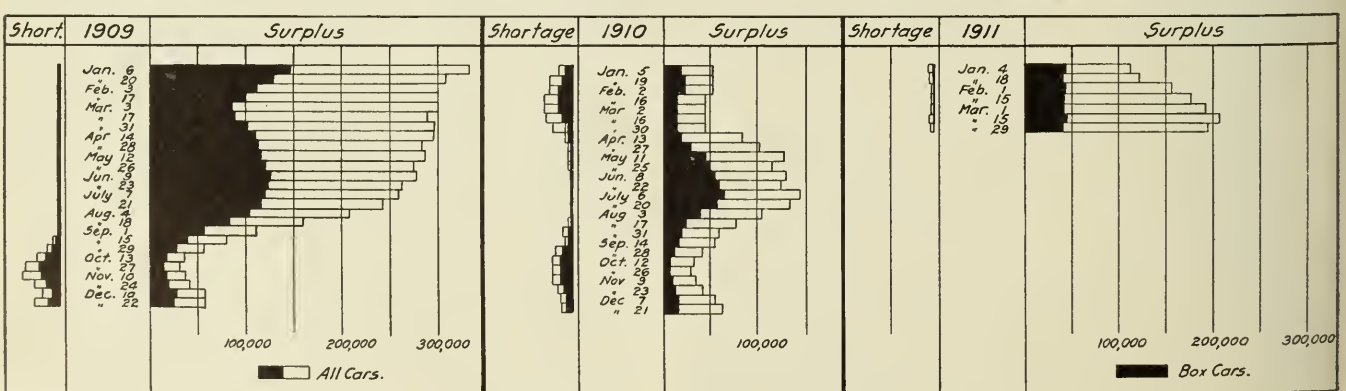
The accompanying table gives surpluses and shortages by groups for the latest period covered by the report and the chart shows biweekly totals for 1907 to 1911 inclusive.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—March 29, 1911	8	1,440	1,430	3,561	210	6,641	0	20	0	22	42
" 2.— " 29, 1911	24	2,659	246	28,416	9,487	40,808	0	3	0	0	3
" 3.— " 29, 1911	25	3,665	1,532	52,767	4,399	62,363	0	0	0	242	242
" 4.— " 29, 1911	10	1,488	107	8,784	1,409	11,788	17	302	0	0	319
" 5.— " 29, 1911	19	1,484	435	5,025	1,275	8,219	40	44	0	0	84
" 6.— " 29, 1911	22	10,827	409	4,625	4,280	20,841	39	1	11	102	153
" 7.— " 29, 1911	4	1,293	117	1,505	457	3,372	0	0	0	0	0
" 8.— " 29, 1911	15	6,226	561	3,189	3,252	13,228	10	4	0	184	198
" 9.— " 29, 1911	11	3,645	508	380	1,115	5,648	0	0	0	0	0
" 10.— " 29, 1911	19	5,637	2,283	2,643	9,097	19,660	0	2	0	9	11
" 11.— " 29, 1911	6	2,182	452	32	983	3,649	278	0	0	0	278
Total	163	40,546	8,780	110,927	35,964	196,217	384	376	11	559	1,330

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages in 1907 to 1911 Inclusive.

MONTH OF FEBRUARY, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,536*	$4,292,890	$1,791,144	$6,722,077	$992,023	$1,146,067	$167,234	$2,118,452	$151,909	$4,575,685	$2,146,392	.....	$261,878	$1,884,514	$66,885
Atlantic Coast Line	4,494	2,034,194	731,514	2,952,543	322,946	376,122	46,459	918,939	65,851	1,730,317	1,222,226	.....	108,000	1,114,226	80,315
Baltimore & Ohio—System	4,434†	4,542,646	967,624	5,913,433	600,196	1,110,067	146,725	2,450,836	139,853	4,447,677	1,465,756	—$3,828	249,401	1,212,527	59,999
Boston & Maine	2,243	1,910,702	943,242	3,087,860	316,582	521,878	33,318	1,690,812	84,177	2,646,767	441,093	8,534	186,313	263,314	—137,133
Central R. R. Co. of New Jersey	631‡	1,285,086	321,447	1,731,383	165,053	291,264	29,617	540,683	43,454	1,070,071	661,312	—29,858	56,290	575,164	—159,782
Chesapeake & Ohio	1,947	1,860,122	344,990	2,309,107	238,345	457,136	43,590	736,041	63,469	1,538,581	770,526	—1,259	93,250	676,017	—77,134
Chicago & Alton	1,025§	641,086	298,590	1,036,995	97,536	192,217	39,176	445,981	35,043	809,953	227,042	—1,266	37,000	188,776	—35,493
Chicago & Northwestern	7,744‖	3,388,227	1,260,040	5,141,439	372,503	751,981	102,286	2,463,988	141,223	3,831,981	1,309,458	—6,346	242,000	1,061,112	—165,489
Chicago, Burlington & Quincy	9,091¶	4,014,686	1,460,704	6,158,714	465,340	1,116,266	121,551	2,201,029	196,211	4,100,397	2,058,317	—12,997	241,461	1,803,859	—189,698
Chicago, Milwaukee & Puget Sound	1,980*a*	950,273	105,084	1,090,266	120,767	137,794	35,630	488,643	17,883	800,717	289,549	—3,383	50,307	235,859	10,426
Chicago, Milwaukee & St. Paul	7,511	3,097,708	857,981	4,483,669	406,187	748,063	113,170	2,351,772	87,849	3,707,041	776,628	—3,509	226,617	546,502	—239,534
Chicago, Rock Island & Pacific	7,548*b*	3,013,577	1,320,990	4,647,692	578,855	747,416	158,614	2,071,801	143,463	3,700,149	947,543	—10,360	207,152	730,031	99,891
Chicago, St. Paul, Minneapolis & Omaha	1,744	803,529	295,498	1,177,500	65,295	144,580	19,571	519,982	32,378	781,806	395,694	—2,431	61,096	332,167	25,693
Cleveland, Cincinnati, Chic. & St. Louis	1,979	1,489,022	528,967	2,232,456	244,722	398,990	70,780	1,048,515	62,166	1,825,173	407,283	—5,223	80,000	322,060	—111,409
Delaware & Hudson Co	819*c*	1,272,158	168,817	1,482,294	116,602	242,808	17,626	625,745	42,839	1,045,619	436,675	615	44,000	392,060	—634
Delaware, Lackawanna & Western	930	1,820,026	489,456	2,477,778	158,028	441,388	59,067	860,017	65,901	1,584,401	893,377	23,467	138,028	778,817	—201,304
Erie R. R.	1,994*d*	2,659,546	572,005	3,523,329	310,957	642,734	93,705	1,294,308	75,137	2,416,841	1,106,488	—55,779	120,631	930,078	127,534
Great Northern	7,274*e*	2,464,228	766,914	3,572,001	459,981	627,508	82,478	1,424,786	96,667	2,691,420	880,581	—9,026	212,994	658,561	—122,811
Lake Shore & Michigan Southern	1,663	2,205,691	732,035	3,414,724	426,313	597,904	74,417	1,407,797	67,702	2,574,133	840,591	—7,171	135,000	698,420	—356,837
Lehigh Valley	1,433	2,274,786	259,859	2,626,363	264,378	511,467	75,942	940,725	61,222	1,853,734	772,629	—27,713	101,300	643,616	—27,449
Louisville & Nashville	4,591	2,985,000	908,840	4,151,881	714,062	766,122	91,620	1,425,242	91,756	3,088,802	1,063,079	3,435	150,000	916,514	—136,511
Michigan Central	1,803*f*	1,496,498	450,529	2,185,320	297,209	348,289	66,177	1,051,649	52,570	1,815,894	369,426	—4,887	110,000	254,539	—201,190
N. Y. Central & Hudson River	3,591	4,412,357	1,879,926	7,033,027	938,291	1,389,068	166,606	3,263,099	259,212	6,016,276	1,016,751	—19,830	391,783	605,138	—585,873
New York, New Haven & Hartford	2,041	2,050,192	1,727,761	4,182,774	325,011	580,296	27,169	1,963,949	135,938	3,032,363	1,150,411	97,425	275,000	972,836	—75,424
Norfolk & Western	1,990*g*	2,158,659	280,492	2,563,080	289,568	512,513	46,519	841,584	59,349	1,749,533	813,547	—151	115,000	698,396	—199,087
Northern Pacific	6,029*h*	2,768,276	1,000,070	4,058,531	398,065	624,603	85,435	1,674,935	84,626	2,867,664	1,190,867	5,129	202,927	993,069	46,589
Oregon Short Line	1,646*i*	824,824	285,508	1,222,334	147,532	168,504	25,364	373,385	40,052	754,837	467,497	—2,825	69,000	395,672	—265,978
Oregon-Washington R. R. & Nav. Co	1,636*j*	658,353	304,816	1,041,546	148,748	127,586	44,972	452,152	45,690	819,148	222,398	—8,854	70,135	143,409	—
Pennsylvania *Co.*	1,416	2,314,478	547,466	3,205,316	420,865	654,822	72,949	1,355,133	83,220	2,586,989	618,327	—8,392	189,734	420,201	—312,777
Pennsylvania *R. R.* Co	3,977*k*	8,095,178	2,316,218	11,186,442	1,422,742	2,341,229	155,915	4,656,388	322,932	8,899,206	2,287,236	—173,857	531,228	1,582,151	—805,515
Pere Marquette	2,334	774,227	243,902	1,103,330	153,874	205,832	36,940	643,038	32,450	1,072,134	31,196	—45,908	55,593	70,305	—255,118
Philadelphia, Baltimore & Washington	713	618,645	561,615	1,324,417	205,974	227,583	27,197	645,588	33,908	1,140,250	184,167	.....	47,396	136,771	19,115
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	1,879,820	544,305	2,746,208	297,281	621,131	70,138	1,174,169	67,001	2,229,720	516,488	—1,200	133,077	382,211	—270,000
St. Louis & San Francisco	4,732	2,091,389	829,208	3,144,639	290,138	427,339	99,556	1,214,248	100,815	2,132,096	1,012,543	.....	153,814	858,729	53,905
Southern Ry. Co	7,038	3,275,264	1,127,038	4,783,284	643,014	792,454	127,177	1,731,526	150,976	3,445,147	1,338,137	—539	178,953	1,158,645	19,320
Union Pacific	3,473*l*	2,155,941	728,817	3,249,127	294,983	515,953	89,488	998,965	103,944	2,003,334	1,245,793	—12,330	150,650	1,082,813	—374,409

EIGHT MONTHS OF FISCAL YEAR 1911.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,536*	$39,422,813	$15,226,504	$59,371,932	$8,613,423	$9,195,441	$1,189,019	$17,368,636	$1,237,317	$37,603,836	$21,768,096	.....	$1,939,745	$19,828,351	$1,919,596
Atlantic Coast Line	4,494	14,009,789	5,109,973	20,576,013	2,679,884	3,114,687	364,235	6,728,603	546,939	13,434,348	7,141,665	.....	771,000	6,370,665	—12,103
Baltimore & Ohio—System	4,434†	45,230,565	10,506,842	59,323,126	7,036,471	11,141,032	1,352,532	22,590,939	1,233,678	43,354,652	15,968,474	$83,217	1,769,411	14,115,846	—1,964,727
Boston & Maine	2,243	17,066,592	10,669,406	29,988,209	3,848,756	3,945,077	336,978	13,982,253	717,592	22,830,656	7,157,553	35,340	1,437,880	5,755,013	—1,407,193
Central R. R. Co of New Jersey	631‡	12,006,828	3,188,580	16,024,448	1,672,689	2,486,709	252,841	4,690,245	319,810	9,422,294	6,602,154	79,174	719,833	5,961,495	—410,546
Chesapeake & Ohio	1,947	16,666,007	3,607,988	21,151,344	2,379,884	3,947,460	359,093	6,283,348	482,077	13,451,862	7,699,482	—16,692	647,373	7,035,417	—696,785
Chicago & Alton	1,025§	6,295,824	2,963,816	9,976,810	1,334,536	1,707,112	305,423	3,754,947	278,213	7,380,231	2,596,579	—14,781	288,600	2,293,198	—753,218
Chicago & Northwestern	7,744‖	33,487,453	13,176,557	51,157,835	6,749,189	6,256,190	860,018	21,188,959	1,096,272	36,150,628	15,007,207	—16,937	2,122,000	12,868,270	273,412
Chicago, Burlington & Quincy	9,091¶	40,111,555	15,759,062	61,041,879	7,661,204	9,916,332	1,068,593	19,732,365	1,490,687	39,869,181	21,172,698	—65,561	1,994,673	19,112,464	3,107,061
Chicago, Milwaukee & Puget Sound	1,980*a*	8,386,703	948,230	9,594,839	609,187	1,018,858	237,407	3,484,803	109,084	5,459,339	4,135,500	10,133	327,614	3,818,019	—
Chicago, Milwaukee & St. Paul	7,511	30,927,467	9,690,816	44,742,683	5,855,429	6,344,972	852,323	19,626,006	713,786	33,392,516	11,350,167	120,510	1,756,234	9,714,443	—1,464,038
Chicago, Rock Island & Pacific	7,548*b*	28,307,359	13,342,449	44,242,291	6,326,741	6,031,547	1,260,235	16,919,330	1,112,258	31,650,111	12,592,180	—83,662	1,774,355	10,734,163	480,150
Chicago, St. Paul, Minneapolis & Omaha	1,744	7,423,239	3,153,255	11,298,065	1,218,308	1,326,339	186,834	4,287,781	236,695	7,255,957	4,042,108	—10,537	473,611	3,557,960	502,298
Cleveland, Cincinnati, Chic. & St. Louis	1,979	13,504,261	5,465,035	20,819,074	2,722,974	3,588,561	683,037	8,879,547	464,855	16,338,974	4,480,100	—59,502	653,548	3,767,050	—1,599,938
Delaware & Hudson Co	819*c*	11,308,275	2,085,731	13,816,971	1,061,136	1,926,736	177,866	4,845,050	327,229	8,338,017	5,478,954	1,174	367,638	5,112,490	—141,052
Delaware, Lackawanna & Western	930	17,303,143	5,097,101	23,890,108	2,582,155	3,420,850	473,847	7,211,950	474,112	14,162,914	9,727,194	161,081	1,983,081	8,805,194	—1,706,850
Erie R. R.	1,994*d*	23,904,295	6,180,678	32,453,094	3,755,764	5,482,118	793,052	10,702,757	633,252	21,366,943	11,086,151	—191,204	930,834	9,964,113	456,378
Great Northern	7,274*e*	29,651,727	9,030,929	41,681,412	5,686,756	5,171,399	673,379	12,246,276	771,365	24,549,175	17,132,237	132,707	2,156,996	15,107,948	—1,181,600
Lake Shore & Michigan Southern	1,663	21,214,273	7,776,718	32,838,313	5,341,486	5,182,317	799,448	11,755,661	617,223	23,696,135	9,142,178	—40,968	1,180,182	7,921,027	—3,541,932
Lehigh Valley	1,433	20,316,465	3,077,170	24,247,129	2,478,442	4,135,409	660,747	7,971,464	516,938	15,763,000	8,484,129	—218,295	763,000	7,502,834	—763,984
Louisville & Nashville	4,591	26,514,084	7,912,111	36,605,190	5,946,564	6,367,737	766,872	11,761,617	723,063	25,565,853	11,039,337	11,077	1,126,800	9,923,614	—1,972,375
Michigan Central	1,803*f*	12,977,895	5,186,955	20,257,652	2,964,458	2,931,751	607,207	8,457,452	393,582	15,354,450	4,903,202	—31,645	915,020	3,956,537	—1,595,621
N. Y. Central & Hudson River	3,591	39,039,236	21,055,188	67,182,670	9,433,520	11,614,441	1,640,460	25,901,218	1,784,502	50,374,141	16,808,529	45,615	3,176,669	13,677,475	—3,256,743
New York, New Haven & Hartford	2,041	19,938,629	17,706,690	41,325,715	4,591,519	4,770,851	228,878	16,299,418	1,173,650	27,064,316	14,261,399	954,408	2,462,000	12,753,807	—339,595
Norfolk & Western	1,990*g*	20,232,195	2,878,747	23,988,740	2,751,049	4,525,553	395,076	7,197,252	486,103	15,355,033	8,633,707	—6,209	860,000	7,767,498	—810,618
Northern Pacific	6,029*h*	29,837,329	12,018,095	44,791,999	5,508,655	5,368,648	699,539	14,818,566	681,216	27,076,624	17,715,375	387,292	2,205,693	15,896,974	—2,045,657
Oregon Short Line	1,646*i*	9,746,025	3,342,962	13,957,434	1,784,317	1,488,984	229,247	3,393,066	347,688	7,243,302	6,714,132	—11,966	568,096	6,134,070	—1,079,771
Oregon-Washington R. R. & Nav. Co	1,636*j*	1,672,924	751,477	2,595,036	329,798	287,597	96,368	1,098,121	105,101	1,916,985	678,051	—17,070	166,652	494,329	—
Pennsylvania *Co.*	1,416	26,446,735	5,705,962	35,026,198	4,170,862	6,144,473	648,729	12,550,508	677,679	24,192,251	10,833,947	—46,320	1,432,324	9,355,303	—2,586,845
Pennsylvania *R. R.* Co	3,977*k*	75,973,247	22,478,915	105,454,699	13,275,222	20,034,108	1,535,509	39,073,809	2,685,127	76,603,775	28,850,924	—856,990	3,568,531	24,425,403	—6,313,248
Pere Marquette	2,334	7,216,473	2,754,375	10,816,265	1,424,987	1,667,976	316,224	4,891,912	266,234	8,567,333	2,248,932	—51,270	468,287	1,729,375	—1,032,437
Philadelphia, Baltimore & Washington	713	6,331,204	5,130,491	12,724,998	1,935,458	2,063,790	233,044	5,328,538	282,817	9,843,647	2,881,351	.....	388,233	2,493,118	—111,503
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	18,235,968	5,560,487	26,731,625	3,357,176	4,992,894	600,813	10,136,614	526,546	19,614,043	7,117,582	— 6,933	1,097,527	6,013,122	—1,792,350
St. Louis & San Francisco	4,732	18,386,688	7,783,667	28,122,849	3,799,358	3,827,226	694,571	9,917,333	816,614	19,055,102	9,067,747	.....	1,147,616	7,920,131	714,357
Southern Ry. Co	7,038	26,671,006	11,016,472	40,752,081	5,090,200	6,566,877	1,035,961	13,644,080	1,180,801	27,517,919	13,234,162	9,899	1,455,902	11,788,159	395,787
Union Pacific	3,473*l*	25,319,748	7,644,496	35,916,307	3,422,121	4,129,838	813,359	9,233,728	862,213	18,461,259	17,455,048	—40,151	1,243,695	16,171,202	—1,047,820

Mileage operated on February 28, 1910—* 7,459 miles; † 4,460 miles; ‡ 668 miles; § 998 miles; ‖ 7,638 miles; ¶ 9,021 miles; *a* 1,463 miles; *b* 7,393 miles; *c* 843 miles; *d* 1,961 miles; *e* 7,129 miles; *f* 1,746 miles; *g* 1,942 miles; *h* 5,849 miles; *i* 1,509 miles; *k* 3,947 miles; *l* 3,411 miles.

j Began operations on December 24, 1910; — indicates Deficits, Losses and Decreases.

Dallas (Tex.) Traffic Club.

The Dallas Traffic Club was organized on April 8, when the following officers were elected: President, James E. Ludlow; first vice-president, S. G. Reed; second vice-president, C. W. Hobson; third vice-president, W. G. Crush; secretary, G. S. Maxwell. J. L. West, general freight agent of the Missouri, Kansas & Texas, made an address at the banquet which was held in connection with the organization of the club.

Copper from Alaska.

The first trainload of copper ore from the Bonanza Mine, in the high mountainous interior of Alaska, left Kennecott April 6, at 8 a. m., and arrived April 8 at Cordova, the seaport, over the new Copper River & Northwestern Railway. The distance is 197 miles. It was also the first copper shipment of any magnitude from any point in Alaska. It consisted of 1,100 tons, run of the mine, and was sacked; the crude ore being shipped direct to the Tacoma smelter without going through the mill. The entire shipment ran over 70 per cent., and the value of the shipment was considerably over $200,000. Similar shipments will be made each week from Cordova to Tacoma, so that the product of this new Alaskan property is expected to have a direct effect on the copper market.

A Comparison of English and American Railway Statistics.

The accompanying table compiled by the Bureau of Railway Economics gives a comparison of certain English and American railway statistics for 1908. The United Kingdom is compared in this table with Group II of the Interstate Commerce Commission groups, covering approximately the states of New York, Pennsylvania, New Jersey, Delaware and Maryland, as being the region of densest traffic in the United States:

Subject for Comparison.	United Kingdom. 1908.	United States, 1908. (Group II)
Area in square miles	121,400	107,873
Population per square mile (estimated for 1909)	371	182
Miles of single track operated (miles of line)	23,205	23,696
Miles of additional track	30,464	24,992
Per cent. additional tracks are of all tracks	56.8	51.3
Operating revenues per mile of line	$23,185*a*	$22,915
Per cent. of total operating revenues: (*b*)		
Revenue from passengers	38.55	22.42
Other passenger service train revenue	8.18	4.91
Freight revenue	53.27	71.17
Other operating revenue	.....	1.50
Maintenance of way and structures	10.02	12.27
Transportation, traffic and equipment	44.97	55.41
Taxes	4.73	2.92*c*
All other operating expenses	5.67	2.07
Total operating expenses and taxes (*d*)	65.39	72.67
Expenditure per mile for maint. of way and structures	$2,321	$2,813
Net operating revenue per mile of line	$8,025*e*	$6,263*f*
Capitalization per mile of line (*g*)	$274,842	$142,404
Per cent. net operating revenue is of capitalization	2.92	4.40
Operating revenues per train mile:		
Passenger service train revenue	$0.95	$1.27
Freight revenue	1.81	2.98
Total	1.27	2.24
Train miles per mile of line:		
Passenger	11,398	4,743
Freight	6,775	5,331
Mixed	65	137
Total	18,237*h*	10,218*i*
Number of locomotives per 100 miles of line	98	56*k*
Number of cars per 100 miles of line	3,619	2,327*k*
Number of passengers carried per mile of line	55,079	13,172
Number of tons hauled per mile of line	21,184	19,428*m*
Accidents:		
Number of employees killed per 1,000 miles of line	18.2	39.9
Number of employees injured per 1,000 miles of line	1,035	963

a Revenue from traffic.
b Rail operations in Group II; revenue from traffic in United Kingdom.
c Operating and leased roads.
d Rail operations including taxes in Group II; working expenditure including taxes but excluding steamboats, docks, etc., in United Kingdom.
e Receipts from traffic less working expenditure, including taxes but excluding steamboats, docks, etc.
f Rail operations less operating expenses and taxes.
g Gross capitalization in both countries.
h Report does not mention non-revenue train mileage.
i Revenue train mileage including special.
k Excluding equipment of switching and terminal companies.
m Freight earning revenue.

Hearing Regarding Fourth Section.

The hearing in Washington, D. C., before the Interstate Commerce Commission regarding the meaning and application of the amended long and short haul clause was finished last week. J. G. Woodworth, traffic manager of the Northern Pacific, said that he believed the blanketing of freight rates eastbound probably was the best way to end the demoralization existing until 1898, but he believed similar blanketing of rates westbound would not be a good thing. He expressed the opinion that a reasonable first-class rate from New York to Seattle, Wash., if water competition were absent, would be $3.70. It is not the policy of the Northern Pacific to force commodities to travel past the point of consumption so as to get a back haul.

W. R. Wheeler, manager of the Traffic Bureau of the Merchants' Exchange of San Francisco, stated at length his theory of rate-making. He said that the only logical way to make a rate to the interior West is to make it a combination of the rate by sea and the rate from the coast terminal back to the interior point, provided the back haul rate is reasonable in itself. He said that blanketing the rates from Chicago to the Atlantic seaboard is illogical, and gives Chicago an unnatural advantage. He had consulted traffic men as to the effect on ocean rates of the opening of the Panama canal and they tell him a rate of $4 or $5 a ton will be made, plus whatever canal toll, if any, the government may impose. This would be less than one-half the present rate on most westbound cargoes. Mr. Wheeler said that San Francisco is the natural gateway for California and Nevada, and that the railways, by making terminal rates to numerous interior points in California, refuse to recognize this. The interior point is entitled to the combination of commodity rates to the nearest seaport plus the local, or back haul, charge, if that combination be lower than the direct rate established as reasonable, and he declared it unreasonable to compel the railways to equalize geographical disadvantages. The San Francisco shippers, he said, must be allowed the advantage of ocean competition, or there will be no such competition. The increase in rates made by railways about two years ago were "disastrous" to them. They "stirred up" the people on the coast, and one result was the establishment of the Bates & Chesebrough steamship line, which has become a controlling factor. The position taken by Mr. Wheeler was also taken by Seth Mann, attorney of the San Francisco Merchants' Exchange. He contended that either Sacramento, Stockton and other California cities are not entitled to the terminal rates which they now enjoy, or other places in California on rivers are entitled to them. George Bradley, speaking for the business men of Sacramento and Stockton, said that San Francisco's commercial greediness caused its spokesmen to overlook some rather pertinent facts bearing on the situation. One was that Sacramento was a distributing point before San Francisco, the ships originally bringing goods for the mining camps to Sacramento, and not to San Francisco.

The meaning of the amended fourth section was discussed by a number of persons, including C. E. Durborow (Southern Pacific), N. H. Loomis (Union Pacific), E. C. Lindley (Great Northern), H. C. Barlow (Chicago Association of Commerce), H. F. Bartine (Nevada Railway Commission), W. W. Cotton (Oregon-Washington Railroad & Navigation Company), and Charles Donnelly (Northern Pacific).

Mr. Bartine admitted that there is some water competition, but contended that it is not controlling. He argued that the amended fourth section requires the Interstate Commerce Commission to compel the railways to observe the long and short haul rule with regard to every commodity and permits their exemption from its operation only on a showing that a particular commodity is being carried by steamships at lower rates than the railways are charging, and that unless the railways are permitted to disregard the long and short haul rule in hauling these commodities, they will be driven out of business. Mr. Cotton flouted the suggestion that any railway is deliberately discriminating against any particular community. He said that they should not be penalized for engaging in coast to coast business, which would be the case if they were compelled to make their terminal rates apply to interior points. He contended that competition between rail and water carriers is honest, healthy and sane, but not cut-throat.

Suez Canal.

The number of vessels passing through the Suez canal in the year 1910 was 4,533, having a gross tonnage of over 23 millions. The canal dues, which are at the rate of 7.75 francs a ton, amounted to over 25 million dollars. The canal was opened in 1869, and during the first year the number of vessels passing through was 486. Electric lights were put up, to permit the passage of vessels at night, in 1887. The canal is 87 nautical miles long, and vessels which go through in the night spend an average of 16 hours 42 minutes in the canal. Of the 23 millions of tons passing through in 1910, over 14 millions represent British vessels.

Crop Conditions.

The United States department of agriculture estimates that the average condition of winter wheat on April 1, was 83.3 per cent. of a normal, against 80.8 on April 1, 1910; 82.2 on April 1, 1909, and 86.9 the average condition for the past ten years on April 1. There was an advance in condition from December 1, 1910, to April 1, 1911, of 0.8 points as compared with an average decline in the past ten years of 4.4 points between these dates.

The average condition of rye on April 1, was 89.3 per cent. of a normal, against 92.3 on April 1, 1910; 87.2 on April 1, 1909, and 90.2 the average condition for the past ten years on April 1.

Comparisons for winter wheat and rye states follow:

States.	Winter Wheat. Condition April 1. 1911.	1910.	10-yr. av.	Condition Dec. 1, 1910.	Rye. Condition April 1. 1911.	1910.	10-yr. av.	Condition Dec. 1, 1910.
Kansas	75	64	87	73	75	70	89	74
Nebraska	86	70	90	90	86	84	92	88
Indiana	86	84	84	84	92	90	90	92
Illinois	82	84	88	82	90	93	93	91
Missouri	91	69	88	83	92	80	91	85
Pennsylvania	87	89	88	90	90	91	90	91
Ohio	84	85	82	91	86	87	86	93
Washington	97	94	90	96	95	98	94	98
Oklahoma	55	87	85	58	65	87	87	76
Michigan	88	84	83	94	90	91	88	95
California	88	98	93	90	96	96	93	99
Oregon	97	93	92	98	98	97	97	97
Maryland	81	92	88	80	84	90	91	82
Idaho	98	97	96	95	98	99	97	94
Virginia	85	90	86	81	88	91	87	83
New York	85	94	90	96	88	96	91	96
Tennessee	86	84	86	80	88	86	87	87
Kentucky	89	84	84	83	91	88	86	89
Montana	96	97	..	97	93	97	96	98
N. Carolina	89	90	89	83	88	90	89	84
Texas	85	89	78	71	95	82	76	80
W. Virginia	85	88	84	83	87	90	87	82
S. Carolina	87	88	88	87	88	89	88	92
Utah	95	94	..	87	98	99	100	94
Iowa	89	75	90	92	92	92	95	93
Colorado	92	96	..	90	82	93	89	88
Georgia	90	86	88	88	90	88	90	90
New Jersey	89	91	89	91	91	93	91	93
Arkansas	87	90	87	82	88	87	88	80
Delaware	84	96	88	75	85	94	89	86
Wisconsin	85	95	90	96	91	98	94	98
Alabama	91	85	88	89	88	90	89	91
Wyoming	95	97	..	100	98	97	95	100
Mississippi	86	90	88	92	..	..	..	..
Minnesota	..	..	..	..	85	96	90	88
United States	83.3	80.8	86.9	82.5	89.3	92.3	90.2	92.6

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until October 14 numerous tariffs presented by express companies naming charges for the transportation of liquors.

The trunk lines have notified the commission that they intend to claim the right to continue in force their present tariffs for passengers and baggage to and from Chicago, regardless of the requirements of the long and short haul rule of the fourth section of the Interstate Commerce Law. The roads claim that it is out of the question to prepare a list of all the instances in which present rates fail to conform to this rule. They say that only by disregard of the long and short haul rule can they make up for the losses forced upon them on interstate rates by the laws of the states through which they run.

Rules to Avoid Damage Claims.

Millinery Jobbers' Association v. American Express Co. et al. Opinion by Commissioner Harlan.

As damage claims increase the expense of carriage and thus effect the rates, it is reasonable and to the interest of the general shipping public as well as of the carriers to discourage shipping methods and the use of shipping cases that are lacking in safety. On these grounds and on the facts disclosed by the record, the classification rule of the defendants applying minimum weights on shipments of merchandise, and more particularly millinery, packed in ordinary pasteboard or strawboard boxes, is not unreasonable; nor is the rule unreasonable that provides for the refusal of such shipments when not crated.

The classification rule of the defendants applying minimum weights on shipments in corrugated paper or pulp cartons of certain sizes, when uncrated, instead of assessing the charges on the basis of their actual weights, found unreasonable. (20 I. C. C. 498.)

Rates to Texas Common Points Upheld.

Railroad Commission of Texas v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Harlan.

On March 15, 1903, all the class rates and most of the commodity rates from St. Louis and Kansas City to Texas common points were advanced by the carriers interested in that traffic, the extensive territory taking rates based on St. Louis being also necessarily affected by the increase. This readjustment of rates on a higher level was the occasion of a thorough investigation instituted by the Commission for the purpose of inquiring into the question of their reasonableness. The report was announced on August 16, 1905, under the title *In the Matter of Class and Commodity Rates from St. Louis to Texas Common Points,* 11 I. C. C. Rep., 238; and the view expressed was that while the advances on the whole seemed to be without justification, this did not appear with sufficient certainty to warrant the commission in ordering the old rates to be restored. On the same day on which the increased rates went into effect the Railroad Commission of Texas filed this formal complaint attacking them as unjust, unreasonable, and discriminatory.

In the tariff of August 10, 1908, there are about 110 special commodity items naming rates to Texas common points from the Mississippi river and territory beyond. It appears that advances were made in about 54 of these items, while 44 carried reductions, and in 12 items the commodity rates were unchanged. The extent of the traffic affected by the advanced rates does not clearly appear. Counsel for the Texas lines seem to think that they affect about 50 per cent. of Texas interstate traffic. Counsel for the complainant on the other hand assert very positively that the traffic moving under the increased rates did not exceed 10 per cent. of the total tonnage of any one of the railways involved. It is said in the petition that the advanced rates will add $2,600,000 a year to the revenues of the carriers, but no testimony on the point was offered by the complainant. The railways are of the opinion that the total increase in the revenues would range in the aggregate anywhere from $500,000 to about $1,250,000.

Of the four trunk lines that are defendants, namely, the Missouri, Kansas & Texas, the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, it is believed that the M. K. & T., from a traffic standpoint, is probably the most typical and representative. The defendants claim that the advanced rates will not afford them more than a fair return on the value of their property, while the complainants try to prove that under the lower rates previously in effect, the companies were earning a sufficient return on their own investment. The commission attempts to get a per mile value for the M. K. & T., by taking the aggregate market price of the securities of the company one year after its reorganization in 1891 and adding to it the sums spent since that time, for additions and betterments and additional equipment, and arrives at a total apparent investment per mile of road of $38,993, and on this valuation the net return during the year 1910 applicable to interest and dividends with the increased rates in effect was but 5.41 per cent.

As heretofore stated, the issue made on the pleadings and enlarged upon throughout the record both in the exhibits offered and in the testimony given by various witnesses, expert and otherwise, and again emphasized on the oral argument and on the briefs, was that the returns enjoyed by the defendants on their respective investments were as large as, and in some cases larger than, they should be, and therefore that no increase in rates for the purpose of securing additional revenues was justified. But on their brief and on the oral argument the com-

plainant also insisted that the increased rates are unreasonable irrespective of the question of the adequacy or inadequacy of the returns to the defendants on their several properties. It was also contended by the complainant that the advances were made without regard to any consistent or logical system or plan; that those who pay advanced rates were selected to bear the burden of the desired increase only because the carriers were able to agree to advance those particular rates, thus stifling all competition among them with respect to such rates; that those who now pay reduced rates enjoy that benefit under the new schedule only because the defendants were able to agree to reduce those particular rates; and that other rates remained unchanged only because they are controlled by the orders of this commission or because for some other reasons the carriers could not agree either to raise or to reduce them. All this is urged as showing the unreasonableness of the advanced rates. It is also contended that the advances in rates, made for the purpose of securing additional revenue and thus yielding a better return on the investment, should have been spread more or less over the whole traffic instead of being laid upon a part of the traffic. It will be remembered, as heretofore indicated, that the complainant minimizes the extent of the tonnage of the defendants that was affected by the increased rates, while the defendants endeavor to show that not less than 50 per cent. of the total tonnage into Texas was affected by the new schedules.

It is of course manifest that when additional revenues are desired and rates are to be increased for that purpose a horizontal advance in all rates on a fixed percentage, instead of yielding additional revenue, would not improbably result in a reduced revenue. Competitive and commercial conditions have so important a relation to the movement of particular kinds of traffic as to make such a readjustment of a rate schedule inadvisable if not altogether impossible. While many advances were made, many reduced rates were also published in the new schedules, other rates being left unchanged; and we think the testimony fairly shows that the defendants at least thought there was a reason for their action or inaction in each case. It is doubtless true that certain rates were increased for no other reason than that the particular traffic to which they applied could bear a higher rate; and that many reductions were made in the expectation of inducing a heavier movement of particular commodities and in that way of increasing the revenues; and that no change was made in other rates because it was thought that they were already on the right basis and that a change either by way of reduction or increase would not be effective. This explanation was made by several witnesses who participated in preparing the new tariffs, and we do not see how experienced railway men could or would otherwise approach the question of a general rate revision for increased revenues.

Certainly in the absence of testimony showing that specific mistakes or blunders were made in the revision, we see no grounds in that course of action for a general condemnation of the whole rate structure now before us.

During the argument none of the important questions discussed in the eastern and western rate advance cases now pending was considered. The amendment to the act casting upon carriers the burden of justifying increases in rates was enacted long after the rates here in question were put in effect, and the construction and interpretation of that provision, argued so earnestly in those cases, may not therefore be appropriately discussed here. Nor did any question arise here, as in those cases, of the right of carriers so to adjust their rates as to yield earnings sufficient to enable them to put back into the property some fixed proportion of the amount paid out in dividends. That question is therefore not considered. Apparently that is a policy that many of the carriers defendant in this proceeding are not in a position to consider from a practical point of view.

Nor was it contended here that the general rate schedules should be so adjusted as to give the carrier a sufficient surplus of net income to be the basis of credit in the money markets or an assurance to investors of the security of the funds advanced or to be advanced by them for additional construction. The only matter among all the questions of that nature argued in the eastern and western cases that was brought to our attention in this proceeding was the contention of the complainant that when real estate has been acquired for right of way and for terminals and has been put to that use by a common carrier, it loses to some extent the ordinary attributes of real property and is not to be regarded as increasing in value with the abutting and adjoining property, but remains an earning asset only on the basis of its original cost or on the basis of its value at the time it was actually subjected to the public use. That, it seems, has been the declared policy of the Railroad Commission of Texas. In the first valuations made by it in 1894 the market value of the real estate was ascertained and used; but one of its members when testifying before us in this case said that it was neither the practice nor the policy of his commission, in any subsequent valuation of a road valued by it in 1894, to make any allowance for the increased value of the real estate comprising its right of way and terminals, but to make allowances only for the additions and betterments added to the property since the original valuation. And it was contended here that in considering the value of the respective properties used in the public service by these defendants no allowances should be made for the increment in the value of their real estate. The question is perhaps of as great importance as any other pending problem of public interest, but as we have not found it necessary in disposing of the issues in this case to rest conclusions on either view of the matter, we need not attempt any discussion of it in this report.

We have reached the conclusion, all things being considered, that no grounds have been shown or have been disclosed by our own investigations for making any substantial disturbance in the rate schedules of the defendants that went into effect on August 10, 1908. We do not find that they have so increased the revenues of the defendants as to make them extortionate or to yield earnings that are unduly large, as alleged. We shall not therefore interfere with the commodity rates that were made effective by the defendants on August 10, 1908, it being understood, of course, that any particular rate or set of rates in those schedules is still open to attack before this commission on the grounds that are ordinarily assigned in challenging the reasonableness of a rate or rates in effect. But all things considered and in view of the signs now observable of a recovery from the financial disturbances occurring at the close of 1907 and of a return to normal commercial conditions, we should regard the continued maintenance of the present class rates as discriminatory and as imposing an unreasonable burden upon the commerce that moves from St. Louis and elsewhere to Texas common points. In our judgment the present rate of $1.47 on articles of the first class may be retained as a maximum; the present second class rate of $1.29 for the future should not exceed $1.25; but the prior rates on all the lower classes should now be restored. We accordingly find that the present scale of class rates is unreasonable and discriminatory and that reasonable class rates for the future ought not to exceed the following:

Class	1	2	3	4	5	A	B	C	D	E
Rate	147	125	104	96	75	79	70	58	46	39

(20 I. C. C. 463).

STATE COMMISSIONS.

The Minnesota Railway Commission has again postponed its investigation into the reasonableness of express rates. It is announced that the hearing will be held at St. Paul on April 27, instead of April 13.

George McCaughan, chief rate clerk for the Iowa Railway Commission, has been elected secretary of the commission, succeeding Dwight N. Lewis, who has been appointed a special examiner of the Interstate Commerce Commission.

The New York Public Service Commission, Second district, has postponed until May 1 the time at which its order directing the New York Central & Hudson River to use oil burning locomotives exclusively in the Adirondacks is to go into effect.

The New York Public Service Commission, Second district, has appointed George J. Mack of Syracuse inspector of locomotive boilers at a salary of $3,000 per year. Mr. Mack has been employed by the commission since July, 1908, as mechanical engineer, acting as assistant to G. P. Robinson, who has been appointed a federal boiler inspector. Mr. Mack is a graduate of Syracuse University, and has had practical experience, as well as technical instruction in boiler work. On the promotion examination held by the Civil Service Commission for the place, his standing was 95 per cent.

COURT NEWS.

The Pennsylvania eight-hour law of 1897, applicable to workmen engaged on public works, has been declared unconstitutional by the Supreme Court of that state.

The Supreme Court of New Jersey on April 8 issued an opinion sustaining the constitutionality of the employers' liability law of that state, passed in 1909, in which the fellow-servant doctrine is abolished. The court sustains the action of the legislature in abolishing this rule and also in enacting a rule which is applicable to railways and not to other employers. The more drastic employers' liability law which has been passed this year, will go into effect July 1 next.

A decision which has been rendered by Judge Wellborn, of the United States District Court at Los Angeles, Cal., in the case of the government against the Atchison, Topeka & Santa Fe, in which the road was accused of having given rebates to the Grand Canyon Line and the Cement Company of Nelson, Ariz., has the effect of acquitting the road. The court denied the right of the government to introduce railway tariff sheets which T. J. Norton, general attorney of the road, objected to on the ground that the rate given in the tariff was essentially different from that cited in the indictment.

The United States Circuit Court of Appeals at St. Paul, Minn., in an opinion by Judge Sanborn has decided the case which former Governor Haskell of Oklahoma and others of that state appealed from the order of the circuit court of the eastern district of Oklahoma enjoining the state from interfering with pipe lines. The opinion holds that the Oklahoma law "discriminates against and prevents interstate commerce in natural gas in Oklahoma by preventing use of pipe lines across the highways of the state to transport such gas out of the state, violates the constitution of the United States, and is void."

Decision in the Minnesota Rate Case.

Judge Walter H. Sanborn in the United States Circuit Court at St. Paul, Minn., on April 8 handed down an opinion holding unconstitutional the reductions in state passenger and class and commodity freight rates which were required by orders of the Minnesota commission and laws passed by the state legislature in 1907. The decision prohibits the enforcement of reduced rates after June 1, 1911. He holds in his opinion:

"1. The acts of the legislature of Minnesota of April 4, 1907, chapter 97, reducing passenger fares within the state about 33 1-3 per cent. and of April 18, 1907, chapter 232, reducing commodity rates within the state about 7.37 per cent., and the orders of its railway and warehouse commission of September 6, 1906, reducing general merchandise rates within the state from 20 to 25 per cent. and of May 3, 1907, reducing in-rates within the state to distributing points by their natural and necessary effect substantially burden and directly regulate interstate commerce, create undue and unjust discriminations between localities in Minnesota and those in adjoining states, violate the commercial clause of the constitution, article 1, section 8, and are void.

"2. These acts and orders which prescribe maximum fares and rates, that bring from their respective Minnesota intrastate business to the Northern Pacific company an annual net income of only 2.909 per cent., to the Great Northern company an annual net income of only 3.359 per cent., and to the Minneapolis & St. Louis company an annual net income of only 2.476 per cent. of the respective values of their Minnesota properties devoted to these businesses, prohibit a fair return upon these values, take the properties of the companies without just compensation, violate the fourteenth amendment to the constitution, and are void.

"3. The power to regulate commerce among the states was granted by the people to the nation in the constitution, is exclusive, may be exercised to its utmost extent by the use of all means requisite to its complete exercise, and no state, by virtue of its police power or any other power, may restrict this grant or the plenary exercise of this power, for these inhere in the supreme law of the land and are paramount to the powers of the states."

"4. The fares and rates of transportation in interstate commerce are national in character, susceptible of uniform regulation and so far as the nation has not regulated them are free from regulation by virtue of the commercial clause of the constitution.

"5. The nation may regulate interstate fares and rates and all interstate commerce.

"To the extent necessary completely and effectually to protect the freedom of and to regulate interstate commerce, but no farther, it may by its congress and its courts regulate intrastate commerce.

"To the extent that it does not substantially burden or regulate interstate commerce a state may regulate intrastate commerce and the fares and rates therein within its borders, but no farther. It may enforce regulations of intrastate commerce and its fares and rates which only incidentally or remotely affect interstate commerce. But state laws, orders and regulations concerning intrastate commerce, or the fares or rates therein, which substantially burden or regulate interstate commerce or the fares or rates therein, are beyond the powers of the state, unconstitutional and void.

"And where the attempted exercise of the power of a state to regulate intrastate commerce, or the attempted exercise of any of its other powers, impinges upon or conflicts with the constitutional power of the nation to protect the freedom of, and to regulate interstate commerce and the fares and rates therein, the latter must prevail because 'that which is not supreme must yield to that which is supreme.'

"6. Neither the effect nor the terms nor the purpose of state regulations determine whether they substantially burden or only incidentally or remotely affect interstate commerce.

"And this is a judicial question which each court must decide on its own responsibility on the special facts of the case before it and in the decision of which it 'must obey the constitution rather than the law-making department of the government.

"7. The nation has the power to forbid, and by the act to regulate commerce, 24, statute 379, it has prohibited undue discriminations between localities in different states wrought by unreasonable differences between intrastate and legal interstate rates caused by the reduction of the former by the acts and orders of the officers of a state.

"8. The facts considered and held:

"The unavoidable effect of the general and sweeping reductions of intrastate fares and rates in Minnesota made by the acts and orders considered, was and is substantially to burden, directly to regulate and to discriminate against the interstate commerce of the defendant companies, and to create undue and unjust discriminations between localities in Minnesota and those in other states in violation of the commercial clause of the constitution.

"9. The just compensation secured by the fourteenth amendment entitles the defendant railway companies to a fair return upon the reasonable value of their property in Minnesota devoted to the public for transportation. Such a return is just to the public as well as to the carriers.

"10. Under the evidence in these cases the cost of reproduction of the Minnesota properties of the defendant companies devoted to the public use of transportation is more evidence of their values than the market value of their stocks and bonds, or the original cost of their acquisition and construction.

"11. Rate making looks to the future and is a legislative function.

"Rate judging, determining whether or not rates made are confiscatory, is a judicial function.

"There is a presumption in the first instance that legislatures and commissions make reasonable and just rates and clear proof is requisite to overcome it.

"But when, after fares and rates have been tried by actual use for months, after plenary proof of their effect and other facts determinative of the issue confiscation *vel non* has been made before a master learned in the law, who finds the facts, the legal or judicial presumption that his findings are just and right, while not conclusive, is superior to the original presumption that the rates were just and reasonable.

"12. Interest on the cost of reproduction of railway property at 4 per cent. per annum during one-half the time requisite to acquire and construct it is a necessary expense of reproduction and may be lawfully allowed as such.

"13. Apportionment on the basis of revenue is the most reasonable and equitable method of assigning the value of railway property in a state used for transportation to the various classes of its business in order to determine the reasonableness of fares and rates.

"14. A net income of 7 per cent. per annum upon the value of railway property in Minnesota devoted to the public use of transportation is not more than the fair return to which a railway company is entitled under the fourteenth amendment to the constitution."

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Elija Robinson, assistant to the general solicitor of the Missouri Pacific, with office at Kansas City, Mo., has resigned.

E. F. Osborn, assistant secretary of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Cincinnati, Ohio, has resigned, after a service of 40 years with that road.

Carl R. Gray, who has been elected president of the Spokane, Portland & Seattle, the Oregon Trunk Railway, the Astoria & Columbia River, the Oregon Electric Railway, the Pacific & Eastern and the United Railways Company, with office at Portland, Ore., as was previously announced in these columns, was born September 28, 1867. He was educated at the Arkansas Industrial University, and began railway work in 1882, as a telegraph operator for the St. Louis & San Francisco. Four years later he was transferred to the traffic department as a clerk, and in April, 1887, was appointed commercial agent. For seven years from July, 1890, he was division freight agent, and he was then transferred to the operating department as division superintendent. He was promoted to superintendent of transportation in October, 1900, and early in 1904 was appointed general manager. In November of the same year he was appointed second vice-president and general manager, and was elected vice-president in 1906, which office he resigned to become president of the Hill lines as above.



C. R. Gray.

W. C. Nixon, whose election as vice-president in charge of maintenance and operation of the St. Louis & San Francisco, the St. Louis, Brownsville & Mexico and other Frisco lines, with office at St. Louis, Mo., has been announced in these columns, was born February 15, 1861, at Earlville, Ill. He was educated in the public schools at Washington, Ill., and began railway work as a bridge carpenter for the Burlington & Missouri River of Nebraska in February, 1879. Later in the same year he went with the Atchison, Topeka & Santa Fe, with which road he was consecutively, night watchman and then clerk and baggage man at Emporia Junction, Kan.; clerk, cashier and chief clerk at Albuquerque, N. Mex.; agent at Las Cruces, N. Mex.; agent at Albuquerque; chief clerk to superintendent at San Marcial, N. Mex.; trainmaster on the Southern Kansas division at Wellington, Kan.; superintendent of terminals at Kansas City, Mo. He was appointed superintendent of the Chicago division at Chillicothe, Ill., in November, 1890, and early in the next year became superintendent of terminals at Chicago. He was made general agent in the freight department at Chicago in August, 1896, and was superintendent of the Chicago division for three years from January, 1897. From January, 1900, to August, 1906, he was consecutively, general superintendent, general manager, second vice-president and president of the Gulf, Colorado & Santa Fe at Galveston, Texas. In the latter year he went with the St. Louis & San Francisco, being elected vice-president and general manager at St. Louis, from which office he is now promoted.



W. C. Nixon.

W. B. Wilkins, district auditor of the Union Pacific at Omaha, Neb., has been appointed auditor of disbursements, succeeding R. Anderson, who has been retired under the pension rules of the company.

Operating Officers.

L. A. Daffan has been appointed superintendent of the Texas State Railroad, with office at Palestine, Texas, succeeding T. T. Clark, resigned.

P. G. Williams, trainmaster of the Chicago, Milwaukee & Gary at Rockford, Ill., has been appointed trainmaster of the Pacific & Idaho Northern, with office at Weiser, Idaho.

J. B. Chandler has been appointed superintendent of car service of the Minneapolis & St. Louis and the Iowa Central, with office at Minneapolis, Minn., and the position of car service agent has been abolished.

C. E. Urbahns, assistant superintendent of the Minneapolis, St. Paul & Sault Ste. Marie, at Chicago, has been appointed superintendent of the Northern district—Chicago division, succeeding A. J. Van Valkenburg, resigned. F. W. Urbahns, trainmaster at Fond du Lac, Wis., succeeds C. E. Urbahns, and C. L. Leighty succeeds F. W. Urbahns.

Daniel W. Dinan, whose appointment as superintendent of the Mohawk division of the New York Central & Hudson River, with office at Albany, N. Y., has been announced in these columns, was born November 14, 1866, at Whiteport, N. Y. Mr. Dinan graduated from New Paltz Academy in 1883, and in December of the same year began railway work on the West Shore Railroad. In November, 1900, he was appointed trainmaster on the Pennsylvania division of the New York Central & Hudson River, and in September of the following year was appointed chief trainmaster of the same division. He was appointed assistant superintendent in May, 1904, and was promoted to superintendent of the Pennsylvania division in May of the following year, which position he held at the time of his recent appointment as superintendent of the Mohawk division.

M. G. McInerney, whose appointment as assistant superintendent of the Buffalo & Rochester division of the Buffalo, Rochester & Pittsburgh, with office at East Salamanca, N. Y., has been announced in these columns, was born May 24, 1868, at Meadville, Pa. He was educated in the public schools and at Salamanca-Rochester Business University, at Rochester, N. Y. Mr. McInerney began railway work as a call boy on the Erie Railroad at Salamanca August 1, 1881, and in March, 1883, was appointed a telegraph operator on the Western New York & Pennsylvania, now a part of the Pennsylvania Railroad. In August, 1887, he was appointed switchman at Rochester on the Buffalo, Rochester & Pittsburgh, and the following year was made assistant yardmaster, becoming general yardmaster in December, 1888. In December, 1903, he was appointed trainmaster at East Salamanca on the same road, which position he held at the time of his recent appointment as assistant superintendent.

Richard G. Mathews, who has been appointed terminal superintendent of the Buffalo, Rochester & Pittsburgh, at Rochester, N. Y., was born July 7, 1862, at Marietta, Ohio, and was educated in the common schools. He began railway work in April, 1878, as a telegraph operator on the Marietta, Pittsburgh & Cleveland, now a part of the Pennsylvania. In 1885 he was appointed a despatcher on the Scioto Valley, now a part of the Norfolk & Western, and in November, 1888, was appointed chief despatcher of the Columbus, Hocking Valley & Toledo. In

December, 1890, he went to the Chicago & Eastern Illinois as trainmaster, and was promoted to superintendent in July of the following year. He went to the Buffalo, Rochester & Pittsburgh in April, 1893, as superintendent and was promoted to general superintendent in June of the following year. He then went to the Florida Central & Peninsula, now a part of the Seaboard Air Line, as chief despatcher, and was later made trainmaster, resigning from that company in 1901, to go to the Plant System as trainmaster. In 1902 he was appointed terminal superintendent of the Savannah Union Station Company, and in December of the following year he was appointed general yard master of the Buffalo, Rochester & Pittsburgh, at Rochester, which position he held at the time of his appointment as terminal superintendent at Rochester.

John J. McCann, who has been appointed superintendent of the Scranton division, with temporary jurisdiction over the Bangor & Portland division of the Delaware, Lackawanna & Western, with office at Scranton, Pa., as has been announced in these columns, was born in Scranton. Mr. McCann began railway work in 1871, as a brakeman on the Delaware, Lackawanna & Western, and when he was 17 years old was promoted to conductor on the same road. He remained in this position until 1883, when he was made yardmaster at Elmira, N. Y., and in 1888, he was promoted to passenger conductor on the Buffalo division. Mr. McCann was appointed a trainmaster of the same company in September, 1900, which position he held at the time of his recent appointment as superintendent of the Scranton division.



J. J. McCann.

J. F. Keegan, whose appointment as superintendent of the Baltimore & Ohio, with office at Wheeling, W. Va., has been announced in these columns, was born March 29, 1870, at Cleveland, Ohio, and graduated in June, 1885, from St. Columba's Academy, Cleveland. He began railway work in November, 1886, as a telegraph operator on the Cleveland, Cincinnati, Chicago & St. Louis, and then left that company to go to the Cleveland, Lorain & Wheeling, now a part of the Baltimore & Ohio, as a telegraph operator in June, 1890, the following November he was appointed train despatcher at Canal Dover, Ohio. Mr. Keegan was promoted to chief train despatcher in May, 1902, and in September of the following year, was appointed assistant trainmaster at Cleveland. In December, 1904, he was transferred in the same capacity to Wheeling, W. Va., and in September, 1906, he was promoted to trainmaster at Parkersburg. He was transferred to Keyser as trainmaster of the Cumberland division in December, 1910, which position he held at the time of his recent appointment as superintendent.



J. F. Keegan.

Traffic Officers.

W. L. Louis has been appointed traffic manager of the Elgin, Joliet & Eastern, with office at Chicago, succeeding F. E. Learned, resigned to engage in other business.

W. H. Richmond has been appointed traveling passenger agent of the Missouri Pacific-Iron Mountain system, with office at Pittsburgh, Pa., succeeding H. C. Young, resigned.

H. B. Herrington has been appointed a soliciting agent of the Tennessee Central, with office at St. Louis, Mo., succeeding James G. Larkin, resigned to engage in other business.

A. O. Ellis has been appointed a traveling passenger agent of the Wheeling & Lake Erie, with office at Cleveland, Ohio, succeeding Charles Hamilton, resigned to accept service with the Wabash.

M. C. Bradley has been appointed a contracting agent of the Lackawanna Fast Freight Line, with office at St. Louis, Mo., succeeding W. J. Keane, resigned to accept service with another company.

J. I. Johnson has been appointed a general agent of the Chicago, Rock Island & Pacific, with office at Amarillo, Tex., succeeding A. B. Spencer, resigned to accept service with another company.

George B. Huget has been appointed traveling freight and passenger agent of the Chicago & Alton, Minneapolis & St. Louis and Iowa Central, with office at Peoria, Ill., succeeding W. B. Gibbs, resigned.

T. J. McGeoy, agent of the Lackawanna Fast Freight Line at St. Louis, Mo., has been appointed assistant general western freight agent of the Delaware, Lackawanna & Western, with office at Chicago, a new position.

A. F. Sullivan, traveling freight agent of the Chicago & Alton and the Toledo, St. Louis & Western at Minneapolis, Minn., has been appointed a commercial agent, with office at Minneapolis, and his former office has been abolished.

Walter S. Turner has been appointed a commercial agent of the Chicago & Alton and the Toledo, St. Louis & Western, with office at Little Rock, Ark., succeeding Joe A. Shearn, traveling freight agent, resigned, and the office of traveling freight agent has been abolished.

F. R. McMillan, traveling passenger agent of the Southern Railway at Norfolk, Va., has been appointed district passenger agent, with office at Houston, Tex., a new position. M. H. Bone, district passenger agent at Birmingham, Ala., has been transferred to Dallas, Tex.

Jesse J. McLane, city passenger and ticket agent of the Illinois Central, at Cincinnati, Ohio, has been appointed a traveling passenger agent, with office at Cleveland, succeeding Perry A. Marr, promoted. F. D. Caddy, assistant city passenger agent, at Cincinnati, succeeds Mr. McLane.

P. E. Ahern, city freight agent of the Delaware, Lackawanna & Western, at Brooklyn, N. Y., has been transferred to New York City. J. F. Rydene, contracting agent, at New York City, succeeds Mr. Ahern, and H. A. Klase succeeds Mr. Rydene. J. A. McTague has been appointed a traveling freight agent, with office at New York City.

George H. Bower, assistant general passenger agent of the Illinois Central and Indianapolis Southern, at Chicago, has been appointed general passenger agent of the southern lines of the Illinois Central and Yazoo & Mississippi Valley, with office at Memphis, Tenn., succeeding J. A. Scott, deceased. A sketch of Mr. Bower's railway life was published in the *Railway Age Gazette*, March 3, page 432. J. V. Lanigan, chief rate clerk in the Chicago office, succeeds Mr. Bower.

H. A. Jackson, assistant general freight and passenger agent of the Great Northern at Portland, Ore., has been appointed assistant traffic manager, with office at St. Paul, Minn., succeeding W. P. Kenney, promoted. Archibald Gray, assistant general freight agent at Seattle, Wash., succeeds Mr. Jackson, and H. A. Kimball, assistant general freight agent at St. Paul, succeeds Mr. Gray. W. J. Power, general agent in the freight department

at Duluth, Minn., has been appointed an assistant general freight agent, with office at St. Paul, Minn., and H. R. Carl succeeds Mr. Power at Duluth.

Engineering and Rolling Stock Officers.

A. E. Harvey, division engineer of the Kansas City Southern, at Mena, Ark., has resigned to become chief engineer of the Metropolitan Street Railway of Kansas City, Mo.

S. S. Morton has been appointed an assistant engineer of the Kansas City Southern, with office at Mena, Ark., succeeding A. E. Harvey, division engineer, resigned to accept service elsewhere. C. L. Wallace has been appointed an office engineer at Kansas City, Mo.

M. Donahue, roadmaster of the Chicago & Alton, at Bloomington, Ill., has been appointed general supervisor of roadway and structures, with office at Bloomington, a new position; and the offices of roadmaster and of supervisor of bridges and buildings of the northern and southern divisions have been abolished.

George T. Hand, who was recently appointed division engineer of the Delaware, Lackawanna & Western, with office at Hoboken, N. J., as has been announced in these columns, was born in 1872 at Elizabeth, N. J. Mr. Hand began railway work in 1889, as chainman on the National Docks Railway, and in 1900 he went to the Delaware, Lackawanna & Western as assistant engineer. He was promoted to terminal engineer on November 1, 1909, which position he held at the time of his recent appointment as division engineer of the Morris & Essex division.

Curtis Edward Knickerbocker, whose appointment as chief engineer of the New York, Ontario & Western, with office at Middletown, N. Y., has been announced in these columns, was born November 17, 1867, at Morrisville, Madison county, N. Y. He attended Cazenovia Seminary and graduated from Princeton University with the degree of civil engineer in 1891. The same year he began railway work as a draftsman in the office of the chief engineer on the New York, Ontario & Western, at Middletown, remaining in that position until March, 1893, when he was appointed an assistant engineer at Norwich, N. Y. In January, 1902, Mr. Knickerbocker was promoted to engineer of maintenance of way, with office at Middletown, which position he held at the time of his recent appointment as chief engineer of the same company.



C. E. Knickerbocker.

Special Officers.

Louis P. Harris, formerly advertising manager of the Cincinnati, Hamilton & Dayton, has been appointed assistant advertising manager of the St. Louis & San Francisco, with office at St. Louis, Mo.

F. G. Athearn, superintendent of railway clubs of the Southern Pacific at San Francisco, Cal., has been appointed manager of the bureau of economics, with office at San Francisco, Cal., a new position. F. T. Scott succeeds Mr. Athearn, and the office of assistant superintendent of railway clubs is abolished.

OBITUARY.

Richard H. Williams, until the first of this year treasurer of the Chicago & North Western, died on April 12 at his home, Mount Vernon, N. Y., of heart disease. He has been ill about a week. Mr. Williams was 63 years old.

Railway Construction.

New Incorporations, Surveys, Etc.

Aberdeen & Asheboro.—A new branch has been opened from Candor, N. C., southward to Ellerbe, 17.5 miles.

Atchison, Topeka & Sante Fe Coast Lines.—The Wahtoke district has been opened for business from Reedley, Cal., west to Piedra, 16 miles.

The Laton & Western has been opened for business from Laton, Cal., west to Lanare, 15 miles.

It is reported that this company will build a cut-off on the San Francisco division from a point near Victorville, Cal., north to a connection with the branch at Hinkley.

Atchison, Topeka & Santa Fe.—An officer writes regarding the reports that a cut-off is to be built from Dodge City, Kan., to southwestern Kansas and the panhandle of Texas to Colmor, N. Mex., that nothing has been done in regard to such a proposition except a preliminary survey. There is no prospect of the construction of such a line in the immediate future.

Antioch & Stockton (Electric).—See Oakland, Antioch & Eastern (Electric).

Barger Railway & Light Co.—An officer writes that grading work has been finished from Whitewater, Wis., southeast to Lake Geneva, 22 miles. H. B. Kamschulte, president, Milwaukee. (March 3, 1911, p. 433.)

Baltimore & Ohio.—According to press reports contracts for nearly 35 miles of second track work on the main line of the Chicago division have been let.

Bellingham-Skagit Interurban.—This company, it is said, will build a line from Bellingham, Wash., to Mount Vernon, 22 miles, thence to Everett. The Stone & Webster Engineering Corporation, Boston, Mass., is back of the project.

Bloomington Southern.—See Indianapolis Southern.

Brinson Railway.—This road has been extended from Mill Haven, Ga., to Sardis, 5 miles.

Canadian Pacific.—On the Saskatchewan division a new line has been opened for business from Macklin, Sask., on the Battle River subdivision, to Kerrobert, 46 miles.

Chesapeake & Ohio.—The Paint Creek branch of the Kanawha district has been extended to Kingston, W. Va., which is six miles beyond Mahan.

Chicago, Rock Island & Pacific.—An officer writes that it has been decided to build under the name of the St. Paul & Kansas City Short Line from Carlisle, Iowa, south to Allerton. The company has definitely decided upon the location between Carlisle and Dallas, but between Dallas and the Missouri River division it has not been definitely decided at what point the line would join that division or through what towns it would pass. Bids are now being asked for, and it is expected to let contracts about April 20, so that work can be started this month. The work will be very expensive, the line passing through a rough country. Maximum grades will be 0.8 of 1 per cent. compensated for curves, maximum curves 3 deg. The estimated cost of building the line is $60,000 a mile. There will be a number of short plate girder bridges, also some short but high trestle bridges and ordinary station buildings. This is to be essentially a coal line, the Rock Island owning large bodies of coal land which it will develop at once, the line will also carry coal for other operators. When the line is built in connection with the St. Paul & Des Moines it will form a through and very important line for the Rock Island between St. Paul, Minn., Minneapolis, and the northwest, and Kansas City, Mo., and the company's line to California and to the gulf. It will be by far the shortest line between Minneapolis, St. Paul and Kansas City. It will be well built and will be an important passenger and freight line between the points named. (January 27, p. 183.)

Clinton, Oklahoma & Western.—This company, which operates a line from Clinton, Okla., to Butler, 21.5 miles, is said to have made definite arrangements to build an extension into the Texas Panhandle.

Corvallis & Alsea River.—See Portland, Eugene & Eastern (Electric).

Denver, Northwestern & Pacific.—The bill which was introduced in the Colorado legislature to provide for the construction by the state of the Continental Divide tunnel on the D., N. W. & P., has been passed by the House. The measure now goes to the Senate for action. The bill authorizes the state to issue bonds to the amount of $4,000,000 to be used in the construction of a tunnel through the Rocky mountain range at James Peak. The tunnel will be used by the Denver, Northwestern & Pacific. The railway is to put up a bond guarding the state against loss. (February 17, p. 334.)

Detroit, Bay City & Western.—This company, which operates a freight line from Bay City, Mich., to Carrol, 28 miles, recently opened the line for passenger traffic.

Eastern Utah.—Contracts have been let and grading work is under way on the first section of 20 miles of this line. The company was organized to build from Wellington, Carbon county, Utah, southwest to Emery, 60 miles. Henry Wade, president, Price. (March 3, p. 433.)

Grand Trunk Pacific.—An officer sends us the following particulars of the work the company expects to carry out this year:

Grading—

Main Line.

Prairie Creek to Tete Jaune Cache	114 miles	
Copper River to Aldermere	140 "	
		254 miles

Branches.

Calgary Branch (to complete)	117 miles	
Battleford Branch (to complete)	28 "	
Regina Branch (to complete)	30 "	
Regina-Boundary Branch (to complete present contract)	40 "	
Regina-Moose Jaw Branch (to complete)	35 "	
Prince Albert Branch (to complete)	59 "	
Alberta Coal Branch (to complete)	48 "	
New branch off same (new contract)	25 "	
Biggar-Calgary Branch (new contract)	50 "	
		432 miles
Total		686 miles

Tracklaying—

Main Line.

Prairie Creek to Tete Jaune Cache	114 miles	
Copper River to Aldermere	140 "	
Calgary Branch	117 "	
		371 miles

Branches.

Battleford Branch	48 miles	
Regina Branch	58 "	
Regina-Boundary Branch	90 "	
Regina-Moose Jaw Branch	40 "	
Prince Albert Branch	87 "	
Alberta Coal Branch	54 "	
		377 miles
Total		748 miles

It is also the intention of the company to put up 140 station buildings. The report that the company is going to construct 100 hotels is inaccurate.

Houston & Texas Central.—Surveys are said to be under way for a cut-off between Giddings, Texas, and Stone City, about 50 miles.

Indianapolis Grade Changes.—In connection with the proposition to make extensive elevation of railway tracks in the city of Indianapolis, Ind., for the purpose of eliminating grade crossings, the engineers of a number of the principal railways have made tentative proposals which have been submitted to the city engineer, for the construction of lines around the city, which would permit of the abandonment of some of the lines which are included in the plans for elevation. The map which has been made shows a line starting at the Lake Erie & Western tracks, near Castleton, and running southeast to the intersection of the tracks of the Indianapolis division of the Big Four, west of Lawrence. It would then run south to the intersection of the Peoria & Eastern west of Hunters station, continuing south to the tracks of the Pennsylvania about two miles east of Irvington. Continuing south the line intersects the C., H. & D. about two miles east of Irvington, then it runs south to the Cincinnati division of the Big Four, near Beech Grove. Trains from the various roads mentioned would then come into the city from Beech Grove on the Cincinnati division of the Big Four. A second proposed new line would start at the Monon tracks, north of Broad Ripple, and run southwest, intersecting the Chicago division of the Big Four about 1½ miles south of New Augusta. With east and north lines coming into the city over two lines, track elevation would be reduced materially. The Pennsylvania lines running south and west would not be affected by the proposed scheme.

Indianapolis Southern.—Steps are being taken by residents of Bloomington, Ind., to extend the Bloomington Southern from the present terminal south of Bloomington, south through the stone belt of Monroe county into Lawrence county, about 15 miles. Options on the right-of-way have already been secured.

Iowa City, Ottumwa & Southwestern (Electric).—An officer writes that contracts will be let about June 1 to build this line. The plans call for building from Iowa City, Iowa, southwest to Ottumwa, 70 miles. The work will include a 444-ft. steel bridge. A contract for a power house has been let to the B. J. Arnold Co. Frank Tanner, president, Iowa City. (See Iowa City-Ottumwa Interurban, March 31, p. 813.)

Johnstown Railroad (Electric).—Incorporated in New York with $300,000 capital, to build from Johnstown, N. Y., west to Little Falls, 27 miles. L. O. Bucklin, Little Falls; J. P. Argersinger, Johnstown, and H. D. Harmickell, New York, are directors.

Kansas City Southern.—An officer writes that a contract has been given to Porter Brothers, Spokane, Wash., for carrying out improvement work on seven short changes of line. The work calls for grade reduction, from 1 per cent. to 0.5 per cent., on a total distance of about 25 miles.

Laton & Western.—See Atchison, Topeka & Sante Fe Coast Lines.

Milwaukee Northern (Electric).—An officer is quoted as saying that the grading for the proposed extension from Sheboygan, Wis., southwest to West Bend, about 35 miles, will be started this coming fall. Considerable double-tracking work on the present line between Milwaukee and Sheboygan will be carried out during the spring and summer.

Nebraska Transportation Company.—Organized in Nebraska to build from Omaha, Neb., northwest to Elk City, from which point one line is to be built north to Sioux City, Iowa, 98 miles, and another line is to be built from Elk City, northwesterly to Norfolk, about 100 miles. Right-of-way has been secured for 60 miles and contract for building the line has been let to the Baker Construction Company, Omaha.

Nevada Copper Belt.—This road has been extended from Mason, Nev., to Hudson, 14.2 miles, and a new branch, called the Smelter branch, has been opened for business from Wabuska, to Thompson, 2.5 miles. (February 24, p. 369.)

New Orleans, Mobile & Chicago.—This company is making a survey from Middleton, Tenn., the present northern terminus, north to Jackson, 40 miles, and plans to extend to that point as soon as arrangements for financing the work can be made. President Berg says it will cost about $800,000 to build the road into Jackson. The people of Jackson plan to raise $100,000 for the undertaking, and will take stock in the company in return, arrangements for securing the remainder have not been completed. It is the intention to extend the road ultimately north to the Ohio river. Definite plans for reaching the river have not been decided upon, but will probably include trackage rights over the Illinois Central to Milan and then construction to Paducah or some other river point. At Middleton the road connects only with the east and west line of the Southern Railway. When it reaches Jackson it will have better connections to the north over the Illinois Central, Mobile & Ohio, and the Nashville, Chattanooga & St. Louis. (March 3, p. 434.)

Nooksack Valley Traction.—This company will build an extension, it is said, from Bellingham, Wash., northwest via Marietta to Ferndale, about 10 miles. The line is to be extended eventually to Blaine. (December 16, p. 1167.)

North Coast.—See Oregon-Washington Railroad & Navigation Company.

Oakland, Antioch & Eastern (Electric).—Incorporation has been asked for in California by this company. The plans include taking over the Antioch & Stockton, which has been build-

ing an electric line from Antioch, Cal., southwest to Oakland, 30 miles, now nearing completion, and to build an extension from Antioch, east to Stockton, about 50 miles. The directors include: A. W. Maltby, Concord; J. R. Selby, S. L. Naphthaly, L. Arnstein and A. J. Krutmeyer, San Francisco.

Oregon Roads.—The Booth-Kelly Lumber Company is said to be asking for bids to build a logging line 3.5 miles long, above Wendling, Ore.

Oregon Short Line.—According to press reports, contracts are to be let soon for building about 50 miles of the Raft River branch. The line is to be built southwest from Burley, Idaho, through the Raft river country.

An officer writes that track has been laid on about 0.5 mile on a line from Caldwell, Idaho, west to Greenleaf, 11.2 miles.

Oregon-Washington Railroad & Navigation Company.—A contract is said to have been given to the Watson, Flagg & Standifer Co., Portland, Ore., for building an 18-mile section on the North Coast, between Spokane, Wash., and Cheney. It is estimated that the work, which will be difficult, will cost $1,000,000.

Pensacola, Mobile & New Orleans.—An officer writes that this company, which was organized to build from Pensacola, Fla., northwest to Mobile, Ala., 60 miles, expects to have the line in operation to the east side of the valley of the Mobile river by December of this year. The grading and bridging to that point is nearly finished and one-third of the track has been delivered at the yard at Pensacola. Some preliminary work is being carried out for the bridge over the Mobile river, but nothing will be done on this structure until December. (October 14, p. 712.)

Pennsylvania Roads.—H. W. Hamblin, Harrisburg, Pa., is said to be back of a project to build a line from near Biglerville, southwest via Arendtsville to Cashtown, about ten miles.

Portland, Eugene & Eastern (Electric).—This company has bought the Corvallis & Alsea River, operating a logging line between Corvallis, Ore., and Monroe. It is the intention of the new owners to electrify the line and build an extension.

Southern Railway & Navigation Company.—An officer writes that this company has work under way on an extension of 11 miles, and that the plans call for building at some later time a further extension of 50 miles. The company now has in operation a line from Vidalia, Miss., southwest to Crooksville, 13.8 miles.

St. Paul & Kansas City Short Line.—See Chicago, Rock Island & Pacific.

St. Paul & Des Moines.—See Chicago, Rock Island & Pacific.

Union Pacific.—The contract for building the extension between Northport, Neb., and Gering, has been let to Shirley & Phelan, Omaha. (March 3, p. 434.)

Western Pacific.—This company will spend $2,000,000 reballasting its roadbed through the Feather river canyon, Cal., it is said, to prevent further trouble from snow slides. In Keddie a masonry retaining wall will be constructed.

Tenders for the construction, equipment, and operation of the railway from Madrid, Spain, to Valencia, were opened on March 17 at the Ministry of Public Works, Madrid, and the contract was awarded to a combination of American and British capitalists and promoters under the name of the Spanish Railway Co., London, England. The alternative of electric traction, left optional in the conditions submitted by the government, was not considered in the bid accepted, steam traction alone being provided for. The field of operations of the company in Spanish railway construction and development is apparently not limited to the railway under notice, but includes also the building of the new line between Madrid and Bilbao, which it is proposed to construct on the same gage as the French trunk lines so as to establish direct through communication between Madrid and Paris without necessitating present transshipments of all passengers and freight traffic at the frontier.

Railway Financial News.

Alberta Railway & Irrigation.—The Canadian Pacific offers until May 1, 1911, to buy at $153 per share, the minority stock of the Alberta Railway & Irrigation, on condition that the holders of 8,000 shares consent to sell.

Boston & Maine.—The Connecticut River Railroad, a subsidiary of the B. & M., has asked permission of the Massachusetts Board of Railroad Commissioners for authority to buy the franchises and property of the Vermont Valley Railroad, which it now controls through stock ownership.

Chicago, Indianapolis & Louisville.—This company has sold to Potter, Choate & Prentice, New York, $2,300,000 refunding mortgage 4 per cent. bonds, due 1947. These bonds were issued to retire a like amount of Louisville, New Albany & Chicago (Chicago and Indianapolis division) first mortgage 6s, due August 1, 1911. On that date the refunding 4s will become an absolute first mortgage on the entire mileage owned by the company, aggregating 509 miles of road.

Chicago, Milwaukee & Puget Sound.—This company, operating the Pacific coast extension of the C., M. & St. P., has called a stockholders' meeting for May 31 to vote on the question of increasing the capital stock from $100,000,000 to $200,000,000. All of the stock except directors' shares is held by the St. Paul.

Cleveland & Pittsburg.—A stockholders' meeting has been called for June 15 to vote on the question of authorizing an increase in the capital stock of the company from $22,000,000 to $40,000,000; the additional stock to be issued to the Pennsylvania Railroad, which leases the property for the Cleveland & Pittsburg.

Connecticut River Railroad.—See Boston & Maine.

Detroit, Toledo & Ironton.—In proceedings being brought by the trustees of the $4,250,000 first and second lien bonds looking to a foreclosure sale of the property under these bonds, the representatives of the junior bond issues have asked for and been granted a postponement of two weeks. In the junior bondholders' petition it was said that under the plan of reorganization which they had worked out, the company would receive $10,000,000.

Indianapolis Southern.—The property of this company is to be sold under foreclosure on May 5. The upset price is fixed at $2,500,000.

Intercolonial Railway.—The minister of railways and canals of Canada, says that during the Easter recess of the Canadian parliament the department of railways and canals will take up the question of acquiring the branch lines now operated independently as feeders of the Intercolonial. A statute has already been passed permitting such a purchase.

Knoxville, Sevierville & Eastern.—A suit has been brought asking for the removal of W. J. Oliver as receiver of this road. The road runs from Knoxville, Tenn., to Sevierville, 30 miles.

Maine Central.—This company has sold to F. S. Moseley & Co. $1,500,000 one-year 4 per cent. notes, dated April 1, 1911. The proceeds will be held to pay off in cash the $1,500,000 5 per cent. four-year notes maturing June 1.

Missouri Pacific.—H. I. Miller, receiver of the Buffalo & Susquehanna and formerly president of the Chicago & Eastern Illinois, has been appointed to make a physical valuation of inspection of the Missouri Pacific.

New York Central & Hudson River.—See West Shore.

Norfolk Southern.—A quarterly dividend of half of 1 per cent. has been declared on the $16,000,000 stock, payable May 1. The initial quarterly dividend of half of 1 per cent. was paid February 1, 1911.

Pennsylvania Railroad.—The directors have announced a stock allotment of 10 per cent. to stockholders of record May 5 at par. Stockholders may subscribe for the new stock between May 31 and June 5.

The amount of stock outstanding on March 1 was 8,252,324 shares, of par value $412,616,200. The amount of stock on which the 10 per cent. allotment will be made to stockholders of record May 5 will not be greatly different from that of March 1, in which case the amount of new stock issued will be $41,261,620. The total amount of stock outstanding after the allotment is complete will be about $454,000,000. The Pennsylvania warrants were listed in New York Wednesday afternoon. The opening sale was 160 at 10⅝. See Cleveland & Pittsburg.

Pittsburg, Cincinnati, Chicago & St. Louis.—At the stockholders' meeting on April 11, D. T. McCabe, G. L. Peck, John P. Green and S. Stuart Patterson were elected additional directors.

Pittsburgh & Lake Erie.—This company, which is a subsidiary of the New York Central's Lake Shore & Michigan Southern, earned gross in 1910 $17,052,698, an increase over the gross of 1909 of $2,213,750. Net, after the payment of expenses, last year amounted to $9,106,631, an increase over 1909 of $686,889. The operating ratio last year was 46.60, as against 43.26 the year before. The company operated the same mileage in 1910 as in 1909, namely, 191 miles. There was issued during the year $6,000,000 additional capital stock, making the total capital stock outstanding at the end of 1910 $21,000,000, leaving a balance of $9,000,000 authorized stock unissued. The funded debt of the road is $4,000,000. After the payment of interest, rentals, 10 per cent. dividends, and $4,864,091 for additions and betterments and additional equipment, the company had a surplus of $1,225,816 in 1910. In the previous year, after the payment of 10 per cent. dividends, the company had a surplus of $6,115,605, but in 1909 nothing was charged against income for additions and betterments or additional equipment.

Operating expenses last year amounted to $7,946,066, an increase of $1,526,861 over 1909. Of this increase, $793,404 was an increase in transportation expenses.

In 1910 revenue ton miles totaled 2,006,824,483, an increase over 1909 of 212,077,679. The tons of revenue freight carried one mile per mile of road (freight density) amounted last year to 10,493,200. The average haul of revenue freight was about the same last year as the year before, 64 miles. The average train load was 1,207 tons, an increase in 1910 over the impressively high figure of 1909 of 15 tons. The average revenue per ton per mile in 1910 was 7.48 mills, and in 1909 7.29 mills.

Of the total tonnage, 31,378,435 tons, of freight moved by the P. & L. E. in 1910, 11,181,850 tons was bituminous coal and 6,093,188 tons was coke. The increase in bituminous coal tonnage was about 17 per cent.

The two most important developments of the year for the Pittsburgh & Lake Erie were the traffic agreement for 99 years made with the Western Maryland, which has during the past year built a 90-mile line from Cumberland, Md., to Connellsville, W. Va., forming a connection with the Pittsburgh & Lake Erie, and the new agreement ratified since the close of the calendar year, but negotiated during the past year, by which the P. & L. E. has been given trackage rights over the Erie's New Castle-Sharon branch; and the Erie has begun to actively solicit business in the Pittsburgh district for haul over the P. & L. E. to a connection with its own lines.

Rutland Railroad.—This company, operating 468 miles of railway and controlling the Rutland Transit Co., which operates a line of steamers from Ogdensburg, N. Y., through the Great Lakes to Chicago, has been controlled by the New York Central & Hudson River. A short time ago the New York Central sold half of its majority stock to the New York, New Haven & Hartford, so that now the Rutland is controlled jointly by the New Haven and the New York Central. This arrangement gives the New York, New Haven & Hartford its own entrance into Montreal.

In 1910 operating revenue of the Rutland amounted to $3,339,834, an increase over 1909 of $237,401. Operating expenses amounted to $2,356,256, an increase of $154,411 over 1909. Operating income last year, after the payment of taxes, was greater by $75,375 than in 1909 and totaled $861,656. The Rutland has outstanding an issue of about $9,000,000 cumulative preferred stock, and the provisions governing the issue of this preferred stock make it impossible for the company to issue new securities for capital expenditures until the cumulative dividend has been paid. No dividends have been paid for some years, and therefore the Rutland has been forced to make all improvements to its property from income. In 1910 $291,029 was appropriated for additions, betterments and improvements, and in 1909 $204,005, leaving a nominal surplus in both 1910 and 1909.

The total number of tons of revenue freight carried one mile was 253,285,609 in 1910, an increase of 9,186,863 tons. Freight density on the Rutland was 610,165 tons one mile per mile of road. The average haul last year was 119 miles, a shorter haul by three miles than the average for 1909. The average revenue train load was 271 tons, which is less by nine tons than the 1909 train load. Lumber, grain and miscellaneous manufactured articles form the bulk of the Rutland's freight traffic, and the tonnage of all of these commodities showed increases in 1910 over 1909.

Southern Pacific.—A press despatch from San Francisco says that this company has bought the entire holdings of L. E. Hanschet in the stock of the traction companies in the Santa Clare valley. The report says that this purchase gives the Southern Pacific control of three extensive electric railways.

St. Louis & San Francisco.—Speyer & Co., New York, have arranged for the sale to French bankers of $7,000,000, or about 35,000,000 francs, general lien 15-20 year 5 per cent. bonds. There are at present $10,000,000 of these general lien bonds listed on the parquet of the French Bourse. Of the bonds now sold, $5,443,000 are for refunding purposes, and $1,557,000 for additions and betterments.

Tennessee Central.—A formal decree has been entered dismissing the suits brought by the Illinois Central and the Southern Railway against the Tennessee Central, the matter under controversy having been settled out of court some time ago.

Terminal Railroad Association of St. Louis.—At a meeting of the stockholders held on April 10, the following new directors were elected: F. H. Britton, St. Louis Southwestern; C. W. Galloway, Baltimore & Ohio Southwestern; C. S. Clarke, Missouri Pacific; C. R. Gray, St. Louis & San Francisco; W. L. Park, Illinois Central; F. O. Melcher, Chicago, Rock Island & Pacific. The following have been appointed members of the finance committee: George H. Ross, George E. Evans, W. L. Park, and Julius S. Walsh, chairman and ex-officio member. The following are on the executive committee: C. E. Shaff, T. C. Powell, Henry Miller, C. H. Middleton, A. A. Allen, Benjamin McKeen, C. R. Gray and W. S. McChesney, Jr., chairman and ex-officio member.

Vermont Valley Railroad.—See Boston & Maine.

West Shore.—The *Commercial & Financial Chronicle* says that in order to pave the way for a merger of the West Shore with the New York Central & Hudson River, a bill has been passed in the New Jersey legislature permitting the consolidation, so far as the property of the West Shore in New Jersey is concerned, of this company and the N. Y. C. & H. R. No new legislation, it is said, will be required in New York, the permission of the Public Service Commission, however, being necessary. While the merger has not been definitely decided on, the New York Central desires to obtain the necessary permission to do so should it wish in the future to carry out the plan.

FOREIGN RAILWAY NOTES.

Contracts for the extension of the Bagdad Railway, Asia Minor, to Bagdad, for the branch line from Osmanich to Alexandretta, and the construction of harbor works at Alexandretta were signed at Constantinople, Turkey, on March 21.

Higher passenger and freight rates on the State Railways of Chile will go into operation August 10, 1911. This increase of rates is due to the fact that during the past five years the State Railways have been operated at an average annual loss of $2,979,372.

Supply Trade Section.

The Chicago Steel Car Company, Chicago, is building a number of acid tank cars for the Pioneer Iron Company, Marquette, Mich.

The Whipple Car Company, Chicago, has opened an office at the Grand Central Terminal, New York, in charge of J. H. Burwell, eastern sales agent.

The Orton & Steinbrenner Company, Chicago, announces the appointment of W. Van R. Whitall, Inc., New York, as its representative in New York and England for the sale of locomotive cranes and grab buckets.

C. H. Pearson, of the Noera Manufacturing Company, Waterbury, Conn., has taken a position in the hoist department of the Yale & Towne Manufacturing Company, New York. Mr. Pearson's field will be in the West.

The Carnegie Steel Company, Pittsburgh, Pa., has leased the fifth and sixth floors of the Frick Annex, and is connecting them with the Carnegie building by two bridges across Relief alley. This new space will give the company about 50 additional offices.

Edward W. Snowdon, of the Union Spring & Manufacturing Company, Pittsburgh, Pa., died in New York on April 9. Mr. Snowdon was born in Cincinnati, Ohio, in 1863. He was formerly in the mechanical department of the Queen & Crescent; later with the American Car & Foundry Company, New York, and in 1908 he went to the Union Spring & Manufacturing Company.

The Smith locomotive adjustable hub plate, made by the Smith Locomotive Adjustable Hub Plate Co., Pittsburgh, Pa., has been fitted to one of the Pacific type passenger locomotives of the New York, New Haven & Hartford. The outside box trailer and engine truck wheels, as well as the driving wheels, are equipped with this device. The plate is in use on the Delaware & Hudson and on the St. Louis & San Francisco.

The McKeen Motor Car Company, Omaha, Neb., has shipped the thirtieth gasoline motor car for service on the Southern Pacific. A 70-foot car for the Sand Springs Interurban Railway, Tulsa, Okla., will leave the builder's plant on April 15. The Oregon-Washington Railroad & Navigation Company has ordered a second 70-ft. motor car which will be a duplicate of the one now under construction for that line. This road is now operating two 55-ft. McKeen cars.

The sales of the Western Electric Company, Chicago, for March were 10 per cent. larger than for the corresponding month of last year. During the first quarter of the calendar year to April 1, the company did 11 per cent. more business than in the same period of last year. This company now employs 25,000 persons, compared with 23,464 on January 1, 1911, and 17,835 on December 1, 1909. The present number is within 4,000 of the largest pay roll the company ever had.

The Detroit Steel Products Co., Detroit, Mich., reports the following recent installations of Fenestra steel sash in railway buildings: Pennsylvania Railroad roundhouses at Frankfort, Pa., and Orangeville, Md., N. Y. C. & H. R. shops at West Albany, N. Y.; M. K. & T. freighthouse at St. Louis, Mo.; Duluth, Missabe & Northern shops at Proctor, Minn.; St. Louis & Southwestern shops at Tyler, Texas; Chicago & North Western shops at Kankakee, Ill.; new terminal and power station at St. Paul, Minn.; Northern Pacific freighthouse at St. Paul, Minn.; Interborough Rapid Transit car terminal buildings, at New York.

The Transportation Utilities Company, 30 Church street, New York, has been organized to represent directly the Acme Supply Company, Chicago, and the General Railway Supply Company, Chicago. The territory in the steam railway field will cover all roads running east of Chicago and St. Louis, Mo., and in the electric railway field will cover the United States, Canada and Mexico. The company will be represented in Baltimore, Md., by H. B. Chamberlain, 704 North Fulton avenue; and in Chicago by John T. Morton, the Steger building. W. L. Conwell, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is president and treasurer.

TRADE PUBLICATIONS.

Files.—The Nicholson File Company, Providence, R. I., has published a 90-page catalog illustrating in actual sizes the different types and designs of files made by that company.

Electrification.—The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has published in a small illustrated booklet all the Railroad Electrification Talks which recently appeared in the advertising pages of the *Railway Age Gazette.*

Engines.—The American Blower Co., Detroit, Mich., has devoted bulletin No. 288 to its vertical self-oiling engines, types A and E. This bulletin supersedes bulletin No. 232 and gives detailed descriptions, diagrams and dimension tables.

Text-Books.—John Wiley & Sons, New York, have issued a 200-page catalog of text-books published by them. Among the subjects covered are civil engineering, mechanical engineering, electricity, physics and mechanics, pure and applied.

Car and Track Jacks.—Templeton, Kenly & Company, Ltd., Chicago, is distributing catalog No. 13, describing the Simplex jacks made by that company. These jacks are made in numerous types for use in track work and in shop repairs on cars and locomotives.

Missouri Pacific-Iron Mountain.—The passenger department of the Missouri Pacific-Iron Mountain Lines has published a booklet describing Little Rock, Ark., and Hot Springs, on account of the United Confederate Veteran's Reunion to be held in Little Rock, May 16, 17 and 18, 1911.

Queen & Crescent Route.—The passenger department has published under the title of, "From the Window," a 95-page illustrated booklet describing the scenery, industries and points of historic interest along this line. A brief description, including interesting data, is given of each town through which the road passes.

Bangor & Aroostook.—The passenger department of this company has published a 170-page booklet entitled "In the Maine Woods." This will prove valuable to the prospective camper in that region, as it points out the choicest spots for hunting, fishing, canoeing, etc., and includes the names of the best camps and guides.

Railway Motor.—The General Electric Co., Schenectady, N. Y. in bulletin No. 4817 illustrates and describes its 75 h. p. direct-current commutating pole railway motor. A form is included which when filled out will show the company just what service the motor is for so that the company can decide what type of motor would give the best results.

Nut Locks.—The various uses of nut locks in car construction are explained in a pamphlet issued by the Jones Positive Nut Lock Company, Chicago. The applications of this nut to trucks, arch bars, brake beams and truss rods are illustrated in the drawings, and tables of dimensions and prices are included. The Positive nut lock is also used in frog and crossing work.

Capt. John Smith and Carborundum.—Those who read the first two volumes of the Revised American Statesmen's Series, published by the Carborundum Company, Niagara Falls, N. Y., will be glad to hear that the third volume has appeared. This small booklet is even better than its predecessors, and tells in its unusually humorous and original way the hitherto unpublished facts about Capt. John Smith and Carborundum.

Concrete Surfaces.—The Universal Portland Cement Company, Chicago, has published a pamphlet on concrete surfaces, describing and illustrating the various types, such as the brushed, the rubbed, the tooled and the sand blasted surfaces. The costs of the different types are discussed and formulae for colored mortars are given. The colored plates, showing surfaces which were brushed to expose the aggregate, are particularly interesting.

RAILWAY STRUCTURES.

Anadarko, Okla.—The Chicago, Rock Island & Pacific has let contracts to T. S. Leake, Chicago, for building one-story and basement, brick veneer passenger stations at Anadarko and Lawton.

Anniston, Ala.—The Louisville & Nashville has prepared plans for improvements, including an enlargement to its roundhouse and the installation of a stationary boiler.

Bethlehem, Pa.—Residents of Bethlehem are back of a project to build a bridge over the Lehigh river at Bethlehem. It is understood that the bridge will carry tracks for street railways.

Bloomington, Ind.—See Hammond, Ind.

Comanche, Texas.—The St. Louis Southwestern has prepared plans for a passenger and freight station upon which work will be begun in a short time. The building will be of pressed brick with stone trimmings and tile roof. The estimated cost is $12,500.

Council Bluffs, Iowa.—The Chicago, Rock Island & Pacific has let a contract to Geo. B. Swift & Co., Chicago, for building a freight house and office building to cost about $100,000. The structure will be 40 ft. x 540 ft., of brick and re-enforced concrete construction.

Brownville Junction, Me.—Application has been made by the Canadian Pacific to the Maine railroad commissioners for permission to replace the single span 150-ft. truss bridge over the Pleasant river, near Brownville Junction with a double span plate girder bridge. The company has been surveying in that section for a new route with easy grades, but the application for the new bridge does not indicate any change of grade or location.

East St. Louis, Ill.—Bids are wanted up to noon, April 25, by H. D. Sexton, president of the board of trustees of the East Side Levee & Sanitary district for building five railway bridges along Cahokia creek diversion channel in Chouteau township, Madison county.

Fort Collins, Colo.—The Union Pacific has let a contract to Searle Bros., Denver, Colo., for building a brick roundhouse.

Grand Rapids, Mich.—The Pere Marquette has let a contract for building a 42-stall brick roundhouse.

Hammond, Ind.—The Chicago, Indianapolis & Louisville, according to local press reports, has prepared plans for new stations, at Hammond, Bloomington, and Rensselaer.

Hickman, Ky.—The Mississippi Valley Transportation Company plans to build a concrete dock to cost about $10,000.

Hollister, Cal.—Plans have been made by the Southern Pacific for putting up a new station at Hollister, to cost $18,000.

Lawton, Okla.—See Anadarko, Okla.

Ottawa, Ont.—The Grand Trunk will use the Bush train shed in its new terminal in Ottawa; the Canadian Railway Commission has given formal approval to the railway company for the use of this type of structure at the Ottawa terminal. The train shed will cover seven tracks, and is to be 530 ft. long. Six of the tracks in the shed will be stub-end tracks, and one will be a through track enclosed within the train shed structure, with the shed open at both ends for through movement on this track. To be effective, the smoke duct in the Bush shed must be close to the smoke stack of the locomotive, so the Canadian government clearance restrictions have heretofore prevented its use. The government approval of its use at Ottawa is an indication that restrictions may be removed at other stations in Canada.

Rensselaer, Ind.—See Hammond, Ind.

Rosalia, Wash.—The Chicago, Milwaukee & Puget Sound, it is understood, will build a steel bridge over Pine creek at Rosalia.

Southover Junction, Ga.—An officer of the Atlantic Coast Line is quoted as saying that improvements are to be made at a cost of $200,000, to include the erection of a roundhouse, a turntable and necessary offices at the yards south of Southover Junction. Some additional tracks are also to be put in.

Westby, Wis.—The Chicago, Milwaukee & St. Paul, it is said, will put up a new passenger station at Westby, in Vernon county.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, St. Paul, Minneapolis & Omaha is in the market for 12 locomotives.

The Carolina, Clinchfield & Ohio is said to be making inquiries for 5 Mallet locomotives and 2 Mikado locomotives.

The Chicago & North Western is said to be negotiating with the American Locomotive Company for 30 locomotives. This item is not confirmed.

The Western Maryland has ordered 30 consolidation locomotives from the American Locomotive Company, and 5 Mallet locomotives from the Baldwin Locomotive Works.

The Rutland has ordered 2 consolidation locomotives from American Locomotive Company. The dimensions of the cylinders will be 22 in. x 30 in., the diameter of the driving wheels will be 63 in., and the total weight in working order will be 211,000 lbs.

The Steel Company of Canada, Ltd., Hamilton, Can., has ordered 1 four-wheel saddle tank locomotive from the American Locomotive Company. The dimensions of the cylinders will be 17 in. x 24 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 88,000 lbs.

The Pennsylvania Lines West have ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 139,000 lbs. This locomotive is for the Cincinnati, Lebanon & Northern.

CAR BUILDING.

The Grand Trunk, it is said, will build 10 first class coaches and 20 express cars at the company's shops.

The Texas Company, St. Louis, Mo., has ordered 200 tank cars from the American Car & Foundry Company.

The Spokane, Portland & Seattle is said to have ordered 14 baggage and mail cars. This item is unconfirmed.

The Chesapeake & Ohio, it is said, will build 1,300 freight cars at the company's shops. This item is not confirmed.

The Chicago, Milwaukee & St. Paul is negotiating with the American Car & Foundry Company for 8 baggage cars.

The Duluth, Missabe & Northern has ordered 6 coaches and 2 combination baggage and mail cars from the American Car & Foundry Company.

The Delaware, Lackawanna & Western, mentioned in the *Railway Age Gazette* of March 10 as being in the market for 3 combination baggage and buffet cars, has ordered this equipment from the American Car & Foundry Company.

IRON AND STEEL.

The Seaboard Air Line is reported in the market for 14,000 tons of rails.

The Japanese Government has ordered 3,900 tons of rails from the Carnegie Steel Company.

The Sandy Valley & Elkhorn has ordered 5,350 tons of rails from the Carnegie Steel Company.

The Richmond, Fredericksburg & Potomac has ordered 1,000 tons of rails from the Maryland Steel Company.

The Boston & Maine has ordered 1,200 tons of bridge steel from the Boston Bridge Company, and is in the market for 10,000 tons of bridge steel.

The Chicago, Milwaukee & St. Paul is said to have ordered 100,000 tons of rails from the United States Steel Corporation. This item is not confirmed.

The Harriman Lines have ordered 72,000 tons of rails. Of this order 40,000 tons will go to the United States Steel Corporation, being divided between the Illinois Steel Company and the Ten-

nessee Coal, Iron & Railroad Company. The remaining 32,000 tons will go to the Colorado Fuel & Iron Company.

General Conditions in Steel. There has been a falling off in orders since the first of the month, but the average daily orders of the Steel Corporation are still well above 30,000 tons. During the week cuts of several dollars a ton on fabricated steel have been reported. A large amount of business is pending, but consumers continue to hold off until the general outlook is more settled. The monthly report of the Steel Corporation as of March 31 shows that that month was one of the best in the history of the corporation, as far as earnings are concerned. About 950,000 tons were shipped and a trifle less than 1,000,000 tons were ordered during the month. The net earnings for the month must have been about $11,000,000, or $4,000,000 more than in December. The earnings for the first quarter are expected to be between $29,000,000 and $30,000,000. The unfilled orders on March 31 were 3,447,301 tons, a gain of 46,758 tons for the month and an increase of 772,544 tons during the first quarter of the calendar year. The March shipments, on a basis of 31 days, were at the rate of 30,750 tons a day, an increase of over 2,500 tons a day over the February shipments and an increase of over 7,450 tons a day over the January shipments. During March the Steel Corporation operated on an average of about 69 per cent. of its capacity. It is now operating at about 72 per cent. of its capacity.

SIGNALING.

Alternating Current Automatic Block Signals on the Cumberland Valley.

The first steam road to use automatic signals with alternating current for operating and lighting the signals, as well as supplying the track circuits was the Cumberland Valley. Signals thus worked, between Lemoyne and Mechanicsburg, seven miles, have recently been put in service.

Power for operating the system is supplied from a 2,200-volt, 25-cycle, single-phase, alternating current line carried on poles along the right-of-way, current being obtained from the power plant of the United Electric Company at Lemoyne. The line has lightning arresters at intervals of two miles and trouble from lightning has been confined practically to an occasional fuse blown out. The signals are three-position, upper quadrant, normal clear. The amount of energy used by the two-candle power electric lamps used to light the signal is so small that they are not put out in the day time.

Transformers are used at each signal location with suitable taps to step the voltage down from 2,200 to 55 volts for operating the signal motor and lights, and 5 volts for track circuits. The motors are of the induction type and have no contacts or brushes and no friction surfaces aside from the two armature bearings. The relays are of galvanometer type for track circuits with a Vane type for slow release control.

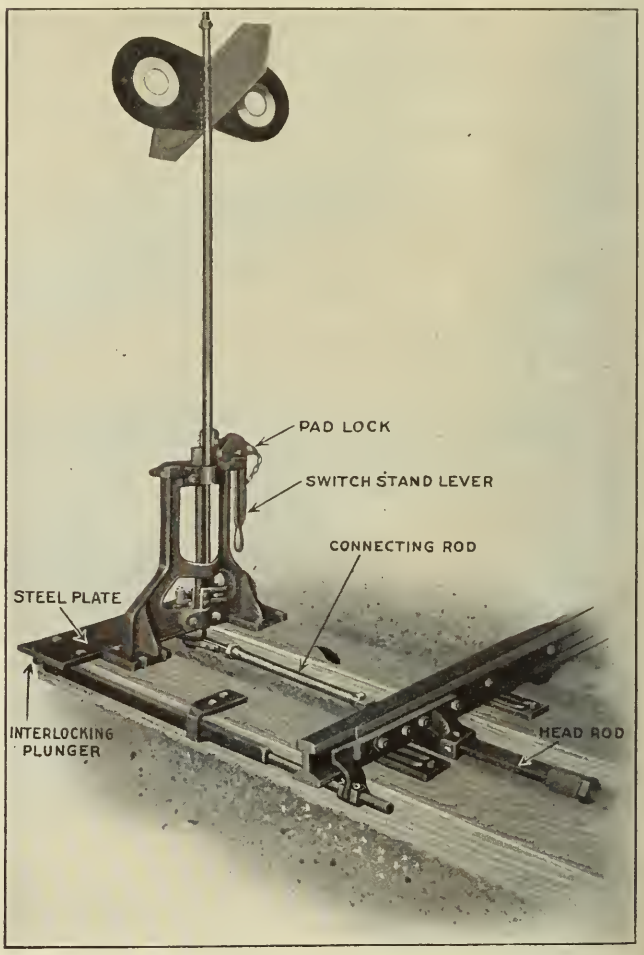
The polarized system of alternating current track circuits is used; this controls the third or clear position of the signals, without the use of line wires, so that the two main wires are the only line wires used in the automatic territory. Track circuits average one mile in length, the longest being 7,000 ft.

No batteries are used on any part of this automatic signal system and the maintenance expense is limited chiefly to the proper lubrication of the signal mechanism and the care of the rail bonds and insulated joints.

The operation of these signals has been so satisfactory that a contract has been awarded for signaling forty-three miles additional (double track), divided into three sections: Mechanicsburg to Mile Post 27, Shippensburg to Chambersburg, and west of Chambersburg to Mason-Dixon, together with the single track between Lemoyne and Harrisburg, a distance of about one mile, where the Susquehanna River is crossed by a single track bridge. Alternating current at 3,300 volts, 25-cycle, single-phase, will be used, with such modifications and improvements in the signals and equipment as have been made since the original installation, which was begun in 1908. It is the intention in these installations to carry sufficient current in the signal mains to supply electric lights at all the stations. This will be the first instance of such use of signal circuits on a steam road. The current supply for this signal and lighting system from Harrisburg to Mile Post 27 will be furnished by the United Electric Company, of Lemoyne, while the sections east and west of Chambersburg will be supplied from the power plant owned by the company at Chambersburg.

Interlocking Switch Stand.

The Anderson interlocking switch stand, made by the American Valve & Meter Company, of Cincinnati, Ohio, is shown in the accompanying illustration. It is of the skeleton type, and is furnished with either an intermediate or high target and ladder as desired. The construction is simple and practical, and all the parts are exposed so that any derangement may be quickly noted. The interlocking mechanism is independent of the switch stand, but is operated by it. The interlocking plunger is directly under the steel plate, which is provided for its protection. The switch lever has a throw of 180 deg.; the first 40 deg. releases the interlock without moving the switch point, and the remaining 140 deg. opens the switch and turns the target. The



Anderson Interlocking Switch Stand.

reverse movement closes the switch and locks it. The switch must be properly closed in order to be interlocked, for the plunger could not mesh with the interlocking bar and the switch stand lever would be 40 deg. from the slot in the switch stand plate in which it must fit in a vertical position in order to be locked. The switch must thus be positively closed, as even the width of a small chip will prevent the padlocking of the switch lever. Without the interlock the lever of this switch stand, like any other, could be forced into position and padlocked, leaving the switch point partly open, which is liable to cause an accident. If in closing the switch it should in any way become disconnected, the switch stand cannot be locked, as the interlocking bar is directly connected to the switch point. The interlock provides protection to the switch, even if the switch stand should be damaged or destroyed by accident, and prevents the switch from being opened if any other derangements should take place in the mechanism.

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BEGINNING May 19, the *Railway Age Gazette* will publish in its third weekly issue of each month a section devoted to engineering and maintenance of way matters, similar to the shop section now published in its first weekly issue of each month. It should be understood that engineering matter will not be confined to this section; in fact, more space than ever will be given to engineering articles in all the other weekly issues. The section in question will be chiefly given over to the consideration of means for increasing the efficiency and economy of maintenance work. For the purpose of getting material about methods and devices not now in general use, but which have been effectively employed by individual railway men or individual lines to increase the economy and efficiency of maintenance work, we shall award a first prize of $25 and a second prize of $15 for the best contributions that may be sent to us describing such methods or devices. All contributions submitted in this competition which do not win prizes, but which are published, will be paid for at a flat rate of $3 each. The various articles will be printed in the engineering and maintenance section from time to time. Descriptions should be brief, but clear; and drawings, photographs, or sketches should accompany the matter unless entirely clear without them. Questions of correct English, the finish of sketches, etc., will not enter into the making of the awards. All contributions entered in this contest should be sent to the civil engineering editor of the *Railway Age Gazette,* Plymouth building, Chicago, and should be received by us not later than June 1.

A SOMEWHAT interesting venture is to be tried on the New York, New Haven & Hartford. The city of Waterbury, on the Naugatuck branch, is an isolated but progressive city of about 75,000 inhabitants, allowing for increase during the year since the last census was taken. It had 73,141 inhabitants when the census was taken, 51,139 in 1900 and 33,202 in 1890, its population having thus increased more than 121 per cent. in two decades. Its only railway outlets are on the New Haven system and, barring distant trolley connections, passengers must travel by steam lines to and from the city. Moreover, just now it is a period of pretty acute economies on the New Haven system, with general reductions of working force, of freight service and, in less degree, of passenger train service. Yet Waterbury is now to be the objective of a new route between Boston and New York via Hartford, with two express trains daily—one each way—making the running time between the two terminals in a little more than six hours. It is an application of the theory that new train facilities make new business—that more passengers will travel accordingly, as they are given greater opportunity. That is a law which sooner or later enforces itself, only in this case it has a radical application, the outworking of which will be instructive in the case of a community comparatively remote from a railway's main stem. The plan recalls, by contrast, an incident of the New Haven road's history. It was at a meeting of the old moss-back directorate some 35 years ago that the president proposed a new express train between New York and New Haven. A white-haired director strenuously objected to it. "Why, gentlemen," said he, in high wrath, "it won't be a week before passengers will be crowding it!"

UNTIL last Tuesday it was hoped that the Missouri Pacific was to be put in proper physical shape and made to take the position it ought to among western roads. The prospects now are bad. The Gould interests are still in control and the company has lost its promised powerful financial support. The latter is not, however, any irretrievable loss. The Missouri Pacific credit is fundamentally good and it could get money at reasonable rates in the open market. It is not highly capitalized. Its underlying issues are all closed and what it has to sell now are the 5 per cent. convertibles; it could sell a good many of them without having to take a heavy discount. But Gould control does not mean operating efficiency. While competing railways have been improving physically, the Missouri Pacific has been deteriorating; while others have increased their earnings, the Missouri Pacific's have decreased; service on other roads has been improving and on the Missouri Pacific it has been getting worse. Out of its 6,775 miles of track, 2,200 miles are laid with 56-lb. rail and 414 miles are laid with 52-lb. rail. It is not that the road has not had competent men in the operating, traffic and other departments, but that it has not had home rule. The men having real

power in the Gould organizations have often not been actively engaged in work on the properties, while the men on the ground have not had enough authority or money to do their work. If President Bush is given a free hand and allowed to manage the road from its headquarters at St. Louis, or, better still, from his car out on the line, he will have the greatest opportunity of any railway man in the country. If he is not given this chance, he has before him the hardest and most thankless task of any railway man in America. His work is to build up a physically run-down property and at the same time get the public behind him. To do this he has got to show the public that he is working in their interests, and he has got to do this in the face of the well founded prejudice of people toward a road which certainly has *not* been run in their interests. The Missouri Pacific could be developed into one of the greatest railway properties in the West, but this cannot be done if details of its management are dictated 1,500 miles away from the nearest end of its rails. The shortcomings of the Gould lines have been primarily due to absentee landlordism, which has been the curse of many other American railways. Our railways must give good service at reasonable rates, and the absentee landlord form of management is not the kind that gives either.

THE Nebraska State Railway Commission finds that "generally speaking, there is no imperative demand for new railway legislation at the present time." Still, the commission does not fail to recommend some changes in the present railway laws of Nebraska and some additions thereto. The commission in its third annual report, says in good grammatical English, that it wishes to be entirely fair to the railways. One of the laws that the commission recommends is, that severe penalties be provided for shippers found guilty of false billing, since severe penalties are prescribed for railway companies that are guilty of false billing. More light, however, was thrown on the commission's conception of what it was paid for by its manner of discussing present litigation now pending between the railways and the commission than is given by any number of general assurances that the commission intends to be perfectly impartial. In referring to the railways' suit attacking the validity of the commodities freight rate law and the maximum passenger rate law enacted by the legislature of 1907, the commission points out that it is usual in cases of this kind for the railways to enjoin state and railway commissions from enforcing laws reducing rates and fares, thus continuing the higher rates until the reasonableness of the lower rates has been determined. The commission points out that if the supreme court should reverse the lower courts in the Missouri rate case the railways will have been able to charge the higher rates in the five and a half years during which litigation has been carried on. The commission points out with a pride than amounts almost to a boast that such a situation does not obtain in Nebraska because of the prompt action of the attorney general's office in connection with the commission. Anticipating that the railways would refuse to put the reduced rates of the Nebraska 1907 law into effect, action was brought to enjoin them from disobedience of the laws, and both the maximum passenger rate and commodity freight rate acts were made effective. The commission estimates that the total actual saving to the people of Nebraska, by reason of the enforcement of these two bills, is considerably in excess of $10,000,000 to date. The commission does not point out that, if the supreme court should decide that the Nebraska laws were confiscatory, the commission, through its promptness in connection with the attorney general's office, will have succeeded in getting out of the railway companies $10,000,000 for the people of Nebraska, which belonged to the railway companies. The total expenses of the commission for the year 1910, exclusive of the physical valuation department, were $14,375. Surely the commission does not *need* to point out that if it can get for the people of Nebraska $10,000,000 of the railways' money, they are making a wise investment to spend $14,000 for a commission.

THE PSYCHOLOGY OF ANTI-RAILWAY LEGISLATION.

RETURNS from 37 state legislatures in session this year—not including that of Maine and probably some other of the 46 states—show no less than 484 new bills relating to railway operation alone. The number would, no doubt, be increased much did it include such matter as capitalization, power of railway commissions, accounting, relations of railways to one another, and broad matters of a similar character. The great majority of the new measures, as was to be expected, look to railway restriction and often to new expenditure. The record also shows some striking variations. A slow and small commonwealth like Vermont, but an old state where one would infer that railway legislation had long ago passed its formative and plastic stage, has as many new measures as the new state of Washington, where population and development are going on by leaps and bounds; and by farther contrast the great state of Pennsylvania has only 3 and New York but 13. There are local lifts and depressions. But, as a general conclusion from the returns as a whole, the hoped for general reduction of railway baiting has not been realized, especially if the measures bearing on branches outside of operation are taken into account. Some of them are of exceptional import as, for example, the long and bitter fight over a public utilities commission in Connecticut now coming to a new climax after four years of controversy.

So protracted and persistent a period of anti-railway legislation, itself to a great extent an expression of a state of public feeling, can be viewed from many corners. One is its psychology, using the term to denote sentimental elements, as contrasted with material interests—the influences which affect popular and legislative feeling as contrasted with the more vulgar irritants and the pocket nerve.

Far back and in the beginning it probably dates for its original impulse to the mental attitude of the railway corporation itself. There can be no denying that for many years that attitude was as offensive as it was misguided. It was the bearing toward the public and, more particularly toward the passenger, of a superior being exalted by circumstance over the average man. Corporation hauteur reached from the president down to the conductor and brakeman; and even the stockholder—unless owner of a big block of shares—was viewed not as master, but minion. The passenger, after a fashion, took the status of a bale of goods; and, in large scope, the profane phrase of the second Vanderbilt expressed a railway mental condition. Something was needed to incarnate and focus popular resentment on that condition. It came when our spectacular and decidedly psychological ex-president struck his counter pose. It was material in form, in its aims against concrete abuses, actual or alleged. But it was emotional in its effects on the popular imagination and in arousing an anti-railway sentimentality. That it went too far does not abate the fact.

It had also secondary derivative influences of an emotional character. The head of the nation is *per se* a psychological force, especially when in picturesque and spectacular action. His temperament, as well as policy, reaches through the whole federal organism with its host of attorneys and passes by easy transition into state policy also. It will not escape the eye of the historical student that the wave of anti-railway legislation in the states has owed its antecedent impulse to Washington. The movement was logically enough, from the executive head downwards, and, later, from the federal legislature down to the state legislature. Under our political system all such movements are contagious; and, once they get fairly started, and the vaulting ambition of the politician sees the opportunity to ride them, his oratory foams on the crests of the wave, as a fresh irritant. Running through all these popular impulses has undoubtedly been a motive of public interest here and there reaching down into socialism. But the latter, at least, has been a minor force and effecting the individual rather than the mass.

The psychology of labor in the situation is not to be overlooked. Synchronous with the four years or more of anti-railway

statute making has been not merely a rapid development of labor organization, but of change in labor's mental attitude. It has had two phases. First, the transfer of loyalty from the corporation to the union, and, secondly, the legislative campaign on the part of labor for milder working conditions on the railway. The men have secured higher wages with comparative ease and with general success. The result is a state of mind that has prompted them to appeal to the legislatures for what may be called higher wage in another shape—the wages for either a larger force of workers or, what is often tantamount, an easier individual job. It would be interesting to know how many of the 484 measures relating to railway operation before 37 state legislatures have been due to this emotional momentum started by the easy success of the unions in securing a higher wage. It would be even more interesting if we could foresee when the movement will recede.

Finally there can hardly be a doubt that the tendency of great cases in the higher tribunals bearing on railway questions has kept up the emotional tension and had a direct effect on anti-railway legislation. The magnitude of the cases and of the interests at stake in the final interpretation of such a federal statute as the Anti-Trust act have been constant and exciting causes of popular feeling. Nor can one now see where that judicial excitation is to end.

INCREASING TARIFF EXPENSES.

At a time when the Interstate Commerce Commission has just said that the railways cannot be permitted to raise their rates unless they show that they are operating with reasonable economy, all of the causes which tend to increase expenses, or to prevent their reduction, become of interest and importance. Perhaps no class of railway expenses has increased so fast in proportion in recent years as those incurred in the preparation and publication of railway tariffs. The *Railway Age Gazette,* in its issue of July 15, 1910, page 111, published an editorial discussing this subject, in which it gave some figures regarding the increases in these expenses on the Wabash, the New York Central Lines and the Burlington. We have since secured more detailed information from a number of roads, which is even more striking than that given in the editorial referred to.

The expenditures of the Chicago, Milwaukee & St. Paul during the years from January 1, 1900, to December 31, 1909, have been as follows:

1900	$22,392.83	1905	$24,807.40
1901	20,935.59	1906	27,930.69
1902	19,440.92	1907	38,508.19
1903	29,448.95	1908	67,929.06
1904	33,049.29	1909	92,199.05

The following comparison of the year 1906—the one in which the Hepburn act went into effect—with the year 1909 is of interest:

1906.	1909.	Increase.	Per cent.
$27,930.69	$92,199.05	$64,268.36	231

Of the sum expended since January 1, 1907, $15,000 represented the cost of compiling and printing the index to tariffs, which is published under a rule of the Interstate Commerce Commission, and which a traffic officer of the St. Paul pronounces "totally valueless."

The following figures show the increases in the similar expenses of the Rock Island Lines:

	Printing.			Clerical Help.	
	Annual expense.	Expense per mile of road.	Expense per $100,000 frt. earnings.	Annual expense.	Expense per mile of road.
1905-6...	$44,535.06	$6.17	$128	$25,992.96	$3.60
1906-7...	71,145.40	10.43	202	27,515.84	3.53
1908-9...	119,828.18	14.93	306	31,727.18	3.95

The increase in the printing expense per mile of road between 1906 and 1909 was almost 142 per cent., and the increase per $100,000 of freight earnings was almost 155 per cent.

In the St. Louis & San Francisco's figures are included those for 1887, the year in which the original Interstate Commerce act was passed, as well as those for later years. Its figures are as follows:

	Printing.			Clerical Help.		
Year.	Annual expense.	Expense per mile of road.	Expense per $100,000 frt. earnings.	Year.	Annual expense.	Expense per mile of road.
1887,....	$7,665	$7.00	$180.00	1887...	$8,280.00	$7.56
1905-6...	80,976	16.00	390.00	1906...	22,644.00	4.47
1906-7...	106,512	21.00	400.00	1907...	36,600.00	7.21
1909-10..	.....	25.00	470.00			

The increase in the printing cost per mile of road since the Hepburn act went into effect has been 56 per cent.; in the printing cost per $100,000 of freight earnings, 21 per cent.; and in the total clerical help, 62 per cent.

The following figures are for the Chicago, Burlington & Quincy:

	Clerical Help.	Printing.	Total.
1903	$29,883	$28,526	$58,409
1904	31,732	39,540	71,272
1905	31,308	37,316	68,624
1906	37,462	35,011	72,473
1907	53,394	88,925	142,319
1908	54,045	134,358	188,403
1909	53,030	179,279	232,309
1910	56,353	158,046	214,399

It will be noted that the increase in the cost of clerical help in 1910 over 1906 was more than 50 per cent., the increase in the cost of printing tariffs over 351 per cent., and the increase in the total cost of preparing and printing them almost 196 per cent.

On the Illinois Central the cost of clerical help in the tariff department was $74,829.94 in 1905, and this increased to $124,788.71 in 1909, or 66.7 per cent. The cost of tariff publication increased from $71,000 in 1905 to $144,891.61 in 1909, or 104 per cent. The cost of tariff indices in 1909 was $15,000. A witness for the Illinois Central at the hearings in the rate advance cases said that the expense incurred in publishing these indices brought the carriers no return and was of benefit only to the Interstate Commerce Commission.

These increases in expenses are undoubtedly typical of increases that have been taking place on all the railways of the United States. It is generally conceded that in the main the tariffs of the railways are in better shape now than they were before the passage of the Hepburn act, but railway traffic officers seem to be unanimously of the opinion that a large part of the increase has been needless and of no benefit to anyone. Members of the Interstate Commerce Commission show a disposition to resent criticisms of their rules for the publication and posting of tariffs. They indicate that the course they have taken is made necessary by the law, and that if the railways do not like it they should get Congress to change the law.

The requirements of the law are, indeed, very specific, but it is provided "that the commission may, in its discretion and for good cause shown, . . . modify the requirements of this section (section 6) in respect to the publishing, posting and filing of tariffs, either in particular instances or by general orders applicable to special or peculiar circumstances or conditions." The commission has modified the requirements in ways which have made the cost of preparing, filing and posting tariffs very much less than it would be if the provisions of the statute were rigorously enforced. It does seem, however, that there are further modifications which the commission might make which would reduce the expenses of the railways without violating the spirit of the law or impairing the facilities afforded to shippers for ascertaining the legal rates. Some changes which many think might properly be made were suggested by this paper in the editorial already mentioned (July 15, 1910, page 111). It is desirable that no steps shall be taken which will interfere with the proper enforcement of the law; but certainly no expense ought to be imposed on the carriers which is not necessary to that end.

Letters to the Editor.

ARBITRATION OF RAILWAY LABOR DISPUTES.

Chicago, April 14, 1911.

To the Editor of the Railway Age Gazette:

The letter from President Delano of the Wabash, in your issue of April 7, 1911, pertaining to the labor situation on American railways, and his suggestion that a permanent court of arbitration should be created for the adjustment of labor disputes, is worthy of the best thought of the interested parties—the owners, the employees and the public.

I will not comment on Mr. Delano's views as to the causes which contribute to the present situation. He finds reason for criticism of labor organization methods, of their increasing financial and economic power without corresponding responsibility to the public which, as he states, must eventually pay the bill. His views, though, are couched in moderate language and reflect his characteristic good temper. A representative of any responsible railway labor organization would, no doubt, from the employees' standpoint, easily justify the prevailing methods as necessary.

Whatever objection may be urged against the present situation, it is my belief that the relations between the companies and their employees are better than they have ever been. If the Interstate Commerce Commission is correct, the carriers were never more prosperous than now, while on the other hand the leaders of railway labor, in emphasizing the success of the organizations, point out that the employees generally work under the best conditions that ever obtained.

As a railway employee, and as a representative of railway employees in one capacity or another for over thirty years, I have been in fairly close contact with labor conditions on American railways. The history of the relations of railways and their employees during this time may be divided into three periods of a decade each.

In the first, beginning in 1880, there prevailed the extreme idea of private ownership which did not acknowledge the right of employees during this time may be divided into three periods of ing relations; this was a period of extra hazardous operation with little or no thought of safety devices or solicitude for what have since become ordinary safety measures. Such organizations of employees as existed were of but little influence; in many instances they were either ignored or actively opposed.

The second period witnessed the development of organized effort among the employees with generally active resistance on the part of the companies and the beginning of the program of the employees to get redress through legislation of their grievances, this being principally directed to the securing of greater safety. The declarations of the employees' organizations almost uniformly were for arbitration during this time, in some instances going so far as to advocate compulsory arbitration, while as a rule the principle was denied by the companies.

The third, and present, period finds the organizations in a highly developed state, representing practically all of the employees of their respective classes, militant, showing in isolated cases an arbitrary disposition, and broadening their legislative program to include measures which the companies claim relate to purely operating conditions and have no direct relation to the safety of the employees or the public. Arbitration is avoided by the employees except as a last resort, or when it is apparent that public sentiment would strongly disapprove of a strike. Now, when the companies are met with a serious wage or other labor situation they usually show a willingness to arbitrate, either under the federal law known as the Erdman act or, as in many instances, voluntarily by mutual agreement with the employees.

It is generally conceded that arbitration is a "safe and sane" method of adjusting disputes, as compared with industrial warfare. I understand Mr. Delano's objection is more to the methods at present employed than to the principle itself. Arbitration is usually the hope of the weaker interest in a controversy. I have represented employees at times and under circumstances when we were quite willing to arbitrate, but our proposals were declined by the companies, evidently because they felt that they were entirely right and should not be compelled to resort to arbitration or, right or wrong, that they could handle the situation. Later on, in the days of greater organization effectiveness, we have as adroitly avoided arbitration as we patiently sought for it in former times; and it would not be unreasonable to say that we were probably moved by the same motives as the companies in our change of attitude.

However, there has been on the part of both the companies and the employees a growing appreciation of the public's rights in the premises; and when a tense situation in a labor dispute is reached neither side is quite as ready to say the final word as it used to be. I believe it can be accepted as a fundamental fact that the public favors fair wages and reasonable working conditions for the employees of the carriers, and that the same reasoning implies that the carriers should be permitted to earn enough to pay good wages as well as to insure a fair return to the stockholders. But public sentiment will not approve of any arbitrary or inconsiderate action on the part of either the employees or the carriers which shall seriously embarrass or prevent the uses for which these highways are created. Therefore, employees, or the labor leader representing them, before declaring a strike of any consequence on any of the great railway systems of this country should be certain that the causes are sufficient and the action justifiable; the companies must also deal with labor crises on the same basis.

It is doubtful if a fixed and permanent court of arbitration, such as Mr. Delano proposes, would bring the remedy that he hopes. To require by law the submission of disputes to such a court would be, in effect, "compulsory arbitration," which I do not believe is desired either by the carriers or their employees. It would mean government control over what is now private right. The United States Supreme Court said in the Adair case that a law passed by Congress prohibiting a carrier from dismissing an employee for joining a labor organization was an invasion of the carriers' constitutional rights. This decision, in effect, established the right of an employer to discharge an employee at will for good cause, or for no cause. Eminent counsel tells us that this same decision implies the right of an employee to quit the service of his employer with or without cause. If such are their rights, then, if required by law, as proposed, to submit their differences to a court of arbitration they might do so, but it would not prevent the employer from discharging all of his employees and filling their places with others, if able to do so, or correspondingly, all of the employees quitting the service of the company at an appointed time and stopping the operation of the road, the effect of which would be the same as a strike.

Even if arbitration were made compulsory a permanent board or court of arbitration would not be without objection. A vital one, the political feature, is mentioned in your editorial. A few decisions regarded as unfavorable by one side or the other would easily furnish the grounds for refusal by the stronger party to submit further cases for adjustment to the court.

The Canadian law requiring conciliation and hearing of labor disputes wherein public service corporations are involved has not operated wholly to prevent strikes on railways, street car lines and in coal mines, which, I understand, come under the law. It might be regarded as significant, though, that in every case where there has been a railway strike following the operation of this law, the employees have emerged from the contest in a more or less battered condition.

It is my belief that eventually the wage rates and the essential working conditions of railway employees will be uniform throughout the country for their respective classes except where influenced by unusual living or operating conditions, and that

no company will be asked to change its wage conditions by its employees, or *vice versa*, until all other carriers similarly affected are placed in the same relation. We are gradually working toward wage uniformity, as in other vital things. It will have its advantages in relieving individual lines and their employees of the constant annoyance of local adjustments, and when a wage matter is taken up for an entire territory it will involve so much for the weal or woe of the contestants, as well as for the public, that the responsibilities of those who deal with these great questions will be so overpowering that settlement of them by means other than resort to strike impresses me as certain.

As long as railways are privately owned they will in some degree be subject to conditions arising out of inherent differences between employer and employee, and in my judgment no artificial measure will permanently eliminate this. Railway companies and railway employees are in a better relation today than they were ten years ago, and ten years hence those relations should be better than they are today as a result of natural development and a higher appreciation of each other's rights.

P. H. MORRISSEY,

President American Railroad Employers and Investors' Association.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

Chicago, April 14, 1911.

To the Editor of the Railway Age Gazette:

Referring to the editorial in the *Railway Age Gazette* of April 7, on The Efficiency of Railway Equipment, the enclosed statement gives for the fiscal years ending June 30, 1902, to June 30, 1910, inclusive, statistics relating to rolling stock on railways of the United States and its efficiency in amounts, also relatively by years taking 1902 as unity or 100.

From 1902 to 1907 inclusive railway passenger and freight traffic increased annually about 9 per cent., requiring enormous additions to the railway facilities to handle it. According to figures published by the *Railway Age Gazette* during these five years, approximately 28,000 new locomotives, 16,000 new passenger cars, and over 900,000 new freight cars of the heaviest capacity were built to take care of new business, to equip new lines and to replace rolling stock going out of service. Following the fall in traffic subsequent to 1907, the roads naturally found themselves with an abundance of equipment for the traffic offered and were obliged to purchase very little except to replace that retired. This I think is the principal reason for the difference in *miles run* per annum per locomotive or per freight car in 1909 compared with 1902.

Some of the factors influencing utilization of locomotive and car capacity now, as compared with 1902, when statistics of capacity were first reported by the Interstate Commerce Commission, are the following:

LOCOMOTIVES.

1. Increase in traffic density per mile of road with increase in length of trains due to the greater hauling capacity of locomotives resulting in greater delay through loss of time at sidings; passenger train movement, which is given the preference, also increasing in greater ratio than freight.

2. As the lightest class of power is retired from service through obsolesence and new power purchased is naturally of the very heaviest type, it is often necessary to use on branch lines and in local freight and passenger service, locomotives of greater tractive power than are required and larger than the lighter power retired from such service. This excess of tractive power has been found beneficial in such service because it permits prompter and more efficient movement, especially in the case of way freight trains.

3. A part of the decrease shown by the statistics is due to difference in classification of service of the total locomotives in 1909, as compared with 1902. During this period there was an increase of 49 per cent. in the number of freight locomotives and only 29 per cent. in the passenger locomotives. As freight

Performance of Locomotives and Cars—All Railways in United States, Years Ending June 30, 1902, to June 30, 1910.

		1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910 (c).	
		Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.	Amounts.	Relative.
	Locomotives.																		
1.	Ton miles freight .....(millions)..	157,289	100	173,221	110	174,522	111	186,463	119	215,878	137	236,601	150	218,381	139	218,803	139	250,418	159
2.	Passengers carried one mile.....(millions)..	19,690	100	20,916	106	21,923	111	23,800	121	25,167	128	27,719	141	29,083	148	29,109	148	33,271	169
3.	Total freight locomotives	23,594	100	25,444	108	27,029	115	27,869	118	29,848	127	32,079	136	33,655	143	33,935	144	.....	...
4.	Total passenger locomotives	10,318	100	10,570	102	11,252	109	11,618	113	12,249	119	12,814	124	13,185	128	13,317	129	.....	...
5.	Total switch and other locomotives.....	7,313	100	7,857	107	8,462	116	8,870	121	9,575	131	10,495	144	9,893	135	9,960	136	.....	...
6.	Total locomotives	41,225	100	43,871	106	46,743	113	48,357	117	51,672	125	55,388	134	56,733	138	57,212	139	57,359	139
7.	Total pounds locomotive traction (b).....(millions)..	845	100	950	112	1,067	126	1,144	135	1,278	151	1,430	169	1,521	180	1,524	180	1,547	183
8.	Total freight and mixed train miles.....(millions)..	531	100	558	105	587	111	579	109	627	118	662	125	622	117	605	114	659	124
9.	Total passenger train miles.....(millions)..	406	100	425	105	440	108	460	113	479	118	509	125	506	125	506	125	534	132
10.	Ton miles per freight locomotive.....(thousands)..	6,666	100	6,808	102	6,457	97	6,691	100	7,233	109	7,376	111	6,449	97	6,448	97	.....	...
11.	Passenger miles per passenger locomotive.....(thousands)..	1,908	100	1,979	104	1,948	102	2,049	108	2,055	108	2,163	113	2,206	116	2,186	115	.....	...
12.	Average traction per locomotive.....(pounds)..	20,485	100	21,781	106	22,804	111	23,666	116	24,741	121	25,823	126	26,356	129	26,634	130	26,962	132
13.	Tons freight per train.....	296	100	311	105	308	104	322	109	344	116	357	121	352	119	363	123	380	128
14.	Passengers per train	45	100	46	102	46	102	48	107	49	109	51	113	54	120	54	120	59	131
	Cars.																		
15.	Passengers carried one mile.....(millions)..	19,690	100	20,916	106	21,923	111	23,800	121	25,167	128	27,719	141	29,083	148	29,109	148	29,109	148
16.	Passenger cars (a).....(millions)..	36,967	100	38,140	103	39,752	107	40,713	110	42,262	114	43,973	119	45,117	122	45,584	123	45,953	124
17.	Ton miles freight .....(millions)..	157,289	100	173,221	110	174,522	111	186,463	119	215,878	137	236,601	150	218,381	139	218,803	139	250,418	159
18.	Tons freight car capacity (a).....(thousands)..	43,391	100	48,531	112	50,759	117	53,255	123	59,059	136	67,033	154	73,087	168	73,137	169	73,304	169
19.	Total freight cars (a).....(millions)..	1,546,101	100	1,653,782	107	1,692,194	109	1,731,409	112	1,837,914	119	1,991,557	129	2,089,302	135	2,073,606	134	2,091,491	135
20.	Total freight car miles.....(millions)..	13,340	100	14,194	106	14,354	108	15,082	113	16,590	124	17,122	128	16,857	126	17,169	129	18,772	141
21.	Ton miles per freight car.....(thousands)..	102	100	105	103	103	101	108	106	117	115	119	117	105	103	106	104	120	118
22.	Average tons capacity per freight car	28.08	100	29.40	105	30.06	107	30.83	110	32.21	115	33.75	120	34.87	124	35.31	126	35.05	125
23.	Average tons freight per loaded car.....	16.92	100	17.60	104	17.72	105	18.14	107	18.92	112	19.68	116	19.62	116	19.26	114	.....	...
24.	Box cars of capacity of 40 tons or more.....	42,901	100	70,180	164	83,884	196	104,645	244	144,148	336	204,974	478	252,653	589	262,909	613	.....	...

(a) Excludes privately owned cars, such as Pullman cars, private freight cars, etc. Statistics for 1908, 1909 and 1910 exclude switching and terminal companies. Statistics for 1902 to 1909 from I. C. C. Statistics of Railways of United States.

(b) Ratably increased to include unclassified equipment.

(c) Based on returns to Bureau of Railway News and Statistics, covering about 97 per cent. of the entire traffic in the United States.

locomotives are very much heavier than passenger, and operate at lower speeds, the effect of this is unduly to increase the average tractive power of all locomotives.

4. In passenger service the increased weight of cars and the large number of high speed trains have consumed a considerable part of the locomotive tractive power as compared with former conditions.

So far as utilization of locomotive efficiency in hauling trains is concerned, it is reasonable to conclude, from consideration of the above factors in connection with the statistics presented, that there has been no material loss in locomotive efficiency. Comparing 1910 with 1902, the freight train load increased 28 per cent., passenger train load 31 per cent., and average tractive power of locomotives 32 per cent., which latter increase would have been somewhat less if the classification of locomotives as to passenger and freight service had remained unchanged. There has been, however, a greater percentage of increase in the total number of locomotives than in the total train mileage. Improvement in utilization of locomotive capacity in hauling tonnage could be best effected through general adoption of improved methods of tonnage rating, and particularly through the avoidance of uneconomical and unnecessarily high speeds in conducting freight traffic, which decrease train tonnage and are often of doubtful utility in reducing time between terminals through offsetting increased delay at meeting points because of the increased train density required to move a given traffic.

PASSENGER CARS.

Statistics of gross weights of passenger cars and passenger car mileage are not available, but average car weights have materially increased. Comparing 1910 with 1902, however, an increase of 48 per cent. in the number of passengers one mile was handled with an increase of only 24 per cent. in the number of passenger cars reported.

FREIGHT CARS.

In 1910, as compared with 1902, ton mileage of freight increased 59 per cent., total cars owned increased 35 per cent., total car capacity increased 69 per cent., total car mileage increased 41 per cent. Following the fall in freight traffic subsequent to 1907, miles run per total car owned were reduced because of the surplusage of car equipment not needed for traffic. According to the reports of the American Railway Association, a shortage of 150,000 cars in the early part of 1907 was turned into a surplusage often amounting to over 300,000 cars in the following two years. Notwithstanding a surplus of equipment still existing in 1910, miles run per car were greater than in 1902. Car efficiency as reflected by comparison of average tonnage capacity with average load has, however, decreased, due principally to the following causes:

1. As average capacity increases beyond the limits measuring the amount of freight to which carload instead of less than carload rates apply, the difficulties of utilizing the additional capacity increase and the opportunities for fully loading equipment to capacity decrease. At smaller stations limited amounts of tonnage are frequently offered for transportation that could be put into a car of small capacity when only cars of large capacity are available. The transportation of less-than-carload freight and of way freight is generally independent of average capacity, and with this traffic only a small proportion of the weight capacity of the larger cars can be utilized.

2. In the case of open cars weight capacity can nearly always be fairly well utilized. With box cars, as well as stock and refrigerator cars, the loading capacity with certain bulky commodities is measured by the space capacity and the difficulty of utilizing the weight capacity increases greatly with cars of 40 tons marked capacity or over. With the use of more powerful locomotives the strength and weight of freight cars has necessarily been increased, while the marked capacity has been increased very much more proportionately, although the cubic capacity could not be increased to the same extent. Some of the larger box cars have a marked capacity of 50 tons, or 67 per cent. in excess of former standard 30-ton capacity cars, while the weight of the larger cars is only 32 per cent. greater. It is unfair to measure the efficiency in use of such equipment altogether on the basis of ratio of marked capacity to load, as while these large cars cannot be fully loaded with some commodities, their full weight capacity can be utilized when loaded with heavy freight, so that when their use effects an increase in the *average load* beyond the proportionate increase in *dead weight*, an increase in efficiency has been realized regardless of the marked capacity of the car.

There has been an extremely large increase in box cars with marked capacities of 40 tons or more since 1902. Cars of this class, which are those for which loading to weight capacity is most difficult, were six times as numerous in 1909 as in the earlier year.

The introduction of the large capacity cars has increased the range in carload capacity between the largest and the smallest cars, but with the elimination of the smaller capacity cars improved loading should result if increases in minimums at which carload rates apply are made whenever possible. Increases in efficiency must otherwise be found by eliminating all unnecessary empty haul and through increasing average daily mileage through methods that will eliminate unnecessary delay at terminals.

As suggested by the *Railway Age Gazette*, all shippers of freight should co-operate with the railways in securing methods of increasing efficiency of rolling stock.

W. A. WORTHINGTON,
Assistant to Director of Maintenance and Operation, Harriman Lines.

Chicago, April 10, 1911.

To the Editor of the Railway Age Gazette:

I have read with interest your editorial on The Efficiency of Railway Equipment, in the issue of April 7, and, while it suggests an important investigation, I do not think the methods used are entirely correct; and the figures will hardly be accepted as accurate. The assumption that the average tractive power of freight and passenger locomotives is the same is so far from correct that it vitiates all calculations based on it. I should say that the average tractive power developed by freight locomotives is 50 per cent. greater than that developed by passenger locomotives, and 20,000 lbs. might be taken as the average for passenger and 30,000 for freight locomotives. This difference is much greater now than it was in 1902.

Your figures show that from 1902 to 1907 there was an increase of 20 per cent. in the average tons per train and of 11 per cent. in the ton miles per freight engine per year, and comparison shows a tendency in the right direction, even if not as pronounced as should be expected.

Comparisons of statistics of the year 1902 with those of 1907 and 1909 are not very satisfactory, as the conditions in the two latter years were abnormal and not sufficiently representative to make the comparisons instructive. In 1907 there was such a congestion of freight traffic that it could not be moved under favorable conditions, and yards and terminals were so far unequal to the requirements that trains were moved under light tonnage and engines not credited with the tonnage they were capable of hauling. During 1907 and 1908 a large number of heavy locomotives were built, and in 1909 this equipment was available for service, but the amount of traffic offered to the railways had decreased and the tonnage handled per engine was unduly light.

The use of the item "ton miles per pound freight locomotive tractive power per year," makes a showing of a decrease of 31.3 per cent. in efficiency between 1902 and 1909, and, while such a unit may be useful as suggesting the general trend, it cannot be accepted as an accurate index for measuring the economic value of large locomotives. The same is true of the item "ton miles moved per year per ton of car capacity," which shows a decrease of 19½ per cent. for 1909 compared with 1902. Suppose a

given tonnage is moved in a certain number of 20-ton cars in one year and in the same number of 40-ton cars in another year. To divide this tonnage by the car capacity in each case would show a loss in efficiency for the heavy car of 100 per cent., which would indicate that the use of such a unit in these comparisons is not a practical one. The cars haul the same tonnage in each case, and the real loss is only that due to the interest on extra first cost and the extra dead weight hauled, which we know would hardly amount to 10 per cent.

Coming now, to the final conclusion, that shippers should cooperate in making maximum carload weights and in modifying demurrage rules so that the road could get the maximum reasonable results for their large equipment. So far as the railway has provided the large capacity cars and locomotives to satisfy the clamor of the shipper for large shipping facilities, there is some merit in this suggestion. But so far as the providing of large equipment has been overdone the shipper will properly decline to make any sacrifice in helping to correct the mistakes of the railway. In England freight is handled in 10-ton cars and the shipping facilities and schedules are based on them. If, now, the railways say, "We will increase the capacity to 30 or 40 tons," as they do in America, the shipper would have to change warehouses, storage tracks, etc., and would not have as frequent or as fast service as at present, and he would, therefore, not be inclined to meet the railways in their demands.

I believe that the general average figures covering all the railways in the United States, as used in your tables, cannot be made to show any definite results for increase in capacity of equipment, but they must be worked out for each road or system separately. It is probable that on some roads the capacity of freight locomotives and cars has already exceeded the economic requirements and the greatest value to be derived from your statistics is the suggestion which would lead each manager to study the subject on his own road and find out what is actually needed, instead of blindly following other roads whenever new equipment is necessary.

MOTIVE POWER.

The Swiss state railways in 1910 earned 7 per cent. more than the year before, while the expenses were 0.4 per cent. less, and the resulting increase in net earnings was $2,410,000.

REBUILDING THE SALT LAKE ROUTE.

BY H. M. M'CARTNEY.

To understand the conditions with which the San Pedro, Los Angeles & Salt Lake has to contend, culminating with the washout last year, it is necessary to review the history of the location of the line.

In 1888 the Union Pacific took up the question of extending its Utah line to southern California. This company, by means of leased lines, had reached deep water navigation at Portland, Ore., and was meditating an extension to Puget Sound which should run along its eastern shore to the Canadian boundary. It was decided to see what could be done toward an extension southward from Utah to reach the Los Angeles region, the line not only to have an ocean port there but to be pushed on to San Diego. This with the northern extension would give a continuous track from the Mexican to the Canadian frontier—a daring conception which subsequent developments have shown to be entirely warranted.

The Union Pacific had recently come into control of the lines



Old and New Lines Near Guelph.

south of Salt Lake City whose terminus was at Milford, Utah, 222 miles distant by rail. Milford was inside of the Salt Lake basin—the curious region now without a drainage outlet which at its overflow stage contained a lake 300 miles long and about the same size as Lake Ontario, whose waters, nearly 1,000 ft. deeper than the present lake, reached the Pacific Ocean by way of the Snake and Columbia rivers. The first point for the engineers was to find a practicable pass in the southern rim of the basin, which was about 80 miles from Milford. Several passes were speedily found which did not vary much in elevation. They were about 1,000 ft. higher than Milford and could all be reached on 1 per cent. grades. The next objective point was a continuous line of drainage starting in the vicinity of Freiburg, Nev., and extending by way of the Pahranagat and Moapa valleys and the Virgin and Colorado rivers all the way to the Gulf of California. This drainage, at a point where a line in the righ direction from Milford would intercept it, was about 100 miles from the rim of the basin and 4,400 ft. below it. This drainage must be crossed. The problem, therefore, was to select a pass from which a descent could best be made to

the drainage. It was soon ascertained that the natural gradient on the south side of the passes was 2 per cent., which gradually flattened to 1.5 per cent. and then to 1 per cent. After many months of examination it was found that nature had graded a pathway from one of the passes to the drainage by way of a route called the Meadow valley. This could be reached by a tributary called the Clover valley, which headed in one of the lowest passes, the two valleys giving a continuous water grade 113 miles long, and terminating at the Moapa river, directly opposite the mouth of a dry valley or wash, which led up to the next summit to the south. After the contour maps of the region were completed, there was never any question as to the route. The Meadow valley had no competitors. It ran in the right direction, cut through three mountain ranges, and afforded the same grades which were necessary on any of the other routes. In detail, the Meadow valley was not very discouraging. Most of it was a close canyon with rocky sides, but there was usually room enough between the foot of the slopes and the edge of the stream bed to hold a road. There were only 20 miles of the 113 which necessitated any heavy construction work.



Washout of Elgin Yard; San Pedro, Los Angeles & Salt Lake.

Most of this was near the summit and required six short tunnels, which aggregated 2,600 ft. in length. There were no high trestles and, at the outset, no bridges. For the greater part of the year the small creek which occupied the bed of the Clover and Meadow valleys disappeared beneath the sands for most of the distance. Frequently for years at a time there were 100 miles of the 113 where not a drop of surface water could be obtained. In the whole length of the valley there was but one small wagon road bridge. One disgusted traveler who had been compelled to make a dry camp in the creek bed, expressed his feelings by painting on a large white granite boulder: "The longest, the dryest, and the damnedest wash on earth." In the whole length of the two valleys there were some twelve settlers whose ranches had been cultivated since 1876 without any trouble from high water except such as occurred near the southern end from occasional cloudbursts which came down from the surrounding mountains during the hottest months of the summer. Such were the conditions which confronted the locating engineers in 1889. The line was located along the edges of the channel in most places and pile trestles laid out for crossings. The 32 miles in the Clover valley were graded in 1890 but no track was laid. The bankruptcy of the Union Pacific stopped this work. When it was resumed in 1901 the project was in the hands of the San Pedro, Los Angeles & Salt Lake, in which the Union Pacific took a one-half interest. In the 11 years which had elapsed there had been no floods. The abandoned grading was intact. Many of the earth embankments built in the edges of the channel had not been rip-rapped, but were uninjured. Down the main Meadow valley the cedar stakes of the engineers stood where they had been placed in 1890. Th location made in that year was practically adopted, the grading was resumed and the track reached the lower end of the Meadow valley in June, 1904. There was nothing in the known history of the valley since 1876 which presaged any disaster. The whole line was completed in 1905.

In 1906 there came a small flood which did a little damage and closed the road for two weeks. Then in 1907 came the highest water ever known. It damaged the line so badly as to cause it to be closed for six weeks. Several trestles crossing the channel were destroyed and miles of embankment were undermined. The company raised the grade in places, protected the exposed embankments with 34 lineal miles of heavy rip-rap and put in 8 steel bridges where the trestles had been destroyed. It also changed so much of the creek channel that it was the saying that the engineers had re-located the creek instead of the railway. Apparently everything had been done to withstand any high water which could be expected. Nothing happened in 1908. In December, 1909, there came an unusually heavy fall of snow which covered the entire mountain range at the rim of the Salt Lake basin and extended southward nearly to the California line. The drainage basin of the Meadow valley is an immense one, but under ordinary conditions the snow would have gone off gradually and probably done little or no damage to the recently strengthened roads. But on January 1, 1910, there came a tremendous storm of warm rain which in itself would have made trouble, and which turned to water the entire snowfall in one night. The result was the greatest flood ever known in that region. It was all over in 24 hours, but in that short time it had closed 89 miles of railway, of which 23 miles of main line in various pieces and 6 miles of sidings and Y's were totally destroyed. This portion of the road remained closed until June 13, 1910.

The volume of water at its maximum was five times greater than any before known. The flow attained a velocity of 20



Old and New Lines Near Rox.



Condition of Road Near Kyle, in May, 1910.

miles per hour in some places. The bed of the stream on steep grades was scoured down 5 to 15 ft. and in flat places was raised 5 to 8 ft. The deepest water was 15 ft., but this was in a narrow part of the canyon and was moving on a grade of 79 ft. per mile.

The water carried so much silt that in many places rails which were partially buried had their exposed portions polished as bright as if held on an emery wheel. The force of the water was terrific. Rocks weighing 2,000 lbs. were washed from the creek bed up onto the track and left there. A large tonnage of rails disappeared altogether. In sinking a coffer dam on the new works a rail was recently found 9 ft. below the bed of the



Pile Trestle Carried Away After Debris Had Banked Up Against It.



Debris Left on Track Where Water Was Shallow; San Pedro, Los Angeles & Salt Lake.

stream. Hundreds of rails were bent so as to be ruined.

At Caliente a dyke had been built to protect the engine terminal. The flood broke this and filled the roundhouse and turntable pits with sand and raised the general level of the yards. The roundhouse was substantially built of brick, but a breach 110 ft. wide was made in it.

The drift and ice blocked the trestles and dammed up the water. When enough had accumulated it would tear the trestle out bodily, everything going down in a mass against the next trestle and often taking it out in an instant. Of the trestles crossing the channel 36 were totally and 50 partially destroyed. The 8 steel bridges fared better. One was upset and buried 13 ft. in the sand. Two had an abutment each undermined but were saved and put back into position. The other five were not damaged. About 3 lineal miles of rip-rap were destroyed. Part of this was undermined and part cut out from the top by water which accumulated and finally came over the bank. Ties which were torn from the rails went all the way to the Colorado river. In one place the main track retained its shape but a siding was bent around 180 degs. and washed under the main line. Many of the ranches in the Meadow valley were nearly ruined. In some places the fields were washed out, in others they were covered with sand.

One freight train was caught by the flood and was unable to move either forward or back. The embankment on which it stood was gradually undermined and the engine and train were overturned. The crew escaped, but 36 horses were drowned



Overturned Bridge.

and 28 cars destroyed. One steel gondola was carried nearly a mile down stream. Part of its lading was light structural steel and much of this was ruined by being twisted around rocks in the channel, some being bent 180 degs. Tinware and fire extinguishers were carried for long distances. One carload of a popular breakfast food was strewn along the banks for 50 miles. The proprietors missed a chance for a series of photographs showing how widely their product was distributed.

A passenger train was also caught, but fortunately was on a high rocky shelf where it was not injured. The passengers were removed the next day in wagons, but the train was compelled to wait for the rebuilding of the road and eventually reached Salt Lake City under its own steam some 150 days after it left Los Angeles, probably the most belated train on record.

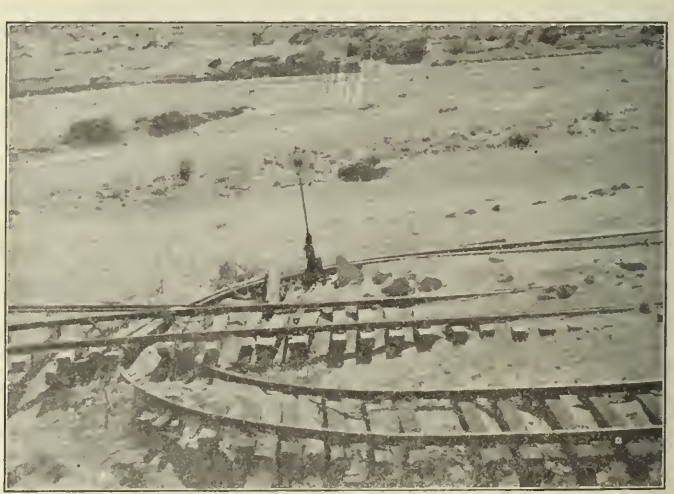
The company met the situation with great energy. A short time was devoted to considering alternate lines, but the decision made in 1899 was adhered to and the Meadow valley route retained. The first step was to provide a temporary line for the resumption of business. This was done by closing the gaps partly with grading and partly with trestles. Altogether 26,000 lineal feet of pile trestles were built. The banks were protected by sand bag rip-rap. The entire work was completed in 75 days at



Boulder Left on Track.

a cost of about $500,000, and train work immediately resumed. In the meantime, a new line had been located along the slopes of the valley 8 to 12 ft. above the high water line of 1910, and 68 miles of it from Caliente westward were put under construction last fall. In this distance 6 miles of old grade were used. The rest is all new location. The grading involved much heavy rock work and 8 tunnels, aggregating 4,201 ft., yet it was all practically finished in the surprisingly short time of 150 days, a monument to the energy of Chief Engineer E. G. Tilton. About 40 miles of track were laid by April 1. In the new line both alinement and distance are sacrificed to safety. The distance is nearly two miles longer than the old line. The maximum curve is 8 degs. No change has been made in the former maximum grade of 1.5 per cent. The equation for curvature is 0.04. The tunnels are 17 ft. x 23 ft. in the clear, and they are lined with timber which is protected against fire by a covering of galvanized sheet iron. All the tunnels were dry.

The greatest care has been taken with the crossings of the channel, which are 15 in number on this 68 miles and are all to be steel bridges. The longest are 300 ft., composed of 3 spans of 100 ft. each. The riveted spans are 100 and 125 ft. The plate girders are 90 and 100 ft. There is but one deck bridge among them. The piers and abutments are sunk to bed rock or hard gravel wherever possible. Where this cannot be done they are excavated to a minimum depth of 12 ft. and then piled. Pile trestles are used across side gulches only. The spans are 15 ft. and the ballast decks are supported by eleven stringers 8 x 16-30. The piles are all creosoted.



Siding Twisted under Main Track.



Bridge Swept from Abutment.

There are a few 10-ft. openings which are made with plain concrete end walls and flat decks of rails embedded in concrete. Culverts are of continuous concrete pipe. There are several concrete retaining walls, of which the largest is 400 ft. long and 18 to 20 ft. high. Miles of heavy rip-rap have been put in.

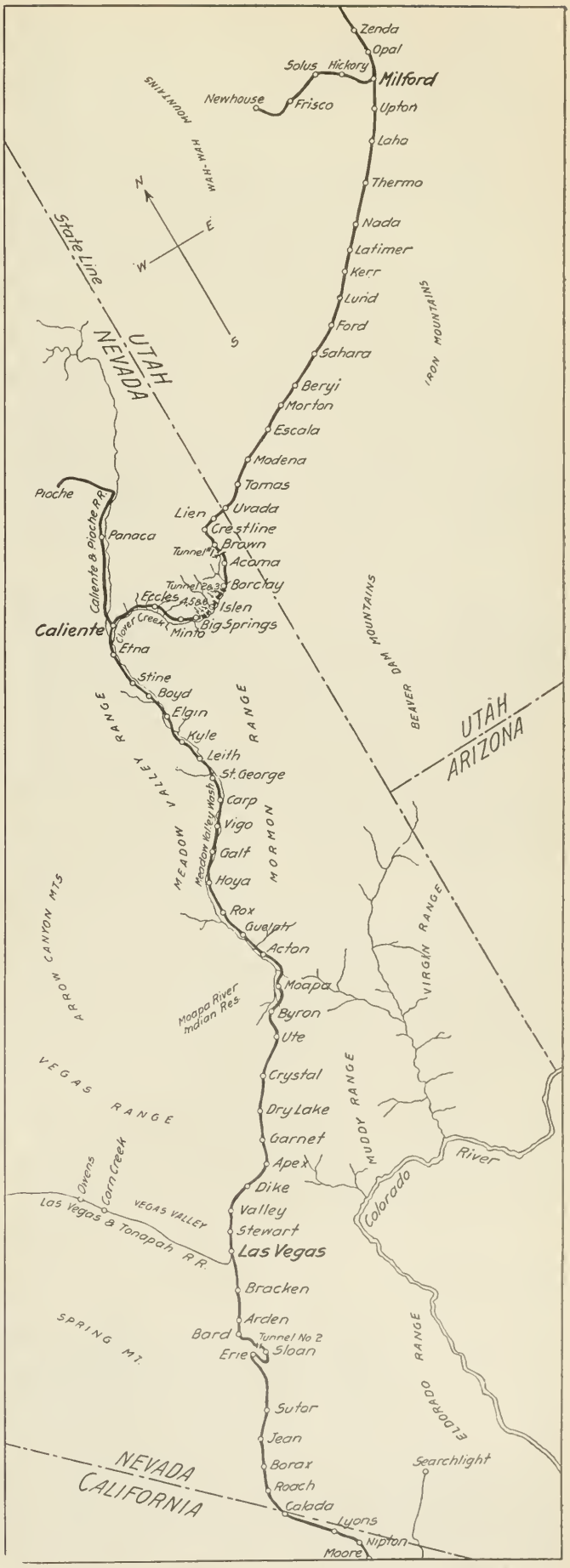


New Station at Las Vegas.

The old track was composed of 75-lb. rail and 7-in. x 8-in. ties. The new track has 85-lb. rail, A. S. C. E. section, with 7-in. x 9-in. ties laid 18 to the 33-ft. rail. All the ties are Oregon fir and burnettized. Continuous rail joints are used, weighing 71 lbs. The entire line is tie plated with 8-in. x 8½-in.



Gondola Washed Down-Stream.



Line South from Milford; San Pedro, Los Angeles & Salt Lake.

standard flat Harriman plates weighing 6½ lbs. each. The standard frog is number 9. Standard water tanks are of steel and 70,000 gal. capacity. The road uses oil for fuel on all of its lines except the easterly 200 miles. At Caliente is a steel storage tank holding 30,000 barrels. All of this work in progress is west of Caliente. East of that point work has been started on 12 miles of grading, 1½ miles of which will occupy the old roadbed and 10½ miles will be on new alinement which will involve much heavy grading and two tunnels, 400 and 1,300 ft. in length, and 8 steel bridges. The total work to fight the Meadow valley flood will be 72½ miles of new grading and 80 miles of new track. The total new tunnels will be 10 in number, aggregating 5,901 ft., and the total steel bridges will be 23, aggregating about 4,715 ft. in length and calling for more than 5,000 tons of steel.

Altogether the work will cost over $5,000,000, and all of it is for protection against a desert stream which is practically dry for years at a time and whose greatest devastation occurred in 24 hours. By next winter the work will be completed and the officials of the company will feel their property is secure against further disaster. And what will the Meadow valley creek do? Will it repeat its tactics of 1910 and make one final effort for supremacy, or will it sulk along as it did for the thirty years from 1876 to 1906?

TRAIN ACCIDENTS IN MARCH.*

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of March, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
6.	Delaware & Hudson	Oneonta.	rc.	F. & F.	2	0
*11.	Boston & Maine	Greenfield.	rc.	F. & F.	1	3
15.	Atchison, T. & S. F.	Glendora.	bc.	P. & P.	0	2
16.	Southern	Aiken.	xc.	P. & F.	0	8
20.	Atchison, T. & S. F.	Kingman.	ms.	P. & P.	2	2

Derailments.

Date.	Road.	Place.	Cause of derailmt.	Kind of Train.	Kil'd.	Inj'd.
1.	Houston & T. C.	Corsicana.	malice.	P.	2	0
3.	Mo., K. & Texas	Brookshire, Tex.	unx.	P.	0	0
5.	Southern	Bearden.	unx.	P.	0	8
8.	Augusta So.	Wren. (ag. spl.)	unx.	P.	0	2
13.	Central N. J.	Penn Haven J.	derail.	F.	1	1
14.	Baltimore & Ohio	Alberton.	slide.	F.	0	5
*22.	Boston & Maine	Clinton.	unx.	P.	0	2
†25.	Atlantic C. L.	Alapaka.	b. axle.	P.	10	10
27.	Chicago G. W.	Cannon Falls.	d. track.	P.	0	2
*28.	Del., L. & W.	Tully.	b. rail.	P.	0	5
29.	Penn.	Spruce Creek.	unx.	P.	0	0
29.	Ill. Central	Dubuque.	slide.	P.	0	1

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of Train.	Kil'd.	Inj'd.
9.	Mo., K. & Texas	Durant, Okla.	fire.	F.	0	0

The derailment at Alapaha, Ga., on the 25th, occurred on a trestle bridge, and six passengers and four trainmen were killed, and nine passengers and one express messenger were injured. Some of the victims were drowned. The derailment was caused by the breaking of a driving wheel axle, and the trestle was destroyed for a length of about 400 ft. This accident was reported in the *Railway Age Gazette,* March 31.

The derailment at Corsicana, Texas, on the 1st, was caused by a large cast iron washer placed on the rail. That the washer did not come there accidentally was shown by the testimony of a farmer living nearby, who said that about a week prior to the derailment he had picked up this washer from the center of the track and had thrown it into the weeds several yards to one side.

The train derailed at Wren, Ga., on the 8th, was the "Agricultural Special," carrying lecturers from the State Agricultural College. The engine was running backwards and the tender was the first vehicle to leave the track. The engine, crowding on the tender, was overturned and fell down a bank. The tender was the first vehicle to leave the track also in the derailment at Bearden, Tenn., on the 5th, on the Southern railway, and at Clinton, Mass., on the Boston & Maine, on the 22d. At Bearden it is said that the train was running at about 40 miles an hour and all of the cars in the train ran off the track, except one at the rear. Most of the passenger cars were ditched and fell against the side of an embankment. At Clinton, one passenger car fell down a bank, but the passengers in it numbered only 3.

The train which was damaged by fire at Durant, Okla., on the 9th, was one carrying troops to Texas and a carload of horses was destroyed. The report that two soldiers were killed as a result of the fire appears to have been unfounded.

The derailment at Penn Haven Junction, Pa., on the 13th, was at the approach to the Lehigh Valley crossing, and the locomotive and five cars fell into the Lehigh river.

Of the 10 electric-car accidents reported in the newspapers as occurring in the United States in the month of March, one at Buffalo, N. Y., on the 19th, resulted in the death of two persons and the injury of four. In this case a locomotive ran into a street car on a crossing and wrecked the car, but it was occupied by only three passengers. One rear collision occurred in Indiana, a state in which public opinion is sensitive on the subject of collisions because of a number of disasters on interurban lines in that state last autumn. In the present case a freight car became disabled and the conductor went forward to flag a passenger car, but was utterly unable to attract the attention of its motorman.

Near Bluejay, Ont., on the Canadian Pacific March 25, a butting collision between a westbound colonists' train and an eastbound freight resulted in the death of three trainmen.

* Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

MALLET LOCOMOTIVES FOR THE CHICAGO, MILWAUKEE & ST. PAUL.

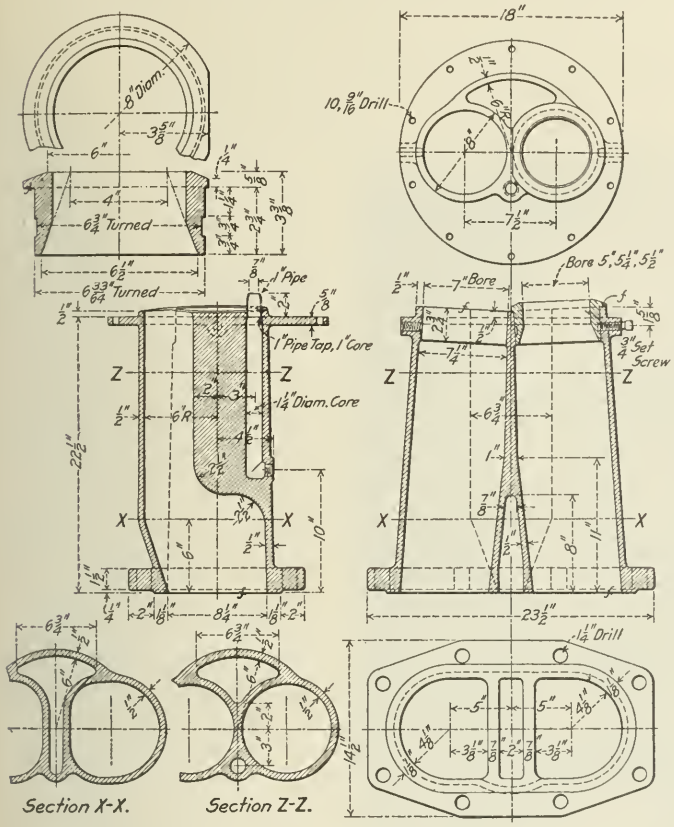
Twenty-five Mallet locomotives have recently been built for the Chicago, Milwaukee & St. Paul by the American Locomotive Company. Part of the number are to be used on that railway and the rest on the Puget Sound line. Seventeen of the order are designed for burning coal and the other eight for burning oil as they are to be used on divisions in the Idaho Forest Reserve. The locomotives have a theoretical hauling capacity of 900 tons at a speed of 6 to 8 mi. per hr. on a 2.7 per cent. grade, the tonnage being based on 5 lbs. per ton resistance for cars; they are to be used in pusher service for both the passenger and freight trains.

These locomotives are similar in general design to the 2-6-6-2 type built for the Chesapeake & Ohio, and described in the *Railway Age Gazette* of December 16, 1910. They are of very nearly the same weight, but the Chesapeake & Ohio locomotives have a rated tractive effort of 82,000 lbs., which is 7,000 lbs. greater than for these engines. This difference is accounted for by the following dimensions of the two engines; the Chesapeake & Ohio has 22 in. and 35 in. x 32 in. cylinders, 225 lbs. boiler pressure and 56 in. drivers; the Chicago, Milwaukee & St. Paul locomotives have 23½ in. and 37 in. x 30 in. cylinders, 200 lbs. boiler pressure and 57 in. drivers. The boilers of the two locomotives are almost identical. In both, the tubes are 24 ft. long and 2¼ in. in diameter. There is a long combustion chamber which brings the firebox back of the rear driving wheels and gives a good depth of throat sheet. In the newer locomotives the distance from the top of the grate to the lowest tube is 24⅛ in. The Chesapeake & Ohio locomotives have 401 tubes, while these engines have 439, which give them 536 sq. ft. more heating surface.

A separate exhaust pipe is provided for each low pressure

cylinder. This new feature is illustrated herewith and was incorporated with the idea of reducing the back pressure in the low pressure cylinders. Although this construction increases the number of joints, it is not considered a serious objection, in view of the advantages claimed for it. The trailing truck was made in accordance with the design developed by J. F. De Voy, assistant superintendent of motive power of the Chicago, Milwaukee & St. Paul, which has been adopted as a standard by the road.

Except for the necessary modification required in the construc-



Details of Exhaust Pipe; Mallet Locomotive.

tion of the firebox, ash-pan, exhaust pipe and tender, due to the use of oil as fuel, the oil and coal burning locomotives are identical in design. These changes make a difference in the total weight of the engine of 2,500 lbs. The locomotives equipped for burning coal have a total weight of 390,000 lbs., while those arranged for burning oil have a total weight of 387,500 lbs. Between the weights of the tenders of the two classes of engines there is only a difference of 700 lbs. in favor of the oil burning class. Following are the principal ratios and dimensions of the coal burning locomotive:

General Data.

Type	2-6-6-2
Service	Freight
Fuel	Bit. coal
Tractive effort	75,000 lbs.
Weight in working order	390,000 lbs.
Weight on drivers	323,500 lbs.
Weight of engine and tender in working order	555,700 lbs.
Wheel base, driving	30 ft. 6 in.
Wheel base, total	48 ft.
Wheel base, engine and tender	79 ft. 8¼ in.

Ratios.

Total weight ÷ tractive effort	5.2
Weight on drivers ÷ tractive effort	4.31
Tractive effort × diameter drivers ÷ heating surface	652.
Total heating surface ÷ grate area	90.6
Firebox heating surf. ÷ total heating surf., per cent.	5.28
Weight on drivers ÷ total heating surface	49.3
Total weight ÷ total heating surface	59.5
Volume equivalent simple cylinders, cu. ft.	22.9
Total heating surface ÷ vol. cylinders	286.5
Grate area ÷ vol. cylinders	3.15

Cylinders.

Kind	Compound
Diameter	23½ in. and 37 in.
Stroke	30 in.

Valves.

Kind	Piston and slide
Travel	6 in.
Steam lap	1 in. and ⅞ in.
Lead, forward gear	3/16 in.

Wheels.

Driving, diameter over tire	57 in.
Driving, thickness of tire	3½ in.
Driving, journals, main, diameter	10 in. x 13 in.
Driving, journals, others, diameter	10 in. x 13 in.
Engine truck, diameter	33 in. Paige
Engine truck, journals	6½ in. x 12 in.
Trailing truck, diameter	43 in.
Trailing truck, journals	8½ in. x 14 in.

Boiler.

Style	Conical connection
Working pressure	200 lbs.
Outside diameter of first ring	83¾ in.
Firebox, width and length	96¼ in. x 108 1/16 in.
Firebox, plates, thickness	⅜ in.
Firebox, water space	5 in. and 4½ in.
Tubes, number and diameter	439—2¼ in.
Tubes, length	24 ft.
Heating surface, tubes	6,182 sq. ft.
Heating surface, firebox	346.5 sq. ft.
Heating surface, arch tubes	26.1 sq. ft.
Heating surface, total	6,554.6 sq. ft.
Grate area	72.3 sq. ft.
Center boiler, above rail	10 ft.
Top smokestack, above rail	15 ft. 5⅞ in.

Tender.

Tank, style	U shape
Frame	13 in. steel channels. 55 lb.
Wheels, diameter	33 in.
Journals	5½ in. x 10 in.
Water capacity	9,000 gals.
Coal capacity	14 tons

A concession is being sought from the Uruguayan government for an American company organized under the laws of Maine to construct a trans-Uruguayan railway to extend from Coronilla on the east coast, across Uruguay in a westerly direction to a port on the Uruguay river, there connecting with the railways of southern Brazil, northwestern Argentina and Paraguay. The concession also contemplates the construction of an extensive terminal port on the Atlantic coast. The present company has already completed all necessary preliminary surveys. This project, which has been periodically under consideration since 1888, is an extremely popular one in Uruguay. The name of the leading person connected with the new company may be obtained from the Bureau of Manufactures, Washington, D. C.



Mallet Locomotive; Chicago, Milwaukee & St. Paul.

BENJAMIN F. BUSH.

Benjamin Franklin Bush, president of the Western Maryland, was elected president of the Missouri Pacific, succeeding George J. Gould, at a meeting of the board of directors last Tuesday. His election was voted against by five of the twelve directors, these being: Paul M. Warburg and Cornelius Vanderbilt, representing the Kuhn, Loeb & Co. interests, F. T. Gates and E. L. Marston, representing the Rockefeller interests, and E. D. Adams, representing the Deutsche Bank interests. After the meeting, Messrs. Warburg and Vanderbilt resigned from the board. Mr. Gould made the following statement:

"The board has, I think, made a wise choice in selecting Mr. Bush as president. He is familiar with the conditions on the line, and with the affairs of the company gained while in its employ some years ago. I was much influenced in my advocacy of his election by the results he has attained in his administration of the Western Maryland property, and by the esteem in which I knew he was held by Mr. Rockefeller, who is so largely interested in the Western Maryland, and who, next to our family, is the largest stockholder in Missouri Pacific. Kuhn, Loeb & Co. have stated that in case of Mr. Bush's election to the presidency they would abandon their relations to the Missouri Pacific as bankers. My personal relations with the several members of the firm of Kuhn, Loeb & Co. have been so pleasant that I was reluctant to conclude that the continuance of that firm as bankers for the property was not to the corporation's best interests. I part with them with personal regret, but their interests in the Union and Southern Pacific, both essentially competitive lines to the Missouri Pacific, made a continuance of their relationship as bankers in my judgment inadvisable for the stockholders of the Missouri Pacific as well as for the public."



Benjamin F. Bush.

Kuhn, Loeb & Co., made a statement as follows: "A majority of the special committee, consisting of Messrs. Gates, Adams and Gould, appointed by the board immediately after the annual election in February last to consider and recommend a suitable president, did not favor Mr. Bush, who was the candidate of the Gould interests; but he was, nevertheless, elected to-day through the predominancy in the board of the Gould interests and against the votes of Messrs. Gates, Adams, Vanderbilt, Warburg and Marston. In consequence, Messrs. Warburg and Vanderbilt, deeming it impracticable to accomplish under prevailing conditions the objects which prompted them to enter the board and unwilling to share responsibility in the management of the compnay under these circumstances, have resigned as directors."

It is not believed that Kuhn, Loeb & Co. have sold any of their Missouri Pacific holdings. There have been rumors to that effect, but there is no reason to suppose that the bankers up to the time of the meeting, thought that the understanding between them and the Gould interests was not to be carried out.

The problems President Bush has to face are discussed in another column. He has the ability. He has built up the Western Maryland physically and has also developed its business. He has won the liking and respect of the people served by the Western Maryland, and he has made an organization which is running the road successfully. The qualities thus indicated are the qualities which a president of the Missouri Pacific needs. Also, Mr. Bush has been trained as a civil engineer and he is healthy.

He was born in Wellsburg, Pa., in 1860, and began railway work in 1882 as a rodman on the Northern Pacific. He worked in the engineering department until he was made a division engineer, and was then transferred to the company's coal properties. Here he did most efficient work, building up the properties and enlarging the output. After serving as chief engineer and general superintendent of the Oregon Improvement Co. and as general manager of the Northwestern Improvement Co., he became, in 1903, vice-president and general manager of the Western Coal & Mining Co. He was in charge of fuel purchases on the Missouri Pacific, and, in 1907, was made president of the Western Maryland. He was receiver of the property during its receivership.

FOREIGN RAILWAY NOTES

The southern terminus of the Tientsin-Pukow Railway, China, is at Pukow, just across the Yangtze Kiang river from Nanking, in Kiangsu province. A construction-train service was opened on January 20, 1911, which makes a daily run between Pukow and Linhwaikwan, 93 miles to the northwest, in about 12 hours. The rails are laid to Pengpu, 10 miles farther than Linhwaikwan, where the road crosses the Hwai river and where, according to the engineers, is located the largest task on the southern section, viz., the construction of the bridge. This work is being done by an American engineer, who is one of the three Americans thus employed on the southern section, and it is expected that this division will be ready for traffic by November, 1911, giving train service from Pukow to Hsuchowfu, in the northern part of Kiangsu.

The commission of the Russian Ministry of Communications has taken over and opened to traffic the newly built broad-gage railway from Herby on the German frontier to Kielce via Czenstochowa. The new line, which is 81 miles long, runs through a portion of the country rich in natural resources, which have as yet remained undeveloped owing to lack of proper communication. The line also forms a direct connection between the southern portions of Silesia and the interior of Russia, as at Kielce it joins the existing Dombrowa-Vistula railway, along which traffic can pass to the east without going through Warsaw or changing the gage except at Herby. Water-borne freight from Stettin via Kosel can thus be forwarded by a nearer direct route to the central and southern Russian provinces.

BLOCK SIGNAL MILEAGE JANUARY 1.

The Interstate Commerce Commission has issued its bulletin showing the mileage of railways in the United States worked by the block system on January 1, 1911. The principal table in this bulletin (table 1) is reproduced herewith; also table 2, showing the kinds of automatic block signals in use.

The total length of road in the United States operated under the block system on January 1, 1911, was 71,269.1 miles; 17,711.5 miles automatic, and 53,557.6 miles manual. There was an increase in 12 months of 3,473.8 miles automatic and 2,037.3 miles manual, making the increase in road operated under the block system during the year 5,511.1 miles.

Table 3, containing statistics of methods and apparatus used with the manual block system, shows a large increase in the mileage of road on which telephones are used in blocking. The Pennsylvania now reports more miles worked by telephone than by telegraph, and there are four prominent roads on which all of the manual blocking is done by telephone, namely: the Atchison, Topeka & Santa Fe; the Chicago, Rock Island & Pacific; the Chicago, Milwaukee & Puget Sound, and the Seaboard Air line. Other roads on which there are large increases in the telephone mileage are the Atlantic Coast Line, the Chicago & Northwestern, the Erie, the Evansville & Terre Haute, the Louisville & Nashville, and the Cleveland, Cincinnati, Chicago & St. Louis.

Table 4, containing statistics of different practices in use in the operation of the manual block system, shows that on a number of prominent roads the use of three-position signals for permissive blocking has largely increased; namely, on the Baltimore & Ohio Southwestern; the Chicago, Burlington & Quincy; the Chicago, Milwaukee & Puget Sound; the Louisville & Nashville, and the Nashville, Chattanooga & St. Louis.

The present bulletin includes the following roads which have not heretofore reported the use of the block system:

Beaumont, Sour Lake & Western (St. Louis & San Francisco); Central New England; Chesapeake & Ohio Railway of Indiana; Chicago, Rock Island & Gulf; Evansville & Terre Haute; Kentwood & Eastern; New Orleans & North Eastern (Queen & Crescent); New Orleans, Texas & Mexico (St. Louis & San Francisco); Orange & Northwestern (St. Louis & San Francisco); Quincy, Omaha & Kansas City and Iowa & St. Louis; Toledo, Peoria & Western; Toledo, St. Louis & Western; Western Pacific.

And the following electric or "interurban" lines which were not included in preceding bulletins:

Auburn & Northern; Illinois Traction; San Francisco, Oakland & San Jose Consolidated; Syracuse, Lake Shore & Northern; Tidewater Power Co.; Washington Water Power Co.

The Atlanta & West Point, the Davenport, Rock Island & Pacific, and the Mississippi Central do not appear, former reports having been erroneous. The Duluth, South Shore & Atlantic and the Western of Alabama have also dropped out. The Chicago, Burlington & Quincy and the Chicago, Milwaukee & St. Paul operate jointly 12.4 miles of double track, covered by automatic signals. Each company owns and has signaled one track; this installation is shown as double track for each company. The Northern Pacific and the Great Northern operate jointly 60.3 miles of double track covered by automatic signals. Each company owns one track, and the signals are owned and maintained by the Northern Pacific. This is operated as double track and is shown as such in these tables for each company. The Illinois Central and the St. Louis & San Francisco operate jointly 35 miles of single track covered by automatic signals. In these tables this mileage is credited to both companies.

Comparing the present report with the report for January 1, 1910, the following notable changes appear, the figures in each case representing miles of road:

Name of railroad.	Increase. Automatic. Miles.	Increase. Non-automatic. Miles.	Decrease, non-automatic. Miles.
Baltimore & Ohio	28.8	43.2	.....
Boston & Maine	153.7	.....	.....
Chesapeake & Ohio	154.9	.....	.....
Chicago Great Western	117.8	1,039.9	.....
Chicago, Rock Island & Pacific	333.4	.....	154.1
Cincinnati, Indianapolis & Western	.....	57.2	.....
Delaware, Lackawanna & Western	52.5	.....	.....
Great Northern	60.6	.....	.....
Hocking Valley	.....	69.3	.....
Illinois Central	36.5	.....	.....
Long Island	21.2	.....	.....
Louisville & Nashville	11.0	279.6	.....
Maine Central	153.0	.....	.....
Minneapolis, St. Paul & Sault Ste. Marie	.....	265.5	.....
Missouri Pacific: St. Louis, Iron Mtn. & Southern	29.5	.....	.....
New York Central Lines:			
Cleveland, Cincinnati, Chicago & St. Louis	.....	57.1	.....
Peoria & Eastern	.....	81.2	.....
Northern Pacific	179.0	.....	396.7
Pennsylvania:			
Grand Rapids & Indiana	.....	55.8	.....
Pennsylvania Co.	103.6	170.5	.....
Philadelphia, Baltimore & Washington	.....	47.8	.....
Pittsburg, Cincinnati, Chicago & St. Louis	.....	32.6	.....
Vandalia	.....	124.0	.....
St. Louis & San Francisco	428.8	.....	122.4
Southern Pacific, Atlantic System	63.8	.....	.....
Southern Pacific, Pacific System	279.9	.....	.....
Union Pacific	116.2	.....	.....
Oregon Short Line	203.0	.....	.....

Alternating Current.—The use of alternating current track circuits in connection with signal installations is reported by the Auburn & Northern; Cumberland Valley; Hudson & Manhattan; Syracuse, Lake Shore & Northern; Long Island; New York, New Haven & Hartford; Northwestern Pacific; Pennsylvania; Philadelphia, Baltimore & Washington; West Jersey & Seashore; San Francisco, Oakland & San Jose Consolidated, Washington Terminal and Washington Water Power Company. All of these installations are on lines equipped for electric traction except the Cumberland Valley, the Washington Terminal and a small part of the Pennsylvania.

Automatic train stops are used on the Erie, the Hudson & Manhattan, the New York City Terminal of the Pennsylvania, and the suburban lines of the Washington Water Power Company. On the Erie the Harrington automatic stop is used on 11.8 miles of one track of double-track road. On the Hudson & Manhattan automatic stops are used in connection with all signals. In the Pennsylvania Terminal in New York automatic stops are used in connection with signals throughout the tunnels, covering 4.4 miles of road, or 13.7 miles of track. The Washington Water Power Company uses automatic stops in connection with automatic signals on 29 miles of track.

The Train Staff.—The Delaware, Lackawanna & Western and the Tide Water Power Company (Wilmington, N. C.) operate a few miles of road by means of the train staff without electric control. So far as known, these are the only two installations of this form of block system. The installation on the Lackawanna is on a section of road which is used only for freight trains. On the Tide Water Power Company's line the staff system is regularly used every day from May 1 to September 20, and on Sunday afternoon only from September 20 to May 1.

Trolley Electric Lines.—The bulletin this year for the first time gives statistics of certain interurban electric railways, on which space-interval regulations are in force, but the list is not complete, as many companies of this character do no interstate business. The mileage given under this head is not added to that given in the other tables.

The interurban lines are nearly all single-track roads. Usually the cars make frequent stops, more frequent than is customary on steam railways, and in many cases the electric lines have to deal with a fluctuating traffic. For these and other reasons they provide freely in their regulations for the presence of two or more trains, running in the same direction, in one block section at the same time; that is to say, where any block system is in use it is generally permissive block signaling. One train (usually a single car) follows another under rules requiring motormen at meeting points to give to one another by word of mouth the necessary information concerning the number of trains run-

TABLE 1.—RAILWAYS WORKED BY BLOCK SYSTEM JANUARY 1, 1911. (SEE NOTES ON NEXT PAGE.)

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block-signaled (miles of track).
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Ann Arbor							1.4				1.4	1.4	1.4	1.4	291.9	291.9	0.4
Atchison, Topeka & Santa Fe:																	
Eastern lines	5.7	73.6			79.3	152.9	361.4	475.3	12.9		849.6	1,350.7	928.9	1,503.6	2,519.0	3,097.1	48.5
Western lines	33.4	2.4			35.8	38.2	541.8	23.9			565.7	589.6	601.5	627.8	2,797.8	2,824.1	22.2
Coast lines	18.9	1.0			19.9	20.9	4.3				4.3	4.3	24.2	25.2	1,825.5	1,872.3	1.3
Gulf, Colorado & Santa Fe	10.8				10.8	10.8	2.1				2.1	2.1	12.9	12.9	1,540.0	1,540.0	.8
Atlantic Coast Line	3.1	12.1			15.2	27.3	373.1	101.7			474.8	576.5	490.0	603.8	3,832.4	3,957.9	15.1
Auburn & Northern	6.5				6.5	6.5							6.5	6.5	6.5	6.5	100.0
Baltimore & Ohio	15.2	198.3		4.6	218.1	430.1	363.6	580.4	87.0	15.7	1,046.7	1,847.9	1,264.8	2,278.0	3,140.5	4,205.1	54.2
Baltimore & Ohio Chicago Terminal	.8	10.0			10.8	20.8							10.8	20.8	45.8	73.0	28.5
Baltimore & Ohio Southwestern		14.0			14.0	28.0	922.8	35.0		2.2	960.0	1,001.9	974.0	1,029.9	980.1	1,039.7	99.0
Baltimore & Sparrow's Point							1.7	3.0			4.7	7.7	4.7	7.7	4.7	7.7	100.0
Bessemer & Lake Erie							64.4	130.3			194.7	325.1	194.7	325.1	191.8	322.2	96.9
Boston & Maine	124.7	570.3		2.1	697.1	1,273.7		4.8			4.8	9.6	701.9	1,283.3	2,238.6	2,801.6	45.8
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburg							301.2	128.7			429.9	558.7	429.9	558.7	429.9	558.7	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	25.3	25.3	31.2
Central New England							16.0				16.0	16.0	16.0	16.0	275.0	296.9	5.7
Central of Georgia							52.3	7.4			59.7	67.1	59.7	67.1	1,915.9	1,915.9	3.5
Central of New Jersey	13.0	165.5	2.4	31.5	212.4	477.2							212.4	477.2	464.1	742.9	64.2
Chesapeake & Ohio		183.0			183.0	366.0	1,274.2	125.9			1,400.1	1,526.0	1,583.1	1,892.0	1,607.4	1,916.3	98.7
Chesapeake & Ohio Ry. of Indiana							269.0				269.0	269.0	269.0	269.0	269.0	269.0	100.0
Chicago & Alton	416.1	144.9			561.0	705.9	141.2				141.2	141.2	702.2	847.1	998.9	1,143.0	74.1
Chicago & Eastern Illinois		98.4			95.4	196.8	173.9	57.5			231.4	288.9	329.8	485.7	693.0	849.5	57.2
Chicago & North Western		719.6	13.8	6.0	739.4	1,504.6	2,409.3	115.3			2,524.6	2,639.9	3,264.0	4,144.5	6,894.0	7,806.0	53.1
Chicago & Western Indiana		17.8			17.8	35.6		6.3	3.2		9.5	22.2	27.3	57.8	27.3	57.8	100.0
Chicago, Burlington & Quincy		35.4	1.6	5.4	42.4	97.2	8,070.8	602.7	17.1	1.4	8,692.0	9,333.1	8,734.8	9,430.3	8,421.5	9,171.2	100.0
Chicago Great Western	61.0	64.9			125.9	190.8	1,307.2	23.7			1,330.9	1,354.6	1,456.4	1,545.4	1,472.2	1,568.4	98.5
Chicago, Indianapolis & Louisville							525.0				525.0	525.0	525.0	525.0	579.1	579.1	90.6
Chicago, Milwaukee & St. Paul	5.9	103.7			109.6	213.3	3,368.2	438.8			3,807.0	4,245.8	3,916.6	4,459.1	7,511.6	8,081.5	55.2
Chicago, Milwaukee & Puget Sound							1,364.7				1,364.7	1,364.7	1,364.7	1,364.7	1,364.7	1,364.7	100.0
Chicago, Peoria & St. Louis Ry. of Illinois	1.3				1.3	1.3							1.3	1.3	226.9	226.9	.6
Chicago, Rock Island & Pacific	653.3	279.6			932.9	1,212.5	997.7				997.7	997.7	1,930.6	2,210.2	6,682.7	6,974.4	31.6
Chicago, Rock Island & Gulf	32.6				32.6	32.6							32.6	32.6	468.9	468.9	6.9
Chicago, St. Paul, Minneapolis & Omaha		6.2			6.2	12.4	591.9	64.1			656.0	720.1	662.2	732.4	1,468.1	1,553.4	47.2
Cincinnati, Hamilton & Dayton	20.0	14.3			34.3	48.6	20.0	13.9			33.9	47.8	68.2	96.4	527.9	563.4	17.1
Cincinnati, Indianapolis & Western							99.0				99.0	99.0	99.0	99.0	360.9	360.9	27.2
Colorado Midland							2.0				2.0	2.0	2.0	2.0	258.4	258.4	.8
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.3	34.8	38.2
Cumberland Valley		6.7			6.7	13.4	19.6				19.6	19.6	26.3	33.0	162.2	207.0	15.9
Delaware & Hudson	163.1	225.1	4.3	17.5	410.0	696.3							410.0	696.3	743.9	1,042.4	55.1
Delaware, Lackawanna & Western	104.7	435.1	38.3	6.6	584.7	1,116.3	5.8				5.8	5.8	590.5	1,122.1	922.1	1,465.9	76.5
Duluth & Iron Range							14.8	1.4			16.2	17.6	16.2	17.6	168.0	240.0	7.3
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	2.0	3.0			5.0	8.0	11.3				11.3	11.3	16.3	19.3	223.9	281.6	6.8
Erie		212.2		14.9	227.1	484.0	643.5	432.3			1,075.8	1,508.1	1,302.9	1,992.1	1,706.5	2,395.7	83.1
Chicago & Erie							240.4	8.4			248.8	257.2	248.8	257.2	248.8	257.2	100.0
Columbus & Erie							12.6	9.8			22.4	32.2	22.4	32.2	22.4	32.2	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight line.		
New Jersey & New York		10.5			10.5	21.0	26.1				26.1	26.1	36.6	47.1	51.8	61.3	76.6
New York, Susquehanna & Western							16.0	18.7			34.7	53.4	34.7	53.4	208.4	227.1	23.5
Evansville & Terre Haute							105.8				105.8	105.8	105.8	105.8	143.3	143.3	73.8
Grand Trunk	1.1	1.6			2.7	4.3							2.7	4.3	686.6	1,014.9	.4
Great Northern	8.5	122.3			130.8	253.1	258.5				258.5	258.5	389.3	511.6	7,020.4	7,142.7	7.2
Hocking Valley							144.0				144.0	144.0	144.0	144.0	336.6	375.5	38.3
Hudson & Manhattan		7.3			7.3	15.6							7.3	15.6	7.3	15.6	100.0
Illinois Central	65.1	235.1		12.0	312.2	620.9	9.0	5.0			14.0	19.0	326.2	639.9	4,462.7	5,027.2	12.7
Yazoo & Mississippi Valley	6.6				6.6	6.6							6.6	6.6	1,193.0	1,200.7	.6
Illinois Traction							24.0				24.0	24.0	24.0	24.0	415.0	415.0	5.7
Iowa Central							11.0				11.0	11.0	11.0	11.0	503.0	503.0	2.2
Kanawha & Michigan	.8				.8	.8	1.3				1.3	1.3	2.1	2.1	162.9	162.9	1.3
Kansas City, Clinton & Springfield							2.5				2.5	2.5	2.5	2.5	156.7	156.7	1.6
Kentucky & Indiana Bridge & R. R. Co							4.8	5.8	.5		11.1	17.9	11.1	17.9	11.1	17.9	100.0
Kentwood & Eastern							3.3				3.3	3.3	3.3	3.3	30.0	30.0	11.0
Lackawanna & Wyoming Valley							1.0	2.4			3.4	5.8	3.4	5.8	22.6	43.4	13.3
Lehigh & New England	.7				.7	.7							.7	.7	67.2	67.2	
Lehigh Valley	14.1	439.3	34.6	13.0	501.0	1,048.6	652.0	62.3			714.3	776.7	1,215.3	1,825.3	1,171.5	1,741.3	100.0
Long Island	4.0	96.8	3.3	8.8	112.9	242.7		22.7			22.7	45.4	135.6	288.1	391.9	549.5	52.4
Louisville & Nashville	40.9	22.3			63.2	85.5	392.3	103.6			495.9	599.5	559.1	685.0	4,372.0	4,543.0	15.1
Maine Central	415.1	57.7			472.8	530.5							472.8	530.8	907.6	967.2	54.8
Marquette & Southeastern							3.7				3.7	3.7	3.7	3.7	50.8	50.8	7.3
Minneapolis, St. Paul & Sault Ste. Marie							2,446.8	4.4			2,451.2	2,455.6	2,451.2	2,455.6	3,423.4	3,427.8	71.6
Missouri, Kansas & Texas	5.9				5.9	5.9	8.6				8.6	8.6	14.5	14.5	3,072.0	3,072.0	.2
Missouri Pacific	55.2	25.7			80.9	106.0	11.6	7.0			18.6	25.6	99.5	131.6	3,708.4	3,767.0	2.5
St. Louis, Iron Mountain & Southern	113.8	8.6			122.4	131.0	11.1	1.6			12.7	14.3	135.1	145.3	3,178.5	3,318.8	4.4
Mobile & Ohio		4.7			4.7	9.4	47.8				47.8	47.8	52.5	57.2	825.0	825.0	6.9
Monongahela	.5				.5	.5							.5	.5	66.7	66.7	.7
Nashville, Chattanooga & St. Louis							92.8	11.8			104.6	116.4	104.6	116.4	1,230.1	1,241.9	9.3
Newburgh & South Shore							1.0	5.2			6.2	11.4	6.2	11.4	Freight line.		
New York & Long Branch		38.0			38.0	76.0							38.0	76.0	38.0	76.0	100.0
New York Central lines:																	
Boston & Albany		132.9	50.1	23.6	206.6	510.6		1.9			1.9	3.7	208.5	514.3	351.6	602.0	85.4
Chicago, Indiana & Southern		5.0			5.0	10.0	143.8	59.9			203.7	263.6	208.7	273.6	309.4	374.3	73.1
Cleveland, Cincinnati, Chicago & St. Louis							562.7	361.8			924.5	1,286.8	924.5	1,286.8	1,832.9	2,214.7	59.9
Lake Erie & Western							862.9	9.0			871.9	880.9	871.9	880.9	832.5	841.5	100.0
Lake Shore & Michigan Southern	6.9	173.2	98.4	240.3	518.8	1,609.7	996.0	48.3	11.8		1,056.1	1,128.0	1,574.9	2,737.7	1,452.7	2,596.6	100.0
Dunkirk, Allegheny Valley & Pittsburg							90.5				90.5	90.5	90.5	90.5	90.5	90.5	100.0
Lake Erie, Alliance & Wheeling							87.7				87.7	87.7	87.7	87.7	87.7	87.7	100.0
Michigan Central		271.9			271.9	543.9	901.0	19.3			920.3	939.6	1,192.2	1,483.5	1,192.2	1,483.5	100.0
New York Central & Hudson River	2.0	262.4	6.3	110.8	381.5	988.7	1,632.0	688.5	15.4	138.8	2,474.7	3,610.4	2,856.2	4,599.1	2,873.7	4,674.5	98.4
Peoria & Eastern							84.0	2.5			86.5	89.0	86.5	89.0	337.9	340.4	26.1
Pittsburg & Lake Erie		101.8		47.0	148.8	391.6	19.8	2.9			22.7	25.6	171.5	417.2	183.9	420.4	99.2
New York, New Haven & Hartford	17.5	245.0		9.2	271.7	562.7	154.3	205.7		75.8	435.8	868.9	707.5	1,431.6	1,926.4	2,967.1	47.7
New York, Ontario & Western	36.0	111.6			147.6	259.2							147.6	259.2	492.8	626.2	41.4
Norfolk & Western	68.0	272.8			340.8	613.6	1,245.3	66.1			1,311.4	1,377.5	1,652.2	1,991.1	1,671.6	2,025.5	97.1
Northern Pacific	101.5	136.7			238.2	374.9	708.0	285.5			993.5	1,279.0	1,231.7	1,653.9	5,303.4	5,752.6	28.7
Northwestern Pacific	2.5	11.4			13.9	25.4	250.5				250.5	250.5	264.4	275.9	330.6	342.0	80.7
Pennsylvania		58.0	4.9	200.0	262.9	934.2	1,428.2	708.3	25.8	199.2	2,361.5	3,769.0	2,624.4	4,703.2	3,261.0	5,479.5	85.8
Cleveland, Akron & Columbus							126.5	17.4			143.9	161.3	143.9	161.3	177.8	195.8	82.4
Cincinnati & Muskingum Valley							11.4				11.4	11.4	11.4	11.4	148.4	148.4	7.7
Grand Rapids & Indiana							55.8	2.2			58.0	60.2	58.0	60.2	536.7	547.3	11.0
Northern Central							287.1	120.1		20.5	427.7	609.3	427.7	609.3	439.7	635.9	95.7
Pennsylvania Company		273.7	23.3	47.3	344.3	806.5	418.9	325.0	5.2		749.1	1,084.5	1,093.4	1,891.0	1,315.0	2,125.6	89.0
Philadelphia, Baltimore & Washington		18.2		21.0	39.2	121.7	154.5	147.0	17.1	15.3	333.9	561.0	373.1	682.7	639.4	945.5	72.2
Pittsburg, Cincinnati, Chicago & St. Louis		7.8		3.4	11.2	29.2	507.2	515.4	58.9	20.6	1,102.1	1,797.1	1,113.3	1,826.3	1,415.3	2,140.7	85.3
West Jersey & Seashore		87.1	6.3		93.4	193.1	47.1	33.0			80.1	113.1	173.5	306.2	318.2	455.6	67.2
Vandalia							300.9	61.0			361.9	422.8	361.9	422.8	797.0	868.1	48.9

RAILWAYS WORKED BY THE BLOCK SYSTEM.—(TABLE 1 CONTINUED.)

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block-signaled (miles of track).
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Peoria & Pekin Union								6.0			6.0	12.0	6.0	12.0	15.4	26.6	48.8
Pere Marquette	15.2				15.2	15.2	39.0				39.0	39.0	54.2	54.2	1,534.2	1,541.4	3.5
Philadelphia & Reading	6.2	324.0	42.1	14.0	386.3	836.5	143.6	96.9			240.5	337.4	626.8	1,173.9	875.3	1,452.3	80.8
Atlantic City		86.9			86.9	173.8	35.7				35.7	35.7	122.6	209.5	163.6	251.6	83.3
Northeast Pennsylvania	2.8	1.8			4.6	6.4	1.6				1.6	1.6	6.2	8.0	25.5	27.3	29.3
Perkiomen							38.1				38.1	38.1	38.1	38.1	38.1	38.1	100.0
Philadelphia, Newton & New York	3.8	1.8	1.5		7.1	11.9							7.1	11.9	21.7	26.6	44.7
Reading & Columbia							35.9				35.9	35.9	35.9	35.9	53.3	53.3	67.4
Quincy, Omaha & Kansas City and Iowa & St. Louis							305.0				305.0	305.0	305.0	305.0	305.0	305.0	100.0
Queen & Crescent Route:																	
Alabama Great Southern	91.7	.4			92.1	92.5							92.1	92.5	290.6	295.4	31.7
Cincinnati, New Orleans & Texas Pacific	264.9	69.2			334.1	403.4	.7				.7	.7	334.8	404.1	335.4	404.6	99.8
New Orleans & Northeastern		15.5			15.5	31.0							15.5	31.0	15.5	31.0	14.7
Richmond, Fredericksburg & Potomac							9.0	78.7			87.7	166.4	87.7	166.4	87.7	166.4	100.0
St. Joseph & Grand Island							.3				.3	.3	.3	.3	251.6	251.6	
St. Louis & San Francisco	562 3	37.8			600.1	637.9	157.3				157.3	157.3	757.4	795.2	4,726.6	4,764.4	16.7
Beaumont, Sour Lake & Western							84.7				84.7	84.7	84.7	84.7	117.0	117.0	72.3
New Orleans, Texas & Mexico							157.6				157.6	157.6	157.6	157.6	265.6	265.6	60.5
Orange & Northwestern							61.6				61.6	61.6	61.6	61.6	61.6	61.6	100.0
St. Louis Merchants Bridge Terminal		5.9			5.9	11.8		1.1			1.1	2.2	7.0	14.0	10.0	19.8	77.7
St. Louis Southwestern	.4				.4	.4							.4	.4	622.7	622.7	....
San Francisco, Oakland & San Jose Consolidated		3.9			3.9	7.8							3.9	7.8	15.7	27.7	28.5
San Pedro, Los Angeles & Salt Lake	1.1				1.1	1.1							1.1	1.1	904.4	904.4	.1
Seaboard Air Line							213.5				213.5	213.5	213.5	213.5	2,782.9	2,782.9	7.6
Southern		3.0			3.0	6.0	1,588.3	247.3			1,835.6	2,082.9	1,838.6	2,088.9	6,619.6	6,898.6	30.3
Southern Illinois & Missouri Bridge		4.6			4.6	9.2							4.6	9.2	4.6	9.2	100.0
Southern Pacific, Atlantic System:																	
Galveston, Harrisburg & San Antonio	279.1				279.1	279.1							279.1	279.1	1,270.5	1,275.0	21.9
Louisiana Western	103.6				103.6	103.6							103.6	103.6	140.3	140.3	73.9
Morgan's Louisiana & Texas	95.3				95.3	95.3							95.3	95.3	241.9	282.1	33.8
Texas & New Orleans	109.8				109.8	109.8							109.8	109.8	438.4	441.8	24.9
Southern Pacific: Pacific System	2,189.2	164.9		1.0	2,355.1	2,523.0	98.0				98.0	98.0	2,453.1	2,621.0	6,447.7	6,671.4	39.3
Staten Island Rapid Transit		10.9			10.9	21.7							10.9	21.7	10.1	20.1	96.5
Staten Island							2.5	10.2			12.7	22.8	12.7	22.8	12.7	22.8	100.0
Spokane, Portland & Seattle								10.0			10.0	20.0	10.0	20.0	422.0	432.0	4.6
Syracuse, Lake Shore & Northern		6.5			6.5	13.0							6.5	13.0	33.0	44.5	27.6
Terminal R. R. Association of St. Louis		6.0			6.0	12.0		1.1			1.1	2.2	7.1	14.2	12.7	25.5	55.7
Tidewater Power Co							6.2				6.2	6.2	6.2	6.2	11.3	15.7	39.5
Toledo, Peoria & Western							.3				.3	.3	.3	.3	220.0	220.0	.1
Toledo, St. Louis & Western							188.0				188.0	188.0	188.0	188.0	451.0	451.0	41.7
Ulster & Delaware	24.4				24.4	24.4							24.4	24.4	126.3	126.3	19.8
Union		.6			.6	1.2	1.4				1.4	1.4	2.0	2.6	7.4	14.8	17.6
Union Pacific	871.0	551.0		1.7	1,423.7	1,979.1	11.4				11.4	11.4	1,435.1	1,990.5	3,467.3	4,088.2	48.7
Oregon R. R. & Navigation Co	433.0				433.0	433.0							433.0	433.0	1,140.9	1,140.9	37.0
Oregon Short Line	551.5	25.7			577.2	602.9							577.2	602.9	1,442.4	1,468.1	41.0
Virginia & Kentucky							.6				.6	.6	.6	.6	4.8	4.8	12.5
Virginian							2.2				2.2	2.2	2.2	2.2	435.6	435.6	.5
Wabash		7.2			7.2	14.4	1,726.7	94.0			1,820.7	1,914.7	1,827.9	1,929.1	1,954.9	2,056.1	93.8
Wabash Pittsburg Terminal		4.1			4.1	8.2							4.1	8.2	59.8	63.9	12.8
Washington Southern								32.2			32.2	64.4	32.2	64.4	32.2	64.4	100.0
Washington Terminal		1.1		1.0	2.1	20.4							2.1	20.4	2.1	20.4	100.0
Washington Water Power Co	29.0				29.0	29.0							29.0	29.0	29.0	29.0	100.0
Western Pacific	11.2				11.2	11.2							11.2	11.2	921.6	921.6	1.2
Total	8,312.2	8,225.4	331.2	842.7	17,711.5	29,202.4	44,897.1	7,913.1	257.9	489.5	53,557.6	63,505.5	71,269.1	92,707.9	172,389.9	195,922.4	.....

NOTE.—On the Atchison, Topeka & Santa Fe there is a length of 81 miles, in manual block signalled territory, on which there are short sections of automatic signals. On the Bessemer & Lake Erie there is a length of nine miles on which no passenger trains are run. On the Hudson & Manhattan the signals are light signals, not shown in Table 2. The column headed "Four-track" includes short sections of road having more than four tracks on the following lines: Illinois Central; New York, New Haven & Hartford; Pennsylvania; Washington Terminal.

ning on a single schedule. The electric track circuit is used very little on these roads. Most of their signal installations operate in the following manner: When a train enters a block section the action at that end is made to produce an effect at the other end, as a protection against opposing cars, by means of an electric current flowing through line wires on poles. This operation is concontrolled at the entering end either by the motorman, who stops his car and moves a hand switch fixed in a box on a pole, or automatically by a circuit-closing device arranged on the overhead trolley wire which extends along the track, which device is so designed as to produce the necessary impulse on the block-signal wire whenever it is touched by the trolley wheel of a passing car. Signal indications are given by incandescent electric lights, often of two or more colors, shown in boxes on the poles. To provide against the failure of the trolley contact to perform its function properly, it is required that the motorman observe the behavior of the signal light as the trolley contact is passed, and if the contact does not produce the desired effect, to back his car and cause the operation to be repeated.

To facilitate permissive block signaling on single-track lines for following cars, while at the same time retaining absolute block rules as regards cars running in opposite directions, some of the systems have "counting-in" apparatus which is designed to insure that the signal against opposing trains shall not be cleared until as many cars have passed out of the block section as passed in. This counting-in apparatus, however, does not seem to have secured general approval among the officers of the roads which have used it.

For the reasons here suggested the mileage is not included with that showing the use of the block system as the term "block system" is usually understood. Two important features of the system as used on the steam roads are not found on the roads under consideration, namely (1) control of the signal at the entrance of each block section by a signalman constantly in attendance or, in the case of automatic signals, by the train which occupies the block section, this train control being effected through a track circuit continuous through the block section; and (2) the prohibition of permissive block signaling under all ordinary circumstances except between trains which carry no passengers.

Those interurban lines which have automatic block signals of the ordinary type are included in Tables 1 and 2, as above noted.

TELEGRAPH AND TELEPHONE FOR TRAIN ORDERS.

The bulletin contains the usual table, showing the extent to which the telephone has been adopted for use in transmitting train orders. This table is much longer than last year, because there are now included those electric railways which report to the commission. Including these, there are now 55 companies (8 of them electric roads) which have 100 miles or more of their

TABLE 2.—KINDS OF AUTOMATIC SIGNALS IN USE.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear. (miles of track).	Normal danger (miles of track).	Total automatic signals.		
					Electropneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.			Miles of road.	Miles of track.	Number of block sections.
Atchison, Topeka & Santa Fe:															
Eastern lines	.....	.....	13.3	26.6	.....	.....	66.0	126.3	.....	.....	152.9	.....	79.3	152.9	92
Western lines	.....	.....	.....	.....	.....	.....	35.8	38.2	.....	.....	38.2	.....	35.8	38.2	36
Coast lines	.....	.....	5.4	5.4	.....	.....	14.5	15.5	.....	.....	20.9	.....	19.9	20.9	19
Gulf, Colorado & Santa Fe	.....	.....	8.3	8.3	.....	.....	2.5	2.5	.....	.....	10.8	.....	10.8	10.8	8
Atlantic Coast Line	.....	.....	.....	.....	.....	.....	15.2	28.3	.....	.....	28.3	.....	15.2	28.3	35
Auburn & Northern	.....	.....	.....	.....	.....	.....	6.5	6.5	.....	.....	6.5	.....	6.5	6.5	3
Baltimore & Ohio	.....	.....	9.9	9.9	7.5	22.4	107.1	211.6	93.6	186.2	.....	430.1	218.1	430.1	502
Baltimore & Ohio Chicago Terminal	.....	.....	1.0	2.0	.....	.....	9.8	18.8	.....	.....	20.8	.....	10.8	20.8	32
Baltimore & Ohio Southwestern	.....	.....	.....	.....	.....	.....	14.0	28.0	.....	.....	.....	28.0	14.0	28.0	35
Boston & Maine	.....	.....	.8	1.6	.....	.....	687.4	1,254.3	8.9	17.8	1,254.3	19.4	697.1	1,273.7	1,615
Boston, Revere Beach & Lynn	.....	.....	.....	.....	.....	.....	13.8	27.6	.....	.....	27.6	.....	13.8	27.6	59
Butte, Anaconda & Pacific	.....	.....	7.9	7.9	.....	.....	.....	.....	.....	.....	7.9	.....	7.9	7.9	7
Central of New Jersey	.....	.....	.....	.....	29.7	116.0	163.3	323.2	19.4	38.0	439.2	38.0	212.4	477.2	731
Chesapeake & Ohio	.....	.....	.....	.....	.....	.....	183.0	366.0	.....	.....	366.0	.....	183.0	366.0	262
Chicago & Alton	.....	.....	.....	.....	.....	.....	561.0	705.9	.....	.....	183.0	522.9	561.0	705.9	368
Chicago & Eastern Illinois[1]	.....	.....	8.7	13.8	.....	.....	98.4	196.8	.....	.....	210.6	.....	107.1	210.6	165
Chicago & North Western	.....	.....	736.5	1,498.8	2.9	5.8	.....	.....	.....	.....	1,504.6	.....	739.4	1,504.6	1,162
Chicago & Western Indiana	.....	.....	.....	.....	.....	.....	17.8	35.6	.....	.....	35.6	.....	17.8	35.6	59
Chicago, Burlington & Quincy	.....	.....	23.0	46.0	2.0	8.0	17.4	43.2	.....	.....	97.2	.....	42.4	97.2	38
Chicago Great Western	.....	.....	.....	.....	.....	.....	125.9	190.8	.....	.....	190.8	.....	125.9	190.8	182
Chicago, Milwaukee & St. Paul	.....	.....	2.4	2.4	.....	.....	103.7	207.4	3.5	3.5	197.4	15.9	109.6	213.3	203
Chicago, Peoria & St. Louis Ry. of Ill.	.....	.....	.....	.....	.....	.....	1.3	1.3	.....	.....	1.3	.....	1.3	1.3	1
Chicago, Rock Island & Pacific	.....	.....	6.0	12.0	.....	.....	926.9	1,200.5	.....	.....	1,209.5	3.0	932.9	1,212.5	1,252
Chicago, Rock Island & Gulf	.....	.....	.....	.....	.....	.....	32.6	32.6	.....	.....	32.6	.....	32.6	32.6	50
Chicago, St. Paul, Minneapolis & Omaha	.....	.....	.....	.....	.....	.....	6.2	12.4	.....	.....	12.4	.....	6.2	12.4	6
Cincinnati, Hamilton & Dayton	.....	.....	.....	.....	.....	.....	34.3	48.6	.....	.....	48.6	.....	34.3	48.6	78
Cumberland Valley	.....	.....	.....	.....	.....	.....	6.7	13.4	.....	.....	13.4	.....	6.7	13.4	13
Delaware & Hudson	.....	.....	38.4	76.8	.....	.....	.....	.....	371.6	619.5	.....	696.3	410.0	696.3	1,013
Delaware, Lackawanna & Western	.....	.....	26.6	51.2	.....	.....	558.1	1,065.1	.....	.....	1,116.3	.....	584.7	1,116.3	1,558
Elgin, Joliet & Eastern	.....	.....	.....	.....	.....	.....	5.0	8.0	.....	.....	8.0	.....	5.0	8.0	5
Erie	.....	.....	.....	.....	.....	.....	227.1	484.0	.....	.....	5.2	478.8	227.1	484.0	579
Erie & Jersey	.....	.....	.....	.....	.....	.....	42.3	84.6	.....	.....	84.6	.....	42.3	84.6	88
New Jersey & New York	.....	.....	.....	.....	.....	.....	10.5	21.0	.....	.....	.....	21.0	10.5	21.0	22
Grand Trunk	.....	.....	.....	.....	2.7	4.3	.....	.....	.....	.....	4.3	.....	2.7	4.3	3
Great Northern	.....	.....	.....	.....	.....	.....	130.8	253.1	.....	.....	251.1	2.0	130.8	253.1	219
Illinois Central	.....	.....	29.5	104.2	.....	.....	118.8	186.9	103.9	329.8	254.6	366.3	312.2	620.9	535
Yazoo & Mississippi Valley	.....	.....	.....	.....	.....	.....	6.6	6.6	.....	.....	6.6	.....	6.6	6.6	8
Kanawha & Michigan	.....	.....	.....	.....	.....	.....	.8	.8	.....	.....	.8	.....	.8	.8	1
Lehigh & New England	.....	.....	.....	.....	.....	.....	.7	.7	.....	.....	.7	.....	.7	.7	1
Lehigh Valley	.....	.....	251.2	534.6	.....	.....	233.8	482.0	16.0	32.0	.....	1,048.6	501.0	1,048.6	1,068
Long Island	.....	.....	.....	.....	.....	.....	112.9	242.7	.....	.....	238.7	4.0	112.9	242.7	386
Louisville & Nashville	.....	.....	.....	.....	.....	.....	63.2	85.5	.....	.....	85.5	.....	63.2	85.5	132
Maine Central	.....	.....	.....	.....	.....	.....	472.8	530.5	.....	.....	530.5	.....	472.8	530.5	542
Missouri, Kansas & Texas	.....	.....	.5	.5	.....	.....	5.4	5.4	.....	.....	5.9	.....	5.9	5.9	8
Missouri Pacific	.....	.....	.....	.....	.....	.....	80.9	106.0	.....	.....	106.0	.....	80.9	106.0	90
St. Louis, Iron Mountain & Southern	.....	.....	.....	.....	.....	.....	122.4	131.0	.....	.....	131.0	.....	122.4	131.0	122
Mobile & Ohio	.....	.....	.....	.....	.....	.....	4.7	9.4	.....	.....	9.4	.....	4.7	9.4	3
Monongahela	.....	.....	.....	.....	.....	.....	.5	.5	.....	.....	.5	.....	.5	.5	1
New York & Long Branch	.....	.....	.....	.....	.....	.....	38.0	76.0	.....	.....	76.0	.....	38.0	76.0	118
New York Central Lines:															
Boston & Albany[2]	16.2	33.3	.....	.....	.....	.....	182.5	447.7	7.2	14.4	154.9	350.5	205.9	495.4	634
Chicago, Indiana & Southern	.....	.....	.....	.....	.....	.....	5.0	10.0	.....	.....	10.0	.....	5.0	10.0	19
Lake Shore & Michigan Southern	.....	.....	5.3	5.3	.....	.....	336.4	928.9	177.1	675.5	934.2	675.5	518.8	1,609.7	1,611
Michigan Central[3]	.....	.....	67.5	134.9	.....	.....	193.8	387.6	.....	.....	522.5	.....	261.3	522.5	359
New York Central & Hudson River[4]	.....	.....	9.9	19.7	.....	.....	416.0	944.7	8.1	16.2	695.4	285.2	379.4	980.6	1,282
Pittsburg & Lake Erie	.....	.....	.....	.....	.....	.....	148.8	391.6	.....	.....	391.6	.....	148.8	391.6	207
New York, New Haven & Hartford	177.1	338.3	64.7	129.4	.....	.....	29.9	95.0	.....	.....	562 7	.....	271.7	562.7	591
New York, Ontario & Western	65.6	100.9	.....	.....	.....	.....	82.0	158.3	.....	.....	259.2	.....	147.6	259.2	150
Norfolk & Western	.....	.....	.....	.....	.7	.7	340.1	612.9	.....	.....	612.9	7	340.8	613.6	594
Northern Pacific	.....	.....	1.5	1.5	.....	.....	236.2	372.4	.5	1.0	374.9	.....	238.2	374.9	401
Northwestern Pacific	.....	.....	.....	.....	.....	.....	13.9	25.4	.....	.....	25.4	.....	13.9	25.4	42
Pennsylvania[5]	.....	.....	5.0	10.0	242.3	874.8	10.6	21.2	.....	.....	906.0	.....	257.9	906.0	1,556
Pennsylvania Co	.....	.....	.....	.....	.....	.....	344.3	806.5	.....	.....	806.5	.....	344.3	806.5	1,082
Philadelphia, Baltimore & Washington	.....	.....	.....	.....	39.2	121.7	.....	.....	.....	.....	121.7	.....	39.2	121.7	150
Pittsburg, Cincinnati, Chicago & St. Louis	.....	.....	.....	.....	.....	.....	11.2	29.2	.....	.....	29.2	.....	11.2	29.2	70
West Jersey & Seashore	.....	.....	.....	.....	93.4	193.1	.....	.....	.....	.....	193.1	.....	93.4	193.1	249
Pere Marquette	.....	.....	10.0	10.0	.....	.....	5.2	5.2	.....	.....	15.2	.....	15.2	15.2	11
Philadelphia & Reading[6]	.....	.....	386.6	837.3	1.0	2.0	.....	.....	14.0	20.1	2.0	857.4	401.6	859.4	993
Atlantic City	.....	.....	86.9	173.8	.....	.....	.....	.....	.....	.....	.....	173.8	86.9	173.8	93
Northeast Pennsylvania	.....	.....	4.6	6.4	.....	.....	.....	.....	.....	.....	.....	6.4	4.6	6.4	8
Philadelphia, Newtown & New York	.....	.....	7.1	11.9	.....	.....	.....	.....	.....	.....	.....	11.9	7.1	11.9	16
Queen & Crescent Route:															
Alabama Great Southern	29.0	29.0	9.0	9.0	.....	.....	54.1	54.5	.....	.....	92.5	.....	92.1	92.5	62
Cincinnati, New Orleans & Texas Pacific	35.3	35.3	56.6	56.6	.....	.....	240.2	309.5	2.0	2.0	374.6	28.8	334.1	403.4	326
New Orleans & Northeastern	.....	.....	.....	.....	.....	.....	15.5	31.0	.....	.....	31.0	.....	15.5	31.0	16
St. Louis & San Francisco	.....	.....	3.9	7.8	.....	.....	596.2	630.1	.....	.....	630.1	7.8	600.1	637.9	553
St. Louis Merchants' Bridge Terminal	.....	.....	.....	.....	.....	.....	5.9	11.8	.....	.....	11.8	.....	5.9	11.8	30
St. Louis Southwestern	.....	.....	.....	.....	.....	.....	.4	.4	.....	.....	.4	.....	.4	.4	1
San Francisco, Oakland & San Jose Consolidated	.....	.....	.....	.....	.....	.....	3.9	7.8	.....	.....	7.8	.....	3.9	7.8	76
San Pedro, Los Angeles & Salt Lake	.....	.....	1.1	1.1	.....	.....	.....	.....	.....	.....	1.1	.....	1.1	1.1	1
Southern	.....	.....	.....	.....	.....	.....	3.0	6.0	.....	.....	6.0	.....	3.0	6.0	9
Southern Illinois & Missouri Bridge	.....	.....	.....	.....	.....	.....	4.6	9.2	.....	.....	9.2	.....	4.6	9.2	18
Southern Pacific—Atlantic System:															
Galveston, Harrisburg & San Antonio	.....	.....	.....	.....	.....	.....	279.1	279.1	.....	.....	279.1	.....	279.1	279.1	204
Louisiana Western	.....	.....	.....	.....	.....	.....	103.6	103.6	.....	.....	103.6	.....	103.6	103.6	73
Morgan's Louisiana & Texas	.....	.....	.....	.....	.....	.....	95.3	95.3	.....	.....	95.3	.....	95.3	95.3	72
Texas & New Orleans	.....	.....	.....	.....	.....	.....	109.8	109.8	.....	.....	109.8	.....	109.8	109.8	77
Southern Pacific—Pacific System	.....	.....	1.0	1.0	6.0	14.0	2,348.1	2,508.0	.....	.....	2,523.0	.....	2,355.1	2,523.0	2,177
Staten Island Rapid Transit	.....	.....	10.9	21.7	.....	.....	.....	.....	.....	.....	21.7	.....	10.9	21.7	50
Syracuse, Lake Shore & Northern	.....	.....	.....	.....	.....	.....	6.5	13.0	.....	.....	13.0	.....	6.5	13.0	26
Terminal R. R. Association of St. Louis	.....	.....	.....	.....	.....	.....	6.0	12.0	.....	.....	12.0	.....	6.0	12.0	16
Ulster & Delaware	.....	.....	.....	.....	.....	.....	24.4	24.4	.....	.....	24.4	.....	24.4	24.4	29
Union	.....	.....	.6	1.2	.....	.....	.....	.....	.....	.....	1.2	.....	.6	1.2	2
Union Pacific	.....	.....	8.9	15.1	.....	.....	1,381.5	1,902.1	33.3	61.9	1,979.1	.....	1,423.7	1,979.1	1,585
Oregon R. R. & Navigation Co	.....	.....	.....	.....	.....	.....	433.0	433.0	.....	.....	433.0	.....	433.0	433.0	308
Oregon Short Line	.....	.....	10.4	10.4	.....	.....	566.8	592.5	.....	.....	602.9	.....	577.2	602.9	463
Wabash	.....	.....	.....	.....	.....	.....	7.2	14.4	.....	.....	14.4	.....	7.2	14.4	25
Wabash Pittsburg Terminal	.....	.....	.....	.....	4.1	8.2	.....	.....	.....	.....	8.2	.....	4.1	8.2	11
Washington Terminal	.....	.....	.....	.....	2.1	20.4	.....	.....	.....	.....	.....	20.4	2.1	20.4	13
Washington Water Power Co	.....	.....	.....	.....	.....	.....	29.0	29.0	.....	.....	29.0	.....	29.0	29.0	23
Western Pacific	.....	.....	.....	.....	.....	.....	11.2	11.2	.....	.....	11.2	.....	11.2	11.2	8
Total	323.2	536.8	1,920.9	3,866.1	433.6	1,391.4	14,167.6	21,339.4	919.1	2,017.9	23,058.9	6,092.7	17,709.8	29,151.6	29,881

[1] (Chicago & Eastern Illinois.) The figures in this table include 8.7 miles of inclosed disk signals used in manual block territory which are not shown in Table 1.
[2] (Boston & Albany.) 1.7 miles of road, 5.2 miles of track protected by slotted signals not shown in this table.
[3] (Michigan Central.) 10.6 miles semiautomatic and slotted signals not shown in this table.
[4] (New York Central & Hudson River.) 2 miles 4-track, light signals, not shown in this table. The apparent discrepancy in road mileage in this table is due to the fact that different types of signals are used on the different tracks of 4-track sections of road.
[5] (Pennsylvania.) 5 miles of road, 28.2 miles of track protected by light signals not shown in this table.
[6] (Philadelphia & Reading.) Includes 15.3 miles of road used exclusively for freight trains not shown in Table 1.

lines equipped for telephone operation. Last year there were only 32 companies thus equipped, though the electric lines were not then included.

The commission's last preceding bulletin was noticed in the *Railway Age Gazette* of June 3 and 17, 1910.

JUDGE SANBORN ON STATE INTERFERENCE WITH INTERSTATE COMMERCE AND VALUATION OF RAILWAYS.

The two principal questions passed on by Judge Walter H. Sanborn of the United States Circuit Court for the District of Minnesota, in his opinion (rendered on April 11) in the Minnesota rate case were: When does state regulation become an unconstitutional interference with interstate commerce? and What are the correct bases of valuation of railways and a "fair return" on such valuation? We published last week (page 921) the syllabus of Judge Sanborn's opinion. The two principal questions passed on by him are in themselves of such interest and importance, and his discussion of them and holdings in regard to them of such interest and importance, because of the new precedents they establish, that we will give abstracts (in the court's own language) of the discussions and rulings regarding these matters. Below is the court's remarks on state interference, next week we will give an abstract of the discussion on valuation.

STATE INTERFERENCE WITH INTERSTATE COMMERCE.

The first question for consideration is whether or not the orders of the commission and the acts of the legislature substantially burden interstate commerce, and the answer to this question must be drawn from an application of the facts which disclose their effect to the rules of law which govern this subject.

The power to regulate commerce among the states was carved out of the general sovereign power by the people when the national government was formed, and granted by the constitution to the congress of the nation. That grant is exclusive. The United States may exercise that power to its utmost extent, may use all means requisite to its complete exercise, and no state, by virtue of any power it possesses, either under the name of the police power or under any other name, may lawfully restrict or infringe this grant, or the plenary exercise of this power; for these are paramount to all the powers of the state and inhere in the supreme law of the land. The fares and rates of transportation of passengers and freight in interstate commerce are national in their character and susceptible of regulation by uniform rules. The silence or inaction of congress relative to such a subject is a conclusive indication that it intends that the interstate commerce therein shall be free, so far as the congress has not directly regulated it.

If the plenary power of the nation to protect the freedom of and to regulate interstate commerce and the attempted exercise by a state of its power to regulate intrastate commerce, or the attempted exercise of any of its other powers, impinge or conflict, the former must prevail and the latter must give way, because the constitution and the acts of Congress in pursuance thereof are the supreme law of the land, and "that which is not supreme must yield to that which is supreme."

Subject to the constitutional limitation, which has been stated, a state may enact and enforce laws prescribing reasonable fares and rates for and otherwise regulating its intrastate commerce, although the operation of such laws remotely or incidentally affects interstate commerce.

On the other hand, the laws of a state or the orders of its commissions relating to its intrastate commerce which by their necessary or natural or probable operation have the effect substantially to burden interstate commerce are beyond its powers, violative of the commercial clause of the constitution, and void.

The acts of the legislature of Minnesota and the orders of its commission are so general and so far reaching in their effect that there is no doubt that they unavoidably affect the interstate commerce of the companies. In the light of the rules and decisions reviewed, the question here at issue therefore becomes: Do these statutes and orders substantially burden or only incidentally or remotely affect the interstate commerce of the companies? This question, however, may not be answered by the words or terms of the laws and orders, or by a consideration of the intent or purpose of their makers alone. The touchstone to the true answer to the question and the test of the validity of the orders and statutes is their effect upon interstate commerce.

The counter proposition again presented in this case, that it is only where orders and statutes by their terms or by their construction by state courts substantially or directly regulate interstate commerce, or where by their terms they disclose an intent of their makers so to do that they may be adjudged violative of the commercial clause, has been repeatedly urged upon the consideration of the Supreme Court, only to be conclusively denied.

Only last year in the Kansas cases (216 U. S., 1, 56) the Supreme Court again repudiated this contention. In those cases a statute of Kansas required of foreign corporations certain fees as a condition of permitting them to conduct intrastate business in that state. The Western Union Telegraph Company, which was carrying on both intrastate and interstate business in Kansas, applied for permission to continue its intrastate business, and the charter board of the state ordered that its application be granted only on condition that it pay the fee prescribed by the statute, and "that nothing herein contained shall apply to nor be construed as restricting in any wise the transaction by the said applicant of its interstate business, nor its business for the federal government, but that this grant of authority and requirement as to payment relates only to the business transacted wholly within the state of Kansas." The officers of the state insisted that this statute and this order were valid because by their express terms they excluded interstate business, applied to intrastate business alone, and disclosed a clear purpose and intent of the legislature and the board not to obstruct or embarrass interstate commerce in any way. But the Supreme Court reviewed several of its earlier decisions upon this subject, held the statute and the order unconstitutional, and, among other things, said:

"But the disavowal by the state of any purpose to burden interstate commerce cannot conclude the question as to the fact of such a burden being imposed, or as to the unconstitutionality of the statute as shown by its necessary operation upon interstate commerce. If the statute, reasonably interpreted, either directly or by its necessary operation burdens interstate commerce, it must be adjudged to be invalid, whatever may have been the purpose for which it was enacted, and although the company may do both interstate and local business. This court has repeatedly adjudged that in all such matters the judiciary will not regard mere forms, but will look through forms to the substance of things." (216 U. S., 1, 27.)

Here, then, is the decisive question upon this branch of these cases. Is the effect of the statutes and orders assailed substantially to burden the interstate commerce of the companies? And we turn to the facts of this case for the answer.

Counsel for the defendants insist that this question should be answered in the negative.

They say that, while the reduction of the local fares and rates may induce the companies to reduce their interstate rates and fares across the borders of the state to a parity with the local rates, this is the voluntary act of the companies not directly required by the laws and orders. There are, however, known and inexorable laws of commerce, and one of them is that transported articles will move at the lowest available rates. Reduce local fares and rates so that fares and rates in interstate commerce across the borders of the state are substantially higher than the sums of the locals over the Minnesota stations on or

near the state boundaries, and the companies must reduce their interstate fares and rates on that portion of their interstate commerce affected by the sums of the locals over the Minnesota borders to a substantial parity with the sums of the locals, or their interstate commerce affected thereby will unavoidably become intrastate commerce, and move at the sums of the locals. There is nothing voluntary on the part of the companies in the loss or burden imposed upon them by these reductions. That they must suffer whether they reduce their interstate rates or maintain them and permit the transformation of their affected interstate commerce into intrastate commerce by rebilling and local contracts so that it can pass at the sums of the locals. The loss of the difference in revenue between that derived from their former interstate rates and that derived from the sums of the locals is a direct and unavoidable burden upon their interstate commerce imposed by the acts and orders stated which the companies may not by any device avoid.

Moreover, the acts and orders making these intrastate reductions necessarily operate to discriminate against interstate commerce and the right of the companies to carry it on, and in that way constitute a direct burden upon such commerce.

Another vicious and inevitable effect of these acts and orders is the unjust discrimination in fares and rates between localities in Minnesota and those beyond its borders which they affect. Moorhead, Minn., and Fargo, N. D., are practically the same distance from St. Paul, Minneapolis and Duluth, respectively. They have long received, and they ought to continue to receive, the same fares and rates in and out. This is also true of Duluth, Minn., and Superior, Wis.; Breckenridge, Minn., and Wahpeton, N. D.; East Grand Forks, Minn., and Grand Forks, N. D. These acts and orders reduced the fares to and from the Minnesota towns of these pairs from and to other Minnesota points 33 1-3 per cent., and the freight rates from 7 per cent. to 25 per cent., while the former interstate fares and rates from and to the other towns of the pairs remained in effect, as to commodity rates under the protection of the injunction of this court, and would have continued in effect in the matter of merchandise rates and the passenger fares, had not the prohibition of discriminations between localities by the interstate commerce law and the laws of trade which have been considered compelled the companies to reduce their interstate rates to a parity with the local rates prescribed. The discrimination thus wrought by these acts and orders between the towns mentioned on the state lines is but illustrative of the undue preference and advantage the local reductions gave to Minnesota cities and towns, and the unreasonable prejudice and disadvantage to which they subjected the towns and the cities of other states similarly situated in their vicinity.

Congress, by the "act to regulate commerce" (24 Stat., 379), forbade the companies to make or give any undue or unreasonable preference or advantage to any party or locality, or to subject any party or locality to any unreasonable prejudice or disadvantage in any respect whatsoever, and the prevention of the discrimination thus prohibited was one of the main purposes of this legislation. The first section of the act, however, contained this provision:

"Provided, however, that the provisions of this act shall not apply to transportation of passengers or property, or to the receiving, storage or handling of property wholly within one state, and not shipped to or from a foreign country from or to any state or territory aforesaid."

The result was that the act of Congress forbade, and the acts and orders of the officers of Minnesota compelled, this discrimination between localities under the penalty of the surrender by the companies of a substantial part of their interstate commerce or of the revenue therefrom. Counsel for the defendants argue, however, that this radical discrimination is not forbidden by the interstate commerce law because it is a discrimination wrought, not by an undue difference between intrastate rates of which they say the state has exclusive jurisdiction, nor by an undue difference between interstate rates of which they admit the nation has exclusive jurisdiction, but by an undue difference between intrastate rates and interstate rates, and they contend that over the discrimination thus wrought neither state nor nation has any power. The argument, however, again disregards the broad and fundamental difference between the power of the state over intrastate commerce and the power of the nation over interstate commerce. The state may regulate its intrastate commerce so far only as the exercise of its power does not substantially burden or regulate or discriminate against interstate commerce, but no farther. A state may not prohibit or regulate discrimination between interstate and intrastate rates in such a way as substantially to burden or regulate interstate commerce, as, for instance, by the prohibition of a higher charge or rate for a short haul wholly within the state than for a long haul that includes the short haul and extends into another state, because such action burdens and regulates interstate commerce. By the same mark, because it is a direct regulation of interstate commerce, the nation may regulate and prohibit discriminations wrought by an undue difference between interstate and intrastate rates, although such regulation or prohibition may also to some extent affect and regulate intrastate commerce. For to the extent necessary completely and effectually to regulate interstate commerce the nation by the Congress and its courts may affect and regulate intrastate commerce.

"This power," said Chief Justice Marshall, "like all others vested in Congress, is complete in itself, may be exercised to its utmost extent, and acknowledges no limitations, other than are prescribed in the constitution. . . . If, as has always been understood, the sovereignty of Congress, though limited to specified objects, is plenary as to those objects, the power over commerce with foreign nations, and among the several states, is vested in Congress as absolutely as it would be in a single government having in its constitution the same restrictions on the exercise of the power as are found in the Constitution of the United States." The power therefore to prohibit the railway companies from making or permitting any undue discrimination between localities and parties by unreasonable differences between intrastate and interstate rates was vested in Congress, and no acts or orders of the state or its officers could justify such a discrimination.

But counsel insist that, if Congress had the power to forbid this discrimination, it did not exercise it because it declared in the proviso to section 1 that the provisions of the interstate commerce act should not apply to transportation wholly within one state. But the main object of the act was to prevent every undue discrimination between parties and between localities. When it was enacted there was a crying evil in such discriminations, an insistent public demand for the remedy thereof, and a determined effort by the legislators to make the prohibitions of such discriminations as broad, searching and effective as the Congress had the power to make them. It had, as we have seen, ample authority to forbid discriminations wrought by differences between intrastate and interstate rates, but none to prohibit discriminations caused by differences in rates for transportations wholly within a state. The act prohibits any undue discrimination in any respect whatever between localities under similar circumstances and conditions by any common carrier subject to its provisions. In the light of these facts the natural and reasonable construction of the proviso in section 1 is that it was inserted out of abundance of caution to make sure that the broad terms of the act did not go beyond the constitutional power of the Congress and directly regulate intrastate commerce more than was necessary completely to regulate interstate commerce, and that it has no farther effect upon the subject of discrimination now under discussion. The evil the act was passed to remedy, the main purposes of its passage, the public demand for a prevention of all discriminations, the patent effort of the legislators to meet this demand, and the broad terms of the prohibitions themselves compel the conclusion that the Congress

intended to exercise, and that by this act it did exercise, its constitutional power to prevent discriminations of the character here in question to its utmost extent, and that the companies were and are prohibited thereby from making or maintaining the unjust discriminations between localities which the maintenance of their former lawful interstate fares and rates and the intrastate rates prescribed by the acts and orders of the officers of the state would necessarily effect."

Finally, counsel cite, to overcome the proof of the substantial burden and the direct regulation of interstate commerce affected by the acts and orders in this case, with which this record teems, these words from the opinion of Mr. Justice Brewer in Ames v. Union Pacific (C. C.), 64 Fed. 172:

"Neither can I understand how the reduction of local rates, as a matter of law, interferes with interstate rates. It is true that the companies may, for their own convenience, to secure business, or for any other reason, rearrange their interstate rates and make them conform to the local rates prescribed by the statute; but surely there is no legal compulsion. The statute of the state does not work a change in interstate rates, any more than an act of congress prescribing interstate rates would legally work a change in local rates. Railways cannot plead their own convenience, or the effect of competition between themselves and other companies, in restraint of the otherwise undeniable power of the state."

The reduction of local rates does not interfere with interstate rates, "as a matter of law," yet it may do so as a matter of fact. Whether or not the general and sweeping reductions in local rates in Minnesota necessarily interfere with interstate rates and interstate commerce is in this case, as it must be in every case, a question of fact. The facts which determine that question in this case have been set forth in this opinion at great length, because it is upon them, and not upon legal inferences, that the answer to the question, whether or not the effect of the necessary operation of the acts and orders challenged is substantially to burden interstate commerce, now rests. Those facts are that it was not for "their own convenience," but at great inconvenience and loss, not on account of the "effect of competition between themselves and other companies," but because these acts and orders, the prohibition of discrimination between localities by the interstate commerce act and the laws of trade forced them to do so, that the defendants reduced their interstate commerce rates to a parity with the local rates and submitted to the loss of interstate revenue this action entailed. The opinion of Mr. Justice Brewer in the Ames case is inapplicable to the cases in hand, because no such array of condemnatory facts was ever submitted to him in that case, and it is perhaps not too much to say that no case has been found in the books in which any such proof of the unavoidable effect of general reductions of intrastate rates to substantially burden and directly regulate interstate commerce has ever been presented.

If, in the early proceedings in the Northern Pacific case, the Supreme Court was moved to say of the issue whether the necessary effect of these acts and orders was to interfere with and to regulate interstate commerce, "the question is not, at any rate, frivolous," how, now, that their necessary effect upon that commerce has been indisputably proved to be not only general and substantial, but controlling and compelling, may they escape the ban of the constitution? If one state might by such radical reductions of its local fares and rates below legal interstate fares and rates constitutionally use the laws of trade and the prohibition of discriminations in the interstate commerce law to force like reductions of interstate rates, all states might do so, and the power of the states to regulate fares and rates in interstate commerce would be supreme and that of Congress and the Interstate Commerce Commission inferior and futile. Such does not seem to be the law.

The section from Yuto to Pichanal of the Ledesma to Embarcacion Railway, Argentina, has been opened to public service.

SEWALL'S POINT TERMINAL; VIRGINIAN RAILWAY.

The terminal of the Virginian Railway, at Sewall's Point, Va., is of interest, both from the standpoint of the engineering features which it embodies, and the fact that it is an attempt to utilize on the seaboard the facilities for the rapid handling of bulk freight that have been used so successfully on the great lakes. In a previous article (*Railway Age Gazette*, March 31, 1911), the reasons for the adoption of this system are set forth. They were based on the necessity of handling large



Standard Gondola.

quantities of coal with rapidity and economy, and these led to the adoption of the car unloader and the special conveyor car with a gravity system of moving the loads and empties about the yard.

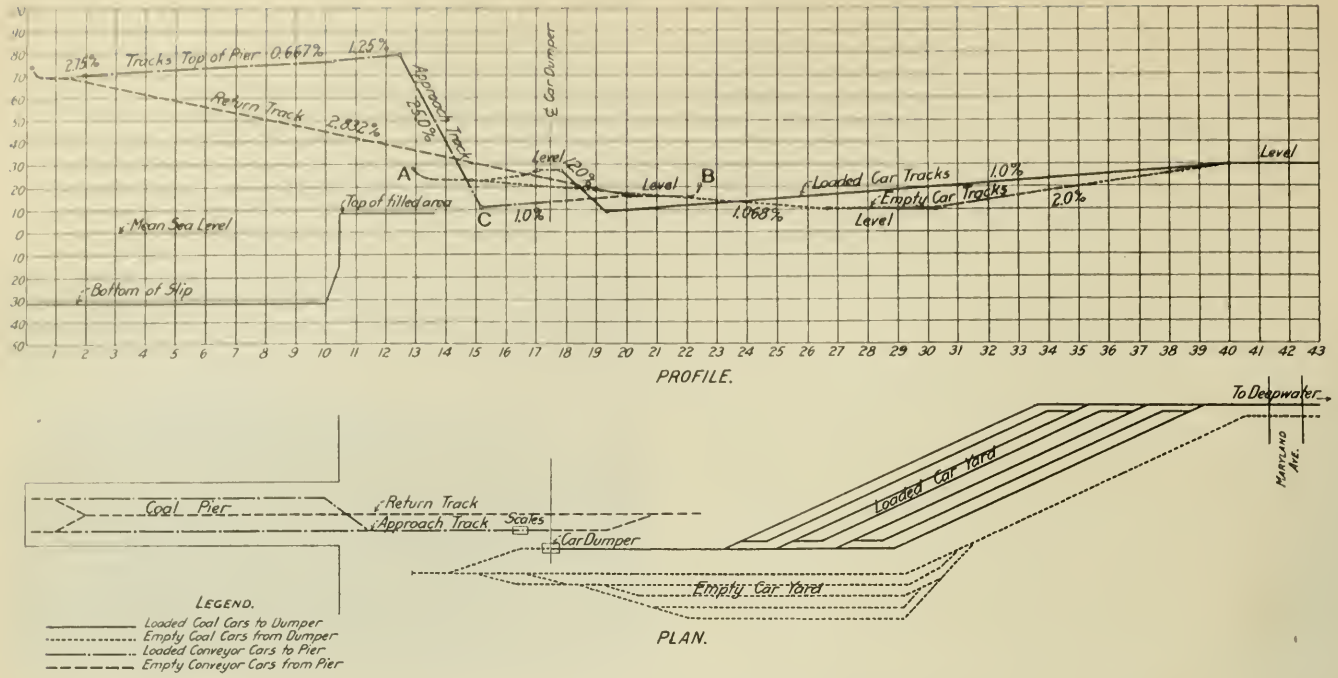
As in other matters pertaining to the construction of the road, the engineers were blessed with a free hand and a fair field, unencumbered with previous constructions and unhampered by the necessity of utilizing or modifying existing facilities in the construction of the terminal. The site selected was well removed from the city, improvements being about six miles to the north of the business centre of the city of Norfolk, Va.,



Car Unloader; Virginian Railway.

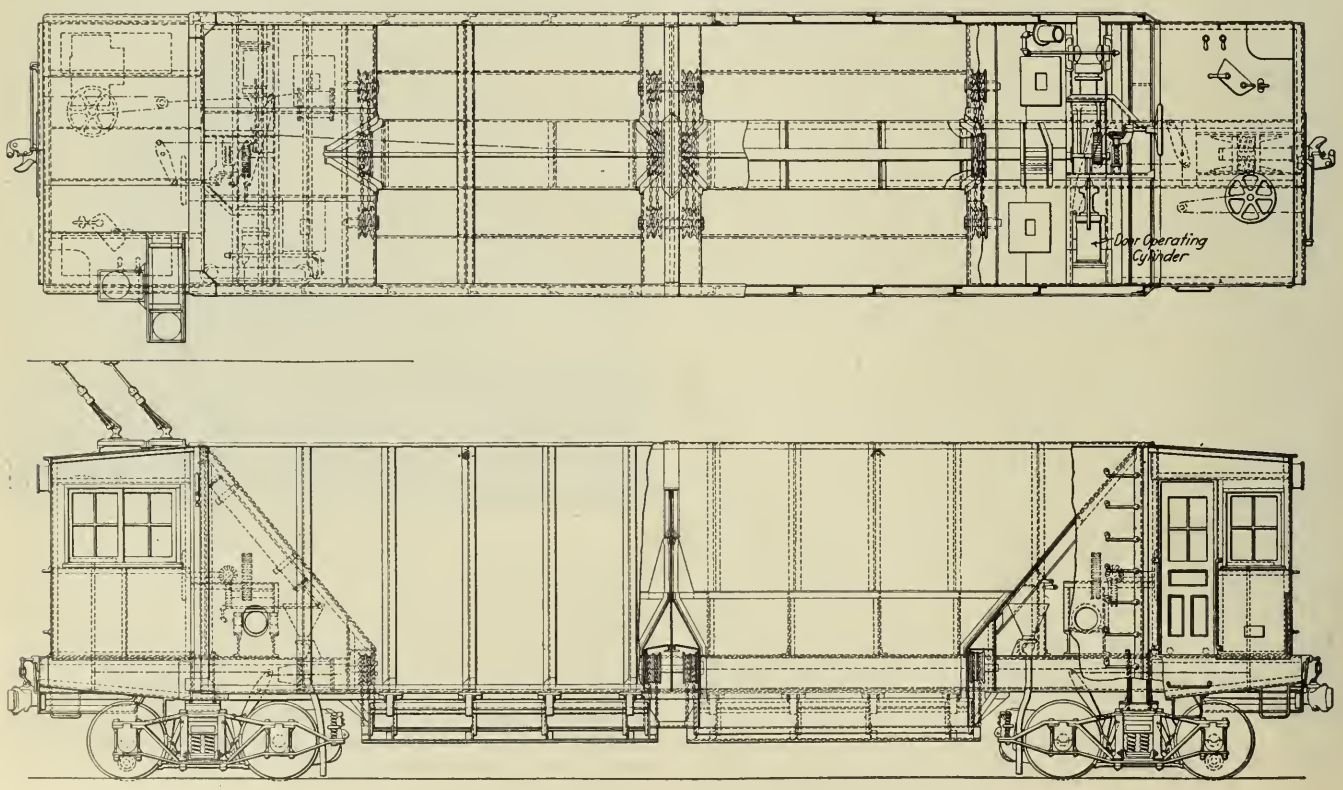
on Hampton Roads. When the property was acquired several years ago, it was an open plain near the site of the Jamestown Exposition, but not occupied by any of its buildings. It is reached by the line making a wide detour around and to the east of the city, so that, even in the approach, there is no interference because of an encroachment on the lines of existing traffic. Then, in addition to the freedom, there was ample space for the work to be done.

The terminal property may be divided into two parts. The



Plan and Profile of Sewall's Point Terminal.

receiving and classification yard, and the terminal yard and wharf. The former serves as a receiving and storing yard for the cars as they are received from the mines. It will be borne in mind that there is but little pooling of the output of the mines on the Virginian Railway, and that each selling agent ships to seaboard for loading into vessels ordered alongside the wharf for his own product. Hence, there comes to be an accumulation of cars in the receiving yard that must be held back until a vessel is ready to receive their contents. Then, when the vessel is ready, they are ordered delivered to the barney or loaded car yard, which lies inland to the east of the wharf and which is built on a 1.0 per cent. grade. The tracks from this yard lead out to a ladder track, still holding the same grade that runs down to within about 153 ft. of the car dumper. From this point to the latter there is a stiff rise on a 12 per cent. incline to the car dumper, up which they are pushed by a barney car. Each car has a rider who releases the brakes in the yard, controls the speed to the foot of the grade and sets the brakes so as to spot the car in the proper position on the dumper. The track of the latter is level, and when it has returned to the release or receiving position with the empty car, this car stands there until it is bumped off by the one following. As it is struck it runs out down the incline to the switchback at A and thence through an automatic switch, down a 1.068 per



Plan and Elevation of Conveyor Car; Virginian Railway.

cent. grade to the empty car yard, whence they are handled by locomotives up a 2 per cent. grade to the main line level and westbound track. This is the cycle for the regular road gondolas.

It will be seen from the diagram that the car dumper is well in shore from the wharf and the foot of the incline leading to it. It delivers into a specially constructed conveyor car, driven by electric motors. It is of 60-tons capacity, is of the hopper-bottom type and has a cabin at each end for the operator.

to furnish current to the cars so that if they overrun the chute into which they are to be dumped, they can be run back and accurately spotted. Emptied, they run out to the switchback at the end of the pier and drop down the return track at the center to the switchback at B, from which they started. The whole work of handling the cars at the terminal is, thus, a gravity system supplemented by two barneys for pushing the cars up the inclines and by the motors on the conveyor cars to insure the accurate spotting of them.



General View of Terminal.

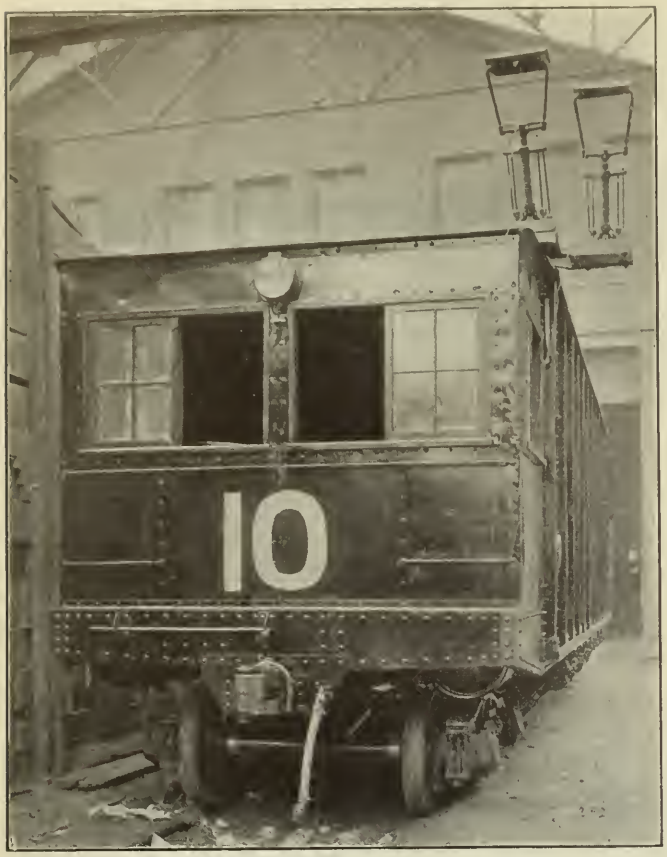
This car is dropped down the 1.0 per cent. incline from the switchback at B, and stopped opposite the car dumper. After receiving the load they are run on down to the foot of the incline at C, where they are picked up by a barney and pushed to the top of the 25 per cent. incline at the shore end of the wharf. The tracks on the latter drop down to the outer end, starting on a 1.25 per cent. grade, and ending on one of 0.667 per cent. These tracks are also equipped with an overhead wire

The wharf itself is a steel structure carried on towers standing on concrete piers resting on long piles. The concrete piers are protected by an independent timber pier built as a fender about them so as to ward off the blows of vessels alongside. The floor of this fender pier is 10 ft. above mean low-water level, and 1.6 ft. above the maximum high water of the spring tides The steel work of the superstructure is of steel bents set on 50 ft. centers, and so braced as to form alternate towers and



Conveyor Car; Virginian Railway.

bays. The girders are designed to carry the tracks for the conveyor cars, which weigh 200,000 lbs., loaded. The pockets, of which there are 22, are so constructed that they have a vertical range of 33 ft. and a side range of 25 ft., so that vessels can be tied up at any point, and loaded or coaled, regardless of the location of their hatches. The capacity of each of the pockets is 60 tons, and they are of such strength that a full load can be dumped into them at once without overstraining the metal. This large capacity, besides making it possible to unload the



End View of Conveyor Car; Virginian Railway.

conveyor cars at once, serves as a storage from which coal can be gradually discharged while the vessel below is being trimmed, while the vertical adjustment enables the loading to be done with very little breakage.

The wharf is about 2,000 ft. long, from the shore to the outer end. The steel portion of the structure has a length of 1,045 ft., a width of 65 ft., and is 76 ft. high at the shore end, and 69 ft. at the outer end. The approach is over a steel and timber incline, located on filled ground, between temporary bulkheads which are 860 ft. long, the permanent bulkhead at the front being 500 ft. long.

The original slope of the shore was that of a smooth gravelly beach into shallow water. The bottom has been dredged, so that there is a clear depth of 30 ft. at low water for 180 ft. on either side of the wharf and for 2,500 ft. out to the main channel.

As previously stated, the terminal has a continuous working capacity of a car every two minutes, or 1,500 tons per hour.

The gondola cars that are used on the road were especially designed for the service, one of the features of which is the use of a stiffening angle along the top edge to prevent a buckling or crimping of the plates in the unloading machine. The car was illustrated in the *Railway Age Gazette* of June 12, 1908. The stiffening angle which had not been worked out in detail at that time is shown here. The design has been a success, and despite the apparent roughness of the handling, the top edges of the sides are still as straight as when they left the manufacturer.

The conveyor cars were designed and built by the Wellman-Seaver-Morgan Co., Cleveland, O., in accordance with the requirements of the railway company. There are ten of these cars, each of 60 tons capacity, and each equipped with electric motors, air brakes and pneumatic door openers, supplied with air by a compressor on the car. A cab is built at each end for the operator, though he does not change his position with the reversal of the motion of the car. The current is taken from an overhead wire, and Westinghouse motors are used. The cars dump readily and clear themselves perfectly.

It will be seen from the drawing that the slope of the hopper, at the ends, is much steeper than that ordinarily used in a hopper-bottom car. The whole bottom drops between the lower ends of these inclines. This insures the rapid action that is necessary. In other respects, such as the tracks, draft gear and so forth, the cars follow the general details of ordinary car construction.

The terminal has now been in service for a little more than a year, and is meeting all of the requirements for which it was designed.

MALLET LOCOMOTIVES BUILT AND UNDER CONSTRUCTION.

The accompanying table gives the number and sizes of Mallet locomotives built by the American Locomotive Company and the Baldwin Locomotive Works, up to the middle of March of this year. While it does not represent all the Mallet locomotives built in this country, it represents at least 96 per cent. of them. The total number shown in this table is 539. Their total weights amount to 185,500,000 lbs., and their total hauling capacity is very nearly 36,000,000 lbs. Assuming an average train resistance of 5 lbs. per ton, these locomotives would haul a train of 144,000 freight cars, weighing 50 tons each, loaded.

MALLET ARTICULATED COMPOUND LOCOMOTIVES BUILT AND UNDER CONSTRUCTION.

Road.	No.	Type.	Cylinders.	Diameter Drivers, inches.	Boiler Pressure, lbs.	Tractive Effort, lbs.	Total Weight, lbs.	Weight on Drivers, lbs.	Gage of Track.
Alabama Great Southern	1	2-6-8-0	23 & 35 x 32	56	200	72,700	363,550	332,700	4 ft. 8½ in.
American R. R. of Porto Rico	4	0-6-6-0	12½ & 19 x 20	37	200	20,300	106,650	106,650	3 ft. 3⅜ in.
Atchison, Topeka & Santa Fe	2	4-4-6-2	24 & 38 x 28	73	200	53,000	376,450	268,000	4 ft. 8½ in.
Atchison, Topeka & Santa Fe	2	2-8-8-2	26 & 38 x 34	63	220	96,000	462,450	412,350	4 ft. 8½ in.
Atchison, Topeka & Santa Fe	2	2-6-6-2	24 & 38 x 28	69	220	61,500	392,300	317,300	4 ft. 8½ in.
Atchison, Topeka & Santa Fe	28	2-6-6-2	24 & 38 x 28	69	220	61,500	365,900	295,500	4 ft. 8½ in.
Atchison, Topeka & Santa Fe	10	2-6-6-2	24 & 38 x 28	69	220	61,500	370,200	304,300	4 ft. 8½ in.
Baltimore & Ohio	1	0-6-6-0	20 & 32 x 32	56	235	71,500	335,000	335,000	4 ft. 8½ in.
Baltimore & Ohio	5	0-8-8-0	26 & 41 x 32	56	210	105,000	454,000	454,000	4 ft. 8½ in.
Baltimore & Ohio	5	0-8-8-0	26 & 41 x 32	56	210	105,000	454,000	454,000	4 ft. 8½ in.
Binghamton & Garfield	2	0-8-8-0	26 & 41 x 28	51	220	107,000	450,000	450,000	4 ft. 8½ in.
Booth-Kelly Lumber Company	1	2-6-6-2	17 & 26 x 24	44	200	37,800	205,950	177,200	4 ft. 8½ in.
Boston & Albany	1	2-6-6-2	20½ & 33 x 32	57	210	66,600	343,000	296,500	4 ft. 8½ in.

MALLET ARTICULATED COMPOUND LOCOMOTIVES BUILT AND UNDER CONSTRUCTION.

Road.	No.	Type.	Cylinders.	Diameter Drivers, inches.	Boiler Pressure, lbs.	Tractive Effort, lbs.	Total Weight, lbs.	Weight on Drivers, lbs.	Gage of Track.
Boston & Maine	4	2-6-6-2	22 & 35 x 30	61	200	62,700	308,000	262,000	4 ft. 8½ in.
Carolina, Clinchfield & Ohio	1	2-6-6-2	23 & 35 x 32	57	200	71,000	342,650	299,250	4 ft. 8½ in.
Carolina, Clinchfield & Ohio	10	2-6-6-2	24 & 37 x 32	57	200	77,500	378,650	325,850	4 ft. 8½ in.
Caspar Lumber Co.	1	2-6-6-2	13 & 19 x 20	37	200	21,900	124,050	105,000	4 ft. 8½ in.
Central R. R. of Brazil	10	0-8-8-0	20 & 32 x 26	50½	200	54,600	265,000	265,000	5 ft. 3 in.
Central R. R. of Brazil	3	0-6-6-0	18 & 28 x 26	60½	200	40,000	208,000	208,000	5 ft. 3 in.
Central R. R. of Brazil	3	0-6-6-0	17½ & 28 x 26	50	200	42,400	206,000	206,000	5 ft. 3 in.
Central South African	9	2-6-6-2	18 & 28½ x 26	46	200	47,700	230,000	196,000	3 ft. 6 in.
Central South African	1	2-6-6-2	18 & 28½ x 26	46	210	48,100	225,000	192,500	3 ft. 6 in.
Chapman Timber Co.	1	2-6-6-2	18½ & 28 x 28	51	200	48,600	235,300	204,500	4 ft. 8½ in.
Chesapeake & Ohio	1	2-6-6-2	22 & 35 x 32	56	225	82,000	392,000	324,000	4 ft. 8½ in.
Chesapeake & Ohio	24	2-6-6-2	22 & 35 x 32	56	225	82,000	392,000	324,000	4 ft. 8½ in.
Chicago & Alton	3	2-6-6-2	22 & 35 x 30	62	220	61,650	327,000	286,300	4 ft. 8½ in.
Chicago, Burlington & Quincy	3	2-6-6-2	21½ & 33 x 32	55	200	64,500	362,150	321,450	4 ft. 8½ in.
Chicago, Burlington & Quincy	5	2-6-6-2	21½ & 33 x 32	56	200	63,300	361,450	327,200	4 ft. 8½ in.
Chicago, Burlington & Quincy	10	2-6-6-2	23 & 35 x 32	64	200	63,500	361,650	304,500	4 ft. 8½ in.
Chicago Great Western	10	2-6-6-2	23 & 35 x 32	57	205	73,000	353,100	307,000	4 ft. 8½ in.
Chicago, Milwaukee & St. Paul	25	2-6-6-2	23½ & 37 x 30	57	200	75,000	387,500	321,500	4 ft. 8½ in.
Columbia National	2	0-6-6-0	13 & 20½ x 20	38	200	23,400	128,000	128,000	3 ft.
Delaware & Hudson	6	0-8-8-0	26 & 41 x 28	51	220	106,000	445,000	445,000	4 ft. 8½ in.
Denver & Rio Grande	8	2-6-6-2	20½ & 33 x 32	57	210	66,000	335,000	291,500	4 ft. 8½ in.
Denver, Northwestern, Pacific	2	0-6-6-0	21 & 33½ x 32	55	225	78,400	335,000	335,000	4 ft. 8½ in.
Denver, Northwestern, Pacific	7	0-6-6-0	21 & 33½ x 32	55	225	78,400	326,000	326,000	4 ft. 8½ in.
Denver, Northwestern, Pacific	1	0-6-6-0	20½ & 33 x 32	55	225	73,900	328,000	328,000	4 ft. 8½ in.
Duluth, Missabe & Northern	8	2-8-8-2	26 & 40 x 32	57	200	91,300	448,100	406,600	4 ft. 8½ in.
Eastern Railway of France	2	2-6-6-0	17½ & 28 x 26	50	200	42,300	206,000	182,000	4 ft. 8⅞ in.
Eastman, Gardner & Co.	1	2-4-4-2	15 & 23 x 22	40	200	28,200	152,900	121,000	4 ft. 8½ in.
Erie	3	0-8-8-0	25 & 39 x 28	51	215	94,800	410,000	410,000	4 ft. 8½ in.
Great Northern	45	2-6-6-2	20 & 31 x 30	55	210	55,000	302,650	263,350	4 ft. 8½ in.
Great Northern	22	2-6-6-2	21½ & 33 x 32	55	200	64,500	355,000	316,000	4 ft. 8½ in.
Great Northern	35	2-6-8-0	23 & 35 x 32	55	200	73,800	378,300	359,600	4 ft. 8½ in.
Guayaquil & Quito	2	0-6-6-0	12½ & 19 x 20	37	200	20,300	114,100	114,100	3 ft. 6 in.
Imperial Government (Japan)	6	0-4-4-0	15½ & 24½ x 24	49	180	27,600	122,000	122,000	3 ft. 6 in.
Ingenio, Angelina, Santa Domingo	1	2-6-6-2	10 & 15 x 16	33	180	10,500	60,200	51,900	2 ft. 6 in.
Little River	1	2-4-4-2	14 & 21 x 22	44	200	23,500	141,700	111,500	4 ft. 8½ in.
Mexican Central	1	2-6-6-2	21½ & 33 x 32	55	200	64,500	309,450	272,950	4 ft. 8½ in.
Mexican International	20	2-6-6-2	21½ & 33 x 32	56	220	69,500	338,500	298,200	4 ft. 8½ in.
Mogyana Railway	2	2-6-6-2	17 & 26 x 22	45	200	33,800	189,800	161,100	3 ft. 3⅜ in.
Natal Government	1	2-6-6-0	17½ & 28 x 26	45½	200	46,600	196,000	179,500	3 ft. 6 in.
Natal Government	5	2-6-6-0	21 & 33½ x 32	55	200	46,600	208,000	191,000	3 ft. 6 in.
New York Central Lines	25	2-6-6-2	21½ & 34 x 32	57	200	68,300	354,000	307,000	4 ft. 8½ in.
Norfolk & Western	5	0-8-8-0	24½ & 39 x 30	56	200	85,000	376,000	376,000	4 ft. 8½ in.
Norfolk & Western	5	2-8-8-2	24½ & 39 x 30	56	200	77,000	390,000	360,000	4 ft. 8½ in.
Northern Pacific	6	2-6-6-2	20 & 31 x 30	55	210	55,000	305,150	262,350	4 ft. 8½ in.
Northern Pacific	16	2-6-6-2	21½ & 33 x 32	55	200	64,500	351,600	313,550	4 ft. 8½ in.
Northern Pacific	5	2-8-8-2	26 & 40 x 30	57	200	85,500	437,950	403,800	4 ft. 8½ in.
Oregon R. R. & Nav. Co.	3	2-8-8-2	26 & 40 x 30	57	200	85,500	438,850	402,750	4 ft. 8½ in.
Pekin-Kalgan	4	2-4-4-2	15 & 23 x 22	48	210	26,000	163,000	130,000	4 ft. 8½ in.
St. Louis & San Francisco	7	2-8-8-2	24½ & 39 x 30	57	200	83,300	418,000	360,000	4 ft. 8½ in.
Sorocabana	4	2-6-6-2	17 & 26 x 22	45	200	33,800	190,800	161,200	3 ft. 3⅜ in.
Sorocabana	6	2-6-6-2	16 & 25 x 20	41¾	200	29,400	150,600	132,000	3 ft. 3⅜ in.
South African Railway	1	2-6-6-2	18 x 26 & 28½ x 28	46 h.p. / 51 l. p.	200	46,400	230,000	196,000	3 ft. 6 in.
South African Railway	5	2-6-6-2	18 & 28½ x 26	46	200	48,100	230,000	196,000	3 ft. 6 in.
Southern	2	2-6-8-0	23 & 35 x 32	56	200	72,700	363,500	332,700	4 ft. 8½ in.
Southern Pacific	12	2-6-6-2	21½ & 33 x 30	57	200	58,500	338,950	297,550	4 ft. 8½ in.
Southern Pacific	2 / 27	2-8-8-2	26 & 40 x 30	57	200	85,500	425,900 / 437,000	394,000	4 ft. 8½ in.
Southern Pacific	12	2-6-6-2	25 & 38 x 28	63	200	66,500	385,000	320,000	4 ft. 8½ in.
Union Pacific	3	2-8-8-2	26 & 40 x 30	57	200	85,500	438,850	402,750	4 ft. 8½ in.
Virginian	8	2-6-6-0	24 & 36 x 32	56	210	82,800	388,320	356,780	4 ft. 8½ in.
Virginian	1	2-8-8-2	26 & 40 x 32	56	210	97,000	448,750	405,400	4 ft. 8½ in.
Virginian	4	2-6-6-0	22 & 32 x 30	54	200	71,000	323,000	301,500	4 ft. 8½ in.
West Side Belt	2	0-6-6-0	20½ & 33 x 32	55	225	74,100	326,000	326,000	4 ft. 8½ in.
Western Maryland	2	2-6-6-2	23 & 35 x 32	55	200	73,700	342,000	298,100	4 ft. 8½ in.
Western Maryland	2	2-6-6-2	23 & 35 x 32	55	200	73,700	354,000	310,000	4 ft. 8½ in.
Whitney Co., Ltd.	1	2-4-4-2	15 & 23 x 22	48	200	24,800	162,650	129,850	4 ft. 8½ in.

General News Section.

The Chicago, Burlington & Quincy is using, experimentally, between Chicago and Galesburg, 163 miles, a printing telegraph, known as the Morkrum apparatus.

On some of its trains "de luxe" the Pullman Company now provides passengers who sleep in the lower berths with coat hangers, to be suspended from the edge of the upper berth.

The roundhouse of the Chicago, St. Paul, Minneapolis and Omaha, at Omaha, Neb., was burned on April 16, causing an estimated loss of $50,000. Ten locomotives were damaged.

A bill has been introduced in Congress to prohibit express companies from competing with the post office department in the transportation of packages weighing less than 11 lbs. each.

Judge J. H. Henderson, of Indianola, Iowa, has been appointed to the newly created office of commerce counsel for the state of Iowa, his nomination by the members of the state railway commission having been confirmed by the senate.

The Southern Pacific has completed the electrification of its line between Clement Junction and Centous, Cal., near Los Angeles. The line will be used by the Pacific Electric mainly for freight, and will be known as the Santa Monica Air Line (distance 12 miles.)

The legislature of Pennsylvania has before it a bill, the principal features of which have been approved by one or the other of the two Houses, which provides for the expenditure of $6,000,000 for the construction of wagon roads. The plan includes the establishment of 300 routes between county seats.

At Syracuse, Kan., April 13, the conductor of passenger train No. 5 of the Atchison, Topeka & Santa Fe, was shot and injured by a train robber, having resisted the robber as he got on to the train. After robbing the conductor and one brakeman of what money they had, the robber stopped the train and escaped.

J. C. Stubbs, vice-president and director of traffic of the Harriman Lines, with office at Chicago, has announced that he will retire from railway work in about a year. Mr. Stubbs is 64 years old, and for over 40 years of his life he has been on the pay-roll of the Southern Pacific. He says he concluded long ago that when a railway officer is 65 years of age he should retire.

A bill has passed the lower house of the Michigan legislature which requires a man to have had at least one year's experience as a fireman before he can become an engineer in charge of a freight train, that all conductors on passenger trains must have had at least a year's previous experience as conductors on freight trains, and that only experienced brakemen shall act as flagmen.

Senator Jones, of the state of Washington, has introduced in Congress the bill which he presented in the last Congress, designed to provide for uniform train-operating rules for the railways of the country, by enforcing a standard code by authority of the federal government. The bill to limit the working time of trainmen to 14 hours a day—two hours less time than that provided in the present statutory limit—has also been re-introduced.

The commercial club of Topeka, Kan., gave a dinner on the evening of April 11 in honor of H. U. Mudge, president of the Rock Island Lines, and other officers of that road, including F. O. Melcher, second vice-president; John Sebastian, third vice-president; H. Gower, freight traffic manager, and E. B. Peirce, general solicitor. Talks were made by Mr. Mudge and members of his staff as well as by officers of the Santa Fe and several business men of Topeka. About 175 persons were present.

Walter L. Ross, vice-president in charge of traffic of the Chicago & Alton and the Toledo, St. Louis & Western, made an address before the Chicago Transportation Association on April 17, in which he said that "there is now no branch of railway ownership and operation that cannot be discussed freely and frankly and with advantage to the railways themselves." He said the railways welcome reasonable regulation as proper and necessary, but that reductions in rates should not be fixed by the same bodies that demand expensive improvements.

The legislature of New Hampshire, which has just adjourned, passed a law providing for the establishment of a public service commission; but at the same time adopted a separate law in regard to freight rates, directing the public service commission to make a general investigation and report to the next legislature; and the rates now in force are legalized until July 1, 1913; but the law contains a clause leaving shippers free to recover excess charges on a finding of the commission. This proviso applies to certain rates (not all rates) now in force. A workmen's compensation act was also passed.

The bill before the New York State Legislature, looking to the establishment of docks, harbors and other terminal facilities at numerous points on the line of the Erie canal, calls for an expenditure of $18,600,000, which is about two millions more than was provided for in the estimates of the commission. Representatives of business interests in a number of cities have met at Albany and approved the proposed action by the legislature; and the addition to the commission's estimates is to provide for harbors at Lyons, Rome, Herkimer, Little Falls, Clyde and Plattsburg, which were not included in the original scheme.

Newspaper reporters in several cities learn that the Pennsylvania is to take off two of its fast trains between New York and St. Louis; Nos. 40 and 41; and also possibly other trains. The New York Central has changed the time of its Southwestern Limited. It now leaves New York at 4 p. m. and arrives at St. Louis at 3 the next afternoon. The La Salle Street Limited, leaving New York for Chicago at 5 p. m., has been consolidated with the Wolverine, heretofore leaving at 4:30. The train will arrive at Detroit at 7:15 a. m. and Chicago 2 p. m. Eastbound a new train, "The Detroiter," leaves Detroit at 6:40 p. m. and arrives in New York at 9:25 a. m. The Central's fast train from St. Louis leaves that city at 5 p. m., instead of 8:45 a. m., and arrives in New York at 6 p. m. This train makes a daylight run from Buffalo to New York in 8 hours 40 minutes.

The Atchison, Topeka & Santa Fe now has in operation 51 circuits on which telephones are used, most of them train wires. The aggregate length of these circuits is 7,105 miles. The sections or divisions of railway of which these wires are a part of the operating equipment aggregate a length of 5,756 miles, a number of sections of road being equipped with two circuits, one for the use of despatchers, and one for messages. Between Amarillo, Texas, and Waynoka, Okla., 207 miles, there are three circuits, one for the despatcher, one for the joint use of the railway company and the Western Union Telegraph Company for messages, and one devoted wholly to railway messages. There are three circuits also on the line between Amarillo and Clovis, N. M., 104 miles. On the 51 circuits, there are 976 offices, an average of 19 telephones to each circuit. The selectors used are the Gill E-2; the Gill X and the Western Electric Company's; and, on two circuits, the Kellogg. No. 9 copper wire is used for nearly all of the circuits.

Commenting on the recent decision of Judge Sanborn in the Minnesota rate case, Governor Hadley of Missouri said he regarded it, in so far as it affects the powers of the states, as the most important rendered by the federal courts since the Dred Scott decision. He said that "if this decision were sustained by the United States Supreme Court it would seriously impair, if not totally destroy, the police power of a state in so far as that power relates to the regulation of corporations engaged in interstate commerce. This would certainly be a 'new nationalism' with a vengeance. The logical and necessary result of the decision, if sustained, will be that states eventually will become more geographical subdivisions possessing and exercising no powers of government except those which pertain to purely local affairs." As Judge Sanborn brought out a vital point in connection with the power of the state to regulate corporations doing an interstate business, his decision will have an important bearing on the Missouri rate cases which have been reopened for argument in the United States Supreme Court, and it is

said that Governor Hadley may ask the supreme court to let him participate in the arguments.

The house committee on railways of the Illinois legislature has reported favorably on the bill which is proposed to take the place of the present state railway commission law. In addition to the powers conferred by the present law, the substitute measure provides that the commission shall have the following additional powers: Jurisdiction over the subject of car demurrage, of refund or overcharge on freight rates and return of overcharge on passenger rates; power to fix through routes and rates; power to fix joint rates; jurisdiction over express companies, steamboat lines and sleeping car companies; authority to require interchange of cars between common carriers; jurisdiction to determine rules or rates for storage and other charges incident to the transportation of freight; power to compel physical connection between common carriers; authority to establish switching rules and regulations and to fix the limits of switching districts, and authority to make investigation of the general business management of common carriers in relation to the distribution of cars, granting of sidings, location of passenger and freight stations, and use and compensation for cars owned or controlled by common carriers. It also provides that the orders of the commission shall be mandatory and enforced by the state courts, just as the orders of the Interstate Commerce Commission are carried out by the federal courts.

Hydroplane Record.

Sir John I. Thornycroft, according to an account in *Engineering* (London), of April 7, in his hydroplane launch "Maple Leaf III," has traversed a nautical mile at the rate of over 58 miles an hour. This was on a measured course. "The Maple Leaf III" is 40 ft. long, with a beam of 9 ft. The boat has twin screws, and each of the two engines has 12 cylinders.

H. G. Burt Chairman of Chicago Electrification Commission.

Horace G. Burt, formerly president of the Union Pacific, has been appointed chief engineer of the Chicago Association of Commerce commission on electrification, and will open an office in the People's Gas building, about May 1. At a meeting held at the Union League club in Chicago on April 14, the following were appointed members of the special committee in charge of the various electrification problems: W. F. M. Goss, of the University of Illinois; H. G. Hetzler, Chicago & Western Indiana, and E. R. Graham, of D. H. Burnham & Co. Mr. Burt, who will have a number of assistants to help him in making a systematic study of the conditions, has been in railway work since 1868, when he became a rodman on surveys on the St. Louis, Vandalia & Terre Haute. Afterward he worked with a locating party on construction of railways in Kansas. He graduated from the University of Michigan in 1873, after which he went into the engineering department of the Chicago & North Western, becoming chief engineer of that road in 1881. He then entered the operating department and held various important operating positions on that and other roads, rising to the presidency of the Union Pacific in 1898, which position he held for six years.

Three-Phase Electric Locomotives in Italy.

Tests made by the Italian State Railway on three-phase electric locomotives built by the Societe Italiana Westinghouse, present some interesting results. The locomotives were built for heavy freight service in the Giovi tunnel and have a normal operating speed of 28 m.p.h. They do not weigh more than 60 tons, but the weight may be increased to 75 tons by means of ballast. During the tests a train of 418 tons, exclusive of the weight of the locomotive, was taken with a speed of 28 m.p.h. from Pontedecimo to Busalla, a distance of 6½ miles with a maximum grade of 3.50 per cent., an average grade of 2.70 per cent., and a minimum curve radius of 1,200 ft. After this the train was taken back at a speed of 14 m.p.h., the locomotive being connected for regenerating power. The time allowed for one round trip was 140 minutes. After 20 hours of such continuous operation, one round trip without forced ventilation of the motors was made with a temperature rise of the motors considerably less than 135 degs. F. The one hour motor rating for the same temperature is 720 h.p. per motor corresponding to a locomotive pull at the wheel circumference of 19,500 lbs.; during the test this rate was exceeded. The friction rating under the most unfavorable conditions is such that a train of 380 tons, exclusive of the weight of the locomotive, may be accelerated to 28 m.p.h. in less than 200 seconds by two locomotives, one pushing and one pulling on a grade of 3.50 per cent. and on a curve of not more than 1,200 ft. radius. One locomotive can accelerate a train of 400 tons, not including the weight of the locomotive, to a speed of 14 m.p.h. on a grade of 3 per cent. and 300 tons on a curve of 540 ft. radius thirty times in one hour.

The motors are three-phase, 3,000-volt, 15-cycle machines arranged to give two synchronous speeds of 112½ and 225 r. p. m.; intermittent speeds are obtained by inserting rheostats in the circuit. Electrification became necessary on the Giovi line on account of the impossibility of coping with the increase in traffic with steam locomotives. The artificial ventilation of the tunnel, owing to its great length, could not be improved and the condition of the atmosphere in the tunnel was such that an increase in the number of trains or steam locomotives would endanger the safety of the service. An important feature of the three-phase installations is found in the utilization of regenerated power, which reduces the cost of operating the line and also reduces, by proper arrangement of the schedules, the peak of the load in the generating station and does not require the use of mechanical brakes when the train is going down grade.

Aviators' Records.

In Belgium, April 14, an aeroplane was flown about 55 miles carrying three passengers—the three sisters of Lanser, the man who was running the machine. The flight of Pierre Prier from London to Paris, reported in our last issue, which was at the rate of 70.14 miles an hour for about 290 miles, was faster than any trip for so great a distance which has ever been made by a locomotive, so far as the records show, though possibly the special train which was run over the Lake Shore & Michigan Southern on June 13, 1905, nearly or quite equalled it. In this Lake Shore run, a distance of 525 miles was made at 69.53 miles an hour; almost equal to the rate made by the monoplane, and the distance was much farther. The Locomotive Dictionary list of best recorded speeds made by steam locomotives shows a run on the Pennsylvania Lines October 24, 1905, of 257 miles at 74.55 miles an hour. A significant thing to remember in comparing these records is that the flying machine, by reason of its lightness and its shape, may be greatly helped or retarded by wind.

The New Haven's Advice to Boston.

President Mellen, of the New York, New Haven & Hartford, speaking at a dinner of the Boston Chamber of Commerce on Thursday of last week, told the citizens of Boston, in substance, that they ought to wake up, and get the better of New York. The large new trans-Atlantic steamships are having difficulty in getting satisfactory dock facilities at New York and their owners have been looking at New London and also have been considering Montauk Point, but Boston could beat either of those ports if she saw fit to do so. She could prepare her docks in far less time than suitable preparations could be made anywhere else; and the New Haven road will take the passengers from Boston to New York so quickly that they will reach there earlier than would be possible if the ship sailed direct to New York. If Boston will build a dry dock for the repair of these large vessels she can have a "call" upon them. If Boston will improve her water-front and put up fireproof buildings on the piers, then Mr. Mellen will furnish the traffic. Speaking both for the New Haven and the Boston & Maine he said:

The arrangements of our company are such that I feel sure I am not at all drawing upon my imagination when I say, we are practically in alliance with the Pennsylvania Railroad, through the New York Connecting Railroad which we are jointly building, with the New York Central Railroad, through the Grand Central Station investment, and our recent arrangements regarding the Boston & Albany and Rutland roads,—and I feel more than certain within no great while we shall have most intimate arrangements with Canadian lines, in view of which there is promise of a business such as we have never before been able to consider in the way of cargo for such steamships as shall seek this port.

Railway Prospects in the South.

Atlanta itself sets at naught all the traditions of the more remote past and brings to our minds the knowledge that the introduction and development of railways has meant the establishment of a new industrial force in the progress of this country and has demonstrated that great industrial centers may exist and thrive away from locations which were formerly considered necessary to substantial commercial progress.

Men who had studied the past and gathered together the experience of former ages would have sought at the water's edge the location of Georgia's future commercial and industrial center. Probably at some ample harbor on the seacoast, or at least on the banks of some navigable stream. That Atlanta exists as a dominating factor in the commerce of the South, indicates that some new principle has become a part of our economic development.

The construction of railways in the early history of the South possessed but few attractions to those who had money to invest in business enterprises. The experiment was considered doubtful and the undertaking highly speculative; and, although the necessity and advantage of more adequate transportation facilities were recognized, and appreciated as being important in the development of the country, yet so indifferent was private capital to venture upon an undertaking both costly and uncertain, that very few of the roads of the South in its early history were constructed purely through individual contribution. As a matter of fact, the promotion and construction of most of the earlier built roads was the result of the co-operation of the state with individuals, to which was generally added the aid of communities and cities whose interest it was thought would be particularly advanced by such construction.

Many causes co-operated to bring about the final abandonment by the states of their control and interest in their railways, but chiefly was this policy of abandonment due to the conviction on the part of the people that the operation of railways, involving the employment of vast numbers of men and the inauguration of competition between sections and cities equally entitled to protection and consideration from the state, made it impossible for the state wisely and efficiently to carry on these complicated and hazardous undertakings.

After the civil war the states did not undertake to rehabilitate the roads, but usually turned them over to companies financed by individuals and, for all practical purposes, we may say that the growth of railways in the South since the year 1865 has been the result of individual enterprise and corporate energy. Those railways which existed at the close of the war represented, as many of you well know, but little else than a franchise and a right of way, and the work of the years that had gone before had been to a large extent annihilated as the result of four years of enforced neglect, and I defy any one to name another kind of property that deteriorates as rapidly as a railway, resulting from lack of repair. Eternal vigilance, and no small amount of money, is the price that must be paid for the maintenance and continued existence of a railway, yet these roads have been reconstructed and new lines have been built to an extent that has been marvelous, considering the difficulties that had to be overcome.

In 1890, the capitalization of the railways in this territory, which capitalization includes the outstanding stock and funded debt of those roads, was $1,153,374,401. This capitalization in 1909, had increased to $2,265,101,150. I have no means at hand for ascertaining how much of this capitalization has been contributed by the people of the South, but I think that it is safe to say that a very small portion has been secured from that source and I take it that, from that reason, much credit is due to the people—mostly your own citizens—who have had the character and ability, so to impress themselves upon the investing public of the world whereby such large sums of money have been entrusted to their care and placed at the service of your communities, to be primarily benefitted by the construction and upbuilding of these railways. This money has been secured, and expended for the benefit of this territory, although the return thereon has, in most cases, been very meager, and the average return much less than reasonable. Interest on bonds and dividends on stock which have been received on account of railway investments in the South from 1891 to 1909, both inclusive, represent a rate of interest upon this capitalization ranging from 2.54 per cent. to 3.60 per cent.

No small portion of the stock of existing companies, which is now frequently being criticized as "watered stock," represents, as a matter of fact, stock issued to the original owners of the road, which was turned over after the war to some new company being organized for the purpose of constructing and maintaining a through line of travel, and represented only a small portion of an actual investment in money. This stock, in fact, represented, in many cases, the fortunes of not a few courageous men who invested their all in the railways of the South, and because an effort has been made to preserve this investment to the original owners or to their successors in title, the opportunity is frequently sought in these days to criticize stock issued for such purposes as being uncntitled to recognition as an investment. I cannot agree with this theory, but have always felt that the money which was originally contributed is a part of the investment, the benefit of which is now enjoyed by the public and which in good conscience should be preserved to those entitled to it.

Deducting the amount of stock of one railway held by another railway from the total capitalization, the average per mile valuation of the roads of the South is $44,911.

And now, coming to the question of what the prospects of the railways in the South are: From my observation and general knowledge of the southern section of our country, I unhesitatingly express the opinion that there is no section of our country that has a brighter prospect for full development by its railways than that section lying south of the Ohio and east of the Mississippi rivers, and extending also westward from the Mississippi river on the northern border of the gulf of Mexico, provided an energetic, comprehensive, and proper financial support is given to the matter of better farming, thereby diversifying your crops, enriching your lands, utilizing your water power, and, in fact, bringing this vast area of tillable and productive land into and under correct and effective cultivation.

You should not be satisfied with merely being represented before the world as the grower of one article, notwithstanding the common parlance "Cotton is King." You have the best climate on the face of the globe. You have, as a rule, sufficient rainfall to furnish moisture necessary to the growth of all characters of crops; you are in easy access to transportation to all parts of the world, and with the completion of that undertaking to which our government is committed, viz., the Panama Canal, you will then be at the door of Central America, South America, and many thousands of miles nearer to the Pacific coast, China, and Japan, than any competing section or territory.

And now, if you again ask what are the "Railway prospects of the South," my reply is that the future development of the railway in the South is, to my mind, entirely dependent upon the attitude of the southern people towards the railways.

It seems to me that recent history has demonstrated that the day is past when the railway question can be properly dealt with as a political proposition. In fact, it is altogether an economic proposition and cannot be successfully handled by the politicians, however sincere may be their ultimate purpose. Such attempts have always resulted in disaster to the roads as well as to the community. I do not, however, conceal from myself the fact that all railways are in some measure monopolies and as such should be subject to the regulating hand of the body politic. In the working out of our system, we have established both for the nation and for most of the states, commissions, whose duty it is to exercise regulating influences to prevent the evils that arise from monopoly; and if, as the years go by, it shall appear that these bodies will be able, with equal hand, to protect all sections from undue discrimination and, at the same time, preserve to the railways such rates that the revenues shall be remunerative, then I look forward to the early day when railway development in the South shall take steps far in advance of any section of this country.

One more word and I have finished. All of these things I believe will be finally and best accomplished when the people of the South get in the habit of owning their own railways. Stocks and bonds of these companies can be purchased on the open market today at prices which will justify a reasonable return under fair and just governmental regulations, and I do not know any better opportunity for investment by the people of the South than in the securities of their own transportation companies.—*L. E. Johnson* in an address before the Southern Commercial Congress.

National Association of Manufacturers.

The sixteenth annual convention of the National Association of Manufacturers will be held at the Waldorf-Astoria Hotel, New York, May 15-17. Among the labor problems which will be considered are the prevention of accidents and the question of industrial relief. The results of the investigations made in Europe by the association's special commissioners, F. C. Schwedtman and James A. Emery, covering the subjects of accident prevention and industrial relief, will be presented in the form of a report to the convention. A special feature will be made of banking and currency, and the attitude of our manufacturers toward the plans recently proposed to reform our banking and currency systems will be discussed. Other questions of economic importance, such as immigration, industrial education, a reform of our patent laws and the creation of an independent tariff commission of experts will be considered. The sessions will be open to the general public and the association extends a cordial invitation to all manufacturers to attend, whether members of the association or not.

Transportation Club of San Francisco.

At the annual meeting of this club the following officers were elected for the ensuing year: President, A. G. D. Kerrell, general passenger agent of the Pacific Mail Steamship Company; first vice-president, E. E. Wade, assistant general passenger agent of the Southern Pacific; second vice-president, Thomas Finigan, purchasing agent of the United Railroad of San Francisco; treasurer, Henry Avila, city ticket agent, Union Pacific; secretary, Theo. H. Jacobs, city passenger agent, Union Pacific. This club publishes a monthly periodical called "The Time Card." It is edited by the publicity committee, W. F. Schmidt, chairman, and the last number contains portraits of the officers of the club.

Civic Forum.

Under the auspices of the Civic Forum, New York, Frederick W. Taylor, of Philadelphia, Pa., the originator of the movement known as scientific management, will, on April 28, make an address on The New Conception of Business and Industrial Efficiency, in Carnegie Hall. Brief addresses will also be made by John Golden, president of the United Textile Workers of America, on the attitude of organized labor towards this movement, and by Frank B. Gilbreth, on its practical operation. Details regarding tickets may be obtained at the office of the Civic Forum.

Western Railway Club.

At the meeting of the Western Railway Club, held in Chicago, April 18, the reports of the committee on revision of the rules of interchange and of the special committee on joint interchange and inspection bureau at the Union Stock Yards, Chicago, were taken up.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on April 19, a paper entitled Some Tests of Large Steel Columns, by James E. Howard, was presented for discussion. This paper was printed in the *Proceedings* for February, 1911.

American Institute of Electrical Engineers.

A convention of the American Institute of Electrical Engineers will be held at Los Angeles, Cal., April 25-28.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9-10, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—A. H. Christiansen, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13 New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept. Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

In accordance with the decree handed down by Judge Sanborn in the Minnesota rate case, the railways operating in that state will restore 3-cent passenger fares on June 1.

The Santa Fe has removed its 100-mile limit rule in regard to tickets on its California Limited west of Albuquerque. Heretofore it has been impossible to buy a ticket good on this train for a distance less than 100 miles.

Effective May 20 the Erie will establish a passenger rate of $9.50 between Chicago and Pittsburgh, thus making its rate between those points the same as that of the Lake Shore, the Pan Handle and the Baltimore & Ohio.

The Adams Express Company is now able to run cars from the Atlantic to the Pacific coast, having made a traffic agreement with the Globe Express Company, which operates over the Denver & Rio Grande and the Western Pacific.

The Dixie Cotton Oil Company of Argenta, Ark., has filed suit at Little Rock, Ark., against the St. Louis, Iron Mountain & Southern for $169,000 damages. The oil company alleges that the road discriminated in favor of the Buckeye Cotton Oil Company in the matter of switching charges.

While the volume of freight traffic on all the roads in the United States increased 7.6 per cent. for the year 1910 over 1909, the increase on the roads of the Southeastern states was 10.1 per cent., and while the volume of passenger traffic on all the roads increased 6.1 per cent., the increase in the Southeastern states was 10.0 per cent.

The lower house of the Minnesota legislature has passed the Cashman bill, which provides that railway freight rates shall be based on actual mileage. If this measure were enacted it would annul the state commodity and merchandise laws which the recent decision of the United States Circuit Court of Appeals held to be unconstitutional.

Statistics covering the 30-day period ended April 10, when the special colonist passenger rates to the west were in effect, have been prepared by several of the railways engaging in that business, and show that the traffic from the east, north and south to points in California and other western and northwestern states was more than 20 per cent. greater in 1911 than last year, 85,000 persons having taken advantage of the special rates.

The expenditures for maintenance of way and structures in 1910 for the railways of the entire United States showed an increase of 11.3 per cent. over 1909, while the expenditures for the railways of the Southeastern states showed an increase of 15.8 per cent., and while the expenditures for maintenance of equipment for the entire United States showed an increase of 9.6 per cent., the increased expenditures of the railways in the Southeastern states under this heading amounted to 13.2 per cent.

Mayor W. J. Gaynor of New York City has announced that he intends to ask the Interstate Commerce Commission to admit the city as an intervenor in the case which has been presented by the Chamber of Commerce and other mercantile associations, complaining against the differentials in freight rates between the Atlantic seaboard and the West, under which Philadelphia and Baltimore have rates lower than those to and from New York; and Mr. Gaynor has written to the governor of the state, asking him to take similar action on behalf of the state.

As a result of an opinion handed down by the supreme court of Oklahoma, the corporation commission of that state will have to hold further hearings in connection with express rate reductions which it has ordered. The express companies involved have represented to the court that since the original order of the commission was made they have filed with that body reports which give it more accurate information on which to base proposed changes in the rates, and the court has instructed the commission to report its additional findings within 60 days.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting

Car Balance and Performance in December, 1910.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	80,563	710,327	217,449	176,536	166,251	390,355	17,714	137,355	27,206	140,050	106,395	2,170,199
Average number of system cars on line	37,711	384,780	114,061	90,682	79,166	263,274	6,449	71,518	16,613	62,852	69,671	1,196,777
Railway-owned cars: Average foreign on line	47,919	312,350	101,025	74,105	70,052	144,556	13,400	72,091	28,085	60,753	33,638	957,974
Total Railway-owned cars on line	85,630	697,130	215,086	164,787	149,218	407,830	19,849	143,609	44,698	123,605	103,309	2,154,751
Excess	5,067	.....	.....	.....	.....	17,475	2,135	6,256	17,492	.....	.....	.....
Per cent. of cars on line to total owned:												
Home	47	54	52	52	48	67	36	52	61	45	65	55
Foreign	59	44	46	41	42	37	76	52	103	43	32	44
All railways	106	98	98	93	90	104	112	104	164	88	97	99
Private cars on line	3,416	43,592	11,306	3,112	6,324	15,708	1,960	8,075	2,973	10,577	2,572	109,615
Total, all cars on line	89,046	740,722	226,392	167,899	155,542	423,538	21,809	151,684	47,671	134,182	105,881	2,264,366
Per cent. of cars in shop	4.18	5.14	9.60	5.96	7.92	5.69	5.36	6.64	4.42	4.42	6.57	5.96
No. of freight engines owned	1,160	10,328	2,919	3,032	2,483	6,278	495	2,763	715	2,566	2,164	34,903
Average cars on line per freight engine owned	77	72	78	55	63	67	44	55	67	52	49	65
Total freight-car mileage	44,031,841	515,714,639	145,320,504	119,855,773	122,101,565	282,188,640	24,231,845	90,845,895	36,163,019	124,981,227	86,126,587	1,591,561,535
Average miles per car per day	16.0	22.5	20.7	23.0	25.3	21.5	35.3	20.3	24.5	30.0	26.2	22.7
Per cent. loaded mileage	72.3	67.2	67.7	67.7	72.1	71.6	72.9	71.0	68.9	70.6	78.4	69.7
Ton-miles of freight, including company freight	494,247,289	8,179,706,416	2,169,591,621	1,868,314,986	1,786,123,335	2,618,067,125	383,626,272	1,360,088,401	433,993,730	1,858,566,841	1,369,125,420	22,521,451,436
Average ton-miles, including company freight:												
Per car-mile	11.2	15.9	15.5	15.6	14.8	14.4	16.6	15.0	12.0	15.1	15.9	15.2
Per loaded car-mile	15.5	23.6	22.5	23.0	18.7	20.8	22.7	21.3	17.4	21.4	20.3	21.8
Per car per day	179	356	325	359	373	323	626	303	294	453	417	349
Gross freight earnings	$5,564,563	$47,748,045	$12,457,866	$11,687,311	$12,135,665	$28,709,600	$3,045,771	$11,720,405	$4,138,628	$18,423,020	$8,708,954	$164,339,828
Average daily earnings: Per car owned	$2.23	$2.17	$1.85	$2.14	$2.35	$2.37	$5.55	$2.75	$4.91	$4.24	$2.64	$2.44
Per railway car on line	2.10	2.21	1.87	2.29	2.62	2.27	4.95	2.63	2.99	4.81	2.72	2.46
All cars on line	2.02	2.08	1.78	2.25	2.52	2.19	4.51	2.49	2.80	4.43	2.65	2.34

statistical bulletin No. 94, covering car balance and performance for December, 1910, says:

"There was a decrease in the revenue per mile and an increase in operating expense per mile, the net result being an increase in the ratio of expenses to revenue. The items of car performance show a decrease corresponding with these results. Following is a comparative summary for a few selected averages:

	December, 1910.	November, 1910.	December, 1909.
Gross revenue per mile of road	$981.	$1,031.	$928.
Freight revenue per mile of road	677.	735.	645.
Average freight cars owned per mile of road	9.73	9.66	9.40
Average miles per car per day	22.7	24.3	22.2
Per cent. loaded mileage	69.7	70.1	69.9
Per cent. home cars on line	55.1	55.0	56.2
Tons per loaded car	21.8	22.5	22.2
Ton miles per car per day	349.	385.	342.
Daily earnings per car on line	$2.34	$2.66	$2.30

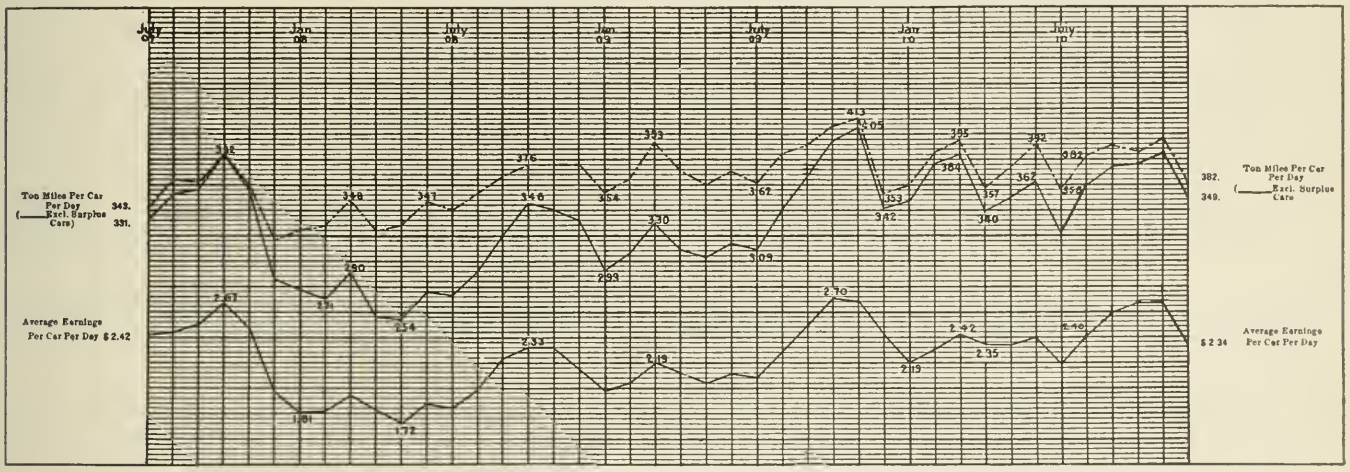
"It will be noted that in the main the performance in December, 1910, was similar to the December, 1909, performance, with a slight improvement in the principal items. As the number of idle cars during the two periods was practically the same, the averages per car are fairly comparable, although allowance should be made for the increased equipment per mile of road from 9.40 in December, 1909, to 9.73 in December, 1910, the increase being equivalent to 3.51 per cent. It is probable that in this increase we can find the explanation for the fact that the freight revenue per mile of road increased in greater proportion than the revenue per car on line

"Comparing the December results with those for November there is very little out of the ordinary December performance, excepting the fact that there was practically no change in the per cent. of cars on their home line, although the decrease in the per cent. of loaded mileage continued during December."

The accompanying table gives car balance and performance figures by groups for December, and the charts show car earnings and performance in 1907 to 1910 inclusive.

Mail Route on Atchison, Topeka & Santa Fe.

The Atchison, Topeka & Santa Fe has consented to resume its connection with the Missouri Pacific at Kansas City for mail traffic. A short time ago the Santa Fe put on a fast mail train from Chicago which was scheduled to reach Kansas City at 1 a. m., in an effort to induce the post office department to send eastern mail for Kansas through Chicago and over its line, rather than via St. Louis over the Pennsylvania and the Missouri Pacific. This situation was met by the Missouri Pacific when it put on a fast mail train from St. Louis which reached the Union station in Kansas City simultaneously with the Santa Fe train. Then the Santa Fe changed the route of its eastern mail through Kansas City from the Union station to the Grand avenue station, under which arrangement the Missouri Pacific could not make connections with it. If the Santa Fe had continued to route the mail in this way the Post Office department would have found it necessary to route eastern mail via Chicago and the Santa Fe, as that would have been the shortest route for mail from the east destined to points beyond Kansas City on the Santa Fe. Under the arrangement made by the Santa Fe (under pressure from the Post Office department) its train No. 15 will reach the Union station in Kansas City at 1:45 a. m. and leave 15 minutes later.



Car Earnings and Car Loading.



Car Balance and Performance.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1911. (SEE ALSO ISSUE APRIL 14.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Buffalo, Rochester & Pittsburgh	572	$558,975	$67,181	$644,341	$42,549	$120,255	$10,041	$230,487	$14,003	$417,335	$227,006	—$29	$16,000	$210,977	—$21,734
Central of Georgia	1,915	796,834	235,089	1,119,929	129,771	188,107	32,771	371,842	34,940	757,431	362,497	5,286	42,544	325,239	52,593
Chicago & Eastern Illinois	965	704,438	156,867	932,086	83,963	133,313	22,885	374,099	33,473	647,733	284,353	—1,286	28,500	254,567	36,424
Chicago Great Western	1,495	694,900	185,628	957,877	92,473	166,262	43,913	435,091	35,373	773,112	184,765	—571	32,823	151,371	27,438
Chicago, Indianapolis & Louisville	617	282,707	105,592	433,564	59,077	62,401	15,477	173,112	15,257	325,324	108,240	.....	22,500	85,740	—8,227
Cincinnati, Hamilton & Dayton	1,014*	475,080	102,323	649,697	73,768	136,226	23,477	339,727	22,108	595,306	54,391	.....	32,576	21,815	57,216
Colorado & Southern	1,173†	441,186	85,122	571,150	55,717	124,292	10,828	203,440	21,903	416,180	154,970	—1,530	24,700	128,740	—121,978
Denver & Rio Grande	2,542‡	1,095,228	277,482	1,445,736	107,554	318,047	46,517	569,019	50,313	1,091,450	354,286	—8,025	73,000	273,261	—98,824
El Paso & Southwestern Co	901§	453,543	82,312	567,110	64,440	73,665	11,624	179,156	22,567	351,452	215,658	—852	20,076	194,730	23,454
Elgin, Joliet & Eastern	831¶	497,474	7	524,652	53,868	125,419	3,932	194,996	13,994	392,209	132,443	.....	18,400	114,043	—92,315
Florida East Coast	583	198,542	239,464	499,211	39,046	55,910	12,114	142,285	7,228	256,583	242,628	.....	15,500	227,128	57,802
Galveston, Harrisburg & San Antonio	1,338	546,788	252,243	846,321	114,648	107,307	34,391	342,404	28,944	627,694	218,627	—1,683	30,072	186,872	40,000
Gulf, Colorado & Santa Fe	1,518	590,053	199,324	871,556	177,575	156,843	23,148	389,641	36,081	783,288	88,268	.....	33,307	54,961	71,127
Illinois Central	4,574‖	3,088,681	1,013,839	4,712,238	466,545	945,850	107,651	1,780,495	116,170	3,416,711	1,295,527	1,586	241,524	1,055,589	63,679
International & Great Northern	1,159	455,613	152,753	652,968	109,636	106,545	19,498	341,803	23,243	600,725	52,243	—295	22,000	29,948	—11,638
Iowa Central	559	220,805	36,977	269,679	31,149	41,002	7,159	127,519	8,514	215,343	54,336	.....	9,735	44,601	11,858
Kansas City Southern	827	542,527	115,230	739,846	70,329	113,334	27,060	268,924	34,592	514,239	225,607	.....	27,399	198,208	—34,378
Lake Erie & Western	886	309,504	54,408	386,494	68,796	77,885	13,357	172,377	13,350	345,765	40,729	.....	18,000	22,729	—82,454
Maine Central	932	436,508	156,463	633,066	74,395	123,025	7,174	289,362	23,313	517,269	115,797	—2,223	38,280	75,294	—62,465
Minneapolis & St. Louis	1,027	258,998	77,097	359,932	34,626	53,411	11,051	176,344	13,479	288,911	71,021	—29	16,861	54,131	28,346
Missouri, Kansas & Texas	1,737a	909,853	370,529	1,377,475	148,604	222,571	40,517	467,380	45,770	924,842	452,633	1,114	58,515	395,232	—
Missouri, Kansas & Texas of Texas	1,348	457,192	267,858	781,352	115,401	71,440	23,783	442,501	33,752	686,877	94,475	784	22,500	72,759	78,026
Mobile & Ohio	1,114	613,020	106,749	841,648	98,119	162,582	33,430	309,584	40,823	644,538	197,110	—768	25,460	170,882	—18,307
Nashville, Chattanooga & St. Louis	1,230	754,758	210,189	1,032,685	152,782	183,480	32,019	361,216	24,795	754,292	278,393	131	25,278	253,246	—18,368
New York, Chicago & St. Louis	562	715,183	83,200	827,264	73,856	126,617	46,339	402,662	16,906	666,380	160,884	—1,739	29,600	129,545	—62,280
New York, Ontario & Western	546	515,859	67,320	604,552	68,569	111,740	10,208	290,636	15,876	497,029	107,523	—4,633	17,500	85,390	12,323
Philadelphia & Reading	1,022	2,473,290	484,264	3,099,214	215,770	634,446	34,971	1,110,174	60,139	2,055,500	1,043,714	34,772	84,866	993,620	—297,626
St. Louis Southwestern	797b	507,878	100,820	637,750	75,392	93,210	24,040	157,696	23,252	373,590	264,160	—393	21,575	242,192	55,085
St. Louis Southwestern of Texas	703	218,281	60,670	298,329	100,220	75,506	10,489	159,529	18,442	364,186	—65,857	—202	10,000	—76,059	—17,513
San Pedro, Los Angeles & Salt Lake	1,105c	342,508	196,118	576,754	109,100	122,150	33,362	259,911	18,195	542,718	34,036	—5,381	26,695	1,960	29,708
Seaboard Air Line	3,046d	1,381,171	404,397	1,965,195	234,521	253,047	57,755	648,654	51,920	1,245,897	719,298	—2,448	70,000	646,850	72,163
Southern Pacific Co	6,187e	3,583,350	2,400,159	6,493,027	813,396	914,125	144,592	1,974,421	226,569	4,073,103	2,419,924	—54,697	283,654	2,081,573	—426,032
Texas & Pacific	1,885	802,811	288,666	1,159,412	143,613	271,648	26,356	565,095	38,138	1,044,850	114,562	8,535	38,403	84,694	—110,882
Vandalia	827	490,833	177,828	751,616	80,764	155,562	29,032	336,705	18,547	620,610	131,006	.....	26,791	104,215	—10,729
Wabash	2,515	1,457,063	460,347	2,091,078	190,904	381,544	69,425	1,013,761	68,301	1,723,935	367,143	—2,564	76,948	287,631	—215,491
Yazoo & Missisippi Valley	1,372	631,960	217,467	910,243	118,530	109,958	15,054	304,069	24,578	572,189	338,054	—154	36,053	301,847	151,785
EIGHT MONTHS OF FISCAL YEAR 1911.															
Buffalo, Rochester & Pittsburgh	572	$5,319,941	$735,918	$6,289,241	$610,074	$1,151,878	$90,624	$2,004,227	$106,741	$3,963,544	$2,325,697	$635	$128,000	$2,198,332	—$26,078
Central of Georgia	1,915	5,832,197	2,390,406	8,989,184	1,202,130	1,440,262	261,260	2,823,899	327,007	6,054,558	2,934,626	51,730	366,488	2,619,868	92,693
Chicago & Eastern Illinois	965	6,604,106	1,454,397	8,581,795	817,435	1,483,027	190,415	3,133,430	265,174	5,889,481	2,692,314	—10,934	224,129	2,457,251	72,756
Chicago Great Western	1,495	5,902,748	1,949,595	8,492,102	938,463	1,283,941	372,980	3,428,975	284,523	6,308,882	2,183,220	1,848	262,581	1,922,487	—
Chicago, Indianapolis & Louisville	617	2,675,348	1,052,686	4,084,891	532,924	578,943	132,133	1,464,742	117,638	2,826,380	1,258,511	.....	180,000	1,078,511	—124,404
Cincinnati, Hamilton & Dayton	1,014*	4,590,964	1,161,764	6,411,100	508,075	1,129,590	194,148	2,960,214	175,193	4,967,220	1,443,880	.....	243,716	1,200,164	—118,834
Colorado & Southern	1,173†	5,077,345	1,101,036	6,525,435	754,459	1,253,652	93,767	2,060,764	177,440	4,340,082	2,185,353	—11,184	197,600	1,976,569	—177,011
Denver & Rio Grande	2,542‡	11,858,851	3,543,113	16,109,839	1,848,994	2,785,380	382,271	5,515,244	395,010	10,926,899	5,182,940	—22,484	566,000	4,594,456	166,846
El Paso & Southwestern Co	901§	3,971,033	649,269	4,858,447	614,166	643,722	85,641	1,388,295	181,362	2,913,186	1,945,261	—9,450	149,251	1,786,560	82,267
Elgin, Joliet & Eastern	831¶	5,043,941	58	5,341,196	701,802	1,117,214	32,357	1,724,031	138,409	3,713,813	1,627,383	.....	126,200	1,501,183	—712,888
Florida East Coast	583	1,148,727	853,738	2,284,964	344,217	352,729	51,568	795,411	62,301	1,606,226	678,738	.....	111,641	567,097	158,939
Galveston, Harrisburg & San Antonio	1,338	5,234,807	1,865,892	7,477,442	964,955	1,120,315	219,727	2,741,732	226,405	5,273,135	2,204,307	—21,550	240,818	1,941,939	74,124
Gulf, Colorado & Santa Fe	1,518	5,954,582	2,156,866	8,678,064	1,507,105	1,270,392	194,868	3,277,071	259,003	6,508,439	2,169,626	.....	263,652	1,905,974	334,848
Illinois Central	4,574‖	27,653,116	8,902,577	41,456,268	5,015,914	8,307,086	896,125	14,165,850	854,010	29,238,985	12,217,283	—24,646	1,730,347	10,462,290	2,461,027
International & Great Northern	1,159	4,554,934	1,455,692	6,410,659	927,171	917,182	157,837	2,629,857	173,770	4,805,817	1,604,842	—2,881	174,000	1,427,961	355,201
Iowa Central	559	1,881,780	381,707	2,367,794	279,583	404,252	57,131	991,308	70,191	1,802,465	565,329	.....	78,351	486,978	13,328
Kansas City Southern	827	5,051,658	1,128,246	6,874,591	690,124	896,715	214,105	2,320,359	243,211	4,364,514	2,510,077	.....	230,641	2,279,436	357,689
Lake Erie & Western	886	2,943,327	632,265	3,779,548	614,081	705,445	125,758	1,455,260	99,065	2,999,609	779,939	.....	149,762	630,177	—344,953
Maine Central	932	3,590,389	2,063,621	6,032,203	978,792	887,910	59,678	2,314,212	204,739	4,445,331	1,586,872	13,086	292,167	1,307,791	—431,905
Minnetpolis & St. Louis	1,027	2,463,812	848,328	3,541,859	380,223	454,623	88,638	1,415,817	122,445	2,461,746	1,080,113	—268	158,585	921,260	1,838
Missouri, Kansas & Texas	1,737a	7,935,913	3,318,993	11,991,132	1,562,842	1,681,316	297,872	3,998,607	351,394	7,892,030	4,099,102	802	463,583	3,636,321	—
Missouri, Kansas & Texas of Texas	1,348	4,757,398	2,585,294	7,793,851	1,106,169	535,839	183,895	3,570,876	284,273	5,681,052	2,112,799	—5,599	179,602	1,927,598	450,296
Mobile & Ohio	1,114	5,330,160	988,305	7,342,146	857,367	1,279,349	262,882	2,530,513	271,824	5,201,935	2,140,211	—11,850	200,080	1,928,281	17,746
Nashville, Chattanooga & St. Louis	1,230	5,685,005	1,953,243	8,148,605	1,196,359	1,531,363	277,950	2,885,851	197,478	6,089,001	2,059,604	—4,425	181,287	1,873,892	—79,250
New York, Chicago & St. Louis	562	6,173,474	1,062,670	7,507,626	832,409	988,226	399,874	3,125,241	129,046	5,474,796	2,032,830	—12,899	246,520	1,773,411	—629,805
New York, Ontario & Western	546	4,824,589	1,201,047	6,263,794	741,820	970,595	92,881	2,446,444	140,103	4,391,843	1,871,951	—34,824	140,000	1,697,127	191,344
Philadelphia & Reading	1,022	23,113,611	4,742,425	29,142,078	2,468,615	5,418,404	345,192	9,463,667	527,821	18,223,699	10,918,379	129,424	673,886	10,373,917	—620,412
St. Louis Southwestern	797b	4,217,542	970,288	5,421,661	578,899	834,719	215,108	1,337,679	180,022	3,146,427	2,275,234	—5,682	158,515	2,111,037	128,057
St. Louis Southwestern of Texas	703	2,132,036	720,715	3,027,197	742,566	584,370	85,233	1,305,579	135,536	2,853,284	173,913	—1,732	75,726	96,455	64,095
San Pedro, Los Angeles & Salt Lake	1,105c	3,196,716	1,806,471	5,337,825	964,295	855,861	251,009	1,981,036	137,666	4,189,867	1,147,958	—40,055	214,086	893,817	—79,557
Seaboard Air Line	3,046d	9,541,596	3,125,783	14,106,609	1,902,886	1,905,843	487,534	4,766,387	399,412	9,462,062	4,644,547	—9,409	530,000	4,105,138	165,328
Southern Pacific Co	6,187e	36,301,747	21,501,952	62,002,260	7,580,523	7,921,909	1,313,455	16,717,912	1,830,481	35,364,280	26,637,980	195,728	2,217,632	24,616,076	—2,824,312
Texas & Pacific	1,885	7,762,433	2,848,229	11,427,204	1,270,490	2,107,010	172,682	4,546,764	291,979	8,388,925	3,038,279	—4,430	420,626	2,613,223	—497,478
Vandalia	827	4,851,521	1,657,700	7,228,586	929,447	1,322,599	225,647	2,897,267	158,121	5,533,081	1,695,505	.....	223,051	1,472,454	—125,203
Wabash	2,515	13,716,580	5,135,646	20,329,843	2,239,993	3,209,346	620,152	7,995,379	584,618	14,649,488	5,680,355	—13,403	604,250	5,062,702	—535,495
Yazoo & Mississipp Valley	1,372	5,200,693	1,934,225	7,586,441	1,337,840	1,051,726	119,939	2,314,441	188,871	5,012,817	2,573,624	—3,659	270,048	2,299,917	955,080

Mileage operated on February 28, 1910.—* 1,036 miles; † 1,249 miles; ‡ 2,505 miles; § 867 miles; ¶ 781 miles; ‖ 4,551 miles; *a* 1,724 miles; *b* 773 miles; *c* 979 miles; *d* 2,995 miles; *e* 6,067 miles; — indicates Deficits, Losses and Decreases.

Dr. Seaman A. Knapp.

The death of Dr. Seaman A. Knapp, of the United States Agricultural Department, which occurred in Washington, D. C., on April 1, has been a great loss to the farmers of the United States and especially to those of the southern states.

Dr. Knapp understood thoroughly the agricultural problems of the South, and, as the official in charge of the farmers' co-operative demonstration work of the department, it may be said, comprehensively speaking, that he did more than any other one man in our time to bring about the adoption of improved agricultural methods in the South.

When the Mexican cotton boll weevil began to spread over the fields of Texas and there were predictions that it would render cotton production unprofitable in all of the territory to which it might spread, Dr. Knapp solved the problem of maintaining cotton production in spite of the presence of that insect. Dr. Knapp was an apostle of good farming in every department. He taught the value of fall plowing with deep breaking of the ground, of growing winter cover crops, and of building up soil fertility by the proper rotation of crops and by the intelligent use of manures and commercial fertilizers. He believed in growing live stock, at least to the extent of utilizing all the waste products and idle lands of the farm, and in producing on each farm, as far as possible, all of the foods required by the men and animals on the farm.

One feature of Dr. Knapp's work which I believe to be of inestimable value to the South was his organization of Boys' Corn Clubs. While the immediate purpose of these clubs is the growing of corn, they are performing a much more valuable work for the South in the growing of farmers. Their full value to our section will be realized when Dr. Knapp's Corn Club boys, as grown-up farmers, apply the same methods of intensive farming to other crops and to entire farms that they have used in making record yields of corn on single acres. While doing so much for the boys of the South, Dr. Knapp did not neglect the girls, and the organization of a Girls' Tomato Club at Aiken, S. C., last season marked the beginning of a work which has been greatly enlarged for this season and which, at the time of his death, he was preparing still further to expand.

I feel sure that I voice the sentiments of the farmers of the South and of all the southern people in expressing the opinion that Dr. Seaman A. Knapp was one of the most useful citizens of the United States in his generation, and that, in his death, our whole section has suffered a great loss.—*W. W. Finley* in a letter to the Farmers of the South.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended, until August 10, tariffs presented by the Pennsylvania Railroad, providing for an increase of 15 cents a ton on buckwheat anthracite coal, also to Watkins, N. Y., and to other eastern destinations.

The commission has suspended from May 15 to September 12, proposed advances in coal rates from West Virginia to Lake Erie ports over the Kanawha & Michigan. Similar suspensions were ordered sometime ago in connection with rates proposed by other lines in the same territory.

Reparation Awarded.

William K. Noble v. Jonesboro, Lake City & Eastern et al. Opinion by Commissioner Meyer.

The defendant should have observed the routing specified in the bill of lading. (20 I. C. C., 500.)

Crescent Coal & Mining Company v. Baltimore & Ohio et al. Opinion by Commissioner Clark:

Tariffs of carrier performing the road haul name rates to Chicago, which include delivery on tracks of other carriers in the Chicago switching district, and provide that shipper or consignee shall have 24 hours free time after arrival within which, without further charge, to reconsign to such deliveries on tracks of other carriers. A carrier that is party to the tariffs containing the reciprocal switching arrangements declines to accept cars for such deliveries except at its convenience. Consignee gives reconsignment to the carrying road within the time provided in its tariff. The delivering road delays acceptance of such shipments and the carrying road thereupon assesses demurrage against the consignee. The consignee, having given his reconsignment order and requested delivery of shipment, is powerless to do anything except await the action of the carriers. If defendants' tariffs provide something that it is impossible for them to perform, something that they may not be reasonably required to perform, their recourse is not in the assessment against the shippers or consignees of additional charges growing out of causes in the creation of which neither shipper nor consignee has any part and over which neither of them has any control.

Complaint Dismissed.

Charles Goldenberg v. Clyde Steamship Co. Opinion by the Commission.

On the facts disclosed by the record it is held that defendant's action in connection with the storage of the property in question was not unreasonable and that complainant is not entitled to reparation; but that defendant has failed to comply with the law because it has not filed with the commission a tariff stating definitely the storage privileges and charges applicable to shipments over its line which move partly by railroad and partly by water under a common arrangement for a continuous shipment. (20 I. C. C., 527.)

International Salt Co., of Illinois, complainant, and Morton Salt Co., intervener, v. Genesee & Wyoming et al., defendants, and Detroit Salt Co., and Sterling Salt Co., interveners. Opinion by Commissioner Harlan.

On complaint that a carload rate of 10 cents per 100 lbs. in effect for several years on coarse salt in bulk from Retsof, and certain other originating points in New York, to Chicago, is a normal and reasonable rate between those points and ought therefore to be scaled to intermediate points in Central Freight Association territory in accordance with the percentage system of rates. It is held that the record shows that the rate is compelled by competitive conditions that do not exist at intermediate points. The complaint is dismissed. (20 I. C. C., 530.)

Big Cañon Ranch Co., and Corder & Co., intervener, v. Galveston, Harrisburg & San Antonio Co. et al. Opinion by Commission.

Complainant alleges that the charges exacted by defendants for transportation of certain carloads of sheep from Dryden and Sanderson, Tex., to Soldani, Okla., were unreasonable. It appears that the shipments moved from points of origin to Fort Worth, Tex., where freight charges were paid, and delivery made to the shipper's agent, who thereupon took out new bills of lading for the movement to Soldani. The movement to Fort Worth was intrastate and therefore not subject to the jurisdiction of the commission, and the charges for the interstate movement beyond Fort Worth do not appear to have been unreasonable. (20 I. C. C., 523.)

Failure to Show Damage.

International Salt Co., of Illinois, complainant, and Morton Salt Co., Intervener, v. Pennsylvania Railroad et al. Opinion by Commissioner Harlan.

Reparation on shipments of coarse salt in bulk from Retsof, N. Y., to Detroit, under a rate of 11 cents, subsequently reduced to 7.8 cents under an order by this Commission finding the former rate to be discriminatory, denied on the ground that the complainant has not shown that it was damaged, all competing shippers to Detroit from the same salt field having paid the same rate. (20 I. C. C., 539.)

Refund Allowed on Lost Commutation Ticket.

William E. Moore v. New York & Long Branch Railroad Company. Opinion by the commission:

Complainant is a resident of Philadelphia, Pa. His petition herein, filed December 12, 1910, puts in issue the lawfulness of defendant's regulation governing return of purchase price of commutation tickets which have been lost by the owner.

Complainant bought 50-trip season ticket, between North Asbury Park, N. J., and New York. The ticket was used for one trip from North Asbury Park to New York, then lost and never

recovered. Defendant was notified of the loss and orders were issued directing conductors to refuse to honor any of the coupons from the ticket, and there is no evidence that they were ever presented by anyone for passage. Demand for refund was made by complainant at the expiration of the time limit of the ticket and apparently proof of ownership and identity was satisfactory since an offer of repayment was made by defendant, provided an order of the commission to that effect could be obtained.

The form of the ticket is such that defendant can readily protect itself against fraudulent use thereof. The purchaser's name appears on the inside cover of the book and on the coupon which is surrendered for the first trip. On each of the coupons is stamped the number of the book. Therefore, even if conductors should accept coupons from a person other than the purchaser, that fact can be ascertained at expiration of the time limit by defendant's accounting department. Complainant appears to have complied with all the conditions except that relating to recovery of the lost ticket.

Without at this time attempting to determine the many questions which are pending respecting the extent of our jurisdiction over the commutation fares, or to say what conditions may properly be enforced in connection with the sale of tickets at reduced rates, it seems obvious that carriers may not lawfully attach to the use of commutation tickets conditions which unduly discriminate between the individual purchasers thereof. There are many cases in which recovery of a lost ticket is impossible; and in view of the fact that the carrier is protected against fraudulent use thereof by the form of the ticket, as well as the conditions relating to refund thereon, we see no sound reason for the rule here in question. It is our conclusion that it results in undue discrimination against complainant and others similarly situated and that defendant should be ordered to cease and desist from enforcing it. In the present instance we find that complainant is entitled to refund in an amount equal to the difference between the price paid for the commutation ticket and the one-way fare from North Asbury Park to New York, or $31.35, with interest from October 31, 1910. (20 I. C. C. 557.)

Rates on Grain Left Undisturbed.

Board of Trade of the city of Chicago v. Atlantic City Railroad et al. New York Produce Exchange v. New York Central & Hudson et al. Opinion by Commissioner Prouty:

Both the above complainants attack what are known as ex-lake rates upon grain from Buffalo to eastern points. In the first the complaint is directed against both domestic and export rates, while in the second export rates alone are involved. The two cases were heard together and may be disposed of in a single report.

DOMESTIC RATES.

Grain can move from the western field of production to the eastern point of consumption either by some all-rail route or by what is known as the rail-and-water route. In the latter case it is carried from the point of production to some port upon the Great Lakes, like Chicago or Duluth, by rail, is taken from the western lake port by water to some eastern lake port, of which Buffalo is the principal one, and is thence transported by rail to destination. When grain takes the all-rail route it may pass through Chicago or it may reach its eastern destination without entering that market. If it takes the rail-and-water route, it must move through some lake port, of which Chicago is the largest. It is therefore for the advantage of Chicago that such rates should be maintained as will permit grain to move by the water route. The board of trade of that city, which is an organization having in charge the grain interests of that community, insists that rates are now so constructed as to divert traffic from the water route to the all-rail route and that this results in undue prejudice against that locality.

The position of the complainant will be best understood by an illustration drawn from the rates now in effect. The rate on wheat from Chicago to Boston is, at the present time, 18 cents per 100 lbs. If this grain moves by the New York Central lines it would pass through the city of Buffalo en route and would be transported from Buffalo to Boston by the New York Central & Hudson. For this service that carrier would receive, under the present adjustment of rates, 7.9 cents per 100 lbs., that being its division of the joint through rate after all allowances have been made for terminal expenses, etc. This figure is taken from the brief of the complainant and is sufficiently accurate for the purpose of illustration.

By ex-lake rates are meant those rates which apply upon grain reaching Buffalo from the west by water. The present ex-lake rate on wheat from Buffalo to Boston is 13.3 cents per 100 lbs. This ex-lake rate includes elevation; that is, the taking of the grain from the ship into the elevator and again loading it from the elevator into the car, for which the charge is one-half cent per bushel, or, in case of wheat, 0.83 of 1 cent per 100 lbs. When this absorption is deducted from the ex-lake charge the carrier receives for handling the grain from Buffalo to Boston about 12.5 cents per 100 lbs. The cost of transporting to Boston the wheat which has reached Buffalo by lake is to every practical intent the same as that of transporting the wheat which has come to Buffalo by rail, and the complainant insists that when the New York Central charges for handling the ex-lake wheat 12.5 cents, while it handles the all-rail grain for 7.9 cents, it is guilty of an unjust discrimination against the lake grain, and therefore against the city of Chicago, which is interested in moving the grain by water.

The defendants reply that their ex-lake rate from Buffalo to Boston is reasonable; that the rate from Chicago to Boston is competitive, and that the division which they are willing to accept from Buffalo to Boston as the price of engaging in this competitive business ought not to be used as the standard by which to measure the reasonableness of their ex-lake rate from Buffalo.

As already observed and as fully stated in the *Banner Milling case*, flour ground at Buffalo is almost entirely from wheat received ex-lake at that port. It is difficult to see how this Commission, if it is to maintain the parity of rate between wheat and flour which generally prevails, upon the strength of which mills have been erected at Buffalo and throughout all parts of the United States, and which has been generally approved by this Commission, could enforce or even permit the charging of a rate upon grain from Buffalo materially lower than the rate upon the flour manufactured at Buffalo from that grain. To sustain the contention of the complainants would require us to establish rates on wheat from Buffalo from 3 to 5 cents per 100 lbs. less than the present flour rates. The effect of such a rate adjustment would be not only to injure the mills at Buffalo but to seriously affect those at all western points. While there is very great force in the contention of the complainant, we feel that, upon a view of the entire situation, it can not be accepted. If this rate from Buffalo were unreasonably high, so that the cost of transporting grain or grain products from the western point of origin via the Great Lakes to the eastern point of consumption was unreasonably high, it would be our clear duty to reduce this rate; but where it is practically admitted that the transportation charge is not excessive, and where we are asked to take this action simply because more grain would thereby flow through a particular grain market, we are at liberty, in just consideration of all interests, to decline to interfere with the present arrangement, which is, in the main, satisfactory.

Ex-lake rates were in fact for many years lower than corresponding local rates from Buffalo, and the complainants point to this as the most conclusive evidence that the maintenance of lower ex-lake rates today would not break down the rate structure. But it must be remembered that until about the time when these rates became substantially what they now are the published tariff was not observed, and that this was especially true of highly competitive business, like grain and grain products, where the rate was of vital importance.

It should also be noted that Buffalo millers have always insisted that the charging of a lower rate upon ex-lake wheat than upon the flour ground from that wheat was a discrimination against Buffalo. Now that published rates are actually observed, and that the margin of profit tends to decrease rather than increase, we can not assume that any locality can grind flour under a permanent rate disability. To make the rate on ex-lake wheat to New York City materially lower than the rate on flour from Buffalo would inevitably throw the grinding of flour consumed in the city of New York and that vicinity to the seaboard.

EXPORT RATES.

The New York Produce Exchange asks a rate of 4 cents per bushel on export grain and defendant's refuse to grant it.

The real reason why these defendants decline to accede to the request of the New York interests for the 4-cent export rate seems to be the fear upon their part that the result of complying with that request would be to disorganize the general rate structure upon grain and grain products from the west to Atlantic seaboard territory.

In 1908 the defendants, upon the insistent request of the New York grain interests, did establish and maintain, for 57 days, an export rate of 4 cents per bushel. This rate was withdrawn because the defendants believed that its continuance would result in a reduction of the rates from the west upon grain and grain products. During the season of 1910 a rate of 4 cents was applied to the movement of Canadian grain in bond, but the defendants are satisfied that no distinction can be maintained between Canadian and American wheat and, therefore, upon a view of the entire situation, have declined to restore the 4-cent rate.

The difference between the domestic and export rate from Chicago at the present time is 3 cents per 100 pounds. The difference between the export and the domestic rates, ex-lake, at the present time is 1 cent per bushel, or six-tenths of a cent per 100 lbs. It will be seen, therefore, that the difference in export rates where the wheat moves by the Great Lakes from Chicago is much less than the difference where it moves all rail. At 4 cents per bushel the difference would still be in favor of the all-rail route.

American millers insist that to make a rate of 4 cents on wheat without a corresponding rate upon the product of wheat is to discriminate against the home miller in favor of his foreign competitor. It can not be denied that the result of making a lower transportation charge on the wheat than upon the flour to foreign destinations does operate in favor of the foreign miller, but it must also be recognized that the cost of transporting wheat by water is less than the cost of transporting flour by water, and that wheat will move to the foreign consumer in the form of wheat cheaper than it can be moved in the form of flour, unless the Government sees fit to make an arbitrary rule that whatever carrier transports wheat at a certain price shall carry flour at the same price, which is not suggested. This wheat will move abroad through the port of Montreal if it does not move through the port of New York, and it is doubtful whether the claim of the miller and of the western railroad that the effect of this 4-cent ex-lake export rate would be discriminatory toward them is well taken. It would not materially increase the amount of wheat which will be exported; it would simply determine whether that wheat should flow through an American or a Canadian port of export.

We are inclined to think that, under all the circumstances, these carriers might well establish, during the period of navigation, a 4-cent ex-lake export rate upon wheat and corresponding rates upon other grain, but the rate itself is so low, the margin over and above the cost of operation is so narrow, that we do not feel warranted in making this requirement. Whether it shall be established is a matter of policy which must be left to the carriers themselves, and not a matter of right which may be demanded by the port of New York. When the improvements in progress upon the Erie Canal are completed that waterway will undoubtedly determine the rate at which grain shall be carried from Buffalo to tidewater. (20 I. C. C., 504.)

STATE COMMISSIONS.

The lower house of the Colorado legislature has passed a bill which provides for enlargement of the powers of the state railway commission, including the power to make and enforce rates.

The California State Commission has granted the railways an extension of 60 days from April 10, the final day according to new law, in which to file intrastate tariffs in conformity with the long-and-short-haul clause of the state constitution.

The State Railroad Commission of California has refused to approve the tariffs filed with it by Wells, Fargo & Company's express and the company has been ordered to appear before the commission on May 9 and justify the charges. If the company is not able to explain to the satisfaction of the commission, this body will fix the rates.

The Manitowoc & Northern Traction Company petitioned the Railroad Commission of Wisconsin for authority to increase the passenger rate of 10 cents between the cities of Manitowoc and Two Rivers to 15 cents, an amount in excess of the maximum provided in the franchise, and for an order putting in effect such increased rate as an emergency rate, pending the hearing and decision on the application. The case was taken to the courts in proceedings for an injunction. The circuit court held that the existing rate of 10 cents was unreasonable and the proposed rate of 15 cents reasonable. The supreme court held that the commission has power, in proper proceedings, to increase the rate beyond the maximum provided in the franchise. It is apparent that if the franchise rates are restored, it will result in such a diminution of the petitioner's revenue as to jeopardize the public service. Petitioner is therefore authorized to maintain its present rate of 15 cents until further order of the commission. (6 W. R. C. R. 395.)

The Railroad Commission of Wisconsin has held that the rates for petroleum products should not exceed the rate of charge for articles that come in class four of the western classification. The National Refining Company alleged that the less than carload rates on certain classes of petroleum products from La Crosse and Milwaukee to Wisconsin points are unjust and unreasonable, in that the respondents exact the third class rate instead of the fourth class rate or less, which the petitioners deem reasonable. It appeared from the testimony that the carload rate paid by the Standard Oil Company from Whiting, Ind., its shipping point, to Wisconsin points, distances about 70 miles greater than those covered by shipments from Milwaukee to the same points, is about equal to the fifth class rate from Milwaukee, somewhat lower than the fourth class rate and about half of the third class rates now in effect; that the Wisconsin rates are higher than the rates in other states where similar commercial conditions prevail, and higher than the rates on similar commodities. The railway companies which are involved were ordered to discontinue the present classification and rates.

In the case of the Wisconsin Pulp and Paper Manufacturers v. Chicago & North Western et al the Railroad Commission of Wisconsin holds that carriers are ordinarily entitled to rates that will yield sufficient revenue to cover operating expenses, including a reasonable amount for interest and profit; that no rates should be so low that they do not cover their fair share of operating expenses, including something in the way of net earnings; that the earnings per unit of profit should be lower for low grade than for high grade articles; that the relation which the rates on the various classes of freight ought to bear to each other, largely depends upon such factors as the value of the articles, their bulk in proportion to their weight, the risk involved, the magnitude and regularity of the traffic. The petition in this case alleges unreasonable rates for the transportation of coal from the Lake Michigan ports in Wisconsin to various points in the Fox River Valley and the Wisconsin River Valley districts. The rates at present in effect are uniform to the different points in each of the above named districts, regardless of the distance of such receiving points from the respective shipping points. The petitioners contend that if the railways wish to continue group rates, made to apply from all lake ports equally, they should be based upon the shortest haul instead of on the longest, as it is alleged is now the case; or, if the railways prefer, that the rates from the different lake ports should be based upon the average distance from each port into the two manufacturing groups involved, without any attempt to put the ports on an equal footing. Many comparisons were made between the rates complained of and the rates in neighboring states where similar conditions prevail, and also with the rates in the paper mill districts in the New England states. Some evidence was also introduced relative to the cost to the carrier of the services involved. The commission says in the instant case the present grouping should be preserved, and that the rate on coal from the lake ports to the two mill groups should be based on the average distance from these ports to some point in the center of each of these mill groups; that under the facts disclosed herein, no reduction in the rate to the Wisconsin river mills can be made at this time; that the rate to the Fox river mills should be reduced from 75 cents to 65 cents per ton. (6 W. R. C. R. 436.)

COURT NEWS.

The Commerce Court last week announced, in connection with the case of Proctor & Gamble, and others, that it would take jurisdiction of cases relating to interstate commerce which had been dismissed by the Interstate Commerce Commission on account of lack of jurisdiction.

In suit now before the Commerce Court, the attorney of the Goodrich Transit Co., operating a line of boats on the Great Lakes, has attacked the power of the Interstate Commerce Commission to prescribe rules for accounting for a company, the great part of whose business is intrastate and only a very small part interstate.

The Supreme Court of the United States has restored to its docket for reargument the case involving the constitutionality of the laws of Missouri limiting passenger fares to two cents and limiting certain freight rates. The cases involving the constitutionality of the two-cent passenger fare law of West Virginia is to be argued on the 10th of next October.

The Supreme Court of Iowa has decided in favor of the Iowa Railway Commission and against the Chicago, Milwaukee & St. Paul in what is known as the Clark Coal Company case. The coal company had been shipping coal from its fields in Illinois into Iowa, paying the interstate rate to Dubuque, Iowa, and then reconsigning the same cars out over the St. Paul and other roads to different points in Iowa, for which latter service it paid the state rate. When the St. Paul refused to accept the shipments unless the coal was transferred into its own cars, the railway commission issued an order requiring it to do so. The case was then brought before the district court, which upheld the commission, and the Supreme Court has now affirmed the decree of the lower court.

Imprisonment for Bill-of-Lading Frauds.

In the United States District Court at Aberdeen, Miss., April 13, J. H. Miller was sentenced to seven years in prison and to pay a fine of $11,000 for fraudulent use of the mails; and L. C. Steele and C. H. G. Linde, members of the same firm with Miller, were sentenced to two years imprisonment and a fine of $10,000 each. These suits were based on cotton bill frauds, accounts of which made such a sensation last autumn, when it was found that banks and manufacturers in England had suffered losses, aggregating millions of dollars, by accepting bills-of-lading, purporting to represent cotton which had been shipped in Alabama and other southern states, but which had been procured from railway freight agents without the delivery of the cotton. In connection with the present convictions, the New York *Journal of Commerce* says:

The cotton men of the South are much pleased with the outcome of the Steele-Miller trial. A telegram is quoted saying that "the entire South feels that the stain on its commercial affairs has been removed." New York cotton men and bankers believe that the conviction will deter other shippers from negotiating fraudulent documents. The opinion was expressed that the members of the Knight-Yancey firm ought to be dealt with in the same way and receive severe punishment. The long delay in bringing the southern cotton men to justice has created a bad feeling abroad, where it is believed in some quarters that the American government has been rather lax because the sufferers from the frauds were not American citizens.

The East Malay States Trunk Line northward from Gemas is the proposed line which will ultimately connect with the proposed Peninsular Railway from Bangkok, Siam, provided for in the recent Anglo-Siamese treaty. The first section is 76 miles in length connecting Gemas with Kuala Semantan. The survey of this section was commenced in March 1906, and completed in April, 1907. Sanction of construction was given in July, 1907. On this section there are 338 bridges and the line deviates at the 62nd mile to avoid danger from the flood water of the Pahang river. In December the earthwork on this section was reported completed to the Kuala Semantan end and the rail head was within nine miles of that point.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

B. F. Bush, president of the Western Maryland, has been elected president of the Missouri Pacific. See an account of Mr. Bush's railway life elsewhere in this issue.

C. C. Green, acting secretary of the Central of Georgia, at Atlanta, Ga., has been appointed assistant secretary of the Illinois Central and the Central of Georgia, with office at Chicago.

Edward J. White, an attorney at Aurora, Mo., has been appointed assistant to the general solicitor of the Missouri Pacific-Iron Mountain system, with office at Kansas City, Mo., succeeding Elijah Robinson, resigned.

W. H. V. Rosing, mechanical engineer of the Missouri Pacific, at St. Louis, Mo., who was appointed assistant to vice-president and general manager of the St. Louis & San Francisco on April 1, has been appointed assistant to Vice-President Nixon, effective May 1, in special charge of mechanical matters. B. T. Wood, chief clerk in the office of B. L. Winchell, president, at St. Louis, has also been appointed an assistant to Mr. Nixon, in charge of office business relating to operation, maintenance and other matters not assigned to Mr. Rosing.

R. E. Powers, secretary and treasurer of the Gulf & Ship Island, at Buffalo, N. Y., has been elected senior vice-president and treasurer, with office at Buffalo. W. T. Stewart, general superintendent, at Gulfport, Miss., has been elected vice-president and general manager, with office at Gulfport. D. H. Jack has been appointed general counsel, with office at Bradford, Pa. B. E. Eaton has been appointed general attorney, and J. C. Simpson has been appointed secretary, both with offices at Gulfport, Miss. K. B. Hazzard has been appointed assistant secretary, with office at Buffalo, N. Y.

Alexander Simpson Greig, vice-president and general purchasing agent of the St. Louis & San Francisco, with offices at St. Louis, Mo., has been appointed also assistant to the president.



A. S. Greig.

Mr. Greig was born October 25, 1861, in Aberdeen, Scotland, and he received a common school education in that country. He began railway work in 1883 as secretary to the purchasing agent of the Denver & Rio Grande. Three years later he was appointed secretary to the superintendent of machinery and in 1889 became chief clerk to the general superintendent. He was appointed trainmaster of the Santa Fe, Prescott & Phoenix in 1896, and in less than two years was made general superintendent and traffic manager of the El Paso Northeastern and the El Paso Southwestern, where he remained until 1903, and during these five years had charge of the construction of nearly 500 miles of road. In January, 1904, he was made clerk to B. L. Winchell, then president of the Chicago, Rock Island & Pacific, and two years later was appointed assistant to the president of the St. Louis & San Francisco, which office he held until June, 1907. He then went to New York as assistant to B. F. Yoakum, at that time chairman of the executive committee of the Rock Island-Frisco lines, and in December, 1909, when the Rock Island-Frisco merger was dissolved, he was appointed vice-president and general purchasing agent, which office he continues to hold in addition to his duties as assistant to President Winchell.

Operating Officers.

N. E. Ball has been appointed assistant general manager of the Fernwood & Gulf, with office at McComb, Miss.

R. J. Clancy has been appointed assistant to the general manager of the Southern Pacific, with office at San Francisco, Cal.

W. P. Allan, acting commissioner, has been chosen commissioner of the Pacific Northwest Demurrage Bureau, headquarters at Seattle.

W. E. Leonard, superintendent of transportation of the Gulf & Ship Island, has been appointed superintendent, with office at Gulfport, Miss.

C. E. McMullin, who was recently appointed superintendent of terminals of the Northern Pacific at Tacoma, Wash., as was previously announced, will also continue in charge of the Seattle terminal.

William Bryden, trainmaster of the Wabash, Chester & Western at Chester, Ill., has been appointed superintendent, with office at Chester, succeeding Henry Mason, resigned on account of ill health.

D. L. Sommerville, division engineer of the Western division of the New York Central & Hudson River, at Buffalo, N. Y., has been appointed assistant superintendent of the Pennsylvania division, with office at Jersey Shore, Pa., succeeding J. W. Evans, promoted.

George Hodge, superintendent of the Canadian Pacific, at Montreal, Que., has been transferred to Toronto, Ont. A. L. Smith, superintendent at Farnham, Que., succeeds Mr. Hodge, and J. K. McNellie, superintendent at London, Ont., succeeds Mr. Smith.

E. Thomason, general manager of the Durham & Southern, and not the Durham & Charlotte, as previously announced in these columns, having resigned, his position has been abolished and all correspondence should in future be addressed to J. E. Stagg, vice-president, at Durham, N. C.

F. J. Gavin, chief clerk to general superintendent of the Great Northern, at Spokane, Wash., has been appointed a trainmaster of the Kalispeel division, with office at Whitefish, Mont. F. E. Clarity, traveling car agent, has been appointed chief clerk to general superintendent, succeeding Mr. Gavin.

E. S. Cooper, chief train despatcher of the First and Second districts, Eastern division of the Grand Trunk, at Island Pond, Vt., has been transferred to the Fourth and Fifth districts, with office at Bonaventure station, Montreal, Que., succeeding E. S. Waterman, resigned. T. H. Mason succeeds Mr. Cooper.

J. S. Pyeatt, superintendent of the Pere Marquette, at Detroit, Mich., has been appointed superintendent of the River and Cape divisions of the St. Louis & San Francisco, comprising what was formerly known as the Third district, with office at Chaffee, Mo., succeeding J. A. Frates, promoted.

F. I. Cummins, traffic manager and general superintendent of the South Dakota Central at Sioux Falls, S. D., has been appointed assistant general manager, with office at Sioux Falls, a new position. Mr. Cummins will continue in charge of the traffic department and his former office has been abolished.

J. H. Keefe, assistant to the second vice-president and general manager of the Gulf, Colorado & Santa Fe at Galveston, Tex., has been appointed assistant general manager, with office at Galveston, a new position, and his former title has been abolished. In addition to his former duties he will have direct charge of transportation matters pertaining to export, import and coastwise traffic.

J. W. Evans, whose appointment as superintendent of the Ontario division of the New York Central & Hudson River, at Oswego, N. Y., has been announced in these columns, was born October 25, 1864, at Remsen, N. Y. He began railway work in May, 1884, on the Utica & Black River, and until October, 1895, he was consecutively operator, despatcher and chief despatcher of the Utica & Black River, the Rome, Watertown & Ogdensburg, and their successor, the New York Central & Hudson River. He resigned in 1905 to become trainmaster of the Choctaw, Oklahoma & Gulf, now a part of the Chicago, Rock Island & Pacific, at South McAlester, Okla., remaining with that company until January, 1900, when he went to the Atlanta & West Point, with office at Montgomery, Ala. In October, of the same year he returned to the service of the New York Central & Hudson River, as despatcher at Corning, N. Y., and in March, 1903, was promoted to assistant trainmaster at Clearfield, Pa., and in May, 1905, was made trainmaster at Jersey Shore. Mr. Evans was appointed assistant superintendent at Jersey Shore in September, 1907, which position he held at the time of his recent appointment as superintendent of the Ontario division of the same road.

Traffic Officers.

A. J. McDowell has been appointed a traveling dairy agent of the St. Louis & San Francisco, with office at St. Louis, Mo.

J. G. Eads, chief clerk to the assistant general freight agent of the Denver & Rio Grande at Pueblo, Colo., has been appointed a traveling freight and passenger agent, with office at Pueblo.

W. H. Allen, district passenger agent of the Minneapolis, St. Paul & Sault Ste. Marie, at New York, has been promoted to the new position of general eastern passenger agent, with office at New York.

E. E. Wade, chief clerk in the passenger department of the Southern Pacific, has been appointed assistant general passenger agent, with office at San Francisco, Cal., succeeding F. E. Batturs, promoted.

W. M. Hogue has been appointed a traveling freight agent of the Chicago Great Western, with office at Des Moines, Iowa, succeeding John L. Sullivan, resigned to accept service with another company.

W. S. Dewey, traveling freight agent of the Chicago, Burlington & Quincy at Cleveland, Ohio, has been appointed traveling freight agent, with office at Boston, Mass., succeeding E. Copeland, promoted.

George D. Blair, Jr., has been appointed agent of the Union Line of the Pennsylvania Lines West of Pittsburgh, with office at South Bend, Ind., succeeding George E. Trenam, resigned to engage in other business.

J. J. Carroll, general baggage agent of the Chicago & Western Indiana at Chicago, having been appointed station master at the Dearborn station, succeeding T. W. Evans, deceased, Robert L. Parmelee has been appointed general baggage agent.

J. H. Davis, traveling freight and passenger agent of the Colorado Midland at Salt Lake City, Utah, has been appointed general agent, with office at Salt Lake City. F. N. Dowler has been appointed a general agent, with office at New York City.

W. J. Keane, contracting agent of the Lackawanna Fast Freight Line at St. Louis, Mo., has been appointed commercial agent of the Rutland Michigan Central Line and southwestern agent of the Ontario Central Despatch, with office at St. Louis.

Robert B. Creagh, traveling passenger agent of the Southern Railway, at Selma, Ala., has been promoted to district passenger agent, with office at Birmingham, succeeding M. H. Bone, promoted. Emmet S. Sullivan, city passenger and ticket agent, at Selma, succeeds Mr. Creagh, and Grover C. Robson succeeds Mr. Sullivan. Willis H. Parnell, traveling passenger agent at Raleigh, N. C., has been transferred to Norfolk, Va., succeeding F. R. McMillin, promoted. J. O. Jones, city ticket agent at Raleigh, N. C., succeeds Mr. Parnell, and Marshall H. Schell succeeds Mr. Jones.

W. B. Bamford, general freight agent of the Canadian Pacific, at St. John, N. B., has been appointed division freight agent, Atlantic division, with office at St. John. H. E. MacDonnell, general freight agent, at Montreal, Que., has been appointed division freight agent, Eastern division, at Montreal, and M. H. Brown, general freight agent, at Toronto, Ont., has been appointed division freight agent, Ontario division, at Toronto. J. H. Griffin has been appointed district freight agent, Ontario division, at Toronto. W. J. Grant has been appointed district freight agent, at Hamilton, and L. Mulkern, has been appointed district freight agent, at London; W. S. Elliott, has been appointed division freight agent, Lake Superior division, at North Bay, and R. J. Hunt, has been appointed chief of tariff bureau, at Montreal, Que.

The freight traffic department of the Western Lines of the Canadian Pacific, of which W. B. Lanigan, assistant freight traffic manager at Winnipeg, Man., is in direct charge, has been reorganized into the Central Western, Kootenay and Boundary, and Pacific divisions as follows: R. E. Larmour, general freight agent at Winnipeg, has been appointed division freight agent of the Central division at Winnipeg; and reporting to him George H. Smith, assistant general freight agent at Winnipeg, has been appointed a district freight agent at Winnipeg, and R. W. Drew has been appointed a district freight agent, with office at Saskatoon, Sask. John Halstead, general freight agent at Calgary, Alta., has been appointed division freight agent of the Western division at Calgary. W. R. Haldane, general freight agent at Nelson, B. C., has been appointed division freight agent of the Kootenay and Boundary divisions, with office at Nelson. W. C. Bowles, general freight agent at Vancouver, B. C., has been appointed division freight agent of the Pacific division at Vancouver; and reporting to him F. H. Clendenning, assistant general freight agent at Vancouver, has been appointed a district freight agent at Vancouver, and W. H. Gardiner has been appointed a district freight agent, with office at Victoria, B. C. R. G. Holmes has been appointed chief of the tariff bureau, with office at Winnipeg, in charge of tariff publications and divisions on the Western Lines.

J. S. Hall, whose appointment as general passenger agent of the Lake Erie & Western, with office at Indianapolis, Ind., has been announced in these columns, began railway work 27 years ago as a ticket clerk with the Michigan Central at Detroit, Mich. He was later made agent at Battle Creek, Mich., and then Michigan passenger agent, first with office at Grand Rapids and then at Jackson. He was afterwards transferred to Detroit as Michigan passenger agent, and was then promoted consecutively to district passenger agent, general agent in the passenger department and assistant general passenger agent, resigning the last office on April 1, to become general passenger agent of the Lake Erie & Western, the Fort Wayne, Cincinnati & Louisville and the Northern Ohio, with office at Indianapolis, Ind.



J. S. Hall.

Engineering and Rolling Stock Officers.

Guy H. Watson has been appointed roadmaster and supervisor of bridges and buildings of the Montpelier & Wells River, with office at Montpelier, Vt., succeeding F. E. Dodge, deceased.

George E. Cessford has been appointed district master mechanic of the Chicago, Milwaukee & Puget Sound, with office at Miles City, Mon., succeeding A. V. Manchester, resigned.

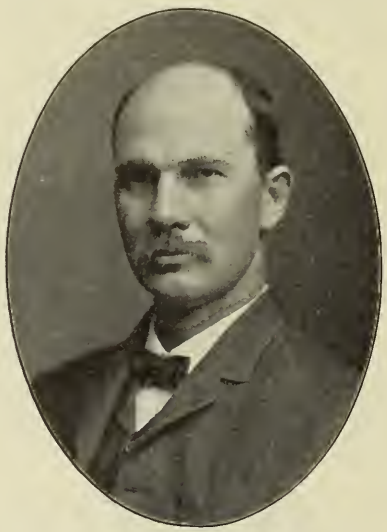
D. B. Bartholomew, assistant supervisor of signals of the Pennsylvania Railroad, at Camden, N. J., has been appointed assistant supervisor of signals of the New York division, with office at Jersey City, N. J.

W. H. V. Rosing has been appointed assistant to Vice-President Nixon of the St. Louis & San Francisco, in special charge of mechanical matters. (See an item under Executive, Financial & Legal.)

B. M. McDonald, division engineer of the Pennsylvania division of the New York Central & Hudson River, at Jersey Shore, Pa., has been appointed division engineer of the Western division, with office at Buffalo, N. Y., succeeding D. L. Sommerville, promoted. J. M. Fitzgerald, assistant signal engineer, at Albany, has been appointed engineer maintenance of signals, with office at Albany. J. Parker, signal supervisor, at Buffalo, has been appointed signal supervisor of the Western division, with office at Rochester, and J. W. Hackett, of the signal department at Albany, has been appointed signal supervisor of the Buffalo division, with office at Buffalo, succeeding Mr. Parker,

B. M. McDonald, who has been appointed division engineer of the Western division of the New York Central & Hudson River, with office at Buffalo, N. Y., was born January 17, 1872, at Springfield, Mass., and graduated from the high school of his native town in 1891, and in 1896, he graduated from the School of Civil Engineering at Lehigh University. In 1897 Mr. McDonald entered the service of the Pennsylvania Railroad in the maintenance of way department, and in May, 1899, he went to the New York Central & Hudson River, and since that time he has been in the service of that company, consecutively, as assistant supervisor of track on the Harlem division and the Mohawk division, then supervisor of track on the Western division; Rome, Watertown & Ogdensburg division, and Mohawk division. On July 1, 1905, he was appointed division engineer of the Pennsylvania division with office at Jersey Shore, Pa., which position he held at the time of his recent appointment as division engineer of the Western division.

Robert L. Doolittle, whose appointment as superintendent of motive power of the Atlanta, Birmingham & Atlantic, with office at Fitzgerald, Ga., has been announced in these columns, was born in April, 1867, at Waverly, Ala. He was educated in the common schools and began railway work in January, 1885, as a locomotive fireman on the Columbus & Western, now a part of the Central of Georgia, and the following year went to the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, as a machinist's apprentice. In 1893 he was appointed general foreman of the steam lines of the Metropolitan Street Railway, at Atlanta, Ga., and two years later entered the service of the Atlanta Consolidated Street Railway. From 1897 until January, 1902, he was out of railway work, and was then appointed assistant master mechanic of the Central of Georgia, at Chattanooga, Tenn. He left this position in August, 1905, and again returned to railway work in July, 1907, as assistant master mechanic on the Central of Georgia, at Macon, Ga. In October, 1907, he went to the Atlanta, Birmingham & Atlantic as master mechanic, which position he held at the time of his recent appointment as superintendent of motive power.



R. L. Doolittle.

Special Officers.

F. E. Resler has been appointed agent of the land and industrial department of the Southern Railway and the Mobile & Ohio, with office at Columbus, Miss., a new agency.

OBITUARY.

W. S. Polhemus, until the latter part of 1909 joint division superintendent of the Texas & Pacific and the Missouri, Kansas & Texas at Fort Worth, Tex., died at Fort Worth on April 13, at the age of 73 years. Mr. Polhemus began railway work as a brakeman on the New York Central & Hudson River. He went to the Central of New Jersey as assistant superintendent, and was then division superintendent and later general superintendent. In 1888 he was appointed joint division superintendent of the T. & P. and the M., K. & T., at Forth, Worth, Texas.

Ford Woods, until January, 1911, assistant general freight agent of the Cleveland, Cincinnati, Chicago & St. Louis and the Cincinnati Northern, with office at Indianapolis, Ind., died in that city on April 14. Mr. Woods was born at Albion, Ill., in August, 1850, and began railway work in 1867 with the Illinois

Central. From that time until his retirement last January he was connected with the freight traffic department of different roads in Illinois, Indiana and Ohio. He became assistant general freight agent of the Big Four in 1890, and for a number of years from 1893 was general freight agent of the Peoria & Eastern division of that road.

Charles W. Goodyear, former president of the Buffalo & Susquehanna, the New Orleans Great Northern and the Buffalo, Attica & Arcade, died at Buffalo, N. Y., on April 17. Mr. Goodyear was born October 5, 1846, at Cortland, N. Y., and was educated at Cortland Academy. He was admitted to the bar in 1871, and practiced law until 1887, when he was elected vice-president of the Sinnemahoning Railroad, now a part of the Buffalo & Susquehanna. Mr. Goodyear was interested in the development of timber and coal lands, and his interest in railway construction began in connection with the development of his lumber interests. His brother, F. S. Goodyear, was associated with him in his Pennsylvania enterprises and also in the development of yellow pine timber lands in Mississippi and Louisiana. Mr. Goodyear was also interested in numerous industrial and banking institutions, and was a director in the General Railway Signal Company of Rochester.

Edward A. Moseley, secretary of the Interstate Commerce Commission, died at his home in Washington, April 18, after a long illness. He had been suffering from heart trouble since last summer, and this was complicated at the last with acute kidney disease. Mr. Moseley was born in Newburyport, Mass., in 1846. He first came into national prominence in 1887, having been appointed secretary of the Interstate Commerce Commission on the organization of that body in that year; but before this he had been a member of the legislature of Massachusetts, and was active in politics in that state. On going to Washington he at once took a hand in the efforts of the railway brotherhoods to secure such legislation as they wanted from Congress, and he has been prominent in everything of that kind that has been done at the capital during these 24 years. His energy and success in these lines made him very popular with all of the brotherhoods, and his office was filled with engrossed testimonials to his friendliness, and to the great value of his humanitarian labors. The legislature of Massachusetts adopted a joint resolution thanking him for what he had done. After the war in Cuba the administration of that country called upon Mr. Moseley, as secretary of the commission, to guide the new government in the establishment of freight tariffs and other traffic regulations; he went to Cuba, furnished what they wanted, and took no pay for his services. With similar unselfishness he espoused the cause of the labor unions in law suits to test the validity of the safety appliance laws, appearing in the supreme court as their attorney, without compensation. On the establishment of the Anthracite Coal Strike Commission in 1902, President Roosevelt appointed Mr. Moseley assistant recorder of that body. About a year ago the University of Notre Dame (Indiana) conferred upon him the degree of Doctor of Laws. Mr. Moseley is survived by a widow, a daughter, two brothers and a sister.

Secretary Moseley has been known to railway men mostly in his capacity of champion of the employees in the enactment and enforcement of the safety appliance laws. He was a man of independent means, and no one ever charged him with other than honest generosity in what he did for the trainmen; but, glorying in his Irish blood, he avowed that he loved a fight, and those railway officers who measured swords with him sometimes thought he carried this love too far. This was only one side of his character, however, for he was a most genial companion. He saw to it that the railways were vigorously prosecuted for violations of the coupler law and, on the other hand, resisted pressure put on him to try to enforce to the letter the unworkable air-brake law, as applied to long trains on steep grades.

Though neither a mechanical man nor a railway expert he has been entrusted by the commission with substantially the entire management of the safety appliance laws; and those Washington correspondents who say that he was the adviser of presidents and congressmen are not far from right, for these law-makers have uniformly made it their business to know the desires of the labor unions, and on this subject, in the railway field, no one could inform them more accurately than Mr. Moseley. And it must be said that in many cases he caused those desires to be more reasonable than they otherwise would have been.

Railway Construction.

New Incorporations, Surveys, Etc.

Baltimore & Ohio.—A contract has been given to H. S. Kerbaugh, Incorporated, Philadelphia, Pa., for piercing a tunnel at the summit of the Allegheny mountains in the vicinity of Sand Patch, Pa. The new tunnel will be of standard B. & O. design, with a bore of about 4,000 ft. and 30 ft. high, double-tracked throughout and lined with brick. Sand Patch is on the Connellsville division between Cumberland, Md., and Connellsville, Pa. The new tunnel is to cost about $1,250,000. It will greatly facilitate the operation of trains by providing three tracks on one of the busiest sections of the train line to Pittsburgh and Chicago. Work on the improvement will be started without delay.

Birmingham & Northwestern.—An officer writes that a contract has been given to J. W. Wright, Jr., Union Springs, Ala., to build from Jackson, Tenn., northwest to Dyersburg, 50 miles. The contract calls for the completion of the work within six months. Construction work is to be started at the Jackson end. The work calls for the handling of about 500,000 cu. yds. of earth work, clearing 100 acres of land, constructing 3,300 lin. ft. of trestles and building a 70-ft. steel span across Forked Deer river. The line will pass through Madison, Crockett and Dyer counties, via the towns of Whitestore, Humphries, Bells, Alamo, Crockett Mills, Friendship and Bessents, and traverses some of the best timber and farming lands in west Tennessee. Connection will be made with the Nashville, Chattanooga & St. Louis, the Illinois Central and the Mobile & Ohio at Jackson; the Louisville & Nashville at Bells, and with the Illinois Central and the Chicago, Memphis & Gulf at Dyersburg. R. M. Hall, president, Jackson; Mike Harvey, chief engineer, Dyersburg. (March 17, p. 525.)

Canada & Gulf Terminal.—An officer of this company, which operates a line from Ste. Flavie, Que., via Little Metis to Matane, 36 miles, is quoted as saying that plans are nearing completion to build an extension through the Gaspe peninsula to Gaspe basin, about 180 miles.

Canadian Northern.—This company is said to be asking for bids up to May 12 to build 163 miles of line as follows: Hope, B. C., to Boston Bar, 40 miles; Boston Bar to Lytton, 28 miles; Lytton to Ashcroft, 44 miles; Ashcroft to Kamloops, 51 miles. Some of the work will be heavy, and there will be a large amount of tunnels, including one of 2,400 ft. on the north side of Kamloops lake at Big Bluff. There will also be a 2,000-ft. tunnel through the mountain near Yale. Construction work along the Fraser river will cost $300,000 a mile. It is understood that it will cost $15,000,000 to build the 163 miles.

Chicago, Memphis & Gulf.—According to press reports, this company proposes to build an extension from Hickman, Ky., northeast through Fulton, Hickman, Carlisle, Ballard and McCracken counties to Paducah, about 50 miles.

El Paso & Southwestern.—An officer writes regarding the press reports that an extension is to be built to Tucson, Ariz., that the company is considering the construction of such a line, but has not yet definitely decided to carry out the work. (November 25, p. 1023.)

Erie Railroad.—An officer sends us particulars of second-track work on the Meadville and Cincinnati divisions, as follows: The entire Cincinnati division east of Marion, Ohio, will be double-tracked when the present improvements now under way and the improvements now authorized are completed, with the exception of one mile through the city of Akron. Second-track work has been completed on the Cincinnati division from Sherman to Sterling, 9.7 miles, and from Nankin to Ashland, 4.4 miles. Bids have just been received for second-track work from Tallmadge to Hills, 3.0 miles; West Salem to Polk; 5.4 miles, and from Barberton to Sherman, 2.7 miles, and bids are now being prepared for second-track work from Creston to West Salem, 9.2 miles, and Milton to Summit, Pa., 6.5 miles. On the Meadville division similar work has been completed from Braceville, Ohio, to Windham, 5.0 miles, and work is now under

way from Ravenna to a point five miles east, and from Brady lake to Kent, 1.6 miles.

Regarding the reports that the New Castle branch is to be double tracked, an officer writes that the company has not made any definite plans at present to carry out this work.

Fairmont & Pittsburgh.—According to press reports, contracts will be let and work is to be started soon on the first section of this line from Blacksville, at the state line between Pennsylvania and West Virginia, north to Waynesburg, Pa., 13 miles. The company was organized to build from Fairmont, W. Va., north via Blacksville and Waynesburg, Pa., to Pittsburgh, about 75 miles, with a loop line from Fairmont, northwest. Right-of-way from Waynesburg has been secured to Bridgeville, in Allegheny county. W. M. Laws, Jersey City, N. J.; J. F. Beatty, Mannington, W. Va., and S. E. Miller, Fairmont, are said to be interested.

Fresno, Coalinga & Monterey.—This company will soon begin construction work on the Fresno-Coalinga division and later will build the Monterey-Hollister branch. Albert Albrecht is the promoter.

Gilmore & Pittsburgh.—According to press reports this company has given a contract for building an extension beyond Salmon City, Idaho. This includes the section down the river beyond Shoup, and near the mouth of Pine creek.

Great Northern.—An officer writes regarding the reports that work is to be started in June on the Midland of Manitoba, from Winnipeg, Man., south to the international boundary, also on terminals to be built at Winnipeg, that no instructions to commence this work have yet been given. (April 7, p. 877.)

Great Southern.—According to press reports, this company will start work within 60 days on an extension from Dufur, Ore., south to Juniper Flats, 40 miles. It is understood that it will cost $1,000,000 to build the line. Surveys have been made and bids are being asked for the work. The company now operates a 30-mile line from The Dalles to Dufur.

Hagerstown & Clearspring (Electric).—An officer writes that contracts are to be let after April 28 to build from Hagerstown, Md., west through Huyett and Wilsons to Clearspring, 12 miles. J. B. Ferguson, Hagerstown, may be addressed.

Hanford & Summit Lake (Electric).—According to press reports, this company will build an extension from Hardwick, Cal., to Jamison, 36 miles.

Illinois Central.—The improvement plans for this year include double tracking the lines from New Orleans, La., north to Ponchatoula, 48 miles, and rectifying grades between Macomb City and New Orleans, 105 miles, about $1,000,000 will be spent. With this double-track work completed, the Illinois Central will have a two-track line between Chicago and New Orleans.

Lake Superior Southern.—This company proposes to build from Huron bay, on the shore of Lake Superior, Mich., southerly through Baraga, Marquette and Iron counties, and eventually through Wisconsin to Madison, in all about 260 miles. The route is through the iron district of the upper peninsula and traverses a well timbered section. The offices of the company are at Madison.

Louisville & Nashville.—A contract has been given to Thrasher & Gunter, Knoxville, Tenn., for grading the yard on the Kentucky division about six miles south of Cincinnati, Ohio. The same contractors have had for some time a contract for enlarging the tunnel at Covington, Ky.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that contracts have been let to Foley, Welch & Stewart, St Paul, Minn., for work on the line from Frederick, Wis., north to Duluth, Minn. (March 24, p. 711.)

Mill Valley & Mt. Tamalpais (Electric.)—This company, which operates the Mount Tamalpais Railway, will extend that line, it is said, from Westpoint, Cal., to Willow Camp, seven miles. The offices of the company are at San Francisco.

Missouri, Arkansas & Gulf.—Incorporated in Missouri with $2,000,000 capital, and office at Rolla, Mo. The plans call for building from Rolla south to Bakersfield, 125 miles.

New Iberia & Northern.—This company is said to be making surveys for an extension north to Moreauville, La., about 30 miles. The company now operates a 48-mile line from Port Barre to New Iberia.

Oregon Short Line.—An officer writes that the company has made a survey for a line from Saline, Utah, on the Lucin cut-off, northwest to Burley, Idaho, but at the present time there is no prospect or intention of constructing such a line, as conditions do not warrant it. The company, however, expects to build this year that section of the line from Burley, southeast to Kelton Summit, about 60 miles. This line will traverse a section of Idaho that is rapidly being developed agriculturally. As yet no work has been started, but survey is being retraced and work will probably be started in the near future. (April 14, p. 926.)

Pacific Power & Light Co.—This company will build an electric line, it is said, from the mouth of the White Salmon river, Wash., to Trout lake, 30 miles. The offices of the company are at Portland, Ore.

Pennsylvania System.—The record of the mileage of the road on December 31, 1910, shows that the total length of main line on the lines east of Pittsburgh, Pa., and Erie, is 5,323 miles, with 1,858 miles of second-track; 548 miles of third-track; 475 miles of fourth-track, and 4,396 miles of company's sidings, a total of 12,600 miles. There was an increase of 19 miles of first-track; 32 miles of second-track; five miles of third-track; six miles of fourth-track, and 97 miles of company's sidings, a total increase of 159 miles. On the Pennsylvania Lines west of Pittsburgh and Erie, the mileage is 2,911 miles of first-track, 1,296 miles of second-track; 192 miles of third-track; 101 miles of fourth-track, and 2,408 miles of company's sidings, a total of 6,908 miles. During the year there was an increase of 103 miles of second-track, eight miles of third-track; 10 miles of fourth-track, and 69 miles of company's sidings, and a decree of 0.5 mile of first-track, making a total increase of 189.5 miles. The mileage of the Vandalia Railroad is: First-track, 923 miles; second-track, 106 miles; third-track, eight miles, and company's sidings, 679 miles, a total of 1,716 miles. During the year there was an increase of 22.12 miles of second-track and 35.24 miles of company's sidings, and a decrease of 0.62 miles of first-track, making a total increase of 56.74 miles. The grand total of all lines, including those operated by and associated in interest with the Pennsylvania Railroad, is 11,263 miles of first-track, 3,524 miles of second-track; 780 miles of third-track; 593 miles of fourth-track, and 8,457 miles of company's sidings, a total of 24,617 miles. Of this 6,324 miles of first-track is east, and 4,939 miles west of Pittsburgh and Erie.

Prairie Farm & Southwestern.—An officer writes that contracts are to be let soon for work on the line between Prairie Farm, Wis., and Emerald, 22 miles. George E. Scott, president, Prairie Farm. (November 18, p. 985.)

Southern Colonization.—An officer writes that this company will build from Whittier, Fla., south via Pine Island, Deeso, Halsey and St. George to Bassenger, 34.7 miles. The work calls for the handling of about 12,000 cu. yds. a mile. There will be 4,000 ft. of trestles, also station buildings and water tanks. The work will be carried out by day labor. F. B. Lynch, president, St. Paul, Minn., and C. H. Armstrong, chief engineer, Kissimmee, Fla., and Rochester, Minn.

Texas Roads.—The Gulf & Rio Grande Construction Company has been given a charter in Texas with $100,000 capital. The company proposes to build a railway through southwest Texas from a point on the gulf of Mexico, west to Eagle Pass, about 200 miles. The incorporators include: A. L. Lilliendahl, Saltillo, Mex.; L. Frisby, Beeville, Texas; R. P. Coon and A. Tolle, San Antonio, and R. K. Valentine, Brooklyn, N. Y.

United Railways.—This company has announced that it will open for traffic on April 16, the extension from North Plains, Ore., to Banks.

Vandalia Railroad.—See Pennsylvania System.

Wisconsin Northwestern.—An officer writes that this company expects to build about 10 miles of logging branches, and will carry out the work with its own men.

Railway Financial News.

Ann Arbor.—Farson, Son & Co. and J. S. Bache & Co., both of New York, have bought $600,000 two-year 5 per cent. notes of the Ann Arbor and are offering them at 99. The notes are secured by the deposit of $1,000,000 second mortgage bonds.

The Ann Arbor, according to a press dispatch from Toledo, has bought control of the Manistique & Lake Superior. Control of the Manistique & Lake Superior was held by H. B. Hollins and associates, who until recently were also in control of the Ann Arbor.

Atlantic, Waycross & Northern.—Stockholders have voted to authorize an issue of $4,800,000 bonds.

Baltimore & Ohio, Chicago Terminal.—The United States Circuit Court of Appeals has denied a petition of the minority common stockholders to intervene in the foreclosure proceedings brought against the predecessor company, the Chicago Terminal Transfer. The minority stockholders did not press their claims until after the Baltimore & Ohio, which bought in the property, had settled with the preferred stockholders and had refused to make any offer for the minority common stock. The court held that a resale would not benefit the common stockholders.

Canadian Northern.—Wm. A. Read & Co., New York, and the Dominion Securities Corporation, Toronto, Can., have bought $3,500,000 equipment mortgage 4½ per cent. bonds series A1, issued by the Imperial Rolling Stock Company, and guaranteed principal and interest by the Canadian Northern.

Chicago & Northwestern.—W. K. Vanderbilt, Jr., has been elected a director, succeeding Frank Work, deceased.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, have bought $1,494,000 first and refunding mortgage 4 per cent. bonds, due 1934, issued to retire an equal amount of Choctaw collateral 4 per cent. bonds, series I, maturing May 1, 1911.

Cincinnati, New Orleans & Texas Pacific.—Potter, Choate & Prentice, New York, have bought $1,000,000 4½ per cent. ten year equipment trust certificates, series "C." The certificates were resold at a price understood to be such as to yield the investor 4.60 per cent.

Cleveland, Akron & Columbus.—See Pennsylvania Railroad.

Cleveland Short Line.—This company, whose capital stock is owned by the Lake Shore & Michigan Southern, has been granted permission to increase the outstanding stock from $3,750,000 to 7,375,000. A mortgage has been authorized to secure $20,000,000 bonds. It is understood that at least a part of these bonds will be issued in the near future.

Eagles Mere Railroad.—H. L. Greyelin has been appointed receiver of this narrow gage road which runs from Sonestown, Pa., to Eagles Mere Park, ten miles.

Hocking Valley.—The United States Supreme Court has denied a writ of mandamus directing the United States District Court to return to the state courts he case brough to restrain the officers of the Hocking Valley from merging this property with the Chesapeake & Ohio. The case therefore will be tried in Federal Court.

Illinois Central.—This company is to take over at foreclosure sale on May 5 the Indianapolis Southern. The main line of the Indianapolis Southern runs from Effingham, Ill., to Indianapolis, Ind., 177 miles.

International & Great Northern.—The receiver of this company and the Texas Railroad Commission have come to an agreement in regard to the valuation to be placed on the property for the purpose of issuing new securities after foreclosure sale and reorganization. The commission has agreed to an addition of $3,000,000 to the original $31,000,000 at which the property was valued. This makes the present valuation $34,000,000, the additional $3,000,000 being allowed for franchise value.

Maine Central.—This company has sold to F. E. Moseley & Co., New York, $1,500,000 one year 4 per cent. notes, dated April 1, 1911. The proceeds of the sale are to be used to pay a like amount of 5 per cent. four year notes maturing June 1.

Manistique & Lake Superior.—See Ann Arbor.

Manitoulin & North Shore.—This company has applied to the Canadian Parliament for permission to change its name to the Algoma Eastern. The company has made a mortgage to secure $3,000,000 5 per cent. first mortgage fifty year bonds, guaranteed principal and interest by the Lake Superior Corporation.

Manufacturers' Railway (St. Louis).—G. H. Walker has been elected a director, succeeding W. D. Orthwein, resigned.

Missouri Pacific.—After the retirement of Kuhn, Loeb & Co. from Missouri Pacific affairs, mentioned elsewhere in this issue it was announced that Speyer & Co., New York, will be substituted for Kuhn, Loeb & Co., as bankers, and all the other new interests on the board, including the Rockefellers, the Deutsche Bank and Blair & Co. are, according to present plans, to remain identified with the company as originally planned. James Speyer and Frank Vanderlip, it is understood, are to be elected directors, succeeding Paul M. Warburg and Cornelius Vanderbilt.

Northern Central.—See Pennsylvania Railroad.

Pennsylvania Railroad.—This company has bought, it is understood, nearly the entire minority stockholdings of the Cleveland, Akron & Columbus, heretofore held in Holland. The price paid is said to have been about 92. The Cleveland, Akron & Columbus runs from Hudson, Ohio, to Columbus, 144 miles.

William C. Bruce, counsel for the Public Service Commission of Maryland, has filed his opinion with the commission holding that the lease of the Northern Central to the Pennsylvania Railroad and the issue of additional stock is legal.

Seaboard Air Line.—Blair & Co., and Ladenburg, Thalmann & Co., both of New York, are offering $19,000,000 refunding mortgage 4 per cent. bonds of 1909-1959 at 83½. (January 20, p. 145.)

Southern Railway.—Kissel, Kinnicutt & Co., New York, have prepared an analysis of the present earnings and future earning possibilities of the Southern Railway. The circular containing this analysis contains a rather interesting chart showing the course of the net income, total charges, and surplus since 1896.

St. Louis & San Francisco.—This company has called for payment on August 1, 1911, $4,000,000 4½ per cent. notes, due February 1, 1912, but redeemable at par on 90 days' notice. The notes were secured by the deposit of the entire issue of $4,500,000 stock and $4,500,000 first mortgage bonds of the Arkansas Valley & Western. Cash for the redemption of these notes was provided through the recent sale of $7,000,000 general lien 15-20 year 5 per cent. bonds.

Tennessee & North Carolina.—A press despatch from Chattanooga, Tenn., says that the Champion Lumber Company, which has bought about 10,000 acres of timber land in North Carolina, near the Tennessee line, is to take over the control of the Tennessee & North Carolina.

Wabash-Pittsburgh Terminal.—The $433,771 receiver's certificates due April 11, 1911, have been extended for one year.

The Russian government has introduced a bill in the duma permitting railways to be built by private companies. It states that in Russia the railway mileage is only one-tenth that of America and one-fifth that of Western Europe. The supporters of the proposition claim that the increase of the Russian network of railways is necessary for the further development of the productive forces of the country. The government on its own account cannot, it is stated, increase its railway building program, owing to a large number of unavoidable expenditures, hence it finds it necessary to grant concessions for private railway construction. These private railway companies will receive remuneration for the outlays made on preliminary railway surveys and determination of directions and locations from the capital stock. The time limit for the purchase of a private line by the imperial government is 25 years.

Supply Trade Section.

Jenkins Bros., New York, have moved their general offices from 71 John street, to 80 White street.

Alexander Crawford has been made purchasing agent for the Hyatt Roller Bearing Company, Newark, N. J.

The Chicago Pneumatic Tool Company, Chicago, has enlarged its quarters in the Fisher building, by taking nearly the whole 10th floor.

Rodman Gilder, secretary of the Crocker-Wheeler Company, Ampere, N. J., has resigned to go to Dick Bros. & Co., New York, brokers.

The Kennicott Company, Chicago, has moved its sales offices from the sixth to the fourth floor of the Corn Exchange Bank building. It will have about half the entire floor.

Gardiner M. Lane, of Lee, Higginson & Co., New York, brokers, was elected to the board of directors of the United States Steel Corporation on April 17, succeeding the late Nathaniel Thayer.

Frank B. Hart, formerly sales manager of the Ohio Steel & Foundry Company, Lima, Ohio, has resigned and organized the firm of Hart, Doane & Hart, Rector building, Chicago, dealers in railway and industrial supplies.

The United States Cast Iron Pipe & Foundry Company, New York, has moved its Chicago office from the Rookery to the Peoples Gas building, where it will have about double the space afforded in its present quarters. The company has been in its present offices for the past 12 years.

The United States Electric Company, New York, has received orders from the Canadian Pacific for 255 Gill selectors. The Canadian Pacific makes extensive use of the telephone in train despatching. Gill selectors have also been ordered lately by the Seaboard Air Line for 74 telephone stations and by the Atlantic Coast Line for 88 stations. The Seaboard Air Line has used 52 Gill selectors for about a year; all of them on one line.

The Power Specialty Company, New York, has received orders from the following companies, among others for Foster superheaters: Cleveland, Cincinnati, Chicago & St. Louis; Milwaukee Electric Railway Company; Winnipeg Electric Company; New York, New Haven & Hartford; El Paso Electric Railway Company. With one exception these contracts are all from previous users of Foster superheaters, and in many cases the contracts represent from the fifth to the fifteenth repeat order.

The government of a Latin-American country has under consideration the construction of roundhouses and railway repair shops at a cost of $60,000 or $70,000. The plans have been prepared, and it is expected that construction will be begun before the end of the year. It is proposed to put in up-to-date machinery suitable to rebuild an engine or thoroughly overhaul a coach. The address of the official in charge may be had by applying to the Bureau of Manufactures, Washington, D. C. File No. 6,541.

The Boss Nut Company, Chicago, announces that arrangements have been made for the United States Steel Corporation to make the Boss nuts at the Joliet, Ill., plant. Special machinery is being installed for that purpose. J. A. McLean, formerly with the American Arch Company, New York, joined the sales department of the Boss Nut Company, April 1, with headquarters in Chicago. The Adreon Manufacturing Company, St. Louis, Mo., has been appointed southwestern representative of this company, and a branch office has been opened in the Candler building, Atlanta, Ga.

TRADE PUBLICATIONS.

Melting Furnaces.—The Rockwell Furnace Company, New York, in bulletin 28 illustrates and discusses its Simplex melting furnace for melting aluminum, brass, bronze, etc.

Electric Fans.—The General Electric Company, Schenectady, N. Y., has devoted bulletin No. 4806 to its ceiling, column and desk fans. Illustrations, price lists and dimension tables are included.

Generating Sets.—The Crocker Wheeler Company, Ampere, N. J., has published in bulletin No. 130 a description of its small direct current generating sets, consisting of Crocker Wheeler generators, 1.75 to 21 k. w., driven by Giles type E engines. This bulletin supersedes bulletin No. 109.

Signal Relays.—The Hall Signal Company, New York, has published a small illustrated booklet describing its new signal relays. It claims that this is a line of relays in which the resistance of the contact does not increase with use, and in which every known precaution has been taken for the prevention of signal failures.

RAILWAY STRUCTURES.

Armourdale, Kas.—See Kansas City, Mo.

Baltimore, Md.—The Western Maryland has bought the block adjoining its main terminal, and it is announced will build a passenger and freight depot on the site.

Boyles, Ala.—The new shops of the Louisville & Nashville will probably be completed within the next 60 or 90 days, the total cost being approximately $700,000.

Chickasha, Okla.—The Chicago, Rock Island & Pacific has let the contract to A. W. Lane, Chicago, for the building of a one- and two-story, 32 ft. x 200 ft., brick and plaster, $35,000 passenger station.

Glenwood, N. Y.—The New York Public Service Commission, Second district, has authorized the New York Central & Hudson River to discontinue its present Glenwood station at the foot of Point street in the city of Yonkers, on the condition that a new station with ample accommodations, including elevators and other facilities for the handling of baggage be provided at the foot of Glenwood avenue.

Greenville, S. C.—According to press reports, plans are being made by the Piedmont & Northern (Electric) to build shops in Greenville.

Kansas City, Mo.—The Chicago, Rock Island & Pacific has built a new freight house and team tracks in Kansas City, and will improve its yard at Armourdale during the coming season. Other work on the second division includes a large amount of bank widening, the building of three eating houses and two coal chutes.

Middletown, N. Y.—An officer of the New York, Ontario & Western writes that the company is putting up an erecting shop 65 ft. x 360 ft., two stories high, and a storehouse 33 ft. x 218 ft., one-half of which is to be two stories high; also an addition to the power house, 45 ft. x 110 ft. This work is under contract with Westinghouse, Church, Kerr & Co., and will probably be finished in July. The estimated cost of improvements is $250,000.

Opelika, Ala.—An officer of the Central of Georgia writes that the company is considering the question of remodeling the present station at Opelika, the work is to be carried out by the company's men.

San Francisco, Cal.—The Southern Pacific has plans made, it is said, for building an addition to the hospital at San Francisco, for which bids are not being asked. It is understood that the improvements will cost $35,000.

Spokane, Wash.—The Oregon-Washington Railroad & Navigation Company has given contracts at $900,000 for steel for two bridges on the North Coast division. One of the bridges will be the largest in the northwest, crossing the Snake river at an elevation of 275 ft., near the mouth of the Palouse river. It will be 4,070 ft. long, and besides crossing the river also will cross the old O. R. & N. and Northern Pacific tracks. Due to its height false work is out of the question, and a huge traveler will be erected to put the steel in place. The second bridge will be built over the Spokane river at the mouth of Hangman creek, it will cross both streams. It will be 165 ft. high and 3,400 ft. long. Both bridges are to be completed within 15 months and work will be commenced at once.

Toledo, Ohio.—The Pennsylvania recently bought the property of the old Toledo rolling mill of the Republic Iron and Steel Company, and, it is said, will convert the building into repair and car shops.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Cuban is making inquiries on 10 locomotives.

The Chicago & North Western has ordered 30 locomotives from the American Locomotive Company.

The Marshall & East Texas is said to have bought two 75-ton locomotives from the Kilby Locomotive & Machine Company. This item is not confirmed.

The Fort Dodge, Des Moines & Southern has ordered one 404-E-80 electric locomotive. The American Locomotive Company will furnish the mechanical equipment and the General Electric Company the electrical equipment.

The Bingham & Garfield, mentioned in the *Railway Age Gazette* of March 17 as having ordered 1 Mallet locomotive from the American Locomotive Company, placed an order for 2 Mallet locomotives at that time with the American Locomotive Company.

The Missouri, Oklahoma & Gulf has ordered 4 consolidation locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 20 in. x 26 in., the diameter of the driving wheels will be 46 in., and the total weight in working order will be 165,000 lbs.

The New York, Ontario & Western has ordered 2 six-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 20½ in. x 26 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 150,000 lbs.

The San Antonio & Aransas Pass, mentioned in the *Railway Age Gazette* of March 10 as being in the market for 4 mogul locomotives, has ordered this equipment. The Baldwin Locomotive Works will build 3 of these locomotives, and the Lima Locomotive & Machine Company will build 1. The cylinders will be 19 in. x 26 in., and the total weight in working order will be 150,000 lbs.

CAR BUILDING.

The Midland Valley is in the market for coaches and combination cars.

The Erie has ordered 10 all steel frame box cars and 4 steel underframes for passenger cars from the Kennicott Company.

J. G. White & Co., New York, is in the market for 50 twenty-ton steel underframe box cars. These cars are for use in Cuba, and will have a gage of 1 meter.

The Seaboard Air Line is in the market for 30 caboose cars in addition to the 1,000 box and 200 phosphate cars mentioned in the *Railway Age Gazette* of April 7.

The New York Central Lines are building 1,000 refrigerator cars at their shops at East Rochester, N. Y., for the Merchants' Despatch Transportation, New York.

The Pittsburg & Lake Erie has ordered 1,000 fifty-ton gondola cars from the Pressed Steel Car Company, and 1,000 forty-ton coke cars from the American Car & Foundry Company.

IRON AND STEEL.

The Baltimore & Ohio is in the market for 7,500 tons of rails.

The New Orleans Railway & Light Company has ordered 500 tons of rails from the Carnegie Steel Company.

The Richmond, Fredericksburg & Potomac has ordered 100 tons of rails from the Maryland Steel Company.

The Galveston, Houston & Henderson has ordered 735 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Pennsylvania is reported to have ordered 6,000 tons of plates and shapes from the Cambria Steel Company, for use in the shops at Altoona, and 500 tons of fabricated steel for its new freight sheds at Harrisburg, Pa., from the Pennsylvania Steel Company.

The Isthmian Canal Commission is asking bids until May 10 on rails, frogs, switches, switch stands, tie plates, angle bars, track bolts and spikes, etc. Circular No. 628.

The Boston Elevated has ordered 600 tons of Bessemer rails from the Pennsylvania Steel Company, and 1,200 tons of open hearth rails from the Bethlehem Steel Company.

The Missouri, Kansas & Texas, mentioned in the *Railway Age Gazette* of March 31 as being in the market for 14,000 tons of rails, has ordered 8,000 tons from the Pennsylvania Steel Company, and 6,000 tons from the Steel Corporation.

General Conditions in Steel.—Buying in the steel industry continues to be very light, but prices hold firm. The Steel Corporation is operating at about 73 per cent. of its capacity. A decrease both in orders and unfilled tonnage is expected for the month of April, but inquiries are large, so a marked improvement is looked for next month.

SIGNALING.

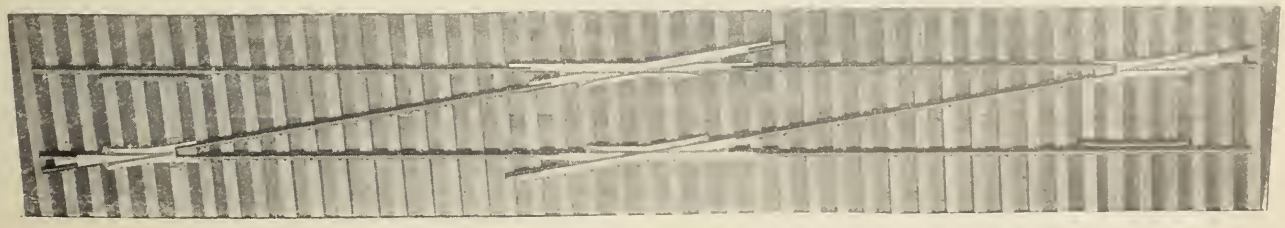
The Kansas City Terminal will soon displace the old 36-lever hydro-pneumatic interlocking machine at the west end of the Union station with an electro-pneumatic machine of 59 levers. The signals will be made dwarfs in almost all cases. The old switch movements will be retained. Electric detector locking will be used.

Manganese Frog Crossings.

The accompanying illustration shows a model of the R-N-R single and double manganese frog crossings made by the Indianapolis Switch & Frog Company, Springfield, Ohio. The model is a convenient means of exhibiting these frogs; it has already been used at the Coliseum exhibit during the engineering convention in Chicago last month.

The frog is cast in one piece, thus eliminating the 10 pairs of splices used on the built-up frog. The connecting rails are joined directly to the frogs proper by manganese easers, giving good solid connections. There are no parts of these frogs which, when they are to be renewed, require the removal of the frog itself. In other words, when the crossings are put down they need not be disturbed during the life of the manganese.

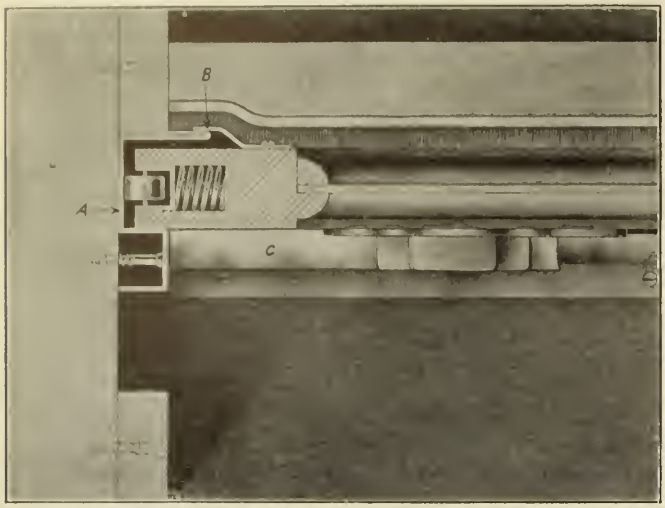
This frog should maintain a maximum width of tread at all connections beyond the points of intersection, eliminating point and joint pounding so as to make the frog nearly as smooth riding as the rail itself. The single end R-N-R frogs are now in use on nearly 50 of the large railways.



R-N-R Single and Double Manganese Frog Crossings.

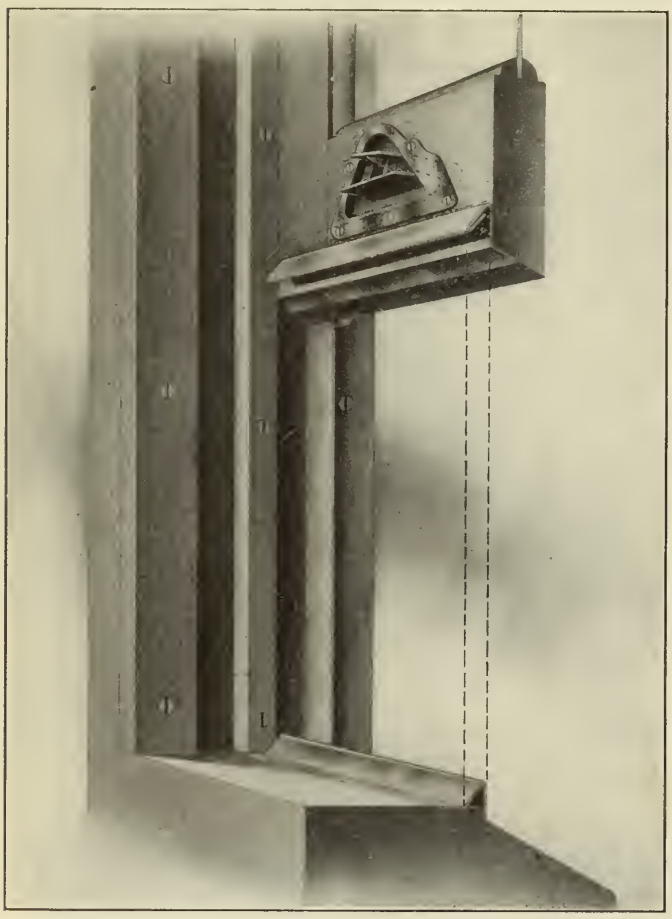
Metal Weather Strip for Coach Window Sash.

The ordinary coach window sash is held in place by wooden stops and an effort is made to keep out dust and rain by weather strips applied on the outside, but the pressure of the wind will



Horizontal Section of Acme Window Sash.

sometimes force the sash inward away from the weather strip, making an opening for dust and rain to enter. The Acme Supply Company, Chicago, has designed metal stops and weather strips which tend to overcome this objection. A partial horizontal



Acme Window Sash Showing V-Shaped Metal Strips.

section through the sash shows the metallic stop at A, the vertical weather strip at B and the horizontal strips on the sill at C. In the other illustration the V-shaped horizontal strips are shown in section. The one on the sash wedges tightly on the fixed one on the sill, and the weight of sash tends to keep the joint tight as the sash does not rest on the wooden sill as is usually the case.

Any irregularity in the fit of the wood portion of the sash, due to shrinkage or warping, causes leakage in the usual construction, but in these windows the spring of the V-shaped metal strips overcomes this difficulty and with excessive wind pressure from the outside the joints become tighter. The same is true of the vertical metal strip B; the wind pressure on the outside is constantly tending to keep this joint tight. The metallic stop A is slotted diagonally, so that when the catch is in, the weight of the sash tends to make it bear hard against the inner surface, which also has the effect of making a tight joint. Tests of the stops and metal weather strips have been made with compressed air and with water under pressure from a hose and no leakage was observed.

Insulation for Steel Passenger and Refrigerator Cars.

After considerable experience with various kinds of insulating materials for steel passenger and refrigerator cars, Resisto Insulation, manufactured by the General Railway Supply Company, Chicago, has been found to be very satisfactory. It is a non-conductor of heat and is non-absorbent, thus giving protection against varying temperatures, fire and water, which makes it desirable for car insulation. The felt and its protective coatings are flexible and may be made to conform to any curved surface of large or small radius without injury to its fibers. It is also very light as compared with other insulating materials.



Resisto Insulation Applied to Steel Passenger Car.

Numerous tests conducted by railways, car builders and private laboratories have demonstrated that Resisto Insulation is especially efficient as an insulating material for all-steel passenger cars, and reports of the methods and results of these tests will be furnished on application. Resisto Insulation is made in single and double thicknesses of ¼ in. and ½ in. respectively, the former being recommended for use in connection with metallic steel sheathing and the latter where steel plates only are used. Steel plate construction makes a solid conducting surface and necessarily requires a larger amount of insulation. The single thickness is sufficient when metallic (steel) sheathing is used, because its air cells or chambers ½ in. deep provide an air insulation which in itself is a good protection against heat and cold. Sample pieces of Resisto Insulation will be furnished for inspection and test purposes upon request.

The Anglo-German syndicate, which recently received a concession for the construction of a railway from Puerto Pinas to the interior of Darien, has requested the government's permission to extend the railway to Panama City by way of Chepo, the latter place being situated in the narrowest part of the isthmus. If permission is granted for this extension, which is considered likely, the new road will open up for colonization extremely rich virgin lands.

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THE matter of keeping permanent records of side tracks has not generally been given as serious attention by the different railways as it deserves. Many of them have few, if any, records of these tracks; often the only reliable information available is that in the possession of the roadmaster or section foreman under whose supervision the tracks were built. It is constantly becoming more necessary to have complete and accurate data at hand as to their location, length and ownership, to meet the demands of the various state and national commissions for information concerning the physical conditions of the properties. Such information is also of assistance in making plans for improvements, the question of the length of existing tracks and the weight of their rails often arising when any change or addition is contemplated. The greatest value of a complete record probably consists in its usefulness in settling the question of the ownership and maintenance of industry tracks, which so often leads to disagreements and disputes. In many cases these tracks are owned in part, or entirely, by private concerns, and are maintained by the railway at their expense. In such cases the point of division of ownership is of great importance. The officers in charge of the maintenance of side tracks should have complete information at hand concerning their ownership, and not have to search through files of correspondence or contracts, if the latter exist. Frequently where tracks have been in use for many years all definite records of ownership are lost; and when a disagreement arises it is difficult to find a basis for settlement. One railway, which serves numerous industries in an important section of a large terminal city, had so many controversies arising from this cause that its officials, unable to find authentic records of ownership, were forced, in order to settle the matter, to make arbitrary divisions of ownership with the various industries. Each year's delay in compiling such information renders it increasingly difficult to get at the exact facts. When once compiled the records should be carefully revised at regular intervals to keep them up to date, and entries should be made for all new tracks at the time they are built. After having studied this subject the Committee on Records and Accounts of the American Railway Engineering Association for the past year rendered a valuable service by calling attention to the necessity of collecting the necessary information and submitting a form for keeping it.

THE increases a number of roads are making in the rates of pay of section and extra gang foremen is a step towards increasing the efficiency of track forces. The inefficiency of the foremen is the cause of a large part of the unnecessary cost of track maintenance, and by increasing his pay the greatest improvement can be secured for a given increase in expenditure. It sometimes happens that when sending out for track labor a road will offer five or ten cents a day more than the prevailing wage, believing that in this way it will secure a better class of labor. This is not, and will not be, the result as long as the wage paid by the railways remains as far below that paid for unskilled labor in other industries as it is now. No increase short of that which will place the wages paid by the railway on a par with those of other industries will draw a new and improved supply of labor into this market. On the other hand, a small increase in the foremen's wages is money well spent, for the ratio of efficiency secured from a gang of men depends directly upon that possessed by the foreman. An able foreman will secure better results from poor men than an inefficient foreman will from good men. The necessity of having a high-class of foremen has long been realized, but the wages offered have not been adequate, and as a result the general standard has gradually declined. There is today a necessity for a higher grade of foremen than ever before, because of the continually declining quality of the labor, and also because of the continually higher standards demanded in track maintenance. It requires a man of no mean ability to get the best results from a gang of fifty men engaged in the simpler forms of track work, to say nothing of the more complicated frog and crossing work; for knowledge of the work as well as ability to handle men is required. Again, the question of providing for the future supply of foremen must be considered. To a very large degree these men should be recruited from outside the ranks of present track labor, and in order that this may be done some inducement must be offered sufficient to attract competent men from other fields. The track apprentice system was tried on several roads with varying degrees of success. The plan was correct in theory, but failed on its practical side—that of offering sufficient financial reward. It is desirable to attract bright young men, technically trained, if possible, into track work, but greater financial inducements must be offered if they are to be secured. The average salary paid foremen at present does not appeal to such a class of young men as something toward which to work.

NEW YORK CENTRAL-NEW HAVEN AFFILIATION IN NEW ENGLAND.

We have noted briefly heretofore facts and symptoms pointing to the closer affiliation in New England of the New York, New Haven & Hartford, and the New York Central interests. Such indications as the joint control of the Rutland and the transfer of three heavy and profitable express trains from the New London route to the Boston & Albany route via Springfield to northern New England were not to be overlooked, as well as minor changes of traffic to the Boston & Albany, and plans for closer interchange of traffic on the Boston & Albany subsidiary lines. To these steps is now added a much longer stride in the same direction. The lease balance over operation and fixed charges of the Boston & Albany carried by the New York Central as lessee for nearly a decade is to be shared by the New York Central jointly with the New Haven on even terms, half and half. Whether deficit or surplus the two companies will divide it; and, though the New York Central will operate the leased road the implication is strong that the New Haven will also share on even terms in the Boston & Albany directive influence and policy. The two railway corporations, already holding common terminals at New York and Boston have now in the Rutland and the Boston & Albany what may be called a large intermediate community of interests. Terminal interests of the two are expanded to the railway territory between them and northward.

The financial results for the two corporations are interesting, but also somewhat speculative. The purchase of Rutland stock not now paying dividends, by the New Haven, is credibly reported to have cost $2,500,000. At the low rate of 4 per cent., this is an annual interest charge of $100,000. During the last seven years the deficit on the Boston & Albany has averaged $660,307 yearly. It has ranged from a surplus of $310,803 in 1905-6, to a deficit of $1,927,837 in 1907-8, and last year it was $578,337. It is understood, however, to be roughly estimated, now and under existing conditions, by officers of the two companies, at about $900,000, half of which, or $450,000, the New Haven assumes. On that basis putting the Rutland and Boston & Albany deals together, the New Haven assumes a fixed charge of $550,000, and the New York Central is relieved practically of the same burden.

This is the present financial aspect of the bargain. How far by the new transfer of traffic, by economies of joint operation and interests, by shippings of through business, will the Boston & Albany load be lightened—and that without loss to the New Haven in other directions? The answer must obviously be deferred until the returns for the fiscal year 1912. But the gains will, doubtless, be considerable. As one clue it is stated that the transfer of the three express trains to the Boston & Albany, to better roadbeds, to a shorter route and with much shorter time, will profit, net, the New Haven more than its present long haul of those trains. General business conditions, however, complicate any estimates, and in any particular year may prove a greater element in the traffic returns than any new phases of operation.

But the primary object of President Mellen in accepting a plan that, on its face, is a large new financial charge, is stategic and based on the long look ahead. Absorption of New England railway territory as completely as possible is the key to his campaign. That policy has become the more imperative now that the Grand Trunk is threatening an invasion at its center. With that menace the Boston & Albany assumed new import. It might, potentially, piercing New England at its heart and reaching to Boston become a base line of Grand Trunk exploitation, holding not merely terminal rights at New England's capital, but with radiating branch line possibilities affecting other centers of industry. With the New Haven sphere of influence extended to the Boston & Albany, that peril, while not extinct, is thrust further into the background. In that connection, as a part of the strategy against the Grand Trunk, attention should be called to the outlet to Montreal and into Grand Trunk territory secured by the New Haven in the Rutland purchase; also, on a smaller scale, there is the purchase of the Montpelier & Wells River, heretofore a feeder of the Grand Trunk.

In this conflict with the Grand Trunk, which so clearly underlies the New Haven's policy, the close relations of the New Haven with the Canadian Pacific must not be underrated. That the New York Central, so far as concerns its New England business, will be drawn into harmony with the Canadian Pacific, is a fair inference. From the new affiliations of the New Haven. A broader view of those affiliations is suggested by the query as to where the natural and territorial kinship of the New Haven and the New York Central is to stop. On that point forecast would be more clear were the traffic relations of the New Haven and the Pennsylvania less intimate and important to both.

Sharp historical reminders go with the partial fulfillment of the New Haven's old ambition for control of the Boston & Albany. Eighteen years ago President C. P. Clark, of the New Haven, opened a policy of rapid railway absorption which, at the time, well nigh dazed its old fashioned and ultra-conservative directorate. He took in the New York, Providence & Boston, with its double boat lines and its leased Providence & Worcester; he leased the Old Colony, with its maze of Massachusetts roads, its prosperous boat line and its leased Boston & Providence, giving the New Haven its own through line to Boston; and he reached out boldly into Boston & Maine territory, and all but acquired the Connecticut River road—a project only thwarted by the purchase by the Boston & Maine interest of the Connecticut River majority shares at a great price. There followed the "Partition of Poland," by which the Boston & Maine agreed with the New Haven to divide territory, making the Boston & Albany the separating line. A few years of President Mellen's aggressive policy now finds a dramatic change from the railway map of New England, as it was then. The New Haven holds not only the whole railway system of the party of the second part in the historic partition, but has firm and probably permanent lodgment in the division itself.

THE GENERAL ELECTRIC COMPANY.

The record of business done by the General Electric last year is an impressive illustration of the growth and development of industries using electric power. Descriptions of installation of new hydro-electric plants in different parts of the country from Oregon to North Carolina are so common that one is apt to overlook the significance and magnitude of this new development. The total sales of the General Electric for the year ended December 31, 1910, amounted to $71,478,558, while the cost of sales, including $4,661,175, depreciation of plant, amounted to $63,134,602, and the profit for the year was $10,855,692. In the 11 months ended December 31, 1909, total sales amounted to $51,656,632, and profits to $6,493,671. During that 11 months $2,447,984 was charged for depreciation.

In the report for 1910 of the vice-president in charge of the engineering department of the General Electric, special mention is made of the success of the company's engineers in the solution of problems arising from the utilization of water power, which in many cases requires the transmission of electric power over long distances, and which can be accomplished economically only by the use of high potential currents. The company is now manufacturing turbines and electric generators of 20,000 k. w. and transformers of 14,000 k. w. capacity. Mention is also made of the improvement in high tension direct current railway apparatus, which the General Electric has made a specialty of.

The report of the vice-president in charge of sales and orders shows that last year total sales billed amounted to $71,478,558, and total orders received amounted to $71,182,391, both the sales billed and orders received being the largest for any year in the history of the company. The orders received were 17.7 per cent. greater than the orders received in 1907, the largest year heretofore reported. The increased business last year came largely from regular customers in small contracts and current orders,

rather than from new enterprises requiring larger amounts of electric apparatus. Unfilled orders as of December 31, 1910, amounted to $15,500,000 and as of December 31, 1909, amounted to $15,600,000.

The annual report of the General Electric Co. is a model of thoroughly sound accounting. In the explanation of the various items that go to make up the balance sheet, especially the General Electric is specific in its statements and sound in its theory of accounting for industrial incorporations. During the 18 years to December 31, 1910, the company spent for land, buildings and equipment $42,142,255, and charged off to profit and loss for depreciation $30,584,469, leaving the book value of an investment of $46,100,783 ($3,958,528 original value in 1893) as $15,516,314. This is a valuation of but $1.82 per sq. ft. of floor space owned by the company including land buildings, machinery and other equipment. Notwithstanding these charges to profit and loss the company showed a total surplus at the end of 1910 of $23,022,706 Cash on hand at the end of 1910 amounted to $14,912,400 and total current liabilities to $4,602,712. Notes and accounts receivable totaled $19,047,459 at the end of last year, as against $19,377,972 at the end of the previous year, while merchandise inventories, which are figured on a conservative basis, totaled $28,059,941 last year, and $25,150,036 the year before.

The General Electric Co. has outstanding $65,179,600 stock and $14,962,000 debentures. It pays 8 per cent. dividends on the stock, and in 1910 had a surplus for the year of $10,855,692 after a payment of $5,214,368 in dividends.

NEW BOOKS.

Track Formulae and Tables. By Shelby Saufley Roberts, C. E., Mem. Am. Soc. C. E.; Mem. Am. Ry. Eng. and M. of W. Assoc. 514 pages, 4 in. x 7 in. John Wiley & Sons, New York.

The purpose of the book, as explained by the author, "is to present in a practical manner those track problems most frequently met in actual practice, supplemented by time-saving tables in connection therewith and other tables of assistance in estimating." It is chiefly devoted to algebraic solution of problems of track layouts, and includes the various tables of logarithms and functions of angles, as well as other tables involving short cuts in the solution of track problems. The book shows clearly typical methods of computations of data from which track work may be laid out in the field. Simple turnouts from straight and curved tracks, slips, three-throw switches, crossovers, yard leads and layouts are included. To make the methods clear many problems are worked out thoroughly, and their study should be of value to men engaged in such work. All this is well done and well expressed and shows the author's thorough familiarity with his subject. A study of the book would certainly be of advantage to students whether they are in the class room or engaged in active practice.

One cannot criticize the work that went into the making of this book, but one can have some doubt of the great value of any book which is intermediate in size and scope between the small collection of the tables required for actual field work and the larger treatises giving more broadly the mathematics and methods of solving these problems. Each one of us engaged in track layouts has to develop for himself concise methods of doing the particular work that is before him, and if he is thoroughly grounded in the mathematics and has any common sense and some executive ability will find these short cuts very soon and be able to judge just what accuracy is justified. It is hard for anyone to study a number of specific cases in which he is not vitally interested and learn the exact way that that particular piece of work was done. Such study lacks the incentive which the broader text books used in a class room have of showing a solution which may be applied to any subject; and it lacks the inspiration which the desire of getting results inspires in a good man who has been assigned a definite work.

To sum up, the work represented by this book is well done. It is of limited scope. It is too heavy and voluminous to be convenient for a man to carry in the field. It does not involve enough mathematics to cover all of the principles of track layouts.

E. L. T.

The Elements of Graphic Statics and of General Graphic Methods. By William Ledyard Cathcart and J. Irvin Chaffee. Cloth, 312 pages, 59 illustrations, 6 in. x 9 in. Published by D. Van Nostrand Co., 23 Murray street, New York. 1910. Price, $2.

Graphic methods are usually applied in the analysis of stresses in stationary structures, and a majority of the text books on the subject have been written for civil engineers, but this treatise is intended also for students in mechanical and marine engineering and as a possible service to engineers in those professions. The book provides a review of the principles of graphics and their application to framed structures and mechanism. The text is fully illustrated by diagrams, and the principles of applied mechanics and of the strength of materials are discussed where necessary. The methods of Hermann, Cremona and Reuleaux have been freely used and are properly acknowledged. The treatise covers much that is usually found in the text books on mechanics, but the treatment of graphics is fuller, has a greater variety and is more complete. The portion relating to graphics of forces occupies two long chapters, and that on beams and trusses four chapters, while that relating more particularly to machinery is dealt with under the graphics of friction and moment diagrams for shafting. The volume should prove a useful text book for courses in mechanics, as the graphical methods are more direct and simpler than a mathematical analysis and further extension of such methods would seem desirable. For a standard text book of this size, considering the quality of the paper and illustrations, the price is unusually low.

Proceedings of the Thirteenth Annual Meeting of the American Society for Testing Materials. Atlantic City, June, 1910. Volume 10. Cloth, 6 in. x 9 in., 671 pages. Office of the secretary, University of Pennsylvania, Philadelphia, Pa.

The work of the Society for Testing Materials increases in volume and importance from year to year, and the proceedings for 1910 contain such a large number of papers and discussions that it is difficult to indicate their variety and scope without giving the whole table of contents, which covers three pages of the volume. Many of these papers are of special interest to those in charge of railway physical and chemical laboratories, and the society has become the medium, or exponent, for the publication of the more important work of these laboratories. The former president of the society, Dr. Charles B. Dudley, was the first to organize a chemical laboratory for railways, and his work for the Pennsylvania Railroad at Altoona covered a period of 35 years. The addresses delivered at the Dudley memorial session at Atlantic City are contained in this volume, beginning with one by Theodore N. Ely on Dr. Dudley as a railway man, and ending with a personal tribute by R. W. Hunt. A special memorial volume commemorative of Dr. Dudley's life and his life work is now in course of preparation and will soon be available for distribution.

Among the principal papers included in this volume which are of special interest to railways are the following: The group relating to standard specifications for iron and steel; those on corrosion of iron and steel, including the painting of steel test panels at Atlantic City; those on preservative coatings for structural material, including the inspection of the Havre de Grace bridge; those on linseed oil and the influence of pigments on corrosion; and the report of the committee on varnish. Standard specifications for yellow pine bridge and trestle timbers; waterproofing materials. The influences of titanium on segregation of bessemer steel rails; low carbon streaks and open hearth rails; elongation and ductility of rail sections under drop testing. Unevenly chilled and untrue car wheels. A group of papers relating to reinforced concrete, cement and bituminous materials. The scleroscope; with a general discussion on hardness; apparatus for microscopic examination of metals. The volume is well printed and illustrated, and has both a subject index and an author's index.

Letters to the Editor.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

Chicago, April 12, 1911.

To the Editor of the Railway Age Gazette:

The editorial on The Efficiency of Railway Equipment, in your issue of April 7, 1911, is quite timely. It not only points out a serious defect in locomotive and car performance statistics, but by the use of such statistics as are available it demonstrates quite clearly the failure of the railways to secure the benefit of, or the public to avail itself of, the additional locomotive and car capacity provided during the past seven years.

When one attempts to analyze transportation results with a view to locating and correcting some item of unsatisfactory performance, the incompetency of many so-called "units" is obvious. An attempt, for instance, to measure locomotive efficiency by a year-to-year comparison of tons per locomotive mile is very unsatisfactory, as that unit takes no account of the increase in size and power of locomotives. A comparison of ton miles handled per tractive unit is equally unsatisfactory, since it injects the factor of traffic density. A comparison between increased tons per locomotive mile and the increase in average tractive power would be more illuminating, but, unfortunately, an accurate comparison of this sort is prevented by the failure of the tractive statistics to make a separation between freight and passenger locomotives. In the case of cars, we have a little better record than we have for engines, in that the performance of freight cars is shown separately from passenger cars. We also have some fairly reliable data on the number of cars idle at various times. Added to this, there are figures showing cars idle on "account of being in bad order," percentage of movement without load, and the average lading per car.

Both locomotive and car statistics, however, are open to at least one common objection; i. e., their failure to take into consideration the hours of service. If all cars and all engines were fully employed during each hour of every day in the year, the averages, "ton miles per engine," "miles per car per day," and "ton miles per car per day," when compared with increased locomotive power and additional car capacity, would prove rather accurate measures of the degree of efficiency secured. As things are the units available are not only unsatisfactory measures, but to the extent that they do reveal a lack of general efficiency they do not permit of a definite location of responsibility.

Statistics are in the nature of post-mortem data, and their chief value lies in their applicability to future performance. It avails little that we are informed of a decrease in the tons handled per car unless the information indicates the cause. With the exception of possibly one common item, there is a marked difference in the kind of statistics required for locomotive and car performance. I shall pass over the question of locomotive statistics by referring to the excellent formulae prepared by the Committee on Conducting Freight Transportation of the Association of Transportation & Car Accounting Officers, submitted at the June, 1909, meeting of that Association. These formulae provide a scientific method for handling power. They take into account tractive power, gradient, speed of train, temperature, in fact every item entering into the transportation problem, and even provide for an accurate determination of the advisability of running light trains, or holding power for tonnage, by reducing to dollars and cents the value of an increase in miles per car per day.

Now, as regards car performance. Up to within a few years ago, the "average miles per car per day," was the accepted unit. With the advent of the Car Efficiency Committee of the American Railway Association in the winter of 1906-7, and the inauguration of their statistical compilations, this unit, while still maintained as a valuable measure of car movement, was supplemented by the introduction of a new unit—"ton miles per car per day." This figure combines the various factors of car loading, loaded haul, daily movement, time idle on account of bad order or light traffic, and represents the net daily productive performance of all freight cars, reduced to an average for each car in existence. It is admitted that this unit does not furnish a fair basis for comparison between different roads, and it is probable that no unit will ever be discovered that will serve that purpose, since it is obvious that no two roads operate under precisely similar conditions. As a combination unit, however, backed by the averages of the various factors that influence it, the "ton miles per car per day" was a valuable addition to transportation statistics. It is clear, however, that even for the individual road this unit falls short of providing a "statistics" that will measure the percentage of potential efficiency obtained. The difficulty is not with the unit itself, as it is complete so far as it goes, but it fails as a measure merely because a standard is lacking. We do not yet know what 100 per cent. efficiency of freight car is.

In the matter of capacity, we know that a 20-ton load in a 50-ton car is 40 per cent. loading efficiency, and that an empty movement of 30 miles each 100 traveled is 70 per cent. efficiency in loaded haul We cannot, however, say even approximately what percentage of efficiency is obtained in a movement of say 25 miles per car per day. Among the factors entering into that average are items of all kinds, such as idle time spent on storage tracks by reason of light demand for equipment; delays by shippers or consignees; time held out en route by traffic congestion, and time spent in shops for repairs. It is apparent, therefore, that unless we have a figure representing the ideal or highest possible performance of a car, we can not judge from the actual performance what per cent. of efficiency is reached. Furthermore, unless both the ideal and the actual performance retain measures of the individual factors entering into car performance, the results will not be adequate as a check on car efficiency. Under present conditions, 10 miles per hour is accepted as standard for freight train movement. Applying this schedule to a 50-ton car, the maximum possible daily efficiency would be represented by 10 miles × 24 hours × 50 tons = 24,000 ton miles per car per day. This is of course a purely ideal standard. In practice it is subject to reduction by—

(a) Time idle on account of insufficient traffic.
(b) Detention by shippers and consignees loading or unloading.
(c) Detentions en route from various causes.
(d) Time undergoing repairs.
(e) Empty movement to point of next loading.
(f) Loading light of car capacity.

Many of these factors are under the control of the transportation officer, and all of them are susceptible of analysis with a view to correction or improvement. The following crude example will give an idea as to how this analysis may be made:

Month of ....., 19....

Total cars owned	1
Average capacity	50 tons
Total capacity	50 tons
100% efficiency.....50 × 10 × 24 = 12,000 ton miles per day	

Reduction account of		Amount of Reduction.	% Utilized.
Light loading of car.....		25 tons	50
Time in shop.....	05%		
Time idle, account surplus..	10%		
		15%	85
Empty movement		30%	70
Detention—			
R. R. yards, terminals, and en route	35%		
Shippers—consignees	35%		
		70%	30

50 × 85 × 70 × 30 = 8.75%
12,000 × .0875 = 1,070 ton miles.

The ton miles arrived at by this analysis could be checked against the averages secured from the regular tonnage statistics, and if serious discrepancies were developed the analysis could be corrected until it provided an accurate statement of the efficiency in the various items. The calculation of such items as yard and road detention is no more impracticable than the calculations of the tons per car; the percentage of empty movement; the shop percentage, or other items that are standard statistics on the majority of roads. The general adoption of some system like the above for working out the percentage of maximum efficiency for each individual road would go a long way toward

locating the responsibility for failure to utilize increased capacity, and would as a natural result lead to a correction of the trouble.

O. C. CASTLE.

THE ARBITRATION OF LABOR DISPUTES.

Peoria, Ill., April 14, 1911.

To the Editor of the Railway Age Gazette:

President Delano's letter in your issue of April 7, is not only interesting to railway employees, but will receive their careful thought because of his past fair attitude to employees.

The Erdman act provides for the optional arbitration of railway labor disputes. If it is proposed that arbitration should now be made compulsory instead of optional, such a law would probably be found unconstitutional if it included provisions for the enforcement of an award that compelled one man unwillingly to labor for another.

I know of no proposition which would be so distasteful to working people in any class of employment as *compulsory* arbitration, even though it could legally be enforced. Without assuming the role of a ghoul and digging from history's graveyard the skeletons of workingmen a century old, it can readily be shown that when the courts dictated the wages and working conditions of the working people they enjoyed but little greater privileges than those of serfs. The distinction between judgments of the courts and awards resulting from compulsory arbitration is not sufficiently clear to convince the working people that they should trust their future welfare, and the welfare of coming generations of working people, to what we have been taught to call "blind justice."

The Erdman act, as originally approved, by the President, prevented the dismissal of employees because of their membership in labor unions. A labor union is almost essential to carrying out the machinery of the act; but the United States Supreme Court subsequently held that this portion of the act was unconstitutional. Provide any form of arbitration which denies the right to working people to quit the service of their employer, and the same United States Supreme Court would probably find that clause unconstitutional. This would suggest the idea that the framers of the constitution did not anticipate the necessity of labor unions or compulsory arbitrations.

Dismissing "compulsory" arbitration as unpractical, and recognizing that there can be no such thing in fact, it is true that there is a growing respect among railway employees for optional arbitration, and the records of the office of the chairman of the Interstate Commerce Commission, and of the commissioner of labor, show that many strikes have been averted, which doubtless would have resulted in great financial loss to the employing companies, to the striking employees, and to the public. Many amicable adjustments of disputes between railway employers and employees have been reached through the "mediation" provided for in the Erdman act, without these disputes having approached the stage where arbitration was even proposed. The Lemieux act of Canada has, no doubt, averted many similar strikes, not only on railways, but in many other industries. Personally, I believe that great good has been accomplished through mediation under both the Erdman act of the United States and the Lemieux act of Canada.

But there is a vast difference between mediation and arbitration, and it is evident that mediation is not so objectionable to the rank and file of railway employees as arbitration. Mediation, as practiced both in Canada and the United States, results in concession and compromises, to which Mr. Delano seemingly objects. It is because of such concessions and compromises that these acts are beneficial. Usually the employer and employee in labor disputes represent two extremes, both sometimes prompted by selfish motives, and neither giving due consideration to the interests of the other. The great success of the mediation of wage differences in the United States, which has been achieved by Judge Knapp and Dr. Neill, and in Canada by Professor Adam Shortt, and others, is largely due to the fact that they convince both parties that their respective positions are extreme, and that an intermediate position would be fairer to all concerned.

Arbitration awards of any kind might be justly described as "fickle" in that everything seems to depend upon the mood of the arbitrator. We witnessed during the year 1910 quite a large number of arbitrations of railway labor disputes, and while the economic conditions were practically the same in every instance, some of those awards were almost entirely in favor of the company, and others were quite liberal to the employees. I have never heard any one even intimate that any of those arbitrators was other than honest in his findings. This shows that much depends not only upon the man who is selected as the third arbitrator, but the state of his mind at the time the arbitration is conducted and the impression produced upon him by other than general conditions.

Mr. Delano suggests that there should be a "standing court, which by reason of experience and special training, is well fitted to settle such matters." In this were brought about I could name two men, either of whom are intensely honest and conscientious, but whose awards would be at great variance. If the same class of men were selected for these permanent arbitrators that are usually selected for the higher judicial positions, we would find men whose recognition of property rights was more pronounced than of the rights of man. If permanent arbitrators were selected whose life environment had taught them to consider the rights of property above that of the man, they would conscientiously make awards in behalf of the railway investor if proposed wage increases reduced incomes.

On the other hand, there are many men of most excellent character whose environment has been such that if they were assigned as permanent arbitrators of labor disputes they would honestly decide in favor of the men and against property, when questions of wages were at stake.

That this peculiarity of the human mind is evident to others is shown by the fact that there has been such difficulty in finding a man to act as "third" arbitrator, either in the United States or Canada under the existing laws. I am informed that no more trying burden has fallen upon the chairman of the Interstate Commerce Commission and the commissioner of labor than this selection of the third arbitrator. To find a man who is absolutely unbiassed, whose past environment would not make him "naturally" favorable to either property or the individual, is a most difficult task.

If arbitration boards could be made up of four, six, or eight men, none of whom were partisans, an award should be reached with a clearer conception of the equities of the case than under the present plan, but unfortunately working people are extremely suspicious that some men cannot withstand temptation. It seems inbred in the average workingman to distrust those placed in positions where it may be profitable to betray an interest involved. It may be that American political practice, examples of which have recently taken up much of the time of Congress, has led working men to distrust those placed in authority. They realize that if a man in authority is corrupt, and will sell his influence, the employer has a decided advantage. One of the happy features of arbitration under our present laws is that, so far there has not been the least suspicion against any one. But institute a board of permanent arbitrators, and whatever their award might be, unless it were a compromise, it would probably receive condemnation. If the award was extremely favorable to the employees, as suggested in Mr. Delano's letter, they probably would be accused of "playing politics." If their award maintained the employer's contention they would be accused, by some, of having "sold out."

I feel sure that but few railway employees would favor the institution of a permanent board of arbitration, and for largely the same reasons that the owners of property found it necessary to substitute temporary juries for fixed judges in determining the rights of contending property interests. There is no doubt,

as Mr. Delano says, that as at present constituted, a board of three arbitrators is really but one arbitrator with two advisors, each harassing him for a favorable decision for the respective interests.

Experience makes it evident that in the arbitration of wage disputes railways invariably assert their financial inability to pay higher wages. The "financial ability" of railway corporations is one of the unsolved problems of the age. Without taking the magazine "muck rakers" as authority, we can readily believe that there is much connected with railway finances, past and present, that would not easily be understood by an arbitrator. In investigations, state and national, those railway corporations that most eloquently plead poverty, have usually been those that should have been opulent. It would be difficult for a board of arbitration intelligently to pass upon the ability of a railway corporation to pay increased wages, or to pass upon the necessity of a railway corporation reducing wages, without a thorough knowledge of what has been done with all of the money that has been earned by a railway company.

If a shoe manufacturer would be justified in reducing the wages of his shoemakers because his father almost bankrupted the shoe factory by patronizing some "get-rich-quick-concern," a standing railway board of arbitration could reason a like effect from a like cause. If a gold mining corporation had sold its stock from 8 to 15 cents on the dollar and then could secure an arbitration award reducing the wages of miners, because the stock was not paying dividends at a par valuation, railway employees might expect similar awards.

One of the defects of the Erdman act, which has caused railway employees to suffer loss, is that there is no provision for the interpretation of an award. An award is made under the act and then the employer and employee disagree as to what it means. The employer asserts his right to interpret the award and refuses to apply the award as understood by the employees. Even when the arbitrators subsequently meet and endeavor to interpret their own award, railway employers take the position that the Erdman act does not provide for this method of interpretation, and refuse to apply the award as interpretated by the arbitrators themselves. The Erdman act should be amended to the extent that disputes arising out of the award may be adjusted by the same persons who rendered the award.

Summing up the entire matter, it is evident that arbitration is a complex problem; that it has many features to be admired; others that can rightfully be questioned, and some that are justly feared by working people.

W. S. CARTER,
President, Brotherhood of Locomotive Engineemen and Firemen.

ERECTION OF THE KENTUCKY RIVER HIGH BRIDGE.

BY H. H. STARR,
Assistant Engineer, American Bridge Company.

The Cincinnati, New Orleans & Texas Pacific crosses the Kentucky river at High Bridge, Ky., 21 miles south of Lexington, and just below the junction of the Dix river with the Kentucky. Along this portion of the river the water has dug a course for itself in a deep and wide chasm in the limestone formation. At the bridge site this chasm is about 250 ft. deep to ordinary water level and is about 1,200 ft. wide. The cliffs are either precipitous or stand at a very steep slope with bottom lands on one or both sides of the river. The building of a bridge across this chasm was therefore no small undertaking.

As originally planned, John A. Roebling was to build a bridge of the suspension type, and accordingly the building of the towers and anchorages on either side of the chasm was started in 1854. These were completed, but further work was suspended because of financial difficulties, due to the panic of 1857. The towers were built of limestone quarried near the bridge site and stand upon the edges of the chasm 1,240.9 ft. apart center to center. Each consists of two shafts 33 ft. 3 in., center to center, rising to a height of 85 ft. 5 in. above the base of rail.



Fig. 1—Old Bridge, Showing Old Towers for Suspension Bridge.

Each shaft is 16 ft. 7½ in. x 24 ft. 7 in. at the base of rail, tapering to 7 ft. 2 in. x 8 ft. 2 in. at the top, the larger dimensions being parallel to the track. They are joined together by a semi-circular arch beginning 56 ft. above the base of rail, and being 16 ft. 2 in. from springing line to top of coping, which is 13 ft. 3 in. below the top of the shaft. See Figs. 1 and 2.

No further work was done about building a bridge at this point until some 20 years later, when the Cincinnati Southern, owned by the city of Cincinnati, built its line from Cincinnati, Ohio, to Chattanooga, Tenn., and bought and used as a part of its line the old Lexington & Danville. The deed conveying this road reads as follows: "Resolved that the Cincinnati, Lexington & East Tennessee Railroad hereby agrees to sell and convey to the trustees of the Cincinnati Southern Railway all the line of railway belonging to this company from its north terminus in Lexington to its south terminus at Nicholasville, Ky., together with all graded roadbed between Nicholasville and Danville, and all the grounds, rights of way, depots and other buildings and structures, including the towers and anchorages for the suspension bridge on the Kentucky river."

At this later time the Cincinnati Southern asked for bids and designs for a bridge across the river at this point, and on July 9, 1875, awarded the contract for both the superstructure and



Fig. 2—Setting Lower Section of South Temporary Bent.

the masonry to the Baltimore Bridge Company, C. Shaler Smith, president and designer of the bridge. Thomas Rogers was subcontractor for the masonry, the iron work was fabricated by the Edge Moor Iron Company, Wilmington, Del., while Mr. Smith erected the superstructure himself.

The bridge is of the cantilever type with three openings 375 ft. long. (See Fig. 1.) Each of the two end openings consists of a 300-ft. suspended span and a 75-ft. cantilever arm, while the center span, 375 ft. long, serves as the anchor span and rests on two pyramidal towers. The trusses are deck, pin-connected, 18 ft. center to center for single track, and 37.5 ft. deep center to center of chords, with panels 18.75 ft. long, and are of the multiple system type, having two web systems. Both top and bottom chords are stiff members, built up of plates and angles, and have pins passing through them, forced to place by hydraulic pressure. All diagonal members are eye bars packed

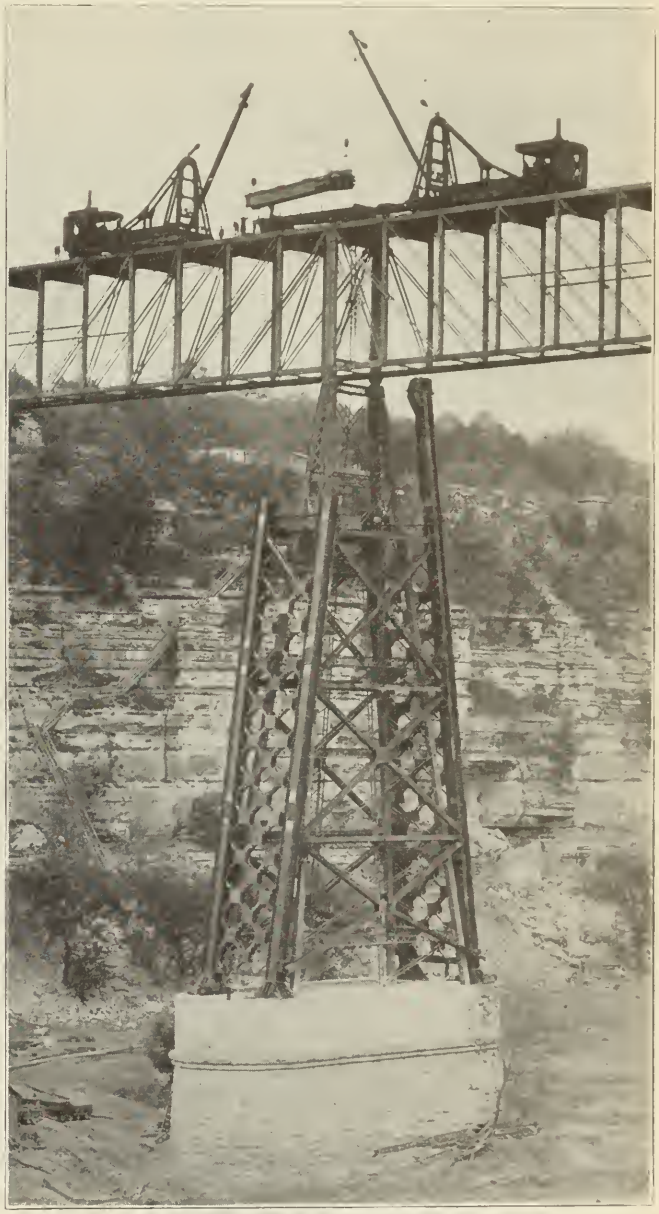

Fig. 3—Setting New North Tower.

on the pins outside of the chord. The posts also are of sections built up from plates and angles or I-beams and channels, and have no connection to the pins, simply bearing against the chords and have the floor beams framing into them at the top.

Each tower consists of four columns, forming pyramids 173.5 ft. high, which rest upon limestone piers. At the base they are 71.5 ft. center to center of columns by 28 ft. center to center of columns, each column base resting on two nests of rollers at right angles to each other to facilitate movement under temperature changes. The piers were carried down to rock foundations at a depth of about 286 ft. below the present base of rail.

As the depth of the ravine would have made falsework very

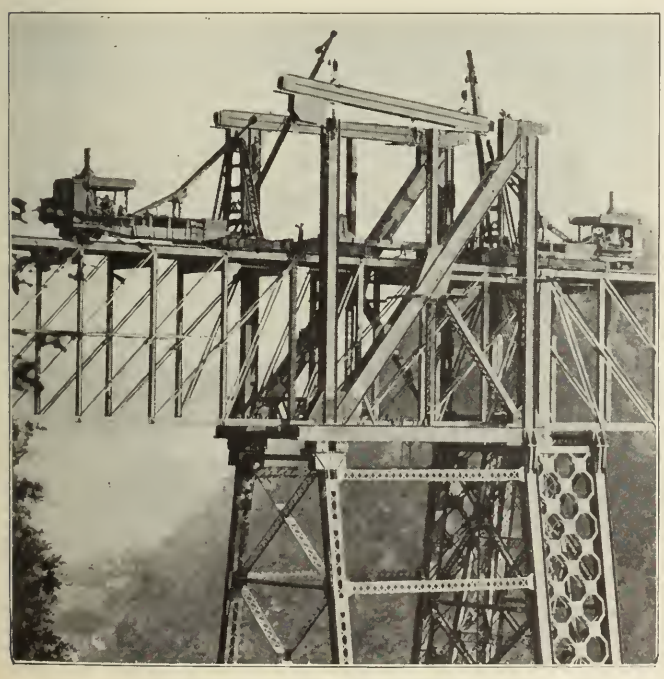

Fig. 4—Setting First Panel of North Span.



Fig. 5—First Panels of Shore Spans Set Ready for Cantilever Erection.

expensive, and as frequent and heavy rises of the river made falsework unsafe in the center, or channel span, the method of cantilever erection was determined upon. Briefly, it consisted of cantilevering the span out from the north abutment to a point 10 panels out, where a wooden tower had been erected to support the span, as it was cantilevered still farther out to the tower, which in the meantime was being erected with gin poles to meet the span. The north half of the center span was then built out half way. Anchorage for the cantilevering of the north span was obtained by fastening the top chord with bars to the base of the stone tower. Temporary additional rods were used in the tower end of the span to provide for the transmission of erection stresses in the web system. The south half of the bridge was then built out in a similar manner until it met the north half at the center of the center span. The structure now being a continuous girder over four supports, two of them being at varying elevations, it became necessary to cut the bottom chords of the shore spans at the fourth panel point out from the tower and so place the structure in the condition as apparently designed—that of a cantilever bridge.

The official record of the railway states that the erection of the superstructure commenced October 12, 1876, was prosecuted without interruption through the bad weather of the winter and completed February 20, 1877. The bridge was successfully tested April 20, 1877. Owing to the inclemency of the weather on the day of the test, instrumental observations of the deflec-



Fig. 6—Setting Center Diagonals of the Center Span; Kentucky River High Bridge.

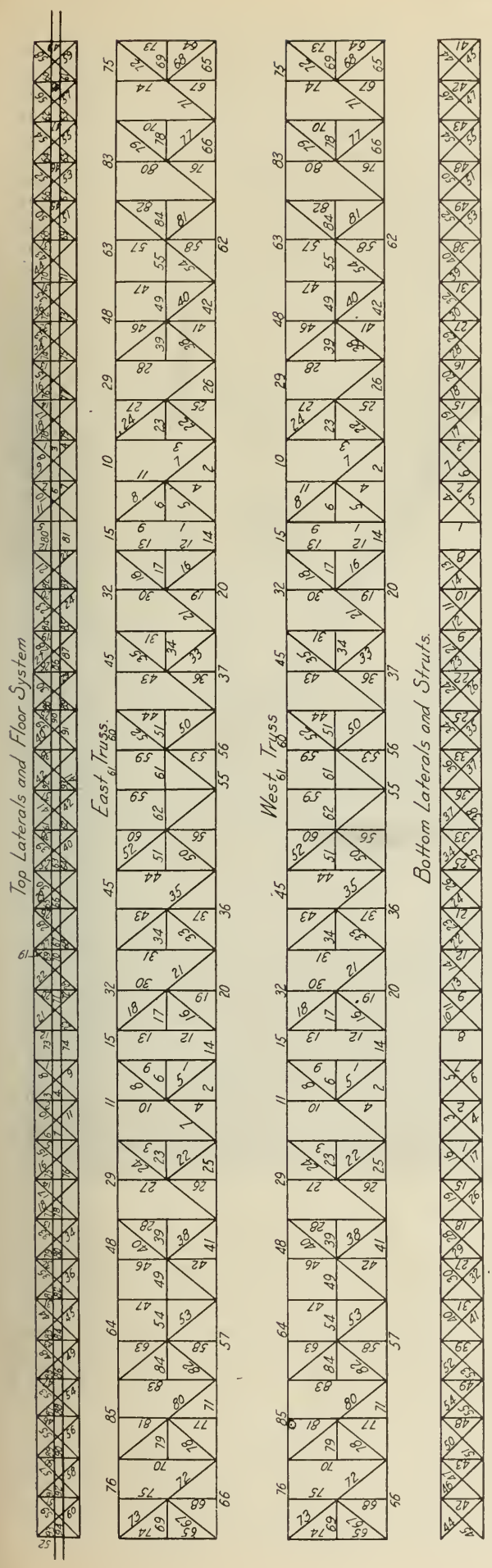

Fig. 7—Progress Report.

tions for each operation could not be taken with accuracy, but were sufficient to show the remarkable rigidity and perfect elasticity of the structure.

The total cost of the entire structure, $404,374, is less than the estimated cost of completing the suspension bridge commenced by Roebling, the towers and anchorages of which were already built.

The cost of superstructure was	$225,420
" " " substructure was	178,954
The weight of iron in spans was	2,855,379 lbs.
" " " " towers was	788,902 "

The old drawings state that the bridge was the highest in the world at that time, being 275.5 ft. from base of rail to low water, and 286.1 ft. to bottom of foundations, although the level of the water in the river has since been raised by dams.

Although the present structure is in good physical condition, the increase in weight of the rolling stock made it imperative to renew this bridge with a heavier one. Opportunity was taken in the renewal of the bridge to improve the alinement and eliminate the heavy down grades which approach the bridge from both directions, these grades making it necessary in hauling heavy freight and passenger trains to use two engines and, in some cases an additional helper. To improve these conditions,



Fig. 8—Handling Top Section of Temporary Bent.

the base of rail of the new bridge was therefore raised 31.3 ft. above the old location.

At first it was intended to build an entirely new structure—an arch bridge, 200 ft. east of the existing one, so as to avoid interruption of traffic during the building operation; but the final design settled upon was for a new structure on the old location.

The new bridge is of the riveted deck truss type, and has three spans, each 353 ft. long, resting upon steel towers and abutments, with two plate girder spans 55 ft. and 69 ft. long, one at each end of the bridge. The trusses are 31 ft. center to center, and 73 ft. deep, of 6 panels, each 58 ft. 10 in. long, sub-divided to 29 ft. 5 in. each for the floor and lateral systems. The floor system is connected to the posts below the top chord. Each tower has two vertical bents 22 ft. apart and about 160 ft. high; 31 ft. center to center of columns at the top, and 78 ft. center to centers of columns at the bottom, and is divided vertically into four bays or sections. The girder spans frame into the end floor beams and into cross girders which rest in pockets in the old stone towers. The old piers were made use of but increased in height by the addition of a reinforced concrete cap about 14 in. thick to give room for the placing of the new tower on the pier. To provide for future double track, the new structure is designed for a double track E-60 loading, although but two lines of stringers are placed at present. As the new struc-

ture is upon the old alinement, it became necessary to construct the new work entirely surrounding the old and allow the traffic in the meantime to be carried on the old structure under the new floor system. As any accident affecting the old structure would probably be of serious consequence, and as the great height of the bridge above the bottom of the chasm made falsework in the erection very expensive, it was therefore imperative that a safe and economical method of erection be decided upon. The method finally chosen was considered to be the best under the circumstances and, briefly, consisted of building out from each tower in each direction by cantilevering and balancing over the tower and a temporary bent until the arms of the center span met at the middle; then building out from the abutments to meet the uncompleted portions of the shore spans.

In the fall of 1909 preparations for the receipt of material were made by establishing a yard north of the bridge, and foundations for the temporary bents were prepared. Each of the temporary bents first used was located under the first main panel point of the shore span away from the tower, and consisted of two columns 31 ft. apart at the top and 87 ft. 1¼ in.



Fig. 9—Setting Second Panel Top Chord of South Shore Span; Kentucky River High Bridge.

As the material forming the members is heavy, and the gusset plates quite large, it was thought best to assemble the trusses as a whole at the shop and ream all field holes while the members were in place and match-mark the joints, thus insuring proper fit and quicker erection in the field.

Since a considerable portion of the work at the beginning had to be handled by a derrick car standing on the old structure, and as the old floor system was too weak to allow the car to handle heavy loads while resting upon it, it first became necessary to adapt the car to these conditions. This was done by strengthening the front bolster, and by adding stiff legs and connecting links on each side of the car to widen its base to 18 ft., which was the distance center to center of the old trusses. Twenty-four-inch I-beams were also provided, upon which the car was blocked while lifting; these I-beams extended over two panels of each old truss and were blocked upon and anchored to the old chords at the panel points. After the derrick car had moved out to the proper position the stiff legs were moved out over the I-beams, the connecting links dropped to place and the car wedged up on the I-beams and anchored to them, in this way relieving the old floor system from all load at the front end of the car, except that of the truck. By blocking on the I-beams at the center of an old panel the load could be put into both web systems of the truss (see Fig. 2).

At the bottom, braced transversely by horizontal and diagonal bracing, and longitudinally by horizontal struts to the new towers. The columns themselves were each formed of two sections of the bottom chord, LO-2 and L2-4, and a post U2-L2 of the permanent material, with additional splice and cap plates and castings to adapt them to the work. The material for the north temporary bent was taken from the south end of the south span, while that for the south temporary bent was taken from the north end of the north span.

The foundations for each bent consisted of a cluster of piles 42 in each cluster, under the foot of each column, capped with 12 x 12 timbers, upon which were placed two tiers of 24-in. 80-lb. I-beams to receive the load and distribute it over the piles. The maximum estimated load was about 15 tons per pile, with an additional load of about 6 tons per pile from wind at 20

lbs. per sq. ft. of exposed area of bridge, making a total of 21 tons per pile. On the north shore the piles were driven down through firm earth of a clay-like nature until about flush with the ground. On the south shore, however, the bent fell just at the water's edge in very soft mud overlying the rock bottom. As the piles stood about 15 ft. out of water, loose rock and earth were dumped in to the water level and the piles afterwards driven through this to the rock bottom.

The erection of the new towers was begun April 21, 1910, the north one being completed on May 9, and the south one on May 21. The method of setting the column sections was as follows (see Fig. 3): The main derrick car, or the car which set all column sections to place, always faced north toward the material yard. At the time of setting any column section the main car moved out to position under its own power and was wedged and anchored to the 24-in. I-beams. The second, or helper car, facing south, moved out with the column ahead of it on a flat car and was in turn wedged and anchored to other 24-in. I-beams. The boom of the main car was set at the proper reach for setting the column in position, the falls of both cars hooked on, the section picked from the flat car, swung over the side of the bridge and slacked into the falls of the main car, which lowered it to the approximate height; then swung out and landed it in permanent position. In the meantime the helper car had been cut loose and backed off the bridge, and if there was sufficient time between trains, had brought out a second section. As soon as all columns of each section or bay were set, all transverse and longitudinal bracing was placed. The heaviest column section weighed 24 tons, while the bottom section weighed 22 tons and was swung out 36 ft. from the center of the bridge. The cast bases weighed 14 tons and were swung out 39 ft. from the center of the bridge. As the transverse bracing on the two lower bays fouls the old tower when in permanent position, these two bays were set in a temporary position to clear the old work until such time as the old tower can be removed. After being erected, both towers were riveted up as far as possible. The time required in setting two column sections averaged approximately two hours for the whole operation.

On July 7 the erection of the temporary bent at the north end of the south span was started, the members being handled by two derrick cars. Owing to the difficulty of temporarily bracing the columns of the lowest section until the permanent bracing could be placed, these two column sections were laid upon the ground, the transverse bracing set, and then tripped to an upright position by two sets of falls running from the top of the new tower to the upper end of the bent section and operated by the spools of the derrick car, which was anchored to the track at the south end of the bridge. The other two sections of each column were set by the derrick cars directly to place, being handled in the same manner as the tower columns. The north temporary bent was set in a similar manner between July 19 and August 3, there being some delay, due to the non-arrival of material. Previous to using the car the various positions of the car, from which the members would be handled, were determined upon and the stresses in the old structure computed to determine the safety of the old structure while under these loadings.

White oak blocking, upon which the bottom chord was to rest, was placed upon the top of each temporary column in two piles, leaving a space between them for the setting of a 500-ton jack. After completing the temporary bents the 24-in. I-beams were moved to the south tower and the derrick cars erected the first panel of the south shore span, which rested upon the tower and the temporary bent. The truss members and bottom laterals were erected first, and the floor beams placed afterwards by jacking the top chords apart to allow the beams to slip down between them. The stringers for the two sub-panels were then placed and the traveler erected upon this panel. The derrick car next erected the first panel of the north shore span with its traveler. Either one or two cars were used in handling each member, as was deemed most advantageous, as shown in Fig. 4.



Fig. 10—Spans Completed Except for Stringers.

The travelers were duplicates, each consisting of a steel platform of girders and I-beams mounted on wheels at the corner, with an A-frame and one boom in the center at each end; the A-frames being braced together by a strut connecting them at the top and by diagonal bars running to the corners of the platform. Two hoisting engines were mounted on each traveler and operated the ¾-in. wire cables of the boom and hoisting falls using 13 parts of line for the boom falls, and 9 parts for the load falls. The travelers ran upon traveler runs on the top chord, consisting of rails spiked to 8 x 16 timbers laid flat.

Active erection of the spans with the travelers began on September 12, when various members of the first panels of the center span were set, and was continued until October 6, when the center span was connected (see Figs. 5 and 6). A calculated positive reduction at the top of each temporary bent and at LO of at least 90,000 lbs. per truss was maintained throughout the work by moving the travelers back and forth and setting various members, first in the center span, and then in the shore span, as shown in the accompanying diagram, Fig. 7. To in-

crease the anchorage, the bottom chords of the shore spans were anchored to the temporary bents, and the bents to their foundation. The point L2 of each shore span was erected 1⅛ in. lower than LO at the tower, and the lengths of the tension members UO-UO and the compression members LO-LO over the towers were varied from 22 ft., so as to raise L6 of the center span 10 in. above the horizontal through LO, and insure its not being below the proper position for connecting the center span. As a matter of fact, L2 of the shore span and L6 of the center span were at greater distances from the horizontal, due to compression in the temporary bent, blocking and foundations.

By measurements made after the towers were erected, it was found that they were not exactly 375 ft. apart center to center, and when the last pieces of bottom chord were about to be set, the gaps in the trusses were found about an inch too short to allow the entrance of the chords. This was overcome by placing 30-ton jacks between the old and the new towers and springing the new towers apart as far as possible; then when a train passed over the old bridge the deflection of the center span forced the towers a little farther apart and the chords were slipped into place.

After setting all main truss members and most of the floor beams and bracing of the center span, the L2 points of the shore spans were jacked up until the top chords came together at the U6 joint; then by using special drifts the connection of the U4-L6 diagonal of the south half of the span was made to the gusset at L6. The travelers then filled in as much as possible of the U6-4 panel of the shore spans and removed the temporary bents. On October 18 the 24-in. I-beams were set at the north end of the old bridge, and on the 19th there was started the erection of the temporary steel bent which had formerly been near the north tower. Because of the higher level of th foundations only two sections of columns were used instead of three. The lower half of the bent was erected on the flat car and tripped by Manila falls operated from the derrick car. The top sections were then set and braced and the bent fastened longitudinally to the old structure with wire cables (see Fig. 8).

On October 22 the derrick car began the erection of the first panel of the north shore span at the abutment end in the same manner as at the tower. The trusses and bottom bracing were erected first, and the floor beams omitted to allow the derrick car to run out on the old bridge. The traveler was then advanced to the center of the shore span and assisted the derrick car, which faced south, in setting the members of the second panel. (See Fig. 9.) Because of the droop in the arm of the span cantilevering from the tower, LO and L2 points were erected in a lowered position so as to continue this curve and leave a gap in the top chord for clearance. After placing all the truss members the LO points were jacked up so as to close the opening in the top chord at U4, and with the assistance of special drifts to connect U2-L4 to the gusset at L4. After the remaining floor beams and bracing were placed on November 7 the span was jacked high enough to set the 30-in. segmental rockers and to drive out the 12-in. pins from the shore ends of the tension members UO-UO, which connected the north to the center span, over the north tower. For jacking purposes the two cross girders for use at the stone towers were temporarily bolted to the end posts UO-LO and the span raised by four 500-ton jacks.

After the traveler had removed the temporary bent at the north abutment, work was transferred to the south end of the bridge. The same method was pursued there as at the north end, except that a timber bent 44 ft. high was used instead of a steel one, and in place of the cross girders there were used short 24-in. I-beams spanning each cast base, with two jacks resting upon them and jacking against the gusset plates at LO. After completion of the south span on November 29, the traveler placed the girder span at the south end of the bridge, and from there proceeded to set all the stringers for the whole length of the bridge and the girder span at the north end. (See Fig. 10.) In the meantime riveting had been started on the bottom chord joints and bottom laterals, using oil forges for heating the rivets. After all possible erection had been completed all forces were turned to riveting and the traveler was used for carrying swinging scaffolds, the forges and rivet supplies during the riveting of the upper chord joints.

As trains are still operating upon the old bridge, owing to the non-completion of the approaches by the railway company, the upper panel of sway bracing has been omitted until trains can be run over the new structure. Many of the lower panels of sway bracing are in a temporary position, due to interference with the old diagonals. After the removal of the old structure these will be changed, and the rods lengthened by short pieces and sleeve nuts.

The total weight of the new bridge is 7,046 tons. The heaviest member handled by one derrick car was LO-2, weighing 26 tons. The heaviest member handled by the traveler was L4-6, weighing 34½ tons.

The track at the north end approaches the bridge on the general surface elevation, while at the south end it leaves the bridge through a rock cut. As the new base of rail is 31.3 ft. higher than the old one, a change in the approaches was necessary. At the north end this was cared for by a heavy fill at one side of the present temporary alinement and a wooden trestle at the immediate end of the bridge. At the south end, girders span the cut and carry the stringers and track for deflecting the traffic to a new alinement.

All masonry work was done by railway forces, under the direction of Horace Baker, general manager, and Curtis Dougherty, chief engineer, of the Queen & Crescent Route. All plans were prepared and all work, both shop and field, was performed under the direction of Gustav Lindenthal, consulting engineer for the C. N. O. & T. P. The shop drawings were made and the steel work fabricated by the Ambridge, Pa., plant of the American Bridge Company, and erected by the eastern division erecting department, American Bridge Company of New York. H. F. Lofland was general manager of erection; J. B. Gamberling, division erecting manager; Daniel Burns, foreman in charge of the field work at High Bridge; and the writer, resident engineer in charge. The writer is indebted to Curtis Dougherty for data regarding the cost and official records of the old structure.

FOREIGN RAILWAY NOTES.

The Chinese ministry of communication has decided to devote the money raised for the Shanghai-Ningpo line to build the Kai-fong-Kai-chow railway. This was not used for the Ningpo line, on account of the local opposition to a foreign loan. The minister agrees to a British engineer, that British material will be purchased, and that the amount of the loan be increased.

The Trans-Paraguayan Railway is in three great sections, their approximate lengths being as follows: Sao Francisco, Brazil, to Uniao, 248 miles; Uniao to Iguassu Falls, Paraguay, 373 miles; Iguassu to Asuncion, 248 miles. About 60 miles up from the coast, and part of the most difficult section, is already built. The section from the coast to Uniao ought to be completed in two or two and one-half years. The line from Uniao to Iguassu Falls will require five or six years. Speed should reach 45 miles an hour, and the whole run be accomplished in between 36 and 48 hours, nearer 36. The line already in existence when the Trans-Paraguayan plan was taken up had been built and run by a small private company. The grades average 1½ per cent. Rolling stock and equipment on the Trans-Paraguayan are to be the same as that in general use on the Sao Paulo-Rio Grande; American locomotives and largely American cars, particularly the passenger cars.

JUDGE SANBORN ON STATE INTERFERENCE WITH INTERSTATE COMMERCE AND VALUATION OF RAILWAYS.*

VALUATION AND A "FAIR RETURN."

The master also found that the maximum state rates prescribed by these acts and orders produced incomes insufficient to pay the cost of earning them, taxes and just returns upon the real values of the Minnesota properties of the defendants respectively used to carry on their intrastate commerce in that state. The actual earnings, taxes, and cost of conducting transportation during the year ending June 30, 1908, the year when the fares and all the rates, except the commodity rates, were in actual operation, were proved, and the master found that the net freight income for that year of the Northern Pacific Company from its Minnesota intrastate freight business yielded an annual return of only 1.941 per cent. on the value of its property used to produce that income, and that if the commodity rates had been in operation this percentage would have been still smaller, that its net income from its intrastate passenger business was sufficient to yield an annual return of only 4.2 per cent., and its net income from all its intrastate business in Minnesota an annual return of only 2.909 per cent. of the values of its property assignable thereto respectively. He reported that the net income of the Great Northern Railway Company from its Minnesota intrastate freight business was sufficient to yield an annual return of only 5.468 per cent. of the value of its property assignable to that business, and if the commodity rates had been in force the return would have been less than 5 per cent., that its net income from its Minnesota passenger business yielded a return of only .925 per cent. on the value of its property assignable to that business, and that the net income from all its Minnesota intrastate business was sufficient to yield an income of only 3.359 per cent. on the value of its property assignable thereto. His report is that, if the acts and orders of which complaint is made had been in force during the fiscal year 1907, the year to which the proof is expressly addressed in the case of the Minneapolis & St. Louis Company, the net income derived from that company's Minnesota intrastate business would have been sufficient to pay an annual return of only 2.93 per cent. on the value of its property assignable to that business, that the net income derived from its Minnesota passenger business would have yielded an annual income of only 1.79 per cent. on the value of its property assignable to that business, and that its Minnesota net income from intrastate freight and passenger business would have been sufficient to earn an annual return of only 2.47 per cent. on the value of its property assignable to all its Minnesota intrastate business.

Numerous exceptions are leveled at the master's findings of the values of the Minnesota properties of the companies used to conduct their intrastate transportation on the ground that they are too high. Evidence of the cost of reproduction of the Minnesota property of each of the companies, of the original cost of acquisition and construction thereof, and of the average market value of the stocks and bonds of each of the companies for a reasonable period of time prior to June 30, 1908, was introduced before and considered by the master.

The master found the original cost of the acquisition and construction of the entire railway systems of each of the companies and the proportion thereof assignable on a track mileage basis to Minneapolis. The amounts thus found prove to be much less than the values ultimately found by the master, and for this very good reason: These railways were pioneers; they were built in large part over the prairies of Minnesota before they were settled and before many of the existing towns, villages and cities along their lines came into existence. A large part of the right of way of the Northern Pacific was granted to it by the nation. The cost of rights of way from five to forty years ago through wild lands, and through towns and villages whose population and the value of the property in which have since been multiplied by from 2 to 10, is obviously no criterion of the value of those rights of way in 1908, when they were used under these fares and rates and when agricultural lands in Minnesota were worth from $35 to $100 an acre, and rights of way and lands for yards and sites for stations in cities like St. Paul and Duluth have wonderfully increased in value. It is a fair return upon the reasonable value of their Minnesota property in 1908 to which these companies were entitled, and the cost of that property at times varying from five to forty years ago may be some evidence; but it is certainly no criterion of its value in that year. In view of these facts, the master rightly decided that the cost of reproducing this property new was a more rational and reliable measure of its real value than the original cost of its acquisition and construction or the market values of the stocks and bonds of the companies, and upon that basis he made his findings.

The railway commission seems to have reached the same conclusion at an earlier date, for in the first part of the year 1906, before these suits were commenced, they had employed Dwight C. Morgan as their engineer and had instructed him and had requested the railway companies to find the respective values of their railway properties in Minnesota on the basis of the cost of their reproduction new.

A schedule of about forty items originally suggested by the commission, and perhaps subsequently somewhat modified, was used by both parties in these cases, and their evidence was directed to the values of these items on the basis of the cost of their reproduction new.

The first and largest item on the schedule was "lands for right of way, yards and terminals." In the case of the Northern Pacific Company the evidence on behalf of the complainant tended to show that the cost of reproducing this item was about $25,000,000. The claim of counsel for the commission now is that the value of this item does not exceed $9,498,099, and the master found that the cost of its reproduction and its value were $21,240,562. Mr. Morgan had never bought and sold any real estate, except his homestead, nor was he acquainted with the value of real estate in general. To ascertain the value of the terminals in each of the three cities he took from the county records the considerations recited in the records of deeds of a large number of lots and lands in each of the cities, compared them with the assessed values of those lots and lands, and found the per cent. that on the average the assessed values were of the considerations recited in these records. In St. Paul this was about 60 per cent. He then laid out strips of lands of varying widths along each side of the railway lands he desired to value, divided these strips into such sections as he thought were of about uniform value, found the values of the land in these sections from their assessed values on the theory that the assessed values were, in St. Paul, 60 per cent. of their real values. From these values of the sections of his strips he deduced the values of the railway lands between the strips by a comparison of areas. To the values of the railway lands thus ascertained he added 75 per cent., because in his opinion it costs railway companies 75 per cent. more than the normal market value of lots and lands in these three cities to obtain such irregular tracts as they need and now own. To ascertain the value of the lands outside of terminals, he searched out himself and by means of employees the prices at which many lots and lands throughout the region traversed by the railways had been sold, and from these prices he estimated the value of the lands of the railway companies, and then multiplied these values by three, because, as he testified, it costs railway companies three times the normal value of lands to procure the irregular tracts necessary for their rights of way and station grounds through agricultural lands and the smaller towns, cities and villages. By these means Mr. Morgan found and testified that the cost of reproduction, and hence the present value of the land for right

*The abstract of Judge Sanborn's opinion dealing with state interference with interstate commerce appeared April 21, p. 949.

of way, yards and terminals of the Northern Pacific Company was $15,385,078. At the request of counsel for the defendants he made another estimate in which he omitted to use the multiples 75 per cent. of the normal terminal values and three times the normal values of lands outside the terminals, and disclosed therein the fact that if these multiples were not used his estimate would become $9,498,099, the value for which counsel for the defendants argue. But neither Mr. Morgan nor any other witness came to say that the latter was the true cost of reproduction or the real value of this item of the schedule. The defendants also introduced evidence of purchases and sales that tend to sustain Mr. Morgan's estimate of the value of this item.

On the other hand, the evidence for the complainants was, as to the terminals in the three cities, the testimony of three residents of each of those cities engaged in the real estate business, of long experience and accurate knowledge of the values of real estate in their respective cities, as to the values of the terminals of each of these companies, the testimony in the Northern Pacific case of Mr. Cooper, the land commissioner of that company, who was in charge of its rights of way and had purchased for it since 1903 property for which there had been paid $6,139,542.35, and who had a general knowledge of the property in question and its value, the testimony in the cases of the other companies of offices thereof similarly qualified, and evidence of purchases and sales which tend to sustain the evidence of these witnesses. As to the lands outside of the terminals, the Northern Pacific Company produced the testimony of Mr. Cooper and proof of purchases and sales for railway purposes which tend to prove that his testimony of the cost of reproduction and the value of the property was not substantially above prices that had actually been paid for like property. He testified that he had much knowledge from his experience and observation of the cost and value of these lands outside the terminals, and he verified his knowledge by investigating the purchases and sales of property in the vicinities of these various rights of way, that the necessary cost of obtaining such rights of way by a railway company was three times as much as the normal value of the land, and that his testimony of the value of these tracts was based upon that fact. The evidence in the other two cases was of the same character. In each of the three cases the master added to the values of the terminals in St. Paul and Minneapolis, established by the testimony of the real estate dealers and Mr. Cooper, 5 per cent. for the cost of acquisition and consequential damages and to the values of the lands for terminals in Duluth, verified by the witnesses for the companies, 25 per cent. for railway value and the cost of acquisition and consequential damages, and from the values of lands outside terminals, established by the evidence for the companies, he deducted 25 per cent. The result was that his ultimate finding of the value of the first item in the schedule was about $4,000,000 below the value which the testimony of all the witnesses, except Mr. Morgan, sustained, about $6,000,000 above that which Mr. Morgan's testimony supports, and about $11,000,000 above the amount which counsel for the defendant now urge the court to adopt. This finding of the master is assailed because he allowed 5 per cent. of the value of the terminals for cost of acquisition and consequential damages, because he increased the values of the terminals at Duluth, established by the testimony of the real estate dealers, 20 per cent., for the reason that they failed to give due weight to the value of these terminals for railway purposes, because the companies, estimates of the value of this item included an addition to the values of the St. Paul and Minneapolis terminals fixed by the real estate dealers of 25 per cent. thereof for railway value, and because he failed to follow the theory of Mr. Morgan and to adopt the value which Mr. Morgan would have found if he had discarded his multiples.

But the evidence in this case is conclusive, nay, we may say it is without conflict, that every railway is compelled to pay more than the normal market value of property in sales between private parties for the irregular tracts it needs and acquires for rights of way, yards and station grounds. The defendants' witness, Mr. Morgan, testified that in his opinion the companies necessarily paid three times the normal value for the lands outside of the terminals in the three cities and 75 per cent. more than the normal value for their terminals within those cities. The master in effect found that the cost of reproduction and the present value of the lands for the terminals in the three great cities, including therein all cost of acquisition, consequential damages, and value for railway use which he allowed, was only about 30 per cent. more than the normal value of the lands in sales between private parties. He found the value of the lands outside the terminals to be only twice their normal value. Findings of lower values would have been contrary to the great weight of the evidence and without substantial support therein.

The measure of the value of real estate is its market value for its most available use.

But counsel argue that this court should disregard Mr. Morgan's multiples and fix the value of this entire item at the amount that his estimate would produce if his multiples were not used, $9,498,099, because the original presumption was that the fares and rates fixed by the legislature and the commission were just and reasonable, clear proof was requisite to overcome that presumption, if there is any substantial evidence to the contrary the proof is not clear, and the master's findings must be presumed to be wrong, and Mr. Morgan's evidence is sufficient to enable one fairly, in the exercise of an honest judgment, to disregard the findings of the master and the evidence which supports it, and to adopt the lowest value claimed. This contention is urged with such force and frequent repetition in brief and argument, and is applied so persistently to the various specific findings of the master, that it deserves consideration.

But the question whether fares and rates which have been put in operation confiscate the property of the companies in violation of the Constitution of the United States is a judicial, and not a legislative, question. And when that issue is presented the rules of law, of equity and of practice applicable to the determination of judicial questions have effect. When, therefore, rates have been tried by actual use for many months, and their effect has become known and is proved, when the issue whether or not they take the property of the railway company without just compensation has been made in a competent court, and all parties have introduced, in the presence and subject to the cross-examination and rebuttal of each other, all the evidence they desire, when that issue and the numerous subordinate issues it involves have been heard and decided, as they have been in the case in hand, by a master, who has personally heard the testimony of every witness, received and examined all the evidence, and made specific findings of every material issue of fact in the case, the judicial presumption arises that his findings are right. This is a presumption of reason as well as of law, a presumption that forces itself upon and compels the reflective mind. Take the general issue. The legislature and the commission decided it upon the information they had acquired as to the probable effect of the rates they were making before those rates were tried. The master decided it after the fares and all the rates, except the commodity rates, had been tried for many months and their actual effect was known and proved. The former decision was based on the conjectural effect of the rates, the latter on their actual effect. The master decided this issue upon a full trial, in which all parties produced all their evidence, subject to the cross-examination and rebuttal of each of the other parties, in the manner which the wisdom and experience of centuries has taught is most conducive to the discovery of the truth and the administration of justice. The legislature and the commission decided it without such trial or such proof.

Doubtless if the fares and rates had been tested by the actual operation of the railways under them, and the plenary proof of their effect and of the other facts presented to the master had been introduced before the legislature and the commission, they would have reached the same conclusions which the evidence forced upon the master's mind. They decided the issue upon evidence more conjectural or speculative; he, upon proof more certain and conclusive.

Returning now to the finding of the value of the first item of the schedule, it is sustained by the testimony of nine real estate dealers familiar with the values of the properties in their respective cities, by the testimony of the officers of the companies who were well acquainted with the properties and their values, who had purchased rights of way that cost many millions of dollars, and by the corroborative evidence of purchases and sales at prices approximating the values found. It is met by the theoretic value of Mr. Morgan, based on his assessment sales method of proof, and by evidence of purchases and sales corroborating it. But the foundation of this value is what copying clerks wrote that grantors in deeds wrote were the considerations of their conveyances of certain properties, and all of these parties were strangers to the parties to this suit. It is conditioned by Mr. Morgan's opinion of the number of such considerations it was necessary to use to discover the true relation of considerations of deeds or presumptive values of properties described therein to their assessment values, by his opinion as to the width of the strips on each side of the rights of way and as to the number and the lengths of the sections of the strips requisite to ascertain just measures of the values of the rights of way between them. He concedes, and counsel for the defendants do not deny, that his method would not reliably indicate the value of any specific lot or tract of land of moderate dimensions, and it is difficult to understand how it can escape the maxim, "falsus in uno, falsus in omnibus." A careful consideration and analysis of Mr. Morgan's testimony and of the other evidence introduced to support it has convinced that they are too indirect, uncertain and inconsequential to overcome the direct and convincing proof of the values of these properties which the complainants have made, and the exceptions to the master's findings of these values must be overruled.

Exceptions were taken to the allowance of interest at 4 per cent. per annum on the cost of the reproduction of the railway properties during one-half of the estimated times of their construction. But the evidence is conclusive that moneys invested for the purchase of rights of way for, and in the construction of, railways, ordinarily produce no net income during the period of construction, that the amount of capital thus losing returns is ordinarily equal to one-half of the cost of reproduction during the entire period of construction, or to the entire cost during one-half of that period. There is no doubt that interest at a fair rate on the capital invested in materials and labor that remain idle during construction is as much a part of the cost of constructing or reproducing a railway as is the money paid for those materials or that labor. Brunswick Water District v. Maine Water Company, 99 Me. 371, 59 Atl. 537, 542. Mr. Morgan, the engineer and witness for the defendants, allowed in his report to the commission, and verifies the justice of an allowance of 4 per cent. per annum during one-half of the period of construction; but the amounts he allowed were less than those found by the master, because his estimates of the cost of reproduction and of the times requisite for construction were less. The weight of the testimony on this subject, however, sustains larger amounts than those fixed by Mr. Morgan or the master, and there was no error against the defendants in the latter's finding and allowance of the item here under consideration in either of the cases in hand.

The Minnesota Transfer Railway Company is a corporation and the joint agent of the owners of ten different lines of railway for the interchange of their freight traffic in St. Paul and Minneapolis. Each of the ten owners owns one-tenth of the property of the Transfer Company by virtue of an ownership of stock. The St. Paul Union Depot Company is a like corporation and joint agent of the owners of nine lines of railroad for the exchange of their passenger traffic, and it is owned by nine constituents in the same way. Each of the three defendant companies owns one share in each of these terminal companies, and the latter corporations and their properties are operated and used as tools of the railway companies that own them, to conduct transportation for their exclusive use and benefit. The defendants complain because the master allowed to each of these three companies $1,186,191 as the cost of reproduction and the value of their respective interests in the property of these subsidiary companies, and because he allowed to the Northern Pacific $1,180,151 for the cost of reproducing and the value of its interest in a similar corporation and its property used by the Northern Pacific for a like purpose at Duluth. It is not claimed that these interests are not worth, or that their cost of reproduction would not be, the amounts allowed; but it is contended that these values are not allowable at all, because they are represented by the stocks and bonds of the subsidiary companies. But these interests in these terminal corporations and their property are the most indispensable parts of the Minnesota properties of the defendant companies used to earn the fares and rates here in question, and any estimate of the value or of the cost of reproduction thereof which omitted the value or the cost of reproduction of these interests would have been incomplete and deceptive. The master rightly considered and allowed their value.

There are exceptions because the master allowed to the Northern Pacific $1,613,613, to the Great Northern $3,219,642, and to the Minneapolis & St. Louis $608,896, for the solidification and adaptation of their respective railways, and deducted nothing from the cost of reproduction for depreciation. But these amounts are those allowed by the defendants' engineer and witness Morgan in his original estimates of the cost of reproduction which he reported to the commission, and there is much other evidence in the record to sustain them. It is clear that a new railway may appreciate or depreciate as it grows older. It may be renewed, repaired, and improved day by day until the whole property becomes more valuable than it was when it was first constructed. On the other hand, its embankments and its roadbed may be neglected until the entire property suffers great depreciation. Whether at a given time a railway property is more or less valuable than it would be if it had just been constructed is a question of fact, that in a suit of this nature must be answered by the evidence. That evidence in this case is that the railways, rolling stock, and appurtenances which constitute the great transportation machines of these companies in Minnesota are in better condition for use, more efficient, more steadfast, better adapted to each other, than if their construction was just completed, that all depreciation has been offset by appreciation, and that values to the amounts here allowed by the master have been added to the values of these properties new, by their age, their repairs, their renewals, their adaptation, and their assured efficiency that comes from constant careful maintenance and operation. There was no error in these allowances.

The master divided the values of the Minnesota properties between freight business and passenger business and between interstate business and intrastate business on the basis of the respective gross earnings of these classes of business. Counsel for the defendants challenge this basis of division, and contend that the apportionment should have been made on the basis of the use made of the property by each of these classes of business, measured either (1) by the aggregate number of the ton miles and passenger miles of the respective classes, or (2) by the aggregate number of the car miles and engine miles of these classes. They say that if that proportion of the value of the property of a company which the number of ton miles hauled

by it in Minnesota bears to the aggregate of its ton miles and passenger miles in Minnesota be assigned to its freight business, and that proportion which its number of passenger miles bears to the same aggregate be assigned to the passenger business, and if that proportion of the value thus assigned to the freight business which the aggregate of the car miles and engine miles appertaining to the intrastate freight business bears to the car miles and engine miles used in the freight business be assigned to the intrastate freight business, and the same method be pursued in apportioning value to the intrastate passenger business the apportionment will be more equitable and just. The issue is between apportionment by use without regard to the worth or value of the use and apportionment according to the value of the use. The latter basis seems to be more logical and rational. Capitalization is founded on the worth of use, not on mere use. The value of property and of investment in every form is measured by the value of its use, not by its use divorced from the value thereof. The Minnesota railway commission, the railway companies, all rate-makers, base their rates primarily on the worth of the use of the railway machines by the various classes of freight and by the passengers, and not on the amount of that use. The rate for hauling a ton of merchandise of the first class a mile is not five times the rate for hauling a ton of merchandise of class E a mile, because the former ton mile uses the railway property five times as much as the latter, but because the use by the former is worth more than the use by the latter. Moreover, there is no unit of measurement of ton miles and passenger miles, of freight car miles and freight engine miles, or of passenger car miles and passenger engine miles, divorced from the values of the uses they make of the railway property, from the classes of loads they carry and the distances these loads are hauled. Indeed, there is no proportioning or measuring relation between such varying uses of property, when no regard is given to the values of these uses.

On the other hand, the values of the uses, the earnings of the property, unavoidably condition the value of the property used, and present a natural and equitable basis of apportioning that value to these uses. Cases may indeed be imagined in which this basis does not produce persuasive results. One of them was suggested by Mr. Justice Brewer in Chicago, Milwaukee & St. Paul vs. Tompkins, 176 U. S. 167, 176, and others of like character have been presented in argument by counsel. But no basis has been suggested and none has been discovered which seems to be more equitable or more accurate. It may be that there is no basis or method that brings perfect or ideal results. But because the ton mile and passenger mile basis has no common unit of measurement, because that basis and the car mile and engine mile and the passenger car mile and passenger engine mile basis exclude the effect of the values of the uses made of the railway property by the various classes of freight and by the passengers carried, because there is really no proportioning relation between uses divorced from their values and the value of the property used, because these bases ignore the differences in the classes of freight carried and in the distances they are hauled, because the apportionment of the value of railway property on the basis of the gross earnings of the classes of business, which disclose approximately the values of their uses of it, gives effect to these material differences, appeals more persuasively to the reason and produces results more equitable than any other basis suggested, and because this basis has commended itself to the judgment of, and has been adopted by, the courts upon whom duties of apportionment of this nature have been imposed in like cases, the master was justified in following their decisions and his action and report in this regard is confirmed.

Complaint is made that the master finds that the companies are entitled to a net return of 7 per cent. per annum upon the respective values of their properties devoted to this public use. The character of the business in which an investment is made, the locality in which it is placed, the returns secured in that locality from other investments of a similar nature, the uniformity and certainty of the return, and the risks to which the principal and the income from it are subjected condition the measure of a fair return upon capital invested. An investment in a bank, in a factory, in a mercantile, manufacturing or agricultural business, is substantially free from regulation by the government and exempt from any duty to the public, except that of paying taxes. If the business in which such an investment is made is unprofitable, its owners may promptly discontinue its operation until more prosperous days come and then return to their undertaking. An investment in a railway which operates in many states is subject to the regulation of its business by many governments. Its owners owe the duty to the governments and to the public to operate their railway continually in days when its operation is unprofitable as well as when it is remunerative, a duty they must discharge under the penalty of forfeiture of their property if they fail. In view of these facts, they ought to be permitted to receive a return large enough to enable them to accumulate in prosperous days a surplus sufficient to enable them to protect their property in days of disaster and to make their average return through days of prosperity and of adversity fair and just. The lands in Minnesota through which these railways extend are fertile and productive. The cities, villages and towns they reach are rapidly increasing in population and wealth, and the people they serve are thriving and successful. The evidence satisfies that the railways are maintained in excellent condition, that they are efficiently and on the whole economically managed and operated, and are rendering commendable service. Justice to the thriving people they serve does not require that the owners of these railway properties should be deprived of a fair return upon their values. To deprive them of such a return would prevent advances and tend to compel reductions in the wages and salaries of their employees, would tend to prevent the extension of their lines in portions of the state where the development and accommodation that railway service assures would be welcome and may be needed, to deteriorate the character of the service they render, and to retard the general prosperity. The legal rate of interest on a debt in Minnesota, in the absence of contract, is 6 per cent., and by contract it may be 10 per cent. per annum. Rev. Laws Minn., 1905, Sec. 2733. Rational investments in agricultural, manufacturing, mercantile and other industrial pursuits, and even well-secured loans, yield returns in Minnesota corresponding with these lawful rates. Investments in railways and the returns thereon are at the risk of failures and partial failures of crops, of the disasters, delays and expenses of unusual storms, snow and cold, of the great financial disasters which occasionally prevent or delay the movement of traffic, and of the burden of continuous operation whether profitable or unremunerative. It is an axiom in economics that the greater the risk the greater must the return be upon invested capital, and the conclusion is irresistible that a net return of 7 per cent. per annum upon the respective values of the properties of these companies in Minnesota devoted to transportation is not more than the fair return to which they are entitled under the Constitution of the United States.

It is proposed to run the Fukien Railway, China, along the northern bank of the North river as far as the town of Pholam, and to build a bridge across the river at that point, curving southwards to the city of Chang Chow Fu. This would be done to avoid the almost prohibitive cost of bridging the North river so far down as the Kang Tang Kio bridge, which would be the nearest and most natural route to the city of Chang Chow Fu. The proposed bridge would make the distance from Amoy to Chang Chow Fu considerably longer, but it would tap two most lucrative sources of income—the very large North river area and the extensive Chang Ta county.

MOTOR DOLLY FOR HANDLING MISCELLANEOUS PACKAGE FREIGHT.

BY GEORGE B. FRANCIS,
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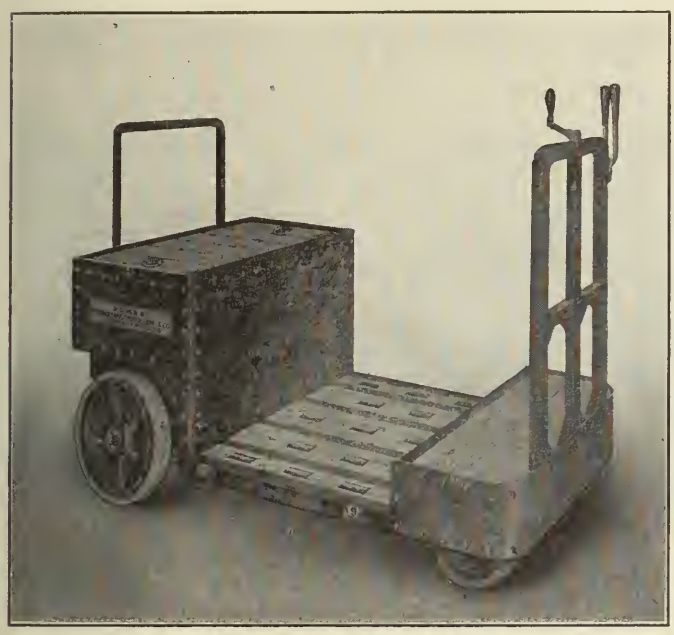
During the past two years railway transportation men and engineers have been giving much attention toward the reduction of the cost of freight handling at the large terminals by means of mechanical apparatus.

It is said that the largest cost item in freight transportation is the one at the terminal, and that this is the place where there has been practically no improvement since the earliest days of railroading. This applies particularly to the outbound and inbound freight houses where it is necessary to move all sorts of packages from any one spot to any other spot, to sort the packages in the outbound house for classification, so that the proper rates may be applied to the particular weights of individual consignments, and to sort them again so that the individual consignments may be trucked to the right car for destination.

It is also necessary to have some positive method of checking so that truckmen do not leave the packages in the wrong car,



Motor Dolly.

through carelessness, without it becoming instantly known to those in charge.

At the inbound house the weighing and classification therefor and the sorting for destination, other than placing the package in the proper section of the house for final delivery to teams. is done away with. Thus the movement of packages from any one spot to any other spot at the inbound house is more simple than at the outbound house.

Up to the present no method of moving packages in these two kinds of houses has been found equal in efficiency or more economical in cost than the hand truck and hand power, which have been with us from time immemorial. Where freight of one classification must be moved from some one point to some other one point there are many successful methods of doing this by power machinery, such as the moving platform, the belt conveyor, the overhead crane and the overhead carrier generally known as the telpher. The many well-known types of fixed or traveling cranes assist in a variety of movements, so that one particular class of freight is handled at vastly less cost than the miscellaneous package freight at the outbound and inbound houses above referred to.

Nearly all manufacturing or industrial plants throughout the country have installed some type or types of power handling machinery where the material is to be handled or conveyed from some one point to some other one point. Many of these mechanical appliances are applicable in the loading and unloading of vessels at wharves and water terminals. They are also, to some extent, useful at railway freight transfer stations where less than car load lots are broken up for the purpose of making car load lots for particular destinations, or the reverse.

Great effort has been made to devise for outbound and inbound freight houses a system of telpherage to embrace lifting, conveying and lowering, say from the time freight is delivered at the doors of the outbound house or teams until it is deposited inside or upon the car; also to make this apparatus workable in handling any kind of package from any one spot in or alongside of the house to any other spot in any car in any part of the yard adjacent to the house. This system involves overhead tracks everywhere in the house and yards sufficient to cover almost every square foot of area, the distribution of contact wires for power, the use of many switches in the track, automatic or otherwise, for diverting of route, etc. When it is tried to lay it out, in connection with existing facilities, it is found, that to get supports for the overhead track this telpherage system practically requires the reconstruction of entire yards and buildings, and that there are often physical obstructions, like overhead bridges, to prevent the utilization of head room over the cars, etc. It has even been said that to make this system most efficient would require the reconstruction of the cars themselves so that they might be loaded through a removable roof or top hatches. These difficulties have prevented railway officers from installing such plants, and there is hardly such a system in the country. Should any manager have sufficient confidence in obtaining the reduction of cost in freight handling by this system the best place to try it out would be in an entirely new terminal where all facilities could be planned to harmonize with this system.

While this mechanical handling discussion has been going on other improvements have been developing, which allow of economy at freight houses by simpler means. Over and over again have railway men repeated the statement that nothing would ever be found to take the place of that wonderful tool, the hand truck, so efficient, in all save expense, in moving the package freight in the freight houses; and a eulogy might be written on its utility as a crow-bar, an elevator (at least sufficiently to clear the floor), a turntable and a conveyor.

The tool now suggested to take the place of the expensive hand truck is nothing more or less than a miniature storage battery power truck, which improvements in batteries and other apparatus have made available for the purpose. The development of this miniature truck is natural, following on the immense success achieved by the recently adopted larger power trucks for baggage handling in New York and other places.

The best features of the miniature truck is its availability in all existing freight houses, and the low cost to any railway to make a test of its efficiency. This machine has been named the "motor dolly," because the timber dolly used on construction work is the smallest known type of machine used for the conveyance of heavy weights. The overall dimensions selected for the motor dolly are those considered most desirable for present outbound freight house conditions. The average working speed will be twice that of the hand truck and the average carrying capacity utilized about three times that of the hand truck. This makes the power dolly, when efficiently used, equivalent to six hand trucks in speed and capacity.

The machine suggested consists of a steel-framed spring mounted platform 6 ft. long and 38 in. wide. The front and rear portions are raised, the rear to accommodate the power plant and driving gear, the front to provide clearance for the steering wheels. The central portion, which is but 9 in. above the floor, is intended for heavy packages, and the raised portions are for light packages. The entire platform area is available for loading. The central or low portion is provided

with a unique and original system of depressable rollers for convenience in loading and unloading. During transit these rollers are depressed, allowing the package to rest directly on the platform. By means of these rollers, large or heavy packages, ordinarily requiring considerable time and labor for loading, may be readily slid on and off the platform, materially facilitating this portion of the work.

The space occupied by the motor dolly is approximately the same as that occupied by a loaded hand truck in transit with the trucker either pushing or pulling the load. The maximum speed practicable is 6 m. p. h., while the average speed will be about 5 m. p. h. The turning radius is 2 ft. at the rear wheels, which allows of its use in as cramped and congested situations as that in which the present hand truck operates. No wider trucking aisles are required than with the hand truck.

The power plant consists of a storage battery in connection with a compact and efficient motor of 2 k. w. rated capacity. As one of the chief requirements is rapidity of movement, or liveliness, a motor capable of considerable overload capacity is required. Similarly, all details of the propelling mechanism should be extremely rugged and capable of rough handling without injury. The battery should be removable, with the idea of recharging batteries independently of the machine; spare batteries should be provided for this purpose. It is considered that under ordinary conditions of operation the battery provided will give about 5 hours' operation without charge, or being recharged. The time required for battery change is about 5 minutes.

The motor is hung on the main frame directly under the battery and is direct-geared to the countershaft through a spur gear reduction. The countershaft runs the width of the machine and is provided with a differential gear. At each end of the countershaft there are sprockets engaging a chain running on sprockets direct connected to the driving wheels. The rear axle is solid, of ample strength and rugged construction.

After providing for the several details comprising the motive power equipment, it will be seen that the space allotted to this purpose is reduced to a minimum. The same may be said of the front portion of the machine. Therefore, any increase in the length of the machine, within reasonable limits, for inbound house conditions would represent net increase of the heavy load portion or low platform section.

The body of the machine is mounted on coil springs, guide pedestals similar to railway car practice being provided. The front wheels are separately pivoted and are operated for steering in the same manner as in automobile practice, except that greater freedom of movement is allowed. The front vertical frame carries the control handles. The removable steering handle is connected through a vertical shaft and suitable reduction to the steering wheels. The automatic controller handle is connected to a compact controller under the front floor, which gives three speeds in both directions. The brake lever works through the usual connections on a brake drum direct connected to the rear wheels. These brakes are of the internal expanding type.

The operator may either stand on the front platform or sit on the folding seat which is hung on the front frame. In case of the front platform being occupied by packages, he can sit on the packages. The automatic controller returns to the off position when released, so that in normal operation it requires small mental effort on the part of the operator to shut off power and apply the brakes. The brake is further provided with means for holding at any position in which it may be placed. It is considered that, in view of the quality of liveliness possessed by this machine, refinement of control is justified.

The maximum capacity is 1,000 lbs., and the weight without load about 1,200 lbs. It is expected that under average conditions the capacity utilized will be about 750 lbs. and the average speed, excluding stops, will be about 5 m. p. h. At the rear of the machine a removable rack or stakes will be provided. These latter may be used as levers in case of necessity to assist in loading.

The motor dolly will readily manoeuver wherever the hand truck will; it can enter the standard freight car and turn around inside if necessary. In general, it represents a compact and lively counterpart of the hand truck with the additional desirable feature of speed, carrying capacity and freedom of movement. No other transportation medium, other than a charging plant, is necessary for the efficient utilization of present freight houses as they now stand, than the installation of this form of transportation in such quantities as is required by the volume of freight handled. The net capacity of the freight house will be increased and the initial investment, operating costs and capital charges will be in direct proportion to the amount of freight handled. This system serves areas and not predetermined fixed points whose locations cannot be changed except at considerable cost.

The entire top surface of the motor dolly can be loaded with freight and its several top surface divisions lend themselves very conveniently to keeping separate the parts of the load that are labeled for separate destinations, either in the cars, or in the house. In order that no freight shall be sent to its wrong destination, pockets are provided for the car numbers, which, instead of being handed to the trucker, are placed in the pocket opposite the freight itself. After the freight is placed in the correct car, the checking numbers are taken from a similar pocket on the car in which the freight is placed and this duplicate number put in the proper pocket on the dolly, so that on the return of the dolly to the loading point the checker may verify the fact that each of the several loads on the dolly has gone to the correct car for destination. This avoids any mixing of cards in the hands of the operator of the dolly.

The use of a motor dolly of this character would probably require in some instances that the facilities for weighing the packages as they come off the team and before they go on the dolly be at the door when the transfer from team to dolly is made. In other cases, where the freight is of one classification, the dolly can go to the scales, as is usual with hand trucks. A portable platform scale could be used at the receiving doors to supplement the usual house scale.

This system of freight handling has been devised by the writer; he has been assisted in the mechanical and other details by B. H. Smith, M. E. Patents have been applied for on this form of apparatus.

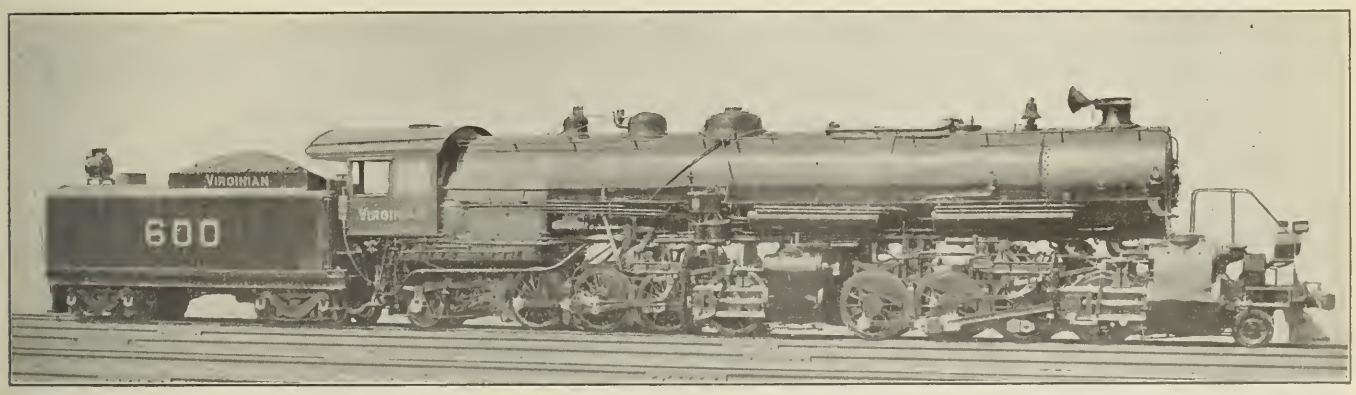
THE TEXAS LEGISLATURE.

The Texas legislature, as recently noticed in this column, has adjourned after a 60-days' session without having passed a single law increasing the restrictions on railway operation and, in fact, without adopting any measure of any kind which will tend to accentuate the hostility toward railways which has been so prominent a feature of public sentiment in that state during the past 15 years. Moreover, the bills called for by the labor unions were uniformly rejected. These bills were numerous, as in former sessions, but not one was enacted into law. One of the bills which proposed to require an additional man on all trains was reported favorably in the lower house but it never came to a vote. John Gould, a Texas newspaper man, who sends us these notes, says that there was encouraging evidence throughout the session of a tendency to give the railways a "new deal," but how much permanency there is to this improvement is difficult to say. While the attitude of the legislature on general laws was thus commendable there were introduced two measures which would encourage railway building in Texas, and which were favored by a strong sentiment among the business community, but which were rejected. These were the bill to allow the consolidation of the Missouri, Kansas & Texas of Texas with the Texan Central, and the bill to repeal the worst features of the law passed last summer for the benefit of unsecured

creditors of the International & Great Northern. The M. K. & T. controls the Texas Central and the T. C. is not a competing line, but the bill failed, even after being favorably reported in both houses. It was reported that the governor meant to veto the bill if it were passed. The I. & G. N. bill is said to have been favored by the governor and it was featured by both committees, but it died of neglect during the last days of the session. Two other consolidation bills failed, one allowing the St. Louis & Southwestern to acquire the Stephenville, North & South Texas Railway, a small western line with which the cotton belt connects, and another permitting the Gulf, Colorado & Santa Fe to take over the Concho & San Saba Valley, another West Texas short line. The original outlook for both of these bills was quite favorable, but both failed in the rush of other business.

LOCOMOTIVE BUILDING DURING 1910; BALDWIN LOCOMOTIVE WORKS.

Locomotive building in the United States during 1910 was characterized by the development of types previously introduced and tried out in service, rather than by the introduction of radically new designs. The year 1909 had witnessed the construction by the Baldwin Locomotive Works of the first Mallet articulated compound locomotives with the 2-8-8-2 wheel arrangement. The first examples of this type were built for the Southern Pacific and were followed later in the year by two similar locomotives for the Atchison, Topeka & Santa Fe. The Santa Fe engines were described in the *Railway Age Gazette* of November 26, 1909, page 1018. They weighed 462,450 lbs. in working order and this weight has not yet been exceeded, unless exception be made in the case of certain ten-coupled locomotives for the same road which were rebuilt as Mallet compounds during the past year by the addition of front units. As the ten-coupled engines had been in service for some time, the rebuilt locomotives can hardly be classed as new construction.



Mallet Locomotive of the 2-8-8-2 Type; Virginian.

MALLET LOCOMOTIVES.

During 1910 the increasing use of the Mallet locomotive was notable, 169 being built by the Baldwin Locomotive Works. These locomotives are now being used to a considerable extent in heavy road service, especially on lines where grades are severe and speeds are necessarily slow. In common with other compound locomotives the Mallet shows its greatest economy at comparatively slow speeds and does its best work on heavy pulls where a high tractive effort is exerted for a maximum period of time.

Virginian Mallets.—The heaviest locomotive built during 1910 was of the 2-8-8-2 type and was constructed for the Virginian. It weighs 448,750 lbs. in working order and develops a tractive effort of 97,200 lbs. It is capable of hauling 20 cars, each weighing 78 tons, and a caboose up a grade of 2.07 per cent. This locomotive is an excellent example of the eight-coupled Mallet, as built by Baldwin, and attention may therefore be called to the principal features of its design. The boiler is of the separable type with the main, or evaporating portion, in the rear section and a feed-water heater in the front section. The separable joint surrounds a combustion chamber which is located between the feed-water heater and the evaporating section. The heater contains ordinary fire tubes except at the center where a large flue, 21 in. in diameter, is located. The injectors force water directly into the heater which is kept filled. The overflow leaves the heater through an outlet placed on the top center line and enters the boiler proper through a check valve so that any discharge from the evaporating section into the heater is impossible.

The throttle is of the usual balanced type and is located in the dome, which is of pressed steel flanged from a single sheet. The steam, in passing from the high to the low pressure cylinders, flows through a nest of small tubes which traverse the central flue of the feed-water heater. It then passes to a flexible receiver pipe which is placed on an angle under the smokebox. With this arrangement the high pressure exhaust steam is reheated and the piping is exposed to the cooling effects of the atmosphere as little as possible. The frames are arranged with a single hinge connection in the form of a cast steel radius bar. The hinge pin is seated at the bottom in a cast steel frame brace, and at the top in the high pressure cylinder saddle. The high pressure cylinders are cast entirely separate from the saddle and from each other. The low pressure cylinders are bolted and keyed to either side of a steel casting secured to the front frame and constitute part of the front frame system. This form of construction makes it possible to keep the transverse distance between the low pressure cylinder centers within reasonable limits, regardless of the distances between frame centers. Eight locomotives similar to the Virginian Mallets and nearly the same capacity, were built in 1910 for the Duluth, Missabe & Northern.

Santa Fe Mallets.—Two Mallet locomotives, with articulated boilers, were built for the Atchison, Topeka & Santa Fe, and were described in the *Railway Age Gazette* of February 24, page 351. They have a 2-6-6-2 wheel arrangement and are alike except for the design of the flexible boiler connection used. On one engine the connection consists of two cast iron sleeves fitted one within the other and provided with snap rings to keep the joint tight. Each sleeve forms a ball joint with a cast iron ring, which is bolted to the shell of the corresponding boiler section. The connection is thus double ball-jointed, as well as slip-jointed, and can accommodate itself to any change in the relative positions of the two boiler sections. On the second locomotive, the articulated boiler connection consists of a number of steel rings which are made with a set, so that when placed adjacent to each other, they form a series of V-shaped sections. These rings are riveted together at their inner edges and bolted at their outer edges, the general arrangement being somewhat similar to the bellows of an accordion. An internal flue traverses the connection and prevents cinders from lodging in the crevices between the flexible plates. The rear section of the boiler contains a superheater and the front section a reheater of the Jacobs type. The front sec-

tion is held in alinement with the frames, but is carried at the rear on a sliding support which provides for expansion and contraction.

The Atchison, Topeka & Santa Fe also received 38 Mallet locomotives generally similar to those described above, but having rigid boilers of the separable type. All the Mallets are fitted for coal burning and are in service on the Belen cut-off, where the maximum grade is 0.6 per cent. On this grade they have handled 2,700 tons of cars and lading at a speed of 15 miles per hour.

In addition to the Mallet locomotives there were built for this road during the past year, 23 Atlantic type locomotives with balanced compound cylinders, and 12 Pacific type locomotives with single expansion cylinders. These engines, in common with the Mallet locomotives, are equipped with the Jacobs-Shupert design of fire-box. This fire-box was described in the *Railway Age Gazette* of November 18, 1910, page 965. The inside and outside shells are each composed of a series of steel plates which are flanged to a channel section and bent to suit the contour of the fire-box. Stayplates, cut out to allow the free circulation of steam and water are interposed between the adjacent channels. As the flanges of the channels composing the inside shell are placed on the water side, the rivet heads are not exposed to the action of the fire. With this construction, staybolts are required in the front and back water legs only.

The Mallet locomotives with rigid boilers, as well as the Atlantic and Pacific type engines, are fitted with superheaters of the Buck-Jacobs type. This form of superheater is built into the boiler shell, and is placed in front of the evaporating section. It consists of a chamber traversed by fire-tubes, around which the steam is compelled to circulate by internal baffle plates. In the Mallet locomotives the superheater is placed in the forward boiler section, and is divided into two parts by an intermediate tube sheet. In the rear part the steam is superheated before it enters the high pressure cylinders, while the front part is used as a reheater between the high and low pressure cylinders. On the compound Atlantic type locomotives, a reheater only is used. All the locomotives equipped with Buck-Jacobs superheaters have two steam domes and the steam pipes are placed outside the boiler so that the joints are readily accessible. These pipes are heavily lagged to prevent radiation.

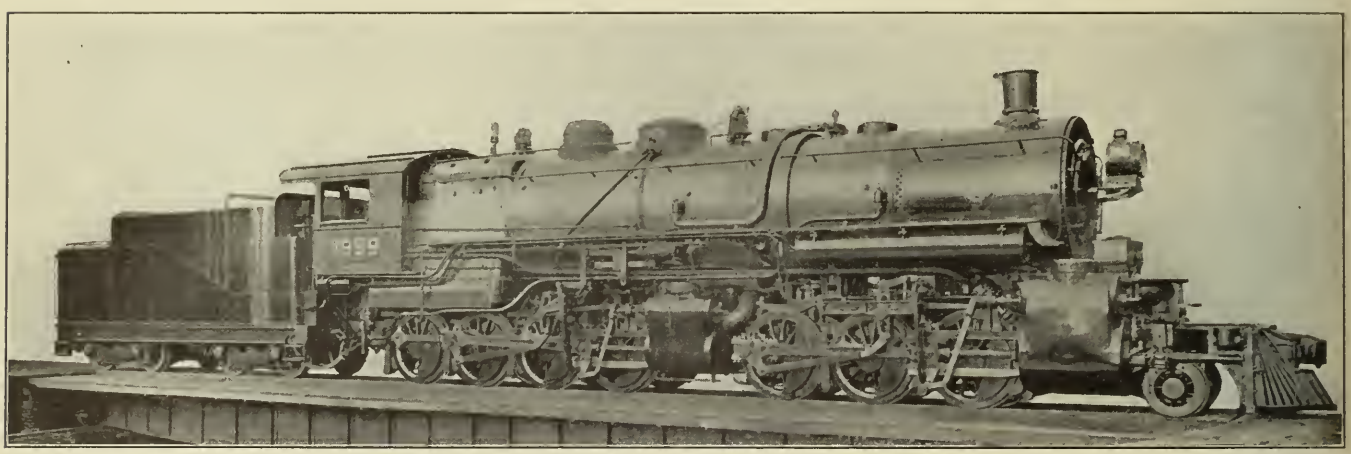
Burlington Mallets.—The Chicago, Burlington & Quincy received ten Mallet locomotives of nearly the same capacity and having the same wheel arrangement as the Santa Fe locomotives. These locomotives were described in the *Railway Age Gazette* of May 13, 1910, page 1213. A fire-tube superheater of the Emerson type, which is also described, is used and the reheater is similar to that applied to the Virginian locomotive. The fuel used is lignite. The boiler is of the separable type, and a feature of the design is the large amount of heating surface (2,172 sq. ft.) provided by the feed-water heater.

Great Northern Mallets.—The first American railway to use the Mallet locomotive on an extensive scale was the Great Northern, which since 1906 has been using locomotives of the 2-6-6-2 type in both road and pushing service. The engines built for this road during 1910 have the 2-6-8-0 wheel arrangement, with a separable boiler and the Emerson superheater. The feed-water heater is traversed by a large central flue, as in the Virginian and Burlington locomotives, but this flue in the Great Northern design contains a single pipe, instead of the nest of small tubes. The surface available for reheating is thus comparatively small but the piping is exposed as little as possible to the cooling effects of the atmosphere.

Mallets for Logging Roads.—During the past year a number of Mallet locomotives were placed in service on logging roads. These engines include a tank locomotive with the 2-6-6-2 wheel arrangement, built for the Booth-Kelly Lumber Company, of Oregon. This locomotive exerts a tractive effort of 37,800 lbs. The line has grades of 6½ per cent. and curves of 35 degs., and is laid with rails weighing 56 lbs. per yard. The engine is an example of a powerful unit designed for service where severe limitations are imposed.

CONVERTED MALLET LOCOMOTIVES.

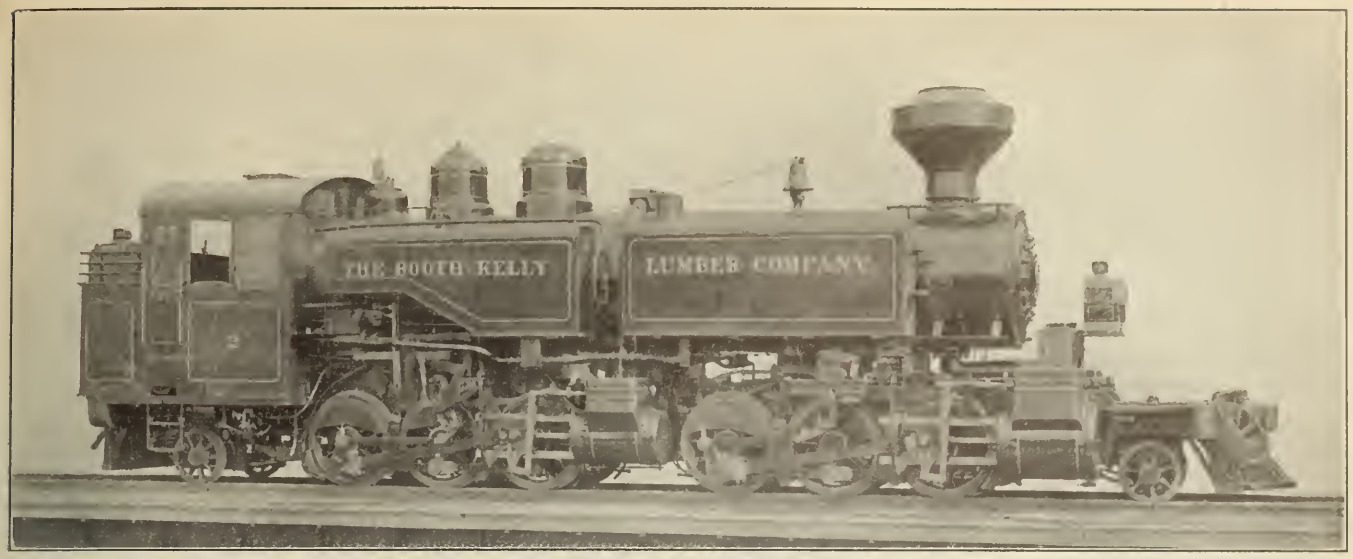
Forward units for converting single expansion locomotives to Mallet compounds were built for the Erie, the Chicago Great Western and the Atchison, Topeka & Santa Fe. The Erie unit was applied to a consolidation locomotive; the Chicago Great Western units (3 in number) to prairie type locomotives; of the fourteen Santa Fe units, four were applied to consolidation locomotives and ten to engines of the Santa Fe, or 2-10-2 type. The method of converting these locomotives on the Chicago Great Western was described in the *Railway Age Gazette* of November 4, 1910, page 867, and on the Santa Fe, in an article by M. H. Haig, mechanical engineer of that road, published February 10, 1911, page 278. In applying these units comparatively little change is necessary on the original locomotive. The added boiler section is utilized as a feed-water heater, and it has been customary to apply some form of reheater and, in some cases, a superheater. This plan of rebuilding makes it possible to materially increase the power of the locomotive by utilizing energy formerly wasted in exhaust steam, also, the fuel and water consumption per horse power developed is considerably reduced.



Mallet Locomotive of the 2-6-8-0 Type; Great Northern.

SUPERHEATERS.

The development of the single expansion locomotive in both passenger and freight service, has been characterized by the increasing use of superheated steam. The Baldwin Locomotive Works has applied the Vauclain type of smoke-box superheater and various types of fire-tube superheaters principally of the Emerson type. In the case of the Santa Fe locomotives, the superheaters have been built in accordance with designs prepared



Narrow Gage Mallet Locomotive for Logging Service.

by the mechanical officers of that system. On single expansion locomotives equipped with superheaters, it is customary to carry a steam pressure as low as 160 lbs., and to enlarge the cylinders to secure the desired tractive effort. It has been found so difficult to lubricate and maintain slide valves when high temperature steam is used that piston valves are now applied to all locomotives equipped with fire-tube superheaters. With the Vauclain type of smoke-box superheater, which gives a moderate degree of superheat, both piston and balanced slide valves have been successfully used.

Judging from the distribution of locomotives equipped with superheaters, they appear to have met with their greatest success in the middle west, where a large number are employed in both freight and passenger service. Emerson superheaters were applied during 1910 to the Pacific type and consolidation locomotives for the St. Louis & San Francisco, to the Pacific type, Mikado and Mallet locomotives for the Chicago, Burlington & Quincy, and to ten-wheel and Mallet locomotives for the Great Northern.

The Great Northern ten-wheel engines are used in passenger service and are of two sizes. The heavier engines have wide fire-boxes with the grates placed above the rear pair of driving wheels. The boilers are built for a pressure of 210 lbs., but in service the safety valves are set at 170 lbs. As the cylinders are 26 in. x 30 in. and the driving wheels 73 in. in diameter, the tractive effort exerted is 40,000 lbs. This is high for a passenger locomotive and indicates the heavy class of service which these engines are required to perform.

MIKADO LOCOMOTIVES.

The original Mikado locomotives were built by the Baldwin Locomotive Works for the Japan Railway Company in 1897. These engines had a gage of 3 ft. 6 in.; they were designed for burning a low grade coal and had wide fireboxes placed over the trailing trucks. Although a decided innovation, they proved most satisfactory in service. The first heavy Mikado locomotives built by the Baldwin Locomotive Works for service in the United States, were completed in 1902 for the Atchison, Topeka & Santa Fe.

A Mikado and a consolidation locomotive may have equal weights on driving wheels and may develop equal tractive efforts, but considerably higher boiler capacity may be provided in the former than in the latter. The Mikado is thus fitted for heavy freight service where speed is an important consideration, or where, because of long grades or other physical conditions, exceptional steaming capacity is required. This wheel arrangement can also be used to advantage in locomotives designed to burn low grade fuel, requiring a deep fire-box with large grate area. It has also been applied with excellent results, to eight-coupled locomotives for logging or other special service, where it is frequently necessary to back into sharp curves and switches.

The Virginian has purchased 42 locomotives of this type for heavy service from the Baldwin Locomotive Works during the past two years. These engines are handling coal traffic on a section of the line where the grades are generally favorable to the movement of loaded trains. They exert a tractive effort of 50,000 lbs., and one of them has hauled, in a single train, 100

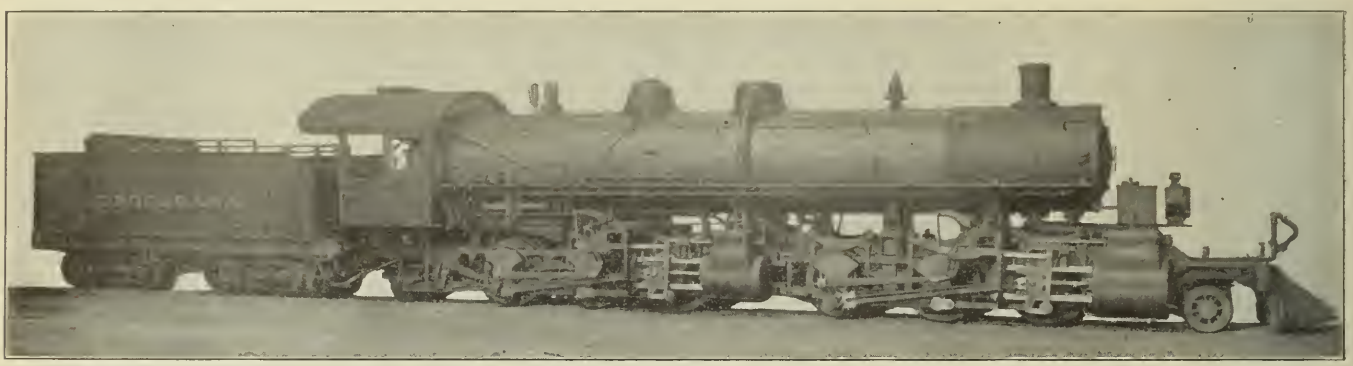


Mikado Locomotive for Heavy Freight Service; Virginian.

loaded cars weighing 7,562 tons. These locomotives use saturated steam at a pressure of 180 lbs., and are equipped with the Walschaert valve gear and pneumatic power reversing gear.

In July, 1910, an experimental Mikado locomotive was built for the Oregon Railroad and Navigation Company. This engine was specially equipped for burning lignite and has proved so successful, as described in the *Railway Age Gazette* of January 27, page 167, that a number of similar locomotives are now being built for the Associated Lines. The boiler has a wide fire-box of ample depth and volume and the smoke-box is of exceptional length in order to provide sufficient netting area. The design embodies the Associated Lines standards wherever practicable. This engine steams freely when using a large nozzle and very little difficulty has been experienced from spark throwing in spite of the light character of the fuel.

Another notable order for Mikado locomotives was received from the Chicago, Burlington & Quincy and partly filled before the close of the year. This order called for 50 engines, all of which have fire-tube superheaters of the Emerson type. These are among the heaviest eight-coupled single expansion locomotives thus far built and their driving-wheels, which are 64 in. in diameter, are among the largest thus far applied by the builders to an eight-coupled engine. With 27 in. x 32 in. cylinders and a boiler pressure of 170 lbs., the tractive effort exerted is 49,300 lbs. The superheater contributes a heating surface of 845 sq. ft. and the superheater pipes are placed in 24 tubes 5½ in. in diameter. The steam distribution is controlled by 14 in. piston valves and Walschaert valve gear. The high tractive effort and steaming capacity of these locomotives, together with the large driving wheels used, make the design specially suitable for heavy road service where speed is an element of consideration.



Narrow Gage Mallet Locomotive with Outside Frames.

CONSOLIDATION AND TWELVE-WHEEL LOCOMOTIVES.

For general freight service there continues a demand for consolidation locomotives. These engines have shown a steady advance in size and capacity, and the total weight of a consolidation locomotive for trunk line service is now usually in excess of 200,000 lbs. and cylinders with a diameter of 23 in. or 24 in. are becoming common on engines carrying 200 lbs. pressure. A modification of the consolidation type is the twelve-wheel, which has a four-wheel leading truck but no trailing truck. Locomotives of this type, weighing 113,000 lbs., were built by the Baldwin Locomotive Works for the Lehigh Valley as far back as 1887, to specifications furnished by James Weaver, master mechanic. Forty locomotives with this wheel arrangement, weighing 261,000 lbs. each, were built in 1910 for the Norfolk & Western. These engines use saturated steam at 200 lbs. pressure and the distribution is controlled by piston valves. The locomotives were built to drawings furnished by that railway.

PASSENGER LOCOMOTIVES.

The majority of passenger locomotives built during 1910 were of the six-coupled type having either the 4-6-0 or 4-6-2 wheel arrangement. Locomotives with three pairs of driving wheels are becoming more and more of a necessity in express passenger traffic because of constantly increasing train loads and more exacting requirements of service. The largest order for four-coupled passenger locomotives filled during the year was from the Baltimore & Ohio for 26 Atlantic type locomotives. These engines were described in the *Railway Age Gazette* of May 20, 1910, page 1255. They use saturated steam at a pressure of 205 lbs., and with 22 in. x 26 in. cylinders and driving wheels 80 in. in diameter, the tractive effort exerted is 27,400 lbs. The boiler design is characterized by a large grate, having an area of 55.5 sq. ft., and a moderate amount of well-disposed heating surface (2,350 sq. ft.). The steam distribution is controlled by 14 in. piston valves and Walschaert valve-gear. The tender is equipped with a water scoop operated by compressed air.

Balanced Atlantic type locomotives for the Santa Fe were described in the *Railway Age Gazette* of December 23, page 1189. They have two high pressure cylinders between the frames and two low pressure cylinders outside. All four pistons are connected to the leading pair of driving-wheels and the steam distribution is controlled, on each side, by a single piston valve. Since their introduction on the Santa Fe in 1903, they have been highly successful and some of them have made remarkable mileage records. One engine, received from the builders on May 1, 1906, was in service until October 22, 1910, without being shopped for general repairs, during which time it covered 241,335 miles.

MISCELLANEOUS DETAILS.

Trailing Trucks.—The locomotive designs during the past year present comparatively few details that are radically new. An increasing use of outside journal trailing trucks is to be noted on all types of engines to which such trucks are applied. A large number of locomotives have been equipped with the Hodges truck, which is simple in construction and may be clamped to the engine frames if it is desired to prevent side swing. This truck is provided with leaf springs which are mounted directly over the boxes and the side swing is taken by the spring links which are jointed for the purpose. Several of these trucks have also been equipped with centering springs.

Piston and By-Pass Valves.—With the increasing use of piston valves there has been a steady improvement in the design, not only of such valves but also of the cylinder castings and their accessories. A by-pass valve is an important feature on a piston valve cylinder and the form of by-pass valve generally used by the Baldwin Locomotive Works is one which has been extensively used on the Pennsylvania Railroad. The live steam ports are extended upward to a horizontal face placed above the steam chest and are normally covered by a flat plate, which is held to its seat by steam pressure acting on its upper surface. Excessive pressure beneath the plate will cause it to lift from its seat thus opening communication between the two ends of the cylinder. This style of by-pass has been applied not only to single expansion locomotives but also to Mallet compounds on which piston valves are used.

Walschaert Valve Gear.—The majority of the standard gage road engines built during 1910 were equipped with Walschaert valve gear. This gear has been simplified and materially strengthened, special attention having been given to the structural parts which support the motion work. As far as possible, all moving parts are located in the same vertical plane. Where this cannot be done it is customary to attach the upper end of the combining lever either to a rocker or to a crosshead having offset lugs so that the movement is transferred from the plane of the combining lever to that of the valve stem.

Wheels.—Many of the locomotives built in 1910 were equipped with solid forged and rolled steel truck wheels. In some cases these wheels were used under the tender only, the steel tired wheels being used on the engine truck. Rolled steel wheels are moderate in cost, and their durability and freedom from breakage makes them specially suitable for service under heavy motive power and rolling stock.

LOCOMOTIVES FOR EXPORT.

The locomotives built for export during the year included two of the Pacific type for the Central Railroad of Brazil, which are the largest passenger engines thus far shipped by these builders to South America. These locomotives have a gage of 5 ft. 3 in., and are equipped with fire-tube superheaters of the Emerson type. They exert a tractive effort of 29,000 lbs., and weigh in working order 189,100 lbs. The fuel used is Cardiff coal. At the International Exhibition of Railway and Land Transport, held at Buenos Aires, the Baldwin Locomotive Works exhibited three locomotives: a wood burning Mallet articulated compound for the Sorocabana Railway, Brazil; a ten-wheel passenger locomotive for the Entre Rios Railway, Argentine, and a consolidation freight locomotive for the same road. The Mallet locomotive has the 2-6-6-2 wheel arrangement, and is built for meter gage track. The tractive effort exerted is 33,800 lbs., and the total weight of the locomotive is 190,800 lbs. Because of the large size of the boiler and the narrowness of the gage, the frames are placed outside the wheels in order that ample stability may be secured. The power reverse mechanism is operated by steam and a steam brake is applied to the driving wheels with separate cylinders for the front and back groups. The automatic vacuum brake with train connections front and back, is applied to the tender wheels. The locomotives for the Entre Rios are designed for standard gage track, and are generally similar to each other, with interchangeable details where practicable. Both engines are equipped with smoke box superheaters of the Vauclain type. The steam distribution is controlled by balanced slide valves, driven by the Walschaert valve gear.

TENDENCIES IN DESIGN.

The output for 1910, considered as a whole, shows that steady progress has been made in augmenting the capacity and efficiency of American locomotives. On the principal roads the reconstruction of tracks and bridges during recent years has made possible a marked increase in the weight limit per pair of driving wheels. This limit, on the majority of trunk lines, is now between 50,000 and 60,000 lbs. and the tractive effort of 8-coupled locomotives with this wheel loading is sufficient on low grade lines for one engine to handle the maximum tonnage practicable in a single train. On mountain sections Mallet locomotives are effecting economies in operation and their use has resulted in a corresponding increase in the tonnage handled per train. A study of the motive power built in 1910 and of the present operating conditions on American railways leads to the conclusion that in the immediate future locomotive development will be characterized by an increasing efficiency and an improvement of details, together with the adoption of locomotives of the maximum weights permissible.

The government of Jamaica now operates 184 miles of railway. Of these 120 miles were built by American syndicates.

CONCRETE FOR RAILWAY WORK.*

It may not be amiss to give a partial list of railway structures to which concrete and reinforced concrete have been applied. This list can probably be added to considerably, but it will at least serve as a starting point and give some indication of the extent of concrete usages to date, and perhaps suggest other applications of this most adaptable material.

TYPES OF RAILWAY STRUCTURES ALREADY BUILT OF CONCRETE.

- Ash Handling Plants
- Ash Pits
- Benches
- Bridges
  - Abutments
  - Arches
  - Cattle Passes
  - Culverts
  - Foot
  - Floors
  - Girders
  - Highway
  - Piers
  - Raising grade of old abutments and piers
  - Track Elevation
  - Trestles
  - Viaducts
- Bumping Posts
- Caissons
- Cattle Guards
- Chimneys
- Cisterns
- Coal Breakers
- Coal Stations
- Coal Trestles
- Curbs
- Depots
  - Coal
  - Freight
  - Passenger
- Docks
  - Coal
  - Ore
  - Terminal
- Drain Tile
- Driveways
- Ducts
- Dwellings
- Fences
  - Right of Way
  - Ornamental
- Filter Plants
- Flower Boxes
- Foundations
- Grain Elevators
- Houses
  - Crossing Tender
  - Clipping
  - Cleaning
  - Milk
  - Oil
  - Section
  - Switch
  - Station
  - Sand
  - Superintendent
  - Storage
  - Transfer
  - Y. M. C. A.
- Man Holes
- Mile Posts
- Offices
- Paths
- Pattern Shops
- Pavements
- Piles
- Piers
- Platforms
  - Freight
  - Passenger
  - Shipping
- Poles
  - Light
  - Power Transmission
  - Telegraph
  - Tickler
- Posts
  - Fence
  - Bumping
  - Signal
- Power Stations
- Reservoirs
  - Oil
  - Water
- Retaining Wall
  - Gravity
  - Reinforced Concrete
- Road Bed
- Round Houses
- Signal Stands
- Signal Towers
- Shops—all kinds
- Stairs
- Stations
  - Passenger
  - Freight
- Stock Yards
- Telegraph Pole Butts
- Tanks
  - Grain
  - Oil
  - Sand
  - Water
- Terminal Buildings—all kinds
- Ties
- Toilets
- Train Sheds
- Trenches
  - Linings
  - Pipe
  - Wire
  - Troughs
  - Drinking
  - Feeding
- Tunnel Linings
- Turn Table Pits
- Trestles
  - Coal
  - Ore
  - Sand
  - Stone
- Vaults
- Walks
- Warehouses—all kinds
- Water Closets

Structurally, reinforced concrete buildings meet most tests in a reasonable manner. It has been stated on high authority that more is known of the strength of reinforced concrete columns and other members than is actually known of steel work. More laboratory study has been spent and more tests have been made on concrete than on the other material and the design of reinforced concrete rests on a sane and high standard, which, although varying in many details, is fairly uniform the country over.

Briefly, the points in which concrete offers better results than other materials are, rigidly, load carrying capacity, elimination of maintenance and depreciation charges, sanitary qualities, fire proofness, water proofness and cost.

The rigidity of a concrete building under moving or vibrating loads is apparent from the manner in which reinforced concrete bridge decks have given service under train loads. The shock and vibration sustained by a relatively thin concrete floor on a plate girder bridge under a fast train probably exceeds anything likely to occur in any building. As a matter of fact, concrete factory buildings this country over, furnish positive testi-

* Abstract of a copyrighted paper by J. P. H. Perry, Turner Construction Company, New York, presented before the New York Railroad Club, April 21.

mony as to the ability of this material to withstand vibratory stress in a satisfactory manner. In numerous instances this form of building construction has been accepted over others solely because of its rigidity and practical elimination of vibration. The value of a stiff building is chiefly apparent in the cost of operating the machinery contained therein. If shafting can be lined up, machines set in place and leveled up and maintained as first installed without variation, the repairs and maintenance charges are considerably reduced, as are also the attendance, oil, and new bearings, items of the annual up-keep of a plant.

Concrete buildings are built on a larger actual safety factor than are most other types of buildings. This is due largely to the fact that ordinarily no allowance is made in the design of a floor of concrete for continuous action and the theoretical safety factor is much less than the actual one. The owner finds that he can load his building pretty much as he pleases. It is difficult to conceive of any depreciation on a properly designed and erected concrete building, that is, structural depreciation. As far as decrease in the serviceability of the building for its originally designed usage, aside perhaps from an allowance of one-quarter of 1 per cent. per year to cover windows, doors, roofings and similar details, there is none. Painting alone will often in a few years more than eat up the difference in first cost between a concrete structure and one of steel or wood. Concrete is known to increase in its strength. It is fairly generally admitted by the engineering world that the reinforcement is amply protected.

A recent canvass of some 255 owners of concrete industrial buildings showed that 27 per cent. of the owners carry *no fire insurance* on their buildings, and that an almost equally large number more would not pay any premiums were it not because of mortgages or loans.

The sanitary qualities offered by a concrete building are due in one way to the cement being a lime product and naturally hygienic. Furthermore, the method of constructing reinforced concrete prohibts the presence of vermin and permits of maximum window area, and consequent maximum light with a subsequent reduction in unsanitary corners of darkness and probable dirt or filth. Dampness is unknown in reinforced concrete buildings. This statement possibly sounds startling and perhaps even untrue to some, but it is a fact. There is probably no more common prejudice against reinforced concrete buildings than that they are damp. This idea undoubtedly originated in the experience of so many summer cottage or bungalow owners, whose dwellings were constructed of concrete blocks. Such edifices unquestionably are damp. But with reinforced concrete construction there is a surplus of water at the time of depositing the concrete and instead of the cement having to absorb moisture from the atmosphere to complete its crystalization, it gives off during the finishing of the building such water as it does not need, and this results in the finished structure being a building impervious to moisture, and furthermore, a building which, owing to the low conductivity of the component material, is even temperatured as well. None of the reinforced concrete factories or warehouses within the writer's experience, and he knows personally over 200 such structures, is damp-proofed in any way above the basement.

Although concrete floors with granolithic finish placed monolithic are generally considered waterproof, they are seldom strictly so. Small shrinkage cracks are liable to develop and their existence makes probable some damage below if the floor is flooded. Concrete structural slabs covered with cinder fill and maple flooring laid on sleepers are not much, if any, better, as water goes through the wooden floor and through the porous cinder fill between the sleepers. Recently, however, a form of granolithic finished floor has been built, which seems to be practically waterproof, and has been accepted by the board of underwriters as satisfactory. The granolithic finish is not placed monolithic with the structural concrete, but is laid 1 in. thick on top of a 2 in. rich cinder concrete bed, which is placed on the slab proper. This gives ordinarily 7 in. of concrete for water to find its way through—the three strata, placed at different times and of different mixtures, seem to eliminate shrinkage cracks extending entirely through the floor. At any rate, on one floor test 22,500 sq. ft. of surface was flooded to a mean depth of three inches and maintained in that condition some 48 hours. The total leakage amounted to about five gallons and no leakage whatsoever occurred until five hours had elapsed. The cost of placing finish in this manner is but little higher than as conventionally laid.

As regards cost, reinforced concrete buildings vary from a very slightly higher cost to about 20 per cent. less cost than structural steel fire proofed, and will run generally from equal, or, in very large undertakings, a trifle less cost than first-class mill construction, to an excess cost of as much, occasionally, as 25 per cent. or 30 per cent. These figures may be considered a fair average. Where building codes do not unduly restrain the design, concrete skeleton frames are fast replacing steel cages for buildings not exceeding eight stories in height. Especially is this true of industrial buildings which differ but little, if any, from the ordinary railway shop, warehouse, terminal store, or office structure. It is safe to state that a reinforced concrete building, approximately square in shape, with floor area from 8,000 up to 20,000 sq. ft. per floor, with a height of from 5 to 10 stories (story heights 12 ft. to 13 ft. floor to floor), with maximum window area on all sides protected with hollow metal window frames and sash and glazed with wire glass, with stair and elevator wells enclosed in fireproof partitions, cut off with automatic fire doors, with board of fire underwriters equipment throughout, with the exception of a sprinkler system, will cost a sum not exceeding 10 cents per cubic foot of contents, equal to $1.25 per square foot of floor space. This figure includes a building complete with elevators, plumbing, electric wiring and steam heating. There is no other form of fireproof construction which can equal this proposition.

Certainly, warehouses, pattern shops, terminal stores, large station buildings, freight houses, express depots, round houses and office buildings come within a class of structure to which concrete might be economically adopted. At least competitive figures should be taken on plans. Almost any concrete contractor is capable of bidding upon a set of blue prints which may call for either mill construction or steel frame work.

The effect of oils on concrete has been a subject of considerable discussion, and the best information on this point has come largely from railway engineers. The Chicago, Milwaukee & St. Paul men made extensive studies of the effect of signal and machine oils on concrete semaphore pedestals, switch stands, oil store house floors, bridge decks, etc., and found that mineral oils do not damage. Other investigations have found that vegetable oils may or may not harm concrete, depending somewhat upon whether or not the oils are the so-called drying kind, such as linseed, which probably have no bad effect, or one of the non-drying class, such as cotton seed, olive and castor, which it is thought do injure concrete. Animal fats and oils are also destructive. There is much positive evidence on record, however, to show that mineral oils do no harm.

Locomotive smoke and gases also apparently do not hurt concrete. Several roundhouses have been built in the western portion of the country, and, as far as is known, have given entire satisfaction. Concrete bridges, and concrete protection around steel bridges, seem to be impervious to injury from this source.

As to the protection afforded by concrete to reinforcement, the *Engineering News* recently recorded the demolishing of a seven-story reinforced concrete office and publishing building in Baltimore. This building was nearly seven years old when it had to be wrecked to make way for an 18-story loft building. The testimony is to the effect that the reinforcing bars were found to be in perfect condition. The writer knows of a case of the removal of some seven year old concrete footings, which were below mean low water on Staten Island, N. Y. The reinforcement, though at some points protected by but three-quarters of an inch of concrete, was as bright as the day it was put in place.

There is a super-abundance of evidence of this kind and it may be accepted that reinforced concrete construction need not be feared on this score.

It is claimed that installing piping, shafting, motors and other machinery is very difficult in a concrete building after it has been once erected. As a matter of fact, an investigation of concrete buildings occupied for industrial purposes will show that making changes in mechanical equipment is not considered a problem difficult to solve. The writer visited some 50 factory buildings and was surprised to find the ease with which mechanical engineers or factory superintendents made their changes and made provisions for the supporting of their pipes, etc., from concrete ceiling or on concrete floors or walls.

Railway buildings other than warehouses, shops and factories, are confined chiefly to stations. Several very successful structures of this kind already exist, and offer themselves as an advance guard of what seems likely to become a very large class of concrete buildings. The Sante Fe, the Canadian Pacific and the Lackawanna have been leaders in this special field, and can show excellent work. The permanency and the low cost—for a fireproof structure—combined with a satisfactory exterior appearance, which has no maintenance charges to be provided for, make concrete stations, switch houses, and signal towers good investments.

Summing up the use of concrete for railway work the chief thought would seem to be that only a very few of the railways in this country have adopted concrete to the extent to which it so readily lends itself, and that it might profit them to use it more freely. With the magnificent future before this country and the great growth which inevitably must take place it is almost criminal to build non-fireproof or temporary structures. The fire loss of $2.30 per capita in the United States as against a mean loss of $0.30 in seven European capitals stands forth as a blot on the commercial reputation of the land.

REPORT ON CONDITION OF TREATED TIES ON GULF, COLORADO & SANTA FE.

The Bureau of Forestry of the United States Department of Agriculture, in co-operation with the Santa Fe and several other railways, laid a section of experimental track about 2½ miles long on the Beaumont division of the Gulf, Colorado & Santa Fe in 1902. A complete description of the installation is given in Bulletin No. 51 of the Bureau of Forestry, and a report of the inspections of the track up to September, 1909, is included in the proceedings of the American Railway Engineering Association, Vol. 11, Part 2. This locality was selected for this test because of its extreme weather conditions. During a number of months in each year the temperature is very high and rainfall extremely heavy, and it was thought that these conditions would hasten the determination of the life of treated ties. The ties were furnished by railways, and were taken out of stock, being of grades that were easily obtained. For this reason, the test does not cover all grades of lumber that are used for ties, and since little care was used in selecting sound timbers, many of them have shown a short life in the track, on account of defects in the timber or in its seasoning.

The ties were treated without charge by preserving companies, and, on account of the small number of ties of each grade, they were in some cases grouped in the process of treating, so that in many instances the ties did not receive the treatment best adapted to them. All ties of the same wood were laid together, so that practically the same conditions exist for all. Each tie was marked with nails showing the kind of timber, the kind of treatment and the year in which it was laid. The track was heavily ballasted between the rails with densely packed sand and the ends of ties were left exposed. There is a continuous stretch of pine forest on both sides of the track, by which it is

Table I—Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe.

Kind of Wood.	No. of Ties.	Kind of Treatment.	Year inserted.	Nov., 1903.		June, 1904.		Nov., 1905.		Dec., 1906.		Feb., 1908.		Nov., 1908.		Sept., 1909.		Feh., 1911.		Ties still in track. Number.		
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Good.	De-cay.	%
White Oak	196	Untreated	May, 1902	..	..	1	0.5	..	..	..	..	146	75	..	..	..	..	..	..	25	24	25
" "	100	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64	64	36	0	36
" "	101	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	3	3	2	5	..	..	..	..	80	16	95
" "	107	Zinc-creosoted—Beaumont	"	45	42	36	75.7	26	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	.	..	..	..	..	..	17	17	1	18	82	100	..	..	0	0	0
" "	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	42	42	..	..	..	..	46	12	58
" "	100	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	1	1	1	2	69	71	29	0	29
" "	196	Hassellman " "	"	..	..	..	..	2	1	22	12.2	140	83.7	..	..	..	..	..	..	17	15	16
Red Oak	93	Untreated	Mar., 1902	..	..	5	5.4	77	88.2	..	..	..	..	5	93.5	..	..	6	100	0	0	0
" "	86	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	3	3.5	21	28	28	34	72
" "	20	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0	100
" "	19	Hassellman " "	"	..	..	..	..	15	78.9	2	89.5	..	..	2	100	..	..	..	..	0	0	0
Black Oak	24	Untreated	May, 1902	..	..	..	..	3	12.5	19	91.7	2	100	..	..	..	..	..	..	0	0	0
" "	86	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	12	14	2	16.3	..	..	10	28	37	25	72
" "	76	Zinc-creosoted—Beaumont	"	36	47.4	40	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	34	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	5	14.7	..	..	..	..	29	100	0	0	0
" "	33	Wellhouse " "	"	..	..	..	..	..	..	..	..	2	6	16	54.5	..	..	11	88	0	4	12
" "	60	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	46	77	14	0	23
" "	118	Hassellman " "	"	..	..	..	..	104	88.1	4	91.5	3	94.1	7	100	..	..	..	..	0	0	0
Turkey Oak	20	Untreated	April, 1902	..	..	..	..	..	..	18	90	..	..	..	..	2	100	..	..	0	0	0
" "	10	Zinc-creosoted—Beaumont	"	..	..	..	..	10	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	19	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	19	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	18	90	..	..	2	0	10
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	2	100
" "	19	Hassellman " "	"	..	..	..	..	18	94.7	1	100	..	..	..	..	..	..	..	..	0	0	0
Spanish Oak	20	Untreated	May, 1902	..	..	..	..	4	20	..	..	16	100	..	..	..	..	..	..	0	0	0
" "	10	Zinc-creosoted—Beaumont	"	..	..	..	..	8	80	..	..	..	..	..	..	..	..	..	..	2	0	20
" "	21	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	5	23.8	..	..	..	..	4	43	8	4	57
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	45	10	1	55
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	50	5	0	50
" "	20	Hassellman " "	"	..	..	..	..	1	5	8	45	11	100	..	..	..	..	..	..	0	0	0
Willow Oak	20	Untreated	May, 1902	..	..	..	..	15	75	5	100	..	..	..	..	..	..	..	..	0	0	0
" "	11	Zinc-creosoted—Beaumont	"	..	..	..	..	11	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	20	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	20	100	..	..	0	0	0
" "	20	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	8	40	..	..	12	100	0	0	0
" "	10	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	100	0	0	0
" "	20	Hassellman " "	"	..	..	..	..	17	85	3	100	..	..	..	..	..	..	..	..	0	0	0
Beech	100	Untreated	Feb., 1902	..	..	..	..	97	97	3	100	..	..	..	..	..	..	..	..	0	0	0
"	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	50	100	..	..	..	..	..	..	0	0	0
"	99	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	75	76	23	1	24
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	84	16	100
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	40	80	10	0	20
"	98	Hassellman " "	"	..	..	2	2	96	100	..	..	..	..	..	..	..	..	..	..	0	0	0
Hemlock	101	Untreated	April, 1902	..	..	101	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
"	49	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	38	77.6	..	..	4	85.7	..	..	1	88	6	0	12
"	100	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	30	30	..	..	..	..	24	46	70
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	4	4	17	21	56	23	79
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	100	0	0	0
"	100	Hassellman " "	"	..	..	..	..	87	87	7	94	..	..	6	100	..	..	..	..	0	0	0

Table I.—Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe—(Continued).

Kind of Wood.	No. of Ties.	Kind of Treatment.	Year inserted.	Nov., 1903. No.	%	June, 1904. No.	%	Nov., 1905. No.	%	Dec., 1906. No.	%	Feb., 1908. No.	%	Nov., 1908. No.	%	Sept., 1909. No.	%	Feb., 1911. No.	%	Ties still in track. Number. Good.	Decay.	%
Tamarack	49	Untreated	May, 1902	..	..	..	..	49	100	..	..	..	..	..	..	..	..	..	..	0	0	0
"	51	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	..	..	46	90.2	..	..	5	0	10
"	49	Burnett—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	15	100
"	100	Wellhouse—Chicago	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	84	16	100
"	50	Allardyce—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	100	0	0	0
"	98	Hasselman " "	"	..	..	..	..	78	79.6	..	..	11	90.8	..	..	..	..	9	100	0	0	0
Shortleaf Pine	100	Untreated	May, 1902	..	..	35	35	20	55	44	99	..	..	..	..	..	..	1	100	0	0	0
" "	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	43	86	..	..	..	..	4	3	14
" "	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	61	61	..	..	1	62	22	16	38
" "	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	79	79	..	..	..	..	13	8	21
" "	50	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	21	42	1	44	..	..	14	14	56
" "	98	Hasselman " "	"	..	..	..	..	..	..	74	75.5	..	..	23	99	..	..	..	..	0	1	1
Redheart Pine	100	Hasselman " "	"	..	..	..	..	25	25	49	74	3	77	23	100	..	..	..	..	0	0	0
Longleaf Pine	93	Untreated	April, 1902	..	..	..	..	85	91.4	..	..	..	..	1	92.5	..	..	7	100	0	0	0
" "	50	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	19	38	1	40	..	..	..	..	22	8	60
" "	100	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	27	27	..	..	..	..	..	..	51	22	73
" "	100	Wellhouse " "	"	..	..	..	..	..	..	..	..	3	5	52	55	..	..	..	..	28	17	45
" "	100	Hasselman " "	"	..	..	..	..	..	..	..	..	95	95	..	..	..	..	..	..	3	2	5
" "	50	Allardyce " "	"	..	..	..	..	..	..	..	..	7	14	..	..	..	..	..	..	30	13	86
" "	100	Beaumont Oil " "	"	..	..	..	..	..	..	70	70	..	..	..	..	..	..	30	100	0	0	0
" "	100	Beaumont Oil-Zinc Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	8	81	11	92
" "	100	Spirittine—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	8	8	72	80	..	..	..	..	5	85	12	3	15
Loblolly Pine	100	Untreated	April, 1902	..	..	100	100	..	..	..	..	..	..	..	..	..	..	..	..	0	0	0
" " (a)	49	Zinc-creosoted—Beaumont	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49	100	0	0	0
" " (d)	99	Burnett—T.T.&L.P. Co., Somerville	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	99	100	0	0	0
" " (c)	99	Wellhouse " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	94	95	4	1	5
" " (b)	49	Allardyce " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49	100	0	0	0
" "	99	Hasselman " "	"	..	..	..	..	18	18.2	81	100	..	..	..	..	..	..	..	..	0	0	0
" "	42	Beaumont Oil " "	"	..	..	..	..	40	95.2	..	..	..	..	..	..	..	..	2	100	0	0	0
" "	80	Beaumont Oil-Zinc Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	80	100	0	0	0
" "	100	Spirittine—T.T.&L.P. Co., Somerville	"	..	..	..	..	80	80	18	98	..	..	..	..	..	..	2	100	0	0	0
Pines	84	Avenarius Carbolineum	April, 1905	..	..	..	..	..	..	1	1.2	76	91.7	..	..	..	..	..	..	..	..	..
"	19	Diamond Glue Private	Feb., 1902	..	..	..	..	17	89.5	..	..	2	100	..	..	..	..	..	..	0	0	0
"	74	Hasselman	"	..	..	..	..	33	44.6	37	94.6	..	..	..	..	1	95.0	1	97.3	2	0	2.7
Cal. Redwood	8	Burnett	"	..	..	..	..	8	100	..	..	..	..	..	..	..	..	..	..	0	0	0
" "	2	Burnett-Cal. Crude Oil	"	..	..	..	..	2	100	..	..	..	..	..	..	..	..	..	..	0	0	0
Longleaf Pine	4	Burnett	"	..	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	1	0	25
Shortleaf Pine	3	"	"	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	1	0	33
New Mexico Pine	10	"	"	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	8	0	80
Arizona Pine	4	"	"	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	3	0	75
Gum	3	"	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	33	1	1	67
Water Oak	2	"	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
Pin Oak	2	"	"	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	0	50
Red Oak	2	"	"	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	0	1	50
Longleaf Pine	6	Boiled in Zinc-Chlo.	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	0	100
Shortleaf Pine	4	" "	"	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	2	1	75
Arizona Pine	2	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
Gum	1	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
Red Oak	3	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	0	100
Pin Oak	3	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	0	100
Water Oak	1	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
Shortleaf Pine	4	Bakersfield Oil	"	..	..	..	..	..	..	1	25	..	..	..	..	..	..	..	..	3	0	75
Loblolly Pine	4	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	0	100
Arizona Pine*	2	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
New Mexico Pine	3	" "	"	..	..	..	..	..	..	2	66	..	..	..	..	..	..	..	..	1	0	33
Gum	1	" "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100
New Mexico Pine	2	Boiled in Zinc-Chlo., Cal. Oil forced in	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	0	100
" " "	7	Burnett-Cal. Oil	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	0	100
Loblolly Pine	1	" " "	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	0	100

*The three Bakersfield Crude Oil Ties were removed in 1906 for inspection and were in a perfect state of preservation.

Remarks.—Longleaf and Lohlolly soaked with Beaumont Oil absorbed 3 lbs. per cubic foot. (a) Original quantity 50, one out for test. (b) Original quantity 59, one out for test. (c) Original quantity 100, one out for test. (d) Original quantity 100, one out for test. Zinc-creosoted ties, Beaumont oversteamed. Mr. Chanute's ties treated—Chicago; T. T. & L. P. Co.—Somerville; International Creo. Co.—Beaumont; Hassellman, by T. T. & L. P. Co., Somerville.

more or less shaded during the day. No tie plates were used and the track is laid with 60 and 61-lb. rails.

Table I shows the results of eight inspections. The columns under each date give the number of ties removed since the last inspection and the total percentage of ties removed since the beginning of the experiment. The last three columns show the number of ties still in track and divide these ties into two classes —those showing decay and those that are still in good condition. Some of those marked "decay" may be removed this year, and others will be good for one or more years of service. The condition of the ties in the track at the time of the last inspection is stated to be excellent. There is little rail wear except on the tamarack and hemlock ties, and the apparent rail cutting on many ties is due to adzing necessary in changing rail. The hemlock and tamarack ties, although listed in the table as sound, show signs of severe checking and shattering in many cases. Ties treated with Bakersfield crude petroleum, some of which have been in service since 1902, show remarkable preservation. It is a noticeable fact that none of these ties shows the slightest checks, and borings taken in them show the interior to be perfectly sound.

Rail wear on ties treated with zinc chloride followed by a treatment with Bakersfield oil is marked, while the wear on ties treated with Bakersfield oil alone is practically negligible.

Table II shows the percentages of ties of each wood and each treatment still in service in the track. The marked difference in the life of oak ties treated by the Burnettizing and the Wellhouse processes in two plants emphasizes the importance of proper application of a treating process to give satisfactory results. The zinc chloride-English creosote process was applied to oak, beech, hemlock, tamarack, and pine simultaneously and the treatment was more adapted to unseasoned pine than the other species, as indicated by the fact that the pines are showing

Table II—Percentage of Ties Still in Track After 9 Years' Service.

Kind of Wood.	Treatment. Burnett, Chicago.	Burnett, Somerville.	Wellhouse, Chicago.	Wellhouse, Somerville.	Zinc-Creo., Beaumont.	Allardyce, Somerville.	Hasselman, Somerville.	B'm't Oil.	B'm't Oil-Zinc Chlo.	Spirittine, Somerville.
White Oak	36	0	95	58	0	29	16	..	..	..
Red "	72	0	..	0	..	100	0	..	..	..
Black "	..	0	72	12	0	23	0	..	..	..
Turkey "	..	0	..	10	0	100	0	..	..	..
Spanish "	..	57	..	55	20	50	0	..	..	..
Willow "	..	0	..	0	0	0	0	..	..	..
Beech	..	24	..	100	0	20	0	..	..	..
Hemlock	..	70	..	79	12	0	0	..	..	..
Tamarack	..	100	..	100	10	0	0	..	..	..
Shortleaf Pine	..	38	..	21	14	56	1	..	..	..
Longleaf "	..	73	..	45	60	86	5	0	92	15
Loblolly "	..	0	..	5	0	0	0	0	0	0
Redheart "	..	..	..	..	..	..	0	..	..	..

greater service in the track than the oaks. The uniformly poor results shown with the Hassellman treatment is explained by the statement of the treating company that most of the ties submitted to them were in an unsound condition, and that an accident to the treating cylinder prevented an accurate record of the treatment being made. For comparison with these figures, the average life of untreated ties as determined in this test and published in the proceedings of the American Railway Engineering Association is given below:

Loblolly pine	1.5 years	Red oak	3.0 years
Hemlock	1.5 "	Willow oak	3.2 "
Tamarack	2.5 "	Black oak	3.7 "
Beech	2.5 "	Turkey oak	3.85 "
Shortleaf pine ...	2.65 "	Spanish oak	4.1 "
Longleaf pine	3.0 "	White oak. (25% still in track)	

We are indebted to George E. Rex, manager of treating plants of the Atchison, Topeka & Santa Fe, for the results of inspections given above.

TRANSPORTATION FEATURES OF CAR INTERCHANGE.*

I wish to touch upon the mechanical side of the interchange bureau at the Chicago Stock Yards, doing so as a transportation man, and then to take up in detail the transportation features of the bureau and point out to members of this club what we hope to accomplish through this move toward establishing working relations with the mechanical department, not only at the stock yards, but elsewhere, in matters of interchange.

I believe that cardable defects should be carded for instead of running cars on "record," and also that those who are inclined to hold out against the carding practice will gladly accept it if assured the number of cardable defects under M. C. B. rules will be reduced by the action of the M. C. B. Association.

Not many members of the club are directly concerned in the settlement of per diem—the rental which roads pay one another for the use of borrowed cars—but the amounts of money involved are upward of eight millions of dollars a month in this country. The amount paid out for per diem is about four times greater than the amounts paid out for repair settlements between railways. A road cannot pay per diem unless it knows when the cars came on its line, and when they were sent off, and a road cannot know these changes if cars come and go without being reported. These reports are what are spoken of as the interchange reports, and I take it that every member of this club will agree that a report which is the basis of settlements involving such large amounts is an important report. Those of us who are directly involved in the settlement of per diem feel that our difficulties are enormous, and have no hesitancy in saying that they are being reduced in proportion as working relations with the mechanical people in the preparation of interchange reports have been established.

Records taken by the mechanical inspectors of interchanged cars can be made more accurate than records taken by transportation representatives. The reason is that the representatives of the mechanical department do and must go about the inspection of cars in a painstaking, deliberate way. A car in interchange is not and can not be inspected while in motion, and inasmuch as it is inspected while standing still there is every opportunity for the men who do the inspecting to secure the correct initial and number. It is true the transportation people could have their representatives on hand to take the data which they require in the handling of per diem, at the time the mechanical representatives make their inspection, but it should be remembered that at the present time the mchanical inspectors usually work in pairs, and sometimes in teams of three, and rather than have a duplicate staff of men on hand, it would seem better judgment to use the data which the inspectors record, making it serve a double purpose.

We want to protect the avenues of interchange sufficiently to cover the requirements of both departments, and then apportion between the two whatever expense is incurred. The division of the expense between the two departments should be made on a fair and equitable basis, but it ought not to be a stumbling block inasmuch as the money all comes from the same treasury.

At the outset many objections presented themselves. The inspectors were extremely suspicious of the bureau plan. They felt it to be a move to increase their work and decrease their pay. As a matter of fact, it was merely a move to use for an additional purpose the data which they secure, and which railway money pays for. It was a move to stop leaks in interchange reports, by going to the men most likely to know when a car is interchanged. It is gratifying to know that the feeling of hostility on the part of inspectors is very much less than in the beginning. It is true the additional work of taking seals is required of them, and while they may not be entirely reconciled to doing this, they are beginning to realize that the amount of work involved is not so great as they had supposed. They are finding that less than a third of the cars which they inspect have seals, and while there is some extra work involved so far as this one-third of the interchange is concerned, the reports made by inspectors are so arranged as to make it unnecessary for them to do any copying whatever. When the inspection of a cut of cars is completed, the sheet on which the record was made is removed from the book or cover, sent to the office, and a fresh sheet inserted for the next cut, whereas, under the old plan each day's work had to be copied by the inspector from his book to a separate report. The feeling was quite general that the writing of inspectors would not be good enough for the purpose. Others took a different view. The inspectors' ability to do the work satisfactorily has been fully demonstrated.

The committee making the experiment at the stock yards regrets that the expense could not have been lighter. The roads no doubt feel that the experiment has been expensive; but it is better to experiment at one place than at a dozen; and the experiment has been conducted, not alone with reference to the effect of the plan in Chicago, but with reference to what it is hoped to be accomplished throughout the entire country.

The cost per interchange is less in the month just closed than at any previous time in the bureau's history. It is barely possible that some of the roads have an exaggerated idea with respect to the expense at the stock yards. I have secured some figures and desire to bring them to the attention of this club, showing a rough comparison of the cost of interchange at several interchange points.

At Fort Worth, Texas, when a car is interchanged the cost is a trifle less than seven cents. All of this is borne by the mechanical department, one-half by the delivering line and the other half by the receiving line. At Cleveland, Ohio, the cost per interchange without taking into account the cost to the transportation department, is a trifle less than four cents, all of which the mechanical department has to stand. There are some 16 avenues of interchange in Cleveland and in the absence of a co-operative plan between the two departments, the transportation people maintain a larger staff to guard these same points of interchange than do the mechanical people, which being true, the total cost per interchange, is of course increased, and instead of being low, is surprisingly high.

At Pueblo, Colo., the cost is a trifle less than eight cents per interchange, one-half being borne by the delivering line and the other half by the receiving line, but not all of this half is borne by the mechanical department. A portion of it is borne by the transportation department, inasmuch as a portion of the work done is for their benefit.

At the Union Stock Yards in Chicago the cost per inspection in March was a trifle under seven cents, and 45 per cent. of this is borne by the transportation department, leaving only 55 per cent. to be borne by the mechanical department. It is true that in the division of this expense per interchange, as

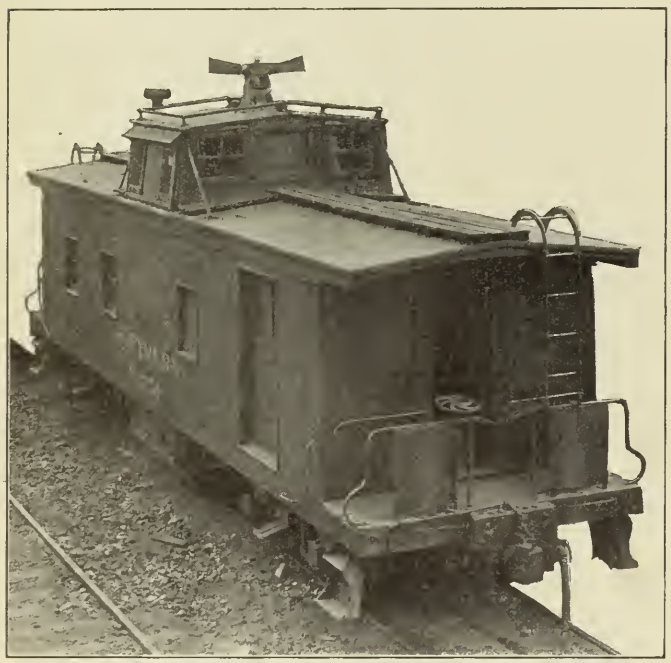
*From a written discussion, Western Railway Club, April 18, by C. B. Strohm, superintendent of transportation, Atchison, Topeka & Santa Fe.

between the trunk lines and the switching line, it is not apportioned on an equal basis, and on this account a comparison of the cost to the trunk lines per interchange at the stock yards, with the cost per interchange elsewhere, has been unfavorable to the bureau plan.

In conclusion: An interchange bureau is nothing more or less than a systematic, co-operative means of handling interchange matters. That system and co-operation are essential in such matters is self-evident. Some may feel that it would be better for the mechanical departments to systematize and co-operate in the matter of car inspection, keeping their organization entirely separate and distinct from the transportation features involved, and that the transportation departments should systematize and co-operate in the gathering and compiling of interchange data, keeping their part of the work separate and distinct from the mechanical features. I grant that a joint inspection bureau run purely upon mechanical lines is an improvement over the plan of each railway undertaking to handle inspection independently of the other. I agree also that a joint interchange bureau operated strictly from a transportation department standpoint is an improvement over the plan of each transportation department undertaking to handle that feature of the work independently of the other. A still better way is to combine the two bureaus into one, calling it a joint inspection and interchange bureau, letting the one set of outside men, and the one office force, and the one staff of supervisors, serve the needs of all concerned, prorating the expense in proportion to the benefits. I believe this is a case where departmental lines may safely be set aside; that the work is so closely related that both departments will benefit by the co-operative plan.

SNYDER'S AIR BRAKE INDICATOR.

O. R. Snyder, a freight conductor on the Southern Railway, with headquarters at Knoxville, Tenn., has in use on his caboose a pair of arms, like semaphore arms, which serve at all times as an indicator, for the benefit of the engineman, giving



Snyder's Air Brake Indicator.

him visible assurance of the condition of the air brake line through the train. In connection with the arms, which constitute the daylight signal, there is a lamp, with a movable colored glass, giving corresponding indications at night.

Fixed in the caboose, beneath the roof of the cupola, is a vertical cylinder, with a piston, the rod of which supports a bracket, within the miniature turret, which controls the signal. The movement of this piston downward pulls the semaphore arms into the horizontal position as shown in the illustration.

Normally, with full pressure in the train line, as when the train is running and the brakes are off, the piston is at the upper end of the cylinder, being held there by pressure conveyed from the train line; and the colored glass is pushed above the level of the flame in the lamp so that at night a white signal is displayed. A reduction in the train line pressure, either accidental or designed, allows the piston to drop, bringing the colored lens in front of the lamp and throwing up the arms. When the indicator is thus made to change its position (the arms going from vertical to horizontal) a whistle is sounded in the caboose. A reduction of 3 lbs. per sq. in. in the pressure of air in the brake-pipe will change the indicator, even in the case of a long train. An angle cock at a point 30 cars ahead of the caboose, being turned, has caused the danger signal to be displayed within 15 seconds.

The reader will understand that the track shown in illustration is not the standard of the Southern. No such shoulderless roadbed is to be found in real life.

Mr. Snyder proposes to organize a company to make this indicator.

The West Siberian Railway.

The difference of opinion over the route of the new railway in West Siberia has been adjusted. The commission consisting of the representatives of six ministries which met last autumn to discuss the matter has come to a decision. The project is now before the Imperial Council and the Council of Ministers, but it is not believed that these two bodies will raise any further objection. The new West Siberian main line will begin at the town of Uralsk, proceeding via Orenburg and Akmolinsk to Semipalatinsk in a due east direction; thence northeast to Barnaul, from which a short branch will run to the prosperous town of Biisk. From Barnaul it will proceed due north to the Great Siberian railway joining it at Ob or Novo-Nikolaievsk. This town is already regarded as the center of the Siberian grain trade and the opening of the new line will give an impetus to its rapid development.

It is believed construction will begin immediately, for the reasons the commission has given for the railway are sufficiently convincing to exclude governmental opposition. The principal arguments presented in support of the construction are as follows: The line is of great strategic importance. It is absolutely necessary in the interest of the colonization of Siberia; for it runs through country that is very fertile and well suited for immigrants, thus aiding the settlement of the agrarian question, not only in Siberia but also in Russia. It traverses a region that is now sparsely inhabited but is capable of producing largely both grain and other natural products. Above all, it opens the enormous natural wealth of the Altai mountain region which, according to the latest researches, will be worth many millions to Siberia. Besides the mountain forests, that are still vaguely known, mines of iron, copper, silver, lead and zinc have been in operation for many years, but have never been properly worked, in spite of the richness of the ores. Freight and other expenses have swallowed up the profits. The new line will transform all this. The new line will be more than 1,360 miles long. It is hoped that it will be open to traffic in five years at latest, as it can be begun at both ends at once. A line has been decided upon in Trans-Caucasia, from Aryss, a station on the Orenburg-Tashkend Line, via Pischpek to Verny. This line will be especially serviceable to the cotton and silk industry in Ferghana province.—*Far Eastern Review.*

The Rosario Western Railway Company, recently registered in London, is contemplating a new Argentine railway in the Province of Santa Fe.

General News Section.

The lower house of the New York state legislature, by a vote of 85 to 20, has passed the Jackson full crew bill.

The Denver & Rio Grande has granted an advance of 10 per cent. in wages to the passenger conductors on its line, and a 7½ per cent. advance to its freight conductors. About 2,000 men are affected by this increase.

On Saturday, Sunday and Monday last, Pierre Vedrine, flying in a monoplane, traveled from Paris to Pau, by a circuitous route, 500 miles in 6 hours, 55 minutes; but not all in a single flight; there were a number of long stops. The time "on the wing" figures out over 72 miles an hour.

Two telephone circuits, with Gill selectors, have just been put into service on the Cincinnati, New Orleans & Texas Pacific from Danville, Ky., to Oakdale, Tenn., 134 miles. One of the circuits is for the use of the train despatcher and the other for messages. Much of this division is double-track, but the train wire is said to be a very busy one.

The Bureau of Railways in the Department of Internal Affairs of the state of Pennsylvania no longer has a superintendent and an assistant superintendent, a law having been passed abolishing these offices and creating those of chief and assistant chief of the bureau. The chief of the bureau is Freeman C. Gerberich, heretofore assistant superintendent.

The Pennsylvania Railroad has renewed for a period of one year from May 1, the temporary agreement under which it operates the New York station and tunnels owned by the Pennsylvania Tunnel & Terminal Railroad Company. This extension of time has been made, because it has not as yet been possible to gather all data necessary to establish a satisfactory basis for a long term lease.

At Daytona Beach, Fla., April 23, Bob Burman ran an automobile one mile in 25.40 seconds, and two miles in 51.28 seconds; or at the rate of 141.73 miles an hour for one mile, and 140.40 miles an hour for two miles. This is faster than any man ever before traversed the face of the earth, the highest record by vehicles on rails being 130½ miles an hour, which was made in the electric car experiments in Germany, October 27, 1903.

The Philadelphia Rapid Transit Company has refused a request of its conductors and motormen for an increase of pay from 23 cents an hour to 28 cents. The company tells the employees that there is an over-supply of men at the present rates, and says that the sum of $3,000 a month is paid out to extra men, who, under the agreement made when the strike was settled a few months ago, have to be carried on the pay rolls at $2 a day.

On Thursday, April 20, for about one hour, operators of the Western Union Telegraph Company worked through between New York City and Douglas, Ariz., by way of Los Angeles, a distance of 3,865 miles. This circuit was made up for the associated press to enable the agent in New York to communicate directly with the agent in Douglas. There were repeaters in the circuit at Chicago, Kansas City, Dallas, El Paso and Los Angeles.

In its twenty-second annual report the relief department of the Chicago, Burlington & Quincy shows that during 1910 a total of $579,204 was contributed by its members, and that the benefits paid to members amounted to $643,854. The membership at the end of the year was 26,925, an increase of 31 over the previous year. The number of disabilities reported during the year was 19,343, of which 17,853 recovered, and 209 resulted in deaths, leaving 1,281 disabilities at the end of the year.

A special train of 60 cars, which contained 15,000 rolls of carpet, left Chicago on April 19 via the Chicago & North Western on its way to Omaha, Neb. The shipment originated at Yonkers, N. Y., and was taken to Buffalo by the New York Central, and from there to Chicago by the Michigan Central. From Omaha it will go over the Union Pacific and the Southern Pacific to San Francisco, where it goes to supply the demand on the Pacific coast. The total weight of the carpet in the train was 1,500,000 lbs., and it was valued at almost $1,000,000.

The Kansas Grain Dealers' Association will ask to inter-plead in a case brought by the state to compel the railways hauling grain from Kansas to Kansas City, and the large elevator operators at Kansas City, Kan., to allow the inspection and weighing of all grain entering the Kansas City market. The defendants refused to pay the fee, which was raised by a recent state law from a flat rate of 50 cents a car to 1 cent per 1,000 lbs. of grain, and the grain dealers, who believe, with the railways in the suit, that the charge is unreasonable, propose to assist in fighting its collection.

The appointment of F. G. Athearn as manager of the bureau of economics of the Southern Pacific Company, with office at San Francisco, Cal., has been announced in these columns. Referring to the duties of Mr. Athearn, an officer of the road writes that they "will be to establish harmony between the railway and its patrons. It is hoped to accomplish this by educating the public and our own employees, by means of public addresses and through correspondence, as to the fundamental principles and needs underlying successful railway operation. The time has come when the railways must appeal their case to the people."

The committee on relations of railway operation to legislation has issued a revised edition of its bulletin giving the number of bills affecting railway operation which have been introduced in state legislatures during the present year; and the total number is 512, or 38 more than the number reported in the first bulletin, which was reproduced in the *Railway Age Gazette* of April 7, page 869. The additional 38 measures comprise the following: Ten in Iowa; 5 in Arkansas; 4 in Illinois; 1 in Indiana; 3 in Michigan; 7 in Minnesota; 1 in Missouri; 3 in New Jersey; 1 in New York; 2 in Rhode Island, and 1 in Washington.

A. J. Earling, president of the Chicago, Milwaukee & St. Paul, has offered a prize of a thousand-dollar silver cup for the best oats grown in the United States during the present season. The prize is to be given at the American Land and Irrigation Exposition, which is to be held in New York next November, and at which farm and orchard products from all parts of the country will be displayed. It is Mr. Earling's belief that much of the land opened by the recently completed Puget Sound extension of the St. Paul is capable of producing the best crops in the country, and it is his aim to arouse popular interest in it.

A new book of instructions printed in nine languages has just been issued by the Pennsylvania Railroad for the government of employees working on or about the tracks. The 16 rules are first given in English, and following it are translations into German, Greek, Hungarian, Italian, Lithuanian, Polish, Slovak and Swedish. In the average track gang in this section of the country there are from three to six nationalities represented. The poorer classes of immigrants are not so very ignorant; foremen who are in charge of the track gangs say that practically all of the men can read, and that rarely is one found who cannot sign his name.

On April 12, a Pacific type locomotive, equipped with Schmidt superheater, with seven all-steel mail cars and two Pullman cars on train No. 43, of the New York Central & Hudson River, made the three miles between Depew, N. Y., and Lancaster, in one minute and 51 seconds. The first mile was made in 38 seconds, the second in 37 seconds and the third in 36 seconds. Thirty-six seconds is at the rate of 100 miles an hour. The time was taken by a traveling engineer who was riding on the locomotive, and the record is therefore only semi-official. The locomotive was one of those recently delivered to the New York Central Lines and was described in our issue of March 31, page 785.

The numerous proposals for the construction of new subways in New York City, which have been the subject of tedious discussions by city and state officers and the newspapers for many months, are drawing to a close; at least, this is the assurance of Mayor Gaynor. The most tangible fact given out in support of this view is, that the Brooklyn Rapid Transit

Company, which several months ago proposed to operate subways throughout the city, has this week presented a revised proposal embracing an elaborate scheme for the operation of subways in Manhattan, Brooklyn, the Borough of Bronx, and in Staten Island, connection with the island to be made by a tunnel beneath the narrows. The Brooklyn Rapid Transit Company, while proposing to spend $75,000,000 on equipment of the proposed lines and on extensions of its existing elevated lines in Brooklyn, stipulates that all of the new subways embraced in the plan for Manhattan and for other boroughs outside of Brooklyn, shall be built and paid for by the city. The estimated financial burden on the city would be over $80,000,000.

Disastrous Train Wreck in South Africa.

A press despatch from Grahamtown, South Africa, April 23, reports 23 persons killed and many injured in the wreck of a passenger train which plunged off a bridge and fell into a gorge 250 ft. deep. This was on the Kowie Railway at Blaauwkrantz. The extrication of the injured and dying victims from the wreck was extremely difficult. A large mass of wreckage lodged on a ledge half-way down, and it was many hours before the passengers were taken out. This work had to be done by hoisting in sacking.

Prizes for First Aid to the Injured.

The American Red Cross, using the interest received on a fund of $5,000 which has been given to it, is to offer prizes among railway men for proficiency in first aid to injured persons; and also will give prizes and medals for excellence in competitive drills in this work. The first prize will be $50; the second, $25, and so on.

Sardines and Cotton Seed.

Texas and Maine are closer together than brothers, whether they like the situation or not. A correspondent at Belfast writes: "The Maine Central is up against one of the troublesome features of the interstate commerce law," and he goes on to tell of a case which is parallel to the Galveston wharf case, recently decided by the United States Supreme Court. The Maine Central owns some unused land at Belfast, which it was proposed to lease at a nominal rental to a sardine packery which would produce much freight for the company. The lease was to be for 99 years, and the packers have put a considerable sum of money into the building of a granite sea wall. Now the railway learns that, being a transportation company engaged in interstate commerce, it must not allow the use of any of its property, except for a fair price, and, says our correspondent, "the people of Belfast fear that they will lose an industry." Waiving the question of whether it is possible to lose anything that you do not possess, it might be suggested that a reduction of the freight rate on the sardines ought to be practicable. If such a reduction should result in stimulating sardine shipments at a lot of other places, in addition to Belfast—why, that would only enhance the good results of the railway's public spirit.

A Fast Schedule.

The Canada division of the Michigan Central once more calls attention to the fact that, in the language of the turf, it is a "fast track." "The Detroiter," the new passenger train of the Michigan Central, and the New York Central (train No. 48), from Detroit to New York, is scheduled over the Canada division from Windsor to Bridgeburg, 226.24 miles, in 3 hours, 40 minutes, or at the rate of 61.7 miles an hour. This is claimed to be the fastest regular schedule in the world for so great a distance; and, so far as we can find from the records, the claim is well founded. The train makes one stop, at St. Thomas, of five minutes. Deducting this stop, the schedule speed is over 63 miles an hour. The train leaves Windsor at 8 p. m. and is due at Bridgeburg at 11:40. The Great Western of England has trains scheduled 194 miles at 56.7 miles an hour. The Pennsylvania has one train scheduled from Manhattan Transfer to North Philadelphia, 77.5 miles, in 77 minutes, or at the rate of 60.4 miles an hour. The longest distance for which we find a train scheduled faster than this is 59 miles over the West Jersey & Seashore, where one train traverses the distance in 52 minutes, or at the rate of 68.1 miles an hour.

The Canada division of the Michigan Central, straight and level, and having the minimum of junctions and large stations, has been the scene of fast runs for many years. On May 7, 1896, a train of three cars was run over the division at 65 miles an hour; on September 5, 1901, a train of five cars at 62½ miles an hour; on April 27, 1904, a train of four cars at 68.3 miles an hour, and on May 21, 1910, a train of 12 cars filled with locomotive runners, at 61.93 miles an hour (224 miles in 217 minutes, without a stop).

Earnings of United States Steel Corporation.

The United States Steel Corporation reports net earnings for the quarter ended March 31, 1911, $23,519,203, as compared with $25,990,978 for the quarter ended December 31, 1910, and $37,616,876 for the quarter ended March 31, 1910. The total net earnings of the United States Steel Corporation for the first quarter of 1911, amounting to $23,519,203, failed to come up to public expectations by at least $3,500,000. The favorable feature of the statement is the rising tendency of net earnings. For example, they were $5,869,416 in January, $7,180,928 in February and $10,468,859 in March. The March earnings show an increase over January of approximately 80 per cent. Earnings in the first quarter of 1909 were $22,921,000; 1908, $18,229,000; 1905, $23,025,000; 1904, $13,445,000; 1903, $25,068,000, and 1902, $26,715,000. Earnings of $10,468,859 in March, 1911, can be regarded as favorable, comparing with $7,989,000 in 1909, $7,466,000 in 1908, $9,585,000 in 1905, $6,036,000 in 1904, $9,912,000 in 1903 and $10,135,000 in 1902. The surplus for the quarter was $31,155 as compared with $6,532,531 for the first quarter of 1910. Sinking funds on bonds of subsidiary companies, depreciation and extraordinary replacement charges aggregated a total of $3,517,386. In the first quarter of 1910 similar charges amounted to $6,113,682. Net earnings in the first quarter were at the rate of $94,076,812 a year. On the other hand, March earnings were at the rate of nearly $126,000,000 a year.

How to Catch Passengers.

Courteous diplomacy is the secret of the ticket agent's success. The first requisite is real interest in the inquirer. When the prospective passenger enters an office, he feels complimented to find a clerk ready and smilingly willing to wait on him, and correspondingly disgusted if a clerk sits in a chair at a desk and perfunctorily answers the questions propounded—volunteering nothing. It is well to allow a prospective passenger to have his full say, the clerk merely acquiescing pleasantly until a conversation of discussion is opened; in this way the ticket seller will frequently get the customer's measure while concealing his own, and this alone is a prime advantage.

It frequently happens that a shopper has really made up his mind to use a line other than yours and merely comes in to confirm his judgment. This class of passenger is very often converted to your line by well-timed remarks on his good judgment, followed up by pointing out some particular advantage of your line that had been unknown to him such as "By-the-by, here is something on our line that the world should know more of, but you are aware how difficult it is to make everybody cognizant of such wonderful things as this!" Then show him an illustration of, say, the Spiral Tunnels or Lake Louise, and follow it up by the comment of some authority on railway engineering or mountain scenery.

It happens at times that the inquiring passenger is not stupid, but simple, and in such cases it is well to establish acquaintance along lines familiar to him. It is probable such a passenger is from a farming community, and it sometimes occurs that the ticket seller is either familiar with his particular district or perhaps knows some person in that vicinity, or has some knowledge of farming and its requirements—in fact, any ticket seller who is out for business will find some avenue of interest to attract and hold such a man's confidence with the desired result. Then there is the "prospect," who either has or assumes all knowledge—this man can invariably be landed by asking his opinion on the relative merits of railways, of service, etc., and indicating to him by your attitude that you respect his knowledge.

Another type is the inquiring passenger who really is in perplexity; such a one's patronage is almost certain if painstaking interest is taken in him. Show him the route map; indicate specially, with red ink if necessary, the line he will travel; make an itinerary; show him a sleeping car or its picture; mark on the map or annotated time table two or three places that he must not

miss under any consideration—and then the money is yours.

How great a percentage of possible patrons will enter a ticket office and say, "Is this the Great Central?" or "Is this the Union ticket office?" or "Is this the X., Y., Z.?" and how often the clerk will answer, "No; corner Third and Madison." This is wrong, because this is the fellow you are after; he must be held until his business is ascertained. Maybe the "Canadian Pacific" will do him just as well or better, and even if it does not, "It pays to advertise." Show him and probably part of your information will stick.—*A. B. Calder, Canadian Pacific.*

American Electric Railway Engineering Association.

At a meeting of the Executive Committee held November 15, 1910, a resolution was passed authorizing the secretary to send out a circular letter to all member companies and associate members giving an outline of the work laid down for the standing committees for the present year. This circular letter tells of the work in hand by the standing and special committees, and says that sub-committees have been appointed from the standing committees to serve on sub-committees of the American Society for Testing Materials, who are drawing up specifications for wrought iron, steel in rails and rolled steel wheels.

International Association of Railway Special Agents and Police.

At the annual meeting of the International Association of Railway Special Agents and Police, which was held at Chattanooga, Tenn., April 18 to 21, the following officers were elected for the ensuing year: President, M. B. Earle, Birmingham, Ala.; first vice-president, P. J. Kindelon, San Francisco, Cal.; second vice-president, H. C. Harold, Buffalo, N. Y.; third vice-president, L. T. Phelps, Bluefield, W. Va.; secretary and treasurer, W. C. Pannell, Baltimore, Md. Buffalo, N. Y., was chosen as the place of the next annual meeting.

Committees of the American Railway Engineering Association.

The following new directors of the American Railway Engineering Association have been elected: J. A. Atwood, Pittsburgh & Lake Erie; J. B. Berry, Rock Island Lines; W. B. Storey, Jr., Santa Fe. The new name of the association became effective on April 24.

The new committees of the association, together with their instructions, are as follows:

COMMITTEE I.

Roadway.

1. Present formulae of general application for determining waterway areas under varying conditions, with consideration also of hydraulic features.
2. Report on unit pressures allowable on roadbeds of different materials, conferring with the Committee on Ballast.
3. Report on tunnel construction and ventilation.
4. Report on the question of agricultural drainage as it affects railways:
   (a) Laws and assessments.
   (b) Methods of construction of drainage channels through railways.

J. E. Willoughby (L. & N.), Chairman; W. M. Dawley (Erie), Vice-Chairman; J. R. W. Ambrose (G. T.); John C. Beye (C. R. I. & P.); D. J. Brumley (I. C.); W. C. Curd (M. P.); Paul Didier (B. & O.); R. C. Falconer (Erie); S. B. Fisher (M. K. & T.); T. H. Gatlin (Southern); C. B. Hoyt (N. Y. C. & St. L.); C. S. Millard (C. C. C. & St. L.); A. C. Prime (Pennsylvania); H. J. Slifer (C. G. W.); J. A. Spielmann (B. & O.); John G. Sullivan (C. P.); W. D. Pence (University of Wisconsin); F. L. Wheaton (D. L. & W.); W. P. Wiltsee (N. & W.); R. C. Young (L. S. & I); L. W. Baldwin (I. C.).

COMMITTEE II.

Ballast.

1. Report on the proper depth of ballast to insure uniform distribution of the loads on the roadbed, conferring with Committee on Roadway.
2. Report on physical tests of stone for ballast.
3. Complete review on gravel ballast and recommended methods for grading the different qualities.

H. E. Hale (M. P.), Chairman; J. M. Meade (A. T. & S. F.), Vice-Chairman; W. J. Bergen (N. Y. C. & St. L.); C. C. Hill (M. C.); F. J. Stimson (G. R. & I.); F. T. Darrow (C. B. & Q.); T. W. Fatherson (C. R. I. & P.); A. S. More (C. C. C. & St. L); E. V. Smith (B. & O.); H. L. Gordon (B. & O.); J. M. Egan (I. C.); S. B. Rice (R. F. & P.); T. C. Burpee (Intercolonial); G. H. Harris (M. C.); J. V. Neubert (N. Y. C. & H. R.); A. F. Blaess (I. C.); S. A. Jordan (B. & O.); S. N. Williams (Cornell College).

COMMITTEE III.

Ties.

1. Study the size of cross-ties required for the stresses to which they are subjected.
2. Report on the saving in track labor brought about by the use of treated ties.
3. Report on the effect of the design of tie-plates and spikes on the durability of the tie.
4. Report on the renewal of cross-ties in continuous stretches versus single tie renewals.
5. Report on the use of cypress timber for cross-tie.
6. Report on the use of metal, composite and concrete ties.

L. A. Downs (I. C.), Chairman; W. F. H. Finke (Southern), Vice-Chairman; F. G. Jonah (St. L. & S. F.); E. E. Hart (N. Y. C. & St. L.); G. W. Merrell (N. & W.); W. J. Burton (M. P.); J. G. Shillinger (C. C. C. & St. L.); H. C. Landon (Erie); F. R. Layng (B. & L. E.); L. M. Perkins (N. P.); H. K. Wicksteed (C. N. Q.); D. O. Lewis (C. N. P.); H. W. Brown (Pennsylvania); L. C. Hartley (C. & E. I.); H. S. Wilgus (P. S. & N.); E. D. Jackson (B. & O.); G. D. Swingly (B. & O.); D. W. Thrower (I. C.); Duncan MacPherson (Transcontinental).

COMMITTEE IV.

Rail.

1. Recommend changes in specifications for steel rails.
2. Present recommendations on standard rail sections.
3. Continue investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.
4. Report on the results obtained from the use of open-hearth and special alloy steel rails, and the chemical composition of such rails.
5. Present reports on the results of tests made on the various kinds of rail in conjunction with the Manufacturers' Committee on the revolving machine at South Chicago and the reciprocating machine at Sparrows Point.
6. Report on the strength of rail joints, with a view to recommending design and specifications.
7. Report on standard drilling for rails.
8. Report upon the advisability of using rails longer than 33 ft., including estimates of relative cost.

Chas. S. Churchill (N. & W.), Chairman; R. Montfort (L. & N.), Vice-Chairman; E. B. Ashby (L. V.); J. A. Atwood (P. & L. E.); A. S. Baldwin (I. C.); J. B. Berry (C. R. I. & P.); M. L. Byers (M. P.); W. C. Cushing (Pennsylvania); F. A. Delano (Wabash); Dr. P. H. Dudley (N. Y. C. L.); C. H. Ewing (A. C.); John D. Isaacs (Harriman Lines); Thos. H. Johnson (Pennsylvania); H. G. Kelley (G. T.); C. A. Morse (A. T. & S. F.); G. W. Kittredge (N. Y. C. & H. R.); D. W. Lum, (Southern); J. T. Richards (Pennsylvania); J. P. Snow (B. & M.); A. W. Thompson (B. & O.); R. Trimble (Pennsylvania); M. H. Wickhorst (Rail Committee); C. W. Huntington (C. R. N. J.).

COMMITTEE V.

Track.

1. Present general specifications covering material and workmanship for frogs, crossings and switches, including the use of manganese and other special alloys.
2. Present general specifications for track bolts, nutlocks, tie-plates, common track spikes and screw-spikes.
3. Study designs of main-line turnouts.

J. B. Jenkins (B. & O.), Chairman; G. J. Ray (D. L. & W.), Vice-Chairman; L. S. Rose (C. C. C. & St. L.); Garrett Davis (C. R. I. & P.); L. R. Leighty (M. P.); Curtiss Millard (C. G. W.); A. Bruner (N. & W.); E. G. Ericson (Pennsylvania); T. H. Hickey (M. C.); Raffe Emerson (A. T. & S. F.); J. M. R. Fairbairn (C. P.); H. T. Porter (B. & L. E.); P. C. Newbegin (B. & A.); W. G. Raymond (Iowa State University); S. S.

Roberts (I. C.); F. A. Smith (civil engineer); R. A. Van Houten (Erie); W. J. Towne (C. & N. W.); H. R. Safford (Edgar Allen & Co.); R. O. Rote (L. S. & M. S.); R. M. Pearce (P. & L. E.); Geo. H. Bremner (C. B. & Q.); C. H. Stein (C. R. of N. J.); Thomas Maney (L. & N.); F. S. Stevens (P. & R.).

COMMITTEE VI.

Buildings.

1. Report on the advantages and disadvantages of various types of freight house floor construction.

2. Continue the study of roof coverings.

3. Present principles covering the design of inbound and outbound freight houses.

4. Continue the study of reinforced concrete coaling stations.

Maurice Coburn (Vandalia), Chairman; M. A. Long (B. & O.); Vice-Chairman; O. P. Chamberlain (C. & I. W.); W. F. Schultz (Memphis Union Station Co.); A. T. Hawk (C. R. I. & P.); C. G. Delo (C. G. W.); W. S. Thompson (Pennsylvania); C. F. W. Felt (A. T. & S. F.); J. W. Orrock (C. P.); N. H. LaFountain (C. M. & St. P.); A. T. Tomlinson (G. T. P.); J. S. Metcalf (contracting engineer); C. H. Fake (M. R. & B. T.); E. N. Layfield (Grade Separation Commission); J. P. Canty (B. & M.); W. T. Dorrance (N. Y. C. & H. R.); G. W. Andrews (B. & O.); H. A. Lloyd (Erie); J. O. Thorne (C. B. & Q.); W. G. Arn (I. C.).

COMMITTEE VII.

Wooden Bridges and Trestles.

1. Report on the formulae for use in determining the strength of sheet piling.

2. Report on equipment required for pile driving.

3. Collect information on special methods of driving sheet piles in cofferdams where conditions do not permit the use of ordinary equipment.

4. Collect information of actual experience on the bearing power of piles and on the practical results of the use of formulae.

5. Report on the use of guard rails for wooden bridges and trestles.

6. Report on fire protection of wooden bridges and trestles.

C. C. Wentworth (N. & W.), Chairman; W. F. Steffens (B. & A.), Vice-Chairman; F. H. Bainbridge (C. & N. W.); F. E. Bissell (A. C. & Y.); W. S. Bouton (B. & O.); R. D. Coombs (consulting engineer); Hans Ibsen (M. C.); Henry S. Jacoby (Cornell University); J. A. Lahmer (K. C. S.); I. L. Simmons (C. R. I. & P); H. Rettinghouse (C. & N. W.); E. A. Hadley (M. P.); B. R. Leffler (L. S. & M. S.)

COMMITTEE VIII.

Masonry.

1. Report on waterproofing of masonry and bridge floors, including methods, cost and results.

2. Report on principles for design of plain and reinforced concrete retaining walls and abutments.

3. Report on the principles of design of reinforced concrete trestles, and state advantages resulting from their use.

4. Report on the best methods of repairing the worn surface of plain and reinforced concrete.

5. Report upon conditions which tend to produce disintegration of the concrete, or corrosion of the reinforcement.

6. Report on methods for depositing concrete under water.

G. H. Tinker (N. Y. C. & St. L.), Chairman; F. L. Thompson (I. C.), Vice-Chairman; T. L. Condron (consulting engineer); B. Douglas (Detroit River Tunnel Co.); L. N. Edwards (G. T.); F. E. Schall (L. V.); A. N. Talbot (University of Illinois); Job Tuthill (C. H. & D.); L. D. Crear (Erie); A. A. Wirth (Pennsylvania); H. E. Boardman (M. P.); L. J. Hotchkiss (C. B. & Q.); A. H. Griffith (B. & O.); G. J. Bell (A. T. & S. F.); J. H. Prior (C. M. & St. P.); W. H. Petersen (C. R. I. & P.); G. H. Scribner, Jr. (contracting engineer).

COMMITTEE IX.

Signs, Fences and Crossings.

1. Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.

2. Report on the relative advantages and disadvantages of the different kinds of fence posts.

3. Report on the best form of track construction and flangeways at street crossings in paved streets.

4. Report on the relative advantages and disadvantages of the different kinds of telegraph poles.

K. J. C. Zinck (G. T.), Chairman; C. H. Stein (C. R. of N. J.), Vice-Chairman; F. M. Patterson (C. B. & Q.); E. R. Lewis (M. C.); H. E. Billman (M. P.); G. E. Boyd (I. C.); L. C. Lawton (A. T. & S. F.); A. M. Funk (B. & O.); J. B. Myers (B. & O.); C. H. Splitstone (Erie).

COMMITTEE X.

Signals and Interlocking.

1. Continue investigation of outline and description of a comprehensive and uniform signal system, suitable for general adoption, conferring with proper committee of the American Railway Association.

2. Revise mechanical interlocking specifications, and include wrought iron pipe as well as steel.

3. Revise electric interlocking specifications, and submit statement of the results from experience.

4. Report on the effect of treated and metal ties on track circuits.

A. H. Rudd (Pennsylvania), Director-Chairman; L. R. Clausen (C. M. & St. P.), Vice-Chairman; Azel Ames (United States Train Control Board); C. C. Anthony (Pennsylvania); H. Baker (C. N. O. & T. P.); H. S. Balliet (N. Y. C. & H. R.); W. G. Besler (C. R. of N. J.); W. B. Causey (C. G. W.); C. A. Christofferson (N. P.); C. E. Denney (L. S. & M. S.); W. J. Eck (Southern); W. H. Elliott (N. Y. C. & H. R.); M. H. Hovey (Wisconsin Railway Commission); A. S. Ingalls (L. S. & M.); J. C. Mock (Detroit River Tunnel); F. P. Patenall (B. & O.); J. A. Peabody (C. & N. W.); Frank Rhea (General Electric Co.); W. B. Scott (Harriman Lines); Thos. S. Stevens (A. T. & S. F.); H. H. Temple (B. & O.); E. F. Wendt (P. & L. E.); J. C. Young (U. P.); A. G. Shaver (C. R. I. & P.); G. E. Ellis (K. C. T.).

COMMITTEE XI.

Records and Accounts.

1. Make a comprehensive study of the forms in the Manual which were adopted a number of years ago.

2. Study the economical way of managing a storehouse so as to assure a minimum stock of material at all times.

H. J. Pfeifer (Terminal Railroad Association), Chairman; M. C. Byers (St. L. & S. F.), Vice-Chairman; Edward Gray (Southern); E. E. Hanna (M. P.); Henry Lehn (N. Y. C. & H. R.); J. H. Milburn (B. & O.); C. W. Pifer (I. C.); Guy Scott (Pennsylvania); W. A. Christian (C. G. W.); R. W. Willis (C. B. & Q.); G. J. Graves (A. T. & S. F.); J. M. Brown (C. R. I. & P.); C. W. Cochran (C. C. C. & St. L.); G. T. Warren (B. & O.); H. Stephens (L. S. & M. S.).

COMMITTEE XII.

Rules and Organization.

1. Continue the compilation of rules for the government of maintenance of way employees.

2. Formulate rules in the nature of specifications or instructions regarding the conduct of work, making use of the recommendations of the various committees dealing with these subjects, and of the best practice of railway companies as embodied in their books of rules.

J. O. Osgood (C. R. of N. J.), Chairman; F. L. Nicholson (N. & S.), Vice-Chairman; F. D. Anthony (Q. M. & S.); G. D. Brooke (B. & O.); E. J. Correll (M. P.); C. Dougherty (C. N. O. & T. P.); F. P. Gutelius (C. P.); J. A. Gordon (C. G. W.); K. Hanger (C. R. I. & G.); Jos. Mullen (C. C. C. & St. L.); J. B. Dickson (Erie); W. C. Smith (N. P.); S. E. Coombs (N. Y. C. & H. R.); J. B. Carothers (B. & O.).

COMMITTEE XIII.

Water Service.

1. Report on the design and relative economy of track pans from an operating standpoint.

2. Present typical plans and specifications for tank supports.

3. Report on the use of reinforced concrete for water tanks and supports.

Robert Ferriday (C. C. C. & St. L.), Chairman; J. L. Campbell (El. P. & S. W.), Vice-Chairman; E. G. Lane (B. & O.); James Burke (Erie); H. M. Church (B. & O. S. W.); G. H. Herrold (C. G. W.); A. Mordecai (consulting engineer); W. A. Parker (St. J. & G. I.); Chas. E. Thomas (I. C.); C. L. Ran-

som (C. & N. W.); A. F. Dorley (M. P.); G. C. Millett (A. T. & S. F.).

COMMITTEE XIV.

Yards and Terminals.

1. Report on typical situation plans of passenger stations, of both through and stub types, with critical analyses of working capacity, and include a review of the different methods of estimating their capacity.
2. Report on developments in the handling of freight by mechanical means.
3. Report on developments in the design and operation of hump yards.
4. Report on typical situation plans for a division engine terminal.
5. Report on methods of handling baggage, express and mail at passenger terminals.

C. H. Spencer (Washington Terminal Co.), Chairman; E. B. Temple (Pennsylvania), Vice-Chairman; Hadley Baldwin (C. C. C. & St. L.); W. C. Barrett (B. & O.); M. S. Blaiklock (Grand Trunk); G. H. Burgess (D. & H.); A. E. Clift (I. C.); Maurice Coburn (Vandalia); H. T. Douglas, Jr. (W. & L. E.); A. C. Everham (K. C. Terminal); D. B. Johnston (Pennsylvania); H. A. Lane (B. & O.); L. J. McIntyre (N. P.); B. H. Mann (M. P.); A. Montzheimer (C. L. S. & E.); W. L. Seddon (S. A. L.); A. Swartz (Erie); J. E. Taussig (H. & T. C.); E. E. R. Tratman (Engineering News); W. L. Webb (C. M. & St. P.); J. G. Wishart (C. R. I. & P.).

COMMITTEE XV.

Iron and Steel Structures.

1. Continue investigation of impact and secondary stresses.
2. Continue investigation of the influence of experiment and experience on theory of bridge design.
3. Report on rules for instruction and guidance of inspectors in mill, shop and field.
4. Study the design of built-up columns, co-operating with other investigators and committees of other societies.
5. Report on the methods of protection of iron and steel structures against corrosion.

C. H. Cartlidge (C. B. & Q.), Chairman; A. J. Himes (N. Y. C. & St. L.), Vice-Chairman; J. A. Bohland (G. N.); Chas. Chandler (C. G. W.); C. L. Crandall (Cornell University); J. E. Crawford (N. & W.); Albert Reichmann (American Bridge Co.); J. E. Greiner (B. & O.); J. M. Johnson (Louisville Bridge & Iron Co.); C. N. Monsarrat (C. P. R.); W. H. Moore (N. Y. N H. & H.); W. F. Robinson (A. T. & S. F.); C. C. Schneider (consulting engineer); O. E. Selby (C. C. C. & St. L.); C. E. Smith (M. P.); I. F. Stern (C. & N.); F. E. Turneaure (University of Wisconsin).

COMMITTEE XVI.

Economics of Railway Location.

1. Continue the consideration of all questions connected with railway location, alinement grades and improvement of alinement and grades affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and comparing different routes and making improvements in alinement and grade alinement.

A. K. Shurtleff (C. R. I. & P.), Chairman; R. N. Begien (B. & O.), Vice-Chairman; C. Frank Allen (Massachusetts Institute of Technology); Willard Beahan (L. S. & M.); C. K. Conard (Erie); A. C. Dennis (civil engineer); W. A. James (C. P.); C. P. Howard (civil engineer); C. J. Parker, N. Y. C. & H. R.); F. W. Smith (C. C. C. & St. L.); Francis Lee Stuart (B. & O.); W. D. Taylor (C. & A.); Walter Loring Webb (consulting engineer); M. A. Zook (C. G. W.).

COMMITTEE XVII.

Wood Preservation.

1. Continue investigation of proper grouping of different timbers for antiseptic treatment.
2. Compile available information from service tests.
3. Investigate the merits of various preservatives, giving especial attention to oil from water gas tar, and to the use of refined coal tar in creosote oil.
4. Report on the desirability of revising the adopted specifications for creosote oil.
5. Recommend forms for the inspection of preserving processes.
6. Present specifications for impregnation with creosote oil.
7. Report on the value of impregnation with crude oil.
8. Report on the value of brush coating and dipping.

Earl Stimson (B. & O.), Chairman; E. H. Bowser (I. C.), Vice-Chairman; W. H. Courtenay (L. & N.); G. M. Davidson (C. & N. W.); H. B. Dick (B. & O. S. W.); W. W. Drinker (Erie); R. H. Ford (M. P.); Dr. W. K. Hatt (Purdue University); V. K. Hendricks (St. L. & S. F.) George E. Rex (A. T. & S. F.); E. A. Sterling (Pennsylvania); C. M. Taylor (C. R. of N. J. and P. & R.); H. Von Schrenk (C. R. I. & P.); Charles Yoder (L. S. & M. S.); C. E. Knickerbocker (N. Y. O. & W.).

COMMITTEE XVIII.

Electricity.

1. Continue the consideration of the subject of clearance.
2. Continue the preparation of a standard specification for overhead transmission line crossings.
3. Report on the effect of electrolytic action on metallic structures, and the best means of preventing it.
4. Report on methods of insulation and protection.

G. W. Kittredge (N. Y. C. & H. R.), Chairman; J. B. Austin, Jr. (L. I.), Vice-Chairman; N. E. Baker (I. C.); R. D. Coombs (consulting engineer); A. O. Cunningham (Wabash); L. C. Fritch (C. G. W.); Geo. Gibbs (P. T. & T. R.); G. A. Harwood (N. Y. C. & H. R.); E. B. Katte (N. Y. C. & H. R.); C. E. Lindsay (N. Y. C. & H. R.); W. S. Murray (N. Y. N. H. & H.); J. R. Savage (L. I.).

COMMITTEE XIX.

Conservation of Natural Resources.

1. Continue the study of tree planting and general reforestation.
2. Continue the study of coal and fuel oil resources.
3. Continue the study of iron and steel resources.

E. O. Faulkner (A. T. & S. F.), Chairman; William McNab (G. T.), Vice-Chairman; R. H. Aishton (C. & N. W.); Moses Burpee (B. & A.); F. F. Busteed (C. P.); C. H. Fisk (C. S.); W. A. McGonagle (D. M. & N.); G. A. Mountain (Canadian Railway Commission); W. L. Park (I. C.); G. H. Webb (M. C.).

SPECIAL COMMITTEES.

Uniform General Contract Forms.

1. Report on general contract forms.

J. C. Irwin (Rutland), Chairman; W. G. Atwood (L. E. & W.), Vice-Chairman; E. F. Ackerman (L. V.); W. L. Breckinbridge (C. B. & Q.); R. G. Kenly (M. & St. L.); E. H. Lee (C. & W. I.); C. A. Paquette (C. C. C. & St. L.); H. C. Phillips (A. T. & S. F.); J. H. Roach (L. S. & M S.); H. A. Woods (G. T. P.).

Grading of Lumber.

1. Continue the collection of current specifications, Grading and Inspection Rules, for maintenance of way timber and lumber not heretofore reported on, and present same for all classes of maintenance of way timber and lumber which will conserve the interests of railways and be acceptable to manufacturers' associations; conferring with committees of this association and with other organizations whose work is affected.

W. H. Sellew (M. C.), Chairman; B. A. Wood (M. & O), Vice-Chairman; D. Fairchild (N. P.); R. Koehler (S. P.); A. J. Neafie (D. L. & W.); W. H. Norris (M. C.); C. W. Richey (Pennsylvania); Dr. H. Von Schrenk (C. R. I. & P. and St. L. & S. F.); F. B. Walker (N. P.).

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., S. Louis, Mo.; May 9-10, 1911, Detroit, Mich.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa., 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except, June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

Reporters in New York learn that the Florida tourist travel of the past winter has been very satisfactory in volume.

The Pennsylvania Railroad on one of its 28-hour trains, now runs day coaches through between New York and Chicago. Heretofore only sleeping-car passengers have been carried through without change.

The New York, New Haven & Hartford announces that it will establish at Boston the "New England Lines Industrial Bureau," to promote agricultural and manufacturing industry. The head of the bureau will be William H. Seeley, at present general freight and passenger agent of the Central New England.

Arrangements have been made by the New York Central & Hudson River and the Boston & Maine by which regular through passenger service will be established between Boston and Buffalo over these lines. Up to this time through cars have been run only in the rushes of the vacation seasons. (See also Financial News.)

Since the beginning of March, the "North Coast Limited," of the Northern Pacific, which runs from St. Paul to Puget Sound, has arrived at Spokane from the east every day on time, and only twice in March and in April once has it been late in reaching the coast. The train makes a run of over 1,900 miles through five states.

Attorney General Major of Missouri has advised the State Railway Commission not to attempt to reduce the state passenger rates, or interfere in any way with railway rates, until a decision has been reached in the cases now before the Supreme Court involving the reductions in rates required by the state authorities. He believes that any interference on the part of the commission at this time might tend to weaken the state in this litigation.

The New York & Hudson Steamboat Company, running boats between New York City and Hudson, N. Y., has made a new traffic agreement with the Boston & Albany, by which through rates will be made on freight to and from all stations on that road, and to carry the additional freight which is expected the company has built two new steamboats. This makes five in all, in the service of the company, and there will be two sailings a day from New York.

The United States Motor Company prints a statement to the effect that in the month of March (27 working days), it shipped 2,639 carloads of automobiles; and another to the effect that on a single day's shipments from its factories the freight bills amounted to $12,944. These freight bills represented 108 carloads sent to 27 different states. The factories are situated in Providence, R. I.; Hartford, Conn.; Tarrytown, N. Y.; Detroit, Mich.; Dayton, Ohio, and Newcastle, Ind.

On wheat and corn, delivered by vessels at Lake Erie ports, the trunk line railways have put in effect, beginning April 27, a rate of 4 cents a bushel to New York and Boston; and a rate of 3.7 cents to Philadelphia and Baltimore. These rates are made to meet Canadian competition and expire October 31. This action is in consonance with the suggestion which was made by the Interstate Commerce Commission in its recent decision on the subject of grain rates from Buffalo to Boston.

Governor Hadley of Missouri has vetoed the Phelps bill, which prohibited a railway from charging a higher passenger rate per mile between any two points on its line than between any other two points. He said it was his belief that the measure might be declared unconstitutional. The Carter bill was signed. This gives the state railway commission power to fix maximum passenger rates in Missouri, and provides for a classification of the roads with reference to their earnings per mile for fixing the passenger rates. The governor also signed the bill giving the railway commission power to fix express rates, to establish free delivery zones in cities of 1,000 or more population, and to fix the amount express companies shall pay railways for carrying express.

The Kansas City-Missouri River Navigation Company, which has been organized by several business men of Kansas City to establish a boat line on the Missouri river between Kansas City and St. Louis to compete with the railways, has agreed to make 80 per cent. of the rail rates the maximum charges on its line; and at the start it will charge the maximum rates. No tariffs will be published the first year, and it is announced that the classification of freight will be the same as on the railways. To prevent the company from coming under the jurisdiction of the Interstate Commerce Commission, no through bills of lading will be issued for points outside of Missouri, shipments for points beyond St. Louis having to be reconsigned at that place.

John L. Mathews, secretary of the Mississippi Valley Transportation Company, which is about to open a barge line service on the Mississippi, between St. Louis and New Orleans, has given out a statement in which he expresses regret that the business men of St. Louis have not taken more active interest in the company. It was started in the fall of 1909, and now has a capital of $135,000, very little of which was subscribed by St. Louis people, although when it was proposed the Businsss Men's League indorsed the project and advised the merchants and manufacturers of St. Louis to give it financial support. Mr. Mathews, who is about to resign, says that although he is disappointed at the lack of interest shown by St. Louis, that has nothing to do with his leaving the company.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 93, giving a summary of car shortages and surpluses by groups from December 10, 1909, to April 12, 1911, says:

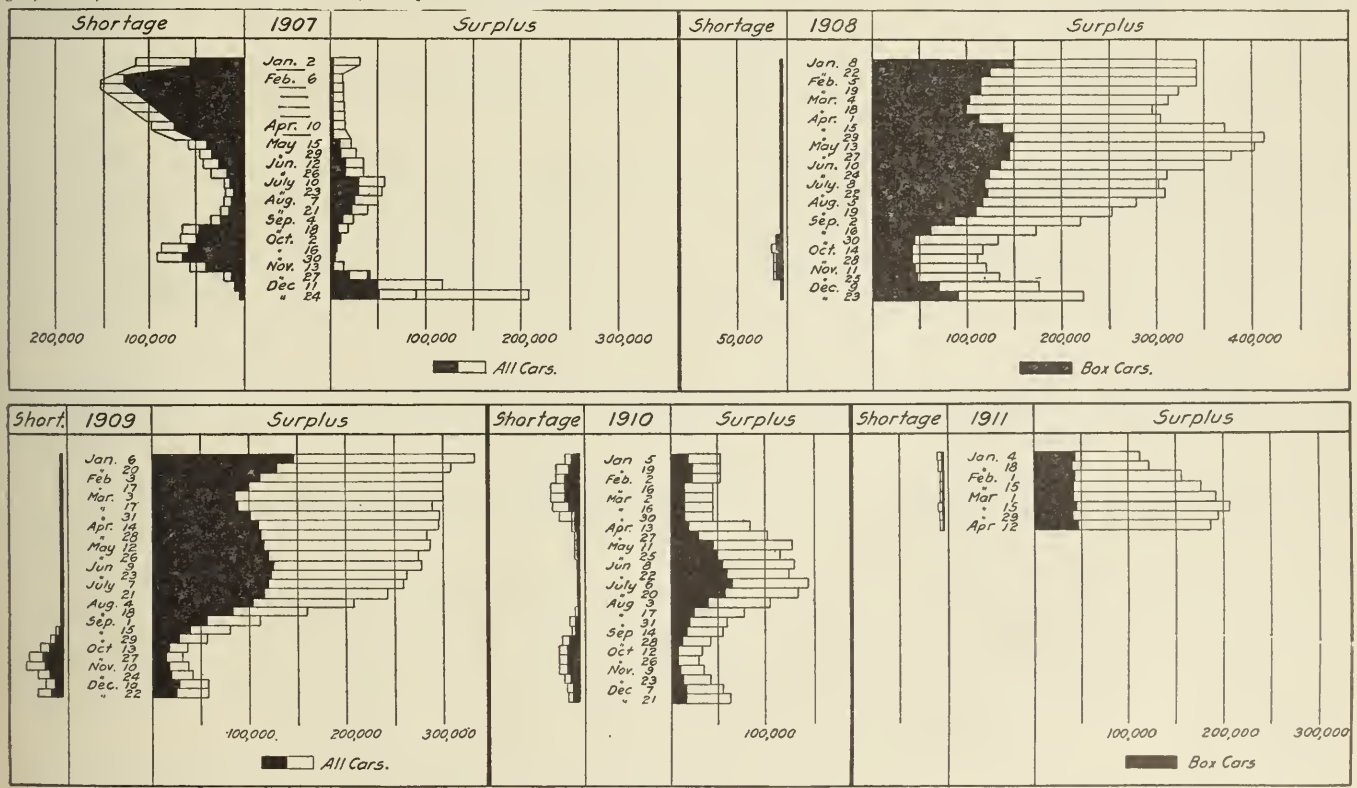
"There has been a decrease of 16,971 in the coal car surplus during the two weeks since our last bulletin, but an increase of 6,993 in the box car surplus, with a slight increase in the surplus of flat cars, brings the net decrease down to 8,998 cars, leaving a total of 187,219 surplus cars of all classes. In group 1 (New England), 2, (Eastern), 3, (Central), and 4, (Middle Atlantic), where the coal car accumulation has been the heaviest, there are decreases in the total group surpluses, while in the West and Northwest the increase in box car surplus caused increases in the total group figures. Group 9 (Southwestern), 11 (Canadian), and 1 (New England) show some decreases in box as well as in the total of all classes."

The accompanying table gives surpluses and shortages by groups for the latest period covered by the report, and the chart shows totals for 1907 to 1911, inclusive.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses Box.	Surpluses Flat.	Surpluses Coal, gondola and hopper.	Surpluses Other kinds.	Surpluses Total.	Shortages Box.	Shortages Flat.	Shortages Coal, gondola and hopper.	Shortages Other kinds.	Shortages Total.
Group *1.—April 12, 1911	8	1,077	1,753	1,318	262	4,410	0	25	0	28	53
" 2.— " 12, 1911	24	2,674	187	25,753	8,793	37,412	16	0	2	0	18
" 3.— " 12, 1911	26	4,429	1,466	45,456	4,351	55,702	0	0	0	197	197
" 4.— " 12, 1911	10	2,427	249	6,222	1,489	10,387	8	285	0	0	294
" 5.— " 12, 1911	19	4,617	587	4,579	1,417	11,200	10	50	0	1	61
" 6.— " 12, 1911	25	10,870	1,435	3,319	5,054	20,678	31	17	8	100	156
" 7.— " 12, 1911	4	1,640	115	1,479	456	3,690	0	0	0	0	0
" 8.— " 12, 1911	15	8,499	626	3,234	3,095	15,454	0	4	0	0	4
" 9.— " 12, 1911	10	2,799	517	472	732	4,520	0	0	0	300	300
" 10.— " 12, 1911	21	6,738	2,388	2,098	9,471	20,686	0	2	0	4	6
" 11.— " 12, 1911	6	1,764	491	35	790	3,080	48	0	0	29	77
Total	168	47,539	9,814	93,956	35,910	187,219	113	384	10	659	1,166

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907 to 1911 Inclusive.

Traffic Club of New York.

At the meeting of the Traffic Club of New York, held April 25, Frederick Monsen gave an interesting illustrated lecture on

The Panama Canal and Its Makers. Besides a number of well-chosen pictures of various phases of the work there were some highly interesting moving pictures showing work underway, for instance there was a picture of "a slide taken from a slide while it slid."

Total February Earnings and Expenses.

Logan G. McPherson, director of the Bureau of Railway Economics, in Bulletin No. 12, giving a summary of revenues and expenses of steam roads in the United States for February, 1911, says:

For the month of February, 1911, total operating revenues decreased from the same month of 1910 about $3,500,000, which was equivalent to $29 per mile, or 3.2 per cent. This decrease was entirely in freight revenue, and was in part offset by an increase of nearly $13 per mile in passenger and miscellaneous revenue. Operating expenses were almost stationary as compared with a year ago, the increase amounting to only 0.8 per cent. There was an increase of 2 per cent. in maintenance of equipment and 2.1 per cent. in transportation expense, but these increases were offset by a decrease of 5.8 per cent. in maintenance of way. The operating ratio was 74.7 per cent., as compared with 74.9 per cent. in January, 1911, and 71.7 per cent. in February, 1910.

Net operating revenue showed a decrease of $34 per mile, or 13.6 per cent. It is clear that this decrease was due to a decline in revenues rather than an increase in expenses.

Net revenue per mile per day was $7.68, as compared with $7.51 in January. November, 1910, showed a daily average per mile of $11.91, and December of $9.96. There was an increase in taxes of 2.2 per cent., and operating income, which is net revenue with taxes and outside operations included, consequently showed a decline of $35 per mile, or 16.6 per cent.

Increase in total operating revenue was confined to the southern group of roads. This increase was found in both freight and passenger revenue. In the eastern and western groups, the decrease in freight revenue was large enough to more than offset increases in passenger revenue. In operating expenses the South showed an increase of 8.2 per cent., which was generally distributed through the different accounts. In the East the increase was 2.8 per cent., which was a resultant of increases in transportation and general expenses and decreases in the other accounts. The West, as in the previous month, showed a decline in operating expenses amounting to 2.9 per cent. There was a decrease of 13.9 per cent. in maintenance of way, and, of still more significance, a decline of 2.8 per cent. in transportation expense. The variations in this last account correspond more closely with those of gross revenue than do the variations in any of the others. This is the first instance of a decrease in transportation expense in any of the three groups since these bulletins began to be issued in July, 1910, although a statement was erroneously made in the January bulletin to the effect that there had been such a decrease in the western group. The operating ratio increased in all three groups, the greatest increase being in the eastern group, where it rose from 73.1 per cent. in 1910 to 77.7 per cent. in 1911. The South alone shows any increase in net revenue, and in that group the per cent. of increase is only 1:6. The East shows a decline of nearly 20 per cent., and the West of 12 per cent. Operating income shows corresponding results, a decrease of 25 per cent. in the East, and nearly 14 per cent. in the West, and again in the South of only 0.2 per cent.

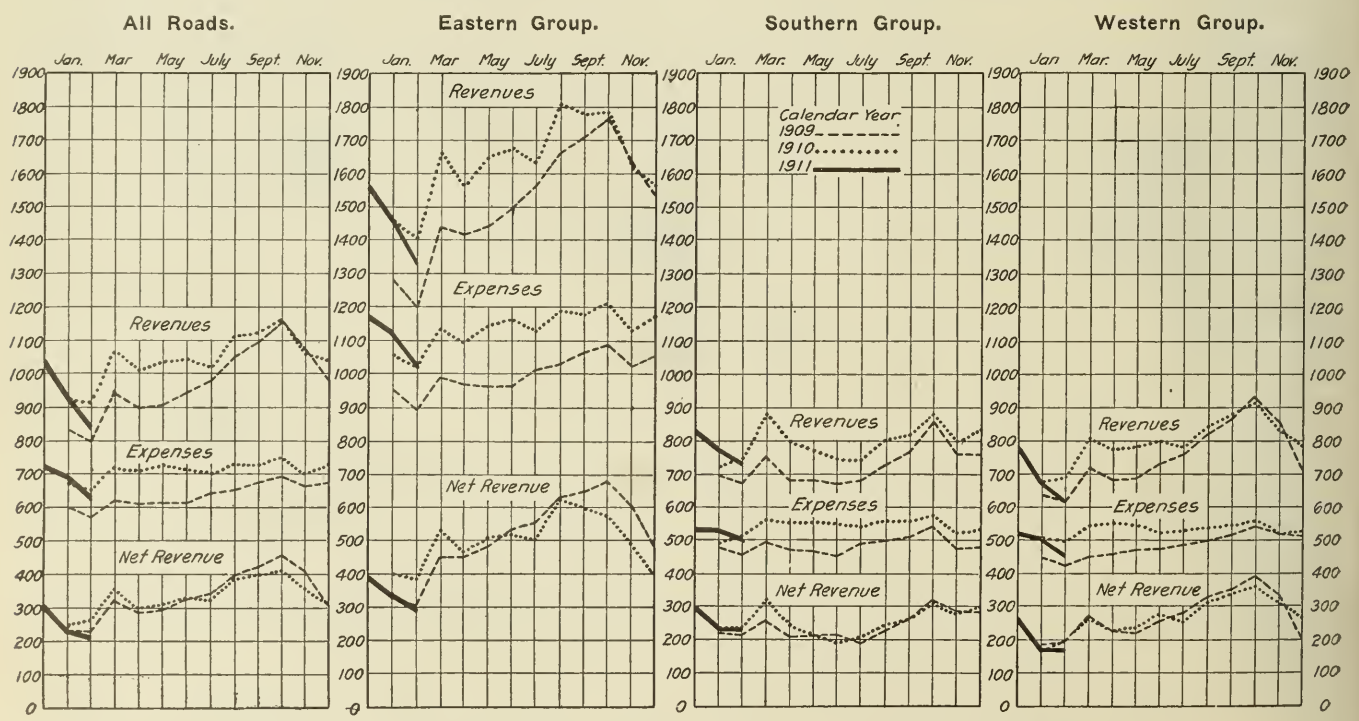
For the eight months of the fiscal year 1911, there is an increase of operating revenues per mile for all roads of 1.8 per cent. over the corresponding period of 1910. However, expenses increased 6.6 per cent., with the result that net revenue shows a decrease of 7.3 per cent. This decrease runs as high as 13 per cent. in the eastern group. In the southern group there is a slight increase, amounting to 1.1 per cent.

The calendar year to date makes an even more unfavorable showing than do the eight months of the fiscal year, because in addition to increasing expenses, there is the fact of declining revenues. Operating revenues for these two months for all roads declined 1.4 per cent., all the decrease being in freight revenue. Expenses increased 2.1 per cent., with the result that net revenue shows a decrease of 10.3 per cent., and operating income of 12.8 per cent. As has been the case during the eight months of the fiscal year, the heaviest decline in net revenue is found in the eastern group. The South alone shows any increase, and this is the result of increasing revenues rather than decreasing expenses.

The accompanying chart shows the variation in revenues and expenses in the separate months:

Ratio of Expenses to Total Operating Revenue.

	Feb., 1911.	Feb., 1910.	Fiscal year ended June 30, 1910.
Percentage of Total Operating Revenue—			
Maintenance of Way and Structures..	11.7	12.0	13.4
Maintenance of Equipment.....	17.4	16.5	15.0
Traffic Expenses	2.4	2.3	2.0
Transportation Expenses	40.3	38.2	33.4
General Expenses	3.0	2.7	2.5
Total Operating Expenses.....	74.7	71.7	66.3



Earnings and Expenses of all Railways Showing a Three-Year Comparison.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1911. (SEE ALSO ISSUES APRIL 14 AND 21.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$261,663	$81,472	$378,377	$56,991	$76,635	$11,101	$115,851	$9,593	$270,171	$108,206	—$808	$13,241	$94,157	$1,830
Ann Arbor	301	104,859	28,541	142,570	11,808	20,600	3,771	52,651	6,773	95,603	46,967	—3,180	14,265	29,522	18,664
Atlanta, Birmingham & Atlantic	662	192,291	40,238	246,576	32,289	37,091	15,476	89,635	11,499	185,990	60,586	.....	10,500	50,086	21,524
Bangor & Aroostook	627*	235,804	33,553	281,501	49,186	29,845	2,730	95,004	9,907	186,672	94,829	.....	2,525	92,304	—20,190
Central Vermont	411	182,970	56,675	259,797	32,225	43,479	5,661	182,768	7,392	271,525	—11,728	234	11,750	—23,244	45,300
Charleston & Western Carolina	341	162,756	23,142	193,336	30,939	14,848	2,971	62,152	3,805	114,715	78,621	.....	4,475	74,146	26,337
Chicago, Indiana & Southern	329	272,191	18,925	299,832	35,176	65,297	6,972	118,567	8,320	234,333	65,499	—2,615	13,900	48,984	—79,901
Chicago, Rock Island & Gulf	471†	150,043	51,538	217,102	24,388	25,910	8,719	79,327	7,833	146,177	70,925	—62	9,501	61,362	26,138
Cincinnati, New Orleans & Texas Pacific	337	577,907	145,384	759,004	56,146	183,390	20,220	222,063	17,790	499,609	259,395	—6,259	21,800	231,336	—35,021
Detroit, Toledo & Ironton	441	93,023	10,048	110,129	24,770	6,497	2,477	70,392	4,974	109,110	1,019	.....	6,712	—5,693	346
Duluth, South Shore & Atlantic	611	126,921	51,875	190,805	34,959	29,083	10,653	93,419	6,227	174,341	16,464	—937	18,000	—2,473	—38,547
Evansville & Terre Haute	310	111,732	54,425	185,787	21,116	19,675	5,543	67,258	6,025	119,617	66,170	—613	9,410	56,147	20,348
Fort Worth & Denver City	454	203,839	100,170	324,234	35,632	77,212	5,966	122,326	15,163	256,299	67,935	—991	10,522	56,422	—76,940
Georgia	307	194,067	60,366	271,683	35,469	39,493	10,230	120,716	7,638	213,546	58,137	.....	1,600	56,537	13,139
Grand Rapids & Indiana	587	258,091	90,735	380,302	51,952	76,681	10,187	185,989	14,482	339,291	41,011	48	23,351	17,708	—14,448
Hocking Valley	350	340,496	57,739	418,980	48,248	86,457	7,981	154,795	18,543	316,024	102,956	.....	24,300	78,656	—108,065
Houston & Texas Central	789	318,386	108,896	464,355	84,339	58,898	19,597	237,419	20,392	420,644	43,711	—1,702	17,842	24,167	—8,252
Long Island	395	193,417	339,067	561,353	100,592	106,619	12,651	384,022	19,096	622,980	—61,627	16,104	53,333	—98,856	68,111
Morgan's La. & Texas R. R. & S. S. Co.	404‡	218,447	110,486	349,935	69,243	42,401	12,669	140,439	15,216	279,968	69,967	—728	18,756	50,483	—39,481
New Orleans, Mobile & Chicago	404	120,519	24,752	152,847	22,723	9,006	2,750	47,401	8,577	90,457	62,390	.....	3,910	58,480	9,028
Norfolk Southern	608	164,414	48,345	228,622	24,718	23,982	4,798	75,480	13,650	142,628	85,994	—76	5,900	80,017	—
Northern Central	469	675,548	151,099	881,427	167,148	201,818	14,210	469,922	24,805	877,903	3,524	259	36,740	—32,957	—108,946
Northwestern Pacific	376	78,762	96,952	194,349	42,051	37,062	2,894	101,469	9,247	192,723	1,626	.....	10,700	—9,074	—20,473
Peoria & Eastern	351	185,338	47,919	252,549	34,901	52,061	5,627	124,599	6,504	223,692	28,857	.....	9,500	19,357	—24,811
Pittsburgh & Lake Erie	191	878,571	102,935	1,017,173	120,904	117,613	15,246	274,648	24,515	552,926	464,247	—563	30,000	433,684	—169,591
Rutland	468	128,782	65,367	218,900	26,044	48,609	8,341	111,483	8,447	202,924	15,977	.....	9,878	6,098	—25,122
St. Louis, Brownsville & Mexico	501§	84,332	59,485	155,873	35,301	10,037	2,440	62,552	8,234	118,564	37,309	.....	4,500	32,809	6,611
San Antonio & Aransas Pass	727	192,630	77,011	289,747	76,283	37,966	5,428	123,368	11,577	254,622	35,125	.....	11,000	24,125	—7,499
Santa Fe, Prescott & Phoenix	364¶	88,932	33,285	130,182	23,759	7,833	3,260	39,129	5,554	79,535	50,647	.....	103	50,544	—3,951
Spokane, Portland & Seattle	433	213,339	72,038	305,431	20,862	36,287	5,120	72,640	8,971	143,880	161,551	—619	38,000	122,932	89,396
Texas & New Orleans	458	223,069	86,943	328,413	56,022	46,722	7,885	131,973	9,223	251,825	76,588	919	12,257	65,250	14,678
Toledo & Ohio Central	444	228,061	44,644	284,138	55,594	46,438	5,806	128,427	6,861	243,126	41,012	105	20,344	20,773	—47,653
Toledo, St. Louis & Western	451	217,815	29,943	266,431	30,789	47,016	7,645	108,535	8,422	202,407	64,024	.....	14,550	49,474	2,101
Virginian	474‖	226,072	16,605	250,636	32,073	55,404	4,992	75,488	7,719	175,676	74,960	5,201	17,600	62,561	23,644
West Jersey & Seashore	353	113,035	183,121	317,134	74,071	48,380	8,996	182,964	10,028	324,439	—7,305	—2,084	23,228	—32,617	2,607
Wheeling & Lake Erie	457	380,163	38,298	447,228	38,330	101,425	6,904	176,535	13,126	336,320	110,908	4,758	19,472	96,194	—31,096
EIGHT MONTHS OF FISCAL YEAR 1911.															
Alabama Great Southern	309	$2,063,481	$771,616	$3,090,641	$383,406	$689,366	$83,281	$930,882	$73,488	$2,160,423	$930,218	—$6,025	$109,076	$815,117	$74,090
Ann Arbor	301	894,361	339,193	1,316,269	164,612	159,096	31,570	447,041	58,274	860,593	455,676	978	111,731	344,923	53,828
Atlanta, Birmingham & Atlantic	662	1,371,982	419,450	1,907,427	230,457	297,061	118,779	694,686	73,659	1,414,642	492,785	.....	59,146	403,639	80,816
Bangor & Aroostook	627*	1,500,857	441,100	2,058,261	352,402	244,869	26,797	646,610	85,325	1,356,003	702,258	.....	18,149	684,109	—58,735
Central Vermont	411	1,671,568	738,471	2,605,621	321,862	394,561	56,491	1,200,657	60,809	2,034,380	571,241	4,594	86,366	489,469	—25,973
Charleston & Western Carolina	341	983,512	250,051	1,289,981	230,479	150,057	25,023	429,719	30,606	865,884	424,097	.....	35,800	388,297	128,377
Chicago, Indiana & Southern	329	2,160,027	196,943	2,424,384	338,526	476,365	71,267	955,365	71,432	1,912,955	511,429	—1,197	108,493	401,739	—249,704
Chicago, Rock Island & Gulf	471†	1,407,325	486,903	2,022,079	301,553	153,671	73,205	720,520	65,669	1,314,618	707,461	—2,298	48,675	656,488	—5,555
Cincinnati, New Orleans & Texas Pacific	337	4,881,578	1,167,878	6,355,454	636,603	1,222,966	165,658	1,776,972	142,521	3,944,720	2,410,734	—14,527	173,416	2,222,791	163,689
Detroit, Toledo & Ironton	441	1,078,993	115,324	1,296,083	259,143	199,956	22,348	691,438	45,108	1,217,993	78,090	—73	53,696	24,321	2,011
Duluth, South Shore & Atlantic	611	1,349,261	664,298	2,126,261	299,091	235,811	79,899	812,966	56,645	1,484,412	641,849	6,971	141,871	506,949	—18,176
Evansville & Terre Haute	310	1,158,201	495,232	1,824,021	225,240	248,969	44,433	591,645	51,232	1,161,519	662,502	—6,044	75,280	581,178	25,141
Fort Worth & Denver City	454	2,408,755	1,169,960	3,742,547	359,654	596,400	48,338	1,163,243	117,884	2,285,519	1,457,028	—10,716	81,044	1,365,268	—114,253
Georgia	307	1,468,613	614,678	2,217,801	286,029	334,334	84,167	879,649	58,078	1,642,257	575,544	.....	16,313	559,231	4,266
Grand Rapids & Indiana	587	2,054,100	1,194,210	3,501,750	454,114	574,987	98,789	1,554,016	118,340	2,800,246	701,504	—219	192,831	508,454	—228,763
Hocking Valley	350	4,169,718	609,718	5,088,386	645,830	814,926	70,428	1,617,105	135,224	3,283,513	1,804,873	.....	228,265	1,576,608	—257,187
Houston & Texas Central	789	3,096,086	1,153,165	4,534,298	618,193	527,803	147,759	1,774,438	170,819	3,239,012	1,295,286	—3,559	147,319	1,144,408	2,790
Long Island	395	2,009,271	4,334,760	6,663,536	767,658	947,441	139,220	3,190,649	178,848	5,223,816	1,439,720	494,464	368,088	1,566,096	—460,840
Morgan's La. & Texas R. R. & S. S. Co.	404‡	2,522,786	817,101	3,546,310	473,944	401,231	89,535	1,210,678	109,188	2,284,576	1,261,734	—12,937	156,745	1,092,052	—12,017
New Orleans, Mobile & Chicago	404	925,505	230,521	1,236,307	170,156	98,454	22,701	364,205	64,680	720,196	516,111	.....	34,742	481,369	92,368
Norfolk Southern	608	1,229,826	520,897	1,886,934	210,222	226,322	38,953	588,390	110,028	1,173,915	713,019	3,778	48,000	668,797	—
Northern Central	469	6,513,659	1,557,254	8,576,458	1,509,739	1,647,052	135,807	4,041,122	199,162	7,532,882	1,043,576	5,007	260,872	787,711	—928,053
Northwestern Pacific	376	962,342	1,138,512	2,270,847	399,684	326,761	22,786	848,151	73,636	1,671,019	599,828	.....	84,600	515,228	—41,381
Pecria & Eastern	351	1,832,781	495,255	2,502,987	321,087	410,883	48,455	1,044,136	46,373	1,870,934	632,053	.....	76,878	555,175	—85,996
Pittsburgh & Lake Erie	191	9,385,811	1,091,686	10,800,947	1,315,202	1,044,000	115,944	2,593,223	189,871	5,258,240	5,542,707	—2,992	216,576	5,323,139	—1,402,996
Rutland	468	1,249,103	794,436	2,311,233	309,617	354,854	57,993	894,886	56,837	1,674,187	637,046	.....	84,941	552,105	—32,914
St. Louis, Brownsville & Mexico	501§	749,319	397,691	1,239,169	350,681	100,589	18,500	448,467	63,326	981,563	257,606	.....	38,500	219,106	19,369
San Antonio & Aransas Pass	727	2,066,775	768,029	3,000,000	543,527	380,523	40,059	1,049,980	79,639	2,093,728	906,272	.....	78,000	828,272	27,762
Santa Fe, Prescott & Phoenix	364¶	759,965	287,969	1,118,390	197,375	102,004	22,500	352,172	45,262	719,313	399,077	.....	844	398,233	—28,291
Spokane, Portland & Seattle	433	2,148,418	668,140	2,972,747	344,016	202,960	32,373	793,942	76,702	1,449,992	1,522,755	—7,608	260,600	1,254,547	757,999
Texas & New Orleans	458	1,765,956	723,518	2,643,971	467,610	451,301	57,710	1,047,524	76,601	2,100,746	543,225	4,170	98,511	448,884	—152,485
Toledo & Ohio Central	444	2,911,406	460,470	3,547,317	480,062	477,578	52,907	1,192,315	61,552	2,264,414	1,282,903	—369	150,502	1,132,032	150,935
Toledo, St. Louis & Western	451	2,059,998	321,745	2,539,293	333,095	367,864	68,796	893,649	75,245	1,738,649	800,644	.....	113,150	687,494	—128,538
Virginian	474‖	2,099,505	175,843	2,341,503	266,274	384,521	41,124	643,718	60,781	1,396,418	945,085	38,548	114,156	869,477	614,105
West Jersey & Seashore	353	1,211,041	2,715,928	4,191,242	656,718	517,887	128,999	1,744,436	85,478	3,133,518	1,057,724	—45,283	183,093	829,348	27,624
Wheeling & Lake Erie	457	3,862,926	426,574	4,595,783	505,417	910,811	66,663	1,644,318	109,761	3,236,970	1,358,813	25,435	165,958	1,218,290	—80,636

Mileage operated on February 28, 1910—* 546 miles; † 530 miles; ‡ 348 miles; § 456 miles; ¶ 257 miles; ‖ 444 miles; — indicates deficits, losses and decreases.

President Finley to the Farmers of the South.

The consumption of meat products in the United States is constantly increasing and there is a steady demand for American meats in foreign markets.

The maximum number of cattle, other than milch cows, in the United States, was 51,566,000 on January 1, 1907. On January 1, 1910, the latest year for which figures have been published, the number was 47,279,000, a decrease of 4,287,000 or 8.3 per cent. in three years. The maximum number of hogs reported was 56,982,000, on January 1, 1901. On January 1, 1910, the number was 47,782,000, a decrease of 9,200,000, or 16.1 per cent. The maximum number of sheep reported was 63,965,000, on January 1, 1903. On January 1, 1910, the number was 57,216,000, a decrease of 6,749,000, or 10.5 per cent.

The decrease in the number of cattle has been in large measure due to the cutting up of the great western ranges into farms. These great ranges are now becoming a thing of the past, and the meat supply of the United States, both for home consumption and for export, must, to an increasing extent, be produced on the farms. A publication recently issued by the United States agricultural department on beef production in Alabama serves to emphasize the advantages of the South as a live stock region, for results equally as favorable as those in Alabama are being obtained in other States throughout the South, and much that the report says as to the growing of beef applies with equal force to other live stock. This report sums up the reasons why the farmers of the South should engage more extensively in the growing of beef cattle substantially as follows:

The South, under the system of farming heretofore prevailing, has thousands of acres of land, and good land, too, which are not being used at all. Statistics show that only about 40 per cent. of the tillable or arable land of the South is being used. Sixty per cent. of the land is lying idle and returns no income to the owner. The farms are large, and, principally because of the lack of sufficient labor, many acres are not being used. At present there is no better way to put the whole farm to work than by introducing beef cattle into the system. They require but a small amount of labor in addition to that employed in the other work of the farm. The report to which I have referred emphasizes the importance of cattle raising in connection with diversified farming and building up soil fertility. It says: "As the farmers learn the value of diversification in farming operations there will be an increased amount of roughage, such as corn fodder, cowpea and clover hays, and soy beans, which many times can be marketed more profitably through the beef animals than in any other way. The beef cattle serve as important machines for converting the surplus fodders into valuable barnyard manure, which gives to the growing crops not only the benefits of its fertilizing elements, but enhances the natural condition of the soil by the addition of that important compound—humus."

The department has conducted some careful experiments to determine the value of barnyard manure. In these experiments it was demonstrated that the average increase in crop yields obtained by the use of barnyard manure alone gave it a value of $3.35 per ton, and that barnyard manure combined with commercial fertilizers had a value of $4.88.

On a plantation where corn and cotton were grown an experiment was conducted which would seem to be of interest to farmers throughout the cotton belt. On part of the land on this plantation devoted to corn, peas were grown in the corn. After the corn had been gathered the peas and the stalks were grazed by steers, which were fed some cotton seed in addition to the grazing. The next season cotton was grown on part of this land and corn on part of it. As a result of the crop of peas and the grazing, the yield of cotton per acre was 626.5 pounds of seed cotton greater on an area where corn alone had been grown. On the part devoted to corn the increased production was 14 bushels per acre. . . .

Southern farmers are favorably located with reference to markets for live stock. With the growth of commercial and industrial communities throughout the southern states, the home demand is constantly increasing. I may illustrate this by quoting United States Agricultural Department statistics showing that during the year 1907 more than 15,000 home-raised animals, including beef cattle, veal, hogs, sheep, and kids, were slaughtered in one of our large southern cities, while 36,097 live western animals were shipped into the same city and slaughtered. In addition to this total of more than 51,000 live animals there were also shipped into the city large amounts of fresh and cured meats. . . .

Taking all of the advantages of the South into consideration, I do not believe that any other section of the United States is better suited for the profitable growing of live stock as a feature of diversified farming and as a means not only of obtaining profit directly from the sale of live animals and meat products, but also as a means of utilizing lands which are now lying idle, and of increasing the production of cotton and other farm products of the South by building up soil fertility.

INTERSTATE COMMERCE COMMISSION.

The commission, by an order issued April 19, has suspended until August 15, tariffs presented by the Missouri Pacific showing increased freight charges on cotton.

Complaint Dismissed.

Furnace Run Saw Mill & Lumber Co. v. Boston & Maine et al. Opinion by the Commission:

Defendant's rate on spruce lath and lumber from Boston to Toledo not found to be unjustly discriminatory or unreasonable. (20 I. C. C. 586.)

Rates on Horses Reduced.

Arizona Railway Commission v. Wells Fargo & Company. et al. Opinion by the commission:

Defendant's rates for the transportation of horses, in carloads, of $500 between El Paso, Texas, and Phoenix, Ariz.; $400 between Phoenix, Ariz., and Los Angeles, Cal.; and $575 between Phoenix, Ariz., and San Francisco, Cal., found unreasonable to the extent that they exceed, respectively, $300, $320 and $470, which rates are prescribed for the future. (20 I. C. C. 571.)

Rates on Fertilizer Reduced.

Meridian Fertilizer Factory v. Vicksburg, Shreveport & Pacific, et al. Opinion by the commission.

Rates on commercial fertilizer from Shreveport, La., to Hamburg, Ark., and Crossett reduced from 12½ and 13 cents per 100 lbs. to 11 cents. (20 I. C. C., 554.)

The Initial Carrier Held Responsible.

Platten Produce Co. v. Kalamazoo, Lake Shore & Chicago, et al. Opinion by Commissioner Prouty.

At the rehearing of this case it was shown that the initial carrier delivered a shipment of grapes to an intermediate carrier with a waybill specifically calling for a certain routing, and the initial carrier is therefore responsible for the misrouting, but complainant is not entitled to recover in this proceeding for the icing charges which it was compelled to pay. (20 I. C. C., 543.)

New Rates on Lumber Sanctioned.

In re investigation of proposed schedules of rates on lumber by the Vicksburg, Shreveport & Pacific. Opinion by Commissioner Meyer.

The Vicksburg, Shreveport & Pacific filed a new schedule of rates, effective September 19, 1910, and the commission suspended these rates until investigation could be made. The new rates do not appear to be such as to require the commission to further suspend the operation, and therefore they are sanctioned. (20 I. C. C., 575.)

Express Rate on Sample Brick Reduced.

Ohio Face Brick Manufacturers' Asso. v. Adams Express Co., et al. Opinion by the commission.

Express companies charge merchandise graduated rates for the transportation of sample brick. Brick manufacturers are almost wholly dependent on express companies for the transportation of their samples. They cannot ship them by mail because even one brick exceeds the weight limit; neither can they ship by freight, because in most instances time is an important factor. Grain samples and hop samples are given special rates, and owing to the nature of shipments of sample brick, this is a very desirable business for the express companies, and the rates are therefore reduced from the merchandise graduated charges to the merchandise pound rates. (20 I. C. C., 582.)

STATE COMMISSIONS.

The Railroad Commission of Louisiana has issued rate bulletin 1 A, containing authorities issued by the commission for changes in rates and new rates from July 1, 1910, to December 31. The authorities are classified according to commodities. The commission has also issued rate bulletin No. 2, containing telephone and telegraph rates authorized by the commission and in effect January 1, 1911.

The New York State Public Service Commission, Second district, has appointed William McClellan of New York as its consulting electrical engineer at a salary of $5,000 a year, to succeed Howard H. Crowell, resigned. Mr. McClellan has been engaged in the electrification of the New York Terminal of the Pennsylvania Railroad, the electrification of the Rochester branch of the Erie Railroad, and as consulting engineer on many other important enterprises.

COURT NEWS.

The Appellate division of the New York supreme court has reversed the decision of the lower courts in the case in which E. O. Goldan had been given judgment for $85,500 against the Delaware & Eastern and F. F. Searing and other directors. The court holds that bonds in the hands of a bona fide holder are not void because they have not been approved by the New York Public Service Commission. A bond salesman, Enthoven, accepted as his commission $85,500 bonds of the Delaware & Eastern, and made an assignment of these bonds to Goldan. The bonds not having been approved by the New York Public Service Commission, Goldan sued the railway company and its directors on the ground that the bonds were void. The court sustains the demurrer of the defendant.

Judge Charles Wolverton of the federal court at Portland, Ore., has rendered a decision by which, if finally sustained, over 2,000,000 acres of land, valued at between $50,000,000 and $75,000,000, and held by the Southern Pacific in central Oregon will, it is said, revert to the government. While the original grant of the land to the Oregon Central in 1866 made no specific requirements as to how the land should be sold, the court held that in granting this land as an aid to railway construction, Congress intended that it should be sold by the railway to bona fide settlers in tracts not greater than 160 acres and at the rate of $2.50 an acre, basing its findings on the terms of a grant made in 1868. As the Southern Pacific, which did not obtain control of the line until several year later, did not take advantage of additional rights secured in the grant of 1868, it traced its title to the original act, which made no specifications as to how the land should be sold. Settlers who occupied the land before the suits of the government were begun gain no advantage by this decision.

Indictments have been brought against D. R. Hanna, Robert L. Ireland of the M. A. Hanna Co., and D. T. McCabe, fourth vice-president of the Pennsylvania Company, and seventeen indictments against the Lake Shore & Michigan Southern, the Pennsylvania, Bessemer & Lake Erie, and New York, Chicago & St. Louis by the Federal Grand Jury, which has been investigating charges of rebating on ore shippers in Cleveland. The three individuals are charged in the indictments with conspiring to violate the Elkins law. A maximum penalty of two years in the penitentiary and a $10,000 fine is provided. D. R. Hanna and D. T. McCabe are indicted on the charge of signing a contract under which the Hanna company is alleged to have promised to rebate to individual shippers the profits of the Ohio & Western Pennsylvania Dock Company, which is also indicted. The dock company was organized by M. A. Hanna & Co., and the docks themselves were leased by the Pennsylvania company to the Hanna interests. One exhibit alone shows the alleged payment of $50,112 as part of the earnings of the dock company to the Carnegie Steel Company. Evidence produced before the Grand Jury is said to show that the railways own the dock companies and lease the docks to operating companies under different names. Testimony was introduced to show that railways arrange for the dock companies to unload vessels and load cars and vice versa, and out of the amounts the railways have paid the dock companies the dock companies have rebated to the shippers sums reaching into the hundreds of thousands of dollars.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. L. Dickeson, special inspector of transportation of the Chicago, Burlington & Quincy at Chicago, has been elected vice-president of the White Pass & Yukon Route, the Pacific & Arctic Railway and Navigation Company, the British Columbia Yukon Railway, the British Yukon Railway and the British Yukon Navigation Company, with office at Vancouver, B. C. Mr. Dickeson was born September 18, 1877, near Ottumwa, Iowa, and received his early education in the public schools of Ottumwa. When he was 15 years old he went to Chicago and took a business course under a private tutor, after which he became a clerk for a commercial concern. He began railway work as a stenographer in the transportation department of the Chicago, Burlington & Quincy in January, 1899, and two years later became chief clerk in the same department. He was appointed superintendent of freight and passenger transportation of the lines west of the Missouri river, with office at Omaha, Neb., in 1905, and in December, 1908, was appointed inspector of transportation, with office at Chicago, reporting direct to Vice-President Daniel Willard. Since January, 1910, when Mr. Willard became president of the Baltimore & Ohio, Mr. Dickeson has reported direct to the president of the Burlington.



O. L. Dickeson.

Frank B. Bowes, general traffic manager of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern, has been elected vice-president in charge of all traffic, with office at Chicago, Ill. Mr. Bowes was born January 29, 1862, at Chicago. His entire railway career has been with the Illinois Central, where he began as office boy in the general auditor's office on July 1, 1876. A little later he was transferred to the general freight office as clerk, and from 1880 to May 1, 1886, was secretary to the general passenger agent. He was then made general northern passenger agent at Chicago, and in 1894 was transferred to New Orleans as assistant general passenger agent, where he remained until May 1, 1895, when he was appointed general freight agent of the southern lines of the Illinois Central and the Yazoo & Mississippi Valley. He was made assistant traffic manager of both roads, with headquarters at Chicago on January 1, 1903, and on July 1, 1905, was promoted to freight traffic manager. On September 21, 1909, he was chosen general traffic manager of the entire system, which title he retained until his



Frank B. Bowes.

new appointment as above. Mr. Bowes is the first vice-president of the Illinois Central to have jurisdiction solely over traffic matters.

Frank W. Morse, general manager of the Chicago & Alton and Toledo, St. Louis & Western, at Chicago, has been elected vice-president and general manager, with office at Chicago, succeeding George H. Ross, resigned on account of ill health.

F. A. Deverell, auditor of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed general auditor, in charge of the accounting department, with office at Cincinnati. J. L. Cramer, vice-president and comptroller, with office at Cincinnati, having resigned, that office has been abolished.

Alexander Robertson, vice-president and general manager of the Western Maryland, at Baltimore, Md., has been elected president, succeeding B. F. Bush, who becomes president of the Missouri Pacific and the St. Louis, Iron Mountain & Southern. Mr. Robertson was born at Albany, N. Y., in 1860, and began railway work with the Fitchburg Railroad, now a part of the Boston & Maine, in 1885, serving as brakeman, conductor, general yardmaster, station master and trainmaster respectively until 1897, when he was appointed general yardmaster of the Wabash Railroad at Decatur, Ill., the following year he was promoted to trainmaster, and in September, 1899, was appointed superintendent at Decatur. In August, 1903, he was called East by the Goulds to take charge, as manager, of the operations of the Western Maryland and West Virginia Central & Pittsburg, which were then disconnected properties. He only remained in Baltimore about five months, when he was selected by the Terminal Railroad of St. Louis to operate that property as general manager, which position he held until November 1, 1905, when he was appointed general manager of the unified Western Maryland, with jurisdiction over all departments. In March, 1907, he was elected vice-president of the same road, which position he has held up to the present time.



A. Robertson.

Operating Officers.

Harry Gallwey has been appointed general manager of the Butte, Anaconda & Pacific, with office at Butte, Mont. M. F. Kolbe has been appointed superintendent, with office at Anaconda, Mont.

A. P. Spencer, general agent of the Chicago, Rock Island & Pacific at Amarillo, Texas, has been appointed assistant general manager of the Crosbyton-Southplains Railroad, with office at Crosbyton, Texas.

John A. Bower, chief clerk in the office of Superintendent W. H. Anderson of the Louisville & Nashville, has been appointed assistant superintendent of the Kentucky Central division, with office at Paris, Ky.

F. R. Mullen, trainmaster of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed trainmaster, with office at McCook, Neb., succeeding A. G. Smart, promoted to superintendent of the Omaha division. R. E. Steele succeeds Mr. Mullen.

W. C. Brown, president of the New York Central & Hudson River, announces that J. H. Hustis, assistant general manager of the Boston & Albany, is to be appointed general manager of the Boston & Albany, with office at Boston, Mass., reporting direct to President Brown.

John A. Shepherd, superintendent of the Maryland division of the Western Maryland, at Hagerstown, Md., has been appointed general manager, with office at Baltimore, Md., succeeding as general manager A. Robertson, vice-president and general manager, who becomes president.

C. J. Phillips, whose appointment as superintendent of the Morris & Essex division of the Delaware, Lackawanna & Western, with office at Hoboken, N. J., has been announced in these columns, was born November 30, 1861, at Washington, Ill. He was educated in the public schools of his native town and at the Oskaloosa (Iowa) College, graduating in the class of 1879. The same year he began railway work as a brakeman on the Chicago, Rock Island & Pacific, since which time he has been consecutively, telegraph operator, agent, general agent and general live-stock agent. In 1890 he was appointed division freight agent, at Des Moines, Iowa, remaining in that position until 1900, when he went to the Delaware, Lackawanna & Western as superintendent of the Buffalo division, with office at Buffalo, N. Y., which position he held at the time of his recent appointment as superintendent of the Morris & Essex division of the same company.



C. J. Phillips.

Edward Dailey Levy, whose appointment as assistant general manager of the St. Louis & San Francisco, with office at Springfield, Mo., has been announced in these columns, was born October 16, 1879, at Paris, Texas. He was educated at the public schools of Paris and Dallas, and began railway work in February, 1898, as a stenographer in the office of the Santa Fe Refrigerator Despatch at Chicago. During the next six years he was consecutively stenographer or secretary in either the operating or mechanical departments of the following roads: Michigan Central at Detroit, Mich.; Chicago, Milwaukee & St. Paul at Chicago; Atchison, Topeka & Santa Fe, first at Chicago and then at Needles, Cal.; Fort Worth & Denver City at Fort Worth, Texas; Mexican Central at the City of Mexico; Kansas City Southern at Texarkana, Texas; Gulf, Colorado & Santa Fe at Galveston, Texas. He was then made senior clerk in the general manager's office with the latter road, and in May, 1904, was appointed chief clerk to the general superintendent. In August, 1906, he went with the St. Louis & San Francisco as assistant superintendent of car service at Springfield, and was promoted to superintendent of transportation in June, 1907, from which office he was recently promoted to assistant general manager as above.



E. D. Levy.

Theodore Ensel, superintendent of telegraph of the Pere Marquette at Detroit, Mich., has been appointed superintendent of the Grand Rapids district, with office at Grand Rapids, Mich.,

succeeding J. S. Pyeatt, resigned to accept service with the St. Louis & San Francisco. William M. Hayes succeeds Mr. Ensel. It was incorrectly stated in our issue of last week that Mr. Pyeatt had been superintendent at Detroit.

Donald L. Sommerville, who has been appointed assistant superintendent of the New York Central & Hudson River, with office at Jersey Shore, Pa., as has been announced in these columns, was born October 17, 1870, at Bellefonte, Pa. He was educated in the Pennsylvania State College, and began railway work in December, 1890, in the engineering department of the Beech Creek Railroad, which was a leased line of the New York Central, but was operated independently until May, 1899. He was appointed supervisor of bridges and buildings on the Pennsylvania division of the New York Central, in May, 1899, remaining in that position until January, 1902. Mr. Sommerville was then appointed division engineer of the Rome, Watertown & Ogdensburg division, and was later transferred to the Pennsylvania division, and then to the Western division, which position he held at the time of his recent appointment as assistant superintendent.

Traffic Officers.

W. M. Kirkpatrick, general freight agent of the Canadian Pacific, at Toronto, Ont., has been transferred to Montreal, Que.

W. R. Sibley has been appointed agent of the Erie Despatch, with office at Columbus, Ohio, succeeding Theodore Davis, resigned.

E. P. Swan has been appointed general agent, freight department, of the Chicago, Burlington & Quincy, with office at Detroit, Mich.

D. A. O'Brien has been appointed a traveling freight agent of the Trinity & Brazos Valley, with office at Kingsville, Texas, a new office.

Frank L. Salisbury has been appointed a contracting agent of the Louisville & Nashville, with office at Knoxville, Tenn., succeeding R. S. Cooley, resigned.

Warren J. Lynch, passenger traffic manager of the New York Central Lines west of Buffalo, N. Y., has resigned to go to the American Steel Foundries Co., effective May 1.

John L. Sullivan, traveling freight agent of the Chicago Great Western at Des Moines, Iowa, has been appointed assistant general freight agent of the Fort Dodge, Des Moines & Southern, with office at Chicago.

W. M. Hardin, commercial agent of the Iowa Central and the Minneapolis & St. Louis at Kansas City, Mo., has been appointed commercial agent, with office at St. Louis, Mo., succeeding Raymond Kelly, resigned to engage in other business.

T. P. Hinchcliff, soliciting freight agent of the Chicago, Burlington & Quincy at Cleveland, Ohio, has been appointed a traveling freight agent, with office at Cleveland, succeeding W. S. Dewey, transferred. J. B. Sanford succeeds Mr. Hinchcliff.

T. J. Kizer, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, at Terre Haute, Ind., has been appointed a soliciting freight agent, with office at Indianapolis, Ind., succeeding L. J. Blaker, resigned. W. W. Baum succeeds Mr. Kizer.

N. G. Spangler, division freight agent of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed also division freight agent of the Cincinnati, Hamilton & Dayton, with office at Chillicothe, and the office of division freight agent of the latter road at Toledo, Ohio, has been abolished.

E. M. Burns, traveling freight agent of the Chicago Great Western at Tacoma, Wash., has been appointed general agent of the freight department, with office at Portland, Ore., succeeding G. A. Cooper, resigned to engage in other business. A. C. Keyes, contracting freight agent at Portland, succeeds Mr. Burns.

Engineering and Rolling Stock Officers.

H. A. Hatch has been appointed a division engineer of the Atchison, Topeka & Santa Fe, with office at Chanute, Kan., succeeding M. N. Wells.

Carl Stradley, locating engineer of the Oregon Short Line, has been appointed chief engineer, with office at Salt Lake City, Utah, succeeding William Ashton, resigned.

E. E. Mullins, mechanical engineer of the Northern Railway Company (Costa Rica), has been appointed superintendent of motive power, with office at Limon, Costa Rica, succeeding W. H. Sample, resigned.

J. N. Mowery, who has been appointed master mechanic of the Western division of the New York, New Haven & Hartford, with office at Waterbury, Conn., as previously announced in these columns, began railway work as a special apprentice on the Chicago, Burlington & Quincy in July, 1899, remaining with that company until May, 1900. He then held various positions until his appointment as mechanical engineer of the Lehigh Valley on February 12, 1906. Mr. Mowery remained in this position until November, 1909, when he was appointed assistant master mechanic of the same company, and was promoted to master mechanic of the Auburn division in June, 1910, which position he held until his recent appointment as master mechanic of the New York, New Haven & Hartford.

OBITUARY.

S. A. Kendig, colonization agent of the Gulf, Colorado & Sante Fe, with office at Galveston, Tex., died at Temple, Tex., on April 19.

W. H. Bush, commercial agent of the Pacific Coast Steamship Company, with office at Nome, Alaska, died at his home in Seattle, Wash., on April 16. Mr. Bush was a brother of B. F. Bush, recently elected president of the Missouri Pacific.

John Dennis Keiley, electrical engineer of the New York Central & Hudson River, died of pneumonia at his home, 58 Arthur street, Yonkers, N. Y., on April 21. The engineering profession thereby lost one of its most resourceful leaders, who has left an enviable record in the pioneer field of railway electrification. Mr. Keiley was the son of Major J. D. Keiley, a director of the Brooklyn Rapid Transit. He was born in Brooklyn, February 6, 1871, and educated in the Christian Brothers' School of that city, St. Francis Xavier College, and John Hopkins University, where he took a four years' scientific course, specializing in electrical engineering. Upon finishing this course, in 1893, he undertook some civil engineering work in South Carolina. In 1897 Mr. Keiley entered the service of the Brooklyn Rapid Transit in connection with the reconstruction of the Brighton Beach Railroad, and after a few months he was made assistant engineer. His natural work, however, was in the electrical field. When train movement tests were inaugurated by the Brooklyn Heights Railroad he invented an instrument to record automatically the movement of the trains and simultaneously the readings of electrical instruments. This device was called the Keileyograph. Mr. Keiley's excellent record led to his appointment as assistant master mechanic, in which capacity he acted as technical advisor to the vice-president of the Brooklyn Rapid Transit, a position which he retained until 1903. When the electric traction commission of the New York Central was organized, Mr. Keiley was appointed assistant electrical engineer. He entered upon this work February 1, 1903, and immediately began to help solve the problems which attended the first great trunk line electrification. He brought to this work enthusiasm, a broad experience and a clear, logical mind, which was the inspiration of all with whom he was associated. His familiarity with civil, mechanical and electrical engineering, in addition to his high mathematical talent, were of the greatest assistance to the commission, and in recognition of his services he was appointed electrical engineer in 1906. The dominant characteristic of Mr. Keiley's work was intellectuality. Dispassionate logic settled every problem that confronted him. Nothing was ever slighted, nothing ever decided by prejudice. Among Mr. Keiley's other inventions are a self-ventilated armature and a hand brake system for street cars. He also developed many of the practical details of the New York Central type of under-contact third rail. His most valuable contribution to the art of electric railroading was the circuit breaker house system of third rail connection which has been the means of saving vast sums in feeder copper. In 1907 Mr. Keiley, collaborating with Prof. S. W. Ashe, brought out a book entitled "Electric Railways," which is largely used in technical colleges. Mr. Keiley was a member of the Engineers', Transportation, and New York Railroad Clubs.

Railway Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe Coast Lines.—A contract is said to have been given to George West, San Bernardino, Cal., for reconstructing the roadbed between Fresno and Merced, which are 58 miles apart.

Atlantic, Waycross & Northern.—An officer writes that this company's plans call for a line from St. Marys, Ga., on the Atlantic seacoast, northwest via Waycross, Nicholls, Broxton and Abbeville to either Perry or Ft. Valley, thence to Atlanta, about 220 miles. The company now operates a 11-mile line from St. Marys to Kingsland. It is expected that contracts for the new work will be let in two or three months. The work will be comparatively light earth work, and there will be one trestle over Satilla river. Maximum grades will be 1.5 per cent. The line is being built to carry fertilizer, cotton, fruit, lumber, turpentine, rosin and general merchandise. L. Johnson, president, St. Marys, and Dean G. Edwards, chief engineer, Waycross.

Canadian Northern.—This company is asking for bids May 12, it is said, to build the section through British Columbia between Hope and the crossing of the North Thompson river at Kamloops, 163 miles. The work will be let in four sections; it must be completed within two years, and will include tunnels aggregating 2¾ miles, the longest being 2,400 ft. It is expected that work along the Frazer river canyon will cost from $80,000 to $100,000 a mile. An officer is quoted as saying that the Canadian Northern proper now has about 4,000 miles of track laid, of which 600 miles is not yet in operation. In addition there are allied lines, disconnected links of the system amounting to about 2,000 miles, which will be absorbed by the Canadian Northern as soon as connected up, which will require the construction of some 1,700 miles more.

Central Vermont.—See Grand Trunk.

Chicago, Milwaukee & Puget Sound.—A contract is said to have been given to Bates & Rogers, contractors, of Chicago and Spokane, Wash., for building a tunnel in Spokane, to be used by the railway in entering the terminal building. The tunnel will cost about $600,000. Additional contracts for terminal work will be let within a few weeks.

Crosbyton & South Plains.—This company recently began operating the line from Lubbock, Texas, east to Crosbyton, 40 miles. It is understood that work will be carried out on the proposed extension from Crosbyton to Spur, 35 miles. John A. Knox, chief engineer, Lubbock. (December 16, p. 1167.)

Grand Trunk.—According to press reports the Central Vermont will at once begin work on 50 miles of new line in the Connecticut valley in Vermont, to connect the gap between Windsor, Vt., and Brattleboro. This new line will give the Grand Trunk—Central Vermont, a through route over its own tracks from Montreal, Que., to New London, Conn. (March 10, p. 478.)

The Rhode Island legislature having granted authority to the Southern New England Railway to change its charter to provide for proper entrance facilities to the state docks to be built at Providence, R. I., the Grand Trunk will build about 70 miles of new line from Palmer to Providence. (March 10, p. 478.)

Gulf, Texas & Western.—An officer writes that this company, which operates a line from Jacksboro, Tex., west to Seymour, 75 miles, is planning to build an extension from Jacksboro, east, also another extension from Seymour, west, but it is undecided to what points the extensions will be built. The plans have not yet been completed and it has not been determined when bids will be asked for the work.

Houston Bay Shore Traction.—Contracts have been given to the W. E. Ule Construction Company, it is said, to build an interurban line from Houston, Texas, east to La Porte and Sylvan Beach, about 25 miles. A. F. Irwin, Houston, is right-of-way agent for the company.

Lake Erie & Pittsburgh.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—An officer writes that no orders have been given to build an extension of the Lake Erie & Pittsburgh. The line is completed from Cleveland, Ohio, southeast to a junction with the Pennsylvania Railroad at Ravenna, but as yet no use is being made of the line. No work has been done between Cleveland and Lorain. The original plans called for building in the interests of the Lake Shore & Michigan Southern and the Pennsylvania Railroad, from Lorain, southeast to Youngstown, 91 miles, with a branch to Cleveland, 29 miles.

Missouri, Arkansas & Gulf.—According to press reports, all the right-of-way has been secured and contracts have been let for building this line. The projected route is from Rolla, Mo., south to Bakersfield, 125 miles. (April 21, p. 970.)

Nacogdoches & Southeastern.—An officer writes that this company, which operates a line from Nacogdoches, Texas, to Dockville, 13 miles, has recently finished work on an extension of six miles, but does not expect to begin operation over that section until about June 1. Regarding the reports that an extension is to be built to Chireno, Texas, the matter is still in an unsettled state, but a decision will probably be reached soon.

Nevada-California-Oregon.—According to press reports, the extension of this road from Alturas, Cal., north, will be built along the east side of Goose lake to Lakeview, Ore., this coming summer. Grading has been finished to within a few miles of Davis, Cal. (January 27, p. 183.)

Northern Pacific.—According to press reports, this company will extend the branch line from Mott, N. D., west to Miles City, Mont., this coming summer.

Ocilla Southern.—A contract has been given to R. S. Talmadge, it is said, for building an extension from Alapaha, Ga., south to Nashville, about 15 miles.

Oregon Short Line.—Work has begun on a connection of the main line of the Oregon Short Line, it is said, with the grade of the San Francisco, Idaho & Montana. The latter was projected about four years ago, as the Golden Gate, and was to run from Caldwell, Idaho, to Winnemucca, Nev., where connection was to be made with the Southern Pacific.

Pennsylvania Lines West.—The Cleveland & Pittsburgh division is securing property, it is said, in the central part of Columbiana county, Ohio. It is understood that the company proposes to build a low grade cut-off from Smiths Ferry, Pa., near the Ohio-Pennsylvania state line, through Columbiana county, to Kensington, Ohio.

Philadelphia & Western (Electric).—According to press reports, this company will build an extension from Villanova, Pa., to Norristown. A contract for the work has been given to the Stone & Webster Engineering Corporation, Boston, Mass. It is understood that the construction work will cost about $2,000,000.

Sacramento Valley West Side Electric.—Organized in California, with headquarters at Willows, Cal., to build from Woodland, north to Kennett, about 50 miles. C. L. Donohue and E. L. Sisson are interested.

San Francisco, Idaho & Montana.—See Oregon Short Line.

Southern New England.—See Grand Trunk.

Tidewater & Southern (Electric).—This company, which is now building from Stockton, Cal., southeast, to Modesto, about 30 miles, will extend the line southeast to Merced, about 25 miles. J. H. Wallace, president, Stockton.

Washington Roads.—The Washington Water Power Company has given a contract to Boynton, Church & McKoy, Spokane, Wash., it is said, to build from Springdale to Long Lake, 22 miles. It is expected that the line will be finished by September 1. (See Springdale & Long Lake, March 31, p. 814.)

The Buenos Aires & Pacific Railway has opened to public service the railway line from Buena Esperanza to Guadales, a distance of 160 miles.

Railway Financial News.

Albuquerque Eastern.—M. A. Otero has been appointed receiver of this company, which is controlled by the same interests that control the New Mexico Central.

Chesapeake & Ohio.—This company has sold to Kuhn, Loeb & Co., and the National City Bank, both of New York, $16,000,000 4½ per cent. notes. These notes are part of an authorized issue of $25,000,000 notes, which are secured by the deposit of bonds of the recently authorized issue of $125,000,000 5 per cent. 20-year bonds. It is understood that the bankers have resold the notes at 99½.

Eagles Mere Railroad.—G. W. Kipp has been appointed co-receiver of this property, which was recently placed in the hands of A. L. Geyelin as receiver. The company has outstanding $80,000 5 per cent. bonds and $20,000 4 per cent. bonds. A plan of reorganization has been formulated calling for the issue of $100,000 new 5 per cent. bonds and $40,000 stock.

Crosbyton & South Plains.—This company, which has recently completed a line from Lubbock, Texas, to Crosbyton, has asked the Texas Railroad Commission to make an examination of its road with the purpose of making a valuation against which to issue bonds.

Grand Trunk.—Stockholders have voted to authorize the directors to make a mortgage securing $30,000,000 bonds, guaranteed as to interest by the Grand Trunk, with a lien on the Grand Trunk Western.

Gulf, Texas & Western.—This company has asked the Texas Railroad Commission for authority to issue bonds on 25 miles of road from Megargel to Seymour. The road runs from Jacksboro to Seymour, 75 miles, and $1,700,000 bonds have been issued on the 50 miles of road from Jacksboro to Megargel.

Kansas City & Memphis.—F. J. Lisman & Co., New York, have bought $540,000 new 5 per cent. mortgage bonds of May 1, 1911-1961. The company is now operating about 30 miles of road and has under construction an additional 26 miles of road.

Lake Erie & Pittsburgh.—Stockholders are to vote May 19 on the question of increasing the capital stock from $100,000 to $6,000,000, and authorizing a mortgage to secure $15,000,000 bonds. The road is to run from Lorain, Ohio, to Youngstown, 91 miles, with a branch to Cleveland, 29 miles. The company now has in operation about 20 miles of line from Cleveland, east.

Long Island.—Holders of the $600,000 Long Island City and Flushing first mortgage 6 per cent. bonds due May 1, 1911, are offered the privilege of exchanging these bonds at par for refunding mortgage 4 per cent. bonds, due 1949, guaranteed principal and interest by the Pennsylvania Railroad, at 97.

Louisville & Nashville.—J. P. Morgan & Co., New York, have bought $10,000,000 first mortgage Atlanta, Knoxville & Cincinnati division 4 per cent. bonds, from the Louisville & Nashville.

Missouri, Kansas & Texas.—This company has asked the Board of Railway Commissioners of Kansas for authority to issue $107,000,000 bonds, of which $82,000,000 will be for refunding and $25,000,000 will be sold to pay for improvements. This about covers the balance of $125,000,000 bonds recently authorized by the stockholders, the railway commissioners having already authorized $17,131,000 of this issue.

Missouri Pacific.—James Speyer and H. I. Miller were elected directors, succeeding Paul M. Warburg and Cornelius Vanderbilt, whose resignations were mentioned last week. Frank Vanderlip, who was mentioned last week as likely to be elected a director, refused to accept election.

New Mexico Central.—Judge McFie has denied the petition of creditors to have C. C. Murray, of Pittsburgh, removed from the receivership. The court ruled that none of the charges brought against Mr. Murray were proved. Mr. Murray is receiver of the Albuquerque.

New York Connecting Railroad.—Lewis Cass Ledyard, a director of the New York Central & Hudson River, and of the New York, New Haven & Hartford, has been elected a director also of the New York Connecting Railroad, succeeding H. A. Fabian, manager of purchases of the New York, New Haven & Hartford.

New York, New Haven & Hartford.—This company will, on July 1, assume half the annual deficit of Boston & Albany. When the Boston & Albany property once more earns an operating surplus over its guaranteed 8 per cent. dividend, it must divide this surplus with the New Haven. The Boston & Albany will be operated from Boston (See Railway Officers), except that W. C. Brown, president of the lessee road, will remain president.

The New Haven will have trackage rights over the Boston & Albany, between South Framingham and Boston, between Ashland and South Framingham, between Ludlow and Springfield, and between Pittsfield and North Adams.

The lease of the B. & A. to the New York Central & Hudson River has 88 years to run, and it provides for a guarantee by the N. Y. C. of 8 per cent. dividends on the $25,000,000 stock of the B. & A. The operations of the B. & A. are included with the other leased lines in the New York Central & Hudson River's annual report, and are not shown separately. (See editorial comments elsewhere.)

This company has sold to J. P. Morgan & Co., New York, an issue of $12,300,000 4 per cent. 50-year Central New England bonds which the bankers will soon offer for subscription. These bonds are part of an authorized issue of $25,000,000 and are sold to refund several different issues, total of which is practically the same amount as the bonds to be sold. Several of the issues to be refunded, however, carry higher than the 4 per cent. rate on the new bonds, so that the saving in interest charges through refunding will be about $125,000 per annum.

Of the $12,200,000 bonds to be refunded, about $9,000,000 are held in the New Haven treasury, having been bought during the course of the last six or eight years.

Theodore N. Vail, president of the American Telephone & Telegraph Company, has been elected a director of the New Haven, succeeding Nathaniel Thayer, deceased.

Philadelphia & Reading.—Stockholders have approved the increase of stock from $20,000,000 to $45,000,000. The new stock will be issued to the Reading Company to reimburse it for the payment of prior lien and consolidated mortgage bonds of the old Philadelphia & Reading Railroad, and the stock will be deposited as collateral under the Reading Company's general mortgage bonds.

St. Louis & San Francisco.—William Salomon & Co., New York, and G. H. Walker & Co., St. Louis, have bought $5,000,000 New Orleans, Texas & Mexico division first mortgage 5 per cent. bonds. Of the total authorized issue of $50,000,000, $21,000,000 have been issued as 5 per cent. bonds, which includes the $5,000,000 just sold and $5,000,000 have been sold in France, bearing interest at 4½ per cent., and $10,000,000 are pledged as collateral for notes due March 1, 1913.

St. Louis Southwestern.—See Stephenville North & South Texas.

Stephenville, North & South Texas.—The Guaranty Trust Company, New York, has bought $2,000,000 first mortgage 30-year 5 per cent. bonds, guaranteed by the St. Louis Southwestern.

Plans for the rebuilding of the Ofoten Railway from Hundalen, Norway, to Kapparaasen, Sweden, have been submitted to the Swedish railway authorities. By the route proposed the total length of the line would be shortened by nearly four miles, the number of curves would be reduced considerably, and the traffic during the winter would not be obstructed by snow, as often happens at the present time, while the working expenses would be reduced by about $85,000 a year. The rebuilding will embrace about 15 miles of single track, the cost of which is estimated at about $2,073,500, while the largest tunnel would cost about $1,150,000. As the shipments of iron ore are shortly to be largely increased, the carrying capacity of the railway will have to be improved, and it is therefore considered very probable that the project will be approved of.

Supply Trade Section.

The Southern Car Company, High Point, N. C., will increase its capital stock from $100,000 to $300,000.

The Investment Trust Company, Montreal, Que., has bought a large block of the 6 per cent. bonds of the Canadian Car & Foundry Company, Montreal.

The Western Electric Company, Chicago, has received an order to furnish telephones and selectors for use on train despatching circuits on the Duluth & Iron Range, the length of road aggregating 123 miles.

The Kirby Equipment Company, Chicago, has moved its offices and the Chicago office of the Globe Seamless Steel Tubes Company, Milwaukee, Wis., from the Railway Exchange to the Peoples' Gas building.

The Call Switch & Frog Company, Denver, Colo., a subsidiary of the Call Switch Company, has been incorporated with $50,000 capital, fully paid, to make the Call type of switches and track supplies. The plant which the company is building at Denver is now nearing completion.

The Delaware, Lackawanna & Western, mentioned in the *Railway Age Gazette* of March 31 as specifying Nathan sight feed lubricators for the 35 new locomotives ordered from the American Locomotive Company, advises that Detroit bull's eye lubricators will be used on the 15 consolidation locomotives, and Nathan bull's eye lubricators on the passenger, freight and switching locomotives.

John C. Anderson, of Westinghouse, Church, Kerr & Company, Pittsburgh, Pa., has resigned to become mechanical engineer in the sales department of the Pressed Steel Car Company, Pittsburgh, Pa., with office in New York, effective May 1. Mr. Anderson is a graduate of the Sheffield Scientific School of Yale University, and has been on the Northern Pacific and Baltimore & Ohio. He is a son of the late General Adna Anderson, formerly vice-president and chief engineer of the Northern Pacific.

Morgan T. Jones, president and inspecting engineer of the American Bureau of Inspection and Tests, Chicago, has resigned to engage in the same line of work under the firm name Morgan T. Jones & Co. He will open an office May 1, in the Monadnock block, Chicago. George W. Greene, mechanical engineer of the American Bureau of Inspection and Tests, will succeed Mr. Jones as inspecting engineer, and E. C. McMillan will succeed Mr. Greene.

The Roberts & Schaefer Co., Chicago, has closed a contract with the Queen & Crescent for a 500-ton reinforced concrete and steel main line coaling station to be designed and built at Montlake, Tenn., immediately. This company has also taken a contract recently for a 200-ton frame construction coaling station for the St. Louis & San Francisco at Palos, Ala., and a contract for a 500-ton main line steel and frame construction Holmen coaling station for the Cleveland, Cincinnati, Chicago & St. Louis at Greensburg, Ind.

Warren J. Lynch, passenger traffic manager of the New York Central Lines west of Buffalo, has resigned to go with the American Steel Foundries, Chicago, effective May 1. At the meeting of the directors in May, he will be elected fourth vice-president of that company, with office at New York. Mr. Lynch entered railway service in 1883 as clerk in the auditor's office of the Cleveland, Columbus, Cincinnati & Indianapolis (now the Cleveland, Cincinnati, Chicago & St. Louis) at Cleveland, Ohio. In March, 1896, he was appointed assistant general passenger agent of that road at St. Louis, Mo., and the following April was transferred to Cincinnati, Ohio, with the same title. He held this position until May, 1899, when he was made general passenger and ticket agent of the same road, which had in the meantime become the Cleveland, Cincinnati, Chicago & St. Louis. On December 1, 1905, he was made passenger traffic manager of the New York Central Lines west of Buffalo, including the Lake Shore & Michigan Southern, the Michigan Central, the Cleveland, Cincinnati, Chicago & St. Louis, the Lake Erie & Western and the Indiana, Illinois & Iowa (now part of the Chicago, Indiana & Southern). Later his jurisdiction was extended over the Cincinnati Northern, the Indiana Harbor Belt, the Pittsburgh & Lake Erie, the Toledo & Ohio Central, and the Zanesville & Western.

TRADE PUBLICATIONS.

Pennsylvania Railroad.—This company has published a 100-page illustrated booklet called Increase the Crop per Acre, for distribution throughout the territory along its lines. This booklet deals with the use of dynamite on the farm and tells how the best results may be obtained.

Drills.—The Ingersoll Rand Co., New York, has just issued bulletins 4,003 and 4,016, describing and pointing out the advantages of its Little Giant rock drills and its Imperial valveless telescope hammer drills, respectively. Illustrations, diagrams and tables are included.

Railway Motors.—Bulletin No. 4,822, of the General Electric Company, Schenectady, N. Y., illustrates and describes its GE-98 railway motor for heavy city and suburban service. The motor is rated at 50 h. p. The bulletin contains dimension diagrams, characteristic curves, and a table of schedule speeds.

Telephone Line Construction.—W. N. Mathews & Bro., St. Louis, Mo., have published the third edition of their telephone line construction book, under the title, "From the Bottom of the Hole to the Top of the Pole." The book includes valuable data for designing and constructing pole lines, and several specially written articles on subjects of interest to telephone men.

Concrete Mixers.—Catalog 3, Series M, of the Municipal Engineering & Contracting Co., Chicago, gives interesting information on the theory and practice of mixing concrete, the construction of the Improved Cube Mixer and a number of large installations of these mixers. It is well illustrated with photographs and sketches of possible applications of the cube mixer.

Steam Turbines and Generators.—The Allis-Chalmers Company, Milwaukee, Wis., has issued bulletin No. 1079 superseding bulletin No. 1054, on steam turbines and generators. It includes descriptions of the principles of the Parsons turbine and of the machines of that type built by the company. The illustrations include numerous installations of turbines and turbo-generators.

RAILWAY STRUCTURES.

Abbottsford, B. C.—The Canadian Pacific has given a contract to A. D. McQuarrie, Vancouver, B. C., for putting up a station at Abbottsford.

Bayview, Wash.—The Spokane International has given a contract to H. J. Skinner, Spokane, Wash., for putting up a station at Bayview, which is at the southern end of lake Pend d'Oreille.

Canal Dover, Ohio.—The Baltimore & Ohio will build a new freight yard to replace the yard at Holloway, Ohio.

Council Bluffs, Iowa.—The Chicago, Rock Island & Pacific plans to add to its yards and to rebuild the freight house recently burned. The estimated cost is between $200,000 and $300,000.

Dunsmuir, Cal.—The Southern Pacific will enlarge its roundhouse, also the station at Dunsmuir.

Fishkill Landing, N. Y.—The New York Central has plans made for building a $50,000 station.

Grand Island, Neb.—The Chicago, Burlington & Quincy is asking bids for a pressed brick passenger station, with tile floor, enamel brick wainscoting, hard plaster walls and ceiling, slate roof, hot water heat, and electric light.

Greensburg, Ind.—See Montlake, Tenn.

Greenwood, B. C.—The Canadian Pacific will build a steel

bridge, it is said, at Greenwood during the coming summer, at a cost of $60,000.

Knoxville, Ia.—The Chicago, Burlington & Quincy will build a pressed brick passenger station.

Lyons, Ore.—The Corvallis & Eastern has been ordered to build a station, it is said, at Lyons, in Linn county.

Merritt, B. C.—The Canadian Pacific has given a contract to J. Boch, Merritt, for putting up a new freight house at Merritt.

Montlake, Tenn.—The Queen & Crescent has given a contract to the Roberts & Schaefer Co., engineers and contractors, Chicago, for a 500-ton reinforced concrete and steel coaling station. The same contractors will also put up a coaling station of frame construction for the St. Louis & San Francisco, at Palos, Ala., and in March were given a contract by the Cleveland, Cincinnati, Chicago & St. Louis for putting up a 500-ton Holmer coaling station of steel and frame construction, at Greensburg, Ind.

Moulton, Ia.—The Wabash will double the capacity of its switching yards and enlarge the roundhouse from six to twelve stalls.

Mount Hope, N. Y.—The New York Public Service Commission, Second district, has ordered the elimination of the grade crossings of the Erie Railroad at county highway No. 313 in the town of Mount Hope, Orange county. The highway is to be carried over the grade of the railway by means of an overhead steel bridge of plate girder construction. A temporary crossing for the accommodation of the public shall be maintained during the construction of the new crossing and its approaches.

New Westminster, B. C.—The Canadian Pacific has given a contract to C. Tossell, New Westminster, for building an addition to the station at that place.

Norfolk, Va.—The Norfolk & Western, the Norfolk Southern and the Virginian Railway have completed arrangements for building a union station in Norfolk at an initial cost of about $1,000,000, with plans for a $1,000,000 addition. The building will be eight stories high, the upper floors being designed for offices. Bonds to the amount of $1,000,000 will be sold to provide for the construction. Bids will be called for soon. (February 11, p. 332.)

Omaha, Neb.—The Chicago, Burlington & Quincy will build a freight house, 40 ft. x 750 ft., of brick and steel construction, second story over 250 ft., for offices, the estimated cost being $175,000.

Palos, Ala.—See Montlake, Tenn.

Port Huron, Mich.—The Pere Marquette will erect a roundhouse to cost about $30,000.

Portland, Ore.—The Oregon-Washington Railroad & Navigation Company, it is said, has agreed to build a station to cost $100,000 on the east side of the city of Portland, if certain streets are vacated.

The Oregon-Washington Railroad & Navigation Company has started work, it is said, on a new viaduct across the Willamette river at the foot of Glisan street, Portland. This is to be a double deck structure, the lower level is to be used by the railway company, and the upper level for highway traffic.

San Saba, Texas.—The Gulf, Colorado & Santa Fe has given a contract to Chas. L. Ryals, Galveston, Texas, for building a pressed brick passenger and freight station.

Spokane, Wash.—The Great Northern has plans made for building an addition to the station at Spokane, at a cost of $10,000.

Stockton, Cal.—The Southern Pacific will build a division headquarters and freight shed 680 ft. long, to cost $175,000.

Tampa, Fla.—A contract for building the Tampa union station, it is said, has been given to the King Construction Company. The plans call for a brick and stone building.

Tyler, Texas.—The St. Louis Southwestern of Texas will build a $12,500 pressed brick, stone trimmed, passenger and freight station.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Midland Valley is in the market for passenger locomotives.

The Southern Railway has ordered 50 locomotives from the Baldwin Locomotive Works, 23 switching locomotives from the Lima Locomotive & Machine Company, and 20 passenger locomotives from the American Locomotive Company.

The Marshall & East Texas, mentioned in the *Railway Age Gazette* of April 21, in an unconfirmed item, as having bought two 75-ton locomotives from the Kilby Locomotive & Machine Company, has ordered one, which will be a rebuilt one.

The Georgia & Florida has ordered 2 ten-wheel locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 56 in., and the total weight in working order will be a little over 150,000 lbs.

The Pere Marquette, mentioned in the *Railway Age Gazette* of March 24 as having ordered 50 locomotives from the American Locomotive Company, has changed this order. Instead of 35 consolidation locomotives with 22 in. x 30 in. cylinders and total weight of 215,000 lbs. in working order, as originally ordered, there will be only 10. The remaining 25 consolidation locomotives will be of a heavier class and will be equipped with superheaters. The dimensions of the cylinders will be 25 in. x 30 in., the diameter of the driving wheels will be 57 in., and the total weight in working order will be 236,000 lbs.

CAR BUILDING.

The Canadian Northern is said to be in the market for 350 freight cars. This item is not confirmed.

The New York Central Lines are in the market for 7 coaches for the Lake Shore & Michigan Southern.

The Illinois Central is said to be in the market for 94 all-steel passenger cars. This item is not confirmed.

The United Fruit Co., Boston, Mass., has ordered 50 twenty-five-ton steel cars from the Youngstown Car Manufacturing Company for use in Costa Rica.

The Spokane, Portland & Seattle, mentioned in the *Railway Age Gazette* of April 14, in an unconfirmed item as having ordered 14 baggage and mail cars, has ordered this equipment.

The Chicago, Milwaukee & St. Paul reported in the *Railway Age Gazette* of April 14 as negotiating with the American Car & Foundry Company for 8 baggage cars, has ordered this equipment from this company.

The Southern Railway has ordered 35 coaches from the Harlan & Hollingsworth Corporation, 10 combination passenger and baggage cars from the St. Louis Car Company, and 20 steel underframe postal cars from the American Car & Foundry Company.

IRON AND STEEL.

The San Antonio & San Jose Interurban, San Antonio, Texas, is in the market for 150 tons of 50-lb. or 60-lb. rails.

The Baltimore & Ohio has ordered 2,500 tons of rails from the Carnegie Steel Company, 2,500 tons of rails from the Illinois Steel Company and 2,000 tons from the Pennsylvania Steel Co.

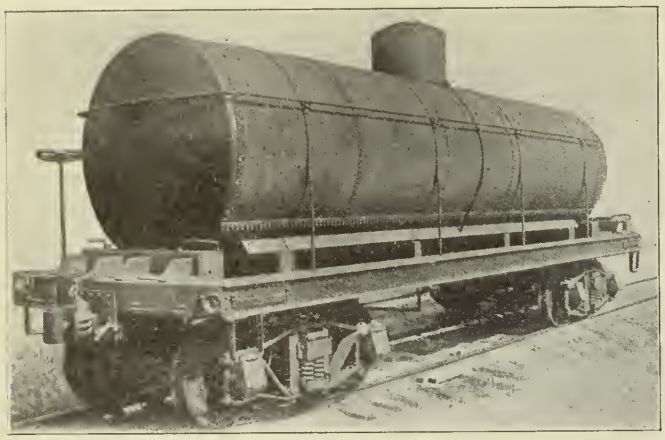
General Conditions in Steel.—The steel industry shows little change. New orders average about 30,000 tons a day and the Steel Corporation is operating at about 68 per cent. of its capacity. Some large orders are expected before the end of the month, which will probably bring the average of daily orders for April to about 33,000 tons, as compared with 35,500 tons for the month of March.

SIGNALING.

The General Railway Signal Company has the contract for automatic signals on the Cumberland Valley between Mechanicsburg and mile post No. 27; between Shippensburg and Chambersburg, and for two other sections, aggregating 44 miles. In this installation alternating current will be used for the track circuit, and the feed wire will supply not only the current necessary for the operation and control of the signals, but also for lights in the passenger stations along the line. These are the signals referred to in the last paragraph of the article published in this column, April 14, page 930.

Kennicott Tank Cars.

The shops of the Kennicott Company at Chicago Heights, Ill., have been further enlarged by the erection and equipment of a special shop for the construction of steel frame tank cars and a tank car specialist of wide experience has been employed to direct this work. The tank car shown herewith was recently completed for a western private car line. It conforms to the requirements of the M. C. B. standards, having four steel longitudinal sills and a substantial head block held by deep angles riveted to a steel plate, which is the top member of the end sill. This construction is shown plainly in the illustration. The interior of the tank is provided with a heater for handling such commodities as lard and molasses and other heavy viscous liquids. The truck is of the usual diamond type with heavy arch bars, steel channel transoms and Simplex bolsters. The



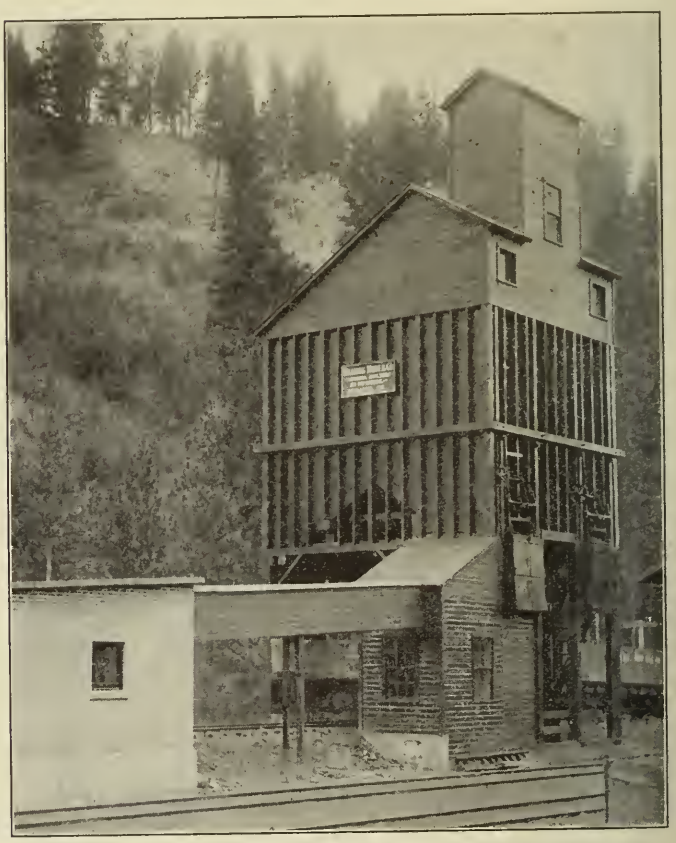
Kennicott Tank Car.

equipment includes Westinghouse air brakes and steel couplers with the Cardwell draft gear. The principal dimensions are: Length over end sills, 31 ft. 6 in.; width over side sills, 8 ft. 10 in.; length of truck, 27 ft.; diameter of tank, 7 ft.; height over all, 13 ft. 6½ in.

Locomotive Coaling Chute.

One of the first builders of coal chute equipment in this country were Williams, White & Company, Moline, Ill. During the last 23 years they have filled orders for 9,845 sets of fixtures. Their gravity type station is well known, and was widely used before the development of the mechanical plant. The illustration shows a small station of the mechanical type designed and built by this company. The track hopper bucket pits and foundations are of reinforced concrete. Coal is dumped from drop-bottom cars directly into a track hopper, and is delivered to a bucket through a steel gravity feeder or measuring box, which is placed in the opening between the track hopper and the bucket pit. This apparatus consists of a steel box with an inclined bottom, which rests on steel beams built into the side walls of the bucket pits. It has an undercut gate at the upper end, and an apron at the lower end hinged to the bottom plate. The apron is connected to the gate arms with steel links, which causes a reciprocating action between them. When the gate opens the apron closes, the movement being effected by the movement of the bucket. When the bucket descends the steel fingers on the bail engage the rolls on the apron link and open the apron, at the same time closing the undercut gate at the upper end of the feeder, thus allowing the contents of the feeder to flow into the bucket. When the bucket rises, it closes the apron at the lower end and opens the gate at the upper end, allowing the feeder to refill. It thus insures a full bucket each trip and prevents spilling coal into the pits. The operation of this apparatus requires little power, the weight of the empty bucket being more than sufficient to open the apron and close the gate. The opening between the track hopper and feeder has an area of 24 in. x 46 in., which allows the coal to pass into the feeder rapidly and prevents choking or clogging at this point.

The bucket is made of heavy steel plate, with a rounded bottom, and is carried on trunnions attached at each end. It is held in an upright position by latches, which are automatically released at the top of the shaft, where the bucket tips and discharges its contents into the storage bin. The buckets are operated by a double-belted reversing worm-geared hoist, which has a bronze gear and steel worm, enclosed in a dust-proof casing. The steel worm running in a bath of oil insures proper lubrication at all times. The hoist is operated by belts from a



Locomotive Coaling Chute.

countershaft, which runs constantly in one direction and allows the use of either gasoline, steam or electric motive power. The hoist is equipped with a friction brake that sets automatically whenever the belt is shifted to the loose pulley. It also has a stop nut on the extended end of the worm shaft, which engages a clutch that automatically shifts the belt to the loose pulley at either the top or the bottom of the shaft. This nut is adjustable, and the exact point at which the bucket stops at the top or bottom is easily controlled by adjusting this nut. This arrangement is a positive stop to the bucket, and when properly set, the point at which the bucket stops, either at the top or bottom, will not vary more than one inch. A safety device is also attached to the drum so that in case the cable gets crossed or slack for any reason, it trips a clutch and the hoist is stopped instantly, setting the brakes at the same time.

The plant is equipped with a belted car puller which enables the operator to easily move the cars either to or from the track hopper. The automatic starter used on these stations consists of an oscillating pipe capped at both ends and pivoted at the center. The pipe is partially filled with a non-freezing fluid and

a spherical iron ball is placed inside. It is placed underneath the hoist and connected to the belt shifter so that the pipe in oscillating or rocking moves the belt shifter in either direction. The bucket raises the end of the pipe where the ball is and starts the ball rolling to the other end. When the ball reaches the other end of the pipe, it depresses it so as to shift the belt and starts the hoist in the opposite direction. The length of time necesssary for the ball to travel from one end of the pipe to the other regulates the time that the bucket is stationary. This, however, may be varied by moving a button on the cable that operates the pipe so that the ball will travel more slowly and consequently allow more time for the filling and emptying of the bucket. The hoisting capacity of the plant is from 70 to 100 tons of coal per hour, depending on the size of the bucket used. Four sizes of buckets are provided, one and one-quarter, one and one-half and two tons' capacity.

A recording delivery chute for measuring and delivering coal from the storage bin to the engine tender is designed to take the place of scales. Any number of engines may take coal at a plant during the night, and the operator in the morning may open his box and find a correct record showing the number of engine and amount of coal taken by each one. A steel undercut gate and self-balancing delivery apron is used for conveying coal from storage bin to tender.

Smoke Jacks for Concrete Engine House.

Cast iron smoke jacks, installed in a concrete roundhouse, are shown in the accompanying illustration. They are substantial and durable and embody several new ideas. The hood is sufficiently long to permit ample movement of locomotives while undergoing light repairs. The sides of the hood are adjustable, which allows the flare to be increased when the locomotive stack is not directly under the hood. The ends are made with a steep pitch to prevent the steam and smoke choking in the upper part of the hood as it comes from the stack at a high velocity. To keep the roundhouse clear of smoke and steam while the locomotives are passing in or out, a ventilator is furnished around the pipe at the roof line. This idea has been found particularly valuable. To retain the heat in the roundhouse when the smoke jack is not in use a damper is furnished which is operated by a sliding weight or ball connected



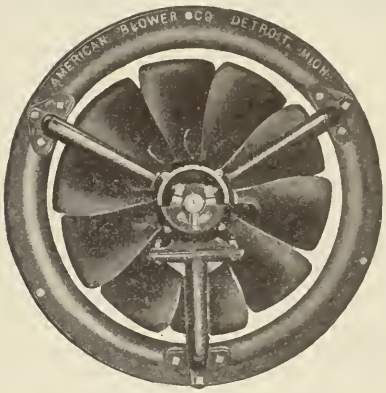
Concrete Roundhouse Equipped with Cast Iron Smoke Jacks.

to the damper, the ball holding the damper in an open or closed position. These smoke jacks were designed and are manufactured by Paul Dickinson, Incorporated, Chicago, Ill.

Railway construction is progressing rapidly in China and Manchuria. New lines are being built by the Chinese without foreign aid in any form. Other roads are built and operated almost entirely by foreigners, but financed by the Chinese. The first 30 miles of the Chinese section of the Kowloon-Canton Railway, China, from Canton to Tung Mei, was opened December 5. The construction of this section was begun in 1908, and is expected to be in operation by July 1, 1911. The bridging of the East river valley offers the greatest difficulty, but the construction is already under way. The length of the section will be 87 miles. The tidewater bridges at Hangchow and Pahkuam on the Hangchow-Ningpo Railway, China, are the most difficult features of construction on this line, but progress is reported. A large force is engaged in working from the Ningpo end toward Yu Yao, and the work of grading is progressing at either end of the line. Tiehling has been approved as the western terminus of the Heilung Chang Railway, Manchuria. Tiehling is near the Liao river, so the railway will have the advantage of water transportation. The alternative, Kaiyun, which is situated about 18 miles from Liao, was discarded because the line would have become a feeder for the South Manchurian Railway and would have diverted the traffic from Yinkou to Dairen.

Disc Ventilating Fan.

The American Blower Company, Detroit, Mich., has been developing a new curved blade disc fan during the past four years. It is called the Ventura, and has ten broad blades of the necessary curve to produce large volumes of air. It will discharge freely against pressures of from one to two inches, the central disc preventing any back flow of air when the fan is working against pressure. It runs at the speeds common to all disc fans and is so designed that its discharge flow seems to bend inward before



Ventura Ventilating Fan.

beginning to diffuse. This feature is peculiar to the Ventura fan, not being found in other fans of the disc type. A strong direct breeze is thus provided, which makes it valuable for ventilating purposes. The mechanical efficiency of these fans is uncommonly high, having been determined from many tests made by the makers to be 64 per cent.

Side Dump Car.

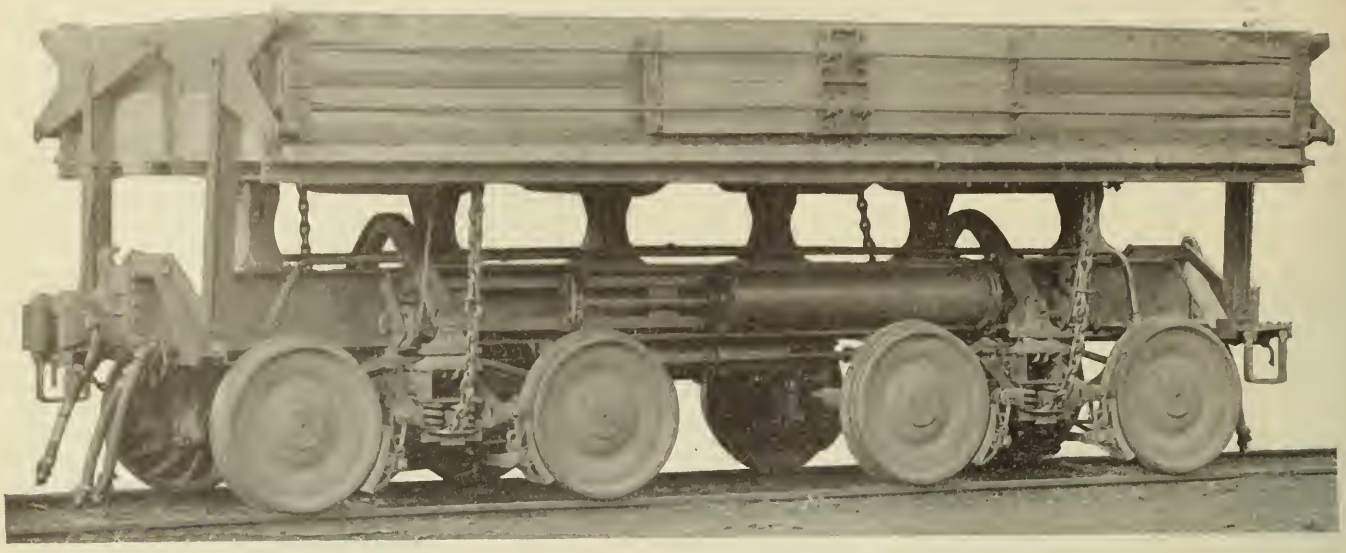
A two-way, double truck, air operated, side dump car, which is somewhat heavier than those now in general use, has recently been designed and put on the market by the Fitz-Hugh, Luther Co., of Chicago and New York. Its design is the result of several years' experience of an engineer in construction work. The details have been worked out with a view to securing the greatest strength of the materials used, and the parts have been designed with the idea of enabling contractors and other users to make repairs without shop facilities and with the most common hand tools. Though the car is of standard height for this type, it dumps to an angle of 49 deg., which facilitates its clearing of material. This is accomplished by having the pedestal and hinge castings of one piece each, and so arranged that when the load is dumped the center of support is changed to the dumping side. The car body is slightly lifted by the momentum of the load and is left poised so that it will right itself when the air is released. Journal boxes are placed inside the wheels to avoid injury, and where they will enable the car to clear the dumped material. This location also tends to keep the wheels on the rail while running over bad track.

The cars are constructed in accordance with M. C. B. requirements as to wheels, axles, wedges, brasses, couplers, sill

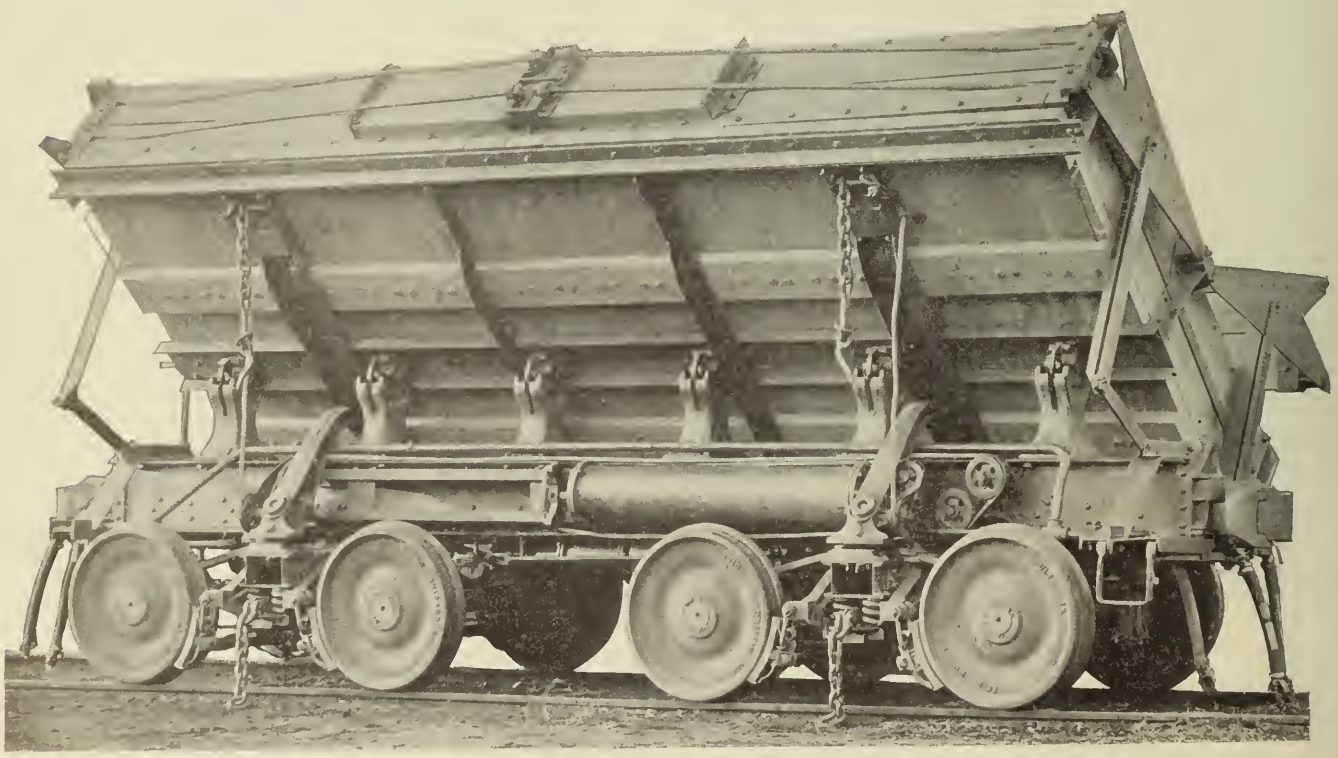
steps and air brakes. The center sills are continuous from end to end, running through solid cast steel body bolsters. No rivets are put through the flanges of the sills where there are tension strains and like precaution has been exercised at other places. The one-piece body bolster of steel has cast integral with it two center plates, two side bearings and two spring pockets which contain coil springs arranged to take the shock of the body as it dumps to discharge its load.

As in other cars of this type, chains are used to hold the body in a horizontal position while traveling. Instead of fastening one end of the chain to the non-elastic car body, and the other to a rigid truck bolster, the chains on this car are anchored below the truck springs, so that as the chains on one side receive sudden strains they are relieved by the cushion effect of the spring, avoiding breakage and delays. Doors on this class of car are frequently broken by boulders striking them just as the car starts to dump. On this car the door is designed to distribute the strains throughout its length, and is made of planks set into the steel end door casting. A steel tee as long as the door is placed between the edges of the planks and is engaged by the steel end castings and a center bracket. To still further stiffen the door a batten section is placed along the center third of the door and the whole is bound together by truss rods running through the steel end castings and terminating at a steel bracket in the middle of the door. Each truss rod is straight with an upset end and is tightened by screwing up a common right hand threaded nut either at the door end or at the center bracket, the use of left-hand threads being avoided entirely.

All chain fastenings, door and dumping iron pins are loose and straight, and are held in place by cotter pins at each end, thus permitting their removal in either direction. Care has been taken to protect all hose connections, brake apparatus and coupling appliances from breakage by falling material by either placing them under the car body or by shielding them with steel forged guards.



Two-Way Side Dump Car Operated by Compressed Air.



Two-Way Side Dump Car; Dumping Position.

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THAT branch of the Grand Trunk's invasion of New England which relates to securing a tide water terminal at Providence against the opposition of the New York, New Haven & Hartford has come to a new and advanced stage. After much controversy before the Rhode Island legislative committee, a decision has been reached; it is in the nature of a compromise, with advantage to both companies as well as to the municipality. The Grand Trunk sought the right of crossing the New Haven's main line at grade and the use of the New Haven terminals. These the Canadian corporation has not obtained, but it has secured a pledge from the New Haven company of payment of the difference between what may be termed the grade crossing entrance and a new entrance on sunken tracks; and the Grand Trunk must look out for its own tide water facilities. The alternative before the New Haven was evidently a compromise of this kind or facing a legislative act giving the Grand Trunk use—of course for compensation—of the New Haven's terminal and, beyond, a long controversy in the courts over the constitutionality of the measure, with uncertain results. The conflict of the two companies now reaches its climacteric point. Hitherto it has been limited to questions before the Rhode Island and Vermont legislatures and the Massachusetts railway commission, and to the New Haven defensive strategy exampled by the Rutland semi-control, the Montpelier & Wells River purchase and the Boston & Albany joint lease obligation. But on neither side has there been the threatened new rival construction, nor, so far as known, diversion from the Grand Trunk of business originating on the Boston & Maine. In an essential sense the campaign in New England now passes from the domain of strategy and law into that of concrete expense, into that stage where "dollars talk."

THE agricultural activities of the railways are becoming more varied every day. The Pennsylvania Lines west of Pittsburgh are running a train for the Ohio State Agricultural College for the express purpose of dealing with difficult questions which have been encountered by the farmers *since this spring's planting.* The Pennsylvania people are "on the job" surely. Another manifestation of this widespread change in our modes of life is to be found in the activities of the Illinois Central in Mississippi. This road, we are told, "by co-operation of its industrial, immigration and freight traffic departments proposes to offer special inducements to farmers in the stricken boll weevil districts and abandoned land sections to cultivate their acreage for corn and other grains. An effort will be made to get buyers to take the product as fast as it is known what it will be." . . . Efforts to get buyers will be a new kind of activity for railway officers; though it cannot be doubted that such activities may be made profitable to the shipper, the railway and the public. But the road that turns its enterprise in this direction is wandering a good way out of the narrow path marked out by the Interstate Commerce Commission when it frowns on the expenditure by a railway of 25 cents for a telegram which may be of some little benefit to a shipper. Where shall we find the Act to Regulate Commerce, at this rate? It will be knocked into a cocked hat. From hunting up buyers for corn we shall soon descend to the trick of encouraging marriageable young men to seek wives in distant towns in order to increase the profits of the passenger trains. Think of a passenger agent sending in a voucher for expenses in introducing city swains to farmers' daughters! Professor Adams would spend the whole of his $350,000 appropriation before he would approve such an expenditure; and yet even worse things are being legitimized rapidly by the force of custom. Not all of the Washington officials are critical, however. Professor Adams is a cold-blooded accountant; but the cabinet members are human, and we find the Secretary of the Interior requesting the Southern Pacific Company to publish in its folder warnings of the danger of forest fires. "The interior department is doing everything possible to spread knowledge of this danger, and the railways are co-operating, so that campers and excursionists who travel

to the forests will be made aware of the dangers of building or leaving camp fires in the thickly forested areas." The Southern Pacific is going to comply with the request. Thus we have one more example of businesslike and friendly philanthropy between the government and the railways.

ONE bad result of recent advances in the wages of railway employees is that in a good many cases certain classes of employees are receiving wages as high as, or higher than the wages of their superior officers. On some lines road enginemen are receiving an average of $6.30 a day, firemen $4.15, conductors $5, flagmen $3.65, and brakemen $3.50. The wages earned by the best paid employees exceed these amounts, being as much as $7.25 to $10.50 for enginemen, $4.40 for road firemen, $6 for conductors, and $3.95 for road flagmen. On the same roads, officers are receiving sauaries which figure out as follows, per day: Trainmasters $7.77 to $9.70; assistant trainmasters $6 to $7.07; road foremen of engines $6.83 to $7.77; assistant road foremen of engines $4.83 to $6; yardmasters $3.33 to $4.89. In some cases a night yard brakeman, working the same number of hours and days as a yardmaster, gets $130 a month, which is more than the average received by the yardmasters on the roads where the wages in question are paid. There probably are numerous cases where conductors and enginemen on good runs make more than the trainmasters. The seniority rule, as insisted on by the labor unions, tends to prevent the promotion of employees to official positions. The existence of an arrangement under which employees get higher wages than the officers immediately above them is adapted to deaden their ambition. The officer, of course, has the advantage of being in line for promotion to higher positions in the operating department, but the number of employees who are apt to work hard for promotions involving reductions in their incomes in order to get in line for further promotions is not large. The knowledge on the part of employees that they are receiving larger incomes than those who give them orders is as little adapted to promote good discipline as it is to stimulate the ambition and the exertions of employees. Viewed from any standpoint, the situation is most unsatisfactory. Either in many cases the employees are being paid too much, or the officers are being paid too little. The inconsistencies in railway wages and salaries are not confined to the wages of train employees and their superior officers. The wages of clerical employees in division and general offices have not been increased in anything like the same proportion as the wages of train employees. Perfect consistency in the payment of wages and salaries has never been attained in any business, and never will be. There are always some who get more than they are worth, and others who are worth more than they get. But the inconsistencies in the existing payrolls of the railways are too glaring to be tolerable for long, because they are so great and indefensible that they tend directly and in a serious measure to cause inefficiency.

SEEKING A "BASIS" FOR RATE REGULATION.

HOWEVER much those considering the problem of rate-making and rate regulation may differ regarding other matters, there is one point on which all agree—at least in the abstract. This is that fundamentally the problem is one of public expediency, and that it should be settled solely with a view to furthering the public welfare in the long run. No doubt, also, all will agree that the constant and prolonged agitation of the subject is contrary to the public interest. It would be better to have it settled on some basis, even though that basis were not exactly the best one, than to continue perennially the controversies and litigation about what basis shall be adopted. Perhaps, also, all intelligent persons can be convinced that in fixing the relations between the rates on different commodities, and on the same commodities for different hauls, both the cost of the service and the value of the service must be given due consideration, the latter principle usually being given preponderant weight. Everyone can see that the rates on sand and automobiles ought not to be the same per ton per mile.

But everyone cannot be persuaded that when fair relations have been established between the different rates, and traffic moves freely under them, the rate problem is solved. The shippers, as a whole, are apt to continue to insist that rates, as a whole, are too high, and the railways that they are too low; the former basing their contention on the ground that the railways are making too much money, and the latter theirs on the ground that they are making too little. In other words, the total return of railways from all their rates is generally regarded as a very important element in determining the reasonableness of their rates as a whole. It has been held to be such by the courts. But in order to ascertain what the return is it is necessary to compute it on some basis. The railways with high capitalization would like to compute it on the basis of capitalization; those with low capitalization, on the value of their properties. The shippers are equally consistent; they would compute the return of roads with a high capitalization on the value of the properties, and the return of roads with a low capitalization on their capitalization!

If the Supreme Court of the United States upholds the decision of Judge Sanborn in the Minnesota rate case, the question of the basis of computing the fairness of a railway's return will be moved a long way toward settlement. He held that the proper basis is the cost of reproduction, new. He also held that each of the railways involved in the litigation in Minnesota is entitled to a net return of 7 per cent. The Supreme Court of the United States held that the Consolidated Gas Company of New York was entitled to 6 per cent. It might hold that eastern railways are entitled to this return; that those situated similarly to the Minnesota lines are entitled to 7; and railways in the extreme western part of the country to 8 per cent.

There are some important points, however, which will be left entirely unsettled, even though the Supreme Court upholds the Minnesota rate decisions. One of these is as to how, if cost of reproduction be accepted as the proper basis for regulating railway rates, as a whole, they shall be so adjusted as to enable each of a group of competing roads to earn this return. Different roads vary greatly in their operating expenses and in the density and nature of their traffic, as well as in the value of their physical plants. It would be impossible, therefore, to make all of a group of competing roads earn the same percentage of return on their valuations with the same freight and passenger rates. Yet all their rates between competitive points must be the same; and if any fair relation is to be maintained between competitive and non-competitive rates the latter must be made with some reference to the former. Valuation based entirely on cost of reproduction ignores the fact that two roads having plants whose physical cost of reproduction would be the same may, viewed from any rational standpoint, have very different values. As the road having the greater density of traffic and the proportionately lower operating expenses will, while charging exactly the same rates, render more service to the public and earn more money for its owners, it is obviously the more valuable road. Is it not, therefore, entitled to a higher valuation?

While it is easily demonstrable that, of two railways with equally good physical plants, the one having the relatively larger business and the relatively lower operating expenses is the more valuable, the value of a difference in volume or quality of traffic, or in operating expenses, cannot be expressed in terms of money until it emerges in net earnings; and it can only emerge in net earnings after rates expressed in money have been applied to the traffic. Possibly, however, there is a way in which, while using *physical* valuation as a basis for regulating rates and profits, we might secure to each railway the benefit of all elements entering into its value as a going concern.

It might be found, if a physical valuation were made, that some roads could not earn the current rate of interest on their valuations without charging rates which would interfere with

the movement and growth of traffic. They would have to be denied a right to earn a "fair return," for the right of a railway to earn any return is subordinate to the right of shippers and travelers to reasonable rates. Just above this class of railways would be found others in all parts of the country, which would, perhaps, be just able, with rates that would not oppress the traffic, to earn a fair return on their cost of reproduction. It would seem they could not be restricted to less.

Still above them would be found everywhere roads, which, on the same rates, could earn more, and in some cases much more, than the current rate of interest on their physical valuations. Should they be permitted to do so? While they could earn larger percentages of return on their *physical* value, their percentages of return on their *total* value, including their physical value and their utility to the public and to their owners, as evidenced by the amount of business that they handle and the economy and efficiency with which they handle it, might be no larger. Even if some railways did earn large profits this would not be proof, either legal or economic, that their rates were excessive. The fact that other fairly well managed roads in the same territory, charging the same rates, earned no more than a fair return on the physical value of their properties would be strong evidence that the rates were reasonable and that the larger profits of these more prosperous roads were due largely to differences of management.

Letting the more successfully managed roads earn more than the less successfully managed would tend to foster efficient management on all; no stimulus to the use of enterprise and skill is so potent as allowing enterprise and skill to garner and enjoy the fruits that they have nurtured. It would not necessarily result in any case in entirely excessive profits; the courts have held that where the profits of a railway are "truly enormous" this raises a presumption—although not a conclusive one—of the unreasonableness of its rates. If, however, the average rate of return in the railway business were no greater in proportion than the average in other businesses, such as banking, farming and manufacturing, and the profits of none of the railways were larger than those of well managed concerns in other lines of enterprise where competition was active, it would seem it could hardly be concluded that they were so great as to raise a conclusive presumption of the unreasonableness of their rates.

Valuations have been made in a number of states: In Washington, South Dakota, Michigan, Minnesota and Wisconsin the aggregate capitalization was $1,276,949,698, and the aggregate estimated cost of reproduction was $1,211,806,522. The only one of these estimates of cost of reproduction, new, which has been passed on by a federal court is that in Minnesota. Whereas the commission's estimate of the cost of reproducing the Great Northern, the Northern Pacific and the Minneapolis & St. Louis in Minnesota was $193,000,000—which was greatly in excess of their capitalization in that state—the court's finding amounted to $250,000,000 The result of litigation in other states probably would not be different. Wherever valuations have been made by railway commissions, they have been made more with a view to finding a basis for reducing rates than for regulating them; and those who set out to devise means for reducing rates are pretty apt to *find* means for reducing rates! Railway managers have long been of the opinion that valuation would show that the present value of the property of the railways is much greater than their capitalization, and the result of the litigation in Minnesota tends to justify the confidence that they have expressed. But even if a valuation should be so high as to give the roads legal license greatly to raise their rates, it might not be practicable for them to take anything approaching full advantage of it. The public notion has been that the railways are not only over-capitalized but that they have so adjusted their rates as to pay a return on their watered stock. If it were so easy to adjust rates on the basis of valuation or capitalization there would never have been any bankrupt railways. Railways have had to make rates which the traffic would bear and with which they could meet the competition of each other and the water carriers. Thus conditioned, they have been unable so to adjust them as to earn a given return on their aggregate capitalization, however much they have longed to do so. They would be confronted with similar conditions after a valuation was made, and if their aggregate valuation, like their aggregate capitalization in the past, were such that rates could not be so adjusted as to earn a return on all of it, they would have to go without any return on parts of it. A valuation might at least serve to satisfy the public on the question of whether or not the railways are earning more or less than a fair return; and if the public must have a "basis" for regulating rates, it probably would offer one high enough to prevent any great harm being done to anybody.

On the whole, therefore, it would seem that all interests can afford to look on the agitation for a national valuation with tranquility of spirit; and the railways most of all, for its effect would be much more apt to justify some advance in the general level of rates than any considerable reduction in it.

CORROSION AND PROTECTION.

THE wholesale destruction of iron and steel by corrosion is a depreciation loss in which the railways are vitally interested, as they are large users of steel in structures which are exposed to corrosive conditions to an unusual degree. In 1907 the consumption of steel plates, shapes and axles for metal railway cars was two million tons, and the steel rails rolled that year amounted to three and one-half million tons. To this, add a large tonnage of structural material for bridges, trestles, steel buildings, tanks, etc., and it will be found that the railways consume nearly one-third of the total production of steel in the United States. There is a great loss by corrosion of this material, and the expense of the various efforts made by the roads to protect it is larger than that in any other single industry.

Considerable progress has been made in the past few years toward a better understanding of the corrosion problem, and in the art of protecting iron from rapid decay. The expensive failures of some methods of protection will not be repeated and some valuable lessons have been learned which will lead to the use of coverings that approach more nearly to a permanent protection.

The steel framework of the roof of a large trainshed in Chicago was recently replaced after a few years' service, as it was found that the covering made of cinder concrete slabs had cracked and allowed steam and sulphur gases from the locomotives to penetrate, and coming in contact with the cinders resulted in a chemical action which caused a rapid corrosion of the steel reinforcement. The rust of the latter expanded and caused further cracks, which allowed more gas and moisture to penetrate the steel framework, with such destructive effect as to require entire renewal. The sulphur gases and moisture from smoke stacks have also destroyed a large amount of elevated railway structures in St. Louis. These structures were covered with cinder concrete, but this failed as a protection against corrosion. These are only prominent examples of a large amount of steel work which has been partly destroyed through the failure of the means used for their protection, and which must be replaced at a large expense. Records kept by one of the large railways, relating to steel hopper cars used in coal traffic, show a loss of 700 lbs. per car per year due to corrosion, and the large area of thin steel surface exposed to corrosion in this class of equipment is causing a very large annual depreciation. The proper method of painting steel cars during construction and in service, so as to prevent this rapid destruction, is a subject which has received much serious attention by the painter, and is now being given that scientific investigation by the chemist which the great importance of the subject demands.

Much of the corrosion of steel track materials and structures is attributed to the salt water dripping from refrigerator cars, but that condition can be improved, as the meat cars are the only ones which require salt, and the ice tanks are now made large enough to hold the accumulated brine between icing sta-

tions. It is probable that the sulphur in the ashes and cinders from the locomotive is a more destructive agent to track structures. This condition is likely to become worse by reason of the general use of self-dumping ash pans now required by federal law, and which, on account of their construction, are often leaky and difficult to keep entirely tight.

The scientific investigation of the cause of corrosion has no where been more thorough or more illuminating than that by Dr. Allerton S. Cushman, and his papers on electrolytic action as a cause of corrosion are well known. In a recent address before the Franklin Institute on the Conservation of Iron, Dr. Cushman showed that the consumption of iron ore in proportion to population is increasing more rapidly than that of any of the other staples, that the present generation may see the exhaustion of high-grade ores in this country, and that the use of lower grades must largely increase the cost of pig iron and its products.

The electrolytic theory of corrosion affords a logical explanation as to why steel which is made so rapidly that the impurities are badly segregated is more subject to corrosion than pure metal made by slower and more careful processes. This has led to new metallurgical processes, by which iron of excellent quality and remarkably pure is made in open hearth furnaces on the same large scale as is employed in steel manufacture. The particular value of pure iron is that it corrodes slowly and uniformly, and there is not the tendency to pit as is the case in less homogenous metal. This metal can be used for sheets or tubes where the element of strength is not important. It is possible that pure irons may be used as a base and alloyed with nickel, copper or other metal in the production of a strong structural metal which will be much less subject to corrosion than the carbon steels as now manufactured.

Steel can be protected from rust by a coating of black oxide of iron, or by rolling zinc on to the surface, as in the Speller process, and while this adds to the expense, it is frequently an economic measure where corrosion is to be avoided. It is not generally realized by engineers that it is not best to bring in contact in one construction metals of unlike electro-chemical properties, and iron and steel have been destroyed in large quantities on account of a lack of knowledge of these relations.

Zinc is particularly valuable in preventing corrosion due to electrolysis, as it is electro-positive to iron and will protect iron or steel at its own expense as long as it is kept in contact with it. The bare ends of galvanized wire do not rust on exposure, and it is important that in the use of zinc for protection the coating must be of sufficient thickness to allow for some loss of the metal by electrolysis, as, if the coating is very thin, it will be gradually destroyed and the iron left bare.

There is an important difference between the value of zinc as a protective coating and of tin, lead or copper. The latter three are electro-negative to iron, and, theoretically, they should not be used for such a purpose. Any crack in tin-protected iron will lead to more rapid corrosion than if the tin were absent, as the burden of the attack is thrown upon the iron in the couple. Aluminum and magnesium are electro-positive, but alloys of these metals suitable for iron protection have not been manufactured, and the cost in most cases would be prohibitive.

Paint coatings for the protection of iron or steel will not now be considered in detail, but a great improvement has been made in the manufacture of paints for such purposes as a result of Dr. Cushman's investigation. He first called attention to the fact that the pigment portion of paint has an important relation to corrosion, and that certain pigments in contact with iron render it chemically passive, and, therefore, for the time, non-corrosive. The best agents for this purpose in paint manufacture are slightly soluble chromates and other substances which form with iron a distinctly alkaline reaction. The test plates of iron and steel covered with paints made on this principle have been exposed at Atlantic City for three years and the last inspection of them shows that they are effective protectors, and they are leading to decided improvements over the ordinary paints used for the protection of iron and steel.

NEW BOOKS.

Loose-Leaf Pocket Book. By Norman R. Corke, A. M. I. E. E. Published by John Walker & Co., Ltd., London, Eng. The Cooke & Cobb Co., Brooklyn, N. Y., agents for the United States. Morocco, leather lined; 4 in. x 6 in. Price, $4.

This pocket book is especially adapted for mechanical, civil and electrical engineers. It was originated to supplement the use of engineers' hand books, which are generally too large to be conveniently carried about. It contains 50 pages of useful tables, formulae, etc., condensed into the smallest possible space and arranged for easy reference. Co-ordinate, plain and ruled pages are provided to permit the engineer to inclose data of his own, pertaining directly to his special work. The pages are made of special, tough, thin paper, and are provided with or without metallic eyelets, according as the notes are for temporary or permanent use. The advantage of this book is that it never becomes obsolete, as its contents may be readily removed or added to. It is well and strongly made of good material, and will stand hard usage.

The Supply Department. By H. C. Pearce, General Storekeeper, Southern Pacific Company. 120 pages; 13 illustrations; 6 in. x 9 in. The Railroad Gazette, New York. Price, $2.00.

This is a study of the purposes, organization and operation of the supply department. It was published serially in the *Railway Age Gazette* this winter. While the advantages and disadvantages of different systems are discussed, the book is chiefly an exposition of the centralized system under which one man is at the head of a department which attends to both storekeeping and purchasing, the movement of all supplies, whether inter-departmental or from outside sources, being controlled by one organization. Mr. Pearce develops and explains the plan logically and fully. Beginning with purposes and organization, he then discusses the duties of officers and the layout and facilities for general and division stores. Having thus placed the system clearly before the mind of the reader, he goes on and shows, how to do business with the given organization and facilities. We are indebted to Major Charles De Lano Hine for the following:

"It is a great pleasure to respond to a request for a 'postscript' to The Supply Department by an old Rock Island and Southern Pacific friend, H. C. Pearce. By their works ye shall know them, and 'Pearce, he delivers the goods.' Some storekeepers put all the accent on the *keep* and unconsciously regard the practical *issue* of material as something of a nuisance. Not so with Pearce, he is up and shipping, and, best of all, as his chapters show, he assembles the material and supplies, in rational arrangement, making the 'job of work' a unit of supply.

"The Soo Line gave our profession Pearce as well as his former bosses, Underwood, Willard and Pennington, all influenced, more or less, by the broad views and comprehensive policy of that many sided genius, Sir William Van Horne. The great northwest has developed its quota of all 'round men, while the denser East—beg pardon, the East of denser traffic—has turned out specialists. The most undesirable corollary of specialization is centralization, which is the direct opposite of self contained concentration. Therefore, if my friend Pearce in our talkfests would let me interlock supply with the higher speed route, operation, by making the supply head an assistant general manager, and each division storekeeper an assistant superintendent, I would say 'Amen' to all his conclusions.

"So terribly in earnest is Pearce that he takes little for granted, leaves nothing to chance, and works out his plans and classifications in advance. On his neat desk in the general office building in San Francisco is compact, concise information showing him the master of his situation, saving the Southern Pacific thousands and thousands of dollars every year. No man in the country has done more, if as much, to originate and develop methods for the supply car which he so happily describes as a 'transfer store.' No man is more enthusiastic in developing, by precept and example, higher standards of efficiency and integrity. Happy is the man who has found his work, and fortunate are we to have in instructive form the lessons of that work."

Letters to the Editor.

A TERRIFYING ADVERTISEMENT.

Temple, Tex., April 8, 1911.

To the Editor of the Railway Age Gazette:

While passing the city ticket office of one of the great transcontinental systems (Harriman Lines) in Chicago the other day, my attention was called to a beautiful picture, evidently a colored photo-engraving, showing a passenger train standing at an automatic block signal indicating stop. This view is evidently designed to impress upon the public the high degree of safety maintained by a combination of discipline and signals on the road in question; and but for one slight defect the psychological results upon prospective travelers would be perfect. Unfortunately, the scene is on a single track road and there is another signal, governing in the opposite direction, directly across the track from the one at which the train has stopped, and this signal indicates *proceed*. So vivid is the impression that one almost expects to witness a butting collision. One is led to query if it would not be a good idea to have surprise checking for advertising agents and their artists as well as for trainmen. V. C.

["V. C." has our sympathies. The picture maker always seems to succeed in having the last word. In laying out a picture he has no objection whatever to running a lightning express over a 14 deg. curve if the exigencies of his background demand such a curve. An eastern road, a few years ago, advertised one of its fast trains on a poster, of gay colors, in which the signals were arranged so as to indicate that the train was backing (more truth than poetry, perhaps!). Literary fellers and artists are dangerous company at best. There is no doubt that they would unanimously prefer a flagman to a block signal, if they spoke from the heart; the flagman is so much more human.—Editor.]

THE EFFICIENCY OF RAILWAY EQUIPMENT.

Chicago, April 22, 1911.

To the Editor of the Railway Age Gazette:

I have read with interest the editorial in the *Railway Age Gazette* of April 7, page 822, on "The Efficiency of Railway Equipment." In analyzing some of the figures given I do not get quite as much "inefficiency" as was shown. In the first table of statistics is an item "ten miles per pound freight locomotive tractive power per year," which was stated to have been based on the assumption that the tractive powers of freight and passenger locomotives were the same, for the reason that the Interstate Commerce Commission figures does not show them separately. If I follow the line of reason correctly, this item should be the quotient arising from dividing the "ton miles per freight locomotive per year" by the "average tractive power per freight locomotive" which gives me considerably different figures from those in the article. Below is a comparison of my figures with those of the *Railway Age Gazette:*

Ton miles per pound freight locomotive tractive power per year.		1907.		1909.	
	1902.		Per cent. decrease over 1902.		Per cent. decrease over 1902.
Railway Age Gazette figures...	357.6	298.9	18	245.5	31.3
Revised as above outlined.....	325.4	285.6	12.2	242.4	25.5

On the assumption that the figure for "passengers hauled one mile per pound passenger locomotive tractive power per year," is the quotient arising from a division of the item "passengers hauled one mile per passenger locomotive per year" by the "average tractive power of passenger locomotives," there is considerable difference between the results of my calculations and those of the *Railway Age Gazette,* and I give both sets of figures below:

Passengers hauled one mile per pound passenger locomotive tractive power per year.		1907.		1909.	
	1902.		Per cent. decrease over 1902.		Per cent. decrease over 1902.
Railway Age Gazette figures...	102.4	85	17	81.9	20
Revised as above outlined.....	93.1	83.8	10.9	82.2	11.8

There is no question about there being numerous difficulties in the way of arriving at a correct answer to the problem, which is all the more reason for its being attacked in a vigorous, persistent and consistent manner. There is, however, a question in my mind about the propriety of attempting to arrive at the efficiency of the railway equipment of the country as a whole from such limited and general data. It appeals to me that the term "utilization" more appropriately fits the case than the word "efficiency" and may possibly prevent a distorted view of the situation being taken by a layman, or one not desiring to see the matter in its true light. Undoubtedly a failure to make such a distinction in the past has resulted in erroneous deductions reflecting prejudicially on the railways.

With a view of ascertaining the comparative miles per locomotive per year and day, I have divided the "ton miles per freight locomotive per year" by the "average tons per train" and show below the results:

Year.	Average miles per locomotive. Per Year.	Per Day.	Per cent. decrease compared with 1902.
1902.....	22,486	62	..
1907.....	20,639	57	8
1909.....	17,783	49	21

Is it fair to the railways to consider "efficiency" as based on the "utilization" and of all the locomotives owned during an entire year, when it is well known that the volume of traffic to move varies widely; that a large percentage of the power is stored awaiting business from six to nine months of the year? The same statement, of course, applies to cars; and while there is no question that the figures show that the roads did not utilize the increased motive power or cars in the same proportion as their capacity increased, does this not reflect the fact that there are *too many cars and locomotives?* There certainly was no very great economic loss to shippers in 1909 by reason of failure on the part of the roads to move the tonnage offered; and at the same time, according to the American Railway Association's figures for the fiscal year ending June 30, 1909, there was an average daily surplus of freight cars amounting to 244,000, with a maximum at one time during the period of 340,000. At an average valuation of $1,000 per car this equals an investment of $244,000,000 practically standing idle for one year, the interest on which at 5 per cent. is $12,200,000. These cars require over 1,800 miles of track to store them and much of it is in large cities where terminal facilities are expensive. Yet did we not only a short time ago hear that there was a *car shortage,* and the railway commissioners were ordering the roads to increase their equipment? While I haven't the information as to the increased number of locomotives owned nor the surplus locomotive days, the decrease of 21 per cent. of miles per day in 1909 as compared with 1902 indicates to my mind that a considerable surplus existed. I doubt, however, if it was 21 per cent., for there were other factors in 1909 tending toward a reduction in the miles per locomotive per day.

From the above it will be seen that there is a number of factors which need to be *known* before judgment should be passed.

The factor of "increased tons per train" cannot be intelligently passed upon when compared with an increased "average tractive power" without taking into consideration the question of "balancing" traffic. If there is a material variation in the *volume of traffic moving in one direction* during the period to be compared, it will be quite apparent that full use of the pulling power of the locomotive can be obtained in but one direction, and this may easily bring down the general average although in *the direction of traffic* more nearly the theoretical rating may have been hauled.

To say that a decrease of 21 per cent. in "average miles per locomotive per day" reflects inefficiency is of course an easy way to dispose of the matter if one does not care to see the other side. In order to see the other side one must have a knowledge of how much of the power is stored, and held to protect prospective business; and how much longer it takes the mechanical department to make heavy repairs on a consolidation, Mallet or mikado engine than on the smaller type in use a few years ago, etc. What bearing has an increase of 20 per cent. freight and 14 per

cent. passenger *traffic density* on the ability promptly to move trains over single, or double, track? What bearing has the increase in tonnage of commodities moved at high speed on the *train mileage?*

Averages of performance during a given period means the equivalent use for every day during the period. If the business to move came to the railways uniformally each day, it wouldn't take them long to materially increase their dividends. But they must be prepared to take the business when offered regardless of the *economic necessities* for its prompt movement. Grain, cotton, etc., which are harvested once a year can be forced on the roads for movement in three or four months. The A. R. A. statistics of "tons moved one mile" for 1910 by months show a variation between the minimum and maximum of 22.8 per cent., while a representative trunk line in western territory showed a variation during the same period of 42.6 per cent.; and on some divisions of this road the variation was as high as 100 per cent. Of course to handle such a variable traffic, means a variable number of men; and where a force of trainmen, enginemen, yardmen, etc., is increased with men who know their services are temporary it is not surprising if the efficiency obtained from them was much less than the general average under normal conditions.

Such matters as these cannot be ignored in practice and ought not to be in discussions. Owing to the embryonic condition in which the fundamental operating statistics of the railways are and the complications and expense incident to their proper preparation, it is practically impossible for the railway manager of today definitely to place a cash equivalent opposite many of the items enumerated or prove to himself exactly what bearing they have on operation. At the same time, the practical and capable officer has intuition born of experience; and intuition is not altogether a bad thing to follow,—should it not at least have preference, in passing final judgment, until the prosecution shall have evidence enough to convict (or convince) him?

The measure of efficiency should only be applied during a time when there is a maximum demand for power and equipment, or else after deducting the surplus locomotives and cars during dull periods, data for which is probably not available. It seems to me the following points are the principal ones which need to be persistently followed up *in detail* to bring about a better and more economical use of equipment in general and more real efficiency during times of heavy traffic:

1. A record should be kept of the use obtained from locomotives and the service in which they have been engaged. This should account for each hour of the twenty-four, and should be not only on an engine, but also on a tractive power basis.

2. Thorough yard checks and more accurate car reports should be made.

3. There should be a higher grade of car distribution, and a continual checking of details.

4. A closer acquaintance should be formed between the operating officers and the shipping public in order that shippers may personally know some of the obstacles the operating department has to overcome, and *vice versa,* so that a better understanding be reached which cannot fail to increase efficiency and at the same time result in more satisfaction to shippers.

5. There should be a careful supervision and continual modification of merchandise and package car service, having in view not only good service as to time but the uses of proper cars, with a view of saving empty mileage and transfers; also, when empty cars are moving in the same direction that increased set-out cars are made, so as to save delays to local trains. This, of course, brings down the average "tons per loaded car" slightly, but on the whole increases efficiency.

6. Continual checking of empty car mileage should be done by classes and sub-divisions for cross-hauls.

7. Opportunities should be better availed for transfer of loads into equipment ordinarily moving empty one way, as stock cars, coal cars and refrigerator cars.

8. Increase minimums as far as practical according to the actual requirements of the traffic.

9. There should be gradual tightening of the rule for preventing detention of cars by shippers.

10. A more intimate knowledge should be acquired by the car distributors of "cost of transportation," that advantage may be taken of opportunities for short routing empty foreign or system cars via the line of lowest *real cost* instead of by routes that make excessive empty mileage producing an invisible, although real, increased cost.

N. D. BALLANTINE,
Superintendent Car Service, Rock Island Lines.

EFFICIENCY OF PUBLIC SERVICE OF AMERICAN RAILWAYS.*

BY JULIUS KRUTTSCHNITT,

Director of Maintenance and Operation, Union Pacific System and Southern Pacific Company.

A railway is a machine designed to manufacture freight and passenger transportation; it makes ton miles and passenger miles. How this machine does its work is a matter of great interest and great importance to the public, for the railway derives its franchise from, and renders its service to, the public.



Note: United States, year 1909. United Kingdom and Germany 1908. France and Switzerland 1907.

Chart A—Relative Efficiency of Capital and Public Service.

The unit of freight service is one ton hauled one mile; of passenger service, one passenger hauled one mile. The people are concerned in the quantity and quality of the ton and passenger miles that the machine produces; in the cost incurred in their production and in the prices, or rates, charged for them. They are concerned in the punctuality and safety of the transportation the railway furnishes and, indeed, in all those characteristics of its management and operation, which, taken together, make for efficiency or inefficiency.

The efficiency with which any one of our railways is, or all of them considered as a single system, are managed must be gauged by the results produced by the machine as a whole. Criticism has sometimes been made that parts of it are not efficiently operated. No railway man will deny that some parts of the transportation plant are not worked to their maximum possible capacity.

It can be shown, for example, that the average tractive power

*Abstract of a lecture delivered at Harvard University on April 26.

of locomotives and capacity of freight cars have increased faster than the amount of traffic which on the average is hauled per locomotive and per car. It can be shown that the amount of mail handled per postal car is much less than the average amount which each car is capable of transporting. It can be shown that the average number of passengers hauled per train is much less than the average passenger train can easily accommodate. But while it may easily be demonstrated that the maximum

Table 1.—Capitalization and Results of Operation.

	United States. 1909.	United Kingdom. 1908.	Germany. 1908.	France. 1907.	Switzerland. 1907.
1. Capitalization per mile of road	$59,259	$275,040	$109,788	$139,237	$110,740
2. Units of frt. and pass. service per dollar of capital	18.07	4.04	12.46	6.31	8.12
3. Relative service per dollar of capital	447	100	308	156	201
4. Net operat. revenue per mile of road	$3,505	$9,127	$4,816	$5,641	$4,672
5. Ton miles freight per mile of road	953,986	529,622	827,400	496,939	442,012
6. Ton miles frt. per dollar net revenue	272	58	172	88	95
7. Passgrs. one mile per mile of road	127,299	580,044	540,045	380,355	456,654
8. Pass. & frt. units serv. per mile of road	1,081,285	1,109,666	1,367,445	877,294	898,666
9. Units of pass. and frt. serv. per dollar net revenue	308	122	284	156	192
10. Average earnings per passenger mile, cts.	1.928	1.542	0.93	1.54	1.30
11. Average earnings per ton mile, cts.	.763	2.333	1.42	1.43	1.74

Authorities: I. C. Statistics of Rys. of U. S., 1909; Report of British Board of Trade, 1908; Statistik der im Betriebe befindlichen Eisenbahnen Deutschlands, 1908; Statistical Abstract for Foreign Countries, issued by British Govt., March, 1910; Statistiques des Chemins de fer Suisses, 1907.

possible efficiency with which different parts of the railway plant might be operated under ideal conditions is not attained, it would be much harder to show that the maximum efficiency *practicable* under the conditions which actually exist, and with which the railway managers have to deal, is not approached. The railway manager has not, never has had, and never can have, the same degree of control over the operations of his plant and of each part of it that the manager of a mercantile or a manufacturing concern may exercise. Shippers demand, and properly, that freight shall be transported with regularity and expedition; and speedy and regular transportation are important elements in efficiency of operation. But it is often not practicable to move freight with the maximum speed and regularity, and at the same time hold cars and engines at terminals until the maximum car load and the maximum train load have

Table 2.—Comparative Capitalization and Service Rendered the Public, of Railways of United States, Years 1889, 1899 and 1909.

	Totals or Averages.			Relative.		
	1909	1899	1889	1909	1899	1889
1. Railway capital per mile of road	$59,259	$51,764	$48,028	123	108	100
2. Railway taxes per mile of road	$401	$245	$179	224	137	100
Certain facilities per 100 miles of road:						
3. Additional main track and sidings	45.43	33.32	27.37	166	122	100
4. Locomotives	24.30	19.39	18.93	128	102	100
5. Passenger cars	19.36	17.88	16.73	116	107	100
6. Freight cars	880.87	684.39	556.79	158	123	100
7. Operating expenses and taxes per $1,000 of capitalization.	$123.25	$104.50	$91.26	135	115	100
8. *Public service rendered (ton and passenger miles):*						
A—Per $1.00 of capitalization	18.07	14.25	10.89	166	131	100
B—Per $1.00 of earnings over exp. and taxes	348	337	274	127	123	100

been obtained. It would be easily possible for the railways to haul a much larger average load of mail per mail car, but under regulations of the postal department, postal cars are limited to a carrying capacity of only about three tons, whereas express cars can easily be loaded to the roof with twenty to thirty tons of express. Again, in the passenger service, the reason why the railways on the average haul only 54 passengers per train when the average train has a capacity of at least 150 passengers, is that the public demands, and properly, that it be given frequent and regular service, and frequent and regular service is incompatible with the maximum loading of trains.

The facts which I have cited illustrate one point which has been quite generally overlooked in discussions of railway efficiency. This is that efficiency from the standpoint of the railway manager often is not the same thing as efficiency from the standpoint of the public. Efficiency from the standpoint of the railway may consist in loading cards and trains to their capacity and moving only the minimum number of cars and trains necessary to handle the business. Efficiency from the manager's standpoint may involve a relatively slow movement of trains, because the faster engines are driven the greater the amount of fuel they consume and the smaller the load they can pull, the result being that the cost of running the train is increased, while the revenue derived from running it is reduced. On the other hand, as I have said, speedy, frequent and regular service is a very important factor in efficiency from the standpoint of the public. Now, when the public insists on a kind of transportation which is incompatible with the most economical operation, no one can justly criticise the railway managers for

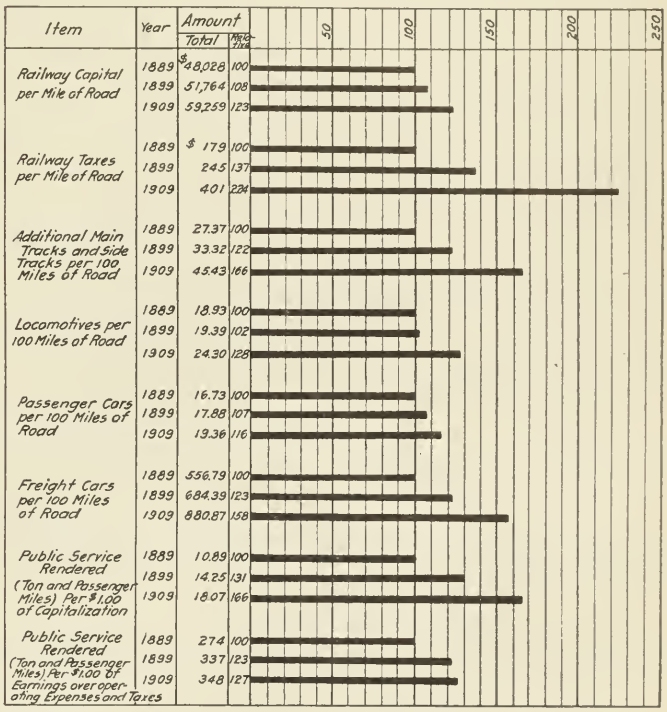


Chart B—Capitalization and Public Service of Railways of the United States.

complying with the public's demands and for that reason failing to operate the properties with the maximum possible economy. If the railway managers operates the properties, not with the maximum economy that might be possible under certain conceivable ideal conditions, but with the maximum economy that is practicable under the actual conditions with which they have to deal, they do all that they reasonably can be asked to do. I think that the railway managers of the United States are approximately much closer to the maximum *practicable* efficiency and economy of operation than most people believe.

The gentlemen whom I have the honor of addressing tonight will soon be actively participating in the public affairs of this country; many may become interested in railways and many may be occupying seats in state and national legislative bodies, in municipal, federal and state commissions, or even much higher offices, regulating the railways that their comrades have bought. It is important that such men should be properly informed regarding important questions affecting so great an industry as that of transportation. It shall be my endeavor, there-

fore, to demonstrate to you that the popular clamor about inefficiency in the management of our railways is unjustified; and by doing so to try to show you why you should bring the light of reason to bear on all questions pertaining to railways that may be presented to you in future, resisting temptation to tinker with or attempt to repair a piece of machinery until it is thoroughly understood, heeding the wise injunction that I remember as a child to have seen prominently displayed on French mechanical toys:

"Quoi qu'elle soit tres solidement montée il ne faut pas brutaliser la machine."

THE EFFICIENCY OF CAPITAL INVESTED IN AMERICAN, AS COMPARED WITH FOREIGN RAILWAYS.

I have chosen for comparison with the railways of the United States, those of the United Kingdom, Germany, France and Switzerland. The railways of two of these countries, Germany and Switzerland, are in the main owned and operated by the governments; and those of the United Kingdom, which are privately owned, and of France, most of which are privately owned, would naturally be included in any comparison. One of the best tests of the efficiency with which any business is managed is the ratio between the capital invested in it and the results obtained with that capital. The capitalization per mile of the railways of the United Kingdom, Germany, France, Switzerland and the United States, and the relation between their capitalization and the results of their operation are shown in Table 1 and graphically in Chart A.

The capitalization per mile of the American roads is very much smaller than that of the roads in any of the other countries. This is very largely due to the conservative policy that has been followed by our railways of paying for many improvements, such as renewals with heavier rails and fastenings, larger cross ties, etc., out of earnings and charging them to operating expenses instead of to capital account.

The very large capitalization per mile of the British roads is to a great extent a result of following the opposite policy—that of charging all additions and improvements, no matter how small, to capital. The effect of this policy has been to embarrass the English railways seriously and even to raise grave fears as to their continued solvency.

As I have already said, the units of service rendered by the railway to the public are one ton hauled one mile and one passenger hauled one mile. It is for rendering these services that the public creates and pays the railway. Every dollar of capital which the owners of the railways of the United States have invested, renders four and a half times the service that the same dollar renders in the United Kingdom; one and a half times as much as in Germany; three times as much as in France, and two and a fourth times as much as in Switzerland.

It will be noted that the net operating revenues per mile of road—that is the net earnings or annual rental paid by the public for the hire of capital in the railways of the United States—are smaller than those of any of the other railways with which comparison is made. For every dollar of net earnings the railways of the United States rendered two and a half times as much service to the public as did the railways of the United Kingdom, and twice as much as did the railways of France. The Swiss and German railways are owned and operated by the governments, and yet for every dollar of net earnings the railways of the United States rendered from one and a fourth to one and a half times as much service to the public as did the railways of Switzerland and Germany. And they did so while charging the lowest average freight rates in the world. In other words, the owners of the railways of the United States received less profit in proportion to the amount of service that they rendered to their patrons than did the owners of any of the other railways, and the amounts that they charged shippers for rendering these services were smaller than the amounts charged the shippers by the railways of any of the other countries.

Let me try to indicate the results by another comparison. For the net amount earned on each dollar of capital the railways of the United States moved a passenger and about five and a half tons of freight one mile; those in the United Kingdom, a passenger and only .85 of a ton of freight, and those in Germany, a passenger and three tons of freight.

Because the owners of our roads received less in proportion to the services rendered by them than did the owners of any of the other railways, they might very well pronounce the management of their properties comparatively inefficient, but the users—the public—that received more services in proportion to what they paid than did the users of any foreign railways, have reason to consider the management highly efficient.

Table 3.—Fatalities on Railways of United States, Years 1889, 1899 and 1909.

	Averages.			Relative.		
	1909	1899	1889	1909	1899	1889
Passengers Killed:						
Due to collision or derailment	86	82	135	64	61	100
At stations, crossings, and other causes	163	157	175	93	90	100
Total	249	239	310	80	77	100
Passengers carried one mile	29,109,322,589	14,591,327,613	11,553,820,445	252	126	100
Passengers Killed per 100,000,000 Passenger Miles:						
By collision or derailment	0.30	0.56	1.17	26	48	100
By other causes	0.56	1.08	1.51	37	71	100
Total	0.86	1.64	2.68	32	61	100
Employees Killed:						
Due to collision or derailment	460	334	292	157	114	100
At stations, yards, and other causes	1,899	1,876	1,680	112	112	100
Total	2,358	2,210	1,972	120	112	100
Number of employees	1,502,823	928,924	704,743	213	132	100
Employees Killed per 1,000 Employees:						
By collision or derailment	0.31	0.36	0.41	76	88	100
By other causes	1.25	2.02	2.39	53	85	100
Total	1.57	2.38	2.80	56	85	100
Trespassers and Others Killed:						
Due to collision or derailment	76	63	66	115	95	100
Struck by trains and other causes	5,737	4,611	3,475	165	133	100
Total	5,813	4,674	3,541	164	132	100
Total train mileage	1,112,452,351	862,258,714	660,441,377	168	131	100
Trespassers killed per 1,000,000 train miles	5.23	5.42	5.36	98	101	100
Total deaths incident to train movement	8,420	7,123	5,823	145	122	100
Deaths not incident to train movement	302	Not reported		...	...	...
Total shown by I. C. C. reports	8,722	7,123	5,823	...	...	...

Note.—Excludes accidents due to causes other than those resulting from movement of trains or cars, also accidents to trespassers and persons other than passengers and employees.

INCREASE OF EFFICIENCY OF RAILWAYS IN TWENTY YEARS.

Let us now turn from comparison of the efficiency of our own with foreign railways to a comparison of the present with

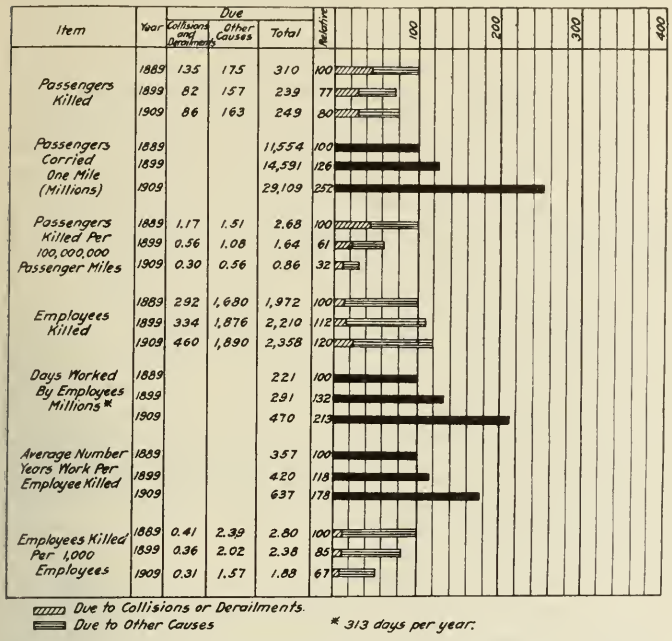


Chart C—Fatalities to Passengers and Employees on Railways in the United States.

The figures given in the chart for employees killed per 1,000 *employees for* 1909 *should read:* 0.31—1.26—1.57—56, *conforming to those given in Table* 3.

the past efficiency of our railways. Chart B and Table 2 show the increases from 1889 to 1899, and then to 1909, in the capitali-

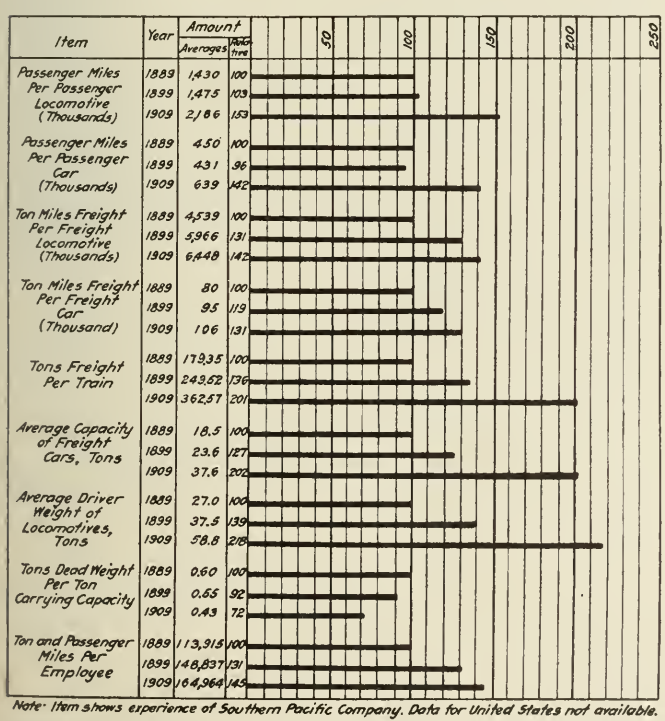


Chart D—Efficiency Per Unit of Men and Transportation Vehicles, on Railways in the United States.

zation of our railways, in taxes paid by them, in their sidings and additional main tracks, and in locomotives, passenger and freight cars, and also the increase between these years in the public service rendered per dollar of capital and per dollar of earnings over expenses.

It is a very remarkable fact that the increase in capitalization in twenty years was only $11,200 per mile, or 23 per cent. The cost of additional side tracks and equipment would easily cover $7,000 per mile of this increase. This leaves but $4,200 to represent the very large sums spent principally in the last ten or twelve years in the practical reconstruction of many important railways, which involved extensive reductions of grades and rectifications of curves; the building of additional expensive stations and terminals; the ballasting and tie-plating of tracks; the laying of heavier rails and ties; the construction of heavier bridges; the installation of interlocking and signalling systems; the replacement of perishable wooden by permanent structures using cement, masonry and steel; and the accomplishment of numerous other betterments. These improvements represent an average expenditure of very much more than $4,200 per mile, and that the increase in capitalization has been so small has been due to the fact that, as previously stated, much of the expenditure for them has been out of earnings and has not been capitalized. It is not represented by securities at all, but it is very clearly reflected in the more substantial character of the property and in a very large increase in its value.

The American practice of investing large amounts of earnings in improvements, together with the rapid rise in property values caused by the development of our country, has made the actual physical value of our railways much larger at the present time than their capitalization, regardless of "stock water-

Table 4.—Efficiency per Unit of Men and Transportation Vehicles; Railways of United States.

	Averages.			Relative.		
	1909	1899	1889	1909	1899	1889
1. Pass. miles per pass. locomotive	2,185,877	1,474,765	1,430,105	153	103	100
2. Pass. miles per pass. car..	638,586	431,059	450,178	142	96	100
3. Ton miles frt. per frt. locomotive	6,447,708	5,966,193	4,538,786	142	131	100
4. Ton miles frt. per frt. car	105,518	95,458	80,473	131	119	100
5. Tons freight per train....	362.57	243.52	179.35	201	136	100
6. Average capacity of frt. cars, tons	37.6	23.6	18.5	202	127	100
7. Average driver weight of locomotives, tons	58.8	37.5	27.0	218	139	100
8. Tons dead weight per ton carrying capacity	.43	.55	.60	72	92	100
9. Ton and passenger miles per employee	164,964	148,837	113,915	145	131	100
Ton and passenger miles per employee:						
10. United Kingdom—1907...	42.155					
11. Germany .....—1908...	69,546					

Note.—Items 6, 7 and 8 show experience of Southern Pacific Co.—data for United States not available.

ing" that may have been done in the past. In several instances, notably in the states of Minnesota and Washington, valuations of railway properties made by public commissions have exceeded the total capitalizations of the roads included. The boards of assessors in many states have made official records of their opinion that the increase in the value of the railways of the United States during the last two decades has been greater than the increase in their capitalization. The capitalization per mile increased from $48,028 in 1889 to $59,259 in 1909, or 23 per cent. Meantime the taxes which the railways were obliged to pay increased from $179 to $401 per mile of road, two and a half times as much, or 124 per cent. Assume, for the purpose of this discussion, that one-third of the capital of $48,000 in 1889 was fictitious or "water," the real value was only $32,000 per mile. An increase of 124 per cent. in that amount makes $72,000 per mile, which we may take as the estimate of the public through its taxing authorities of the present value of our railways, as compared with their actual capitalization of only $59,259 per mile.

While capitalization per mile has increased only 23 per cent. and taxes per mile have increased 124 per cent., the intensive development of the properties has been so carried forward that the increase in the mileage of additional main and side tracks has been 66 per cent., the increase in the number of locomotives 28 per cent., in passenger cars 16 per cent., and in

freight cars 58 per cent. This takes no account of the great enlargement of the capacity of equipment, which was proportionately in excess of the increase in its amount. In consequence of the improvements indicated by these figures, the railways were enabled to so increase their efficiency that at the end of the twenty years' period they rendered 66 per cent. more public service for each dollar of their capitalization than they did at its beginning. In spite of a 35 per cent. increase in the operating expenses and taxes per dollar of capital they rendered in 1909 27 per cent. more service per dollar of earnings over operating expenses than they did in 1889. The extent to which their efficiency was increased will be much better understood if it be considered that during this period the wages of all kinds of labor and the prices of most commodities were increasing while the rates received by the railways decreased. Quantities of labor and commodities which in 1890 could be bought in exchange with one ton mile, required for their purchase 1.60 and 1.43 ton miles respectively in 1907. Of course, the obvious tendency of these reductions in rates and these increases in prices of labor and commodities was to enhance the difficulty of rendering a given amount of public service with a given amount of capital. It would seem that the foregoing figures demonstrate conclusively that on the average each dollar of capital invested in railways has been progressively made much more productive and much more efficient during this twenty years.

THE ACCIDENT RECORD OF AMERICAN RAILWAYS.

Contrary to general belief, great progress has been made by the American roads within the last two decades in making transportation safer, and this has been done notwithstanding the number and speed of fast passenger trains, to which most of the fatal accidents are attributable, have been increased; that the density of traffic has been largely augmented, and that the rapid growth of business has made necessary the employment of numerous inexperienced men, and the promotion to responsible positions in train service of others with less experience than would ordinarily be put in such service.

Owing to acts of Congress requiring reports of individual casualties the statistics of the Interstate Commerce Commission regarding them are, for recent years, extremely complete. They were much less complete in earlier years, as then the carriers had to make only annual reports, and there is no question that many minor injuries now reported under the head of "persons injured" escaped notice and were not included in the earlier reports. The ratio of injuries to fatalities reported in 1889 was 4.5; in 1899, 6.2; and in 1909 nearly 11. It is fair to assume that the ratio between injuries and fatalities remains reasonably constant, and the fact that the ratio between those reported have not remained constant, justifies the belief that in the earlier years a smaller proportion of injuries was reported than is now the case. I believe, therefore, that the only way to arrive at a correct conclusion as to the relative safety of travel at present and in past years, is to ignore the statistics as to injuries and to make comparisons only between the number of fatalities, every one of which necessarily has been reported.

Table 3 and Chart C show that both travel and employment on the railways of the United States are much safer than is popularly supposed. The statistics indicating the ratio of passengers killed to passengers hauled one mile, demonstrates that on the average in 1909 a passenger could travel 4,000 times the distance around the earth without being killed, or to state the matter in another way, he could ride at the rate of 60 miles an hour for 220 years without having a fatal accident. Similarly the figures giving the ratio of the number of employees in service to the number killed show that on the average an employee could work for 637 years before being killed.

As we must all rely on the statistical reports of the Interstate Commerce Commission for our information about the results of operation of the railways as a whole, I wish to call attention to the fact that the comparative summary of railway accidents on page 86 of the commission's statistics for 1909 is misleading. It is apt to cause the conclusion not only that a great number of persons are hurt on railways, but that there has been a large increase in the number. The number of casualties in 1899 is given as 5,282, and in 1909 as 8,722, an increase of 3,440. But a reference to the report for 1899 will show that in that year no casualties due to such causes as handling freight at stations, accidents in shops, etc., were included. These figures are included in the report for 1909, which accounts for 302 of the increase in deaths. Again, 2,318 of the increase in deaths were those of trespassers and other persons, leaving a net increase of only 820 in passengers and employees killed, or 36 per cent. Meantime, there was an increase of 113 per cent. in the number of employees, and of 152 per cent. in the volume of passenger traffic, which shows that proportionately there was a reduction and not an increase in accidents.

Guided by the light of statistics all the dark holes and corners of American railway operation have been explored; the life of timber in cross ties and trestles has been increased from two to four fold; equipment has been improved in design and wonderfully increased in capacity; new locomotive designs to burn the lowest grades of cheap fuels have been perfected; hot boxes so annoying and productive of delays in past years have been reduced so that they are practically a thing of the past; the wasteful haul of empty cars has been largely reduced by pooling freight equipment.

INCREASED EFFICIENCY PER EMPLOYEE AND MACHINE.

Table 4 and Chart D herewith, show the extent to which by means of more efficient methods the work done by each locomotive and car owned, and by each employee, as measured by the ton miles and passenger miles handled per employee per car and per locomotive, has been increased since twenty years ago. The efficiency per passenger locomotive has been increased 53 per cent.; per passenger car, 42 per cent.; per freight locomotive, 42 per cent.; per freight car, 31 per cent.; and per employee, 45 per cent. These results have been achieved in spite of the fact that conditions of employment have become more favorable to the employee so that he works less hours per day for a month's salary and runs less miles in train and engine service in doing a month's work.

I have incidentally referred to reductions of grades and curvature involved in rebuilding many miles of our railways. A typical piece of reconstruction on the line of the Southern Pacific, was the Lucin Cut-Off, in Utah, which shows strikingly how the efficiency of motive power is increased through modernizing the permanent way. By the construction of that cut-off, the hauling power of a consolidation locomotive used on that part of the system was increased 148 per cent.

In the general reconstruction of the Union Pacific and Southern Pacific in the states of Wyoming, Utah and Nevada, 19,742 degs. of curvature, or 55 complete circles, were eliminated. The maximum grades were reduced from approximately 100 ft. to the mile to 43 ft. to the mile on the Union Pacific, and 21 ft. on the Southern Pacific, and the line between Cheyenne and Reno was shortened 82 miles. In doing this 484 miles of new railway were constructed, or almost enough to reach from Boston to Buffalo.

Chart E shows the following:

1. The trend of labor and commodity prices for fifteen years from 1894 (the year following the panic of 1893), to 1909, based on data taken from bulletins 77 and 87 of the United States Bureau of Labor. As these bulletins do not contain data as to prices for labor subsequent to 1907, we have assumed that these prices did not increase in 1908 and 1909, an assumption known to be incorrect, but which we make, as its effect is unfavorable to our exhibit.

2. The rates per passenger mile and per ton mile actually received by the railways and *estimates* of what these rates *would have been* had they followed the trend of labor and commodity prices.

Do you fully appreciate what the present average rates of

1.92 cents per passenger and 0.76 cents per ton mile mean? The former is a little less than the value of a two-cent postage stamp, yet for the cost of this small stamp the railway transports a passenger and his luggage one mile, and in addition, 3,600 lbs. of vehicle to seat him, 650 lbs. of vehicle for his luggage, and 2,000 lbs. of sleeping, dining and parlor equipment for increasing his comfort. For the same tiny stamp the railway carries 2¾ tons of freight one mile for the shipper, and provides and hauls on its passenger trains for the Post Office Department the equivalent of a fully-equipped post office on wheels weighing 45 to 50 tons a distance of about ¾ of a mile.

The ordinates intercepted between full and dotted lines in the lower diagrams give the savings per passenger and per ton mile accruing to the public from the action of forces that prevented rates from following the trend of prices. The most potent were, (a) Reduction in cost resulting from larger increase in volume of business and, (b) More efficient operation made possible by reducing curves and grades, adopting larger, heavier and better designed locomotives and freight equipment; building more main tracks, side tracks, yards and terminals; adopting more refined methods of operation, such as carefully rating locomotives, running them at most economical speeds for

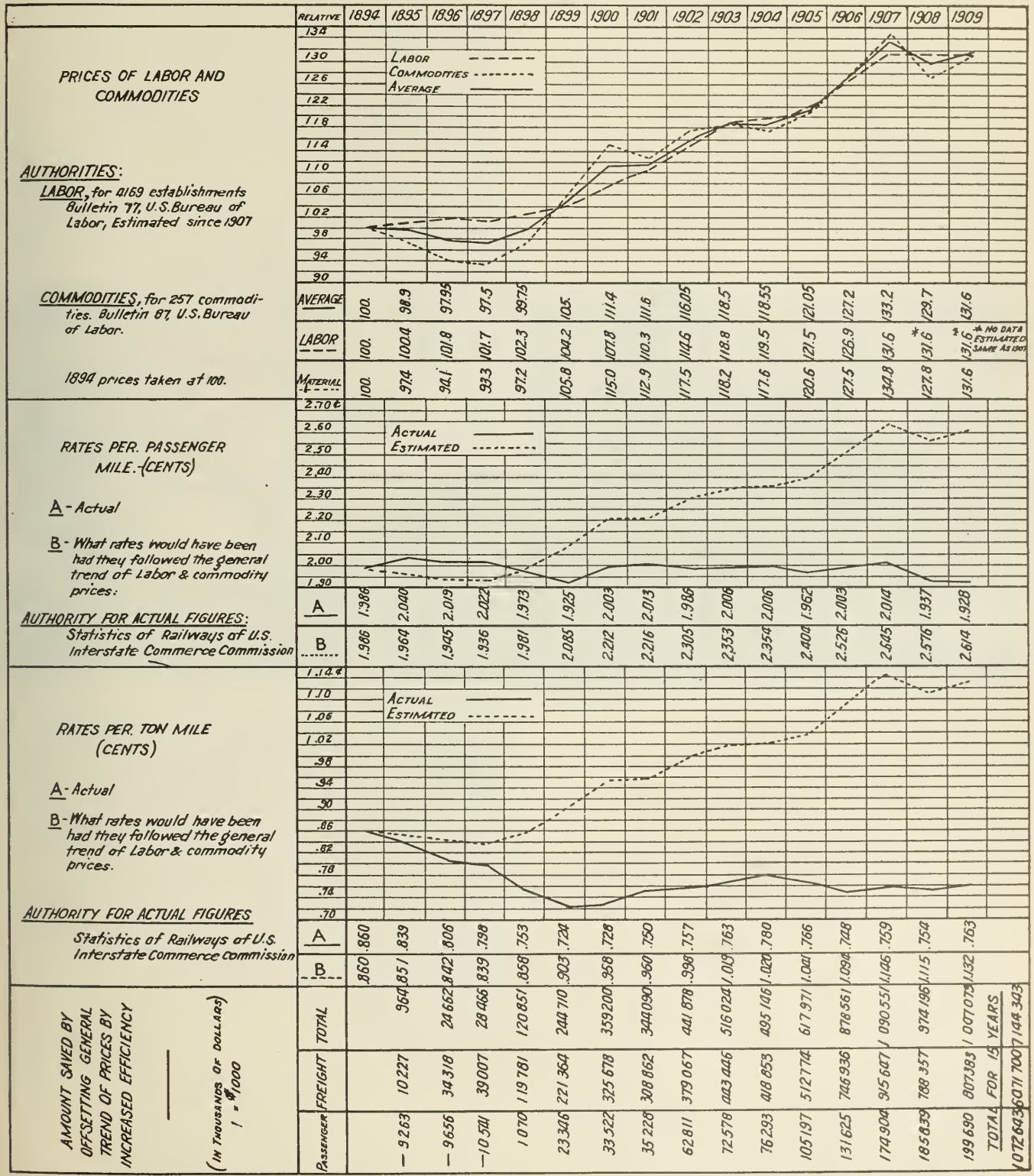


Chart E—Relative Prices of Labor and Material and Earnings Per Passenger and Ton Mile of All Roads in the United States.

freight trains, eliminating delays to men, motive power and equipment, etc.

Multiplying the saving in rate for each year by the passenger and ton mileage, and adding the products, shows that in the fifteen years $7,144,343,000 was saved to the public in transportation charges. Some conception of this amount may be formed by considering that it means an average saving per day over the entire period of a little over $1,300,000, and that for the year 1909 it means a saving to the public of $2,760,000 every twenty-four hours.

BRIDGE REPLACEMENT ON THE BOSTON & ALBANY.

The increase in the weight of cars and locomotives has made it necessary to renew a number of bridges on the Boston & Albany during the past year. In all, 19 bridges have been replaced, their spans running from 38 ft. to 114 ft., and the work contemplated involves renewing 40 more. The method of doing the work has been to erect the new bridge alongside the old, couple the two together, set them on a nest of rollers, and when the rails and ground connections are broken, draw the old out and the new into place at once.

The time occupied in the actual moving has varied from 35 to 50 seconds, most of them being between 40 and 50 seconds. The time between the last train over the old structure and the first one over the new has varied from 1½ to 2 hours, while the time from the start of breaking the rails until the connecting rail is down and ready to take a train runs from 1 to 2 hours, with an average of about 1¼ hours. In all of the work, however, it has not been found to be necessary to flag a single train, though, of course, a slow order is kept in force from the time work begins on the disturbance of the old bridge until all work is done on the new and the approaches are adjusted and settled.

The last bridge replaced was a three-span, through-truss bridge over the Westfield river at Huntington, Mass., the work being done on Sunday morning, April 9. The lengths of the three spans were 80 ft., 103 ft. and 80 ft. respectively. The new bridge is of the through plate-girder type and is composed of three spans of the same lengths as the old ones. The general details of the bridges are shown in the accompanying table.

The old truss spans were of the usual lattice type, with chords and end posts of box sections latticed on the open sides. This bridge was built in 1875 and was reinforced in 1894.

The new bridge is a heavy plate girder structure, with 8 in. x 8 in. x 1 in. flange angles and side plates for reinforcing the web, as well as partially serving as flange sections. This steel work was built under the 1910 specifications, and to Cooper's E-60 loading.

The floor system is continuous, with an anchorage of the spans on one pier only. The girders expand on the abutment immediately adjacent to that pier, and in the other direction continuously over the adjacent pier and on the farther abutment. Expansion pockets are used merely for convenience during erection and for preventing any consecutive thrusts from the track being transferred to adjacent spans.

Bridges Replaced on the Boston & Albany, 1910-1911.

Bridge No.	Location.	Length.
70	Rochdale	114 ft.
81	West Brookfield	113 ft.
92	West Brimfield	93 ft.
125 (3 spans)	Huntington	295 ft., in progress
126 (3 ")	Huntington	263 ft.
129 (2 ")	Chester	190 ft.
132 (2 ")	Chester	194 ft.
133	Chester	109 ft.
145	Middlefield	80 ft.
147	Becket	108 ft.
148	Becket	98 ft.
149	Becket	106 ft.
167-A	Pittsfield	47 ft.
172	Pittsfield	38 ft.
173 (2 spans)	Pittsfield	100 ft.
201	Chatham, N. Y.	70 ft.
202	Chatham, N. Y.	105 ft.
203	Chatham, N. Y.	71 ft.
209 (2 spans)	Chatham, N. Y.	148 ft.
222	Rensselaer, N. Y.	55 ft.

Note.—Total length of *single* track on bridges replaced aggregates about one mile.



Bridges Before Being Moved.

The illustrations will give a fair idea of the location and general methods involved. In the first place the old bridge had to be carried by blocking, while new piers were being built below it. This necessitated raising the whole structure about 12 in. to give the necessary clearance and to permit placing the train of rolls that was to carry it out of the way. As the work has been done during the past few months, it involved the usual protection against high water, ice and drift. After the completion of the masonry the new bridge was erected on trestles that extended about 45 ft. up stream from the

old structure. This was just beyond the up-stream girder of the new bridge as it was erected. The trestles are of short vertical posts, set on sills laid in the bed of the stream, with caps and cross ties to carry the runway for the rest of the



End View of Old Bridge, After Moving.

rollers. These runways were formed of nine 90-lb. rails nested as shown in the photograph. They were laid on a very easy incline, so as to facilitate the movement of the bridge, and with a slight adverse incline like a gentle kick-back at the lower end so as to check the motion of the bridge. They were carefully wedged and brought to a true alinement, so that they presented a smooth bearing for the rollers over the whole width. The rollers were 2 in. in diameter, and were spaced about 24 in. apart. They were 36 in. long, and were held in position by spacing bars or angle racks drilled to set over



Blocking Under Old Bridge, After Moving.

the ends of the rollers outside the runway and the runners on the bridge. The runners were also made of rails, but were not nested. They were set side by side, flange down; seven were used in each runner, so that it was somewhat narrower than the runway. The bridges were set on these runners through blocking and wedging that kept them at the proper height.

At the ends of the old bridge a good deal of temporary blocking had to be used in order to facilitate the clearing away on the morning of the movement. The obstructions on the down-stream side at one end necessitated the complete cutting away of the truss and carrying it by temporary blocking and falsework. The end was simply cut off and a wooden post with tie bolts inserted; in this condition it carried its load for some time. The cutting was done with the oxy-acetylene flame, which is used by the contractors in all of their work of demolition. If a girder is to be cut the flame does it. If a pin cannot be driven out the piece is cut away around it and taken out with the pin. If rivets are in an awkward position to be cut, no time is spent in attempting to cut with a chisel; the oxy-acetylene does the work.

At the ends of the bridge it was impossible to put in the walls and back filling until the new bridge was in place. As soon, then, as the last train had passed, the connecting rails were removed, the blocking torn out and everything cleared so that there was a space of about 15 ft. between the ends



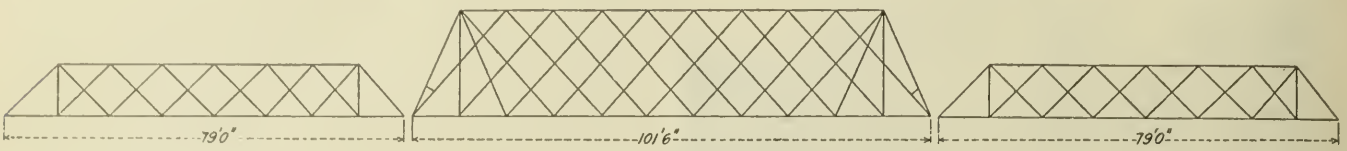
False Work on Which New Bridge Was Erected.

of the bridge and the banks, due to removing the skew end stringers. As soon as this was done the signals were given and the bridge moved. The time occupied in the movement was 49.2 seconds.

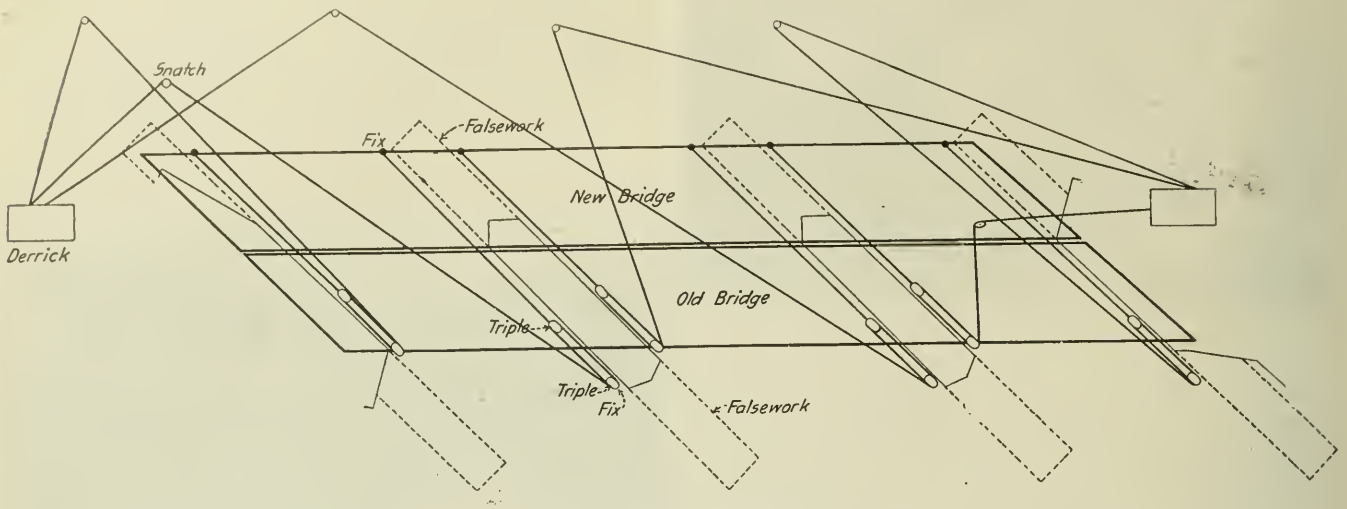
It was moved by six leads running out to three drums on each of two derrick cars stationed on either bank. The method of reeving the lines is shown in the accompanying sketch. There was a triple block and fall on each lead from the up-stream side of the new bridge, the steel rope being led around a snatch block to the winding drum on the car. The purchase was thus raised to 6 to 1, enough to permit of slight variations in winding speeds without it being perceptible on the moving structure. When all was ready, the erecting foreman, H. D. Mason, under whose supervision and control the work was done, took a position at the center of the bridge, with an assistant at each end. Hand signals were used, and these were so complete and clearly understood that there was no perceptible difference in the time of starting or stopping at the two ends, while the movement was gentle and steady throughout. Standing on the bridge there was no jerk or jar from start to finish, and it was difficult to realize what had been done. The movement started smoothly and accelerated for about 5 seconds; then there was a steady motion for about 40

seconds, and finally a gradual slowing down to the stop at 49.2 seconds.

The smoothness and success of the performance was of course due to the care and foresight that had been exercised in the preparation. For a week before the movement the engineers had been busy in checking the levels and the alinement. The levels of the runways had been repeatedly taken and their alinement had been checked and cross-checked until every possibility of an error had been eliminated.



Old Truss Bridge.



Arrangement of Tackle.

This sketch is not drawn to scale, and the positions of the snatch blocks are not accurate.

The moment the bridge was in position there was a display of team work on the part of the several departments interested that spoke more volumes for the general efficiency of railway operation than their critics could utter on the other side in weeks. The floor, the ties and the rails on the bridge were in place. The rails were plated and loosely spiked, but not bonded. They were laid so as to be approximately in place to admit of the dropping in of a single rail between their ends and the rails on land. The gap to be spanned was about 15 ft.

A trestle bent had been left in against the bank, the top of whose cap was level with the top of the adjacent pier. The moment the bridge stopped a gang of men started to place the stringers across from the bent to the pier. Main ties were laid on these and they were blocked to take the cross-ties. At the same time a section foreman commenced leveling the back fill and driving back the bridge rails to permit the connecting rail to be dropped into place. The moment it could be slipped in, it was placed, the ties were slipped beneath it and tamped up to surface. Then the permanent spiking of the bridge rails was done. At the same time the signal forces were at work with the bonding. The holes were drilled and the bonds riveted home. It would be difficult to say as to which finished first, but at any rate the bridge was ready for a train full 20 minutes before the first one presented itself for passage.

A noticeable feature of the performance was the alacrity



New Bridge in Position.

with which the men sprang to their work, apparently sharing in the anxiety of the foremen to maintain the record of not flagging a train. The efficiency of the organization was also shown by the smoothness with which the work progressed. There were no false moves. Every stringer dropped into its place and fitted there, the bents and masonry needed no shimming, ties and plates and bonds were at hand, every shovelful of dirt went to its appointed place and remained there, and there was no scarcity of cinder to raise the rails. Each man had his place and filled it without interfering with others, and though they seemed packed like sardines about the bridge ends there were no cross currents or counter-movements. They acted like well-drilled veterans for the work in hand.

The schedule of the performance was as follows:

Last train over old bridge	9:35 a. m.
Bridge started to move	10:18 a. m.
Time of moving bridge	49.2 seconds
First track completed	11:15 a. m.
Second track completed	12:00 m.

No trains flagged.

The general design of the new bridge came from the railway company and was executed by the American Bridge Company. The plan for erection and replacement, as given in the first few lines of this article, together with the execution of the details, was handled by the Lucius Engineering Company, Pittsburgh, Pa., under the approval of the railway's engineering department. The railway staff which directed the entire work consisted of F. B. Freeman, chief engineer; W. F. Steffens, engineer of structures; and W. B. Knight, division engineer. The details were worked out in the field by the Lucius Engineering Company, and especially by their foreman of erection, H. D. Mason.

SOME SUGGESTIONS FOR INCREASING EFFICIENCY.

BY N. F. DOUGHERTY,
Yardmaster, Pennsylvania Railroad.

In this country generally the railways have reached the end of their construction period. Today the problem is how these great commercial factors may be maintained and operated so as to give to the public efficient transportation service, and to their owners a fair profit on their investment. The solution is, first, in better organization; and, secondly, as in any other business, in a low cost of production.

Under the present scheme of organization there is no adequate system. This is apparent in the absence of direct control of operations. Before a plan can be executed it must pass through various so-called departments, many of which are not concerned, and by the time it reaches the place of execution the emergency or necessity for which it was evolved has passed, or else the plan has become so encumbered with suggestions as to be impracticable. For instance, the president will issue an order to a vice-president, who, in turn, issues it to the general manager, thence to a general superintendent of transportation, thence to a superintendent of transportation, thence to a general superintendent, thence to a chief car distributor, thence to a division superintendent, thence to a trainmaster, thence to a yardmaster, at last reaching the person who is to execute it, a conductor. By that time there is nothing to be done—the emergency has passed, or, as is usually the case, has taken care of itself.

The field of railway operation is so vast that to secure direct control requires unit control; in other words, divisional responsibility. The important point on a railway is the yard, for it is there that congestion of traffic begins which in a short time works back and results in road congestion. In nearly every instance the cause may be traced to want of authority in the yardmaster to control the operations of the roundhouse, car inspection, track and clerical forces, all of which in the complex organization of railways have a certain bearing on operation. Therefore, by increasing the scope of authority of the yardmaster, and making that position directly responsible to the division superintendent, the first step in the avoidance of congestion in the movement of cars is secured. Let the trainmaster control road operation only. The divisional unit should be next. As the trainmaster and yardmaster units would give "on the ground" supervision, divisions could be enlarged, which would mean a decreased operating cost.

It may be well here to explain how the giving of additional authority to yardmasters will result in a benefit to the operation of a railway. Cars cannot be moved without locomotives; and the yardmaster is at the mercy of the roundhouse foreman, unless he has authority to control the work of the roundhouse in so far as the matter of getting locomotives in and out of the house is concerned; and he is at the mercy of the car inspectors unless he can control their operations. The same is true of the track and clerical forces.

The plan suggested is simply the concentration of authority and responsibility in the yardmaster as far as the movement of cars is concerned. It contemplates individual responsibility, and, all officers being active men, abolishing many intermediate offices. Yards are the pivotal points of divisions; and as yardmasters, under this plan, are to be men with authority and power and not members of committees or correspondence clerks, their position must rank with that of the trainmaster.

So much for the staff. Now as to the organization below the offices of trainmaster and yardmaster:

The theory of a railway organization is sometimes compared to that of a standing army. But the fault is that the comparison has been made to an army in peace, whereas the comparison should be made to an army in action. Railways are always "fighting" to move cars; there is no time of peace, for peace to a railway means insolvency.

That the plan of army organization may be applied to railway employees is true; but, admitting that it is the trained and well-equipped army that gets results, at the same time it must not be overlooked that the strength of an army is in the ranks, and that a soldier fighting for his country is also fighting for himself. In other words, it is individuality that prompts men to action.

Now, under the present plan of railway organization and management, employees below the staff are divided into classes; a clerk is a clerk, a brakeman a brakeman, a conductor a conductor, an engineman an engineman, and, as a rule, they generally so remain. But with an army in action a private today may be a corporal tomorrow, and often before war is terminated he becomes a member of the staff, and any private may look forward to distinction of some kind; in other words, an efficient army is simply the effect of merit rewarded.

To apply the plan of army organization to railways the employees must be given an opportunity to advance in the service by—

(1) A system of promotion based on merit, as outlined in an article by the author published in the *Railway Age Gazette,* July 22, 1910.

(2) Graduated wage promotion, which means a decreased cost of production.

A further evidence of lack of system on railways is the haphazard method of compensating labor. The plan of graduated wage promotion would secure a uniform and equitable system of compensating labor, and ultimately a reduction in operating cost. If the rates charged for transportation could be increased proportionately, there would be no objection (outside of the inutility of the plan) to flat increases in wages; but it is a fact that cannot be disguised that there is always presenting itself (because it is a disease that thrives by culture) a constant demand on the part of employees for increased wages, so much so, that, combined with the cost of materials, railways having unsuccessfully attempted to meet such conditions by increased rates of transportation are now obliged, as a matter of self-preservation, to curtail their working forces.

Surely the idea underlying every increase in wages is not that

employees may have more money to spend, but rather that they may feel that their work is meritorious and is recognized, and will, consequently, render their best service. A flat increase in wages gives no such incentive to this; it robs men of individuality and places them in the position of merely keeping up with the herd. Under a plan of graduated wage promotion an appeal is made to the individuality of the employee. At the same time, it gives him a strong inducement to remain in the service, and to work intelligently and faithfully.

For reasons which are obvious, the division of employees into classes must, to a certain extent, obtain; the solution is in grading the classes. The basis for this grading is worth and length of service; discarding the principle that because a man is a brakeman, or a conductor, or an engineman, or a clerk, he should receive the rate of pay that pertains to that class of work; and instead applying the principle that because a man has been in the service a certain number of years, and is worthy, he shall advance from a lower to a higher grade.

The practice of frequent readjustments of wages has resulted in the absurd situation of enginemen and conductors receiving greater compensation than trainmasters and yardmasters and road foremen of engines, and brakemen getting greater compensation than yardmasters. Paying the superior less than the subordinate results in lack of respect for the directions of the superior; and a smaller salary cannot be considered an incentive to seeking advancement in the service. In these circumstances the employee loses interest, makes no effort to improve himself, and the effect is inefficiency and demoralization.

The suggestion of this paper is the application of graduated wage and promotion systems to railway trainmen, including enginemen; if practicable in these departments it can readily be adopted for all employees. It is, as before stated, a return to grades and the abolition of trip rates.

Again, there is the question of hours. The eight-hour day is here, and the railways should provide for it voluntarily. By a system of graduated salaries and the eight-hour day the operating cost will not be increased, and at the same time the wages of the senior employees will not be reduced. For example, a conductor or engineman receiving $125 to $150 under the present ten-hour, or trip rate, system should receive the same rate under the eight-hour scale, the increased cost to be met by a decreased force and a lower rate to the junior employees. There should be three grades of brakemen and firemen, and three grades of conductors and enginemen. The brakemen and firemen should reach the highest grade and rate in that line in three years. It should take conductors and enginemen longer—say, from five to ten years—but the difference in rate should be greater. It would take ten to fifteen years to work through the different grades of pay and promotion. There would always be some definite goal ahead, and after ten or fifteen years a man's family and social ties are established, and agitation would be a thing of the past. The graduated promotion means loyalty. Reward for worth will give loyal service, whereas the present system of practically one rate to all employees in the train service, and punishment for failure instead of reward for merit, can only result in disaster, trouble and loss. First, there is no incentive, which results in lack of interest; secondly, punishment is a custom of the past, and results only in sullenness and resentment.

The product of railways is not magnificent terminals, never-ending stretches of steel rails, powerful locomotives, or miles of cars, but it is transportation; and it is the cost of this that must be scrutinized and every factor entering into it constantly controlled. One of the factors making for unnecessary cost is the prevailing plan of compensating labor. Another factor is unproductive labor, much of which is devoted to the gathering and refining of needless statistics of every imaginable kind; a practice which causes an enormous amount of duplication and triplication of work In other words, there is a condition of organization within organization. This cost to find cost has become burdensome.

ACCOUNTING OFFICERS' CONVENTION.

The Association of American Railway Accounting Officers held its twenty-third annual meeting at New Orleans, April 26, with about 200 members present. The business of the first day was the discussion of the new plan for interline ticket reporting which was presented by the standing committee on passenger accounts. This plan, which makes changes in some respects radical, was adopted. The principal reasons for making the change, as set forth in the argument for it, presented by Mr. Hermany, auditor of passenger traffic of the Rock Island Lines, are to save time, so as to enable each road to send its report to connections within about 20 days after the end of the month; and to give for each form of ticket, on all the reports to all the roads, a statement showing the revenue accruing to each road interested in that ticket. A separate sheet will be used for each form of ticket. The committee believed that the large majority of roads would deem it a considerable advantage to have these reports sent in season to allow the revenue to be taken into the accounts of the month in which it was earned. The plan has been tried by some of the members of the committee during the past year. The St. Louis Southwestern was able to mail its reports on the 15th and 16th of the following month. The Central of Georgia mailed its February reports on March 18. The principal saving in work is in the elimination of the apportionment book and in the use of carbon paper in preparing reports to be sent to foreign roads. The reports to all foreign lines are written at the same time. Smaller sheets can be used, but there will be a larger number of sheets. It will be necessary to sort agents' reports according to terminal carriers and intermediate routes, but this can be done by junior clerks. By the use of carbon sheets in preparing the reports to foreign roads each item is written but once and this makes a reduction of 25 per cent. in the time necessary for this work. In the experiments made by the committee it was found that of the total number of tickets reported, 75 per cent. read over two roads; 20 per cent. over three roads; 4 per cent. over four roads; 0.80 per cent. over five roads; 0.32 per cent. over six roads; 0.13 per cent. over seven roads; and 0.11 per cent. over eight or more roads. The roads making these experiments are the Baltimore & Ohio; the Rock Island; the Lake Shore; the Long Island, and several others.

By condensing the sales reported from the different stations according to connecting line junctions, the preparation of passenger statistics will be simplified, and it is estimated that this saving will amount to one-third. The road receiving these reports will have accurate and authentic information as to each junction through which each ticket passes; thus giving it information (not now available) as to actual mileage and revenue without waiting to check the reports by the coupons collected. Under the plan now in use there is much guessing as to the route of tickets and the elimination of this will not only promote accuracy of statistics but will save much correspondence. It is estimated that the average report will consist of seven times as many sheets as are now used. Members objecting to this increase are reminded that the settlement of freight accounts already involves a multiplicity of sheets, but this objection is over-balanced by the benefits. To the objection that the sheets would be worn out in handling, it was replied that when sheets are bound flat, this objection has no force. The experiments made on the St. Louis Southwestern show that the increase in the cost of stationery, including station reports, was about 15 per cent.

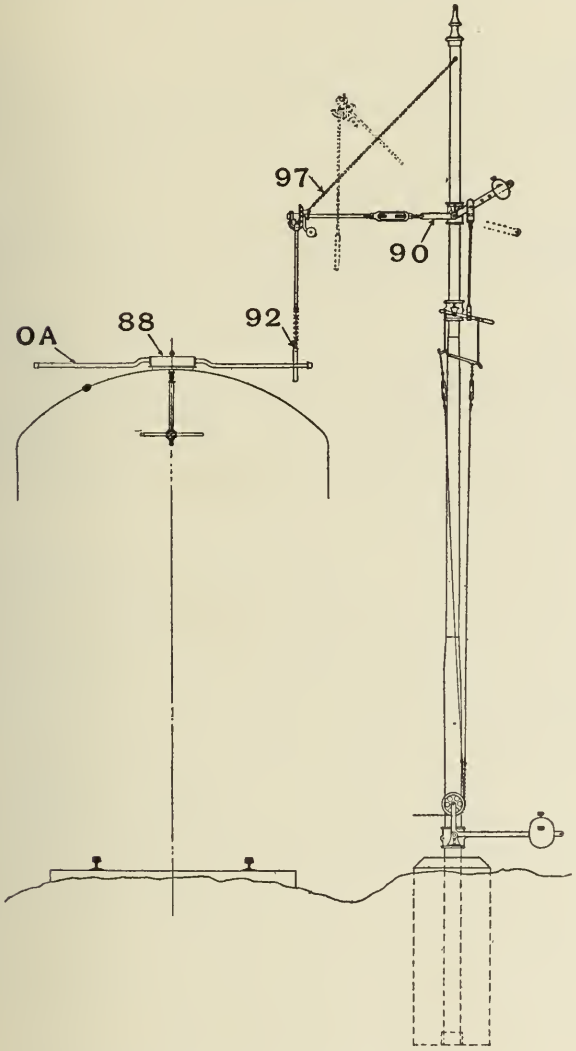
L. A. Jones, vice-president and comptroller of the New Orleans & North Eastern, the A. & V., and the V. S. & P., was elected president of the association for the ensuing year.

Work has been started on the construction of the northern section from Chaneral to Lagunas, of the Longitudinal Railway, Chile. The length of this section will be 465 miles.

HARRINGTON AUTOMATIC TRAIN STOP.

The Harrington Automatic Train Stop, which is in use on 11 miles of the Erie Railroad (Northern of New Jersey Division) has now been in service at all of the signal stations in that territory for over two years, and the construction and behavior of the apparatus are described at length in the last annual report of the Block Signal and Train Control Board. From that report we take the following descriptive matter and comments:

The system comprises an overhead mechanical-trip train stop and audible cab signal, invented by S. H. Harrington, of New York City. It differs from other mechanical trips, either of the ground or overhead type, in that the roadside apparatus, which is intended to actuate the apparatus installed upon the locomotive, is not a rigid structure, but consists of a movable support from which is freely suspended by a chain a cylindrical, tubular weight protected by an outer covering of vulcanized rubber. This suspended weight and its connections, called a "suspension," are so designed that the weight may be lowered into or raised out of the path of a horizontal arm extending transversely across the top of the engine cab, pivoted at its center on a vertical axis and designed by its motion about this axis to impart motion through suitable leverage to an air valve placed on top of the locomotive cab in an extension of the air-brake train line. The suspension moves the engine operating arm wholly by its inertia. If the engine is moving at very low speed, the operating arm is not moved. The suspension simply drags over it. The valve in the air-brake pipe is connected with a whistle so that every movement of the operating arm not only reduces the pressure of the train line, but also sounds an alarm.



Harrington's Automatic Train Stop.

The weight and chain forming the suspension are attached to the end of a pivoted arm, moving in a vertical plane mounted on an iron post placed alongside the track, and provided with suitable levers and wire connections so that by the movement of a lever located in a signal station a signalman may cause the arm and suspension to be raised or lowered. The suspension could of course be operated by compressed air, electricity, or other means commonly used to operate railway signals. The stop is supported on a post about 1,000 ft. in the rear of the home block signal.

The construction and the arrangement of the different parts of the apparatus are indicated in the drawing. The transverse arm on the top of the cab of the locomotive, *O A*, is called the operating arm, and the short arm below this, within the cab, is for the use of the engineman in restoring the operating arm to its normal position after a stop has been made. The "suspension" 92, has, at its upper end, where it is attached to the arm 90, a damping device to prevent excessive oscillation. The arrangement of the front and back wires, counterweights, and disengaging arms is similar to that ordinarily used with hand-operated semaphore signals. The position of the suspension when raised to permit the passage of a train is indicated by dotted lines. The air valve arm on the locomotive is held in its normal position by means of a notch in the upper surface of a curved shoe, pressed upward against the underside of the arm by a spring.

Sixteen locomotives, some freight and some passenger, are equipped with the apparatus, and at the roundhouse in Jersey City where these engines are kept when not running, there is a gage by which, when the engines pass out of the house, the operating arms on the engines can be adjusted. The inspector has also a wooden frame, to be placed across the track on top of the rails, with which to gage the distance of the suspension from the track, horizontally and vertically.

The inspector of the Block Signal Board made 269 tests of the stops with passenger trains, of which nine were failures and two others were unsatisfactory. Four failures were caused by the suspension being too low, two by its being too high, one because it was absent, and one because the operating arm rebounded on the shoe. In the case where the suspension weight was absent (it had fallen to the ground, having been separated from the chain) it is believed that the chain was broken, on the day before, when by reason of being out of adjustment, the suspension struck the roof of the cab of an engine. This maladjustment was caused by a new chain being installed and put in service without first having been tested by the gage. In one case where the suspension was not in the full stop position, the trouble was due to the breaking of a stake, which allowed a pulley to twist around the back wire and prevent its full movement. In another case the suspension failed to go to its full stop position because of lost motion in the connections. A variation of from one to three inches could be obtained by varying the speed with which the lever in the cabin was moved. Other failures were due to the operating arm in engines rebounding on the shoe and closing the valve.

These references to the record of failures as given in the Board's report, are cited here to illustrate the careful manner in which the tests were made. As will be seen below, the Board looks upon the faults developed as readily curable, and presents favorable conclusions.

In comparing this with other types of stops, the report calls attention to the objections to the use of an overhead stop. One of the first is the difficulty of arranging and adjusting the roadside apparatus and the vehicle apparatus, because of the narrow space between the equipment clearance line and the structure clearance line, due to the fact that engines and cars as wide and as high as it is practicable to use are common on all the railways

of the country. Brakemen do not ride on the tops of freight cars so much as formerly, but still they must frequently be in that position, and the presence of men on the cars must be taken into consideration. Running boards are provided on the tops of box cars, and trainmen should stay as near the center of the car as possible. The suspension device, when cleared for the passage of a train is raised to a point where it would not strike a man on top of a box car. When the device does act, it blows a whistle, which might offer a warning to a brakeman, though it is doubtful if this would be of benefit to a man on the front end of the train. Again, the suspension oscillates violently when it is struck by the engine arm and might hit a man standing on the running board. But during the two years and ten months in which the stop has been used no train man has been struck by it, and on the whole the objections to overhead stops seem to be accorded less weight than railway men have commonly accorded them in the past.

Summarizing its report, the Board says:

In spite of its constructive defects, the results of the operation of the stop on the Erie give strong promise that the device may be readily developed to a state of very considerable efficiency. It is hardly to be expected that any train-stop device will ever be perfected that will not sometime fail, or that such devices can be expected to do more than the engineman would do if alert and obedient to the indications of fixed signals.

The expense of installation and operation of fixed signals is considerable, and it is doubtless this expense that has prevented their use to such an extent that scarcely one-third of the railway mileage of this country is block signaled. On the block-signal mileage most of the installations are of the simplest and least expensive form. On over 80 per cent. of the mileage of the country the only fixed signals, except at occasional interlocking plants, consist of manual train-order or telegraph block signals. Furthermore, by far the greater percentage of accidents that might be prevented by the use of automatic train stops occur on roads that could ill afford complicated and expensive train-stop installations; so that the greatest field is for cheap and simple devices suitable for use with the ordinary type of manually operated signals. If they are also efficient with power-operated automatic signals, so much the better. The loss of property and life caused annually by accidents due to non-observance or disregard of signals is so great that the fact argues strongly for the encouragement of all cheap and simple devices that operate directly with the simpler forms of signals and which will be reasonably sure to perform their functions.

The Harrington system appears to provide means for a considerable step in this direction, and the Board concludes (1) that the Harrington stop should, if used, be operated either by reliable power devices, or by short, rugged, and direct mechanical connection to manually operated levers; (2) that if the constructive faults hereinbefore mentioned are remedied, and it sees no reason why they should not be substantially overcome, the sytsem, with reasonable inspection and maintenance, would be safe and reliable and its use would tend materially to promote safety of operation on a railway using it, and (3) that the expense to install and maintain it would appear to be so small, in proportion to the losses which its use might prevent, as to render desirable the encouragement of its development and design to meet all service conditions.

Progress has been made during the year on the Ichang-Wanhsien Railway, China, and there are now 30,000 men employed on it. Construction trains are running for five or six miles from Ichang, and the embankment is almost completed for about 13 miles. The first tunnel, which occurs at this point, and is some 1,000 ft. long, was successfully pierced several months ago, and work is being vigorously carried on at another tunnel 6,000 ft. long, as well as on the earthworks up to Kueichow, about 100 miles. The work is progressing even more rapidly than was expected.

NECESSITY FOR THE USE OF TRACK SCALES IN TIMBER TREATING AND RESULTS TO BE OBTAINED FROM THEIR USE.*

In the treatment of timber it is of the greatest importance that accurate means be used for determining the exact quantities of preservatives put into the timber and left in the timber. In most treating plants, both in this country and abroad, the actual quantities of preservatives injected into the wood are measured by volumetric determination, that is, the amount of liquid injected is determined by measuring the quantity of liquid in the storage tank before the treatment and again after treatment, the differences (measured in gallons) being taken as the quantity injected into the wood. The volumetric method, with care and attention, can be made to record the quantities of liquid absorbed with great accuracy, and in many of the modern treating plants the degree of accuracy obtained in making volumetric determinations has been excellent. There are certain factors of error in making volumetric determinations, however, which it is almost impossible to avoid. In order to assist in correcting these errors and to check the volumetric readings, many treating plants have installed small track scales as a part of the equipment of the plant. These scales are generally used to check the volumetric determinations, that is, the timber is weighed on these scales before treatment and immediately after treatment. It should be pointed out, however, that even with the most careful work, the determination by careful weight of the liquid absorbed is not absolute. The degree of seasoning must be taken into consideration, except where thoroughly seasoned timber is treated, and the amount of moisture that may be in the timber, caused by a heavy rain, or the amount of snow and ice which accumulates on it, as well as the tram cars in the winter time may be a source of considerable error. Some of the preservatives injected will usually run out of the timber during the period between the end of the treating operation and the end of the weighing operation, or in the case of creosote oil a certain percentage of the oil will evaporate from the hot timber before the end of the weighing operation is reached. The tram cars should be light-weighed and stenciled, and should be re-weighed as frequently as necessary to check the tare weights.

The value of the track scale, however, in connection with the operations of the timber treating plants, lies in the fact that the determinations of the liquid absorbed by weight act as a check on the determinations by volume. With careful work the determinations by weight and volume should check reasonably close.

From the answers which the sub-committee has received, it appears that most of the railway companies in this country use the track scale occasionally to check the volumetric readings, and in one case every tram of timber or ties treated is weighed before and after treatment. It would be extremely desirable that determinations of the preservative absorbed be made for every run that is made. There are so many variables in the treatment of timber due to the nature of the material and to the varying conditions of seasoning that any method which would increase the regularity of the treatment should be adopted.

In view of the fact that past experience has shown that there are always some differences in the readings by weight and volume, the committee has endeavored to ascertain how great the variations may be and still indicate fairly accurate determinations. According to the reports of some of the European railways, a variation of 15 per cent. between volumetric readings and weights is allowable. In this country the variation hardly ever reaches such a high figure; in the majority of instances they will not be more than 10 per cent., and usually much less than that.

If correctly designed scales are properly installed and maintained and a reasonable amount of care exercised in weighing, making allowance for conditions which may affect results as obtained by weighing and volumetric determinations, there should be even smaller variations between the two methods.

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*From Appendix F of the Report of the Committee on Wood Preservation, presented at the annual meeting of the American Railway Engineering and Maintenance of Way Association.

The design and size of scales to be installed will depend on local conditions and the sizes of timber to be treated.

Having in mind a scale for general use, such as the weighing of ties and timber up to 35 or 40 feet in length, it is the recommendation of the sub-committee that a 22-foot, 2-section, 50,000 pounds capacity, suspension bearing platform scale be installed directly on cast-iron plates embedded in concrete, with the pit of sufficient size to permit thorough inspection and cleaning.

The platform bearings should be of sufficiently rigid I-beams, and on top of these should be placed the ties carrying the scale rail stands. The deck should be rigid and not connected with the scale, but shields applied to the rails to keep as much dirt and water out of the pit as possible. The scale should be fitted with a capacity beam, graduated and sensitive to 8½ lbs. in 50,000 lbs.

This type scale is recommended for the reason that it is so designed as to be accessible in all of its parts for thorough cleaning and inspection, owing to the desirability of the suspension feature over scales where the shock is transmitted to the bearing points with a direct thrust. It should be purchased and installed for approximately $1,200.

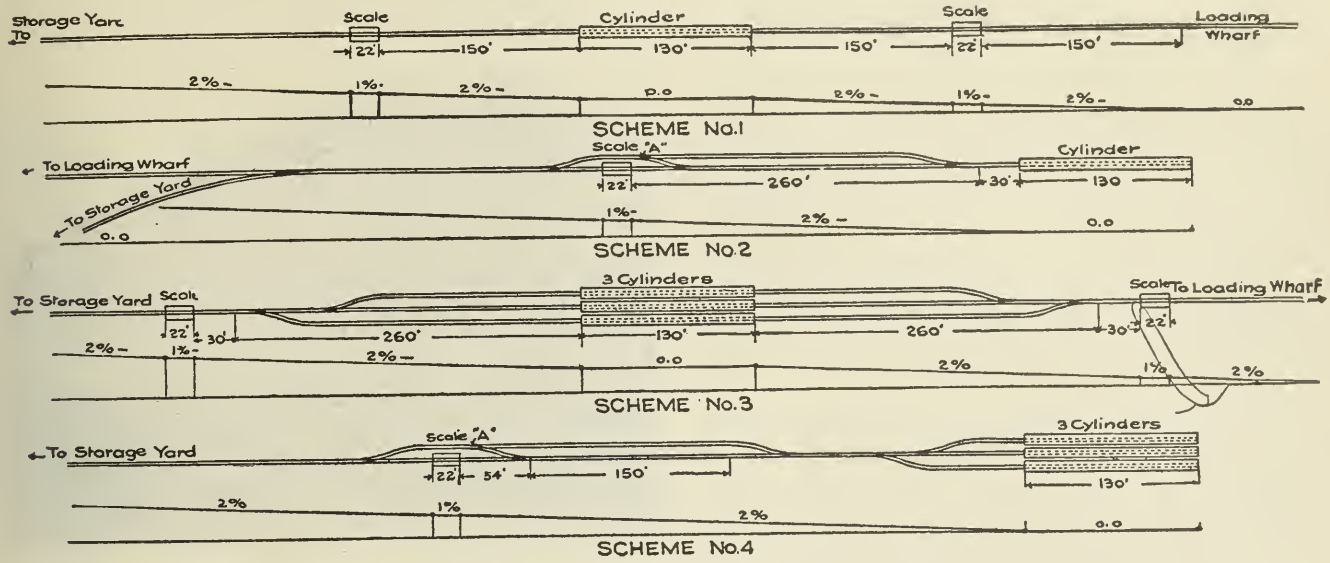
A two-section scale is recommended on account of its greater accuracy over one containing more sections, and 22 ft. is about as long as it is desirable to install a two-section scale.

While various lengths of tram cars are used by various railroads in timber treating plants, it would seem that one about 7½ ft. long, with 5-ft. wheel base, would be the most desirable, inasmuch as the bottom ties will then project over the end of the car, providing a hand-hold at each end when unloading. Such a scale as recommended above will permit weighing of two trams at a time, if necessary or desirable.

In case ties alone are to be weighed in single tram loads, a scale 10 to 12 ft. in length and of ten tons capacity, of the "A" lever type, similar to those ordinarily used in warehouses and for wagon scales, may be used. The cost of this scale will be approximately $350, installed with concrete and timber.

For more enduring accuracy and service, it is recommended that a 10 to 12 ft., 15-ton scale of the suspension bearing type, similar to the 22-ft., two-section scale, already described, be installed with concrete and steel at an approximate cost of $700.

Attached hereto is a sketch showing the proposed location of scale and arrangement of tracks, where one or more cylinders are used, and where trams are shoved into one end of the cylinder and pulled out of the other, or where shoved into and pulled out of the same end. Such an arrangement permits trams to be weighed ready to be placed into the cylinder as soon as it is emptied, without delaying the output of the plant. If the profiles shown can be adopted the trams may be handled to advantage by men instead of engine, when weighing.



Layouts of Scales and Tracks at Creosoting Plants.

Recommended profile to facilitate weighing trams to be weighed on descending grade. If local conditions do not permit such grades they will have to be changed to suit. Crossovers marked "A" near scale are there to prevent unnecessary use of scale.

The tracks, switches and cross-over are so arranged as to permit weighing at all times on descending grade. If local conditions do not permit of the arrangement as shown on sketch, with the advantages outlined above, the arrangement will have to be modified to suit the conditions.

Attached is a statement showing information in regard to scales located at various timber-treating plants. It would seem from most of the replies that a depot scale has been installed, and, while satisfactory for freight house and other light work, is not desirable for track scale weighing, in that it is not durable and the arrangement of the levers is such that the friction is across the knife edges instead of in the direction of its length. It is also impossible to clean and inspect it with the same thoroughness as the scale recommended.

One of the members of the committee recently visited a large number of the European timber-treating plants and made special

Statement Showing Information in Regard to Scales Located at Timber Treating Plants.

Road or Company.	Location of Plant.	Length of Scale.	Width of Scale.	Capacity.	Beam Graduation.	Cost.	Remarks.
Illinois Central	Memphis, Tenn.	5 ft.	5 ft.	9,000 lbs.	2 lbs.	$74.00	Not including installation, scale an old one.
D. L. & W.	Paterson, N. J.	8 ft.	4 ft.	15 tons	2½ lbs.	403.83	$223.83 of this for installation.
Lehigh Valley	Bound Brook, N. J.	7 ft. 10¾ in.	4 ft. 10½ in.	31,000	5 lbs.	275.00	$100 of this for installation.
C. B. & Q.	Galesburg, Ill.	20 ft.	4 ft.	40,000	20 lbs.	.....	
Frisco	Hugo, Okla., and Springfield, Mo.	7 ft. 9¾ in.	4 ft. 10 in.	.....	.....	600.00	$246 of this for track charges.
Rock Island	Tie Plant, Ark., and Kansas City, Mo.	8 ft. 3 in. / 7 ft. 11 in.	5 ft. / 3 ft. 11¼ in.	..... /	20 lbs. / 20 lbs.	504.36 / 473.64	$364.36 of this for installation. / $333.64 of this for installation.
West Pascagoula Creo. Co.	Gautier, Miss.	None	.....	.....	.....	.....	Recommend scales.
Texas and Lumber Pres. Co.	Somerville, Texas.	8 ft. / 38 ft.	.....	8,000 / 120,000	..... / 10 lbs.	..... / 480.00	Not clear whether this is cost of scales alone or includes installation; should think just the scales.
M. K. & T.	Dennison, Texas.	None	.....	.....	.....	.....	Recommend 40 ft. scale, 6 to capacity.
N. P.	Brainerd, Minn.	.....	Small scales to weigh a tie.				Recommend a track scale.

inquiries as to the prevailing practice concerning the use of track scales in connection with the treatment of ties and other railroad timbers. It was found that almost all of the timber-treating plants on European railways are equipped with track scales, and at most of these treating plants all ties and other timbers are weighed on trams before being treated and again after treatment. This method of checking the oil absorption is possible because of the small daily output of treated material. Most of the cylinders hold only from three to four trams of ties. These trams are pushed onto the scale by hand before treatment and again after treatment. The weighing operation takes about five to ten minutes for each tram, because in the majority of instances the scale is situated at the end of a spur track and the tram has to be pushed onto it, weighed and pushed off again before the next tram can be weighed.

The type of scale used differs materially from that hitherto used in the United States. Practically all of the scales are the so-called printing scale, that is, the operator pushes a number of levers on the scale arm until the scale balances, a card is then pushed into the slot, and, by pressing on a small lever, the exact weight is printed on the card. Errors of observation are thereby made practically impossible. There are frequently several thin sheets of paper pasted to the cars which are used so that duplicate and triplicate slips are made at one pressure of the lever, one slip remaining with the treating company and the others with the railway officer in charge. These scales weigh with great accuracy, weights being obtained down to one (1) kilo, which is equal to 2.2 lbs.

A visit was made to a large scale factory, where a type of scale is now being made which weighs cars and records the weights automatically, that is, the cars are run over the scale slowly, and each car stops on the scale platform only long enough for the weight to be registered. This registering is made on a small card, which drops into a small box at the side of the scale box. These automatic scales are now being made in this country, and are worthy of serious consideration.

The general impression obtained, after visiting many of the European timber-treating plants, is that the timber-treating engineers are fully convinced that the weighing of timber before and after treatment is very desirable and of great assistance in regulating the treatment. They stated that the weighing of every charge is very desirable but not essential, and, where the weighing of every charge was carried out, it was explained that this was done, owing to the fact that the time required was insignificant at a plant treating only a small quantity of material daily.

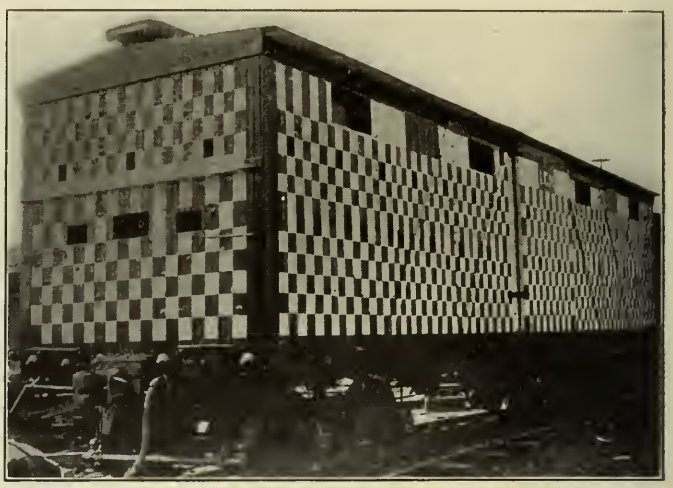
Another point of great importance in connection with the weighing of timber before and after treatment is the variation observed between volumetric readings and weight readings of the preservative actually injected. Without going into details, it may be stated that the variations observed between weight and volumetric readings in the European treating plants was very much greater than those which have been obtained in the United States. At one plant the variation in 16 runs showed the average absorption as indicated by weight to be 6 or 7 per cent. below the average volumetric readings (the minimum being 2 per cent. and the maximum 16 per cent.), and in four cases the absorption by weight was greater than the volumetric reading, the minimum being 1 per cent. and the maximum 20 per cent. The government officials at this plant indicated that these were usual conditions.

It is particularly gratifying to the committee to report that the American operative methods have shown a very much closer approximation between the volumetric and weight readings than has been the case in the European plants. It was noted in the accompanying diagram, showing the results of weights taken at one of the American timber-treating plants, that the variation average 2 to 3 per cent.

The general findings of the sub-committee are that track scales are now being used at a small number of treating plants in this country, and quite generally in Europe they are used to check the work of the plant, with excellent results. The committee recommends that the track scale be installed at every treating plant wherever possible. After their use has become general, it will be possible to obtain data which will permit one to state more definitely the variation which will take place in treatment, and thus enable one to formulate some general rules as to the extent of allowable variation.

ARMORED BOX CAR.

A car fitted up for military use by the Mexican government is shown in the accompanying illustrations. It is made from an ordinary box car, the inside of which is lined with steel armor plate. By referring to the interior view of the car it will be seen that there are port holes at the end and on either side. Three of



Armored Box Car for the Mexican Government.

the end holes are for two machine guns and one rapid fire gun. There are also eight windows at the top of the sides, which are used for ventilation when the car is not under fire. They are protected by steel shutters, which are slid over them when the car is in the danger zone. Ladders are placed at both side doors, so arranged that they can be readily swung down as soon as the door is opened, or lifted up into the car after it has been loaded.



Interior of Armored Car.

It will be noticed also that the ceiling is lined with metal, which provides protection from any attack made from vantage points above the car. Although this car would not be a protection against shells, it is of decided advantage where only musketry fire is concerned. The outside of the car is painted with the checkered effect to hide the location of the port holes, for, as will be noticed, these holes come directly in the dark patches and at a few hundred yards would look like all the other dark patches.

Shop Section.

HOW scientific management can be applied to a railway shop will be the subject of the competition to close June 15. We have been very frank in calling attention in these columns to the mistakes made by efficiency men. At the same time we have insisted that much good could be accomplished by a more scientific application of the principles of efficiency. The efficiency engineers have undoubtedly profited by the discussion of the past few months and we feel that it is only right that they should be allowed to state their case fairly. Three prominent railway mechanical officials have signified their willingness to act as judges—H. H. Vaughan, assistant to the vice-president of the Canadian Pacific, G. W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, and T. S. Lloyd, superintendent of motive power of the Delaware, Lackawanna & Western. These men are all regarded as more than ordinarily successful motive power officials, and as men who are willing to consider without prejudice any practical suggestion which promises to give good returns for the investment A prize of $50 will be awarded for the best article and $35 for the second best. Such others as may be accepted for publication will be paid for at our regular space rates.

THE shop kink competition, announced in the February and March Shop Numbers, will close May 15. A first prize of $50 will be given for the best collection of three kinks which are used in connection with the repair or maintenance of rolling stock and other equipment in charge of the mechanical department. The second best collection will be awarded a prize of $25. Contestants may submit more than three kinks, allowing the judges to base their decision on what they consider to be the best three in the collection. Kinks accepted for publication, but not awarded a prize, will be paid for at our regular space rates.

LAST month we announced a competition on reclaiming scrap material, to close June 15. Because of the announcement in this issue of another competition to close on that date the time limit for receiving articles on the reclaiming or utilization of scrap material will be extended to July 15. It is probably safe to say that every railway mechanical department in the country has studied this question and that some phase of it has been followed up and developed on each of the roads. Some have specialized along certain lines with good results, but have paid little attention to other features, often of as great, or greater, importance. What we want to draw out and place on record are articles telling what methods have been used successfully for reclaiming and using materials of various kinds which are used in the maintenance and repair of equipment in charge of the motive power department. The best article will be awarded a prize of $35 and the second best a prize of $20. Articles not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

THE competition on the instruction of apprentices and workmen, which closed April 15, was unusually successful. The first prize of $35 was awarded to H. S. Rauch, apprentice instructor, New York Central & Hudson River, Oswego, N. Y., and the second prize of $20 to John H. Linn, apprentice instructor, Atchison, Topeka & Santa Fe, Topeka, Kan. All of the other contributions have been accepted for publication. The other contestants were Le Roy W. Alison, Los Angeles, Cal.; L. L. Collins, bonus inspector, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.; D. C. Davis, apprentice inspector, Atchison, Topeka & Santa Fe, Newton, Kan.; Henry Gardner, assistant superintendent apprentices, New York Central Lines, New York; Joseph W. L. Hale, head instructor, Pennsylvania Railroad school for apprentices, Altoona, Pa.; Richard Keefe, apprentice, New York Central & Hudson River, Oswego, N. Y.; John V. Le Compte, foreman, Baltimore & Ohio, Garrett, Ind.; E. B. Ralph, apprentice instructor, Atchison, Topeka & Santa Fe, Fort Madison, Iowa; William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; F. M. M. Richardson, educational secretary, Railroad Department, International Committee of Young Men's Christian Associations, St. Louis, Mo.; and our old friend, the Old Railroader.

THE judges had anything but an easy task in awarding the prizes in the competition on the instruction of workmen and apprentices. The articles submitted were exceptionally good. The chief merit in Mr. Rauch's ("Dad Rauch," as his apprentices delight to call him, although he is not a great many years older than some of them) article is that it so forcibly directs attention to the spirit which must underly any successful apprenticeship system. Such a system cannot be operated mechanically; it must have all the warmth and inspiration which can be given to it by big-hearted men with a love for their fellows. Mr. Linn, the winner of the second prize, is not only an apprentice instructor on the Santa Fe, at Topeka, but is also chief clerk to F. W. Thomas, the supervisor of apprentices, and without doubt has, because of his close association, absorbed much of Mr. Thomas' wonderful gift of understanding, appreciating and developing the boys under him. Mr. Gardner, of the New York Central Lines, has tackled the problem from a rather unique standpoint, and emphasizes the relation of education to industrial waste in a forceful manner. To Mr. Richardson we are indebted for a splendid description of the way in which the Y. M. C. A. is assisting in this work and of the results which are being obtained. It is rather surprizing that so little publicity has been given to this important phase of the work. Mr. Hale of the Pennsylvania is equally as enthusiatic over the advantages and possibilities of modern apprenticeship as are his associates on other roads. Mr. Keefe was the only apprentice to enter the competition, and his conception of the opportunities in railway service is of special interest.

THOSE who are intimately acquainted with David Van Alstyne expected a big, broad conception and view of the problem of the science of management, when it was announced that he would present a paper on Practical Ethics at the Congress of Technology at Boston—and they were not disappointed! Intensely earnest and practical in his work he has a keen realization of the fact that the American workman will quickly respond when he realizes that he is being given a square deal. In his article, a large part of which appears in this issue, he shows how detail management, as he calls it, will do much to close the gap between employee and employer, uniting them in harmonious co-operation and cultivating in each a broader sympathy for the welfare of the other. His comments on that most serious defect of our industrial system, which results in large numbers of men being out of employment a considerable portion of the time, demand the attention of all those who are interested in bettering the conditions of our industrial workers and making them more efficient employees and better citizens. Unquestionably the establishment of sociological departments by large employers of labor would bring splendid returns, although it would be a question of several years before their influence and effect would be fully realized. They would necessarily have to be in charge of big men. The methods of getting in touch with the men and bringing them to see that the welfare of employer and employee are dependant one upon the other, would be varied and would have to be carefully studied to suit the special conditions in each case.

IMPROVEMENTS IN SPIRAL MILLING CUTTERS.

THE change from a straight to a spiral cutter for milling machines was an important improvement, but the desire for larger output per hour has forced the spiral cutter, as formerly made, to the limit of its capacity, and a further change has been found necessary. An analysis of the conditions under which these cutters work has shown that the tooth compresses the metal until it causes a plane of cleavage at some angle with the direction of the cutter, and then begins to compress a new piece and push it off. The chip made by a milling cutter is quite different from that produced by a lathe or planer tool. The latter makes chips of uniform section, while the section of a milling chip increases from zero to a maximum.

When the cutter revolves it penetrates into the work and compresses it, which results in a springing of the arbor. After a certain amount of spring, the blade begins to remove a chip. It is believed that this action more than any other causes a dulling of the cutter. With a light cut it is possible that one tooth would fail to take a chip and the succeeding tooth would remove double the amount of its normal cut. This action is inherent in milling cutters, and recently experiments have been made by the Cincinnati Milling Machine Company for the purpose of discovering some method of minimizing these results. The ability of a milling cutter to remove metal is also limited by the relation between the size of the chip and the space between the teeth. This limitation does not exist with lathe or planer tools, as the chips or turnings have ample space in which to flow off. It was found that with the ordinary spiral milling cutters the amount of metal removed per tooth was sufficient to fill the chip space, and the capacity of the cutter was limited to small output; but when the space between the teeth was increased to allow ample room for the chip, a given amount of metal was removed with less power. This fact has led to the adoption of standard cutters 3½ in. in diameter, with only 9 teeth and 4½ in. in diameter with 10 teeth, corresponding to a spacing of 1¼ in. between the teeth. The chip space is thus made four times as large as that in general use at the present time.

By the use of these improved milling cutters, the amount of metal removed per horse power has been largely increased, and the capacity of the knee and column milling machine has been considerably enlarged without increasing its size or weight. Experience with these cutters has shown that they have other advantages, and few, if any, of the minor disadvantages which might have been expected. In roughing ordinary work the wide-spaced cutter remains sharp for a longer period, even where the feeds have been increased, and in many cases double the amount of work can be done without re-sharpening. With a smaller number of teeth, it is also found that the time required for re-sharpening is only one-half that for the fine-toothed cutter.

The ratio of the pitch to the depth of tooth is practically the same as with the older form, and the depth of the new tooth is about twice as large as formerly, so that the cutter can be sharpened a greater number of times, and its life is thereby considerably increased. Another advantage of the wide-spaced tooth is the fact that, while at first glance it has the appearance of weakness, it is always stout and well proportioned, and while breakage of the old cutters is not frequent, the new ones do not break even when subjected to the heaviest class of service. It might be thought also that the wide spacing of the teeth would cause the feed to act with a jerk, but the feed is smoother and there is less jerk when the cutter first strikes the work, because there is less spring in the arbor, which is made larger than formerly, and less tendency for the cutter to ride over the work.

The new spiral cutter is particularly well adapted to milling cast iron, and with it there is a notable absence of jerking and chattering which is often found in milling this material. Where very smooth finish is required it has been the custom to use a roughing cutter with a chip breaker, followed by a fine-toothed cutter without the breaker, and this requires a large number of extra cutters. Another advantage of the wide spaced cutter is the fact that the chip breaker can be used without affecting the smoothness of the finish, and only one cutter is required for roughing and finishing. Drawings of these cutters and diagrams showing the power required for various feeds accompany a paper by A. L. DeLeeuw in the April *Journal of the American Society of Mechanical Engineers.*

PLANS FOR LOCOMOTIVE REPAIR SHOPS.

DURING the past ten years over 70 locomotive repair shops have been built or completely renovated, and it is estimated that more than $80,000,000 has been spent on these plants in the United States and Canada. This work required the making of numerous plans, most of which have been worked out with reference to those which preceded. It might be expected that the best features would finally prevail in some typical design which would be accepted by general agreement as ideal. While there is some evidence that the process of developing such a typical design is going on—such evidence being afforded, for example, by the similarity of the cross sections of most of the new main locomotive shop buildings—there is still a diversity of opinion and practice as to general arrangement and size, and it is not likely that such matters will ever be completely standardized. H. H. Maxfield presented a paper on a General Plan for a Locomotive Repair Plant at the January meeting of the New York Railroad Club and the discussion which it called forth illustrated how widely the views of different men differ on this subject. An abstract of the paper and the proposed shop plan will be found elsewhere in this issue.

The first important difference of opinion developed by the discussion related to the average number of engines which can be repaired per erecting pit per month. The author found it possible under conditions in his district to repair three locomotives per pit per month, and on this assumption provided an equivalent of 25 pits in a longitudinal shop for the repair of 900 engines per year. Others thought two engines per pit a fair average, as with the best facilities it requires 25 days to install a new firebox and make general repairs, and at least ten days to make heavy repairs alone. A large space, 9,800 sq. ft., at one end of the erecting shop, marked "frame department" will be noticed on the plan. This can be used for frame repairs and for the storage of frames with cylinders on them, while the boilers are being equipped with new fireboxes in another department. This space, equal to 7 pits, relieves the live erecting pits, so that the actual number of pits available is 25 + 7 = 32 pits; on the basis of 75 engines repaired per month, the number for equivalent pit space is less than 2.5 engines per pit per month. There can be no fixed unit for this output per pit. It must vary with the number of engines requiring new fireboxes and with the number of machine tools and their output. The conditions should be such that there will be a constant and ample flow of finished details from the machines to the erecting floor, and no delays awaiting material.

In the plan proposed by Mr. Maxfield the floor space provided for light and heavy machine tools is 46,000 sq. ft., or 1,840 sq. ft. per erecting pit, which is not a large allowance, but ample if the shop is equipped with modern tools, most of which are motor driven. The saving in space which is possible where motor driven tools are substituted for those using belts and countershafts is well illustrated in the article on the "Re-Arrangement of Machine Tools in the Union Pacific Locomotive Shop at Omaha," which was published in the *Railway Age Gazette* of December 2, 1910, page 1084.

The floor space for the boiler shop and smith shop is usually determined with some reference to that of the erecting shop, or to the total floor space of the erecting and machine shops. In Mr. Maxfield's plan the boiler shop has less than 27 per cent., and the smith shop less than 15 per cent. as much floor space as the main locomotive shop. These proportions are much smaller than are found in any modern shops. The ratio is usually 60 to 80 per cent. for the boiler shop, and evidently must

vary with the quality of the water used in the boilers. The floor area of the smith shop is usually 35 to 45 per cent. of the floor area of the main locomotive shop, but the tendency is for the floor area of the smith shop to be made less on account of the very large substitution of steel castings for forgings and the increased use of machine forgings which require a comparatively small amount of floor space. At many places the smith shop supplies a considerable amount of car forgings and bolts, but the plan here considered is for locomotives only.

Coming now to the general arrangement of the buildings in the proposed plan; the first obvious suggestion is that a craneway be provided for the midway between the boiler and the erecting shops, as there appears to be no provision made for the transportation of forgings from the smith shop to the machine shop, except by shifting on the longitudinal tracks. The midway space could be utilized to some extent for the storage of material or for frames, cabs, pilots, etc., which usually occupy floor space in the shop. The plan would be improved if that space were omitted altogether, and, as the boiler shop has the same cross section as the machine and erecting shops, they might as well make one continuous building. It is a fault of most shop plans that there are too many buildings, and they are too widely scattered. The plans should be more compact, even providing for a second story in some instances. When two large buildings having the same cross section are placed in line, with a space 80 to 100 ft. between them, this intermediate space only increases the distance that must be traversed in the movement of materials and men. If the gable ends were swung around through 90 deg., they would form the side walls, with a considerable number of bricks to spare, and the only expense for 80 or 100 ft. additional length of shop would be for the roof. This economy in the cost of shop buildings could be effected in numerous instances, where expensive gables are used on comparatively short shops.

A transfer table, while useful in a car shop, is not necessary in a locomotive shop where cranes are provided for placing the engine on the through track where it has a direct outlet. One of the principal objections to it is that it affects the construction of the shop walls, requiring large doors opposite every track instead of a continuous side wall with large doors for engine exits at the ends. A more serious objection to the transfer pit relates to the movement of men and materials. The rates of wages for labor are now so high that shop plans should provide for the concentration of materials so that they can be handled directly from the store platform to the machine tools, and from these to the locomotive. The transfer pit usually occupies space alongside the erecting shop and the sides or ends of several shops on the opposite side, and this space could be more advantageously occupied by storage platforms and overhead traveling cranes.

A notable merit of the plan proposed by Mr. Maxfield is that the heavy machine tool department is located adjacent to the principal material platform, and four doorways with tracks are provided for delivering material directly from the store to the tools. The tendency in shop design is more and more in the direction of a plan which will dispense as far as possible with lost motion in handling heavy material like castings, steel plates, tires, tubes, etc. Castings and tires should be on a platform directly in line with the machines where they are to be finished, and it is probable that the bulk of tubes and sheets could be stored to advantage in the boiler shop or directly outside, where they can be handled by the traveling cranes. The sub-store idea also extends to small fixtures and has become so important a part of the locomotive shop as to require about the same area as the tool room, and it is managed so that material is only obtained by requisition from a representative of the store's department.

A final criticism of the shop plan in question is that the power house is too far removed from the main buildings, which are heated by large exhaust pipes. These pipes are expensive on account of their size, and the loss due to radiation in the long distance is large. The expense for the pipes and the tunnel could be largely reduced. It is possible to place the power house near the smith shop, and yet have it much closer to the center of the shop system.

The "after trial" shop is a new feature in shop planning and appears here for the first time as an essential part of the original plan. Such a provision is necessary for any shop having as large an output as two or three locomotives per day, and it is seen in the plans of a large locomotive shop now under construction. It should be located near the erecting and machine shops, so that too much time will not be lost in the passage of workmen between the shops.

THE MIKADO LOCOMOTIVE.

WHILE the consolidation locomotive is still the prevailing type for freight service, the orders during the past year indicate that the Mikado is growing in favor, and it is now used in large numbers by the Baltimore & Ohio, the Southern Railway, the Illinois Central, the Burlington and the Oregon-Washington Railroad & Navigation Company. A Mikado locomotive for the latter railway was illustrated in the *Railway Age Gazette*, January 27, 1911. In the wheel arrangement the Mikado has a leading pony truck, eight driving wheels and a trailing pony truck. It may be regarded as a consolidation locomotive with a trailing truck, or as a Prairie type with an additional pair of drivers. The extension of the boiler shell for tubes 21 ft. long places the firebox so far back that the trailing truck is necessary, but it also permits of the use of large drivers. The Mikado engines built for the Burlington have 64-in. drivers, this being the largest wheel thus far applied by the Baldwin Works to an eight-coupled locomotive. The front truck wheels on this engine are 37¼ in. in diameter, and the trailing wheels 42½ in. in diameter. The rear truck wheels are also useful in guiding the engine when backing into switches and crossovers, and in yards where the track is not kept close to gage. The weight on drivers, 50,000 lbs. per axle, is about the same as that on the larger consolidation locomotives, and provides sufficient adhesion for a tractive effort of 50,000 lbs. The cylinders are so proportioned that this amount of traction is obtained with the moderate working pressure of 170 to 180 lbs. The large driving wheels of the Burlington locomotives naturally require large cylinders, and they are 27 in. x 30 in. in size.

One of the principal advantages of the Mikado as compared with the consolidation is the use of larger boilers which are as large as 82 in. in diameter at the first ring, allowing the use of nearly 500 two-inch tubes, 20 to 21 ft. in length, and providing over 5,000 sq. ft. of tube heating surface. The large boiler capacity enables the engine to develop a greater horse-power, and it can, therefore, haul a given tonnage at higher speed than the large consolidation locomotives. The ratio of heating surface to grate area, 90 to 1, is very much larger than that used under the old rules, and this must result in a substantial economy in fuel. The large firebox and long tubes have been utilized in the successful combustion of lignite and other low-grade fuels, and the spark troubles have been eliminated by the low rate of combustion and the long passage through the tubes. If the grade of fuel requires a deep firebox, it can be more conveniently placed over the trailer wheels of the Mikado than over the drivers of the consolidation.

These are some of the principal features of the Mikado locomotive as distinguished from the larger freight engines in general use heretofore, and these qualities recommend it to railways having a heavy traffic over long grades, or for pusher service on the shorter but steeper grades. It offers some relief, also to those lines which feel the need of a more powerful locomotive than the consolidation, but do not have proper facilities for taking care of Mallet locomotives.

The Mikado engines for the Burlington include features which are somewhat out of the ordinary construction, and are worthy of mention. They have rather a long rigid wheel base, 16 ft. 9 in., but the trucks have sufficient swing to enable the locomotive

to traverse 20-deg. curves. The side water legs of the firebox taper in width from 6 in. at the front to 4 in. at the back, and this appears to be an attempt to make the area of cross section of the water space somewhat proportional to the volume of water passing through, producing a better circulation of the water on the side sheets, where the rate of heat transmission is the greatest. The engines have superheaters, and an equalizing pipe connects the live steam passages in the cylinder saddles The value of this was pointed out in the article relating to the tests of superheaters on the Lake Shore and Michigan Southern, published in the *Railway Age Gazette* of March 31, 1911. In those tests the crossover pipe was a temporary measure used to connect the two steam pipes at the bottom of the smokebox, while in the Baldwin design the equalizing pipes are made a permanent feature by incorporating them in the cylinder saddle casting.

While bronze hub liners are often used in repairs, in these engines the steel wheel centers have bronze hub liners supplied by the builders, and the shoes and wedges are also made of bronze. One other improvement indicates that the fireman is kept busy and must be assisted, if not by an automatic stoker, by having the coal moved near the fire door. This is accomplished by making the sloping floor of the tender movable and with hinges in front. The rear portion is raised by a steam cylinder and the coal is thus moved forward toward the fireman as he needs it.

HELICAL CUTTERS FOR MILLING.

At the Pittsburgh meeting of the American Society of Mechanical Engineers, A. L. DeLeeuw will present a paper on the Efficiency of Milling Cutters, in which he gives the results of tests of new shaped cutters which have a much higher efficiency than the older forms. The new type of helical cutter is particularly interesting and worthy of a brief description with some account of its performance. These cutters, which are illustrated elsewhere in this issue, have a cylindrical body with two or three screw threads turned on the solid, the helix forming an article of 69 deg. with the axis; for cutting steel the side of the cutter forms an angle of 17 deg. with a vertical line, and the top of the cutter an angle of 8 deg. with a horizontal line. They are made either with a single helix or with one right hand and one left hand interlocking.

The peculiar feature of these cutters is that they push the chip off in the direction of the axis of the cutter, or at right angles to the feed. The power consumption for cutting steel is so low that a roughing cut requires only about one-third the power used by the old style spiral mill. For cast iron their performance is not so favorable. As they do not make revolution marks, a much coarser feed can be used for finishing, and a cutter with three teeth will allow a finishing feed three times as fast as the ordinary spiral cutter. On account of the direction of thrust being parallel with the axis of the arbor, there is a complete absence of spring in the arbor in cutting steel. This fact makes it possible to use the milling machine without braces in most cases where they would be otherwise needed.

The end pressure on the spindle is not excessive, and although the interlocking right and left hand helix was made to obviate this objection, little advantage was found from it in this respect. The best results are obtained when running at the usual speeds of the ordinary spiral cutter, and the new cutters show a remarkably low power consumption in cutting steel as compared with any other form of cutter. Mr. DeLeeuw explains why the new helical cutter shows a less saving in power on cast iron than on steel by saying that a cutting tool must detach the chip by bending and partially breaking it. When cutting steel, the radius of curvature of the chip becomes greater with increased rake, and the extent to which the chip is broken off becomes less. Cast iron allows much less bending before breaking, so that even with the increased rake, the chip is still broken up, as when the usual form of spiral is used, and no saving of power is possible. These new cutters have been found especially useful in the rapid cutting and finishing of tensile test pieces of boiler and structural steels.

MECHANICAL ARTICLES DURING APRIL

The following articles of special interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of April 7:

The Largest Locomotive. A brief description of three Mallet locomotives recently built at the Topeka shops of the Atchison, Topeka & Santa Fe. They were made from two decapod locomotives and have the 2-10-10-2 wheel arrangement. The total weight of engine and tender is 750,000 lbs. and the rated tractive effort is 110,000 lbs. These locomotives are said to be the largest in the world. April 14, page 906.

Electric vs. Steam Locomotives on the New Haven. Abstract of a paper read before the American Institute of Electrical Engineers at Toronto, Can., April 9, 1911, by William S. Murray, electrical engineer of the New York, New Haven & Hartford. Mr. Murray tells of his study of the four types of locomotive service, namely, passenger express, passenger local, freight, and switch engines, and how they were replaced by electric power. He also compares the train minute delays in December, 1908, and in December, 1909, showing how the electric service has improved. A tabular summation of train delays is given for six months in 1908 and 1909, showing the superiority of electric over steam service in this respect. April 14, page 907.

Mallet Locomotives for the Chicago, Milwaukee & St. Paul. A description of twenty-five 2-6-6-2 Mallet compound locomotives, recently built by the American Locomotive Company, whose special feature is a separate exhaust for each low pressure cylinder. April 21, page 942.

Mallet Locomotives Built and Under Construction. A table giving the number of Mallet locomotives, the railways for which they were built and a few of their important dimensions, which was compiled from data obtained from the American Locomotive Company and the Baldwin Locomotive Works. The total number of these locomotives built by these companies is 539. April 21, page 954.

Locomotive Building During 1910; Baldwin Locomotive Works. An article of 4½ pages on the important features in locomotive building during 1910 as developed at the Baldwin Locomotive Works. It was a year of development of previous designs rather than the introduction of radically new features. The rebuilding of Mallet locomotives from old power and the increasing use of the Mikado engines are of special interest. The article closes with the prediction that further development will be towards increasing the locomotive efficiency and the improvement of details. April 28, page 993.

Air Brake Indicator. A description of the Snyder air brake indicator which operates a pair of arms on the caboose, thus giving the engineman visible assurance of the condition of the train air brake line. April 28, page 1002.

Letters to the Editor.

THE EFFICIENCY ENGINEER AND BELTING.

New York, April 25, 1911.

To the Editor of the Railway Age Gazette:

In referring to the economies which they have effected, the efficiency engineers point with pride to their achievements in reducing the cost of belt maintenance. It would be interesting to see how far the methods for which they claim success would apply to railway shop practice. The accompanying illustrations show a set of belt forms used by a prominent efficiency engineer. Fig. 1 is a belt repairer's time card. Fig. 2 is a belt tickler memorandum, or a day's work prompter issued by the planning department. Fig. 3 is a daily report of belt repairing, dressing, etc., for the plant, and Fig. 4 is a life history of each individual belt.

These forms tell their own story of the clerical and mechanical complexities introduced by the efficiency men for the purpose of saving time and money. A record such as these forms demand must be complete and accurate in order to be of any value. The difficulties which attend a careful keeping of these records can best be appreciated by anyone who has tried to determine with fair accuracy the item, tension in pounds, before and after tightening, with the portable apparatus devised by the engineer.

It is perhaps needless to say that any thinking man thoroughly believes in and supports the study and the shop efficiency. But when such study results in an infinite amount of efficiency ham-

OUT / IN — ORDER No. — MAN'S No. _____

TIME AL'W'D | TIME TAKEN | MAN'S NAME

BONUS | RATE | IF JOB IS NOT FINISHED SCRATCH OUT THIS ☞ F

PAY FOR | WAGES | IF JOB IS FINISHED SCRATCH OUT THIS ☞ N F

BELT SYMBOL	TENSION BEFORE TIGHTENING / POUNDS ON EACH SPRING BALANCE	TENSION AFTER TIGHTENING / POUNDS ON EACH SPRING BALANCE	INCHES TAKEN OUT OF BELT	WORK TO BE DONE ON BELT AND MATERIALS TO BE USED	TIME TAKEN

ENTERED IN: PAY SHEET | COST SHEET | BELT RECORD

THE ABOVE BELTS HAVE BEEN ATTENDED TO AS STATED.

SIGNED BY FOREMAN OR HIS REPRESENTATIVE _____

BELT TIME CARD

Fig. 1—Belt Repairman's Time Card.

pering, instead of efficiency promoting detail, there certainly seems to be no need of introspective study on the part of the engineer. The recent violent and sweeping claims made by some of these men regarding railway practice can hardly be regarded in a serious light until the tools used by the engineers themselves become more practical.

Another illuminating example of efficiency engineer methods is furnished by the usual setting of tasks by means of a time study with a stop watch. In these remarkable analytical calculations, results which are obtained with a split second stop watch are carefully compiled by the efficiency engineer, who then determines the task by adding to the result thus obtained an arbitrary figure, say 15 per cent. for the human equation, etc. In practice the arbitrary percentage which he uses, and which is based on guesswork or judgment, usually differs with each job or piece of work. Afterwards this task is rigidly adhered to as an exact mathematical basis on which to figure operators' earnings. In other words, an exact figure in decimals is combined with a guess, and the result is accepted as a standard. Yet that same engineer would not multiply three place decimals and expect to get a result that is accurate for more than three places.

BELT TICKLER MEMORANDUM.

MAXIMUM TENSION _____ POUNDS ON EACH SPRING BALANCE BELT GREASE TO BE USED _____

DATE TO BE TIGHTENED			DATE TO BE CLEANED AND GREASED			DATE TO BE			DATE TO BE		
MONTH	DAY	YEAR	MONTH	DAY	YEAR	MONTH	DAY	YEAR	MONTH	DAY	YEAR

Fig. 2—Belt Tickler Memorandum Furnished by the Planning Department.

The writer's experience is that a force of rather good mechanics and foremen becomes a force of very poor detail clerks when they attempt to satisfy the data demanding mania of an efficiency engineer. There is good authority for the fact that in the year 1909, a shining example of efficiency engineering frequently quoted during the past few months, had more clerks, time-study men and planning-department employees than operatives in the shop.

AN EX-TIME-STUDY EXPERT.

BELT REPORT — MONTH — DAY — YEAR

SHOP	MACHINE NAME AND NUMBER	SINGLE OR DOUBLE	STRAIGHT OR CROSSED	WIDTH	TENSION BEFORE TIGHTENING	TENSION AFTER TIGHTENING	AMOUNT TAKEN OUT	HOW FASTENED	TIME WORK TOOK

Fig. 3—Daily Record of Belt Repairs.

BELT RECORD.

LENGTH OVER PULLEYS _____ BELT GREASE TO BE USED _____

WIDTH _____ THICKNESS _____ BELT DRESSING TO BE USED _____

CROSS SECTION IN SQ. IN. _____ MAX. VELOCITY _____

WEIGHT PER SQ. FT _____ MIN. VELOCITY _____

DIAMETER OF DRIVING PULLEY _____ MAX. TENSION _____ } ON EACH SPRING BALANCE

DIAMETER OF DRIVEN PULLEY _____ MIN. TENSION _____ }

HOW FASTENED _____

KIND OF BELT _____

SINGLE	TRIPLE	1 PLY	3 PLY
DOUBLE		2 PLY	4 PLY
STRAIGHT		QUARTER-TURN	
CROSSED			

DATE PUT IN USE _____ DATE TAKEN OUT _____

MAKER'S NAME _____

LIFE OF BELT _____

COST OF BELT _____

COST OF MAINTENANCE _____

TOTAL COST _____

COST PER YEAR _____

DATE RE-TIGHTENED	TENSION IN LBS. INDICATED BY EACH SPRING BALANCE: BEFORE TIGHTENING	TENSION IN LBS. INDICATED BY EACH SPRING BALANCE: AFTER TIGHTENING	AMOUNT TAKEN OUT	DATE TENSION AGAIN SHOULD BE TAKEN	DATE CLEANED AND GREASED	DATE TO BE CLEANED AND GREASED AGAIN	DATE DRESSING PUT ON DURING SERVICE	GENERAL REMARKS ABOUT WORK DONE ON BELT, CONDITION OF BELT, ETC	WORKMAN'S NAME	MAN'S TIME REQUIRED TO DO THE WORK	COST OF WORK

Fig. 4—Individual Belt Record.

INSTRUCTION OF WORKMEN AND APPRENTICES.*

FIRST PRIZE.

BY H. S. RAUCH.

Apprentice Instructor, New York Central & Hudson River, Oswego, N. Y.

It is not the intention to describe any specific course of instruction for workmen or apprentices, but to deal with the subject in a general way and try to make some suggestions, which, during six years' experience as an instructor of workmen and apprentices, have been found invaluable. The instruction of workmen and apprentices must, to a large extent, be individual; therefore, in making an analysis of the essentials of such instruction, we find: *First,* that we must know the student. *Second,* that we must gain his confidence. *Third,* that the student and instructor must have a mutual understanding that they are partners in a business proposition and that each is working for a common goal, which we will call 100 per cent. efficiency.

The first requisite for successful instruction is a knowledge of the student. In order to gain this knowledge the inspector must be a student of human nature; he must be able to size up his man at a glance, or at most by passing a few pleasant words with him, else he is liable to antagonize the student at the start and lay the foundation for failure, or for a condition that will take much valuable time to correct. No man, however ignorant, would pretend to get 100 per cent. efficiency out of a machine with which he was not thoroughly familiar. Then why should we expect to get this efficiency out of the greatest of all creations, the human being, if we do not thoroughly understand him before suggesting any improvements.

This leads to the point where the instructor must gain the confidence of the student. It is not always an easy matter to do this, but it can usually be done by finding some subject in which he is deeply interested. This requires some tact and study, and when the subject is found, the instructor must interest himself in it by asking questions and allowing the student to become the instructor in so far as this particular subject is concerned; it will be surprising how soon the student will become interested in the subjects uppermost in the instructor's mind, and a confidential relation be established. To maintain this relation it remains for the instructor to give a square deal in every case; be square with the company and square with the student; show the student that you are his friend at all times in or out of the shop; encourage his confidence at every opportunity; give him the best advice at your command, even though it is necessary for you to go out of your way to obtain it, and it has no application to the work whatever.

I will go farther and say that it is the duty of an instructor to know, to a great extent, what his students are doing with their time outside of the shop hours. This is especially true in the case of apprentices. These young men are just budding into manhood, are at the most receptive and impressionable age and they need a balance wheel. If the instructor finds that their time is not always spent to good advantage, that they frequent questionable places, it is his duty to use his best efforts to set them right.

This is a delicate subject to handle at any time. It has, and is being handled successfully, but only where the instructor knows his man thoroughly and has his confidence. Then a man to man talk, with a few examples of what the habits in question lead to will, in many cases, make the best of citizens out of those who might have been otherwise. This may look like sentimentalism, but it is business from the ground up. Where can any business succeed without the confidence of its patrons; or where can any man or mechanic give the best service to his company, or to the community in which he lives, unless he is a good citizen.

*Submitted in a competition on the instruction of workmen and apprentices which closed April 15, 1911. Mr. Rauch was awarded the first prize of $35.

WHAT SHALL WE TEACH?

The writer would suggest the following subjects in the order in which they are given:

First.—Character, by setting a good example and using your best efforts to have it followed.

Second.—Self preservation, by instructing in the proper way to handle the ordinary tools and machinery found in the shop, the proper method of shifting belts, safe-guarding gears, saws, etc.

Third.—Loyalty, by being loyal to the company's interests, and to the company's institutions; by teaching that a railway company is a commercial enterprise which has something to sell and is also a large buyer, and if through public sentiment and unjust laws a company is forced to sell at a reduced price, it must pay less for what it buys, or buy less of it; and that a large percentage of that which railways purchase is labor which is what the apprentice and mechanic have for sale. In other words, teach every man to be a "booster" for the company with which he is connected.

Fourth.—Conservation, by teaching the most economical method of manufacture; how to cut sheet metals with the least waste; how to reclaim scrap materials; to save bolts, nuts and washers; how to make a machine do a maximum amount of work with a minimum amount of stress; that the company furnishes oil, waste and wrenches for keeping machinery oiled, cleaned and properly adjusted. How to conserve human energy by cutting down the number of false movements. In short the best and most economical way to do all classes of shop work, not only from the view-point of the mechanic, but from the broader view-point of the foreman and superintendent.

In addition to the shop work instruction, which by the way usually shows immediate and lasting results, I would suggest courses in mechanical drawing, using actual machine parts for models and eliminating geometrical drawing as much as possible, introducing it only as needed, then only a sufficient amount to cover the case in question. Courses in practical shop mathematics, introducing such problems as are met with in every day shop practice. A short course in English so far as it is necessary to enable the student to render intelligent reports and to carry on intelligent correspondence; for who among the heads of departments in railway service has not been driven almost to the point of hysteria through the reception of reports that did not report anything, and correspondence that was unintelligible.

In the large and medium size shops instruction of this character can easily be carried on, as men who are capable of work of this sort are usually available and the field is large enough to permit of their making a study of, and devoting their whole time to it; but in the very small shops and engine houses a different proposition is presented. This could be taken care of in one of two ways; either by having an instructor from one of the larger points make regular calls at these small places for the purpose of instruction in class work, with a local man giving part of his time in connection with other duties to the shop end of the work; or the class work might be carried on through correspondence, although the former method would undoubtedly be productive of the best results.

TIME FOR CLASS INSTRUCTION.

The time for class instruction of apprentices should unquestionably be the day time, preferably the first two hours after checking in in the morning. At this time they are clean and fresh and their intellects clear and more receptive. In addition to the class instruction, which is given on company time, the apprentices should be required to do a reasonable amount of home work, usually mathematics dealing with shop problems. This promotes the study habit which is a valuable asset to the man and to the company in after years.

For shop men, other than apprentices, evening classes have been found a valuable adjunct and it has been the writer's experience that the hour and one-half immediately after shop closing time is best, as the attendance at that time has in most cases

proved better than is the case when classes are held later in the evening. The benefits, where classes of this kind have been held, have been both immediate and permanent, as the men in most every case show an increased interest in their shop duties.

THE INSTRUCTOR.

The instructor, as stated above, must be a keen judge of human nature, a man who is deeply interested in boys and young men, capable of taking a brotherly interest in their sports and pastimes as well as in their work; he must be clean morally, just, impartial and honest; he must be a disciplinarian in the broadest sense, firm and fair; must ask nothing but what is possible and right, then insist on getting it. In addition to this he must have patience and ability to instruct and be capable of placing himself in the position of the student in order to put the subject before that student in an intelligent and understandable manner. In short he must be able to think with them, feel with them and know their ambitions.

No man can be truly successful as an instructor, either in the shop or the class room, no matter how thorough his technical and theoretical education may have been, unless he has worked as they work, sweated as they have to sweat; knows their likes and dislikes, their desires and emotions; and through this training is able to feel with them in their joys and in their sorrows, thus winning their friendship and their confidence, which is the most valuable asset any instructor of men and boys can have.

METHOD OF INSTRUCTION.

It has been found that demonstration through the use of models is the best method to insure a thorough understanding of the subject by the student. In teaching the principals of the gear, the screw, the lever, the inclined plane, valve motions, air brake apparatus, etc., working models have been found invaluable. Printed lessons issued should be in loose leaf rather than in text book form, as the loose leaf method enables the students to make as much progress as possible individually without regard to what the others in the class are doing. In an educational scheme, as outlined above, where it is intended to do the greatest good to the greatest number, it is essential that the dull, plodding boy and the mediocre be taken care of as well and as thoroughly as their more brilliant and favored brothers.

RAILWAY CLUBS FOR YOUNG MEN.

As an aid in carrying out many of the features of the foregoing, the organization of a local railway club has been found to be most important. An organization of this kind has been in active operation for the last four years. During that time its membership has increased over 400 per cent., with a proportionate increase in interest taken. This club is officered and conducted by young railway men. Papers are prepared and read by them; entertainments and excursions are planned and executed. The members hold debates and make addresses on railway subjects, all of which broadens them, gives them confidence in themselves and is in itself a training for good citizenship.

The club library is kept stocked with the best general and railway literature; the members become readers and are posted regarding current railway events, all of which has a healthy and beneficial effect on the character of the young men. They absorb the spirit of doing great things, a door of wonder is opened up to them and they become ambitious to forge ahead to make history repeat itself and to become not only the cog of a wheel, but the wheel itself.

Just previous to writing this article, a canvass was made among the apprentices at our shop for the purpose of finding out just what the sentiment was regarding the instruction which they were receiving. They were unanimous in the opinion that they would be better mechanics, that their chances for advancement were being increased and that they were capable of rendering a higher class of service, that their earning power was greater and that their condition in life would in every way be benefited through the training which they are receiving as apprentices.

ENGINE HOUSE KINKS; ERIE RAILROAD.

SECOND PRIZE.

BY H. L. BURRHUS,
Assistant to General Foreman, Susquehanna, Pa.

REMOVING TENDER TRUCK BRASSES.

A special kink, which is useful in removing tender truck brasses, is shown in the photograph, Fig. 1. It not only saves the time which is required in looking for blocking on which to place the jack, but also holds the wheel to the rail, as the lip on

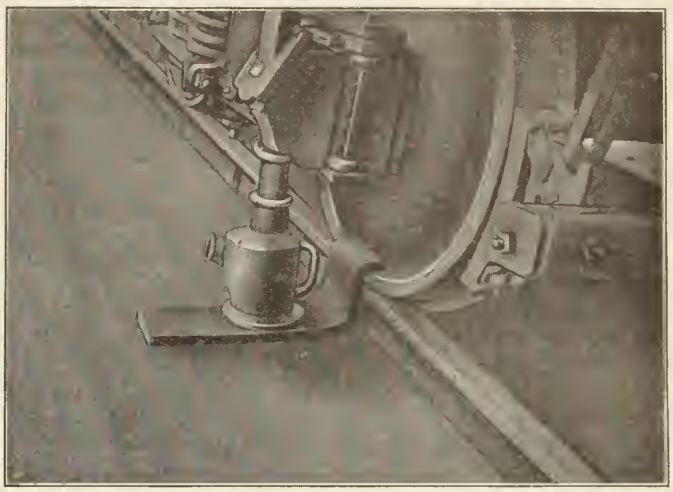


Fig. 1—Jacking Up Journal Box Preparatory to Removing Brass.

its end fits over the tread of the wheel. Occasionally the wheel will tip up if a device of this kind is not used, due to the weight on the other end of the axle. The tool has been used successfully on soft ground where ordinary blocking would sink in. It can be made of any size iron, but for good results it is best to use a piece of 1-in. x 5-in., about 14 in. long.

FRONT END CRANE.

A handy and inexpensive crane for lifting steam chests and covers, cylinder heads, pistons and front end work is shown in Fig. 2. The arm is made of a 6-in. I-beam taken from an old brake beam. The upper part of the beam forms a runway for a roller from which the hoist is suspended. The inner end is clamped to the top of the smokestack, as shown. The clamp may be made of any length to suit the height of the stack. In adjusting it, the crossbar, X, is tipped up and dropped down through the stack. As

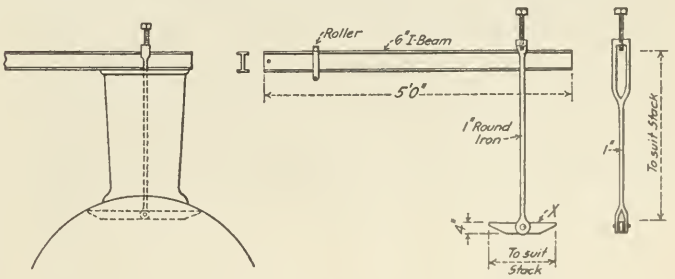


Fig. 2—Simple Crane for Front End Work.

it is evenly balanced, it takes a horizontal position after it has dropped through the stack. The beam can then be applied and be clamped in any position by the screw at the top. While the device is light enough to be handled easily, it is sufficiently strong for the work which may be required of it. In removing the crane, the screw is slacked off and the I-beam is taken out. The clamp is then lowered sufficiently so that with the use of a long stick the piece X can be tipped and be drawn up through the

stack. An important feature of the crane is that the beam is placed high enough above the work, so that the tackle blocks do not come together.

TRUCK FOR MOUNTED WHEELS.

In the different collections of kinks which have been published in the *Railway Age Gazette* there have been two or three trucks for handling mounted wheels in the shops and engine houses. The one shown in Fig. 3, however, differs considerably from any of these. A piece of 10-in. channel forms the floor of the truck, the flanges of the channel projecting upward. The wheels are loaded by placing the ends of the wheel sticks over the flange of the channel and under the journal; the flanges of the channel keep the wheels from rolling off. The large wheels are 10 in. in diameter and the treads are 2 in. wide. The two small wheels at either end of the truck keep it from tipping and catching when the load is not evenly balanced. The truck has been used successfully over soft ground and on uneven floors, and, in addition to handling mounted wheels, may also be used to advantage for transporting other heavy parts.

TELESCOPIC AIR JACK.

A telescopic air jack in a drop pit in the engine house permits the use of a comparatively shallow pit which is of considerable advantage in that it is more handy to work about and also less dangerous. A jack which has been used for this purpose is shown in detail in Fig. 4. The wheels of the truck on which it is supported are 18 in. in diameter, the general arrangement of the truck being clearly shown on the drawing. The piston is 17 in. in diameter. After it has reached the top of the cylinder the inner cylinder starts to rise and the stroke of the piston is thus practically doubled.

KEEPING TRACK OF ENGINES IN THE HOUSE.

A good arrangement for keeping track of the exact location of an engine after it is placed in the engine house is shown on the accompanying form. It should have the same number of spaces as there are stalls in the house. When the hostler brings an engine in the house he must write the engine number, the

Stall. No.	Engine. No.	IN. Date.	IN. Time.	OUT. Date.	OUT. Time.	Remarks.
1.						
2.						
3.						

time in and the date, on the blackboard on the line opposite the stall number where the engine is placed. The foreman can then fill in the time that the engine is to be called, or under the column headed "Remarks." can show any special work that is to be done on it. If all the work is completed before the engine is called, he marks it O. K. Any person interested can readily see the condition of every engine in the house by looking over the board. It also enables the workmen to find the engine on which they are to work quickly. If the engine number is not shown on the board, they will know positively that it has not yet been placed in the house, and that it will be useless for them to waste time in looking for it. As soon as the engine has left the house, the foreman or some person with the proper authority can erase the information, indicating that the stall is empty and ready for another locomotive.

ENGINE WORK REPORTS.

An important feature of a good engine house organization is the use of the individual engine work report book. This should be kept in a small box or holder in the engine cab, provided exclusively for the purpose, and should be used only by the engineer who is running the engine. The book should have

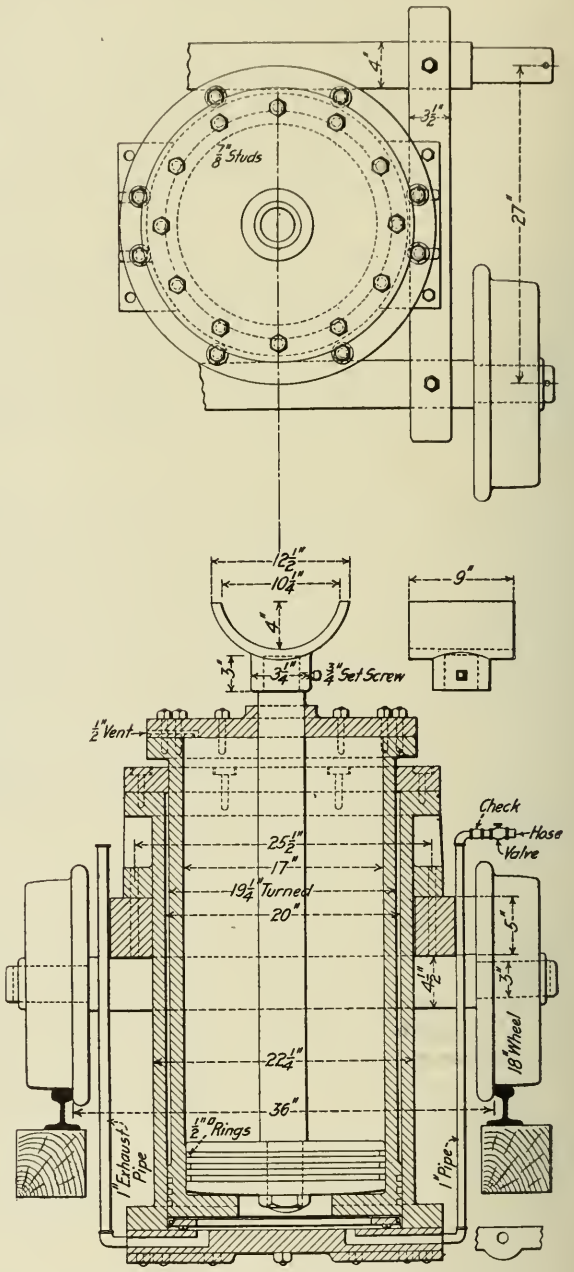


Fig. 4—Telescopic Drop Pit Air Jack.

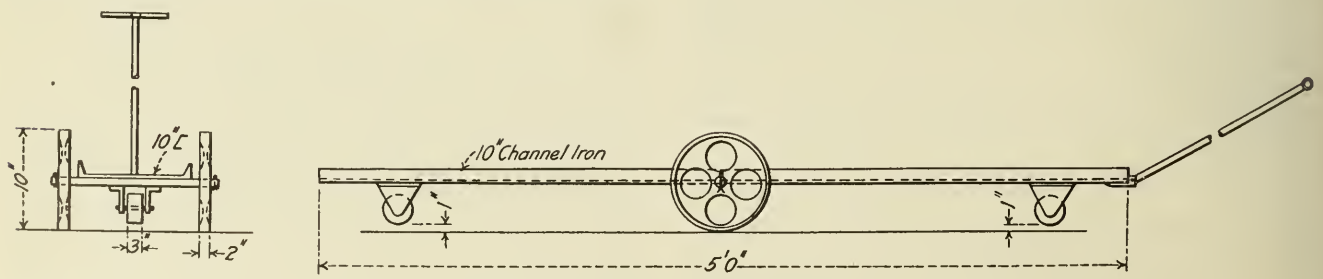


Fig. 3—Truck for Mounted Wheels.

duplicate or carbon sheets, and the engineer should fill out his work report as soon as he discovers anything wrong. Quite often the train must be stopped on the road, giving the engineer a good opportunity to inspect the engine. He may notice some repair that should be made, but too often trusts to his memory to report it on his arrival at the terminal, and sometimes forgets it. If he immediately makes a note of it in the report book there will be no trouble of this kind. Again, if the engine is due at the terminal after dark, and the engineer has an opportunity to inspect it on the road by daylight late in the afternoon and to make out his report at that time, he will make a much closer inspection and his report will be more accurate.

Another advantage is that where engines are not assigned to regular engineers, any engineer that is called to take an engine out can look over the report book and see just what the troubles on the previous trips were and thus be forewarned. By always having the work report book on the engine, any information concerning its performance can be obtained quickly, thus saving the time of checking over a great number of work reports. When an engine arrives at the engine house, the work report should be taken from the cab by the leading inspector or the foreman of the ash pit, and be given to the roundhouse foreman, thus enabling him to get a check on the kind and amount of repairs that will be required, and also assisting him in assigning the engine to the pit in the house where this work can be most advantageously done. This one point alone is quite important and eliminates a great deal of unnecessary transferring of engines after they have been placed in the house.

REMOVING DRIVING BOX CELLARS.

A handy tool for removing driving box cellars is shown in Fig. 5. Often a cellar sticks tightly and it is a difficult job to get it out. By hooking the lug X into the cellar bolt hole and using

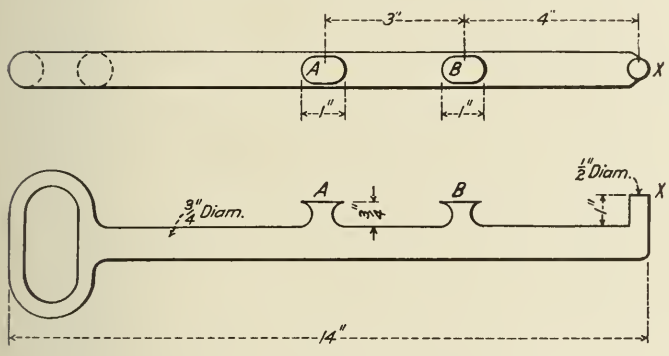


Fig. 5—Tool for Removing Driving Box Cellars.

the points A and B on the tool as fulcrums for a small bar, the cellar can be pulled out quite easily. The tool may also be used to advantage for stirring up or pulling the old packing out of the cellar after it has been removed. It is made of soft steel and the handle can be of any convenient size.

FOREIGN RAILWAY NOTES.

A direct through freight service by railway has been inaugurated between Vladivostok on the Pacific ocean and Odessa on the Black sea.

One end of the Loetschberg tunnel is at Kandersteg, in the Bernese Oberland, Switzerland, the other at Goppenstein, 17½ miles from Brigue, and about 18½ miles from one portal of the Simplon tunnel. The approach line on the south side, from Brigue, to Goppenstein, runs mostly along a steep mountain side above the Rhone valley. In its course it passes through no fewer than 21 small tunnels, as well as over ten viaducts and several very high bridges. Besides all this, protection works have had to be erected in several places to guard against avalanches.

EFFICIENT SHOP MANAGEMENT.

BY DAVID VAN ALSTYNE.

Vice-President, Allis-Chalmers Co., Milwaukee, Wis.

Maximum output, lowest cost of production and highest wages can be accomplished through the accurate knowledge of what every detail of the business actually is, the determination of what it should be and the bringing of the actual to the standard and keeping it there. The higher the efficiency, the lower the unit cost and the higher wages the employer can afford to pay as compared with competitors.

The measure of the efficiency of an organization is the extent to which the enthusiasm of the individuals in it is maintained through the organization and not through the personality of the man at the head of it.

Not the least asset created by the management which has accurate record of the individual, is the impression made upon the employee that the highest officials know of him personally; that he is less subject to the whims and prejudices of his immediate superior, and that he is recognized as an essential part of the organization, which arouses an enthusiasm that cannot be too highly valued. The treatment of men like machines by dealing with them as a class and treating good and bad more or less alike creates indifference and antagonism, and is the necessary result with conventional management. The organization created by this control of details is of vastly greater importance than the facilities or equipment. The good organization will obtain good results with poor equipment, but the poor organization will obtain poor results no matter how good the equipment may be.

Management through control of details takes advantage of the fact that few men know how to work efficiently and few employers know definitely what they should expect of their employees or from their money otherwise expended. Some employees take advantage of the ignorance of their employers by doing even less than they know they could do. Time and material are wasted in an infinite number of ways and the efficiency is limited by the personal attention of those who are in charge are able to give to the comparatively few details coming under their notice.

Under detail management an investigation of the possibilities of each operation and each pound or foot of material is made and a standard set per unit of output. These investigations are made and the standards set by experts, each in his own line. Records giving a continuous comparison of each detail of labor and material with its standard indicate which are satisfactory and which need attention. The value of establishing a standard or measuring stick for every detail cannot be overestimated. It not only gives the manager a feeling of security in his knowledge as to exactly how his affairs stand and as to what needs his concentrated attention, but also gives his subordinates something definite to work for and arouses their enthusiasm, especially when extra pay is given for reaching the standard. Men do not object to hard work if they are well paid and contented, and the harder they work within reasonable limits, the more contented they are.

It may seem that the expense of such details will not be justified by the results, but this argument is not used very long after the effort is made. The results are usually beyond expectation, and the returns frequently as high as one thousand per cent. on the investment necessary to obtain them. It is probable that the profits of the average railway or manufacturing concern can be increased from 25 to 100 per cent.

The fundamental principles in reaching high efficiency are as follows:

First, Records.—An accurate record of each detail, or group of details, of labor and material. A record should be looked upon

Abstract of a paper presented before the Congress of Technology at the Fiftieth Anniversary of the granting of the charter of the Massachusetts Institute of Technology.

as a working tool and its value measured by its capacity for producing lower cost and greater output.

Second, Standardized Conditions.—This involves putting the equipment into such condition as will make maximum output and most economical operation possible.

Third, Standardized Quality.—The determination of a standard of quality of output or efficiency of service below which it is not permissible to go is necessary because efforts to reduce cost and increase output may result in lowering the quality unless systematically prevented.

Fourth, to find out what is to be done and how to do it.—This involves stripping the work of all unnecessary refinement, finish, material and operations, bearing in mind that what is worth doing at all is worth doing well enough for its purpose and not a bit better, and then determining the simplest and quickest method of doing it with the facilities at hand and establishing a time or cost limit.

Fifth, written instructions as to the standard method of reaching the required time or cost.—Such instructions constitute a textbook of the business and are not to be deviated from. Employees should be constantly checked on their knowledge and close observance of instructions; otherwise the instructions are rarely fully understood and are quickly forgotten or ignored.

Sixth, constant comparison of actual performance with standard to see that the actual reaches the standard and continues there.—It is not essential that allowances, standards or ideals should be ultimate or represent the highest state of the art; in fact such standards may appear to be so hopelessly impossible of attainment as to be undesirable for present purposes. The standard should be set as far ahead of present practice as is practicable. The essential thing is to see that whatever ideals are set, are reached, and that, as long as they are not changed, there shall be no falling away from them.

This is the principle which is most neglected by managers and in which ordinary management fails. It is easy to establish rules and standards, but it is not easy to have them lived up to continuously. Unless the organization provides for comparing in detail what is done with what should be done, with mathematical accuracy, a high efficiency cannot be maintained. It is a common experience for a concern to reach a good efficiency during dull business and to drop to a low efficiency during heavy business because the management has so little control over details.

These principles are a decided recognition of the capacity of the individual and may be considered antagonistic to some of the expressed principles of organized labor. Restriction of output (which is not the policy of organized labor, but is their tendency), opposition to piecework and premium or bonus systems of paying for labor, and the limitation of the number of apprentices are not economically correct and nobody realizes it more than the more intelligent union men; but they constitute correct policy from the union point of view, because they are among the few weapons labor has with which to fight and defend itself against aggressive employers. Under usual conditions they are necessary to the existence of organized labor. So long as employers consider it necessary to oppose organized labor, just so long these weapons will be used to the detriment of the employers. If, on the other hand, it should be considered safe to work with organized labor the men soon get the employer's point of view, and he theirs. Each sees that the other is right, and they adjust their differences by making an agreement.

The usual form of trade agreement which binds the employer to pay fixed rates per hour, day or week and the employee to put in his time and produce whatever the employer is able to get out of him, is economically wrong because one-sided and indefinite. Each has his opinion as to what constitutes a fair day's work, which the employer will constantly try to increase and the employee tend to decrease. What one employer may consider a fair output may be too little for another employer and more than required by a third. It is to the interest of both employer and employee to agree on a reasonable time for each operation, so that each may know definitely what he is to expect from the other. An agreement which binds the employee to a definite output as well as the employer to definite working hours, rates of wages, etc., is a safeguard for both parties. To whatever extent the employer is liberal in his treatment of men, they will usually meet him half way. The agreement is a protection to the employer, in that it reduces petty injustices on the part of minor officials and also prevents local troubles from men widely distributed, but bound by the same agreement, as in the case of railways. A large percentage of the restrictions which unions try to add to their agreements from time to time are an effort to check abuses by minor officials, who are too narrow to see any but their own side and are over-zealous in the interest of their employers. Labor has learned its bad tricks from employers and in using them has been a great educator of employers in making them see that there are two sides to even the labor question. There is much to be said, however, in justification of those employers who refuse to deal with organized labor because of the unscrupulous methods of some labor leaders.

Laboring men are by inheritence and training suspicious of employers and inclined to take a sentimental view, to brood over their down-trodden condition. Whenever they can be persuaded to take a business-like view of affairs, to determine what is to their interest and whether it is to their ultimate interest to consider the interest of the employer, they at once become rational, and there is no difficulty in coming to terms with them.

Whenever the employer can create the feeling that the sole object of his official existence is to get the most out of his employees for the money invested in them, and that he realizes this can be done only with the best paid, most thoroughly contented employees, he has won his point and need waste no further effort to destroy unionism. He will find that he has accomplished all that is necessary or desirable in modifying radical unionism, and that it is as much appreciated by employees as employers. Every union man, like all other individuals, is primarily interested in his own welfare and is interested in his union or his employer only to the extent he thinks each contributes to his welfare. Whichever impresses him as most profitable for him to adhere to will receive his loyalty and support.

During the recent period of great commercial activity many complaints were heard of the difficulty in getting skilled men, many employers claiming that the unions were making men indifferent and independent, and through various restrictions preventing the development of a sufficient number of skilled men to supply the demand. I am inclined to think that to a certain extent this may have been true and that it was largely the fault of the employer for permitting it. The influence of the unions, however, in this direction is limited and only indirectly the result of their efforts to better their conditions. The chief cause of the scarcity of skilled labor is the extreme fluctuations in business, creating at one time an abnormal demand and at another throwing both skilled and unskilled labor out of work. There are more skilled men and there is skill of a higher order than ever before; but by the nature of things their number is more or less adjusted to the average demand. There is always available a nucleus of these good men who have comparatively steady work, and during times of extreme activity the only men available are those who spend a considerable portion of their time in idleness. In times of great activity there is no good opportunity to train this generally unemployed increment and in dull times idleness encourages laziness, indifference and a loss of the little skill men acquire while at work. We are inconsistent in throwing as many men as possible out of work as soon as business begins to decline and then complaining that they are not capable of the highest efficiency when they are employed.

This is the greatest evil for which our present social system

is responsible, and it is also the most difficult to regulate. Apprenticeship, trade schools and like efforts to train skilled workmen are all good to a certain degree, but their influence is insignificant as compared with the influence of long periods of enforced idleness to which the laboring class is subjected. It is important to develop skilled workmen, but it is of much greater importance to develop loyal American citizens who are interested in promoting the welfare of the state and consequently that of the employer. It is out of such employees that the employer makes the greatest profits in the end. There is not much encouragement for a man who spends a considerable portion of his time in idleness to become either the right kind of citizen or employee.

This ever-present fear of being thrown out of work makes men hold back their output in order to make the work last as long as possible. Aside from the inhumanity of periodically depriving a considerable percentage of our citizens of the means of earning a living, it would seem good business policy in the long run for employers to find some way to keep a large percentage of their employees on the pay roll at at least a living wage during periods of dull business, whether there is work for them or not; and it is probable that a great deal more could be done in this direction than is done. It is to be hoped that some day it may be found practicable for the law to require employers to take care of a certain portion of their idle employees during periods of depression, and the government to give employment to the rest on public improvements.

It is encouraging to note the number of concerns which are introducing old age pensions, profit sharing, etc. It is to the pecuniary interest of the employers to do these things themselves rather than to wait for them to be done by the government with its inevitable inefficiency. Every large employer of labor can afford to have what might be called a sociological department, whose duty it would be to look to the welfare of its employees so long as it is not done in a patronizing manner. Such a department should keep a personal record of each employee, consisting of whatever information of value is obtainable, to be used in deciding as to desirability as an employee, and eligibility for promotion, instead of depending on haphazard opinions which are usually superficial and biased. It would also keep as closely in touch as possible with employees to find out what secret grievances they are brooding over due to brutal, prejudiced and partial treatment by superiors; and be ready to lend a helping hand in case of misfortune, sickness or death. Apprenticeship, pensions, profit sharing, prevention of accidents and hospital service might also properly come within the jurisdiction of this department.

Having in mind that the large employer will not attain highest efficiency which will continue indefinitely until he produces, as closely as possible, the personal relationship between superior and subordinate which exists in the case of small employers, it would seem that the best way to accomplish it is through a department created for the purpose. This department would, in the long run, be one of the most effective in increasing net earnings.

The speculative financial influence is a serious obstacle to the progress of better management, and, in consequence, to its own interests. Not only does it not understand the human element in its business, which is the important element with a large employer of labor, but being in control it usually dictates a narrow, opportunist sort of policy based on superficial opinion rather than scientific investigation. It cannot see that a moderate investment in better organization and management will in nine cases out of ten save a large investment in equipment, besides reducing the cost of the operation. As a result, executives, no matter how well intentioned, are afraid to depart from the narrow conventional limits prescribed; so that "big men," are not developed for the "big" positions.

Little improvement can be expected until the average board of directors takes more interest in the business it directs and becomes more intimately acquainted with the details. It would seem that one way to accomplish this would be to have each department head report direct to the board instead of through the president, who as a rule is a specialist in only one department. It would also seem advisable for the board to have specialists report on the efficient operation of all departments in the same way that chartered accountants report on the accounting department.

ENGINE HOUSE KINKS; NEW YORK CENTRAL & HUDSON RIVER.

BY H. S. RAUCH.
Apprentice Instructor, Oswego, N. Y.

PORTABLE WORK BENCH.

A portable work bench, which is different from any of those which have been illustrated in connection with previous competitions, is shown in Fig. 1. By raising the end of the 1-in. handle and placing it in the hook, the wheels are lowered to

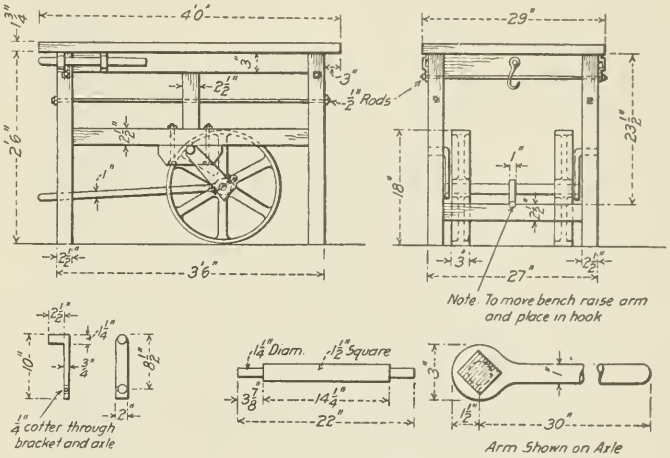


Fig. 1—Portable Work Bench.

the floor, and one pair of bench legs is raised upward. The bench can then easily be rolled to the most advantageous position for handling the work for which it is to be used. By unhooking and lowering the handle, the legs of the bench again come in contact with the floor. The construction is simple and inexpensive and provides the necessary rigidity. The detail of the brackets in which the axle fits and of the arm or handle at the center of the axle are shown on the drawing.

UNIVERSAL COUPLING.

A universal coupling, which will be found valuable in connection with a tube cutter or tube roller when operated by an air motor near the shell of the boiler, or where there are obstruc-

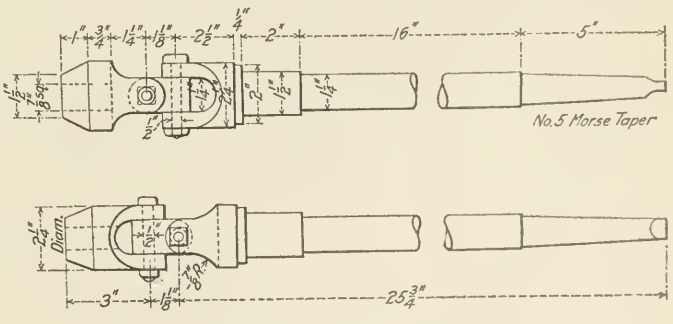


Fig. 2—Universal Coupling.

tions which prevent the motor from being placed in line with the tool which it is driving, is shown in Fig. 2. The pins in the coupling are ½ in. in diameter.

IMPROVING AND MAKING MECHANICS.*

SECOND PRIZE.

BY JOHN H. LINN.

Apprentice Instructor, Atchison, Topeka & Santa Fe, Topeka, Kan.

The Need of Mechanics.—The cry on every hand, from one end of the industrial world to the other, is the lack of competent workmen. In the struggle and competition of modern business push, brawn and muscle have necessarily given place to brains and skill. While inventions and improvements in endless succession are everywhere increasing the effectiveness of commercial enterprise, they are likewise daily increasing the demand for thinking men, men capable of performing the work incident to our rapid industrial development. The worker or artisan who labored at the bench in his own home, assisted perhaps by his son or a few helpers, has been supplanted by immense shops and manufactories with thousands of workers under a single roof. To meet these changed conditions we must have trained minds and skilled hands, not of the few but of the many. The educational forces of the country are beginning to realize that they have failed to keep pace with our rapid industrial progress and are struggling blindly for some solution of the difficulty. Meanwhile the wheels of industry will be checked for lack of operatives unless the industrial concerns themselves come to the rescue. Many of them are doing so. Nowhere is the lack of workers more keenly or more sorely felt than in the modern railway shops. I might add that nowhere is the problem being so successfully solved. The mission of this article is to tell briefly what one of these companies is doing to meet this emergency and to suggest a further solution of the difficulty.

A New Apprenticeship System.—Before touching on what may be done to increase the efficiency and happiness of the older employees, I shall discuss the education and training of the apprentices, that important class of workmen on whom the hope of the industrial future must depend. Some would tell you that the apprenticeship system is dead, but I assure you it is a very lively corpse. The old system wherein the apprentice had to depend for his instruction on his foreman or fellow workmen did almost entirely disappear with the specialization of modern industrial life, but from the germ of the old apprenticeship has blossomed forth an advanced system, which is as yet the most successful solution of this important problem.

Support of the Management.—In considering this later system it is well to note wherein the older systems failed. Too often the busy foreman, responsible for the immediate output of the shop, lost sight of the real aim of an apprenticeship course; that is, the making of skilled mechanics for the future. For this reason any scheme to be successful must have the support of the officials highest in authority, men big enough and broad enough to look beyond the immediate pay roll and shop output, and see the more vital and more lasting results to be derived later on. Although our company is spending between three and four thousand dollars each month toward making skilled mechanics for the future, the results achieved prove conclusively that the scheme is the best investment the company ever made; that the plan more than pays its way as it goes; this without taking into consideration the primary result of graduating into our shops skilled mechanics familiar with our methods and loyal to the company in the very highest degree.

Qualified Supervisor.—In addition to the unlimited support of the management, the apprentice department should be in direct charge of one having a natural love and sympathy for boys, an intimate knowledge of the training which an apprentice in each trade should receive, sufficient executive ability to properly conduct his department, and last but not least, sufficient tact to inaugurate with the least possible amount of friction the necessary changes in the handling of apprentice matters in the various shops. It has been the writer's observation that from the office boy up everyone connected with railway work is very sensitive about his prerogatives. Considerable tact and firmness is necessary to inaugurate any change which transfers duties from one official to another. This road has been especially fortunate in having a supervisor endowed with the above and other essential qualifications. To his ability and to the support given him from the management, are due the extraordinary results already achieved.

Competent Instructors.—Next in importance, is the selection of competent apprentice instructors. No expense should be spared in getting the best men available. The duties of the instructor are as difficult as they are important, as full of trials and hardships as of blessings for those whom he influences. He should not only have sufficient knowledge and skill to command the confidence of the apprentice and all with whom his work brings him in contact, but must also know how to impart his knowledge to others. He must not be a mere machine, but a living soul, obedient to the light of a cultivated intelligence and the impulses of a generous heart. He must love boys in general and have a fatherly love for the particular boys in his charge, yet be able to sympathize as one of them in their games and sports, their joys and their troubles. He must make an individual study of each boy and learn just what help each one needs and how this help can best be given. He must be exceedingly patient and self-sacrificing, showing his love and care most conscientiously towards those who need it most—not the most deserving, but the most needy. He should become familiar with each boy's home life, know with whom he associates and how he spends his evenings; remembering that if these boys are to become good mechanics and loyal employees they must also be honest and upright citizens. The instructor's success or failure will depend very largely on his own personality, on his own manner and temper, on his own life and character, on the ideals he impresses by his own spirit and example.

School and Shop Instruction.—The instruction given the apprentices should be two-fold, that which can be given in the schoolroom, and that which must necessarily be given in the shop. The shop instruction is by far the more essential and fruitful. It is the shop instructor's duty to give the boy whatever instruction he may need on any machine or class of work. He it is who decides when the apprentice should be changed from one kind of work to another. He works in harmony with the foreman. The foreman decides what work the apprentices as a whole shall do, but the instructor distributes this work among the various boys, taking into consideration the fitness and needs of each. Results have proved this a very satisfactory arrangement both for developing the boy and for increasing the output of the shop. There should be a shop instructor for every twenty-five or thirty boys. With a greater number he can look after them only in a general way.

The school instruction should be confined to subjects pertaining directly to the respective trades. There are so many things that the mechanic should know, that with but four hours a week and a course of only four years it will require every moment of the apprentice's time to master the essentials of his trade. Furthermore, a too wide diversity of subjects will only tend to lead him astray. The school instruction should be during working hours. Night schools so far as the average boy is concerned are a failure. It takes a great deal of stamina for even an ambitious man to sit down to night lessons after having worked ten hours in the shop. The boy with his immature mind and his growing body is certainly entitled to a little time for rest and play. If we wish him to be loyal, we must not deny him the pleasures and recreation of his evening hours. If education pays at all, and it certainly does, any corporation can well afford to pay its apprentices for the time spent in school, two hours a day, two days a week.

Where there are only a dozen or fifteen boys, one man (if

*Submitted in the competition on the instruction of workmen and apprentices which closed April 15, 1911. Mr. Linn was awarded the second prize of $20.

a competent one can be found) can take care of both school and shop instruction. This arrangement really has many advantages, not the least being the closer relation between the school and shop instruction. For the smaller shops we have traveling instructors who spend two days a week at each shop. Corporations not deeming it advisable to conduct the school work themselves can in many cases arrange for the local school authorities to open a special school for the employed boys of the community. But we know of no substitute for the shop instruction. In our modern shops, especially those working under any kind of individual effort system, neither the foreman nor any of the men have time or inclination to show the apprentice the many things he needs to know.

Wages Paid Apprentices.—The apprentices should be paid living wages from the start, with a slight increase as they advance in service. It is true many readers of this article served an apprenticeship on fifty cents a day. But conditions are now changed. There are now too many avenues open for the boy, many of these much more attractive to him at his critical age. In too many cases our most promising applicants must help the father provide for the home, or possibly keep the wolf from the door of a widowed mother or orphan sister. If the scheme is to be successful, we must make these boys self-supporting from the start. The amount of work they actually accomplish more than justifies paying them liberally. It is a conservative estimate to say that the average apprentice with competent instruction (which will cost less than two and one-fourth cents per hour per boy) will accomplish fully 80 per cent. of the work done by a full-paid journeyman. Upon graduation they should be paid journeyman's wages, for they are certainly worth far more to us than any other class of mechanics.

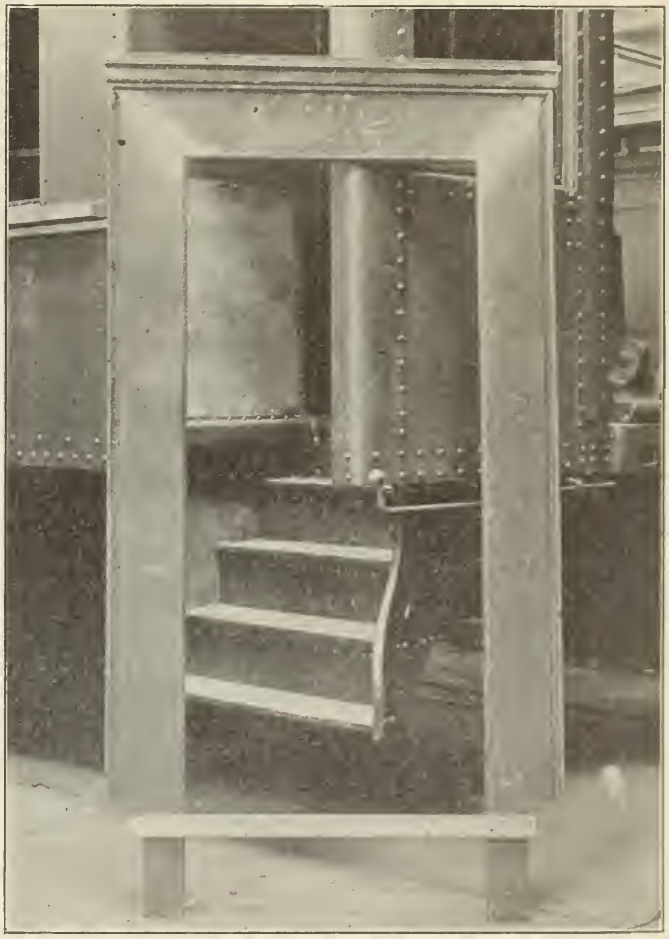
Does it Pay?—Thanks to the treatment received, over 85 per cent. of our graduates have remained in our service. These men are not only skilled mechanics, but they are familiar with our ways and means and are vitally interested in the company's welfare. Not all of them are, or will be, leaders. It is not our desire that they should. Our aim is merely to make skilled and loyal mechanics. It is a significant fact, however, that several of our graduates have already been placed in responsible official positions. Does the scheme pay? The management, the local officials, and the apprentice boy himself answer: Yes, a thousand times, yes.

Other Employees.—But what about the countless others in our service, who are beyond the age of an apprenticeship? Should nothing be done for them? Space here does not permit going into detail, but the writer believes that many features of our apprentice training could be applied with profit to the improvement of other employees. Some of the younger handymen or helpers could be encouraged to attend night school, the tuition of which the company could well afford to pay. A shop demonstrator capable of performing the various operations with the least possible waste in time and energy would be of assistance to even the skilled mechanic. In the smaller shops perhaps the apprentice instructor could also instruct some of the handymen and poorer mechanics. At least these men should receive more of the courteous treatment received by the apprentices. They should also be disciplined with a firm but friendly hand. Too often they are treated as though they were devoid of human feeling.

Any corporation will do well to cultivate a more friendly and unselfish feeling among its employees, and especially between its workmen and shop officials. The company should have a genuine interest in its men, not merely in reference to possible increased value in dollars and cents, but a real regard for their welfare as men. The treatment given them should be such that they will not look upon their employer as an aristocrat or corporation of aristocrats, their foreman as a slave driver, their machine as a treadmill, and the world at large as against them. They should be made to realize that their employer's interests are their own, that they are working for the same end, that mutual effort will bring mutual reward. When these conditions are realized we will be ready for a still greater industrial achievement.

OXY-ACETYLENE WELDING FOR STEEL PASSENGER CARS.

Oxy-acetylene welding is being used to splendid advantage in the building of steel passenger cars for making strong, and at the same time invisible joints, which have an efficiency of from 80 to 85 per cent. The great strength of the riveted joint has made it a favorite for many locations on the steel car. But even where the rivets are countersunk and the heads are filed or ground flush it is not an invisible one. Soldering is sometimes used, and at times with success. There are, however, two objections to it; it is weak, having only about 40 or 45 per cent. of the strength of the metal united, and it has a different coefficient of expansion from that of steel.

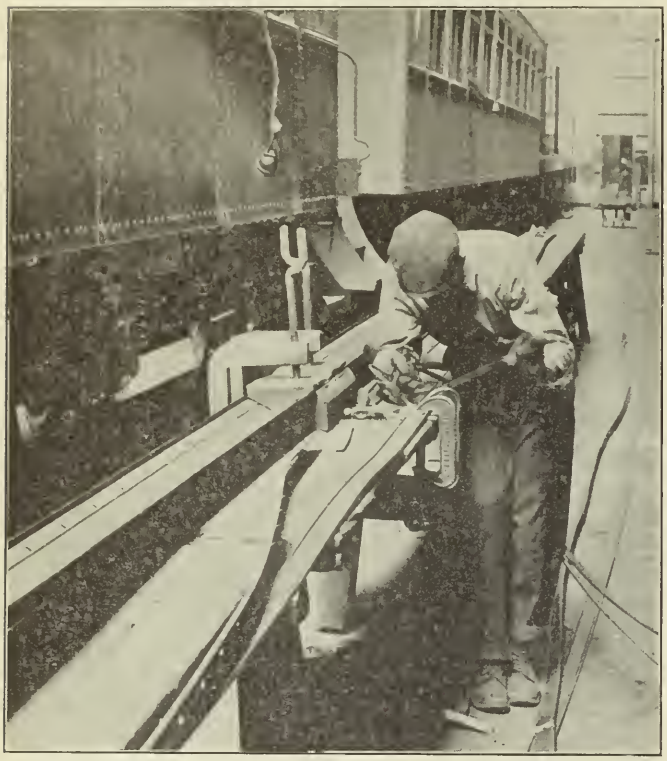


Door Frame for Steel Coach Made in One Piece by Oxy-Acetylene Welding.

On the coaches for one road the joints of the roof plates are closed by the oxy-acetylene torch. The roof joints on a standard car total about 232 lineal feet. The principal joints are transverse, extending clear across. At either end of the car is a longitudinal joint several feet in length where the right and left hood plates meet. The metal of the roof is 1/16 in. or 3/32 in. thick. A difficulty that has been met in such work is a tendency of the plates to bend downward and form a groove with the joint at the bottom. This tendency is successfully dealt with by using a small T-bar, to the arms of which the edges of the plates are riveted. The web of the T lies immediately underneath the joint. The T-bar so increases the capacity for the absorption of heat that a heavy wire, ⅛ inch thick, is employed as

a welding stick. A flat rate of 4 cents per lineal foot is paid for the labor; the gas expense is estimated at about 1½ cents per ft. The welding of the entire roof thus costs about $12.75. It is not necessary to chamfer the edges in butt-welding such thin sheets. The roof plates are about 7 ft. across. The T-bars have a metal thickness of ⅛ in., the arms are about 1 in. wide, and the web about 1½ in. deep. The acetylene is supplied through flexible tubing from an overhead ¾-in. pipe.

Another example of welding on steel coaches relates to the joints of the panel frieze. This is a flat, longitudinal panel with a molding above and below. There are three sections on one side of a car. The pieces are straight, but the joints must be such that there will be a difference when in place of ⅜ in. between the level of the center and the ends, which are 60 ft. apart, to provide the proper camber. Formerly, soldering was employed. It was, however, quite expensive, costing about $9 per car, and not so satisfactory because of the weakness of the



Welding Parts of Deck Molding Together; Eight Welds Per Car.

joint. By the oxy-acetylene process, the work is being done for $4.50 and makes a much better job. The plates are 1/16 in. thick. In making the weld, work is begun at a a point distant one-third of the total width from the side which is to be uppermost when the frieze is in final position. Beginning at this point, the upper third is welded. The camber will now be in the wrong direction. However, by beginning at the same point as before and welding the remaining two-thirds, this camber is eliminated and the correct one introduced. There are no supporting strips riveted to the frieze, the plates being held together by the weld alone. So perfectly is the joint made and the excess metal removed that it would require considerable examination to find the joints in the finished car.

Another interesting piece of work relates to the joints of door frames. It is necessary that this shall be a perfect piece of work, but it is easily and satisfactorily done by the oxy-acetylene process, as shown on one of the accompanying illustrations.

Ten door-headers for five cars were each made ⅜-in. too narrow. The old remedy would have been to tear out the frames, involving an expense estimated at $5 per door. However, a strip was successfully welded on, correcting the defect. The cost of welding and subsequent filing was estimated at 20 cents per door.

The diamond shaped window frames used on some coaches are made of 3/32-in. plate, and have four mortised joints each. Oxy-acetylene welding is employed here. Similar joints in the rectangular deck frames are also welded by the same process. In a single car, there are upwards of 176 such joints, or about 30 lineal feet of welding.

Another example of the employment of welding as a finishing procedure is in connection with the grab handles. These consist of three parts, a steel tube and two fittings. The fitting when in position has a vertical projection which is enveloped by the tube end. A counter-sunk pin is employed to hold the two firmly together. The welding process is used to efface the joint where the end of the tube comes in contact with the shoulder on the fitting. The labor cost of setting and welding these fittings is 1½ cents each, or 3 cents for each grab handle.

On certain cars, the roof sheets and the steel head lining are about 1⅞ in. apart, along the top of the roof. There are ten chandeliers per car, and the double covering made of thin material has to be strengthened at ten points. This is accomplished by inserting a box-like support in two sections in the space between the head lining and the roof at each chandelier. Each of the twenty pieces is a rather complicated sheet metal form. The upper and lower bases are shaped somewhat like the letter C in Gothic type, only they are not precisely duplicates. These are connected by a strip between the convex sides of the C's. Formerly this entire piece was formed by pressing. There were, however, a large percentage of failures through radial cracks at the bends of the C's. Moreover, it required six operations on the press. At the present time, these pieces are formed of three pieces of 3/32-in. sheeting welded together by the oxy-acetylene process. It is estimated that a saving of 50 per cent. has been accomplished by the change in method, and there are practically no failures.

In some steel cars there is a recess or alcove for the water cooler. At the bottom of the alcove, a somewhat complicated depression is made for the reception of the drinking glass. It seems to be practically impossible to form this bottom together with the depression from one piece by the use of the press. The oxy-acetylene welding process permits the pressed piece and the bottom to be united into a single piece. The bottom is also welded to the vertical part of the alcove.

Perhaps the most interesting piece of work being performed in steel car construction is the welding together of sheets to form units of head lining. The units required are about 7 ft. square. The requirements call for the use of patent level stock. Apparently this is the only steel sheeting that is absolutely flat; but it is not obtainable of sufficient width. By the use of the oxy-acetylene welding process, two strips are so united, edge to edge, that a piece of the desired width is produced without destroying the required flatness. The stock used is quite thin (about 1/16 in. thick) and no reinforcing strip is employed. It is a butt weld. In carrying out the operation, the two half-sheets are secured edge to edge on a suitable table by heavy bars properly clamped. The edges of the sheets are not prepared, but are placed in contact on one side, and perhaps ¾ in. apart on the other. The operator begins on the side where there is contact, using a No. 4 tip and 1/16-in. wire. At first, the separation of the edges opposite tends to increase. But as the work advances, they press towards each other. Two or three times during the operation the clamps on the open side are loosened and the edges permitted to approach a little. As the operator works across the 82-in. seam, a buckle follows. But this disappears as he finishes the weld. The ends of the lengths which have been joined may not form a line that is quite straight, but this is readily corrected by trimming. The surface of the weld will not be smooth, and this is remedied by filing. The expense for the labor, including the filing, is 4 cents per

lineal foot. The gas expense may be taken at 1½ cents, so that the weld costs, altogether, about 38.5 cents. The major portion of the welding apparatus used in the shop in which these operations were performed was obtained from the Davis-Bournonville Company, New York City.

ENGINE HOUSE KINKS; CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.

BY THOMAS NAYLOR.

Roundhouse Foreman, St. James, Minn.

AIR PUMP PISTON HEAD HOLDER.

One often hears an engineer coming in after an engine failure say that if he had only had something to hold the air pump piston from turning he would have brought his train in without trouble. The device shown in Fig. 1 is so simple that it hardly seems worth while illustrating, and yet many an engine failure could have been prevented by its use. Every engineer could

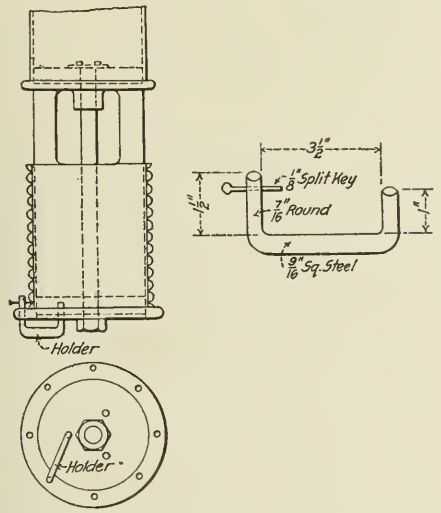


Fig. 1—Air Pump Piston Head Holder.

make one in a moment or two from an old packing hook, a large nail, or even by bending a piece of ⅜-in. wire into the form of the figure 3. The holder shown in the illustration is made of 9/16-in. square steel bent at each end as shown. A ⅛-in. hole is drilled ¼ in. from the end of the longer arm. This is for a split key to keep the holder in place, as shown on the drawing. All air pump piston heads have two or three holes in them, and by putting one end of the holder in one of these, and the other end in one of the cylinder head tap bolt holes, the piston head can be kept from turning.

APPLYING LINER TO CROSSHEAD.

A simple method of applying a lost liner to a crosshead without taking down the main rod and crosshead is shown in Fig,

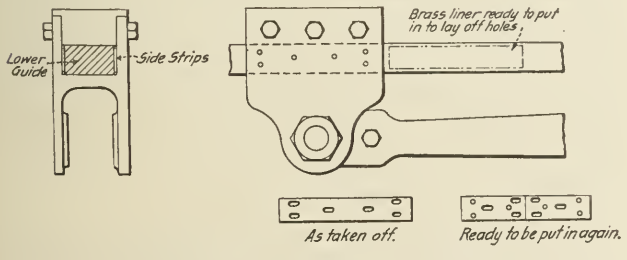


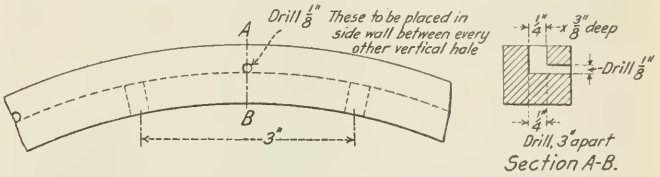
Fig. 2—Applying a Liner Without Taking Down the Crosshead.

2. The liner is slipped into position between the guide and the crosshead, and the holes are marked off. It is then removed and the holes are drilled and tapped, after which the liner is replaced and a copper rod with threads on one end is screwed into the hole and is cut off to allow ¼ in. for riveting over on the outside of the crosshead. In performing this latter operation the crosshead is wedged on the other side of the guide, so as to draw the liner, which is being riveted, close to the guide. Liners may be applied in this way in about an hour, and I have often seen them run until the engine went to the shop for overhauling. A liner that has become loose, and in which the rivet holes are elongated, may easily be used by removing it and cutting it into two pieces, as indicated on the illustration, and redrilling it as shown.

LEIGHTON CYLINDER PACKING RING.

A series of experiments are being conducted by the Illinois Central with a new type of snap cylinder packing ring, the invention of Wm. Leighton, a machinist in the roundhouse at Clinton, Ill., who has obtained patents on it in United States and Canada. The invention differs from the common type of ring to the extent that it has an annular groove in its outer edge, holes extending from the bottom of the groove radially inward to its inner surface, and other holes extending from the groove axially through one of the side walls of the ring.

Those familiar with the handling of heavy power are aware of the difficulties experienced with defective cylinder packing, resulting in engine failures, delayed trains, and time lost at



Leighton Cylinder Packing Ring.

terminals for making repairs; often the character of the material composing the ring makes little difference in the results. Excessive wear on the ring and the cylinder wall is brought about by the pressure of steam under the ring in addition to the natural spring or snap in the ring when applied. This also tends to some extent to wipe away the lubrication.

With this idea in mind, the patentee advances the following claim: The smaller bearing occasioned by the annular groove in the face of the ring reduces frictional resistance between the ring and the cylinder wall, and the holes extending from the bottom of the groove inward to the inner surface of the ring permit the admission of steam into the groove. In other words, the pressure of the steam at the bottom of the groove equalizes the pressure under the ring and produces a balancing effect, besides providing ample lubrication at all points of the stroke through the medium of the steam saturated with the oil contained in the groove. The holes extending from the groove through the side walls are optional and are placed against the pressure side of the piston head, front and back, with a view of relieving the groove in the packing ring at each exhaust and permitting the free movement of the ring in the piston head groove. Recently the above holes were omitted and no perceptible difference was noted in the results.

The management of the Illinois Central has given all assistance possible to carry out the experiments, and is well pleased with the results obtained. The standard freight engines on the division where the experiments were conducted are of the mogul and consolidation type, having cylinders 20 in. x 28 in., and carrying 200 lbs. steam. The ring has given equally good service in passenger locomotives and switching power of smaller size. The improved rings now in service have run 25,000 to 50,000 miles without any perceptible wear. In one instance—that of a passenger engine—they ran 70,000 miles

and were only removed on account of a change in cylinders due to cracked bridges.

The manufacture of this ring, as compared to the common type, consists of two more distinct operations, the grooving of the ring and the drilling of the holes; both operations should not cost to exceed 10 or 15 cents, which is a small item compared with the saving obtained by the increased service.

ENGINE HOUSE KINKS; MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.

BY B. N. LEWIS.

Roundhouse Foreman, Enderlin, N. D.

PLATFORM FOR BOILER WASHER.

A large amount of time and labor are ordinarily expended in arranging temporary platforms for washing over the crown sheets and tubes of locomotive boilers. This is especially true in bad water districts, where the boilers have to be washed after every trip. A light platform for this purpose, which may be easily adjusted, is shown in Fig. 1. It is 3 ft. wide and 5 ft. long, and is made of two strips of ⅜-in. x 1½-in. iron, to which a ⅞-in. x 5-in. matched pine floor is secured with bolts. Loops

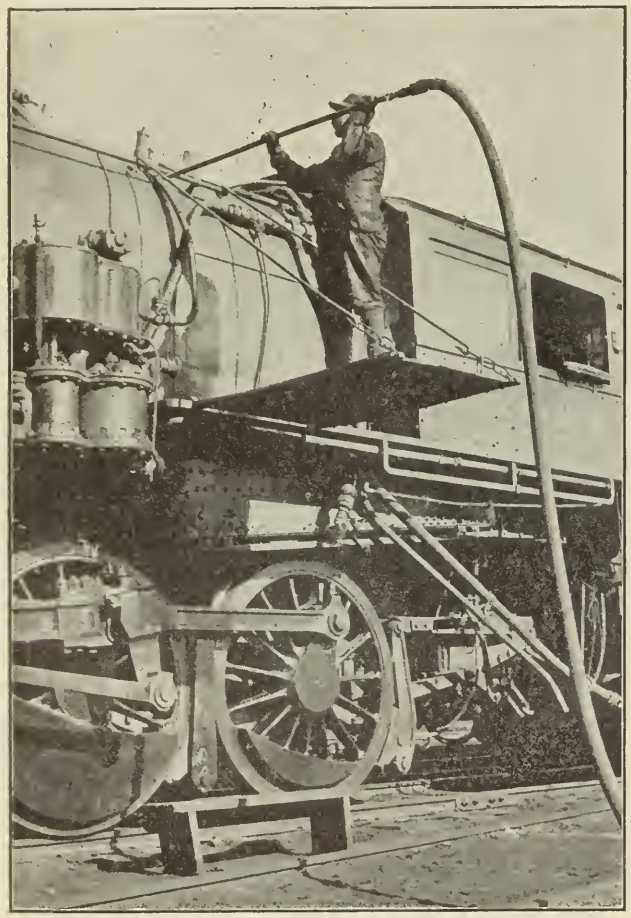


Fig. 1—Platform for Boiler Washer.

are formed at the outer ends of the iron strips, which may be connected to the hand rail by two ⅞-in. round iron rods made with a hook at each end, and the two pieces of chain each having four links, as shown in the illustration. The chain allows the platform to be properly adjusted for the different classes of locomotives. At the other end of the platform the iron strips are offset to catch the edge of the running board.

BENDING ROLLS FOR LIGHT WORK.

A simple bending rolls for light work in an engine house, such as forming the petticoat pipes or for use as a clamp when flanging a baffle plate, is shown in Fig. 2. Not being located near the main shops, where we could have access to the rolls in the boiler or tank shop, we find indispensable. The top roll is made of standard 4-in. wrought iron pipe, and the lower ones

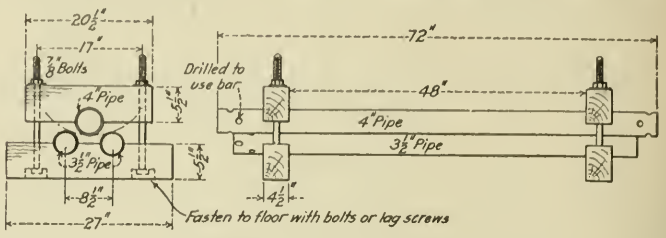


Fig. 2—Bending Rolls for Light Work.

of 3½-in. pipe. The rolls rest on 4½-in. x 5½-in. oak blocks, which are fastened to the floor by lag screws. They are revolved by using an ordinary bar in the holes at the end of the pipes.

OPPORTUNITY IN A RAILWAY SHOP.*

BY RICHARD KEEFE.

Apprentice, New York Central & Hudson River, Oswego, N. Y.

Casey-Jones has two sons; one a bright, well-set-up lad, whom it is decided will be a doctor, even before he has worn long trousers. The other son shows no bent for anything, unless it is three square meals a day, so he is rushed into long trousers and sent to the railway shop to earn the price of them.

The state aids Casey-Jones to make an M. D. of his bright son and then the public pays the bright fellow well to perform an autopsy or break up a fever—and hats off. State nor father pay attention to the other chap, who becomes part of an organism so great that its arms encircle the globe, its head in the aurora borealis, and its feet seeking the south pole; an organism so complicated that the defect of one part affects another separated by thousands of miles, and one that makes the dope-can as important as the general manager's pen. This organism is an army; it has its cavalry (the clerics), its artillery (the directors), and its infantry (the toilers), the branch in which there is no honor, but upon which the other two rest—the foundation.

This is the branch that takes in young Jones, and it requires him to respect himself and respect labor. Shirks are not wanted in the infantry; he will have to work for an opportunity—work hard without any prizes offered for even 100 per cent. work, and he must prove himself a 100 per cent. man to hope for promotion, unless he is thirty-second cousin to the boss.

In a smaller place Jones would get more knowledge of some one thing, but his work would lack variety, life, the touch with big things, which is the fascinating part of railroading. This is what rouses even the half-asleep boy and pushes him up, for like the pumpkin, growth is from within, as well as thought, and Jones thinks he has his problems. The greatest of these is as yet unsolved, the problem of capital and labor; but he dreams of a time when they will smoke the pipe of peace and bury their differences so deep that they will sleep the sleep that knows no waking, and both join hands in giving man a boost out of the slump. A pipe dream perhaps, but without it life would be too gray even for a fellow as healthy as Jones. The ordinary boy knows that in the railway service there have been ordinary boys who have climbed to high places. Such places are not all filled, and some of them make the position of an M. D. look sick by comparison.

The government of Cuba has authorized the Cienfuegos Palmira and Cruces Railway and Power Company to construct and operate a railway from Caonao to Manicaragua, and a branch line from the former point to Cruces.

*Entered in the competition on the instruction of apprentices and workmen, which closed April 15.

THE MISTAKES OF THE EFFICIENCY MEN.*

BY ONE WHO HAS WORKED WITH THEM.

V.

NEGLECT OF LARGE FACTORS.

A mistake common to the majority of the leading efficiency men, due perhaps to their zeal for a perfect control of the most minute details of every operation, is the neglect of certain large and important factors. The efficiency system cannot be separated from the other departments of shop activities, for the reason that it affects them all. It is not a branch grafted on to the main tree, but when properly introduced is a part of the body itself. There are many systems of shop management, which if installed in their entirety and strictly according to the ideas of their originators, are so complicated that it is manifestly impossible for a shop manager to familiarize himself with their details without neglecting many of the larger interests that have previously demanded his attention. Efficiency men, when given the opportunity to introduce scientific methods are often so intent upon proving the correctness of their theories that they, too, neglect the large factors. The difference is that they do so from choice, while the shop manager does so from necessity when he is required to adopt a system which he knows beforehand to be inadequate.

One of the most difficult problems confronting the efficiency engineer when he attempts to establish a new system of shop management is that of labor. The task of keeping the workmen contented without sacrificing profits is often the supreme test of a man responsible for their relations with the company. The successful manager is usually equal to this test. Efficiency men, however, are strangely blind to the attitude of labor toward a system which the men believe can tend only to reduce their earnings. Whether they are correct in this attitude or not does not alter the situation; they are a factor that cannot be ignored with impunity. An eminent efficiency engineer has said that "under efficiency operation strikes are inconceivable." It is because of this abounding faith in their theories that they fail to recognize the rumblings of discontent until the earthquake occurs. A disinterested investigator need not seek far to find examples of serious labor difficulties and strikes following the introduction on any extensive scale of certain efficiency methods; and many strikes are anticipated by withdrawing the specialist from the field. It is the policy of certain companies to avoid labor troubles at almost any cost—they do not like the notoriety and are anxious to get along amicably with their employees. In such cases it has often occurred that after the men have been strongly organized in opposition to the new system, their demands for increased wages have been granted as the price of peace.

In a certain manufacturing plant where there had been practically no organization among the workmen until the introduction of the standard time and bonus system by an eminent efficiency engineer, almost every craft quickly became strongly intrenched. During the operation of this method of shop management day rates were materially increased as an inducement to the men to accept the new basis of determining earnings. Afterwards, the attitude of labor—a factor which has been studiously ignored—became so hostile that the system was discontinued. The day rates, however, necessarily remain high, a permanent increase in cost, and where formerly organized labor was not an important element, it has now become a force to be reckoned with. In another important shop in the West a highly satisfactory piece-work system was displaced and standard time and bonus introduced. The same results followed, and upon the discontinuance of the new system a day rate equal to the former piecework earnings had been secured, with every advantage to the men, but none to the company.

Another factor all too frequently overlooked is the opportunities for increasing efficiency and reducing costs through simple expedients. Many a successful superintendent motive power has accomplished by the exercise of ingenuity and common sense what efficiency engineers, after exhaustive investigations and the introduction of theoretical schemes of doubtful value, have failed to bring about. Instead of following the line of least resistance they seem to prefer indirect and devious ways. Successful practical men know of better methods. If, for example, the cost of a certain class of locomotive repairs is running at, say, 12 cents a mile, the superintendent motive power may reach the conclusion that it is too high. It is not necessary that he should make an extended investigation in order to determine exactly how excessive his costs have been. Comparative figures interpreted by common sense and good judgment will tell him closely enough for his present purpose, and he may conclude that the cost should average not over 9 cents. He has thus arrived, through the expedient of a simple determination of the possibilities, at a standard which may be termed a *practicable* ideal cost as distinguished from a *theoretical* ideal cost. Then by another simple calculation of charges and credits, and through comparative records by divisions, roundhouses and shops, the percentage of inefficiency may be determined and localized. If traceable to defective organization this can be corrected; if due to some inherent weakness in the design of any particular part of the locomotive, the part can be strengthened. This, of course, is not the "scientific" method, for it does not attempt to determine *for every separate operation* included in the cost of repairs the actual cost and efficiency. It is enough for all practicable purposes at this stage to know that the costs are computed on the same basis as formerly and that the figures for different periods are properly comparable, so that if costs are reduced from 12 to 9 cents a mile he is assured that it is not in the bookkeeping but that a reduction of 25 per cent. has actually been made.

It is a fair statement that if in a certain instance locomotive or car repairs are excessive by, say, 30 per cent., it will cost less than half as much to save the first 20 per cent. as to save the last 10 per cent. In fact, it is not unlikely that it would be practically impossible to secure the last 10 per cent., however elaborate a system might be installed. When the cost of a system is equivalent to the possible savings, it is, of course, only a useless burden. Proof that a high efficiency can be reached without recourse to a highly specialized system is found in the fact that it is recognized even by the scientific engineers that on many of the representative railways and in scores of industrial shops, low costs of operation accompanied by a high standard of service have been maintained for years. The possible economies through somewhat unscientific but effective calculations, comparisons and allowances, are enormous. They are receiving too scant consideration even by many otherwise capable managers; they are ignored almost entirely by the efficiency men.

By the introduction of efficiency standards determined by direct rather than roundabout methods, the establishment of fair allowances, the compilation of statistics in a practicable form, the advancement of men who show ability in a particular line and by the recognition of their efforts to bring about a high state of efficiency through liberal salaries, a number of railways have made such progress in reducing costs as to surprise even those superintendents motive power who have instituted these methods. These are fundamental factors, which bring results, and it is unfortunate for the efficiency men that they fail to recognize their effectiveness.

RED TAPE.

The objections of practical men to a system of shop management involving a large amount of clerical labor and introducing elements that tend to complicate operations, have met the ef-

*The first article, which considered the extravagant statements and claims made by efficiency engineers, appeared in the January 6 issue. The second article, on the failure of many of their theories when put to the test of practical application, was published in the issue of February 3. The third, on the neglect of the human element, appeared in the March 3 issue, and the fourth, on the unscientific methods used and the impatience for results, in the issue of April 7.

ficiency men on every side. The answer has been made that the new science is so different from the old that it is not understood nor appreciated. But so long as this new school depends for success more upon its familiarity with the theories that have been presented in defense of its radical departure from the usual procedure than upon an intimate knowledge of the industry at hand, it is approaching its problems improperly equipped. Ignorance of the fundamentals of efficiency on the part of the rank and file is more easily dissipated than wilful neglect of equally important fundamentals on the part of the scientific engineers. Their theories must be made applicable to conditions as they are, not as they have imagined them to be or as they should be, otherwise they fail. The leaders among them have built up a system whose parts are perfectly fitted to each other. Certain principles have been laid down, the absence of any one of which materially weakens the whole structure. Likewise in applying these principles specific requirements must be observed or the results are inadequate. This has involved complicated methods, usually characterized as "red tape." While the introduction of red tape has not been the greatest mistake made by the efficiency men, it is the one most commonly recognized. Perhaps 90 per cent. of the petty difficulties with workmen which often lead to serious disturbances are traceable to this cause. An efficiency scheme may be theoretically perfect—but if it lacks flexibility, it cannot succeed.

The principles of scheduling and despatching and of a proper routing of work have been recognized in well regulated shops for years; they go hand in hand with the division of labor. They do not, however, require elaborate records, with specialists in every department to determine months beforehand how and when each step shall be taken. Efficiency engineers would take from the foremen in a shop all initiative with reference to operations. The difference between a shop of the usual type and one in which such a system has been introduced is that the one is controlled from the floor by competent men trained to their task, and the other is run (not controlled) from the office. For example, a foreman may not tell a machine operator what he shall do, whatever the contingency may be; the workman must receive his instructions, except as to discipline and quality of work, in the form of a written order from the despatcher, as it would, of course, be contrary to the theory of the system for the foreman to interfere with the regular sequence of operations. If he had this right in a contingency he might assume it at other times.

If no emergencies ever arose, if materials always arrived as scheduled, if machines never broke down and men never failed to perform their tasks in a given time, it is conceivable that a shop might be operated by the issuance of written orders for every step, and not a word be spoken. But shops do not run in this way. The necessity for the practised hand to determine what shall be done under given conditions continually arises. This cannot properly be delegated to a despatcher, for the reason that a complicated schedule cannot anticipate emergencies. It lacks the personal element. In a manufacturing plant where detailed scheduling and despatching of all operations had been introduced on a large scale it was not unusual for a long line of workmen to be found before the despatcher's office awaiting their turn as men await their turn before the box office of a theatre. Often the line would be stationary for minutes while the schedule was being consulted to ascertain what job should be given out. It was not the despatcher's fault. He did the best he could, but he was only a wheel in a large machine, and could not know what was going on out in the shop. In a certain machine shop the writer has seen men in line twelve minutes and more waiting for orders. When the regular schedule has been seriously interfered with, due to unforeseen occurrences, the system has been known to fail utterly. In such an emergency the foreman has been obliged to take operations into his own hands in order to avoid serious loss. The result is that *instead of preceding and determining the order of the work, the despatching system often follows it and becomes but an expensive and cumbersome means of recording output.*

The difference between a shop employing forty men under the control of a single boss, and one employing hundreds is not one of essence, but of size. When the force is increased sufficiently to warrant it, additional foremen are employed. It is as easy to secure satisfactory results from a shop of four hundred men as from one of forty, providing its organization keeps pace with its growth. If in a small shop a simple schedule of requirements, put into the hands of the foreman at the beginning of the day or week, has proved sufficient, similar schedules submitted to the various foremen of a large shop may be equally successful.

The possibilities of perfecting a schedule to cover every contingency, so that all operations are planned in detail and follow each other as regularly as the ticks of a clock, has been demonstrated with more or less success in a certain manufacturing plant. The cost of maintaining the necessary organization, however, has been so enormous, that when dividends are passed in order to meet the expense of the system, the stockholders naturally are not favorably impressed by the demonstration. This is a case illustrating the truth so clearly put by "Exyl" in the April 7 issue of the *Railway Age Gazette,* that "the moment we begin to run a shop for a system instead of a system for a shop we begin to lose money.

A well-known efficiency engineer has recently said, "No manager, no accountant, knows where he stands unless he has records of quantity and price with efficiencies of both, of *every unit of materials used,* whether a ton of rails or a pint of oil; records of time and wage rate *for every operation* and the efficiencies; and records of time and investment charges *per hour for every operation.*" (The italics are ours.) It is not surprising that practical men should complain of red tape in a system that deprives the superintendent and foremen of the power of initiative, that necessitates the predetermination of the sequence of the minutest operations, that is so complicated that even the initiated do not agree upon its essentials, that calls for printed instructions to such an extent that it is almost impossible to keep pace with their contents, and that requires in determining "where we are at," the adoption of the formula quoted above.

INCOMPETENT COUNSEL.

When the efficiency men are charged with the mistake of giving incompetent counsel when their advice is sought, they are taken to task for ignoring one of the principles upon which their structure of shop management is built; for among the principles enumerated by Mr. Emerson in the series of articles current in the *Engineering Magazine,* not the least prominence is given to "competent counsel." We have read these and other similar effusions written by the chief efficiency men with the hope that much of what has been termed misunderstanding of their methods and theories might be cleared away. The particular series referred to has been hailed as a great work, and should contain the last word on scientific management. One has a right, therefore, to expect competent counsel at the hands of one speaking with such authority.

It has been correctly stated in the *Railway Age Gazette* on various occasions, that the interest in efficiency methods and scientific management has been increasing rapidly. It is a question, however, whether this is not in spite of, rather than because of, their exposition by certain efficiency men who are recognized as the leaders of the new philosophical school. Railway and industrial managers have been asking for bread and they have been given a stone. In the April number of the *Engineering Magazine,* is published the eleventh of the series of articles on "The Twelve Principles of Efficiency," entitled "The Ninth Principle—Standardized Conditions." Recognizing the importance of having conditions standardized and the economic loss due to the absence of standards, one naturally looks for valuable suggestions regarding this feature of scientific management. If there are any such suggestions in the article in question, a second and a third reading have failed to disclose them. As a

philosophical dissertation, it may have a place, but as a contribution to the cause of scientific management it is sorely deficient. It opens with an interesting chapter from the life of the grub, followed by a comparison of the standards of the spider and the firefly with those of man, much to the detriment of the latter. Egypt and her pyramids have a place, then consideration is given to the evolution of the aeroplane. Efficiency principles are compared to the framework of a dome. The eight-hour train between New York and Chicago, and the three-day schedule for general repairs to a locomotive are prophesied, but no hint is given of the methods that will bring them into being. A large publishing house (which, if we read correctly between the lines, paid dearly for the introduction into its plant of a certain system of shop management) is put on the rack with other business men, who do not progress because of "imaginary specters that terrorize the soul." The article closes with an appeal for standardizing conditions in "our lives, our shops and our nation." To what extent competent counsel is given to those who are interested in standardizing conditions can be judged from the above summary.

This absence of competent counsel is not peculiar to the article in question; in a previous installment of the same series on the subject of the first principle—"Clearly Defined Ideals," five pages are given over to a discussion of the seven ancient and the seven modern wonders of the world, and the seven American wonders. Nor is it peculiar to this series of articles. Ask one of the leading efficiency engineers to make a trip over a railway system, or make a study of a certain manufacturing plant, and to report upon the existing conditions and the possibilities. The larger part of such a report is likely to be akin to the conversation of Polonius, which Hamlet characterized as, "Words, words, words."

It is not unusual for certain efficiency men to refer the failure of their plans to a lack of co-operation on the part of those in authority. Is it not rather that the counselor has failed to give sound advice, and that consequently results have not squared with the promises? His attitude is too often that of one who never needs, but always gives counsel. That prejudice sometimes exists is no doubt true, but this is perhaps no more marked than that of many of the efficiency men toward the organization common to nearly all railway and industrial shops. This attitude on the part of at least one of the leading efficiency men is explained in his own words, as given on page 488 of the *Engineering Magazine* for July, 1910.

"In American organization a successful man becomes president; he selects his staff, his cabinet and—he puts it up to them. Each in turn selects his staff of managers and—puts it up to them. The manager selects his superintendents, and passes the power and responsibilities on to them. The superintendent selects foremen, and delegates to them the power 'to make good.' The foremen select their workmen, and transmit to them the power to do the thing the president really wanted done. The man at the bottom, with the least spare time to plan, the least training, the least compensation, runs the whole affair. This is the type—so usual, so universal, that many will wonder that it is questioned. It is the baboon, the wolf-pack, type of organization and it is all wrong."

We submit that this is neither a fair nor a scientific analysis of the "American organization." It is not to be wondered at that the counsel that is given when expert advice is sought, is usually incompetent—the real situation is so little understood.

CONCLUSION.

An effort has been made in these studies to point out for the advantage both of the efficiency men and of those who are interested, or should be, in the principles of scientific, or common sense, management, some of the chief mistakes that have figured in connection with its exposition and introduction. No claim is made to literary excellence in these discussions. They have been written by one who is himself deeply interested in the vital issues, and who recognizes and applies in his own field many of the principles that have been recommended, who is also familiar with extended efforts on the part of efficiency men to introduce systems of greater or less excellence. That they have made mistakes, however, need not be seriously regretted, providing profit is secured from them. The important thing is not to make the same blunders repeatedly. Those mistakes, which have seemed to the writer to be the most common, are (1) Extravagant statements and claims, (2) The failure of many of their theories when put to a practical test, (3) The neglect of the human element, (4) The unscientific nature of many of their discussions and conclusions, (5) Impatience for results, (6) Neglect of large factors, (7) Red tape and (8) Incompetent counsel. Of these the most surely fatal to the success of any advanced system of shop control, are the neglect of the human element and impatience for results.

The nature of these observations has precluded the possibility of a recognition of the good that has been accomplished by the efficiency men, either directly or as a result of the publicity that has followed their utterances. The fact that we have charged them with many and serious errors has not blinded us to those features of their systems which have merit. It is not our province to refer to them here in detail; it would be unfair, however, and might lead to a misconception of the purpose of these studies to close them without a word of commendation for those among the efficiency men who have urged the principles of a common sense management in the face of almost insurmountable obstacles. It has been largely a campaign of education, and a call has gone out to operating men of all classes to seek a more intimate knowledge of the details of their business. The charge of gross inefficiency that has become a popular slogan, while much exaggerated, has led to systematic plans to reduce waste, and economies have already resulted, which had not been considered within the realm of possibility. From whatever point of view this science of management may be considered, and in all the heat of argument, it should be remembered that the law of the survival of the fittest holds in the economic as in the animal realm, and that because the principles of scientific management are vital to our industrial life, they have come to stay.

SAFETY APPLIANCES.

BY CHARLES L. ALDEN.

Foreman Car Repairs, New York Central & Hudson River, West Albany, N. Y.

This subject, no doubt, is now uppermost in the minds of all car department employees from the superintendent of rolling stock to the inspector and car repairer. Let us consider some statistics from the last annual report of the Interstate Commerce Commission. Its inspectors have found the following percentage of defective cars and locomotives among those inspected during the past five years:

	1910.	1909.	1908.	1907.	1906.
Freight cars defective, per cent.....	5.2	6.03	6.6	7.8	11.31
Passenger cars defective, per cent.....	6.55	8.37	4.8	4.8	1.16
Locomotives defective, per cent.....	4.4	5.4	5.7	7.7	8.14

This indicates, so far as freight equipment is concerned, a steady increased oversight in inspection, repairs and supervision. In passenger service 1910 is better than 1909, but neither show up so well as the years 1908, 1907 and 1906. We are unable to say why this should be so. The condition of safety appliances on locomotives has improved steadily.

Under the number of defects per 1,000 cars inspected, we find an average of 65.33 made up, as follows, for the year 1910:

Couplers and parts.....	4.39
Uncoupling mechanism	7.55
Air brakes	36.89
Handholds	12.89
Ladders	.6
Sill steps	1.85
Height of couplers.....	1.13

Nearly 88 per cent. of the defects are due to defective air brakes, handholds, and uncoupling mechanism. Here then is where we could and should spend our energy effectively. Let

us ascertain the causes assigned by the commission for the defects relating to these three items. Of defective air brakes, 80 per cent. are for brakes cut out, cylinder and triple not cleaned within 12 months, release rod missing, retaining pipe defective, and train pipe loose, in the order given. Nearly 50 per cent. are for air cut out. Of the defective handholes, 70 per cent. were missing. No comment is necessary here, except that such a condition is serious. This mind you is for the year 1910.

Of defective uncoupling mechanism, 60 per cent. of the defects are for uncoupling chain broken, uncoupling chain kinked, knuckle pin broken, lock block broken, and lock block inoperative. Uncoupling chains (which includes clevises) are responsible for 70 per cent. of this, and can be avoided by using a chainless pin lifter, of which there are several types on the market that are effective and meet all requirements.

From the foregoing it would seem that more attention should be given to the cleaning of air brakes, missing release rods, loose and defective retaining pipes, causes for air being cut out, missing and bent handholds and sill steps, pin lifters of a different type, broken knuckle pins, and broken and defective lock blocks.

On roads on which the commission inspected 10,000 cars and over, the percentage of defects ranged on 13 roads from 2.0 per cent. to 8.4 per cent., the Pennsylvania being credited with the former; the Chicago & North Western, with the latter. On my road the percentage was 2.6. The average for the 13 roads was 4.6 per cent. The Southern Pacific is second on the list, with 2.3 per cent. These statistics are for the year 1910. Do they not serve to direct our attention to some particularly weak points in our inspection and repair work?

The commission under date of October 13, 1910, issued in pamphlet form an order to secure uniformity of application and location of ladders, grab irons, brake shafts, etc. This is a drastic change from old conditions, and in the end will surely reduce casualties. To make these changes looks big to most shop men, but it really is not, once a start is made. To this end let one man have full charge of it, he to be alert, active and patient. Before stenciling cars "United States Safety Appliance Standards," everything must comply with the law in every particular. One will find various interpretations, perhaps, of one or more sections or clauses. A good idea is for the ones interested to get together and agree on one interpretation, and, if in doubt, to get advice from the commission.

Take for instance the 2-in. allowable variation in the location of side and end ladders. Some have said ladders must not be spaced over 19 in., and less than 17 in. apart. This is only partly true, 19 in. being the *maximum, no limit* being given on the minimum. A provision not in the original pamphlet is to the effect that "when construction of car will not permit the application of bottom tread of end ladder in line with bottom tread of side ladder, the bottom tread of end ladder shall coincide with second tread from the bottom of side ladder. In which case this second tread shall have a foot guard same as bottom tread." Another is to the effect that the "maximum distance from bottom ladder tread to sill step may be 21 in." Also that stiles of wood ladder sides will serve as foot guards *"when 2 in. or more from face of car."*

Special care should be taken to avoid equipping any car, unless it is being rebuilt, that is likely to be retired from service within the time limit prescribed by law. This is an error that many no doubt will fall into.

As a rule I find that on cars with buffers 6 in. or over, and new M. C. B. latest type standard couplers, one can readily come within the clearances on brake wheels, steps, running boards and 30-in. passage from sides. On other cars with less than 6 in. buffers, etc., take advantage of the provision relating to cars built prior to October 13, 1910, for passage clearance.

WHAT THE APPRENTICES THINK OF MODERN APPRENTICESHIP.

The apprentices of the New York Central Lines were recently given a slip with the following six questions on it and were asked to honestly and briefly answer them and to turn the slip in to the instructor at the end of the school period with the face downward and unsigned.

First.—Do you like the school work or would you rather stay in the shop all the time?

Second.—Do you expect at all times to get more pay and have a better job on account of your shop and school training? (Answer by "yes" or "no.")

Third.—Do you think that it pays the railway company to educate you; that is do you do enough more work and better work to pay for the time spent in the school and pay for having a shop instructor? (Answer by "yes" or "no.")

Fourth.—Do you expect to always stay in railway service, or do you expect to go into some other kind of business some day? (Answer by "yes" or "no.")

Fifth.—Do you think the school work is too hard or too easy?

Sixth.—How would you change the present methods of instruction in the shop and school. Would you cut out some of the courses now given and put in other kinds of work or study? State exactly what you would do, if anything.

Apparently the boys believe in the benefits to be derived from a thorough course of practical shop training, coupled with a certain amount of classroom work. This has been proved in a practical way by the greater number of applicants for positions as apprentices at all of the shops on the system, as compared to the conditions of a few years ago before the installation of the new method of instruction. The percentage of those who expect to leave railway service is not as great as might have been expected, and indicates that the young men realize

Shop.	Question No. 1.			No. 2.			No. 3.			No. 4.			No. 5.			No. 6.					Remarks.
	No. Replies.	School.	No School.	Replies.	Yes.	No.	Replies.	Yes.	No.	Replies.	Yes.	No.	O. K.	Too Hard.	Too Easy.	O. K.	No Home Work.	No Class Prob. Work.	Change Shop Instruction.	Change School Instruction.	
W. Albany, N. Y...	103	96	7	103	102	1	103	91	12	103	89	14	77	11	15	..	42	8	29	7	.....
Depew, N. Y.....	55	54	1	55	50	5	55	51	4	47	37	10	48	..	6	38	..	..	..	..	.....
St. Thomas, Ont...	23	21	2	27	24	3	27	27	..	23	18	5	21	4	2	10	5	..	..	5	More courses for boilermakers and electricians.
Jackson, Mich	40	40	..	42	42	..	42	42	..	38	33	5	40	..	2	41	..	..	..	1	Provide drill in spelling.
McKees Rocks, Pa.	28	28	..	28	27	1	28	27	1	28	26	2	26	..	2	25	..	..	..	3	Provide elementary chemistry.
Beech Grove, Ind..	66	60	6	66	65	1	66	62	4	66	45	21	39	9	18	66	..	..	..	..	.....
Elkhart, Ind.	53	52	1	55	54	1	55	53	2	51	36	15	44	..	7	31	..	..	15	6	Provide higher mathematics. No blackb'd work.
Collinwood, Ohio...	102	97	5	102	98	4	101	98	3	87	59	28	72	11	6	56	..	..	25	13	Electrical course wanted. Instructor in car shop.
Oswego, N. Y.....	28	28	..	28	27	1	28	27	1	28	26	2	25	2	1	23	..	..	..	5	More English and business training.
Totals	498	476	22	506	489	17	505	478	27	471	369	102	392	37	49	290	47	8	69	40	
Percentages	..	96	4	..	97	3	..	95	5	..	78	22	82	7.7	10.2	64	10.4	1.8	15.1	8.7	

that there are good prospects ahead for those who have the advantage of a thorough training in the various trades. It is rather interesting to note that the proportion of boys who expect to leave the service is much greater in the West than in the East.

Judging from the fact that 82 per cent. think the present school work is about right, while 10 per cent. think it is too easy and 7.7 per cent. believe that it is too hard, it must be pretty well planned. We would naturally expect about that proportion of exceptionally bright and exceptionally dull boys. The home work is probably not very taxing, or a larger percentage would have felt strongly enough about it to have added their protests to the 47 boys who did object to it. Possibly conditions are more severe at the shop from which most of the protests come. That there are not more criticisms of the classroom instruction is undoubtedly due to the determined effort which has been made to provide complete courses for each of the various trades.

NEW MILLING CUTTERS.

A new form of spiral milling cutter used by the Cincinnati Milling Machine Company is illustrated in Fig. 1. The spacing between the teeth is 1¼ in., and this allows ample room for the

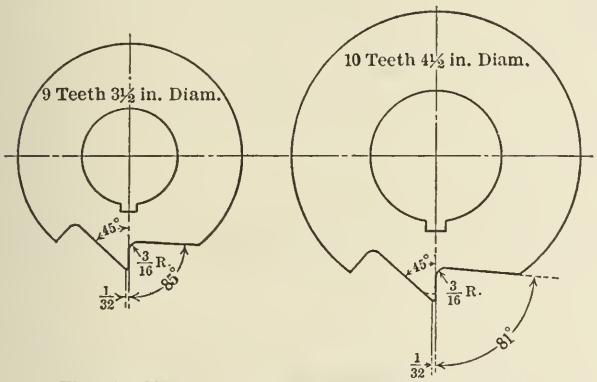


Fig. 1—New Form of Spiral Milling Cutter.

chips, the space being about four times as great as in the usual standard cutter. The advantage of this wide spacing of the teeth in spiral milling cutters is explained on another page of this issue.

The new standard end mills used by the same company are

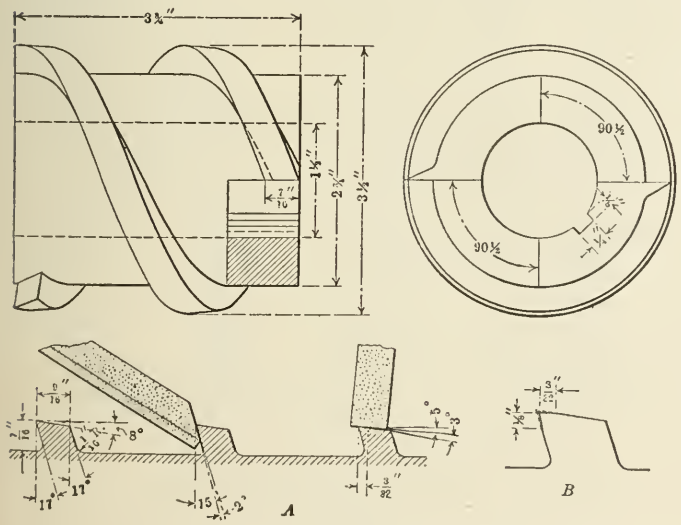


Fig. 4—Details of New Type of Helical Milling Cutter.

shown in Fig. 2. The one-inch mill has only four teeth, and the two-inch mill has eight teeth. In cutting these mills are remarkably free. A two-inch end mill will cut a slot 1 1/16 in. deep

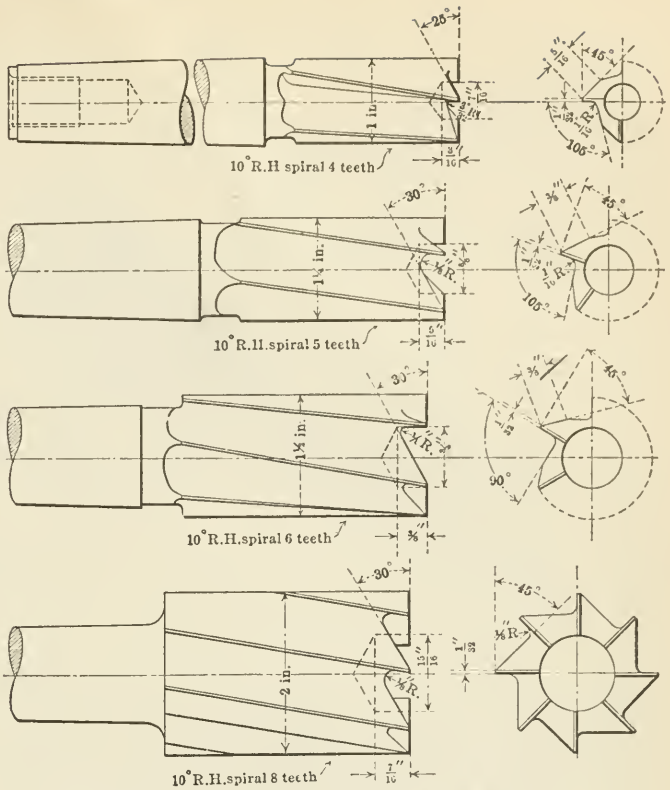


Fig. 2—New Type of Taper Shank End Mills.

in cast iron at the rate of 6 in. per minute. The same cutter removed a section from the end of a casting 1½ in. wide and 1½ in. deep with a feed of 11 in. per minute. A similar cut

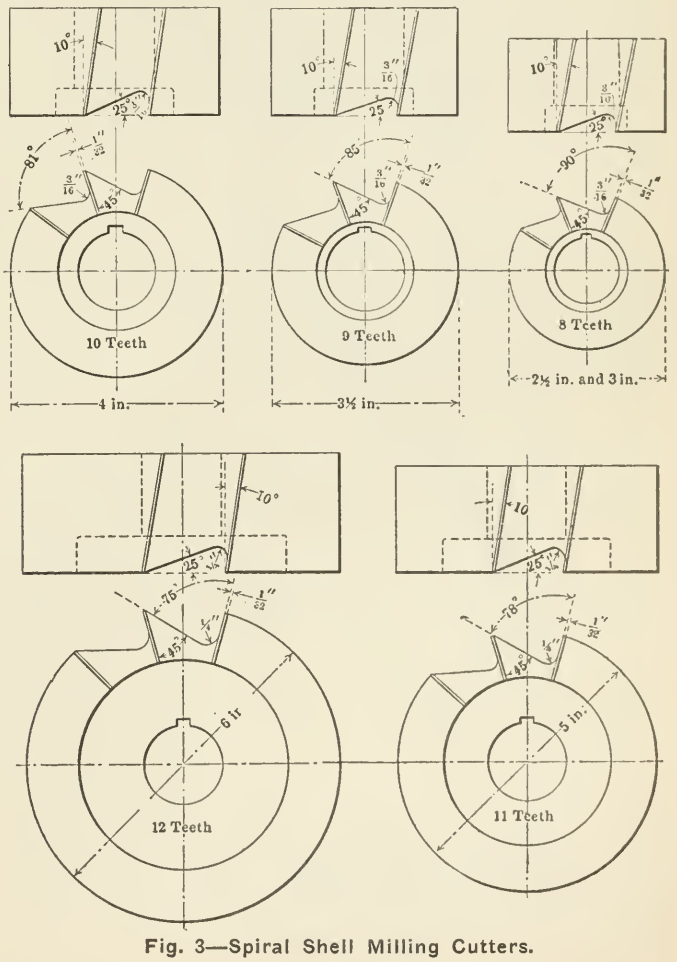


Fig. 3—Spiral Shell Milling Cutters.

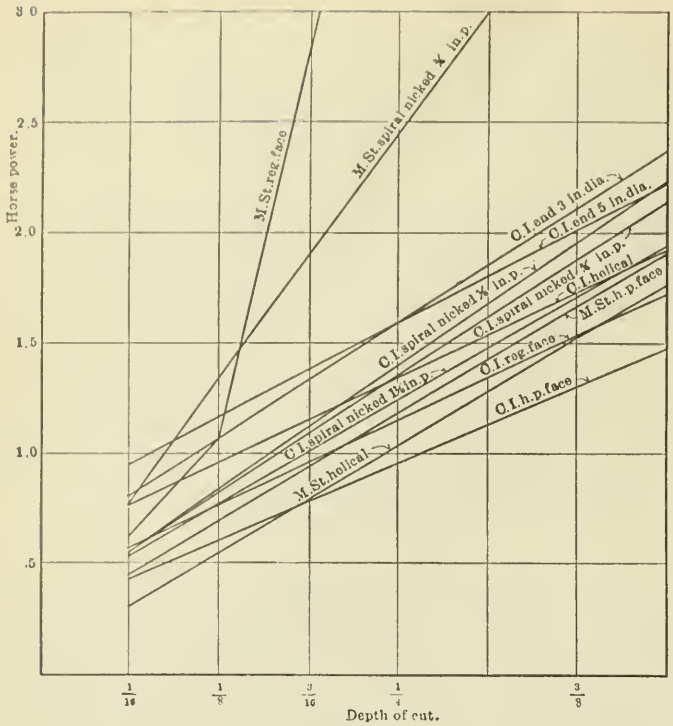


Fig. 5—Efficiency Tests of Milling Cutters with a Feed of 4 In. Per Minute.

Comparison curves reduced to 1 in. width of cut. Cast iron curves corrected for hardness of material.

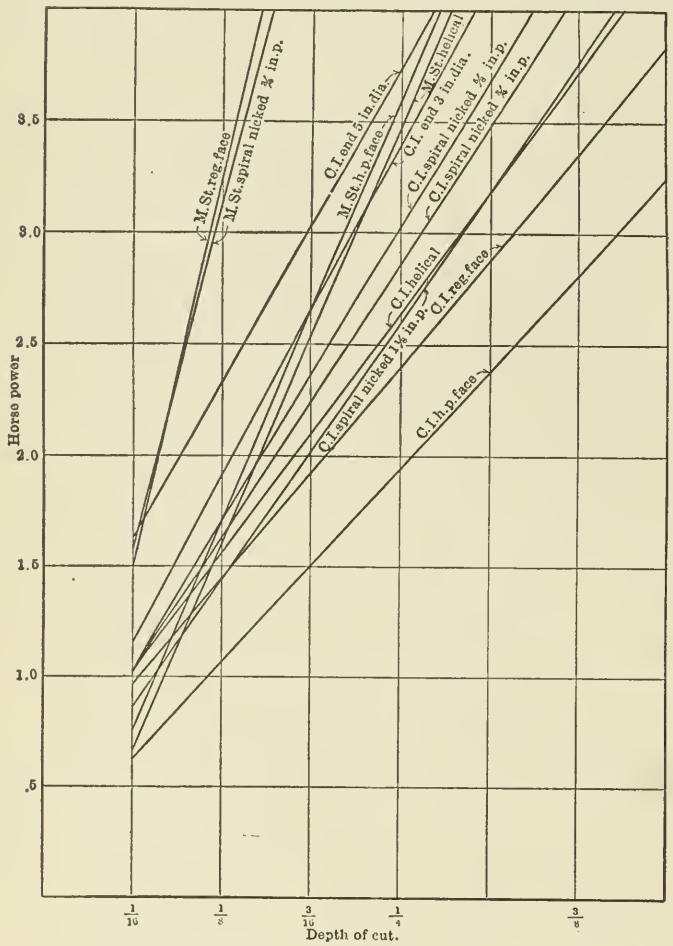


Fig. 6—Efficiency Tests of Milling Cutters with a Feed of 14 In. Per Minute.

Comparison curves reduced to 1 in. width of cut. Cast iron curves corrected for hardness of material.

1 in. by 1⅛ in. in section was taken with a feed 33 in. per minute. Shell end mills of the wide spaced type are shown in Fig. 3.

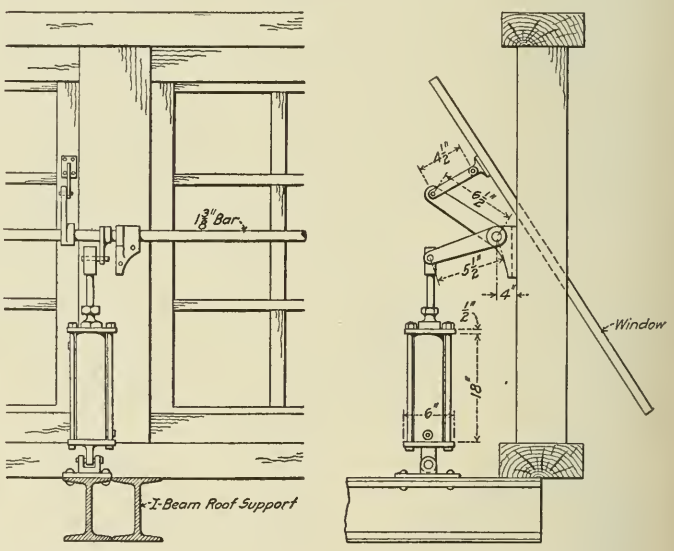
Perhaps the most interesting improvement is that shown in Fig. 4, illustrating the new type of helical cutter as designed by the Cincinnati Milling Machine Company. These cutters are very efficient when working on steel, and the power consumption is extremely low compared with that of ordinary cutters, the tests showing that a roughing cut in steel requires only one-third the power of an old style spiral mill. The chips come from the work in the form of gimlets with the back burnished, and the surface shows no sign of tearing of the metal.

Diagrams comparing the performance of different styles of cutters for different materials and various depths of cut are shown in Figs. 5 and 6. Fig. 5 gives the power required with feeds 4 in. per minute, and Fig. 6 with feeds 14 in. per minute. In Fig. 5 the lines are practically straight and show that for cutting cast iron the high power face mill is the most efficient. Then comes the regular face mill, then the spiral mills with various spacings; the end mills come last in efficiency. These end mills were of the old type with relatively fine spacing. The order of efficiency of the different cutters is somewhat different for machine steel. The helical mill comes first, then the high power face mill, then the spiral mills, and finally the regular face mill. In Fig. 6, with a feed of 14 in. per minute, the order of efficiency is much the same as in Fig. 5, with some exceptions; the helical mill, for instance, becomes more and more efficient as the heavier cuts are taken. These illustrations are from a paper on the "Efficiency of Milling Cutters by A. L. DeLeeuw," in the *Journal of the American Society of Mechanical Engineers* for April, 1911.

APPARATUS FOR OPENING AND CLOSING SHOP WINDOWS.

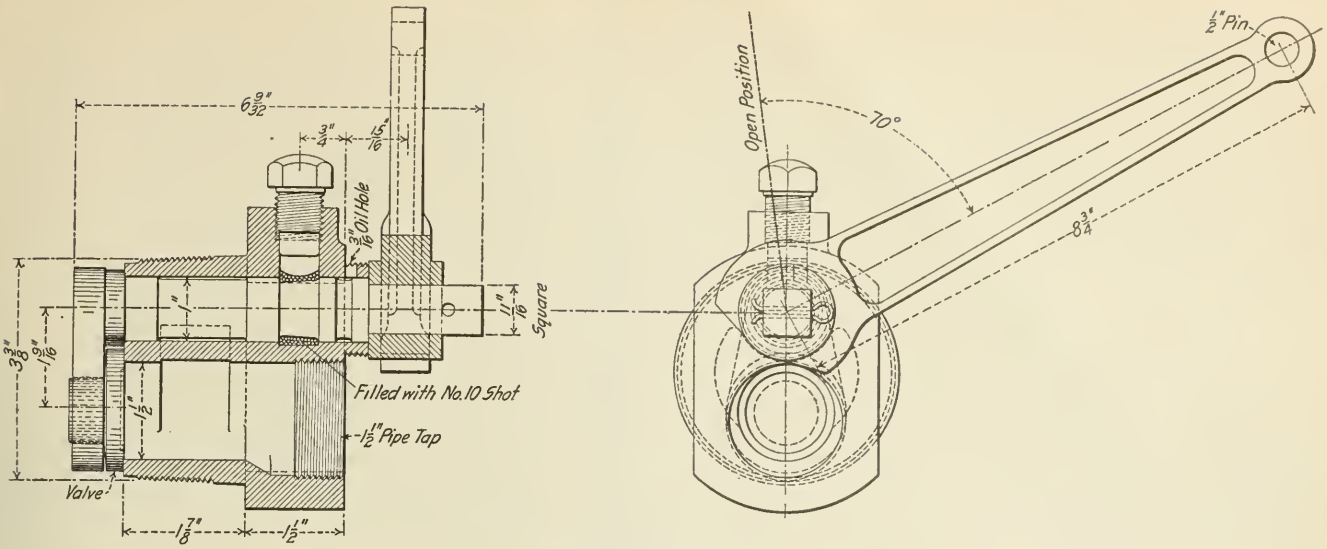
BY T. M. DRYDEN.

An arrangement for opening and closing shop windows by compressed air is shown in the accompanying illustration. It consists of an air cylinder 18 in. long, made of 3½-in. pipe, a long 1⅜-in. bar and the necessary connections. The cylinder sets on a pin which allows it to swing when turning the rod. The rod extends the length of the shop, being connected to



Apparatus for Opening and Closing Windows by Compressed Air.

the windows by the lever arms as shown. There are ⅜-in. air connections at the top and bottom of the cylinder to lower and raise the piston when desired. This arrangement is used in the shop power house of the Central Railroad of New Jersey at



Wafer Blow-off Cock.

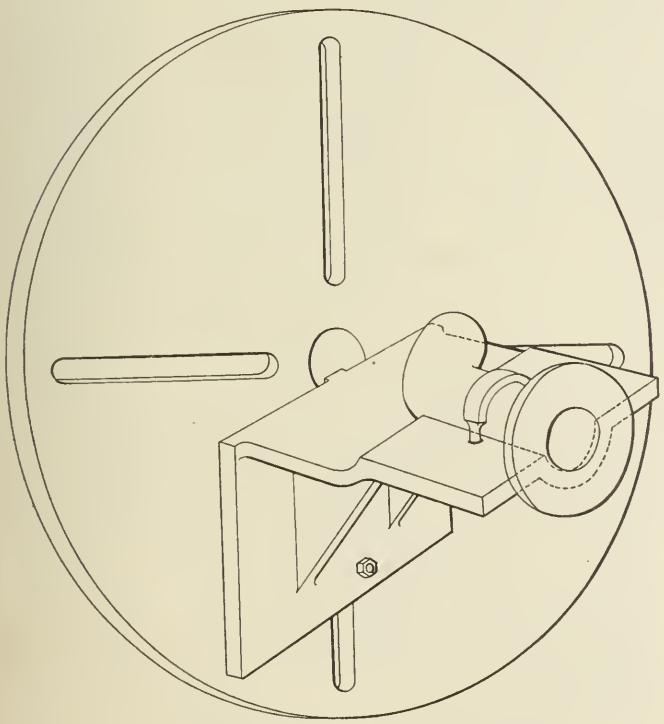
Ashley, Pa. It operates sixteen windows, and without a doubt could handle three or four times as many. It was designed by Frank P. Meekins, foreman of the car wheel shop.

MACHINING GOOSE-NECKS.

BY SAMUEL MAGILL.

Apprentice Instructor, Atchison, Topeka & Santa Fe, Topeka, Kan.

The bracket shown attached to the face plate of a lathe in the accompanying sketch, is a jig for facing, threading or drilling holes in a goose-neck. The tongue at the back of the jig fits in a slot in the face plate, and the semi-circular groove in



Jig for Machining Goose-Necks.

the jig, in which the goose-neck rests, is bored in line with the tongue, which makes the jig easy to adjust and set up. The goose-neck is strapped down into this groove. The output may be tripled with this device, which may readily be adjusted and handled by an apprentice, if necessary.

THE WAFER BLOW-OFF COCK.

The Chicago & North Western is using a new and improved blow-off cock, which was designed and patented by Wm. Wafer, foreman of the brass department at the West Chicago locomotive shops. The fixture has been in successful and satisfactory use for some time, and is greatly superior to the ordinary blow-off cock used on locomotive boilers. The principal feature is the separate disk with a lug which fits into the crank on the inside of the boiler with the pressure constantly tending to hold it tight. The crank is operated by a shaft which extends through a stuffing box filled with fine shot and having an outlet closed with a set screw. A malleable iron handle 8¾ in. long provides ample leverage, and has a sweep through 90 deg. for complete opening. The movement of the disk valve tends to scrape all scale and sediment from the seat and there is no difficulty in keeping it tight.

A MODERN LOCOMOTIVE REPAIR PLANT.*

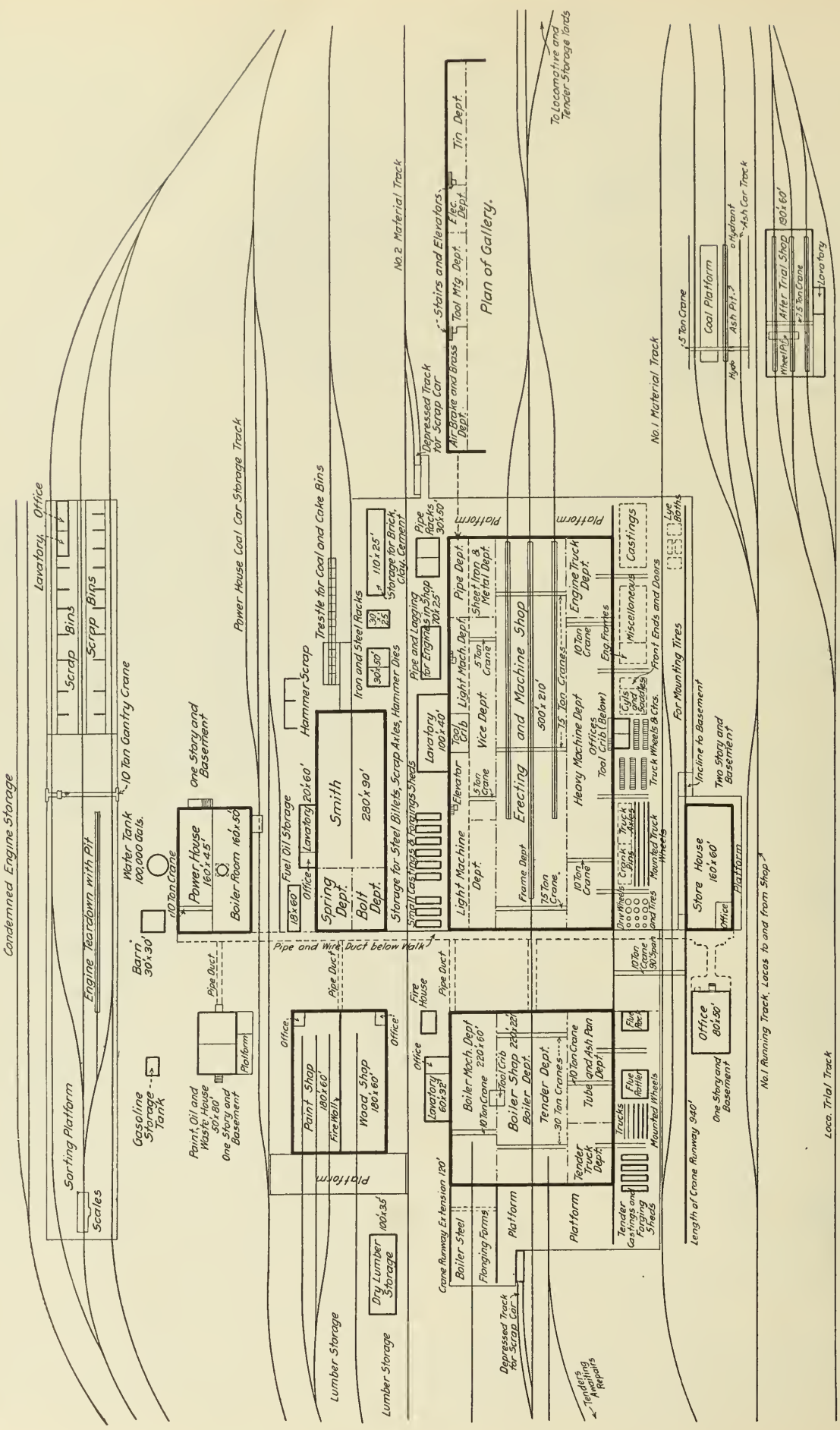
BY H. H. MAXFIELD.

Master Mechanic, Pennsylvania Railroad, Trenton Shops, N. J.

It is not the intention to discuss the relative merits of the transverse and longitudinal erecting shop. The writer has found that, as a rule, the opinion held depends to a great extent on whether past experience has been with a transverse or with a longitudinal shop. The longitudinal shop provides greater flexibility, more economical use of track space, and greater output from a given amount of track space.

The machine shop should house, besides the machine department proper, the vise, air brake and brass, sheet iron, tin and copper, and pipe departments. All of these are of necessity intimately connected with the erecting department, and not only should be adjacent to it, but under the same roof. The blacksmith shop is principally a feeder of the machine department and should be close to it. It should also be close to the power house, for it is a heavy consumer of steam, and practically the only consumer of steam in an electrically driven shop. As there is a great deal of boiler and tube work done in the erecting department, the boiler shop, if for no other reason than ease of supervision, should be close to the erecting shop. It should also be so located to avoid unnecessary time and labor being consumed in transferring boilers and tubes between it and the erecting department. The most convenient location for such a building would be as a continuation of the erecting shop, but should not be under the same roof on account of the incessant din. It is best located by placing it in a line with the erecting shop, but

*Abstract of a paper presented before the New York Railroad Club, January 20, 1911.



Suggested Arrangement for a Locomotive Repair Plant.

removed from it a reasonable distance. The middle track of the erecting shop should be continued through the boiler shop, in order to afford an easy method of handling boilers and tubes between these departments.

The wood-working department of a purely locomotive repair shop is one of diminishing importance, but it is still extensive enough to warrant a small mill under the same roof and jurisdiction as the carpenter or cab department. A considerable proportion of the work is done in the erecting shop. There is also considerable traffic between it and the smith shop. It should therefore be located as conveniently as possible to these departments, which can best be accomplished by placing it alongside of the boiler shop, opposite the smith shop. Practically all of the locomotive painting is done in the erecting shop, and a large proportion of the tender painting, other than varnishing, is done in the boiler shop. It does a good deal of work in connection with the wood department, especially as regards cabs, pilots and miscellaneous work. It should therefore be adjacent to the wood department, and reasonably near the boiler and erecting departments. This can best be accomplished by housing the paint and wood departments under one roof, and placing a fire wall between them.

The stores department should be located with reference to the largest consumers of material, which are the erecting, machine, vise, air brake and brass, sheet iron, and tin and copper departments. The casting sheds, boiler tube racks, iron and pipe racks, boiler steel yard, lumber yard, etc., all of which are under the jurisdiction of the storekeeper, should be located convenient to the points of consumption. The paint, oil and waste storehouse will naturally be located near the paint shop.

The location of the scrap bins will depend to a great extent on the size and shape of the property available. At its best it is an unsightly proposition, and for this reason the scrap bins should be located outside of the area bounded by the main buildings. They should be reasonably accessible and should be reached by trucks and cars from either end of the shop yard.

If a separate office building is provided, the main essential is that it should be reasonably accessible to all the shop departments, and as convenient as possible to the main entrance of the plant, so that visitors and applicants for work can, if desired, be kept out of the plant proper. It should also be located so that the private office commands a fair view of the plant in general. These conditions can perhaps best be met by placing it in line with the storehouse and about twenty-five feet in advance of the line formed by the ends of the boiler, wood and paint, and oil house buildings.

After repairs to a locomotive have been completed, it is necessary to fire it up and throughly try it out in order to develop minor defects. If an engine house is available, this work is generally taken care of at that place. In the case of the principal shop, however, it is possible that the nearest engine house is too remote to allow this being done, and, furthermore, it may be under different jurisdiction. Assuming the above to be the case, it becomes necessary to provide for this after-trial work at the shop proper. To bring the locomotive back into the erecting shop involves a serious delay to the work of that department, it being necessary to hold track space in reserve, which prevents bringing other locomotives into the shop, not only reducing the efficiency of the department, but reducing the earning capacity of the men. Furthermore, the escaping smoke and gases are objectionable. The only satisfactory way to handle this after-trial work is to provide a separate building for the purpose, making it an auxiliary of the erecting shop, and under the supervision of that department. This auxiliary shop, or after-trial shop, should be reasonably close to the erecting shop, and yet far enough away to prevent the escaping smoke and gases from flooding the other buildings. It should be adjacent to the track on which engines are tried, and also adjacent to the track over which incoming engines pass. Along side of the building should be a coal platform and an ash pit.

It will be noted that there is a rectangular space between the ends of the storehouse and the erecting and machine shop, smith shop and power house on one side, and the boiler shop, wood and paint shop and oil house on the other. The width of this space or street, is a matter of choice, but it should not be less than 80 ft., and it is preferable, as a matter of appearance, to have it 100 ft. The space formed by the side of the erecting and machine shop and the boiler shop on the one hand, and the storehouse and office building on the other, should be served by a traveling crane for the purpose of handling material. This space should be not less than 90 ft. wide to allow for the necessary tracks, platforms, etc. Between the erecting and machine shop and smith shop buildings should be a space of 80 ft. to allow of tracks, storage of material, etc. The same distance should be allowed between the boiler shop and wood and paint shop. At least 70 ft. will be required between the wood and paint shop and the oil house.

The width of the various buildings should be about as follows: Erecting shop, 90 ft. center to center of columns. This allows of three tracks spaced 30 ft. center to center, on all of which locomotives can be repaired, and, in addition, locomotives can be carried between these tracks without danger of interference. Machine shop bays, 60 ft. center to center of columns, which allows ample aisle room and a sufficient crane runway space between the machines. The boiler and tank shop building being, in a sense, a continuation of the erecting and machine shop building, should be of the same cross section. Smith shop, 90 ft. center to center of columns. The paint and wood shop building should be 180 ft. deep, which will allow ample space for six tenders on each track. The after-trial shop will require a maximum space of 75 ft. in width, while the coal platform and ash pit, etc., will require practically the same. Storehouse, 60 ft. center to center of columns. This will allow adequate bin and aisle space. The scrap bins will require a space 90 ft. in width, making due allowance for the necessary tracks, platforms, etc.

The machine department should be subdivided into, at least, two parts, thus separating the heavy machinery which should have full overhead crane service, and the light machinery which requires only partial crane service, and which may be advantageously laid out, partially, at least, in groups of machines driven from countershafts, they, in turn, being driven by suitable motors. The question arises as to whether the erecting bay should be in the center, and the machine bays on either side, or whether the erecting bay should be on one side and the two machine bays follow in order. In the latter case there is the advantage of having the entire machine department under, as it were, one roof, thus making the supervision somewhat simpler. Personally I question if this advantage means very much from a practical standpoint. The advantages of the other scheme are as follows: Symmetrical design of building; division of movement of material removed from locomotives, thus avoiding congestion in passageways; more advantageous storage of rough material outside of buildings in order that heavy material will not have to pass through the light machine department, and vice versa. There is no doubt but what the weight of evidence is in favor of the erecting bay being in the middle with the machine bays on either side. Experience with such an arrangement confirms this.

The light machine shop department requires only partial crane service. This allows of a gallery being put in this bay, running the full length of the building, the width of the gallery being something less than one-half the width of the bay. This allows the grouping of the lighter machines under the gallery. It also provides floor space in the gallery for the air brake and brass department, the tool manufacturing department, the tin manufacturing department, and the department for repairs to electrical equipment. That portion of the bay not covered by the gallery should be served by a traveling crane. On the ground floor of this bay, in addition to machinery, will be located the vise, pipe, and sheet iron and copper departments. In the heavy machine bay will be found sufficient floor space for the repairs of engine trucks, thus relieving the erecting bay to this extent.

The center bay of the boiler shop will be devoted to the repairs of boilers, tender frames and cisterns. In one of the side bays will be located the strictly boiler working machinery, flanging fires, laying off tables, etc., while in the other bay will be located the tender truck, boiler tube and ash pan departments.

The after-trial shop should be rectangular in shape and should have three tracks running through it, each track long enough to accommodate two engines with their tenders. This building should be equipped with wheel pits and an overhead traveling crane.

In order to complete the layout we will make the following assumptions: *First:* Number of locomotives to be maintained, 750. *Second:* Average weight of locomotives, 80 tons. *Third:* Character of territory served, generally level. *Fourth:* Character of traffic, mixed—high speed passenger, local passenger, fast freight and slow freight.

Under these conditions approximately 120 per cent. of the locomotives will pass through the shop for repairs each year, these repairs varying from new firebox and general repairs to machinery, to repairs such as renewal of broken parts, repairs due to wreck, or heavy running repairs which are not usually attempted in the ordinary engine house. With an equipment of 750 locomotives the shops will have to turn out 900 per year, or an average of 75 per month. A shop of this character should be able to turn out on an average three locomotives per track space per month, assuming that the shops are working under the piece-work system or under some individual effort system. Therefore the erecting shop will require 25 engine pit spaces. In addition, sufficient space should be provided to allow of making the necessary repairs to frames, etc., while the boilers are in the boiler shop having the fire boxes renewed.

If we make the erecting shop building 500 ft. long, and utilize the center track for repairs with the exception of an engine space at either end, and make the side tracks 360 ft. long, utilizing all the space for repairs, with the exception of one engine space at the entrance end, we will have ample room to accommodate 25 locomotives under repairs at one time, and also provide a space of approximately 9,800 sq. ft. for repairs to frames. In addition to this should be provided at least 6,000 sq. ft. in the heavy machine shop bay for repairs to engine trucks. This gives us a total of 51,000 sq. ft. of floor area for the erecting work.

The floor area required by the other departments is approximately as follows:

Erecting and machine shop building:		
Erecting department	51,000	sq. ft.
Heavy machine department	24,000	"
Light machine department	14,900	"
Vise department	9,100	"
Sheet iron and copper department	3,500	"
Pipe department	2,500	"
Tool manufacturing department (in gallery)	3,000	"
Tin manufacturing department "	4,000	"
Air brake and brass department "	4,000	"
Electrical repair department "	1,500	"
Total	117,500	"
Boiler and tender shop building:		
Boiler department	9,900	sq. ft.
Boiler machinery department	13,200	"
Tube and ash pan department	8,400	"
Tender department	9,900	"
Tender truck department	4,800	"
Total	46,200	"
Smith shop building:		
Smith department	18,000	sq. ft.
Spring department	3,600	"
Bolt department	3,600	"
Total	25,200	"
Paint and wood shop building:		
Paint department	10,800	sq. ft.
Wood department	10,800	"
Total	21,600	"
After-trial shop	12,600	sq. ft.
Power house	30,400	"
Storehouse	28,800	"
Paint and oil storehouse	8,000	"
Office building	8,000	"

SHOP KINKS; WHEELING & LAKE ERIE.

BY WILLIAM H. WOLFGANG.
Draftsman, Toledo, Ohio.

BLACKSMITH'S TOOL RACK.

A convenient tool rack used in the blacksmith shop is shown in Fig. 1. The top of it, on which tools may be laid, revolves

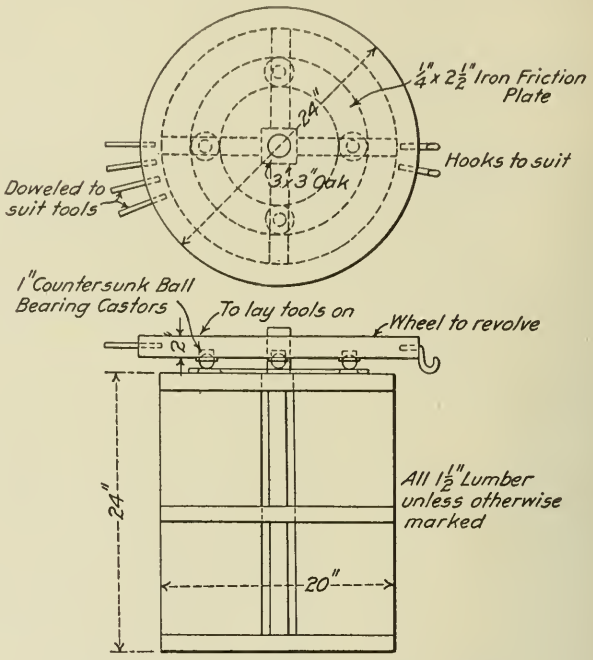


Fig. 1—Blacksmith's Tool Rack or Bench.

on four ball bearing casters. The tools may also be hung on the hooks or between the dowel pins on the circumference of the revolving table. The compartments underneath may be used for the storage of tools or material.

LUMBER TRUCK.

The truck for handling lumber, shown in Fig. 2, is not very heavy, and as it is mounted on ball bearing casters may easily be turned about or pushed over the floor in any direction. It is constructed largely of yellow pine, except for the oak strips which form the floor. These strips are placed 2 in. apart, so

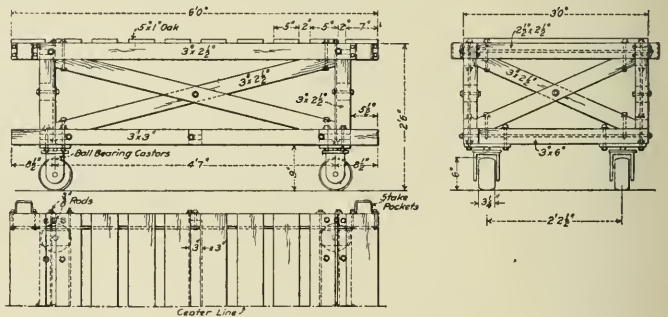


Fig. 2—Lumber Truck.

that a man can get his fingers underneath the timbers in lifting them off the truck. There are four stake pockets, so that stakes may be used if desired. The construction of the truck is clearly shown on the drawing. The casters were purchased from the W. A. Jones Foundry & Machine Company, Chicago, Ill.

TRUCK FOR HEAVY MATERIAL.

The advantage of the truck shown in Fig. 3 for handling heavy material, such as wheels, axles and couplers, is that it

is very low and the material may easily be loaded on it. The truck will run much easier if the journals are provided with 7/16-in. roller bearings. The floor is constructed of 2½-in. oak planks; the ¼-in. x 3-in. iron plates at the ends prevent the floor from being damaged in loading material on the truck.

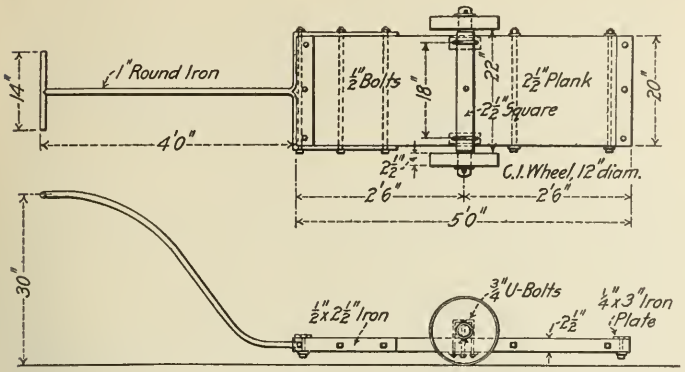


Fig. 3—Truck for Handling Heavy Material.

FORGING COUPLER YOKES.

Dies for bending coupler yokes on a bulldozer are illustrated in Fig. 4. The stock, which has had the ends turned over, is placed between the dies, and as the crosshead moves forward the two wings are forced inward as they come in contact with the rollers on the short arms of the header. These rollers bear against steel friction plates. The 1-in. gibs on the bottom of the former fit in the bulldozer face plate slots and guide it. As the header of the machine moves backward, the two wings are drawn to their initial positions, as shown in Fig. 5. This arrangement makes it possible to bend yokes which are considerably longer than the stroke of the machine.

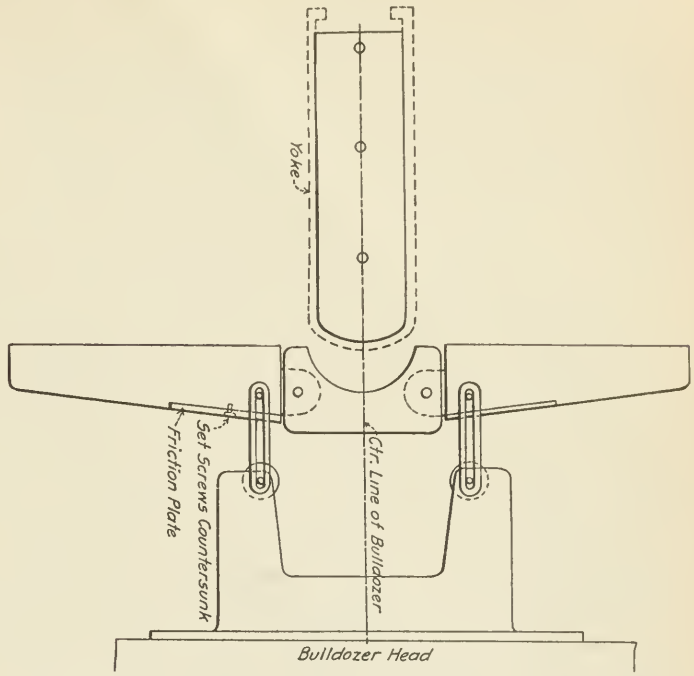


Fig. 5—Open Position of Dies for Bending Coupler Yokes.

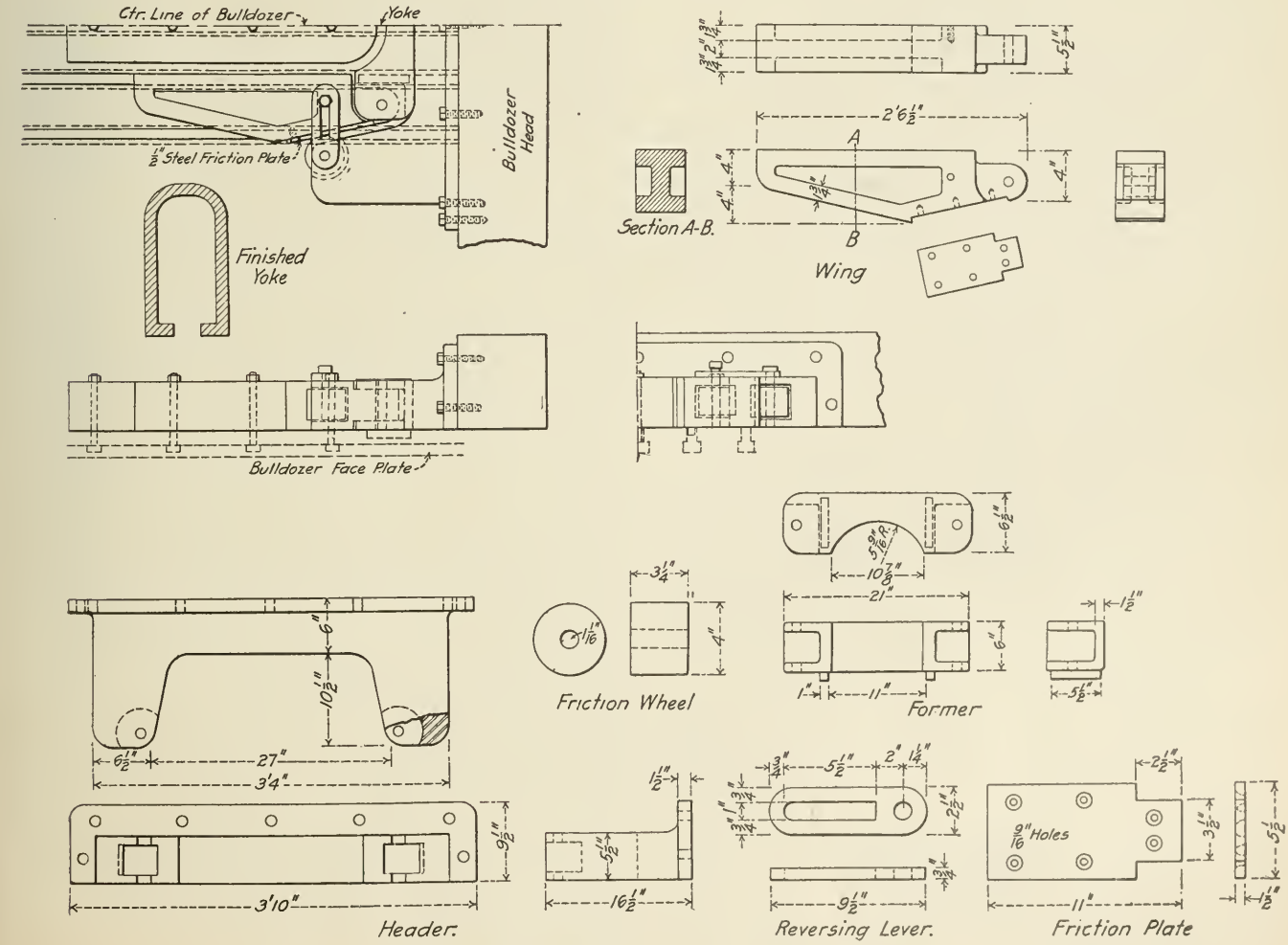


Fig. 4—Dies for Bending Coupler Yokes on Bulldozer.

THE RELATION OF EDUCATION TO INDUSTRIAL WASTE.*

BY HENRY GARDNER.

Assistant Superintendent of Apprentices, New York Central Lines.

Much is being said and written nowadays about scientific management and efficiency is the watchword of the hour. F. W. Taylor in his book, The Principles of Scientific Management, makes the following statement: "We can see our forests vanishing, our water power going to waste, our soil being carried by floods into the sea, and the end of our coal and our iron is in sight. But our larger wastes of human effort, which go on every day through such of our acts as are blundering, ill-directed or inefficient, are less visible, less tangible and are but vaguely appreciated. We can see and feel the waste of material things. Awkward, inefficient, or ill-directed movements of men, however, leave nothing visible or tangible behind them. Their appreciation calls for an act of memory, an effort of the imagination. And for this reason, even though our daily loss from this source is greater than from our waste of material things, the one has stirred us deeply, while the other has moved us but little."

But how shall we best eliminate these larger wastes of human effort which go on every day through our blundering, ill-directed, inefficient acts? Three ways present themselves; these are systematic education, suitable reward, and good-will or co-operation. Unquestionably education, or knowledge increases efficiency, since by definition efficiency means, "the state of possessing adequate skill or knowledge for the performance of a duty or calling." Skill originates in the brain and is a direct result of training, which is a form of education. The effect of suitable reward or wages is well known. Without good will no organization can be successful and no individual, however efficient, will exert an influence to prevent waste.

Since large industrial wastes of material and energy occur in our shops and factories, obviously we should bring education to these shops and apply it to those who are responsible for such conditions. This brings us to the practical question, how shall we best introduce this much needed education into our shops and factories; when and where shall we apply it and through what agencies shall we communicate it to those most needing it? Admittedly the best time to train or educate men is when they are young and in the adaptable and formative period; in other words when they are boys from 16 to 20 years of age. Prior to this time they will have obtained such common school education as is given to all. At 16 the boy is sufficiently matured physically to work in many factories, and at 17 he is usually able to work in shops assembling heavy parts, such as building and repairing locomotives and cars.

Modern apprenticeship—not the old time arrangement whereby the boy was wholly neglected and learned little or nothing—will effectually satisfy the need for that industrial education which is to aid us in the elimination of industrial waste of material and energy. The new apprenticeship system brings the school to the shop and there, in a suitable classroom, competent teachers instruct apprentice boys in the trades. This instruction not only covers the common school branches, but more than that, it embraces all the traditional knowledge which in the past has been possessed only by the older mechanics. This knowledge, intensely practical in character, is reduced to easy rules and formulas which are presented in a simple manner, abolishing all of that mystery which formerly surrounded such information. The school is not all. In the shop another qualified instructor shows the boy how to run his machine in the most efficient and economical manner, and by constant supervision prevents waste of time, energy and material. Wasted energy—lost motion—is more expensive in the human machine than with the ordinary machine. For example, with what infinite pains the designer calculates the time of the return stroke of the planer table so that one or two seconds may be saved at each reversal. But what overworked foreman can find the time to so instruct his men that seconds, or even minutes of their time shall not be wasted?

Incentive and efficiency are closely allied. It must be conceded that men will not willingly increase their efficiency without some incentive, either the never-failing incentive produced by increased reward or wages, or the incentive of increased ambition—always found as a by-product of education. By ambition is meant the desire for success and wealth. Workmen cannot be expected to use their greatest effort and skill unless they feel that they are getting good returns for it. The best modern apprenticeship system, such as is now successfully in use on several of our largest railways, gives education free, without charge, thereby furnishing a well-recognized incentive for the increased initiative which produces higher wages, either through more rapid promotion or advancement (which will follow at the expiration of apprenticeship) or through the piecework system. This free education in itself constitutes a reward, inasmuch as it is given without bond or restriction; moreover it is something for which others pay.

Perhaps the most important feature of this whole educational system is the element of good-will which it introduces. The personal contact of the boy with his instructors creates a more friendly attitude towards his employers and his whole environment and working conditions. He is made to feel and understand that hearty co-operation which is the strength of the organization. Heretofore a considerable part of his time was spent in criticism, suspicious watchfulness, and often in open warfare. Good-will, more than any other factor, encourages that habit of conscientious saving which eliminates waste.

We have attempted to prove that waste of material and human energy could be largely reduced by the introduction of an adequate educational scheme, since all savings in material and effort are effected primarily through the employees. Coal, for example, costs a railway millions of dollars a year; how much of this could be saved if every fireman were willing and anxious to get the most steam possible from each shovelful? Is there any better way to bring this about that by stimulating his interest in his work through proper education, and at the same time instilling into his mind a feeling of loyalty for the company he serves? This familiar illustration of the coal and the fireman is more impressive, but not more significant, than the case of the mechanic in the shop or factory.

Not a few have criticized the modern apprentice educational scheme as too stimulating, developing leaders and leaving the rank and file—the men behind the guns—dissatisfied with their positions as skilled workmen or journeymen in the trade. But this has not been the case. After four years' experience one railway found that it had developed three or four times as many skilled mechanics as it had foremen or inspectors or draftsmen. Since these high grade mechanics receive upon graduation from their apprenticeship a day rate equal to regular journeymen in the trade, they cannot consistently be dissatisfied. Any apprenticeship system which neglects to recognize the superior ability of a young man who has successfully completed four years of intensely practical special training, both in shop and school, is bound to fail. It is impossible to keep a graduate apprentice from knowing his value to his employers, and he justly rates himself as the equal of any journeyman in his trade. He argues that his services for the four years have been well worth the wages he has received; if not he would have been discharged. His account so far is squared, and he is not willing to make a start all over again and work three or four years longer before arriving at journeyman's wages. Such a lack of appreciation can have but one result—desertion—and the graduate has no difficulty in obtaining more remunerative employment in some other shop or factory.

From the foregoing it may appear that we have made shop

*Submitted in the competition on the instruction of workmen and apprentices, which closed April 15, 1911.

efficiency wholly a function of the men and not of the management. Unquestionably the shop management must keep exact records of all materials used, and must see that these materials are always ready, and that the proper tools for doing the work are always available. We do not claim that industrial education diffused through the medium of a rational apprenticeship system will wholly eliminate waste, either of energy or material, but we may say conclusively that it does develop initiative, increasing efficiency, and induces that good-will and cooperative spirit without which the most exalted type of scientific management must fail.

SHOP KINKS; NASHVILLE, CHATTANOOGA & ST. LOUIS.

BY WILLIAM G. REYER.
General Foreman, Nashville, Tenn.

CASTING BRASS LINERS ON CROSSHEAD GIBS.

Instead of riveting brass liners on cast iron or steel crosshead gibs or driving boxes, we cast the brass directly on them. The clamp shown in Fig. 1 may be easily and quickly adjusted for any thickness of liner that may be desired. It has not been found necessary to heat the gib before pouring the metal. This does away with all drilling and riveting, and effects a considerable saving both in time and material.

PETTICOAT PIPE ADJUSTER.

A device that is convenient for properly setting the petticoat pipe and holding it in position while the hangers are being fastened is shown in Fig. 2. It may be adjusted to any size of petticoat pipe. The toggle joints which fit on the long bar are forced outward and fastened by the set screws, thus holding the petticoat pipe securely in place and central with the bar. The lower end of the bar is fitted with a plug which fits in the exhaust nozzle; the upper end may be adjusted to a central position in the smoke stack by calipering. The pipe may then easily be held in position while the hangers are being fastened. This is much more convenient than the old way of using a string and a plum bob.

GREASE CUP PLUGS.

With the device shown in Fig. 3, 60 grease cup plugs may be finished in one hour. A hole has been drilled through the drill press table allowing the plugs to drop through it into a box as they pass through the device. It is only necessary to clamp the chuck to the drill press table and to apply a square socket to the drill press spindle. The design of the plug is of interest. The projection at its bottom is forced into the hard grease and prevents the plug from loosening and working

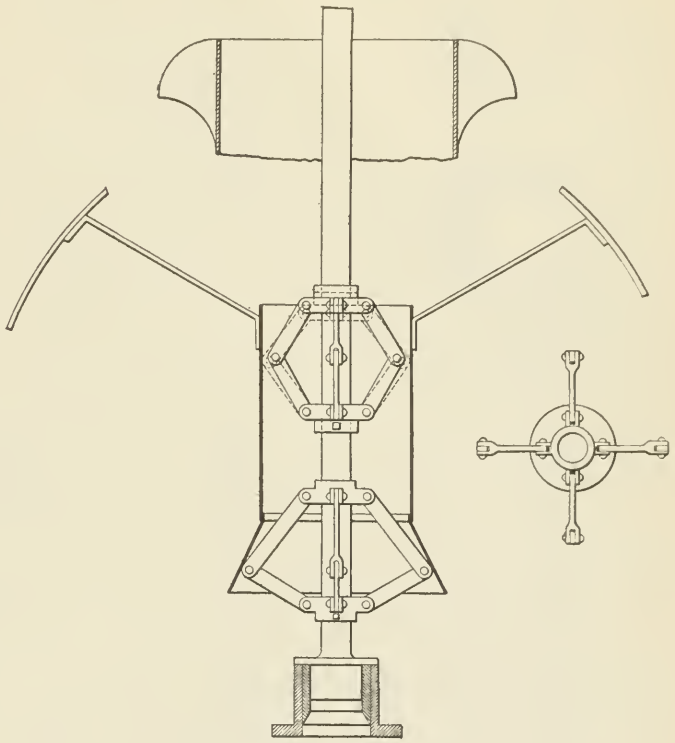


Fig. 2—Petticoat Pipe Adjuster.

out. The finished plug, which is made of brass, weighs 7 oz.; it would probably give just as satisfactory results if made of malleable iron. Another advantage of this style of plug is that the engineers do not have to loosen up a jam nut in adjusting it. The engines are supplied with a wrench similar to the one

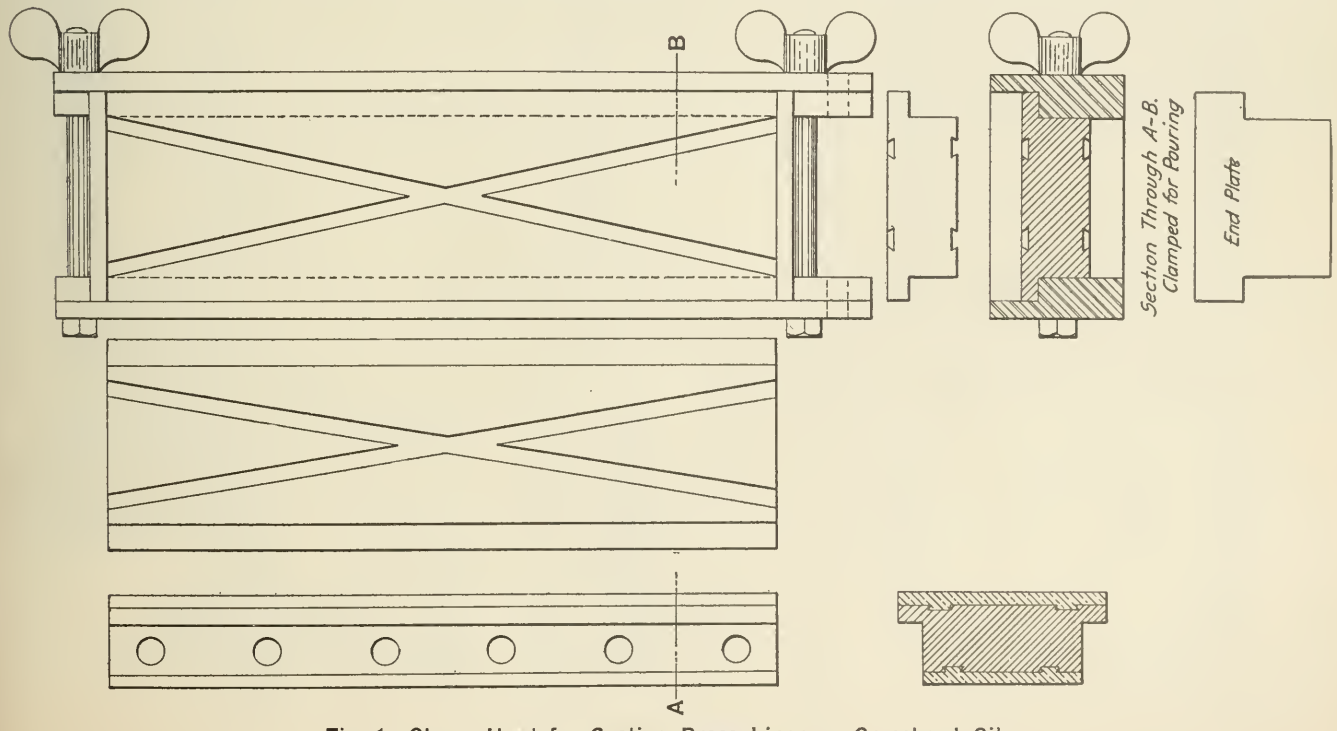


Fig. 1—Clamp Used for Casting Brass Liner on Crosshead Gib.

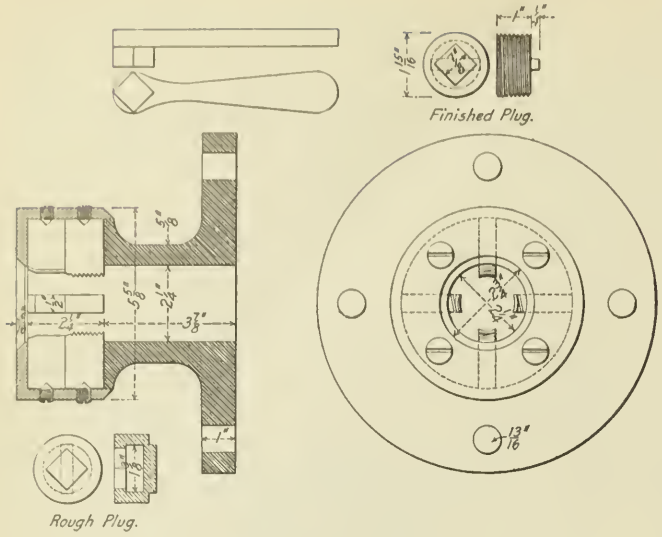


Fig. 3—Device for Finishing Grease Cup Plugs.

shown in the illustration, and the engineer has no difficulty in quickly tightening down the plug. The plugs should be screwed down into the cup their full length and should not be allowed to project above the top of the cup.

SHOP KINKS; PENNSYLVANIA RAILROAD.

BY C. C. LEECH.
Foreman, Buffalo, N. Y.

PRESS FOR LIGHT WORK.

The 30-ton press for rod bushings and link work, which is shown in Fig. 1, consists of a frame work of wrought iron, resting on an oak plank, and a standard hydraulic 30-ton jack. The jack is mounted in the framework as shown, the top fitting in the top crosspiece. The yoke or crosspiece on which the jack rests is supported by the springs at either side. As the jack is operated it is forced downward and the springs are compressed. When the pressure is released the springs return the jack to its normal position, as shown on the drawing. The frame work is simple and inexpensive, and may be constructed to suit any special requirements. The capacity of the press

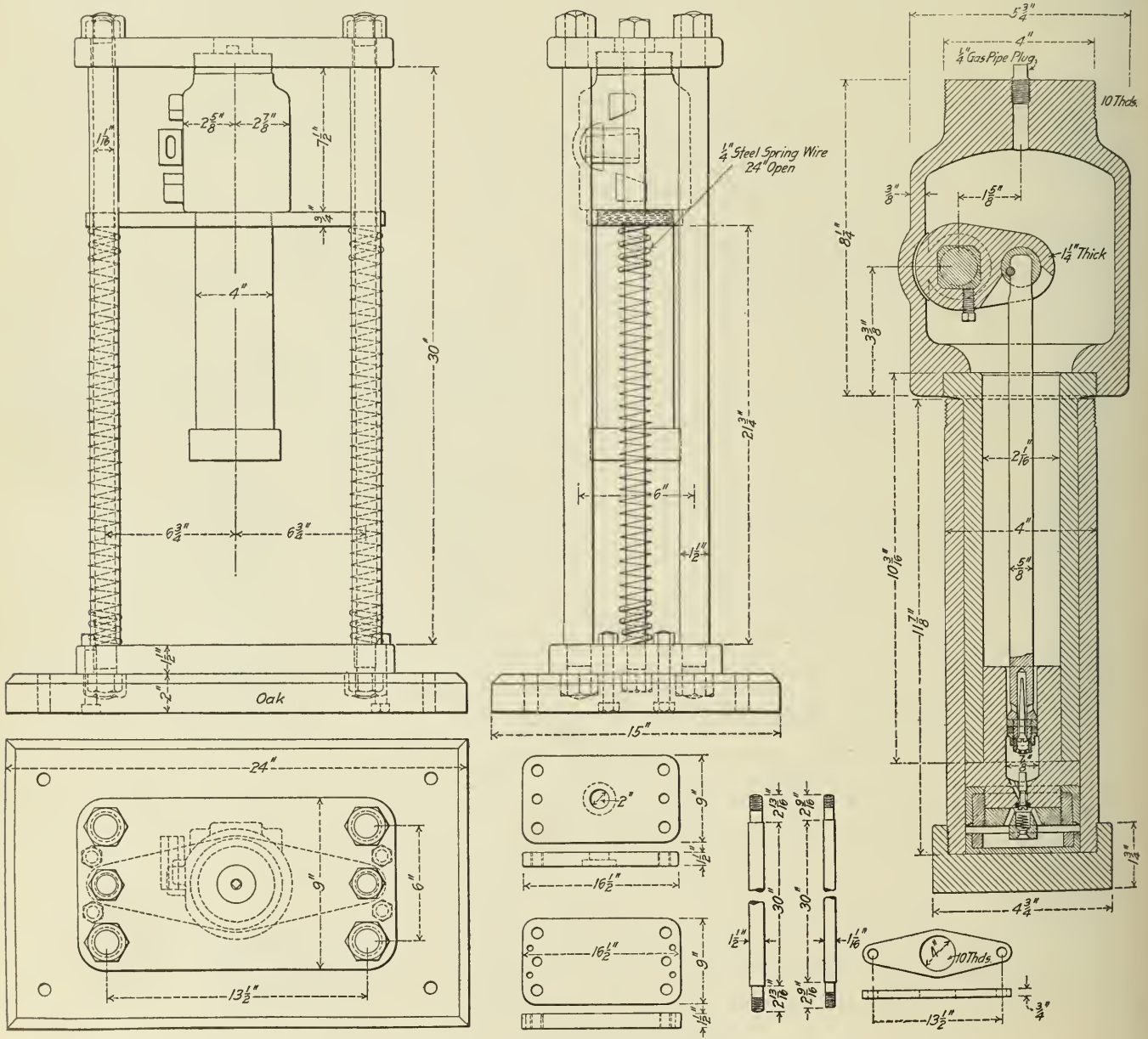


Fig. 1—Press for Light Work.

may of course be made greater by selecting a jack of a capacity suitable to the class of work which is to be done. If it is desired to make the press portable, it may be mounted on a small four-wheel truck. It may be used to equal advantage in either the erecting shop or the engine house.

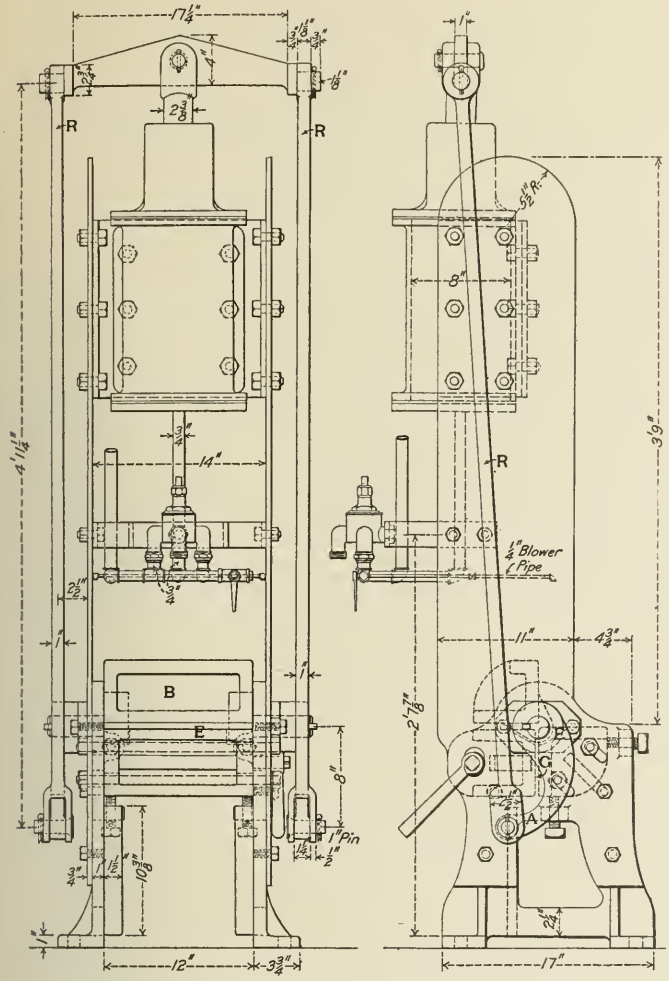


Fig. 2—Machine for Bending Right Angles.

MACHINE FOR BENDING RIGHT ANGLES.

In using the machine for bending right angles, shown in Fig. 2, the material is heated at the point where it is desired to make the bend, and is then placed in the slot G in a vertical position and clamped. The 8-in. by 10-in. air cylinder actuates the arms A through the rods R at each side of the machine, which are 1 in. in diameter. The arms or levers A are keyed to the heavy casting B, which moves far enough to bend the iron, which projects above the slot G, down to the table E, thus forming a right angle. The frame of the machine is constructed of steel plates, castings and forgings, as shown. Iron up to 5-in. x 1¼-in. in section may be bent in this machine.

SPRING BALANCE FOR LOCOMOTIVE BELL.

A bell yoke and spring balance as used on the locomotives of the Pennsylvania Railroad is shown on the accompanying drawing. The spring balance is intended to secure a more uniform movement of the bell and prevent it from turning over when the bell cord is pulled vigorously. The spring case is secured to the bell stand by two bolts, and the plunger with its cap is pin-connected to a yoke which has circular bearings on lugs cast on each side of the bell stand. A small lug projects below the trunnion arm, and before it revolves through 90 deg. it comes in contact with one or the other ends of the yoke, tending to lift it and to compress the spring. The spring thus acts as a stop with a yielding resistance causing the bell to return to its normal position and preventing the excessive movement which would overturn it.

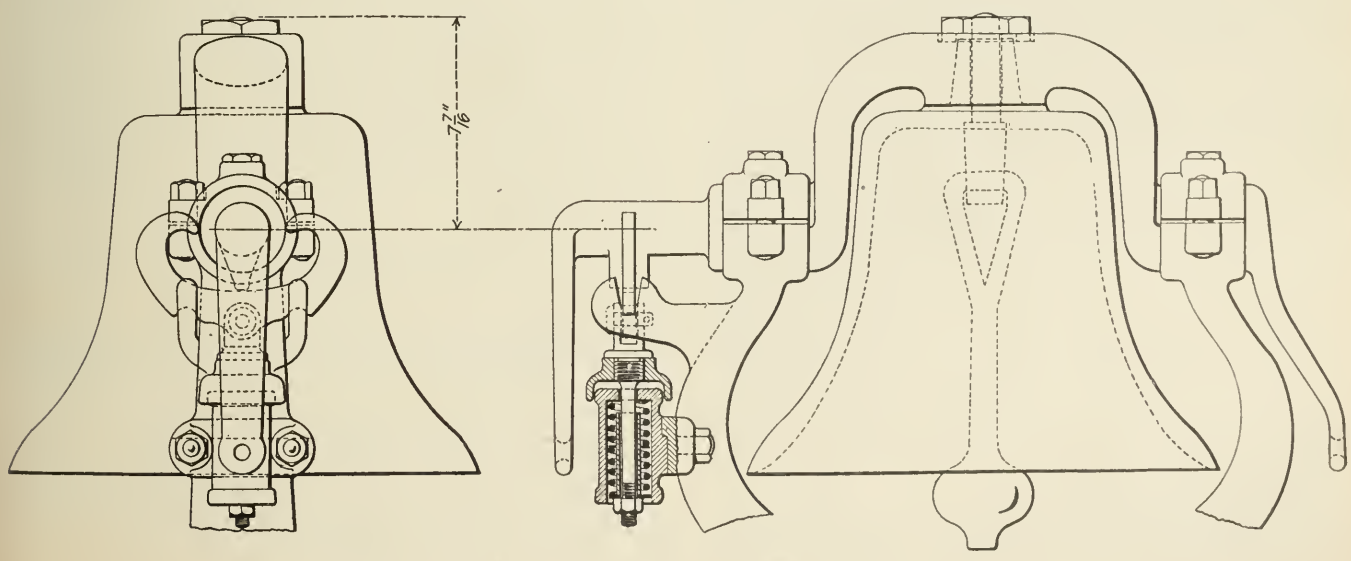
INSTRUCTION OF WORKMEN AND APPRENTICES.*

BY JOSEPH W. L. HALE.

Head Instructor, Pennsylvania Railroad School for Apprentices, Altoona, Pa.

In order that a proper efficiency may obtain in the industrial life of the nation, those engaged in manufacturing and industrial callings must effect a rational system of practical education, having as its aim a proper utilization of the conditions of modern trade and industry. During the middle of the nineteenth century the skilled mechanic, as such, was not given the proper attention. This was due largely to the rapid changes in industrial conditions brought about through the introduction of labor-saving machinery with the consequent high specialization of labor. Through these causes, and on account of the former neglect to provide a proper system of recruiting the service, the decrease in the number of skilled and intelligent employees has been felt very keenly in recent years. What is the solution of the problem of providing employees who can bring both skill

*Entered in the competition on the instruction of workmen and apprentices which closed April 15, 1911.



Spring Balance for Locomotive Bell; Pennsylvania Railroad.

and intelligence to meet the present complex conditions? During the present decade many of the larger and more influential of the manufacturing and railway companies will endeavor to solve the problem by providing their employees with a form of training furnished through the medium of shop instructors and a shop school located on shop ground with instruction provided during working hours. This movement, which has already taken a strong root in the interest of the young industrial worker, forms the essential element of the modern or new apprenticeship Other modern methods for producing greater skill and intelligent workmen in industries, may be grouped under the heads of trade, industrial and correspondence schools. At present, through these means, a vast army of industrial workers is receiving instruction in specific trades and callings.

If one reviews the present situation, he is sure to find a strong appreciation, such as never before shown, of the returns which an investment in education will provide for the employer. As exemplified in the new apprenticeship, the attempts to meet the present situation by the larger concerns is through a means providing academic training closely co-ordinated with the shop work of the trade. Examples of this are shown in the recent high development effected by the New York Central Lines, the General Electric Company, the Pennsylvania Railroad and others. The writer recently had the privilege of inspecting one of the largest of recent developments—that of the New York Central Lines. The development of the system thus far effected, it is believed, is such as to place the work out of the experimental stage and establish it on a firm basis as an integral part of railway organization. Apprentices have already been graduated in some instances and the general development and efficiency produced has been very marked, such as to many times outweigh the investment involved in the training.

A prominent and necessary feature of the modern systems is the establishment on shop grounds of shop schools closely connected with the shop work. These the apprentices attend *during working hours while under full pay.* Night schools are inadequate to meet the present situation of the railways. The apprentice is decidedly "a day time proposition." This is entirely rational when viewed from a physical and physiological standpoint, to say nothing of the psychological principles involved.

The courses provide class room work covering, first, the fundamentals, that is, the three R's, and later a little higher development in mechanics and possibly some elementary physical principles, applied closely to the every-day shop work of the apprentice. Involving this elementary instruction are problem courses designed, first, to provide a general instruction for all apprentices, and later to bear more specifically on the separate trades. A course in drawing is taken with the class room work, beginning necessarily in an elementary way and applied throughout to the specific needs of the trade. This system is in vogue on a number of the larger railways at present, and is generally satisfactory. No small expense is incurred not only through the cost of instruction as such, but through the time which the apprentices give to the work. The time generally allowed is four hours per week.

There is a wonderful opportunity throughout the work for adapting the subjects of the common schools to specific industrial and trade needs. The question of how satisfactorily the present public educational agencies meet the needs of employers is altogether too extensive for this article. The fact that employers who are financially able are instituting their own systems in their shops, shows that at present the common public school, providing instruction for high school and for college and tending along cultural lines, does not meet their needs satisfactorily. This is, however, a question for the student of industrial education, who in attempting to solve the problem should review the remarkable work done at Cincinnati, Ohio; Fitchburg, Mass., and other places.

An important feature of a number of the modern systems of apprenticeship is the shop instructor, who amounts practically to an assistant foreman. His duties are specifically to instruct the apprentices in the shop work, to see that they secure the proper variety of work, and to prevent exploitation in any sense of the word. In a larger sense, he relieves the foremen of many responsibilities and his reports to the apprentice supervisor connects the work of the shop very vitally with that of the shop school.

The question may be asked, does the apprentice appreciate the efforts which so distinguish the present indenture or term of service from that under the old system? When every means is provided for a proper and thorough instruction and a keen interest is shown in his moral welfare there can be little doubt as to the manifestation of a strong appreciation. The writer can sincerely say from his experience with one of the largest companies, that this attention to apprentice welfare is decidedly appreciated, and will be more so when the apprentices have become journeymen. How many a foreman has said: "We did not have this opportunity when we were apprentices."

The new apprenticeship aims to develop not only industrial efficiency, but social usefulness. Through its efforts a marked influence for moral good can be exerted on the apprentice. He is made a better man and a better citizen, and is thus much better fitted through education and moral influence to meet the modern industrial conditions. It should be perfectly apparent that this is a decided contrast to the former practice, which did not look toward the moral side or that of broader training. A much better grade of employees is manifestly obtainable, and the shops furnish a far greater opportunity for the bright boy who would make a useful and efficient man.

What is to be done in the case of employers unable to provide a system of shop and school instruction on such an extensive plan? Many employers at the present time either encourage or require their apprentices to attend evening trade or industrial schools. The writer suggests that a far higher efficiency in more directly co-ordinating school with shop work might be effected by assigning a room within the works for apprentice instruction and allowing a portion of the time of one of the company's draftsmen or engineers to provide a course in drawing and problem work. If this instructor lacks pedagogical experience, evidently the method will lack somewhat in efficiency, nevertheless, it will open up a new field for later development and will surely many times outweigh in results any effort involved. The school room may not be elaborate; it may be a store room not in use, or a portion of a spare store room, which can be devoted to this work; only a portion of the time of the instructor may be required.

The effect of this direct interest in apprentices will, without question, be decidedly evident if the instructor has an interest in boys and a proper encouragement is given to his work.

Manufacturers and railways who do not appreciate the meaning of the new apprenticeship and the necessity for providing intelligent and skilled workmen, through attention to both their industrial efficiency and social usefulness, will be left behind in the struggle for industrial supremacy which is constantly growing stronger. In this case as in all others, the principle of the survival of the fittest applies with equal force. Efficiency may be obtained through the proper instruction and proper recruiting of the service.

FOREIGN RAILWAY NOTES.

The legislative council of Jamaica has voted to appropriate about $500,000 for the construction of a branch line in the Minho valley, which will open up a fertile district well adapted to growing bananas.

The opening of the railway from Nazan, Argentina, to Tinogasta has been authorized by the minister of public works. This official has also approved the plans and estimates of the first section of the state railway between Diamante and Curuzu-Cuatia, the estimates amounting to $1,242,146.

General News Section.

The Chicago, Burlington & Quincy station at Galesburg, Ill., was almost completely destroyed by fire on April 27; loss about $75,000.

Under the new Public Utility Law of New Jersey, free rides are so severely restricted that policemen and firemen can be carried on street cars only by paying fare.

Thirty-two railways in Texas show a deficit of $1,472,000 for eight months. Probably Texas will now legislate to prohibit deficits within the limits of the state.—*Wall Street Journal.*

The roundhouse and the repair shop of the New York, New Haven & Hartford, at Danbury, Conn., were destroyed by fire, April 25. Loss, including damage to three locomotives, $50,000.

A farewell luncheon was given to Warren J. Lynch, retiring passenger traffic manager of the New York Central Lines west of Buffalo, by fifty of his friends and railway associates at the La Salle Hotel, Chicago, on April 29.

Maintenance of way employees on the lines of the Canadian Pacific and the Canadian Northern between Port Arthur, Ont., and Vancouver, B. C., have received an increase of 14 per cent. in wages. About 10,000 men are affected.

Fourteen of the general officers of the Chicago & Alton and the Toledo, St. Louis & Western surprised George H. Ross, who recently resigned as vice-president of those roads, by presenting him with a loving cup on April 27.

The special commission on Boston transit problems, reporting to the legislature this week, recommends the construction of a subway through Boylston street from the Common westward to Charlesgate. The estimated cost of a subway over this route is $4,700,000.

The Pennsylvania Railroad Company, which now has offices at 2 Sherman street, Chicago, has leased 11,000 sq. ft. on the second floor of the Rand-McNally building, which it will occupy when the building at 2 Sherman street is torn down to be replaced by a new one.

The proposed amendment to the Oklahoma constitution eliminating a provision prohibiting foreign corporations to acquire control of railways in that state, was defeated at the special election on April 27. Preparations are being made to renew the fight for the amendment.

Suit has been filed by the government in the Federal Court at Prescott, Ariz., against the Atchison, Topeka & Sante Fe, for penalties amounting to $95,000, because of alleged violations of the 16-hour law as applied to train and engine crews. The complaint contains 190 counts.

To test their adequacy for carrying heavy loads of merchandise long distances, a number of automobile truck wagons were run recently from New York to Philadelphia and back in a single day. Four tons of merchandise were carried each way, but the number of vehicles or their size is not stated. The average rate of speed is said to have been 15¾ miles an hour.

The United States Steel Corporation has posted notices at the South Works of the Carnegie Steel Company, Sharon, Pa., to the effect that hereafter no employee may work more than six days a week. In the blast furnace, which does not close on Sundays, the rule will be that men who have to work on that day shall lie off one day during the following six days.

The first division of the Chicago & North Western to be awarded the banner provided by the management to be given each six months to the division which has made the best record for safety is the Sioux City division. The banner was conferred at a meeting of the officers and employees at Sioux City, Iowa, on April 20, the presentation speech being made by Ralph C. Richards, general claim agent, who is chairman of the Central Safety Committee.

On the Baltimore & Ohio, between Salem and Parkersburg, W. Va., the use of the Morse telegraph for train despatching has been resumed, in place of telephones. This is not because of any dissatisfaction with the telephone, but because of a consolidation of districts of the Monongah division. The telephone system has recently been put in use on an entire despatching district of the division named, and it will be extended to other sections of the road.

Francis Owens, who for 17 years has been connected with the auditing department of the Chicago, Milwaukee & St. Paul, has been appointed by the new mayor of Chicago as commissioner of track elevation for that city. The importance of this position is indicated by the fact that during the last 3½ years Mr. Raymer, Mr. Owens' predecessor, has had charge of the administration of ordinances covering the elevation of 250 miles of track and representing expenditures aggregating $18,000,000.

The Pennsylvania Railroad has finally declined to adopt the recommendation of certain employees, presented about two years ago, to make certain changes in the company's pension regulations. There was a movement to have the age of voluntary retirement changed from 65 to 60, and to provide for the additional burden which would thus be entailed, by having assessments made on the employees. The system will remain as it is; employees may retire at the age of 65, if incapacitated for service.

The General Managers' Association of Chicago, using figures furnished by the coroner's office, showing that 96 persons were killed during the past year while trespassing on railway property in that city, is urging the municipal court to enforce rigidly the city trespassing ordinance. The figures show that 77 were killed while walking on the tracks and 19 were stealing rides. The ordinance which it is desired to enforce was passed in 1907, and provides for a fine of from $5 to $100 for trespassing on railway tracks.

The Pennsylvania Railroad has recently issued a book of instructions printed in nine languages. This is for the benefit of men working on the tracks, with a view to enabling them to better protect their own lives. If such a book were to be adopted as a standard for the whole country, it would have to be printed in ten languages—at least. The Boca & Loyalton, a road in California, now controlled by the Western Pacific, has in its employ a number of Koreans. However, it is said, that the Koreans are to be discharged, as it has been found difficult to convey instructions to them.

Some of the western "insurgent" members of Congress propose a law to give the government a monopoly of building and operating railways in Alaska. The Secretary of the Interior has instructed the governor of Alaska to receive any complaints which may be made concerning railway rates in that territory; hear the evidence and report to Washington. It will be recalled that the Interstate Commerce Commission refused to assume jurisdiction over the railways in Alaska, and that in this position the commission was sustained by the United States Supreme Court.

The conflagration at Bangor, Me., on April 30, destroyed the Morse-Oliver building in which were the general offices of the Bangor & Aroostook Railroad. The Western Union and Postal telegraph offices and the telephone central office were also destroyed. None of these companies suffered any vital loss, but all were temporarily inconvenienced or crippled. The greater part of the business section, several hundred houses, the public library and high school, post office and custom house, several banks, six churches, etc., were destroyed. The total loss is estimated at from three to six millions.

Commercial clubs representing several cities in southern Idaho have joined with the Consolidated Fuel Company and the Castle Valley Coal Company of Salt Lake City, Utah, in a suit against a number of western roads for a reduction of rates on coal shipped from mines in Utah to points in Utah, Idaho, Montana, Washington, Oregon, Nevada and California. The complaint is made that under the present adjustment of rates the market in southern Idaho territory is monopolized by operators in certain coal fields lying along the Union Pacific, and that unreasonable prices are charged for the coal.

The governor of California has signed the bill limiting to 16 hours the working day of railway trainmen and telegraphers, passed by the recent legislature. This bill, now a law, appears to have been drawn with little care. It requires that when an employee has been on duty 16 hours he must lie off for 8 hours; but if he should work only 15 hours and 59 minutes, the clause prescribing a period of rest apparently does not apply. The penalty is $200 to $1,000 or imprisonment; but the accounts do not say whether this applies to the superintendent or to the employee, or to both. The time limit does not apply to men on wrecking or relief trains.

The Chicago, Milwaukee & Puget Sound is to use telephones for train despatching between Mobridge, S. D., and Deer Lodge, Mont., 755 miles. Seventy-five sets of selector and telephone equipments have been ordered from the Western Electric Company. The Pennsylvania Railroad, which is already operating a number of its divisions with Western Electric selectors and telephone equipment, has just ordered similar equipment for use on its Bellwood division. The equipment for this division consists of two complete circuits—one a train despatching circuit between Bellwood and Fordham, a distance of 65 miles, and the other a 57-mile message circuit between Bellwood and Punxsutawney.

A strike of maintenance of way employees in the Chicago terminals of the Chicago & Western Indiana, the Chicago Junction, the Baltimore & Ohio Chicago Terminal, the Indiana Harbor Belt, the Illinois Central and the Chicago, Milwaukee & St. Paul was called on May 1 at 6 p. m., by the International Brotherhood of Maintenance of Way Employees. This action followed a demand that the general managers of the roads concerned accept a uniform scale of wages and an agreement covering conditions of labor. The brotherhood claims to have a membership of 2,400 men on the roads concerned, and it is reported that a number of employees not members of the organization are also out on strike.

Governor Foss, of Massachusetts, in a special message to the legislature, advocates the abolition of the state railroad commission and the merging of its business with a public utilities board. The governor repeats the recommendations of a report which has been made to him by C. H. Scovell, criticising the methods or conduct of the railroad commission. Petitions of railways for the right to increase capital stock have been granted without thorough investigation of the business and earnings of the road. Reports of new equipment are not made by the roads to the commission with sufficient fullness, and the board does not make public record of its conferences with railway officers in regard to new issues of stock. The determination of the expenses of abolishing grade crossings ought to be a part of the duties of the commission instead of being made the work of a special commission in the case of each crossing. To abolish these special commissions would save the state $10,000 a year. The present law, under which the cost of running the railroad commission is charged against the railway companies is declared to be vicious.

A strike of shopmen in the shops of the Pennsylvania Railroad at Pittsburgh, Pitcairn and other points on the Pittsburgh division, which took place on Monday, May 1, brought work almost to a stop in those shops and resulted in some little violence, the newspapers of Tuesday reporting attacks on non-union men. The strikers say that 1,500 men have gone out. The company has dismissed large numbers of men during the past few weeks and the strikers say that in these dismissals the company has discharged some of its oldest men because they belonged to the union. The company at once began engaging new men and prepared lodging and eating rooms for them in or near the shops; and called for police protection. At Pitcairn it was said that the strikers induced the city or town to appoint men from their own number as guards over the railway company's property. An officer of the road said that the number of men who struck was 1,171 and that about 400 remained at work in the shops. The statement issued by the company said that on the lines of the company east of Pittsburgh and Erie about 20,000 men had been furloughed because of the depression in business. Committees of shop men went to Philadelphia last week and asked that all reductions in force be made on an absolute seniority rule, regardless of the qualifications of the employe. This request the general manager denied.

The Passing of the Green Flag.

On the New York division of the Pennsylvania, the through passenger trains which run to and from the new terminal in New York City, have to carry marker lamps on the rear car in the daytime as well as at night, because of the long tunnel which has to be passed through, and the keeping of these lamps on the cars so constantly suggested to the officers that flags were unnecessary. The suggestion was put in practice and now the lamps (unlighted) have been designated as regulation markers for trains running in the daytime. Experience has shown that the lamps are quite as distinguishable as the flags, and answer every purpose. The lamps are painted a bright green. The same rule has been prescribed on the Amboy division, over which some of the New York trains run. On the Belvidere division, the rule prescribing markers by day allows either green flags or marker lamps without lights.

Federal Examinations for Locomotive Boiler Inspectors.

The Civil Service Commission has recently issued circular 397, relative to examinations for district inspectors of locomotive boilers. The examinations will take place June 7-8, 1911. The salary is $1,800 per annum, and necessary expenses while absent from headquarters in discharge of official duties. The applicants must be between 25 and 50 years of age and also of good moral character and habits, active, intelligent, and discreet; of good speech and manner; qualified to address and confer with railway officials as occasion may require, and must have not less than three years' railway experience in the capacity of master mechanic, road foreman of engines, boiler maker, boiler inspector, roundhouse foreman, shop foreman or locomotive engineer; or not less than five years as locomotive fireman. The applicant must have been in active service in such capacity of inspector of locomotive equipment under the government of the United States or of any state or territory, within two years next preceding the date of his application. The experience required must be in addition to time served in apprenticeship or spent attending a technical school. Applicants should at once apply to the United States Civil Service Commission, Washington, D. C., for application and examination Form 1892. In applying for this examination the exact title, District Inspector of Locomotive Boilers, should be used in the application.

Passengers Burned to Death at Martin's Creek, N. J.

By the derailment of a southbound passenger train at Martin's Creek, N. J., on the Belvidere division of the Pennsylvania last Saturday afternoon, April 29, about 3 p. m., 11 persons were killed and 40 or more injured; eight of the killed being burned to death in the wreck, which took fire almost instantly after the cars lodged at the foot of a low bank, after being derailed. The train was an excursion from Utica, N. Y., bound for Washington, and the passengers were school teachers from Utica and vicinity, mostly women. The killed numbered seven passengers, the conductor of the train, the baggage man, the engineman and the tourist agent in charge of the excursion. Two other passengers are reported missing, and are believed to have perished in the fire. The train was made up of an engine and five cars and was running at about 40 to 50 miles an hour over a curve of 3 deg. The engine fell over on its side and the first two cars lodged nearly at right angles to the track.

The cars in this train, one combination, three coaches and one dining car all belonged to the Delaware, Lackawanna & Western, over which road they had come from Utica to Stroudsburg. The first two cars were equipped with Pintsch gas lighting apparatus; the third car, No. 100, with Commercial acetylene gas lighting apparatus; the fourth with Pintsch, and the fifth, the dining car, with acetylene. The fire started in the third car, No. 100, and it was in this car that nearly all the loss of life occurred. The gas tank beneath this car had been ruptured and gas issuing from the rupture appears to have been ignited as soon as the car came to rest or before. The train ran a considerable distance after leaving the rails and the ignition of the gas may have been due to coals spilled from the locomotive or from friction of broken parts. The fire spread rapidly to the rear and to the front. The gas apparatus on the fourth car was not seriously damaged; the gas pipes on the first and second cars were broken, but the tanks had not been punctured. There was no evidence that the gas had been burning when issuing from any of these breaks in the

pipes. It is believed that the gas in these two cars had escaped and had been dissipated in the atmosphere before the flames from the third car had reached the first or second.

The combustible parts of all of the cars were destroyed by the fire. Some hours after the wreck occurred the remaining parts of the dining car, one end of which had remained on the track, was thrown into the ditch; and by 8 p. m. the heat had so fused one end of the gas tank under this car that there was an explosion of the gas left in the tank, blowing off one end of it.

The passengers who were injured suffered mainly from being cut by glass in getting out of the wreck and from being burned.

The cause of the derailment has not been determined. Track repairers had been relining the surface of the track on the curve, but two passenger trains and a freight train had passed over the track after the men had stopped work and before the arrival of the excursion train. The flanges of the wheels of the derailed engine were found to have been in good condition and there is no evidence that the engine left the track first. So far as the officers of the road have been able to inspect the track, it is found that every tie had tie plates and that the rails were spiked to the ties with two spikes for each rail at each tie. Every joint was fully bolted and the rails and ties are reported as having been in good condition.

The track men who were on the ground gave assistance to the passengers at once, so far as they were able, and a train with eight physicians reached the scene of the accident within 40 minutes after it happened; other physicians arrived soon after. Both the Pennsylvania and the Lackawanna were energetic in giving assistance to the injured persons and to their friends who visited the scene.

Philadelphia-Washington Underground Telephone Line.

The American Telephone and Telegraph Company is laying an underground cable between Boston and Washington. The section between Philadelphia and Washington will be completed this year.

The conduit between the two cities is approximately 135 miles in length, which, added to the existing underground line between Philadelphia and New York, makes a total of about 235 miles. The wires used in these cables are larger than those employed on overhead lines and are so arranged that from each two pairs it is possible to obtain simultaneously three complete telephone and eight complete telegraph circuits. In addition there are contained within the cable sheath a number of pairs of smaller gage wires for use between intermediate cities along the route. These pairs of the small-gage wire may also be used for telegraph purposes. Altogether the cables contain 148 wires, which are arranged in 74 pairs and capable of giving 99 telephone and 296 telegraph communications simultaneously.

At intervals along the cable the wires are connected to Pupin "loading coils." Nearly 10,000 of these coils are to be used between Philadelphia and Washington and their aggregate weight will be about 200 tons.

On the section between Wilmington and Washington the trench in which the cable is being laid is about 100 miles in length and in the distance between the two cities there are 75 bridges over which the cables are to be carried. The manholes are 3 ft. wide by 4 ft. 6 in. long, and are placed at an average distance apart of about 500 ft. One thousand of these manholes will be constructed along the line between Philadelphia and Washington.

On one section of this line a trenching machine is used to excavate the trench. The machine is capable of digging daily a trench of 1,000 ft. long, 18 in. wide and 3 ft. deep. In the other sections a trench plow is used.—*Telegraph and Telephone Age.*

Paradise of Deadheads.

California still deals tenderly with people who have got used to traveling free—or rather it allows the railways still to deal loosely with such. The state railroad commission has announced the classification of persons who may be entitled to passes or reduced rates as follows: Ministers of religion, traveling secretaries of railway men's religious associations, executive officers, organizers or agents of railway employees' mutual benefit associations, inmates of hospitals and charitable and eleemosynary institutions, persons and property engaged or employed in patriotic work (when transportation is to be used for furtherance of such), persons and property engaged or employed in educational work or scientific research (when transportation is to be used for the furtherance of such, this authority not extending to persons employed by educational institutions which are run for profit), hotel employees of season resort hotels while traveling to and from such employment. In the case of representatives of executive officers of Chambers of Commerce and similar organizations, application is to be made to the commission who will act on such, such transportation to be for a furtherance of the work of the organization. By order of the commission all railway or other transportation companies are directed to furnish the commission quarterly reports giving details of all reduced or free transportation furnished.

American Society of Mechanical Engineers.

The headquarters of the American Society of Mechanical Engineers at its annual spring meeting, to be held in Pittsburgh, Pa., May 30-June 2, will be the Hotel Schenley, and all the professional sessions will be held in the lecture hall of the Carnegie Institute. The application of mechanical engineering to the field of cement manufacture will be one of the important questions considered. Among the papers presented there will be one on Edison Roll Crushers, by W. H. Mason, superintendent of the Edison Portland Cement Company, Stewartsville, N. J.; and one on Some Problems of the Cement Industry, by Walter S. Landis, associate professor of metallurgy at Lehigh University. A feature of the convention will be an excursion by special train to the plant of the Universal Portland Cement Company at Universal, Pa., on invitation of E. M. Hagar, president of the company. Other important topics will be Turbo-Compressors and Forging Presses. In addition to papers already mentioned, the professional sessions of the convention will deal with machine shop practice, with papers on the Assembling of Small Interchangeable Parts, by John Calder, manager of the Remington Typewriter Works, Ilion, N. Y.; the Process of Assembling Small and Intricate Parts, by Halcolm Ellis, of the Ellis Adding-Typewriter Company, Newark, N. J.; and the Design of Milling Cutters and their Efficiency, by A. L. DeLeeuw, mechanical engineer of the Cincinnati Milling Machine Company, Cincinnati, Ohio; also with Steel Works Practice, with papers on the Commercial Application of the Turbine Turbo-Compressor, by R. H. Rice of the General Electric Company, Schenectady, N. Y.; and upon Hydraulic Forging Pressors and Blowing Engines; and with miscellaneous topics, including papers on Stresses in Tubes, by Reid T. Stewart, professor of mechanical engineering of the University of Pittsburgh; the Purchase of Coal on the Heat Unit Basis, by Dwight T. Randall, engineer in charge of the fuel engineering department of Arthur T. Little, Inc., Boston, Mass.; Energy and Pressure Drop in Compound Steam Engines, by F. B. Cardullo, of the department of mechanical engineering of the New Hampshire College of Agriculture and the Mechanic Arts; and A Pressure Recording Indicator for Punching Machinery, by Gardner C. Anthony, dean of the engineering school of Tufts College. There will also be a session on Gas Power, with papers to be announced.

At the next regular meeting of this society, to be held in New York on May 9, several important papers on patents will be presented. The subject will be discussed by E. W. Marshall, D. Howard Haywood, Edwin J. Prindle, all of New York. The purpose of this meeting is to outline to the engineer and manufacturer the fundamental principles of the patent law, the position and qualifications of a patent expert and the industrial development for the purpose of establishing a patent monopoly.

Tool Foremen's Convention.

The annual convention of the American Railway Tool Foremen's Association will be held at the Wellington Hotel, Chicago, July 11-13. All steam and electric railway tool foremen should make a special effort to attend this meeting, as many subjects of mutual interest to the railways and tool foremen will be presented and discussed, and from numerous answers to a circular letter, sent out in January, there is no doubt that the coming convention will be the most enthusiastically attended of any yet held. It is expected that the meeting will be addressed by some of the most prominent superintendents of motive power in railway service. Following is the list of sub-

jects that will be discussed, besides papers sent in answer to circular letter: The Making of Dies for Forging Machines, by J. E. Roberts (C. C. C. & St. L.); H. E. Wright (Nat. of Mex.); and by H. E. Webb (S. A. L.); The Economical Use and Care of Emery Wheels, by H. E. Blackburn (Erie); Equipment of Railway Tool Rooms, by B. Hendrickson (C. & N. W.); Special Appliances for Use With Pneumatic Tools, by A. M. Roberts (B. & L. E.); W. A. Fairburn (N. Y. C. & H. R.); J. T. Fuhrman (G. N.); and by Mr. Brown (M. St. P. & S. S. M.); Standardizing Tools in Railway Tool Rooms, by E. J. McKernan (A. T. & S. F.); The Co-operation of the Shop Foremen and Tool Room Foreman in the Care and Maintenance of Small Tools, by W. J. Eddy (Erie). The supply men are planning to have many interesting exhibits. The secretary of the Tool Foremen's association is O. T. Harroun, Bloomington, Ill.

American Railway Association.

The spring session of the American Railway Association will be held at the United Engineering Society building, New York, on May 17. Reports will be presented by the Executive Committee and by the committees on Transportation, on Maintenance, on Relations between Railroads, on the Safe Transportation of Explosives and Other Dangerous Articles, on Electrical Working, and on Nominations. A second vice-president, two members of the Executive Committee, three members of the Committee on Transportation, three members of the Committee on Maintenance, three members of the Committee on Relations between Railroads and three members of the Committee on Nominations are to be elected at this meeting.

National Federation of Traffic and Transportation Clubs.

The National Federation of Traffic and Transportation Clubs was organized in Cincinnati, Ohio, on April 3. The object of the Federation is to give its members a more thorough knowledge of transportation problems, to encourage the organization of additional traffic clubs throughout the country, and to promote harmonious co-operation. The officers are as follows: President, J. V. Zartman, president of the Zartman Oil Company, Indianapolis, Ind.; vice-presidents, Thomas Conlon, Michigan Central; James L. Marens, St. Louis Southwestern; and Walter G. Norvell, traffic manager, Parke-Davis & Co., Detroit, Mich.; secretary and treasurer, Carl K. Landes, Canadian Pacific, Cincinnati, Ohio.

Association of American Railway Accounting Officers.

The twenty-third meeting of the Association of American Railway Accounting Officers was held at the Grunewald Hotel, New Orleans, La., April 26 and 27. The following officers were elected for the ensuing year: President, L. A. Jones (Q. & C.); first vice-president, M. P. Blauvelt (I. C.); second vice-president, C. W. Bunting (Pennsylvania); secretary, C. G. Phillips, 143 Dearborn street, Chicago. A further account of this meeting is published in another column.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on May 3, a paper entitled Sinking a Wet Shaft, by John P. Hogan, Jun. Am. Soc. C. E., was presented for discussion. This paper was printed in the *Proceedings* for March, 1911.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., S. Louis, Mo.; May 9-10, 1911, Detroit, Mich.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa., 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except, June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The governor of Michigan has signed the bill passed at the session of legislature just closed, reducing passenger rates in the upper peninsula to two cents a mile.

The Frank Parmelee Transfer Company has purchased 30 motor carriages of the style of limousine cars to use in its cab service between the different railway passenger stations in Chicago.

New York City taxicab companies have raised their rates from 70 to 80 cents a mile. Take one across the river to New Jersey by the ferry and give the Interstate Commerce Commission a chance to butt in.—*Wall Street Journal.*

The Chicago, Rock Island & Pacific on May 14 will inaugurate through passenger service between St. Paul, Minn., and Des Moines, Iowa, over the St. Paul & Des Moines, which it recently acquired and which provides a more direct line between those points. Construction is also under way which will result in a shorter line for the Rock Island between St. Paul and Kansas City.

Alexander Hilton, general passenger agent of the St. Louis & San Francisco, has been elected president of the St. Louis Traffic Club, succeeding Carl R. Gray, who recently went to Portland, Ore., as president of the Spokane, Portland & Seattle. B. M. Flippin, freight traffic manager of the Missouri Pacific, has been elected to succeed C. S. Clarke as vice-president of the club.

The Pennsylvania now runs a local Trenton passenger train to and from the new station in New York City. The new train leaves Trenton in the morning and returns to Trenton in the afternoon. It will be recalled that hitherto the new station has been used only by through trains; the local trains continuing to run to and from Jersey City, except in the case of the Long Branch express and one or two night trains.

The Agricultural College of the Ohio State University has announced that germination tests show that seed corn for planting this year is exceedingly low in vitality. As a consequence, the Pennsylvania Company, co-operating with the State College authorities, is to operate a "Corn Special" train across the state to give farmers instruction in corn breeding and cultivation. The Pennsylvania will furnish and operate the train free of cost to any one, as it has disseminated literature, established experiment stations, and given lessons in making good roads.

Three-cent Fares in Florida.

The Louisville & Nashville has notified the governor, the attorney-general and the railway commission of Florida, that beginning May 8, all passenger fares in that state will be made three cents a mile. At present the fares on this road in Florida are four cents a mile. The railway commission has been prosecuting a case in the courts for several years past, with a view to forcing a reduction, and a bill to compel the reduction has been favorably considered by the legislature at the present session.

The Indictment Against the Pennsylvania.

In view of the recent indictment against the Pennsylvania Company in Cleveland, and of apparent misunderstanding, the following statement is made by President James McCrea:

"The action of the Grand Jury, so far as I understand it, is based on the following condition of affairs: During the year 1908, and a portion of the year 1909, iron ore was landed from vessels at docks on Lake Erie belonging to the Pennsylvania Company, which docks were being operated by M. A. Hanna & Co. as a dock company, with whom an agreement was entered into for handling ore from the vessels to the cars and docks of the railway company. The vessels paid a fixed price per ton for unloading, and the railway company a fixed price per ton for loading the ore on the cars, the prices thus established being the current prices at practically all of the docks of all railways at Lake Erie ports.

"Owing to the introduction of improved ore handling machinery during this period, the cost of handling the ore was found to be less than the sum of the payments made to the dock companies by the vessels and the railway companies, but the exact amount of this possible saving could not be determined until the close of the season. It was therefore provided in the agreement that after deducting from the gross receipts of the dock company, rental, cost of operation and maintenance, and proper remuneration for services rendered, that portion of the saving per ton published in the tariffs of the railway company, filed with the Interstate Commerce Commission, was to be paid currently by the dock company to the consumers of ore, and any additional surplus or saving that might possibly remain at the close of the year should also be apportioned among the consumers of ore in the proportion that the ore received by them over the Pennsylvania Company's lines and connections bore to the total ore tonnage forwarded from the Pennsylvania Company docks. This, of course, absolutely insured uniform rates to all consumers of ore forwarding from those docks.

"The tariffs duly published and filed with the Interstate Commerce Commission showed clearly the current payments to be made by the dock company to all these consumers of ore, but appear to have been silent as to the final distribution to be made by the dock company of any possible additional saving; consequently, if in the company's effort to carry out the exact spirit of the law and insure impartial treatment to its patrons, the failure to note in the published tariffs the provision for the final distribution of the possible additional saving (of which every consumer had not only knowledge but notice) was not strictly in accordance with the law, the violation was only technical and wholly unintentional.

"There can be no question of discrimination involved, as all consumers, both large and small, were treated with strict impartiality; there never was nor could be any favoritism, for the rate to each one was exactly the same.

"The indictment of Mr. Hanna, president of the dock company, and of Mr. McCabe, vice-president of the railway company, for alleged conspiracy, appears to be due solely to the fact that it was they who executed, on behalf of their respective companies, this contract by which exact and absolute equality of rates to all consumers of ore forwarded from Pennsylvania Company's docks was guaranteed."

Uniform Baggage Rules.

Uniform rules for the handling of baggage went into effect on all the railways of the United States and Canada on May 1. Heretofore there have been considerable diversities in the rules of the railways in different parts of the country. Changes have been made in the more important rules and also in numerous details.

One of the important changes relates to the handling of corpses. The rules of the eastern and western lines have heretofore been so different that passengers accompanying corpses have had to leave trains at Gateways between east and west and re-check them. In many instances the passenger has arrived at a junction ahead of the corpse and had to stay over in order to wait for it. Under the new system the corpse is checked through to any destination in the United States or Canada, the ticket for it being endorsed with the number of the baggage check and the baggage check being endorsed with the number of the attendant's ticket, thus preventing confusion. The maximum permitted weight of caskets and their contents is 500 lbs. All weight in excess of this will be charged for at excess baggage rates.

There has been a good deal of controversy in the past between railways and travelers as to what constitutes baggage. The rules of some roads have been rather broad and those of others rather narrow. The most serious controversies have arisen over the carrying of commercial travelers' samples as baggage. Under the new rules there are two kinds of baggage—personal and sample. Personal baggage is wearing apparel, toilet articles and similar effects in actual use and necessary and appropriate for the wear, use, comfort and convenience of the passenger for the purpose of the journey, and not intended for other persons or for sale. Money, jewelry, negotiable paper, liquids, perishable articles, etc., are excluded, and the railways refuse to be liable for damage caused to or by them. Sample baggage is defined as samples of merchandise carried by commercial travelers with the view of enabling them to make sales of goods similar to the samples carried, and not for sale or free distribution by the owner or owners, branch houses, customers or others. This rule is made to include samples carried by "commercial

travelers," but to exclude goods carried by peddlers. Money, jewelry, negotiable papers, etc., are not allowed to be carried as sample baggage.

Under the rules heretofore in effect the contracts on passengers' tickets limited the baggage liability of the roads to $100. Under the new contracts the limit on an adult's baggage will be $100 and on that of a child $50. If the passenger declares a greater valuation, excess baggage rates will be charged at 10 per cent. of excess baggage rates per 100 lbs. for the distance the baggage is to move. For example, if the excess baggage rate per 100 lbs. were $1 the railway would charge 10 cents for each $100 of valuation in excess of $100. No piece of baggage for one passenger which is declared to exceed $5,000 in value will be accepted.

Dogs heretofore have been carried by the western lines as baggage free at owner's risk. The eastern roads have had more strict rules regarding their transportation. The eastern rule, with some modifications, has been adopted by all lines. Under the new arrangement dogs not exceeding $25 in value, or not for exhibition or field trials, if muzzled, or in crates, so marked as to show the name and address of the owner, and accompanied by owner, will be checked and charged for at the regular excess baggage rate for the gross weight, the minimum charge being 25 cents. In all other cases dogs will be turned over to the express companies for transportation.

One of the most important changes is to take effect next January. Under the present rules no piece of baggage will be checked which contains more than 40 cu. ft. and weighs more than 250 lbs. After the date mentioned an excess rate will be charged for any piece the greatest dimension of which exceeds 40 in. For each inch of any dimension in excess of 40 in. a charge will be made equal to the charge for 10 lbs. of excess baggage, and no piece whose greatest dimension exceeds 70 in. will be accepted at all, unless it be immigrant baggage checked at a port of landing.

The purpose of these rules is to eliminate entirely the large trunks in which a great deal of baggage—especially sample baggage—is now handled. The capacity of baggage cars is not unlimited and a good many of the large trunks now used have such great dimensions in one way or another that it is impossible to pile them so as to get efficient loading.

INTERSTATE COMMERCE COMMISSION.

The commission has ordered a further suspension of tariffs filed by southwestern roads, changing or abolishing their allowances to the Manufacturers' Railway of St. Louis. These tariffs had been suspended until May 1, and now they are put over until August 28.

The commission last week held hearings to take evidence on the suitableness of the regulations of the American Railway Association for the transportation of inflammable articles and acids. A representative of a number of dealers in petroleum objected to some clauses of the rules.

The commission has denied the application of the New York, Ontario & Western for relief from the fourth section of the law with respect to rates on anthracite coal from the mines to Port Jervis, N. Y.; also the application of the Rock Island for relief from the fourth section on coal, cement and salt from Kansas City to Watonga, Okla.

At Boston last week, Commissioner Lane gave an extended hearing on the question of freight car demurrage. Some months since, the commission ordered the standard demurrage rules established in New England, but permitted the temporary or experimental allowance of 72 hours' free time on lumber and grain. At the hearing Commissioner Lane told the merchants and shippers of Boston that he saw no reason why New England should be treated differently from the rest of the country, and especially none to justify the allowance of 96 hours' free time on shipments of cotton.

Advanced Rates on Cement Refused.

In re Investigation of Advances in Rates on Cement by Carriers in Trans-Missouri Territory. Opinion by Commissioner McChord:

The principal railways in trans-Missouri territory filed with the commission tariffs which were to become effective September 1, 1910, containing new rates on cement from what is known as the gas belt in eastern Kansas and Oklahoma, and embracing such points as Iola and Chanute, Kans., but extending as far north as Sugar Creek, Mo., in the neighborhood of Kansas City, and as far south as Dewey, Okla., to points in Colorado, Kansas, Nebraska, and in other states embracing a wide range of territory, reaching from Illinois on the east into practically all trans-Missouri and intermountain territory. They also filed tariffs naming advances from Portland, Colo., to points chiefly in Colorado, Nebraska, Kansas and Wyoming. These tariffs are now suspended until July 1, 1911, pending investigation. The proposed rates are not condemned between the following points of origin and destination, viz., Portland, Colo., to all destinations; Kansas City territory and points in Kansas and Oklahoma to points in Texas, as contained in Southwestern Lines Tariff, I. C. C. No. 737, Sup. No. 6; and from Bonner Springs, Kans., and Yocemento, to various points in the states of Colorado, Iowa, Kansas, Missouri, Nebraska, Wyoming, and New Mexico, as contained in tariffs I. C. C. Nos 2318 (Sup. No. 2), 2346, and 2348 of the Union Pacific. With these exceptions, the propriety of the new rates and charges has not been shown.

It does not appear that such of the present cement rates as it is held should not be advanced fail to pay their due proportion of the general burden of transportation. Some of them are now materially higher than they were for a long period, during which there was a considerable movement and the business had adjusted itself thereto.

The railways publishing said tariffs are requested to withdraw them forthwith. If such action be not taken before May 15, 1911, the commission will issue an order directing the maintenance of the present rates for a period of two years from that date. (20 I. C. C. 588.)

STATE COMMISSIONS.

The Board of Public Utility Commissioners of New Jersey has been reorganized by the appointment of Prof. Winthrop Daniel of Princeton, in place of Frank H. Sommer, and by the election of Robert Williams as president of the board.

Carl C. Witt, who was engineer of the South Dakota railway commission during the time the appraisal of the railway property in that state was made, has been appointed engineer of the reorganized public utilities commission of Kansas at a salary of $4,500 a year.

COURT NEWS.

Judge Sanborn at St. Paul has granted the petition of the state of Minnesota for an appeal to the Supreme court of the United States in the Minnesota rate cases.

At Fort Smith, Ark., April 28, the Fort Smith & Western was fined $18,250 on a charge of violating the state law requiring the provision of buildings or shelters for the protection of men repairing cars.

The United States Circuit Court of Appeals at Cincinnati has declared void the action of the Ohio Railroad Commission in reducing, from 90 cents a ton to 70 cents, the rate on coal over the Wheeling & Lake Erie to Lake Erie ports. The coal in question was destined (by boat) to other ports on the upper lakes and the court held that it was an article of interstate commerce.

In the United States Circuit Court May 3 Judge Trieber handed down his opinion in the Arkansas rate cases making permanent the temporary injunctions granted by Judge Van Devanter, restraining the Arkansas state railway commission from enforcing the 2 cent fare and reduced freight rate law. The court finds that the net earnings from all state traffic, freight and passenger, are less than 1 per cent. for the St. Louis, Iron Mountain & Southern, and 2¼ per cent. for the St. Louis Southwestern. These earnings the court finds to be non-compensatory and in effect confiscatory. The court holds that a railway built in pursuance of public demand through a fertile section of the country, rich in timber and other valuable resources, economically managed, is entitled to a return of 6 per cent. on its actual investment or physical valuation, provided the rates to enable it to secure such returns do not have to be so high as to be oppressive to those who from necessity are compelled to employ its services.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1911. (SEE ALSO ISSUES APRIL 14, 21 AND 28.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$90,628	$32,717	$135,758	$18,687	$28,355	$3,332	$47,027	$5,653	$103,054	$32,704	$187	$4,490	$28,401	—$11,349
Arizona Eastern	364*	90,397	31,850	129,582	50,389	11,177	1,731	36,515	3,483	103,295	26,287	185	6,944	19,528	—51,203
Bessemer & Lake Erie	204	296,375	18,917	322,450	40,468	129,226	7,113	122,489	8,690	307,986	14,464	.....	6,000	8,464	31,146
Carolina, Clinchfield & Ohio	236†	138,471	9,725	151,449	12,909	21,251	5,481	32,973	8,960	81,574	69,875	1,433	5,500	65,808	37,142
Carolina, Clinchfield & Ohio of S. C.	18	7,560	1,251	9,062	540	131	1,054	2,043	527	4,295	4,767	.....	200	4,567	—
Central New England	277	185,975	21,491	224,678	32,675	19,504	1,319	67,117	3,466	124,081	100,597	.....	19,000	81,597	—7,997
Chesapeake & Ohio of Indiana	285	80,595	13,500	100,087	33,815	35,131	6,027	73,212	5,899	154,084	—53,997	56	3,790	—57,731	—
Chicago & Erie	270	304,116	50,650	399,103	32,259	89,253	19,631	209,763	10,068	360,974	38,129	.....	11,387	26,742	—94,840
Chicago, Peoria & St. Louis	255	98,035	19,277	124,083	15,718	28,689	6,961	60,340	6,017	117,725	6,358	.....	4,500	1,858	—9,513
Chicago, Terre Haute & Southeastern	351‡	107,670	14,308	123,616	10,782	26,630	3,160	44,120	7,734	92,426	31,190	56	8,700	22,546	—
Cleveland, Akron & Columbus	212	125,398	38,741	178,599	25,517	38,783	3,281	64,853	3,226	135,660	42,939	.....	8,500	34,439	—9,907
Colorado Midland	337	84,562	17,376	117,971	14,206	29,130	4,691	61,240	5,966	115,233	2,738	—1,217	8,500	—6,979	2,621
Cumberland Valley	162	159,004	42,472	213,565	19,627	29,362	3,564	76,693	5,736	134,982	78,583	127	5,141	73,569	—7,257
Detroit, Grand Haven & Milwaukee	190	97,349	31,268	154,619	19,701	26,654	6,795	99,031	4,830	157,011	—2,392	—65	3,009	—5,466	—42,811
Duluth & Iron Range	191§	105,982	23,218	138,311	46,618	43,500	398	81,523	8,552	180,591	—42,280	—2,756	10,919	—55,955	3,764
Duluth, Missabe & Northern	316¶	91,001	34,449	129,773	69,146	82,867	1,574	85,226	11,609	250,422	—120,649	—1,140	5,279	—127,068	—62,566
Georgia Southern & Florida	395	121,250	64,699	209,379	20,918	40,597	6,198	78,609	8,681	155,003	54,375	.....	9,157	45,218	12,607
Grand Trunk Western	347	336,408	112,956	478,312	31,369	78,026	17,254	244,054	12,991	383,694	94,618	—1,583	31,697	61,338	—64,091
Gulf & Ship Island	307	118,662	27,869	159,024	20,429	32,068	1,295	52,241	7,428	113,461	45,563	.....	4,995	40,568	5,686
Kanawha & Michigan	175	157,381	25,360	187,541	16,915	36,440	1,854	59,124	7,321	121,654	65,887	1	7,081	58,807	14,324
Louisiana & Arkansas	255	102,559	12,662	118,994	17,113	16,107	2,304	33,575	4,436	73,535	45,459	.....	2,825	42,634	11,787
Louisiana Ry. & Nav. Co.	351	94,870	18,224	122,372	18,955	17,122	4,837	55,872	5,591	102,377	19,995	.....	4,400	15,595	5,499
Louisiana Western	207	103,123	61,542	172,525	20,557	25,877	7,084	52,385	8,365	114,268	58,257	884	6,577	52,564	9,419
Midland Valley	324	61,366	32,655	100,808	20,723	15,633	2,280	33,543	5,871	78,050	22,758	940	5,475	18,223	—16,491
Minneapolis, St. Paul & S. S. Marie	3,764‖	1,155,197	261,758	1,521,231	149,226	252,683	36,405	715,041	42,366	1,195,721	325,510	—2,873	80,260	242,377	—126,416
Missouri Pacific	3,920*a*	1,150,718	314,836	1,661,404	276,417	282,861	56,971	938,818	73,885	1,628,952	32,452	—5,486	83,500	—56,534	—266,327
New Orleans & Northeastern	196	208,490	56,216	291,928	30,496	52,067	8,442	106,102	11,385	208,492	83,436	—727	8,550	74,159	—22,950
New Orleans Great Northern	282	103,575	27,581	141,799	15,282	20,010	2,853	45,650	5,525	89,321	52,478	—175	2,471	49,832	—1,998
New York, Philadelphia & Norfolk	112	187,460	24,456	229,907	30,674	45,969	2,712	102,259	11,670	193,284	36,623	.....	7,500	29,123	—23,893
New York, Susquehanna & Western	152	164,832	40,962	231,380	19,992	22,138	1,914	84,622	3,431	132,097	99,283	—1,507	11,771	86,005	9,220
St. Joseph & Grand Island	319	66,785	30,209	107,180	17,237	20,237	6,220	56,436	6,669	106,799	381	15	5,711	—5,315	15,232
St. Louis, Iron Mountain & Southern	3,316*b*	1,624,677	465,759	2,272,677	295,121	290,916	52,566	808,721	81,338	1,528,662	744,015	—8,128	78,916	656,971	173,471
Tennessee Central	294	81,077	25,645	104,029	15,813	16,647	4,312	40,410	7,150	84,332	29,697	.....	3,980	25,717	679
Trinity & Brazos Valley	463	109,138	25,374	139,119	28,262	20,885	8,191	75,322	11,807	144,467	—5,348	.....	3,500	—8,848	—2,922
Vicksburg, Shreveport & Pacific	171	64,434	33,259	109,949	24,505	19,028	3,324	35,090	4,711	86,658	23,291	—219	6,175	16,897	—5,855
Western Maryland	543	405,518	50,977	476,436	37,177	59,492	7,474	183,921	13,807	301,871	174,565	—401	19,500	154,664	—72,802
EIGHT MONTHS OF FISCAL YEAR 1911.															
Alabama & Vicksburg	143	$789,014	$345,229	$1,225,553	$160,968	$203,761	$29,641	$410,150	$42,875	$847,395	$378,158	$193	$37,426	$340,925	$8,757
Arizona Eastern	364*	750,278	263,498	1,086,269	223,971	98,671	15,440	305,249	31,632	674,963	411,306	—80	48,875	362,351	—22,076
Bessemer & Lake Erie	204	4,679,695	255,090	5,010,454	609,880	1,065,471	62,093	1,426,421	96,224	3,260,089	1,750,365	.....	74,209	1,676,156	—672,094
Carolina, Clinchfield & Ohio	236†	963,321	109,095	1,103,108	105,590	153,887	43,937	243,172	66,673	613,259	489,849	1,983	44,000	447,832	237,653
Carolina, Clinchfield & Ohio of S. C.	18	53,269	12,001	67,331	4,817	587	7,441	18,500	4,328	35,673	31,658	.....	1,600	30,058	—
Central New England	277	1,735,282	239,492	2,087,665	412,477	181,706	15,513	614,101	24,744	1,248,541	839,124	.....	92,000	747,124	—23,232
Chesapeake & Ohio of Indiana	285	804,327	192,998	1,051,131	254,632	210,248	48,742	571,286	40,270	1,125,178	—74,047	56	30,320	—104,311	—
Chicago & Erie	270	2,647,157	546,802	3,502,231	396,115	733,017	162,921	1,587,090	76,703	2,955,846	546,385	.....	90,650	455,735	—168,007
Chicago, Peoria & St. Louis	255	934,321	214,855	1,207,486	180,340	257,910	58,237	548,200	46,581	1,091,268	116,218	.....	36,000	80,218	—131,500
Chicago, Terre Haute & Southeastern	351‡	237,242	29,377	270,536	28,231	56,707	6,047	103,535	16,510	211,030	59,506	—94	17,400	42,012	—
Cleveland, Akron & Columbus	212	1,289,971	397,683	1,807,139	321,779	300,319	24,920	605,890	31,891	1,284,799	522,340	.....	71,000	451,340	68,821
Colorado Midland	337	980,048	234,773	1,374,534	176,039	291,478	39,686	598,490	45,211	1,150,904	223,630	—3,904	66,382	153,344	—91,757
Cumberland Valley	162	1,544,950	442,365	2,083,025	235,753	276,966	37,969	659,188	52,409	1,262,285	820,740	2,238	44,165	778,813	—20,992
Detroit, Grand Haven & Milwaukee	190	785,171	384,999	1,360,743	190,791	173,063	50,872	680,142	36,447	1,131,315	229,428	—305	24,072	205,051	—141,273
Duluth & Iron Range	191§	5,080,339	208,424	5,365,799	533,608	458,937	3,827	1,169,828	104,586	2,270,786	3,095,013	7,480	263,352	2,839,141	—1,184,813
Duluth, Missabe & Northern	316¶	7,362,966	320,534	7,735,866	810,814	758,124	13,398	1,196,110	118,396	2,896,842	4,839,024	47,514	389,270	4,497,269	—1,511,906
Georgia Southern & Florida	395	881,374	543,585	1,637,914	176,894	331,368	48,466	607,298	72,028	1,236,054	401,860	.....	75,318	326,542	—17,473
Grand Trunk Western	347	2,553,292	1,313,833	4,138,852	407,500	601,225	145,135	1,782,261	104,534	3,040,655	1,098,197	—9,540	253,579	835,078	—218,194
Gulf & Ship Island	307	972,257	282,239	1,348,276	165,749	235,930	13,245	384,763	63,296	862,983	485,293	.....	39,759	445,534	58,876
Kanawha & Michigan	175	1,829,103	242,864	2,117,038	221,826	375,668	18,357	585,670	55,057	1,256,578	860,460	—90	61,648	798,722	296,530
Louisiana & Arkansas	255	797,533	129,020	963,423	154,028	133,075	19,599	257,586	35,828	600,116	363,307	.....	21,400	341,907	47,302
Louisiana Ry. & Nav. Co.	351	881,034	162,938	1,144,268	198,134	137,031	39,528	470,902	49,166	894,761	249,507	.....	35,200	214,307	73,801
Louisiana Western	207	896,043	446,316	1,408,248	184,443	200,085	50,337	416,004	60,285	911,154	497,094	51	56,526	440,619	—46,848
Midland Valley	324	560,767	272,409	884,103	161,598	136,131	17,415	258,052	57,360	630,556	253,547	8,730	43,804	218,473	—6,253
Minneapolis, St. Paul & S. S. Marie	3,764‖	10,393,714	3,371,707	14,724,051	1,499,188	2,078,676	341,187	5,482,001	327,265	9,728,317	4,995,734	89,809	807,791	4,277,752	—2,114,768
Missouri Pacific	3,920*a*	11,758,535	3,226,439	16,718,449	2,620,755	2,676,087	475,056	7,694,961	562,409	14,029,268	2,689,181	—22,218	668,000	1,998,963	—
New Orleans & Northeastern	196	1,823,691	426,929	2,411,282	242,211	370,175	73,078	853,073	92,422	1,630,959	780,323	—1,039	69,887	709,397	10,329
New Orleans Great Northern	282	770,873	250,923	1,115,752	165,839	154,578	24,555	317,162	40,424	702,558	413,194	—758	15,621	396,815	64,728
New York, Philadelphia & Norfolk	112	1,790,481	284,678	2,243,556	248,264	375,552	35,036	866,344	89,448	1,614,644	628,913	.....	61,650	567,263	—85,728
New York, Susquehanna & Western	152	1,321,026	403,536	1,938,694	227,449	181,529	16,299	715,850	33,670	1,174,796	763,898	1,243	93,715	671,426	118,423
St. Joseph & Grand Island	319	755,970	314,089	1,164,493	248,491	162,145	52,022	503,515	49,925	1,016,098	148,395	288	47,613	101,071	—32,506
St. Louis, Iron Mountain & Southern	3,316*b*	13,536,854	4,153,561	19,209,795	2,868,601	2,532,695	446,374	6,528,961	612,815	12,989,446	6,220,349	29,027	629,368	5,561,954	19,165
Tennessee Central	294	671,592	268,519	998,005	142,243	106,061	38,592	309,083	64,794	660,773	337,232	.....	31,841	305,391	14,486
Trinity & Brazos Valley	463	1,172,699	258,995	1,488,600	265,834	241,839	63,926	660,642	89,442	1,321,683	166,917	.....	29,185	137,732	21,626
Vicksburg, Shreveport & Pacific	171	617,380	339,102	1,037,458	158,537	171,326	26,943	312,326	36,424	705,556	331,902	—595	47,200	284,107	54,669
Western Maryland	543	3,930,895	686,747	4,821,145	550,137	575,510	74,485	1,684,864	106,856	2,991,852	1,829,293	—2,852	156,000	1,670,441	—

Mileage operated on February 28, 1910.—* 312 miles; † 225 miles; § 168 miles; ¶ 293 miles; ‖ 3,533 miles; *a* 3,883 miles; *b* 3,287 miles; — indicates deficits, losses and decreases.
‡ Began operations on January 1, 1911.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. P. Wissmann, auditor of the Wisconsin & Michigan, at Chicago, has had his office moved to Peshtigo, Wis.

C. S. Vidor, president; C. W. Hole, general manager, and other officers of the Peach River Lines, have removed their offices from Galveston, Tex., to Beaumont.

T. J. Maloney has been appointed auditor of the Illinois Northern; Chicago, West Pullman & Southern; Deering Southwestern and the Owasco River Railway, with office at Chicago.

A. S. Halsted, assistant general counsel of the San Pedro, Los Angeles & Salt Lake at Los Angeles, Cal., has been appointed general counsel, with office at Los Angeles, succeeding W. R. Kelly, deceased.

Operating Officers.

E. W. Mason, car accountant and superintendent of telegraph of the Western Pacific, at San Francisco, Cal., has been appointed superintendent, with office at Sacramento, succeeding J. W. Mulhern, promoted.

George H. Barnes, trainmaster of the Denver, Northwestern Pacific, has been appointed superintendent, with office at Utah Junction, Colo. W. C. Hollister succeeds Mr. Barnes, with office at Utah Junction.

W. J. Stoneburner, superintendent of the Missouri, Kansas & Texas of Texas, at Denison, Texas, has been appointed general manager of the Texas City Terminal Railway, with office at Texas City, Texas.

J. W. Mulhern, superintendent of the Western Pacific, at Sacramento, Cal., has been appointed general superintendent of the Denver & Rio Grande, with office at Salt Lake City, Utah, succeeding J. C. Dailey, deceased.

William N. Neff, superintendent of the Eastern Texas and the St. Louis Southwestern of Texas, at Mount Pleasant, Texas, has been appointed general superintendent of the St. Louis Southwestern and the St. Louis Southwestern of Texas, with office at Tyler, succeeding J. W. Maxwell, deceased.

J. M. Flannigan, terminal trainmaster of the St. Louis & San Francisco at Kansas City, Mo., has been appointed superintendent of terminals, with office at Kansas City, Mo. F. G. Fulkner has been appointed an assistant superintendent, with office at Sapulpa, Okla., succeeding C. F. Hopkins, who has been made chief clerk to W. T. Tyler, general manager.

B. B. Greer, superintendent of terminals of the Chicago, Burlington & Quincy, at St. Louis, Mo., has been appointed superintendent of the Hannibal division, with office at Hannibal, succeeding A. N. Willsie, transferred. Mr. Greer's former position has been abolished, and the St. Louis terminals will hereafter be operated as a part of the Hannibal division. T. K. Knight has been appointed assistant superintendent of the Hannibal division, with office at St. Louis.

W. H. Coppage has been appointed trainmaster of the Louisiana Railway & Navigation Company, with jurisdiction over the entire line, and H. L. Graham has been appointed assistant trainmaster, both with offices at Shreveport, La. O. H. Wilson, trainmaster of the Western division, at Shreveport, has resigned on account of climatic conditions, which made it impossible for him to remain longer in the southern states. Mr. Wilson is leaving railway service after 40 years with this company, the Rock Island Lines and the Burlington.

F. L. Sheppard, general superintendent of the New Jersey division of the Pennsylvania Railroad, at Jersey City, N. J., has had his authority extended over the West Jersey & Sea Shore Railroad and the Philadelphia & Camden Ferry Company, with office at Jersey City. A portrait of Mr. Sheppard and a sketch of his career were published in the *Railway Age Gazette,* June 17, 1910, page 1565. J. T. Wallis, superintendent of motive power of the Erie division of the Pennsylvania Railroad and the Northern Central Railway, at Williamsport, Pa., has been promoted to superintendent of the West Jersey & Sea Shore and the Philadelphia & Camden Ferry Company, with office at Camden, N. J., succeeding D. H. Lovell, granted extended leave of absence.

J. P. Cantillon, division superintendent of the Chicago & North Western at Casper, Wyo., has been appointed superintendent of the Northern Iowa division, with office at Eagle Grove, Iowa, succeeding E. E. Smith, assigned to other duties. The Iowa division, in charge of F. H. Hammill, at Boone, Iowa, having been subdivided into the East and West Iowa divisions. W. W. Walliser, division superintendent at Winona, Minn., has been appointed superintendent of the East Iowa division, with office at Belle Plaine, Iowa, and F. H. Hammill continues at Boone, with jurisidiction over the West Iowa division. C. T. Boone, assistant division superintendent at Boone, succeeds Mr. Cantillon at Casper, Wyo., and E. E. Nash succeeds Mr. Walliser at Winona.

John A. Shepherd, whose appointment as general manager of the Western Maryland and the Georges Creek & Cumberland, in charge of the transportation and maintenance departments, with office at Baltimore, Md., has been announced in these columns, was born at Homer, Ill., in 1874, and began railway work in 1893 on the Wabash Railroad, first as an operator and later as train despatcher, and then chief train despatcher. In 1903, Mr. Shepherd went to the Western Maryland as superintendent of transportation and early in the following year left that company to go to the Terminal Railroad Association at St. Louis, Mo., as assistant superintendent in charge of freight movement. He left railway service in 1905 and later in the same year returned to the Western Maryland as superintendent of the Maryland division, which position he held at the time of his recent appointment as general manager of the same company.

C. A. Steiner, superintendent of the West Virginia division of the Western Maryland and the George's Creek & Cumberland at Cumberland, Md., has been appointed superintendent of the Maryland division, except Baltimore terminal, with office at Hagerstown, Md., succeeding J. A. Shepherd, promoted. H. H. Berry succeeds Mr. Steiner. F. L. Brendel, trainmaster of the Western Maryland at Hagerstown, has been appointed superintendent of terminals, with office at Baltimore, Md., with jurisdiction over the Baltimore terminals to and including west switch at Lehigh. George H. Sheets, assistant trainmaster at Hagerstown, has been appointed trainmaster, with jurisdiction over the First district west of Lehigh and the Third and Fourth districts, with office at Hagerstown. E. L. Seigman has been appointed trainmaster, with jurisdiction over the Second, Fifth and Sixth districts, including Hagerstown yard and terminals at Hagerstown. M. Stitzel has been appointed trainmaster, with jurisdiction over Baltimore terminals, at Baltimore, and L. U. Albert has been appointed chief train despatcher at Hagerstown.

Traffic Officers.

G. H. McDevitt has been appointed a commercial agent of the Lehigh Valley, with office at Detroit, Mich.

F. M. Renshaw, contracting freight agent of the Baltimore & Ohio, with office at Cincinnati, Ohio, has resigned to engage in other business.

J. C. Fitzgerald, general freight and passenger agent of the Wisconsin & Michigan, at Chicago, has had his office moved to Menominee, Mich.

J. C. Glenn has been appointed a traveling freight agent of the Minneapolis & St. Louis and the Iowa Central, with office at Minneapolis, Minn.

Joseph B. Morrow, city ticket agent of the Trinity & Brazos Valley at Galveston, Tex., has been appointed soliciting freight and passenger agent, with office at Galveston.

D. T. Lawrence has been appointed general freight agent of the Central Vermont, with office at St. Albans, Vt., succeeding C. E. Dewey, resigned to go to the Grand Trunk Pacific.

H. G. Powell, commercial agent of the Illinois Central at Dubuque, Iowa, has been appointed division freight agent, with office at Omaha, Neb. M. S. Beals succeeds Mr. Powell.

G. E. Stolp has been appointed Oriental freight agent of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding T. F. Sweat, Jr., resigned to engage in other business.

W. S. Smith, chief clerk to C. C. Lewis, commercial agent of the St. Louis & San Francisco, at Houston, Tex., has been appointed a traveling freight agent, with office at Houston.

James P. Daly has been appointed general freight and passenger agent of the Ottawa & New York and the New York & Ottawa, with office at Ottawa, Ont., succeeding F. J. Balch, resigned.

A. J. Watts, city passenger agent of the Western Pacific, at Sacramento, Cal., has been appointed a contracting freight agent. Harry Derr, freight agent at Marysville, succeeds Mr. Watts.

A. P. Chapman, Jr., city ticket agent of the Chicago, Milwaukee & St. Paul at Chicago, has been appointed general agent in the passenger department of the Chicago, Milwaukee & Puget Sound, with office at Seattle, Wash.

J. A. Marks, traveling passenger agent of the Chicago, Rock Island & Pacific at Fort Worth, Tex., has been appointed district passenger agent, with office at Houston, Tex. Joseph Gittings, traveling passenger agent at Pittsburgh, Pa., succeeds Mr. Marks. D. G. Goodwill, city passenger agent at Pittsburgh, succeeds Mr. Gittings.

J. F. Govan, district passenger agent of the St. Louis & San Francisco at Cincinnati, Ohio, has been appointed district passenger agent, with office at Houston, Tex. W. S. Merchant, traveling passenger agent at New York City, succeeds Mr. Govan, and E. G. Lamb, traveling passenger agent at St. Louis, Mo., succeeds Mr. Merchant. W. J. Bedford, assistant city ticket agent at St. Louis, succeeds Mr. Lamb.

Harry J. New, traveling passenger agent of the Southern Railway, at St. Louis, Mo., has been appointed a traveling passenger agent, at Kansas City, succeeding William Flannelly, retired. J. R. L. Wulff, traveling freight agent at St. Joseph, Mo., has been transferred to Kansas City, Mo., and the office at St. Joseph has been abolished. J. G. Dryden has been appointed a soliciting freight agent at Kansas City.

J. V. Lanigan, whose appointment as assistant general passenger agent of the Illinois Central and the Indianapolis Southern, with office at Chicago, has been announced in these columns, began railway service 15 years ago, with the Chicago, Burlington & Quincy at St. Louis, Mo. He next went with the Missouri, Kansas & Texas, on which road he held a number of minor positions in the passenger department. In 1906 he went with the Illinois Central, and in 1908 was appointed chief rate clerk in the passenger department, from which office he is now promoted to assistant general passenger agent.

Osborne Scott, whose appointment as assistant general passenger agent of the Canadian Northern, with office at Winnipeg, Man., has been announced in these columns, was born July 6, 1882, at St. Andrews, Man. He was educated at St. John's College and the University of Manitoba, and began railway work in June, 1901, in the office of the auditor of the Canadian Northern, where he remained until February, 1903. He was then transferred to the passenger traffic department, and for three years from September, 1905, was in the general baggage department. He was then for almost two years chief clerk in the general baggage advertising and ticket stock departments. In February, 1910, he was appointed a traveling passenger agent, with office at Toronto, and was appointed chief clerk in the passenger traffic department in September of the same year, which position he held at the time of his recent promotion.

Donald Rose, freight traffic manager of the Illinois Central and the Indianapolis Southern at Chicago, has been appointed European traffic manager, with office in London, England, succeeding J. H. Mallory, general European agent, who has been assigned to duties in the traffic department at Chicago. The jurisdiction of Mr. Rose has been extended also over the Yazoo & Mississippi Valley, the Central of Georgia, and the Ocean Steamship Company of Savannah. D. W. Longstreet, general freight agent at Memphis, Tenn., succeeds Mr. Rose, and V. D. Fort, general freight agent at Chicago, has been appointed an assistant freight traffic manager at Chicago, a new office. J. S. Brown, assistant general freight agent at Chicago, succeeds Mr. Fort; and B. J. Rowe, assistant general freight agent at St. Louis, Mo., has been transferred to Chicago, succeeding Mr. Brown. J. S. Weitzell, assistant general freight agent at Omaha, Neb., succeeds Mr. Rowe. J. Hattendorf, assistant general freight agent at Chicago, has been appointed general freight agent at Memphis, succeeding Mr. Longstreet, and W. E. Downing, assistant general freight agent at Memphis, has been transferred to Louisville, Ky., succeeding William Smith, Jr., general freight agent, transferred to Chicago as assistant general freight agent. William Rhett, general freight agent in charge of export and import traffic at Chicago, has been appointed general foreign agent, with office at Chicago; and C. A. Florence, assistant general freight agent at Chicago, has been appointed assistant general foreign agent.

John W. Daly, assistant passenger traffic manager of the New York Central Lines west to Buffalo, has been appointed passenger traffic manager, with office at Chicago, succeeding Warren J. Lynch, resigned to become vice-president of the American Steel Foundries. Mr. Daly was born June 2, 1868, at Canton, Ill., and began railway work in 1882 as a telegraph operator on the Wabash, St. Louis & Pacific, now part of the Wabash, after which he was consecutively operator on the Santa Fe at Horton, Kan., and then ticket agent for the same road at Burlingame and Augusta, Kan., and at Springer, N. Mex.; chief clerk in the local office at Chicago, and then chief yard clerk for the Wisconsin Central; and chief clerk in the general passenger office of the Jacksonville Southeastern, now part of the Chicago, Peoria & St. Louis. For seven years from May, 1894, he was general passenger and ticket agent of the Jacksonville, Louisville & St. Louis, now part of the Burlington, and in April, 1901, went with the New York Central Lines as southern passenger agent of the Lake Shore & Michigan Southern at Cincinnati, Ohio. In March of the following year he was transferred to Buffalo, N. Y., as general eastern passenger agent. He remained until January, 1907, at Buffalo, having been appointed chief assistant general agent of the Lake Shore and of the Michigan Central in April, 1905. He was then appointed general passenger agent of the Lake Shore with headquarters at Cleveland, Ohio, and was promoted to assistant passenger traffic manager of the New York Central Lines west of Buffalo in February, 1910, from which office he is now advanced to the position of passenger traffic manager as above.



J. W. Daly.

Engineering and Rolling Stock Officers.

E. G. Stradling has been appointed signal engineer of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind.

F. L. Stone, engineer of track elevation of the Chicago, Burlington & Quincy at Chicago, has resigned to engage in other business.

M. N. Wells, division engineer of the Atchison, Topeka & Santa Fe at Chanute, Kan., has been appointed an assistant engineer, with office at Chanute.

H. M. Curry, general master mechanic of the Northern Pacific lines east of Mandan at St. Paul, Minn., has been appointed mechanical superintendent, with office at St. Paul, succeeding William Moir, retired after having been with the company for almost 30 years. Silas Zwight, master mechanic at Missoula, Mont., succeeds Mr. Curry.

I. D. Thomas, master mechanic at the Altoona (Pa.) machine shops of the Pennsylvania Railroad, has been promoted to superintendent of motive power of the Erie division of the Pennsylvania Railroad and the Northern Central Railway, with office at Williamsport, Pa., succeeding J. T. Wallis, promoted. J. C. Mengel, master mechanic at West Philadelphia, Pa., succeeds Mr. Thomas. J. M. James, master mechanic at Olean, N. Y., succeeds Mr. Mengel. J. M. Henry, master mechanic at Sunbury, Pa., succeeds Mr. James. Eliot Sumner, master mechanic at Baltimore, Md., succeeds Mr. Henry. H. P. Meredith, assistant engineer of motive power in the office of the general superintendent of motive power, at Altoona, Pa., has been appointed master mechanic, with office at Baltimore, Md., suc-

ceeding Mr. Sumner. C. L. McIlvaine, assistant engineer of motive power of the Erie division and the Northern Central Railway, at Williamsport, Pa., succeeds Mr. Meredith. C. D. Barrett, assistant master mechanic, at Wilmington, Del., succeeds Mr. McIlvaine, and B. B. Milner, on special duty in the office of the assistant to general manager, has been appointed assistant master mechanic, with office at Wilmington, succeeding Mr. Barrett. (See item under Operating Officers.)

Purchasing Officers.

A. L. McNeill has been appointed assistant purchasing agent of the Chicago & Alton, and the Toledo, St. Louis & Western, with office at Chicago.

J. E. Mehaney has been appointed general storekeeper of the First district of the Oregon-Washington Railroad & Navigation Company, with office at Portland, Ore.

J. Lowell White has been appointed assistant purchasing agent of the New Orleans, Texas & Mexico, the Beaumont, Sour Lake & Western, the Orange & Northwestern and the St. Louis, Brownsville & Mexico, with office at Houston, Texas.

OBITUARY.

R. S. Ege, assistant auditor of the Union Pacific, with office at Omaha, Neb., died in Omaha, on April 30.

William B. Wood, supervisor of bridges and buildings of the Missouri Pacific, with office at Atchison, Kan., died at that place on April 25.

John A. Hinsey, formerly special agent of the Chicago, Milwaukee & St. Paul, with office at Chicago, died in Los Angeles, Cal., on May 1, as a result of injuries received in a street car accident. Mr. Hinsey became special agent of the St. Paul in 1865 and held that office continuously until his retirement, last December.

Floyd H. Crane, superintendent of dining and sleeping cars of the New York, New Haven & Hartford, died at his home in New York City, April 26, at the age of 59. Mr. Crane had held this position on the New Haven road for about 19 years, and before that was on the Tehuantepec National and the Long Island Railways, and for a time was with the Woodruff Sleeping Car Company. He had extensive real estate interests and was interested in other outside enterprises. He is survived by his wife and a son, L. S. Crane.

F. B. Clarke, former president of the Spokane, Portland & Seattle, and previous to that general traffic manager of the Great Northern, died at Portland, Ore., on April 25. Mr. Clarke was born July 1, 1838, in Madison county, N. Y., and began railway work in 1868 with the Wisconsin Central. He was later general freight agent, and in 1872 was appointed general freight and passenger agent of the same company. In 1878 he went to the Chicago, St. Paul, Minneapolis & Omaha as general traffic manager. From September, 1895, to December, 1896, he was general traffic manager of the Northern Steamship Company, and in December, 1906, was appointed general traffic manager of the Great Northern. Mr. Clarke went to Portland, in January, 1908, to take charge of the Hill interests in that city. He was made president of the Spokane, Portland & Seattle, and was the first operating head of that road. Failing health caused him to retire about two years later.

Hilon A. Parker, formerly vice-president of the Chicago, Rock Island & Pacific, died suddenly from apoplexy at his home in Washington Heights, Chicago, on May 3. Mr. Parker was born December 30, 1841, at Plessis, N. Y., and began railway work in 1866 as chairman on the Chicago, Rock Island & Pacific; and by 1869 had become resident engineer on the southwestern extension of the Rock Island. From 1876 to 1885 he was division engineer of the Illinois division, and in 1885 was elected vice-president and chief engineer of the Chicago, Kansas & Nebraska, and was made general manager also in 1888. He was appointed assistant to the president of the Chicago, Rock Island & Pacific in 1889, and in 1890 was elected third vice-president. On June 1, 1898, he was elected second vice-president, and in March of the following year was made first vice-president and general manager. He left the Rock Island in 1903, and during recent years acted as consulting engineer for the Grand Trunk Pacific.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona Roads.—The Inspiration Copper Company will build a railway from its property at Globe, Ariz., to Wheatfields, on Pinal creek.

Arkansas City, Wellington & Northwestern.—An officer writes that surveys are now being made from Arkansas City, Kan., northwest via Wellington, Conway Springs and Cheney to Hutchinson, about 95 miles, and it is expected to let contracts soon after the surveys are completed. The prospects for carrying out the work are good. G. H. Hunter, president, Wellington, and Fremont Hill, chief engineer, Wichita. (March 24, p. 710.).

Aroostook Valley (Electric).—The plans of this company call for building 100 miles of new lines, it is said, this coming summer. (April 14, p. 907.)

Bangor & Aroostook.—This company has filed with the Maine Railroad Commission the final survey for the Allegash extension, from West Seboois, Me., north to St. Francis, 157 miles, much of which it is expected will be built this year. The new line will be built through a heavy timber section. (April 14, p. 907.)

Birmingham & Southeastern.—This is the new name of the Union Springs & Northern. The company operates a line from Union Springs, Ala., to Fort Davis, 7.5 miles, and will resume work at an early date on the extension from Fort Davis, northwest to Milstead, about 20 miles.

Canadian Pacific.—An officer is quoted as saying that construction work on the lake shore line between Montreal, Que., and Toronto, Ont., via Smith's Falls and Belleville is to be commenced at once, so the line can be placed in operation within two years. The line as projected will have a 0.4 per cent. grade throughout and will be used exclusively for fast passenger service. Work will begin at both ends in order to expedite construction. The Canadian Pacific's business between Montreal and Toronto is said to be big enough not only to make necessary the construction of the above additional line, but to warrant the double-tracking of same at once.

Central California Traction.—This company will build an extension, it is said, from Lodi, Cal., northwest to Woodbridge, about five miles.

Denver, Enid & Gulf.—According to press reports, a contract has been let to build from Kiowa, Kan., northwest to Dodge City, 125 miles.

El Paso & Southwestern.—This company has filed right-of-way maps showing the route of an extension to be built from Benson, Ariz., northwest to Tucson.

Fort Dodge, Des Moines & Southern.—An officer is quoted as saying that surveys are being made to build an extension from Fort Dodge, Iowa, northwest to Spirit Lake, about 85 miles.

Great Southern.—An officer writes that this company, which operates a 30-mile line from The Dalles, Ore., to a point southwest, at Dufur, is letting contracts for building an extension of 38 miles, from Dufur, in a southwest direction. There will be 10 trestles and one 1,200 ft. tunnel. The line will tap a heavy timber section.—(Apr. 21, p. 970.)

Idaho & Washington Northern.—This company will build a branch, it is said, from Newport, Wash., to Diamond lake, and another branch from Dalkena, south to Davis lake.

Kentucky Midland.—An officer writes regarding the reports that an extension is to be built from Earles, Ky., west to Madisonville, 14 miles, that it has not yet been definitely decided to build this extension.

Long Island.—The improvement work to be carried out during this year will be confined chiefly to sections of the lines into and in Jamaica. A comprehensive reconstruction plan will be followed there, as has already been mentioned in these columns. The work to be done on the North Side division will be confined to grading work and elimination of grade crossings. It will require about one year to put this division, which extends to Port Washington, in shape for electrification. When these improvements are finished work will be started on the Wood-

side—Winfield cut-off. This work will include straightening the present line and the elimination of 16 grade crossings. The electrification of the Oyster Bay division will be taken up later, probably early in 1912, and when this improvement is finished the electrification of the lines to Babylon, Huntington and Farmingdale will be carried out. Work is now actively under way on the Bay Ridge extension, which includes the construction of a cut-off and tunnel to East New York. The elimination of grade crossings on the Atlantic avenue division between Jamaica and the Brooklyn city line, and in Queens borough, will be undertaken after the above improvements have been finished, probably some time in 1916 or 1917. (Sept. 30, p. 599.)

Methow Valley & Washington Northern.—Plans are being made to build from Winthrop, Wash., southeast to Pateros, 50 miles.

Missouri, Arkansas & Gulf.—An officer writes that the proposed route is from Rolla, Mo., south via Lecoma, Anutt, Lenox, Licking, Raymondville and Willow Springs to Bakersfield, about 125 miles, and the prospects of building the line are good. Gilbert Lay, president, St. Clair. (April 28, p. 1010.)

Nashville-Gallatin Interurban.—An officer writes that contracts are to be let in a few weeks to build from Nashville, Tenn., northeast via Madison, Goodlettsville and Henderson to Gallatin, 27 miles. The Fidelity Securities Corporation has the general contract. Maximum grades will be 3 per cent., and maximum curvature 6 deg. The grading work will include some rock work, but it is not very difficult. There will be two steel bridges and a 1,000-ft. trestle. H. H. Mayberry, president, and John A. Pitts, vice-president and general counsel, Nashville. (January 20, p. 143.)

Nevada-California-Oregon.—In connection with the extension now under construction from Alturas, Cal., north to Lakeview, Ore., the city of Lakeview has been asked to secure a right-of-way into the city from a point eight miles outside of the city, also a site for a station and switching yards outside of the corporate limits of the city. The railway company has agreed to put up a station in Lakeview, to cost $12,000. (April 28, p. 1016.)

Oregon Roads (Electric).—The Canby Canal Company, Oregon City, Ore., it is understood, will build an electric line from Canby, Ore., southeast to Molalla, with branches to Beaver creek, Meadowbrook, Colton, Needy and Macksburg.

Oregon Short Line.—An officer writes that the company has started preliminary work for building two short branches, one from Caldwell, Idaho, west 11 miles, and the other from Nyssa, easterly to Homedale along the south bank of Snake river, 26 miles. These lines are to be built to accommodate some newly developed irrigated lands.

Pacific Electric.—This company will build an extension, it is said, from Arlington, Cal., near Riverside, west to Corona, about eight miles.

Palacios, San Antonio & Pecos Valley.—An officer is quoted as saying that contracts for building the first 36 miles will be let within the next 30 days. The construction work is to be started from Palacios, Texas, west to Francitas, in Jackson county, thence to Edna. About two-thirds of the right-of-way northwest to San Antonio has been secured. The plans call for building a main line, with branches of 160 miles. J. P. Pierce, president, and H. W. Dean, secretary and manager, Palacios. (October 7, p. 672.)

Pennsylvania Lines West.—An officer writes that the proposed improvements on the Cleveland & Pittsburgh division to make that a four-track division and to eliminate the grade crossings in Cleveland, are only contemplated. The work has not yet been authorized.

Pennsylvania Railroad.—Governor Wilson, of New Jersey, has signed the Leavitt measure, which will permit the Pennsylvania Railroad to acquire by purchase or condemnation land for two additional tracks between Trenton, N. J. and Jersey City. The company has four tracks at present, and the additional facilities are deemed necessary to relieve the congestion of the New York division due to the heavy suburban traffic.

Pittsburg & Shawmut.—An officer writes that it is expected to have work finished in September of this year on the section from Knoxdale, Pa., south along Mahoning creek to Mahoning, thence over the Allegheny river and along the west bank to Freeport. The work is very heavy and includes five tunnels; four viaducts, one 1,500 ft. long and 125 ft. high, another 1,500 ft. long and 150 ft. high, and two viaducts, each 600 ft. long and 125 ft. high, also a bridge over the Allegheny river at Mahoning, about 1,200 ft. long. Track has been laid on 10 miles. James Corbett, Kitanning, is the contractor.

Sioux Falls & Southern Minnesota Traction.—Incorporation has been asked for by this company in South Dakota, with $300,000 capital, and office at Pierre, S. D. The plans call for a line from Sioux Falls, S. D., east via Worthington, Minn., Sioux Valley, Loon Lake, Petersburg, Dunnell, Coylon and Pilotgrove to Albert Lea, about 175 miles. The incorporators include: L. B. Wyckoff, Syracuse, N. Y.; C. S. Sollars, H. W. Knight and J. J. Danforth, Chicago, and G. P. Peterson, Pierre, S. D.

Southern Pacific.—An officer is quoted as saying that double-tracking work on the Southern Pacific and the Union Pacific aggregating about 300 miles, has been authorized for completion this year. On the Southern Pacific the work will be principally on the section near Ogden, Utah, and Sacramento, Cal. On the Union Pacific 150 miles will be added to the double-track between Omaha, Neb., and Ogden, Utah, and a small section will be double tracked in Wyoming.

Texas, Oklahoma & Eastern.—This company, which was incorporated last year in Oklahoma with $200,000 capital, has work under way on four miles and track already finished on 19 miles. The plans call for building from Valliant, Okla., through McCurtain county, east through a timber section, via Bismark, to Mountain Fork river, 30 miles, and it is understood the line will eventually be extended into Arkansas. H. Dierks, president and general manager, and H. L. Dierks, secretary, both of Kansas City, Mo. (October 28, p. 813.)

Tidewater & Southern (Electric).—This company has been granted a 43-year franchise at Modesto, Cal., to which place the line is now being built from Stockton. The rights include an entrance into Modesto and maintenance of tracks on Ninth street. (April 28, p. 1016.)

Union Pacific.—See Southern Pacific.

Union Springs & Northern.—See Birmingham & Southeastern.

Washington Roads.—Application has been made by Paul L. Richards, Ellensburg, Wash., to the county commissioners for a franchise to build an electric line in Kittitas county.

FOREIGN RAILWAY NOTES.

The Swiss Federal Railways have approved a project for the construction of a new line, slightly over eight miles in length, from Moutier, under the Jura mountains, to Lengnau, a station about midway on the line between Solothurn and Bienne. The proposed line, the object of which is to pierce the Jura mountains, is to leave Moutier, 1,730 ft. above the sea, and is to run for a great part of its course under the Grenchenberg by means of a tunnel, which will be over four miles long, or about half of the total length of the line. The highest point to be attained will be about 1,787 ft. above the sea level. No unusual difficulties are expected, but it is probable that a large amount of water will be encountered. The tunnel will take about four years to complete.

There are at present 142 railways in Germany, owned or operated by private companies. Of these, 60 are in Prussia, 14 in Baden, 11 in Bavaria, 10 in Wurtemberg, eight each in Alsace-Lorraine and Brunswick, five in Schwarzberg-Sondershausen, four in Saxony, three each in the Grand Duchies of Hesse, Sachsen-Koburg and Anhalt, two each in Mecklenburg-Schwerin, Mecklenburg-Strelitz, Schwarzburg-Rudolstadt and Lubeck, and one in Oldenburg, Sachsen-Altenburg and Russ. Most of these are, of course, small local lines, and the Lenz Railway Building & Operating Co., Berlin, alone operates over 50 short local railways in various parts of the country. The best-known private line is perhaps the Lubeck-Buchen Railway, which is a little less than 100 miles long.

Railway Financial News.

Arkansas, Oklahoma & Western.—See Kansas City & Memphis.

Atlantic Coast Line.—J. P. Morgan & Co., New York, have bought $3,000,000 unified 4 per cent. bonds, due 1959.

Atlantic Northern & Southern.—A press despatch from Atlantic, Iowa, says that a receiver is to be appointed. This road runs from Kimballton, Iowa, to Atlantic, 17 miles.

Carolina, Clinchfield & Ohio.—The *Wall Street Journal* says: "Officers of the Chesapeake & Ohio and the C. C. & O. are figuring on a lease of the C. C. & O. to the Chesapeake & Ohio. * * * Under the proposed terms the construction of a line from Dante to Elkhorn City (between 40 and 50 miles), which will connect the two roads, will be paid for with funds raised by the Clinchfield on securities bearing the Chesapeake & Ohio's guarantee.

Chesapeake & Ohio.—Eastman, Dillon & Co., New York, have prepared a little booklet giving a brief review of the Chesapeake & Ohio's past history and an analysis of its present and future earning possibilities. Besides the usual analysis made from the figures published in reports of the company, there are included some estimates of the coal tributary to the Chesapeake & Ohio's lines.

See also Carolina, Clinchfield & Ohio.

Chicago & North Western.—Kuhn, Loeb & Co., New York, have bought $7,500,000 general mortgage 4 per cent. bonds. The proceeds of the sale of these bonds will be used by the railway company for the completion of a line which will form a direct route from Milwaukee, Wis. to Wyeville, where the road connects with the Chicago, St. Paul, Minneapolis & Omaha.

Havana Central.—The stockholders of the United Railways of the Havana & Regla Warehouses Co. have authorized an increase in the capital stock of that company of $10,000,000, of which part is to be used to pay for $2,500,000 Havana Central notes.

Illinois Tunnel.—James B. Colgate & Co., Chicago, have bought the remaining $500,000 of the authorized issue of $3,500,000 6 per cent. receivers' certificates and have resold these securities at 100⅛.

Kansas City & Memphis.—This company on May 1 took over the Arkansas, Oklahoma & Western and the Monte Ne.

Kansas City, Mexico & Orient.—The engineer of the Texas Railway Commission has placed a value of $519,000 on that part of the Kansas City, Mexico & Orient running from San Angelo to Mertzon, 30 miles. The company, it is understood, will issue $491,000 bonds secured on this part of the road and $28,000 stock.

Michigan United Railways.—This company has leased the Kalamazoo, Lake Shore & Chicago for five years. The K. L. S. & C. runs from Kalamazoo, Mich. to South Haven, 54 miles, and during the summer only from South Haven to Paw Paw, 17 miles. It is planned to equip the road for operation by electricity.

Missouri Pacific.—James Speyer, recently elected a director, has been elected a member of the executive committee, succeeding Cornelius Vanderbilt, resigned.

Monte Ne.—See Kansas City & Memphis.

National Railways of Mexico.—Ladenburg, Thalmann & Co., Speyer & Co., Kuhn-Loeb & Co. and Hallgarten & Co., all of New York, have bought $10,000,000 two-year 4½ per cent. notes, secured by the deposit of prior lien and general mortgage bonds. The proceeds of the sale of these notes is to be used by the railway company to retire $3,661,000 Mexican Central consolidated mortgage 4 per cent. bonds, due July 1 and the balance is to be used for new equipment and improvements.

New York, New Haven & Hartford.—It is announced that Edward Milligan, of Hartford, Conn., and Francis T. Maxwell, of Rockville, Conn., are to be elected directors to succeed A. S. May and A. E. Clark.

Northern Central.—See Pennsylvania Railroad.

Oregon Short Line.—This company has made a mortgage to secure $150,000,000 first and consolidated mortgage bonds, dated December 1, 1910, to bear interest not to exceed 5 per cent. and due 1960. Series A, which includes $24,000,000 bonds, now issuable, are subject to call after December 1, 1915, at 105. The mortgage is on about 1,688 miles of line, of which 1,512 miles are in operation and 176 miles are now under construction, and of which about 594 miles are free from any prior mortgage lien. Of the total bonds, $24,000,000, as mentioned above, may be issued at once to reimburse the company for the cost of acquisition of lines already paid for, and $34,422,000 bonds are reserved to retire a like amount of underlying bonds held by the public, and $91,578,000 bonds are reserved to pay for additional lines and for double-tracking and for additions and betterments, including improvements of tunnels, trestles and bridges, ballasting, reduction of grades, and for additional rolling stock, etc.

Pennsylvania Railroad.—The Public Service Commission of Maryland has approved the proposed lease of the Northern Central to the Pennsylvania Railroad and has authorized the issue of $7,735,050 Northern Central stock as a 40 per cent. stock dividend.

Pittsburgh, Cincinnati, Chicago & St. Louis.—This company has sold to Kuhn, Loeb & Co., New York, $3,000,000 consolidated mortgage 4 per cent. bonds. These bonds are part of an authorized issue of $75,000,000, of which about $50,000,000 are outstanding.

Seaboard Air Line.—The bankers who recently bought $19,000,000 refunding mortgage 4 per cent. bonds, are to exercise the option which they have on an additional $4,000,000 bonds. The company will use the proceeds from the sale of the additional bonds for improvements and for additional working capital, and President Meldrum is quoted as saying that no more financing will be necessary for the remainder of the year.

St. Louis & San Francisco.—This company has leased the Louisiana Southern, which operates about 40 miles of line.

Western Maryland.—E. D. Adams, representing the Deutsche Bank of Berlin, has been elected a director of the Western Maryland, succeeding B. F. Bush, resigned. Mr. Adams is the representative of the Deutsche Bank interests on the board of directors of the Missouri Pacific.

FOREIGN RAILWAY NOTES.

A new railway line opening up a dormant part of Poland began operations in March. This line will stimulate the economic and industrial conditions even in the most remote parts. Its line is 83 miles long and runs from Herby, on the borders of German Silesia, to Kielce, the capital of the province of that name, via Czenstochova, thus cutting through the southern part of the province of Piotrkov and the northern part of the province of Kielce. The other principal stations are Ostrowy, Gwarzyn, Czenstochova, Hantke, Olsztyn, Sloty Potok, Koniecpol, Zelislawice Wloszczowa, Ludynja, Malogoszcza, and Piekoszow. From Ostrowy there is a 1-mile branch to a large iron factory at Blachownia and from Hantke another 1-mile branch runs to the smelters at Rakow.

Belgian State Railways Administration has decided to make an important improvement in the Franco-Dutch services via Brussels, by building a direct line connecting the Nord and Midi stations at Brussels. This will do away with the present circuitous route through the outskirts of the city over which the international expresses travel. The most important part of the scheme is the construction of a new central passenger station, a project that has been under discussion for some years. This central station will be situated between the Nord and Midi stations and will be the most important passenger station in Brussels. Most of the new line will be in tunnel, and electric traction will be employed. The central station and connecting line are to be opened by 1915 and the entire cost, including subsidiary works and electric locomotives, is estimated at $16,000,000.

Supply Trade Section.

The Andreson-Evans Company, Chicago, has moved its general offices from the Monadnock block to the Railway Exchange.

The Detroit Steel Products Company, Detroit, Mich., on May 1 moved its New York offices from 2 Rector street to 225 Fifth avenue.

The Sprague Electric Company, New York, has moved its Boston office from the Weld building to 201 Devonshire street, where larger floor space has been obtained.

The forge shops, the machine shop and one of the iron foundries of the Canadian Car & Foundry Company, Montreal, Quebec, at Amherst, N. S., were destroyed by fire on April 27.

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has moved into its new five-story office and laboratory building at the corner of Seventh avenue and Bedford avenue. This plant is said to be the largest of its kind in the country.

George A. Blackmore has been appointed eastern manager of the Union Switch & Signal Company, Swissvale, Pa., with office in New York, and Aaron Dean has been appointed western manager, with office in Chicago. Both appointments will be effective May 15.

The American Journal Bearing Company, Portland, Me., has recently been incorporated to make bearings for locomotives, cars and machinery. The authorized stock issue is $250,000. The officers of the company are as follows: President, Clarence E. Eaton; treasurer, Albert F. Jones; clerk, James E. Manter; all of Portland.

F. L. Stone, engineer of track elevation of the Chicago, Burlington & Quincy at Chicago, has resigned to go with Mrs. W. B. Ewing and Edwin Hancock, to continue the business of the late W. B. Ewing, civil and consulting engineer, specializing in civil, sanitary and municipal work, with office in the Monadnock block, Chicago.

John Reis has been appointed vice-president of the United States Steel Corporation; and Ward B. Perley has been made assistant to the president, James A. Farrell. Mr. Perley was assistant to W. B. Dickson, who recently resigned as a vice-president. Mr. Reis has been and will continue to be in charge of the construction.

The Haskell & Barker Car Company, Michigan City, Ind., has acquired five city blocks adjacent to its shops and will build a plant for the manufacture of steel freight cars, steel front-end passenger train cars, cast steel trucks, etc. The plant will cost $1,500,000, or more. At present the company makes only wooden and steel-underframe cars.

The Kerite Insulated Wire & Cable Company, New York, has acquired the interests of its western representative, the Watson Insulated Wire Company, Chicago, and has opened a branch office in the People's Gas building, Chicago. E. L. Winchell, Jr., vice-president of the Watson Insulated Wire Company, has been made western sales manager of the Kerite company.

The Grand Trunk has specified Bohn syphon refrigerators, made by the White Enamel Refrigerator Company, St. Paul, Minn., for its special refrigerator equipment in the new $1,000,000 Hotel Chateau Laurier and Central Union station at Ottawa, Canada. The equipment consists of 44 specially built refrigerators of various sizes equipped with the Bohn system.

The Milwaukee Refrigerator Transit Company and the Milwaukee Car Manufacturing Company, makers of refrigerator and other freight cars, have been consolidated and the name changed to the Milwaukee Refrigerator Transit & Car Company, Milwaukee, Wis. The officers are as follows: President, Fred Papst; vice-president, Robert Nunnemacher; secretary and general manager, H. W. Marsh. The company intends to make extensive improvements, but probably not before the railway situation shows improvement.

The railway supply men for the International Railway General Foremen's Association, will give an exhibit in connection with the sixth annual convention of this association, which will be held at the Sherman Hotel, Chicago, July 25 to 27. The exhibit will be on the floor where the meeting will be held and the fee of $25 for representation will entitle an exhibitor to one representative and 5 ft. of front exhibit space. Additional space may be had if desired. Applications for space should be addressed to J. C. Younglove, secretary and treasurer, 322 North Michigan avenue, Chicago. Space will be assigned by the executive committee in the order in which applications are received.

Explaining the deal concerning the Baldwin Locomotive Works, Philadelphia, Pa., which has been arranged except as to details, Alba B. Johnson, vice-president, issued this statement on May 3:

"At a meeting of the directors and stockholders of the Baldwin Locomotive Works, held today, it was decided to reconstruct the present close corporation in such a way as to admit new interests into our company. No change, however, in policy or management is contemplated. This business has long been one of the standard industries of Philadelphia and the same principles of management which have built up the property to its present proportions and have always yielded adequate profits to the owners will continue to prevail. Drexel & Co., of Philadelphia, and White, Weld & Co., of New York City, will act as bankers in connection with this matter."

Alexander E. Brown, president of the Brown Hoisting Machinery Company, Cleveland, Ohio, died at his home in Cleveland, April 26, of apoplexy. Mr. Brown was a mechanical and civil engineer, as well as an inventor. He was born on May 14, 1852, in Cleveland. In 1869 he entered the Brooklyn Polytechnic Institute at Brooklyn, N. Y., from which he was graduated in the engineering course in 1872. For several months Mr. Brown was in the employ of the United States Geological Survey. During the next two years he served as chief engineer of the Massillon Iron Bridge Company, Massillon, Ohio, where he obtained his first real experience in the iron business. From 1875 to 1878 he designed, built and contracted for the sale of bridges and buildings. He later acted as superintendent at iron mines in the Lake Superior iron region and became familiar with blast furnace work. In 1875 he designed and patented new machines and processes for annealing malleable iron castings. In 1878 he became a mechanical engineer for the Cleveland Electric & Supply Company. He developed while with this concern the process and method of manufacturing light carbons. Still later he worked with Charles F. Brush, of the Brush Electric Company, London, England, in developing and placing on the market the Brush arc-lighting system. It was in 1879 that he took up the problem of the rapid and economical unloading and handling of iron ore from boats. A year later he took out patents on the Brown hoisting and conveying machines on the dock of the New York, Pennsylvania & Ohio, now the Erie. Then he organized the Brown Hoisting & Conveying Machine Company for the manufacture of his machines. The name of this company was changed a few years ago to the Brown Hoisting Machinery Company. He was president and general manager of this concern. For the past 30 years he had spent most of his time designing and manufacturing machinery for the handling of different materials. Several hundred patents were granted to him in this and other countries. Mr. Brown also took an active interest in the development of trade schools in Cleveland. He was



Alexander E. Brown.

a member of the American Institute of Mechanical Engineers, the American Institute of Mining Engineers, the Civil Engineers' Club, the Electrical Engineers' Club, the Union Club and the Country Club of Cleveland, the Engineers' Club of New York and the Chamber of Commerce of Cleveland.

The Universal Vanadium Company, New York, has recently been incorporated in Delaware. The officers are as follows: President, Edward M. McIlvain, 30 Church street, New York; vice-president, Col. Millard Hunsicker, 23 Rue de la Paix, Paris, France; secretary and treasurer, James C. Gray, Frick building, Pittsburgh, Pa. Hitherto the entire product of vanadium alloys produced by the American Vanadium Company, Pittsburgh, has been marketed by the Vanadium Sales Company of America, Pittsburgh. The Universal Vanadium Company was formed to act as selling agent for the American Vanadium Company in a more comprehensive and effective manner, and it will act in a selling capacity in conjunction with the Vanadium Sales Company of America; both companies together taking charge of the entire product of the American Vanadium Company.

TRADE PUBLICATIONS.

Central Vermont.—This company has published a small booklet on summer homes in the green hills of Vermont, giving full information on the summer resorts on Lake Champlain and in Canada, reached by the lines of the Central Vermont.

Pressure Blowers and Exhaust Fans.—The American Blower Company, Detroit, Mich., has published a series of bulletins, illustrating and describing its pressure blowers and exhaust fans. These bulletins include diagrams and tables and give full information on the products. Bulletin 291 is devoted to disc ventilating fans, bulletin 292 to cooling tower fans, bulletin 293 to pressure blowers, bulletin 294 to cast iron volume blowers, bulletin 298 to steel plate exhaust fans and bulletin 299 to cast iron exhaust fans.

RAILWAY STRUCTURES.

Big Timber, Mont.—The Northern Pacific will build a freight depot. Thomas Brady, St. Paul, Minn., is general contractor.

Bonners Ferry, Idaho.—The Great Northern will build a bridge over the Kootenay river, at Bonners Ferry, to cost $30,000.

Boone, Iowa.—The Chicago & North Western will build a one-story, 35-stall roundhouse of brick and steel construction. Charles W. Gindele is general contractor.

Brookfield, Mo.—The Chicago, Burlington & Quincy will build a one-story, 41-stall, brick and steel roundhouse and water station.

Decoursey, Ky.—The Louisville & Nashville has let a contract for building a freight yard with double hump switching system to have a capacity of 4,000 cars a day.

Delavan, Wis.—The Chicago, Milwaukee & St. Paul will build a passenger station.

Dillon, S. C.—The North & South Carolina will build a freight depot.

Goshen, Cal.—The Southern Pacific is enlarging the station at Goshen.

Grand Rapids, Mich.—The Pere Marquette will build a $75,000 roundhouse.

Grants Pass, Ore.—The Grants Pass & Rogue River, it is said, will build a steel bridge, 775 ft. long, over the Rogue river, at Grants Pass. It is expected to have the work finished by August 1.

Kenova, W. Va.—An officer of the Norfolk & Western writes that the bridge over the Ohio river was originally designed to carry double tracks. The tracks over the structure are now gauntleted and operated as double-track. The company plans to make such improvements as are necessary to provide for full two tracks over the structure.

Lincoln, Neb.—The Chicago, Burlington & Quincy will build a brick passenger station.

Mahoning, Pa.—See Pittsburg & Shawmut under Railway Construction.

Marshall Texas.—The Texas & Pacific has plans made for a $25,000 passenger station, and will begin its erection as soon as the appropriation has been made

Napavine, Wash.—The Northern Pacific has commenced work on improvements to the station at Napavine.

Newman, Ga.—The Atlanta & West Point will build a $30,000 passenger station.

New Westminster, B. C.—The British Columbia Electric will build a new station, it is said, at New Westminster to cost $30,000.

Oscilla, Ga.—The Atlanta, Birmingham & Atlantic, the Seaboard Air Line and the Oscilla Southern have plans for the erection of a brick veneer passenger station.

Pickens, S. C.—The Pickens Railroad has begun construction of a freight and passenger station.

Portland, Ore.—The Southern Pacific has taken out a permit to build a new warehouse at Portland, to cost $40,000.

Redlands, Cal.—The Southern Pacific will make extensive improvements, it is said, to the station at Redlands.

Ridgeville, Ind.—The Pennsylvania will build a two-story brick and plaster passenger station.

Utica, N. Y.—The Delaware, Lackawanna & Western will build a one story, brick freight house, 30 ft. x 300 ft., to cost $25,000.

Waterman, Texas.—The Gulf, Colorado & Santa Fe will build a passenger station.

Yardley, Pa.—An officer of the Philadelphia & Reading writes that a contract has been given to the F. M. Talbot Co., New York, for putting up a concrete arch over the Delaware river at Yardley. There will be 12 spans, each 90 ft. 9 in. long, and two spans, each 83 ft. 6 in. long. The greatest height of the structure will be 75 ft.

Railway Liabilities in France.

Owing to recent severe floods of the Seine, France, transportation by means of barges became impossible, and quantities of goods which ordinarily would have reached Paris by water had to be sent by rail, thus encumbering the freight stations and creating a demand for extra trains, which the state railways were unable to supply. The administration of the state railways has refused to consider itself responsible for any delay or loss of goods intrusted to it for transit, and has introduced the plea of "force majeure" (circumstances beyond its control) to combat all claims for damages. In order to decide the question five test cases were brought on March 22, 1911, and the commercial tribunal decided in favor of the plaintiffs, who were senders of merchandise that was either lost in transit or greatly delayed in delivery. The chief reasons on which the commercial tribunal based its decision were the following: (1) In order that the plea of force majeure may be invoked it must be a complete obstacle to the carrying out of an obligation undertaken by the defendants. In this case the obstacle to the transportation of goods was not due to any cause foreign to the defendants or independent of their good will, but to bad organization and lack of railway material. (2) The courts have already decided that force majeure, by virtue of which contracts can be canceled, must be caused by an event which could not have been foreseen, and whose effects could not be successfully dealt with. (3) The state railway had been taken over from the old company by the government to better the service and material, and the latter had had plenty of time to carry out improvements, as they have the public funds at their disposal. (4) The real cause of delay was the state's own fault and not any obstacle. (5) The line was evidently in good condition and open to traffic, as proved by the fact that special services and trains were arranged for certain traders. (6) It is impossible to invoke the plea of force majeure in certain cases when good delivery had been made in certain others during the same period.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Pennsylvania will build 77 locomotives at its Altoona shops.

W. R. Grace & Co., New York, has ordered 1 locomotive from the H. K. Porter Company.

The Laurinburg & Southern has ordered one ten-wheel locomotive from the Baldwin Locomotive Works. The dimensions of the cylinders will be 18 in. x 26 in.

The Missouri, Kansas & Texas has ordered 9 switching locomotives from the Baldwin Locomotive Works, and 7 Pacific type locomotives from the American Locomotive Company.

The Norfolk & Western will build 12 mikado locomotives at the company's shops. The dimensions of the cylinders will be 24 in. x 30 in., and the diameter of the driving wheels will be 56 in.

The Seaboard Air Line is said to have ordered 10 consolidation locomotives and 5 switching locomotives from the Baldwin Locomotive Works, and 10 Pacific type locomotives from the American Locomotive Company. This item is not confirmed.

The Baltimore & Ohio has ordered 10 six-wheel switching locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 21 in. x 26 in., the diameter of the driving wheels will be 52 in., and the total weight in working order will be 165,000 lbs.

The Chicago & North Western, mentioned in the *Railway Age Gazette* of April 21 as having ordered 30 locomotives from the American Locomotive Company, ordered 32 locomotives from that company at that time. Of this order 12 locomotives were for the Chicago, St. Paul and Minneapolis & Omaha.

CAR BUILDING.

The Pennsylvania will build 81 steel cars at its Altoona shops.

The Pere Marquette has ordered 12 coaches and 2 combination cars from the Pullman Company.

The Northern Texas Traction Co., Ft. Worth, Tex., has ordered 4 interurban passenger cars.

The Houston Electric, Houston, Tex., has ordered 10 single trailer cars and 5 single motor cars.

The Indianapolis, Crawfordsville & Western, Indianapolis, Ind., has ordered 4 trailing interurban cars.

The Western Maryland has ordered 500 fifty-ton all-steel hopper cars from the Standard Steel Car Company.

The Seaboard Air Line, mentioned in the *Railway Age Gazette* of April 7 as being in the market for 1,000 box cars, 200 phosphate cars and 30 caboose cars, has ordered this equipment from the Pressed Steel Car Company. The box cars will have steel underframes and steel upperframes, they will be ventilated and will have a capacity of 30 tons. The phosphate cars will have a capacity of 50 tons. This company has also ordered 3 passenger and baggage cars, 3 postal cars and 3 express cars from the Pullman Company.

IRON AND STEEL.

The Chicago, St. Paul, Minneapolis & Omaha is said to have ordered 3,000 tons of rails.

The Baltimore & Ohio is in the market for 1,600 tons of structural steel for bridges.

The Florida East Coast has ordered 14,000 tons of rails from the Maryland Steel Company.

The Philadelphia & Reading has ordered 5,000 tons of rails from the Carnegie Steel Company.

The Chicago & North Western is making inquiries for 8,000 tons of structural steel for bridges.

The Duluth, South Shore & Atlantic has ordered 5,000 tons of rails from the Illinois Steel Company.

The Louisville & Nashville is said to have ordered 14,000 tons of rails from the Pennsylvania Steel Company.

The Canadian Northern has ordered 105,000 tons of rails. The Dominion Iron & Steel Company will furnish part of this order.

The Seaboard Air Line has ordered 15,000 tons of rails from the Pennsylvania Steel Company and the Tennessee Coal, Iron & Railroad Company.

General Conditions in Steel.—The steel industry showed a marked improvement toward the end of last week, but the change came too late to have much effect on the reports for the month. The average of daily orders of the Steel Corporation for April was about 25,000 tons, as compared with approximately 35,000 tons in March. The unfilled tonnage of the Steel Corporation for April is expected to show a shrinkage of about 150,000 tons. The railways are beginning to place heavier orders and some large structural orders for other purposes are pending, so the present improvement is expected to continue.

SIGNALING.

The Illinois Traction System, which has been installing automatic block signals extensively during the past six months, has just given the Union Switch & Signal Company an additional order for 37 style B semaphore signals, 12 of them to be used on curves between Princeton and Ottawa, and 25 for a continuous automatic block system between Edwardsville and Granite City.

Cast Steel Wheels for Heavy Service.

The excellent results given by cast iron wheels under 30 and 40-ton cars is generally acknowledged, but with the advent of the 50-ton car it has been realized that a stronger wheel is necessary. The first demand was met by the use of the steel-tired wheel, which in England and some other European countries is in universal use. These wheels have also been used for passenger equipment in this country, but have never become common in freight service on account of their high cost. With the realization that a wheel with the strength of the steel-tired wheel would be needed in freight service, the American Steel Foundries, New York, have developed the Davis cast steel wheel, the aim being to produce a wheel of moderate price which would give the longest possible service and cost the least to maintain.

This wheel was the invention of J. C. Davis, assistant to the first vice-president of the American Steel Foundries. By the study of broken flanges on cast iron wheels it was determined from a chemical and metallurgical examination that an excessive amount of sulphur was found at the point of failure. This is a condition which under certain circumstances might occur in one or more of any lot of wheels, and would rather exclude this type of wheel from service under the heavy freight cars now used. Many experiments were made with a blank gear pattern, to see how hard a wheel could be produced in cast steel, which



Annealling Ovens for Davis Cast Steel Wheels.

would have the wearing qualities of the chilled cast iron wheel. It was found that by adding ferro-manganese to the molten steel at the time it was being poured, a casting of any degree of hardness could be made. However, the real problem was to get the desired hardness in the flange and tread, leaving the center soft enough to be machined. It was found that by revolving the mold at the time it was being filled, and introducing



Grinding Cast Steel Wheels.

the ferro-manganese in a certain way, the desired results could be obtained. With the information thus acquired, special apparatus and molds suitable for full-sized wheels were rigged up and the experiments continued on a more elaborate and scientific scale until, from a large number of tests, a standard has been developed for each step in the process. The data obtained at the foundry was further enlarged by results obtained from test wheels put into actual service on various railways where the largest mileage could be obtained in the shortest possible space of time. Some of the early wheels made remarkable mileages, and their records were of great assistance in the standardization of the various operations employed in the manufacture of the wheel.

As carried on by the American Steel Foundries, at their Granite City plant, the manufacture of Davis cast steel wheels has been reduced to an exact science. Rules and formulas have been developed for every step in the process, which, with the instruments used for determining and controlling temperatures, secure a uniformity of results obtainable in no other way. The molds for the wheels are prepared from selected materials and are dried in ovens under the regulation of special pyrometers. When ready for filling they are mounted on tables which revolve during the casting period. The first metal to enter the mold is treated with ferro-manganese in its passage from the ladle to the mold and is followed up, without interruption, by the soft steel which forms the plate and hub of the wheel. The manganese, being heavier than steel, is thrown to the outer parts of the mold by centrifugal force, where it is absorbed in the steel. As manganese steel is one of the hardest and toughest metals known, and has great ability to resist shocks and blows, it is an ideal material for the wearing surface of the wheel.

On being removed from the molds, the wheels are carefully annealed in ovens, in which accurate heat treatment is provided by pyrometer regulation. The object of this treatment is to establish a fine molecular structure, and to eliminate internal strains, which may have been set up during the cooling of the metal after having been cast. From the annealling furnaces the wheels are taken to hydraulic straightening presses, then to bor-



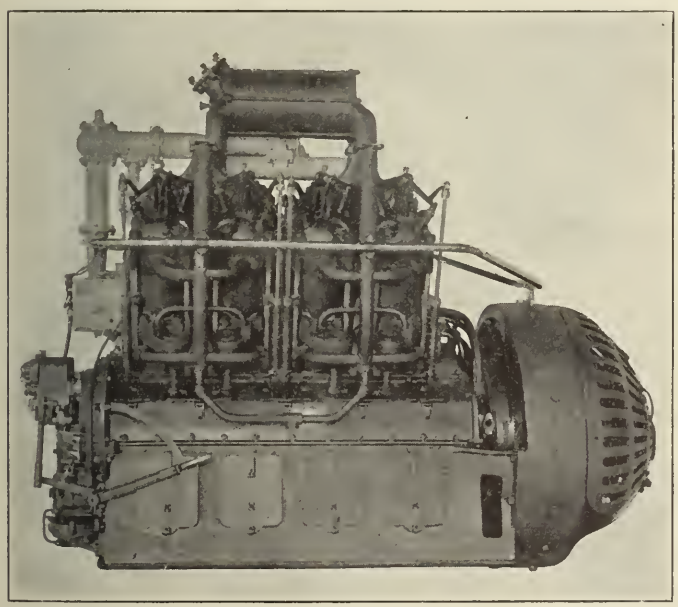
Preparing Molds for Davis Cast Steel Wheels.

ing mills where the wheel fits are rough bored to within ⅛ in. of the finished size, and next to grinding machines, where the tread and throat of the flange are ground. These latter machines are of special construction, being arranged for grinding two wheels at the same time. The wheels are ground not only to make them true, but to give them a polished surface and a general accuracy which reduces the chances of uneven wear after they go into service. After being ground the wheels are again heated and water-toughened, which increases the density of the metal at the rim, at the same time imparting to it that peculiar toughness which is characteristic of good manganese steel.

When the full mileage has been made the wheel may be applied on the purchase of a new one at scrap value. With a multiple mileage wheel there is a temporary loss from service when the wheel is in the shop being trued up, also a loss due to the cost of handling, turning, and the permanent loss in mileage on account of the metal turned off. There are also some advantages over a multiple mileage wheel in the maintenance of standard car and coupler heights on account of there being but slight variation in diameter of the Davis wheel during its life. The standard 33-in. wheel, recommended for heavy freight and tender service, weighs 600 lbs., or about 1,000 lbs. per car less than cast iron wheels, and from 1,200 to 1,600 lbs. per car less than multiple mileage steel wheels.

Gas-Electric Car for Buffalo, Rochester & Pittsburgh.

A gas-electric car recently built by the General Electric Company, Schenectady, N. Y., for the Buffalo, Rochester & Pittsburgh is shown in the accompanying illustrations. The car is 66 ft. long, 14 ft. 1 in. high and has a seating capacity for 49 passengers in the passenger compartment and 20 in the smoking compartment, with two persons per seat. However, the seats are sufficiently wide to accommodate 3 persons, which would give a capacity of 69 and 28 respectively. The car derives its power from a gasolene engine and transmits it to the wheels by means of an electric drive, thus avoiding any direct mechanical gearing or connection between the engine and the wheels. The engine is direct coupled to an electric generator, forming a compact power plant located in the engine compartment. The electric power thus generated is applied to standard railway motors mounted on the axles. The car is operated the same way as ordinary electric trolley cars, by means of a suitable controller. A 100-gal. storage tank supplies sufficient gasolene to carry the car 200 miles. The car is provided with automatic and straight air brake equipment, auxiliary hand brake for use in case of emergency, and also with the standard automatic air signals.

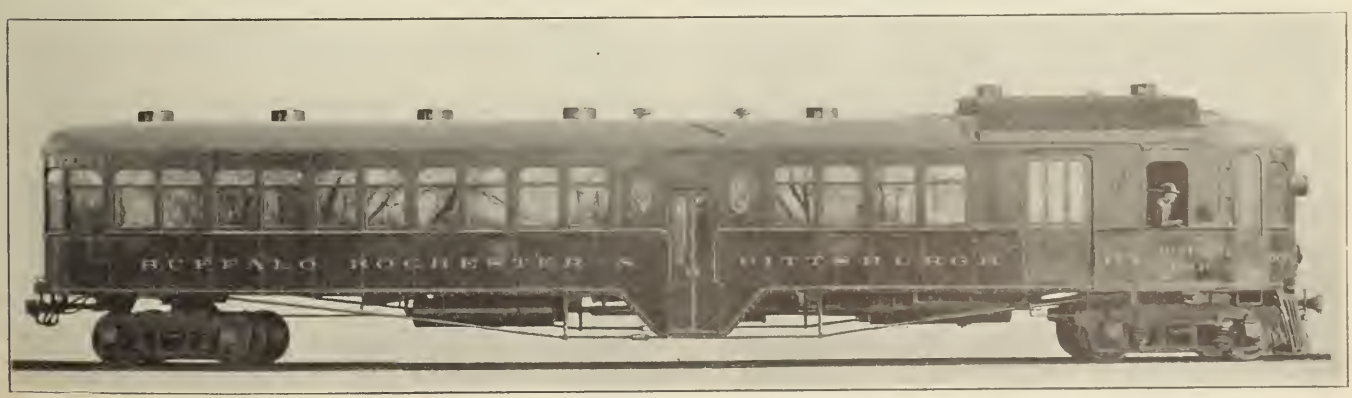


Gas Engine and Generator; Gas-Electric Car.



Passenger Compartment, Gas-Electric Car.

A trial trip was made from Schenectady, N. Y., to Rochester, via the Auburn division, a distance of 244 miles, by officials of the New York Central Lines and the General Electric Company. The trip was thoroughly enjoyed by the passengers, the absence of smoke, cinders and gas being specially noticeable. The smoothness of operation and ease of control were subjects of

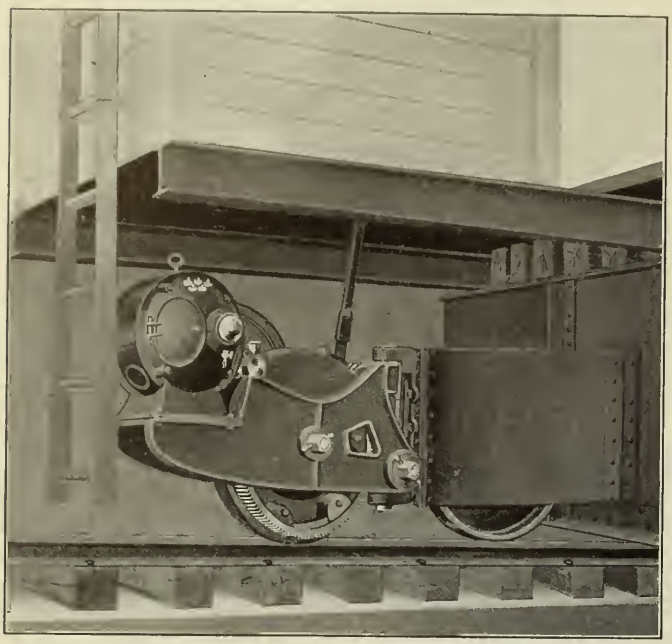


Gas-Electric Car for Buffalo, Rochester & Pittsburgh.

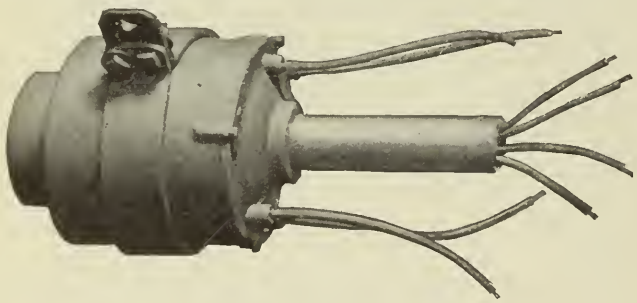
favorable comment, and the speeds attained on the heavy grades were satisfactory. This type of car is adapted for use on branch lines, which at present may be operated at a loss by steam, and where the amount of traffic does not warrant electrification; its use on such lines will reduce operating expenses and increase the traffic.

Heavy Service Tractor for Turntables.

The use of turntable operating devices has become quite extensive, on account of the ease and economy with which heavy locomotives may be turned on power-operated tables. The tractor shown in the accompanying illustration may be operated by either electric power or compressed air. These tractors are uniform throughout, with the exception of the motor, and can therefore be changed to suit conditions by the changing of the motors. The equipments are furnished complete with all accessories, including tractor with motor, controller and resistance, brake, waterproof and smokeproof electric connection for use overhead or in the center of the table, wooden or steel operator's cab with sanding device and all wire and conduit. With the air-operated machines outfits are furnished having brake, cab with sander, and air connections if desired. These machines are manufactured by the Weir & Craig Manufacturing Company, Chicago.



Electric Tractor for Turntable.



Contactor for Electric Turntable.

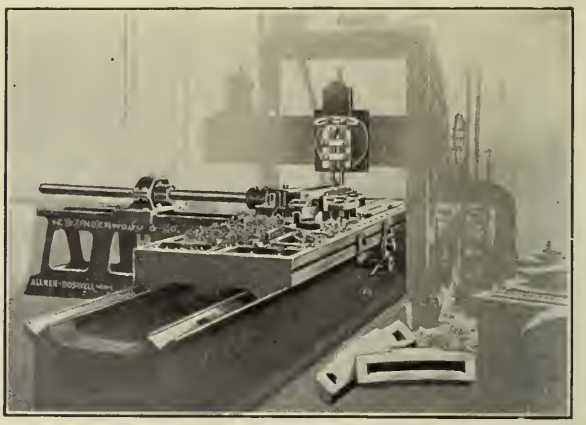
The cost of building the line, including the reconstruction of the existing light railway between Herby and Czenstochova into a broad-gage line, and all the buildings, rolling stock, etc., has amounted to about $3,500,000, on which there is a government guaranty of 4½ per cent. per annum. It seems that the shares of this company are chiefly in the hands of Germans and Russians, but the officials are taken chiefly from the locality.

Shop Equipment.

Radius Adjustment for Planing Motion Links.

A review of nearly all of the devices for machining valve motion links and a careful study of their contruction, with a view to obtaining something that would permit rapid work and accuracy and still be of such construction that wear would not interfere with the exactness of the work, has led to the design and application of the radius planing attachment shown in the accompanying illustration. It was found that six points had to be considered to secure a device that would best suit the requirements. These points are: An absolute correct circle radius; a rigid construction permitting heavy cuts; a wide range of adjustment to any radius needed for links; absence of wear on all parts which would impair the accuracy of the curve; an easy adjustment of radii and of changing and rechanging the radius cutting with straight planer work, and a concentrated method of curve cutting, so that the work may be completed in one operation.

These points are claimed to have been covered in the Allner-Boswell radius attachment, which is made by H. B. Underwood & Company, Philadelphia, Pa. This attachment is applied by rigidly fastening the bottom plate of the device to the table. This plate is made with a square block, over which fits an enlarged pin which is the bearing for the top plate of the setting table. The table is oscillated on this pin by a radial bar which is centered out to one side, as shown in the illustration. The radial bar is in the form of a tube, and being comparatively light, is easily handled. The adjustment to radii of different lengths is accomplished by changing the position of the guide, which is double-pivoted in a post sliding on the outlying foot plate. This attachment allows for heavy cuts and stands up to the limit of the machine tool without injury. After the link has been planed, milled around the edges, and the end clearances drilled and slotted, it is set up on the chuck table and the center block removed with two parting tools working simultaneously. This parting operation, including setting up of link and lifting out of block after parting, has been done on a 15 h. p. planer in 35 minutes, the link being of hammered steel 3½ ins. deep. After parting, the slot is finished by side tools, which are always kept set up in the other tool heads of the planer. The advantage of this method consists in having one setting for blocking out and finishing both sides, and in the correctness of the inside and the outside radius. The attachment is used not only on links, but also on dies, quadrants, curved stone, etc.



Planer Equipped for Motion Link Work.

Hydraulic Press for Light Work.

The small hydraulic press, which is here illustrated, was designed by the Watson-Stillman Company of New York, and has proved useful in machine shops, where small parts are press fitted, or where a high pressure must be brought to bear on any small article, whether for bending, straightening or flattening. The convenient size permits this press to be mounted on a light truck and hauled from place to place, and its operation is quick and easy. Quick movement of the ram may be made by the lever and connecting links shown at the left. The handle

at the right, on the extension lever socket, will operate the pump easily where only light pressures are required, but by applying the extension lever the press will develop a pressure of 30 tons. The platen area is 8 in. square; the platens are



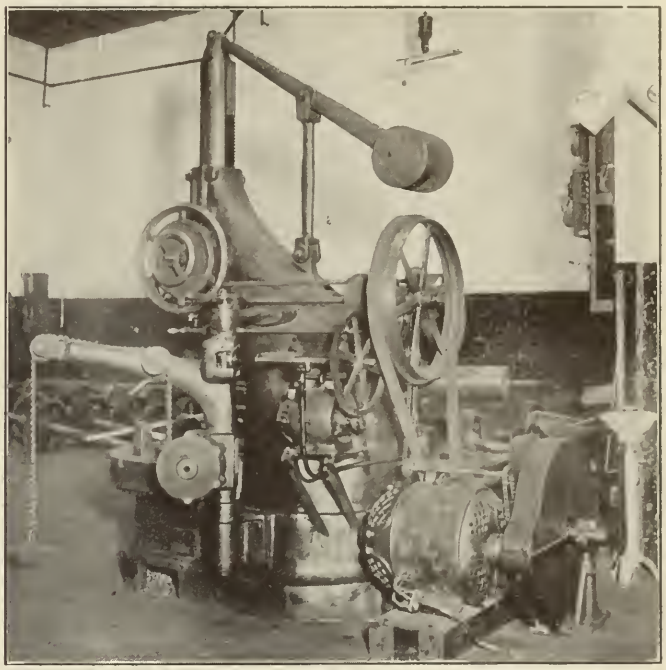
Hydraulic Press for Small Work.

8 in. apart at maximum opening and the ram movement is 4 in. The base is 12 in. x 16 in. and the height of the press over all is 27 in. The main cylinder is a steel forging, machined to fit perfectly into the reservoir, and the pump cylinder is of bronze. This press is designed for severe service and is ideal for small work requiring high pressures.

Individual Motor-Driven Machine Tools.

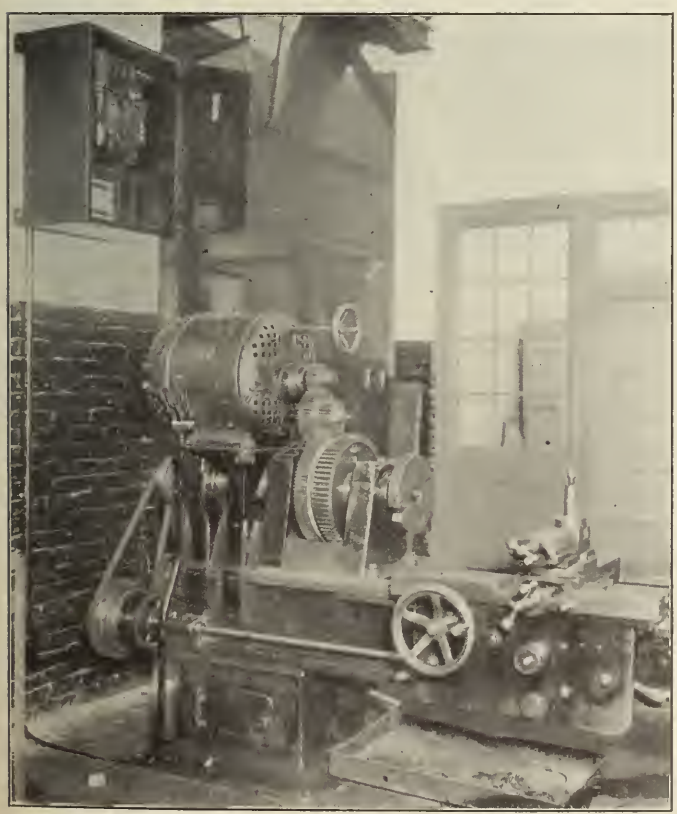
The Chicago Railways Company recently converted the entire equipment of its machine and woodworking shops on West End avenue, Chicago, to individual motor drive. In the engineering details pertaining to the application of motors to the different machines, the engineers of the railway company were assisted by those of the Reliance Electric & Engineering Company, Cleveland, Ohio, who furnished the motor equipment. This installation is unique in several particulars and uses automatic starters for the control of the individual motors. These starters are used not only for the constant speed motors, but also with the adjustable speed motors.

The objects in making these changes were: To effect a saving in power by making possible the use of individual machines, especially for overtime work, without running a 75 h. p. motor



48-in. Car Wheel Boring Mill driven by 7½ H. P., 500 to 1500 R. P. M. Motor.

which was formerly used for driving the entire line shafting of the machine shop; to increase the productive efficiency of the machines by a more powerful drive with an easy and convenient method of speed control over wide ranges; and to increase the general efficiency of the shops by a machine arrangement which would afford the greatest convenience in the handling of material. In planning the installation a number of difficulties presented themselves. One problem was to have as

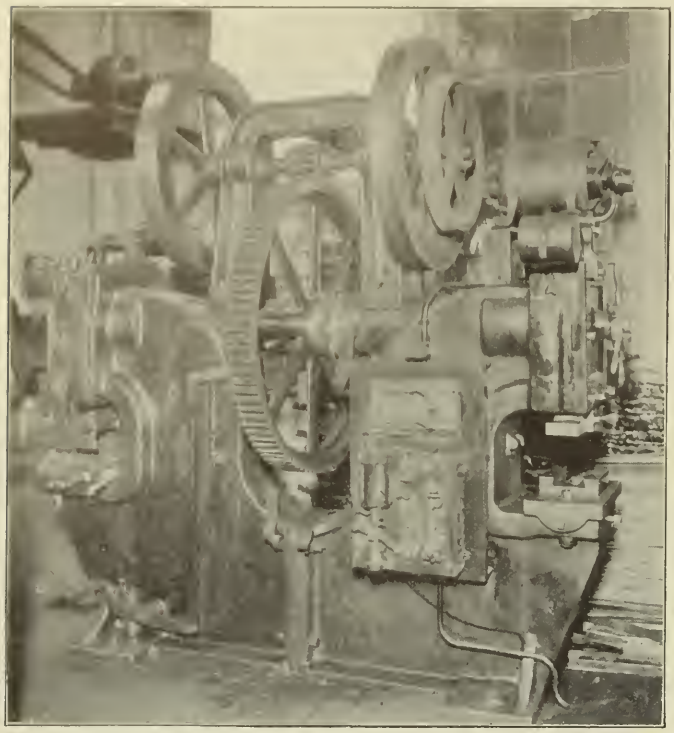


Engine Lathe driven by 5 H. P., 300 to 1800 R. P. M. Motor.



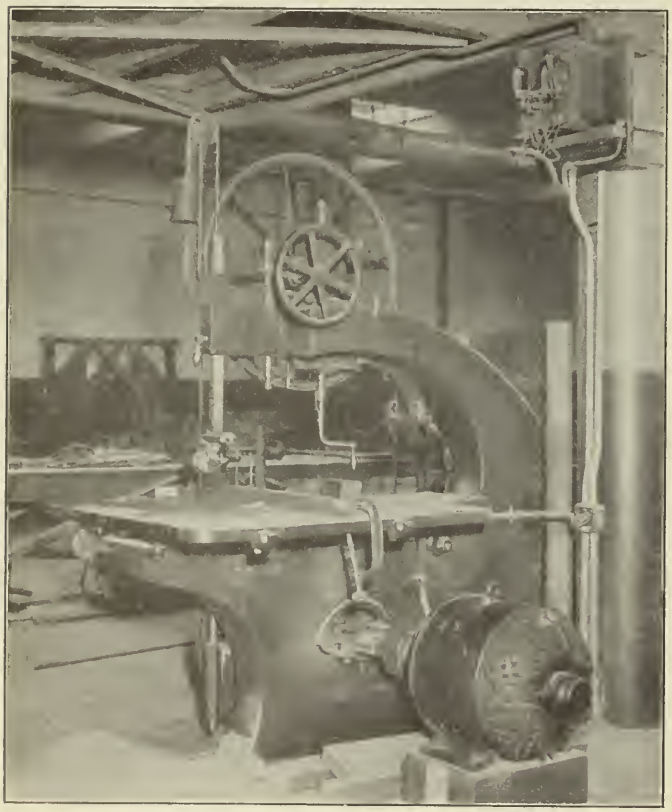
Two Hack Saws driven by 1 H. P. Motor.

little wiring as possible on the machines, as the motors are installed on a 550 volt d. c. grounded circuit, the power being taken from the company's own lines. The only wiring needed on the machines is for the push buttons which require a pilot circuit carrying only about $\frac{1}{6}$ amperes. In the selection of auto-



Punch and Shear driven by 7½ H. P. Motor.

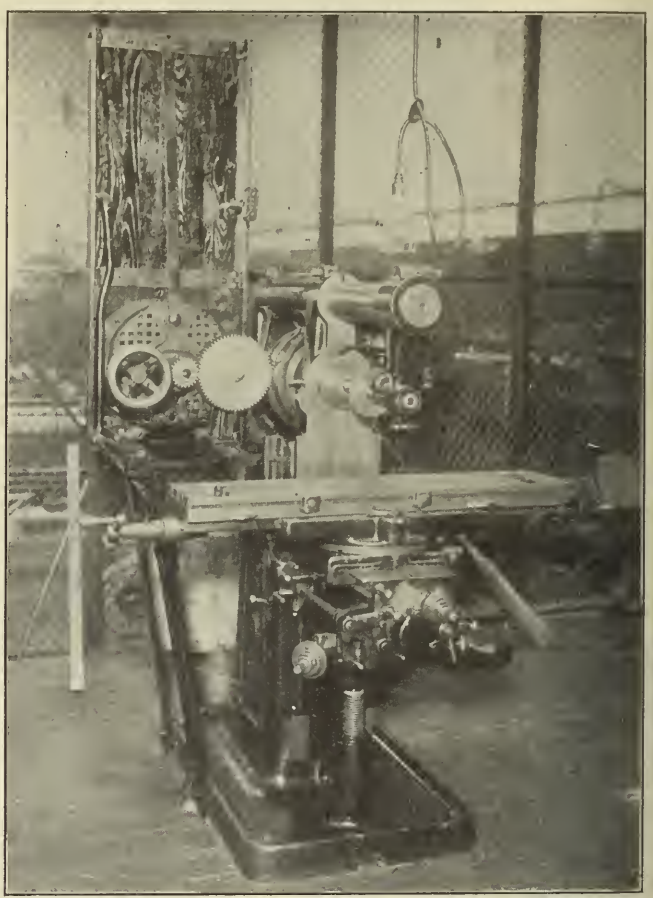
matic starters, the first consideration was the protection of the workmen from the high voltage, and the second, the elimination of any possibility of abuse to either the motors or the starting equipment. In the case of the adjustable speed motors the choice of suitable controlling equipment proved more difficult.



Wood Band Saw driven by 5 H. P. Motor.

When belt-driven tools, equipped with cone pulleys, are changed to motor drives, it is necessary to remove the cone, which in some types was designed to cover a wide range of speeds with only a single back gear. The Reliance adjustable speed motor of the armature shifting type was selected for this service for the following reasons: It eliminated the electrical field resistance controller, which often causes electrical troubles and is dangerous to operators, due to the high voltage; it permitted the use of the same type of automatic starters which had already been chosen for the constant speed motors; and the wide range of speed possible with this type of motor reduced the number of gear changes to a minimum.

The accompanying illustrations show several machines which were converted to individual motor drive. In the illustration of the lathe an example is offered of the method employed in making the changes. The cone is replaced by a quill, the motor driving this quill through an intermediate idler shaft so as to



Milling Machine driven by 2 H. P., 400 to 2000 R. P. M. Motor.

get a double reduction. This intermediate idler shaft may either be supported from the base casting, as shown, or from a suitable boss on the vertical arm of the motor end yoke. A stationary stub shaft is used for these idlers, the two idlers being mounted on a common bronze bushing. In this case the back gear ratio on the belt-driven machine, which was 1 to 10, was changed to 1 to 6. Using a motor with a 1 to 6 speed ratio, this gives a continuous 1 to 36 range of spindle speeds, which is satisfactory for lathes of this size. If a motor with only a 1 to 3 speed ratio is used on such a lathe, an additional gear change must be provided or there will be a jump or gap of over 300 per cent. between the range of spindle speeds obtained with the back gear in and those obtained with the back gear out. By changing the back gear ratio to 1 to 6, and using a motor with a 1 to 6 speed ratio, a continuous range of spindle speeds was obtained without any gap. It is a simple matter to change the back gear on a lathe of this character from 1 to 10, to 1 to 6. It merely means changing the diameter of the two tail gears without any change in the face gears or in the locking device between the large face gear and the quill. In making the change in the two tail gears they may be moved as shown in the illustration, allowing the motor to be set low over the head.

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IN the article on The Supply Department, printed in another column, Mr. McVeigh asks several questions which are already answered in Mr. Pearce's book: For instance, after running over the course taken by a requisition under Mr. Pearce's plan, he asks what is gained by it. Mr. Pearce has already pointed out that by having the requisition pass through the office of a general storekeeper duplications of orders are discovered and, particularly, the desired material can be supplied quickly to the divisional officer from stock on hand from some other point on the system. It would seem that Mr. McVeigh could get a better answer to the question he asks by first explaining why Mr. Pearce's answer does not satisfy him. Similarly, he criticizes routing outside purchases through the general storehouse instead of directly to the division or point of application. Mr. Pearce devoted some space to explaining the advantages of this and Mr. McVeigh does not answer Mr. Pearce's points. Again, he says that Mr. Pearce's general storekeeper's duties and functions are a duplication of the division storekeeper's work. Mr. Pearce emphasizes the point that the general storekeeper should be freed from detail and should spend his time, in part, in "maintaining the organization, strengthening the weak places, providing facilities . . . On him devolves, probably more than any other officer, the maintenance of standards." Is this a duplication of the division storekeeper's work? Discussion on this subject will be of immediate value, and perhaps we can get it by criticizing each other in the same friendly spirit which characterizes Mr. McVeigh's paper.

TWO trust companies and four banking firms in offering at 106 and accrued interest $10,000,000 of New York State Canal improvement 4 per cent. gold bonds, call attention in their circular to the fact that two years ago the 4 per cent. bonds of the state of New York were selling at 114 and interest; that is to say, the drop in the interval of two years has been 8 points. Thus, as tested by the price of these bonds, state securities of a character as unquestioned as cash itself have followed, or, more strictly speaking, attended the fall of municipal bonds of high grade. In Connecticut a state loan has had to fail temporarily, owing to a similar change in the standard of investment rate for bonds. And all this comes to pass at a time when money is cheap and large private funds should be seeking investment. It is pertinent and timely to ask whether a very powerful cause in this decline of public securities does not go back to federal and state policy toward the railways. The line of reasoning runs in some such sequence as this: The steam railway bond is, on the whole, the standard bond of investment. That the federal and state policy has dislodged much investment from railway shares and forced down their market values must be conceded. The timidity of investors reaches to some extent to railway bonds as well as stocks. But so long as such bonds and those of other public utilities, especially street railways, render a decidedly higher return than the state or municipal security the latter suffer acutely by the competition. A policy that forces down one very extensive and high class security in the market affects other securities and affects most directly those that are also of as high grade or higher. New York wants to market bonds to build her large canal, Connecticut to improve her highways. Both the canal and the highways must cost more as the sequel of a policy that inflicts railway hardships. The analysis carried a step further shows the citizen paying, by increased taxes to meet increased bond interest, for a condition ensuing partially from anti-railway legislation. The statement can be generalized into the proposition that no great vested interest can be unduly attacked without reaching other vested interests and, at the last, the taxpayer as a kind of "ultimate consumer." In connection with the subject the increased advertisement of Canadian securities calling attention to the transfer of investment across our northern boundary line is suggestive as an interpretation of results of the divergent policies of the two countries.

THE inequality between the wages of certain classes of railway employees and certain classes of railway officers was referred to in an editorial in these columns May 5. A similar inequality, which is adapted to cause even more serious results, exists between the wages of different classes of employees. The wages of members of the labor brotherhoods have been repeatedly increased during recent years until now, in many cases, they are excessive in proportion to the quantity and quality of the work done for them. Meantime, almost no corresponding advances have been given to unorganized workers, such as the great majority of section foremen, signal maintainers, bridge and building employees, station agents, etc. To suggestions that the wages of these unorganized employees should be put nearer on

a parity with those of organized employees, railway officers are apt to answer that the roads cannot afford to do it. But to pay high wages to the members of the brotherhoods, and keep down those of the unorganized men, is calculated to foster discontent among the latter. They are very apt to say, and with much truth, that the railways will pay high wages only to those who extort them; and that the only way for the unorganized employees to get their deserts is to organize. Railway managers denounce the attitude assumed and the course taken by the brotherhoods; but by treating the members of the brotherhoods better than the unorganized employees they offer a direct incentive to the organization of the latter. A good many railway men think that the best way to deal with the situation is to pick out those among the unorganized employees who are the most competent and faithful, and increase their wages. This would be preferable to flat advances in pay, because it would encourage those who receive the increases and stimulate those who do not receive them to try to do better work in order also to secure them. Furthermore, when attempts were made to unionize the unorganized men, those among them who had received increases in pay would be more apt to oppose the movement because they could have little to gain and might have much to lose by joining it. While it may seem that voluntary increases in wages would unnecessarily increase the expenses of the companies, it is certain that voluntary increases to those employees specially meriting them would, in the long run, cost a great deal less than general increases compelled as the general increases to organized employees have recently been compelled.

ARBITRATION OF RAILWAY LABOR DISPUTES.

WE present in another column a second letter from President Delano of the Wabash on arbitration of railway labor disputes. Mr. Delano's first letter was published in the *Railway Age Gazette* of April 7, page 820. The subject to which it related has since been discussed in these columns by representatives of both the railways and the railway brotherhoods. (See *Railway Age Gazette,* April 21, page 934, and April 28, page 979.) Mr. Delano makes clear in the letter we give this week that he does not advocate compulsory arbitration. He merely favors arbitration without any compulsory feature, and conducted by a different kind of tribunal from those which heretofore have arbitrated railway labor questions.

It will be granted, we think, by all who have considered the subject that arbitration ordinarily is preferable to strikes and lockouts as a means of settling wages and conditions of employment. This is especially true when those concerned are transportation companies and their employees. The public then has a special interest because of the nature of the railway and of the service that it renders.

Both mediation and arbitration of railway labor disputes under the Erdman act have proved unsatisfactory. They are much preferable, of course, to strikes and lockouts, but they fall far short of being ideal means to the desired end, which is not merely the avoidance of strikes and lockouts, but also the settlement of the questions involved in a way that will be just and beneficial to the railways, the employees *and the public.* In conducting mediations, Judge Knapp and Mr. Neill have never pretended to get settlements which would be just and permanently expedient. That is not the function the Erdman act gives to them as mediators. Their sole function, and the only thing that they try to do, is to secure settlements which will prevent breaches between the employers and the employees that would interrupt railway service. Their method has been simply to present to each side the arguments and proposals of the other until finally a basis of agrement is reached which will prevent a breach. What this basis will be always must depend on the circumstances existing at the time and not on the equities involved. The side which, for the moment, under the particular conditions existing, has the greater strategic strength, and not necessarily the one which is in the right, gets the best of the negotiations.

If the controversy goes to arbitration the board is composed, as Mr. Delano has pointed out, of one representative of the railways, one representative of the employees and a third person chosen by them or by the mediators. The representative of the railways always favors the railway side, the representative of labor always favors the labor side, and the third arbitrator determines the award. He usually knows little about the transportation business or the underlying equities of the parties, and bases his decision on a superficial knowledge of the transitory conditions existing at the time gained during the progress of the arbitration.

Mr. Delano proposes to substitute for such bodies a national board composed of men chosen because of special fitness for its work, and appointed for a period long enough to enable them to get the knowledge and experience necessary to rendering decisions which would not merely prevent strikes, but which would be adjudications between the parties based on consideration, not merely of their transitory rights and claims, but also, and chiefly on the enduring rights and interests of the public. It would carefully examine the testimony introduced and the issues involved, and render an opinion setting forth the facts proven, the principles involved and the basis on which, in its judgment, a settlement ought to be reached. It would have no authority to enforce obedience to its decision. It is very questionable if such power could be conferred, because to give it such power would be to empower it to compel the railways to employ men against their will and to compel men to work against their will, and probably no law can give anybody that power. Slavery was abolished in the United States over 40 years ago.

In its inability to enforce its decisions such a body would differ from other courts. But the enforcing of decisions is not the only function that courts perform. One of their most important functions is to render opinions in which the facts developed, and the duties of the parties to each other, are set forth. Their function of defining duties is no less important than their function of compelling their performance. Once a court of arbitration had defined the duties of the parties, public sentiment probably could be relied on to enforce their performance; for the court would define not merely the duties of the parties to each other, but also their duties to the public; and public sentiment, in holding them to a performance of their duties to the public would at the same time hold them to a performance of their duties to each other.

All discussion of this question which ignores the interest of the public in it, or which asumes that the public has no interest in it except to prevent strikes, is valueless. The public is very directly concerned in the conditions of employment and the wages paid on railways. The total wages paid by the carriers to their employees amount to a billion dollars a year. This is 60 per cent. more than the total amount paid out in interest and dividends. There is only one source from which the money to pay these wages can be derived, and that is from the rates paid by the public for transportation. It is to the public interest that railway employees shall receive good wages, and enjoy favorable working conditions. But it is not to the public interest that they shall be paid excessive wages or that their conditions of employment shall be such that they shall not give one dollar's worth of work for every dollar in wages that they receive. And when a dispute arises as to whether wages shall be raised or reduced, or whether the piece work system shall be introduced or abolished, the public ought not only to participate in reaching a settlement, but it ought to participate in such a way as to protect the rights of all—including its own.

The railway is a public service corporation. Every person who enters its service assumes part of the responsibility for its performance of its duty of giving good service at reasonable rates. This does not apply merely to the board of directors.

the president and other higher officers, but it applies to every engineer, conductor, brakeman, fireman, section foreman and track walker. The public has asserted its right to have something to say about the relations between railways and their employees by enacting the Erdman act. The question, therefore, is not whether there shall be any arbitration at all. That is settled. The question is whether there ought not to be some improvement in the present method of conducting arbitrations. Mr. Delano's suggestion as to the way this improvement shall be made seems to be the best that has yet been offered.

THE EXPRESS COMPANIES, THE RAILWAYS AND THE PUBLIC

THE express companies of the United States are daily laying up more trouble for themselves. Their rates are the object of attack from many sources. The evidence which has been introduced before various state commissions, the recent statistical report of the Interstate Commerce Commission regarding them, and the innumerable newspaper and magazine articles about them that are being printed, are convincing the public that their rates and earnings are indefensible. Meantime, when representatives of the companies appear before the commissions and courts to defend themselves they commonly show more disposition to conceal, than to give, pertinent information; and they are doing almost nothing to conciliate or educate public sentiment.

One of two things is true: Either the rates are indefensible, or they are defensible. If they are not defensible they ought to be changed. If they are defensible they ought to be defended very differently from the way they have been thus far, both before commissions and courts, and before the court of public opinion. The best course for the companies to take, if they want the public convinced that their position is untenable, is to continue the utterly stupid, Bourbon policy that they have followed thus far. The Pullman Company, whose relations to the railways are somewhat similar to those of express companies, exhibited much better sense. Seeing that it must either defend its rates or change them, it promptly adopted the latter alternative, and not only reduced the charges directly under attack, but made corresponding reductions throughout the country. The facts to which those who investigate these subjects have access indicate that the Pullman Company had a better case to defend than have most of the express companies. The companies may gain temporarily by continuing to pursue the policy they have thus far followed, but, in the long run, it will cost them much more than it will profit them. The time is past when any public service corporation in the United States can afford to assume an arrogant attitude toward the public, or, ostrich-like, stick its head in the ground and hope that the people will overlook or forget about it.

The relations between some of the railways and some of the express companies are very close, and it is high time that the railway managers used their influence to cause the express companies to assume a different attitude. There is no evidence whatever that the earnings of the railways for handling express are excessive. The preliminary report of the committee on railway mail pay, issued January 6, 1911, shows that the average revenue of the roads per 1,000 ft. miles from the transportation of mail is $3.23; express, $3.86, and passengers, $4.42. As the average freight train revenue per mile is $2.76, while the average passenger train revenue per mile is only $1.27, it seems probable that the railways are actually deriving less net revenue in proportion from the handling of express than they are from the handling of ordinary freight. But the express companies are agents of the railways for the performance of the express service; and if they do not render that service satisfactorily and at reasonable rates, the public is justified in holding the railways largely responsible, and will do so. Under the arrangement by which the railways receive for the transportation of express matter certain percentages of the gross earnings from it, any reduction in the express charges involves a reduction in the railways' part of the revenues. The railways have, therefore, a very important interest in having the entire question of the relations between the express companies and the public settled on a satisfactory basis. Railway officers being directors in a large number of express companies; the express companies in all cases being mere agents of the railways; and a number of them being owned by the railway companies, the railways can exercise a potent influence in bringing about such a settlement, and they ought to do it.

RAILWAY PROMOTION OF NEW ENGLAND INDUSTRIES.

THE New Haven system, including the New Haven, the Boston & Maine and the Maine Central, has established, with headquarters at Boston, an organization under the title New England Lines Industrial Bureau. Its name indicates its general purpose. It is to lend the railway's influence in ways both active and systematic to the enlargement of any form of New England industry, the cost resting on the three railway lines. The two main objectives are, obviously, the factory and the farm. But outside of them there are in New England interests of large importance, some of which stand in a most direct relation to railway business. For example, the hotel and boarding house interests of the White Mountain region alone—saying nothing of summer camps—is of the utmost value. So are such side interests as the preservation of the New England forests, almost extinct in the lowlands, beginning to pass in the uplands. There is the fishing industry of the coast, bound to grow as the cities grow—an industry which reaches far beyond New England; and there are other products, such as ice and quarried stone. In diversity of industries it is probably fair to say, particularly when the variety of her factory output is considered, New England far surpasses any area of similar size in the United States or, perhaps, the world.

The causes which have led to the progressive farm depression in New England are pretty familiar. In their front have been the rivalry of the richer soils of the West, the more steady and higher returns of the factory and mercantile vocations of the cities and the magnetisms of city life for the younger sons of the farm. These through long decades drew away the bone and sinew, as well as the mental ambitions of the farm. Soils and structures of the farm alike ran down; and, as though such evil forces were not enough, there have been added a horde of insect pests attacking field crops and fruits. By a striking but more natural coincidence the factory interests of New England have of late years met rivalries as well as the farm. As populations have grown westward, rival factories nearer the markets created by population, economizing transportation charges, were sure to grow, and have done so. So were rival factories nearer the raw material, like the multiplying cotton factories of the South. These forces have not prevented the New England factories, taken as a whole, from expanding, but they have cut them down from their old normal rate of increase. Measured by population the New England farm as compared with the factory shows positive and continued loss. By the new census 123 farm towns in Massachusetts show during the last census decade a drop in population from 205,217 to 175,542; 69 rural towns of Connecticut show a population practically stagnant, in spite of new foreign elements; and the same is true of the whole state of Vermont, essentially a farming commonwealth.

In the light of the plan of the three New England lines and its wide industrial scope, their classification of traffic during the last fiscal year is interesting as set forth in a condensed table:

	Tons.
Products of agriculture	5,079,946
Products of animals	1,663,788
Products of mines	12,407,830
Products of forests	4,623,570
Manufactures	9,399,982
Miscellaneous, including merchandise	12,379,393
Total	45,554,509

When this general table is analyzed by its items in the original and detailed returns, the results become impressive in their bear-

ings on New England railway transportation in so far as it can be affected by the new promoting bureau. Certain very large items drop out immediately, including the products of mines; grain, flour and other mill products alone take out probably 2,000,000 tons from products of agriculture, and a considerable but indefinite subtraction must be made in the products of animals, and a lesser subtraction from manufactures. But there remains, at a rough estimate, probably 40 per cent. of the total tonnage to be attributed to New England origin, with manufactures much the largest item and farm products comparatively trifling. The work before a railway industrial bureau, in the main, is therefore the bracing up of a languishing farm industry on the one hand and the sustenance and enlargement of a great factory industry, threatened somewhat by external competitions, on the other. To these may be added another important branch, the development of water powers. These, like farming, have languished in New England outside of cities on swift and large rivers. Transmission of electric power has now given new values and economic meanings to remoter streams, and the conservation of their waters. In the case of the hitherto decadent New England farming there are also some rays of light. Such social forces as the telephone and rural free postal delivery have measurably enhanced the farm satisfactions and reduced the counter magnetism of the cities; and intensive fertilization and the application of scientific methods to soil and orchard are offering fresh outlets of positive profit.

The outcome of the New England Lines Industrial Bureau will be watched with the most acute interest. It can easily fail through lack of intelligence and energy. It can, on the other hand, given vigor, judgment and the proper resources, be made a mighty coefficient in a local development equally beneficent to producer and carrier. If successful, not the least of its values would be the welding of a new link in the community of interest between the railway and the people and the substitution of new friendship for old asperities. The recovery of the last few years proves that New England needs such an era of good feeling scarcely less than the West.

NEW BOOKS.

The Coal Trade. By Frederick E. Saward, Editor of *The Coal Trade Journal.* Published by *The Coal Trade Journal,* New York. Cloth, 190 pages, 6 in. x 8 in. Price, $1.50.

This volume is the thirty-eighth annual edition published by the author, who has been editor of *The Coal Trade Journal* for 42 years. It contains a review of the trade for the past year, including statistics of special value to those interested in coal production. The yearly coal tonnage of the United States has now approached to within a few thousand tons of the half-billion mark, while the coal tonnage of the world at large is a billion and a quarter.

Index to Signal Literature. Railway Signal Association; office of the Secretary, Bethlehem, Pa. Cloth, 185 pages, 6 in. x 9½ in. Price, $1.00.

This valuable index, prepared by a committee of the Railway Signal Association, W. J. Eck, chairman, was presented at the annual meeting of the association at Richmond, Va., last October and has already been noticed in the *Railway Age Gazette.* The bound volume has just appeared, and copies may be had of the secretary. The index to articles in technical journals which constitutes the body of the work fills 135 pages. The reader who observed that this index looked a good deal like an index to the last 25 years' bound volumes of the *Railroad Gazette* did not have our authority for the statement; but we do admit that we have printed quite a number of signaling articles during that time, including some that the committee overlooked.

Besides the index of articles in periodicals there is a catalogue of books which deal with signaling subjects, filling a dozen pages; a list of colleges and schools which give some attention to signaling; and information concerning educational work done by railway companies.

Letters to the Editor.

ANOTHER LETTER FROM MR. DELANO ON ARBITRATION OF LABOR DISPUTES.

Chicago, May 6, 1911.

To the Editor of the Railway Age Gazette:

From the letters of P. H. Morrissey, President American Railroad Employes' and Investors' Association, in your issue of April 21, and W. S. Carter, President of the Brotherhood of Locomotive Enginemen and Firemen, in your issue of April 28, as well as from private letters received from various friends who have read my letter on the labor situation, I see that I was misunderstood.

Mr. Carter, particularly, assumes that I believe in compulsory arbitration, and it is very evident that I did not make clear that I regard arbitration, at best, only as a last resort, to be invoked only in preference to an actual conflict, or strike. I believe thoroughly in the Lemieux act of Canada and in the Erdman act in our own country, in so far as those acts provide for investigation of the controversies or disputes, and mediation between the parties; but what I object to in each of these acts is the arbitration provision. Furthermore, my statement that the arbitration provision does not work with entire satisfaction, and that it is unsatisfactory both to the employer and the employee, is bore out by the statements of both Mr. Morrissey and Mr. Carter.

I am well aware, and fully appreciate, that compulsory arbitration cannot be made practical; and that under any arbitration agreement there is nothing but good faith on the part of the employer or the body of employees, to make it effective. Either party to an arbitration agreement might refuse to be bound by that agreement, and good faith of the parties and the consciousness of the force of public opinion are the only effective agents of compulsion.

I agree with all that Mr. Morrissey has said in his letter about the progress of events in the situation, and I am optimistic enough to believe that this problem will in time be worked out in a better way for all concerned. It is often darkest just before dawn. However, it appears to me that both Mr. Morrissey and Mr. Carter overlook the public side of these questions. The point which I tried to bring out is that this is not a question in which employer and employees alone are interested, but that it is a question in which the party most vitally interested is the general public. How, then, is that interest to be represented? That is the question.

The great value of courts of law arises, not so much from the cases they actually consider and dispose of, as from the fact that they stand as tribunals to decide grievances between citizens, corporations, etc. Most good citizens rarely, if ever, have lawsuits, and, in proportion to the amount of business transacted, there are probably fewer lawsuits today than formerly. Nevertheless, it is worth a good deal to every citizen to feel that he has a code of judicial procedure provided and a tribunal to which he can appeal if another citizen tries to do him an injury or rob him of his property or his privileges. It is only, then, in the sense of a tribunal that I suggest a court of arbitration.

Then there is another point. Thinking men of this century, and men who mean to be fair, are coming to see that one of two principles must obtain; that prices must either be regulated by the laws of competition, or they must be regulated by public authority. This applies equally to the trust manufacturer, to the railway or other public service corporation, and to the labor organization. Each has found that competition may go to ruinous extremes, and in order to prevent competition going to these ruinous extremes, combinations have been formed. Whether these combinations, either of capital or labor, are within the law or without its pale, we do not know yet; but, regardless of what the Supreme Court decisions may be, it is

certain that unlimited competition can never exist for long. The more powerful the competitive forces arrayed against each other, the worse will be the conflict, and the ultimate result of any such conflict is the survival of the strongest and the degredation of the weakest. The labor union has dealt with this problem as between laboring men, seeking to check competition and maintain a reasonable minimum wage. As stated in my first letter, I find no fault with this attitude; all that I contend is that this great force cannot be left unrestrained and unchecked.

F. A. DELANO,
President, Wabash Railroad.

THE RAILWAY LABOR SITUATION.

CHICAGO, April 30, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Mr. Delano's letter in your issue of April 7 very graphically sets forth the existing labor conditions on our railways. The solution of the problem presented is much more difficult than to describe these conditions, and in my opinion is not to be found in compulsory arbitration.

A prominent labor leader, in a recent address before a graduating class of divinity students of a large eastern college, said: "If I were asked to offer a solution of the great vexed question of modern industrial strife, I would unhesitatingly recommend a literal application of the golden rule." This, of course, sounded good to the embryo ministers, and undoubtedly was accepted by them as gospel. Personally, I would be inclined, as the Chinese are, to turn the golden rule around, and offer it as a solution in the form in which Confucius offered it to his countrymen: "Others will do to you as you do to them." This, at least, comes nearer human nature and practice.

There is no way under our form of government that compulsory arbitration can be brought about. It is very alluring to talk about, but we might just as profitably discuss compulsory arbitration of rates. While it is perhaps true that in Canada something has been accomplished under the Lemioux Act in postponing or preventing a break between capital and labor when their relations become strained, the controversy is settled ultimately as in the United States—by concession or force.

Railway employees have learned that, "Whom the gods destroy they first make mad." Therefore, they do not, in these enlightened days, go off "half-cocked." They have also an unwritten law that a strike can unmake a labor leader of the higher class as quickly as it has been known to eclipse a railway manager. Therefore, diplomacy is as essential on one side of the question as on the other.

I am not willing to admit that our Canadian cousins have gained any material advantage under their semi-compulsory arbitration act, at least on the railways. Working rules have been accepted by the managers that are considered onerous on this side. There are also, perhaps, favorable conditions that do not exist here; both the rules and the conditions being incidental to environment and the peculiarities of the situation. It is to be noticed that, however, in dealing with certain classes the Canadian managers avail themselves of our "mutual protection" conferences; so that it may be considered that honors are even, and the panacea for labor troubles is not to be found even under their form of government.

Italy, and more recently France, discovered a new method, that of calling the railway men into the army reserve; a temporary expedient, offset by obstructionism, or the recall of the minister of railways, both of which teach the official in authority, or his successor, to be more liberal.

There is nothing to be gained, apparently by criticizing our labor organizations or their leaders The organizations are numerically greater than the railway managements and have more time and greater disposition to criticize the railways and their managers than the managers have to criticize them. This exchange of mutual regards—or disregards—is prolific of disloyalty, and gets the public into the controversy at the wrong place—where its corns will be trampled on—and it is apt to hit the first offender it can reach, which is generally the railway.

We must find the cause of the existing conditions before we attempt the remedy. Commercial strife follows closely the law of nature, "the survival of the fittest." As we are at present constituted, during the process of converting raw material into the universal medium of exchange—money—we will each take for his share as great a portion as we can get, whether it be the producer, the carrier, the manufacturer or the merchant. This has always obtained, and always will. It was formerly taken by force; then under social regulation, by law, which is considered more equitable. We have never been satisfied with a sufficiency; and we must judge the future by the past. Therefore, how the division shall be made will continue to be determined by intelligence, energy and avarice. Some call the desire of each to get his fair share—or most—laudable ambition; and success in getting it, luck, brains, brawn, cunning, or even stealing. "A rose by any other name would smell as sweet." Whenever in social, political or commercial life the individual succeeds he is applauded or assailed, according to the viewpoint of his critics.

In the recent controversies over rate increases it was made manifest to the railways that no matter how fairly, intelligently or justly they set forth their claims for a share of the increased prosperity of the country, the powers that are created by the people must consider the subject only from the viewpoint of public sentiment. The only real question that seriously entered into the controversy at any time from the standpoint of the railways was, "Does a rate advance mean prosperity or continued depression?" Those broad of vision knew it meant prosperity, and were disappointed with the railway men—perhaps for selfish reasons—because prosperity was deferred by the decision. The result has taught the railways that they need more power politically, whether it come from their own employees or from those who sympathize with them because they know that unless the railways prosper the material growth of the country will be checked.

The influence of employees on the side of the railways can be obtained permanently in only one way—by profit sharing. When a large portion of the employees can be induced to identify themselves financially with the roads, looking to their profits for better living conditions rather than to wage increases or overtime perquisites, the infliction upon the railways of personal injury compensation laws, or the crumbs gathered from the operation—regulative monstrosities produced through their legislative committees, there will undoubtedly come about a change in conditions. Where one employee in a thousand now watches the expenditures there will be at every station, on every train, and at every machine those who will demand and compel from their fellows thrift, honesty and loyalty. There will be those in every community who will watch the ballot and see that candidates inimical to their interests are relegated to political obscurity. There will be those on the jury who will say, "Hold! this is an attempt to obtain money under false pretense." There will be newspapers that will give the railways the credit due them for efficiency. There will be ministers in the pulpit who will preach the righteousness of one moral law for all their congregations. The ambulance chasers will be following agricultural pursuits, or earning their bread otherwise by the sweat of their brow.

"A house divided against itself must fall." No business can prosper under the conditions obtaining on the railways, and under the conditions inflicted upon them. The personnel of the railways should be actuated by the same motives from the bottom to the top. Voluntary loyalty, alert, aggressive and intelligent, ready to meet any enemy from whatsoever source it may appear; voluntary efficiency, voluntary courtesy, voluntary diplomacy, these are what are needed; and they can be produced only by self-interest.

The hundreds of millions of dollars paid in recent years to

railway employees as increased compensation have been absorbed by extravagance and the imposition of high living prices, not justified in any way. If in some way an equal amount of financial interest in the properties had been secured by employees it would have been guarded more jealously; economy and thrift would have been inculcated, and an entirely different atmosphere would prevail, both in the service, and politically, so far as the railways are concerned.

To bring about the ownership by employees of such an interest in the railways is within the range of possibility. To obtain as good results by compulsory arbitration is absolutely impossible. A court of compulsory arbitration may be established. It is so impracticable, however, as to be almost chimerical. If established it will strain the relations existing between employer and employee to the breaking point, and force government ownership and operation of the railways.

VICE-PRESIDENT.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

Kansas City, Mo., April 28, 1911.

To the Editor of the Railway Age Gazette:

In dealing with the subject of equipment efficiency, consideration must be given to the factors that limit performance. The principal factors which may be classed as uncontrollable are the average haul, the minimum load, demurrage rules, unbalanced traffic. Improvement in equipment efficiency must be made independently of the limiting factors. The remedial agents on which reliance must be had are proper facilities and maintenance thereof, improved handling through terminals, organization, supervision, check of operations.

In analyzing operations one is prone to take figures at their face value and disregard contributing factors. Thus, statistics are often based on total results without considering the individual units. In the particular instances pointed out in the editorial on "The Efficiency of Railway Equipment," in your issue of April 7, disproportionate increases in the ratio between tractive power of locomotives and tons moved one mile can probably be traced to large purchases of locomotives between 1902 and 1907, made on the theory that business would continue to increase, or at least would not decrease. Smaller engines, which were not large enough to use economically or to command a ready sale and which were too good to scrap, were kept in stock. The experience of the Kansas City Southern is probably that of many other roads. In 1905, 1906 and 1907, 100 per cent. of all the engines owned were in work stock, while in 1909 and 1910 but 66.1 per cent. and 70 per cent, respectively, were in work stock.

A comparison of total locomotive tractive power and total tons moved one mile is only of relative value. Conditions surrounding the handling of traffic on the individual roads must be known. Statistics frequently indicate poor operation, while, in fact, the best possible results are being secured. Thus, it may be shown that, while the average tractive power per locomotive and the locomotive tractive power per mile of road have increased greatly, the average tons per train, the ton mile per freight locomotive, the ton mile per pound freight locomotive tractive power do not show corresponding increases. It is unfair to assume that operations have been poor until conditions of traffic are known, and what part of total available engine efficiency was used.

In the years under consideration, the average tons moved per loaded car mile did not keep pace with increase of average carrying capacity per freight car. This is due to rapid increase in heavy capacity cars and decrease, through destruction and wear, of light capacity cars. The increase of the average car load, because of limitations mentioned, has been small. Probably few, if any, freight cars have been built for railways since 1902 of less than 30 tons capacity, while the greater part of the cars worn out and destroyed were of smaller capacity. The rapid increase in the average weight of freight cars has decreased the efficiency of locomotives and the apparent efficiency of freight equipment. On some roads, where rapid increase has been made in capacity and weight of cars, ratio of weight of load to weight of car is more nearly equal, whereas on roads where the percentage of heavy capacity cars is small the ratio of load is much greater. On the Kansas City Southern in 1910, of the total average weight of car and contents, the average weight of car was 44.2 per cent., and the average weight of load, 55.8 per cent.

Immediately following the panic, freight equipment deteriorated rapidly, and it has not been properly maintained since. Compared with the corresponding period preceding the panic, fewer freight cars were purchased than during the three years following the panic. The cars now owned, on account of their getting older, are not in as good condition as they were in 1907. The percentage of bad order cars is too great. Before the panic, demand for all classes of cars was so great it could not be supplied, whereas, since the panic, a large number of cars have been stored on account of lack of demand. During the past few months business has fallen off in this section of the country and the roads are hurrying home surplus foreign equipment. On this road, alone, more than 5,000 empty cars have been hauled to connections during the first three months of the current year.

It is believed much of this economic waste could have been prevented by the use of a universal home route card. Several attempts have been made to arouse interest in the home route card during the past four or five years, but as the pooling of equipment in some form seemed imminent, the universal home route card did not meet with much favor. It is now under consideration by the Car Service Committee of the Association of Car Accounting and Transportation Offices. If put into use it will, without doubt, reduce delays to cars on foreign lines and increase performance.

An important factor influencing car performance, especially in this growing southwestern country, is the great increase in industrial and terminal switching. On this road switching of this class has increased in three years at Kansas City, 35.4 per cent., at Shreveport, La., 44 per cent.; at Beaumont, Texas, 52 per cent., and at Port Arthur, Tex., 100.6 per cent. An increase in industrial switching decreases the average miles per car per day. But few cars handled in industrial switching make mileage. The country west of the Mississippi river is developing rapidly. Territory, which a few years ago was local, is now competitive and requires a larger number of cars to take care of the same amount of business.

During the car shortages prior to 1908, patrons loaded cars more nearly to full carrying capacity, in order to dispose of the greatest amount of commodities. Because of inability to get proper equipment nearly any kind of a car was loaded. Since the panic there has been a surplus of all classes of cars at different times, and a surplus of some classes of cars nearly all the time. Because of unsettled conditions since 1907 commodities are bought in smaller quantities and at minimum weights. Notwithstanding the increase in carrying capacity of cars the average load of lumber, the chief commodity of this road, decreased from 24.5 tons in 1907, to 23.8 tons in 1910.

The decreases in the average car load suggest that probably the railways have increased the carrying capacity of cars, and consequently their weight, more rapidly than conditions warrant.

A few years ago an investigation was made to determine whether the 30-ton or the 40-ton box car was the more economical in which to handle box car traffic on a certain trunk line. It was found that the average load, exclusive of merchandise, placed in the 40-ton car, utilized less than one-half of the carrying capacity, and the average load placed in the 30-ton car utilized slightly less than two-thirds of the carrying capacity. As the light weight of the 30-ton car was four tons less than that of the 40-ton car, and the former was strong enough to stand the strain of the heavier trains, it was figured that if all box car freight was handled in 30-ton cars there would be a yearly saving, alone, of more than $300,000 in cost of hauling excessive car weight. Interesting figures bearing on this subject were made several years ago by officials of the Erie and the Lackawanna.

Under normal conditions an important factor in performance of freight equipment is the average haul of the loaded car. It is not always realized that mere figures representing average miles per car per day do not always reflect car efficiency. A road whose average is twenty-five miles per car per day may be rendering more efficient service than a road whose average is fifty miles per car per day.

A number of attempts have been made, without success, to increase the minimum car load. The operating and traffic departments are not always in accord as to what these minimums should be. A number of states either have laws or orders of state commissions prescribing the minimums. Railways themselves are responsible for a number of low minimums. It is believed that some progress is being made, but not much can be looked for in the immediate future.

One of the deterring influences on car efficiency is delay in loading and unloading. These delays are legalized by demurrage rules, by orders of various state commissions and by state laws. It is doubtful if much can be done toward reducing these delays in the immediate future. It will probably take several years of commercial activity to make a beginning. One objectionable feature of present car service rules is the average agreement, in that it does not stimulate release of cars. Not nearly as good service is now being secured from large shippers as was secured before the adoption of the average agreement.

Unbalanced traffic is a feature greatly affecting car performance, which is given but slight consideration. Statisticians usually consider the movement of traffic in relation to direction only, regardless of the fact that it may be different on different divisions. The freight district is an operating entity and should be so considered in determining the effect of unbalanced traffic upon operating economy and equipment efficiency. Direction, on roads where the flow of traffic is subject to changes, should be disregarded.

Two very essential things in successful operation are good power and good track. Railways never made money by neglecting either. They may borrow from the future by deferring necessary repairs, but for this neglect they pay dearly. Many roads are too poor to be economical. Because of the desire to make operating results fit financial statements, the condition of track and equipment is frequently neglected during the last few months of the fiscal year. When work is finally begun an inferior grade of men must be taken; equipment is not put in proper shape with sufficient promptness for the increase of business in the late summer and early fall; work is carried forward during the fall and winter when the days are colder and shorter and the cost of production materially greater, and at a time when all equipment should be in active service. It is believed that an improvement would result if the fiscal year were made coincident with the calendar year.

It is necessary that equipment be put in proper shape by the time business moves in the early fall. Unless this is done there will be a lagging in operations which cannot be overcome during that season. Poor power means increased cost because of engine failures and the necessity of running lightly-loaded trains and light trains to relieve engines that have failed.

As a rule, performance of equipment is fairly satisfactory between terminals. The speed of trains on road is a negligible factor in average miles per car per day. On railways which have a fairly uniform gradient on an individual freight district a high percentage of car and locomotive efficiency is secured. More than 75 per cent. of delays occur in yards and terminals. Notwithstanding, conditions are better than a few years back, but there is still room for improvement. Sufficient force of proper caliber, good facilities and comprehensive reports are necessary for terminals and larger stations, and there good supervision must be had. It has been only a few years since operating reports, except those showing loads and empties to be moved, were not received from larger stations because of the labor involved, notwithstanding that a large terminal usually has more cars than a freight district. Lack of proper facilities at terminals and larger stations not only decrease the efficiency of locomotives and cars, but increase operating expenses. On nearly every road may be seen examples where $35 per day is saved by taking off a switch engine and $50 per day expense caused by resulting per diem and overtime.

Perhaps the greatest results in equipment efficiency will be secured through proper organization and supervision. It is believed that better performance will come through strong divisional organizations rather than through the general offices. This organization should be sufficiently large to permit of thorough supervision of all operations. Better service can be secured by working from the bottom up than from the top down. The division should be equipped with competent officers who should handle the details and in whom full confidence should be placed. The handling of details by the general officers dwarfs the division officers and lessens their efficiency. It is better and more economical to have too large a force than too small, as there should be elasticity in every organization.

In the matter of operations no system will be efficient unless there is proper supervision. The simple issuing of instructions will not suffice. The matter must be closely watched. On the average railway too much is taken for granted and not enough care is exercised to see that instructions are understood and obeyed. The supervising force should be sufficiently large to visit at short intervals all the employees having to do with operations to see that instructions given them are fully comprehended and obeyed. This should be made a matter of routine. In supervision the average railway is weak in that there is not enough of it. Too much dependence is put upon reports. Many operating officials receive more reports than can be looked over in half a day and keep a large number of records of current operations that do not "turn a wheel or earn a dollar." More satisfactory results can be secured from fewer reports and better supervision. Proper supervision contemplates an examination at stated times by experts or officials of other roads who are not familiar with the property and can judge of the operation from an unbiased standpoint. The official who is on the ground is very often too close to the work to get the proper perspective. A great deal of supervising efficiency is wasted through the old but revered custom of "putting it up to the other fellow." Explanations should not be exacted for every deviation from the normal. It should be sufficient to point out the error made and, if circumstances warrant, outline the proper procedure. Criticism presupposes knowledge and should not be indulged in unless the proper way can be pointed out. The supervising officer, by precept and example, should nullify the old saying that railroading is the art of evading responsibility.

There is a lot of unnecessary work and useless correspondence on railways which is not tolerated in any other business. Operation is always in a state of incompleteness and always presents vulnerable points of attack. Delays will always occur. Demands for explanations and solicitation of complaints should be eliminated. This class of correspondence should be sent to the operating official on the firing line only in exceptional cases, as it produces no good results and takes up time that could be better spent.

The operating official being responsible for net revenue feels called upon to make reductions when business shows a marked decrease. At these periods the mistake is often made of reducing the supervising force. The reduction of expenses to the minds of many consists of cutting some one off the pay roll regardless of consequences. Real economy can often be effected by increasing the expenses.

A daily check of operations should be made by the division officer to determine costs. This can be done cheaply and effectively. On this road a report is made each day in each dispatcher's office showing the cost of handling one hundred tons one mile the previous day in the direction of the prevailing traffic.

C. C. RILEY,
General Superintendent, Kansas City Southern Railway.

SIGNAL ASPECTS.

Chicago, April 29, 1911.

To the Editor of the Railway Age Gazette:

The arguments set forth in Mr. Rudd's criticism of my Canadian Railway Club paper, which appeared in your issue of April 14, page 893, are so plausible and so attractive to the reader who has not the time to study and digest them, that I desire to make a brief reply in order to assist those interested in arriving at a true understanding of the actual conditions. Mr. Rudd cites three conditions, or cases, in which the minority's recommended scheme of signaling is held to be insufficient and inadequate. These criticisms are worthy of fuller explanation.

The first reads as follows:

"In view of the change in operating methods in the twelve years since Mr. Rhea first promulgated the proposal the minority is now advocating, while granting for the sake of argument that the proposal was sound and adequate for our needs twelve years ago, some of us feel that it is not sufficient for present day requirements. To cite examples: First, given a dense, slow, heavy freight traffic, interspersed with a number of high class, high speed passenger trains scheduled for a stretch of perhaps 15 miles at 75 to 80 miles an hour. A safe braking distance, allowing for all foreseen contingencies, is, say, 1½ miles, but blocks of this length are too long for the operation of the freights, as it would certainly tie up traffic to require the slow freight to reduce speed to the rate required if it were to take a No. 10 crossover and move into an occupied yard at the signal 1½ miles from the point of obstruction; but if the first signal indicated *'Pass next signal at medium speed,'* and the second signal indicated *'Prepare to stop at next signal,'* the requisite information would be given and the blockade avoided."

The schedule speeds named are considerably faster than have previously come to my notice. There is substantial reason for belief that a mile is sufficient braking distance on level track for all speeds that it is *necessary* for passenger trains to run to meet their schedules. This is perhaps, aside from the point, however.

It is stated that, "it would certainly tie up traffic to require the slow freight to reduce speed" at a caution signal 1½ miles from the interlocking where the train is to leave the main track and enter an occupied yard, to such speed that it could enter this same yard at this same caution signal; and, further, to require it to run for the 1½ miles at such reduced speed. If this were necessary the statement might represent the facts. The question is, Would the minority's simple scheme of signaling require such operation of freight trains? We say, No; that such handling is not necessary and was not contemplated by the minority's plan.

We hold that a train finding a signal in the caution position must run with such caution as the conditions require. Mr. Rudd seems to hold that a train finding a caution signal located under the most favorable conditions must run with the same degree of caution and restriction of speed required by the caution signal located under the most unfavorable conditions on the division. We feel that this interpretation of the caution signal is incorrect and indicates a lack of confidence in our enginemen and trainmen. If our enginemen and trainmen can be trusted to run trains at all, they certainly can be trusted to run with the necessary caution when they find a caution signal. This is subject, of course, to proper education, instruction and discipline which must be had for safe operation with any system. It seems idle to say that because the conditions at one caution signal require a reduction of train speed to, say, 4 or 5 miles an hour, and unusually careful handling, that trains must be similarly handled at every other caution signal on the division regardless of much more favorable conditions existing. If this statement is true (and every practical railway man will agree that it is), the blockade of traffic that Mr. Rudd refers to is unlikely to occur. Summing up the situation referred to, we feel that the freight trains can be handled under the conditions outlined as fast as safe operation and terminal facilities will permit, regardless of whether fast passenger trains are run over the same tracks or not.

The second case specified reads as follows:

"Given a road in which permissive block is used for freights and absolute for passenger trains, either class of trains may accept, as per rule, the caution (distant) indication, but the passenger train cannot pass the caution (permissive) signal and enter an occupied block. Should the engineman be required to remember all the points at which the caution signal is located which he cannot accept, or is it preferable to designate it so that he can tell what it is by looking at it? Which practice lends itself better to the enforcement of discipline and which to the promotion of misunderstanding?

"Further, with the minority scheme, if the interlocking plant is in permissive manual block territory, advance signals are compulsory, as otherwise the caution position may indicate either block occupied, on one or two tracks; a movement against traffic; into a yard, or to a branch, and while a passenger train would be permitted to accept it for the latter purposes, it could not accept it for the former. How would the engineer differentiate without stopping and examining the position of switches, etc.? Is this a good way to facilitate traffic?"

I take it that this refers to operation in manual block territory. We feel that no confusion will arise at the ordinary block station, because passenger trains are operated only on positive block and freight trains on both positive and permissive block. This is a common practice over the country, and no bad results seem to arise from the practice. Both the block operator and the train crews in charge of passenger trains are fully conversant with the practice and no difficulty is met today with this manner of operation.

At interlocking plants which are also block stations, the situation is a little different. At such points we may desire to give passenger trains a caution signal for diverging movements, but not for entering an occupied block section. This is easily taken care of by the location of a signal for block and train order purposes at some point beyond or in advance of the diverging switches. As a rule this will not increase the number of signals employed, as it is common practice to install and use at such points, for block and train order purposes, signals located either in advance of the switches or in front of the tower. Further, it should be borne in mind that such advance signals are required only on lines of heavy traffic, where it is desired to clear the block in the rear, as soon as possible after the arrival of the train at interlocking plant. To simplify the apparently difficult problem propounded, I may say without hesitation, that the conditions can be met with the minority's simple plan and are now being met without the use of the complicated scheme of signaling advocated by the majority.

The third case is rather formidable on first reading:

"Given a four track railway handling all classes of traffic and the problem of weaving fast expresses in and out to pass local passenger and freight trains on the outside tracks and tonnage trains on the inside tracks, these expresses scheduled 77 miles in 89 minutes, with two or three slow-downs for water and one and sometimes two station stops. Place interlockings about five miles apart with No. 20 crossovers maintained for a speed of at least 50 miles an hour without danger or discomfort to passengers. Is it good signaling or good railroading to give no advance information to the engineer of the conditions at the interlocking, but to require him when he comes in sight of a signal located perhaps a mile from the home signal, to immediately reduce speed, watch his track for obstruction ahead, misplaced switch, train in block or bad track, moving at this rate to the interlocking signal, passing it prepared to stop if he is diverted over against traffic or into a yard, and to crawl along at this rate for 2,000 ft. more until he reaches the advance signal, if there is one, and in its absence, so run clear through the next block? Or is it better to tell him definitely the condition of the interlocking signals and switches and let him run, especially when he may be crossed in and out three or four times on the 77 mile run?

"If the minority standpoint is correct, why make a distinction between the main or high speed and the low speed, when you make no distinction between the medium speed route (good for 45 m.p.h.) and the low speed?

"Is the providing of these long crossovers a waste of money? If it is bad practice to so signal that they may be taken at speed, why put them in? They certainly cost more than the shorter ones, No. 8 or No. 10. Or is it intended that the engineman shall 'use his judgment' and, having received the low speed signal, run them at medium speed, having decided that, because that is usually the route set up, it always will be right, and having good luck until some day he is sent into a yard by mistake?"

A brief study will indicate that the difficulties are perhaps over-estimated. For example, the taking of water two or three times in 77 miles is, I believe, now generally considered unnecessary. It is common practice at the present time to run 75 to 100 miles betwen water stations. Since reading the criticism by Mr. Rudd, some consideration has been given to the schedule on the division of which I have charge. This has resulted in further confirming and reinforcing my previous opinion that the schedule described in case 3 is not unusual and not especially difficult to meet, with the use of the simple scheme of signaling, "Stop," "Caution" and "Proceed" advocated by the minority. If time is taken to translate the description of conditions into ordinary language used by operating men of the day, it is probable that many will find that they are, with a very simple system of signals, obtaining results which the language in case 3 would indicate could not be obtained without the use of the complicated scheme of signals recommended by the majority. The results of long experience have been to show that it is unnecessary, if

not undesirable, to require or permit trains to run at excessive speeds over diverging routes at interlocking plants. To make such excessive speeds possible requires, in the first instance, the installation of adjuncts and additions to a simple system of signals, which must be accompanied by expensive and complicated electric locking circuits, approach locking annunciators, releases, time locks, etc., to check and guarantee the more or less specific information which it is aimed to give the enginemen.

These adjuncts and complicated automatic checking devices are expensive to install, maintain and operate. They are subject to failure and do fail, in common with all automatic devices.

L. R. CLAUSEN.

THE SUPPLY DEPARTMENT.

BY E. J. MCVEIGH.

Storekeeper, Grand Trunk Railway.

It has long been recognized that there are two sides to any question, and in looking over H. C. Pearce's articles on "The Supply Department," beginning in the January 6 issue of the *Railway Age Gazette,* it has occurred to me that the other side of this question should be presented. Perhaps it might be better to say that we should have a look at the picture from a different angle.

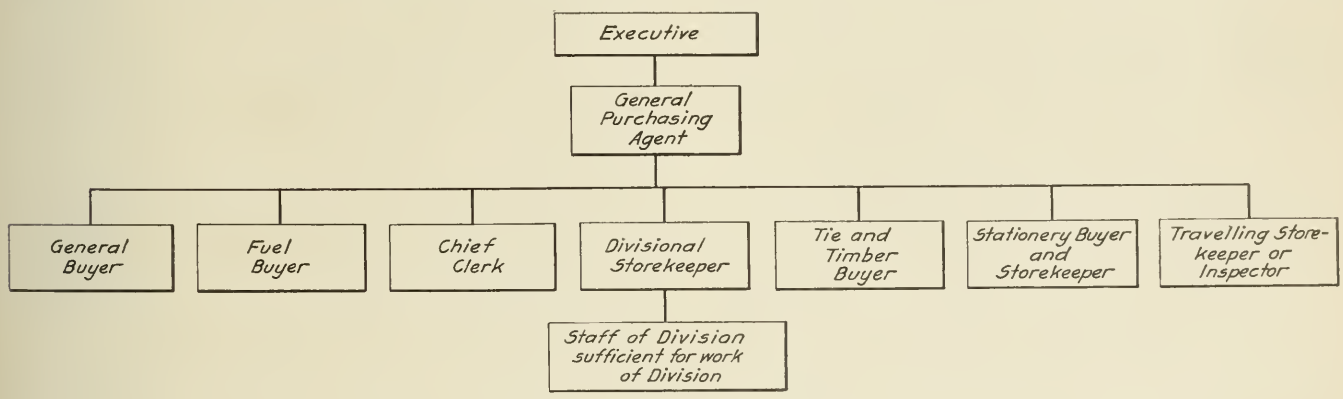
Mr. Pearce has given us a little history showing how things came to be as they are, and no one will question his statements. We all know that our railways "just growed," and are still growing. Like the trees of the forest, they look much alike from a distance. But a close inspection will show that no two are exactly alike, and that few indeed are perfect. "As the twig is bent the tree is inclined," and most of us are so busy just growing that we have had little time to devote to taking out the kinks.

In writing on a subject of this kind the average railway man finds it very hard to get away from his own environment, and most of our writings are little more than a description of our own methods, and what we have been accustomed to. This is natural; indeed, it is almost inevitable. But this does not render such writing of no educational value; for while it does not always show you just how to do it in the best possible way, it may give you the idea of how *not* to do it; and this is of value. For we can hardly know what a thing is like until we have had a look at it, just as we sometimes do not really know what our ideas are on a given subject until we put those ideas into words, and hear how they sound.

I think we might be safe in saying that the present organization of the supply department on most of our roads is the result of accident more than of original design. And as we are all as yet in a state of transition, there is surely room for difference of opinion, especially as we have not yet arrived at the point where we can make intelligent comparison of results, and thus learn what method is the most perfect, and what organization we require to get us the best results.

It has taken our railways many years to learn that the division superintendent is the real unit of the operating department; in other words, that the man on the ground, if he is fit for his job, is the best man to handle the work. Is there no lesson here for the supply department? The shortest distance between two points is a straight line from one to the other. The purpose of the supply department is to procure, and to place in the hands of the people who actually use it, the material necessary for the economical operation of the railway, and to do so in the most direct manner with the least possible cost. Do Mr. Pearce's plan and organization, as outlined, do this?

There are certain large items of material, such as steel rails, steel bridges, etc., that all railways use, and these are handled by each in its own way. We are here dealing with the general supplies, and we will try to begin at the bottom and work up, this being the generally recognized method of progression followed by the human animal when making progress. Now, by whom is the material required? By the man who is to use it. He is in one of the departments on a division. He goes direct, or indirectly, to the head of his department with his list of material, and, if the head of the department has been authorized to proceed with the work, he makes a requisition, on the executive for the supplies. If the executive has decided to curtail expenditures temporarily for any reason, the requisition is returned with orders to discontinue the work. If, on the other hand, the executive approves the requisition, it is up to the supply department to place the material in the hands of the people who are to use it, with the least possible delay and cost. What is the best way to do this?



Supply Department Organization.

Under Mr. Pearce's plan of organization, the requisition would now go to the official in charge of the material and supplies, from him to the general storekeeper, from the general storekeeper to the assistant general storekeeper, from the assistant general storekeeper to the division storekeeper, who would supply what he could from stock, and then make requisition on the general storekeeper for the balance. The general storekeeper, through the assistant general storekeeper, would supply what he could and make requisition on the purchasing agent for the rest. The purchasing agent would buy the items and send them to the general storekeeper who would, through the assistant general storekeeper, send them to the divisional storekeeper, and he would put them in the hands of the men waiting for them. If the material was to be manufactured in company's works the procedure would be the same, except that the order would go to the factory, instead of to the purchasing agent. And, if this has all been done systematically and in order, the general storekeeper has been charged with the value of the goods, he has, through the assistant general storekeeper, debited the divisional storekeeper; and the divisional store-

keeper in turn has charged them out to the proper account.

Can we say that there is no suspicion of circumlocution or duplication of work, here?

Keeping in mind the fact that our railway systems are now operated by divisions, and that the tendency is to go even further in making each division stand on its own feet, recognizing the fact that the man on the division is the one best qualified to do the work of the division, would it not be more consistent to have the requisition go from the executive to the divisional storekeeper; his requisition go to the purchasing agent, or factory; and the material go direct to him, and from him to the user?

What do we gain by the roundabout method, or lose by the more direct plan? May not we claim that when the requisition has gone through the hands of the head of the department, the executive, the purchasing agent and the divisional storekeeper, it has been handled by all of those interested? If so, why continue its wanderings, causing duplication of office work and double handling of material? If may be, and very often is, the case, that the material can be purchased right where required to be used, and this may be a thousand miles from the general storekeeper's supply depot. It is quite as simple for the purchasing agent to order delivery direct to division, as to general depot.

It has been found that it costs our railways, apart from the purchasing office expense, 5 per cent. of the value of the material to handle it through the hands of one storekeeper. That is, it costs that for a storekeeper to requisition, receive, distribute, and account for the material. If this be done a second time, it adds an additional 5 per cent. Now, a railway system of 6,000 miles will use, approximately, $1,500,000 worth of material for maintenance each year; 10 per cent. of this is $150,000. Will it not save half of this by using a shorter and more direct method?

Mr. Pearce carefully outlines the duties or functions of the general storekeeper, but has he any duties or functions that are not a duplication of the divisional storekeeper's work, down to his unit of efficiency? And if we recognize the principle that the man on the ground is best qualified to do the work, why cannot the divisional man do it much detter than the general man? The claim that the general storekeeper is the man best qualified to cut off quantities requisitioned for, will, I am afraid, be disputed by 90 per cent. of our railway officials. The less "cutting off" a man in a general storekeeper's position attempts the better for himself and his railway. This reducing of quantities on requisitions by parties having no actual knowledge of circumstances or conditions has cost our railways, in delays, loss of time by men, and equipment out of service, a hundred fold more than the value of all the material they have successfully "cut off." It is true that this is not always brought to the light, as it should be, but the men inside know that it is a fact. The theory is alluring, the practice is ———.

The only way this may be done successfully is when it is done by the executive, and the work stopped when supplies are stopped. The general storekeeper cannot do this. As to general stocks, the only way to keep them within bounds is to know what is a reasonable stock for a division, keep a close check on the divisional storekeeper by inventory, and by percentage of disbursements to permanent stock carried, and when these are not reasonable get another man. The executive and the auditor of disbursements can keep the check.

While we are on this question of permanent stocks, let us go a little further into it. If we have a railway of 6,000 miles, divided into, say, eight divisions, with each division maintaining a stock of material and supplies necessary to the successful and economical operation of that division, why maintain a general supply depot, duplicating the division stock when, or if, the division stock may be renewed directly and more cheaply than through the central depot? On such a railway the value of the stock on hand on each division will average $150,000, making a total of $1,200,000. To be of any real use in replenishing the stocks on divisions, the stock at the general stores would have to be of a value of $400,000. This increases our stock for the system by that amount. The question to be answered is to what extent our railway system will benefit by increasing the permanent investment by $400,000 and the cost of handling supplies by 5 per cent.

It is true that by buying for each division separately the detail work in the purchasing agent's office will be slightly increased. The purchasing agent may, at times, make eight orders under this plan whereas he makes only one if the general storekeeper's staff compiles the divisional requisitions. But is this serious? Let us suppose that, instead of receiving the requisitions from the general storekeeper for all the divisions in bulk, the purchasing agent received them from each division separately. He would compile them for the purpose of sending out his inquiries, thus getting the benefit of buying in bulk, and separate them again in making his orders. Not a very great amount of clerical work would be involved, and he could place his orders at the point nearest to where material was required, consistently with prices, and often save long haulage, besides distributing the road's patronage and making friends at all points on the system. It is not necessary to point out that friends are a valuable asset—never more so than right now. And their value will not diminish.

It might be claimed that the general supply depot is necessary in connection with the chief manufacturing plant on the system. Is this the case? On each division the main shops do more or less manufacturing, to the order of the divisional storekeeper, and it is seldom that it is found convenient, or advisable, to have all the main factories of a system at one point; and, in any case, no matter where the factory is situated, would it not be a simple matter to put it in charge of the storekeeper on whose division it is?

All divisional stores would not be of the same importance, just as all divisions would not be of equal importance in other respects. But if each divisional store is looking after the needs of the division on which it is situated—and it must do this under any workable plan—why is a general store or depot to supply them all needed, when the source of the supply is as much open to the division store as to the general store?

It is quite true that it is not so many years since we had no supply department at all. But in attempting to remedy this it is possible that we have gone a little too far in some cases, and got too large a department. This is a question the future must decide. But in the meantime, we cannot get away from the fact that the division as the unit of the railway is our basis of operation. Our executives tackle their problems by divisions. There are, of course, questions of general policy into which, as such, the division may not enter. But in questions of operation the divisions are dealt with separately, and would it not be natural and convenient for the executive to deal with the supplies of the division along with its other problems, rather than have them mixed up with that of other divisions coming through a central supply depot? There must, of course, be a head to everything. In the case of the distribution of railway supplies why should not this be the purchasing agent, with the markets of the world to draw from direct, rather than a central depot, which, in spite of the enormous expense attached to it, never has succeeded—and never can succeed—in doing this without delays and duplication of labor and expense?

It is true that when the railways first appointed purchasing agents they were only clerks, without knowledge of material and supplies. The reason for this was that men of ability with this knowledge were not available at that time. This is not the case today; we now have men of this class; and surely it would be wise to make use of them, and get the benefit of their training and knowledge. But, with or without practical knowledge, no purchasing agent of a large railway system can personally attend to the details of all buying. He must delegate

this to members of his staff, a portion to each, and it naturally follows that he will give certain lines to certain men. We might consider the organization of the supply department as shown in the diagram as a direct and compact whole.

It would seem futile to go further with a diagram of organization when suggesting an organization for railways generally, as the staff required on the division will depend on such circumstances as its length, general importance, and the shops and factories situated on it. This also applies to the size and style of the stores buildings, and even to the material and supplies carried in stock, to a greater or less extent. For the class and quantity of material carried by a division on which was situated a large manufacturing plant would differ much from that required to be kept in stock on a division where there was no such plant. On one division there may be a shop for building new locomotives or cars, while, on the next, repairs only are done. Would not all this make it desirable to deal with supplies by divisions? The divisional man must know his business or he is of no use, and how does he benefit by having a general storekeeper between him and the source of supply?

In the organization herein suggested, it is hardly necessary to say that fuel inspectors would report through the fuel buyer, and timber men through the timber buyer, while the traveling storekeeper would report to the general purchasing agent. The stationery buyer, I think, should be stationery storekeeper also. And it would seem advisable that the general buyer, fuel buyer, timber buyer and chief clerk, who would be accountant, should do business in the name of the general purchasing agent, while the divisional storekeeper, traveling storekeeper, and stationery man should use their own names. Each of the officials shown would, of course, have a personal staff sufficient for the work to be done; but the chief clerk and general office staff would be used in common by the general buyer, the fuel buyer, the timber and tie man and the traveling storekeeper.

The traveling storekeeper would be the personal link between the different divisional storekeepers, and between them and the head office. When not on the road he would be a member of the general office staff. It might be of advantage to have him scan the divisional requisitions as soon as they come in, and note such items as may be transferred from one division to another, thus assisting in keeping down the total value of stocks. But he would, of course, have this in view and do it at all times when possible. The work of the right man in this position would be of great general value; he would save much time for the general purchasing agent, and would bring in much valuable information to each member of the general staff, saving an enormous amount of correspondence by them, and he would be equally valuable to the divisional storekeeper in keeping him advised of conditions on the division—not relieving the divisional man of his responsibility, but supplementing his efforts.

The securing and distributing of our material and supplies is simple enough; where we are weak is in following them up and seeing that they are properly applied. The division man, right on the ground, finds this to be the case in spite of his best efforts; how little, therefore, could a general man a thousand miles away do to improve conditions.

There can be no question as to the advisability, and even necessity, of carefully inspecting and testing material purchased for railway use, but there may be room for a difference of opinion as to the advisability of loading down the supply department with an engineer and assistants, as well as the equipment he would require to enable him to be of practical use in testing all material. Each department must maintain its own engineering staff to enable it to carry on its work. Would not these men be quite competent to inspect and test nearly every item of material used by their department, and that without extra cost to their company? And the few items that might be considered beyond their ability to attend to may always be handled by a state college at small cost. Is it not a fact that the men actually using the material will discover defects and report them without considering, or caring, how many engineers have passed on them? But this question could hardly be settled without a very careful inquiry into the working of the testing departments of some of our railways to learn if the facts have borne out the theory.

Has not Mr. Pearce, with the organization he advocates, loaded his gun too heavily for the game he intends to bring down? This question of the supply department is no small one, and we all want exact information if we can get it. Is an organization such as Mr. Pearce has outlined necessary, and what will it cost to handle material under such a plan? I think many of us would be glad of an answer to these questions.

FEDERAL BOILER INSPECTION RULES.

At a conference held in Washington on April 25-27, an agreement was reached between the chief inspector of locomotive boilers and his assistants, and a committee of officers of the mechanical departments of the railways, on the subject of minimum rules and instructions for the inspection of locomotive boilers. The Interstate Commerce Commission has ordered a hearing upon these rules and instructions for May 29, 1911, at 11 a. m. Provided these proposed minimum rules and instructions are approved by the Interstate Commerce Commission after hearing, they will be obligatory upon any carrier failing to file its own rules and instructions.

If any carrier desires more frequent inspections or more rigid requirements than those specified in the proposed minimum rules and instructions, such carrier may so arrange or may file its own rules and instructions with the chief inspector of locomotive boilers. It is not necessary, however, under such circumstances to make more frequent reports to the district inspector of locomotive boilers than those required by the proposed minimum rules and instructions, paragraphs 41 and 42.

If these proposed minimum rules and instructions are unsatisfactory to any individual carrier, such carrier may file its own rules and instructions prior to May 17, 1911, and ask for a hearing therupon, under the first paragraph of section five of the act.

The rules agreed on are as follows:

The railway company will be held responsible for the general design and construction of the locomotive boilers under its control. The safe working pressure for each locomotive boiler shall be fixed by the chief mechanical officer of the company or by a competent mechanical engineer under his supervision after full consideration has been given to the general design, workmanship, age and condition of the boiler, and shall be determined from the minimum thickness of the shell plates, the lowest tensile strength of the plates, the efficiency of the longitudinal joint, the inside diameter of the course and the lowest factor of safety allowed.

FACTORS OF SAFETY.

The lowest factor of safety to be used for all locomotives in service or under construction on or before January 1, 1912, will be fixed after investigation and hearing and after the expiration of the time allowed for filing specification cards.

The lowest factor of safety to be used for all locomotive boilers which are constructed after January 1, 1912, shall be 4.

TENSILE STRENGTH OF MATERIAL.

When the tensile strength of steel or wrought-iron shell plates is not known, it shall be taken at 50,000 lbs. for steel and 45,000 lbs. for wrought-iron.

SHEARING STRENGTH OF RIVETS.

The maximum shearing strength of rivets per square inch of cross-sectional area shall be taken as follows:

Iron rivets in single shear	38,000 lbs.
Iron rivets in double shear	76,000 "
Steel rivets in single shear	44,000 "
Steel rivets in double shear	88,000 "

A higher shearing strength may be used for rivets when it

can be shown by test that the rivet material used is of such quality as to justify a higher allowable shearing strength.

RULES FOR INSPECTION.

The mechanical officer in charge at each point where boiler work is done will be held responsible for the inspection and repair of all locomotive boilers and their appurtenances under his jurisdiction. He must know that all defects disclosed by any inspection are properly repaired before the locomotive is returned to service.

The term inspector as used in these rules and instructions unless otherwise specified will be held to mean the railway company's inspector.

INSPECTION OF INTERIOR OF BOILER.

1. *Time of Inspection:* The interior of every boiler shall be thoroughly inspected before the boiler is put into service, and also whenever a sufficient number of flues are removed to allow examination.

2. *Flues to Be Removed:* All flues of boilers in service, except as otherwise provided, shall be removed at least once every three years and a thorough examination shall be made of the entire interior of the boiler. After flues are taken out the inside of the boiler must have the scale removed and be thoroughly cleaned. This period for the removal of flues may be extended upon application if an investigation shows that conditions warrant it, but in no case shall exceed five years.

3. *Method of Inspection:* The entire interior of the boiler must then be examined for cracks, pitting, grooving or indications of burning and for damage where mud has collected or heavy scale formed. The edges of plates, all laps, seams, and points where cracks and defects are likely to develop, or which an exterior examination may have indicated, must be given an especially minute examination. It must be seen that braces and stays are taut, that pins are properly secured in place, and that each is in condition to support its proportion of the stress.

4. *Repairs:* Any boiler developing cracks in the barrel shall be taken out of service at once, thoroughly repaired, and reported to be in satisfactory condition before it is returned to service.

5. *Lap Joint Seams:* Every boiler having lap joint longitudinal seams without reinforcing plates shall be examined with special care to detect grooving or cracks at the edges of the seams.

6. *Fusible Plugs:* If boilers are equipped with fusible plugs they shall be removed and cleaned of scale at least once every month. Their removal must be noted under "Remarks" on the report of inspection.

INSPECTION OF EXTERIOR OF BOILER.

7. *Time of Inspection:* The exterior of every boiler shall be thoroughly inspected before the boiler is put into service and whenever the jacket and the lagging are removed.

8. *Lagging to be Removed:* The jacket and lagging shall be removed at least once every five years and a thorough inspection made of the entire exterior of the boiler. The jacket and lagging shall be removed whenever on account of indications of leaks the United States inspector or railway company's inspector considers it desirable or necessary.

TESTING BOILERS.

9. *Time of Testing:* Every boiler before being put into service, and at least once every twelve months thereafter, shall be subjected to hydrostatic pressure 25 per cent. above the working steam pressure.

10. *Removal of Dome Cap:* The dome cap and throttle standpipe must be removed at the time of making the hydrostatic test, and the interior surface and connections of the boiler examined as thoroughly as conditions will permit. In case the boiler can be entered and thoroughly inspected without removing the throttle standpipe, the inspector may make the inspection by removing the dome cap only, but the variation from the rule must be noted in the report of inspection.

11. *Witness of Test:* When the test is being made by the railway company's inspector, an authorized representative of the company thoroughly familiar with boiler construction must personally witness the test and thoroughly examine the boiler while under hydrostatic pressure.

12. *Repairs and Steam Test:* When all necessary repairs have been completed the boiler shall be fired up and the steam pressure raised to not less than the allowed working pressure, and the boiler and appurtenances carefully examined. All cocks, valves, seams, bolts and rivets must be tight under this pressure and all defects disclosed must be repaired.

STAY-BOLT TESTING.

13. *Time of Testing Rigid Bolts:* All stay-bolts shall be tested at least once each month. Stay-bolts shall also be tested immediately after every hydrostatic test.

14. *Method of Testing Rigid Bolts:* The inspector must tap each bolt from the firebox side and determine the broken bolts from the sound or vibration of the sheet. If stay-bolt tests are made when the boiler is filled with water there must be not less than 50 lbs. pressure on the boiler. Should the boiler not be under pressure, the test may be made after draining all water from the boiler, in which case the vibration of the sheet will indicate any unsoundness. The latter test is preferable, and it is recommended that the boiler be under not less than 50 lbs. air or steam pressure during the test.

15. *Method of Testing Flexible Stay-bolts With Caps:* All flexible stay-bolts having caps over the outer ends shall have the caps removed at least once every eighteen months, and also whenever the United States inspector or the railway company's inspector considers the removal desirable in order to thoroughly inspect the stay-bolts. The firebox sheets should be examined carefully at least once a month to detect any bulging or indications of broken stay-bolts.

16. *Method of Testing Flexible Stay-bolts Without Caps:* Flexible stay-bolts which do not have caps shall be tested once each month the same as rigid bolts, and in addition shall be tested once each eighteen months by means of a plug wrench and a bar, sufficient pressure being applied to determine if the bolt is broken.

17. *Broken Stay-bolts:* No boiler shall be allowed to remain in service when there are two adjacent stay-bolts broken or plugged in any part of the firebox or combustion chamber, nor when three or more are broken or plugged in a circle four feet in diameter, nor when five or more are broken or plugged in the entire boiler.

18. *Telltale Holes:* All stay-bolts shorter than 8 ins. applied after July 1, 1911, except flexible bolts, shall have telltale holes 3/16 in. in diameter and not less than 1¼ ins. deep in the outer end. These holes must be kept open at all times.

All stay-bolts shorter than 8 ins. except flexible bolts and rigid bolts which are behind frames and braces shall be drilled when the locomotive is in the shop for heavy repairs, and this work must be completed prior to July 1, 1914.

STEAM GAGES.

19. *Location of Gage:* Every boiler shall have at least one steam gage which will correctly indicate the working pressure. Care must be taken to locate the gage so that it will be kept reasonably cool and can be conveniently read by the enginemen.

20. *Siphon:* Every gage shall have a siphon of ample capacity to prevent steam entering the gage. The pipe connection shall enter the boiler direct, and shall be maintained steam tight between boiler and gage.

21. *Time of Testing:* Steam gages shall be tested at least once every three months and also when any irregularity is reported.

22. *Methods of Testing:* Steam gage shall be compared with an accurate test gage or dead weight tester, and gages found inaccurate shall be corrected before being put into service.

23. *Badge Plate:* A metal badge plate showing the allowed

steam pressure shall be attached to the boiler head in the cab. If boiler head is lagged, the lagging and jacket shall be cut away so the plate can be seen.

The builder's number of the boiler, if known, shall be stamped on the dome. If the builder's number of the boiler cannot be obtained, an assigned number which shall be used in making out specification card shall be stamped on the dome.

SAFETY VALVES.

24. *Number and Capacity:* Every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure of more than 5 per cent. above the allowed steam pressure.

25. *Setting of Safety Valves:* Safety valves shall be set by the gage employed upon the boiler, to pop at pressures not exceeding six pounds above the allowed steam pressure, the gage in all cases to be tested before the safety valves are set or any change made in the setting. When setting safety valves the water level in the boiler must not be above the highest gage-cock.

26. *Time of Testing:* Safety valves shall be tested under steam at least once every three months, and also when any irregularity is reported.

WATER-GLASS AND GAGE-COCKS.

27. *Number and Location:* Every boiler shall be equipped with at least one water-glass and three gage-cocks. The lowest gage-cock and the lowest reading of the water-glass shall not be less than 3 ins. above the highest part of the crown sheet. Locomotives which are not equipped with water-glasses shall have them applied on or before July 1, 1912.

28. *Water-glass Valves:* All water-glasses shall be supplied with two valves or shut-off cocks, one at the upper and one at the lower connection to the boiler, and also a drain-cock so constructed and located that they can easily be opened and closed by hand.

29. *Time of Cleaning:* The spindles of all gage-cocks and water-glass cocks shall be removed and cocks thoroughly cleaned of scale and sediment at least once each month.

30. *Water and Lubricator-glass Shields:* All tubular water-glasses and lubricator glasses must be equipped with a safe and satisfactory shield which will prevent the glass from flying in cases of breakage, and such shields shall be properly maintained.

31. *Water-glass Lamps:* All water-glasses must be supplied with a satisfactory lamp properly located to enable the engineer to easily see the water in the glass.

32. All water-glasses must be blown out and gage-cocks tested before each trip, and gage-cocks must be maintained in such condition that they can be easily opened and closed by hand without the aid of a wrench or other tool.

INJECTORS.

33. Injectors must be kept in good condition, free from lime and scale, and must be tested before each trip. Boiler checks, delivery pipes, feed water pipes, tank hose and tank valves must be kept in good condition, free from leaks and from foreign substances that would obstruct the flow of water.

PLUGS IN FIRE TUBES.

34. Flue plugs shall not be used except as temporary expedient to get a locomotive to a point where proper repairs can be made. When used temporarily at outlying points the plugs must be provided with a hole through the center not less than ¾ in. in diameter. Where one or more tubes are plugged at both ends the plugs must be tied together by means of a rod not less than ⅝ in. in diameter. Such plugs must be removed and flues repaired at the first point where such repairs can properly be made.

WASHING BOILERS.

35. *Time of Washing:* All boilers shall be thoroughly washed as often as the water conditions require, but not less frequently than once each month. All boilers shall be considered as having been in continuous service between washouts unless the dates of the days that the boiler was out of service are properly certified on washout reports and the report of inspection.

36. *Plugs to be Removed:* When boilers are washed, all washout, arch and water-bar plugs must be removed.

37. *Water Tubes:* Special attention must be given the arch and water-bar tubes to see that they are free from scale and sediment.

38. *Office Record:* An accurate record of all locomotive boiler washouts shall be kept in the office of the railway company.

The following information must be entered on the day that the boiler is washed:

(a) Number of locomotive.
(b) Date of washout.
(c) Signature of the boiler washer or inspector.
(d) Statement that spindles of gage-cocks and water-glass cocks were removed and cocks cleaned.
(e) Signature of the boiler inspector or the employee who removed the spindles and cleaned the cocks.

STEAM LEAKS.

39. *Leaks Under Lagging:* If a serious leak develops under the lagging, an examination must be made and the leak located. If the leak is found to be due to a crack in the shell or to any other defect which may reduce safety, the boiler must be taken out of service at once, thoroughly repaired and reported to be in satisfactory condition before it is returned to service.

40. *Leaks in Front of Enginemen:* All steam valves, cocks and joints, studs, bolts and seams shall be kept in such repair that they will not at any time emit steam in front of the enginemen so as to obscure their vision.

41. *Report of Inspection:* Not less than once each month and within 10 days after each inspection a report of inspection Form No....., size 6 ins. x 9 ins. shall be filed with the district inspector of locomotive boilers for each locomotive used by a railway company, and a copy shall be filed in the office of the chief officer having charge of the locomotive.

A copy of the monthly inspection report Form No....., or a quarterly inspection card Form No....., properly filled out, shall be placed under glass in a conspicuous place in the cab of the locomotive before the boiler inspected is put into service.

42. Not less than once each year and within 10 days after hydrostatic and other required tests have been completed, a report of such tests showing general condition of the boiler and repairs made shall be submitted on Form No....., size 6 ins. x 9 ins., and filed with the district inspector of locomotive boilers. The monthly report will not be required for the month in which this report is filed.

43. In the case of an accident resulting from failure from any cause of a locomotive boiler or any of its appurtenances, resulting in serious injury or death to one or more persons, the carrier owning or operating such locomotives shall immediately transmit by wire to the chief inspector of locomotive boilers at his office in Washington, a report of such accident, stating the nature of the accident, the place at which it occurred, as well as where the locomotive may be inspected, which wire shall immediately be confirmed by mail, giving a full detailed report of such accident, stating so far as may be known the causes and giving a complete list of the killed or injured.

44. *Specification of Card:* A specification card, Form No..... containing the results of the calculations made in determining the working pressure and other necessary data shall be filed in the office of the chief inspector of locomotive boilers, for each locomotive boiler. A copy shall also be filed in the office of the chief mechanical officer having charge of the locomotive. Every specification card shall be verified by the oath of the engineer making the calculations, and shall be approved by the chief mechanical officer. These specification cards shall be filed as promptly as thorough examination and accurate calculation will permit. Where accurate drawings of boilers are available, the data for specification card, Form No....., may be taken

from the drawings, and such specification cards must be completed and forwarded prior to July 1, 1912. Where accurate drawings are not available, the required data must be obtained at the first opportunity when general repairs are made, or when flues are removed. Specification cards must be forwarded within one month after examination has been made and all examinations must be completed and specification cards filed prior to July 1, 1913, flues being removed if necessary to enable the examination to be made before this date.

The above rules were agreed to by the following committee representing the railways:

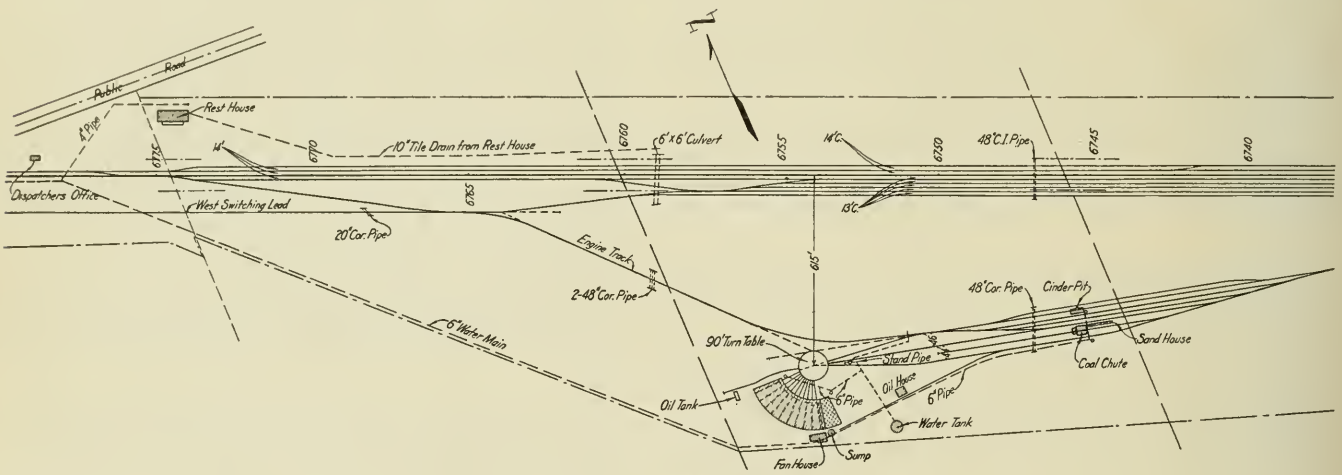
C. A. Seley, T. H. Curtis, C. E. Fuller, D. F. Crawford and D. R. MacBain; by H. E. Wills, representing the railway employees; and by John F. Ensign, chief inspector; Frank McManamy, assistant chief inspector; G. P. Robinson, assistant chief inspector.

GRADE REVISION AND TERMINAL WORK ON THE CHICAGO GREAT WESTERN.

The Chicago Great Western has five main lines on which it handles through traffic—those between Chicago and St. Paul, Chicago and Omaha, Chicago and Kansas City, St. Paul and Omaha, and St. Paul and Kansas City. Although no one of the three lines out of Chicago is the shortest route to the city it reaches, the difference in length is slight in the cases of St. Paul and Omaha and the possible loss of through traffic on account of the extra length of the Chicago-Kansas City line is offset against the heavy local business derived from the territory traversed. From Chicago to Oelwein, Iowa, where the line divides into the three main branches, all the traffic between Chicago and St. Paul, Omaha and Kansas City, is handled over a single line. The maximum grade on this division has been 1 per cent., and the line has been single track for nearly the entire distance. The division is 246 miles long and has been operated as two freight divisions with the intermediate terminal at Fair Grounds, Iowa, two miles west of Dubuque. This made the eastern engine stage 172 miles long, and the western only 74 miles. In order to facilitate the movement of the heavy traffic over this division, it was decided to reduce the maximum grade on the eastern end of the division to 0.7 per cent., add a second track at certain places, and install automatic block signals. In planning for this improvement it was decided to move the engine terminal from Dubuque to Stockton, Ill., making the eastern run 131 miles and the western 115 miles. This change also made it possible to secure the maximum grade of 0.7 per cent. at a much less cost, because the grade from Dubuque to Stockton is heavier than from Stockton to Chicago. At the same time it was decided to use consolidation locomotives east and Mallet locomotive west of Stockton, raising the maximum tonnage from 1,500 to 2,500 tons. This difference in motive power practically equalizes the difference in maximum grades, making it unnecessary in most cases to break trains at Stockton. This, of course, greatly simplifies operation and obviates the necessity of providing a large classification yard at the division point. The first work on the grade revision was begun in November, 1909, and it was practically complete during the season of the following year.

Between Forest Park, Ill., and Elmhurst the maximum grade was reduced to .5 per cent., since this is a switching district of dense traffic, and it was considered desirable to have the grades as light as practicable. Double track was built from Stockton to Kent, 5½ miles; from Forest Park to Elmhurst, 6.8 miles, and from Stanley, Iowa, to Aurora, 4.1 miles. Passing tracks were extended to 3,000 ft. in the clear at Ingalton, Lily Lake, Richardson, Wilkinson, Byron, South Freeport, Elizabeth, Farley, Dyersville, Almoral, Durango, Thorpe and Aurora. Additional yard tracks were built at Forest Park, Maywood and Bellewood. A new spur into the industrial section on the west side of the Fox river was built at West St. Charles, Ill. The entire division was laid with 85-lb. rails with Weber joints, creosoted ties and gravel ballast.

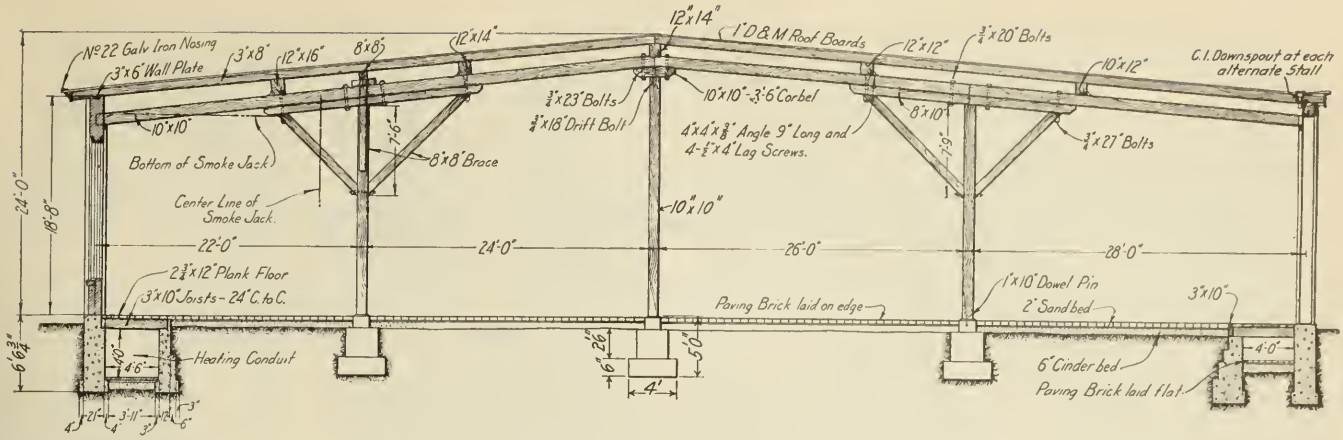
The building of the Maywood yard and of the passing track at Lily Lake was handled by company forces, using flat cars and a Lidgerwood unloader for the former, and side dump cars for the latter. The grading at Elmhurst was done by a contractor using a narrow gage contractors' outfit. The grading for the Stockton terminal, the building of the double track between Stanley and Aurora, and all the bridge and culvert work involved were contracted.



Layout of Terminal at Stockton, Ill.

Quicksand was encountered under peculiar circumstances at Elmhurst and Stockton, in both instances the deposit being in high ground. While the steam shovel was working in a cut at Elmhurst, its supports suddenly went down, slewing the shovel across the running track. It was necessary to crib up under the shovel with ties before work could be continued. When this cut was finished to permanent subgrade there were no evidences of quicksand, but great care was taken in draining it to eliminate any possibility of future trouble. In the Stockton yard work the main track was being lowered under traffic when a deposit of quicksand was encountered, and in order to prevent the filling under the track from flowing out sheeting was driven on either side and allowed to remain in place until the track could be lowered to a firm subgrade. In this case also, the final subgrade was well below the quicksand deposit and no further trouble is expected.

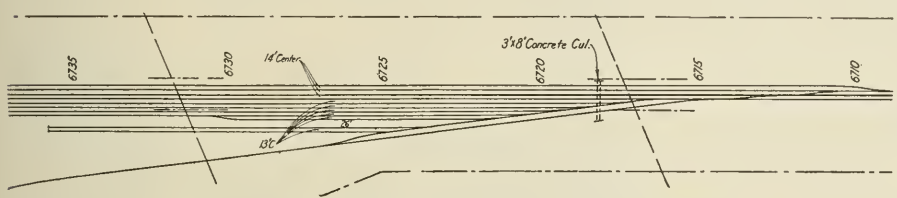
The culverts included in the sections on which a second track was added were extended by adding concrete or cast iron pipes. In some instances the old culverts were rail top stone boxes, and in these cases concrete pipe for the addition was tied to



Cross Section of Roundhouse.

the stone by dowel pins set at a sharp angle on vertical faces and vertically on horizontal surfaces.

The Stockton terminal includes a 6-track storage classification yard and two passing tracks, a 12-stall engine house, 90-ft. turntable, 100-ton concrete Link Belt coal chute, oil house, cinder pit, sand house, water tank, employees' rest house and office building. The yard is laid with 75-lb. rail and No. 8 frogs are used. About 117,000 yds. of material were used in grading the yard. Future growth has been carefully considered in designing this terminal, and the arrangement is such that additional



Layout of Terminal at Stockton, Ill. (Continued).

facilities can be provided at the least expense and with the least interruption to traffic.

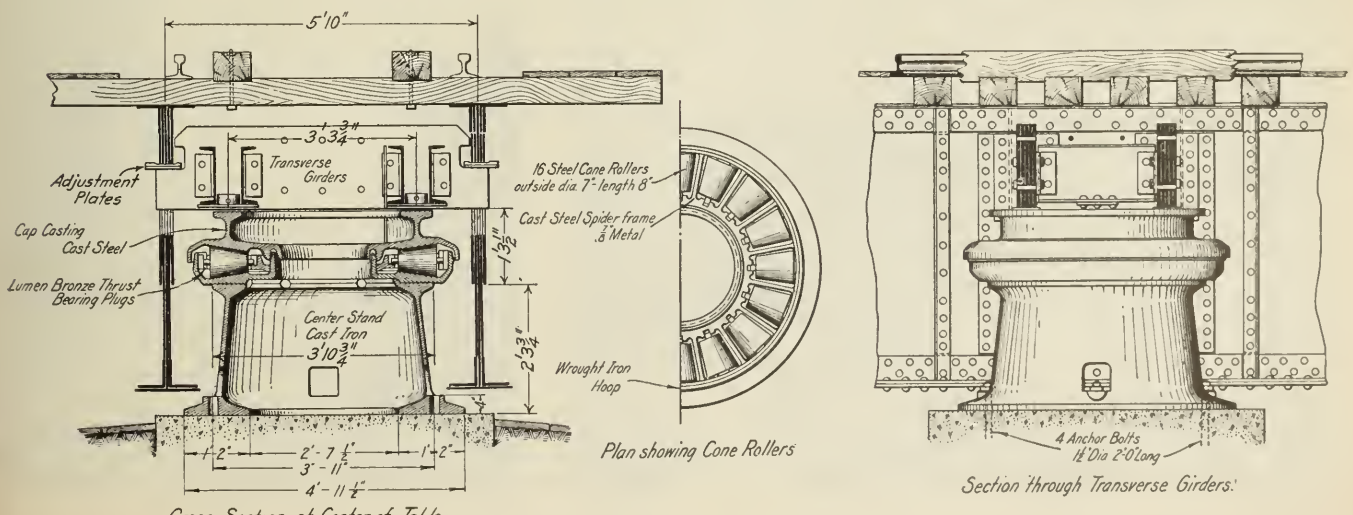
The engine house, which contains 12 stalls, is of brick construction on a concrete foundation. Details of the framing and roof construction are shown in the cross section reproduced herewith. It is equipped with a heating plant, machine shop, automatic washout and refilling system, and a power plant supplying electric current for light and power.

The turntable is of the standard design furnished by the Strobel Steel Construction Company, is set in a concrete pit and is operated by an electric tractor designed by Geo. P. Nichols & Bro. A detail of the 16-cone center for this table is shown in the drawings. The feature of special interest in this type of center is the provision which is made for adjusting the elevation of the table by inserting adjusting plates under the four points of support of the cross girders. The trailing girders at each end of the table carry four high carbon cast steel wheels running on bronze bushings.

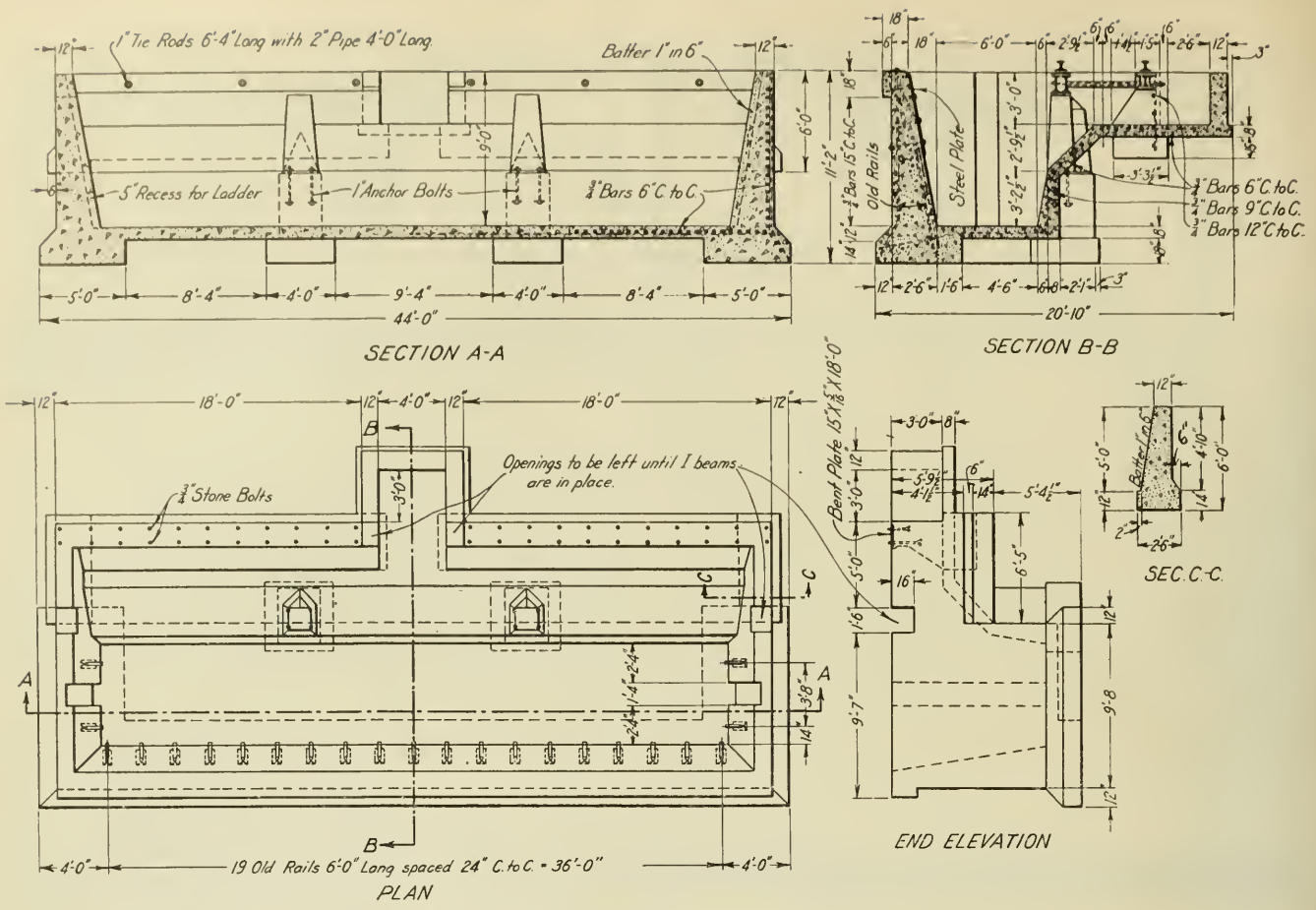
The oil house is of reinforced concrete and is fireproof throughout. A Bowser pumping outfit is installed for handling all oils. The coaling station is of the Link-Belt design and is also of reinforced concrete. It is provided with automatic scales and hoisting machinery of improved design, so that coal and sand can be delivered to locomotives at one spotting. The sand house is of brick construction and the sand is conveyed to the top of the coal chute by a compresed air system.

The cinder pit is of reinforced concrete construction and is operated with a clamshell. Details of its construction are shown. The water tank has a capacity of 100,000 gals., is supported on a 50-ft. steel frame, and is of the hemispherical bottom steel plate design. The tank is fed by gravity from a pumping plant at Stockton station, two miles away. The tank furnishes water for engine supply and fire protection.

The employees' rest house is a two-story frame building containing 28 rooms with a large dining-room and kitchen. It is provided with hot water, heat and electric lights, and affords



Strobel 90-Ft. Turntable at Stockton.



Reinforced Concrete Cinder Pit at Stockton.

first-class living accommodations for the employees who are required to lay over in Stockton. The office building is two stories high, of frame construction, and accommodates the despatcher and the yardmaster.

A complete installation of automatic block signals has been made between Chicago and Oelwein. General Electric, type M 116, d. c., bottom-post, electric motor signals are used throughout and indications are given in the upper right-hand quadrant using the normal-clear system. Each signal is operated by 16 R. S. A. standard primary cells of caustic soda battery, connected in series, and the track circuits are fed from three gravity cells in multiple. The primary batteries are housed in Massey type B battery wells, and the track batteries in concrete battery chutes. The concrete signal foundations are of the sec-

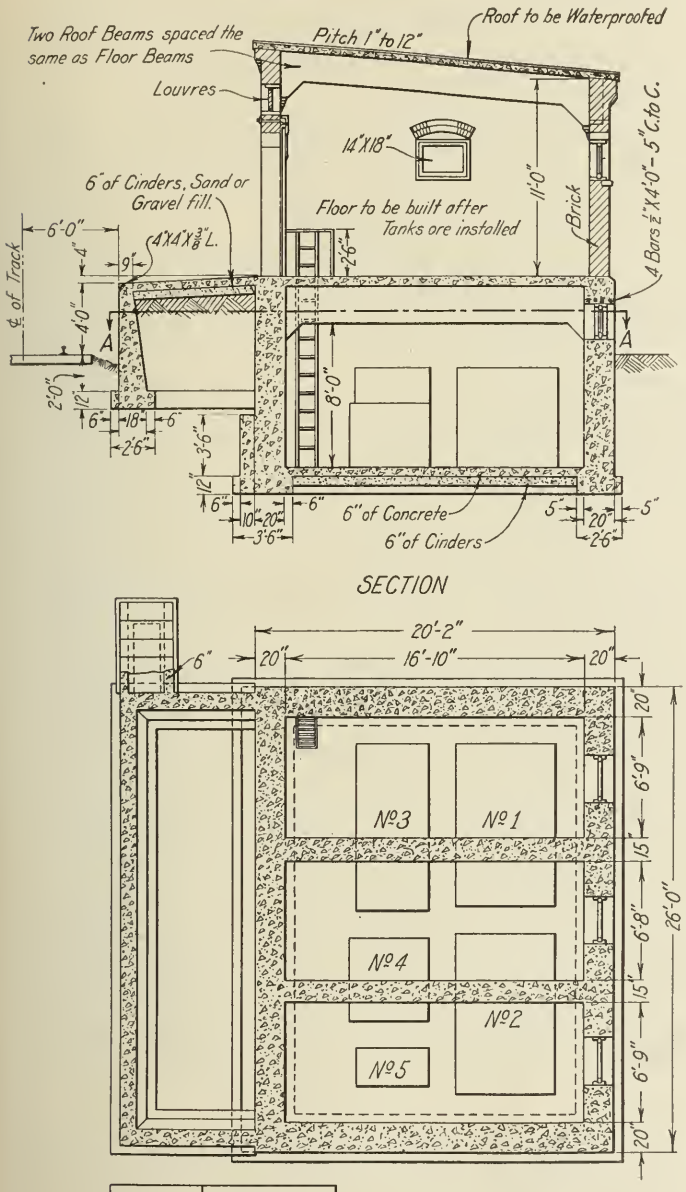




Upper Quadrant Signals on Chicago Great Western.

tional type and were made and delivered in three pieces, the lower and middle sections being placed in position by the steam derrick at the same time the battery wells were placed. The use of this type of foundation avoided the necessity of distributing and protecting the loose concrete materials and eliminated the trouble and loss of time involved in securing a water supply for concrete.

On single track two signals are located near the ends of passing tracks with one or more sets of intermediate signals between



TANK №	KIND OF OIL
1	Car
2	Headlight
3	Engine
4	Valve
5	Signal
6	Gasoline

Concrete Oil House at Stockton.

stations, depending on the distance between tracks and the conditions affecting each particular location. Caution signals are provided 3,000 ft. from the end of passing tracks, except where local conditions make it impossible to use this distance. All signals on single track operate in two positions, except where the block signal is used to regulate the approach to an interlocking plant, where the third or 45-deg. position is used to indicate caution in case the interlocked home signal is at stop. Switch indicators are provided where it was found impracticable to locate signals in the vicinity of main-track switches, as at cross-overs between the main track and the passing track, when such cross-overs are located between the ends of long passing tracks or in yards. On double tracks, indicators are provided for all non-interlocked switches and the control circuits are arranged to overlap the second signal in advance of the switch. Three-position signals, placed approximately 1½ miles apart, are used on all double track. Important main track cross-overs in double-track territory are provided with electric locks to prevent the operation of the switches after a train on the main track has entered the block. A release circuit is provided so that no inconvenience is occasioned in the making of switching movements.

The Chicago Great Western has adopted the practice in this installation of stenciling the station name on the distant signal and the number of miles from Chicago on the home signal, as shown in the photograph. By this means the distant signals replace the mile board formerly used. The numbers on the home signals give the distance in miles and tenths, the odd numbers in tenths being shown on westbound signals and the even numbers on eastbound signals, thus conforming to train numbers. The figures and letters are 6 in. high, 4 in. wide and 1 in. in width of outline.

The signal installation was made by the railway company's signal department, work being commenced in April, 1910, and completed in March, 1911. Between April 1 and April 12 272,544 signal movements were made without a failure of any kind.

The entire work of improving the Chicago-Oelwein division was done under the supervision of L. C. Fritch, chief engineer, the signal work being under the direct charge of J. Beaumont, signal engineer, to both of whom we are indebted for the foregoing information.

ACCIDENT BULLETIN NO. 38.

The Interstate Commerce Commission has issued Accident Bulletin No. 38, containing the record of railway accidents in the United States during the three months ending December 31, 1910. The number of persons killed in train accidents was 248, and of injured 3,729. Accidents of other kinds, including those sustained by employees while at work, by passengers in getting on or off cars, by travelers at highway crossings, by persons doing business at stations, etc., by trespassers, and others, bring up the total number of casualties, excluding "industrial accidents," to 22,586 (2,659 killed and 19,927 injured). The casualties are classified in Table 1, given herewith, which includes some details from Table 1B not here shown.[1] (The accident statistics of electric lines are given in a separate table.) Supplementing the statement of railway accidents proper the commission gives the following record of "Industrial accidents"; those occurring to employees of the railway on railway premises in which the movement of cars or engines is not involved:

Industrial accidents to employees.

	Killed.	Inj'd.
While working on tracks or bridges	36	4,239
At stations, freight houses, engine houses, coaling stations, water stations, etc., where no moving railroad car or engine is involved	26	4,847
In and around shops	21	9,426
On boats and wharves	3	325
At other places	21	1,557
Total	107	20,394

Adding the casualties to employees in industrial accidents to

[1] This bulletin is the second to be issued under the revised accident law. The class termed "Industrial accidents" includes a large part of those casualties to employees which in former bulletins have been included in Table No. 1, under "Other causes."

the figures given in the larger table we find that the total number of employees killed, including those who were not on duty, is 1,042, and the total number injured 24,276; and this makes the total number of persons killed, all classes, 2,766, and injured 40,321.

In those classes of items in Table No. 1 which are made up on the same basis as under the former law, and which therefore may be compared with the records of a year ago, the totals show decreases in every instance, as will be seen by Table 1A below; and the comparison with Bulletin 37, for the quarter immediately preceding this, is favorable also, except under the head of coupling accidents. In connection with the first item of Table No. 1A it is to be observed that in this quarter, as in the one last preceding, the figures here shown should be supplemented by those showing passengers killed in collisions on electric railways for in both these quarters the worst disasters in the record

In the larger double column table will be found the usual list of class A train accidents all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest.

Collision No. 7 was a butting collision of passenger trains on a double-track railway; the westbound train having been turned on to the eastbound track for a few miles in consequence of an obstruction on the westbound track. When it had nearly reached the point where it would be returned to the westbound track and while running at about 25 miles an hour, it was met by an eastbound train running at about 45 miles an hour. The collision occurred at about 2 a. m. The eastbound train had run past one distant and three home signals set against it. The engineman was killed and it is not known how he came to dis-

TABLE NO. 1.—CASUALTIES TO PASSENGERS, EMPLOYEES, AND OTHER PERSONS.

	Passengers.		Employees on duty.		Employees not on duty.		Other persons not trespassing.		Trespassers.		Total persons.	
	Killed.	Inj'd.	Killed.	Inj'd.	Killed.	Inj'd.	Killed.	Inj'd.	Killed.	Inj'd.	Killed.	Inj'd.
Collisions	18	974	115	1,093	2	27	2	16	7	9	114	2,119
Derailments	12	588	56	422	...	15	...	14	7	17	75	1,056
Accidents to trains, cars, or engines, except collisions, derailments, and boiler explosions	...	39	2	205	...	...	1	14	...	...	3	258
Bursting of, or defects in, locomotive boilers or boiler attachments	...	...	26	292	...	...	...	...	...	4	26	296
Total train accidents	30	1,601	199	2,012	2	42	3	44	14	30	248	3,729
Accidents to roadway or bridges not causing derailment, such as fires, floods, landslides, explosions, etc	1	6	...	27	...	...	...	1	...	...	1	34
Coupling or uncoupling cars	...	...	60	877	...	...	...	...	...	...	60	877
While doing other work about trains (not in shops or engine houses) or while attending switches	...	...	39	5,356	...	1	...	1	...	...	39	5,358
Coming in contact while riding on cars, with overhead bridges, tunnels, or any signal apparatus, or any fixed structure above or at the side of the track	...	6	23	429	1	3	...	...	4	11	28	449
Falling from cars or engines	21	96	108	1,669	1	13	4	15	99	109	233	1,902
Getting on or off cars or engines	24	697	50	2,257	8	68	6	45	111	319	199	3,386
Other accidents on or around trains not here named	6	807	1	175	1	21	...	112	10	41	18	1,156
Being struck or run over by engine or car at stations or yards	13	41	209	400	32	19	38	122	266	248	558	830
Being struck or run over by engine or car at highway grade crossings	...	1	10	15	3	2	233	663	35	32	281	713
Being struck or run over by engine or car at other places	...	...	128	157	41	15	18	53	746	345	933	570
Other causes	1	91	14	262	5	62	12	423	29	85	61	923
Total, other than train accidents	66	1,745	642	11,624	92	204	311	1,435	1,300	1,190	2,411	16,198
Grand total	96	3,346	841	13,636	94	246	314	1,479	1,314	1,220	2,659	19,927

occurred on "interurban" lines. These electric-car collisions are included in Table No. 2A.

TABLE NO. 1A.—*Comparison of principal items with last bulletin and with one year back.*

	Bulletin 38.	Bulletin 37.	Bulletin 34.
1. Passengers killed in train accidents	30	63	39
2. Passengers killed, all causes	96	135	105
3. Employees (on duty) killed in train accidents	199	209	205
4. Employees (on duty) killed in coupling	60	56	66
5. Employees (on duty) killed, total	841	869	968
6. Total, passengers and employees (items 2 and 5, above)	937	1,004	1,073
7. Other persons killed (including trespassers, non-trespassers, and employees not on duty), all causes	1,722	1,944	...
8. Employees killed in industrial accidents	107	132	...

The total number of collisions and derailments in the quarter now under review was 3,366, of which 241 collisions and 152 derailments affected passenger trains. The damage to cars, engines, and roadway by these accidents mounted to $2,831,469, as below:

TABLE NO. 2.—*Collisions and derailments.*

	Number.	Loss.	Killed.	Inj'd.
Collisions, rear	405	$427,895	47	482
Collisions, butting	212	462,246	58	663
Collisions, train separating	102	37,832	..	37
Collisions, miscellaneous	1,115	570,313	39	937
Total	1,834	$1,498,286	144	2,119
Derailments due to defects of roadway, etc.	297	$263,186	9	382
Derailments due to defect of equipment	709	599,532	10	146
Derailments due to negligence	108	77,957	10	89
Derailments due to unforeseen obstruction	58	38,176	6	71
Derailments due to malicious obstruction	15	24,376	7	32
Derailments due to miscellaneous causes	345	329,956	33	336
Total	1,532	$1,333,183	75	1,056
Total collisions and derailments	3,366	$2,831,469	219	3,175
Total for same quarter of 1909	3,206	2,733,830	220	3,731
1908	2,684	1,940,133	173	2,616
1907	3,964	2,962,470	197	3,813

regard the signals; but the superintendent reaches the conclusion that probably he had been disabled by sudden sickness or by sudden death. He was 55 years old and had been a careful and painstaking engineman for 26 years. About 10 months before the date of the accident he had taken a vacation of considerable length because of ill-health, and at the investigation of the accident it was disclosed that he had recently been taken sick on the street. At one time he had been unconscious for about 40 minutes in a fainting spell, with apparently complete suspension of animation; but there were no indications of sickness when he reported for duty on the trip which ended in the collision.

Collision No. 12 between westbound and eastbound freight trains, about 3 a. m., was due to the failure of the men on the westbound train to identify eastbound trains which they met. The engineman of the westbound train was killed and his neglect is unexplained. This train was ordered to meet two eastbound trains at G, and the conductor and the other surviving members of the crew say that they thought they saw the tail lights of two trains at that station; but they admit they did not take care to see whether there were two engines. The eastbound train which was met at G sounded a whistle signal to indicate that a second section of the same train was following, and this whistle signal was answered by a whistle signal from the engine of the westbound train; but it is the conclusion of the superintendent that this answer was given by the fireman and that the engineman was asleep.

Collision No. 13 occurred on an electric interurban railway. It was between a northbound and a southbound passenger train, each "train" consisting of a single car. Both were running at a speed of about 35 miles an hour immediately before the

collision, and both were badly wrecked. The collision was due to forgetfulness of the men in charge of the northbound train. They ran their car about 2½ miles beyond the point at which they should have met the southbound, this point having been fixed by an order that had been issued to them by the train despatcher.

The motorman at fault has absolutely no explanation to give as to how he came to forget the order. He had been on duty only 18 minutes, having just begun his trip. He had been in the employ of the road about four years, and is spoken of in the report as a careful and competent employee.

The conductor of this car claims to have observed that the motorman was running past the appointed meeting place, and says that he gave a signal of one stroke on the bell, indicating "stop"; but the motorman denies that he received such a signal, claiming that he received a signal of two strokes, meaning "proceed." The superintendent holds that the conductor, instead of giving the ordinary stop signal, should have given the emergency stop signal provided for in the rules. This was not done. The conductor says that when he noticed that the motorman did not obey the stop signal he assumed that he (the motorman) had received further orders; and the conductor started toward

TABLE NO. 24.—CAUSES OF 47 PROMINENT TRAIN ACCIDENTS.

[Note.—R stands for rear collision; B, butting collision; M, miscellaneous collisions; D, derailment; P, passenger train; F, freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars and roadway.	Reference to record.	Cause.
1	R	P. and P.	1	154	$359	71	Electric car run into by following car by reason of darkness. Leading car had been stopped by some defect and the trolley wheel had been pulled away from the trolley wire, extinguishing tail lights.
2	R	P. and P.	1	24	2,008	72	Despatcher, contrary to rule, authorized the running of the second section of a passenger train on a caution card. Engineman also at fault for not keeping a good lookout; he was flagged but did not heed the signal.
3	M	F. and F.	2	2	2,400	46	Collision at meeting point (5 a. m.). Engineman and fireman of westbound train, asleep, had run past two automatic block signals and a fusee. Men in charge of eastbound train at fault for encroaching on the time of the westbound, 3 minutes.
4	R	P. and P.	5	4	2,812	15	Passenger train approached station not under control (6 a. m.). Five drovers in freight caboose killed. Engineman addicted to liquor, but his superiors had not discovered the fact.
5	B	F. and F.	0	6	2,961	42	Collision at meeting point (4 a. m.). Engineman asleep; had been on duty 4 hours.
6	B	F. and F.	5	25	2,973	1	Work train and extra freight train collided in dense fog. Men in charge of freight at fault for not protecting their train by sending out flagman.
7	B	P. and P.	6	18	35,500	81	Disregard of block signals. Engineman reported killed; but it is believed that he had been disabled by sudden sickness or death. See note in text.
8	R	P. and F.	3	0	4,874	77	Passenger train (3 a. m.) ran into rear of extra freight. Clear block signal given when block was not clear, by telegrapher 21 years old, of 2 years' experience.
9	B	F. and F.	3	1	5,000	6	Operator failed to deliver order.
10	B	P. and F.	0	9	5,200	70	Engineman of light engine overlooked schedule of regular passenger train. No conductor on light engine; engineman experienced; fireman, 21 years old, was on his first trip outside of yard; had been in service in yard 17 days.
11	B	F. and F.	1	4	5,660	3	Operator failed to deliver order; conductor and engineman neglected to check clearance card against orders in their possession.
12	B	F. and F.	4	4	6,200	89	Failure to identify train met. See note in text.
13	B	P. and P.	36	19	7,500	9	Northbound electric car ran past meeting point. See note in text.
14	R	F. and P.	2	21	8,600	13	False clear block signal. See note in text.
15	B	F. and F.	3	2	8,700	82	Westbound extra encroached on time of regular eastbound freight; engineman killed; extra had right over second section, but conductor carelessly assumed had right over both first and second. He did not show order to flagman.
16	B	F. and F.	1	1	9,000	11	Engineman of light engine misread despatcher's order; fireman did not read it.
17	M	P. and F.	1	3	10,000	49	Excessive speed and disregard of stop signal at interlocking. Engineman killed.
18	B	P. and F.	2	13	10,000	52	False clear block signal. See note in text.
19	B	P. and P.	0	29	10,150	14	Misplaced switch in yard; low switch stand; engineman and fireman not blamed.
20	B	F. and F.	1	6	10,475	47	Westbound train ordered to run 2 hours 25 minutes late; ran 2 hours 15 minutes late (3 a. m.). Engineman says he made mistake reading time-table; conductor makes same claim, but superintendent does not admit claim.
21	B	P. and F.	3	7	10,874	54	Careless running. See note in text.
22	R	P. and F.	0	8	14,600	73	Passenger train standing at flag station run into at rear by following freight; operator 6 miles back did not maintain full time interval between trains. Men in charge of both trains also at fault.
23	M	P. and P.	0	28	14,700	39	False clear block signal. See note in text.
24	M	P. and F.	1	18	16,700	87	Passenger train approached station with speed not under proper control; yard engine on main track without protection. Engineman of passenger train killed.
25	B	P. and P.	6	29	18,300	7	Operator failed to deliver order. See note in text.
26	B	F. and F.	8	1	27,600	53	Conductor and engineman of westbound train overlooked schedule of eastbound (4 a. m.). These 2 men were killed.
27	B	F. and F.	3	11	50,000	83	Train of 13 dump cars became uncontrollable on steep descending grade. It is believed that an angle cock accidentally became closed.
28	R	P. and F.	1	10	15,000	90	Careless running, and failure of flagman to protect standing car. (Electric cars.)
	Total	.....	99	457	$318,146	...	

DERAILMENTS.

1	D	P.	1	1	$1,000	38	Improper fitting of miter rail joint at drawbridge. See note in text.
2	D	P.	3	58	2,500	31	Excessive speed; 60 miles an hour on track where the highest allowable speed was 30 miles an hour; conductor and engineman both experienced.
3	D	F.	3	0	4,919	103	Excessive speed on curve; engineman was making his fourth trip on this division.
4	D	P.	0	2	7,200	36	False clear signal. See note in text.
5	D	P.	0	19	8,600	94	Defective side bearing of tender.
6	D	F.	0	0	10,000	18	Broken flange.
7	D	F.	0	0	10,259	61	Broken axle.
8	D	P.	0	1	10,700	60	Excessive speed through crossover. Engineman (3 a. m.) failed to observe distant signal.
9	D	F.	0	0	10,860	59	Runaway on steep descending grade. See note in text.
10	D	F.	0	0	11,100	21	Runaway on steep descending grade. In preparing to move standing cars, the hand brakes were released before the air reservoir was filled.
11	D	P.	1	45	11,259	98	Derailed at frog because of absence of guard rail. Guard rail had been torn up by some cause undiscovered.
12	D	F.	0	0	12,000	91	Part of brake rigging fell on track.
13	D	F.	0	0	12,819	95	Broken arch bar in truck of coal car.
14	D	P.	1	14	14,000	35	Misplaced switch (4 a. m.). Switch had been run through by a freight train traveling in the opposite direction.
15	D	F.	0	3	15,000	27	At derailing switch at end of double track; excessive speed on descending grade.
16	D	F.	0	0	15,859	25	Broken truck (arch bar).
17	D	P.	4	18	19,235	101	Undiscovered; speed 40 miles an hour; curvature of track 6 degrees; track in good condition. Four mail clerks killed.
18	D	F.	2	2	20,200	26	Undiscovered.
19	D	P.	0	55	36,000	23	Failure of top chord of lattice girder bridge, 76 feet long. Plan of bridge provided a sufficient factor of safety; "failure of material a mystery."
	Total	.....	15	218	$233,510	...	
	Total collisions and derailments	....	114	675	$551,656	...	

the front of the car to inquire as to this. He was stopped, however, by a passenger who asked him a question, and before he had finished talking with the passenger the collision had occurred. The conductor had been employed by the company about three months, and his record up to the time of the collision was clear. He had previously and for several years been employed as night agent at a station on a large railway and brought recommendations from that road as a capable man, sober, industrious, and honest; and as one whose work had been satisfactory.

Collision No. 14 was due, primarily, to a false clear block signal. A passenger train, standing at a station, was run into at the rear by two engines, coupled together, without train, and the rear car of the passenger train was wrecked, and was destroyed by fire, illuminating gas from its ruptured pipes having been ignited by sparks in the front end of the colliding engine, which was broken. The station at which the passenger train was standing was at about the middle of the block section. The block section (manual) extends from C, 2 miles west of this station, to S, 2 miles east of it. The passenger train had been delayed eight minutes by a defective coupler, and the rear brakeman is held at fault for not having gone back with red signals to stop any following train. The conductor is also held at fault for not having seen that this was done. The rear passenger car of the train was empty at the moment of the collision, and the two persons killed and three of the injured were standing at the moment of the collision, on the track between the engine of the passenger train and its leading car, the defective coupler having been at this point. The signalman at C had had four and one-half months' experience, but had been a telegrapher for three years before that.

Collision No. 18 was due to a false clear block signal given by a signalman who was confused. He omitted to examine the block sheet, and also gave misleading information to the despatcher. He gave a clear block signal and also a clearance card to a westbound work train. This train was delayed and did not start at the time expected, and the signalman, being called upon to admit another train to the block section, canceled (on his record) the right of the work train to the block, without communicating with the work-train conductor, and then he authorized the station at the other end of the block to give a clear signal to an eastbound train. This signalman had been in the service three months.

Collision No. 21, which occurred at midnight on a cold and stormy night, was due to a lack of caution on the part of the engineman of a passenger train. This engineman was killed. A helping engine, attached to the front of the train, had just been detached and run forward about 1,500 ft. to be backed into a sidetrack, so as to allow the passenger train to proceed on its way. On account of the switch of the sidetrack being frozen, the helping engine was run forward some distance to another sidetrack, and just as it was backing into this track it was struck by a passenger train. The engineman of the helping engine says that he sounded two blasts of the whistle to indicate to the engineman of the passenger train what was being done. It is supposed that the engineman of the passenger train misinterpreted this whistle signal, assumed that it meant that the helping engine was clear of the main track, and did not notice that it had gone forward to the second switch. It appears that he ran his engine into the helping engine without seeing it. An eastbound train, passing at the time, was damaged by the engines which were derailed in the collision.

Collision No. 23, which occurred about 2 a. m., was between eastbound and westbound passenger trains, and was due principally to the error of a telegrapher in giving a clear block signal wrongfully. The westbound train was entering the sidetrack at a point about 750 ft. east of the station, and it was struck in the side by the eastbound, which had been started from the station in consequence of the clear track signal erroneously given. It was the duty of the telegrapher in the station to know positively from his own observation that the westbound train was in the sidetrack, clear of the main line, before giving the clear signal to the eastbound train. The engineman and fireman of the eastbound knew that they were to meet the westbound at this station, and are also held blameworthy for proceeding without knowing that the main track was clear. The engineman said that he was deceived by an "all right" hand signal given by some person standing on the main track in the vicinity of the westbound train. The superintendent finds that no such hand signal was given, but thinks it possible that the engineman saw a signal which was given by a brakeman of the westbound train to the engineman of his own train.

Collision No. 25 was due to failure on the part of a telegraph operator to deliver an order to an eastbound train. This order, sent to the operator at M and requiring the eastbound train to wait at M for the westbound train, was sent in the regular form and after the operator, in accordance with the rule, had advised the despatcher that the stop signal had been displayed to stop the train. But the signal was not displayed, and the train passed the station and collided with the opposing train after running a very short distance. As these two trains had frequently been ordered to meet at this place, the conductor of the eastbound train went to the office and asked the operator if there were any orders for that train, and was told "no." Not satisfied with this, he went to the operator a second time, repeated his question, and received the same reply. The facts of the case as here stated are denied by the operator, and he stated that "he had not been drinking." This operator is 30 years old. He has been in the employ of the road about 18 months, and had had 7 years' experience in railroad work before that.

Derailment No. 1 occurred at a drawbridge at 6:30 p. m. The engine and tender fell into the river and the engineman was drowned. The train had been brought to a stop just before proceeding to cross the drawbridge and had received the proper hand signal from the bridge tender; but one of the movable rails at the end of the bridge, which had been lifted the last time the bridge had opened, had not dropped in place; it had rested on the top of the fixed rail, and this maladjustment was the cause of the wreck. The bridge tender had not discovered the trouble and gave the proceed signal as though the track were in good condition. The report does not say how it came about that the rail failed to drop in place, the cause not having been determined. It may have been from unusual expansion. The rail was not interlocked in any way. The bridge tender in charge was 22 years old and had been in the service seven weeks.

Derailment No. 4 occurred about 5 a. m. to train No. 49. It was due to the negligence of a signalman in charge of switches at a junction and to the improper clearing of a signal which was out of order. The engine ran about 300 feet when off the rails and was overturned, and five baggage cars were damaged. It appears that, after a previous train had used the crossover track, the signalman forgot to close the derailing switch, and the signal which should have stopped train No. 49 before it reached this switch had been fastened in the clear position because of some of the connections being out of order. The superintendent holds blameworthy the signal maintainer for thus fastening the signal, contrary to the regulations, and also the second-track and third-trick signalmen for consenting to work under this irregular condition. All of these men had been in the service several years.

Derailment No. 9, occurring about 5 a. m., was due to the accidental closing of the angle cock in the air-brake pipe on the fifth car back of the engine of a freight train of 42 cars. In consequence of the inability of the engineman to control the speed of the train it ran at uncontrolled speed for about 8 miles, when, at a curve, 36 cars were derailed; the engine and first 6 cars, however, ran safely some distance farther, to a point where they were stopped by an adverse grade. As the train started from the summit, at A, the only men in position to control it were the engineman, the fireman, and one trainman,

as the conductor and the rear trainman were on the caboose, which had been detached with a pushing engine which had assisted the train to this point. When the engineman tested the air brakes, immediately after passing the summit, he noticed by the exhaust that the train line probably was obstructed, and he sent the trainman back to look for the trouble. The engineman lighted a torch and immediately followed, but had gone only as far as the third car when his torch was extinguished by the wind. By this time the speed of the train had so increased that all three of these men became alarmed and jumped off. In the examination of the engine and the six cars which were not derailed it was found that a draft timber at the rear end of the fifth car had become loosened and had dropped so far that it rested on an angle cock in such a way as to turn it, and it is the conclusion that this was the primary cause of the wreck. It is not known where the damage to the draft timber occurred, but it is believed to have occurred at a point 9 miles back, where a stop was made to take water. The air brakes had worked properly as far as this watering station, and on the five cars which were not derailed the brake shoes were found to have been badly heated. As the grade where this accident occurred was descending at the rate of 1.3 per cent., it is the conclusion of the superintendent that it would have been impossible to hold the train by the few air brakes available; that after the train had gained the headway that it did while the engineman was looking for the trouble, it would have been impossible for the three men to have checked the speed by the use of hand brakes, and therefore the engineman did not desert the train until after it was impossible to control it. The detaching of the caboose at the head of the grade was necessary because the helping engine was ahead of it. The company has now ordered this practice discontinued, and helping engines are to be attached behind the caboose.

Electric railways reporting to the Commission had 114 persons killed during the quarter and 1,031 injured; and there were 46 collisions and 21 derailments. Thirty-four passengers and six employees were killed in collisions; and one employee was killed by a derailment. The total number of pasengers killed was 42; employees killed 20, including one not on duty and four in "industrial" accidents; trespassers struck or run over by cars 37. Of this 37 the number killed was 25 and the number injured was 12.

THE TRANS-PARAGUAYAN RAILWAY.

The extension of the Trans-Paraguayan Railway marks one of the most important undertakings in the development of the republic. At present the main line of this road has been constructed from Santos, Brazil, to a point near the celebrated Iguazu falls on the Iguazu river, but the proposed extension will lead it through the great quebracho, or ironwood, districts of Paraguay, Argentina, and Bolivia. It will also place these countries in direct railway communication with Brazil and Chile. Not only will the great tracts of quebracho and other timber lands be benefited, but extensive zones of rich agricultural and grazing lands will be thrown open to settlement and cultivation. The proposed extension will also cross a number of important navigable rivers which, with their numerous tributaries, penetrate vast areas of only partially explored or wholly unexplored countries. The railway will also tap the productive yerba maté region of the upper Parana river, and, traversing the republic of Paraguay, will arrive at Villa Hayes, a bustling port on the Paraguay river. From this point the extended railway will enter the partially explored Chaco territory noted the world over for its abounding forests of ironwood. The completion of the proposed extension will place Paraguay and Brazil into rail communication with the port of Antofagasta, Chile, and with the great railway system of Bolivia and southern Peru, thereby filling a long left want of these five South American countries.

GRAND CENTRAL INTERLOCKING MACHINE.

H. S. Balliet, engineer of maintenance of way of the Grand Central Terminal, New York City (and also signal engineer of the electric division), has just set up a 400-lever electric interlocking machine in one of the two principal cabins of the Grand Central Terminal; and a picture of the machine, as it was set up for testing in the shop of the General Railway Signal Company at Rochester, is given herewith. Back of this machine is seen the 360-lever machine which is to be set up in the cabin for the upper level; the first mentioned being for the lower level. These machines have "lever lights" or illuminated numbers over each lever, and the numbers on some of these are faintly discernible in the foreground of the picture. The irregularity of appearance of the controllers, which appear at the back part of the machine, is due to the fact that on some of the levers these controllers are two tiers in height, on others three, and on others four or five. The construction of these "unit levers" was described and illustrated in the *Railway Age Gazette* of October 7 last, page 624. In that issue was also shown the design of the "four-story" fireproof signal cabin. In this building the rooms used for the interlocking machines are in the second and fourth stories (at the north end) that in the second story for the lower level tracks, and that in the fourth for the upper level tracks. This building, just north of 49th street, stands close to the line of Park avenue, which is over head, and which runs parallel to the center tracks through the yard. The signal station for the upper level is designated "A," and that for the lower level "B."

The interlocking machines are the General Railway Signal Company's model No. 2, but the lever arrangement as well as numerous details was designed by Mr. Balliet and his assistants.

The 400-lever machine is 67 ft. 7 in. long, 2 ft. 6⅛ in. wide and 4 ft. 3⅝ in. high. It is built in ten sections, each section comprising fifteen locking plates, or a total of one hundred and fifty plates. In order to have perfect alinement of tappets and locking, these plates, which are 16 in. long, have been milled to within 1-1,000th of an inch of the calculated size. The length of the longest locking strip used in this machine is 210 in.

There are five distinct operating sections to this interlocking machine. That is to say, it is an assemblage of five interlocking machines in one room, and interconnected by means of mechanical interlocking, instead of electrically, as would become necessary if there were five separate plants.

The following tabulation shows the number of units controlled from each section:

	Section Nos.					
	1	2	3	4	5	Ttl.
Levers for signals	21	43	34	51	60	209
Levers for switches and M. P. frogs	10	33	26	45	39	153
Total working levers	31	76	60	96	99	362
Spare spaces	5	8	7	11	7	38
Total frame	36	84	67	107	106	400

There is a lever for each signal, that is to say, no signals are worked through selectors. There is also a lever controlling each point switch, each set of slip points and each set of movable point frogs, the entire arrangement having been worked out on the basis of the simplest method of maintaining the apparatus and of promptly making repairs if failures occur. The 153 switch levers control switches as follows: 13 turnouts No. 6½, 16 turnouts No. 7, 35, No. 8, 1 No. 10, and 1 No. 12; 6 No. 7 double slips, 23 No. 8 double slips, and 29 movable point frogs, 6 of them No. 7 and 23 No. 8. The use of sub-stations at 10 points in the yards was described in our former article, referred to above.

The levers in this machine are numbered from 701 to 1,100 inclusive. Throughout the yard each switch, slip, movable point frog and signal has a different number, so that there are no duplicates anywhere in the whole terminal, including both the upper and lower levels. This plan was adopted to simplify the issuing of orders and the interchange of directors and other employees between the different cabins. Thus any function in

either yard can be quickly and accurately designated with the least possible chance of error.

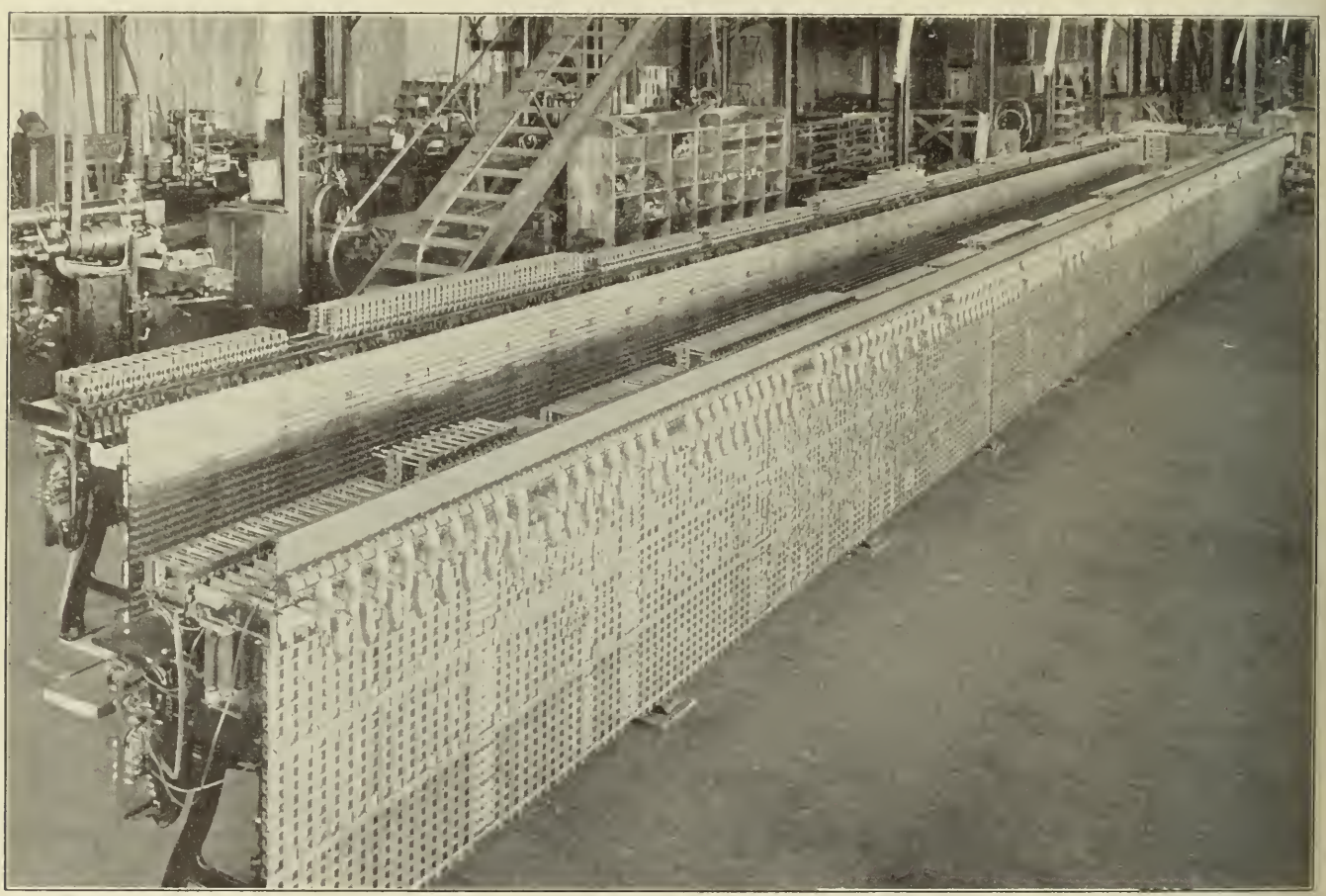
With the two machines in stations A and B this building will house the largest number of interlocking levers ever assembled under one roof. As the cabins, both in the upper and lower levels are surrounded by numerous columns supporting the structure above, the signal men will have to depend entirely on their electric indicators for their knowledge of the position of trains. This being so, it would have been entirely feasible to put all of the 760 levers in a single frame, on the fourth floor; but, after considerable study, it was concluded that the separate arrangement would best promote simplicity of operation. The minimum force of men in each cabin will be a director with one assistant and enough levermen to set the switches and signals with the requisite promptness.

The wooden cabinet which is to inclose this machine will have hinged doors for all of its openings, and these will be locked with Yale & Towne standard locks, thus affording protection against the leverman who yields to the temptation to pick an indication. The wires which extend from the machine to the switches and signals are led out through a series of small doors at the bottom of the cabinet. These wires all start from a terminal board on which connections are so made that any lever can be disconnected and taken out quickly without disturbing adjacent levers or interfering with the locking.

This machine in station B controls the switches and signals in a territory of about 23½ acres—that is to say, a yard, 3,000 ft. long and 600 ft. wide. The limits of this yard are Fifty-fifth street on the north and Forty-third street on the south; Lexington avenue on the east and Vanderbilt avenue on the west. South of Forty-third street there is an independent small cabin for the loops, one cabin for both levels. Diagrams of the tracks of these yards were given in connection with the description published in October, above referred to.

Station B, when put in service, will take the place of a 68-lever electric interlocking machine of the General Railway Signal Company, which is now in use at the east side of the yard, not far from the new building. A number of the tracks controlled from this temporary cabin are not in their permanent locations and will be superseded by others when the control is finally transferred to station B.

This will be the second permanent interlocking to be set up in the new terminal, the first having been the 144 lever machine at station U at the entrance to the yard (Fifty-seventh street), which was set up about a month ago.



Electric Interlocking Machine of 400 Levers, for Signal Station "B"; Grand Central Terminal, New York City.

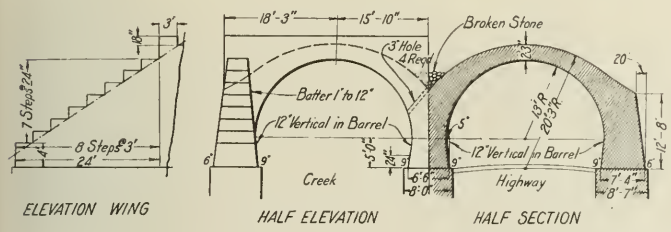
REPLACING STEEL VIADUCTS ON THE BESSEMER & LAKE ERIE.

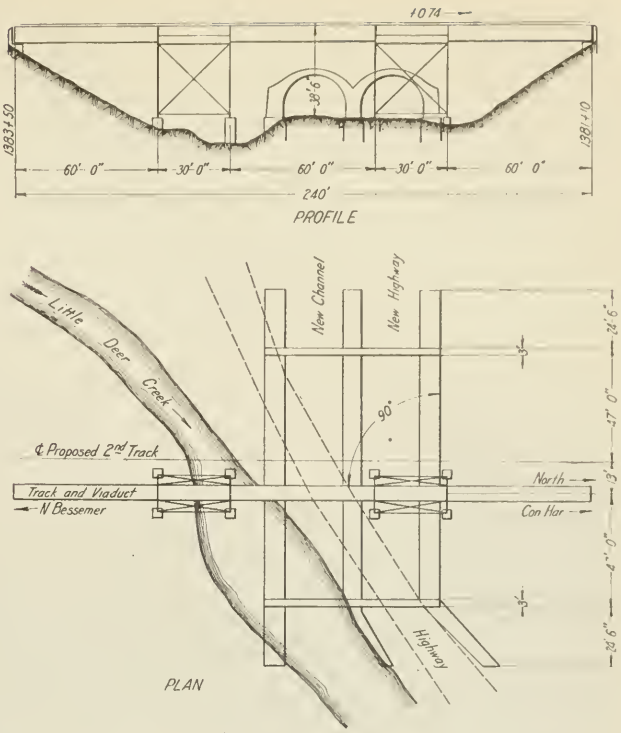
The Bessemer & Lake Erie has for several years been gradually replacing the steel viaducts on its line between Butler, Pa., and North Bessemer with concrete arches. This portion of the Bessemer & Lake Erie was built in 1897 as a single track line through a rough country and required 16 large steel viaducts and bridges, these structures being designed for about Cooper E-40 loading. Due to the increase in weight of the motive power and rolling stock these structures are too light for the present traffic. Also second track either has been constructed or is now under construction over the entire road, with the exception of about four miles. In designing structures for this heavier motive power and for the second track Cooper's E-60 loading has been used, and concrete arches are in most cases replacing the steel viaducts.

Since 1904 a steel viaduct near Frazier, 780 ft. long and 85 ft. above the stream, has been replaced with a double 26-ft. arch for the stream and a 33-ft. arch for a highway, 223,000 yards of material being required to fill the remainder of the structure. A viaduct near Rural Ridge, 240 ft. long and 42 ft. high, has been

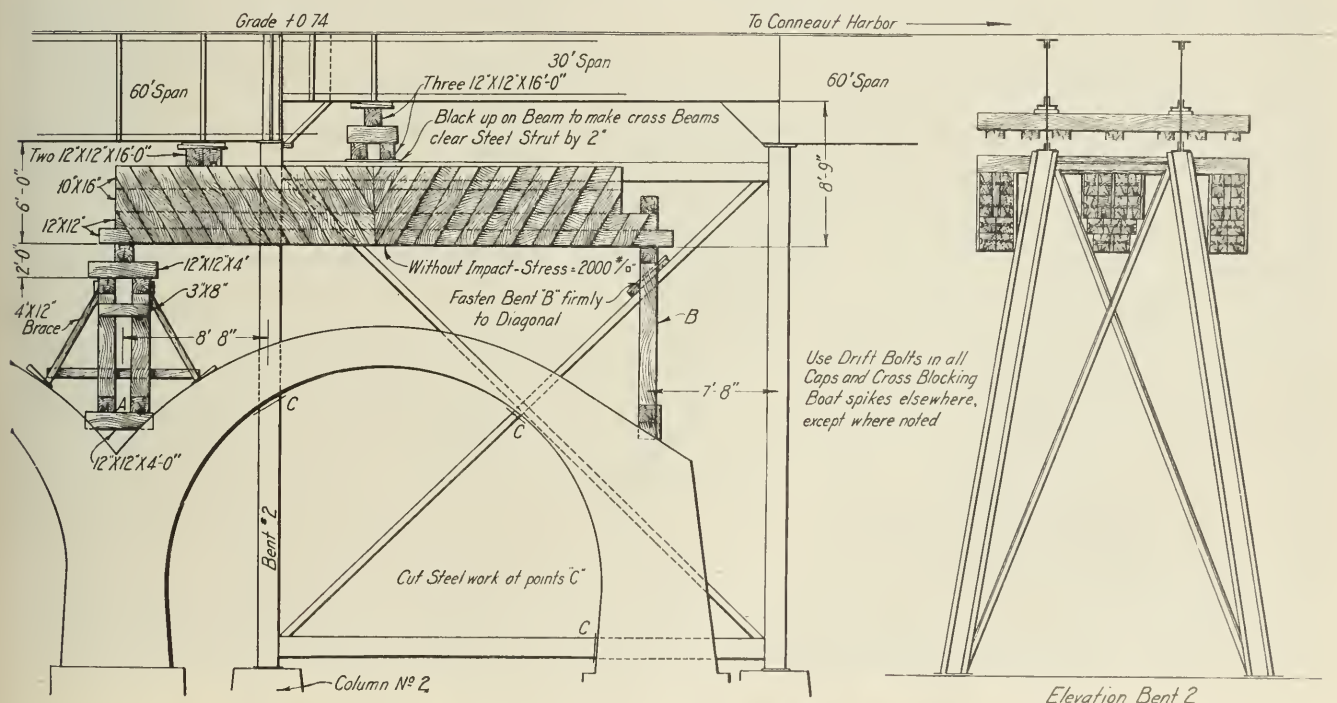
replaced by a double 26-ft. arch, one barrel of which provides an opening for a highway. Another viaduct near Rural Ridge 480 ft. long and 80 ft. high has been replaced by a double 12-ft. arch, while a viaduct near Milltown, 510 ft. long and 84 ft. above the stream, has been replaced by a 12-ft. arch for the stream and a 60-ft. girder span with concrete abutments for a highway.

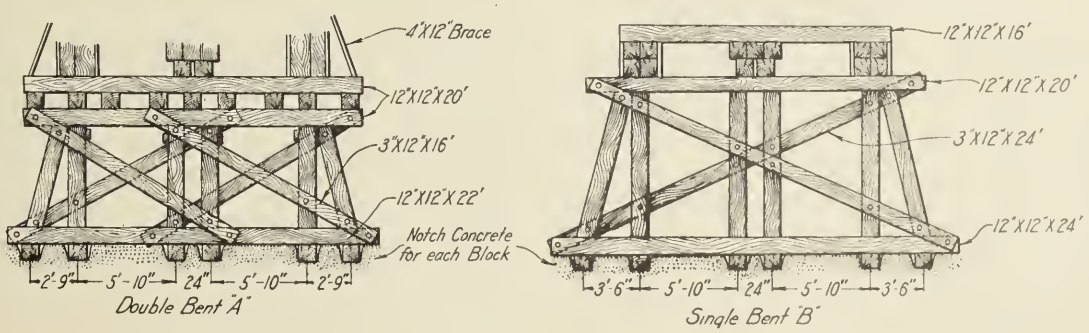
It is also planned to double-track the line between Culmerville and Woods, 3.7 miles, in which stretch four viaducts of 600 ft., 420 ft., 480 ft. and 420 ft. will be replaced with concrete structures. At North Bessemer a temporary viaduct for construction purposes is now being erected to carry the traffic across Plum creek, while the old viaduct is being replaced by arches over Plum creek, over a branch of the Allegheny Valley Railroad and over a highway. This viaduct is being erected 110 ft. distant from the old line and will be bolted instead of riveted. A temporary structure is necessary because of the location at the north end of the Bessemer yard and within the switching limits, it being impracticable, otherwise to carry on the con-





Bridge No. 12, Near Rural Ridge, Pa.





Temporary Support for Viaduct.

struction work and fill over the arches without serious interference to train and switching movements.

At bridge No. 12 near Rural Ridge, where the 240-ft. viaduct has recently been replaced by a double 20 ft. arch, some unusual methods of construction were necessary because of the fact that one arch is built about a tower of the viaduct, as shown in the accompanying plans. The cross section of the highway barrel was determined by the requirements of the Allegheny county highway department. While Little Deer creek is normally a stream with a small flow, it is subject to freshets, and the same section was considered necessary in the other barrel to provide sufficient waterway to protect the land lying above the arch. The middle wing on the east was in place when construction began, having been built by the highway department of Allegheny county before the arches were contemplated. The angle of the north wing on the east corresponds to the angle of the highway, while the wings on the west were made straight to facilitate a further increase in length. A full-sized foundation was put in for the middle wing and the arch was keyed for additions. One foot at the top of the bench wall was made vertical for convenience in handling the centers. Before the work was started a temporary highway was opened north of the site and a temporary creek channel was dug where necessary to the south. The arches were then built in three sections and completed, with the exception of the south wing wall on the east side, without interference with either of the streams or the traffic along the highway. The stream was then turned through the south barrel and the wing wall built.

During construction the steel members of the tower passing through the arch were boxed in so that the viaduct remained intact until the arches were completed. Before the highway barrel could be removed it was necessary to remove that portion of the tower which came within it and to support the dependent girders on the arches. The manner in which this was done is shown in the drawings a slow order of four miles an hour was maintained over the bridge while it was supported in this way and a carpenter was kept on the site day and night to see that there was no movement of the wedges and braces. After the load was transferred from the tower to the arches all the steel work inside the barrel was cut away, as shown on the drawing. When the fill is settled the girders will be removed.



Completed Double Arch.

There is no reinforcement of any kind in this structure, but a 1-3-6 mixture of Universal Portland cement and Allegheny river sand and gravel was used. The foundations were carried down to rock a distance of 10 ft. The amount of concrete, including the foundations, amounted to 3,284 cubic yards. This work was begun in April, 1910, and completed last October. It was designed and built by the T. A. Gillespie Company, New York and Pittsburgh, under the direction and supervision of H. T. Porter, chief engineer, and C. S. Leet, assistant engineer, of the Bessemer & Lake Erie, to whom we are indebted for the above information.

RULES FOR OBSERVING HOURS-OF-SERVICE LAW.

W. G. Bierd, vice-president and general manager of the Minneapolis & St. Louis and the Iowa Central, has issued, for the information of the officers and employes of those roads, a circular giving the essential parts of the federal hours-of-service law as related to trainmen; the rulings of the Interstate Commerce Commission interpreting the law, and a code of 11 rules showing how the law applies to particular situations. These 11 rules follow.

1. The responsibility for the observance of the law is upon those officers and agents of the company who direct and control train movements. Trainmen, enginemen, yardmen and telegraphers are, therefore, free to obey the orders of the despatcher, or of the train master or superintendent when such officers assume the control of train movements.

2. When not able to communicate with the despatcher or any superior officer the conductor of a train will assume the responsibility, as he is then the agent of the company in control of the movement of his train and he will tie up or proceed as the law may require under the circumstances.

3. Conductors will be expected to notify the despatcher a reasonable time in advance of the expiration of sixteen hours on duty for any member of the train or engine crew, but will then proceed or tie up, as the despatcher may direct.

4. The period "on duty" begins at the time required to report for service, and ends when relieved from service. Despatchers must make due allowance for the time ordinarily so consumed in securing relief after arrival at terminal or relay point.

5. A relay point is an intermediate station between terminals at which provisions have been made to terminate, exchange and start crews; to care for and furnish fuel and water to engines; and at which facilities exist to store and switch trains clear of the main line. . . .

6. The movement of trains should be so directed that trains will not need to tie up at stations other than relay points and terminals.

The despatcher will not permit a train to pass a relay point or leave a terminal unless it has sufficient time, all customary and usual delays being considered, to run to the next relay point or terminal before the expiration of sixteen hours. If after passing a relay point or leaving a terminal a train is delayed by a "casualty," or "unavoidable accident," or by reason of a cause that could not have been foreseen, the crew may lawfully continue on duty to the next relay point or terminal.

7. The despatcher in directing the movement of a train, the crew of which is approaching the limit of time on duty, will make reasonable allowance for conditions known by him to exist, including the state of repair or efficiency of the locomotive or cars in the train, physical characteristics of the road, the state of the weather, the performance of the train during the earlier part of trip, the tonnage of the train and all things which in his judgment as a man skilled in the operating of trains, may retard its movement.

When in the judgment of the despatcher, having considered all the known conditions and ordinary contingent delays, there is sufficient time for the train to run from a terminal or relay point to the next terminal or relay point, and he directs the crew to continue on duty he should then closely follow its movement.

If the train fails to make the expected run the precise reason must be ascertained and if caused by a "casualty," "unavoidable accident," or act of God, or any occurrence which could not have been foreseen and guarded against, the crew may continue on duty as intended to the next relay point or terminal; but if no such casualty, unavoidable accident, act of God, or occurrence is evident, and the train has suffered delays from usual and ordinary causes, such as meeting trains, local work and switching, doubling hill at point where trains often but not always double, engine not steaming well, etc., the despatcher must conclude that his first judgment was in error, that the train should not have been permitted to leave the last terminal or relay point and it must, therefore, be tied up before the expiration of sixteen hours on duty and another crew sent to relieve it.

This would occur only in the case of an error in judgment on the part of the despatcher or officer directing the movement, as, if his first judgment was accurate the delay must have been unavoidable and unforeseen, giving the crew the right to remain on duty.

8. When, in the judgment of the despatcher, there is not sufficient time for a train to leave a relay point and run to the next terminal or relay point which notwithstanding he directs the crew to proceed with the intention of relieving them en route, said crew must tie up before the expiration of sixteen hours at the last convenient point possible to reach within the time limit. The train must be on siding and the crew relieved of all responsibility for its protection. Unless something unforeseen has occurred in the movement of the train on which the relief crew is traveling to meet or overtake the crew to be relieved (again excepting possible error in judgment), the relief crew will reach the delayed train before its crew must cease duty.

9. Hot boxes, either on cars or engines, bursted air hose and cleaning fires or ash pans, must not be regarded as casualties, accidents or unforeseen occurrences. The despatcher or person directing the movement of a train must allow in addition to the running time, reasonable time for the crew to care for such hot boxes by treating them or setting the cars out; to put on an air hose or hoses and to clean ash pans or fires, as these delays are common to the movement of all trains and engines.

10. It will be seen from the above that the necessity for relieving employes at points other than relay points and terminals can arise from only two causes.

First—By error in judgment in permitting a train to leave a relay point or terminal without sufficient time to reach the next terminal or relay point.

Second—By deliberate arrangement to proceed from a relay point or terminal to be met or overtaken by a relief crew.

In either event the crew must not remain on duty beyond the sixteen-hour limit.

11. When a crew for any reason has been permitted to remain on duty more than sixteen hours, the officer or agent of the company (usually the train despatcher) who has controlled the movement of said crew, must make and preserve a full and complete record of all facts and conditions affecting said movement and causing such train crew to remain on duty in excess of sixteen hours.

NEW RAILWAY FOR BOLIVIA.

A representative of the Bolivia Railway Company has made a proposal for the final survey of the railway from Potosi, Bolivia, to Sucre. Under the arrangement referred to, the Bolivia Railway Company agrees to make a definite survey and to submit it to the government for approval within one year from the date of its acceptance of this proposal. For these plans the government agrees to pay the railway company $75,000, which is the estimated minimum cost of the survey, and, all things being equal, to give the Bolivia Railway Company the preference in the construction of the said railway. The law of November 27, 1906, provides that the revenue from the sale of the Guaqui to La Paz Railway shall be applied to the construction of the Potosi to Sucre Railway. The commercial interests of Bolivia, and especially the city of La Paz, are urging the construction of this railway, which will penetrate one of the richest, most populous, and progressive sections of the republic. It will open up to development and exploitation an immense territory of the country which has up to this time been extremely difficult of access.

General News Section.

An anti pass bill has been passed by the Illinois senate by a vote of 34 to 12.

The new union station at Tacoma, Wash., was formally opened on May 1. Howard Elliott, president of the Northern Pacific, delivered an address in connection with the dedication ceremonies.

Rene Vallon, a French aviator, fell from a great height at Shanghai, China, last Saturday and was killed. Vallon is said to be the 53d man to lose his life in experiments with heavier-than-air flying machines.

The New York state senate has passed by a vote of 26 to 14 the Bayne bill permitting the formation of corporations to issue stock having no par value. This bill passed both houses of the last legislature, but was vetoed by Governor Hughes.

In the Federal court at Prescott, Ariz., suits have been filed against the Atchison, Topeka & Santa Fe, alleging 190 violations of the 16-hour law, as applied to the working hours of trainmen; and at Los Angeles, Cal., similar suits alleging 60 violations.

The Atchison, Topeka & Santa Fe has arranged for "information meetings" to be held at points along its lines where officers and employees who have to do with the handling of freight will discuss methods for reducing loss of and damage to freight shipments.

The Chicago, Burlington & Quincy, which was one of the first roads to use telephones for train despatching, has ordered from the Western Electric Company 27 of its new selectors and associated telephone equipment for use on the St. Joseph division, from Kansas City to Napier, 96 miles.

The Missouri, Kansas & Texas has ordered from the Western Electric Company selectors and telephones for a telephone despatching line from Dennison to Hillsboro, via Dallas, 172 miles; for a branch 22 miles long; and for the Fort Worth division, 152 miles long, with a branch of 9 miles.

Beginning August 14 the Chicago, Rock Island & Pacific will run through passenger trains between Memphis, Tenn., and California points. Trains will be run daily between Memphis and El Paso, Tex., where connection will be made with the "Californian," on which the trip to the coast will be completed. First class Pullman and chair cars will be provided, and when the traffic warrants it, through tourist sleeping cars will be put on.

The Pennsylvania Railroad appears to have been able to keep its shops running sufficiently to meet all pressing demands for cars, in spite of the strike on the Pittsburgh division. A press despatch of Monday last said that preparations were being made to resume work on the repair of freight cars, though the company already has 40,000 idle cars. About 200 shop men of the Baltimore & Ohio, at Glenwood, near Pittsburgh, went out on strike last Monday.

After making a trip through the switching district of Chicago on May 8, members of a special committee of the Illinois house of representatives, appointed to investigate the desirability of the proposed "full crew" law, which requires railways to employ a crew of six instead of five men on all through freight trains in Illinois, were convinced that the employment of an additional man was neither necessary nor desirable. Inquiries made of railway employees brought out the same opinion.

The freight handlers on the terminal roads in Chicago are adjusting their grievances with individual freight departments, and the threatened strike has been averted. The wage scale will remain the same as last year, but in some cases certain working conditions in the freight houses will be improved by the new contract. The maintenance-of-way employees belonging to the International Brotherhood of Maintenance of Way Employees are still on strike, but the roads involved report little trouble in keeping their tracks in order.

Figures of operating revenues and expenses made public by 32 of the roads doing business in Texas, which carry 98 per cent. of the traffic, show that in the eight months ending March 1 they suffered a net deficit of $1,472,000. In the corresponding months of the previous year they had a surplus of $151,400. Their total operating revenues for the period just ended were $4,750,128, or 7.02 per cent. greater than in the previous year, while the operating expenses, not including taxes, rents, etc., increased $4,193,858, or 8.52 per cent.

The Canadian government has introduced in the Dominion parliament a bill to amend the general railway law. It is proposed to put telegraph, telephone and express companies under the law on the same basis as railways; to empower the board of railway commissioners to make rules for the protection of property adjacent to railways against fire; to require new railways to be fenced, unless the commissioners grant an exemption, and to give the commission new powers in other directions. The bill would repeal the law under which animals may not be allowed to run at large within a half mile of a railway.

For the through passenger train service of the Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound from Chicago to the Pacific coast, which, as previously announced in these columns, will be inaugurated on May 28, all-steel trains will be used, 20 complete trains being required for the service. The "Olympian," which will leave Chicago every evening, will run on a three-day schedule, and the morning train out of Chicago, the "Columbian," will make the run in 75 hours. On these trains tea will be served without charge in a tea room which forms one of the compartments of the observation car.

At the Mt. Clare shops of the Baltimore & Ohio in Baltimore, lessons in English are now given three days each to men of foreign birth employed in the shops. These lessons are given in the noon hour. The Roberts system of teaching languages is followed, under which one teacher is able to instruct an unlimited number of persons of different nationalities. The examples used have to do with the common affairs of everyday life. The Young Men's Christian Association co-operates with the officers of the company in this matter. The Y. M. C. A. also carries on a class in technical education for apprentices.

On Monday night last conversation was held between New York City and Denver, Colo., 2,011 miles, over the wires of the American Telephone & Telegraph Company. Two metallic circuits were used, and Morse telegraph messages were being sent over the wires at the same time. The voices of the men in Denver were heard in New York as distinctly as were words spoken in Chicago, between which city and New York telephone conversation has been carried on for many years. The line between New York and Denver is of copper No. 8 B.W.G., and the number of poles in the 2,011 miles is 87,000. The charge for the use of the telephone between New York and Denver for three minutes is $11.25.

In a recent newspaper interview James J. Hill said that he believed publicity of corporation matters and intelligent public control is needed for the industrial prosperity of the country. He said the business of the country increased 15 per cent. every year, while the transportation facilities for handling it increased only one-sixth of that amount, and this because the men behind those facilities, uncertain as to what public regulation may do, are afraid to invest their money for extensions and improvements. One of the effects of publicity will be, said Mr. Hill, that when the public begins to see corporation affairs from the inside much of the feeling against big business concerns will pass away, and the antagonism which now exists between the people and quasi-public corporations will disappear.

The Manager's Eye is on You.

Agents should never permit their interest to wane on account of not being continually complimented, as their good work, characteristics and qualifications for promotion are frequently discussed by officers of the company and advancement considered when opportunity affords, regardless of the fact that advancement may seem slow. Many presidents and other high officials of railways point with pride to the fact that the proper handling of the smallest and most remote stations was the primary cause to which was attributable their final success.—*H. J. Slifer, General Manager, Chicago Great Western, in circular to agents.*

A Broad Commission.

Certain western roads in their efforts to cultivate that friendliness between employees and officers which is essential to the most complete success, and which has been so greatly jeopardized by the enormous growth of railway companies, have standing notices or offers, to the effect that whenever an employee can suggest an improvement in the service he will be paid for the suggestion. One company, we believe, fixed a price of a dollar an idea, but with the intention, no doubt, of paying a reasonable price for such ideas as should prove to be worth large sums. Most of these proposals have been made, originally, in connection with the system of discipline without suspension—Brown's discipline; but now the idea has been adopted by the Pennsylvania, which has not adopted Brown's discipline. General superintendent J. G. Rodgers, of the Buffalo & Allegheny Valley division of that road, has issued a circular, General Notice No. 2, telling his men that "ideas are worth money; develop them and we will pay you for them." As an outline of what is wanted, the circular sets forth the following:

"SUGGESTIONS

Must contain ideas which will—
- Increase efficiency of operation,
- Improve methods of operation,
- Be beneficial from economical standpoint,
- Increase safety and convenience of passengers and patrons of our company,
- Increase patronage,
- Promote safety of employees.
- In any way promote the interests of the company, whether pertaining to improved mechanism, better office practice or other features.

May involve the use of new methods or the modification of old ones,

May include the comfort or betterment of employees.

Must not include personal complaints or antipathies."

All employees have in the past been free to make suggestions, we are told, but Mr. Rodgers now puts the matter in more definite form. Moreover, employees may offer advice concerning things outside of their own department. Nothing could be more liberal than that. Even a Roosevelt could find scope for his mental energies.

Vox Populi.

I was sitting on my porch in Reading, after dinner, smoking a cigar, when up the walk came a very tall man with a carpet bag in his hand. He stopped at the bottom of the steps and said, "Be you the president of the Reading Railroad?" I drew up my shoulders and said I was. Then he walked up the steps and said, "What is the price of a ticket from here to Niagara Falls and back?" I said, "My dear friend, I do not know. You will have to go down to the ticket office. Do you know where it is?" He said, "Yes," and then he picked up his carpet bag, looked at me, and said, "You are the president of the Reading Railroad, and don't know the price of a ticket to Niagara Falls and back!" Well, I said I didn't. Then he walked down the steps and turned and said, "You're a hell of a railroad president!"—*George F. Baer,* before the Traffic Club of Pittsburgh.

Plain Talk in Massachusetts.

One bill has just come out of the railway committee of the Massachusetts Legislature which should be made short work of. It provides that on the steam railways of this state no person shall act as engineman unless he shall have been employed two years as a locomotive fireman or engineman's helper; and that no person shall act as conductor unless he shall have been employed as a brakeman for two years. This on its face might seem to be all right—merely providing that railways shall employ men of experience in locomotives and on trains for these responsible positions. And this is no more than what railways do and always will do so far as they are able, without statutory requirement.

Clearly, then, this bill must have a hidden or ulterior purpose, and it is not hard to find. It is evidently designed to make effective any demands which the enginemen and conductors may make on the railways. It would either enable the enginemen and conductors to assume the management of the roads for their own profit exclusively; or it would enable them to tie up the lines completely for the loss of everybody in the railway service, the suspension of manufacturing industry and the starvation of the cities. For, under this bill, if the enginemen and conductors should make wage or other demands which the roads could not meet, they could strike and their places could not possibly be filled, since there would never be a supply of available help within reach meeting the requirements of this proposed enactment.

The case needs no argument. The provisions of the bill and the known conditions of expert railway labor supply tell the story on their face. The public welfare is as much and more concerned over such a proposal than the railways. Some states have a law of this kind, but with an emergency section suspending the requirement of experience in cases of strike or other exceptional difficulty. The committee reporting this bill favorably refused to attach an emergency section. With such a section it would merely be a law for the better protection of the public in the use of railways. Without such a section we should have a law whose incidental purpose would be the better public protection and whose primary purpose would be to deliver the railways into the hands of these two classes of employees. That the latter should have made so extraordinary a demand upon the legislature is surprising enough. But what shall be said of legislators who are willing to yield to this demand?—*Springfield Republican.*

Railways Before the State Tax Board.

Herewith are a few headlines of newspapers reporting the proceedings before a certain state tax board. Presumably the railway officers appearing before this board are not the same as those selected to negotiate the sale of securities to foreign bankers.

ROAD THAT NOBODY APPEARS TO COVET.

Corned Beef and Cabbage Route Often Put up for Sale, but Never Sold.

ROADS OBJECT TO STATE TAX LEVIES.

Railway Officials Plead Before Board of Commissioners for Reductions.
State of Unrest, Factor.

DEFICIT FORECAST IN RAIL REVENUES.

Tax Board is Informed That Operating Expenses Soon May Surpass Roads' Incomes.
"Hard Times" Tales Told.

HIGH FINANCE TALE IS TOLD TAX BOARD.

Erie Railroad Agent Asserts Company Was Looted of Millions of Dollars.
Asks Assessment Reduction.

SAYS PENNSYLVANIA HAS MORE FAVORABLE TERMS.

New York Central Man's Contention Before Tax Board.

FEELS BLUE OVER THE OUTLOOK OF BUSINESS.

In real candor the man represented in the last heading surely leads. Of course, one's feelings, not his professional opinion, should be the basis of one's words in so serious a matter. And if the conditions on this man's road are anywhere nearly so bad as on the others, his blueness is in the highest degree justifiable.

The Pennsylvania's Forestry.

The Pennsylvania Railroad Company's forester reports that since the company undertook forestry work on a comprehensive scale more than four million trees have been set out; 617,338 of these last year, on tracts aggregating 650 acres. There were 200,000 trees planted at Altoona; 49,189 at Mount Union; 93,700 near Martic Forge; 65,500 at Newton Hamilton; 62,249 at Petersburg; 36,100 near Middletown; 12,000 at Vineyard; 10,000 at Ryde; 27,750 at Rambo; 5,000 at Conewago; 3,500 at Kinzer; 17,250 at New Brunswick, N. J., and 35,100 at Parkton, Maryland.

The nursery at Morrisville, Pa., covers 32½ acres, affording a capacity of a million trees a year. To replace the seedling trees transferred last year 269 bushels of acorns and 116 pounds of seeds from coniferous trees were planted. The total output of

the nursery during the year was 766,924 trees, and the stock on hand at the close of the year was one and one-half million forest trees, and 137,200 ornamental plants. The following table shows the planting done in the last nine years:

Years.	Number of trees planted.
1902	13,610
1903	43,364
1904	223,656
1905	597,165
1906	801,625
1907	448,226
1908	300,530
1909	1,054,010
1910	617,338
Total	4,099,524

For beautifying lawns around stations and unoccupied places along the roadway, there were imported from France during the past year 41,699 deciduous ornamental plants, 5,480 coniferous ornamental trees and 107,935 coniferous forest seedlings.

The Pennsylvania has two large timber treating plants, both using the pressure treatment, one at Mount Union and the other at Greenwich Point, Philadelphia. These plants have a combined capacity of a million and a half cross-ties yearly. In 1910 there were treated 671,369 ties, four and one-half million feet of lumber and switch timber, 5,432 fence posts, 10,592 cross-arms, 55,212 lineal feet of poles, and 90,306 paving blocks. To do this required the use of 2,866,513 gal. of creosote oil, all of which was imported from Europe. To foster intelligent forest development on the part of the public generally, the company furnishes to private corporations and individuals trees and plants not required for its own uses. Last year over 70,000 plants were disposed of to outside individuals.

Telephone Train Despatching on the Central Vermont.

The Central Vermont has lately put in use a telephone train dispatching circuit from St. Albans, Vt., southward to Windsor, a distance of about 150 miles, including a short branch. There are 38 way-stations on the line. The selectors and telephones were furnished by the Western Electric Company, Chicago. The way-stations on this circuit are fitted with the Van Akin telephone arm, by means of which an operator sitting at his table can keep the telephone at his ear while at the same time



Station Telephone, Central Vermont.

having both arms free; and if he has to turn quickly to some other duty he can get away from the telephone without the delay incident to taking off and hanging up a head set. The appearance of the Van Akin arm is illustrated in the accompanying photograph. The whole telephone set is included in the arm, and the swinging of the arm away from the operating position turns a switch, cutting the telephone off from the line. In connection with this installation, the Central Vermont has equipped two wrecking cars with portable telephone sets, each mounted in a wooden box, fitted with writing shelves. The box and the telephones together furnish a complete temporary office outfit for an operator who may have to open an office at a wreck.

Long Distance Automobile Freight Trip.

The running of an automobile truck from New York to Philadelphia and back in one day has already been noticed in these columns. The trip was made on April 7, and the makers of the truck in their advertisements give the cost of the trip as a trifle less than 20 cents a mile. The capacity of the wagon was 4½ tons and the load consisted of 4 tons of merchandise and 6 men. The time southward was 7 hours 35 minutes, including ferry delays of 35 minutes. The return trip with 3 tons and 6 men was made in 7 hours. The details of the cost are given as follows:

Driver ($20.00 a week) day's work plus 5 hours at time and one-half	$6.16
40 gallons gasoline at 11c.	4.40
Three pints lubricating oil	.20
Grease	.20
Maintenance 4c. a mile (based on maintenance contract)	8.80
Tires 7c. a mile (based on manufacturer's guarantee)	15.40
Insurance at 50c. per day (approx. $150 per annum)	.50
Depreciation 3c. a mile (based on proved records)	6.60
	$42.26

The distance covered was 220 miles. [The distance between the two cities by rail is 90 miles—Editor]; approximate cost per mile, 19.8 cents; average running time, 15¾ miles an hour. No adjustments were needed en route. There were no scratches on the tires, although the truck had to go over a good bit of crushed stone. These loads to and from Philadelphia would have cost nearly twice as much by express. The time necessary to express them, including time of unloading and carting to and from trains to the stores, would have been considerably more than the time the truck took. That same truck did over 800 miles of continuous demonstration service during the week of the run.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held at the building of the United Engineering Societies, New York, May 19. The technical paper for this occasion will be on The Possibilities of the Oxy-Acetylene Torch in the Railroad Shop by Prof. J. M. Moorehead, of Chicago. It will be illustrated with practical demonstrations.

Central Railway Club.

At the next regular meeting of the Central Railway Club, to be held at the Hotel Statler, Buffalo, N. Y., May 12, G. K. Heyer, railway sales engineer of the Western Electric Company, Chicago, will present a paper on Train Despatching by Telephone. This will be the last session preceding the summer vacation.

American Electric Railway Association.

The annual convention of the American Electric Railway Association will be held at Atlantic City, N. J., October 9-13. H. C. Donecker, secretary, 29 West Thirty-ninth street, New York.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.
American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.
Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa., 4th Friday in month, except June, July and August, Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except, June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Long Island road reports that it has not killed a passenger in a train accident since June 1, 1893; and during that time its passenger mileage has been 4,904,736,994; and nearly all of these passengers have been carried on the suburban lines of the company, carrying a dense traffic to and from New York City.

The Travelers' Protective Association and merchants and manufacturers have protested against that part of the uniform baggage rules recently adopted by the railways of the United States and Canada, by which it is proposed after January 1, 1912, to make an extra charge for all trunks any dimension of which exceeds 40 in., the charge to be made on a basis of ten pounds for every additional inch. On account of these protests the roads in the Trunk Line Association (east of Buffalo and Pittsburgh) have increased the dimension limit to 45 in.

Referring to the recent decision of Judge Trieber in the Arkansas rate cases, by which the temporary injunction restraining the state railway commission from enforcing its 2-cent passenger fare and reduced freight rate orders was made permanent, the commission has announced that if the general assembly of the state will not make the necessary appropriations to enable the case to be carried to the Supreme Court of the United States, it intends, if conditions warrant, to prepare and put into effect new freight tariffs on all classes and commodities.

The New York Central has brought suits in equity in the United States Circuit court against 21 merchants and other persons in Newburgh, N. Y., on the charge of illegal dealing in tickets. Season tickets have been bought in fictitious names, and such tickets costing 19 cents a trip, have been lent to persons unauthorized to use them, the price to such users being a dollar a ride, whereas a single trip ticket for this same journey would cost $1.25. It is said that this practice of cheating the road in the use of commutation tickets has been common at Newburgh for a long time.

Franklin K. Lane, of the Interstate Commerce Commission, spoke Wednesday night before the Finance Forum of the West Side Young Men's Christian Association of New York on the misunderstanding in regard to railways. He said, in his opinion, this was a time of real regulation of the railways, but that regulation was only incidental in the general purpose of the people to have more to say in regard to the management of their affairs. The trouble with the New York idea of the railway problem was that Wall street thought a railway was only a basis for a stock issue. The West, on the other hand, thought that a railway was entirely a public servant.

Westbound shipments of freight from New York by the nine trunk lines during 1910 to Buffalo, Pittsburgh and beyond, amounted to 1,986,806 tons, an increase of 113,514 or 6 per cent. over the preceding year. The movement in 1909 was 16.2 per cent. above that of 1908. Since the beginning of the current calendar year the shipments each month have shown a decrease as compared with the corresponding months of 1910. The figures of the different roads for the past three years, as reported by the *Wall Street Journal*, are as follows:

	1910.		1909.		1908.	
	Tons.	P. C.	Tons.	P. C.	Tons.	P. C.
Pennsylvania	395,916	19.9	353,928	18.9	305,769	19.0
New York Central	397,813	20.0	334,415	17.9	397,503	18.5
Erie	257,615	13.0	232,245	12.4	211,728	13.1
Baltimore & Ohio	168,980	8.5	151,977	8.1	118,384	7.3
West Shore	92,044	4.6	108,208	5.8	114,326	7.1
D. L & W.	302,686	15.2	243,960	13.0	233,570	14.5
Lehigh Valley	269,906	13.6	240,399	12.8	209,121	13.0
Central New Jersey	55,375	2.8	49,490	2.6	37,556	2.3
N. Y. Ont. & West	46,471	2.4	158,730	8.5	83,884	5.2
Total	1,986,806	100.	1,873,292	100.	1,611,841	100.

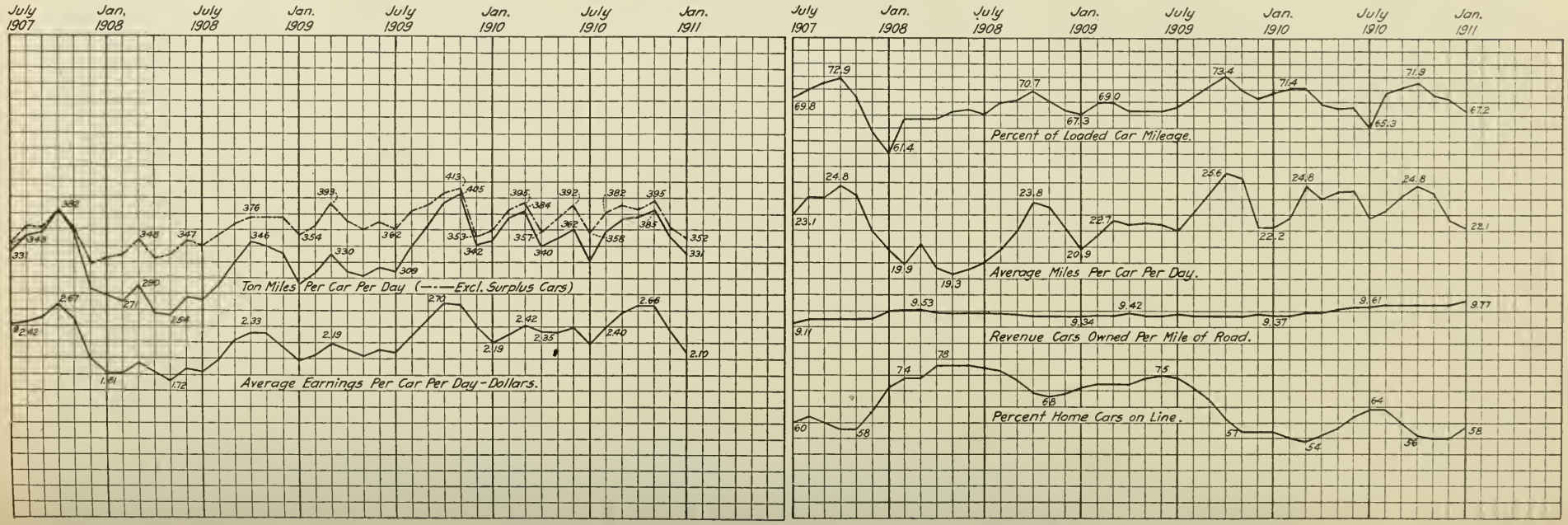
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 96, covering car balance and performance for January, 1911, says:

"So far as general results are concerned there was little in the performance for this month to differentiate it from an average January performance. While the business as a whole

CAR BALANCE AND PERFORMANCE IN JANUARY, 1911.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	75,708	712,397	222,214	181,103	169,522	389,573	17,957	137,279	26,693	141,858	106.095	2,180,398
Average number of system cars on line	39,180	413,325	124,355	98,802	86,199	263,886	6,630	77,285	19,230	64.619	71,570	1,265,081
Railway-owned cars: Average foreign on line	39,656	285,513	104,394	76,016	72,204	128,191	12,753	65,663	24,180	53,328	32,200	894.098
Total Railway-owned cars on line	78,836	698,838	228,749	174,818	158,403	392,077	19,383	142,948	43,410	11.794	103,770	2,159,179
Excess	3,128	.....	6,535	.....	.....	2,504	1,426	5,669	16,717	.....	.....	.....
Per cent. of cars on line to total owned:												
Home	52	58	56	55	51	67	37	56	72	46	67	58
Foreign	52	40	47	42	42	34	71	48	91	37	30	41
All railways	104	98	103	97	93	101	108	104	163	83	97	99
Private cars on line	3,141	43,500	11,256	3,867	6,471	14,338	1,292	7,100	2,978	12,288	2,878	109,109
Total, all cars on line	81.977	742.338	240,005	178,685	164,874	406,415	20,675	150,048	46.388	130,235	106.648	2,268,288
Per cent. of cars in shop	4.36	5.43	6.70	6.34	7.00	6.42	5.70	6.92	4.65	4.51	6.32	5.91
No. of freight engines owned	1,110	10,420	2,949	3,052	2,554	6,369	495	2,759	730	2,609	2,151	35,198
Average cars on line per freight engine owned	74	71	81	59	65	64	42	54	64	50	50	64
Total freight-car mileage	43,298.113	526,805.172	146,207.679	126,173,907	125,600,367	255,069,990	21,443,085	90,009,322	33,212,009	112,491,827	76,424,963	1,556,736,434
Average miles per car per day	17.0	22.9	19.7	22.8	24.6	19.8	33.5	20.2	23.1	27.9	23.1	22.1
Per cent. loaded mileage	70.7	63.4	63.4	65.3	70.4	72.1	76.2	63.2	63.7	70.3	75.8	67.2
Ton-miles of freight, including company freight	464,943,851	8,045,561,169	1,972,280,000	1,995,098,453	1,866,182,090	2,378,165,679	367,873,357	1,268,525,151	393,732,201	1,638,614,587	1,045,199,339	21,436,175,877
Average ton-miles, including company freight:												
Per car-mile	10.7	15.3	14.1	15.8	15.0	14.2	18.0	14.1	11.9	14.7	13.7	14.7
Per loaded car-mile	15.2	24.1	21.6	24.2	18.9	20.7	23.6	20.7	17.9	20.9	18.0	21.9
Per car per day	183	351	282	360	368	302	633	285	274	409	316	331
Gross freight earnings	$5,258,727	$44,808,364	$11,325,579	$11,548,774	$12,100,886	$21,651,577	$2,493,140	$10,655,342	$3,339,458	$15,546,216	$6,619,227	$148,184,740
Average daily earnings: Per car owned	$2.24	$2.03	$1.64	$2.06	$2.30	$2.03	$4.60	$2.50	$4.04	$3.54	$2.01	$2.19
Per railroad car on line	2.15	2.07	1.60	2.13	2.46	2.02	4.31	2.40	2.48	4.25	2.06	2.21
All cars on line	2.07	1.95	1.52	2.08	2.37	1.94	4.03	2.23	2.32	3.85	2.00	2.10



Freight Car Earnings and Performance in 1907 to 1911 Inclusive.

was slightly better than for January, 1910, as indicated by the per mile of road revenue returns made to the Interstate Commerce Commission, the returns per car were somewhat lower. This is explained by the increase in equipment owned, which averaged 9.77 cars per mile of road in January, 1911, compared with 9.37 in January, 1910, an increase of 4.26 per cent., or substantially 100,000 cars. This increase, together with a difference in weather conditions, explains also the apparent discrepancy between the bi-weekly surplus reports, which show approximately 100,000 more idle cars in January, 1911, than in January, 1910, and the revenue returns made by the railways, which, as stated, show some increase over the previous year.

"Possibly the most striking feature of the car performance in January was the general homeward movement of cars, which increased the proportion of cars on home lines from 55 per cent. in December to 58 per cent. in January. To this movement is undoubtedly chargeable the large empty car mileage which decreased the loaded mileage ratio from 69.7 per cent. to 67.2 per cent.

"We have in previous bulletins called attention to the 'excess' empty mileage during certain portions of the year, and while there is nothing definite available or procurable showing just what the per cent. of necessary mileage is, there is little doubt a very large proportion of the empty mileage made during periods of light traffic would be found unnecessary if the traffic throughout the year were such as to create a steady demand for cars. It may be argued that this periodical empty movement is a natural adjustment of balance, and that a full traffic postpones but could not indefinitely prevent this large empty haul. While this is undoubtedly true as regards some individual roads, the general situation is such that a continued heavy traffic means a low per cent. of cars on their home lines with a high ratio of loaded mileage. As illustrative of this, attention is called to the charts accompanying this bulletin, with especial reference to the high loaded movement during August, September and October of the year 1907, the averages for these months running 70.8, 71.8 and 72.9 per cent., dropping to 70.2 in November when the traffic began to recede and to 64.6 in December, when the empty movement became a veritable rout.

"Those who recall the performance of December, 1907, and January and February, 1908, will not dispute the statement that the tactics pursued by a great many roads to decrease their car hire balance were utterly indefensible from the standpoint of the railway system of the continent as a whole. While the conditions at the present time are by no means as serious as were those existing in the winter of 1907-1908, there are indications of a return to some of the practices indulged in at that time, which emphasizes the need for some logical system that will reduce this wasteful movement to the minimum."

The accompanying table gives figures for car balance and performance in January and the charts show certain averages in 1907 to 1911, inclusive:

Conditions in the South.

President W. W. Finley, who has recently returned from an inspection trip of the Southern Railway, says that the agricultural outlook throughout the entire southeast seems to be very favorable. While in some localities in the southwestern part of the territory rains have somewhat retarded cotton planting, and while re-planting will be necessary in some small areas, it will have to be done to a very much smaller extent than was necessary last year. Notwithstanding the increased attention being given by Southern farmers to corn and other crops, the aggregate acreage devoted to cotton will be somewhat greater this year than last. Farmers are using fertilizers more scientifically and better farming is being practiced very generally throughout the south. Conditions in the cotton manufacturing industry are not wholly favorable. The lumber business is still feeling the effects of restricted purchases on the part of the railways, but a slight improvement is noticeable in some of the lumber producing localities.

The Southern Railway's present carrying capacity is comfortably ahead of its present requirements. The carryying capacity of those parts of its lines where the traffic is not sufficiently heavy to require double tracking is being increased by the construction of a modern system of lap-siding. The management now contemplates increasing its main-line double-trackage at a point where the volume of traffic is heavy and expects to be able to keep fully abreast of traffic requirements without going beyond or straining its present financial resources.

Crop Conditions.

The crop reporting board of the department of agriculture estimates that on May 1 the area of winter wheat to be harvested was about 31,367,000 acres, or 1,940,000 acres (6.6 per cent.) more than the area harvested in 1910, and 3,118,000 acres (9.0 per cent.) less than the area shown last fall (34,485,000) acres. The average condition of winter wheat on May 1 was 86.1, compared with 83.3 on April 1, 82.1 on May 1, 1910, and 86.0 the average for the past ten years on May 1.

The condition of the wheat crop on May 1 of the past five years averaged 85.7 per cent.; in the same five years the final yield per acre averaged 15.5 bushels; if the above ratio should prevail this year, the condition of 86.1 per cent. would indicate a yield of 15.6 bushels per acre, which compares with 15.8 bushels, the final estimate of yield per acre in 1910, 15.8 in 1909, and 15.5, the average of the past five years. On the estimated area to be harvested, 15.6 bushels per acre would produce 5.4 per cent. more than the final estimate of production last year, 9.6 per cent. more than the production of 1909, and 8.7 per cent. more than the average annual production of the past five years. The out-turn of the crop will probably be above or below the figures above, according as the change in conditions from May 1 to harvest is above or below the average change in the past five years.

The average condition of rye on May 1 was 90.0, compared with 89.3 on April 1, 91.3 on May 1, 1910, and 89.7 the average for the past ten years on May 1. Details for winter wheat follow:

	Winter Wheat.				
			Condition May 1,		
States.	Per Cent. Abandoned.	Acres Remaining to be Harvested.	1911.	1910.	10-Yr. Av.
Kansas	23.0	4,948,000	76	65	83
Indiana	3.4	2,698,000	90	82	84
Nebraska	6.5	2,665,000	88	67	89
Illinois	4.1	2,223,000	86	80	87
Missouri	2.5	2,195,000	92	73	88
Ohio	3.2	2,049,000	88	86	82
Pennsylvania	3.8	1,532,000	89	93	89
Texas	7.0	1,241.000	83	91	75
Oklahoma	32.0	1,123,000	67	87	84
Michigan	2.0	947,000	91	84	81
California	6.5	926,000	83	94	85
Tennessee	5.0	917,000	88	83	86
Virginia	2.9	796,000	89	92	89
Maryland	2.9	795,000	85	93	90
Kentucky	4.0	760,000	92	83	86
Washington	3.5	726,000	96	95	92
North Carolina	3.9	678,000	90	85	86
Oregon	4.0	530,000	94	95	95
South Carolina	3.4	494,000	85	81	85
New York	3.7	443,000	89	97	87
West Virginia	4.0	404,000	88	90	86
Idaho	3.7	377,000	96	98	95
Montana	5.5	366,000	98	98	..
Iowa	4.1	259,000	93	77	90
Georgia	3.3	258,000	91	83	87
Arkansas	5,0	213,000	88	92	86
Utah	6.0	164,000	92	94	..
Alabama	5.1	143,000	90	80	88
Colorado	11.5	121,000	85	94	..
Delaware	3.0	120,000	87	98	90
New Jersey	3.9	110,000	90	96	89
Wyoming	8.0	50,000	92	94	..
Wisconsin	6.8	71,000	88	92	89
Mississippi	12.5	9,000	85	87	87
Minnesota	...	.....	..	..	..
United States...	9.0	31,367,000	86.1	82.1	86.0

The average condition of meadow (hay) lands on May 1 was 84.7, compared with 89.8 on May 1, 1910, and a ten-year average on May 1 of 89.4.

Stocks of hay on farms May 1 is estimated as 7,546,000 tons (12.4 per cent. of crop) against 7,275,000 tons (11.2 per cent.) on May 1, 1910.

The average condition of pastures on May 1 was 81.3, compared with 89.3 on May 1, 1910, and a ten-year average on May 1 of 87.4.

Of spring plowing 71.0 per cent. was completed up to May 1, compared with 80.3 per cent. on May 1, 1910, and a ten-year average on May 1, of 67.2.

Of spring planting 60.0 per cent. was completed up to May 1, compared with 65.0 per cent. and 51.9 per cent. on May 1, 1910 and 1909, respectively.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,550*	$5,083,291	$1,917,072	$7,876,706	$1,027,794	$1,301,514	$133,742	$2,291,438	$176,883	$4,931,371	$2,945,335	.....	$261,072	$2,684,263	$230,930
Atlantic Coast Line	4,495	2,304,616	768,046	3,290,556	341,810	373,488	44,750	1,007,139	68,329	1,835,516	1,455,040	.....	108,000	1,347,040	63,919
Boston & Maine	2,243	2,210,419	1,101,648	3,579,369	438,052	621,803	37,563	1,999,655	103,178	3,200,251	379,118	$7,079	185,291	200,906	—417,604
Central R. R. of New Jersey	631†	1,660,304	342,506	2,111,977	176,646	296,824	27,065	625,995	37,409	1,163,939	948,038	—12,756	94,427	840,855	119,961
Chicago & Eastern Illinois	966	738,360	160,541	956,926	84,920	159,009	22,018	373,249	33,506	672,702	284,224	—615	28,500	255,109	—144,252
Chicago & Northwestern	7,744‡	3,911,467	1,405,358	5,884,169	468,755	803,555	88,800	2,489,787	134,982	3,985,879	1,898,290	—11,632	260,000	1,626,658	—253,999
Chicago, Burlington & Quincy	9,091§	4,640,519	1,641,807	6,863,026	696,489	1,123,856	126,415	2,336,692	195,249	4,478,701	2,384,325	—12,589	249,854	2,121,882	—144,741
Chicago Great Western	1,496	786,550	206,962	1,070,865	92,854	157,650	45,303	451,413	35,859	783,079	287,786	—125	36,175	251,486	603
Chicago, Rock Island & Pacific	7,548¶	3,396,856	1,476,679	5,200,444	643,299	762,238	161,628	2,154,215	136,057	3,857,437	1,343,007	—5,448	206,692	1,130,867	334,131
Chicago, St. Paul, Minneapolis & Omaha	1,744	849,961	320,308	1,259,559	109,577	105,470	22,719	500,038	32,801	770,605	488,954	—2,021	64,422	422,511	—59,827
Cincinnati, Hamilton & Dayton	1,015‖	575,110	112,950	761,794	73,692	148,048	24,011	348,732	19,836	614,319	147,475	.....	32,028	115,447	—21,291
Delaware, Lackawanna & Western	930	2,058,139	572,776	2,808,183	189,544	495,142	59,558	921,875	60,958	1,727,077	1,081,106	12,219	138,028	955,297	—133,393
Denver & Rio Grande	2,545*a*	1,272,476	341,332	1,687,224	170,607	350,290	47,910	636,053	50,789	1,255,649	431,575	—4,641	73,000	353,934	—246,807
Erie	1,994*b*	3,020,380	664,338	3,968,120	304,859	645,593	87,017	1,422,303	104,524	2,564,295	1,403,824	—11,697	120,631	1,271,496	—210,210
Great Northern	7,327*c*	3,127,873	951,036	4,429,957	473,405	694,479	78,933	1,520,200	90,753	2,857,770	1,572,187	—396	255,021	1,316,770	—140,924
Gulf, Colorado & Santa Fe	1,518	588,046	217,015	872,718	185,409	153,973	27,522	413,981	32,936	813,821	58,897	.....	33,307	25,590	—49,013
Kansas City Southern	827	614,636	129,895	840,103	88,480	110,016	24,411	275,531	37,684	536,122	303,981	.....	27,399	276,582	8,888
Lake Shore & Michigan Southern	1,663	2,697,485	836,591	3,985,897	520,849	599,590	101,278	1,468,786	95,436	2,785,939	1,199,958	—6,477	135,000	1,058,481	—220,106
Lehigh Valley	1,433	2,665,556	287,395	3,045,616	234,425	515,304	76,036	997,007	65,033	1,887,805	1,157,811	—31,914	101,300	1,024,597	—81,843
Louisville & Nashville	4,591	3,639,748	952,077	4,874,674	773,654	791,935	93,246	1,527,769	86,519	3,273,123	1,601,551	7,639	150,000	1,459,190	—8,998
Maine Central	932	499,394	192,594	737,554	75,050	119,183	6,142	298,206	31,109	529,690	207,864	—1,015	41,311	165,538	—86,548
Michigan Central	1,805*d*	1,634,768	523,015	2,410,085	280,221	377,577	73,723	1,117,042	51,092	1,899,655	510,430	—3,616	110,000	396,814	—338,504
New York Central & Hudson River	3,591	4,936,382	2,227,097	8,159,297	972,486	1,517,015	172,154	3,308,992	229,036	6,199,683	1,959,614	15,100	376,783	1,597,931	774,850
New York, New Haven & Hartford	2,040	2,500,920	1,953,694	4,919,827	454,456	622,985	30,296	2,142,351	189,950	3,440,038	1,479,789	99,178	285,000	1,293,967	—186,396
Norfolk & Western	1,990*e*	2,482,104	310,239	2,885,340	339,162	470,126	48,567	886,311	60,012	1,804,178	1,081,162	—557	115,000	965,605	—296,355
Northern Pacific	6,028*f*	3,428,571	1,215,868	4,959,768	345,335	706,713	114,103	1,785,668	83,595	3,035,414	1,924,354	5,229	247,988	1,681,595	—19,336
Oregon Short Line	1,646*g*	1,020,219	325,169	1,449,709	175,618	181,452	24,782	398,594	40,949	821,395	628,314	—3,516	58,665	566,133	77,834
Oregon-Washington R. R. & Nav. Co	1,737*h*	808,179	347,241	1,231,171	157,539	136,906	45,581	491,440	39,843	871,309	359,862	—14,522	74,169	271,171	—
Pennsylvania *Co.*	1,416	2,790,681	609,158	3,747,977	417,157	658,979	69,640	1,431,999	82,402	2,660,177	1,087,800	—8,183	265,367	814,250	—123,015
Pennsylvania *R. R.*	3,977*i*	9,693,390	2,537,832	12,999,491	1,453,119	2,304,021	166,668	4,911,992	360,847	9,196,647	3,802,844	—120,394	531,228	3,151,222	—554,871
Pere Marquette	2,334	929,270	276,555	1,304,040	147,425	219,798	37,241	638,178	46,676	1,089,318	214,722	—8,608	54,635	151,479	—256,236
Philadelphia, Baltimore & Washington	713	775,113	586,427	1,506,887	203,077	234,214	30,333	682,645	52,742	1,203,012	303,875	.....	47,396	256,479	—40,746
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	2,106,877	623,108	3,061,569	298,170	581,020	63,038	1,189,961	64,802	2,196,991	864,578	—1,056	134,245	729,277	—147,501
Southern Railway	7,038	3,722,150	1,221,013	5,349,517	635,498	860,261	124,156	1,865,218	150,022	3,635,155	1,714,362	—6,605	184,437	1,523,320	42,117
Union Pacific	3,473*j*	2,505,489	761,241	3,641,199	462,657	474,191	96,499	1,043,954	101,196	2,178,497	1,462,702	—6,393	152,686	1,303,623	—296,064
Vandalia	827	571,625	182,352	847,799	99,433	156,989	23,704	342,668	19,665	642,459	205,340	.....	27,441	177,899	—4,898

NINE MONTHS OF FISCAL YEAR 1911.

Atchison, Topeka & Santa Fe	7,550*	$44,506,105	$17,143,576	$67,248,639	$9,641,216	$10,496,956	$1,322,761	$19,660,074	$1,414,200	$42,535,207	$24,713,432	.....	$2,200,817	$22,512,615	$2,150,526
Atlantic Coast Line	4,495	16,314,405	5,878,019	23,866,570	3,021,694	3,488,175	408,985	7,735,742	615,268	15,269,864	8,596,706	.....	879,000	7,717,706	51,815
Boston & Maine	2,243	19,277,011	11,771,054	33,567,578	4,286,807	4,566,880	374,542	15,981,908	820,770	26,030,907	7,536,671	$42,420	1,623,172	5,955,919	—1,824,796
Central R. R. of New Jersey	631†	13,667,131	3,531,086	18,136,426	1,849,335	2,783,533	279,907	5,316,240	357,219	10,586,234	7,550,192	66,418	814,260	6,802,350	—290,585
Chicago & Eastern Illinois	966	7,342,466	1,614,937	9,538,721	902,355	1,642,036	212,433	3,506,679	298,680	6,562,183	2,976,538	—11,549	252,629	2,712,360	—71,496
Chicago & Northwestern	7,744‡	37,398,920	14,581,916	57,042,005	7,217,944	7,059,745	948,819	23,678,745	1,231,254	40,136,507	16,905,498	—28,570	2,382,000	14,494,928	19,413
Chicago, Burlington & Quincy	9,091§	44,752,074	17,400,869	67,904,905	8,357,694	11,040,187	1,195,008	22,069,057	1,685,936	44,347,882	23,557,023	—78,150	2,244,527	21,234,346	2,962,320
Chicago Great Western	1,496	6,689,298	2,156,557	9,562,967	1,031,317	1,441,590	418,283	3,880,388	320,382	7,091,960	2,471,007	1,722	298,756	2,173,973	—
Chicago, Rock Island & Pacific	7,548¶	31,704,215	14,819,129	49,442,736	6,970,040	6,793,785	1,421,863	19,073,545	1,248,315	35,507,548	13,935,188	—89,111	1,981,046	11,865,031	814,281
Chicago, St. Paul, Minneapolis & Omaha	1,744	8,273,200	3,473,563	12,557,625	1,327,885	1,431,809	209,553	4,787,819	269,497	8,026,563	4,531,062	—12,559	538,032	3,980,471	442,471
Cincinnati, Hamilton & Dayton	1,015‖	5,166,074	1,274,713	7,172,894	581,767	1,277,638	218,159	3,308,946	195,029	5,581,539	1,591,355	.....	275,744	1,315,611	—140,124
Delaware, Lackawanna & Western	930	19,361,283	5,669,878	26,698,292	2,771,699	3,915,992	533,405	8,133,825	535,070	15,889,991	10,808,301	173,299	1,221,108	9,760,492	—1,840,243
Denver & Rio Grande	2,545*a*	13,131,327	3,884,446	17,797,063	2,019,601	3,135,671	430,181	6,151,296	445,799	12,182,548	5,614,515	—27,124	639,000	4,948,391	—79,962
Erie	1,994*b*	26,924,676	6,845,016	36,421,214	4,060,623	6,127,711	880,068	12,125,061	737,776	23,931,239	12,489,975	—202,902	1,051,465	11,235,608	246,168
Great Northern	7,327*c*	32,779,600	9,981,965	46,111,370	6,160,161	5,865,878	752,312	13,766,476	862,118	27,406,945	18,704,425	132,310	2,412,016	16,424,719	—1,322,523
Gulf, Colorado & Santa Fe	1,518	6,542,628	2,373,881	9,550,783	1,692,514	1,424,365	222,390	3,691,053	291,938	7,322,260	2,228,523	.....	296,959	1,931,564	285,834
Kansas City Southern	827	5,656,295	1,258,141	7,714,695	778,604	1,006,732	238,515	2,595,890	280,895	4,900,636	2,814,059	.....	258,040	2,556,019	366,577
Lake Shore & Michigan Southern	1,663	23,911,758	8,613,309	36,824,211	5,862,335	5,781,907	900,725	13,224,448	712,660	26,482,075	10,342,136	—47,446	1,315,182	8,979,508	—3,762,038
Lehigh Valley	1,433	22,982,021	3,364,566	27,292,745	2,712,867	4,650,712	736,783	8,968,471	581,972	17,650,805	9,641,940	—250,210	864,300	8,527,430	—845,827
Louisville & Nashville	4,591	30,153,833	8,864,188	41,479,864	6,720,218	7,159,672	860,118	13,289,386	809,583	28,838,977	12,640,887	18,717	1,276,800	11,382,804	—1,981,373
Maine Central	932	4,089,783	2,256,215	6,769,758	1,053,842	1,007,093	65,819	2,612,418	235,849	4,975,021	1,794,737	12,071	333,478	1,473,330	—518,453
Michigan Central	1,805*d*	14,612,664	5,709,970	22,667,738	3,244,679	3,309,328	680,930	9,574,494	444,675	17,254,106	5,413,632	—35,262	1,025,020	4,353,350	—1,934,125
New York Central & Hudson River	3,591	43,975,618	23,282,285	75,341,967	10,406,006	13,131,456	1,812,614	29,210,210	2,013,539	56,573,825	18,768,142	60,716	3,553,452	15,275,406	—2,481,894
New York, New Haven & Hartford	2,040	22,439,550	19,660,384	46,245,543	5,045,975	5,393,837	259,174	18,441,769	1,363,600	30,504,355	15,741,188	1,053,586	2,747,000	14,047,774	—525,991
Norfolk & Western	1,990*e*	22,714,300	3,188,986	26,874,080	3,090,210	4,995,679	443,644	8,083,563	546,115	17,159,211	9,714,869	—6,766	975,000	8,733,103	—1,106,974
Northern Pacific	6,028*f*	33,265,901	13,233,963	49,751,768	5,853,990	6,075,361	813,642	16,604,234	764,811	30,112,038	19,639,730	392,521	2,453,681	17,578,570	—2,064,993
Oregon Short Line	1,646*g*	10,766,245	3,668,131	15,407,144	1,959,935	1,670,436	254,029	3,791,660	388,638	8,064,698	7,342,446	—15,482	626,761	6,700,203	—1,157,604
Oregon-Washington R. R. & Nav. Co	1,737*h*	2,481,104	1,098,719	3,826,207	487,337	424,504	141,949	1,589,561	144,944	2,788,295	1,037,912	—31,591	240,820	765,501	—
Pennsylvania *Co.*	1,416	29,237,416	6,315,121	38,774,175	4,588,019	6,803,453	718,369	13,982,507	760,080	26,852,428	11,921,747	—54,503	1,697,691	10,169,553	—2,709,860
Pennsylvania *R. R.*	3,977*i*	85,666,638	25,016,747	118,454,191	14,728,341	22,338,129	1,702,177	43,985,801	3,045,974	85,800,423	32,653,768	—977,384	4,009,759	27,576,625	—6,868,120
Pere Marquette	2,334	8,145,743	3,030,931	12,120,306	1,572,412	1,887,774	353,465	5,530,090	312,910	9,656,651	2,463,655	—59,879	522,922	1,880,854	—1,288,675
Philadelphia, Baltimore & Washington	713	7,106,318	5,716,918	14,231,885	2,138,535	2,298,005	263,377	6,011,183	335,559	11,046,659	3,185,226	.....	435,629	2,749,597	—152,249
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	20,342,845	6,183,595	29,793,194	3,655,346	5,573,914	663,851	11,326,576	591,347	21,811,034	7,982,160	—7,989	1,231,771	6,742,400	—1,939,851
Southern Railway	7,038	30,393,156	12,237,485	46,101,598	5,725,698	7,427,138	1,160,117	15,509,298	1,330,823	31,153,074	14,948,524	3,294	1,640,339	13,311,479	437,904
Union Pacific	3,473*j*	27,825,237	8,405,737	39,557,506	3,884,778	4,604,029	909,858	10,277,682	963,409	20,639,755	18,917,750	46,545	1,396,381	17,474,824	—1,343,884
Vandalia	827	5,423,146	1,840,053	8,076,385	1,028,880	1,479,588	249,351	3,239,936	177,785	6,175,540	1,900,845	.....	250,492	1,650,353	—130,101

Mileage operated on March 31, 1910—* 7,459 miles; † 668 miles; ‡ 7,638 miles; § 9,021 miles; ¶ 7,393 miles; ‖ 1,036 miles; *a* 2,506 miles; *b* 1,961 miles; *c* 7,129 miles; *d* 1,746 miles; *e* 1,951 miles; *f* 5,849 miles; *g* 1,509 miles; *i* 3,947 miles; *j* 3,411 miles.
h Began operations on December 24, 1910.

When the State Was a Common Carrier.

Now let me quote as a matter of history what I think is a precious morsel. Here is the report of the public authorities in charge of the Public Works of Pennsylvania to the Legislature in 1857. They complained that competition from local works compelled them to make material reduction in tolls. Mark you, they had no trains and locomotives; they only charged for the road, the public had to provide the locomotives and cars. It was only a toll road and the tolls they charged were much higher than the transportation charges of today. They go on to say, "This depreciation in revenues from the low rate charged by competing railroads must cease at no distant day. These companies have begun to open their eyes to the fact that mere tonnage or travel alone do not constitute profit upon the capital invested, and that rates which they have a few years past imposed upon the carrying trade have been below a remunerative standard. The result of this conclusion must be that they will be compelled to fix their tolls upon such a basis as to yield bona fide dividends to stockholders commensurate with the capital invested, and to abandon the existing suicidal system of enticing trade to their respective improvements by a sacrifice of capital, and increase of debt, with a total disregard of the interests of those stockholders who have invested their funds under the promise and expectation of deriving at least the usual interest therefrom. When this policy is adopted, as it must be shortly, there can be no fear but that the works owned by the Commonwealth will continue to receive their fair share of the carrying trade, and that no diminution of her revenue from this source need be anticipated." Think of a government pleading for a higher rate of transportation, in the light of our experience within the last few months!—*George F. Baer,* before the Traffic Club of Pittsburgh.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railways Association in presenting statistical bulletin No. 93-A, giving a summary of car shortages and surpluses by groups from December 10, 1909, to April 26, 1911, says:

"The decrease in coal car surplus continues, the accumulation having been reduced by 8,605 cars during the two weeks since our last bulletin. There were increases in box and miscelianeous cars of 7,513 and 3,638 respectively, making a net increase of 2,305 in the surplus of all classes, with totals 189,524.

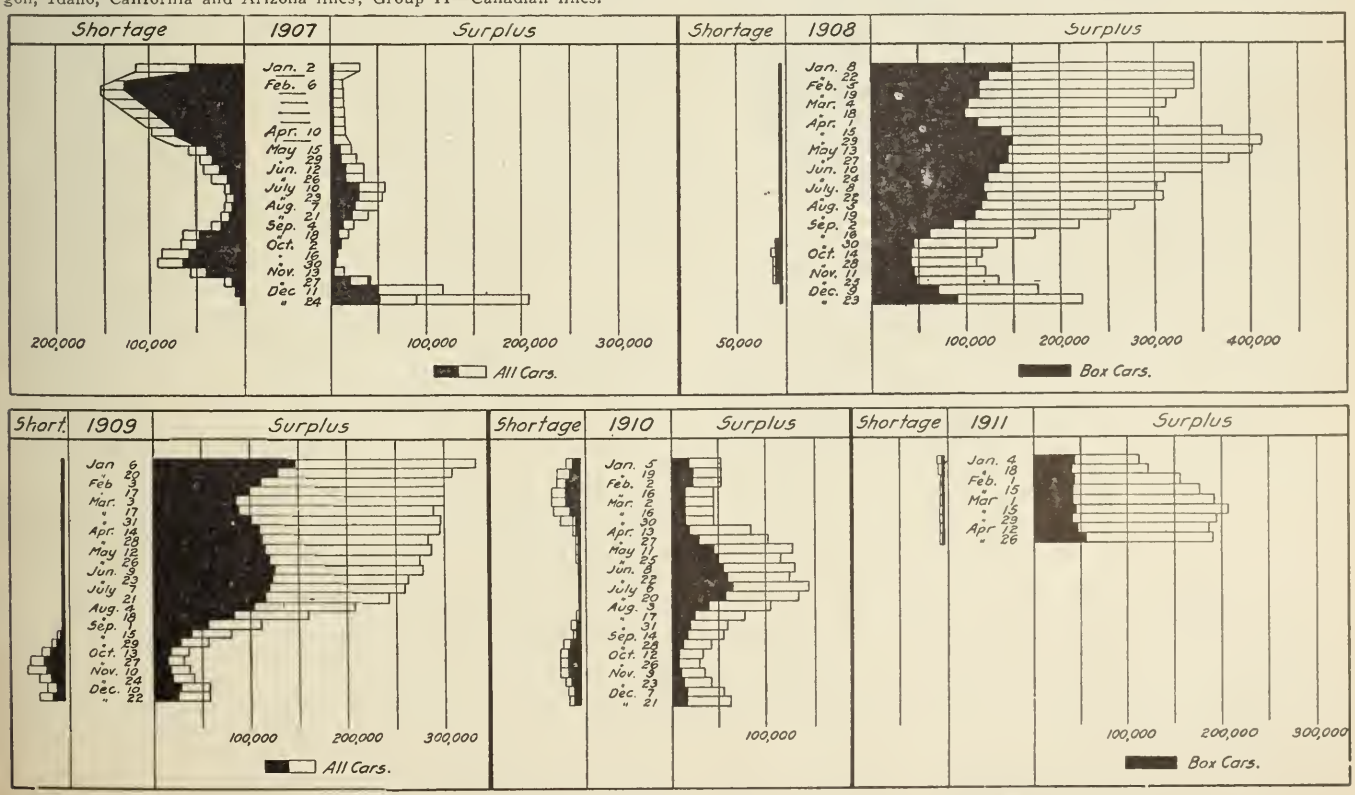
"The increase in box cars is general, with the exception of groups 6 (Northwestern), and 7 (Montana, Wyoming, etc.), where slight decreases are reported. The miscellaneous cars for which increases are shown are chiefly stock cars. The decrease in coal car surplus is principally in group 3 (central) where the lake coal traffic is heaviest."

The accompanying table gives surpluses and shortages by groups for the past period covered by the report, and the charts show bi-weekly totals for 1907 to 1911, inclusive.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—April 26, 1911	8	1,454	1,307	431	224	3,416	0	76	0	4	80
" 2.— " 26, 1911	24	3,682	171	24,606	8,574	37,033	0	0	0	0	0
" 3.— " 26, 1911	25	7,660	1,454	38,089	4,510	51,713	0	0	2,000	62	2,062
" 4.— " 26, 1911	10	3,350	143	6,183	2,102	11,778	6	51	0	0	57
" 5.— " 26, 1911	19	6,007	946	6,097	1,935	14,985	0	40	0	0	41
" 6.— " 26, 1911	26	9,265	1,183	3,583	6,558	20,589	70	13	3	0	86
" 7.— " 26, 1911	4	1,332	260	820	311	2,723	0	0	0	0	0
" 8.— " 26, 1911	16	9,057	553	2,979	3,718	16,307	5	0	0	0	5
" 9.— " 26, 1911	11	3,036	557	337	1,473	5,403	10	0	0	0	10
" 10.— " 26, 1911	20	7,102	2,335	2,206	9,153	20,796	0	2	0	12	14
" 11.— " 26, 1911	5	3,107	664	20	990	4,781	0	138	0	25	163
Total	168	55,052	9,573	85,351	39,548	189,524	91	320	2,003	104	2,518

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Freight Car Surpluses and Shortages in 1907 to 1911 Inclusive.

INTERSTATE COMMERCE COMMISSION.

The commission has changed from May 15 to June 15 the date for compliance with its order forbidding a railway to fix the rate for the transportation of any commodity according to the purpose for which the commodity is to be used.

The commission has granted the request of the Carolina, Clinchfield & Ohio to carry coal from points in Virginia to Charleston, S. C., for a lower rate than is charged to certain intermediate points. This is the first order of the kind which has been issued by the commission since the change in the law made last year. Similar permission has been granted in regard to the Pere Marquette in regard to coal shipped from Black Rock and Suspension Bridge, N. Y., to Milwaukee and other points in Wisconsin.

The commission has issued a revised order relative to irregularity in dating bills of lading, dealing with certain practices which have been found to exist on cotton carrying roads of the South. Bills of lading must not be issued until the cotton has been actually received by the carrier; delivery to a compress cannot be deemed a delivery to the railway. The question whether some compresses may be practically the same as railway stations is not decided. Where a switching line delivers a car to a line carrier, the latter must date the bill of lading the day when it receives the goods; not the day on which they are delivered to the switching road. But if the switching ticket shows consignee and destination and is, in effect, an informal bill of lading, issued by the initial carrier, there is no objection to issuing a formal bill of lading bearing the same date as the switching ticket. Bills of lading must not show a false point of origin. Where this has been done shippers have been able to commit frauds on consignees. Where a bill of lading is issued in exchange for another bill of lading or a receipt the fact must be plainly stated.

Reparation Awarded.

Joseph Peters v. Oregon Short Line et al. Opinion by the Commission:

A rule in the tariff providing that shipments of coal should not be weighed except at point of origin found unreasonable. Charges assessed for the transportation of coal from Diamondville, Wyo., to Anaconda, Mont., found to have been unreasonable because assessed on overweight. (20 I. C. C. 598.)

E. Sondheimer Company v. Illinois Central et al. Opinion by Commissioner McChord.

The original report in this case (17 I. C. C., 60), disposed of all question at issue, except the claim for reparation, the case being held open to permit the complainant to prove the extent of the damages sustained by undue preference of Memphis over Cairo. The undisputed evidence is that during the time Cairo was subject to undue prejudice on shipments of lumber, complainant was forced to reduce its profits on lumber from Cairo by an amount equal to the advantages in freight rates enjoyed by Memphis dealers. The defendants say that no legal basis for reparation has been established because the damages sought by complainant are speculative. They say that it is impossible for complainant to tell to what extent, if any, prices on lumber in a large consuming market such as Chicago are controlled by Memphis prices. The commission finds that the proper measure of the damages to complainant is the difference between the old and new Memphis tariffs, and therefore awards $8,827 to complainant. (20 I. C. C., 606.)

Reparation Denied.

Freeman Lumber Co. v. St. Louis, Iron Mountain & Southern et al. Opinion by Commissioner Clark:

The commission repeats that reparation will not ordinarily be awarded in a formal case attacking a rate as unreasonable, or otherwise in violation of law, unless intent to claim reparation is specifically disclosed therein or in an amendment thereof filed before the submission of the case, adhered to. (20 I. C. C. 612.)

Sweeney, Lynes & Co. v. New York, Philadelphia & Norfolk et al. Opinion by Chairman Clements:

Defendants' rates for refrigeration of strawberries from Norfolk, Va., and Only, and Pittsville, Md., and Marion, found to be unreasonable, and maximum rates prescribed for future. (20 I. C. C. 600.)

Complaint Dismissed.

Bookwalter Wheel Co. v. Tennessee Central et al. Opinion by Commissioner Meyer:

Claim for reparation based on alleged misrouting of shipment from Fourteen Mile Switch, Tenn., to Miamisburg, Ohio, denied. (20 I. C. C. 603.)

Proposed Hearings and Suspensions of Tariffs.

The commission has suspended until September 4, certain tariffs on ice presented by the Chicago, Milwaukee & St. Paul, which were to have gone into effect May 7. The commission has suspended until October 26 certain tariffs on milk presented by the Baltimore & Ohio Southwestern, which were to have gone into effect June 28.

Definition of "Completely K. D."

Pacific Coast Biscuit Co. v. Spokane, Portland & Seattle, et al. Opinion by the commission.

Western classification provides that first-class rates shall be charged on peanut roasters completely K. D. The complainant shipped various kinds of peanut roasters and these machines were taken apart, in so far as it was possible to do so, without injury to the machine. The commission finds that the terms in the western classification are misleading, since some types of roasters merely had the wheels, axles and springs removed from the body, but was rated as completely knocked down, while others having glass cases were not rated as completely knocked down because the glass had not been taken out and packed flat, but this could not have been done without destroying parts of the frame. A refund is ordered, and the commission assumes that the defendants will amend their classification to make definite provision for application of the various rates. (20 I. C. C., 546.)

Rates on Beer into a Prohibition State.

W. J. Scheuing v. Louisville & Nashville. Opinion by the commission.

The defendant is a dealer in soda water and tobacco at Cullman, Ala., and claims that the Louisville & Nashville charged an unreasonable rate on shipments aggregating 74,000 lbs. of bottled beer. The defendant said that there had been almost no movement of beer in carload quantities from St. Louis to Cullman, and that therefore no commodity rate had been established. At the hearing the railway laid great stress on the Alabama statute, which prohibits the sale of beer within the state. Great anxiety was also manifested lest the commission, by reducing the rate to Cullman, might aid and abet a violation of this statute. It doubtless overlooked the fact that a similar construction might be placed on its own action, giving favorable rates to Decatur, Ala., and Birmingham, Ala. However, a shipper is entitled to have his interstate freight moved at reasonable rates. To regulate these rates is the commission's function; to enforce state laws, the duty of the state. Reparation is awarded. (20 I. C. C., 550.)

STATE COMMISSIONS.

The Railroad Commission of Georgia is making an extended and detailed inquiry into the business of the Southern Express Company, which operates on most of the lines of that state.

An interesting contest has been going on before the Railroad Commission of Washington over the adjustment of freight rates as between competing communities in that state. Tacoma and Seattle, which are on the Pacific coast, have petitioned the commission to require substantial reductions in the rates east bound from these cities. Spokane is opposing the reductions asked for as vigorously as it has demanded reductions in its rates from the eastern part of the United States. The state commission finds itself between the two fires of these jealous competing communities just as the railways have been in past years, and the indications are that it will find it as impossible

as the railways have to satisfy both sides. The rate expert of the commission, O. O. Calderhead, testified regarding the value of the different roads involved in the state of Washington, his testimony being based on the valuation made about two years ago by the state commission. The railways, on the other hand, have introduced testimony of their own officers regarding the value of their properties, and the indications are that the case may ultimately result in a test of the validity of the commission's valuation, similar to the test of the Minnesota Commission's valuation in the Minnesota rate case. The Washington valuation is the most important that has been made by any public authority, except that in Minnesota; and the commission has already made some reductions in rates, particularly on grain, which have been based on its valuation. A legal test of the Washington valuation would be of special interest because, while the Minnesota valuation was based entirely on the cost of reproduction of the physical properties, the Washington commission attempted to take into consideration all the elements that enter into the value of the railways as going concerns and to ascertain their market values.

COURT NEWS.

In the federal court at Tulsa, Okla., April 26, the Kansas City Southern was acquitted of the charge of violating the 16-hour law as applied to the working hours of freight trainmen.

The Court of Appeals of Georgia in the case of *Perry v. Atlantic Coast Line,* has sustained the right of the road to require the coupons of mileage books to be exchanged for tickets before asking for transportation on a train. Perry boarded a train at night where there was no ticket seller and paid to the first station where there was an office open; but he did not get off there and provide himself with a ticket for the remainder of his journey, and so when he presented his mileage a second time the conductor put him off the train. There being no state law or rule regulating mileage books, the buyer, says the court, must accept the conditions prescribed by the road in selling him the book.

The Supreme Court of Montana, in the case of Doherty, has sustained the Pullman Company in a rule not to sell seat tickets in sleeping cars between the hours of 10 p. m. and 7 a. m. A party of five men boarded a train one morning about six o'clock; and there being no day cars on the train, applied for accommodations in a sleeping car. Four of the men bought two berths for $3, making the rate 75 cents for each man, but the fifth had to take a whole berth or nothing. Rather than pay $1.50 he allowed the conductor to put him off the train, and he waited for the second section of the train, 40 minutes later. Associate Justice Smith, while concurring in the action of the court on the ground that the plaintiff had magnified a small matter into a law suit, holds that by making such a rigid rule the Pullman Company practices discrimination. The Justice advises the company to exercise a little common sense in such matters.

Judge Sanborn at St. Paul, Minn., has refused the petition to grant a stay of execution of the court's recent order pending the appeal which he allowed the state to make to the United States Supreme Court, although he extended until July 1 the time when the Great Northern, the Northern Pacific and the Minneapolis & St. Louis are required to restore the rates in effect prior to September 6, 1906, that is, the 3-cent passenger fares and the merchandise freight rates that are 20 to 25 per cent. higher than the rates ordered by the state railway commission on that date. The injunction, which would have expired June 1, was extended a month in order that the roads might revise their tariffs and give the Interstate Commerce Commission the necessary 30 days' notice of the changes. While the case tried by Judge Sanborn affected only the three roads above mentioned, it is expected that the court will grant injunctions to the stockholders of the Chicago, Rock Island & Pacific, the Minneapolis, St. Paul & Sault Ste. Marie, the Chicago, Great Western, the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St. Paul and the Chicago, St. Paul, Minneapolis, & Omaha, compelling them to establish the higher rates previously in effect on the ground that the rates established by the state commission interfere with interstate traffic.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. S. Clarke, first vice-president of the Missouri Pacific, with office at St. Louis, Mo., has resigned.

J. H. Steele has been elected president of the Texas City Steamship Company, with office at Galveston, Texas.

D. B. Pankey, treasurer of the St. Louis, Kennett & Southeastern, has been elected president, succeeding R. H. Jones, deceased. L. R. Jones succeeds Mr. Pankey, and A. E. Diamant has been appointed secretary, succeeding J. B. Blakemore, all with offices at Kennett, Mo.

T. J. Freeman, receiver and general manager of the International & Great Northern, at Houston, Tex., has been elected first vice-president in charge of operation and a member of the board of the Texas & Pacific. Plans are under way for the eventual consolidation of the operating management of the Texas & Pacific and the International & Great Northern in charge of Mr. Freeman, following the reorganization of the latter company, subsequent to the foreclosure sale on May 16.

Benjamin Thomas Wood, whose appointment as assistant to the vice-president of the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute, with office at St. Louis, Mo., has been announced in these columns, was born December 31, 1878, at Springfield, Mo. He received a high school education, graduating in 1896, and in 1897 began railway work with the Kansas City, Fort Scott & Memphis as a stenographer in the division superintendent's office. In January, 1899, he became secretary to the general superintendent, and three years later went with the St. Louis & San Francisco as secretary to the vice-president and general manager, where he remained for two years. He was then made secretary to the third vice-president of the Rock Island Lines and afterwards became secretary to the president. He was appointed chief clerk to the president of the Rock Island in January, 1905, and in December, 1909, when the Rock Island-Frisco merger was dissolved, he was made chief clerk to the president of the Chicago & Eastern Illinois, which position he held until his recent appointment as assistant to the vice-president of the Frisco Lines.



B. T. Wood.

Operating Officers.

W. D. Forster, traffic manager of the Tonopah & Goldfield, at Goldfield, Nev., has been appointed also superintendent, succeeding A. B. Phillips.

P. C. Connelly, division roadmaster of the Great Northern, at Spokane, Wash., has been appointed a trainmaster, with office at Grand Forks, N. Dak.

F. S. James has been appointed superintendent of the Missouri, Kansas & Texas of Texas, with office at Greenville, Texas, succeeding W. J. Stoneburner, resigned to go to another company.

F. A. Lattig, superintendent of the National Lines of Mexico at Monterey, Mex., has been appointed superintendent of the Missouri, Kansas & Texas of Texas, with office at Smithville, Tex., succeeding W. Rudd, resigned.

W. J. Stoneburner, whose appointment as general manager of the Texas City Terminal Company, with office at Texas City, Texas, has been announced in these columns, has been appointed also general manager of the Texas City Transportation Company.

J. P. Quigley has been appointed car accountant of the Western Pacific and the Boca & Loyalton, also superintendent of telegraph of the Western Pacific and the Western Union Telegraph Company, with office at San Francisco, Cal., succeeding E. W. Mason.

H. D. Earl, assistant superintendent of the St. Louis Southwestern of Texas at Tyler, Texas, has been appointed superintendent, with office at Mt. Pleasant, Texas, succeeding W. N. Neff, promoted. R. L. Garner, chief despatcher at Mt. Pleasant, succeeds Mr. Earl.

G. H. Alexander, car accountant of the New York Central & Hudson River, at New York, has been appointed superintendent of car service, in direct charge of the freight car distribution and tracing of freight, also the car records, car demurrage, mileage, per diem accounts and such other duties as may be assigned to him, with office at New York.

T. Collins, assistant superintendent of the Canadian Pacific, at Smiths Falls, Ont., has been appointed assistant superintendent of District No. 2, Eastern division, with office at Smiths Falls. W. B. Way, assistant superintendent on the Lake Superior division, at Chapleau, has been appointed assistant superintendent of District No. 3, Eastern division, with office at Montreal, Que., and J. H. Boyle, assistant superintendent at Montreal, has been appointed assistant superintendent of District No. 4, with office at Ottawa, Ont.

A. C. Kellar has been appointed superintendent of the Sierra Railway of California, with office at Jamestown, Cal. Mr. Kellar was born September 24, 1869, at Memphis, Tenn., and was educated in the private schools of his native town and at Western Kentucky College, South Carrollton, Ky. He entered the service of the Louisville & Nashville in 1895, as agent and operator, and in 1897 was promoted to despatcher. He left that company in 1898, since which time he has held various positions on the Missouri Pacific, Union Pacific, Atchison, Topeka & Santa Fe, Northern Pacific and Chicago & North Western.

Frank Cizek, who has been appointed superintendent of the Syracuse and Utica divisions of the Delaware, Lackawanna & Western, with office at Syracuse, N. Y., as previously announced in these columns, was born April 2, 1875. He was educated in the common schools at Chicago, and in 1889, began railway work as a messenger in the office of the Chicago, Rock Island & Pacific, at Chicago. In 1891 he was transferred to the office of the general passenger agent, and the following year was made a ticket soliciting clerk. He was appointed clerk and messenger in President R. R. Cable's office in 1893. From 1895 to 1899, he was stenographer and secretary to W. H. Truesdale, vice-president and general manager of the Rock Island, and when Mr. Truesdale was elected president of the Delaware, Lackawanna & Western in March, 1899, came east in the same capacity. In 1901 Mr. Cizek entered the operating department as chief clerk to trainmaster at Hoboken, N. J., and two years later was appointed assistant trainmaster, becoming passenger trainmaster in 1907. He was promoted to superintendent of the Bangor & Portland division in May, 1908, at Easton, Pa., which position he held at the time of his recent appointment as superintendent of the Syracuse and Utica divisions.



Frank Cizek.

John H. Keefe, whose appointment as assistant general manager of the Gulf, Colorado & Santa Fe, with office at Galveston, Texas, has been announced in these columns, was born August 20, 1880, at Raub, Benton county, Indiana. He was educated at St. Mary's University, and began railway work in November, 1896, with the Colorado & Santa Fe part of the Santa Fe system, as an office boy and messenger in the office of the superintendent of transportation. He held several different clerical positions, and in August, 1902, was appointed chief clerk to the general superintendent. Three years later he was made assistant to the general manager, which position he held continuously until his appointment as above, his title recently having been assistant to the second vice-president and general manager.

Traffic Officers.

W. E. Zirckel has been appointed general agent of the Denver & Rio Grande, with office at Cleveland, Ohio.

W. R. Haughawout has been appointed a traveling freight agent of the St. Louis & San Francisco, with office at Oklahoma City, Okla.

E. S. Vincent has been appointed traveling freight and passenger agent of the Southern Pacific, with office at Little Rock, Ark., a new agency.

W. J. Foley has been appointed traveling freight and passenger agent of the Denver & Rio Grande and the Western Pacific, with office at St. Louis, Mo.

Harry C. Strohm, ticket clerk of the Baltimore & Ohio, at Youngstown, Ohio, has been appointed a traveling passenger agent, with office at Chicago.

L. J. Hausman has been appointed traveling freight agent of the Chicago, Rock Island & Gulf, with office at San Antonio, Tex., succeeding J. I. Johnson, promoted.

Frank C. L. Lathrop, commercial agent of the Southern Pacific, at Pasadena, Cal., has been appointed district passenger agent, with office at Los Angeles, succeeding N. R. Martin.

J. W. Byars, commercial agent of the International & Great Northern at Waco, Texas, has been appointed commercial agent, with office at Dallas, Texas, succeeding E. A. Turner.

H. Y. Williams, traveling passenger agent of the Gulf, Colorado & Santa Fe, at Temple, Tex., has been appointed colonization agent, with office at Galveston, succeeding S. A. Kendig, deceased.

W. O. Skinner, commercial agent of the Atchison, Topeka & Santa Fe at Pueblo, Colo., has been appointed a division freight agent, with office at Pueblo, a new office, and his former position has been abolished.

W. E. Zirckel, traveling freight agent of the Western Pacific, at Pittsburgh, Pa., has been appointed general agent, Cleveland district, of the Western Pacific and the Denver & Rio Grande, with office at Cleveland, Ohio.

Alan W. Graves has been appointed commercial agent of the Atlantic Coast Line, with office at Baltimore, Md., succeeding J. B. Andrews. J. G. North has been appointed soliciting agent at Macon, Ga., succeeding J. W. White, and W. W. Lawton has been appointed a special agent at Havana, Cuba.

C. E. Dewey, general freight agent of the Central Vermont, has been appointed general freight agent of the Grand Trunk Pacific, in charge of the territory from Port Arthur, Ont., west, also general freight agent of the Grand Trunk Pacific Coast Steamship Company, Ltd., with office at Winnipeg, Man.

J. McArthur has been appointed agent of the Grand Trunk Pacific, with office at Victoria, B. C., succeeding H. Brown. W. J. Quinlan, traveling passenger agent at Winnipeg, Man., has been appointed district passenger agent, with office at Winnipeg, succeeding A. E. Duff, and H. J. Lambkin succeeds Mr. Quinlan.

F. W. Hopper, traveling passenger agent of the Grand Trunk at Detroit, Mich., has been appointed a general agent, with office at San Francisco, Cal. C. A. Schmidt, soliciting freight agent

at St. Louis, Mo., has been appointed a traveling freight agent, with office at St. Louis, succeeding F. A. Crow, resigned, and W. T. Page succeeds Mr. Schmidt.

P. F. Finnegan, chief clerk in the general freight department of the Baltimore & Ohio at Chicago, has been appointed general freight and passenger agent of the Baltimore & Ohio Chicago Terminal, with office at Chicago. Mr. Finnegan was born in Chicago, November 4, 1877, and he received a high school education in that city. He began railway work in May, 1895, in the transportation department of the Baltimore & Ohio, where he remained for over five years. He was transferred to the freight traffic department as claim and rate clerk in October, 1900, and since September, 1905, has been chief clerk in the general freight department.

V. D. Fort, who has been appointed to the new office of assistant freight traffic manager of the Illinois Central, with office at Chicago, as was previously announced in these columns, was born January 29, 1870, at Cedar Rapids, Iowa. After receiving a common school education he began railway work at Cedar Rapids in 1885, with the Burlington, Cedar Rapids & Northern, now part of the Rock Island Lines. He was for a time clerk in the general freight department, and for four years from 1888, was chief tariff clerk for the Chicago Great Western. He then went to the Illinois Central in the same capacity and was afterwards promoted to chief clerk in the general freight department. For eight years from October, 1901, he was assistant general freight agent, becoming general freight agent in the latter part of 1909, from which office he is now promoted to assistant freight traffic manager.



V. D. Fort.

Donald Rose, who has been promoted from freight traffic manager of the Illinois Central and the Indianapolis Southern at Chicago to European traffic manager, with office at London, with jurisdiction over those lines and the Yazoo & Mississippi Valley, the Central of Georgia and the Ocean Steamship Company of Savannah, was born in Scotland and came to Canada when a boy. He began railway work in the traffic department of the Grand Trunk at Montreal, Can., and later was connected with the traffic department of the Chicago, Rock Island & Pacific and the Atchison, Topeka & Santa Fe. Since 1892 he has been with the Illinois Central. He began in the freight traffic department, and was for a time commercial agent at Salt Lake City, Utah. He was appointed assistant to J. T. Harahan, then second vice-president, in 1901, and in 1904 was sent to London to represent the company, where he remained for five years. In February, 1909, he was appointed assistant to the president at Chicago, and in September of the same year was promoted to freight traffic manager, which office he resigns to accept the appointment as above.



Donald Rose.

W. B. McGroarty, district freight agent of the Southern Railway, at Jacksonville, Fla., has been appointed agent of the Piedmont Air Line, with office at Baltimore, Md., succeeding G. R. Needham, resigned to go into other business. C. M. Tyler, traveling freight agent of the Southern Railway, at Tampa, Fla., succeeds Mr. McGroarty; H. F. Phipps, soliciting agent, at Tampa, succeeds Mr. Tyler; Robert B. McGroarty succeeds Mr. Phipps, and R. N. Beason has been appointed a soliciting agent, at Huntsville, Ala.

Joseph Hattendorf, whose appointment as general freight agent of the Illinois Central, with office at Memphis, Tenn., has been announced in these columns, was born January 13, 1875, at Arkadelphia, Ark. He was educated in the public schools of Memphis and began railway work in April, 1892, as messenger boy for the Louisville, New Orleans & Texas and the Newport News & Mississippi Valley, now part of the Illinois Central system. He was made chief clerk in the general freight office in January, 1903, and three years later was promoted to assistant general freight agent at Memphis. In January, 1910, he was transferred with the same title to Chicago, which office he now leaves to return to Memphis as general freight agent.

Engineering and Rolling Stock Officers.

T. Kilpatrick has been appointed general foreman at the Cedar Rapids (Iowa) shops of the Rock Island Lines, succeeding J. M. Whalen, resigned.

J. H. Conlen, division roadmaster of the Great Northern at Whitefish, Mont., has been appointed roadmaster at Spokane, Wash., succeeding P. C. Connelly, transferred to the operating department.

S. H. Draper, general air brake inspector of the Northern Pacific at St. Paul, Minn., has been appointed master mechanic of the Rocky Mountain division, with office at Missoula, Mont., succeeding Silas Zwight, promoted.

The office of supervisor of timber preservation on the Rock Island Lines has been abolished, and C. F. Ford has been appointed supervisor of the tie and timber department, with office at Chicago. Mr. Ford will have charge of timber preservation, succeeding Dr. Hermann Von Schrenk, assigned to special work.

Incident to the dividing of the Iowa division of the Chicago & North Western into the East Iowa division and the West Iowa division, W. H. Bradley, formerly master mechanic of the Iowa division at Clinton, Iowa, has been appointed master mechanic of the East Iowa division, with office at Clinton, and J. E. Osmer, assistant master mechanic at Boone, Iowa, has been appointed master mechanic of the West Iowa division, with office at Boone.

Charles Scott, general foreman of the Buffalo, Rochester & Pittsburgh, has been appointed supervisor of bridges and buildings, for Divisions 1 and 2, with office at East Salamanca, N. Y., succeeding J. C. Rouse, master carpenter, retired under the pension rules. E. W. Fair, master carpenter, at Du Bois, Pa., has been appointed supervisor of bridges and buildings, for Divisions 3, 4 and 5 of the Erie division, with office at Du Bois, and the title of master carpenter has been abolished.

George E. Cessford, whose appointment as district master mechanic of the Chicago, Milwaukee & Puget Sound has been announced in these columns, was born September 22, 1858, at Clarence, Iowa. He received a grammar school education and began railway work on June 1, 1876, with the Chicago, Milwaukee & St. Paul. He was a machinist in the locomotive shop first at Milwaukee, Wis., and then at Minneapolis, Minn., and was roundhouse foreman for a number of years, filling that position at Calmar, Iowa; Mitchell, S. D.; Plummer, Idaho; Seattle, Wash., and Tacoma, Wash. He was then promoted to general foreman at Tacoma, from which position he was recently advanced to district master mechanic of the Chicago, Milwaukee & Puget Sound, with office at Miles City, Mont.

Howard M. Curry, whose appointment as mechanical superintendent of the Northern Pacific has been announced in these

columns, was born January 6, 1861, in Ogle county, Illinois. He received a common school education at Freeport, Ill., and began railway work in 1880 with the Northern Pacific. From June 12 of that year he was consecutively fireman, road engineer, assistant road foreman east of Mandan, and in December, 1898, was promoted to road foreman east of Mandan. Three years later he was appointed master mechanic at Fargo, N. D., and was transferred to Staples, Minn., in December, 1902. He was appointed general master mechanic over the territory east of Billings, Mont., in February, 1905, and in January, 1908, his jurisdiction was extended over the Yellowstone, Montana and Rock Mountain divisions which latter office he resigned on May 1 to become mechanical superintendent, with office at St. Paul, Minn.

OBITUARY.

E. B. Pope, western passenger agent of the Chesapeake & Ohio, at St. Louis, Mo., died at that place on May 7.

S. M. Bamberger, vice-president of the Salt Lake & Ogden, at Salt Lake City, Utah, died at Baltimore, Md., on May 9.

A. S. Buford, formerly president of the Richmond & Danville, now a part of the Southern Railway, died May 6, at his home in Richmond, Va.

W. B. Jennings, traveling freight and passenger agent of the Wabash, with office at Moberly, Mo., died at Rochester, Minn., on May 1. Mr. Jennings had been with the Wabash 40 years.

Joseph L. Doherty, auditor of the Chicago, Indianapolis & Louisville, with office at Chicago, died at Chicago on May 5. Mr. Doherty was 48 years old and had been with the Monon about 25 years, having been auditor for the last ten years.

Johnston Livingston, president of the National Express Co., died at his home in New York, May 7, at the age of 95 years. At the time of his death Mr. Livingston was also a director of the American Express Company.

William M. Burgard, formerly general agent of the Chicago & North Western, at Buffalo, N. Y., died May 7, at Mount Clemens, Mich. Mr. Burgard had been in railway service for about 25 years, and for most of that time was with the Chicago & North Western.

Charles G. Clark, vice-president of the American Express Company, died May 6, at his home in Englewood, N. J., at the age of 85 years. Mr. Clark was treasurer from 1885 to 1902, when he was elected vice-president, and at the time of his death he was also a member of the board and of the executive committee.

James M. McKinlay, assistant secretary, with office at New York, of the Chicago, Milwaukee & St. Paul for forty-two years, died Wednesday at his home. He was born and educated in Dunfermline, Scotland, came to America in 1847 and went to Dubuque, where he was admitted to the bar, and acted as attorney for the Dubuque & Sioux City, now part of the Illinois Central. He came to New York in 1868 to go into the service of the St. Paul. He retired from active service only last year.

FOREIGN RAILWAY NOTES.

The government of Ecuador has recently spent $50,000 for repairs on the roadbed of the Machala to Puerto Bolivar Railway. This short line is in the southern part of Ecuador and is of particular importance, as it affords a safe and quick outlet to the Pacific ocean for the products of the fertile country through which it passes.

An imperial edict, issued in Peking, China, May 9, authorizes the conclusion of the loan of $30,000,000 for railway construction in Central China. The loan was signed a year ago, despite provincial opposition by groups of financiers representing the United States, France, Great Britain and Germany. The amount of the loan remains at $30,000,000, notwithstanding the elimination of a branch section of the railway and the four groups of bankers will participate.

Railway Construction.

New Incorporations, Surveys, Etc.

Alabama, Tennessee & Northern.—This road has been extended from Geiger, Ala., south to York, 28 miles.

Angelina & Neches River.—According to press reports, this company, which operates a 20-mile line from Keltys, Texas, east to Naclina, is making plans to build an extension northeast to Chireno, about 15 miles.

Atchison, Topeka & Santa Fe.—Track laying has been finished, it is said, on the section of the Texico-Coleman cut-off between Sweetwater, Texas, and a point on the Lubbock division. It is understood that this new line will be put in operation this month. From Sweetwater, south to Coleman, the line has been finished for some months and is open for traffic. There remains about 100 miles of work yet to be finished to complete the cut-off; this work is now in progress on the last division between Lubbock and Texico.

An officer writes that double-tracking work has been finished on the lines between Chicago and Kansas City, Mo., except on 35 miles between Carrollton, Mo., and Rothville, on which grading is about finished and track laying and ballasting should be completed within the next 90 days. There is 3.5 miles between Carrollton Junction and Floyd on the east bank of the Missouri river which the company will probably not undertake this year, or not until a new bridge over the Missouri river between Floyd and Sibley has been built, but the company has not yet determined whether this bridge is to be a single or double-track structure. When the work between Camden Junction and Floyd is finished the company will have double-track from Chicago through to Kansas City, except for bridges over the Illinois, Mississippi, Des Moines and Missouri rivers.

Atlantic Coast Line.—This company is said to have bought 50 acres of land east of Augusta, Ga., to be used as a site for a freight yard.

Baltimore & Ohio.—An officer writes that satisfactory progress is being made on the improvements being carried out near Tunnelton, W. Va. The heading of the 4,700 ft. tunnel through the Allegheny mountains has been partly bored out, and it will be put in operation at an early date. Bennett & Talbott, Fairmont, are the contractors. (August 26, p. 372.)

Canadian Northern.—An officer is quoted as saying that contracts were let last year for work on 140 miles of main line and bids are now being asked for constructing an additional 200 miles, chiefly rock work through British Columbia, on the Pacific coast section coming eastward. Rails are already on the way to be laid on this section. From the eastern end the main line is built west into the foot hills beyond Edmonton, Alb.

Canadian Northern Ontario.—The Dominion parliament, it is said, has extended the time in which to build various lines already authorized, including one from Berlin, Ont., east via Guelph, Acton and Brompton to Toronto. The railway commissioners are said to have approved revised location plans for a line from near Billings Bridge, on the Toronto-Ottawa line, and have under consideration plans for the route at Smiths Falls. All the right-of-way between Ottawa and Smiths Falls has been secured and most of the right-of-way for the line between Smiths Falls and Sydenham. It is expected that contracts will be let soon to build from Ottawa to Sydenham. Between Toronto and Sydenham work is well advanced, and it is expected that this section will be finished this coming fall. (March 10, p. 478.)

Canadian Northern Quebec.—The Dominion parliament, it is said, has authorized this company to build from Rawdon, Que., to a junction with the Grand Trunk Pacific, with a branch from near Rawdon to Joliette, also a line from St. Jerome to St. Eustasche.

Cary North & South.—An officer writes that grading contracts will be let about July 1, to build from Cary, Ga., north via Danville to Gordon, and to build south from Cary via Cochran to Hawkinsville, in all about 50 miles. Surveys are now being made and most of the right-of-way has been secured. The company expects to have all the grading finished by Oc-

tober of this year. Maximum grades will be 1 per cent. and maximum curvature 5 deg. The line is being built to carry lumber, wood pulp, cotton and agricultural products. H. R. Brown, president, and D. B. Dunn, chief engineer, Macon.

Cherryvale, Oklahoma & Texas.—An officer writes that work is now under way by the Continental Construction Company, Caney, Kan., from Caney, southeast via Wann, Okla., Delaware, Nowata and Vinita to Siloam Springs, Ark. and grading has been finished on 25 miles. Maximum grades will be 1 per cent. and maximum curvature 6 deg. There will be one steel bridge, 160 ft. long, and a 75-ft. girder bridge. S. M. Porter, president, Caney, and B. J. Dalton, chief engineer, Lawrence. (December 2, p. 1096.)

Copper River & Northwestern.—This road has been extended from Chitina, Alaska, east to Kennecott, 66 miles.

Crystal City & Uvalde.—According to press reports, construction work is to be started soon on an extension from Gardendale, Texas, to Dulls, about 25 miles.

Grand Trunk.—The board of railway commissioners has under consideration plans for the elevation of the Grand Trunk's tracks from Bonaventure station, Montreal, Que., to St. Henri.

An officer of the Grand Trunk is quoted as saying that plans are being made to spend from $8,000,000 to $9,000,000 in double-tracking the lines in Toronto and vicinity.

Governor Pothier of Rhode Island has signed a bill which provides for access by the Grand Trunk to the proposed docks at Providence, R. I. This is to be accomplished by building a line over and under the tracks of the New York, New Haven & Hartford. The bill has been mutually agreed upon by Grand Trunk and New Haven interests. It is expected that the Southern New England, under whose charter the Grand Trunk will build, will immediately begin construction work on the line from Palmer, Mass., where connection is to be made with the Central Vermont, another Grand Trunk subsidiary, to the Providence waterfront. By the terms of the agreement with the New Haven, the latter company will pay the cost of constructing a tunnel under its tracks. At another point there will be a grade crossing. (April 28, p. 1016.)

Iowa Traction Company.—An officer writes that grading has been finished on 20 miles of the line under construction from Oskaloosa, Iowa, north via Barnes City, Montezuma, Malcom, Tama, Toledo, Traer and Eagle Center to Waterloo, about 100 miles. It is expected to let some additional contracts in about 30 days. There will be two steel bridges, and 3,000 ft. of trestles. A power plant is included in the plans. G. E. Wodehouse, president, and J. C. Lathrop, chief engineer, Oskaloosa. (November 11, p. 945.)

Levisa Railroad.—An officer writes that it has not yet been decided to build the line projected from Ward, Pike county, Ky., on the Chesapeake & Ohio, up Levisa river to Grundy, Va., 50 miles. The Chesapeake & Ohio is said to be back of this project. G. B. Wall, president, and H. Pierce, engineer of construction, Richmond.

Methow Valley & Washington Northern.—An officer writes that arrangements are being made to begin construction work soon on the line from Winthrop, Wash., along the west bank of Methow river via Twisp, to Carleton, thence along the east side of the river to Methow, again returning to the west side of the river to a point near Pateros, thence along the east side of the river to Pateros, on the Columbia river, 43 miles. Most of the right-of-way has been secured. Under the terms of the charter the company can build from Puget Sound to Spokane. J. C. Barton, vice-president and chief engineer, Twisp. (May 5, p. 1085.)

New Orleans, Mobile & Chicago.—An officer writes regarding the reports that the company contemplates building an extension from some point in southern Mississippi to New Orleans, La., that this is a future plan of the company, but nothing is being done at present on the extension. (April 14, p. 925.)

New York, New Haven & Hartford.—The detailed plans for the improvement of the Air Line division through Middletown, Conn., between New Haven and Willimantic, as filed with the state railway commissioners, show that the work to be carried out will cost over $1,000,000. This is in addition to the cost of the railway bridge, which was recently finished over the Connecticut river between Middletown and Portland.

North Coast.—See Oregon-Washington Railroad & Navigation Company.

Oregon Trunk Line.—This road has been extended from Metolius, Ore., south to Opal City, 11.7 miles. It is expected that the remaining section under construction south to Bend, 30 miles, will be opened this coming summer.

Oregon-Washington Railroad & Navigation Company.—Work is nearing completion on the line from Maegley Junction, Ore., east to Troutdale, and it is expected to have the line in operation by June 1. (December 16, p. 1167.)

An order has recently been given for rails, switches, frogs, tie plates, etc., to finish the section of the North Coast from Spokane, Wash., to Ayer Junction, about 103.4 miles. Delivery is to begin in about three months. It is understood that the work on this section is to be pushed to completion.

This company will build a branch, it is said, from the main line at a point on the Des Chutes river to Ashwood, Ore., about 20 miles.

Pecos Valley Southern.—This company is said to be making plans to build an extension from Balmorhea, Texas, south via Fort Davis to Alpine, about 60 miles. The line may eventually be extended further south to a point on the Rio Grande border, an additional 100 miles from Alpine. (January 27, p. 184.)

Quebec, Central.—The Chaudiere Valley division has been extended from St. Justine, Que., to St. Sabine, three miles.

San Pedro, Los Angeles & Salt Lake.—An officer writes that contracts have been let to the Utah Construction Company, Ogden, Utah, to build from Moapa, Nev., southeasterly, following the Moapa valley to St. Thomas. The work will be generally light valley work. There will be one mile of medium heavy mountain work.

Skaneateles Railroad.—An officer of this company, which operates a five-mile line from Skaneateles Junction, N. Y., where connection is made with the New York Central & Hudson River, to Skaneateles, five miles, writes that the company plans to replace the present tracks with 80-lb. rail to carry the heavy rolling stock and increased traffic. Preliminary surveys are being made for an extension north via Elbridge to Jordan, five miles, and it is expected that work will be started soon on the first section to Elbridge.

Southern New England.—See Grand Trunk.

St. Louis Southwestern.—According to press reports, this company will let contracts soon for building a line from Stephenville, Texas, to the Thurber coal fields, about 30 miles. (April 14, p. 912.)

Tuckahoe & James River.—An officer writes that contracts will be let this month to build a line to carry coal from the Carbon Hill mine of the Old Dominion Development Company in Henrico county, Va., to the Richmond, Fredericksburg & Potomac, near Laurel, nine miles. There will also be one mile of sidings. Location work has been finished. William G. Woolfolk, president, Lorraine. E. W. Hastings, of the Richmond, Fredericksburg & Potomac, Richmond, is temporary chief engineer.

Union Pacific.—According to press reports, this company will build an extension of the line now in operation to Callaway, Neb., northwest of that place.

United Railways (Electric).—This road has been extended from North Plains, Ore., to Banks, 3.6 miles.

Vallejo & Northern (Electric).—This company, which was organized to build from Vallejo, Cal., northeast to Woodland, thence southeast to Sacramento, about 70 miles, is said to have started construction work between Vallejo and Suisun.

Wichita Falls Route.—According to press reports, a contract has been given by the Wichita Falls & Southern to build an extension from Newcastle, Tex., southeast to Graham, about 15 miles.

Wichita Falls & Southern.—See Wichita Falls Route.

Railway Financial News.

Atchison, Topeka & Santa Fe.—The Paris Bourse has listed $10,000,000 common stock of the Atchison, Topeka & Santa Fe on the Parquet. This listing was carried through by private bankers, of course with the consent of the directors of the railway company. Its object is to give the Atchison a broader market in France in which to do any future financing. On June 30, 1910, there was $165,518,500 common stock outstanding, and presumably this has been increased since by the conversion of bonds.

Belt Railroad & Stock Yards (Indianapolis, Ind.).—Estabrook & Co., Boston, Mass., are offering the unsold portion of $1,000,000 first refunding mortgage 4 per cent. bonds of 1909-1939 at 97½, yielding 4.15 per cent. interest on the investment. These bonds are to retire an equal amount of 6 per cent. bonds matured April 30, 1911. When the mortgage securing the 6 per cent. bonds is cancelled the bonds now offered will be secured by a first lien on 39.17 miles of single track and about 150 acres of stock yards.

Birmingham & Southeastern.—This is the new name of the Union Springs & Northern, which operates a line from Union Springs, Ala., to Fort Davis, 7½ miles, and is building an extension from Fort Davis to Millstone, about 20 miles.

Boston & Maine.—A quarterly dividend of 1 per cent. has been declared on the common stock, thus reducing the annual rate from 6 per cent. to 4 per cent. In 1909 the dividend was reduced from 7 per cent. to 6 per cent. The company had been paying 7 per cent. since 1900. Control of the Boston & Maine is held by the Boston Railroad Holding Company, all of whose stock is owned by the New York, New Haven & Hartford.

Canadian Northern.—G. P. Graham, minister of railways of Canada, has given notice of a resolution to be introduced by the government in the Canadian parliament embodying a bill providing for the guarantee of bonds of the Canadian Northern at the rate of $35,000 a mile.

Canadian Pacific.—H. S. Holt, president of the Montreal Light, Heat & Power Company, has been elected a director of the Canadian Pacific.

Central of Georgia.—The income bondholders' protective committee has refused to accept as full payment the compromise offer of the directors of the company to make part payments on the dividends for 1908, 1909 and 1910 on the three classes of income bonds. This offer of the directors was to pay the full 5 per cent. interest on the first income bonds for 1908, and about 2.82 per cent. on the second income bonds; and to pay about 2.31 per cent. on the first income bonds for 1909 and 1910. "In order to end vexatious litigation" holders of the Central of Georgia income bonds offered them to Illinois Central banking interests at 112½ for the first income bonds, 106¼ for the second income bonds and 102½ for the third income bonds, which prices include 17½ per cent. of "overdue" interest on all classes of bonds. The offer was made on condition that the bankers would bear a part of the legal expenses of the bondholders, who have been suing for a long time in the courts to compel payment of interest on their bonds. The bankers were willing to accept the income bonds at the prices named, but refused to bear any part of the legal expenses.

Chesapeake & Ohio.—See Hocking Valley.

Chicago, Milwaukee & Puget Sound.—It is understood that this company is to issue to the C. M. & St. P., $25,000,000 additional first mortgage 4 per cent. bonds in repayment for advances. On June 30, 1910, there was outstanding $123,000,000 Puget Sound bonds, all in the treasury of the St. Paul. Since then over $7,000,000 have been issued to the St. Paul, and the St. Paul has sold $25,000,000 out of its treasury. The St. Paul owns the entire $100,000,000 capital stock of the Puget Sound.

Chicago, Milwaukee & St. Paul.—See Chicago, Milwaukee & Puget Sound.

Denver, Northwestern & Pacific.—The interest due May 1 on the $4,000,000 6 per cent. two-year notes of the Colorado-Utah Construction Company, which are secured by the deposit of $8,000,000 Denver, Northwestern & Pacific bonds, was paid, but the principal of the notes, which was also due May 1, was not paid pending the determination of the best way to refund these securities. The notes bear the personal guarantee of David H. Moffatt, who until his recent death was president of the railway company.

Detroit, Toledo & Ironton.—On application of the trustee of the general lien and divisional mortgage bonds and the trustee of the consolidated mortgage bonds, the United States District Court at Detroit has signed a decree of foreclosure, fixing $2,500,000 as the upset price.

Fort Dodge, Des Moines & Southern.—Judge McPherson has authorized the receivers' to issue $500,000 receivers' certificates to pay for improvements, including additional yards at Fort Dodge, additional passing tracks, preliminary experiments in the introduction of automatic block signals, repairs to bridges on main line, etc.

Hocking Valley.—The injunction suit brought to prevent the Chesapeake & Ohio from voting its majority common stock of the Hocking Valley has at last come to trial in the federal court. Ralph Westfall, attorney for one of the plaintiffs, testified that he had bought Hocking Valley, Chesapeake & Ohio, Lake Shore & Michigan Southern, Minneapolis & St. Louis and Kanawha & Michigan stocks for the purpose of continuing the litigation.

Indianapolis Southern.—This property was sold under foreclosure for $2,500,000 to representatives of the Illinois Central.

Kansas City Southern.—Samuel McRoberts, vice-president of the National City Bank, New York; E. F. Swinney, president of the First National Bank of Kansas City, New York, and Arthur Turnbull, New York, have been elected directors, succeeding George Craig, Port Arthur, Texas; Adolphus Busch, St. Louis, Mo., and D. G. Boissevain, New York.

Louisville & Nashville.—J. P. Morgan & Co., New York, have arranged to sell for the company $10,000,000 Knoxville & Northern division mortgage 4 per cent. bonds of the Louisville & Nashville. It is understood that public offerings are to be made at 93¼.

Missouri, Kansas & Texas Railway.—The company has made application to the Texas railway commission for a certificate permitting the issue of $107,000,000 consolidated mortgage bonds. The application requested advance authority of the commission to issue consolidated mortgage bonds from time to time as needed for the purpose specified in the mortgage. The commissioners declined to approve the application as presented, on the ground that, in their opinion, it was not sufficiently explicit as to the purposes for which the bonds would be issued, or their proceeds used. It is probable that the application will be amended to the satisfaction of the commission.

New York, New Haven & Hartford.—See Boston & Maine.

Union Springs & Northern.—See Birmingham & Southeastern.

Vandalia.—The directors have declared a quarterly dividend of 1 per cent. payable May 25, a reduction of ¼ of 1 per cent. quarterly, thus placing the stock on a 4 per cent. annual basis as compared with the former 5 per cent. rate. .

In the calendar year 1910 the Vandalia earned a surplus over charges of $645,753. The dividend of 5 per cent. on $14,606,400, which was paid last year, required $730,320 a year, so that last year's dividend was paid partly from profit and loss surplus.

Western Pacific.—The construction account of this company is to be closed on June 30. Since the issue of first mortgage bonds on September 1, 1905, interest has been charged to construction account, as has also operating expenses of the road since the line has been opened for traffic. Revenue derived from traffic has been credited to this account. Up to June 30 the Western Pacific will have charged to construction account about $14,500,000 for interest on its first mortgage bonds, so that it is estimated that the road had put into it about $34,000,000 from the sale of $50,000,000 first mortgage bonds.

Supply Trade Section.

C. Henze has been appointed resident manager at Chicago of the Federal Signal Company, Albany, N. Y.

The Central Locomotive & Car Works, Chicago, has filed certificate of incorporation in Augusta, Maine, with $500,000 preferred stock and $100,000 common stock.

L. A. Irwin, formerly purchasing agent of the Quincy, Omaha & Kansas City, is now with the Western Railway Supply Company, Kansas City, Mo.

The U. S. Metal & Manufacturing Company, New York, has opened a branch office in the Morris building, Philadelphia, Pa., to take the place of the office at Lebanon, which has been closed. The new office will be in charge of L. Weimer Murray.

Dr. Charles H. Dressel, vice-president of the Dressel Railway Lamp Works, New York, died at his home in New York, April 25. Mr. Dressel was one of the pioneers in the railway lamp business. He was a member of the Railway Signal Association.

The David Lupton's Sons Company, Philadelphia, Pa., has opened an office in the Oliver building, Pittsburgh, Pa. Walter C. Scott, civil engineer, has resigned his position with the National Tube Company, Pittsburgh, Pa., to take charge of this new office.

The American Electric Railway Manufacturers' Association has secured the use of Young's Million Dollar Pier, Atlantic City, N. J., for its exhibition in connection with the convention of the American Electric Railway Association, to be held October 9-13. Details concerning exhibits, hotels, railway facilities, etc., may be obtained from George Keegan, secretary, 165 Broadway, New York.

Alva A. Griner, western manager of the Dahlstrom Metallic Door Company, Jamestown, N. Y., has been put in charge of this company's New York office, A. T. Hansen taking his place as manager of the Chicago office. This company has opened new offices in Cleveland, Ohio, Detroit, Mich., and Pittsburgh, Pa. W. D. Callinan is in charge of the Cleveland office, in the Garfield building. S. C. Malmberg is in charge of the Detroit office, in the Ford building, and L. H. Gibson is in charge of the Pittsburgh office in the Henry W. Oliver building.

W. M. White, formerly with the I. P. Morris Company, Philadelphia, Pa., has been made manager and chief engineer of the hydraulic turbine department of the Allis-Chalmers Company, Milwaukee, Wis. While in charge of designing for the I. P. Morris Company, Mr. White designed some of the largest installations in the country, including such plants as the Toronto Power Company, Niagara Falls, N. Y.; the Washington Water Power Company, Spokane, Wash.; and the Shawinigan Falls Power Company, Montreal, Que. Mr. White is an active member of the American Society of Mechanical Engineers.

The General Electric Company, Schenectady, N. Y., has received an order for equipment for the Portland, Gray & Lewiston Railway. This road is now under construction and will run from Portland, Mo., to Lewiston. Curves have been eliminated wherever possible. For its entire length of 30 miles, with the exception of about one-half mile, the road is located on private right-of-way. There is but one grade as steep as 4 per cent., this being 4.2 per cent. The sharpest curve is 8 deg. Power will be bought from a private company. The order includes three sub-station equipments, each consisting of a 300 k. w. rotary converter, transformers and switchboard. The equipment for a general utility car which will be used in construction work is included in the order.

The United States Steel Corporation reports unfilled tonnage orders 3,218,704 tons on April 30. This compares with unfilled orders of 3,447,301 tons on March 31, 1911; 3,400,543 tons on February 28, 1911; 3,110,919 tons on January 31, 1911; 2,674,757 tons on December 31, 1910; 2,760,413 tons on November 30, 1910; 2,871,949 on October 31, 1910; and 5,402,514 on March 31, 1910. The showing in unfilled tonnage in the month of April was not as favorable as expected, as estimates placed the shrinkage between 150,000 and 200,000 tons. Evidently, shipments in April were a great deal larger than anticipated by the trade. Based upon new orders received, the Steel Corporation shipped an average of 34,100 tons a day, or 885,250 tons for the month, a figure in excess of March shipments. The following table gives unfilled tonnage over a period of years:

Period.	Unfilled Tonnage.	Period.	Unfilled Tonnage.
Apr. 30, 1911	3,218,704	Dec. 31, 1908	3,603,527
Mch. 31, 1911	3,447,301	Sept. 30, 1908	3,421,977
Feb. 28, 1911	3,400,543	June 30, 1908	3,313,876
Jan. 31, 1911	3,110,919	Mch. 31, 1908	3,765,343
Dec. 31, 1910	2,674,757	Dec. 31, 1907	4,642,553
Nov. 30, 1910	2,760,413	Sept. 30, 1907	6,425,008
Oct. 31, 1910	2,871,949	June 30, 1907	7,603,873
Sept. 30, 1910	3,158,106	Mch. 31, 1907	8,043,858
Aug. 31, 1910	3,537,128	Dec. 31, 1906	8,489,718
July 31, 1910	3,970,931	Sept. 30, 1906	7,936,884
June 30, 1910	4,257,794	June 30, 1906	6,809,584
Mch. 31, 1910	5,402,514	Mch. 31, 1906	7,018,712
Dec. 31, 1909	5,927,031	Dec. 31, 1905	7,605,086
Sept. 30, 1909	4,796,833	Sept. 30, 1905	5,865,377
June 30, 1909	4,057,939	June 30, 1905	4,829,655
Mch. 31, 1909	3,542,595	Mch. 31, 1905	5,579,560

John F. Wallace, chairman of the board of directors of Westinghouse, Church, Kerr & Company, New York, has been made president of this company, succeeding H. H. Westinghouse. As other work requires all of Mr. Westinghouse's time, he recommended that Mr. Wallace assume the active management of the company. Mr. Wallace's career is familiar to the reader, but his more recent positions may be mentioned. After leaving the chief engineership of the Panama canal, he acted as confidential consulting engineer for the Chicago & North Western in the general design of the new passenger terminal for that company in Chicago. He then took the office he has held until his present change. Mr. Wallace is also president of the Electric Properties Company, New York, which controls Westinghouse, Church, Kerr & Company. Among the directors elected at the annual meeting of Westinghouse, Church, Kerr & Company are N. W. Halsey and F. Q. Brown of New York; George Westinghouse and J. R. McGinley of Pittsburgh, Pa., and Homer Loring of Boston, Mass.



John F. Wallace.

The Allith Manufacturing Company, Chicago, and the T. C. Prouty Company, Ltd., Albion, Mich., announce the consolidation of the business of these two companies to be carried on under the name Allith-Prouty Company. At present the two plants are being operated independently, but it is expected that in the near future the Chicago plant will be moved to Albion and that the complete line will be handled from a general office located there. The Allith company has made a specialty of round track door hangers and particularly heavy sliding-door hardware, while the Prouty concern has specialized more particularly on lighter sliding door hangers and track devices, and has also carried a considerable line of hinges and light finishing hardware. The consolidation of these two lines will not make it necessary to discontinue making any of the Allith products and only a few of those of the Prouty company. The sales

force of both companies will be retained by the consolidated company and, in fact, this force will be enlarged to enable them to cover the field more completely.

TRADE PUBLICATIONS.

Long Island Railroad. This company has issued a booklet entitled Long Island Resorts, describing the many attractive points along its line. The booklet is fully illustrated and gives information on the distances, accommodations and pastimes of these resorts.

Draft Rigging. The T. H. Symington Company, Baltimore, Md., has published a small illustrated booklet on Farlow draft rigging entitled Two Yokes in Transportation. This booklet enumerates concisely thirty Farlow facts, pointing out the advantages of this product. Diagrams are included.

The Detroit & Mackinac. The passenger department of this company has issued a well illustrated booklet containing about 100 pages, entitled Health and Pleasure Resorts on the Detroit & Mackinac Railway. The booklet includes brief descriptions of the many attractions of the various resorts along the lines of this road.

Electric Motors. The Crocker-Wheeler Company, Ampere, N. J., has devoted bulletin No. 129 to direct current crane and hoist motors; and bulletin No. 132 to belt type direct current motors for industrial machinery. These bulletins are illustrated and include diagrams and tables. Full information is given on these motors.

RAILWAY STRUCTURES.

Ashtabula, Ohio.—The Lake Shore & Michigan Southern is building a machine shop 42 ft. x 102 ft. on dock No. 2. Bids for the machinery have been received.

Corning, N. Y.—The New York Public Service Commission, Second district, has directed the Elmira, Corning & Waverly, now under construction, to build an under crossing under the tracks of the Erie Railroad in Corning. The cost of the work will be about $65,000.

Geddes, N. Y.—The New York Public Service Commission, Second district, has decided that Bridge street, in the town of Geddes, Onondaga county, should be carried over the tracks of the New York Central & Hudson River and the West Shore on a steel structure.

Harrisburg, Pa.—A contract has been given by the Pennsylvania Railroad to J. N. Bastress & Co., Harrisburg, Pa., for putting up a large freight transfer station in Harrisburg. The walls for the foundations are to be of concrete and the building of frame construction, covered with corrugated iron. The cost of the improvements will be about $150,000.

Hanford, Cal.—Plans are being made by the Southern Pacific, it is said, for putting up new stations at Hanford, Lemoore and Willow.

Hartford City, Ind.—The Pennsylvania Lines West, it is understood, will build a brick freight house, one and one-half stories high, 30 ft. x 100 ft., at an estimated cost of $30,000.

Lincoln, Ill.—The Chicago and Alton will build a brick passenger station, one and one-half stories high. The estimated cost is $20,000.

Little Rock, Ark.—The Chicago Rock Island & Pacific will ask for bids for a brick and steel freight house, one and two stories high, 46 ft. x 800 ft., equipped with steam heat.

Lemoore, Cal.—See Hanford, Cal.

Montreal, Que.—The Montreal Central Terminal Company, which holds a Dominion charter for the construction of subways within the city limits of Montreal, it is understood will start construction work soon on a central railway station in Montreal. (January 6, p. 64.)

Portland, Ore.—Work on the new Southern Pacific roundhouse mentioned in the *Railway Age Gazette* of December 16, 1910, is progressing rapidly, and it is expected that the structure will be completed early in the summer. The building will have 12 stalls and will be of brick and steel construction.

Quebec, Que.—According to press reports, the Grand Trunk Pacific will ask for bids during May for putting up a new station in Quebec. The company is also planning to put up shops near Quebec, for which bids may be asked for in the near future.

Sangerfield, N. Y.—The New York Public Service Commission, Second district, has ordered the elimination of the grade crossing of the Delaware, Lackawanna & Western at the North Brookfield-Waterville county highway, about one-quarter mile north of Sangerfield, in Oneida county. An under crossing is to be constructed in accordance with plans approved by the commission.

Seattle, Wash.—Work is nearing completion on the Northern Pacific's new bascule drawbridge over the Duwamish river at Seattle, and it is expected the structure will be opened for traffic early next month. The cost of the improvement is about $140,000.

Springfield, Mass.—An officer of the Boston & Albany writes that contracts have been given to the New England Structural Company, for putting up 11 steel bridges along the line between Springfield, Mass., and Worcester, also for a new bridge over the Charles river at Cottage Farm. The latter improvement is being carried out in connection with the double-tracking of the Grand Junction Railroad, from Cottage Farm to the Boston & Albany terminals at East Boston. The bridges all along the line will be heavy and modern, capable of carrying heavy rolling stock.

Toppenish, Wash.—The Northern Pacific has given a contract, it is said, to the Rounds-Hurson Co., Seattle, Wash., for building a station in Toppenish to cost $30,000. (April 7, p. 881).

Westerly, R. I.—An officer of the New York, New Haven & Hartford writes that $300,425 has been appropriated for improvements at Westerly, to include a new station to cost $20,000.

Willow, Cal.—See Hanford, Cal.

FOREIGN RAILWAY NOTES.

The Antung-Mukden Railway, Manchuria, has made progress some 20 per cent. in excess of what was estimated as feasible in the past year, so that it is expected to be running through by the end of this year, about six months before the completion originally contemplated. More than two-thirds of the great tunnelling work through the Fuchinlin range has already been completed, a total of 1,600 yds., leaving another 600 yds. to finish the tunnel, which the Japanese have been drilling at the rate of four yards a day. Another tunnel, exceeding 1,000 yds. in length has progressed with equal rapidity and only a few hundred yards remains to complete it.

A proposition for the construction of a one-meter gage railway from Viacha, Bolivia, to La Paz, without a state guaranty of any kind, has been made by the Antofagasta Railway Company to the government and accepted by the federal congress and approved by the president of the republic. The term of the concession is 99 years, after which period the railway, together with its appurtenances, will become the property of the state. The government will enjoy a reduction of 50 per cent. on the freight, pasenger and telegraph rates of the railway company. The company, on the other hand, may import free of duty, for a period of 30 years, the material and equipment necessary for the construction, maintenance and development of the railway, and is likewise exempt during this period from federal, state and municipal taxes. The company is also granted the right to run its freight and passenger cars over the line of the Viacha to La Paz Railway, now in operation, and at present owned by the Bolivia Railway Company.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk is in the market for 136 locomotives.

The Canadian Northern is said to be making inquiries for 9 locomotives. This item is not confirmed.

The Island Creek has ordered 1 eight-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 21 in. x 28 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 173,000 lbs.

The St. Louis National Stock Yards have ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 121,000 lbs.

The Canada Iron Corporation, Montreal, Que., has ordered 2 six-wheel switching locomotives from the Montreal Locomotive Works. The dimensions of the cylinders will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 124,000 lbs.

The Atlantic Coast Line has ordered 20 mikado locomotives and 15 Pacific type locomotives from the Baldwin Locomotive Works. The dimensions of these locomotives will be as follows:

	Mikado	Pacific
Type	Mikado	Pacific
Gage	4 ft. 8½ in.	4 ft. 8½ in.
Cylinders	22 in. x 30 in.	22 in. x 28 in.
Valves	Balanced slide	Balanced slide
Boiler, type	Straight	Wagon top
Boiler, diameter	74 in.	66 in.
Boiler, working pressure	185 lbs.	185 lbs.
Boiler, fuel	Soft coal	Soft coal
Boiler, staying	Radial	Radial
Firebox, length	108⅛ in.	108⅛ in.
Firebox, width	72¼ in.	72¼ in.
Tubes, number	328	309
Tubes, diameter	2 in.	2 in.
Tubes, length	20 ft. 6 in.	20 ft. 6 in.
Heating surface, firebox	190 sq. ft.	190 sq. ft.
Heating surface, tubes	3,420 sq. ft.	3,303 sq. ft.
Heating surface, total	3,610 sq. ft.	3,493 sq. ft.
Grate area	54.2 sq. ft.	54.2 sq. ft.
Driving wheels, diameter	56½ in.	72 in.
Weight estimated, on driving wheels	175,000 lbs.	138,000 lbs.
Weight estimated, on truck, front	20,000 lbs.	42,000 lbs.
Weight estimated, on truck, back	28,000 lbs.	44,000 lbs.
Weight estimated, total engine	223,000 lbs.	224,000 lbs.
Tank capacity	8,000 gals.	8,000 gals.
Fuel capacity	12 tons	12 tons

CAR BUILDING.

The Grand Trunk is making inquiries for 1,000 box cars.

The Cambria & Indiana, Land Title building, Philadelphia, Pa., is making inquiries for 200 all-steel hopper cars.

The Pennsylvania is making inquiries for 41 coaches and 20 baggage cars.

The Seattle Car Manufacturing Company is making inquiries for 50 hopper cars.

The Lehigh Valley has ordered 3 postal cars from the Standard Steel Company.

The Bellingham Bay & British Columbia is making inquiries for from 25 to 50 hopper cars.

The Duluth, Rainy Lake & Winnipeg is making inquiries for 250 box cars and 100 flat cars.

The Barber Asphalt Paving Company, New York, is making inquiries for from 10 to 20 tank cars.

The Chicago, Burlington & Quincy has ordered 500 refrigerator cars from the American Car & Foundry Company.

The Canadian Pacific is making inquiries for from 1,000 to 2,000 box cars, and also for from 300 to 500 gondola cars.

The General Chemical Company, New York, has ordered 20 refrigerator cars from the German-American Car Company.

The Union Tank Line Company, New York, is said to be building 300 tank cars at its shops at Buffalo, N. Y. This item is not confirmed.

The Georgia & Florida has ordered 4 coaches, 1 combination mail and express car and 2 sleeping cars from the Central Car and Locomotive Works.

The Merchants Despatch Transportation, New York, will build 100 refrigerator cars at the company's shop. This company is also taking prices on 1,000 additional refrigerator cars.

The Dominion Iron & Steel Co., Sydney, Cape Breton, Canada, has ordered 25 flat cars, 25 gondola cars and 50 steel lined wooden ore cars from the Canadian Car & Foundry Company.

IRON AND STEEL.

The Atlantic Coast Line is said to be in the market for 5,000 tons of rails.

The Lehigh Valley has ordered 1,500 tons of rails from the Cornegie Steel Company.

The Guatemala Central is said to have ordered 3,500 tons of rails from the Steel Corporation.

The Oregon-Washington Railroad & Navigation Company is in the market for 14,000 tons of 90-lb. rails.

The Louisville & Nashville is said to be making inquiries for 100,000 tons of rails. This item is not confirmed.

The Nashville, Chattanooga & St. Louis has ordered 1,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Pennsylvania Lines West have ordered 500 tons of ferro-titanium open hearth rails from the Carnegie Steel Company.

The Baltimore & Ohio has ordered 1,600 tons of bridge material from the American Bridge Company for its bridge at Wheeling, W. Va.

The National Railways of Mexico have ordered several thousand tons of rails and structural steel from the Monterey Iron & Steel Company.

The Chicago, Milwaukee & St. Paul has divided an order for 40,000 tons of rails between the Steel Corporation and the Lackawanna Steel Company.

The Chicago, Rock Island & Pacific has ordered 8,000 tons of rails from the Illinois Steel Company and 8,000 tons of rails from the Steel Corporation.

The Siamese Government is prepared to receive tenders for a supply of fish plates, bolts, nuts, spring washers, spikes and bearing plates. The specifications and form of tender may be obtained from the Siamese Legation, Washington, D. C., on payment of $1.75, which will not be returned. All tenders must be addressed to H. Gittins, Controlling Engineer, Southern Line Department, Royal State Railways, Bangkok, Siam. Bids will be opened June 17.

General Conditions in Steel. The steel industry has not changed for two weeks. The steadiness of the present flow of business seems to indicate that the readjustment is over and that the next change should be for the better. Prices will not be cut for it has generally been decided that a reduction would not stimulate buying. The railways are expected to place large orders toward the end of June. The Steel Corporation is now operating at about 63 per cent. of its capacity.

SIGNALING.

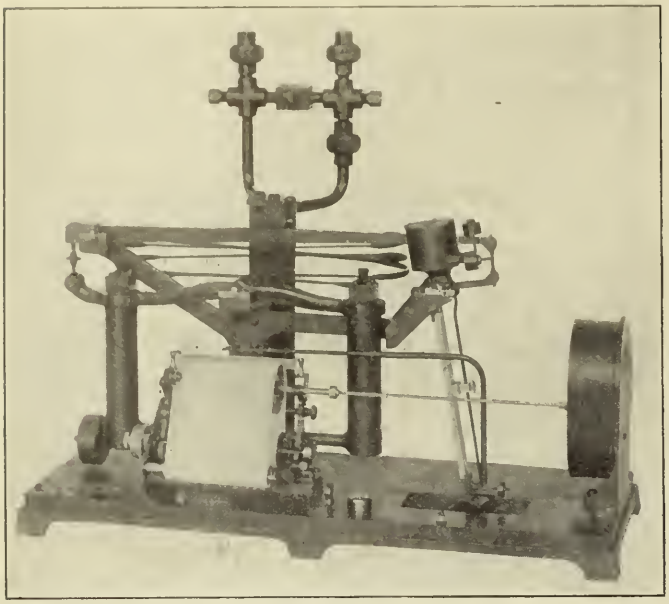
The Chicago, Indianapolis & Louisville will soon submit to the Railroad Commission of Indiana plans for the installation of automatic block signals between Indianapolis and Chicago and for manual block signals between New Albany and Michigan City.

Recording and Indicating Flow Meters.

Several types of flow meters have recently been developed by the General Electric Company, Schenectady, N. Y., to meet the growing demand of improved devices for measuring steam, gas, water and other fluids. Both the recording and indicating types have been made, the former making a continuous graphic record of the rate of flow and the latter giving readings of instantaneous values. The unit of measurement varies with the commodity measured, being pounds per hour for steam, cubic feet per minute for air and gas, and gallons per minute for water.

The recording water flow meter is shown in the accompanying illustration with its nozzle plug which screws in the pipe at the point where the flow is to be measured, thus being exposed to the pressure of the water. This plug has two sets of orifices;

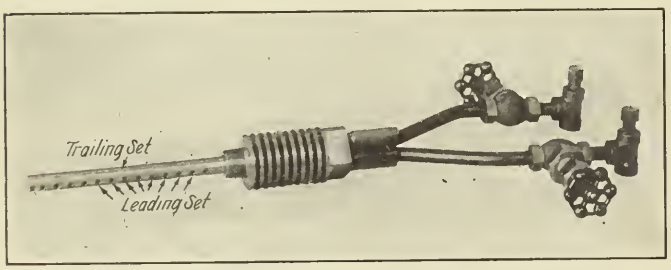
the leading set, located parallel to its axis, extending across the main and facing the direction of flow, and the trailing set, consisting of three holes located on the opposite side of the plug near the middle and at right angles to its axis. The two sets of orifices open into separate longitudinal chambers leading to the outer end of the plug. The plug is suitably arranged for use on either vertical or horizontal mains, and its introduction causes no appreciable drop in static pressure even at very high rates of flow. When the plug is inserted in the main,



Recording Water Flow Meter.

the water impinging against the orifices of the leading set develops therein, a pressure equal to the static pressure plus a pressure due to the velocity head; while the pressure set up in those of the trailing set is equal to the static pressure minus the pressure due to the velocity head, thus causing different pressures in the longitudinal chambers leading to the outer end of the plug. These different pressures are communicated to the meter through suitable pipes attached to the outer end of the plug and connected to flexible steel tubing placed within the meter case.

The meter element consists of two vertical cups or hollow cylinders connected together at the bottom by a tube. The U thus formed is filled with mercury to about half the height of the vertical cups and the whole arrangement is supported on a set of knife edges and is free to move like an accurately constructed balance. The different pressures in the two sets of orifices in the nozzle plug causes the mercury to rise in the left hand cup and to fall a corresponding amount in the right hand



Nozzle Plug and Piping for Water Flow Meter.

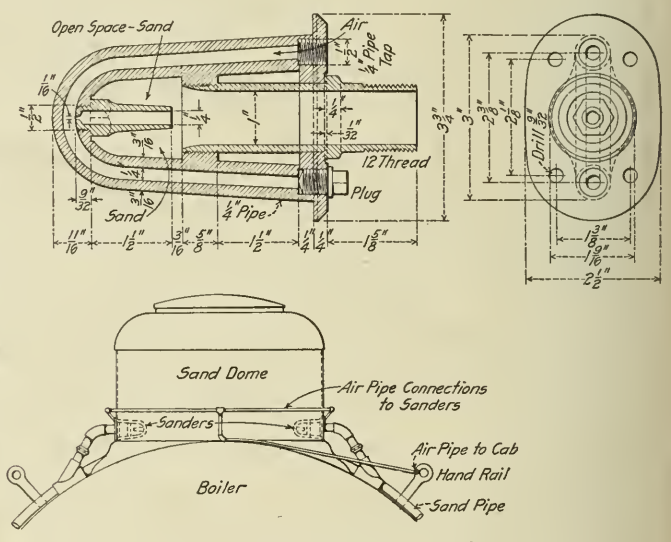
cup until the unbalanced mercurial column balances the difference in pressure. This action causes the beam, carrying the cups, to descend on the left hand side of the knife edges until the moment of the weights on the right hand side balances the moment caused by the displacement of the mercury into the left hand cup. The motion of the beam is multiplied by means of levers and actuates the recording pen, the movement of the latter being proportional to the amount of mercury displaced.

The drum carrying the recording paper is driven by an eight day clock and the paper is calibrated to record the flow in gallons per minute, thus the rate of flow may be read at any instant, or the average rate calculated for any given length of time. Although the meter is calibrated to record the rate of flow in gallons per minute at 39.1 deg., suitable means are provided for readily setting it for different temperatures, pipe diameters and rates of flow. In order to measure the flow under normal conditions in any number of different pipes, it is only necessary to use nozzle plugs of sufficient length to extend across the pipes, and record paper of suitable calibration range. This meter is useful for ascertaining the output of pumping plants; the input to water turbines and their loss of efficiency; the amount of feed water delivered to boilers; the amount of cooling water used in condensers; the slippage in pumps due to leaky plunger packing or worn out valves, and for discovering losses due to leaks in water mains, etc.

The recording air flow meter, suitable also for measuring steam and gas, operates on the same principle as the recording water flow meter, and is similar in all details of construction. The indicating steam flow meter is designed for testing work and other purposes, such as locating trouble due to leaks, determining efficiency of boilers, etc., where accurate, instantaneous readings of the rate of flow are desirable. This type of meter operates on the same principle and employs the same type of nozzle plug as the recording meter, but differs considerably in details of construction. It may be readily adjusted for various rates of flow and indicates the instantaneous rate of flow in pounds per square inch of pipe cross sectional area for steam, or in cubic feet of free air at 70 deg. F., for air.

Locomotive Sander.

The simple locomotive sanding device shown in the accompanying illustration, and patented by Charles Kabisins, an employee of the Denver & Rio Grande, is sold by Norman B. Livermore & Co., Salt Lake City, Utah. It is given the name Never Clog on account of its construction, which is the reverse



Improved Locomotive Sander.

of that ordinarily used; also it is less liable to clog. The air enters the ¼-in. curved pipe at the top and passes out through a 1/16-in. hole in the nipple at the center of the curved pipe. It expands into the opening in the nipple and passes directly into the 1-in. pipe, drawing the sand, which completely surrounds the U-shaped pipe and nipple with it. The lower half of the curved air passage acts as a trap to catch the scale or rust that collects in the piping. This trap is easily blown out and cleaned by removing the small plug on the outside of the sand dome. The force of this jet was tested by coupling one of the sanders to a 1-in. pipe 20 ft. long, fixed in a vertical position. The sander was placed in a pail of sand and when the air was turned on the sand flowed from the top of the pipe in a jet 4 ft. beyond the end.

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THE Interstate Commerce Commission has suspended proposed advances in the rates on ice over the Minneapolis, St. Paul & Sault Ste. Marie and about 50 other roads. The rates were to have gone into effect June 5, but are suspended until September 2, pending an investigation of the reasonableness of the higher rates. As the ice business in the region of "The Soo" is not likely to be very flourishing in the fall, this suspension may be looked on as virtually a final cancellation of the proposed rates. The increase, if it is needed at all, is needed in the summer. The Mann-Elkins amendment, therefore, has empowered the Interstate Commerce Commission to annul an increased rate without a hearing. It would be interesting to know in a case like this, where it seems obvious that the suspension of advance rates by the commission amounts, for all practical purposes, to a prohibition of these rates, whether the Commerce Court might not rightfully enjoin the commission from taking such arbitrary action.

THE Supreme Court has finally loosened the anti-trust law. This has been done, however, by a course of reasoning which Justice Harlan denounces in vigorous terms, and on the same day, the court reasserts the natural love of lawyers for strict construction by declaring valid the law which in the matter of automatic car couplers requires of the railways absolute perfection. This view is not new, for we have had substantially the same opinion in previous cases. To run for a single mile a car with an unworkable coupler makes a railway company a lawbreaker. The only apparent explanation of this different treatment of different subjects is in the real or supposed difference in their magnitude. The trust cases are so important that eight judges have taken all winter to discuss the subject with sufficient thoroughness to develop a common ground on which all of the eight could stand. The coupler question, however, is looked at by lawyers, no doubt, as a mere detail of police regulation. But in actual application the two laws are alike. Both are unworkable. To get along with the anti-trust act the Supreme Court substitutes for the law its own common sense. To keep the railways running, in spite of the impossible demands of the safety appliance acts, the adoption of common sense in place of the law is equally necessary, but the task of making the adjustment has been left to the administrative body, which, in the past, has meant Mr. Moseley. Only by the omission of the government to enforce the coupler law have we been able to endure it. In Justice Harlan's dissenting opinion, this combination loose-construction-strict-construction position was referred to. "At this term of the court," said Justice Harlan, "lawyers have been 'compelled to sit down' and cease arguing against a view that has been settled by a former decision of the court. At any rate, within the last hour, an opinion [on the safety appliance act] has been handed down, in which it was said that . . . the question of the meaning of the act, so far as it relates to couplers, would not be reopened."

THE block system—the method of keeping trains apart by the regular maintenance of space-intervals instead of by doing without the space interval and trusting to clocks, flags and other things—is one of the simplest things in the world; but when it comes to be discussed in public by government officers and railway lawyers it seems to be one of the most confusing. A recent press despatch from Ottawa, Ont., says:

"The proposal of the railway commission to compel the railways to install the block system came up for discussion at the meeting of the board on May 4. The Canadian Pacific and the Grand Trunk both maintained that the protection given their trains was as good as the block system. They held that the block system was only instituted where the traffic was dense to enable them to run trains closer together. It was safer to run them farther apart without the system. It was pointed out by the chairman of the board that there was an average of 115 killed or injured in railway accidents each year in Canada, which would indicate that the protection was not so complete as was claimed. One of the railwaymen said that 40 per cent. of the accidents were due to disregard of signals, and if the employees would disregard a semaphore they would also disregard a block system."

The first point noticeable in this item is the difficulty of getting

the matter clearly before the public. We can hardly blame the reporter for inaccurate use of the terms "semaphore" and "block system," for railway men themselves often use such terms carelessly and in a wrong sense. The statement "115 killed or injured" is almost wholly meaningless, for it may mean 1 killed and 114 slightly injured, or the ratio may be something else. The killed may have been victims of some derailment which would not be prevented by the introduction of the block system. This small number of killed and injured from all railway accidents, or even from all train accidents, would be a favorable record, comparing with other countries. Perhaps, however, this was an error of the reporter rather than of the commissioner. "Forty per cent. due to disregard of signals." Who ever found anything instructive in such percentages as this? It is as useless to cite this figure as to compare the tonnage of freight passing through Chicago with the weight of the pyramids of Egypt. Whatever the percentage of enginemen disregarding signals, the only proper stand for the railway officer to take is to diagnose the trouble in *all* those enginemen and then do his best to remove it. And every railway officer knows that the block system is always one of the best promoters of good discipline.

BUT the main argument of the railways is weak. It was in 1887, we believe, that the Canadian Pacific first advertised that it used the block system on its line from Winnipeg to the Pacific coast. Density of traffic cannot have ben the reason for adopting it there. Do they mean to say that they have abandoned it and feel safer without it? The farther apart trains are run, the greater the safety; but to add "without the block system" is absurd. Probably the railway men did not say this, but the reporter, quite likely, was fully justified in assuming that that was intended to be the real meaning of their words. Whether trains follow one another in ten minutes, or in two hours, the space interval remains superior to the time interval, for the reason that space-interval operation is always the same, needing no adjustment to different time intervals, whereas time-interval regulation of trains is never absolute, but always depends on the aid of the flagman and other uncertain factors. The problem of the commissioners in this case is so to master the subject as to take a comprehensive view; a view extending 10 or 20 years into the future, perhaps. For the railways, claiming that their present system is as good as the block system, may for several years make good that claim, especially if the number of persons killed and injured is the only criterion. Bad collisions may come ten years apart; the trouble is that when they do come they are so distressing that the public at once demands, without delay a change that may take time to accomplish. If the commissioners of Canada, or of any other country, wish to make really intelligent and illuminating estimates of the need of improvement in railway train spacing they should gather the facts relative to all cases of error or neglect which produce the possibility of death and disaster. The accident records show many collisions which wreck only empty passenger cars; but the lesson of these should be just as useful as though a score of persons had been killed.

THE Baltimore & Ohio yard at Chicago Junction, Ohio, described in another column, is worthy of special attention for several reasons. The most important of these is the absense of a departure yard. Although the general practice in building gravity yards has been to provide departure yards, many operating men are questioning whether they are really needed. Many claim that it is necessary to provide such a yard to afford a place where trains can be made up and air brakes properly inspected and tested in accordance with government regulations. Others maintain, on the other hand, that if the tracks in the classification yard are made long enough to hold full trains such work can be done in this kind of yard as well as in a flat yard, thus saving the additional moving of the cars and requiring less track room. It should also be taken into account that the cost of operating and maintaining a switching engine is equivalent to the interest on $200,000 annually; and therefore an outlay approaching this amount would be justified to eliminate one engine.

The details of the yard have been worked out with great thoroughness, and it has been built to a high standard. The use of 85-lb. rail with hard center frogs may be regarded by some as unwarranted, but careful consideration will convince most persons who are familiar with yard work that their use will cause economy in maintenance and is in accordance with the best standards. The same thing may be said of the construction of the various smaller buildings throughout the yard and of the very complete conveniences provided for employees. The provision in yards of individual lockers and washstands, with hot and cold water, is not common, but perhaps the expenditure for them will be compensated for by the satisfaction they will give to the men and the better work they will be prompted to do by this evidence of the management's interest in their welfare.

In view of the care shown in the design of most of the yard, one is surprised to note in contrast that 12 ft. centers were adopted. With the large equipment now in use, and the threatening danger of legislation regarding clearances, it would have seemed advisable to have built to wider centers. To increase centers after the yard is built would be almost equivalent to rebuilding it.

A RAILWAY with small relative capitalization in stock and resulting small dividend requirement is apt to be either a prince or a pauper. In good years it can pay a handsome dividend and carry over a large surplus. In a bad year or in other adverse conditions the small dividend margin is easily exhausted. Such has been the case with the Boston & Maine, which, after dividends for 67 years rising at one time as high as 10 per cent., has now reduced its rate from 6 per cent. to 4. The system, with its road mileage of 2,290, and single track mileage of 4,175, has been working with the low capital of $31,991,490, which its new capital of about $10,000,000 for improvements will not increase over much, especially when its terminals in large New England cities, including Boston, are reckoned in. But, although it has carried a funded debt of but $42,073,000, it has been burdened with a great fixed charge—last year $7,882,361, of which no less than $5,265,497 was in the form of leases. Its gross earnings last year were $43,357,175, or $11,365,685 more than its capital stock; yet fixed charges, as a prime factor, reduced in a pretty good year net earnings for dividends to $2,850,621. Since then have come the great increase in wages, larger in the case of the Boston & Maine than most roads, because lower before, and affecting also the important subsidiary, the Maine Central. There has been also recent depression of business in the large textile industry of the road's territory. But underlying the whole situation has been the Boston & Maine's stagnation in the past and a policy of skinning plant and equipment. It has been, indeed, almost an archaic system. A traveler coming down from the White mountains in one of its express trains of a dozen cars on a Monday of early September could well nigh read the history of American railway equipment in the diverse quality of cars by a simple walk through the train—including the old fashioned water boy. The recital of such conditions, financial and physical, not only explains the reduction in dividend but justifies it and would probably have justified even greater reduction. As a balm for minority stockholders they will read President Mellen's prophecy that the system will be a strong dividend earner with rehabilitation and new efficiency, including the electrified Hoosac tunnel. Not so comforting will be their back thought on how they might have exchanged their shares for those of the New Haven, but for Massachusetts' legislative and judicial intrusion three or four years ago.

THE reorganization plan of the International & Great Northern, a summary of which is given in our news columns, shows how difficult, if not almost impossible, it would be to reorganize a Texas road which had gone nto the hands of a receiver if the securities of such a road were held by a large number of different investors. In the case of the International & Great Northern, the Gould estate is the owner of all of the $9,755,000 stock and a majority of the $2,966,052 4 per cent. third mortgage bonds. Under the plan of reorganization ,which has necessarily been made so as to fit in under the capitalization prescribed by the Texas Railway Commission, the stock is entirely wiped out and holders of the third mortgage bonds are to receive common stock of the new company in exchange for their bonds. Moreover, the unsecured claims, most of which are held by the Gould interests and which amounted to $4,000,000, have apparently been satisfied with the payment of $1,321,000, and it was understood that no part of this payment was to the Goulds. According to the *Wall Street Journal,* the bankers who bought the $11,000,000 5 per cent. notes from the company paid 95, which would give the company $10,450,000 cash out of the total estimated to be raised under the reorganization plan—$15,340,000. As will be seen by reference to the plan, the company also sold for cash $1,600,000 first refunding bonds to a syndicate headed by the Equitable Trust Company and the *Wall Street Journal* says that this syndicate paid over 90 for its bonds, and estimates, therefore, that a valuation of not less than $85 per share is placed on the preferred stock. On the basis of 85 for the preferred, the price at which the syndicate bought $2,500,000 common should be about $22 per share, and since the third mortgage bond holders receive common stock at par for their holdings this would be fairly close to the price at which the third mortgage bonds have been selling. In the case of the International & Great Northern, such a drastic reduction in par value of securities was possible because one set of interests very largely owned and controlled the property and were so thoroughly identified with it that they were necessarily willing to make a large present sacrifice in the hopes of some future return, but the hardships that would have been suffered by a large number of broadly-scattered investors under any such drastic plan would make it very doubtful whether they would ever be brought to accept it.

THE STANDARD OIL CASE DECISION.

THE decision of the Supreme Court in the Standard Oil case completed the court's reversal of its own decisions in the Trans-Missouri Freight Association and the Joint Traffic Association cases. In those cases it held that the Sherman anti-trust law was "not limited to that kind of contract which is in unreasonable restraint of trade," but prohibited all contracts in restraint of trade, whether reasonable or unreasonable, and that "no exception or limitation can be added without placing in the act that which has been omitted by Congress." Chief Justice White—then Associate Justice White—dissented at that time from the majority opinion, which was written by Justice Beckham. He contended that the words "restraint of trade" under the common law really meant "unreasonable restraint of trade," and that the Sherman law should be read in the light of the common law, and should be held to prohibit only combinations which were unreasonable in their purpose and effect.

Several later decisions have indicated a disposition on the part of the court to withdraw from the extreme position taken by it in the traffic association cases. These were regarded by Victor Morawetz, one of the most eminent authorities on corporation law in the United States, as so significant that within the last year he contended, in a published article, that no amendment of the act was necessary in order to protect reasonable combinations. The opinion of Chief Justice White in the Standard Oil case shows that Mr. Morawetz was right. The chief justice, by some rather metaphysical reasoning, seeks to show that the court has not reversed itself. Most lawyers will, however, agree with Justice Harlan that it has done so. On the other hand, they are apt to differ from his view that it ought not to have done so. Most persons who have studied the history of the Sherman act believe that the original decisions of the court gave to it a meaning not intended by Congress at the time of its enactment in 1890, while the decision in the Standard Oil case gives effect to the original intention of the lawmakers.

To railway men the decision is of course, of interest, mainly because of the new precedent it may establish for decisions in railway cases. But the exact amount of comfort that they are justified in extracting from it is doubtful. Chief Justice White, in speaking of the criteria of reasonableness to be applied in different cases, referred repeatedly to the character of the parties by whom agreements were made or combinations formed. It is possible, and even probable, that he intended to hint that railways being public service corporations, agreements or combinations between them might be held unreasonable, which if made between industrial concerns would be held reasonable. But while such a distinction between the application of the law to railways and industrial concerns is hinted at, it has not been established; and it may therefore be assumed, until some decision is rendered establishing the contrary, that the position of the court now is that the law prohibits only unreasonable restraint of trade by concerns of any kind.

There are two classes of railway combinations on the standing of which before the law this decision may throw some light. These are, (1) mere agreements between competing railways regarding rates and service; and (2) combinations between competing railways effected and perpetuated by common ownership of their stock or by the ownership by one of the stock of the other. It has been generally understood, since the decision in the Trans-Missouri freight association case, that any agreement between competing railways to maintain or advance rates is unlawful. It is very questionable, in view of the Standard Oil decision, whether every agreement would now be held to be illegal. The question probably would be whether the particular restraint imposed on interstate commerce was reasonable or otherwise. The Interstate Commission now has power to reduce any unreasonable rate or to prevent any unreasonable advance in rates. It seems likely that the court would take this fact into consideration, and would hardly hold any agreement betwen railways regarding rates unlawful unless it deprived them of freedom to take individual action. If this theory be correct, the various existing traffic associations, and the conferences held and the arrangements made by the railways belonging to them regarding rates, are entirely legal; and perhaps such a proceeding as that brought by the government at Hannibal, Mo., almost a year ago against the western roads could not be successfully prosecuted. If the Supreme Court had held 15 years ago that the law prohibited only unreasonable agreements by competing railways, it is probable that more reasonable agreements regarding rates and service would have been made and that many combinations which have been brought about by acquirement of stock ownership would never have been formed.

How the decision may affect combinations effected between competing railways through stock ownership is a most interesting and important question. The result of the proceeding brought by the government against the Harriman Lines may settle whether the court will hold with respect to railways as well as industrial concerns that the law prohibits only unreasonable combinations, and whether it will apply the same criteria to the question of reasonableness in railway cases as industrial cases. If the courts should hold that the combination of the Union Pacific and the Southern Pacific is in violation of the law it could hardly hold otherwise regarding some other large railway combinations if cases involving them came before it.

The decision will tend to disarm the most severe criticisms that have been made against the Sherman law and probably will stop, at least temporarily, agitation for its repeal. Many have believed that the amendment of it chiefly needed was the inser-

tion of the words "unreasonable" before the words "in restraint of trade or commerce." The court has inserted this word by judicial legislation. No sane man wants unreasonable restraint of trade permitted or reasonable restraint of trade prohibited. The court has therefore made the law say what every sane man feels that it ought to say. The only point left to be settled is, as to whether the court or Congress shall be allowed to say what is reasonable and unreasonable. Certainly, before the authority to determine this question is taken from the court it should be given ample opportunity, in specific cases, to show more fully what is its conception of reasonableness.

LOCAL REGULATION OF RAILWAY OPERATIONS.

COMMISSIONER LANE, in an address before the Finance Forum of the New York Young Men's Christian Association, said that in his opinion one of the worst evils of American railway management is the centralization of control of thousands of miles of road in the offices of a few New York bankers. Mr. Lane insisted that interests of a comparatively small number of capitalists living in New York are entirely foreign to the interests of the population served by their railways.

In a general way railway men themselves have felt this as an evil. It has often been pointed out in these columns that absentee landlordism is a great misfortune for any road, and insofar as the policy of a railway is shaped not by the needs of operation of the physical plant but in accordance with a financial scheme, possibly having nothing to do with the working of the plant as a transportation agency, unquestionably much harm is done.

Commissioner Lane in his New York address proceeded almost immediately after his denunciation of centralized control to advocate a very strict regulation, amounting almost to management of railways of the United States, by a central commission located at Washington. In other words, he objected to the centralization of control of railways in New York, and advocated a centralization of control at Washington. A study of the work of such a commission as the New York up-state public service commission or of the railway commission of Wisconsin impresses one strongly with the advantages to be gained by local regulation. An intelligent state commission knows the problems in its own territory, both of the roads and of the people served by those roads far more intimately than can the Interstate Commerce Commission. Uniformity, desirable as it is in itself, is impracticable in a country as large and having as widely varied conditions as the United States. A commission thoroughly familiar with local conditions can settle grievances without formal complaint and trying of cases.

The faults that make such a regulation needed and demanded lie largely with railway managements. We are thoroughly in agreement with Commissioner Lane's statement that not enough power has been given to the men on the road. It is a rather interesting fact, however, that the railway system having probably the most highly centralized form of financial government of any in this country is the one that has gone furthest in giving extensive powers to its division superintendents. There is no railway system in the country whose machinery was more perfectly adapted for one-man absolute control than the Harriman system. Mr. Harriman had, in practice, most of the powers ordinarily exercised by a board of directors; and at the same time all, or more than all, of the powers usually given to the president; and yet this centralized authority was not used in such a way as to take away the initiative of subordinate local officers. The policy of the Harriman Lines, which has been carried out since Mr. Harriman's death along the same general principles pursued before his death, is to give more and more authority to the superintendent of each division, making him more nearly general manager of his 400 or 500 miles of line. He is thus able to adapt his methods of operation to local conditions and at the same time there is reserved to general officers of the system the power to formulate a comprehensive and uniform general policy.

The great trouble with state commissions is that they are so largely governed by political and *too* local considerations. One commissioner may be appointed or elected from one section of the state, and one from another, and each feels that he has a certain constituency whom he must protect at the expense of the rest of the state; and each state commission seeks to promote the interests of its state at the cost of those of the rest of the country. The Louisiana commission, as a whole, feels that it must protect Louisiana shippers and travelers at the expense of Texas shippers and travelers. The federal judicial department is so organized that there are circuit and district courts in every section, but from which appeal lies to the Supreme Court. Thus a uniform application of the federal constitution and statutes to cases arising under them is obtained, while securing to the people of each locality access to courts familiar with their local conditions. Would it not be possible to form some system of federal commissions or commissioners, subordinate to the Interstate Commerce Commission, but each having a limited territory under its jurisdiction? In this way a general uniformity of policy could be maintained, while the advantages of intimate local knowledge of varied conditions could be retained.

If there were some way in which the duties and activities of the various state commissions could be correlated with, but subordinated to those of the Interstate Commerce Commission, the existing state commissions might be made to serve local needs, much as the federal circuit courts now serve them, without losing sight, as they constantly do now, of the fact that, in the long run, the interests of each state or section will best be furthered by that railway policy which best promotes the welfare of the nation as a whole.

NEW BOOKS.

The Locomotive Headlight. By T. J. Hoskins, Chairman, Legislative Board, Brotherhood of Locomotive Engineers, State of Tennessee. 48 pages.

This is a pamphlet that has been compiled and published by the railway brotherhoods in Tennessee in advocacy of the use of the electric headlight on locomotives. A bill to require the use of the electric headlight has been pending before the legislature of that state. The pamphlet outlines the history of headlights from 1830 down to the present time. It discusses and endeavors to refute all the various arguments that have been made against the use of the electric headlight, both on lines of light traffic where there are no block signals, and on lines having larger traffic, where such signals are used. The conclusion reached by the author is that electric headlights are desirable under practically all conditions. Letters from a large number of enginemen advocating the electric headlight are included.

An Investigation of Built-up Columns Under Load. By Arthur N. Talbot and Herbert F. Moore. Issued as Bulletin No. 44 of the Engineering Experiment Station, University of Illinois.

In the course of this investigation, laboratory tests were made on steel and wrought iron built-up columns, such as are used in bridges and other structures, to determine not only their strength but also the way in which the compressive stresses vary over the cross-section of the channels or other component parts of the column and throughout its length. The amount of stress in lattice bars and its variation from bar to bar was also measured. The distribution of stress over the cross-section of a lattice bar was studied. Field tests were conducted on the columns of a railway bridge under the load of a locomotive and train, and the distribution of stresses over various parts of the columns was measured. The investigation shows that the variations from the ideal column which result from shop and erection processes may be more important than the influence of length, and that on account of such causes the stresses at one or more points in a column may be as much as 50 per cent. in excess of the average stress. This investigation may be expected to have an important bearing on structural engineering practice. Copies of Bulletin No. 44 may be obtained from W. F. M. Goss, director of the Engineering Experiment Station, Urbana, Ill.

Letters to the Editor.

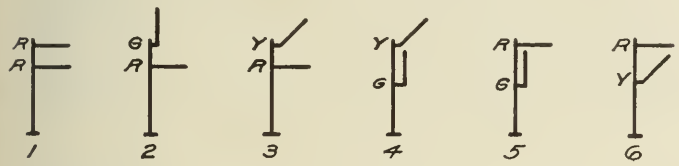
SIMPLICITY OF R. S. A. COMMITTEE'S SIGNAL ASPECTS.

Chicago, Ill., April 29, 1911

To the Editor of the Railway Age Gazette:

I have followed very carefully the subject of signal aspects ever since Committee No. 1, R. S. A. made its first report, and it has always seemed to me that a very simple subject was being befogged by a cloud of words. The fundamental question is, what do you want to tell an engineman? How you tell it is not of great importance, provided the message is clear. For example, you might write a set of instructions on the signal so that they could be read by an engineman after he had stopped his train. The main thing is to stop him when necessary. To make sure of doing this you must tell him at some point in advance that he may be expected to stop, otherwise momentum may take matters into its own hands. Instructions written on the signal would not do to give advance information, obviously. But if "caution," meaning "prepare to stop at some fixed point," can be indicated by the position of a signal arm, that is all that is necessary. If a bulletin board on each signal is unsatisfactory and information can be conveyed conveniently by an arrangement of lights and arms, whose peculiarities need not be comprehended until a train is standing still, then that is the thing to use, for such an arrangement will lend itself to other purposes and tend toward uniformity of appearance.

It appears to me that in the so-called majority report the scheme calls for but six aspects that differ from each other in any essentials and that need be comprehended from a train while running at speed. These are shown below.



The meanings of these aspects as given by the committee are as follows: 1. Stop. 2. Proceed. 3. Proceed prepared to stop at..... 4. Proceed prepared to pass next signal at limited speed. 5. Proceed at limited speed. 6. Proceed at limited speed, prepared to stop at ..... The aspect known as No. 8 shown on page 305 R. S. A. Proceedings, 1909, meaning "Proceed prepared to stop short of any obstruction in the block" I consider to be merely a variation of No. 3, above, and would be naturally interpreted by any engineman used to permissive telegraph blocking, and the same can be said in regard to No. 12 and No. 6 above. In every case shown variations occur to distinguish between the different classes of signals, such variations consisting merely in the relative horizontal position of the arms and lights or in a distinguishing mark on the blade or an additional light. None of these affect the conduct of an engineman until after he has stopped, and therefore are of no importance to a train moving at speed. Surely these five aspects need not prove a burden to an engineman intelligent enough to comprehend the present signals found at an interlocking plant, with all their inherent inconsistencies.

If it is not safe to give advance information to an engineman, it seems to me we should abolish slow signals, whistle posts, station signs, distant signals for isolated interlocking plants, permissive blocking, and train orders, especially the "Form 19."

V. C.

In January last, work was commenced on the second section of the Longitudinal Railway, Chile, comprised between Oficina Granja, in the province of Tarapaca, and Pueblo Hundido, in the province of Chanaral. The section referred to has a length of 450 miles, and the contract cost of construction is $11,200,000.

STUDIES IN RAILWAY ECONOMICS.*

VI.

BY W. M. ACWORTH.

We have agreed that the railway customer is entitled to claim reasonable facilities as well as reasonable railway rates. What is a reasonable facility? With the alteration of a word or two the same definition will serve: "A reasonable facility is a facility which an expert manager would concede, or, as the case may be, would continue, having carefully considered all the relevant circumstances, and being actuated solely by judicial and avowable motives." In fact, reasonable facilities and reasonable rates are really the converse of each other. For it is evident that a rate for the carriage of perishables is only reasonable on the supposition that it connotes corresponding facilities. If the perishables were only given a service such as is adequate for coal, the rate would be most unreasonable. And facilities, like rates, must be reasonable from the point of view of the railway which gives them, as well as from that of the customer who requires them. It is questionable whether the courts, either in England or America, have sufficiently kept this point in view. Broadly speaking, the earnings of a new train are the best measure of its public utility; and when an English court orders a railway company—as it has done before now—to run a new train service, whose average earnings amount to 2d. per mile, the facility is hardly one that the company can be reasonably called on to give. Or, again, when an American state railway commission compels a through express to stop at the state capitol, we may well think that it has lost sight both of the reasonable rights of the railway and of the balance between the convenience of the few and the inconvenience of the many.

I feel, however, that between reasonable rates and reasonable facilities there is a real distinction. I have given in a previous article at some length reasons for thinking that no rate can be reasonable which in the long run does not at least pay out-of-pocket expenses, using that elastic term in a sufficiently wide sense. I do not think the same limitation can be applied to facilities. The broad general statement commonly made in the United States that passenger traffic does not pay undoubtedly contains a considerable element of truth. One can easily imagine that on the Northern Nigerian Railway passenger trains may not pay their working expenses for an indefinite number of years to come, and yet a refusal for this reason to furnish any passenger accommodation could hardly be justified. Some service must, I think, be given as a matter of public policy. And the loss on it must be borne out of the profits on the freight service, when profits there are, and, if not, by a subsidy from general taxation. Here is one of the points where, as it seems to me, the manager of a private undertaking, be he never so competent and never so honest, cannot expect to be allowed to decide for himself, and must be subjected to control by public authority. Of course, public authority must be expected to act with a due sense of responsibility. The interference of a reckless and irresponsible public authority condemns itself. To give one instance. The public in the western states of America have been accustomed to a standard of passenger accommodation unknown under similar circumstances in other countries. In spite of a report by their own expert officials, the state railway commission, that such accommodation could not reasonably be afforded for less than 2½ or 3 cents per mile, the legislature of the state of Wisconsin two or three years ago enacted a law that no railway fare in the state should exceed 2 cents a mile. The illustration is instructive as showing that, when we rise from the private manager to the public controlling authority, we do not necessarily obtain a higher standard either of competence or of impartiality.

The question, what is a reasonable rate or a reasonable facility, is difficult, but the question, what is an undue preference, is

*Previous articles appeared in these columns as follows: January 6, p. 10; January 13, p. 75; January 20, p. 114; January 27, p. 155; February 3, p. 200.

tenfold more difficult. The definition is easy enough. We may use our old formula: "An undue preference, is a preference which an expert manager, having carefully considered all the relevant circumstances, and being actuated solely by judicial and avowable motives, would not give." But the manager spends his whole life in giving preferences. Every time he reduces A's rates, or improves A's facilities, he prefers A to B and C, and all the other letters of the alphabet, whose circumstances have been left unaltered. When, then, does the preference become undue? It is clearly impossible to set out an answer in a legal formula. My own inclination would be towards an answer to the question in the abstract in some such terms as this: "No preference is undue which is honestly and deliberately given, after due consideration of all the conditions, for the sake of developing the traffic." And yet I feel that as a matter of practical politics no such doctrine could possibly be acted on to its full extent, except perhaps by a pioneer railway in a new country. Elsewhere the situation that has grown up over a long series of years would make the freedom theoretically desirable quite impossible in practice.

A relation of rates, *inter se*, that would be regarded in one country as natural and obvious, because the trade of the country has grown up under it, would be regarded in another country accustomed to an entirely different system, as impossible and revolutionary. This may be illustrated on two sides: the relation between the *quantum* of the rate per ton per mile, on the one hand, and the distance carried and the size of the consignment, respectively, on the other. Take first the question of distance. The trade of the United States has grown up under a system which ignores distance in a degree that to the ordinary Englishman seems not merely unjustifiable, but absolutely incomprehensible. Chicago is 1,000 miles east of Denver, and is distant from the great cities on the Atlantic seaboard somewhere between 800 and 1,200 miles. From the whole territory east of Chicago the rates to Denver are the same. A consignment from Boston, 2,200 miles, pays the same rate per ton as for the 1,200 miles, or thereabouts, from Indianapolis and Louisville. In other words, the ton-mile rate is in the one case practically half what it is in the second. Imagine an English railway company attempting to contend before our railway commission that such a practice did not amount to an undue preference of Boston over Louisville. Yet the whole trade of the country has grown up under this system, and fundamental modification off-hand is simply unthinkable. Or, again, take another American situation. In the South there has existed from the beginning what is known as the "basing point" system. Through rates are made from, say, the New England states to the principal towns, or basing points. Traffic for local stations pays the through rate from the point of origin to the nearest basing point, *plus* the local rate from that point to destination, irrespective of whether the destination be short of, or beyond the basing point. In other words, on rates say, from Boston into Georgia, a station 50 miles north of Atlanta never obtains any advantage of its geographical situation over a station 50 miles south of Atlanta, and therefore 100 miles further from Boston.

German practice is at the opposite pole from that of America, and the precise distance is an essential factor in almost every German rate. But, whereas, in most classes of the German tariff, the rate increases in simple artithmetical proportion as the distance increases, that is to say, the conveyance rate for 400 miles is 20 times the conveyance rate for 20 miles, in two classes, "specified small consignments," and "exceptional Class III, ten ton lots," the rates are on a sliding scale, that is to say, the rate per mile decreases as the mileage increases. It is difficult to imagine any justification on the ground of abstract reason for the simultaneous application of these two conflicting principles. But the trade of the country has grown up under them, and, of course, as the rates are part of the law of the land, they cannot be challenged in a law court in any specific instance. It is worth notice, however, as showing the importance of what I have termed the "acquired situation," that the attempt, some 20 years ago, to apply the sliding scale rates (*Staffel Tarife*) to the carriage of grain roused such an outcry that even the autocratic Prussian railway administration had to bow before the storm.

France, again, has a system of its own. The normal rates on which the retail consignments are carried, are based on sliding scale mileage tariffs, but the great bulk of the trade is done on special rates (*prix fermes*), and a *prix ferme* is quoted as merely applicable from A to B. But there are two rules applicable to all such tariffs, known respectively as "Welding" (*Soudure*) and the "Intermediate Station Clause" (*Clause des Stations non-dénommées*), under which any station on the line of the special tariff can claim the benefit of it, and any station off the line can do the same on condition of paying in addition the local rate to the nearest station on the line.

In England contradictory practices prevail for the same traffic in different districts. For example, on shipment coal in South Wales each colliery pays a rate strictly proportional to its mileage distance, whereas in South Yorkshire the collieries are grouped. Grouping has been more than once upheld in the courts. Indeed, it is expressly declared by the Traffic Act of 1888 to be legal, "provided that the distance shall not be unreasonable, and that the grouped rates charged and the places grouped together shall not be such as to create an undue preference." Which, seeing that the real question is, what distance would be unreasonable, and what grouping would create an undue preference, may be interesting as showing the legislature's consciousness of its own limitations, but hardly helps towards a solution of the question. It is difficult, however, to imagine that, if the Taff Vale were now for the first time to attempt to group all the collieries in the Rhondda valley at an average rate, the colliery nearest to Cardiff would fail in an application for an injunction against undue preference. Or, take another instance, Southampton has grown into a great town as an outport of London, under a system by which goods consigned to or from ocean-going vessels are carried on a special classification at rates far below those normally charged in this country for similar goods over an equal distance. On the single occasion when this system was challenged before the court the applicants failed to upset it. Yet it is safe to say that no such system could come into existence nowadays for the first time. As for English rates in general, for merchandise traffic we may perhaps generalize somewhat as follows: Ordinary class rates are, but with innumerable exceptions, based pretty strictly on mileage according to the sliding scale laid down by the Provisional Orders of 1891-1892. Special rates, more particularly for higher class traffic and in districts where sea competition is not a controlling feature, tend roughly to conform to the statutory sliding scale. But in certain cases—for instance, rates on paper from Aberdeen—distance is frankly thrown overboard; while in other cases, as, for example, the fish rates from Scotland to London, there are groups as startlingly large, having regard to the small area of these islands, as the American groups mentioned above.

FOREIGN RAILWAY NOTES.

The construction of the Saigon-Baltambang Railway, Indo-China, and its extension to the Siamese frontier where it will ultimately connect with an extension from Petriew is the subject of much favorable comment in the Siamese press. The cost of the Indo-China project will be covered out of the loan of $20,000,000 projected by Governor General Klobukowski for public works. With the completition of the Indo-China, together with the Peninsular Railway all Malaysia will be put in touch with China by rail.

The Beira Junction Railway and the Mashonaland and Rhodesia Railways, South Africa, have decided to build a new deep-water wharf, extend the existing stage in the Chiveve creek and the railway freight sheds, and to purchase additional machinery, engines and rolling stock.

BALTIMORE & OHIO GRAVITY YARD AT CHICAGO JUNCTION, OHIO.

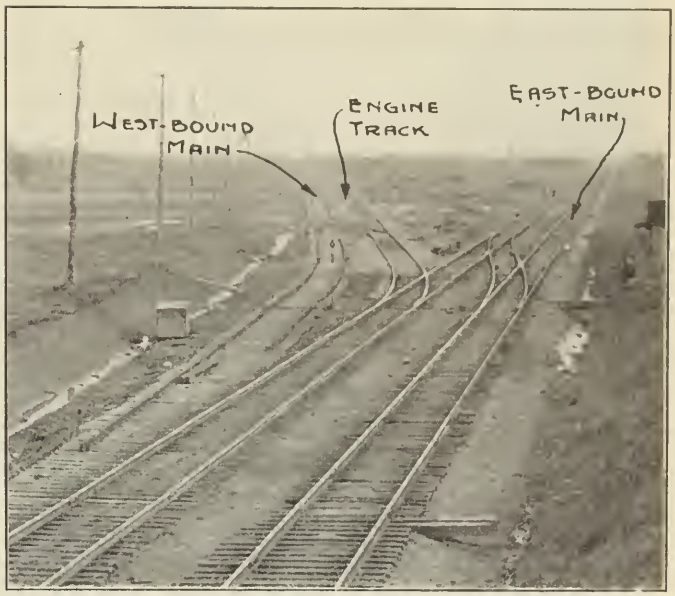
The Baltimore & Ohio is completing the construction of a large gravity yard of 4,000 cars' capacity at Chicago Junction, Ohio, 278 miles east of Chicago, where lines converge from four different directions. At this point eastbound business is divided between the line going directly east through Pittsburgh and that turning southeast through Newark and Wheeling, to a connection with the main line again at Cumberland, Md. All westbound business from Chicago Junction is concentrated on the one line to Chicago. A branch also extends north to Sandusky. Double track is in operation from Chicago Junction east to Pittsburgh and west, a distance of 69 miles, to Hamler, Ohio, while the line south to Newark is single track.

Owing to the dividing of the eastbound traffic and a change in tonnage at this point, it is necessary to break up practically all trains, and the yard is planned so that a maximum amount of switching may be done here and the trains go through succeeding yards with very little breaking up. The facilities at this point have been very badly congested for a number of years. The old eastbound yard had a capacity of about 700 cars, and was situated a short distance west of the coal chute and round house at an angle with the present yard, while the westbound yard was located south of the depot on the Newark branch. No change was made in the engine house, shops or coal chute, as they were built but 5 years ago and were located with the proposed yard in view.



Shop and Supply Buildings at Repair Yard.

The new yard starts immediately west of the round house and extends west about 2½ miles along the north side of the present Chicago main line. The site of the yard was rolling, and rather rough farm land with numerous hills and ravines. For this reason the earthwork was heavy, totaling about 1,000,000 yds. All grading was done by contract, and the material was secured from three borrow pits, one of them being across the main line from the yard on the site of a new reservoir. From this latter pit 300,000 yds. were removed, a large part being below the adopted flow line of the reservoir and materially increasing its capacity. The contractor's equipment used on this work consisted of three 60-ton Marion steam shovels with three yard side dump cars and narrow edge dinkey engines. The grading was started in March, 1910, and completed within eight months, working both day and night shifts. Almost the entire yard was built on a fill, one track being raised to grade and the material unloaded and spread out from this except in cases of the higher fills, where trestles were built across the ravines for the first track. In some cases the fills reached 32 ft. in height.

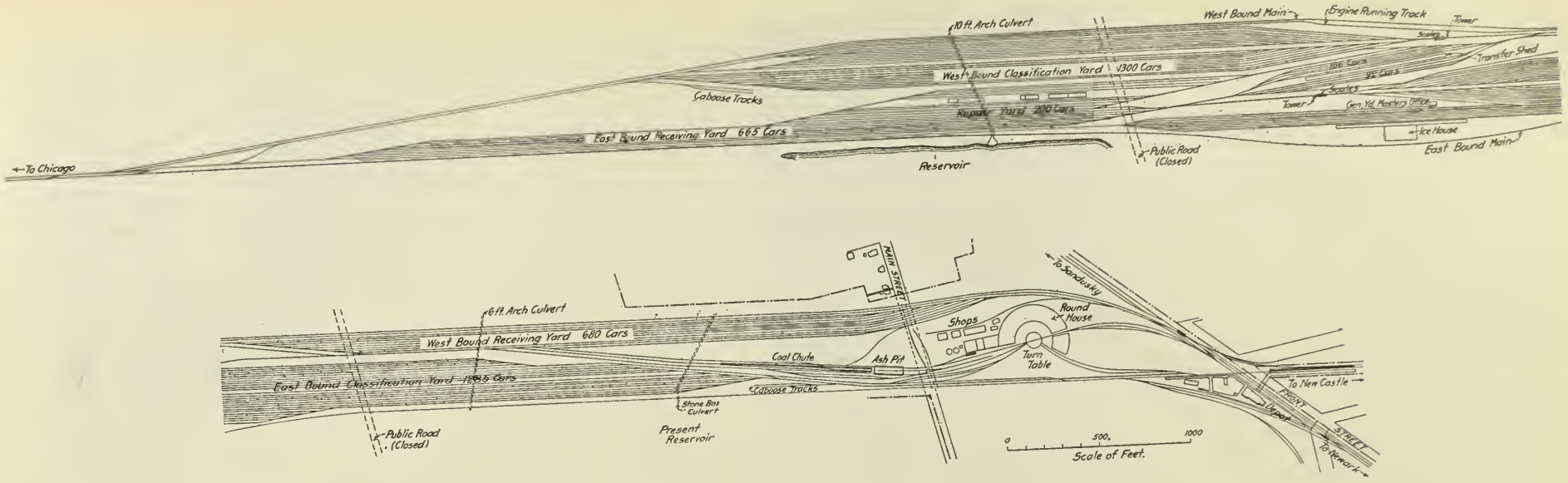


Looking East at West End of Yard During Construction.

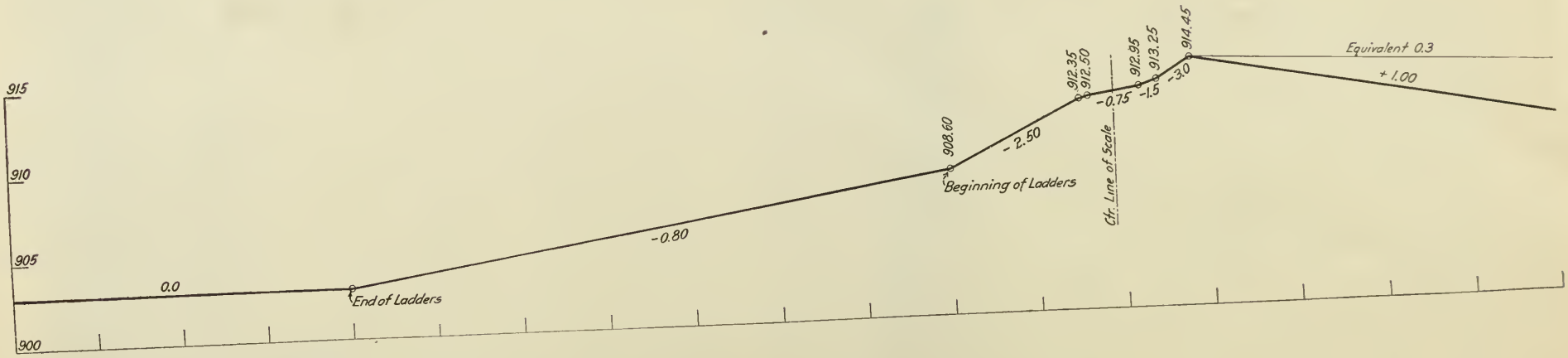
Preliminary to the starting of the grading arrangements were made with the highway commissioners for the permanent closing of two highways which had formerly crossed the site of the yard. Main street had been carried under the tracks of the old yard through a concrete subway of 20 ft. span, 165 ft. long.

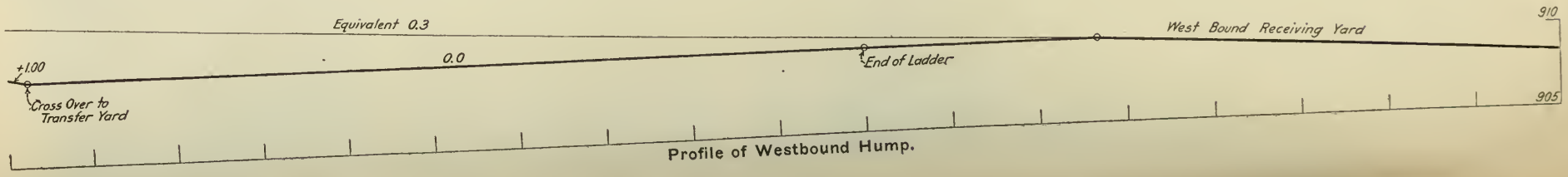


Westbound Hump, with Tower and Scale House.



Plan of Chicago Junction Yard.





Profile of Westbound Hump.

In connection with the new construction the roof of this subway had to be rebuilt. The old masonry walls were used, but the old girders with the wooden deck were replaced by 18-in. I beams embedded in concrete. A 6-ft. arch, a 10-ft. arch, and a 3 ft. by 5 ft. rail top culvert were also built in draws to provide for the natural drainage.

The westbound receiving yard starts immediately west of the round house and is entered directly from the Newark-Sandusky line or from the Pittsburgh line through the Y and a slip switch across the Sandusky line. This receiving yard is composed of eight tracks, averaging 65 cars capacity each, and is built on an equivalent of 0.3 per cent. grade extending to the hump, this equivalent grade formed by alternate level and steeper grades being inserted to reduce the earthwork quantities. On the other side of the hump there is 40 ft. of 3 per cent. grade followed by 20 ft. of 1.5 per cent., and then 60 ft. of .75 per cent. across the scales. Beyond this there is 160 ft. of 2.5 per cent. grade to the first switch dividing the ladders, and then an 8 per cent. grade extending through the ladders. From this point the grade is level through the classification yard, which consists of 20 tracks leading from two ladders, with capacities varying from 50 to 75 cars, and averaging 65 cars. The north 10 tracks are further divided at the west end between two ladders connecting five tracks each. This yard leads directly out on to the engine running track and from that to the main line. This engine running track extends from the round house entirely around the yard on the north, providing an independent lead for the engines in going to and from the yard. This yard is somewhat unusual in that no departure yard was provided, but the road engines pull their trains directly from this classification yard. At the west end of the classification yard are two caboose tracks built on a slight grade so that way cars can be dropped down on to a train as it is pulling out of the yard. The arrangement of the eastbound yard is practically the same as that just described for the westbound yard with the directions reversed. The receiving yard is composed of seven 95-car tracks providing for the longer trains from the west, and giving practically the same capacity as the westbound yard. A new roadbed has been graded for the westbound main line around the yard on the north parallel to the engine running track, and as soon as the yard is put into operation this track will also go into service and the old westbound main track taken up. In this way the yard is located between the two main lines, and there will be no occasion for crossing the main lines. A small change will be made in the eastbound main line at the ice house, where the track will be thrown behind it to provide room for a Q. D. or time freight yard.

A transfer shed for the transfer of l. c. l. freight 800 ft. long by 24 ft. wide, with four tracks on each side, is located midway between the two classification yards and equally accessible from each yard. This shed is mounted on concrete piles, and consists of a covered platform with the exception of an office at the east end, and a storage room 43 ft. long at the west end for hold-over freight. About 125 cars of this l. c. l. freight are handled daily, being brought here from all directions and cars are loaded for all the larger terminals without further transfer.

The repair yard is located between the westbound classification yard and the eastbound receiving yard, and is provided with eight tracks having a capacity of about 200 cars, together with the necessary material sheds and work shops. It can also be reached directly from both the eastbound and the westbound yards.



Eastbound Classification Yard from Tower.

All tracks and ladders are laid with second hand 85-lb. rail throughout the yard, while 90-lb. rail was laid on the main tracks. Untreated ties, principally cedar and chestnut, were used, and tie plates were placed on all except oak ties. For the first raise of ballast cinders were used, but the second raise was made on granulated slag. This was of especial advantage during the winter, for in most cases it was still warm when unloaded and could be worked on the track when other material was frozen, enabling the surfacing to continue during the cold weather. All track work and ballasting has been done by company forces and an average of about 260 men has been employed. No. 8 turnouts were used in all cases, except in main line, where No. 10, 16 and 20 turnouts were installed. All ladders were laid to No. 8 angles and hard center frogs were used at the junction of ladders or wherever the traffic was heavy. Rail anchors were placed on the hump to prevent the track from creeping on to the scale. Tracks in the yard were laid to 12-ft. centers with 14 ft. between the engine track and adjacent ladders and 13 ft. between the engine track and the main track. A 50-ft. 150-ton Fairbanks-Morse automatic scale, with scale house, was installed on concrete foundation at each hump. The scale pit is entirely of concrete and access to it is

gained from the side. The entire pit is easily accessible for inspection and repair work and is brightly lighted by electric lights.

Three complete interlocking towers, with electro-pneumatic push button machines, are being installed. The machine will be located at the west end of the yard to handle movements in and out. The other machines will be installed at the two humps and will handle the switches leading to the classification yards. Air for these machines and for the repair yard will be supplied through a 3-in. pipe line leading from a compressor in the power plant near the round house. A large amount of attention has been given to furnishing office facilities and conveniences for the employees of the yard. Individual steel lockers are installed for all employees, those for the switchmen, yard clerks and tower men being placed on the first floor of the towers, while those for employees in the repair yard are placed in the repair yard office. All buildings are heated by steam from a central plant in the general yardmaster's office building, except the repair yard buildings, which are heated from a separate plant. All buildings are lighted by electricity furnished from a power plant near the round house. The different machines in the repair yard are operated by power from the same source. Electric arc lights on high poles are also installed at intervals of 360 ft. along the ladders leading from the humps. A complete telephone system is installed connecting all offices. An elaborate system of fire protection has been provided, plugs being placed throughout the yard at intervals of about 600 ft. The transfer shed is protected by eight plugs below the platform. A drainage system embracing about nine miles of sewers, with trunk lines along each ladder, is planned and will be built this season.

A reservoir of 110,000,000 gals. capacity was built just south of the main track and opposite the 10-ft. arch culvert by the construction of a concrete dam and spillway across the neck of the small ravine. A small area between the dam and the culvert is paved with concrete to prevent seepage and wash. This reservoir will act as a reserve for the main reservoir near the round house, where the supply frequently is insufficient to meet the daily demands which average about 500,000 gals. It is connected with the main reservoir by a 10-in. gravity equalizing line. This new reservoir will also provide water directly for fire protection, for a pump and concrete tank will be installed near the center of the yards to furnish water for this purpose and for the hump engines.

Due to the congestion last fall the eastbound yard was rushed to completion and put into service last November. The westbound yard is now practically complete and will go into service in a short time. The Q. D. or time freight yard will be built this summer as soon as the main line is thrown back of the ice house.

The contractor for the grading and masonry was the Robert Grace Construction Company, Cleveland, Ohio. All building work, together with the laying of the 10-in. pipe line, was contracted by P. Farrell, Cincinnati, Ohio, and Hoffman & Conklin, Columbus, Ohio, were contractors for the air line. This work was designed and built under the direction of A. W. Thompson, then chief engineer, and F. L. Stuart, chief engineer, by L. G. Curtis, engineer maintenance of way, F. E. Toenniges, assistant engineer, and C. G. Kistler, resident engineer in charge, to whom we are indebted for this information.

The government of Ecuador is pushing the work of construction on the Manta to Santa Ana Railway, inasmuch as the section of the country which it traverses will benefit by railway communication with a Pacific coast port. The extension and completion of the line will doubtless mean increased prosperity to the inhabitants of the zones through which it will pass and insure a more rapid exploitation and development of the immense natural resources of this highly productive region of the republic.

STANDARD OIL COMPANY ORDERED DISSOLVED.

The United States Supreme Court, by a unanimous decision, on May 15 declared the Standard Oil Company to be a combination in restraint of trade, and therefore a violation of the anti-trust law, of 1890; and ordered its dissolution within six months. The decision applies to the Standard Oil Company of New Jersey and 33 subordinate corporations, with an aggregate capital of $110,000,000. The opinion was delivered by Chief Justice White. Justice Harlan concurred in the decision, but dissented from the conclusion of the majority that restraint of trade must be shown to be undue in order to be held unlawful.

Counsel for the oil company claimed that the acts of the company which gave it such great advantages over all competitors were only the result of lawful competitive methods, guided by economic genius, courage and commercial insight. The court rejects this view and says that it is impossible to avoid the conclusion that there was constantly an intent and purpose not only to develop the oil business, but to exclude other persons from a part in it. The methods employed were such as necessarily involved the intent to drive others from the field. To the argument that dissolution of the company and its subsidiaries would work great injury to property, the court replies that the stockholders are not restrained from making normal and lawful contracts. Discussing the question whether the Sherman law prohibits all combinations in restraint of interstate trade, Chief Justice White reviews his study of the common law and the law of the country at the time the Sherman law was passed (1890) and says:

a. That the context manifests that the statute was drawn in the light of the existing practical conception of the law of restraint of trade, because it groups as within that class not only contracts which were in restraint of trade in the subjective sense, but all contracts or acts which theoretically were attempts to monopolize, yet which in practice had come to be considered as in restraint of trade in a broad sense.

b. That in view of the many forms of contracts and combinations which were being evolved from existing economic conditions, it was deemed essential by an all-embracing enumeration to make sure that no form of contract or combination by which an undue restraint of interstate or foreign commerce was brought about could save such restraint from condemnation. The statute under this view evidenced the intent not to restrain the right to make and enforce contracts, whether resulting from combination or otherwise, which did not unduly restrain interstate or foreign commerce, but to protect that commerce from being restrained by methods, whether old or new, which would constitute an interference that is an undue restraint.

c. And as the contracts or acts embraced in the provision were not expressly defined, since the enumeration addressed itself simply to classes of acts, those classes being broad enough to embrace every conceivable contract or combination which could be made concerning trade or commerce or the subjects of such commerce, and thus caused by any act done by any of the enumerated methods anywhere in the whole field of human activity to be illegal if in restraint of trade, *it inevitably follows that the provision necessarily called for the exercise of judgment* which required that some standard should be resorted to for the purpose of determining whether the prohibitions contained in the statute had or had not in any given case been violated. Thus, not specifying, but indubitably contemplating and requiring, a standard, it follows that *it was intended that the standard of reason which has been applied at the common law* and in this country in dealing with subjects of the character embraced by the statute *was intended to be the measure used for the purpose of determining whether in a given case a particular act had or had not brought about the wrong* against which the statute provided.

And the second section was designed to supplement and re-

inforce the first. And it becomes obvious that the criteria to be resorted to in any given case for the purpose of ascertaining whether violations of the section have been committed is the rule of reason, guided by the established law and by the plain duty to enforce the prohibition of the act, and thus the public policy which its restrictions were obviously enacted to subserve. . . .

As the restraints of trade to which the first section applies is not specifically enumerated or defined, it is obvious that judgment must in every case be called into play in order to determine whether a particular act is embraced within the statutory classes, and whether, if the act is within such classes, its nature or effect causes it to be a restraint of trade within the intendment of the act.

To hold to the contrary would require the conclusion either that every contract, act or combination of any kind or nature, whether it operated a restraint on trade or not, was within the statute, and thus the statute would be destructive of all right to contract or agree or combine in any respect whatever as to subjects embraced in interstate trade or commerce; or, if this conclusion were not reached, then the contention would require it to be held that as the statute did not define the things to which it related and excluded resort to the only means by which the acts to which it relates could be ascertained—the light of reason—the enforcement of the statute was impossible because of its uncertainty.

Chief Justice White, referring to the opinion of the Supreme Court in the cases of the United States agt. Trans-Missouri Freight Association and United States agt. Joint Traffic Association, declared that the general language of those opinions had been subsequently explained and held not to justify the broad significance attributed to them.

"And in order not to in the slightest degree to be wanting in frankness," said the Chief Justice, "we say that in so far, however, as by separating the general language used in the opinions in the Freight Association and Joint Traffic cases from the context and the subject and parties with which the cases were concerned, it may be conceived that the language referred to conflicts with the construction which we give the statute, they are necessarily now limited and qualified. We see no possible escape from this conclusion, if we are to adhere to the many cases decided in this court in which the anti-trust law has been applied and enforced, and if the duty to apply and enforce that law in the future is to continue to exist. The first is true, because the construction which we now give the statute does not in the slightest degree conflict with a single previous case decided concerning the anti-trust law, aside from the contention as to the Freight Association and Joint Traffic cases, and because every one of those cases applied the rule of reason for the purpose of determining whether the subject before the court was within the statute. The second is also true, since, as we have already pointed out, unaided by the light of reason, it is impossible to understand how the statute may in the future be enforced and the public policy which it establishes be made efficacious."

It was claimed that as the Standard Oil Company controlled but a small percentage of the crude oil produced, it was not a monopoly; but, says the court, the company's complete control over the refined product gave it substantial power over the crude product.

The sixth section of the decree of the lower court forbade the formation by the subsidiary corporations, or other stockholders, of like combinations. The Chief Justice says that this should not be taken as depriving the stockholder or the corporation of the right to exist under the law. For example, if two of these corporations, controlling pipe lines, should combine so as to make a continuous line, such a combination would not be repugnant to the act. In the same way, the Union Tank Line must be left free to distribute tank cars among the subsidiary corporations, as the public interest may require.

Mr. Justice Harlan in his dissenting opinion, says:

The men in Congress who framed and passed this law knew what they wanted to do and how to do it. They knew the common law with respect to restraint of trade. Ever since 1897 attempts have been made in Congress to modify the Sherman law so as to make it prohibit unreasonable restraint of trade instead of prohibiting plain restraint of trade, but these attempts have all failed. The language of the statute is clear and the court in the present decision, by modifying it to the extent of giving power to the courts to decide what is and what is not prohibited by the law is in effect amending the constitution. The judiciary thus invades the authority of the legislative branch of the government.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.

The third annual convention of the International Railway Fuel Association was held at the Hotel Patten, Chattanooga, Tenn., May 15-18. W. C. Hayes, president of the association and superintendent of locomotive operation of the Erie, presided. In his presidential address Mr. Hayes favored the organization of a fuel department on each railway, to handle the purchasing and distribution of fuel and questions arising in connection with its economical use. This department should co-operate with the operating and mechanical departments. He urged the association to become interested in and support legislation which would make arbitration of disputes between mine owners and employees compulsory.

T. C. Powell, vice-president of the Southern Railway and the Queen & Crescent, said that operating conditions of the present demand that more attention be given to coal supply, distribution, quality and utilization than ever before. An example of the latter is found in the public interest in the effect of coal burning on cleanliness. Coal burning in England is done with much greater cleanliness than in this country on account of efforts to suppress smoke by the design of engines, inspection and proper firing. Mr. Powell spoke of the opportunities of the association in the intensive use of fuel, and suggested the compilation of a manual of recommended practice to govern its handling and use.

The secretary's report showed a gain in the number of members of 118, making the total membership 367.

FUEL INVESTIGATIONS BY THE GOVERNMENT.

In the absence of Dr. J. A. Holmes, director of the Bureau of Mines, the paper on the fuel investigations conducted by the Bureau, which he had prepared, was read by S. B. Flagg, engineer of the Bureau. The paper reviewed the work of the government coal-testing plant since its creation in 1904, commended the now quite general practice of buying fuel by specification and treated of various methods of testing, and of the use of briquetted fuel in locomotives. Of the latter the following was said:

A series of experiments were conducted at the locomotive-testing plant of the Pennsylvania at Altoona, Pa., in which the Geological Survey actively co-operated. All the fuel used was inspected by the Survey at the time shipment was made, a portion of it going to the testing plant in St. Louis to be briquetted, and being then forwarded to Altoona for the test. The conclusions drawn from these tests show that, although the evaporation per pound of briquets was greater than it was per pound of raw coal, and the amount of smoke made was less with briquets, the increased cost of the briquetted fuel was not warranted by the resulting increase in evaporation efficiency.

Another series of comparative trials of run-of-mine and briquetted coal in a locomotive boiler was conducted jointly by the Seaboard Air Line and the representatives of the Survey in the company's yards at Portsmouth, Va. Bulletin 412 of the Geological Survey describes the method of conducting the tests and gives the results. The comparative showing made by the

raw coal and the briquets, under the conditions there obtaining, was somewhat more in favor of the briquets than it was in the other tests mentioned. Among the conclusions drawn were the following: (a) At low rates of working, run-of-mine coal gives a higher equivalent evaporation than briquets; at medium rates there is little difference, at high rates briquets do considerably better; (b) the smaller briquets are easier to fire and to level on the fire than are the larger ones. Either form gives the fireman far less work and trouble than run-of-mine coal; (c) in sparks briquet fires lose less than coal fires; (d) on roads having heavy grades it will probably pay well to burn briquets, at least part of the time; (e) perhaps it would pay to add combustion chambers to the front ends of some locomotive fire boxes, and use a larger number of boiler tubes of shorter length and smaller diameters.

Most of the later briquetting tests have been made on the low-grade fuels, of which there are immense deposits in some parts of this country. In some localities the deposits of these sub-bituminous or lignite coals have remained practically undeveloped because of the fact that there was only a small local demand, and the fuel in its raw state could not be shipped to any distant points because of the slacking or disintegrating action of the air. By partially drying these coals and then subjecting the material to heavy pressure in an open-mold-type press it has been found possible to make from some of them, without the use of any binding material, briquets which could be handled without excessive breakage and which also withstood the action of the weather reasonably well.

The paper also referred to locomotive smoke prevention as follows:

The abatement of locomotive smoke is one of the most difficult problems with which a city smoke inspector has to contend, and yet in many of our cities where efforts are being made to improve conditions, the amount of locomotive smoke has been greatly reduced. In such places the railways have made some changes in their equipment, and in addition to this have put on their own inspectors, whose duties are not only to watch for and report firemen who are violating the ordinance, but also to instruct such men as to methods of firing by which the smoke may be prevented or greatly reduced. The entire elimination of locomotive smoke does not today appear to be a possibility in sections where a high volatile coal is used. At least, it will not come without some decided changes in locomotive design. But it can safely be stated that there is no locality where the present conditions cannot be improved upon.

Discussion.—In the discussion of Dr. Holmes' paper it was brought out that obedience to the rules on the part of the firemen is essential to and an important consideration in the proper burning of coal and the prevention of smoke. Eugene McAuliffe, general fuel agent of the St. Louis & San Francisco, discussing fuel testing, as affecting smoke, said that the best results would be obtained if the technical questions involved in getting the maximum efficiency out of coal, as well as the economical questions of inspection and handling, were put in the hands of a fuel engineer, specially trained.

George M. Carpenter, chief fuel inspector, Nashville, Chattanooga & St. Louis, referring to smoke prevention, described some tests with a locomotive designed by F. F. Gaines, superintendent of motive power, Central of Georgia. The tests showed no smoke during 95 per cent. of the time the tests were conducted.

ORGANIZATION OF A RAILWAY FUEL DEPARTMENT.

T. Duff Smith, fuel agent, Grand Trunk Pacific, presented the following paper on How to Organize a Railway Fuel Department and Its Relations to Other Departments:

When we consider that at least 8 per cent. of the earnings of our railways is spent on fuel, it is plain that it requires expert management and should be under the control of a department which should have proper recognition. The fuel department should consist of the fuel agent, his clerical staff and fuel inspectors, and also in cases where the railway owns and operates its own coal dock, a dock superintendent and his staff.

I do not believe in keeping the accounting separate from the purchasing and distributing parts of the work but think that the fuel agent should be held responsible for all fuel from the time it is purchased until it is finally accounted for to the audit department. There is a great difference of opinion as to *who* should purchase fuel. My own opinion is that it should be done by the fuel agent, under the direction of the general manager or general purchasing agent.

The fuel agent should have a thorough knowledge of the different qualities and grades of coal on his own line and adjacent thereto, and should keep in close touch with all movement in the way of development thereon. He should also study the geological formation of all districts adjoining his line so that he may know where to look for future supplies. To insure economical working he should be familiar with the capabilities of the different classes of bituminous coal; also hard, slack and lignites, by the use of which he may greatly reduce the cost of heating round houses, stations, etc. The distribution of coal should be closely watched so as to prevent congestion and avoid extra haulage. The actual office work of issuing orders for distribution and also tracing cars which have not reached their destination in reasonable time should be assigned to one of the office staff, a fuel distributor.

The fuel agent should not spend too much time in the office where the routine work can be attended to by the clerical staff, but should be out on the line as much as possible, getting in close touch with the men who have the actual handling, master mechanics, road foremen, agents, etc., and thus gain information which will enable him to make economies. He should have a knowledge of the different systems of handling coal so as to be able to meet any contingencies and to keep the actual cost of handling at a minimum; and he should so arrange his supplies that while amply protecting himself against any possible shortage by reason of unforeseen delays, bad weather, wrecks, wash-outs, etc., he may not have too much stock on dumps, thus causing extra cost by shrinkage, double handling and interest on money lying idle.

He should have an all round knowledge of the accounting system, and have such reports sent in as will keep him in close touch with actual stocks and costs. The system of records should be such that it is absolutely impossible for any car or any fuel to remain unaccounted for. The actual charging for the fuel and distribution of charges should be done by the fuel accountant, who is on the fuel agent's staff.

He should keep in close touch with the general manager, purchasing agent or other officer to whom he directly reports, so that he may have immediate advice on questions of policy, etc., and with general superintendents so that they may facilitate movement of cars, and also to get advance notice of any extra supplies required by reason of rush of traffic, opening pits or track laying. He should consult them as to any alterations required to improve coaling tracks or plants, especially at temporary coaling stations.

He should also have daily communication with the car service agent so that a proper supply of equipment may be available at points required. On some lines, as on my own, we have a heavy westbound movement during the early part of the navigation season and a heavy eastbound movement during the fall months. Having to bring in our coal supply over the Great Lakes during navigation, it is most essential to keep well posted as to the car situation so that we may load all cars west with coal and save light cars (in our case we have to use all box cars), and so make traffic both ways, thus saving equipment and power. This same principle will apply to all local conditions.

But the most important official to the fuel agent is the superintendent of motive power or master mechanic. Fully 90 per cent. of our fuel is used by this department and it is only by the close co-operation of the two departments that the best results may be obtained. On a few roads they have a properly organized testing department, but with the majority tests have to be made by the mechanical departments, so that, to a great

extent, the fuel agent has to rely on the result of their labors. Also where a performance sheet is compiled, it will not be possible to get any improved performances unless the two departments work closely together. I am not in favor of the "pooling" system, as under it you cannot place the blame on the actual man who is wasting or burning too much fuel.

The last man, but far from the least, on the fuel staff, is the fuel inspector. To fill this position I prefer a practical miner to any one else. He should be competent to judge whether the coal is up to the standard required by contract. His duties are, to see that all cars before loading, are clean and in fit condition to carry coal, so that there will be no loss by leakage, and to see that all cars are weighed both empty and loaded, noting any differences between actual and stenciled tare. He should also inspect all coal loaded, which should be done at the picking table where he can see and detect impurities.

He should report daily, by mail if within one day's journey, otherwise by code wire, all cars loaded giving car numbers, weights and destination, also reporting any local conditions at the mine, such as variations in quality, opening new seams, car supply and labor conditions, especially when there is any friction between operators and employees, thus giving the fuel agent an opportunity to protect his stocks against any shortage caused by a possible strike or lock-out.

As far as consistent, he should confer with operators when they have trouble with bad veins, etc., and try by practical advice to help improve matters. I have been receiving coal from one mine where, by our inspector's practical advice, the quality has improved fully 20 per cent. during the last six months. Operators, instead of objecting to such inspectors, are pleased to have them. Inspectors should have the power to refuse absolutely any coal not up to standard, and having given your inspector this power, trust him, and stand behind him and you will soon find that operators will tender you only the article you have purchased.

Discussion.—The discussion of Mr. Smith's paper developed the fact that the Rock Island has a well-organized fuel department in charge of the purchase, inspection, and distribution of company fuel. Regarding this, D. B. Sebastian, fuel agent of that road, and secretary of the Association, said:

All contracts are made by the fuel agent who reports to the vice-president in charge of purchases, and the former is held responsible for economical distribution and contract grade and quality of coal when placed on locomotives. Fuel economy on our lines is under the special direction of the assistant general superintendent of motive power. He and the fuel agent work together in all matters pertaining to the grade of fuel to be used for various purposes. Slack coal, or screenings, is generally used at stationary plants and pumping stations, and other plants are being converted to slack burners also.

A fuel agent should have an intimate knowledge of all coal on his own line or vicinity. We are studying conditions carefully in that direction and keep on file complete drawings showing the character and geological formation of every vein from which we take coal. Our company makes an analysis of coal from technical samples taken from all mines periodically, with the object of eliminating, whenever practicable, those coals which run too high in non-combustible matter. In addition, they give us valuable information as to the number of heat units purchased.

The matter of distribution on the Rock Island is perhaps more important than on some other roads, as over 50 per cent. of the company coal is mined on foreign lines, and with the daily consumption running from 250 to 300 cars, it requires careful and constant attention. A practical miner makes a good inspector, if you have enough of them to cover the ground. However, the man with locomotive experience makes a desirable inspector and is a valuable asset to the fuel department. With authority to ride engines he can get right to the seat of the trouble when any complaint is made about poor coal. He can also deal satisfactorily with road foremen, master mechanics and others, when going to and from the mines.

We are buying coal from about 90 mines, and have five inspectors, including a chief fuel inspector, to cover the ground in 10 states loading company coal. We have lately instituted a chute foreman's condition report, and are trying, by education, to make fuel inspectors out of these men. The report includes a 24-hour performance, showing cars unloaded, with initial and way-bill reference, grade of coal and blank columns for chute foreman's estimate of quality, per cent. and kind of impurities, and condition of car as to containing refuse when unloaded. These reports are sent in daily from over 100 coaling stations and are checked carefully for any irregularities, which are immediately taken up for collection. In this way the Rock Island is endeavoing to inspect every car of coal, at the chute, if not at the mine, and we hope before long to have this system perfected to a point where it will be impossible for a car of inferior coal to be unloaded at one of our coaling stations.

Mr. McAuliffe said that the Frisco was the first to establish a fuel department. He believed that fuel economy is largely a matter of education and favored the conducting of continuous tests during the summer months, to determine the quality and effect of the fuel used.

The Missouri Pacific has a foreman's report similar to that on the Rock Island. The Michigan Central does not believe in centralizing the various operations connected with fuel, and so separates the purchasing, accounting and distribution, handling these in three different departments. J. T. Clark, traveling inspector, Southern Pacific, thought that if performance sheets were improved better results could be secured from enginemen, as the standards of comparison of the fuel used by them are not now so arranged as to show actual results.

PURCHASING COAL ON A MINE-RUN BASIS.

The meeting on Tuesday, May 16, opened with the reading of a paper on Some Results of Purchasing Coal on a Mine-Run Basis, by Prof. A. A. Steel of the University of Arkansas, of which the following is an abstract:

Even before the mining methods had changed, the industrial development of the country provided some sort of a market for the slack coal. As soon as slack coal became a marketable commodity, the costs of mining coal and the statistics of the output came to be figured upon a mine-run basis, without regard to size. Coal was also occasionally sold to the consumers upon a mine-run basis. In filling such orders it was not necessary to screen the coal, but in order to avoid this screening, it was necessary to agree upon a mine-run scale of payment to the miners.

As long as the payment to the miners was not directly affected by the weight of slack coal they produced, any increase in proportion of slack obtained from them caused an apparent reduction in the cost of producing coal per ton of mine-run. As a result, those superintendents of mines, whose work was judged only by the cost at which they could get out a ton of mine-run coal, were led to increase the percentage of slack as much as possible. Some even went so far as to neglect or alter the screens over which the coal was passed until an undue proportion of the miners' coal fell through it. This stealing of coal from the miners and the fact that slack was generally of value to the operators, caused the miners to demand direct payment for all sizes of coal they produced.

The miners secured the passage of laws prohibiting the screened coal basis of payment in many of the interior states. Some of the more recent of these laws, such as those of Kansas, Arkansas and Oklahoma, not only require equal payment for all sizes of coal but also compel the operators and, therefore, the railways to pay full price for the slate a careless miner sees fit to mix with the coal.

The mine-run basis of payment to the miners led to such an increase in the use of powder that the firing of shots caused frequent dust explosions. To avoid this danger to themselves, the coal shooters have secured the employment of shot-firers, who get sufficient pay to tempt them to run the risk. The only

thing which now induces the more careless miners to save powder is its cost. Unfortunately this is not very effective because the miners are learning to blow the coal to pieces in a still more convenient way by dislodging more coal with each shot than formerly. Heavy shots so jar the tight mass of coal that it becomes little more than a heap of slack.

The careless shooting of coal that has followed the continued payment of the miners upon a mine-run basis obviously injures the operators. But we are more interested in the consumers, because the fuel departments of the railways are the great consumers of coal. The consumers most directly suffer as a result of the poor quality of the output. Many of you are quite familiar with the so-called coal produced in the mine-run states where machines are not used for mining. You know that the remaining lump coal is so shattered that it becomes largely slack by the time you get it into a locomotive tender. You also know how anxious the operators are to sell you mine-run coal, or at least a modified mine-run. Some of you may have felt the additional pressure in favor of mine-run coal, which has been brought to bear by your traffic department, which does not wish to see the mines go out of business. As a result of buying mine-run coal, you are also familiar with the great increase in the per cent. of slack in the mine-run coal and know how much slack remains in coal from which 25 per cent. of slack has been removed.

Getting coal from other states throws business to competing roads and increases the cost of fuel. It causes other indirect injuries to the railway, such as the loss of traffic of the mines that cease operating when the fuel is purchased elsewhere. This in turn reduces the competition for railway fuel business, requires more inspection and forces the fuel agents to accept a lower grade of coal containing a larger proportion of slack.

The closing of the little mines causes a greater hardship to the railway during the regular biennial suspension of mining, because at such times the only regular supply comes from the smaller mines that have signed up with the union. The lack of discipline and the constant quarreling between operators and miners has been largely increased by the troubles caused by this mine-run basis of payment. One of the results of this is a greater frequency of petty strikes and the resulting annoyance to the railway fuel agents. It also insures a strike at the end of each biennial contract period.

The actual results of these mine-run laws depend upon local conditions. The Arkansas coal operator and the railways dependent upon them for fuel suffer more than the average. Some of the reasons are that this coal has unusually good heating value, low ash and freedom from smoke so that it should be an exceptionally fine engine fuel. It is, however, very tender and suffers especially from the heavy shooting. At nearly all the mines there is, in the coal next to it, a layer of very soft dirt, which is easily shot into pieces small enough to escape the slate inspector, so the miner can not be penalized for selling it to the operator. The operator passes as much of the slate as possible on the railway. Moreover, the miners of Arkansas have so far prevented the successful use of mining machines.

On the basis of the small normal output of coal in Arkansas, of only 2,500,000 tons a year, the losses caused by the mine-run law add up to $4,250,000 a year, not counting the loss to railways and merchants caused by the decline of coal mining business of this state. It is a little difficult to separate the losses affecting either the operator or the consumer. Together these amount to $1,670,500 a year net, and the loss to the consumer must be at least two-thirds of this, or, say, $1,000,000. Since most of the Arkansas coal is sold to the railways your loss must be over half a million dollars a year. During 1910, practically no coal was mined in Arkansas for five months and during the fall the supply was poor, irregular, and high-priced. The cost of that strike to the railways was very much more than half a million dollars.

The only way to be sure of a good quality of coal is to buy it from the miner upon a lump coal basis or at least to pay more for lump coal than for slack. In order to do this, the mine-run laws must be repealed.

So long as the operators have to buy coal from the union on a mine-run basis, they naturally wish to sell it upon the same basis. The good natural railways of the interior have also established the feeling that they should assist the operator as much as possible to struggle through hard times. Just at present the greatest burden the Arkansas operators have to bear is the excessive amount of dirty slack they must buy from the miners and they wish to place this burden upon the railways.

There is already a considerable market for mine-run coal and if the operators are able to sell all railway coal on a mine-run basis they will for some years be readily able to dispose of the slack obtained in the preparation of domestic lump coal. If necessary, they can make the consumer pay for washing the slack. They will under these conditions cease their efforts to repeal the mine-run laws. What is worse, they will relax still more the slight discipline remaining in the mine crews. The result will be the practical disappearance of all care in mining coal and the railways will soon be burning nearly pure slack of very poor grade.

Comparative tests seem to show that so long as engine coal is free from slate, there is but little loss in efficiency as the size of lump coal is reduced, provided that the pieces are not small enough to fall through the grates or be carried through the flue by the increased draft used with small sizes of coal. The smallest economical size of coal is determined by the difference in cost of the various sizes and by the character of the coal. The more important properties of the coal which affect this are its specific gravity and coking quality. The valuable coal certainly includes many of the smaller lumps removed as slack by the 1⅛-inch screens common in the southwest.

When fine coal is burned, the large lumps must be broken into rather small pieces before firing to secure the best results. This requires a good deal of labor and the fireman can hardly do it by hand on large engines. Breaking the lumps by hand also makes an undue proportion of slack. For these reasons some coal is already being broken mechanically before it is loaded upon the tenders. The most valuable engine coal is, therefore, that which can be crushed to yield the largest proportion of pieces between, say 1 in. and 3 in. across and the least proportion of slack less than possibly ½-in. across.

It is generally admitted that the railways must buy a certain amount of slack coal in order to protect the operators, and preserve their fuel supply, but even though much of the so-called slack has value it is not worth as much as lump coal. It seems proper, therefore, that coal contracts should name one price for lump coal broken down to a desirable size and a less price for coal of a size below a limit determined by the railway as uneconomical for the particular field. Coal which is carelessly mined also contains slate. This not only has no value but is a positive detriment.

The scale of prices for different sizes of coal can be adjusted after trial so that the return to the operator will equal the average price of the coal bought under either of the present systems. It might even be greater with profit to the railways. After preliminary tests the railway should invite bids for coal upon the basis of, say, four times as much per ton for lump coal as for coal which will go through a half-inch opening, or whatever size the road places as the limit.

When the operator sells coal on its ability to break with little slack formation and its freedom from slate, he will find it economical to take out as much slack as he can sell elsewhere and the railway can serve as a refuge in time of need, to prevent the wasting of slack. This arrangement will certainly cause the operator to get out the largest amount of solid lump coal as free as possible from slate. Such contracts can be used as inducement to get a good quality of coal from the many good miners and enable these men to coax their fellows to do better work even under mine-run conditions.

Discussion.—The Rock Island succeeds in getting a good quality of coal by showing the miners that it is to their own interest to produce it and by threatening loss of business unless good coal is furnished. Better methods of sampling for tests are also urged. The mine-run law is being fought in Arkansas and the roads' best protection is to pay a bonus for lump coal and less for slack.

A NATIONAL ARBITRATION TRIBUNAL.

Representative George E. Foss, of Illinois, has introduced in Congress a bill to create a national arbitration tribunal to consist of six members, one of whom shall be, ex-officio, the secretary of commerce and labor, and the other members to be appointed by the president. The members first appointed would serve for two, three, four, five and six years, but their successors would be appointed for terms of six years. At least three of the appointed members would constitute a quorum, and the secretary of commerce and labor would have all the powers of other members, except that of voting. The annual salary is fixed at $8,000, and a secretary is provided for at a salary of $4,000. The tribunal would organize by electing a president and a vice-president. Its regular place of meeting would be in Washington, but it would be authorized to hold meetings elsewhere. It will provide that whenever there shall arise a controversy on earnings, wages, hours of labor or conditions of employment in which a strike or lock-out is threatened or is in existence, and in which there is involved interstate commerce or commerce in any of the territories or the District of Columbia, it shall be right and lawful for either party to present to the tribunal a sworn petition setting forth its claims and demands. The petition shall, in substance, be a request to the tribunal to investigate all matters involved, and render a decision on its merits. The petition shall also express a full agreement on the part of the one presenting it, to abide by the decision of the tribunal. If the tribunal, in its discussion, deems a petition and the subject matter involved such as to warrant an exercise of its functions, it shall within a reasonable time transmit to the other party to the dispute, a copy of the petition, requesting the other party to make a sworn answer to it within a specified number of days, and if the other party makes no answer as requested, or refuses to submit the matters in the controversy to the arbitration tribunal, and to agree to accept and to abide by the decision, the original petition shall be made known to the public. If the parties agree to arbitration, the tribunal shall proceed to arbitration. Its findings shall not be made public without the consent of the parties, unless one of the parties agrees to abide by the tribunal's findings, in which case it will be made public. The tribunal is given the power to subpoena witnesses and compel them to testify.

FOREIGN RAILWAY NOTES.

The construction of the railway from Choapa, Chile, to Salamanca was completed on December 19, 1910.

The Brussels chamber of deputies has passed a bill authorizing the Société des Grands Lacs to issue $5,000,000 additional capital for the continuation of the Great Lakes Railway toward Lake Tanganyika in Africa.

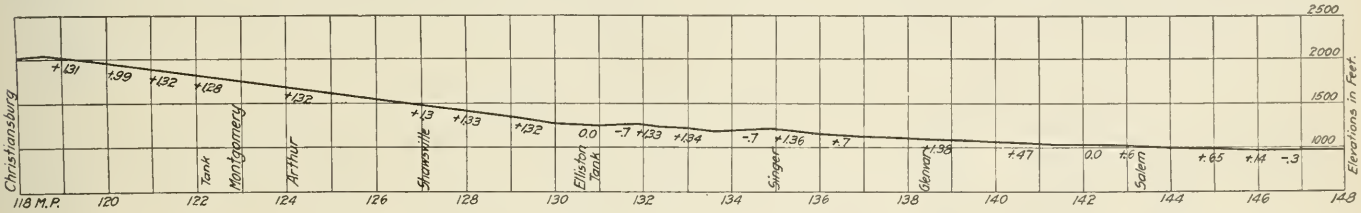
COMPARATIVE TESTS OF MALLET LOCOMOTIVES; NORFOLK & WESTERN.

The Norfolk & Western has recently made a thorough test of two types of Mallet compound locomotives which were received and placed in service during May and June, 1910. The general dimensions of these locomotives are as follows:

Engine No.	993	998
N. & W. classification	X-1	Y-1
Rigid wheel base	15 ft. 6 in.	15 ft. 6 in.
Total wheel base, engine and tender	72 ft. 10 in.	83 ft. 1½ in.
Total length, engine and tender	88 ft. 11¾ in.	92 ft. 5¾ in.
Weight on drivers	376,800 lbs.	370,000 lbs.
Total weight	376,800 lbs.	400,000 lbs.
Diameter of drivers	56 in.	56 in.
Cylinders, in.	24½ and 39 x 30	24½ and 39 x 30
Steam pressure	200 lbs.	200 lbs.
Tractive effort	85,000 lbs.	85,000 lbs.
Valves	Piston and slide	Piston
Heating surface	5,388 sq. ft.	5,894 sq. ft.
Grate area	75 sq. ft.	75 sq. ft.
Exhaust nozzle	6 in. dia., ⅜ in. bridge	7 in. dia., ¾ in. bridge

Engine 993 has four pairs of drivers for each engine and is of the 0-8-8-0 type, while 998 has a pair of truck and a pair of trailing wheels in addition, and is of the 2-8-8-2 type. The principal difference in the two locomotives is in the boiler, the front 63 in. of the boiler for engine 998 being separated from the boiler proper by a 54-in. space. This front section is fitted with tubes the same as the back portion of the boiler and is used as a feed water receiver or preheater. Water is delivered directly to this section by the injectors and overflows from it into the main portion of the boiler. Observations were made of the temperature of the water as it passed from one section to the other.

The amount of coal used on the tests was measured carefully; that used during delays was accounted for separately. An effort was made to have a clean uniform fire at the beginning of each trip and to have it burn to the same condition at the end of each test. The water was carefully measured by calibrating the tank and using gages at each of its four corners. The initial and final water observations were made with the engine standing on the same track elevation. The various water losses were also taken into consideration. For instance, the injector overflow was collected and measured; stroke counters were connected to both air pumps, which gave a basis for calculating the amount of steam used by them. The loss through the calorimeters was also noted and corrections were made for it. Provision was also made for estimating closely the loss of steam through the pop valves in the following manner: The pop casings were drilled and tapped and plugs with a 1/16-inch diameter orifice were screwed in flush with the inside of the casing; these plugs were then connected to a pipe line running back to a condensing coil in the tank. A small percentage of the steam discharged through the pops passed through these orifices and was condensed and collected in a small tank arranged for this purpose. With the engine stationary and the boiler full of water, the engine was fired to keep the pops up until the height of the water in the boiler receded to the bottom of the gage glass. The injectors were then put on and the boiler filled to the original height. With the use of the calibrated tank, it was then possible to determine the amount of water required to fill the boiler which corresponded with the amount discharged through the pops. The ratio of the water discharged through the pop to the water collected from the condensor was used for determining the pop loss on each trip.



Profile of Norfolk & Western Between Roanoke, Va., and Christiansburg.

The draft was measured by open water manometer tubes and

the quality of the steam was determined by the use of Peabody throttling calorimeters. The draw bar pull, or dynamometer horse power, was determined by recording instruments in the Westinghouse Air Brake Company's dynamometer car No. 5. The temperature of the gases was determined by a Hoskin's pyrometer. On engine 998 it was taken in the front of the smokebox, back of the reheater and in the combustion chamber. The temperature of the water passing from the reheater to the boiler proper was also noted. On engine 993 the temperature was taken in the front end of the smokebox and back of the baffle plate.

A general comparison of the performance of the two engines is shown in Table I. The tests were made between Roanoke, Va., and Christiansburg, a profile of this portion of the road being shown on the accompanying illustration. It will be seen that there was a reduction of 15 per cent. in the running time of engine 993, with a 19 per cent. increase in speed, although it hauled 9.8 per cent. more cars and 3.6 per cent. more tonnage than engine 998, with a reduction of 1.6 per cent. in coal used per thousand ton miles.

Table I.—General Performance—Roanoke to Christiansburg.

Eng. No.	Date.	Duration of Test, Hours. Total.	Delay.	Running.	Miles Run.	Speed, M. H. P.	Train Tonnage.	Number Cars.	1,000 Ton Miles.	Pounds of Coal per 1,000 Ton Miles.
998	9-19-10	5.267	1.75	3.517	29.73	8.5	1,579.1	23	46.947	251.3
998	9-20-10	3.493	.865	2,628	29.7	11.3	1,415.8	20	42.049	240.2
998	9-23-10	3.613	1.114	2.499	28.88	11.6	1,415.8	20	40.888	283.7
998	9-24-10	3.537	.882	2.655	29.26	11.0	1,415.8	20	41.426	270.4
998	9-28-10	3.064	.672	2.392	29.73	12.4	1,462.8	20	43.489	310.4
998	9-29-10	3.005	.692	2.313	29.72	12.8	1,462.8	20	43,474	312.8
Average		3.663	.996	2.667	29.5	11.06	1,458.7	20.5	43.046	278.1
993	10-10-10	2.783	.690	2.093	29.76	14.2	1,364.3	20	40.601	275.9
993	10-11-10	3.334	.935	2.399	29.75	12.4	1,541.1	23	45,847	279.2
993	10-12-10	3.264	1.035	2.229	29.74	13.3	1,541.1	23	45.832	279.3
993	10-13-10	3.102	.93	2.172	29.76	13.7	1,541.1	23	45,863	274.7
993	10-14-10	3.248	.797	2.451	29.56	12.1	1,541.1	23	45.555	272.2
993	10-15-10	3.146	.893	2.253	29.87	13.3	1,541.1	23	46.032	260.7
Average		3.146	.88	2.266	29.74	13.12	1,511.6	22.5	44.955	273.7

Data as to the amount of fuel used, the rate of combustion, the drafts and the temperatures of the gases for the different test trips is shown in Table II. The increased coal consumption of engine 998 for the last two runs was due to the removal of a portion of the perforated plate to overcome trouble due to the stopping up of the holes at its front end. This change resulted in a much heavier draft, accompanied by a greater loss in fuel through the stack and a decrease in the boiler efficiency.

Table II.—Fuel, Rate of Combustion, Drafts and Temperature of Gases.

Eng. No.	Fuel, in Pounds. Total. Fired.	Total. Running Fired.	Per Hour. Total.	Per Hour. Running.	Rate of Combustion per Hour. Sq. Ft. Grate Area.	Sq. Ft. Heating Surface.	Draft, In. of Water. Smoke Box.	Fire Box.	Temperature of Escaping Gases. Front Smoke Box.	Combustion Chamber.	Back of Baffle Plate.	Back of Reheater.
998	13,200	11,800	2,506	3,355	44.73	.5693	4.28	1.78	.....	.....	.....	.....
998	10,600	10,100	3,035	3,843	51.24	.652	4.32	1.7	.....	.....	.....	.....
998	11,800	11,600	3,266	4,642	61.89	.7876	5.67	1.72	.....	.....	.....	.....
998	11,700	11,200	3,307	4,218	56.24	.7157	5.73	1.8	.....	.....	.....	.....
998	14,400	13,500	4,700	5,643	75.24	.9574	7.92	2.41	374.5	583.1	.....	452.
998	14,000	13,600	4,659	5,880	78.4	.9976	8.3	2.3	377.5	615.2	.....	475.1
Average	12,617	11,967	3,579	4,597	61.29	.7799	6.12	2.09	376.1	599.4	.....	463.8
993	11,300	11,200	4,056	5,351	71.34	.9932	6.26	1.45	473.7	.....	480.	.....
993	12,900	12,800	3,875	5,335	71.13	.9901	7.00	2.3	481.4	.....	491.1	.....
993	13,000	12,800	3,983	5,742	76.56	1.0657	7.83	2.21	526.4	.....	540.6	.....
993	12,800	12,600	4,127	5,801	77.34	1.0767	8.02	2.4	527.3	.....	564.2	.....
993	12,400	12,400	3,817	5,058	67.44	.9388	6.87	2.14	518.6	.....	538.	.....
993	12,400	12,000	3,943	5,327	71.02	.9887	7.36	1.9	523.3	.....	532.7	.....
Average	12,467	12,300	3,967	5,436	72.47	1.0089	7.24	2.19	514.2	.....	527.0	.....

The omission of the gas temperatures in the earlier tests was due to a delay in receiving the instruments. The average smoke box draft on engine 993 exceeded that of engine 998 by 18 per cent., because of the use of the smaller nozzle. There is also an 18 per cent. increase in coal consumption per square foot of grate area per hour. The feed water heater and reheater tubes in engine 998 had a marked effect on the temperature of the escaping gases, there being a difference of 37 per cent. in favor of engine 998.

The amount of water and steam used is shown in Table III. While the data in this table is intended to show the distribution of steam per hour for the running time, it cannot be considered as absolutely accurate. For instance, although an effort was made to retard evaporation during delays, there was of course an increase in the boiler pressure and also a consumption of steam by the air pumps, as well as some loss through the safety valves. Thus, although the calculations are based on the running time, the amount of steam developed and the losses cover the entire performance.

Table IV shows the average steam pressures, quality of steam and pressures and temperatures in the reheater for the six trips of each engine.

Table IV.—Pressure and Quality of Steam, and Pressure and Temperature at Reheater.

Engine No.	993	998
Pressure, lbs. per sq. in.		
Boiler	193.2	191.3
High pressure delivery	165.2	167.8
Low pressure delivery	48.0	54.9
Quality of steam—per cent.		
High pressure delivery	.83	.943
Low pressure delivery	2.02	1.108
Temperature of steam, deg. Fahr.		
Entering reheater	....	306.94
Leaving reheater	....	301.53
Degrees reheat	....	—5.41
Steam pressure, lbs. per sq. in.		
Entering reheater	....	59.29
Leaving reheater	....	54.9

The minus sign before "degrees reheat," indicates a loss in the temperature of the steam while in the reheater, which was no doubt due to the increased volume of the heater. This would indicate that there is no marked advantage in this arrangement. The reheater, however, had a drying influence on the steam, as indicated by the low per cent. of moisture in the steam delivered to the low pressure cylinders. The boiler pressures for both locomotives were fairly uniform and regular, and as indicated in the table, the average boiler and high pressure delivery pipe pressures were practically identical for both the locomotives.

The average equivalent evaporation per pound of coal for all tests is given in Table V, and shows well for both engines. While the results may at first glance appear to be high, it must be remembered that the boilers were very large and that the evaporative efficiency was high, due to the low temperature of

the escaping gases. The results for the individual tests were quite uniform for each engine and compared favorably with the results on the Pennsylvania Railroad testing plan at St. Louis.

Table V.—Equivalent Evaporation.

Engine No.	993	998
Ratio, total coal to total water	7.85	8.666
Equivalent evaporation from and at 212 deg. Fahr.		
Total	118,276 lbs.	130,889 lbs.
Per hour	52,270 lbs.	49,643 lbs.
Per sq. ft. heating surface	9.70 lbs.	8.42 lbs.
Per lb. of coal	9.49 lbs.	10.46 lbs.

For instance, the Michigan Central consolidation cross compound locomotive gave a maximum equivalent evaporation of 12.01, and the Santa Fe four-cylinder tandem compound an equivalent evaporation of 11.51 lbs. of water per pound of coal. On an evaporative basis there is a difference of 10 per cent. in favor of engine 998.

The drop in pressure between the high and low pressure cylinders of engine 998, as shown by the indicator cards, was 9.2 lbs., while for engine 993 it was only 4.9 lbs., or 46.7 per cent. less. The greater drop in pressure in engine 998 was evidently due to the friction and the increased volume of the numerous passages through the reheater. The mean effective pressures calculated from the indicator cards, but not reproduced here, indicate that the valves on both engines were set to give a well balanced performance in both the right and left cylinders, as well as an equally good distribution of steam in both the front and back ends of each cylinder for both types of locomotives.

The distribution of power in the cylinders of both engines for all of the tests is shown in Table VI. The purpose of this table is to show the relation between the power developed in the high and low pressure cylinders of each engine. The average of the ratios of power existing between the high and low pressure cylinders of engine 998, is 1.18, while for engine 993 it is 1.25, showing that the engines were very much alike in this respect.

The data given in Table VII is a comparison of the conditions indicated by the dynamometer chart at the times when the indicator cards were taken and give a measure of efficiency of the engine and the boiler. For instance, engine 993 developed an average of 1,604.3 indicated horse power, with a corresponding draw bar horse power of 1,347, or 83.9 per cent. of the indicated horse power. For engine 998 the draw bar horse power was 78.2 per cent. of the indicated horse power. The boiler horse power developed by engine 998 is slightly lower than that for engine 993, but the boiler efficiency is 18.8 per cent. higher. From the design of the boiler and the low temperature of the escaping gases, we would naturally expect a higher efficiency from the boiler of engine 998. The data for the individual tests indicate that its efficiency varied from 68 per cent. to 89.4 per cent., although there seems to be some question as to the correctness of the latter figure. The boiler efficiency of engine 993 for the various tests was much more uniform and varied from 61.3 per cent. to 67.4 per cent.

Table VII.—Engine and Boiler Efficiency.

Engine No.	993	998
Indicated horse power—		
High pressure cylinders	889.9	757.1
Low pressure cylinders	714.4	640.6
All cylinders	1,604.3	1,397.7
Draw bar pull	46,021 lbs.	40,363 lbs.
Draw bar horse power	1,347.0	1,093.7
Boiler horse power	1,515	1,439
Boiler efficiency	64.9 per cent.	77.1 per cent.

Table III.—Water and Steam.

Eng. No.	Pounds of Water, Total. Supplied to Injector.	Inject. Overflow.	Supplied to Boiler.	Temp. of Feed Water.	Pounds of Steam Per Hour, Running Time. Moist Steam from Boiler.	Pumps and Calorm.	Pop.	To Cylinder.	Per Sq. Ft. of Heating Surface.	Temp. of Water Leaving Preheater.
998	125,988	915	125,073	64.6	35,562	3,441	5,800	26,321	6.0	.....
998	102,044	695	101,349	66.17	38,565	3,153	2,892	32,520	6.5	.....
998	103,400	580	102,820	65.25	41,146	3,144	5,122	32,880	7.0	234.1
998	107,290	639	106,651	65.3	40,172	3,118	4,219	32,835	6.8	233.6
998	105,800	580	105,220	66.5	43,980	2,655	4,682	36,643	7.5	238.5
998	110,530	938	109,592	64.3	47,381	2,633	7,436	37,312	8.0	236.1
Average	109,175	725	108,540	65.35	41,134	3,024	5,025	33,085	7.0	235.6
993	88,020	800	87,220	61.8	41,672	2,373	490	38,809	7.7	
993	96,260	432	95,828	59.3	39,933	2,761	1,197	35,975	7.4	
993	101,260	552	100,708	59.8	45,181	2,602	2,301	40,278	8.4	No
993	101,890	469	101,421	59.9	46,695	2,462	3,022	41,211	8.7	Preheater
993	102,110	603	101,507	60.	41,408	2,651	1,874	36,883	7.7	
993	99,260	451	98,809	61.	43,864	2,785	2,731	38,348	8.1	
Average	98,133	551	97,582	60.3	43,126	2,606	1,936	38,584	8.0	

Table VI.—Distribution of Power.

Eng. No.	Indicated Horse Power. Right Side. High. Pres.	Right Side. Low Pres.	Left Side. High Pres.	Left Side. Low Pres.	Total. Right Side.	Total. Left Side.	All Cylinders.	Cylinders. High Pres.	Cylinders. Low Pres.	Ratio of High to Low Pres.
998	327.7	269.9	314.6	268.2	597.6	582.8	1,180.4	642.3	538.1	1.19
998	341.1	290.7	344.1	283.5	631.8	627.6	1,259.4	685.2	574.2	1.19
998	377.0	304.2	384.8	307.8	681.2	692.6	1,373.8	761.8	612.0	1.24
998	379.2	307.5	388.6	301.6	686.7	690.2	1,376.9	767.8	609.1	1.26
998	397.1	344.1	394.2	340.2	741.2	734.4	1,475.6	791.3	684.3	1.16
998	398.2	364.1	398.2	361.9	762.3	760.1	1,522.4	796.4	726.0	1.10
Average	377.9	321.8	379.2	318.8	699.7	698.0	1,397.7	757.1	640.6	1.18
993	411.1	337.3	437.3	336.2	748.4	773.5	1,521.9	848.4	673.5	1.26
993	430.9	355.8	452.2	349.3	786.7	801.5	1,588.2	883.1	705.1	1.25
993	472.2	396.8	493.5	389.2	869.0	882.7	1,751.7	965.7	786.0	1.23
993	468.7	371.3	486.7	370.3	840.0	857.0	1,697.0	955.4	741.6	1.29
993	412.5	335.5	427.9	337.1	748.1	765.0	1,513.1	840.4	672.7	1.25
993	425.2	360.9	436.7	358.4	786.1	795.1	1,581.2	861.9	719.3	1.20
Average	435.6	358.6	454.3	355.8	794.2	810.1	1,604.3	889.9	714.4	1.25

The relation of the power developed, both indicated and draw bar, to the heating surface and grate areas, is shown in Table VIII.

Table VIII.—Horse Power Relation.

Engine No.	993	998
I. H. P. per sq. ft. heating surface	.298	.237
I. H. P. per sq. ft. of grate area	21.4	18.6
D. B. H. P. per sq. ft. of heating surface.	.250	.186
D. B. H. P. per sq. ft of grate area	18.0	14.6
H. P. of boiler at dome	1,515	1,439

Table IX.—Pounds of Steam Through Cylinders Per Thousand Ton Miles.

Engine No	993	998
1,000 ton miles, excluding weight of engine and tender	44.955	43.046
1,000 ton miles, including weight of engine and tender	52.429	50.803

Water through cylinders (pounds)—		
Per 1,000 ton miles, excluding weight of engine and tender	1,943	2,020
Per 1,000 ton miles, including weight of engine and tender	1,665	1,711
Total	87,273	86,890
B. I. through cylinders—		
Per 1,000 ton miles, including weight of engine and tender	1,996,331	2,050,900

A comparison of the horse power results from engine 998 as shown in Table X, indicates that 78.2 per cent. of the power

Table X.—Horse Power.

Eng. No.	Speed, M.P.H.	Indicated I.H.P. High Pres. Cylinder.	Indicated I.H.P. Low Pres. Cylinder.	Indicated I.H.P. Total I.H.P.	Draw Bar Pull, Pounds.	Draw Bar H.P.	Ratio I.H.P. to Draw Bar H.P.
998	8.5	642.3	538.1	1,180.4	43,387	973.0	1.21
998	11.3	685.2	574.2	1,259.4	34,559	958.1	1.31
998	11.6	761.8	612.0	1,373.8	41,413	1,124.1	1.22
998	11.0	767.8	609.1	1,376.9	38,481	1,063.3	1.29
998	12.4	791.3	684.3	1,475.6	39,254	1,108.2	1.33
998	12.8	796.4	726.0	1,522.4	42,059	1,226.2	1.29
Average	11.06	757.1	640.6	1,397.7	40,363	1,093.7	1.28
993	14.2	848.4	673.5	1,521.9	40,379	1,235.8	1.21
993	12.4	883.1	705.1	1,588.2	44,125	1,311.5	1.21
993	13.3	965.7	786.0	1,751.7	53,625	1,552.4	1.13
993	13.7	955.4	741.6	1,697.0	45,452	1,455.6	1.17
993	12.1	840.4	672.7	1,513.1	46,071	1,255.8	1.20
993	13.3	861.9	719.3	1,581.2	46,708	1,287.9	1.23
Average	13.12	889.9	714.4	1,604.3	46,021	1,347.	1.19

developed in the cylinders was transmitted to the draw bar, while for engine 993, 84 per cent. of the indicated horse power was available at the draw bar.

A summary of the average results of the tests is given in Table XI, and clearly shows that engine 998 was superior

Table XI.—Summary of Average Results.

	Average of Six Trips. Engine No. 998.	Average of Six Trips. Engine No. 993.	Per cent. in favor of Eng. 998.	Per cent. in favor of Eng. 993.
Boiler pressure, pounds per sq. in.	191.3	193.2	....	....
Water supplied boiler, pounds	108,450.0	97,582.0	....	....
Coal, total, pounds	12,617.0	12,467.0	....	....
Ratio total water to total coal	8.66	7.83	11.0	....
Equivalent evaporation per sq. ft. heating surface per hour	8.42	9.70	....	15.2
Equivalent evaporation per pound of coal.	10.46	9.49	10.0	....
Coal per sq. ft. of grate area per hour	61.20	72.40	....	18.
Moisture in steam, high press. (per cent.)	.94	.83	....	13.2
Moisture in steam, low press. (per cent.)	1.10	2.02	83.7	....
Draft in front end of smoke box (In. of water)	6.1	7.2	....	18.
Temperature of escaping gases, deg. Fahr.	376.1	514.2	37.0	....
Drop in steam press. between high and low press. cylinders (l. side)	9.2	4.9	....	46.9
Boiler horse power	1,439.0	1,515.0	....	5.2
Boiler efficiency	77.1	64.9	18.8	....
Distance of run, miles	29.5	29.7	....	....
No. of cars in train	20.5	22.5	....	9.8
Tonnage of train	1,458.7	1,511.6	....	3.6
Speed, miles per hour	11.0	13.1	....	19.0
Pounds of coal per 1,000 ton miles, excluding delays and wt. of engine and tender	278.1	273.7	....	1.6
Indicated horse power	1,397.7	1,604.3	....	14.8
Draw bar horse power	1,093.7	1,347.0	....	23.2
Per cent. of draw bar to indicated horse power	78.2	83.9	....	7.2

only in the items pertaining to boiler performance. On the other hand, engine 993 also has an important advantage in boiler performance—the difference in the drop in steam pressure between the high and low pressure cylinders. Thus, while engine 998 gives a better boiler performance up to the time the steam passes from the high pressure to the low pressure cylinders, the advantage is largely offset, due to the much greater drop in pressure between the two cylinders, as compared to engine 993. As far as engine performance is concerned, engine 993 handled 9.8 per cent. more cars and 3.6 per cent. more tonnage, at an increase of 19 per cent. in speed. The consumption of coal per thousand ton miles on the two locomotives did not differ greatly, there being a slight difference in favor of engine 993. The indicated and draw bar horse power, as well as the per cent. of draw bar to indicated horse power, were all equally favorable to engine 993. We are indebted to W. H. Lewis, superintendent motive power, for this information.

The Rhaetian Railways Company is said to have decided on the electrification of all its lines in the Engadine, Switzerland.

STATISTICAL MEASURES OF FREIGHT CAR EFFICIENCY.

BY R. J. MCCARTY,
Vice-President and Auditor, Kansas City Southern Railway.

The purposes of this discussion are:

1. To show that on account of the diverse conditions on which freight car efficiency depends it cannot be measured by any single statistical ratio.

2. To suggest several different ratios each of which shall serve as a measure of freight car efficiency when considered with regard to the special practical conditions upon which the value of the ratio depends.

The highest efficiency of freight car service on any given railway manifestly requires that each car on the line shall, during any given time, with proper expedition and at a minimum expense, carry the maximum number of tons one mile.

This naturally requires that all tracks shall be properly maintained; that the road shall be properly equipped with locomotives and cars; that all this equipment shall be kept in working condition up to its full capacity; that the proper volume of traffic shall be secured; that each locomotive and each car shall be loaded to its full capacity; that there shall be no unnecessary hauling of empty cars; and that all cars shall be switched, loaded, hauled and unloaded with the greatest expedition consistent with safety.

The conditions mentioned being to a greater or less extent independent of one another, a proper consideration of the subject manifestly requires that each shall be considered separately.

As the question of track maintenance does not come within the scope of this discussion, it will be assumed that all the tracks are kept up to the proper standard.

The efficiency of the mechanical department in keeping each freight locomotive in good working order up to its full rated load, will be called "Mechanical efficiency of freight locomotives," and may be expressed by the ratio,

$$\frac{\text{Average total tractive force of all freight locomotives in good order for the whole given time.}}{\text{Average total tractive force of good and bad order freight locomotives on hand for the whole given time.}}$$

This ratio should be readily determinable from the records of the mechanical department.

The efficiency of the mechanical department in keeping all freight cars in good order and up to their full rated carrying capacity will be designated as "Mechanical efficiency of freight cars," and may be expressed by the ratio,

$$\frac{\text{Average number of good freight cars available for the whole given time.}}{\text{Average number of good and bad order freight cars on hand during the whole given time.}}$$

This ratio should be also readily determinable from the records of the mechanical department.

The roadbed and track being in first class condition, and the ratios representing the mechanical efficiencies of freight locomotives and cars having proper values, it is manifest that the property is in a suitable physical condition for handling a certain volume of freight traffic with the highest degree of economy and dispatch.

Now the highest degree of economy requires that each locomotive and each car shall be given its full rated load and that there shall be no unnecessary empty haul.

The efficiency of the transportation department in giving to each locomotive its full rated load, will be designated as "Loading efficiency of freight locomotives," and may be expressed by the ratio,

$$\frac{\text{Actual average gross load of freight locomotives used for the whole given time.}}{\text{Average rated gross load of freight locomotives used for the whole given time.}}$$

This ratio is readily obtainable from statistics in general use.

In case the grades of a road should be practically uniform so that the rated load of any given locomotive would be the same over all districts, this ratio would be a measure of the general ability of the transportation officials. In order, however, to obtain a basis for comparing the results obtained on one district with those of another it will be necessary to determine the ratio for each operating district. This, however, may readily be done without undue expense.

Efficiency in giving to each car its maximum rated load, will be called "Loading efficiency of cars," and may be expressed by the ratio,

$$\frac{\text{Average actual load of cars used for the whole given time.}}{\text{Average rated load of cars used for the whole given time.}}$$

This ratio, when determined from all the cars used in carrying freight during the given time would give a general average which, when taken by itself, would not under ordinary conditions be a correct measure of loading efficiency, particularly when the traffic consists of large quantities of light merchandise, furniture, agricultural implements and other freight with which a car cannot be loaded to its full capacity. To give this ratio its full significance, therefore, it is necessary to determine it separately for different classes of traffic. This may be done without undue clerical labor by determining it from the conductor's wheel reports. To this end the conductor's wheel report should be made to show under the head of each heavy commodity which moves only in car loads and in large volumes, and under the head of merchandise and other light freight, in one column the actual load of the car taken from the way-bill and in another column the marked capacity of the car. The totals of these columns taken from all of the wheel reports for the given time and cast up, will furnish the numerator and denominator of the ratio for each classification of commodity that may be required.

Efficiency in reducing empty car haul to a minimum will be designated as "Car mileage efficiency," and may be expressed by the ratio,

$$\frac{\text{Total theoretical minimum empty car mileage required under actual conditions of traffic and calculated from the actual loaded car mileage.}}{\text{Actual empty car mileage.}}$$

The numerator of this ratio may be determined from the loaded car mileage as follows: The theoretical minimum empty car mileage between any two adjacent stations is equal to the difference between the loaded car mileage in one direction and the loaded car mileage in the opposite direction moving between those stations. As a first step, therefore, it will be necessary to ascertain the theoretical empty car mileage between each station and the station adjacent, and this may be done by tabulating the total number of car-loads moving from each station to every other station somewhat after the method used in determining the tons one mile.

This tabulation having been completed, the total theoretical empty car mileage during the given time may be readily ascertained from the loaded car mileage by deducting from the loaded movements in one direction between any two adjacent stations, the loaded movements in the opposite direction, multiplying the difference by the distance between the stations, and casting up the totals. This may be readily done if the form of the table is properly designed. As nearly as can be determined in advance of the actual performance of the work, the cost of completing this calculation for any one month on a road 1,000 miles long with a traffic density of 100,000 net tons per month, would be $150. The result obtained in this way would represent the theoretical minimum empty car mileage required for the traffic during the month provided that each car should at the end of the month be at the station where it was at the beginning.

This, of course, will never happen, but the extent to which the relative positions of the cars at the beginning and at the end of the month varies from this theoretical condition may be determined approximately by the consideration that if each car did return to its original position then the sum of the actual loaded and empty car mileage in one direction would be exactly equal to the sum of the actual loaded and empty car mileage in the other direction during the month. Therefore, the difference between the actual loaded and empty car mileage in the other direction during the month would indicate the extent to which the cars have departed from their general original positions.

This difference, it may be fairly assumed, would arise from certain conditions over which the management of the road has no control, and, therefore, it should be deducted from the empty car mileage determined by tabulation, as explained.

The numerator having been determined in this way, and the denominator having been determined by taking the total of the actual empty car mileage in both directions, the ratio would be established.

This ratio for the different districts of the road may be established without undue expense, and in this way could be obtained the measure of efficiency for each district which would be of great value in comparing the abilities of the district superintendents or others in the immediate charge of car movement.

The highest efficiency in economy and despatch requires that all cars shall be switched, loaded, hauled and unloaded with the greatest expedition consistent with safety. This will be called "Movement efficiency," and may be expressed by the ratio,

$$\frac{\text{Theoretical average number of cars required for the whole given time calculated on basis of maximum speed and minimum delays.}}{\text{Average number of cars used for the whole given time.}}$$

The numerator of this ratio may be obtained as follows:

To the total theoretical minimum empty car mileage determined for the numerator of "Car Mileage Efficiency," add the total loaded car mileage, and divide the sum by the average loaded haul. The quotient will represent the theoretical number of trips required for the traffic during the given time.

To determine the theoretical number of trips which a car should make, divide the average loaded haul by the average speed of the freight trains in miles per hour, and reduce the quotient to days. To this quotient so reduced add the number of days allowed for switching, loading and unloading, and divide the number of days in the given period by the result thus obtained. The quotient will represent theoretically the average number of trips which each car would make during the given time. Divide the total number of trips by this quotient, and the result will represent the theoretical average number of cars required for the whole given time calculated on maximum speed and minimum delays. Divide this quantity by the average number of cars used for the whole given time previously determined for the ratio for "Loading Efficiency of Cars," and the result will represent the "Movement Efficiency."

In this ratio the terms "maximum speed" and "minimum delays" are supposed to be based upon the observed conditions under which the road is being operated. The maximum speed should be fixed by the management at the highest average speed at which it is practicable to operate freight trains, and the minimum delays should be fixed at the minimum average delay which is found to be possible in order to permit of the proper loading, switching and unloading of cars. The extent to which this ratio differs from unity will indicate the extent to which the number of cars used exceeds the number of cars theoretically necessary to handle the traffic.

Ratios indicating the efficiency in keeping equipment in good order and condition, in loading such equipment to its full capacity in avoiding unnecessary hauling of empty cars, and unnecessary delays, having been established, it now remains to find an expression which shall indicate the efficiency with which

freight equipment is adjusted to the volume of traffic generally available and the efficiency of the traffic department in securing such traffic.

The accuracy with which the facilities are adjusted to the volume of available business and the efficiency of the traffic department in securing that business, are under certain conditions indicated by the extent to which the facilities are used, and this is particularly true of freight equipment. For, if the freight equipment is accurately adjusted to the available tonnage, the traffic department would be responsible for all such equipment unnecessarily idle, while if all available traffic is secured, properly loaded and handled, all equipment that remains permanently idle is evidence of improper adjustment, and to that extent may be the result of mistaken policy.

The accuracy with which freight car equipment is adjusted to the volume of traffic generally available, and the efficiency of the traffic department in securing such traffic, will for want of a better term be denominated as "Traffic Efficiency," and may be expressed by the ratio,

$$\frac{\text{Average number of freight cars used for the whole given time.}}{\text{Average number of good order freight cars available for the whole given time.}}$$

Now, it is manifest that should it be financially or physically impossible to provide freight cars sufficient for unsolicited traffic, this ratio might with perfect station and yard service approach closely to unity. In such a case the ratio would, of course, furnish no indication of the efficiency which the management might display under different conditions, but it would indicate that under the circumstances the best results were being obtained.

Again, a superabundance of traffic is always too conspicuous to require either argument or demonstration, so that the conditions under which this ratio should approach closely to the value of unity may be easily recognized. Therefore, these conditions being present, the failure of the ratio to approach the value of unity would indicate that available equipment had been allowed to remain idle in time of need, and thus would point to some defect in station yard or train service.

The ratio in question, therefore, will, according to circumstances, indicate either a deficiency or excess of equipment, a deficiency or excess of traffic, or the absence or presence of efficiency in procuring or transporting traffic. Whence, if properly used with due regard to commercial and other general conditions, this ratio as a proper measure of results is highly significant.

It is manifest that the value of none of the ratios given can be maintained at unity except under ideal conditions, and perfect management:

1. Because of the presence on every road of arbitrary conditions or those which are in the nature of things beyond the control of the most perfect management.

2. Because of conditions which should be controlled by ordinary good management, but which may not be so controlled.

Therefore, in applying the ratios as measures of practicable efficiency, it is necessary that allowances should first be made for arbitrary conditions.

These allowances may be determined with a reasonable amount of accuracy from experience by a systematic observation and comparison with each other of similar ratios for different periods, and in this way the highest value practicable on any particular road under average conditions may be established.

These highest practicable values having been established, they would afford fair standards to which all concerned might work, and therefore, any failure to reach such standards should be explained by the parties responsible for the result.

The establishment of the standard values of these ratios for any particular road naturally requires a comprehensive knowledge of the road and of the general conditions under which it operates, and the determination of these standard values must therefore be made by some high class official. The application of the ratios determined periodically from the actual statistics would then consist of requiring subordinate operating officials to explain the difference between the values of these ratios and the established standard values. This is also a task which can only be performed by a high class official, or under his direction.

To obtain the full benefit of these ratios they should be determined monthly.

In conclusion, it may be remarked that in the hands of an official who merely compares the monthly statistical ratios with unity and makes no systematic effort to have the differences explained, these ratios would be of little practical value. On the other hand, these ratios in the hands of an official who can properly determine their highest practical value and systematically and intelligently compare these standard values with the monthly values, there might be worked out many economies which would otherwise escape notice, the aggregate of which would repay very many times over the total expense involved.

FOREIGN RAILWAY NOTES.

The Brazilian government has approved the definite surveys and estimates of the branch of the Mogyana Railway, extending from Mogy-Mirim to Santos.

The Argentine minister of public works has approved the plans and estimates of the first section of the state railway between Diamante and Curuzu-Cuatia. The opening of the railway from Mazan to Timogasta has also been authorized.

The Russian Ministry of Ways and Communication has definitely decided to adopt on all Russian railways the 24-hour system. The Duma has been asked to allow the credits for the cost of new time-tables and for adding the additional numerals on the dials of the clocks in stations and offices of the system. As soon as this sum is voted the new system will go into effect.

The governor of the department of Antioquia, Colombia, has been authorized to negotiate a foreign loan not exceeding $3,500,000. This money is to be utilized in the completion of the Antioquia Railroad from the Magdalena river to Medellin, about 130 miles. This railway, half of which is already completed, has thus far been built and operated by the department of Antioquia alone, receiving from the national government a bonus for every mile placed in operation.

An all-rail route has recently been opened between Montevideo, Uruguay and Rio de Janeiro, Brazil, by the construction and linking together of several disconnected railways. The companies which form the all-rail route between the two cities are: The Uruguay Central between Montevideo and Santa Anna, on the Brazilian frontier, 352 miles; the Viacao Ferrea do Rio Grande do Sul, which crosses the state of Rio Grande do Sul from Santa Anna to Alto Uruguay, 506 miles; the Sao Paulo-Rio Grande, which traverses the states of Santa Catharina and Parana to Itarare, 546 miles; the Sorocabana between Itarare and Sao Paulo, 259 miles; and the Central do Brazil from Sao Paulo to Rio de Janeiro, 304 miles, a total of 1,967 miles. The actual running time is 112 hours and the first-class fare (including sleeper accommodations for two nights) is about $76. With the exception of the two terminal cities and the city of Sao Paulo the route followed is for the most part thinly populated. It is believed that there will not, in the immediate future, be any great volume of through traffic, either passenger or freight, as the ocean voyage is cheaper and more expeditious. Certain sections of the road have been so recently and hastily constructed and the service is so infrequent that the journey is subject to no little discomfort and delay.

REFRIGERATION BY RAILWAYS.

A report on this subject was presented before the annual meeting of the American Association of Refrigeration, which was held in Chicago, May 9-10, 1911. The commission on railway and steamship refrigeration, of which E. O. McCormick, vice-president of the Southern Pacific, is chairman, considered the resolutions adopted last October at the Second International Congress of Refrigeration, at Vienna, Austria.

Experience in this country has demonstrated the value of standard service rules for re-icing refrigerator cars in transit. A closer co-operation should exist between the steamship companies and the railways in this respect.

A higher demurrage charge on perishable goods than on non-perishable goods at destination is necessary and justifiable for several reasons, among which is the fact that the consignees secure a special advantage in the way of temporary cold storage, which saves them the trouble and expense of hauling the goods to a regular cold storage house. The detention of refrigerator cars under ice also gives other special advantages to consignees by enabling them to hold the goods for higher prices, and to peddle the freight from the car instead of hauling it to their houses for sale in the regular way. Among the most important arguments in favor of higher demurrage charges on perishable goods is the fact that the cars designed for the transportation of such commodities should be promptly released and returned to the loading station to protect additional shipments which may perish if cars are not promptly supplied for loading. The railways cannot and should not be expected to own, operate and maintain throughout the year a larger number of refrigerator cars than will properly take care of the perishable freight traffic during the season in which it regularly moves.

The commission is, in a general way, in favor of charging for refrigeration by distance rather than by weight of ice furnished. There are numerous bases for refrigeration charges by American railways, but the best service and the least damage claims on shipments under refrigeration are to be found in connection with the application of through refrigeration charges in lump sums per car, because the entire responsibility of protection of the property rests on the carrier, who therefore adequately performs the duty. On the other hand, when railway tariffs provide a charge for ice per ton, the shipper often tries to save himself a few dollars for ice and limits the amount of protection to be given in transit. This has the effect of depriving the carrier of the privilege of giving adequate protection to the property in accordance with its own judgment. This latter course results in division of responsibility as between the shipper and the carrier. When shippers desire perishable goods to move under refrigeration, they should so state to the carrier, and the latter should be free to protect the property without restriction.

The commission is, in principle, in favor of not including the cost of refrigerating in the rates of transportation, but of charging for it separately. In cases where a road furnishes icing or re-icing service in transit, without any extra charge above the freight rate of transportation, it creates an inequality. As a matter of principle, the rates assessed by railways for transportation as such, should be based on common car service, and an extra charge should be made for all special service of every kind, including icing, heating, etc.

The commission favors the adoption of a uniform rule, that shippers of perishable goods be required to give reasonable and definite instructions on every shipment, as to refrigeration, non-refrigeration or ventilation in transit. The shipper, being experienced in his own particular business, knows better than anyone else the exact condition or relative maturity of the goods when loaded, and therefore may reasonably be expected and required to give instructions regarding proper protection in transit. Such instructions should always be reasonable, clear and definite to prevent any misunderstanding. The Railroad Refrigerator Service Association has suggested a uniform rule which has received the concurrence of several other railway associations, and will presumably be made generally effective in due course of time. No instructions in detail from shippers are required about the precise manner of re-icing in transit when shipments are transported by carriers subject to a stated refrigeration charge in a lump sum per car, because in such cases the carrier is and should be free to use its own judgment to protect the property adequately. All shipments, however, moving under ventilation, non-refrigeration, or subject to charges for ice by weight, should be covered by reasonable and definite instructions from shippers.

THE SPECIAL COMMITTEE ON RELATIONS OF OPERATION TO LEGISLATION.

The special committee on relations of railway operation to legislation has published its fifth report. Among the most important features of the report are the resolutions regarding the future organization and work of the committee, which were submitted for the consideration of the constituent lines. The resolutions recommended for adoption set forth that the following requisites are necessary for the successful conduct of its future work: That it shall have free access to, and communication with, the railways supporting it and shall have the assurance that it represents the railways; that its membership should represent the several sections of the country as represented by the General Managers' Associations of New York, Chicago, and the Southeast, respectively; that its organization and conduct of its affairs should be such as to permit flexibility in order that it may avail itself of any agency without question of routine, and have the assistance of such sub-committees as it may deem necessary; that the railways it represents shall create and maintain a committee empowered with authority to fill such vacancies as may occur in the membership of the special committee, and to whom it may apply for advice and co-operation. At a meeting of the constituent lines in New York City on May 17 these resolutions were adopted. The committee to fill vacancies in and advise the special committee will be composed of D. Willard, H. U. Mudge, W. G. Besler, J. Kruttschnitt, H. E. Byram, G. L. Peck, T. E. Clarke, C. R. Gray and Fairfax Harrison. Another resolution of the constituent roads was that the special committee submit from time to time, recommendations for uniform practice where a lack of uniformity tends to encourage legislation.

The committee says that it has been deemed advisable to continue the organization of the general committee of railways on the safety appliance standards in order to handle the numerous questions which will undoubtedly arise with respect to the application of these standards to existing equipment, and it urges diligence on the part of the roads in complying with the order of the Interstate Commerce Commission, so that if it proves impracticable to complete the work outlined by the commission within the time limit, such diligence on the part of the railways may have weight with the commission in considering a further extenson of time should it be necessary.

The committee is of the opinion that much mandatory legislation is introduced both in Congress and the state Legislatures to require individual lines to adopt a minimum requisite of recognized practice, and it directs the attention of the railways to the desirability of endeavoring to minimize the tendency toward mandatory state legislation on operating matters by applying to state traffic such federal laws as have been passed and by adopting the practice that is used on a majority of roads. It says that it is also desirable that federal in place of state laws be urged where state legislation is under consideration.

In view of the decision of the Supreme Court of the United States, on February 20, 1911, holding the Arkansas Full Crew law constitutional, the committee has issued a circular asking the railways for information as to their present practice in the matter of the size of train and engine crews. The committee has asked the conference committee of the general committee of railways on safety appliance standards to act as a committee on mechanical matters to assist it in handling any mechanical questions that may arise in future. It has also created a committee on engineering matters under the chairmanship of L. C. Fritch.

AMERICAN RAILWAY ASSOCIATION.

The spring meeting of the American Railway Association was held at the United Engineering Society building, New York City, on May 17, 1911. There were present 162 members, represented by 174 delegates.

The executive committee reported that the membership now comprises 349 members, operating 255,537 miles, an increase of 3 members and 1,824 miles. The associate membership now comprises 84 members, operating 4,559 miles, an increase of 360 miles.

In the report of the committee on transportation, several questions and answers concerning practice under the Standard Code of Train Rules were submitted, and which were duly approved by the association. The committee recommended a revised form of the detour agreement, which was adopted. The committee reported that at the request of the committees on signaling of the Railway Signal Association and the American Railway Engineering Association, the reports submitted by those committees were presented to the committee on transportation for consideration, accompanied with the request that the essentials of signaling be outlined or defined for the future guidance of the committees in question. In that connection the committee formulated the following memorandum which was incorporated in its report for the information of the members of the association:

The subject has been carefully analyzed and considered. There are three signals that are essential in operation and therefore fundamental, viz.:

1. Stop.
2. Proceed with caution.
3. Proceed.

The fundamental, proceed with caution, may be used with the same aspect to govern any cautionary movement; for example, when:

(a) Next signal is "stop."
(b) Next signal is "proceed at low speed."
(c) Next signal is "proceed at medium speed."
(d) A train is in the block.
(e) There may be an obstruction ahead.

There are two additional indications which may be used where movements are to be made at a restricted speed, viz.:

4. Proceed at low speed.
5. Proceed at medium speed.

Where automatic block system rules are in effect a special mark of some distinctive character should be applied at the stop signal.

The committee therefore recommends:

Signal Fundamentals.

1. Stop.
2. Proceed with caution.
3. Proceed.

Supplementary Indications to Be Used Where Required.

4. Proceed at low speed.
5. Proceed at medium speed.

Stop signals operated under automatic block system rules should be designated by some distinctive mark to be determined by each road in accordance with its local requirements.

The committee also called attention to the fact that a special edition of the Standard Code of Train Rules, which includes the various forms of the several rules which have been in use since they were originally adopted and the interpretations rendered by that committee, had been completed and was issued on March 1, 1911.

A. A. Allen, president and general manager of the Missouri, Kansas & Texas Railway, has been elected a member of the committee to fill a vacancy.

The Committee on Maintenance in its report embodied a summary of replies received to Circular No. 1069 referring to the subject of a standard height for car door fastenings. In that connection, on the recommendation of the committee, the following resolutions were adopted by the association:

Resolved, That car door fastenings should be located normally five feet above the top of rail, but not less than one foot above the floor of the car.

Resolved, That these specifications for the location of car door fastenings shall apply for all new equipment and whenever it is necessary to replace fastenings on old equipment.

The committee also reported that it had considered the undesirability of the use of untrussed wooden brake beams, and presented the following resolution which was adopted by the association:

Resolved, That the Master Car Builders' Association be requested to consider the advisability of adding to the interchange rules that cars with an untrussed wooden brake beam be not accepted in interchange after some fixed date, and that the matter be referred to the Master Car Builders' Association for such action as it may deem necessary.

The committee referred to the progress which had been made by the sub-committee on the standard dimensions of box cars and standard clearances, and stated that it hopes to be able to report upon these subjects at the fall meeting of the association. A summary of replies to Circular No. 1066 showing the number of freight cars fitted with air brakes and engines equipped with power brakes in use as of January 1, 1911, was embodied in the report of the committee, as follows:

Number of members reporting	325
Freight cars in service	2,129,898
Fitted with air brakes	2,112,853
Not so fitted	17,045
Engines in service	57,340
Equipped with power brakes	57,324
Not so fitted	16
New equipment, other than passenger, under contract or construction—	
Freight cars to be fitted with air brakes	34,034
Freight cars not to be fitted with air brakes	0
Engines to be equipped with power brakes	1,141
Engines not to be equipped with power brakes	0

The committee on the safe transportation of explosives and other dangerous articles reported that a hearing had been set by the Interstate Commerce Commission on the subject of the promulgation of regulations for the transportation of dangerous articles other than explosives, to be held at Washington, on Wednesday, April 26. The committee further stated that it had under consideration a number of minor amendments to the regulations for the transportation of explosives, which are to be submitted to the commission before they became effective, after which they will be presented to the association with such detailed rules affecting the duties of employees as may be found necessary.

The report of the chief inspector of the bureau for the safe transportation of explosives and other dangerous articles for the fiscal year ending December 31, 1910, giving in detail the operation of the bureau, was made a part of the report of the committee.

The committee on electrical working reported that it had created three sub-committees from among its members on the following subjects: Third rail clearances, electrical connections and overhead crossings for electric light and power lines, and that all of these sub-committees have done considerable work on the subjects allotted to them.

The committee on relations between railways presented several amendments to the car service and switching reclaim rules which were adopted by the association.

The committee reported that the Interstate Commerce Commission on April 11, 1911, gave the same approval to the association's explanations to the demurrage rules which it had already given to the rules themselves. It also reported that the commission made an addition of a few words to the explanation to Rule 1 of the national car demurrage rules and the association adopted its recommendation that in order to make the explanations of the association identical with those approved by the commission the addition in question be approved by the association. The added words are given in italics:

Cars loaded with company material for use of and consigned to the railway in whose possession the cars are held are not subject to demurrage.

Empty cars placed for loading with company material are subject to demurrage, unless the loading is done by the railroad company *for which the material is intended, and on its tracks.*

The committee referred to the fact that the question of the relations of the operating department to the marking and packing of freight had been referred by the executive committee to it and that, after conference with the general managers' associations of New York and of the southeast, and the Association of Western Railways, the committee had appointed the following sub-committee to consider it: Arthur Hale, chairman; R. M. Patterson (Penn.); H. C. Barlow (Erie); C. H. Ewings (New York Central); J. S. Tustin (Missouri Pacific); J. F. Horrigan (Northern Pacific); H. C. Howe (Chicago & North Western); W. H. Gatchell (Southern); A. C. Kenly (Atlantic Coast Line); W. L. Stanley (Seaboard Air Line).

W. G. Besler (Cent. R. R. of New Jersey) was elected second vice-president; H. E. Byram (Burlington) and J. Kruttschmitt (Southern & Union Pacific Systems), were elected members of the executive committee. The Chicago & North Western and Chicago, Burlington & Quincy were elected members of the committee on transportation. The Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis and the Erie were elected members of the committee on maintenance. The Chicago & Eastern Illinois, the Grand Trunk and the Pennsylvania Railroad were elected members of the committee on relations between railways. Benj. McKeen (Vandalia); F. O. Mekher (Rock Island), and J. C. Stuart (Erie) were elected members of the committee on nominations.

The association decided to hold its next meeting in Chicago on November 15, 1911.

MECHANICAL-TRIP AUTOMATIC STOPS.

In our issue of May 5, page 1039, there was a description of the Harrington automatic train stop, together with the results of tests of the apparatus by the Block Signal Board. In reporting those tests the board, making comparisons with ideal conditions, discussed some of the principles of automatic-stop operation as follows:

The apparatus should be so constructed that the removal or failure of any essential part would cause the display of the stop signal and the application of the train brakes.

In any mechanical trip device it is obvious that if the trip is broken off or removed from the path of the engine device which it is intended to engage, it can not act to stop the train. The only means apparently available for insuring the stopping of the train by the absence of the roadside apparatus is to have the engine apparatus so designed as to cause a brake application as the result of the elapse of a certain time interval or the passage of the train through a predetermined distance, unless it received from the roadside apparatus an impulse tending to restore it to the normal running condition. No such system has as yet been presented for the board's consideration.

On account of the delicacy of many essential parts of electrical installations no electrical signal or train-control system could be favorably considered in which the failure of any essential part did not cause a stop indication to be displayed or the brakes applied. With purely mechanical devices, this principle, while no less desirable, is to some extent modified by the fact that such devices may by proper design and the use of suitable materials be made fully as reliable as many other devices in successful use on railways, even though it is well known that the failure of such devices, such as car wheels, steel rails, etc., may cause dangerous conditions.

In the Harrington system, if the weight forming the operative part of the suspension becomes disconnected, it cannot, of course, engage the engine arm. The results of its operations, however, indicate that with proper installation and reasonable maintenance, this device, in spite of theoretical defects, can be made to operate with as high a degree of reliability as many appliances now successfully used.

In like manner to the above, if the engine valve arm becomes bent downward or affected in such a way as to move it out of the path of the suspension, it can not engage the latter to cause a brake application. It is likewise true that many devices are used in railway operation which are more or less susceptible to failure, and which, if absent or out of order, might produce dangerous consequences.

It is believed that while it is very desirable that all devices should be constructed throughout in conformity with the theoretical principle embodied in the characteristic above mentioned, proper design and workmanship will enable devices which do not possess it to be operated with a reasonable degree of safety.

The Harrington air-brake valve is normally held closed by air pressure and is opened by the extension of a compression spring. The absence of this spring would undoubtedly, and its breakage might very possibly, prevent the opening of the air-brake valve, even though the engine valve arm revolved properly about its axis. There appear to be no great difficulties in the way of redesigning this portion of the apparatus in such a manner as to overcome this objectionable feature, and it would doubtless have to be done to render the device acceptable.

On account of the clearance conditions imposed on the test installation, and in order to secure more ready adjustment of the height of the engine-valve arm, this arm was offset and held at its central portion in a clamped bearing. If this bearing became loosened it would be possible for the middle portion of the engine arm to revolve in its bearing and the ends thereof to be lowered to an amount which might prevent engagement with the suspension. Any installation to be acceptable for service use should use an arm so designed as to overcome this difficulty. It is believed that under most conditions to do so would be entirely feasible. This feature, and the feature of having the valve opened by spring pressure, prevent the engine apparatus from being self-checking of its own failures and can not be approved in the form presented.

It is to be noted that no electrical features whatever are embodied in this system.

INSPECTION OF TRAIN DESPATCHING, SIGNALING, ETC., BY THE BLOCK SIGNAL BOARD.*

From time to time complaints of improper methods of safeguarding train movement have been received, and the board has investigated a number of these. It is encouraging to find that so high a percentage of train despatchers, telegraph operators, signalmen, and trainmen are intelligent, well trained, and faithful. The instances of what appear to be undesirable conditions, which are cited herein, should not be considered as indicating the general practice.

It is believed that one important source of carelessness, lack of skill, inattention to duty, and the use of loose methods on the part of employees in transportation service is due to lack of sufficient supervision and inspection. While in a number of instances the responsible officers were found to have been aware of undesirable conditions, to which their attention was called, and lacked either the courage or energy to correct them, it was more frequently found that the officers in responsible charge were overburdened with detail work and actually unable to give proper attention to inspection, and examination and testing of their men.

GROUP I.

C. & D. R. R.—Investigation indicates that a train despatcher on this road frequently used the following method in making a meet order on single track: Assuming the stations in succession to be indicated by letters A, B, C, D, E, etc., a train at A is ordered to meet a train at D, and a train at E is ordered to meet this train at B. This, of course, constitutes a lap order, but at the same time the despatcher puts out an order at C to hold whichever train arrives first, and makes C the actual meeting point. It is alleged that this practice was the cause of a serious collision on that road, due to the operator at C not displaying a stop signal before taking the hold order.

At the time of inspection electric highway crossing bells at two stations were observed to be out of order and not ringing for the passage of trains. A facing main track switch at another station was observed to have so much lost motion that it could be opened with the foot five-eighths of an inch, head rod, throw rods, and lugs being very loose.

Personnel of offices on this road was found to be very good, and examination on book of rules is rigid. With the form of time orders mistakes are liable to occur. Numbers should be spelled out as well as put in figures. The train-order signal is antiquated and not reliable.

*From the board's annual report. The extracts here given refer to roads in the first four geographical groups.

E. & F. R. R.—At a station on single track the inspector noted that a passenger conductor sent his brakeman to deliver copy of a 31-order to the engineman instead of doing so himself. The brakeman handed it to the fireman on the locomotive, and the order was not compared between engineman and conductor.

In a very busy terminal the telegraphers work in the freight office, in a room where there are several billing clerks, and the operators are continually disturbed by clerks and trainmen. There have recently been two serious mistakes in handling train orders apparently on this account. In general, the operators on this road were found to be efficient and competent.

G. & H. R. R.—Derailing device is antiquated and unreliable. Train was observed to run over a grade crossing of another road without coming to a stop, and this is reported to be common practice on this road. In the case observed the baggageman at the station gave hand signal to train.

GROUP II.

A. & B. R. R.—Every interlocking plant on this railway was examined and the operation of at least 95 per cent. of all its automatic signals observed in service. An inspection of 21 interlocking plants showed that no rules or special instructions to cover operation of signals at these plants had been issued. Very few of the employees were found to be provided with a copy of the rules governing operation of automatic block signals. This book contains a rule to the effect that a switch must not be opened to permit a movement to the main track when the indicator (that is, the switch indicator provided in the automatic block system) is at stop until protected by flag, as prescribed by the usual rule (Standard Code No. 99). Approximately 400 train movements from side tracks to main tracks were observed, covering a period of four weeks, and in no case could it be found that any attention was paid to the switch indicator. Seventy-five per cent. of the interlocking plants inspected were either not supplied with emergency hand signals, or if provided, the night signals were not in condition for use on account of not being lighted.

The practice in vogue on this road, as regards giving of hand signals at interlocking plants, rather than the use of caution cards, is considered very undesirable.

Many track relays controlling the automatic block signals were found unsealed, and it was observed that signal maintainers made their own adjustments of these relays in the field.

A number of signal maintainers who were questioned said that they prefer to work for this road, rather than to go elsewhere for more pay, for the reason that inspections were infrequent and they were seldom disturbed.

On the occasion of an inspection of this road the division superintendent and several other officers approached a junction on a special train and permitted the train crew, without flag protection, to cross over from one main track to the other and proceed on to the branch ofter a signal had been cleared for the approach of a train on the main track which was crossed. It is not to be assumed that the rules will be obeyed by the men when such flagrant violations of them are countenanced by their officers. On a portion of this road there are many sidetracks leading by steep descending grades from industrial plants to the main line. Only about 1 in 10 of these side tracks at the time of inspection were found provided with derails.

On a thorough inspection made on this road early in the year conditions as regards personnel of operators were found so flagrant that the matter was immediately brought to the attention of the railway company. An inspection made five months later showed a considerable improvement in the quality of the men, the most incompetent having been discharged and the others instructed. Many men who had never previously been examined on the operating rules had been instructed and examined.

About a mile south of one station on this road two inspectors, riding on a northbound train in such position as to be able to observe the track ahead, saw a trackman flagging the train by waving violently a large red flag. The engineman did not recognize the flag by shutting off steam or blowing the proper whistle signal in acknowledgment, but proceeded at speed around two sharp curves, where the view is obscured, and on to the station. At this point trackmen were repairing the track. The engineman doubtless assumed that the flag which he passed at unabated speed without acknowledgment was put out by this gang of trackmen, but his failure to acknowledge a positive stop signal was quite on a par with many other features of operation observed on this road.

C. & D. R. R.—On this road a stretch of 31 miles of double track is well protected by automatic block signals, which are maintained in excellent condition, except the lights. The night indications in this territory are exceedingly poor. At the time of inspection three lights were out and many so dim as to be hardly discernible. It is believed that a considerable portion of this trouble can be overcome by adjustment of lamp brackets.

E. & F. R. R.—A freight train on this road was observed switching at an interlocking plant. During the operation the signals on the road on which the train was switching were set at stop position to permit a train on the crossing road to proceed. A trainman continued to give hand signals for a back-up movement, not observing that the fixed signal of the plant was set against him, and 10 cars were backed off the track at the derailing switch, causing considerable detention to traffic.

G. & H. R. R.—At the time of inspection at an important interlocking plant there was no supply of carbon paper and the signalman had to make copies in longhand of messages, one for the engineman and one for the conductor; to avoid extra labor he kept no copy himself. As the inspector entered the tower the second-trick signalman had just had his hand torn and considerably hurt by reason of a switch engine starting up without a signal and mounting the detector bar just as the signalman was moving it to lock a derail. No red or white hand lanterns for emergency signaling were provided. Signalman could not remember when he had a red flag, but did have a yellow one. The plant had been rebuilt, but the manipulation chart and track diagram have not been revised, so that any operator unfamiliar with the plant would be unable, from the chart or diagram, to operate the machine.

One dwarf signal was found that could only be cleared part way, and when partially cleared would not return to the stop position unless the signalman went out and restored it by hand. It was found that this signal could be cleared and the lever then placed normal, and a signal cleared to permit a move in the opposite direction on the same track. There are men assigned to this tower, working tricks of eight hours each, but the second-trick man stated that he had worked both the second and third tricks for five consecutive nights.

At an important yard a switch leading to the main track is controlled by an electric lock from a signal station. No padlock is provided on the electric-lock case, and on the two occasions when inspected the cover was found partly off and in such a position that the lock could readily be "picked" by hand and the switch opened without regard to any control from the tower from which it was supposed to be governed.

GROUP IV.

A. & B. R. R.—Train-order office at C is on the opposite side of track from station, with sidetrack nearly always full of cars, obstructing the operators' view of trains. They have to climb over cars to see if trains are carrying proper signals, if rear end of train clears the block, and to deliver orders. This office should be relocated. At a busy train-order office in a yard at a terminal an operator 18 years of age, with but three months' experience as telegrapher, was found. Copies of his orders submitted by the inspector indicate lack of education and experience for this responsible position.

Of 75 telegraph operators on this road, whose work was under observation for some weeks, 40 were classed as excellent, 10 as good, 20 as fair, and 5 as poor or bad. A number of offices are not equipped with emergency hand signals—that is, flags and lanterns—and in several cases hand signals were not kept lighted at night.

Maintenance of Way Section.

IT is not too late to send in contributions for the track kink contest which closes June 1. A first prize of $25 and a second prize of $15 will be awarded for the best two contributions describing devices or methods which have resulted in economy of time or labor, and all other contributions published will be paid for at the rate of $3 each. There are numerous such devices in use locally, many of which might be considered minor, but whose adoption has resulted in savings. It is such things as these that it is desired to draw out by this competition. Any device which has proved successful in track work will be equally more valuable to some others, and its description will at least be suggestive to all who are working under conditions similar to those under which it has been used.

"HOW the Roadmaster Can Promote Efficiency," will be the subject of the next maintenance contest. There will be given a first prize of $35 for the best article received on this subject and a second prize of $20; and for all other contributions that are published will be paid for at our regular space rates. All contributions for this contest must be received by the civil engineering editor of the *Railway Age Gazette*, Plymouth building, Chicago, not later than July 1. The subject suggested is one that every progressive roadmaster has been studying for years. The readers of the *Railway Age Gazette* want to know how *you* have met this problem, if you are a roadmaster, and what results you have obtained. You may have succeeded through the adoption of some new device, a re-arrangement of your forces, closer or more frequent inspection, an occasional gathering together of your foremen for a discussion of time by subjects, or by any one of many other methods. Let us know what you have done, how you have done it, and what have been the results.

IN these days when so many comparisons are being made in all fields of railway work, it must be constantly borne in mind that comparisons of expenditures for maintenance of way must be handled very carefully and with a full knowledge of past expenditures for several years, for there is no department of railway operation which is so subject to the will of the operating executive as is that of track maintenance. For this reason, any comparison between any two years' figures should be regarded with suspicion. When business falls off this is where the first cut in expenses is made, even though the cost of maintaining track to any given standard depends but indirectly on the traffic handled; the effects of such reduction do not appear at once, as is the case in most other departments. It is only after some time that serious results begin to develop, and the operating officer hopes to get his forces back to normal before this time. Whenever retrenchment is on the program, track forces are reduced to a minimum, and this policy is pursued equally in the pruning down of the allotments for rail, ties and ballast, the track being carried over another year wherever possible. When business increases and the forces are returned to normal, additional supplies are necessary to make up for the lack of the previous year and are more readily provided. While this variation is probably necessary from an executive point of view, it tends to demoralize the track forces and foster that spirit, so often exhibited by foremen and roadmasters, of asking for all the material that they think it is possible to secure, as they cannot plan on what they may be able to get next year. The old adage of "a bird in the hand" expresses their sentiments clearly. Owing to the fluctuations in income, it is probable that these expenditures will continue to vary greatly, and as long as they do so the records for several years past must be included in any comparison which is made in this department.

THE *Railway Age Gazette* with this issue establishes a Maintenance of Way Section. Its purpose is to try to help the managements of the railways to increase the economy and efficiency of engineering and maintenance work; and particularly of maintenance work. Perhaps in no other branch of the railway business is the field for increasing economy and efficiency greater than in that of maintenance of way and structures. The total amount spent by the railways of the United States for maintenance of way and structures in the year ending June 30, 1909, was $308,450,105, which was 19.29 per cent. of the total operating expenses. In the more prosperous year 1907 these expenditures amounted to $343,544,907, or 19.65 per cent. of the total operating expenses. Owing chiefly, perhaps, to the character of the labor employed and to the rather unfavorable conditions under which its work is done, the maintenance department generally has been in the past regarded as affording fewer opportunities for increasing efficiency than the mechanical and transportation departments, and therefore less attention and effort have been devoted to contriving new devices for and new methods of handling its operations. The main improvements in roadway have taken the form of reductions in grades, elimination of curvature, laying heavier rail, more general use of ballast, etc. The time has come when the engineering and maintenance departments recognize that they have less to hope for from these larger and more striking improvements and more to gain from the smaller and less striking, but more numerous, improvements in the details of their work. It is believed that no technical publication has in the past given adequate study and attention to these more detailed matters. It will be the function of this section to do this; and in doing so it will cultivate a field the soil in which has as yet been only broken. The most effective way in which the Maintenance of Way Section can make itself useful to railway officers is by collecting into its columns, month by month, information about improvements in devices and methods which are being introduced on the various railways; in other words, by constituting itself a clearing house for new ideas regarding engineering and maintenance work. In order to do this successfully it will require the co-operation and assistance of all classes of railway officers who are concerned with such matters. It is gratifying that such assistance already has been received from many sources, and that numerous executive, engineering and maintenance officers have indicated their willingness and desire to co-operate in every way that they properly can. In no way can they do this more effectively than by sending us for publication articles, or material for articles, describing methods or devices that have been, or might be, successfully used for increasing engineering and maintenance economy and efficiency. It is believed that each of those who thus lend their assistance will be further compensated by the benefit derived from the publication of similar information furnished by others.

PROBABLY no recent development in the maintenance of way field offers so much promise of an increase in economy and efficiency, especially for roads with a large proportion of single track or branch line mileage, as does the motor car. For that reason the compilation, given in another column, of the actual results that have been secured with such cars is especially timely in the midst of the flood of efficiency suggestions now coming from numerous sources. The conditions at present are such that improvement in track work must be secured by using all practicable labor-saving devices and thereby reducing manual labor to a minimum. For the purpose of reducing labor to a minimum operating men are giving a great deal of attention to devices for driving spikes, tamping and renewing ties, handling rail and doing many other details of track work. Perhaps the development of labor-saving devices for this kind of work will

be as conspicuous during the next five or ten years as the want of it has been during the past five or ten years. To anyone not closely in touch with the rapid development of the use of motor cars for section forces, the data given elsewhere will come as a surprise, chiefly because of the uniformity of the success obtained and the definiteness of the results secured. Those roads which have put in service the largest numbers of cars have, as a rule, got the best proportionate results. With their greater experience, the have developed means of inspection and repair that have increased the effectiveness of the cars and reduced the danger of accident and the complaints about their unreliability. After using them a short time the men prize them, and take fewer chances with them than with the hand cars, knowing that if their motor car is hit by a train they will have to go back to the hand car. The objection of unreliability is based very largely on experience with the motor car of 10 or 15 years ago, and does not take account of the great development of the motor within the past five years, due largely to the rapid progress of the automobile industry. The report of the performance of 31 cars on the Seaboard Air Line in March of this year is an excellent argument for their reliability; the total delay they caused being but 4½ hours, and this being caused by two cars. Of course, there will be difficulties connected with their operation, especially just after they have been put in service, but these difficulties will usually in the long run be much more than compensated for by the many advantages which will be gained. To be a success, the cars must have the enthusiastic support of the roadmaster or supervising officer on whose division they are used, and he must exercise patience in training the foremen to operate them. A certain amount of prejudice is to be expected regarding any new development, but the almost uniform experience of the roads has been that after the men become acquainted with the cars they will not willingly return to the old hand cars. There are certain minor shortcomings in the construction of the various types which require remedying, and there is still room for development in a number of details; but, generally speaking, the future of the motor car is perfectly secure.

TIE ECONOMY.

NOW that track forces are largely engaged in renewing ties it is worthy of noting that there is no more fruitful field for economy in maintenance expenses than in tie renewals, this being the largest single item of cost in track maintenance. It is apparently more neglected than any other item, largely because it requires constant and immediate supervision to prevent the removal of good ties, while in other details of track maintenance, such as changing rail, angle bars, and ballast, there is not the necessity for such close supervision.

It is only natural that if the choice of ties to be renewed is left to the section foreman himself he will use all the ties he can get unless it is made to his interest to save them. Thus ties are frequently taken out of track which would have given several years more service. After removal it is too late to tell by inspection whether they should have been left in the track or not, as they are generally split and injured in removal. A section foreman, who was replacing a string of perfectly good ties with new ones, in answer to why he was taking out the good ones, replied that he "had the new ones on hand and wanted to use them up." This is typical of the attitude of most section men and of many supervisors or roadmasters. The difficulty of obtaining a sufficient number of ties in certain years makes the men wasteful of them in other years when ties are more plentiful.

Under no circumstances should ties that are badly decayed be left in the track, for this is not true economy. When it becomes necessary to renew a large percentage of ties in any one season, it is usually because they have been neglected, and as a "stitch in time saves nine," so a tie in time may save others by giving them the added strength necessary to maintain their life. Naturally a high-speed track with heavy traffic requires better ties than a track with few and light trains, but it does not necessarily follow that it requires more frequent renewal of ties than the latter track, for the question of tie renewal is one of decay of the tie, and on a fully ballasted, well-drained track, the decay will not be as rapid as on a track with mud roadbed and poor drainage.

The maintenance officers should decide on the standard of track desired and the supervisors, and through them the section men, should be educated in the best methods of maintaining the track to this standard at the minimum expense for ties for a series of years rather than for one year. This education should include the proper time for renewal, the proper caring for ties by piling and seasoning, the proper places to use hard, soft and treated ties, and where second-hand and cull ties may be used for temporary or light traffic tracks. The proper use of tie plates should also be studied, and the kind of ties on which they are most needed. Ties should be put in early in the season and not left until just before winter. Track should be properly drained so that the ties are not subject to wet and dry exposure, shims and braces should not be used unnecessarily, and, above all things, spike killing should be avoided. In relaying rail, spike holes are not always properly plugged, and spikes are often re-driven more frequently than is necessary. Four rows of spikes are sometimes pulled when only three or even two would be enough. Frequently track is ballasted and afterwards rail relaid, making it necessary to move the ties a second time in order properly to fit the joints of the newly laid rail. Ballast or dirt is unloaded on the tops of the ties and left there, keeping them wet for a long time.

All these things are seen on first-class roads which are supposed to have competent supervision, and until this matter is given the consideration which its importance deserves the expenditures for ties will continue to be excessive. Detailed and thorough reports should be made and then used. As compared with the study of rail, too little inspection is made concerning the failure of ties. To be sure, there is not the immediate danger as an incentive, but the question of cost and economy of maintenance is greater in the case of ties than of rail. Continuous study should be made of every mile of road, for it is detailed investigation and direction that is needed. It is easy to give orders to *save ties*, but it requires supervision to see that they are used in a truly economical manner.

ENGINEERING ARTICLES SINCE APRIL 1.

THE following articles of special interest to engineers and maintenance of way men, and to which readers of the engineering and maintenance of way number may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since April 1:

Retaining Wall for the Milwaukee at Elgin.—J. H. Prior, assistant engineer, C. M. & St. P., describes an unusual condition and a novel type of retaining wall designed to meet it, giving results of a comparative study of five types of wall with yardage and cost of each. April 7, page 826.

Efficiency Committees on the Chicago & North Western.—The committee organization adopted by the Chicago & North Western to encourage employees in the maintenance of way, mechanical and transportation departments, in increasing the efficiency of "men, materials and machinery," is described on page 892 of the issue of April 14.

The plan announced by the Rock Island, of offering premiums for efficiency of roadmasters and section foremen, is outlined on page 830 of the issue of April 7, and an editorial commenting on these and other methods of increasing efficiency in track labor appears on page 819 of the issue of April 7.

American Civil Engineers' Pocket Book.—Review of a new pocket book edited by Mansfield Merriman. April 14, page 893.

A Defense of the Committee Work of the Engineering Association.—Letter from J. L. Campbell, engineer maintenance of way, El Paso & Southwestern, referring to editorials in the daily edition during the American Railway Engineering Association convention. April 14, page 897.

The Burlington's Entrance into the Southern Illinois Coal Fields.—

The Burlington's reasons for entering Southern Illinois and the engineering features involved in the reconstruction are given in an illustrated description on page 900 of the issue of April 14.

Mannheim (Chicago) Yard; Chicago, Milwaukee & St. Paul.—The Chicago, Milwaukee & St. Paul has built a large classification yard, having 44 tracks leading from one hump. The design and construction of the yard is described in the issue of April 14, page 903.

Rebuilding the Salt Lake Route.—The flood of January, 1910, washed out 29 miles of track on this road, requiring a relocation. The article on page 937 in the issue of April 21 touches on the interesting features of the wash-out, brings out the problems that confronted the engineers in rebuilding the line, and describes the methods used in meeting these problems.

Sewall's Point Terminal; Virginian Railway.—The yards and wharf which the Virginian has built at Sewall's Point, Va., for the rapid handling of bulky freight, are described on page 951 of the issue of April 21.

Editorial note on keeping permanent records of side tracks. April 28, page 975.

Editorial note on effect of rate of pay of section foremen on efficiency of track work. April 28, page 975.

Track Formulae and Tables.—Review of book by Shelby S. Roberts, presenting common track problems in a practical way, including time-saving tables for use in estimating. April 28, page 977.

Erection of the Kentucky River High Bridge.—H. H. Starr, assistant engineer of the American Bridge Company, describes the erection methods found necessary in rebuilding the C. N. O. & T. P. bridge at High Bridge, Ky. The bridge that is being replaced was the first cantilever bridge built in this country. The site is the same as that chosen for a suspension bridge in 1854. April 28, page 980.

Concrete for Railway Work.—An abstract of a paper discussing the use of concrete for railway work is given on page 997 of the issue of April 28. A list of types of railway structures built of concrete is a part of this abstract.

Report on Condition of Treated Ties on Gulf, Colorado & Sante Fe.—The latest results of the extensive tests on treated ties being made under the direction of the Bureau of Forestry of the U. S. Department of Agriculture are given on page 999 of the issue of April 28.

A complete list of the committees of the American Railway Engineering Association and the subjects assigned them for consideration during 1911 are given on page 1005 of the issue of April 28.

Corrosion and Protection.—The railways consume nearly one-third of the total production of steel in the United States in rails, structures and cars, and have made considerable progress in properly protecting this metal from corrosion. An editorial discussion of the subject appears on page 1025 of the issue of May 5.

Bridge Replacement on the Boston & Albany.—The Boston & Albany has replaced several bridges by building the new structure alongside the old, coupling the two together, drawing the old one out and the new one into place. The actual operation occupies from 35 to 50 seconds and the time required between the last train on the old bridge and the first one on the new averaged about 1¼ hours. An illustrated description of the work is given on page 1034 of the issue of May 5.

Necessity for the Use of Track Scales in Timber Treating and the Results to be Obtained from Their Use.—Abstract of appendix F to the report of the committee on wood preservation, presented at the annual meeting of the American Railway Engineering Association. May 5, page 1040.

Grade Revision and Terminal Work on the Chicago Great Western.—The economic and engineering features of the improvement work on the eastern division of this road are described on page 1108 of the issue of May 12.

Replacing Steel Viaducts on the Bessemer & Lake Erie.—This article describes the replacement of a viaduct 240 ft. long with a double 26-ft. concrete arch. One barrel was built about the legs of one of the steel towers, requiring the blocking up of the viaduct on the finished concrete arch before the steel inside the barrel could be cut away. May 12, page 1116.

NEW BOOKS.

Field Book for Railroad Surveying. By Charles Lee Crandall, professor, and Fred Asa Barnes, assistant professor, of railway engineering at Cornell University. New York: John Wiley & Sons. Morocco, 202 pages, 4 in. x 6½ in. Price, $2.

This book is the outgrowth of the notes which have been prepared by the authors from time to time to supplement the text-books on railway surveying used in their class rooms, combined with the Crandall's Transition Curve, which appeared previously as a separate book. The authors have left out many of the special problems, but seldom met with in practice, and endeavored to include only those more commonly encountered, and to connect these with practical conditions. Sufficient tables are given for all the ordinary requirements of the engineer in the field.

MOTOR CARS FOR SECTION FORCES.

The problem of the maintenance of track by ordinary section labor is becoming more serious each year because of the continually decreasing efficiency of this labor. There seems no prospect of securing a better class of laborers; officers must get the best results with the labor available. Two ways suggest themselves: One is that of raising the standards of the men themselves; the other, that of reducing the manual labor to be done to a minimum by the use of mechanical devices. The prize and bonus systems and the educational courses provided by different roads aim at the first result, while the use of motor cars is an important development toward the second end.

While motor inspection cars have been used for ten or twelve years, the motor car for section forces is a comparatively recent development. The first of them were put in service but little over five years ago, and it is within the last two years that the most rapid development of their use has taken place. As widely diverging views exist among railway men concerning the advisability of their employment, the *Railway Age Gazette* wrote to the presidents of all the railways in the country over 500 miles long (49 roads in all), to find out the actual number of cars in use and the results that have come from their operation. Replies were received from 41 roads. In this letter the following information was requested:

1. How many of each kind of cars, as, for example, section cars, inspection cars, etc., has your road in service?
2. Kind of service?
3. Name of maker?
4. Period of time in service?
5. Cost of repairs and method of keeping cars in repair?
6. Cost of fuel per car per month?
7. How much have you been able to lengthen sections and what has been your relative saving in labor?
8. Do you secure greater efficiency from your labor?
9. Remarks concerning relative economy and efficiency, especially as compared with hand cars.

The replies received to this circular letter have been tabulated and are given in the accompanying table. It will be noted that a number of the roads are using the motor car for section forces to quite an extent, while a large number are experimenting with it.

Although the primary object of the investigation was to learn the results of the use of the car for section work, the replies relative to light inspection cars are interesting. While nearly all who commented on the use of inspection cars heartily approved of them, a number of the roads do not use them at all. The frequency of accidents while using such cars has created a prejudice against them in many quarters. This danger emphasizes two things; first, that motor cars either for inspection or section purposes are not equally advantageous everywhere; and, second, that their use may be abused either by careless disregard of trains or by running at too high rates of speed.

Referring to inspection cars for the use of the roadmaster, several roads said that with them greater efficiency is secured from the gangs because the roadmaster is enabled to be among them more and keep in closer touch with their work, this being especially true on branch lines where the train service is infrequent. Also, in this connection, the old practice of section gangs taking the roadmaster over their sections, with the resulting inroads on their time, is abandoned, and in addition he is enabled to cover more territory in a day.

A rapidly growing field for these light inspection cars is being created by the installation of automatic signals requiring regular inspection. In the signal department alone the Norfolk & Western has 70 of these cars, and officers of this road estimate that the resulting saving in labor has been 25 per cent., while the increase in efficiency has been 50 per cent.

Strong opposition to the introduction of the motor car for section work is apt to be met at first. Many foremen will oppose it because they realize that it means a reduction in their number. Also, there exists in many cases a strong dislike to anything different from what the men have been accustomed to, and it is difficult to secure a fair trial. The cars are certain to get

USE OF SECTION AND INSPECTION MOTOR CARS.

Name of Road.	No. of Cars.	Kind of Service.	Maker.	Length of Time in Service.	Cost of Repairs Per Month.	Method of Keeping Cars in Repair.
A., T. & S. F.	99	Section	F. M. Co.	Max. F. M. Co., 5 years.	Section, $7.50-$10.	Light repairs by traveling repairman; heavy in shop.
			Autrakar	Max. Autrakar, 3 years		
	75	Inspection	F. M. Co.			
Baltimore & Ohio	6	Section	4 F. M. Co.	Max. 2 years	Minor repairs only.	Light repairs by foreman; heavy in shop.
			2 Rockford			
	27	Inspection	F. M. Co.	Max. 7 years.		
			Buda			
			Rockford			
Bangor & Aroostook	2	Inspection	F. M. Co.	1—10 years; 1—4 years	Average $2.12	
Buffalo, Roch. & P.	0					
Chicago & Alton	2	Section	F. M. Co.	3½ years	$1.67	Light repairs by local machinists.
	2	Inspection	F. M. Co.	10 years	.88	
Chicago Great Western	65	Section	Rockford	Max. 1 year	$1.85 to $2, mainly for batteries.	
			Hendrix			
	12	Inspection	F. M. Co.			
			Buda			
Chicago, Ind. & L.	1	Inspection	Rockford	1 year	Minor repairs only.	Repairs made by user.
Chicago, Mil. & P. S.	27	Section	23 Rockford	4 months	$1.50	
			4 F. M. Co.			
C., M. & St. P.	195	Section	Rockford and	Over 2 years		Inspector makes light repairs; heavy repairs in shops.
	93	Inspection	F. M. Co.			
C., R. I. & P.	41	Section	Rockford	Max. 5½ years	Section $2.37	Light repairs on ground; heavy repairs in shop.
			F. M. Co.			
	75	Inspection	Buda			
			Adams			
C., S. P., M. & O.	8	Section	Rockford	8 months	$1.18	Light repairs on ground; heavy in shop.
	5	Inspection	F. M. Co.	Max. 5 years	5.00	
Colorado & Southern	9	Section	F. M. Co. and	10 months	$1.50	Light repairs by foreman; heavy in shop or by manufacturer.
	8	Inspection	Rockford	1½ years.		
Del., Lack. & Western	0					
Denver & Rio G.	2	Section	F. M. Co.	Max. 9 months	No repairs but batteries and spark plugs.	
Detroit, Toledo & Ir.	0					
El Paso & S. W.	2	Section	Buda	2 years	$5.83	Foreman makes minor repairs under instruction of motor car mechanic; heavy repairs in shop.
	4	Inspection	F. M. Co.	4 years	Minor repairs only	
Erie	2	Section	18 F. M. Co.	4 months to 8 years	$1.80	Repairs made by users.
	29	Inspection	4 Rockford			
			8 Buda			
			1 remodeled			
Florida East Coast	1	Inspection	F. M. Co.	18 months	$1.33, mainly for front tires and spark plugs.	
Great Northern	52		H. K. Harrison			
			F. M. Co.			
			Oldsmobile			
			Buda			
			Adams			
Gulf, Col. & S. F.	5	Section	7 F. M. Co.	Section, 3 months to 1 year.		Inspected monthly by mechanical dept. Light repairs made by users; heavy repairs in shop.
	8	Inspection	5 Autrakar	Inspection, 4 years to 8 years.		
			1 Kalamazoo			
Int. & Gt. No.	6	Section	F. M. Co.	11 months	$1.40 to $6.00	Repairs made by users.
	8	Inspection	F. M. Co.	18 months.		
K. C., Mex. & Orient	0					
Kansas City Southern	0					
Lehigh Valley	7	Inspection	2 Buda	6 months to 3 years	No heavy repairs necessary.	Users have made light repairs.
			5 F. M. Co.			
M. & St. L.—Iowa Cent.	0					
N. C. & St. L.	1	Section	F. M. Co.	15 months	Section $0.86	
	2	Inspection	F. M. Co.	Max. 2 years.		
New York Central Lines	14	Section	F. M. Co. and	Section, 4 months to 2 years.	$2.08	
	135	Inspection	Rockford	Inspection, 1 to 12 years.		
Norfolk & Western	25	Section	7 Rockford	Average 2½ years	$3.50	Repairs in shop.
			10 Buda			
			8 F. M. Co.			
	86	Inspection	66 Buda	Average 2½ years	$2.25	Repairs in shop.
			20 F. M. Co.			
Pennsylvania Lines West	0					
Pere Marquette	3	Inspection	F. M. Co.	Max. 3 years	No record	Repairs in company shops.
Philadelphia & Reading	0					
Queen & Crescent	9	Inspection	Buda and	Max. 9 years		
S. P., L. A. & S. L.			F. M. Co.			
	15	Inspection	12 F. M. Co.	Max. 7 years	No record	
			3 Buda	Max. 1 year		
St. Louis & San Fran.*						
Seaboard Air Line	30	Section	F. M. Co.	Max. 2½ years	$3.50	Repairs by motor car inspector.
	20	Inspection	16 F. M. Co.	6 years	No data.	
			4 Rockford			
Southern	27	Section	27 F. M. Co.	Section, max. 16 months	No data yet available.	
	7	Inspection	3 Buda.	Inspection, 6 years.		
			4 Rockford.			
Terminal R. R. of St. L	2	Section	6 F. M. Co.	5 months to 1½ years	Very light	Made by car repair dept.
	5	For bridge and car repair dept. gangs.	1 Rockford			
Union Pac.—So. Pac. Sys.	94	Section		1 to 4 years	$0.80 to $2.00	Minor repairs by users; heavy repairs in shops.
	144	Inspection				
Wabash	4	Inspection	3 F. M. Co.	4 years	No record	
			1 Buda	1 year.		
Western Maryland	0					
Wheeling & Lake Erie	5	Inspection	2 F. M. Co.	Max. 6 years	Very light	Repairs by users.
			3 Rockford	16 months	Moderate.	

Note.—"F. M. Co." refers to all Fairbanks, Morse & Co. and Sheffield cars. "Rockford" refers to all Rockford and Duntley cars.
*Recently installed a few section cars. No record yet available.

USE OF SECTION AND INSPECTION MOTOR CARS—(CONTINUED).

Cost of Fuel Per Car Per Month.	Amount Section Lengthened. Relative Saving in Labor.	Is Efficiency Increased?	Remarks.
F. M. Co. No. 14, $2.43. Autra ..... $1.80 F. M. Co. No. 2J, $1.35	.....	....	.....
Section $8.50	Consolidated two sections in one. New section 10-13 miles long.	Yes	Facilitates bunching section gangs for small improvements, washouts and wrecks. Use should be confined to branch lines of light traffic. Little saving on heavy traffic main lines with short sections.
25 mi. per gal. gasolene.	.....	....	.....
.....	.....	....	.....
$1.20 (batteries $1.50).. 28 mi. gal. gasolene.	Lengthened 6 or 7 mi. New sections 11½ and 14 mi. long. Labor saving, one-third.	(See "Remarks")	During working season poorer results secured with motor cars on 12-mi. section than with same number men with hand cars on two 6-mi. sections, account numerous motor car failures.
$1 to $4.....	Lengthened from 6 mi. up to 10 or 12 mi. Labor saving, 42 per cent. in winter, 23 per cent. in summer.	Yes	Section men in better physical condition for starting work.
30 mi. per gal. gasolene.	.....	.....	.....
$3.50	Lengthened 5 mi. Saving, 50 per cent.....	Yes	No definite conclusions as to merits account short service and extreme weather conditions.
Average of 25 cars shows .034 gal. gasolene and .012 pints valve oil per mi. run.	Increased 40 per cent. to 100 per cent.....	Yes	Danger of striking motor cars less than hand cars because motor cars cover a certain distance in so much less time that they meet or are passed by fewer trains.
Section $2.30	Lengthened section 3 mi. Annual saving per car $691.22. Labor efficiency increased 18 per cent.	Yes	Decreased time to and from work 60 per cent.
Section $3.25 ..... Insp. $0.60 per 100 mi.	Lengthened 7 or 8 mi. Saving labor $4.72 per mile per month.	Yes	Use of motor cars tends to secure and hold better class of laborers.
$3.97	Lengthened by 5 to 6 mi. Six gangs replace ten.	Very much	More hours work, less on road, easier to secure men. Can use on grades where hand cars cannot be operated. In emergency can send men greater distance.
.....	.....	....	.....
30 gal. gasolene; 3 gal. lubricating oil.	No change on main line. Four sections combined in one on branch. Saving $90 per month on branch.	Yes	Economy lies in saving time to and from work and the fact that laborers are not fatigued from pumping car.
.....	.....	....	.....
Section $4.50 ..... $4.20, or $0.70 per 100 mi.	Sections increased to 31.7 and 35.7 mi. Save 6 men's labor.	Yes	Fifteen per cent. saving account less time to and from work. Also saving in wages account decreased force.
$2	No increase. But little if any saving in labor.	Yes	Section cars have not been used sufficiently to show any material economy or increase in efficiency.
60 mi. per gal. gasolene.	.....	.....	Car run between 10,000 and 15,000 miles. Never walked in.
.....	.....	....	Greater efficiency conceded as employees cover greater territory.
$4.20, or $0.70 per 100 m	100 per cent. increase. Reduced labor one-third.	Yes	Not considered desirable to use gasolene cars where there are a number of curves and deep cuts or where volume of traffic is heavy.
$5 for gasolene.....	Lengthened sections 13 mi. New sections 23 mi. long. Two motor cars replace 5 hand cars. Saving 50 per cent.	Yes	Average time at work increased 2 hrs. a day. If cars continue present record, will increase efficiency of labor and supervision 25 per cent. and decrease cost of section maintenance 50 per cent.
.....	.....	....	.....
.....	.....	....	.....
$4 to $4.50.....	.....	Yes	Greater efficiency secured in track work due to more frequent and better inspection of gangs and track.
.....	.....	....	.....
Section $1.85 gasolene.. .31 lubricants.	No increase in length. $20 a month saving in labor.	Yes	Cost of car .....$0.01 a mile General overhauling and interest on investment..... .01 " Gasolene ..... .005 " Cost of batteries, light repairs, lubricating oil, wire, etc.... .005 "
$1 to $5.....	No increase. On certain lines, able to reduce forces.	Yes	Motor cars, when used for transporting bridge, interlocking and paint gangs, have proven both economical and efficient. They are hardly successful on lines of great density of traffic where they have to be operated under train orders.
$5.90 ..... $3.60	(Two divisions) doubled length. Saving labor $61 each. (One division) no change. Saving labor 25 per cent. (One division) 3 sections made 2. Saving labor $61.	Yes	With motor cars labor can be obtained at points where it is almost impossible with hand cars. Signal department estimates increased efficiency 50 per cent.
.....	.....	....	.....
.....	.....	....	.....
.....	.....	....	.....
.....	.....	....	.....
.....	.....	....	.....
Section $3.00	Lengthened by 4-6 mi. one branch..... Lengthened by 6-10 mi. very light branch. Two 5-men gangs replace three 4-men gangs.	Yes	Experience more than filled expectations. Cars can be successfully used on light traffic branches having practically no extra trains.
Averages $3 per month..	Doubled length of sections from 7 to 14 mi. Dispensed with 20 foremen.	Yes	Section motor cars are giving satisfaction. Foremen recognize their merit. On light lines where road is reasonably straight and cars intelligently used they are a distinct benefit.
$3.50	No increase. Labor saving 10 to 15 per cent.	Yes	Men go to work on their own time, thereby putting in full time on the track.
$2.50 to $4.....	Some districts not lengthened; others lengthened 3 to 15 mi. Savings $1 to $11 per month.	Yes	Use not sufficiently general to admit of relative comparisons.
.....	.....	....	.....
.....	.....	....	.....
$1.00 per 100 miles.....	.....	....	Roadmaster able to inspect sections more frequently, thereby increasing efficiency of section forces. Section men not required to pump car over section to carry roadmasters.

out of adjustment and prove somewhat unreliable when operated by men who are entirely unfamiliar with anything of the kind. To obtain the best results from their use it is essential that their adoption have the hearty support of the roadmaster or official in charge, and judgment must be exercised in deciding where they shall first be employed. As with any appliance, they can be used to greater advantage under some conditions than under others. It has not yet been proven that they are desirable on three- or four-track lines, where sections must be short and where trains are frequent. Some roads are using them with success on double-track lines, while others question their desirability on such lines. Also, many say they are not advantageous on lines of heavy curvature.

Probably one of the greatest objections to the use of the car is the danger of breakdowns and delay. One officer reports that "during the working season we can get better results and accomplish more work with two hand car gangs located near the center of six-mile sections than with the same number of men on a 12-mile section with a motor car, on account of so many failures to a car, especially when in charge of a new foreman who does not fully understand operating it. When the car fails with a large gang of men going to or returning from work the expense counts up." On the other hand, it is interesting to note in this regard that on the Dakota division of the Northern Pacific records kept of the performance of three motor cars for four months last summer showed an average delay of but 32 minutes per month on account of the motor, with an average monthly mileage of 507. In many instances delays are largely over-estimated owing to past experience with the earlier types of power cars, for a great development has taken place in the past few years, and the cars are being continually made more reliable. These delays are also decreased as soon as the foreman begins to understand his car so that he can readily locate and remedy any minor trouble.

The manner of making repairs on the various roads depends mainly on the number of cars in service. Where but a few are being used the general practice is to depend on the individual foremen to keep them in order. The general report shows that no unusual difficulty has been met under this method, and the cost of repairs averages close to the cost where more elaborate methods are used. The El Paso & Southwestern sends a motor car mechanic to inspect thoroughly each car every 60 days and to instruct the foremen in making light repairs. Where a large number of cars is used, the Santa Fe, the Seaboard Air Line and the Milwaukee employ an inspector who travels back and forth keeping all the cars in order. This works out economically and gives greater reliability by insuring that adjustments will be made by an experienced mechanic.

Although the results given are from roads operating in all parts of the country, and under widely differing conditions, the letters say, almost without exception, that the use of the cars has increased the efficiency of track work. With a motor car the men are able to go to and from work in much less time than with a hand car and are fresh on arrival at their work, this being most important on lines of heavy grades. The Colorado & Southern is using motor cars on grades up which hand cars could not be pumped. The elimination of this hand car pumping often enables a road to get a better class of men. The Norfolk & Western reports being able to secure men at points where it was almost impossible to get them when using ordinary hand cars, while the Omaha road reports that in addition to securing a better class of men it is enabled to hold them longer. The almost universal result of the use of motor cars has been an increase in the length of sections and a decrease in the labor necessary. The lengthening of the section has reduced the cost per mile for the foremen, and the general result has also been that a reduction in labor has been possible, owing to the workmen being able to spend more hours on actual track work. On unimportant branch lines the saving has been most marked. On the Denver & Rio Grande in one instance four sections were combined into one and better results were secured on the one long section than on the four short ones. On the El Paso & Southwestern it is made practicable, by the use of these cars, to maintain two sections 31.7 and 35.7 miles in length, respectively. The greater the length of the section, the greater, of course, is the advantage over the hand car, since the labor involved in going over the section is in proportion to the mileage.

The value of the car in emergencies is worthy of consideration. In cases of serious storms, wash-outs or wrecks, employees can be collected from a large radius in a short time; without the motor cars, trains would have to be called out to collect the men. The instance reported by the Chicago, Milwaukee & St. Paul, when, following a heavy thunderstorm, one division of 140 miles was thoroughly patrolled and traffic resumed in 20 minutes after the firemen were called out by the despatcher, illustrates this point. This greater facility for collecting larger forces is an important factor in making small improvements where otherwise it would be necessary to call out an extra gang. In sparsely settled parts of the country it has been necessary for the railways to provide dwelling houses for the foremen, and the foremen, in turn, provide board and lodging for the men. Under such conditions, it is very hard to hold the men, but with motor cars the range for selection of headquarters is increased. Where Italians or Greeks are used for section laborers it is often hard to get them to work in small gangs, owing to their mode of living. With a motor car, some roads have lengthened sections sufficiently to use large enough gangs to remove this difficulty.

Such cars are of special advantage for bridge gangs, whose work is scattered over the entire division. Under the common method, the movements of such a gang depend on the way freight is moving from one place to the next. When one piece of work is completed the men have to wait until a train comes before they can go to the place of the next job, while with the motor car they can proceed immediately, with an interval of probably an hour between the jobs instead of a half day or more. By the use of motor cars the Colorado & Southern increased its bridge territory 20 to 30 miles per gang.

It is interesting to note the support given to the cars by the men after they have become accustomed to them. In many cases, after using them for some time, they will refuse to work on hand cars.

The experience of the Terminal Railway Association of St. Louis is instructive. With the cars the men are willing to go to their work on their own time, and are thus enabled to put in a full day on the track.

The increase in efficiency is estimated by various roads up to 25 per cent., while the saving in labor in some cases has been estimated as high as 50 per cent. The Chicago Great Western reports that it has reduced its labor on a winter basis 42 per cent., and on a summer basis 23 per cent. On the basis of these estimated savings, it does not take long for a motor car costing about $200—as compared with $35 for a hand car—to pay for itself. Consider, first, the reduction in the rate per mile of the cost for foremen. With a six-mile section and a wage of $50 a month for a foreman, the monthly rate per mile is $8.33, while with a section lengthened to nine miles and the foreman's pay increased to $60, as some roads have done, the rate per mile falls to $6.67, a decrease of $1.67 per mile, or of $15 for the section, an amount about twice the average monthly cost of fuel and repairs for the car. This is in addition to the better results obtained with the higher class of foremen secured by the higher rates of pay and by the weeding out of the poorer ones when the number is reduced. Again, consider the saving in time spent going to and from work. If one hour a day is saved, this means a saving of 13 days' labor a month for a gang of five men, or, at $1.50 a day, $19.50 a month, an amount sufficient to pay for the car within less than a year. A number of roads have made savings far in excess of these figures, as is shown in the report. In an article published in the *Railway Age*

Gazette of November 18, 1910, describing the service of three motor cars on the Dakota division of the Northern Pacific, it was shown that these cars more than paid for themselves in four months.

In addition to the two savings computed, the other advantages of using motor cars, such as the freshness of the men on arriving at work and the emergency value of the car, also result in important economies the actual amounts of which cannot be computed.

We give below the experiences of the Seaboard Air Line and the Norfolk & Western in more detail, as furnished us by officers of those roads.

EXPERIENCE OF THE SEABOARD AIR LINE.

We have on this system quite a number of light traffic branch lines from 20 to 75 miles in length, on which there is very little variation in the traffic, and on which it is quite out of the ordinary to run any but scheduled trains. The advisability of using motor cars for sections was investigated during the summer of 1908, and we decided to try a few so as to determine their desirability by actual experience. The first three of these cars were put in service in September of that year; one on a branch 20 miles long, on which there were two sections of 10 miles each; one on a branch 30 miles long, on which there were two sections of 15 miles each; and the other was on a branch 20 miles long on which there were two sections of 10 miles each.

The traffic over each of these branches consisted of one mixed passenger and freight train each way per day. Before installing the motor cars, we paid the foremen $45 per month and furnished them houses free of rent. Each 10-mile section was allowed an average of four men, and the 15-mile sections were allowed an average of six men each. After installing the motor cars, we cut off three foremen and allowed six men each for the sections on the 20-mile branches and eight men on the 30-mile branch, and also increased the wages of the foremen we retained to $50 per month. Below, I give comparative labor costs:

	Foremen.		Laborers.		
	No.	Wages.	No.	Wages.	Total.
With hand cars...	6	$270.00	28	$700.00	$970.00
With motor cars..	3	150.00	20	500.00	650.00

This shows a net saving of $320 per month, from which must be deducted the cost per month of operation of and repairs to motor cars, which we find average about $4 per month for repairs and $3.50 per month for fuel, a total of $7.50, giving a net saving of $312.50 per month.

These cars were placed in charge of men who had never seen a gasoline engine, and the only tutoring they had was from a man sent out by the makers of the cars to set them up. This man spent one or two days with each foreman.

The greatest trouble we have had with our motor cars is from insignificant things, such as wire troubles and weak batteries. It did not take the foremen long to catch on to the wire troubles, but the weak batteries were a different proposition. To overcome that we furnished with each car an ammeter, to test the batteries, and we soon found that this made a saving in our battery bills.

We also found that we were saving a great deal in the time consumed in going to and from work. Before the motor cars were installed, an average of 1½ hours per day were consumed by each of these gangs in going to and from work, while with the motor cars the average was only 45 minutes per day; therefore, the average actual time worked on track when hand cars were used was 8½ hours per day, and with motor cars 9¼ hours per day. We also found that in hot weather when the men pumped a hand car out to their work, they were tired and hot before they had really begun it, and they would begin to think of the long hot drag they would have in going home in the evening; consequently they would begin to rest up so as to be ready for their home journey. With the motor cars, they arrive at their work fresh and cool, and they know when they have finished their day's work on the track, they will have a rest going home.

After testing out the three cars referred to for six or eight months, we were satisfied that we could save money by using them, and we have now installed them on 31 sections, some of which are on branch lines where the traffic is much heavier than on the three branches above described. As near as I can figure, these 31 cars save us $20,000 per year in labor, and in every instance there has been a marked improvement in the track.

As to the influence of motor cars in holding labor, there is no question but what it is a great aid, especially with our negro labor in the south; for if there is anything that a negro likes it is to ride and not have to work while doing so. We had a case on one motor car section where the car had to be sent in for repairs, and every man quit and refused to pump a hand car, but as soon as the motor car was returned every man came back. The foremen at first showed some prejudice against the use of motor cars on account of not wanting to see other foremen discharged; but when they found that we had fully determined to use the cars, they changed their minds. One foreman I have in mind had a brother on the adjoining section, and he objected very much to his brother being let out, but when he found that he would have to operate the car or that both he and his brother would be out of a job, he soon came around; and he has since told me that if he had to use a hand car again he would quit railroading.

To sum up, we feel that our experience with motor cars has been entirely successful, and now that we have sufficient cars in service to warrant having a motor car repairman to look after them, we will get even more satisfactory results.

We have a record kept of the cost of operating each car each month, which is tabulated in the attached table. This record has demonstrated that some men use very much more fuel than others, and one of the duties of our motor car repairer is to handle such cases so as to get better results.

SECTION MOTOR CAR PERFORMANCE—SEABOARD AIR LINE—MARCH, 1911.

Div.	Sec.	Minutes Delay.	Gasolene.	Other Supplies.	Repairs.	Total.
1st	14	00	$2.99	$0.72	$0.00	$3.71
1st	*15	00	1.73	.32	.00	2.05
3rd	40	00	1.43	.27	.00	1.70
4th	1	120	1.80	.00	.00	1.80
4th	2	150	2.40	1.12	.48	4.00
5th	41	00	2.22	1.79	2.14	6.15
5th	42	00	1.98	1.99	.97	4.94
5th	43	00	2.40	2.23	.00	4.63
5th	44	00	1.80	.37	.00	2.17
5th	51	00	2.28	1.96	10.50	14.74
5th	52	00	1.44	1.83	6.70	9.97
5th	53	00	1.44	1.15	3.76	6.35
5th	54	00	3.48	1.17	.00	4.65
5th	55	00	1.20	1.77	5.44	8.41
5th	65	00	2.16	.48	1.84	4.48
5th	†66	00	1.50	1.60	78.23	81.33
5th	‡71	00	.00	.00	.00	.00
5th	72	00	3.60	1.05	.00	4.65
5th	73	00	.72	1.93	14.47	17.12
5th	74	60	2.40	1.20	.00	3.60
5th	81	00	2.22	1.20	1.84	5.26
5th	82	00	1.20	1.27	13.57	16.04
5th	83	00	3.60	2.35	.07	6.02
5th	91	00	.72	1.21	.00	1.93
5th	92	00	4.56	1.84	.00	6.40
5th	93	00	2.40	1.45	.00	3.85
5th	94	00	.84	3.00	.00	3.84
5th	95	00	2.64	2.36	2.79	7.79
5th	104	00	1.80	.47	.00	2.27
5th	105	00	.72	.33	.00	1.05
5th	141	00	2.16	1.08	.00	3.24
5th	151	00	3.24	1.00	.00	4.24
			$65.07	$40.51	$142.80	$248.38

* Car operated only 18 days; in shop for overhauling.
† Car overhauled.
‡ Car out of service for overhauling.

As to the use of the No. 2 velocipede motor cars, the road-master's districts on this system are quite long in many instances, especially on side and branch lines where the traffic is light. We furnished these men with a light inspection hand car and allowed them two laborers for crank hands, which cost $30 per month each. In order to economize, we have begun furnishing No. 2 motor cars and cutting off one laborer, which

makes a saving in labor of $360 per year. The fuel and repair cost of operating these cars does not average over $3 per month per car; therefore, we have a net saving of $324 per year per car, and at same time the roadmasters can get over their districts more frequently and to much better advantage.

EXPERIENCE OF THE NORFOLK & WESTERN.

We have 25 section motor cars in service, and all have given satisfactory service and are highly prized by foremen and men. In only one instance was a car reported as unsatisfactory and undesirable. In this case the car was transferred to another section and is giving excellent service, so the natural inference is that the fault in the first instance was with the foreman and not with the car.

The advantages of motor cars in section work are, the speed and ease with which forces are taken to and from work, saving time and increasing the efficiency of labor; the ability to respond quickly to an emergency call or to mass forces without delay for special work, and to employ competent and perhaps a better class of labor at points where without them the securing of laborers was a serious problem. At some points on our road no trouble is experienced in getting men to work on sections where a motor car is in use, where formerly for several months each summer not a laborer could be hired and it was necessary to import extra forces and domicile them at considerable expense. It is a common occurrence now for a foreman who is looking for laborers to be asked whether he has a motor car. If he has, it is easy to get men. We find still another advantage of section motor cars in their ability to carry section forces with tools up mountain grades of 1 to 3 per cent. at reasonable speed in all kinds of weather, whereas formerly it was frequently necessary for the men to walk and push their hand cars.

The light four-wheeled motor cars used by roadmasters, master carpenters and bridge foremen enable these officials to get over their territory quickly and see their men at more frequent intervals; and all concur in the opinion that the service has been much improved thereby. The use of these cars in the painting of track signs and signals is estimated to have reduced the cost of the work 50 per cent. The use of motor cars in the signal department is commented on as follows by our signal engineer:

"The service and efficiency of gasolene motor cars depend naturally upon the kind of men who use them; our supervisors and signal inspectors have reduced the cost of maintenance to a minimum. Their cars are seldom in the shops for repairs, but the average maintainer is careless in the manner of handling his car and allows it to run down to such an extent that cost of repairs, when made, is excessive.

"The speed attained by these cars is far in excess of what is needed for practical purposes, and there is no way of making a low maximum speed limit. We have had several cases where excessive speed (30 to 35 miles per hour) was the cause of serious accident to men in charge.

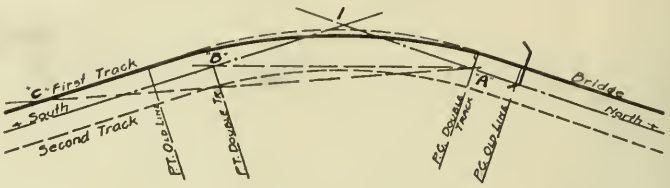
"There is no doubt of the advantage of having motor cars for maintenance purposes aside from the saving in labor. Many applications for positions have been received in which the question was asked as to the use of motor cars, and where they are used there have been few resignations of good men in comparison with the number of men employed."

At the beginning of 1911 the following railways were being actively constructed in Chile: Paloma to San Marcos, 26 miles; Choapa to Salamanca, 17 miles; Longitudinal Railway, whose construction up to November last was carried on by the government, was turned over for termination to the Howard Construction Company, whose bids were approved by the government; the lines from Rayado to Los Vilos, 80 miles; San Bernardo to Volcan, 47 miles; Melpilla to San Antonio, 33 miles; Alcones to Pichilemu; Curico to Hualane; Chillan to Las Termas; Osorno to Puerto Montt; Ancud to Castro; Saboya to Captain Pastene, and Pua to Curacautin.

A CURVE PROBLEM.

BY R. G. K.

A simple solution of a problem which a young engineer worked out several years ago when he forgot his field book may be of value to other engineers. His problem was to shorten up a curve on an embankment leading from a bridge so as to have the elevation run out before reaching the bridge. The old curve, about 1 deg. 30 min., started at the bridge. He assumed that a 2-deg. curve would fit and with an elevation of 1½ in. and a runoff of about 75 ft., he fixed the P C about that distance from the bridge, turned an angle at *A* that would intersect the



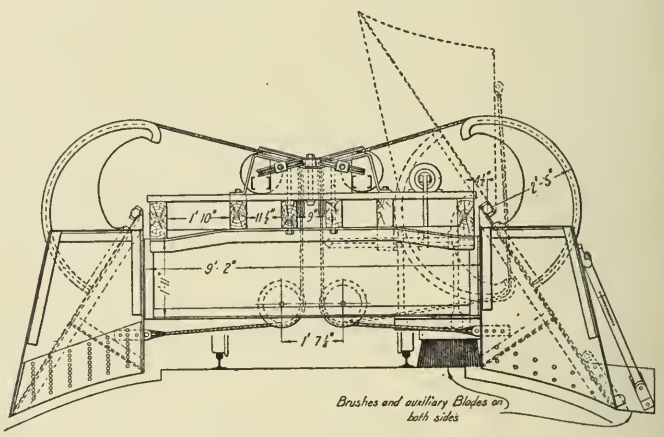
A Curve Problem.

old rail on the tangent beyond the curve at some point, *C*, and read the angle *I A C*. He then moved to C and measured the angle between the line *A C* and the tangent, added the angles *I A C* and *I C A*, and divided by 2. Returning to *A* he deflected this half angle, established the point *B* on the south tangent, thus making the angles at *A* and *B* equal to each other and to one-half *I*. For this reason, *B* became the P T of the curve whose degree was determined by dividing the sum of the angles *I A C* and *I C A* = *I* by the length of the curve, which was found by measuring along the old track from a point opposite *A* to a point opposite *B*.

THE BURY BALLAST TRIMMER.

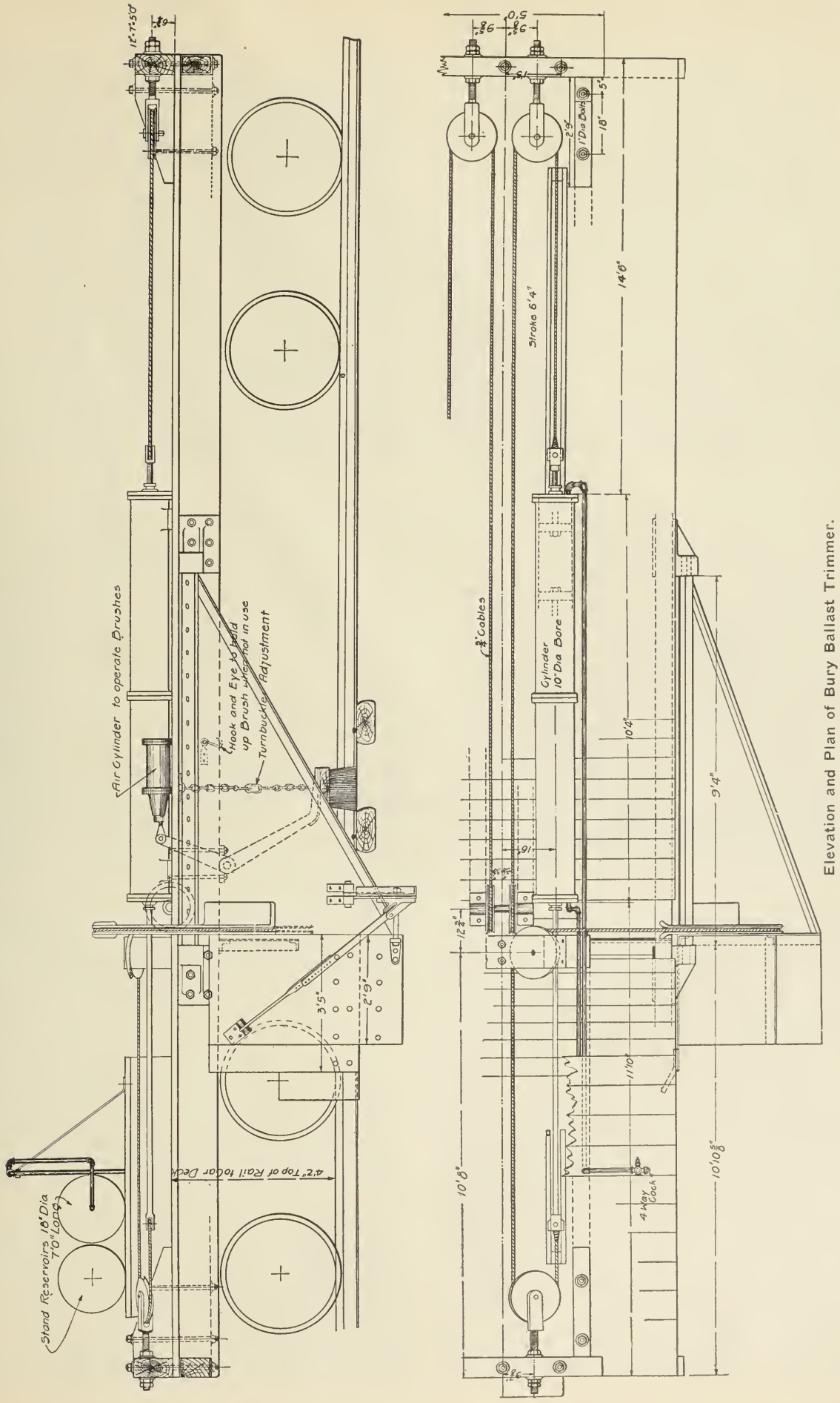
For a number of years the Canadian Pacific has been using a ballast trimmer which has been developed under the direction of its officers west of Winnipeg. Ordinarily the trimming up of the shoulders following the ballasting of track is done by manual labor at heavy expense, a smaller gang following the main ballasting gang and shaping up the shoulders by hand with shovels. Excess gravel is run back and forth on rubble cars to fill out the weak places.

The Bury ballast trimmer is a mechanical device to do this



End Elevation of Ballast Trimmer.

same work with but little labor. It consists essentially of a car with projecting wings which spread down the ballast to the desired slope. Steel brushes extend from the outer base of the rail out about 21 in. on a level with the top of the tie, and beyond this a heavy steel wing extends down over the shoulder to the sub-grade, the shape of the lower edge of the wing conforming to the standard section of the roadbed, which on the



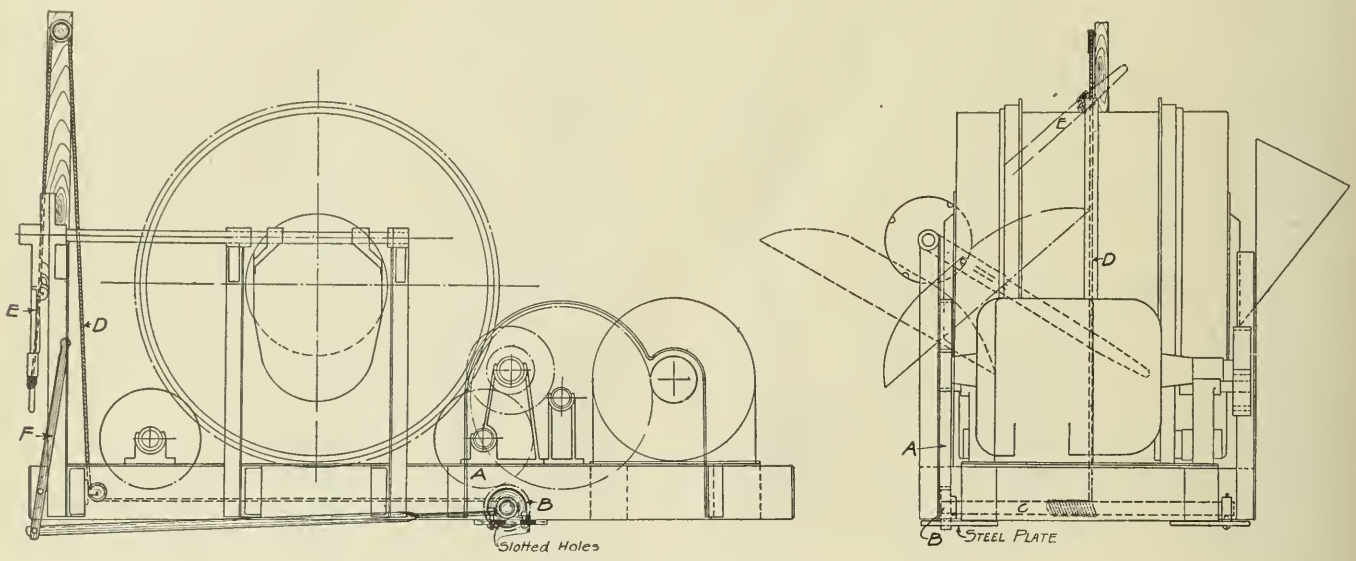
Elevation and Plan of Bury Ballast Trimmer.

Canadian Pacific is a smooth curve. An auxiliary blade can be attached to the wings if it is desired to shape the bank beyond the main wings. The movement of the brushes and wings is operated by air, one cylinder running both brushes, while a separate cylinder is provided for each wing. When not in use the brushes can be hung up out of the way by hooks and eyes provided for that purpose, while the wings are revolved vertically over the car. In operating this ballast trimmer sufficient ballast is unloaded to raise the track the required amount, and this is put under. Then enough more ballast is unloaded to build out the shoulder and the ballast trimmer is run over the track, shaping the bank. The operation of the car requires but one man to handle the air in raising and lowering the wings. It has been found advisable, however, in most cases to have two additional men watch the wings to prevent any damage from wedging of larger stone or other material and to inform the operator concerning the location of crossings, bridges or other interference in order that he may raise the wings accordingly. The car is pushed by a road locomotive in charge of a regular train crew. As much as 135 miles of track has been covered in two days with such a car, but it is not, as a rule, advisable to allow the track to remain unshouldered for such a length of time. It has usually been found advisable to trim up the track whenever 8 or 10 miles of bank is ready. The car works to best advantage, of course, when the ballast is dry. As gravel ballast is used almost exclusively on the Canadian Pacific lines, experience with the car has been entirely with this class of ballast. Even with much interference from trains, this car has proven very economical, as it is possible to cover long distances with a very small amount of labor as compared with the older methods.

The railway construction in Brazil during the year 1910 represents the most notable progress of the past decade, and points to a rapid development of the interior districts by placing them in better communication with consuming markets, as well as by opening them to the outside world as markets for foreign goods. The total mileage added to the railways already in traffic exceeds the gain in any previous year, and is characterized by a greater distribution throughout the country and by a marked tendency to unify the several systems in the republic. The railways, extensions, and branches opened to traffic during 1910 amounted to 1,189 miles. Judging from the large number of lines and extensions which are now under construction in this country and from the mileage which has been opened to traffic since the first of the year it may be reasonably expected that 1911 will not fall far short of 1910 in this respect.

DUMPING A CONCRETE MIXER.

A negro laborer who was put in charge of a concrete mixer on a big bridge job saved himself considerable labor by developing a device for dumping the mixer. A No. 40 Ransome mixer was in use, and when running full it was very difficult for one man to raise the dumping lever with its load of concrete. The arrangement for dumping as worked out in this case is shown in the accompanying figure. It was made on the ground without the use of skilled labor and with slight modifications should be applicable to many mixer installations. The dumping lever, *E*, is raised by a rope, *D*, which runs from the lever over pulleys to a shaft, *C*, which carries at one end a wheel, *B*, that can be brought into contact with the wheel, *A*, supporting the mixer drum. The end of the shaft nearest this wheel is carried in a bearing which can be moved back and forth on a steel plate attached to the supporting frame under the mixer. The movement necessary to bring this wheel in contact with the moving wheel is obtained by a rod attached to the bearing, which is carried under the supporting platform of the mixer to a vertical lever, *F*, which is pivoted by the floor near the point where the operator usually stands. By throwing this lever the small wheel, *B*, on the auxiliary shaft *C*, is brought into contact with the moving wheel, *A*, the shaft is rotated, winding up the rope, *D*, which runs to the dumping lever, *E*. This device has been in operation for some time and has done its work satisfactorily. The labor required to throw the small operating lever is negligible.



Device for Dumping Mixer.

FOREIGN RAILWAY NOTES.

The total length of the main line of the Goyaz Railway, Brazil, and its branches is 850 miles. The surveys for both trunk and branches are now completed. It is said that about 1,500 men are now employed on the different sections. Rails have been laid for a distance of 85 miles from Formiga, and the roadbed is now completed for a distance of 88 miles.

The government of Chile has extended the tariffs of the Chilean Transandine Railway, now in force, until November 18 of the present year, with the exception of the tariff on stock to which an additional charge of 50 per cent. will be added. The railway is required to submit to the government a lower tariff than that now operative, provided it can obtain a proportional reduction from the Argentine Transandine Railway. The tariff now in use dates from November 18, 1907, and the rates can not be reduced without the approval of the Chilean government.

PROTECTION OF TEMPORARY BRIDGES AGAINST FIRE.*

Bridges catch fire from four different sources:

1. From sparks or live coals from ashpans of locomotives.

2. From fire in grass on right-of-way creeping up under bridge and setting it afire, which grass was first set on fire by sparks from stacks of locomotives, by section men letting fire get away from them, or by passengers throwing cigar stubs out of car windows.

3. From nearby forest fires.

4. From fusees.

It is found that about 85 per cent. of such fires are caught in the deck, caused by cinders or coals dropping from ash pans; 10 or 12 per cent. are caused by grass on the right-of-way burning, or grass under the bridge catching fire, and a very small per cent. caused by forest fires or fusees. There have been three or four known cases of fusees doing damage to bridges. Bridges burned by forest fires do not materially endanger the lives of employees nor the traveling public because there is always warning given before any bridge can burn from this cause. Since the burning of bridges by fusees and forest fires is so small they are left out of this discussion, and the protection of bridges from cinders from ash pans, and from the burning of grass below only are considered.

Considering the latter case first, it is recommended that the grass be sheared off around each pile bent or spaded up to kill the vegetation for a distance of two feet on each side of the piles and this space covered with cinders, slag, gravel, or stone dust, which will not support vegetation, and that all brush be kept cleared away in the immediate neighborhood of the bridge. Grass and weeds should be burned under the supervision of the section men at suitable times according to the present practice on other parts of the right-of-way. As an extra precaution, which would not cost much, a row of cinders, slag, gravel or stone dust, which will not support vegetation, can be placed parallel to the bridge on each side of same and about ten feet distant from the bridge, which would tend to prevent grass fires on the right-of-way from creeping up to the bridge; this row or ridge to be about one foot deep and about two feet wide. It would probably have to be replaced once in every four or five years to keep it effective.

The protection of the decks of bridges from sparks falling from ash pans has been taken up by many railways, and different methods have been used with fairly good success and at reasonable cost. Some roads have used a ballasted deck with treated timbers, others have filled in between the ties with strips and then covered ties and strips with two or three inches of gravel, and others have planked over the decks of bridges with two-inch planks and then covered the same with gravel.

In considering a ballasted deck or floor system it is figured that the piles are cedar and the guard rails, planking, stringers, and caps are treated with a preservative. Cedar piles were taken as a basis as their life is about twenty years and they are good for two decks of standard bridge. Also since treated tamarack or Norway pine will cost about the same as cedar and the life when treated is about the same as cedar untreated. The first cost of this type of bridge will exceed the first cost of standard pile bridge by $2.56 per foot. The cost of this ballasted deck bridge with treated timbers will be $12.56 for twenty years' life, not considering the running repairs. The cost of a standard pile bridge for twenty years' life would be $15.47, not considering the running repairs. The objection raised to the ballasted type of bridge by many is that the initial cost is too great, that it approaches too nearly a permanent bridge and that it is difficult of inspection. If an opening is to be maintained for twenty years by a temporary bridge, this kind of bridge will not cost as much as a standard pile bridge. It is cheaper in regard to running repairs as the lining and surfacing will be done by the track forces, while the inspection can be done from underneath the bridge.

It would not, however, be advisable to put ballasted decks on old or existing pile bridges as the piles would either have to be cut down about nine inches, or the grade on either side of the bridge raised this amount, either of which would be very expensive.

The other methods of protecting decks of temporary bridges are similar in that they have a filler between the ties and then a coating of two or three inches of gravel over the deck, except one which has a sheet iron covering over the deck.

The objection to this kind of protection is that when gravel is placed on untreated timber it will tend to decrease the life of the timber two or three years. Such bridges are also expensive to maintain as many of them have to be lined and surfaced during the winter and spring months, because of the heaving on either side. To line and surface such bridges it is necessary to take off most of this top dressing and then replace it, and most of this work has to be done in the winter months when it is frozen. The additional cost of such bridges runs from twenty-six cents per foot to eighty-three cents per foot, which difference is caused mostly by the varying amount of material necessary for fillers between the ties.

The deck covered with sheet iron has the advantage over the ballast covered deck that it does not tend to decrease the life of the bridges but to increase it. This cover, however, is in the way in maintaining the bridge as it has to be removed when necessary to make any repairs. Such a cover can, however, be removed and replaced much more cheaply than the ballast coating. This kind of protection for a bridge is objectionable where there is any current for electric signals carried in the rails. Also, in tearing it up and replacing it many times, it becomes filled with holes and parts are liable to get loose.

Therefore, if a deck protection against fires is to be given temporary bridges, it is recommended that for old pile bridges and bridges now in place the cheapest method be used, costing twenty-six and twenty-seven cents per foot; and in the rebuilding or building new, a ballasted deck bridge with treated timbers be used.

There is another plan which many do not favor, but which it is thought would be quite effective and cheap; that is, to paint the top of the deck—guard rails, ties, stringers, and caps, with the best fire-proof paint to be had and then sprinkle the same with sand. The paint should be put on heavily enough to hold considerable sand. The timbers should be seasoned two or three months before the paint is applied. The Peninsula division has tried this method to some extent in years back using standard No. 12 extra heavy paint, and it seems to have been quite effective.

During the past four years there has been a loss of about $16,000 from bridges burned, or about $4,000 a year, for the lines East and West. During this time there were no injuries nor lives lost, but there were a few narrow escapes. It develops also from comparison that the greatest loss from fire was on the lines that had the smallest traffic, for where the traffic was heavy there were a great many fires discovered and put out before much damage was done.

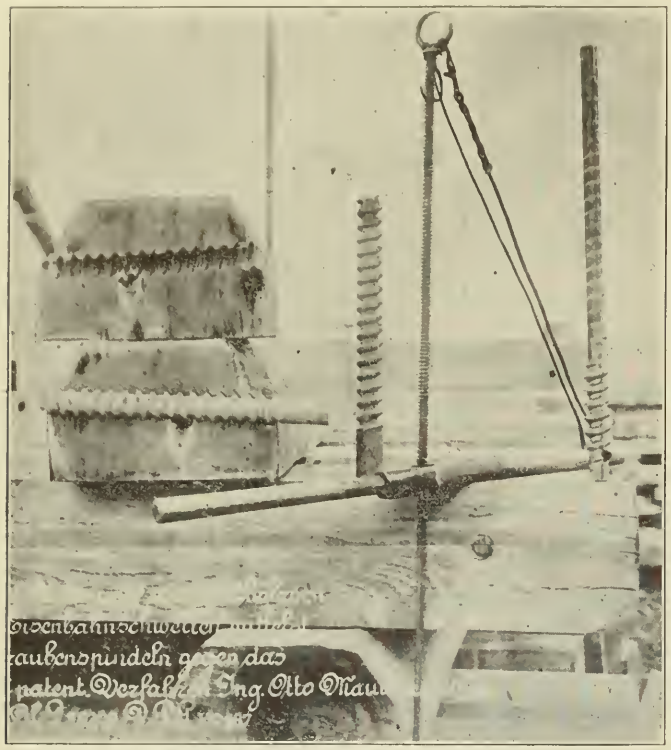
Considering the comparatively small damage to bridges by fire as compared with losses this company pays out each year for damage done adjacent property, it seems that before much money be spent on protecting bridges that it would be advisable to see if something could not be done in the line of making an ash pan and stack for locomotives so that these fires could not be started, or something be done to remove the cause of the fires. These conditions are improving constantly in regard to ash pans and netting arrangements for stacks. An arrangement now being made for the application of water sprinklers to ash pans to deaden the fire in them.

* From a report presented at the April meeting of the Operating Officers' Association of the Northwestern Lines.

DEVICES FOR PREVENTING THE SPLITTING OF TIES.

BY HERMANN VON SCHRENK.

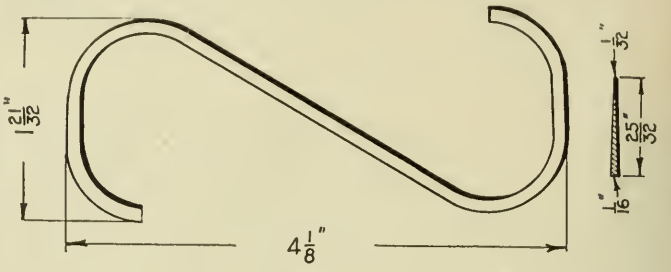
Many kinds of timber used for tie purposes check and split badly, after creosoting, during the seasoning process. This is particularly true of such timbers as beech, red oak, birch and chestnut. Some years ago the writer suggested the use of S-irons, i. e., curved pieces of beveled steel, which have been used on various European railways for many years. A number of roads in the United States have been using these irons for several years, and they have to a certain extent proved very beneficial. One road puts these irons into the end of every red oak tie and into many gum ties as soon as the ties are received in the seasoning yard. Plans are now being made to drive these irons on the right of way as soon as the ties have been inspected and accepted by the railway company.



Section of Tie and Dowel.

During December the writer had occasion to study the methods for preventing splitting used in Europe. In Germany the S-iron is still universally applied, although the standard shape has been changed somewhat, the present form being shown in the drawing. Two sizes are used, one 4⅛ in. long (7.87 in. of straight bar), the other 5⅜ in. long (9.85 in. of straight bar). The smaller irons are made of steel 0.785 in. wide, 0.08 in. thick at the thick edge and 0.04 in. thick at the thin edge, while the larger ones are 1.18 in. wide, 0.12 in. thick at the thick edge and 0.04 in. thick at the thin edge. The smaller size weighs 0.013 lbs., or 100 irons weigh 10.34 lbs., the larger, 0.26 lbs., or 100 irons weigh 25.96 lbs. For badly split ties bolts are used.

A good many of the hardwood ties, particularly the beech, on the Austrian state railways and the Hungarian state railways split very badly in drying. These railways have used the S-irons of the type used in Germany with good success. Recently a new method for preventing the splitting of ties has been adopted on a considerable scale both on the Austrian and the Hungarian state railways. It is called the Mautner dowel method, and is not patented in the United States. Up to the present time approximately 300,000 beech ties which cost about 70 cts. each have been furnished with these dowels. The dowels are made of beech wood and have the form of the Collet dowel, used so extensively on various European roads for increasing the holding power of screw spikes. The Mautner dowels are about 12 in. long and about 1 in. in diameter. At both the Austrian and the Hungarian treating plants all new beech ties are provided with two dowels. Special emphasis was put by the engineers in charge on the fact that it is very desirable to insert the dowel into the ties while they are still as green as possible in order to get its maximum value. At all plants visited, the dowels are still put in by hand, although preparations are being made to apply them by means of machinery. At the present time a number of ties are laid on a table, and two holes are bored through them from side to side at a distance of 4 in. to 6 in. from each end. A threading tool is then run through the hole first made, cutting the thread for the dowels, after which the dowels are inserted and any projecting parts sawed off.



S-Iron for Preventing Splitting.

From the Austrian state railways the following figures were obtained as to the cost of the dowels, labor, etc.: Two dowels per tie cost 1.50 cts. each, labor for boring holes for inserting the dowels, 1.72 cts. to 2.58 cts. per tie. As an actual matter of fact, the state railways pay the contractor who furnishes the ties with dowels 6.88 cts. per tie for furnishing each beech tie with two dowels.



Manner of Inserting Dowels.

At the treating plants of the Hungarian railways, which are owned and operated by the state, the cost of providing one beech tie with two dowels is 5 cts. per tie. At one of the plants on the Hungarian state railways, the dowels are furnished in the shape of round cylinders, and the screws themselves are cut by hand with a small apparatus. 1,000 round dowels, without the screw, cost $5.60.

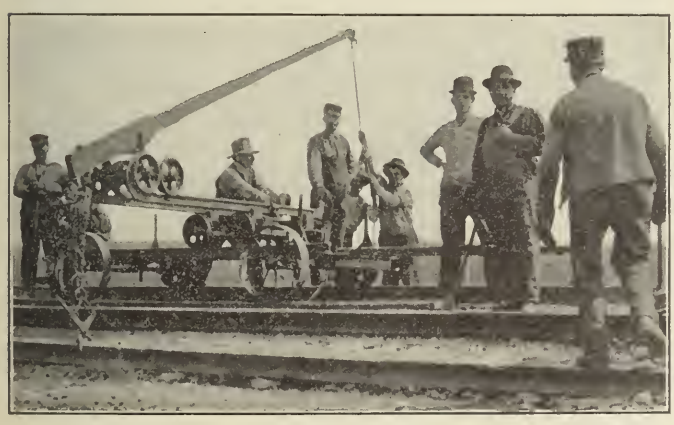
Mr. Mautner, the inventor, is at present at work on a machine, by which he claims that he will be able to reduce the cost of operation very materially. At the present time he states that the hand machine for boring holes, the shaper and the machine for screwing in the dowels can be purchased for $24. He estimates the cost of a machine approximately as follows:

Railway carriage and planks	$120
Boring machine	125
Thread-cutting machine	250
Boring tools	25
Tools for screwing in dowels	125
	$645

A large number of ties were examined which had been provided with these dowels for six months or more. The ties so provided certainly showed a very marked decrease in checking when compared with those which had no dowels. The accompanying photograph shows a tie cut through, and one of the dowels, also a general view of the yard at one of the plants of the Guido Rütgers company, contractors for the Austrian state railways, showing the manner in which the dowels are being inserted. The railway engineers who had used these dowels are without exception favorably impressed, and stated that they mean to continue to use them in increasing quantities.

RAIL RE-LAYING CAR.

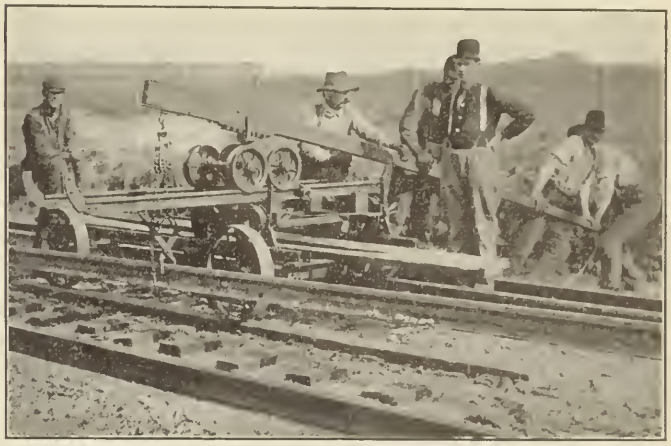
A device tending to reduce the amount of manual labor connected with re-laying rails is being used on several roads this year. The following notes were taken while watching one in service on the Burlington at Waterman, Ill., on May 5: As shown in the photographs, the device consists of a lever pivoted on a small truck which moves at right angles to the roadbed on a small track extending out over the shoulder. This small track, in turn, rests on another heavier truck, which rests on a track parallel to the roadbed and is supported on the main frame of the car. In this way there can be motion either parallel to or at right angles to the track without moving the body of the car. The main car is supported by two double-flanged wheels running on one rail and two flangeless wheels running on a plank laid 4 in. inside the spikes on the opposite side. A pair of tongs on the lever side of the car are clamped to the running rail to maintain the stability of the car when another rail is



Picking Up Rail.

being raised. The hoisting lever can be moved back and forth within certain limits to adjust the leverage to the weight of rail handled. Hand car wheels with short axles are provided which can be attached to the car, lifting the flangeless wheels above the ties when it is desired to move it from point to point. The car can be readily removed from the track in four pieces, although time is not essential here as a car is naturally always working under protection of a flag.

In re-laying rail the spikes are pulled, rail thrown out, and the ties plugged and adzed as usual, the machine simply replacing the tongsmen in handling the new rail. In operating the car the upper carriage is run out over the shoulder, the lever raised, and the clamp placed on the head of the rail at the center as shown in the illustration. As the lever is pulled down, the rail is balanced by one man at each end. The upper truck is pulled in until it strikes a lug fastened on the rail when the rail is directly over its location on the ties as shown in the photograph. The body is then shifted backward or forward on the second truck until the rail is properly heeled in at the joint, when it is lowered onto the ties and the car pushed forward to the next rail, the smooth wheels running on planks laid on the ties. It is evident that careful unloading of the rail is of much importance here, the same as with ordinary methods, for if each rail has to be carried several feet, it seriously affects the speed.



Ready to Place Rail.

In operating the car at Waterman nine men were employed as compared with 14 men necessary to handle the 90 lb. rail with tongs. It required four men on the lever, one to place the clamp on the rail, two at the ends of the rail and two picking up and placing the plank. The gang of 50 hoboes was distributed as follows: Thirteen men drawing spikes and throwing out the old rail; twelve plugging and adzing the ties; nine on the car; one distributing spikes and bolts behind the car; twelve placing the rail to gage, bolting and spiking; two flagmen and a waterboy, in addition to the timekeeper, foreman and assistant foreman. The speed is about the same using the machine as in using tongs. This gang has averaged a half mile of finished track per day since the work was started about a month ago, and on the day the accompanying photographs were taken 8,300 lineal feet of rail was laid in 8½ hours, the joints being half bolted and ties three-fourths spiked, besides closing up for seven trains. Of this amount 5,379 lineal feet were laid in the afternoon in 3 hours and 15 minutes actual time at work with no interruptions. With the large number of trains on this line in the mornings it has been found advisable to lay rail in the afternoons and to do the back work of uncoupling the old rail and completing the bolting and spiking in the forenoons. Also in using the car it has been found advisable to have the timekeeper mark the centers of the rails in advance of the gang in order that no time will be lost in balancing the rail.

In addition to the saving of 5 men while re-laying rail, the car is of special advantage when the rail has to be lifted over ballast freshly plowed off or carried up a shoulder where the footing is insecure. The men naturally like it and it should prove a factor in holding them and also obviate the necessity for paying a higher rate for steel gangs than for other gangs. The first car of this type was built over a year ago by Edward Laas, then engineer mantenence of way of the C. M. & St. P., and John Reinehr, superintendent of the rail mill at Savanna; it is now manufactured by the Q. & C. Company, New York and Chicago. We are indebted to W. S. Kirby, superintendent, and R. C. Violett, roadmaster, of the Burlington, for assistance in securing this information.

DIFFERENT METHODS AND COMPARATIVE COSTS OF DITCHING CUTS.*

BY GEORGE H. BREMNER,
Engineer, Illinois District, Chicago, Burlington & Quincy.

The usual methods of ditching cuts are: First, by hand with a shovel; second, by loading on rubble cars and unloading by hand; third, by the use of a train of flat cars, loading by hand and unloading either by hand or with a plow; fourth, by the use of cars, loading by means of a mechanical ditcher and unloading by hand or with a plow; fifth, by a ditcher which pushes the dirt out at the end of the cut. Each of these methods is useful and has its proper place in the economical handling of work.

Shoveling by hand is economical for shallow cuts with a low bank where men can throw the dirt up to the top of the cuts, leaving a ridge which prevents water from outside the cut running down over the face. It should not be used where the top of the cut is so high that the dirt cannot be shoveled up to the top of the original ground or disposed of by widening the bed for the track. Dirt should never be placed against the face of the cut where it will be washed back into the ditch at the first rain. In good weather a gang of six men should handle about 12 yards per man per day, which would make the cost about 16 cents a yard if we figure the men's time, including the foreman, as worth $2 a day.

Loading dirt on a rubber car and taking it out by hand should be used on branches where there is a very light travel—where the work will not be interfered with by trains and where the amount of ditching is comparatively small. It costs more than the first method, where there is not a large amount of earth to be removed. This should cost, with a gang of six men and a foreman, from 24 to 32 cents a yard, as a man will load and unload six to eight yards a day. If a flagman is necessary, an additional cost of 7 to 9 cents a yard should be added.

The use of a work train is advisable where the material is easily shoveled by hand, where machinery is not available, and where cuts are large and the amount to be removed is small. It is not a good plan for wet cuts and in most cases will cost more per yard of earth moved than any other method. It may, however, be the most economical because the ditch can be shaped up better with the removal of less material than by mechanical means.

The dirt can be unloaded where it will be useful in widening banks or preparing the roadbed for ballast, either by hand or by plow and cable. Where there is but a small amount of dirt loaded each day the best method is probably by hand, as it can be placed just where it is wanted, and the men cannot be used to advantage while the cars are away from the cut. However, with a large output the plow is much cheaper than hand work in unloading. It can be pulled over the flat cars either by cable attached to the engine which handles the train or by the use of an unloader, which requires that the road engine be equipped to attach to and furnish steam to the engine which handles the unloader. With a large output it is most economical to have a plow and Lidgerwood attachment for the cable. I would estimate cost of doing work-train work as follows:

Foreman	$2.00
25 men, at $1.60	40.00
Engine crew and watchman	9.50
Train crew	6.90
Coal and engine supplies	10.00
Total	$68.40

Under light traffic and good weather this outfit should handle and unload by hand about 250 cu. yds. a day, at a cost of 27 cents a yard. By the use of a cable and plow for unloading, the output should be increased to 325 cu. yds. a day, or 21 cents a cubic yard. With a Lidgerwood to handle the cable, there would be an additional cost for the Lidgerwood engine and supplies for the engine, amounting to about $4 a day, making the total cost $72.40. With this the output should be increased to 360 yards a day, or 20 cents a yard. These figures are based on good weather and dry cuts.

There are a number of different machines used for loading the material out of ditches on cars. The steam shovel is only desirable when a very large ditch is needed or a very large amount of material is to be taken out. With the steam shovel the whole train may be either dump cars, cars with sides of the Haskell & Barker type or ordinary flat cars. With the regular ditchers, only flat cars can be used to advantage.

The types of ditches with which we are most familiar are the Marion and Barnhardt, which, in general, may be described as small steam shovels, made so that the arm swings at right angles to the track with a small dipper to take the dirt out of the ditch and load it on the flat cars behind the shovel, which is pulled ahead over the flat cars as fast as they are loaded. The American Railroad Ditcher consists also of a steam shovel with a longer arm, which has a somewhat farther reach from the track. The dipper is larger, although, of course, that can be varied to suit the size of the machine; it is a somewhat heavier machine and is self-propelling over the car. It will take out a wider ditch and can also be used for a variety of other purposes similar to the use of a locomotive crane. I would consider this ditcher as very good for taking out heavy material, such as shale or bluff debris.

The Mahoney ditcher works on a different principle from the other two named. Like both of them, it will load on the cars behind it as it is moved ahead, but there must be a Lidgerwood to properly handle it.

By the use of mechanical loaders, and unloading by plow with Lidgerwood, work can be done for about 15 to 25 cents a yard. The costs should be

Operating the ditcher	$19.10 per day
Train crew	17.05 per day
Material and coal	20.00 per day
Total	$56.15 per day

Three hundred yards a day would make the average cost about 18½ cents, the amount of work done in any of these connections depending more or less on the amount of traffic.

Pushing dirt out of the end of a cut instead of loading it up and carrying it away can be used to advantage in hilly and mountainous districts, or where the material gets very wet and soft and cannot be handled on a flat car to advantage. For this service the Mahoney ditcher, which is equipped to drag the plow alongsile of the track by means of running the locomotive ahead, does efficient work.

The prices estimated above are average prices. The different machines on the market advertise the cost per yard handled by them to run anywhere from 6 cents up, and that the ditchers will handle sometimes a thousand yards or more a day. I do not think we have ever equaled this with any of our machines, and it would require unusually good conditions of material and traffic to allow an output of this size. Let me emphasize that the main advantage of machine work over the ordinary hand work is that wet cuts can be handled by machinery which possibly could not be handled at all by hand, and that work is not so dependent on good weather.

* Read before the annual meeting of the Burlington Association of Operating Officers.

The government of Chile has granted a concession for the construction of a steam railway from the station of Curacautin, or Poncoche, on the line of the state railways, to the boundary of the Argentine republic. The proposed railway will have an approximate length of 75 miles, and construction is to commence within a period of six months from the date of the approval of the plans by the federal government. The plans are to be submitted within a term of two years and the construction terminated within four years.

WATER TANKS EXCAVATED FROM THE SOLID ROCK.

The San Pedro, Los Angeles & Salt Lake has taken advantage of the natural topography of the country in the construction of two water tanks or cisterns with quite unusual features. They are excavated from solid rock. At one point a cistern was excavated in a massive and very solid conglomerate which overlies a flat bench about 40 ft. above the track level. The inner surface of the cistern was coated with rich concrete to prevent possible leakage through seams in the formation, and a roof was built over it. Near the track the bench of rock slopes very steeply toward the track. A small drift was driven through this slope to the bottom of the cistern, and a pipe to supply a standpipe alongside the track immediately oposite was laid in this drift and concreted in place. Water is pumped into the cistern from a well alongside the track below. It was found that this tank, having a capacity of 150,000 gals., could be built for the same cost as a standard steel water tank of half the capacity and its life is of course much greater.

At another point, an emergency storage cistern holding 300,000 gals. was built in the hills about two miles back from the track. It was excavated in dolomite rock, cemented, roofed, and fitted with automatic control. The water supply is drawn from springs about 12 miles away, and the capacity for storage is great enough to furnish several days' supply of water in case the pipe line is put out of commission temporarily by cloudbursts.

These cisterns and their connections were built from original designs prepared under the direction of E. G. Tilton, chief engineer.

A SIMPLE RAIL TONG.

The accompanying photograph shows a very simple rail tong used on the Aurora division of the Burlington. It consists of a wrought iron bar with four hooks as shown, the distance between the ends of the hooks being just sufficient to pass it over the head of the rail. It is much more convenient than the long two-man tong for turning the rail over, and is especially advantageous when used for heeling rail in at the joints, in connection with the rail re-laying machine described in another column. These tongs were made at the shops at Aurora under the direction of W. S. Kirby, superintendent, and R. C. Violett, roadmaster.

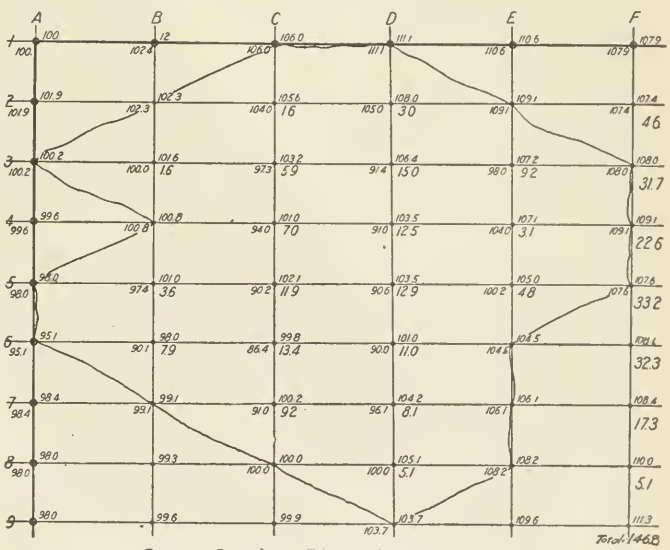


Single-Handle Rail Tong.

METHOD FOR CROSS-SECTIONING BORROW PITS.

In general the method used for measuring excavation quantities over irregular areas, such as large borrow or gravel pits, is to take cross sections at the even station or 100-ft. intervals with as many pluses or intermediate readings as the nature of the surface demands. When large areas are involved this causes very laborious work. After the notes are taken in the field they must all be platted and then figured. As a rule when the areas are large the intermediate readings are very frequent, and with long cross sections each additional section means much additional labor.

A simple but quick method for measuring such borrow pits with a very large saving of labor is here given. In laying out the work two base lines are run at right angles to each other.



Cross Section Plat of Borrow Pit.

On one line stations are marked at intervals of 10 ft. and numbered consecutively. On the other, stations are marked alphabetically at intervals of 27 ft. After laying out these base lines elevations are taken on the lines *A, B, C,* etc., at intervals or multiples of 10 ft., depending upon the nature of the ground, care being taken to note and take readings at the 10-ft. point nearest to changes in slope. Where slopes are uniform it is not necessary to take readings oftener than once in perhaps 100 ft., as the intermediate readings can be interpolated later in the office. The various readings will be marked in the notes *B3, D6,* etc. The field notes for the monthly estimates are taken in the same way.

In the office these base and auxiliary lines are platted to some convenient scale on tracing cloth and the original elevations obtained from the field notes or by interpolation are placed just above the intersections. Blueprints of these are made, and as the field notes for each monthly estimate come in the new elevations at all intersections are written just below the original elevations. The difference between these figures gives the amount the surface has been lowered, and the sum of these differences with the decimal point moved one place to the right gives the total number of yards of material removed, no multiplication or division being necessary. The blueprint can then be filed for future reference.

This method is theoretically correct, and in nearly all cases by proper arrangement of the base lines is sufficiently accurate in the field without further intermediate readings. Compared with older methods the field work in taking the original notes is perhaps as slow, but the time required for taking later estimates is much less, and that required in the office is very much less.

General News Section.

The Illinois anti-pass bill has been killed by the house committee on railways.

One hundred and twenty conductors of the Southern Pacific, from points in and near San Francisco, are visiting New York and other eastern cities as the guests of their employer.

The Western Pacific has increased the pay of conductors, enginemen, firemen and brakemen, substantially granting their request for rates equal to those paid by the Southern Pacific.

Commencing May 15 the Kansas City Southern will run daily for about three weeks a special fast freight train from Siloam Springs, Ark., to Kansas City, Mo., to carry the heavy strawberry shipments from southern Missouri and northern Arkansas.

The strike of the maintenance of way employees in the Chicago terminals that was called by the International Brotherhood of Maintenance of Way Employees has been declared off on the Illinois Central, the Baltimore & Ohio Chicago Terminal and the Chicago & Western Indiana.

The United States Express Company has begun suit in the Supreme court of New Jersey, against the mayor and police department of Jersey City to recover $250,000 on account of losses sustained during the strike of wagon drivers last autumn. The express company charges that the city failed to furnish proper protection to the company and did not take adequate means to suppress rioting.

The secretary of the Brotherhood of Railway Trainmen, at Bakersfield, Cal., has filed a complaint with District Attorney Goodcell charging the Atchison, Topeka & Santa Fe with violation of the full crew law by badging a Wells-Fargo express messenger as a brakeman on a run between Barstow and Randsburg. The complaint has been forwarded to the state railway commission, which will hold a hearing.

At Rheims, France, on Monday last, Henry Weyman, said to be an American, carrying one passenger, flew in a monoplane, a distance of 17 miles in 10 minutes, 30 seconds. Lieutenant Fequent followed this in a new monoplane and made the distance in 10 seconds better time, or at the rate of 100.7 miles an hour. The first flight was made in a strong wind, in which the machine plunged violently, its height constantly varying from 30 to 300 ft.

The Western Classification Committee will hold its regular semi-annual meeting at Milwaukee, Wis., beginning July 18. Pending decisions of the Interstate Commerce Commission in the recent rate advance cases, no meeting was held in January of this year nor in July, 1910, and an unusual amount of work will, therefore, be taken up. At a preliminary meeting on July 11, shippers will present arguments for and against certain proposed changes in classifications and ratings.

An inspection of the almost completed passenger station of the Chicago & North Western at Chicago was made on May 15 by a large company of the prominent officers and directors of the road, the party including Marvin Hughitt, chairman of the board; W. A. Gardner, president; and W. K. Vanderbilt, Jr., Homer Miller, Chauncey Keep and David P. Kimball, directors. After going through the station they started for the west on an inspection trip, leaving on a special train which was the first passenger train to go out of the new station.

The Western Union Telegraph Company has notified its operators that the company intends before long to furnish typewriting machines where needed. At present, and ever since typewriters have been used in telegraph offices, the operators have had to furnish the machines at their own expense. The general manager of the Western Union has also issued a notice informing employees that they may feel free to send grievances direct to the general manager whenever satisfaction cannot be had from the immediate superior officer after the presentation of a complaint in writing.

Recent improvements made by the Chicago Great Western and the Burlington in passenger train service between Chicago and St. Paul and Minneapolis include, among other features, special accommodation for women in the way of private drawing room and library compartments; the Chicago & North Western on its "North Western Limited," which runs between the same points, now has a composite observation library and buffet-smoking car. The C. G. W. has also adopted the plan of allowing passengers to reserve dining car seats at the time transportation tickets are bought and to order the evening meal as early as 10 a. m.

The New York State Public Service Commission, Second district, reports that during the month of March the number of passenger trains run in the state was 63,512; and 88 per cent. of these arrived at division terminals on time. In the list of causes it appears that over 47 per cent. of the delays were caused by waiting for other trains; so that in reality only about 7 per cent. of the trains lost time, instead of 12 per cent., as appears from the statistics. Of the large roads of the state, five reported 90 or 91 per cent. on time, namely, the Delaware & Hudson; Delaware, Lackawanna & Western; Erie; Lehigh Valley, and the Long Island. The New York, New Haven & Hartford, all of whose main line passenger trains in New York state are run by electric locomotives, reported 95 per cent. on time.

The legislature of Massachusetts has passed and the governor has approved a law making it a crime punishable by fine or imprisonment, to publish any false statement regarding the merits of the stock or the financial condition of any corporation, partnership or individual. The law provides that: "Any person who with intent to defraud makes or publishes, or causes to be made or published in any way whatever, or permits to be so made or published, any book, prospectus, notice, report, statement, exhibit, advertisement or other publication of or concerning the affairs, financial condition or property of any corporation, joint stock association, partnership or individual, which . . . shall contain any statement which is false or wilfully exaggerated, and which shall have a tendency to give a less or greater apparent value to the shares, bonds, property or assets of said corporation, . . . than said share . . . in fact possess, shall be punished by a fine of not more than $5,000, or by imprisonment for not more than 10 years, or by both such fine and imprisonment."

Opening of Tacoma Union Passenger Station.

As previously noted in the *Railway Age Gazette*, the new Union station which has been built at Tacoma, Wash., by the Northern Pacific was formally opened on May 1. The opening attracted a crowd of about 30,000 people; and among those who delivered addresses were the governor of Washington, the mayor of Tacoma, and Howard Elliott, president of the Northern Pacific. A plan of the station, which is a large one and of unique design was given in the *Railway Age Gazette* of August 7, 1909, page 365.

The first Northern Pacific passenger station at Tacoma was built on the wharf in 1872, and the passenger station used until recently, which was situated about where the new one stands, was built in 1883.

In his address Mr. Elliott gave some interesting figures regarding the importance of the Northern Pacific to Tacoma. He said that in 1900 an average of 2,017 of the Northern Pacific's employees received their pay in Tacoma, while in 1910 the number was 2,873. Their compensation in 1900 was $1,181,000, while in 1910 it was $2,085,000. In 1900 the taxes paid in Pierce county, in which Tacoma is situated, were $59,000, while in 1910 they were $192,000. Evidently the Northern Pacific is meeting with difficulties in providing Tacoma with good facilities similar to those which the railways meet elsewhere; for Mr. Elliott said that unfortunately the Northern Pacific could not fully utilize the new passenger facilities until its Point Defiance line is completed; and while it is ready to go on with the construction of that line, it is unable to do so because of difficulties in regard to right-of-way. He protested against unreasonable burdens and restrictions being placed on the road in its efforts to obtain

rights and franchises that are necessary in order to give the public the sort of service it asks for.

Continuing, Mr. Elliott said, in part:

"In the United States, as a whole, there are 409 inhabitants to the mile of road; in the New England states 841 inhabitants; and in the Middle Atlantic states 944 inhabitants, while Washington has only 209 people per mile of railway, showing that your facilities are ample for your present population and business; but with the growth that is bound to come to this country, it will be necessary for the railways to increase their mileage and facilities, or that development will be somewhat checked.

"There are in Washington at the present time 4,188.29 miles of railway, of which the Northern Pacific has built one-half, or 2,098.21 miles. Washington has more railway than Montana, with its much greater area; more than Kentucky or Virginia or Colorado; more railway than any one of the New England states, and four-sevenths as much as all the New England states put together. These figures show clearly that the railways have anticipated the needs of business in this state and have given it even better facilities than some of the older states enjoy.

"The ability of the railways to go on with their work will depend very largely upon the general attitude of the people as a whole toward railway investments and railway management. The railways of the country and the railways of Washington have done a great work and have done their full share of providing transportation, without which agriculture and commerce cannot have its highest success.

"Of late years, however, there has been a tendency to attack the railways and to cripple in many ways the effectiveness of the transportation machine. For instance: In the sessions of the state legislatures which have just terminated in the seven states, Wisconsin and Oregon and Washington, inclusive, there were 221 bills introduced affecting the operation, control and management of the railways. It is true that only a part of these bills were enacted into law, but the spirit that prompts the attack on the railways is naturally disturbing to the owners and managers of properties. It makes them hesitate when they really ought to go forward with confidence that they will be allowed the same chance for profits that are allowed to men engaged in other forms of business.

"We have planned the passenger terminal and our extensive scheme of improvement between Seattle, Tacoma and Portland to provide not only for the greater Tacoma of the future, but for the greater Western Washington and the greater Pacific Northwest.

"The railways have provided the people of this large territory with great tools of commerce and magnificent Puget Sound furnishes an outlet to and from other parts of the country and to foreign nations by water. The use of these tools of commerce and of these waterways by the people should bring about a greater growth in the next 10, 15 and 20 years than in the last 20. Upon the people, however, rests the responsibility of making wise, fair and active use of these wonderful facilities."

The Texan's Fear Allayed.

The train illustrated on this page is the one which was referred to by the correspondent in our issue of May 5, who was so scared by the signal indicating clear that he would have fallen in a fit, but for his intimate knowledge of railway life, which assured him that frequently collisions do not happen, even when the conditions are favorable for them. That signal does not invite a collision, for the line is *double track*. An officer of the Union Pacific writes to inform us of this fact and to say that next time he will see that both tracks are visible in the picture. We are sorry to have reflected on him; but still we feel almost glad of the occurrence because of this opportunity to print a picture of such a handsome train! Greenhorns from Texas who visit Chicago must keep their eyes peeled!

From Our Most Brilliant Story Paper.

The station was deserted but for one man who seemed absorbed in a newspaper. The ticket agent was apparently thinking of things far away as he deftly juggled coins on the glass plate under the bars of his cage.

The next morning the man with the newspaper was seeming to read it in another station and the ticket agent of the day before was hunting a job. He had been summarily dismissed.

The man with a newspaper was a detective. The ticket agent had been practicing to win facility in working the shadow game, hence his dismissal.

What's the shadow game? A new trick said to have originated in the brain of a Boston subway ticket seller and to have been taught to the other ticket sellers over the country, and this is how it is worked:

The ticket agent arranges a strip of cardboard or black paper so that it will seem to be a shade to keep the bright light out of his eyes. In reality he so arranges it that it leaves the space directly under the change slot brightly illuminated, but casts a deep shadow upon the plate just to the left. Then he practices till he acquires sufficient dexterity to pass out half a dozen coins; make one of them stop well over under the shadow and bunch the others under the bright light.

About one person in four will fail to see the nickel or dime in the shadow, and in his haste to get a train will not miss it till it is too late to return. If he does come back the coin is there for him to pick up and he sees no cause to complain. If he does not return the ticket seller adds one more coin to his income.

Some men are said to be so adept at putting coins into the dark that the sharpest eyes fail to detect the trick. A ticket seller at a busy station who was caught by a detective recently confessed that he had been stealing an average of $3 a day under the shadow.—*New York Sun.*

Natural Gas in Pennsylvania.

Pennsylvania led all states in the value of the production of natural gas in 1909, according to detailed figures published by the United States Geological Survey. The state's output for the year was valued at $20,475,207, the record value for any state in any year and approximately one-third of the entire value of the natural gas produced in the United States during the year. Pennsylvania's nearest competitor was West Virginia, whose production was valued at $17,528,565. The quantity of the West Virginia output, however, was considerably higher than that of Pennsylvania, although the value was less.

Since the first gas wells were operated, in 1882, Pennsylvania has uniformly led the other states, although once or twice she has almost lost the place of honor. Her total production, however, has been about half that of the entire United States. In 1882 her production was nearly $75,000. By 1885 it had increased to $4,500,000. In 1890 it was $9,551,025. In 1895 it



Union Pacific Puzzle-Picture.

had decreased to $5,852,000, and this year Indiana came within a few hundred thousand dollars of attaining first place. By 1900, however, Pennsylvania's production had risen to $10,215,412. In 1905 it was $19,197,336, and in 1909 for the first time it passed the $20,000,000 mark. The price of the Pennsylvania gas ranged from 2½ cents per 1,000 cu. ft. at the wells, for gas sold for manufacturing, to 60 cents per 1,000 cu. ft. for gas sold for domestic use.

An innovation in the gas industry in 1909 was the installation of a few plants in the Pennsylvania oil fields for extracting gasoline from natural gas.

International Master Boilermakers' Association.

The fifth annual convention of the International Boilermakers' Association will be held at the Rome Hotel, Omaha, Nebr., May 23-26. Immediately upon arrival, each member should report to the secretary for registration. The convention will be called to order on Tuesday, May 23, at 10 a. m., and the first session will be given over to addresses and routine business.

The second session, Wednesday, May 24, will open at 9 a. m. with reports by the committees on apprenticeship, standardization of shop tools and equipment, and standardization of pipe flanges and templets, etc. Papers will also be read on radical improvements in boilers and fire boxes; the use of brick arches and arch tubes in fire boxes; and water circulation in marine return tubular and vertical boilers.

The third session, Friday, May 25, will open at 9:30 a. m. with the reports of committees on oxy-acetylene for boiler repairs; the application of tubes and their storage at terminals; staying of crown sheets on radical stay boilers; steel vs. iron tubes; and an investigation concerning the elongation of tube holes in back flue sheet.

The fourth session, Friday, May 26, will open at 9:30 a. m. with the report of committees on law, subjects, and auditing. The remainder of the day will be given over to miscellaneous and unfinished business, selection of next place of meeting and election of officers.

Railway Telegraph Superintendents.

The Association of Railway Telegraph Superintendents has postponed its annual convention to the week beginning June 26. The announcements heretofore issued stated that the meeting was to be held in Boston, June 19-23; but because of the inability of a number of prominent members to be present it has been decided, by a letter vote, to hold the convention in the same city one week later, as above noted. Papers will be presented at the meeting by G. K. Heyer, W. P. Cline, M. E. Launbranch, W. J. Camp and G. A. Cellar.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held May 17, a paper entitled The Present-Day Pumping Engine for Water Works, by Charles Arthur Hague, M. Am. Soc. C. E., was presented for discussion and illustrated with lantern slides. This paper was printed in the *Proceedings* for March, 1911.

Station Employees.

The Brotherhood of Railway Station Employees held its annual meeting at Bangor, Me., May 9, 10, and 11. The meeting voted to take action toward spreading the organization on the Boston & Albany and the New York, New Haven & Hartford.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren F. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—I. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

New through passenger service was inaugurated by the Chicago, Rock Island & Pacific on May 14 between St. Paul, Minn., and Des Moines, Iowa, and between Memphis, Tenn., and California points.

The decision to make an extra charge for all pieces of baggage, the greatest dimension of which exceeds 40 in., has been reaffirmed by the Western Passenger Association and the Central Passenger Association.

The Bangor & Aroostook in April carried 1,141,386 bushels of potatoes out of Aroostook county, Maine. And since the beginning of the last harvest the quantity of potatoes which was moved through Augusta was 9,835,677 bushels. This quantity shows an increase of 1,474,573 bushels as compared with the previous season.

"The road improvement train," which is being run by the Southern Railway over its lines in Alabama, Mississippi and other states, appears to have been enlisted for the summer, schedules having been laid out which will last until October. Next week, during the Good Roads convention at Birmingham, the train with its exhibits will be on exhibition continuously in that city.

The "Spud special," a fast freight now running between Wharton, Texas, and Chicago, is carrying to the northern city the spring Irish potato crop, and it is expected that by this means, before the middle of June, about $2,000,000 worth of potatoes will be sent out of Texas. The train runs over the Houston & Texas Central, the Texas Midland and the St. Louis & San Francisco.

The Southern Railway, while urging the farmers of the South to diversify their crops and to raise cattle, at the same time takes care to do everything possible in the direction of increasing the yield of cotton per acre; and at the stations of the company and other places has posted placards setting forth the 10 principal points to be kept in mind by a farmer desiring to obtain the most plentiful crop and achieve the greatest success in the cultivation of this product.

Beginning May 28, the "Overland Limited" of the Union Pacific-Southern Pacific, which now leaves Chicago daily via the Chicago & North Western to Omaha at 7 p. m., and arrives in San Francisco at 5:28 p. m. of the third day, will leave Chicago an hour and a half later and reach San Francisco, Cal., at 2:28 p. m. of the third day, thus cutting 4½ hours from its schedule. Eastbound the train will leave San Francisco at 10:20 a. m. instead of 10:40 a. m., and arrive in Chicago at 9:10 a. m. of the third day instead of at 1 p. m., as under the present schedule.

The Chicago & North Western, the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & St. Paul, the Chicago, St. Paul, Minneapolis & Omaha and the Minnesota & International have taken formal action to enjoin the enforcement of the 2-cent passenger fare and the reduced freight and commodity rates in Minnesota. This will make applicable to these roads whatever ruling is made by the United States Supreme Court on the appeal from Judge Sanborn's recent decision, which directly affected only the Northern Pacific, Great Northern and Minneapolis & St. Louis, and will enable them to raise their rates on July 1.

In April, 1911, 374 vessels passed through the canals at Sault Ste. Marie, of which 183 passed through the United States canal, and 191 through the Canadian canal. The total freight on all these vessels was 792,587 tons; 181,736 tons of freight being carried through the United States canal and 610,851 tons through the Canadian canal. Of the total tonnage, 370,325 tons was eastbound and 422,262 tons westbound. The principal eastbound commodity was wheat, of which 5,664,653 bushels moved eastbound in April. The principal westbound tonnage was furnished by soft coal. The tonnage of this commodity moving in a westbound direction during April amounted to 286,468 tons.

INTERSTATE COMMERCE COMMISSION.

The commission is to make a general inquiry into the rates on wool and hides in connection with proposed increases of rates from all of the principal points of origin of this traffic west of the Mississippi river.

The commission has modified its recent order permitting the Carolina, Clinchfield & Ohio to disregard the long and short haul rule in making rates on coal from the mines in Virginia to tidewater at Charleston for export. Under the modified order the low rates must not be applied to coal to be loaded into ships' bunkers.

The special work for which Professor Henry C. Adams was employed by the Interstate Commerce Commission soon after the passage of the Hepburn Act, to inaugurate a system of uniform bookkeeping and accounting, having been concluded, he will retire from the work of the commission, leaving Charles A. Lutz, chief examiner of accounts, in charge of the work in the division of carrier's accounts, and Professor William J. Myers, statistician, in charge of the work in the division of statistics.

Complaint Dismissed.

Georgia Fruit Exchange et al. v. Southern Railway et al. Opinion by Commissioner Harlan:

Considering the methods practiced by growers in Georgia in picking and packing peaches and loading the crates into cars for the northern markets, and the difficulties of refrigerating peaches in transit, it is held that no grounds are shown for requiring the defendants to reduce their minimum carload weight on a 40-foot car from 22,500 pounds, or 535 crates, to 19,000 pounds, or 448 crates, as contended by the complainants. (20 I. C. C., 623.)

Lawrence-Wardenburg Co. v. Southern Pacific et al., F. D. Ogden v. Southern Pacific et al., New Orleans Board of Trade, Ltd. v. Southern Pacific et al. Opinion by Commissioner Harlan:

Following the conclusions reached in *Commercial Club of Omaha v. Southern Pacific,* complaints, seeking reparation for alleged unreasonable rates collected on shipments of lima beans from California points to New Orleans and to points in Texas, Oklahoma, Colorado, and New Mexico, are dismissed. (20 I. C. C., 638.)

Commercial Club of Omaha v. Southern Pacific et al. Opinion by Commissioner Harlan:

The long continuance of a rate voluntarily established and not published under the compelling influence of competitive conditions is in itself evidence of no little weight of its reasonableness; but the long continuance of a rate largely loses its value as evidence in a case involving an advanced rate for the same service, when it is shown that the prior and lower rate was the result of the influence of a strong movement by water.

The record presents no grounds for a finding that a rate of 85 cents per 100 pounds on lima beans in carloads from California to points in the territory extending from Colorado to the Atlantic seaboard is an excessive rate when considered as a blanket rate, or any grounds for taking Omaha out of a blanket territory, with which it has long been associated in this and other traffic without protest from any quarter, by a finding that it is an excessive rate to that particular point. Should it appear, however, from judicial proceedings now pending that the power of the commission to deal with rates applicable to so extensive a group is a limited one and not coextensive with the power of the carriers to establish group rates of such broad application, nothing said here must be understood as indicating that the commission would be satisfied with an 85-cent rate to Omaha.

The order heretofore entered herein vacated. (20 I. C. C., 631.)

Regulation of Telephone Rates.

William D. Shoemaker v. Chesapeake & Potomac Telephone Co. Opinion by Commissioner Harlan:

As between subscribers to a telephone service who are similarly situated, nothing but a difference in the service rendered or facilities furnished can justify a difference in the charges exacted. The fact that a few subscribers connected with a new exchange were previously connected with another exchange which was abandoned by the defendant from motives of economy in management and efficiency of service is not such a dissimilarity of

circumstances and conditions as to warrant the exaction of the current charges from a new subscriber while for the same service and facilities the old subscribers continue to pay the lower charges formerly exacted at the old exchange.

The contracts between such old subscribers and the defendant, even though valid when made, can not, after congress has undertaken to regulate the rates and practices of telephone companies, be accepted as now justifying different charges as between different subscribers similarly situated, such undue discriminations being forbidden by the act. (20 I. C. C., 614.)

Monthly Revenues and Expenses of Railways.

The two tables which we publish herewith, giving the revenues and expenses of railways for March, complete, the figures for March for about three-quarters of the roads reporting to the Interstate Commerce Commission; and the page table which we will publish June 2 will give the figures of the other roads which report to the Interstate Commerce Commission. Heretofore, we have published the figures for one-quarter of the roads each week, but by publishing the figures for half of them at once and then omitting one week it is possible to give the figures for nearly all of the important roads by the 17th or 18th of each month.

STATE COMMISSIONS.

Two railway commission bills, both of which provide for an enlargement of the powers of the present commission and make it an elective instead of an appointive body, have passed the Illinois house of representatives. The senate passed a bill previously passed by the house, placing express companies in the state under the jurisdiction of the commission.

Assistant Attorney General E. B. Robertson, of Texas, has advised the Texas commission that its rule that no stock shall be authorized and ordered registered by the commission on a railway until the line has been built and valued by the commission, is not sustained by law. He holds that a road has the right to present stock to the commission and have a record made of it, and also register it in the office of the secretary of state and sell it, without having built any road.

The Oklahoma Corporation Commission has announced that instead of continuing the fight to dissolve the injunction, recently upheld by the United States Circuit Court of Appeals, restraining the commission from enforcing its orders for reductions in freight rates, it will order new rates, which, to avoid the possibility of putting the commission in contempt of court, will be made either a little higher or a little lower than those in its original orders. A hearing on the proposed new rates on grain, grain products and hay will be held the latter part of May.

Hearings before the Washington Railway Commission regarding the adjustment of freight rates between competing communities in that state were closed on May 11. During the hearings J. G. Woodworth, traffic manager of the Northern Pacific, testified that if the rates from the coast to Spokane were reduced, corresponding reductions would have to be made from Atlantic seaboard points to Spokane if the railways are to get any of the long-haul traffic, as otherwise much of the traffic from the eastern part of the United States to Spokane would be diverted to the water routes. The increased operating expenses due to the working of the Washington "full crew" law was one of the items introduced by the roads to justify their present rates, the figures of the Northern Pacific showing that the increase in its operating expenses on this account will amount to from $175,000 to $200,000 annually.

The Railroad Commission of Louisiana has fined the Louisiana & Northwest $2,000 for failure to obey its order directing the improvement of freight and passenger service. The Louisiana & Northwest runs from McNeil, Ark., to Natchitoches, La., 121 miles, 96 miles of the road being in Louisiana. The commission took evidence from shippers and people who live on the line, and this evidence showed that the freight service had been of a very poor nature for a long time; delays to freight had been frequent and sometimes had amounted to as much as 30 days. In 1907 the commission ordered the railway to run at least one passenger train each way daily over its line in Louisiana and one freight train each way daily. If anything, the freight service during the past few months has been worse than it was when this order was issued. The excuse that the company has made is that its financial condition is such that it is doing all that it can do. The commission, however, holds that a railway company must provide proper and sufficient facilities for transportation, and its failure to do so is of itself a violation of its obligations.

COURT NEWS.

The decision of the United States Supreme Court, dissolving the Standard Oil Company, is reported on another page.

At Pittsburgh, May 13, the Pennsylvania Railroad was fined $1,000 for violation of the Interstate Commerce law in failure to adhere to tariffs in the collection of demurrage at Johnstown, Pa., on a carload of freight from Ashtabula, Ohio, for the Cambria Steel Company.

The Pittsburgh & Lake Erie, which was indicted last month by a special federal grand jury on 20 counts, ten charging failure to comply with tariffs filed with the Interstate Commerce Commission and ten charging unlawful granting of concessions in rates, has been fined $1,000 by the United States District Court at Pittsburgh, the fine being imposed on the first count only. The road's attorney stated that the violation of law was merely technical and that certain records relating to the matter had been destroyed in a flood.

In the Federal Court at Kansas City, May 12, Judge Pollock decided against the Government in its suit against trainmen of the Missouri Pacific on the division between Kansas City and Hoisington, Kan. He sustained a demurrer filed by the attorney for the trainmen, holding that no provision of the Interstate Commerce law had been violated. His decision quashed the indictments returned March 7 by a Federal Grand Jury against twenty-four employees of the Missouri Pacific. The company learned that certain conductors, porters and brakemen were carrying passengers for less than the published tariff rates and were keeping the money. Instead of prosecuting the men the railway turned the case over to the United States District Attorney and the men were indicted.

[Section 10 of the Interstate Commerce Act says that any common carrier, or, if it is a corporation, any person employed by it, who shall wilfully do any thing in this Act prohibited shall be deemed guilty of a misdemeanor and subject to a fine of $5,000; and, if the offense be unlawful discrimination in rates or fares, to imprisonment for two years, also. On a prominent eastern road this provision of the law is posted in the passenger cars.—Editor.]

The Supreme Court of the United States on Monday last again sustained the safety appliance laws, as making it absolutely the duty of interstate carriers to keep in repair automatic couplers and other appliances prescribed by law. In the suit of Delk, a brakeman who was injured on the St. Louis & San Francisco while manipulating a defective coupler, the railway claimed that in exercising reasonable diligence, in the matter of repairs, it had done its full duty. The Court of Appeals for the sixth circuit, decided in favor of the railway, but the Supreme court now reverses this, deciding for Delk. According to the press despatches, this decision settles also three other cases appealed to the Supreme court. In a case against the Chicago, Burlington & Quincy, the road had claimed that the imposition of a fine for violation of the law was unreasonable because the company did not know that the cars in question were out of repair and had no intention of violating the law. In a case against the Colorado & Northwestern, a narrow gauge road, engines and cars were used having the old fashioned link and pin (non-automatic) couplers. This road lies wholly within Boulder county and the defense of the company was that it had no arrangement for a continuous transportation with the connecting carrier, but the Supreme court holds that traffic may be interstate in spite of the absence of such an arrangement. The fourth case was one against the Southern Railway, where the defense was that the defective car was carrying a shipment which originated and ended within the state of Alabama. The court held that the defect in the car was a violation of the law because the car was sometimes used for interstate commerce and therefore was an instrumentality of interstate commerce.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1911. (SEE ALSO ISSUE MAY 12.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$218,525	$81,211	$335,255	$49,234	$99,448	$9,758	$118,477	$9,159	$286,076	$49,179	—$180	$13,241	$35,758	—$79,470
Atlanta, Birmingham & Atlantic	662	215,798	42,823	274,389	33,705	37,061	16,525	95,712	8,986	191,989	82,400	.....	10,500	71,900	11,875
Baltimore & Ohio—System	4,434	5,449,479	1,080,413	6,953,914	645,234	1,150,329	138,722	2,658,970	150,880	4,744,135	2,209,779	—1,496	195,271	2,013,012	—438,231
Bangor & Aroostook	627	258,584	43,250	316,461	39,679	36,694	3,812	94,127	12,810	187,122	129,339	.....	2,524	126,815	—48,604
Bessemer & Lake Erie	204	424,380	20,943	453,204	38,889	158,210	7,550	146,062	8,338	359,049	94,155	.....	6,000	88,155	—56,953
Central New England	277	213,559	27,011	255,186	29,702	20,144	1,128	70,800	19,047	140,821	114,365	.....	19,000	95,365	—30,641
Central of Georgia	1,915	864,894	264,074	1,232,013	138,737	220,420	31,764	399,560	37,407	827,888	404,125	6,623	45,470	365,278	43,363
Central Vermont	411	260,524	62,747	345,184	28,897	33,426	7,171	174,758	11,244	255,496	89,688	297	12,750	77,235	—3,112
Chesapeake & Ohio	1,948	1,962,985	384,135	2,450,651	289,200	516,923	43,515	773,281	62,762	1,685,681	764,970	3,948	93,250	675,668	—484,481
Chesapeake & Ohio of Indiana	285	104,494	13,880	123,896	30,907	51,169	4,404	75,344	5,556	167,380	—43,484	46	3,790	—47,228	—
Chicago & Alton	1,025	691,429	318,761	1,098,931	96,204	109,178	48,255	413,163	33,147	699,947	398,984	—1,915	37,000	360,069	—8,843
Chicago & Erie	269	386,763	56,163	480,894	38,929	88,905	20,033	221,692	10,161	379,720	101,174	.....	11,387	89,787	—8,542
Chicago, Indiana & Southern	329	305,805	19,700	333,605	38,774	73,947	7,175	124,137	9,028	253,061	80,544	—824	13,900	65,820	—53,540
Chicago, Indianapolis & Louisville	616	340,106	126,757	512,880	61,750	76,482	18,643	183,566	16,855	357,296	155,584	.....	22,500	133,084	—7,862
Chicago, Milwaukee & Puget Sound	1,980	1,200,350	127,549	1,355,346	83,789	120,611	28,200	433,214	17,631	683,445	671,901	3,976	50,306	625,571	183,035
Chicago, Milwaukee & St. Paul	7,511	3,710,707	1,049,440	5,238,606	412,257	648,863	108,461	2,202,766	98,481	3,470,828	1,767,778	9,136	226,616	1,550,298	—536,505
Chicago, Rock Island & Gulf	471	159,850	52,346	227,324	31,806	15,266	8,182	93,230	7,745	156,229	71,095	—167	9,501	61,427	16,001
Cincinnati, New Orleans & Texas Pacific	337	402,293	126,387	573,033	87,542	160,393	19,424	240,086	18,803	526,248	46,785	—205	21,800	24,780	—289,324
Cleveland, Akron & Columbus	212	158,854	42,016	214,302	36,452	38,801	2,527	71,121	3,278	152,176	62,126	.....	8,500	53,626	1,041
Cleveland, Cincinnati, Chic. & St. Louis	1,979	1,730,239	584,021	2,555,219	268,400	440,108	77,372	1,074,842	60,916	1,921,638	633,581	—7,519	80,000	546,062	—157,617
Colorado & Southern	1,173	496,405	97,807	641,169	59,862	138,140	13,910	207,318	24,022	443,252	197,917	—780	24,700	172,437	—63,463
Cumberland Valley	162	173,972	44,518	228,109	82,340	30,008	4,056	81,480	8,309	206,193	21,916	354	5,141	17,129	—47,371
Delaware & Hudson Co.—R. R. Dept.	819	1,583,727	180,364	1,812,488	116,525	282,014	20,080	669,750	41,646	1,130,015	682,473	—1,185	44,067	637,221	—86,253
Duluth, South Shore & Atlantic	611	153,842	61,272	227,535	39,265	31,750	10,574	99,193	6,240	187,022	40,513	—664	18,000	21,849	—62,003
El Paso & Southwestern Co	901	488,748	80,363	599,792	72,381	86,727	10,977	177,678	23,803	371,566	228,226	—985	20,076	207,165	—48,081
Elgin, Joliet & Eastern	831	627,462	11	669,039	52,004	92,050	4,197	230,877	13,241	392,369	276,670	.....	19,600	257,070	—57,613
Evansville & Terre Haute	310	137,666	56,506	217,265	24,169	23,916	5,195	70,865	7,111	131,256	86,009	—859	10,023	75,127	—5,956
Florida East Coast	583	350,550	273,588	707,065	42,908	58,701	10,039	176,598	7,783	296,029	411,037	.....	15,500	395,537	109,302
Fort Worth & Denver City	454	209,271	114,882	352,165	39,306	68,070	5,445	129,349	14,653	256,823	95,342	—1,144	10,522	83,676	—71,792
Galveston, Harrisburg & San Antonio	1,338	614,231	257,830	919,695	126,118	166,988	32,993	327,758	31,482	685,339	234,356	—740	29,697	203,919	—9,127
Georgia	307	220,982	64,734	301,783	29,967	41,012	10,282	126,617	7,047	214,925	86,858	.....	2,100	84,758	8,426
Grand Rapids & Indiana	587	301,377	115,059	444,630	51,806	80,630	10,778	185,206	14,085	342,505	102,125	—181	23,351	78,593	—12,092
Hocking Valley	350	366,930	60,890	452,751	66,199	81,399	9,553	189,052	19,609	365,812	86,939	.....	24,725	62,214	—210,745
Houston & Texas Central	789	326,711	119,587	482,477	86,488	75,095	17,424	227,436	23,754	430,197	52,280	—1,337	17,816	33,127	—6,361
Illinois Central	4,574	3,382,612	1,021,289	5,063,317	558,138	1,005,205	112,862	1,865,690	143,829	3,685,724	1,377,593	—7,901	238,123	1,131,569	—546,277
International & Great Northern	1,159	511,323	176,844	733,082	116,913	129,690	19,047	332,343	24,157	619,150	113,932	—142	20,000	93,790	32,627
Iowa Central	559	272,245	44,364	329,053	30,941	45,622	6,857	129,063	7,625	220,108	108,945	.....	9,689	99,256	10,358
Kanawha & Michigan	175	204,488	26,365	235,952	20,621	38,727	2,193	68,754	7,395	137,690	98,262	22	7,267	91,017	16,403
Lake Erie & Western	886	368,606	60,231	452,270	70,213	90,399	13,273	188,830	12,554	375,269	77,001	.....	18,000	59,001	—45,733
Long Island	395	271,498	391,882	699,706	93,656	104,158	12,526	401,756	29,186	641,282	58,424	24,814	53,333	29,905	—65,409
Minneapolis & St. Louis	1,027	327,665	92,534	447,449	28,277	51,377	11,125	167,337	13,333	271,449	176,000	—39	17,332	158,629	32,293
Missouri, Kansas & Texas	1,737	893,363	384,279	1,372,521	155,347	219,770	40,231	483,636	43,821	942,805	429,716	—350	58,500	370,866	—
Missouri, Kansas & Texas of Texas	1,348	413,465	316,999	791,351	179,049	69,704	22,334	457,448	30,662	759,197	32,154	—336	22,500	9,318	—16,458
Missouri Pacific	3,921	1,382,978	355,744	1,934,689	300,314	276,552	55,611	992,251	70,586	1,695,314	239,375	—2,885	83,500	152,990	—236,966
Mobile & Ohio	1,114	755,450	107,993	1,017,345	114,515	171,314	31,424	346,332	39,089	702,674	314,671	—716	25,460	288,495	50,652
Morgan's La. & Texas R. R. & S. S. Co.	404	250,360	99,100	376,273	55,157	60,999	12,102	150,139	13,853	292,250	84,023	206	18,756	65,473	—19,615
Nashville, Chattanooga & St. Louis	1,230	854,198	212,707	1,138,731	207,330	200,379	39,933	395,884	24,450	867,976	270,755	—5,060	25,278	240,417	—26,588
New Orleans & Northeastern	196	230,023	48,280	298,037	28,133	38,387	10,144	108,811	11,364	196,839	101,198	—428	9,250	91,520	—30,359
New Orleans, Mobile & Chicago	404	128,191	27,260	164,291	23,294	13,441	2,759	50,113	9,446	99,053	65,238	.....	4,267	60,971	7,381
New York, Chicago & St. Louis	562	805,336	92,377	933,819	80,640	125,615	46,188	435,974	15,276	703,693	230,126	—1,993	29,600	198,533	—160,805
New York, Ontario & Western	546	635,892	88,419	744,783	93,046	132,242	9,461	321,473	19,397	575,619	169,164	—7,322	17,500	144,342	—65,511
New York, Philadelphia & Norfolk	112	216,600	30,599	265,194	38,077	51,674	4,024	104,750	11,549	210,074	55,120	.....	7,500	47,620	—21,075
New York, Susquehanna & Western	152	191,217	44,341	262,677	15,612	24,398	1,718	99,435	3,641	144,804	117,873	3,832	11,771	109,934	11,173
Norfolk Southern	608	225,794	51,428	290,682	37,865	30,147	4,731	88,334	13,701	174,778	115,904	—158	5,960	109,846	—
Peoria & Eastern	351	194,979	51,618	267,469	34,839	48,522	5,179	126,253	7,295	222,088	45,381	.....	9,500	35,881	—47,975
Philadelphia & Reading	1,022	3,012,947	516,033	3,715,525	284,727	735,696	38,727	1,223,997	62,573	2,345,720	1,369,805	29,766	84,142	1,291,429	—92,360
Pittsburgh & Lake Erie	191	1,068,225	112,619	1,216,951	123,657	119,984	16,422	311,108	27,401	598,570	618,381	—466	30,000	587,915	—241,039
Rutland	468	149,461	75,507	252,857	28,194	45,782	5,736	117,184	7,384	204,280	48,577	.....	9,538	39,039	—19,613
St. Louis & San Francisco	4,732	2,336,676	892,550	3,475,440	361,237	432,895	78,108	1,250,947	93,194	2,216,381	1,259,059	.....	153,814	1,105,245	—68,198
St. Louis, Brownsville & Mexico	501	90,557	57,192	166,786	37,289	12,510	2,525	64,313	8,206	124,843	41,943	.....	4,500	37,443	4,186
St. Louis, Iron Mountain & Southern	3,313	1,725,885	495,198	2,407,063	201,830	273,697	53,186	833,370	74,739	1,436,822	970,241	—4,044	78,916	887,281	—11,938
St. Louis Southwestern	797	536,661	102,590	666,227	75,797	104,893	25,982	164,150	23,948	394,770	271,457	—493	21,574	249,390	4,319
St. Louis Southwestern of Texas	703	230,872	64,751	316,267	93,915	78,570	11,697	159,586	16,394	360,162	—43,895	125	10,000	—54,020	32,036
San Pedro, Los Angeles & Salt Lake	1,105	369,733	192,044	595,798	128,388	123,127	27,740	252,158	18,335	549,748	46,050	—4,015	26,687	15,348	170,053
Seaboard Air Line	3,046	1,600,476	441,466	2,253,819	227,872	292,158	58,103	736,455	55,075	1,369,663	884,156	777	72,000	812,933	100,696
Southern Pacific Co.	6,187	4,191,691	2,484,054	7,231,623	987,990	940,468	167,074	2,173,642	258,872	4,528,046	2,703,577	29,442	295,195	2,437,824	—441,042
Spokane, Portland & Seattle	551	272,595	140,025	429,658	50,142	46,735	6,986	107,198	12,183	223,244	206,414	1,314	42,200	165,528	83,588
Texas & Pacific	1,885	818,151	319,558	1,205,475	184,437	262,438	18,614	574,267	38,248	1,078,004	127,471	1,384	44,764	84,091	—192,597
Toledo & Ohio Central	444	302,634	34,747	351,230	54,205	55,266	7,163	138,222	10,641	265,497	85,733	—53	20,344	65,336	—60,857
Toledo, St. Louis & Western	451	257,325	34,270	311,089	34,514	48,614	10,693	116,740	8,921	219,482	91,607	.....	14,550	77,057	—20,420
Virginian	474	272,698	17,982	299,110	32,592	64,946	5,308	80,353	8,061	191,260	107,850	5,599	17,600	95,849	36,988
Wabash	2,515	1,700,960	499,569	2,372,442	262,054	413,657	70,921	1,049,397	102,727	1,898,756	473,686	—2,668	76,948	394,070	—310,710
West Jersey & Seashore	353	153,870	223,671	400,019	73,723	51,560	10,660	202,085	11,245	349,273	50,746	—4,193	23,227	23,326	—27,967
Wheeling & Lake Erie	457	430,396	40,351	501,483	58,314	109,105	7,538	200,631	13,468	389,053	112,427	2,126	20,015	94,538	—90,238
Yazoo & Mississippi Valley	1,372	632,573	205,362	908,823	156,685	135,938	14,720	315,985	24,229	647,557	261,266	214	36,050	225,430	—2,280

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR, 1911. (SEE ALSO ISSUE OF MAY 12.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$2,282,006	$852,828	$3,425,897	$432,640	$788,814	$93,039	$1,049,358	$82,648	$2,446,499	$979,398	—$6,206	$122,317	$850,875	—$5,380
Atlanta, Birmingham & Atlantic	662	1,587,781	462,273	2,181,817	264,163	334,123	135,304	790,397	82,645	1,606,632	575,185	.....	99,645	475,540	92,691
Baltimore & Ohio—System	4,434[1]	50,680,045	11,587,255	66,277,040	7,681,706	12,291,361	1,491,254	25,249,909	1,384,558	48,098,788	18,178,252	—84,713	1,964,681	16,128,858	—2,402,958
Bangor & Aroostook	627[2]	1,759,441	484,351	2,374,723	392,081	281,562	30,609	740,738	98,135	1,543,125	831,598	.....	20,674	810,924	—107,340
Bessemer & Lake Erie	204	5,104,075	276,033	5,463,658	648,769	1,223,681	69,643	1,572,483	104,563	3,619,139	1,844,519	.....	80,208	1,764,311	—729,047
Central New England	277	1,948,841	266,503	2,342,852	442,178	201,849	16,641	684,902	43,792	1,389,362	953,490	.....	111,000	842,490	—53,874
Central of Georgia	1,915	6,697,091	2,654,480	10,221,197	1,340,867	1,660,682	293,024	3,223,459	364,415	6,882,447	3,338,750	58,353	411,958	2,985,146	136,057
Central Vermont	411	1,932,093	801,218	2,950,805	350,759	427,986	63,663	1,375,415	72,053	2,289,876	660,929	4,891	99,116	566,704	—29,085
Chesapeake & Ohio	1,948	18,628,992	3,992,124	23,601,995	2,669,084	4,464,383	402,608	7,056,629	544,839	15,137,543	8,464,452	—12,744	740,623	7,711,085	—1,181,266
Chesapeake & Ohio of Indiana	285	908,821	206,878	1,175,027	285,539	261,417	53,145	646,630	45,827	1,292,558	—117,531	102	34,110	—151,539	—
Chicago & Alton	1,025[3]	6,987,253	3,282,576	11,075,741	1,430,741	1,816,290	353,678	4,168,110	311,360	8,080,178	2,995,563	—16,696	325,600	2,653,267	—762,061
Chicago & Erie	269	3,033,920	602,966	3,983,125	435,043	821,922	182,954	1,808,782	86,865	3,335,566	647,559	.....	102,038	545,521	—176,548
Chicago, Indiana & Southern	329	2,465,832	216,642	2,757,989	377,300	550,312	78,442	1,079,502	80,460	2,166,016	591,973	—2,021	122,393	467,559	—303,244
Chicago, Indianapolis & Louisville	616	3,015,454	1,179,443	4,597,772	594,674	655,425	150,777	1,648,308	134,493	3,183,677	1,414,095	.....	202,500	1,211,595	—132,266
Chicago, Milwaukee & Puget Sound	1,980[4]	9,587,053	1,075,778	10,950,185	692,976	1,139,468	265,607	3,918,017	126,715	6,142,783	4,807,402	14,109	377,921	4,443,590	—
Chicago, Milwaukee & St. Paul	7,511	34,638,174	10,740,256	49,981,290	6,267,687	6,993,835	960,784	21,828,772	812,267	36,863,345	13,117,945	129,647	1,982,851	11,264,741	—2,000,543
Chicago, Rock Island & Gulf	471[5]	1,567,175	539,249	2,249,404	333,360	168,936	81,387	813,750	73,414	1,470,847	778,557	—2,465	58,177	717,915	10,445
Cincinnati, New Orleans & Texas Pacific	337	5,283,872	1,294,265	6,928,487	724,145	1,383,359	185,082	2,017,058	161,324	4,470,968	2,457,519	—14,731	195,216	2,247,572	—125,635
Cleveland, Akron & Columbus	212	1,448,825	439,699	2,021,442	358,231	339,120	27,444	677,011	35,169	1,436,975	584,467	.....	79,500	504,967	69,862
Cleveland, Cincinnati, Chic. & St. Louis	1,979	15,234,500	6,049,056	23,374,293	2,991,374	4,028,669	760,409	9,954,389	525,771	18,260,612	5,113,681	—67,021	733,548	4,313,112	—1,757,555
Colorado & Southern	1,173[6]	5,573,750	1,198,844	7,166,604	814,321	1,391,792	107,677	2,268,082	201,463	4,783,335	2,383,269	—11,963	222,300	2,149,006	—240,474
Cumberland Valley	162	1,718,922	486,883	2,311,135	318,093	306,974	42,026	740,668	60,718	1,468,479	842,656	2,592	49,306	795,942	—68,363
Delaware & Hudson Co.—R. R. Dept.	819[7]	12,892,002	2,266,095	15,629,460	1,177,660	2,208,751	197,046	5,514,800	368,875	9,468,032	6,161,428	—12	411,705	5,749,711	—227,305
Duluth, South Shore & Atlantic	611	1,503,103	725,570	2,353,796	338,356	267,560	90,474	912,159	62,885	1,671,434	682,362	6,307	159,871	528,798	—80,179
El Paso & Southwestern Co	901	4,459,781	729,633	5,458,240	686,548	730,449	96,619	1,565,973	205,165	3,284,754	2,173,486	—10,435	169,327	1,993,725	34,185
Elgin, Joliet & Eastern	831[8]	5,671,404	69	6,010,235	753,806	1,209,264	36,554	1,954,909	151,650	4,106,183	1,904,052	.....	145,800	1,758,252	—770,502
Evansville & Terre Haute	310	1,295,868	551,738	2,041,287	249,409	272,884	49,629	662,510	58,343	1,292,775	748,512	—6,903	85,303	656,305	19,185
Florida East Coast	583	1,499,278	1,127,326	2,992,030	387,125	411,430	61,607	972,009	70,084	1,902,255	1,089,775	.....	127,141	962,634	268,241
Fort Worth & Denver City	454	2,618,027	1,284,843	4,094,712	398,960	664,469	53,784	1,292,593	132,537	2,542,343	1,552,369	—11,860	91,565	1,448,944	—186,045
Galveston, Harrisburg & San Antonio	1,338	5,849,039	2,123,722	8,397,137	1,091,072	1,287,303	252,720	3,069,491	257,887	5,958,473	2,438,664	—22,290	270,515	2,145,858	64,996
Georgia	307	1,689,595	679,412	2,519,585	315,996	375,346	94,448	1,006,266	65,126	1,857,182	662,403	.....	18,413	643,989	12,692
Grand Rapids & Indiana	587	2,355,478	1,309,269	3,946,380	505,919	655,617	109,567	1,739,222	132,425	3,142,750	803,630	—400	216,183	587,047	—240,855
Hocking Valley	350	4,536,648	670,608	5,541,137	712,029	896,325	79,981	1,806,157	154,833	3,649,325	1,891,812	.....	252,990	1,638,822	—467,932
Houston & Texas Central	789	3,422,798	1,272,753	5,016,776	704,681	602,899	165,183	2,001,874	194,573	3,669,210	1,347,566	—4,896	165,135	1,177,535	—3,571
Illinois Central	4,574[9]	31,035,728	9,923,866	46,519,586	5,574,053	9,312,290	1,008,987	16,031,540	997,839	32,924,709	13,594,877	—32,548	1,968,470	11,593,859	1,914,749
International & Great Northern	1,159	5,066,257	1,632,536	7,143,741	1,044,084	1,043,871	176,884	2,962,200	197,928	5,424,967	1,718,774	—3,024	194,000	1,521,750	387,828
Iowa Central	559	2,154,026	426,071	2,696,847	310,524	449,874	63,988	1,120,371	77,816	2,022,573	674,274	.....	88,040	586,234	23,687
Kanawha & Michigan	175	2,033,591	269,229	2,352,990	242,446	414,395	20,551	654,424	62,453	1,394,269	958,721	—67	68,916	889,738	312,933
Lake Erie & Western	886	3,311,933	692,496	4,231,818	684,294	795,843	139,032	1,644,089	111,620	3,374,878	856,940	.....	167,762	689,178	—390,686
Long Island	395	2,280,770	4,726,642	7,363,243	861,314	1,051,599	151,746	3,592,405	208,035	5,865,099	1,498,144	519,278	421,421	1,596,001	—526,250
Minneapolis & St. Louis	1,027	2,791,477	940,862	3,989,309	408,500	506,000	99,763	1,583,154	135,778	2,733,195	1,256,114	—307	175,917	1,079,890	34,132
Missouri, Kansas & Texas	1,737[10]	8,829,276	3,703,273	13,363,654	1,718,188	1,901,086	338,103	4,482,244	395,215	8,834,836	4,528,818	452	522,083	4,007,187	—
Missouri, Kansas & Texas of Texas	1,348	5,170,863	2,902,293	8,585,203	1,285,219	605,543	206,229	4,028,323	314,935	6,440,249	2,144,954	—5,935	201,102	1,936,917	433,838
Missouri Pacific	3,921[11]	13,141,513	3,582,184	18,653,138	2,921,068	2,952,639	530,667	8,687,212	632,995	15,724,581	2,928,557	—25,104	751,500	2,151,953	—
Mobile & Ohio	1,114	6,085,610	1,096,299	8,359,491	971,882	1,450,663	294,306	2,876,846	310,913	5,904,610	2,454,881	—12,564	225,540	2,216,777	68,399
Morgan's La. & Texas R. R. & S. S. Co.	404[12]	2,773,146	916,202	3,922,583	529,101	462,230	101,638	1,360,817	123,040	2,576,826	1,345,757	—12,731	175,501	1,157,525	—31,633
Nashville, Chattanooga & St. Louis	1,230	6,539,204	2,165,950	9,287,337	1,403,688	1,731,742	317,884	3,281,735	221,929	6,956,978	2,330,359	—9,484	206,566	2,114,309	—105,838
New Orleans & Northeastern	196	2,033,714	475,210	2,709,319	270,345	408,562	83,222	961,885	103,785	1,827,799	881,520	—1,466	79,137	800,917	—20,030
New Orleans, Mobile & Chicago	404	1,053,696	257,780	1,400,598	193,451	111,894	25,459	414,318	74,126	819,248	581,350	.....	39,010	542,340	99,749
New York, Chicago & St. Louis	562	6,978,811	1,155,046	8,441,446	913,049	1,113,841	446,062	3,561,216	144,322	6,178,490	2,262,956	—14,891	276,120	1,971,945	—790,610
New York, Ontario & Western	546	5,460,482	1,289,466	7,008,577	834,866	1,102,837	102,342	2,767,917	159,500	4,967,462	2,041,115	—42,146	157,500	1,841,469	125,832
New York, Philadelphia & Norfolk	112	2,007,082	315,277	2,508,751	286,342	427,226	39,061	971,093	100,997	1,824,719	684,032	.....	69,150	614,882	—106,803
New York, Susquehanna & Western	152	1,512,243	447,877	2,201,371	243,060	205,927	18,016	815,286	37,311	1,319,600	881,772	5,074	105,486	781,360	129,596
Norfolk Southern	608	1,455,621	572,325	2,177,616	248,087	256,470	43,684	676,724	123,729	1,348,694	828,922	3,620	53,900	778,643	—
Peoria & Eastern	351	2,027,761	546,874	2,770,456	355,925	439,406	53,634	1,170,389	53,668	2,093,022	677,434	.....	86,378	591,056	—133,971
Philadelphia & Reading	1,022	26,126,558	5,258,458	32,857,603	2,753,342	6,154,100	383,919	10,687,664	590,394	20,569,419	12,288,184	159,191	758,029	11,689,346	—688,772
Pittsburgh & Lake Erie	191	10,454,036	1,204,306	12,017,899	1,438,859	1,163,984	132,364	2,904,331	217,272	5,856,810	6,161,089	—3,459	246,576	5,911,054	—1,644,035
Rutland	468	1,398,564	869,942	2,564,090	337,812	400,636	63,729	1,012,070	64,221	1,878,468	685,622	.....	94,479	591,143	—52,527
St. Louis & San Francisco	4,732	20,723,364	8,676,217	31,598,290	4,160,595	4,260,122	772,679	11,168,280	909,808	21,271,484	10,326,806	.....	1,301,430	9,025,376	646,159
St. Louis, Brownsville & Mexico	501	839,876	454,884	1,405,955	387,970	113,099	21,025	512,780	71,532	1,106,406	299,549	.....	43,000	256,549	23,555
St. Louis, Iron Mountain & Southern	3,313[13]	15,262,739	4,648,760	21,616,858	3,070,430	2,806,392	499,559	7,362,332	687,554	14,426,267	7,190,591	—33,071	708,284	6,349,236	—92,773
St. Louis Southwestern	797[14]	4,754,203	1,072,878	6,087,888	654,696	939,612	241,090	1,501,829	203,970	3,541,197	2,546,691	—6,175	180,089	2,360,427	132,376
St. Louis Southwestern of Texas	703	2,362,909	785,466	3,343,464	836,481	662,940	96,930	1,465,165	151,930	3,213,446	130,018	—1,858	85,726	42,434	96,131
San Pedro, Los Angeles & Salt Lake	1,105[15]	3,566,450	1,998,516	5,933,623	1,092,683	978,988	278,749	2,233,195	156,001	4,739,616	1,194,007	—44,069	240,773	909,165	90,496
Seaboard Air Line	3,046[16]	11,142,072	3,567,250	16,360,428	2,130,757	2,198,001	545,638	5,502,843	454,486	10,831,725	5,528,703	—8,632	602,000	4,918,071	266,024
Southern Pacific Co.	6,187[17]	40,493,439	23,986,006	69,233,883	8,568,512	8,862,377	1,480,530	18,891,554	2,089,354	39,892,327	29,341,556	225,171	2,512,827	27,053,900	—3,265,354
Spokane, Portland & Seattle	551[18]	2,421,013	808,166	3,402,406	394,158	249,695	39,359	901,140	88,885	1,673,237	1,729,169	—6,294	302,800	1,420,075	841,588
Texas & Pacific	1,885	8,580,583	3,167,787	12,632,679	1,454,927	2,369,448	191,296	5,121,032	330,227	9,466,930	3,165,749	—3,046	465,390	2,697,313	—690,075
Toledo & Ohio Central	444	3,214,040	495,216	3,898,548	534,266	532,845	60,070	1,330,537	72,194	2,529,912	1,368,636	—422	170,846	1,197,368	90,078
Toledo, St. Louis & Western	451	2,317,323	356,016	2,850,383	367,609	416,478	79,489	1,010,389	84,166	1,958,131	892,252	.....	127,700	764,551	—148,958
Virginian	474[19]	2,372,203	193,824	2,640,614	298,866	449,467	46,432	724,071	68,843	1,587,679	1,052,935	44,146	131,756	965,325	651,094
Wabash	2,515	15,417,540	5,635,216	22,702,285	2,502,048	3,623,002	691,073	9,044,776	687,345	16,548,244	6,154,041	—16,070	681,198	5,456,773	—$46,206
West Jersey & Seashore	353	1,364,911	2,939,599	4,591,261	730,441	569,447	139,659	1,946,521	96,722	3,482,790	1,108,471	—49,476	206,321	852,674	—343
Wheeling & Lake Erie	457	4,293,323	466,925	5,097,267	563,731	1,019,916	74,202	1,844,949	123,229	3,626,027	1,471,240	27,560	185,972	1,312,828	—170,874
Yazoo & Mississippi Valley	1,372	5,833,266	2,139,588	8,495,265	1,494,525	1,187,665	134,659	2,630,426	213,100	5,660,374	2,834,890	—3,445	306,098	2,525,347	952,800

Mileage operated on March 31, 1910.—[1] 4,460 miles; [2] 546 miles; [3] 998 miles; [4] 1,463 miles; [5] 529 miles; [6] 1,249 miles; [7] 843 miles; [8] 781 miles; [9] 4,550 miles; [10] 1,724 miles; [11] 3,883 miles; [12] 348 miles; [13] 3,287 miles; [14] 773 miles; [15] 979 miles; [16] 2,995 miles; [17] 6,076 miles; [18] 420 miles; [19] 444 miles. — indicates deficits, losses and decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

L. S. Thorne, vice-president and general manager of the Texas & Pacific, with office at Dallas, Tex., has been retired. See item under Operating Officers.

A. J. Mitchell, secretary and treasurer of the Niagara, St. Catherines & Toronto, at Toronto, Ont., has been appointed assistant to the vice-president of the Canadian Northern, with office at Toronto.

R. F. Whitman has been elected president of the Tennessee & North Carolina with office at Philadelphia, Pa., succeeding J. B. Hart. James G. Campbell succeeds J. D. Lacey as vice-president, with office at New York, and David G. Wilson, succeeds C. R. Drewry as secretary and treasurer, with office at Philadelphia. A. J. McMahon remains as superintendent and auditor, with office at Newport, Tenn.

Operating Officers.

F. E. Jones, chief train despatcher of the Tonopah & Goldfield, has been appointed also trainmaster, with office at Goldfield, Nev.

Lee H. Landis, formerly general manager of the Phoenix & Buckeye, now part of the Arizona Eastern, has been appointed general manager of the Ocean Shore Railroad, with office at San Francisco, succeeding A. H. Otis, resigned.

C. S. Cunningham, joint superintendent of the Grand Trunk and the Wabash Railroad, at St. Thomas, Ont., has been appointed acting superintendent of the Western division of the Grand Trunk, with office at Detroit, Mich., succeeding F. W. Egan, granted leave of absence on account of ill health.

Incident to the election of T. J. Freeman as first vice-president of the Texas & Pacific, L. S. Thorne, vice-president and general manager, has retired. J. W. Everman, assistant general manager at Dallas, Tex., has been appointed general superintendent, in charge of operating and transportation departments, with office at Dallas. Page Harris, division superintendent at New Orleans, La., has been appointed assistant general superintendent, with office at Dallas.

C. G. Bowker, assistant superintendent of the Grand Trunk, at London, Ont., has been appointed joint superintendent of the Southern division of the Grand Trunk and the Wabash Railroad, with office at St. Thomas, succeeding C. S. Cunningham, transferred. W. R. Davidson, trainmaster at Hamilton, has been appointed trainmaster, with office at London, succeeding to the duties of Mr. Bowker, and C. H. Brown has been appointed assistant trainmaster, with office at Hamilton, and the offices of assistant superintendent at London and trainmaster at Hamilton have been abolished.

Guy H. Alexander, who was recently appointed superintendent of car service of the New York Central & Hudson River, with office at New York City, as has been announced in these columns, was born November 8, 1868, at Mobile, Ala., and was educated in the public schools of his native town. He began railway work February 1, 1886, as stenographer and clerk in the auditor's office of the Mobile & Ohio, and three years later was appointed chief clerk in the superintendent's and general superintendent's office. From June, 1894, to October, 1901, he was chief clerk in the superintendent's office of the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River, and was then appointed a traveling auditor. In December, 1906, he was appointed car accountant, which position he held at the time of his recent appointment as superintendent of car service.

Harry D. Earl, whose appointment as superintendent of the St. Louis Southwestern Railway, of Texas, with office at Mt. Pleasant, Tex., has been announced in these columns, was born March 28, 1879, at Martin, Ohio. He received a common school education and in June, 1896, began railway work at Amherst, Ohio, in the operating department of the Lake Shore & Michigan Southern. He was later for one year operator for the Toledo, St. Louis & Kansas City, now the Toledo, St. Louis & Western, and went with the St. Louis Southwestern in September, 1898, as an operator at Sherman, Tex.; he was later transferred to Commerce, Tex., and was then consecutively promoted to train despatcher at Commerce and Mt. Pleasant, chief despatcher at Mt. Pleasant, and for three years from June, 1907, was trainmaster at Tyler, Tex. He was promoted to assistant superintendent at Tyler in April, 1910, from which office he is now advanced to superintendent as above.

Traffic Officers.

R. D. Reeves has been appointed assistant general freight agent of the southern lines of the Illinois Central and the Yazoo & Mississippi Valley, with office at Memphis, Tenn.

C. R. Lonergan, general agent in the freight department of the Northern Pacific, at Tacoma, Wash., has been appointed general agent, with office at Spokane, Wash., succeeding J. O. Dalzell. Devan Rowan, chief clerk and secretary to the assistant general freight agent at Portland, succeeds Mr. Lonergan.

T. G. Roehm, chief clerk in the passenger department of the Chicago, Burlington & Quincy at St. Louis, Mo., has been appointed assistant general passenger agent of the Chicago & Alton and the Toledo, St. Louis & Western, with office at St. Louis, effective May 22, succeeding C. R. Murray, resigned. Mr. Rochm was born on July 25, 1871, at Ann Arbor, Mich., and entered railway service in February, 1890, with the Chicago, Burlington & Quincy at Ottumwa, Ia. From August, 1891, to June, 1893, he was connected with the Chicago, Milwaukee & St. Paul, and on the latter date returned to the Chicago, Burlington & Quincy as secretary to the general passenger agent. Later he was made assistant chief clerk of the general passenger department at Chicago and in July, 1905, was appointed chief clerk of the passenger department at St. Louis, which position he now resigns to become assistant general passenger agent of the Chicago & Alton and the Toledo, St. Louis & Western.



T. G. Roehm.

Engineering and Rolling Stock Officers.

The title of W. H. Snyder, general foreman, mechanical department, of the Tonopah & Goldfield, at Goldfield, Nev., has been changed to master mechanic.

C. H. Jones, assistant resident engineer of the Western Maryland, has been appointed chief engineer of the New York & Pennsylvania, with office at Canisteo, N. Y.

J. B. Elliott, master mechanic of the Baltimore & Ohio, at New Castle Junction, Pa., has been appointed master mechanic at the Glenwood shops, Pittsburgh, succeeding J. F. Prendergast, resigned.

A. M. Darlow, round house foreman of the Chicago & Eastern Illinois, at Danville, Ill., has been appointed mechanical engineer of the Buffalo & Susquehanna Railroad, with office at Galeton, Pa.

John Garrity, division roadmaster of the Great Northern, at Marcus, Wash., has been transferred to Whitefish, Mont., succeeding J. H. Conlen, transferred. F. W. Stiles, assistant roadmaster at Everett, Wash., succeeds Mr. Garrity.

A. N. Willsie, superintendent of the Hannibal division of the Chicago, Burlington & Quincy at Hannibal, Mo., has been appointed master mechanic of the Omaha division, with office at Omaha, Neb., succeeding E. D. Andrews, resigned.

Walter Wells, master carpenter of the Chicago division of the Chicago, Burlington & Quincy, has been transferred to the track elevation department and his former title has been abolished, the duties of that office being assumed by the master carpenter of the Aurora division.

J. H. Cummings, roadmaster of Divisions 4 and 5 of the Buffalo, Rochester & Pittsburgh, at Punxsutawney, Pa., has been appointed roadmaster of Division 4, and George T. Tweed, extra gang foreman, has been promoted to roadmaster of Division 5, both with offices at Punxsutawney.

Silas Zwight, whose appointment as general master mechanic of the Northern Pacific, with office at St. Paul, Minn., has been announced in these columns, was born in May, 1866, at La Crosse, Wis. He was educated in the common schools and at La Crosse Business College, and began railway work in April, 1887, with the Chicago, Burlington & Northern, now part of the Chicago, Burlington & Quincy. The next year he went with the Northern Pacific as a locomotive fireman on the Dakota division, and five years later was made a locomotive engineer. He was promoted to road foreman of engines in August, 1902, and six years later to master mechanic of the St. Paul division. He was transferred to the Rocky mountain division, with office at Missoula, Mont., in December, 1910, from which position he is now advanced to general master mechanic of the lines east of Mandan.

Purchasing Officers.

John E. Mahaney, whose appointment as general storekeeper of the Oregon-Washington Railroad & Navigation Company and the Southern Pacific lines in Oregon, with headquarters at Portland, Ore., has been announced in these columns, was born at St. Paul, Minn., in 1877. He entered railway service in 1894 as messenger boy in the store department of the Minneapolis, St. Paul & Sault Ste. Marie, remaining with that company six and one-half years as stock clerk in the store department and division storekeeper. He was then for a year and a half general foreman of the store department of the Great Northern at West Superior, Wis., and later with the Chicago, Rock Island & Pacific as clerk in the purchasing department for six months, foreman in the store department one year and general foreman one year. Subsequently until April 25, 1911, he was successively general foreman in the store department of the Southern Pacific and division storekeeper, which position he held at the time of his appointment as general storekeeper of the Oregon-Washington Railroad & Navigation Co.



J. E. Mahaney.

OBITUARY.

Henry McFarland, secretary and treasurer of the Union Pacific from 1877 to 1888, died at Concord, N. H., on May 15, at the age of 80 years.

Charles Guille Warner, formerly second vice-president of the Missouri Pacific, died at St. Louis, Mo., on May 13. Mr. Warner was born December 28, 1844, at Zanesville, Ohio, and began railway work in 1868 with the Missouri Pacific, having served during the Civil war as a captain in the United States army. He held several different railway positions and in 1877 was made an auditor, and three years later general auditor of the Missouri Pacific, holding the latter office until December, 1899. He was second vice-president from 1893 to March, 1905, when he retired on account of ill health.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta Electric.—The Canadian parliament has passed the bill permitting this company to build from Medicine Hat, Alb., northwest via Calgary to Banff, about 260 miles. The company was incorporated last October with a capital of $10,000,000, and it is understood will at once commence work on the section from Calgary, west to Banff, 80 miles. It is expected that this work will be finished in about 18 months. (November 4, p. 886.)

Arizona & Gulf.—This company, which was organized to build from Port Lobos, Sonora, Mex., to Sasabe, on the international boundary, has been granted an extension of two years from April, 1911, for completing the first section of 31 miles. The route has been changed from Sasabe to a point about 30 miles west of that place, and the company has been granted permission to construct a branch via Sasabe to Altar, Sonora.

Atchison, Topeka & Santa Fe Coast Lines.—A contract is said to have been given to George West, San Bernardino, Cal., for rebuilding the roadbed between Fresno, Cal., and Merced, 58 miles.

Atlantic Coast Line.—Work is now under way, it is said, at the Altamaha river between Waycross, Ga., and Savannah, to include replacing the wooden trestle work over the Atlamaha river and the swamps and lakes with concrete and steel structures. Work is also under way at Black Gum swamp, east of the river. These improvements are being carried out in connection with the proposed double tracking work from Folkston to Savannah.

Boston & Western Electric.—Under this name a company has been formed to build from Waltham, Mass., west to Marlboro, about 20 miles. It is said an agreement has been reached with the Boston & Maine to use the Central Massachusetts right-of-way from Waltham to South Sudbury.

California Roads (Electric).—A line is projected from Jackson, Cal., northeast to Sacramento, about 50 miles. C. P. Vicini, is said to be interested.

Chicago, Memphis & Gulf.—An officer writes that work has been finished on the line into Hickman, Ky., and the road is now completed from Dyersburg, Tenn., on the Illinois Central, north to Hickman, on the Nashville, Chattanooga & St. Louis, 52 miles. The company is about to let contracts for an extension northeast to Clinton, 15 miles. Connection is to be made with the Mobile & Ohio at Stubbs.

Chicago, Milwaukee & Puget Sound.—A contract is said to have been given by this company to Bates & Rogers, Spokane, Wash., for piercing a 650-ft. tunnel under Front street, in Spokane.

Chicago, Waukegan & Woodstock Traction.—Incorporated in Illinois with $50,000 capital and office at Chicago. The plans call for a line from Waukegan county through Lake and McHenry counties to Woodstock. The incorporators include C. A. Spenny, Columbus, Ohio; I. D. Stevens, W. P. MacCracken, P. B. Olson and H. S. Medderg, all of Chicago.

Conewago & Southern.—Incorporated in Pennsylvania with $150,000 capital, to build from Biglerville, Adams county, Pa., southwest to Cashtown, eight miles. H. W. Hamblin, president, Harrisburg. The directors include: M. A. Garvin, Gettysburg; J. H. Vreeland, Harrisburg; J. A. Deardorf, Cashtown, and J. A. Kane, Arendtsville.

East St. Louis Interurban.—Incorporated in Illinois with $2,500 capital and office at East St. Louis, Ill. The plans call for a line from East St. Louis, easterly through St. Clair and Clinton counties. The incorporators include: J. L. Flannigan, W. H. Haus, F. W. Kraft and E. L. Cragen, all of East St. Louis.

Erie Railroad.—An officer writes that contracts have been let for constructing grade for second-track as follows: Bates & Rodgers, Chicago, on the Cincinnati division, from Milton, Ohio, to Summit, 6.5 miles, and from Creston to Q. M. Tower, 9.2 miles; to Ferguson & Edmondson, Brookville, Pa., from West

Salem, Ohio, to Polk, 5.4 miles, and to the Robert Grace Co., Cleveland, from Barberton to Sherman, 2.7 miles, and from Tallmadge to Hills, three miles.

Everett Railway (Electric).—E. Goode, Los Angeles, Cal., is planning to build a number of lines in the Glendale district. Under the name of the Everett Railway, a line is to be built from Glassell ranch to a connection with the Glendale—Eagle Rock line in Glendale. Other lines are to be built from Glendale to Scholl canyon and from Glendale to Griffith Park, in Los Angeles.

Grafton, Fairmont & Clarksburg (Electric.)—An officer writes that surveys are now being made and it is expected to let contracts in the near future to build a 50-mile line from Grafton, W. Va., west to Clarksburg, thence north east to Fairmont. The company will build a power house. Charles F. Sutherland, president, and Arthur Stealy, chief engineer, Morgantown.

Great Northern.—L. W. Hill, president of this company, is quoted as saying that the only work planned by the Hill lines to be carried out in Oregon at the present time is the completion of the United Railways Company's lines to Tillamook bay and the continuation of work on the Oregon Electric from Salem to Eugene.

Gulf, Colorado & Santa Fe.—According to press reports, this company has under consideration the question of building a branch from Carthage, Texas, northeast to Shreveport, La., about 50 miles.

Gulf, Florida & Alabama.—This company was incorporated in Florida to operate a line from deepwater at Pensacola, Fla., north through the timber and agricultural districts of Florida and Alabama and the coal and iron fields of northern Alabama to Jasper, Ala., about 265 miles. Franchises and rights-of-way have been secured, the property has been bought upon which stations, piers, etc., are to be built between Pensacola and Muscogee, 18 miles, and work is now under way. When work on this section is finished the company will have a line over 80 miles long north to Fremansville, Ala., which is then to be put in operation. Megargel & Co., New York, are the bankers.

Jefferson & Northwestern.—According to press reports from Jefferson, Texas, this company will build a line through Cass county, to Linden. Right-of-way has been secured and contracts to build the line have been let.

Lexington & Eastern.—See Louisville & Nashville.

Los Angeles & Redondo.—See Pacific Electric.

Louisville & Nashville.—A contract is said to have been let to Buffat & Nipper, contractors, Knoxville, Tenn., for building an extension of the Lexington & Eastern from Whitesburg, Ky., to Dryfolk, six miles. The work will be difficult, being mostly through rock. It is understood that the contract is worth $350,000.

An officer is quoted as saying that double tracking work on the Kentucky Central division will be started about June 1. Much of the right-of-way has been secured to carry out this improvement.

Marked Tree, Harrisburg & Newport (Electric).—An officer writes that this company will build from Marked Tree, Ark., west via Harrisburg to Newport, about 50 miles. There will be five miles of hill work. J. C. Mitchell and L. D. Freeman, Harrisburg, are interested.

Matanzas Terminal Railroad.—Incorporated in Maine with $50,000 capital and headquarters at Havana, Cuba, to build a steam or electric railway at Matanzas. Horace Mitchell, Kittery, Me., is president and clerk, and C. E. Smothers, Portsmouth, N. H., is treasurer.

North Coast.—See Oregon-Washington Railroad & Navigation Company.

Oregon Electric.—This company is said to have secured terminal facilities at McMinnville, Ore., and a branch from the main line is to be built southwest to that place.

Oregon Electric.—See Great Northern.

Oregon-Washington Railroad & Navigation Company.—Contracts are said to have been let to Caughren, Boynton & McCoy, for the concrete work on the North Coast, from Spokane, Wash., to Ayer, and work is to be started at once. The Puget Sound Bridge & Dredge Company will have charge of the erection of the large bridge over the Snake river. (May 12, p. 1133.)

Pacific Electric.—This company operates the Los Angeles & Redondo Railway, it is said, and will four-track the line from Redondo Beach, Cal., to Homewood, near Los Angeles. A new line is to be built from Homewood to Watts, on the Pacific Electric.

Porterville Northeastern.—It is expected that this company will finish work by July 1 on the line now under construction from Porterville, Cal., to Springville, Tulare county, 16 miles. The Utah Construction Co., Ogden, Utah, are the contractors. Stations are to be put up at Worth, Globe, McFarland and Springville. F. U. Nofziger, president and C. S. Freeland, chief engineer, Porterville. (Dec. 30, p. 1281.)

Raleigh, Charlotte & Southern.—This company was incorporated in North Carolina to build from Charlotte, N. C., northeast to Raleigh, about 140 miles, with a branch from Pittsboro northwest to Greensboro, 55 miles. Part of the construction work will be difficult. There will be six steel bridges. It has not yet been decided when contracts for the work will be let, but the prospects of building the line are good. The principal commodities to be carried are lumber, fruit and vegetables. W. L. Mann, Albemarle, N. C., is an incorporator.

Raleigh & Southport.—An officer writes that work is to be started at once on a branch from Lillington, N. C., west to Sanford, about 25 miles. The company will carry out the work with its own men.

Tennessee & North Carolina.—An officer writes that this company, which operates a 21-mile line from Newport Junction, Tenn., south to Crestmont, N. C., is planning to build an extension from Waterville, southeast to Canton, 38.5 miles.

Texas Roads.—C. H. Beatty, Ogden, Utah, is said to be back of a project to build between Austin, Texas, and Fredericksburg, about 80 miles. It is understood that the line will be built if $180,000 in bonuses can be raised, and land for two townsites is donated. The people of Fredericksburg have had a standing offer for some time of $100,000 to any railway company that will build from that place to Austin or San Antonio.

It is announced that surveys are being made by the Rio Grande Construction Company for a line between Eagle Pass, Tex., and Brownsville. The route follows the valley of the Rio Grande, via the towns of Laredo, Roma and Rio Grande City. The line will open to development territory that is now lacking railway transportation facilities. A. W. Liliendahl, Saltillo, Mex., is back of the project. (April 21, p. 970.)

Towson & Cockeysville.—An officer writes that contracts have been let to the James H. Harlow Co., to build from Towson, Md., north via Lutherville and Texas to Cockeysville, 7.5 miles. Maximum grades will be 3 per cent., and maximum curvature 6 deg. There will be an 80-ft. steel bridge and a concrete undergrade crossing. J. A. Shriver, president, Bel Air.

United Railways Company.—See Great Northern.

Wasatch Railroad.—Under this name a company will ask for incorporation in Utah to build about six miles of line from San Pitt, Utah, to Wasatch. J. G. Jacobs is said to be back of the project.

Washington Roads (Electric).—An electric railway system is planned at Pasco, Wash., with an extension east to Walla Walla, and another extension south to Pendleton, Ore. A. M. Wehe, Milwaukee, Wis., is said to be back of the project.

According to press reports an electric line is projected from Pateros, Okanogan county, Wash., southwest to Wenatchee, about 60 miles. An extension is projected north to Concully, 40 miles. O. A. Hoag, Chelan, is said to be back of the project.

The section of the Melipilla to San Antonio Railway, Chile, extending as far as Llolleo, was opened to traffic in October, and on December 4 the railway from Rayado to Papudo was inaugurated. During the year the railway from Alcones to Lingue was turned over to the government.

Railway Financial News.

Boston & Maine.—Referring to the rumors which have followed reduction of the Boston & Maine dividend and its effect upon the New Haven, President Mellen says:

"Boston & Maine just before beginning of present fiscal year, July 1, 1910, increased wages of employees by about $2,700,000, equivalent to more than 6 per cent. on increased stock—about $40,000,000. Reduction of maintenance was impossible because of condition of the property. There, therefore, remained only the possibility of reduction in cost of conducting transportation, and reduction there materially to offset increase in wages was practically impossible without a serious cut in the train service. Result of nine months' operation has shown practically no dividend earned, and directors would have been justified in discontinuing all dividends for the immediate future had they not been impressed with hardship that would have resulted to many smaller stockholders, and belief that upon rehabilitation of the property earnings would be sufficiently in excess of dividend requirements to replace such amount as would be disbursed in dividends while rehabilitation was in progress.

"The company has a profit and loss account, sufficient, probably, to warrant continuance of a 4 per cent. rate, until business revives and improved condition of property will result in a more efficient and economical service, which will be reflected in the net earnings."

Central New England.—J. P. Morgan & Co., the National City Bank and the First National Bank, all of New York, are offering $11,927,000 first mortgage four per cent. bonds of 1911-1961, guaranteed principal and interest by the New York, New Haven & Hartford at 93½.

Chicago, Rock Island & Pacific.—This company has formally taken over the St. Paul & Des Moines.

Chicago, St. Paul, Minneapolis & Omaha.—The New York Stock Exchange has been asked to list $1,500,000 first mortgage 5 per cent. bonds. The entire issue has been sold by the company and the proceeds used to pay the cost of the Superior Short Line Railway, now a part of the C. St. P. M. & O.

Denver, Northwestern & Pacific.—The Denver Securities Company has been formed in Denver, Colo., for the purpose of taking over the Moffatt estate interests in the Denver, Northwestern & Pacific. The $4,000,000 notes of the Colorado-Utah Construction Company, guaranteed by the late David H. Moffatt, which matured May 1, and on which interest was paid but not principal, is expected to be extended under some arrangement for one year.

Enid, Ochiltree & Western.—The District Court at Dalhart, Tex., has ordered the property and franchises of this company sold to pay the company's debts. The company was chartered to build from Dalhart, Tex., to Enid, Okla. A good part of the grading has been completed and some track has been laid in Texas.

Intercolonial.—A press despatch says that G. P. Graham, minister of railways, has given notice of the introduction in the Canadian House of a measure providing for the leasing of thirteen of the railways to be operated as branches of the government owned Intercolonial. This will add more than 650 miles to the Intercolonial. The lines to be leased are: The Yale Railway, from New Glasgow, N. S., to Thoburn; the Quebec Oriental, from Matapadia to Parpediac; the Hampton & St. Martin's, from Hampton to St. Martin's; the Albert Railway, from Salisbury to Albert; the Moncton & Buctouche, from Moncton to Buctouche; the Carequet & Gulf Shore, from Bathurst to Acadia; the York & Carleton, from Cross Creek to and beyond Stanley; the International Railway, from Campbellton to the St. John valley, at St. Leonards; the Temiscouata, from Point Tupper to St. Peter's; the Temiscouata Railway, from River du Loup to Connors; the New Brunswick & Prince Edward Island, from Sackville Junction to Cape Tormentine; the Elgin & Havelock Railway, from Elgin to Havelock; the Kent Northern, from Kent Junction to Richibucto.

International & Great Northern.—The third mortgage bondholders protective committee, consisting of Alvin W. Krech, Edward T. Jeffrey and Frank J. Gould, has presented a plan of reorganization, under which they agree to buy for cash at par and interest, the second mortgage bonds represented by the protective committee, of which W. Emlen Roosevelt is chairman. The plan is to become effective unless 50 per cent. of the deposited third mortgage bondholders object.

The present capitalization of the International & Great Northern totals $45,600,413, of which $11,291,000 is first mortgage 6 per cent. bonds due November 1, 1919, and $240,000 Colorado bridge 7's and San Antonio station loans; $668,650 is equipment obligations and receivers' certificates; $10,391,000 second mortgage bonds with $2,516,644 overdue interest; $2,961,000 third mortgage bonds with $942,056 overdue interest; $6,835,063 floating debt and unpaid vouchers; and $9,755,000 stock.

The capitalization of the new company will aggregate $35,457,000, which includes $11,291,000 first mortgage 6 per cent. bonds and the $240,000 Colorado bridge 7 per cent. bonds and the San Antonio loan which will remain undisturbed.

The estimated cash requirements for the reorganization total $15,340,000 and will be raised by the sale of $3,400,000 new preferred stock and $2,500,000 common stock, and by the sale of $11,000,000 three year 5 per cent. notes and by the sale to a syndicate of $1,600,000 new first refunding mortgage bonds. The $15,340,000 cash raised under this plan will permit the new company to pay off at par and accrued interest the second mortgage bonds now outstanding to pay for the company's equipment certificates, its vouchers and claims; to pay reorganization expenses and give it working capital to start with.

The $11,000,000 notes mentioned above are secured by the deposit of $12,150,000 first refunding mortgage bonds deposited by the railway company and the deposit by the syndicate of the $1,600,000 bonds mentioned above as sold to the syndicate. The new company therefore will have issued $13,750,000 first and refunding mortgage bonds and $9,900,000 stock, as noted, and $276,000 10-year equipment trust certificates. The annual fixed charges will aggregate $1,349,840.

The syndicate mentioned above is under the management of the Equitable Trust Company, New York.

The $11,000,000 notes mentioned above have been sold by the company to Redmond & Co., J. & W. Seligman & Co., both of New York, and Middendorf Williams & Co., Baltimore; and have been resold by the bankers at 99¼, which yields 5⅜ per cent. interest on the investment.

The foreclosure sale has been postponed from May 16 to June 13.

Kansas City, Fort Scott & Memphis.—William Salomon & Co., New York, have bought sufficient 4 per cent. refunding bonds of the K. C. F. S. & M. to retire $2,055,300 Kansas City, Fort Scott & Gulf first mortgage 5 per cent. bonds due June 1, and are offering to exchange the new refunding 4 per cent. bonds for the old 5 per cent. bonds, taking the old bonds at the market price, which would make the new bonds yield about 5.42 per cent. on the investment.

Kansas City Southern.—James A. Blair has been elected to the executive committee, succeeding D. B. Boissevain, resigned.

New York, New Haven & Hartford.—See Boston & Maine.

Paris & Mount Pleasant.—The Texas Railway Commission has authorized the company to register $369,479 bonds to be secured on the 25 miles of completed line from Paris to Bogota and has authorized the company to issue $120,000 additional bonds on the completion of improvements.

St. Paul & Des Moines.—See Chicago, Rock Island & Pacific.

Trinity & Brazos Valley.—B. W. Beckham has been elected a director, succeeding L. W. Carr, resigned.

Ulster & Delaware.—The State of New York has agreed to pay the Ulster & Delaware $1,500,000 damages for the removal of the tracks from Ashokan dam. This is one-half the amount asked by the railway company.

Supply Trade Section.

The Forsyth Brothers Company, Chicago, has moved its general offices from 213 Institute place to the McCormick building.

Clarence A. Bartlett has gone to the Garry Iron & Steel Company, Niles, Ohio, as sales agent, with office in Philadelphia, Pa.

The Chicago-Cleveland Car Roofing Company, Chicago, has moved its general offices from the Old Colony building to the Peoples Gas building.

The Willard Storage Battery Company, Cleveland, Ohio, has moved its Detroit, Mich., office from 227 Jefferson avenue to larger quarters at 1191 Woodward avenue. The office will be in charge of Max. G. Hilman.

H. C. Ware has been made superintendent of construction of the western district of the Federal Signal Company, Albany, N. Y., with office in Chicago. J. J. Hubbard has been made superintendent of construction of the eastern district of this company, with office in Albany.

Charles F. Palmer has been made sales manager of the J. Faessler Manufacturing Company, Moberly, Mo., with office in St. Louis, Mo. Mr. Palmer has had previous experience in selling Faessler boiler tools and has also been a representative of the Frank E. Palmer Supply Company, St. Louis.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Sand Springs Interurban, Tulsa, Okla., for a second 70-ft. motor car, and an order from the Peoples' Electric Railway, Muskogee, Okla., for two 70-ft. motor cars. There are now 108 of these cars in service in the United States and Mexico.

The General Electric Company, Schenectady, N. Y., has received orders from the Boston Elevated for the following equipment of its new power station at South Boston, Mass.: Two 15,000 kw. 6600-volt 25-cycle turbo-alternators, six 25000 KVA compensators, and two motor-operated rheostats. The station will supply power to seven rotary converter railway sub-stations.

Judge Kohlsaat, in the circuit court for the northern district of Illinois, entered a decree on May 11, sustaining the Hardie patent which covers the Andrews side frame, made by the American Steel Foundries, Chicago, and holding that the Wolff truck frame, made under the Harrington patent by the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., was an infringement.

The United States Circuit Court of Appeals for the Second circuit, in the suit of the Simplex Railway Appliance Company, Chicago, against the Pressed Steel Car Company, Pittsburgh, Pa., handed down an opinion on May 9, affirming the decision of the circuit court, which sustained the Bauer patent covering the Simplex bolster and holding that the Reliance bolster, made by the Pressed Steel Car Company, was an infringement

The Merchants' Despatch Transportation Company, New York, was incorporated on May 11 with $5,000,000 capital. This company, which is a subsidiary of the New York Central, will take over the assets of the old company and will build refrigerator cars for its own use, for the New York Central, and for lease. It is expected, however, that the New York Central's requirements will keep the plant too busy to accept outside orders.

The Traveling Engineer's Supply Men's Association has reserved the entire second floor of the Sherman Hotel, Chicago, for exhibits during the eighteenth annual convention of the Traveling Engineer's Association to be held in that hotel August 29 to September 1, inclusive. Approximately 8,000 sq. ft. of floor space will be available for exhibits, and numerous applications for space have already been received. Power for live exhibits will be furnished by the hotel at a nominal charge. The Traveling Engineer's Association has a total membership of 750, and it is planned to make the coming convention the best in the history of the organization.

It is understood that in the tentative plans for the reorganization of the Baldwin Locomotive Works, Philadelphia, Pa., the capitalization has been fixed on a basis of the earning power of the company. This has ranged from $4,000,000 up to $6,000,000 net per annum in the last five years. The new company will therefore be chartered with $40,000,000, half preferred and half common. The incorporators are to be Rudulph Ellis, president of the Fidelity Trust Company; Charles S. W. Packard, president of the Pennsylvania Company for the Insurance of Lives and Granting Annuities; Eckley B. Coxe, Jr., Alfred C. Harrison and Herman Dercum. John G. Johnson is acting as counsel in the organization of the new company. This new company will buy outright from the men who now own the property the entire $20,000,000 stock of the Baldwin Locomotive Works.

John Reis, whose election to the vice-presidency of the United States Steel Corporation, succeeding William B. Dickson, was mentioned in the *Railway Age Gazette* of May 5, was born in Niles, Ohio, in 1861. After leaving school, Mr. Reis began work in the New Castle Iron Works, operated by two of his brothers under the firm name Reis Brothers. He learned the trade of sheet and plate rolling and at the Neshannock furnace, also operated by Reis Brothers, acquired a knowledge of blast furnace practice. In 1886 Mr. Reis was made vice-president and general manager of the Gogebic Furnace Company, Iron River, Mich., manufacturers of charcoal pig iron, and two years later became manager of the Nashville Iron, Steel & Charcoal Company, with furnaces at West Nashville, Tenn. In 1889 Mr. Reis went to the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., as manager of the Alice furnace. In 1891 he had charge of the blast furnaces of the Watts Iron & Steel Syndicate, Middlesboro, Ky. In 1893 he went to the Oliver Iron & Steel Company, Pittsburgh, Pa., as manager of the Edith furnace. In 1889, on the formation of the National Steel Company, Mr. Reis was made general manager of all blast furnace operations of this company, which included 16 active furnaces. In 1901, when the United States Steel Corporation was formed, the operation of the plants of the National Steel Company was taken over by the Carnegie Steel Company, Pittsburgh, and Mr. Reis was made general superintendent of the Shenango Valley district, which included all blast furnaces, steel works and rolling mills at New Castle, Pa., and Sharon. In 1905 he was made assistant to President William E. Corey, of the Steel Corporation. As vice-president he continues in charge of construction, in addition to other duties connected with that office.



John Reis

TRADE PUBLICATIONS.

Lock Washers.—The Reliance Manufacturing Company, Massillon, Ohio, has published a very full catalog of its lock washers. Illustrations and price lists are included.

Gas Engines.—The Mesta Machine Company, Pittsburgh, Pa., in a small illustrated booklet discusses the characteristic features and advantages of Mesta gas engines. In the back of this booklet gas is contrasted to steam.

Culverts.—The Canton Culvert Company, Canton, Ohio, has published a folder illustrating and describing its Acme (Nestable) corrugated No-Co-Ro metal culverts. Photographs are given showing divers installing these culverts under water.

Car Wheels.—The Nickel-Chrome Chilled Car Wheel Company, Pittsburgh, Pa., has devoted a small booklet to the advantages of the Improved nickel-chrome chilled car wheels. The subject is thoroughly discussed and some interesting results of tests are included.

Bridges.—The Strauss Bascule Bridge Company, Chicago, has issued Bulletin No. 3, which contains a complete list of the bridges designed and built by this company, as well as those that are now under construction. It includes numerous photographs of Strauss bridges in various parts of the world.

RAILWAY STRUCTURES.

Albina, Ore.—The Oregon-Washington Railroad & Navigation Company has given a contract to W. N. Concanon, San Francisco, Cal., for improvements and additions, to include new buildings at the Albina yards near Portland. The improvements, it is understood, will cost about $50,000.

Chicago, Ill.—The Chicago, Burlington & Quincy has bought property at the southwest corner of Jackson boulevard and Clinton street, Chicago, with 150 ft. frontage on Jackson boulevard and 175 ft. frontage on Clinton street for a new general office building, to be 14 stories high with provision for further stories as required, to contain all general offices which are now scattered in different buildings. Work will be commenced August 1, on wrecking the old buildings, and construction of the new building will be pushed. Marshall & Fox, Chicago, are the architects.

Denison, Texas.—Plans have been made for constructing a subway at a cost of $11,000, under the tracks of the Missouri, Kansas & Texas, the Houston & Texas Central and the Missouri, Oklahoma & Gulf, in Denison.

Elmhurst, Cal.—The Western Pacific, it is said, will build a station at Elmhurst.

Farger, Ore.—See Madras, Ore.

Gateway, Ore.—See Madras, Ore.

Glendive, Mont.—The Northern Pacific, it is understood, will build a division hospital at Glendive, to cost $150,000.

Globe, Cal.—See Porterville Northeastern under Railway Construction.

Hunts Ferry, Ore.—See Madras, Ore.

Kempton, Pa.—The Philadelphia & Reading has given a contract, it is said, to the H. E. Ahrens Company, Reading, for building reinforced concrete bridges at Kempton and at Virginsville.

Lakeview, Ore.—According to press reports, the Nevada-California-Oregon will build a terminal in Lakeview, at a cost of $100,000. A station is also to be put up at Davis creek near the lower end of Goose lake.

Madras, Ore.—The Oregon-Washington Railroad & Navigation Company has let a contract to Moore Brothers, Portland, for putting up five stations on the Des Chutes Railroad as follows: At Hunts Ferry, Gateway, Madras, Paxton and Farger.

McFarland, Cal.—See Porterville Northeastern under Railway Construction.

Paxton, Ore.—See Madras, Ore.

Sidney, N. Y.—The Delaware & Hudson is to put up a new station at Sidney, N. Y., next year. This announcement is made by the New York State Public Service Commission, Second district, which has been listening to the complaints of the people against the "eye sore" that now serves as a station at that town. The promise of the company to build a station after a year is referred to as "a most pleasing settlement" of a disturbing question.

Springville, Cal.—See Porterville Northeastern under Railway Construction.

Tampa, Fla.—An officer of the Tampa Union Station Company writes that a contract has been given to the King Lumber Company, Charlottesville, Va., and work is to be started at once on a brick passenger station, with stone and terra cotta trimmings, at Twigg and Nebraska streets, in Tampa. The building is to be two stories high, 83 ft. x 130 ft., with a 250-ft. wing, and will cost $120,000. (April 28, p. 1019.)

Temple, Tex.—The Missouri, Kansas & Texas will build a passenger station.

Vancouver, B. C.—The Canadian Pacific is said to be making plans for an addition to the freight house at Vancouver. The cost of the improvements will be about $50,000.

Excavation work has been started for the new station to be built at Vancouver by the British Columbia Electric Railway. The cost of the improvements will be about $350,000. McDonald & Wilson are the contractors. (July 29, p. 208.)

Virginsville, Pa.—See Kempton, Pa.

Worth, Cal.—See Porterville Northeastern under Railway Construction.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Kansas City Southern, mentioned in the *Railway Age Gazette* of March 10 as being in the market for 20 locomotives, is now in the market for 11 Pacific type locomotives, 10 consolidation locomotives and 8 Mallet locomotives.

The Cuba Railroad Company, New York, has ordered 5 ten-wheel locomotives from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 24 in., the diameter of the driving wheels will be 52 in., and the total weight in working order will be 127,000 lbs.

The Brazil Railway Company, New York, has ordered 6 Mallet compound locomotives from the American Locomotive Company. The dimensions of the cylinders will be 16 in. and 25 in. x 20 in., the dimensions of the driving wheels will be 42 in., and the total weight in working order will be 157,000 lbs.

The New Orleans & Northeastern Railway has ordered 2 ten-wheel locomotives, and 3 six-wheel switching locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders of the ten-wheel locomotives will be 21 in. x 28 in., the diameter of the driving wheels will be 58 in., and the total weight in working order will be 180,000 lbs. Two of the switching locomotives will have 21 in. x 26 in. cylinders, 51 in. driving wheels, and in working order will weigh 135,500 lbs. The other switching locomotive will have 20 in. x 24 in. cylinders, 51 in. driving wheels, and in working order will weigh 112,000 lbs.

CAR BUILDING.

The New York Central & Hudson River is in the market for 15 coaches.

The Chicago, Burlington & Quincy has ordered 1,000 gondola cars from the American Car & Foundry Company.

The Sydney & Louisburg, Toronto, Can., has ordered 50 all-steel coal cars from the Canadian Car & Foundry Company.

The San Francisco, Oakland & San Jose, Oakland, Cal., has ordered 25 seventy-foot motor coaches from the St. Louis Car Company.

The Cincinnati, New Orleans & Texas Pacific is said to be in the market for 27 steel underframe passenger cars and 100 fifty-ton steel hopper-bottom coal cars.

The Merchants' Despatch Transportation Company, mentioned in the *Railway Age Gazette* of May 12 as taking prices on 1,000 refrigerator cars, will build this equipment at its shops at East Rochester, N. Y.

IRON AND STEEL.

The Great Northern is negotiating for 28,000 tons of rails.

The Kansas City Southern is in the market for 14,000 tons of rails.

The Philadelphia & Reading is in the market for 5,000 tons of structural steel.

The Kansas City, Mexico & Orient has ordered 8,500 tons of rails from the Steel Corporation.

The Chicago, Indianapolis & Louisville has ordered 4,000 tons of rails from the Illinois Steel Company.

The Pennsylvania has ordered 3,000 tons of structural material from the Pennsylvania Steel Company.

The Chicago, Rock Island & Pacific has ordered 2,500 tons of structural steel from the American Bridge Company to be used for bridge renewals.

The Benton Harbor & St. Joseph Railway & Light Company, Benton Harbor, Mich., has ordered 1,200 tons of rails from the Illinois Steel Company.

General Conditions in Steel.—The railways placed larger orders last week than in any week since the first of April. The improvement is regarded as temporary, however, for these orders are only for vital requirements. Production continues to exceed consumption, so a further decrease in unfilled tonnage is expected for May. A reduction in the price of bars is looked for this week; not to stimulate buying but to make the price of this product more equitable, as compared with other products.

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SEVEN years ago (beginning on May 20, 1904) *The Railway Age* published a series of Letters from an Old Railway Official to His Son, a Division Superintendent. Many things have happened since then. The son has become a general manager. The railways of the country have passed through the fiercest agitation against them that ever was conducted against any railways in the world. They have been the subject of more legislation and the object of more public regulation than ever were any other railways in the world in the same length of time. Some railway men during this period have proved themselves Bourbons; they have resolutely refused to learn anything, or to forget anything. Their attitude toward the public, toward railway commissions and toward their employees is the same as it was ten years ago. A very much larger class of railway officers have demonstrated that they are the opposite of Bourbons; that they can forget a lot and learn a lot. This class is composed mainly of the younger officers, but it contains many of the older ones. The "old railway official," in whose disguise the author of the first series of letters has written a second series, is among those who have both learned and forgotten. The first letter in his second series, which will run through these columns for some time, is given elsewhere in this issue of the *Railway Age Gazette*. The first series dealt mainly with operating matters. The second series will deal largely with the numerous railway questions which are of most timely interest, including organization, efficiency, the relations of the managements of the railways to employees, the relations of the railways to the public, etc. Their author has had exceptional opportunities, owing to his connections with railways in all parts of the United States, to get information on which to base very clear and positive ideas as to what is the matter with American railways, and he does not mince words or regard thin skins in expressing them. We trust and believe that the lucubrations that the old gentleman will send to his son, now a general manager, will be as interesting, amusing and thought-provoking as were those he wrote when his son had only just won his spurs in the position of division superintendent.

THE diversion of business *via* the Boston & Albany to the New York Central by the New York, New Haven & Hartford, opens a field of interesting conjecture. The new traffic agreements are, very likely, the forerunners of others yet to come, and indicate an inversion of large currents of southern New England traffic, as well as of the New Haven's general policy. That policy has heretofore been based on through business by the long haul via Jersey City. It now reverts to a short haul, with the Boston & Albany as an extended base line. An old and a new theory will now be tried out in practice, and the results ought to show ere long in the traffic returns. Will short hauls at better rates on through business plus the economies of shorter haul operation prove more remunerative than the old long haul? The New Haven company claims that they will, that smaller gross will give larger net and that, incidentally, the present deficit on the Boston & Albany will be turned into a profit. That the agreements already made profit handsomely the New York Central is obvious, saying nothing of other agreements presumably to come hereafter. That corporation gains to some extent on its local traffic, but much more on through business originating and ending in New England. There are suggestions of losses to the Boston & Maine in this New York Central-New Haven coalition, as well as to the Pennsylvania; and the effects on passenger traffic are an uncertain factor. But the main interest centres on the New Haven system itself and the broader question of the outworking of a long and short haul policy in an essentially monopolized territory, where the controlling corporation can route much, if not most, of its freight business. When the New York, New Haven & Hartford acquired the Boston & Maine we pointed out that extensive rerouting would probably be one of the sequels. One phase of it has now come to pass.

THE following paragraph, from a Massachusetts newspaper, calls to mind the fact, obvious enough when one thinks of it, that fusees are not the only thing that a train can leave behind for the purpose of warning the following engineman to be on his guard:

A train of 10 cars runs every night during the winter months from Toulon to Paris, bearing cut flowers to the Paris markets. America has not got to this state of superrefinement as yet, but one New England railway used to run a fish train every evening, which bore from 12 to 15

carloads of fish from Boston to the terminus of one of the Long Island Sound steamer lines, and scented the country for half an hour or so after its passing.

Whether the New England railway referred to ever made use of this inexpensive device for preventing rear collisions does not appear. It cannot be denied that it would have served the purpose in a most effective manner for after some little experience it might be easily determined precisely how far away the train actually was. In one respect it would be superior to fusees, for it would readjust itself automatically at every foot of the way, if not every inch, whereas fusees are so costly that it would be extravagant to use them oftener than once in 60,000 inches. Within its limit the fish-train-feature would provide a way to put in use the "continuous," or continually changing, plan of maintaining a space interval. Signal engineers have spent untold amounts of brain power in striving to devise a system by which a given block-length—say a mile—would follow a train, whatever the irregularities of its speed, with the precision of a shadow. Here you have it. Old readers of this journal will recall another olfactory system, the asafoetida block signal, proposed by one of our correspondents in the early days of automatic signal rivalry. That, however, was crude and simple. The New England codfish has possibilities of varied adaptation which the drug store cannot even attempt to match. Who knows but that we have here the happy discovery that will compose the East-and-West controversy that has lately been raging in our columns?

THE OPERATION OF A MECHANICAL STOKER.

FROM time to time during the past few years, records have been published in these columns regarding the performances of mechanical stokers on locomotives. In no instance was there any special preparation made for the trip recorded, and in no instance did the stoker fail to maintain the steam pressure. Some of these stokers have gone the way of all things mundane, partly, possibly, because of inherent defects in their mechanism, but partly also, in some cases, because of the failure of their promoters to pay enough attention to the accuracy of their representations. But the fact remains that the stokers could maintain the steam pressure. It is a natural conclusion, therefore, that it is a comparatively easy matter to build a stoker that will do this, and that the real problem does not lie in that direction.

On the other hand, the criticism that has been brought against all those stokers which have failed, is that they used more fuel than hand firing. Speaking theoretically, it does not seem that this should be so, for the admission and regulation of the air, as well as the quantity and rate of coal supply, should and can be kept under perfect control. It seems, then, that it is quite probable that the economical mechanical stoker depends for its success on the education of the man who operates it. It is such an easy matter for a fireman who has been trained in and is accustomed to the strenuous work of the shovel method, to use an excessive coal supply when it involves no exertion on his part.

With a firebox unchanged, and with all appurtenances as they were, it does not seem reasonable that more fuel should be demanded from a stoker of steel than from one of flesh and blood. But when the latter controls the former and knows that the unforgiveable sin is steam failure, he will be sure to err on the side of safety and use an excessive quantity of fuel. It will be a task of no mean magnitude so to educate the firemen in the use of stokers, that they will handle the coal with the intelligent care and thrift that they should, and to prove to railway managers that the failure to work economically is due to the man and not to the machine, if it is so. Until this is done there will be but a slow appreciation of the value of the mechanical stoker, for anything adding to the already excessive cost of locomotive fuel is of too serious a nature to be disregarded.

TWO HINTS FOR RAILWAY FINANCING.

THERE has been of late somewhat of a revival of the demand for bonds, with the bonds of the strong railways sharing in the revival. This upward movement may be temporary and without deep significance, or it may have a more permanent character, but whether brief or abiding it is subject to two interpretations. From the optimistic slant it suggests hoarded money at last seeking investment and seeking the well-secured railway bond; from the pessimist viewpoint, it may connote lack of investment confidence and money dislodged from the junior railway investment and seeking the senior security. It is a situation which in either view of the case raises again the question as to why the railway corporations do not give fuller test to the plan of "popularizing" the railway bond by the issue of small denominations, beginning, say, at $100. Any man, woman or child with the funds can buy a single share of stock of a denomination as low as $100 par, or even $50 par, should the shares happen to be of the latter amount. Why should they be debarred from the same privilege in the case of the bond, with its higher security and quite as convenient whether coupon or registered? Why should our railway corporations in making their foreign loans feed out the "small" bond to the Frenchman and the German—indeed be compelled to do so by the foreign underwriting bankers—and not feed the same bonds out for home consumption?

There are several answers, the best of them in the form of a generality. The small American investor, from the mechanic who lays by his few dollars a week up to the inheritor of small capital has not, like the foreigner, been educated up to the small bond. By financial tradition and habit his recourse is the savings bank, in spite of its disadvantage of loss of interest on funds drawn between the interest periods, though with the partly offsetting gain of drawing the exact sum required. The savings banks in the long process of time, especially in our eastern states, have won, and won justly, the small investor's confidence. Again, the savings bank stands to the small investor in the nature of a safe deposit vault. That statement applies to the small coupon bond, for which the small investor has no safe depository, though the difference between a savings bank deposit book and a certificate of stock is hardly appreciable. Again, the small railway bond rests on confidence in personal advice, while the savings bank has the confidence-breeding quality and solidities of an institution under official watch. Turning, next, to the corporation side, there are in the small bond issue the increased bookkeeping and, speaking generally, the *minutiae* to which the larger banking houses object. Bankers like to handle bonds in blocks, not in small bunches. And every railway corporation knows the vexatious and prolonged detail when the issue of a convertible bond—that is to say the bond convertible into stock—practically compels the use of the bond of small denomination.

These are familiar obstacles to the small and popularized railway bond, yet it can not escape attention that some of them are beginning to fade in the face of new financial conditions. The institutional demand for steam railway bonds has of late, as we have recently pointed out, been relatively diminishing; and the savings banks, with their lowered surpluses, have been considering seriously a reduction of interest to depositors—a reduction which would bring their returns considerably below the better than 4 per cent. that the small investor can secure on an absolutely safe railway bond. The tendency toward increase in the number of small stockholders in the large dividend paying railway corporations is another straw indicating a "small" denomination demand at a time when there is a distinct call for those corporations to utilize every opportunity of the market, especially the savings of commisisons by direct sale. But, besides the financial motive, there is an ulterior and moral one of the utmost import. In the present attitude of the general public toward the railways, what ultimate asset can be larger than a public sentiment at once enlightened and pro-

pitiated by reducing the conventional "bloated" bondholder into the small and multiplied holder—the holder of the small bond, concrete and conscious, instead of the unconscious holder through the medium of his savings bank with its railway investments?

To the opportunism which suggests to our greater railway corporations trials, at least, of placing small bonds in those territorial regions where their credit is highest, may be added the hint of more liberal bond convertibility—that is to say convertibility of the registered into the coupon bond. Some railway bond issues carry that privilege now. But they are not many, and the inconvenience and sometimes disgust of the bondholder who finds that he must sell his registered security in the market—as technically not a "good" delivery—one or two points below the coupon bond of the same issue and class is a familiar experience. It signifies the broader and bigger fact that the good will of the bondholder is cognate with that of the share owner; that in these times of railway loans that are more or less competitive the small units of advantage are not to be ignored; and that the great railway corporation seeking money in the cheapest market has become under existing conditions more and more like the keen merchant who watches for the small margin of profit. We have been hearing much of late about mechanical and operating efficiency on our railways. Are these not new directions or directions imperfectly tried out for financial department efficiency also? The present situation at least sharply suggests them.

NEW BOOKS.

Engineering Law; Vol. I, The Law of Contract. By Alexander Haring, C. E., L. L. B., L. L. M. 518 pages, 6 in. x 9½ in. Myron C. Clark Publishing Co., Chicago.

Engineering law for the use of engineering students usually has been treated either in purely text book form or in complete legal form, citing innumerable cases. The first method has the disadvantage of not enabling the student to understand fully how the rules of law are worked out and applied by the courts to the facts; and the second has the disadvantage that the average engineer, or student of engineering, has not the legal training to enable him to grasp the elements of law which form the bases of the decisions in the cases he studies. The work done by Mr. Haring consists of combining these two methods of treatment so that an engineer can readily grasp the principles of law involved; and if he desires to make a more complete study of the subject he can do so by reading the cases and excerpts from engineering decisions which are included. For use as a text book in engineering schools the volume possesses undoubted merits; but it should be supplemented by a series of lectures by a competent engineer. The present volume treats only of the law of contracts, but since "Vol. I" is included in its title it is assumed that other branches of law involved in engineering practice will be treated in later volumes. The book is divided into five chapters, taking up the inherent elements of contracts, their formation, the parties affected, their interpretation, and their discharge. Each chapter is divided into a number of sections, and in each section is given a short general discussion of the law, followed by a few pertinent cases and excerpts from decisions. In each case cited the feature which it illustrates is tersely stated in bold face type at the head of the citation, enabling the student to grasp readily the points that are made.

The Western Railway Company, Argentina, has been authorized to open to the public the remainder of the extension of its line to Los Toldos, Roberts. The Southern Railway Company has been authorized to open provisionally the part of the branch from Bolivar to Pringles between Recalde and Bolivar. The branch is to be completed by the end of July. These two Argentine railway companies are among the most active in all South America as far as the construction of new lines is concerned.

Letters to the Editor.

INVENTORY OF LABOR ON RAILWAYS.

Chicago, May 13, 1911.

To the Editor of the Railway Age Gazette:

It is a rule on railway systems to take an inventory of material at least twice a year. This inventory is carefully taken to determine exactly the stock of material on hand.

The item of labor on railways represents about 60 per cent. of the expenditure and but little attention is paid to the matter of taking an "inventory of labor." On most systems the organization is built up gradually, men are added here and there and forces increased by stress of necessity during periods of heavy business and not sufficient attention is paid to the reduction of forces to a normal basis after the necessity for existing forces has ceased; in other words, there is no periodical inventory of the labor element entering into the railway operation.

If railways were as careful to keep down their stock of labor as they are of keeping down their stock of material, very large decreases in force could be made during times of light business.

The urgency for economy in the operation of railways is so acute at the present time that every large system would be justified in creating a department of economy, to be supervised by a competent officer who would rank as a vice-president and would be responsible to the president. Through such a department all matters of expenditure on railways should pass in order that every expenditure might be scrutinized by a competent authority. It is almost needless to say that on almost every large railway system many times the cost of conducting such a department could be saved. For small systems, a number of lines could join for the formation of such a department, whereby the expenditures of each of the contracting lines could be properly supervised. Even if such a department could only save sufficient money to cover the cost of conducting the department, there would be the satisfaction of knowing that expenditures are properly made and waste reduced to a minimum.

The formation of such a department need not necessarily infringe upon any other department, but it is a well-known fact that the existing departments of railways are so busy with their own affairs that there is not sufficient time to properly go into the merits of every expenditure to determine whether it is proper or extravagant.

The experience of many years in the railway service will convince any man conversant with railway operation that there is much waste today which could be saved, but it cannot be saved unless it is systematically and intelligently handled.

The railway business necessarily, by reason of its being scattered over large areas, cannot be so closely supervised as a commercial business which is confined to narrow limits, and there is much waste on railways because of this fact, but a proper organization to conserve due economy would by proper inspection eliminate many wastes which now exist.

There has been no time in the history of railway operation when greater economy was more imperative than at the present time, and those railways which pay due regard to a close inspection, not only of the material question, but of the labor question as well, will show the greatest net results.

L. C. Fritch,
Chief Engineer, Chicago Great Western.

The government of Uruguay has conditionally approved the plan presented by the northern extension of the Central Uruguay Railway for extending the line at Rivera, on the Brazilian boundary, till it connects with the Brazilian railway systems. The difference of gage in the two systems will necessitate the employment of three rails on the new extension. Although this method is inconvenient it will have to suffice for the present.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.

BY MAJOR CHARLES D. HINE.

Chicago, April 8, 1911.

My Dear Boy:—Once more a circular comes to gladden my heart and gratify my pride. This circular announces your appointment as general manager, a position of honor and importance, extensive in its opportunities for good administration as well as for wasteful neglect.

Some seven years ago, when you were a division superintendent, I wrote you a book of letters which caused us both to be taken more seriously than perhaps we shall ever be again. Can T. R. come back? I don't know, I am sure, but your old Dad can and will. For never before in our splendid profession of railroading has there been greater need for the wisdom of old age, the enthusiasm of youth, and the balanced execution of middle life. We, the railways, we the most scattered and, ergo, the most exposed of property rights, are the first of the outposts to receive and to repel the assaults of anarchy and its smaller sister, socialism. Subtle, sinister, and specious is the reasoning which supports the claims of those who single out the arteries of inland commerce as a thing apart, as something immune to the irresistible laws of cause and effect. Shall we sit idly by, because we have had our part? No, my son, in that inspiring painting, "the spirit of '76," the old man and the boy, equals in enthusiasm, typify the soul love of liberty of an aroused people. Let you and I, therefore, do our little part to call to arms our brethren of a nation-long village street. Perhaps we are only hired hands of imaginary "interests." Perhaps, nevertheless, we are liberty-loving, God-fearing, right-thinking American citizens. Perhaps we do not need to be backed into the last corner before we turn and stand for the God-given rights for which men of all ages have been willing to fight and die. Perhaps the muck-rakers have not procured all the patents pertaining to perfection, potential or pronounced. But be that as it may, you and I can at least be heard, can have our day in the forum of public opinion, which after all is the court of last resort. In the language of Mr. Dooley, the decisions of the Supreme Court follow the popular elections.

What shall we do to be saved? First, put our own house in order that example may protect precept. It is a pretty good house after all. Only eighty years old to be sure, short in epochs of experience, but relatively long in aeons of achievement. It already has some degenerate offspring, but mighty few when you consider the rapidity of forced breeding, the intensity of incubation. Transportation, acknowledged as second only to agriculture in the world's great industries, has advanced faster and further in eight decades than has agriculture in eight centuries. That is something to be proud of. Therein is glory enough for us all.

Unfortunately, pride goeth before destruction. In the bivouac of the living, glory is a mighty unreliable sentinel. Let us hang up pride and glory as our Sunday-go-to-meeting clothes. Let us don consistent practice and tenacious watchfulness for week-day wear. Let us cease to temporize with principle when such unmanly action seems easy and inexpensive. Nothing is so expensive ultimately as a violation of principle. A platitude, you say. So it is. The aforesaid T. R. has gained a great hold on the American people, at one time a strangle hold, by repeating platitudes over and over again. Great is the man who can measure the limitations of his fellows. Let us take a leaf from his book and repeat, reiterate, and reverberate the Ten Commandments, and the greatest of all commandments, the Golden Rule, alias the Square Deal.

It takes an abnormally intelligent people to grasp at first blush the truism that railways should charge "what the traffic will bear," for the same good reason that the corner grocer makes all the profit the business will survive. Therefore, put the soft pedal on *cost* of service and a fair *return* on capital invested. Get on the band wagon, and follow the able lead of Sam Dunn of the good old *Railway Age Gazette* in playing the logical tune of *value* of service rendered, of charging all the admission fee the show will stand. The people will not go to church to hear our preaching. We must reach them in the highways and the byways, in the moving picture shows, and through improvised Salvation Armies of self-interest. Do not expect the people to espouse a cause in which we are half-hearted. Either we are right or we are wrong. Either the government should own and run the railways, or the stockholders should retain possession and we, the intelligent *entrepreneur* class, should continue our scientific management—for scientific it has been.

Either a man is honest or he is crooked. Either a woman is virtuous or she is loose. In a world of complexities, filled with relative things, some truths are so absolute that they are axiomatic, some positions so pronounced that there is no middle ground. From Trafalgar there rings through the ages Nelson's signal, "England expects every man to do his duty." Its interpretation and its adaptation for us to-day mean that every railway man, every home lover, every believer in property rights must defend the sound position of the railways, must anticipate the assaults of pseudo-socialism. The individual is the indivisible unit of society. The family is the consecrated unit of civilization. The home is the prime requisite for the family whose very existence depends upon the right of property, tangible or intangible.

You say that all railway men are doing something along this line. So they are, but nearly every one can do more if intelligently and persistently directed. We have taken too much for granted in believing that the legal department would look out for legislation, and the press agent for publicity. This phase, like many of our problems, is a question of organization, which itself as a science is a branch of sociology. On most railways some department—never, of course, our own—has unconsciously tried to be bigger than the whole company, in violation of the axiom that the whole is greater than any of its parts. When, by proper organization, we balance these departments—especially on the other fellow's road—we shall be in a better position to present a more united front in forestalling the arrival of the common enemy, prejudice and his principal ally, ignorance. "Men," says Marcus Aurelius, "exist for one another. Teach them, then, or bear with them." We, the railways, have done our share of bearing. It is time to do more teaching. Before we can impart knowledge, we must know ourselves, we must be sure of our own information.

Naturally, I want you to be the best general manager in the country. Therefore, if I am a little too didactic at times, you must be patient with me. Of course, you will have to work out your conclusions for yourself. Remember that I am too old at this teaching game to try always to think for other people. My job is so to state the propositions that you will reach the answers in your own way. Incidentally, the more you think you have discovered for yourself, the greater the credit due your teacher. Men are only boys grown tall. As grown up children they seem to prefer the misfits of their own manufacture to the hand-me-down assortment from the shelves of stored experience. Too often the employing corporation pays the bill for educating an official for his duties after his promotion and appointment, for the cloth he wastes in selecting unwise patterns of procedure.

Most of our large corporations are still in a stage of industrial feudalism. In the middle ages the feudal baron and his methods were absolutely essential to preserve civilization for society. Without him and his forceful ways the relapse to barbarism would have been rapid. In the earlier periods of the large corporation the industrial baron and his ofttimes lawless audacity were essentials of corporate existence. As these great types die off, their system dies with them. Supply keeps close on the heels of demand. These feudal barons of industry and commerce are breeding no successors because none are needed.

As government of laws succeeds a government of men, so administration by system displaces administration by personal caprice. The scheme of progress now demands a higher type of corporation official, and he is being rapidly developed. Altruism, adaptability, consideration and courtesy are the more modern requirements. The successful official of to-day is more of a sociologist than ever before. He must study human nature from its broadest aspects. He must know the public, its whims and caprices, its faults and foibles, its intelligence and its strength. He must learn to know his men that he may see how many things they can do, not how few. Human nature is mighty good stuff. The more it is trusted the better it responds. The feudal baron did not know this. He was jealous of his own authority, because more or less conscious of his limitations, of the weakness of his system. Those who take up his self-imposed responsibilities must be better men. They must be so sure of themselves and of the science of their methods that they can trust others, can delegate authority to the man on the ground. The task of the general manager to-day is so to decentralize authority that the company can obtain the best thought of the humblest employee, that indivisible unit of society whom his feudal superiors have trusted too little. The most important unit of organization is the individual. Give him his due weight as a living, thinking man, and you increase the mass efficiency of the corporation.

This run is too heavy for stringing on one schedule. I am now giving you the first terminal figure, 12.01 a. m. at Problem. Next time if I can push you to Principle you can perhaps flag over a station or two toward the despatcher at Understanding, whose wires have been known to go down in stormy weather.

With a father's blessing,

Your affectionate and rejuvenated,

D. A. D.

STUDIES IN RAILWAY ECONOMICS.*

VII.

BY W. M. ACWORTH.

From the foregoing sketch of the present position in four great countries, it is quite evident that no general agreement exists as to how far it is reasonable to take distance into consideration in adjusting rates *inter se*. The sheer mileage tariffs of Germany obviously find no favor elsewhere. And, indeed, they seem indefensible on the ground alike of the interest of the railway and of the interest of the public, alike on the basis of cost of service and on that of value of service. It needs no argument to show that to move a truck of goods 100 miles does not cost 10 times as much as to move it 10 miles. Nor will it be disputed that under normal conditions to move a trader's goods 400 miles is not to him a service four times as valuable as to move them 100 miles, for at the longer distance he is pretty sure to come into contact with new competition—is, in fact, like a dumper in a foreign country—and, accordingly, has to be contented with a fine or even a vanishing profit. Indeed, the German policy seems self-condemned, for it is admitted that, beyond a distance of something like 150 or 200 miles, low-class goods simply cannot bear the German rates and, accordingly, perform the main part of their journey by water, leaving to the railways only the comparatively unprofitable task of hauling them the short distance to and from the port. Grain, for example, consigned from East Prussia to Bavaria, is carried by rail to a Baltic port, thence shipped right round to Rotterdam and up the Rhine to Mannheim or Frankfurt, and thence transferred once more to rail to reach its destination. In any other country, with railways up to the Prussian standard of efficiency, a through rail rate could and would be made, at once profitable to the railway and advantageous to the trader.

*Previous articles appeared in these columns as follows: January 6, p. 10; January 13, p. 75; January 20, p. 114; January 27, p. 155; February 3, p. 200; May 18, p. 1143.

But, even if we agree that a sliding scale does more justice both to railway and trader, that does not help to decide what the sliding scale should be. Indeed, some people have questioned whether distance ought to be taken into account at all. Ever since the days of William Galt, who wrote as long ago as 1843, quite a number of arguments have from time to time been put forward—by professors, not by railway men—in favor of what is commonly known as the postal principle, most of them, it is true, referring, at least primarily, to passenger traffic. The famous fourteenth zone of the Hungarian tariff of 1889, which included all distances beyond 135 miles at the same fare, was to some extent explained as a concession to this theory. Russia also some years back introduced new passenger tariffs based on the same idea. But Hungary and Russia alike have since found themselves compelled to make sweeping modifications re-establishing the importance of distance as a prominent feature. A distinguished friend of mine, however, who unites long practical railway experience with careful theoretical study of railway problems, asserts that in the public interest distance should be as far as possible disregarded, and this not merely on the ground that conveyance cost is a small part of the total cost, but on the further ground that the advantage of proximity to a market, conferred by a system of mileage rates, merely results in putting the whole difference between cost of production at the most favored spot and cost of production on the margin of competition into the pockets of the owner of the most favorably located land. I am persuaded myself, however, that he is wrong. My own tentative theory is in general terms something like this, looking at the matter first from the point of view of the railway:—Terminal cost, both station and service is a large and ever-increasing portion of total operating cost; and terminal cost is wholly irrespective of distance. Conveyance cost, on the other hand, increases in proportion to distance, but in a geometrically decreasing ratio. But on English railways one-third of the total rate is required to pay interest on the construction capital and the benefit of this capital to the consignor is strictly in proportion to distance. On a railway costing $250,000 a mile a man sending his traffic 20 miles is the user of $5,000,000 of the shareholders' capital; if he sends his traffic 100 miles, he is the user of $25,000,000, and so on. On the whole, we might say, possibly, that if the cost of x miles is y pennies, 2 x miles will cost $1\frac{1}{2}$ y pennies. Then, secondly, looking at the matter from the point of view of the public, there will be general agreement that to widen the area of supply, to increase the competition of markets with each other, to break down local monopolies, to diffuse population, to encourage the establishment of local industries, to cause the full tide of national life to run up into the remotest bays—all these are laudable objects and deserving of encouragement. And, if this be correct, the conclusion follows that the principle, alike of group rates and of sliding scale rates, is sound and, possibly, worthy of greater extension than it has hitherto received in England.

If, instead of considering the relation of rates in respect of distance, we consider their relation in respect of size of consignment, we shall find again that the historic development in different countries has been equally discrepant. I suppose it would not be an exaggeration to say that in America the carload rate is usually about half the rate fixed at so much per 100 lbs. for less-than-carload quantities. In Germany it is safe to say that goods consigned in truck loads pay on the average a good deal less than half what they would pay in quantities of under five tons. Here, for example, are the rates per 100 kilogrammes for a distance of 20 kilometres:—in small consignments, 33 pfennige (or, if belonging to the category of special articles, 27 pfennige); in 10-ton lots, 21, 15, 13, or 11 pfennige, according to classification. I do not myself possess a sufficiently detailed knowledge of the French tariffs to be able to generalize as to the average relation between the rates for wagon-load and less-than-wagon-load consignments in France. Perhaps some reader of the *Railway Age Gazette* can supply the deficiency. In

England there is clearly no general principle. The reductions for 2, 4, or 6-ton lots, or whatever the figure be, varies widely in different cases. I should be inclined to guess that a 20 per cent. reduction off the ordinary class rates would be something like the average figure.

Now, I do not propose to argue here whether the German or English practice in this matter has the better economic justification; but it is relevant here to point out the impossibility of adapting English practice to German ideas. It is quite evident that if an English manager, convinced that the German practice was correct, were to reduce his four-ton rates to half the normal class rates for the same articles, he would be overwhelmed with an avalanche of commission cases, claiming that traders, compelled by the conditions of trade to do their business in small lots, were subjected to an undue preference, and in a year or two the present relation between small and large consignments would be more or less restored, only at a much lower average rate of charge.

A further point is here worth notice. All countries agree in giving a lower rate for truck loads than for lesser quantities, and the economic argument that, just as a truck load is entitled to a lower rate than a small consignment, so a train load is *primâ facie* entitled to a lower rate than the truck load, is surely irrefragable. But practice does not always square with theory. Train-load rates are common in France; they exist in Ireland; I believe they exist for coal and iron ore in Germany. At the time of the revision of rates here in England 20 years ago, figures of train-load rates were introduced into the Board of Trade schedules. But they were struck out in the course of the subsequent proceedings before the Parliamentary Joint Committee. Still, from the earliest days the English courts have accepted what is practically the train-load principle, namely, that a rate below the ordinary truck-load rate, given to a trader who guarantees to send exceptional quantities, is not an undue preference.* And this doctrine has been acted on by one Railway Commission quite recently. On the other hand, in America, where, if anywhere, one would have expected to find Providence on the side of the big battalions, the Interstate Commerce Commission has from the outset set its face against any concession for train-load quantities. In one of the very earliest cases that came before it, the commission decided that "such a discrimination must have a necessary tendency to destroy the business of the small dealers. . . . It cannot be supported by the circumstance that the offer is open to all; although made to all, it is not possible that all should accept." More flat contradiction of the doctrine which found favor 50 years ago with the Court of Common Pleas, to the effect that "it may be that only one trader can take advantage of the reduction offered; if so, so much the worse for his rivals, but that is not the fault of the railway company" one can hardly conceive. Once more, I do not argue which principle is right—I am only concerned at this stage to point out the discrepancy, mainly as illustrating the difficulty of the subject, but partly also as suggesting topics that will require further discussion hereafter.

But I think everyone must agree that, as a matter of practical politics, these questions of undue preference take so wide a sweep and are so vital to the trade of the whole country, that no manager of a private undertaking, be he never so competent and never so honest, can expect to be permitted to deal with them on his own uncontrolled responsibility, and that the state is bound to take a hand and, in the last resort, to interfere peremptorily in their solution. It may be added that reasonableness of facilities may also, like reasonableness of rates, be a question of comparison; that a preference in facilities may also be due or undue. But the comparison of rates is so much more important and complicated than that of facilities that it hardly seems necessary to discuss the latter in further detail.

*Nicholson *v.* G. W. R. 5 C. B. (N.S.) p. 366. Printed also in Railway & Canal Traffic Cases—I. 121.

THE STREET LOCOMOTIVE STOKER.

The Street locomotive stoker, which has been in course of development for the past three years in the hands of Clement F. Street, Schenectady, N. Y., has reached a stage of successful operation and is in use on locomotives of the St. Louis & San Francisco, Atchison, Topeka & Santa Fe, Lake Shore & Michigan Southern, Norfolk & Western, New York Central and Pennsylvania and is being applied on the Chesapeake & Ohio. The stoker is of what is known as the scatter type; the coal is scattered in a shower over the surface of the grate and is burned as in the ordinary hand firing. The main features of the machine are that it takes the coal from the tender, crushes it, conveys it forward to the locomotive, drops it down to the distributing tubes at the back of the firebox and blows it forward to the point on the grate where it is to be used. This is done without any labor on the part of the fireman other than to see that the coal flows or falls down to the crusher at the proper rate.

All of this is done without interfering in any way or even modifying the construction of the fire door, so that hand firing can be resorted to instantly in case of necessity or convenience. In fact in the book of instructions issued by Mr. Street the order is given not to "fire with the stoker when the locomotive is not working steam," or "when the steam pressure is below 125 lbs.," and "before beginning to fire with the stoker, build up a heavy level fire with the shovel, and get up full steam pressure."

The stoker is mechanical, and not automatic, in that it requires attention and adjustment to meet the varying demands of service. The crusher is driven by its own engine and the coal is brought to a condition so that the largest pieces will pass through a slot in the bottom of the crusher, whose maximum opening is 1½ in. wide. As the narrowest opening is ⅝ in., it follows that the greater portion of the coal is quite fine when it has passed the crusher and falls to the trough of the conveyor.

Four requirements, which are considered as primary to all others for a locomotive stoker, were kept in mind by the designer.

First.—The stoker must be able to handle any desired quantity of coal, and while so doing must call for much less physical effort from the fireman than hand firing on average modern locomotives.

Second.—It must handle successfully any grade of coal from the best to the poorest and from all slack to all lumps.

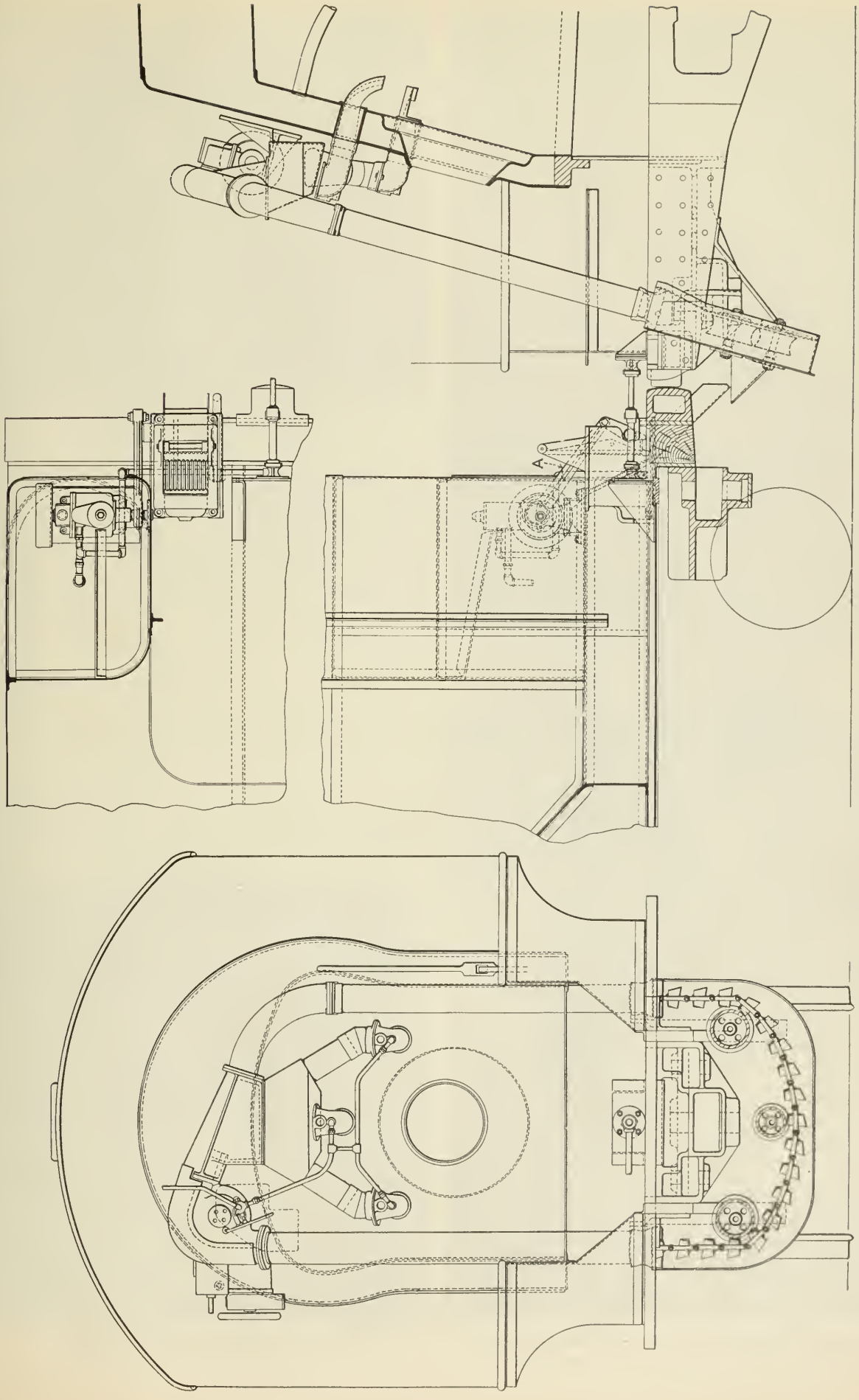
Third.—It must be able to keep up full steam pressure under all conditions.

Fourth.—It must not break down.

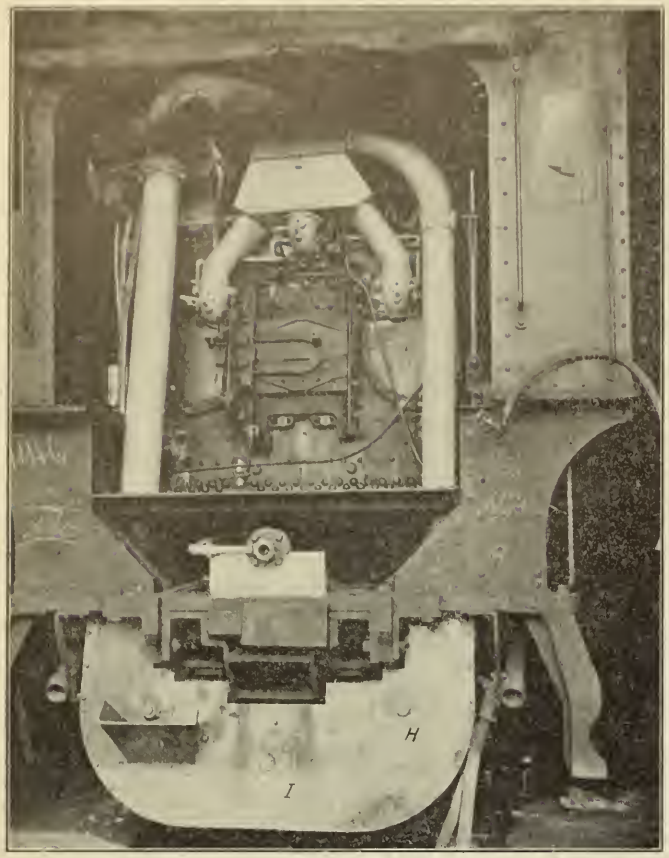
Having these four things in mind the efforts of every one working on the design of the stoker have been along these lines, and the question of fuel economy and smoke have been given secondary consideration. Now that the primary requirements have been successfully met, it is the intention to make a careful study of the question of coal consumption and smoke, and it is confidently believed that these problems are much less difficult than those already solved.

The design has also been given a great deal of attention and study from the engine house standpoint, with a view of producing a machine to meet all of the trying conditions at that point. The results seem to be highly satisfactory in every detail. The regular roundhouse force can treat a locomotive equipped with this stoker in exactly the same manner as one which is not so equipped. The usual processes of cleaning and dumping the fire, kindling the fire, getting up steam, washing out the boiler, making inspections or all kinds of repairs, and, in fact all, of the many little jobs which are done around the roundhouse, can be carried on in exactly the same manner as on locomotives without the stoker.

The parts of the machine have been designed with a view



General Arrangement of the Street Locomotive Stoker.



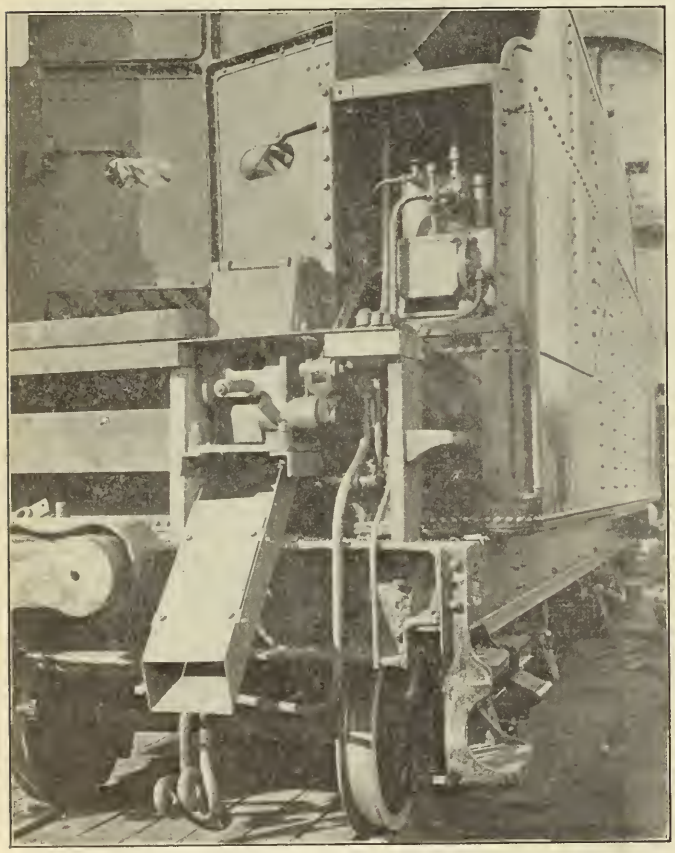
Rear View of Locomotive Equipped With Street Stoker.



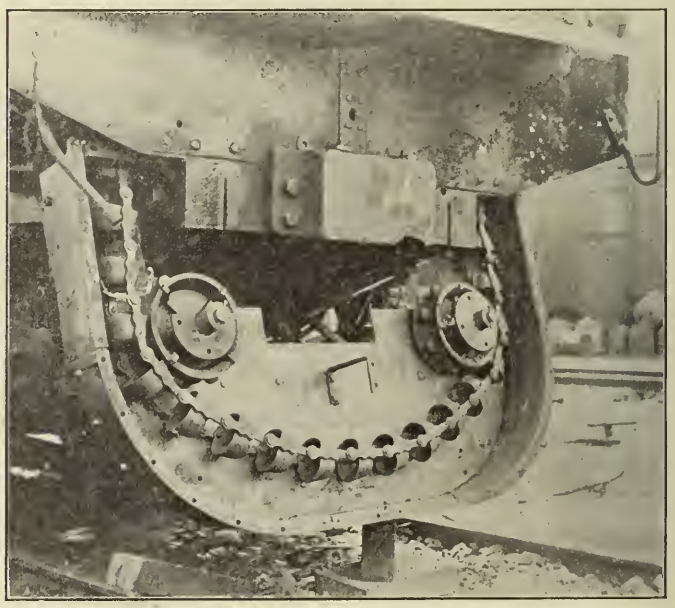
Street Locomotive Stoker and Double Fire Door.

of making them as accessible as possible in order to facilitate the work of inspection, and the stoker can easily be inspected in from five to ten minutes. This work consists of turning steam on the engines, seeing that they are in working condition, looking for steam leaks, seeing that the distributors are properly cleaned out and the steam jets operating, and noting the condition of the fire-box end of the distributers. The only parts of the stoker which require replacement between shoppings of the locomotive are the fire-box ends of the distributors, which are renewed in the roundhouse every thirty to sixty days. An old distributor can be taken out, and a new one can be put in in about ten minutes or a quarter of an hour.

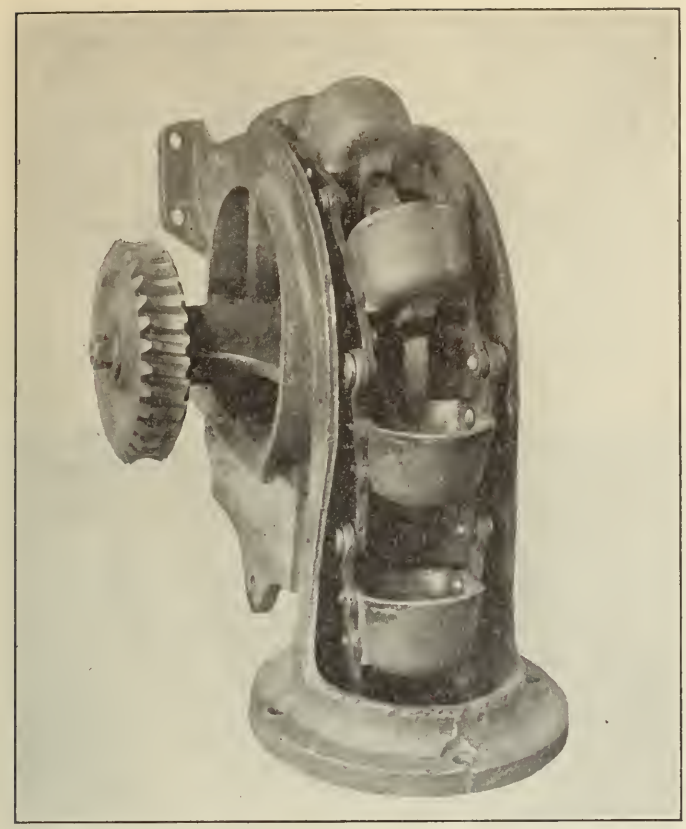
The development of the stoker is a story of a development of details and their adjustment to the work required, and it is to these details that attention will be directed. The stoker is divided into two parts; that on the tender, and that on the locomotive. The part on the tender consists of the crusher, the engine used to drive it, and the chute for delivering the coal to the conveyor on the engine.



Coal Crusher on Tender; Street Locomotive Stoker.



Coal Hopper and Conveyor Chain.

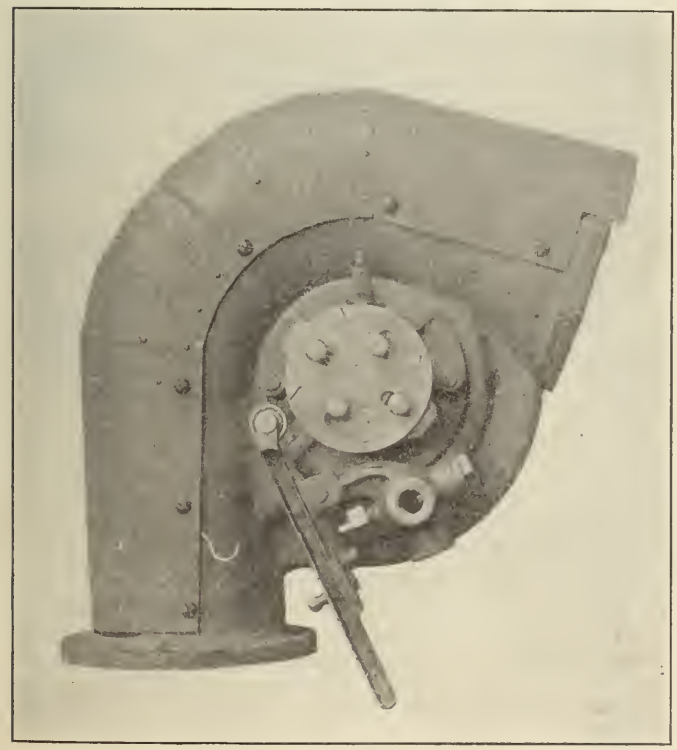


Elevator Buckets and Sprocket Wheel.

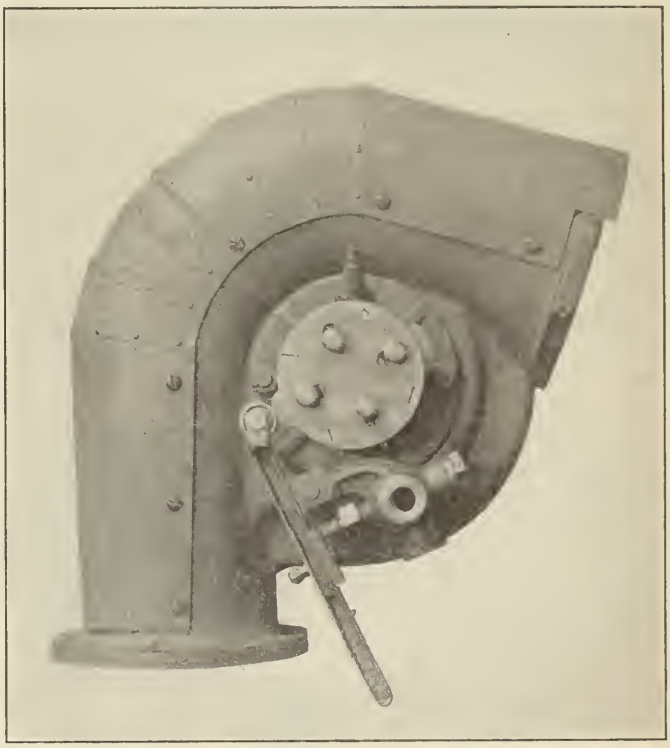
ELEVATOR.

As the coal drops down from the crusher it falls into a chute that delivers it into the elevator hopper attached to the engine below the deck plate. It has been found that, despite the movement of the tender, the fine coal cannot be depended upon to flow down an incline of less than 45 deg., and that angle has been adopted. The opening of the hopper on the engine is elongated so as to permit the lateral displacement of the tender relative to the engine without loss of coal.

Bolted to the left side of the back head of the locomotive is an engine with cylinders 3½ in. in diameter with a 3-in. stroke of piston. This engine drives a worm, meshing with a gear that revolves at the rate of 30 revolutions per minute. The gear shaft carries the sprocket wheel, by which the conveyor is driven at a speed of about 90 ft. per minute. It also carries a disc, known as a controller cam, and shown in one of the photographs. This controller cam regulates the number and duration of the steam jets that are used for blowing the coal into the firebox. The valve, in the pipe leading to the jets, is seated with a spring and its stem projects through the case as with an ordinary stop valve. A lever having a roller at one end is pivoted between the end and the valve stem. If a cam is set out, the roller, in riding over it, pushes the valve stem in, opens the valve and permits a jet of steam to escape from the nozzle.



Controller Lever Latch Thrown Out, Showing the Cams Out of Service and No Steam Jets Working.

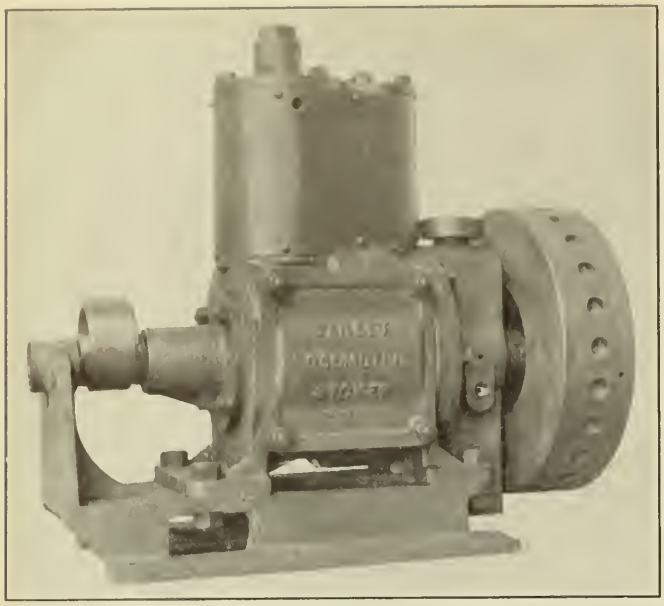


Controller Lever Latch Thrown In, Allowing the Cams to Operate the Steam Jets.

These cams are of varying lengths, so that the duration of the jet and the amount of valve opening can be adjusted to suit the requirements of the moment. Under ordinary working conditions only two are in use.

The elevator is of the bucket type, running across the hopper carried beneath the footplate, into which the coal flows from the crusher, up the straight pipe on the left hand side of the locomotive; over the sprocket wheel in the upper left hand corner; across the top of the machine as it is shown in the cab view, and down the pipe at the right. The whole device as it is applied is shown on the photograph of the rear view of the locomotive. In the face of the hopper it will be noticed that there are two plates, *H* and *I*, on each of which there is an eccentric boss. This boss is the bearing for an idler sheave that holds the conveyor buckets down to their work. By having two sets of bolt holes in the hopper plates, it is possible, by turning the flange, to set the sheaves in or out a small amount and thus take up any slack in the elevator chain; or, when it has stretched, to permit a link to be removed.

The elevator buckets and chain are riveted together. The



The Crusher Engine; Street Locomotive Stoker.

buckets are nearly cylindrical and have a capacity of about 34.5 cu. in. The links are drop forgings with a boss forged at one end and a hole to receive the mate on an adjoining link drilled in the other; they are riveted to the sides of the bucket as shown. The driving is done by a direct contact of the sprocket wheel against the bottom of the bucket. The sprocket, therefore, fits very closely in its casing, so as to avoid a loss of coal as the bucket moves it. The maximum capacity of the conveyor is about 5 tons an hour.

ENGINES AND GOVERNORS.

When work was first started, it was thought possible to purchase small engines and governors on the market that would be suitable for the purpose; but it was soon found that the conditions of operation on a moving locomotive were such as to render an engine built for the quiet of stationary service quite unfit for the work and an engine had to be designed that could stand these strenuous conditions. It is very heavily built and has a cylinder 3½ in. in diameter with a piston stroke of 3 in. The engine is single acting and is controlled by a piston valve and shaft governor; both the piston and the valve work in trunks without crossheads.

The engine valve is driven by a variable eccentric, controlled by a very substantial shaft governor, which is a modification of that used on the Westinghouse engines. Steam is admitted at one end, and is exhausted through the center. All lubrication is effected by means of the splash of the crank; the leakage of water from the cylinder and steam chest into the crank case is cared for by a simple design of water separator that draws the water off into a drip that carries it down to the ground and leaves the oil in the case.

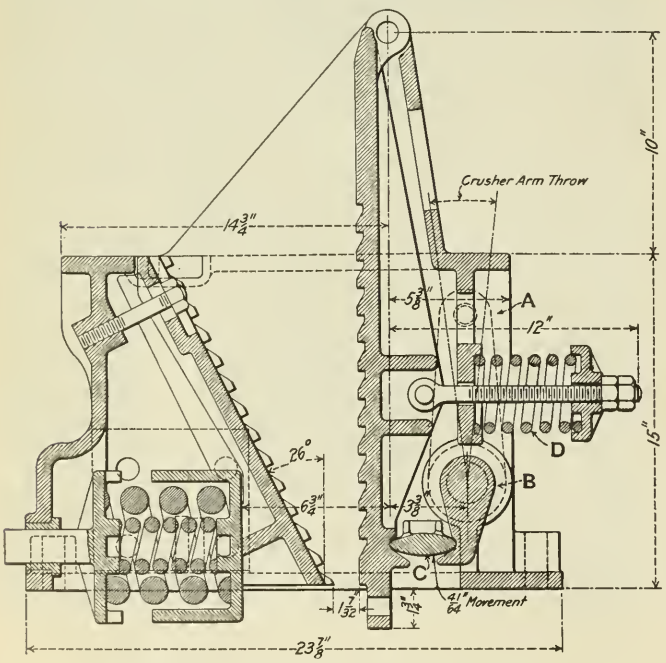
The engine on the tender is set at the front end of one of the water legs which is cut away for the purpose. It is connected to the rocker shaft of the crusher by the rod, *A*, shown on the drawing of the side elevation, which is driven by an eccentric on the engine shaft.



Coal Crusher; Street Locomotive Stoker.

Power and Steam Consumption of Engines.—At a speed of 450 revolutions per minute, using steam at 200 lbs. pressure and cutting off one-third stroke, the engine develops about 6 horse power, which, however, is far in excess of the actual demands. In order to determine what might be the probable maximum demand on the locomotive boiler, tests were made of a locomotive in operation and the exhausts from both of the stoker engines and the steam jets were condensed and weighed.

In these tests the holes in the nozzles were ¼ in. in diameter, and there were 120 spits per minute, consisting of 1 long, 1 intermediate and 2 short. With the understanding that these tests represent extreme conditions, the tests show that the operation of the stoker calls for a steam consumption equivalent to from 1 to 1¼ per cent. of the total production of the boiler.



Crusher for Street Locomotive Stoker.

CRUSHER.

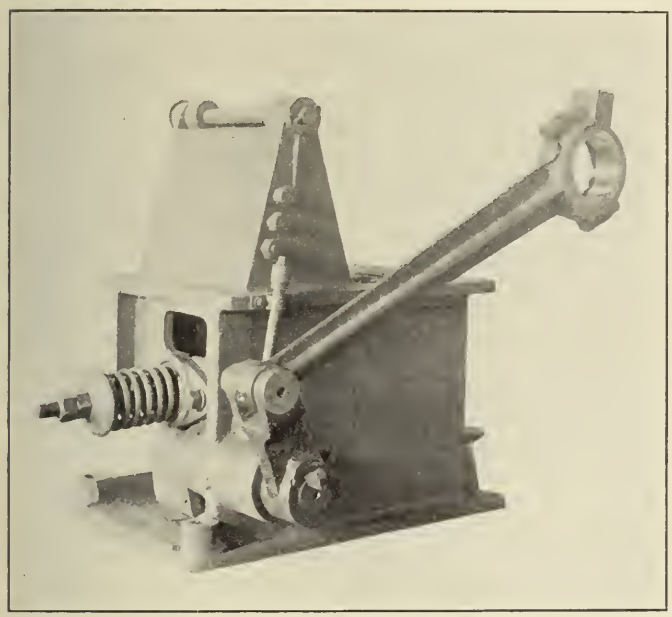
The crusher, which is shown in detail on one of the drawings, is formed of a swinging jaw pivoted at its upper end and driven to and fro by the rocker arm *A*. The lower arm of the rocker, *B*, has a bearing against a distance piece, *C*, which permits of a slight motion between the arm and the jaw. By changing this distance piece, it is evident that the width of opening at the bottom of the crusher can be varied between comparatively wide limits. This piece is held in place by the spring, *D*, which is under tension and draws the jaw back with the back motion of the rocker. The motion of the jaw is thus positive. But, if hard substances, such as rocks or pieces of iron, come down with the coal and get caught between the jaws, there would be a liability to breakage unless some means were provided to relieve the stress. This is done by holding the stationary jaw in

place with a heavy spring. This has sufficient capacity to hold the jaw in place against all stresses that may be set up by the crushing of coal. But, if some substance too hard to be crushed becomes wedged in between the jaws, the stationary jaw simply moves back and forth with the moving one, until the obstruction is removed.

METHOD OF FIRING.

The coal is brought up through the vertical leg at the right, then over the sprocket wheel and out to the center, where the buckets pass through a cylindrical screen. The four quarters of this screen are perforated with holes of different diameters. They are ¼ in., 5/16 in., ⅜ in. and ½ in. By rotating this screen so that one or the other of this set of holes are brought beneath the buckets the quantity of coal passing through can be varied, for it is evident that more will drop through the large holes than the small. The fine coal passing through this screen drops down into the central distributor and is put into the firebox across the back end.

Beyond the screen the buckets pass over a hopper in which there is a deflector plate that can be adjusted so as to turn more or less coal to the right or the left. This deflector plate is set in line with the axis of the conveyor, so that the relative



Coal Crusher and Eccentric Arm.

amount of coal that it sends into one pipe or the other is not affected by the rolling of the locomotive.

Under normal working conditions, the coal is evenly distributed into the pipes leading to the right or left hand side of the firebox. As the coal comes down it is caught by the steam jet and blown out into the firebox to a distance corresponding to the intensity of the jet. Ordinarily it falls in an even shower over the whole surface of the grate, the central jet taking care of the whole of the back end, where the fine particles are burned without danger of being carried into the tubes by the draft unburned. The nozzles are circular, and the distributors are so shaped as to throw the coal evenly over the grate. It has been found, however, that no hard and fast rule can be adopted for the design of these distributors, but that they must be adapted to the engine on which they are to be used and the coal that is to be burned. Finally, though no part of the stoker, but essential to its proper operation, a brick arch is used in the firebox.

As has been repeatedly asserted in these columns, this, like other mechanical stokers, is not intended to and will not take the place of the intelligence of the fireman. It merely does the heavy mechanical work, taking the coal from the tender and delivering it to the firebox, with no demand on the strength of the fireman other than that required to see that the coal is drawn down to the crusher at the proper rate.

It may be added that the crusher is looked upon by the designer as a temporary expedient. If the stoker is adopted and used in large numbers, it will be cheaper to install crushers at the regular coaling stations, and deliver crushed coal to the tender rather than attempt to crush it after it has been delivered. When this is done, the engine on the tender will be done away with and the coal will be carried forward by a conveyor driven by the engine on the locomotive. Meanwhile the present arrangement will be used.

It will be seen from the engraving of the back end of the boiler that the fire door is left perfectly free and clear for instant resort to hand firing, should the stoker fail or should it become necessary to mend any portion of the bed.

It is the expectation that the essential running parts of the machine will run from one shopping of the locomotive to the next. The engines, for example, will require no attention except that of filling a single oil cup, and light repairs can be made on the conveyor and other parts by the roundhouse force.

As it appears on the engine it looks large, but it has been found, in the experimental work that has been done, that a heavy substantial construction with an ample margin of power is necessary to successful operation. If, however, the machine is examined critically, it will be seen to be exceedingly well designed for the purpose for which it is intended, though this is not to assert that the final word has been spoken and that no future modifications will be made.

THE RECENT IMMIGRANT IN RAILWAY CONSTRUCTION AND MAINTENANCE OF WAY WORK.

BY W. J. LAUCK.*

A report of the United States Immigration Commission on the floating immigrant labor supply will soon be available. It has to do with railway construction and maintenance of way laborers upon the roads of the East, the South, the Southwest and the Northwest, and employees of machine and car shops and engine houses in the East. The statistical basis of the study consists of original statistical information secured for 5,913 employees of steam railways in the territory east of the Ohio river and north of the Potomac rivers, and of 5,821 laborers employed in construction and maintenance of way work in all sections of the country. Part of the data were secured through the cooperation of railway officials and contractors, and part through agents who made direct inquiries among the wage earners. A complete census was made of the members of the operating forces of the maintenance of way department of the divisions of a trunk line east of the Ohio river by a representative of the commission, who through the courtesy of railway officials traveled from one section to another on hand cars.

Only 37 per cent. of the employees in railway car and machine shops and engine houses in the eastern states were native white Americans. On the other hand, 39 per cent. were immigrants, and 24 per cent. were native born persons whose fathers had been born in England, Ireland, Scotland, Wales or Germany. Of the laborers of foreign birth, the north and south Italians constituted the largest racial elements. The Irish, who in former years were employed so extensively on section gangs, made up only about 3 per cent. of the total number of maintenance of way laborers, while the south Italians composed 10 and the north Italians 5 per cent. of the operating forces. About 4 per cent. of all the laborers were Slovaks, and 2 per cent. were Magyars. Two other southern and eastern European races who were represented in considerable numbers were the Poles and the Russians. Altogether, 17 immigrant races appeared among the maintenance

*Mr. Lauck had charge of the industrial investigations of the Immigration Commission during its entire existence.

of way employees. More than two-fifths of the foreign-born laborers had been in this country under five years, and about one-fifth had a residence between five and nine years. Of those who had been in the United States less than five years, the Russians showed 77 per cent. of their number, the south Italians over 60 per cent., and the north Italians, Croatians and Poles more than 50 per cent. Over three-fifths of the English, Irish, Scotch and German employees were of a residence of twenty years or longer. A study of the employees in the maintenance of way department east of the Ohio river of one of our most important roads showed that 54 per cent. were of foreign birth, and that the principal races employed were Croatians and north and south Italians. Moreover, 64 per cent. of the laborers of these races had been in the United States less than five years. Not only the laborers for the roundhouses, car building, repair shops and maintenance of way, but also the forces required for construction and other temporary work are largely recruited from members of races of recent immigration, originating in southern and eastern Europe. Even the south, which in former years depended almost entirely upon the negro for this class of work, has found it necessary, owing to its extensive development during the past decade, to employ immigrant labor.

LABOR AGENCIES AND PADRONES.

The principal methods by which the immigrant laborer secures employment in temporary work, are (1) by personal application; (2) by the padrone system; and (3) through labor agencies. The method first mentioned is seldom followed, the only places where it is employed occurring where the construction or other work, because of its extent or by reason of the regular recurrence of demand, is a matter of common knowledge.

As a rule the demand for and the supply of labor are adjusted through a system of regularly constituted agencies. These labor agencies are located in the different cities of the country and co-operate one with another in adjusting the supply of labor to the distribution of the demand. They are usually independent institutions or operated in conjunction with immigrant banks, steamship ticket offices, or other businesses. The usual movement of the immigrant labor supply is from New York to the recognized industrial centers of the interior of the country where the larger number of immigrants seeking work find employment in regularly established industries. The demand for railway construction and other temporary labor is then largely supplied by the agencies in the interior by means of laborers secured from the immigrant colonies of the industrial cities or towns. When one piece of work is completed the laborers usually return to the point where they originally started and they are again distributed by the agencies. In many cases, however, the newly arrived immigrant is sent directly from New York to railway or other construction work in the interior. The principal points in the interior in which the labor agencies operate and which are the centers of distribution of the floating immigrant labor supply are Buffalo, Pittsburgh, Cleveland, Cincinnati, St. Louis, Kansas City, Chicago, St. Paul and Duluth. A great many of the labor agencies have contracts with the railways to furnish them with all the labor needed. In cases of this kind the laborer pays an office fee and is given free transportation to the place where he is to begin work. Where the employment is not directly connected with some road, transportation may or may not be furnished. At the same time the laborer usually secures a very much reduced rate. If he has not the money necessary to pay this charge, it is advanced by the labor agency who, by a contract with the contractor or employer, has it deducted from the laborer's first month's pay. Reputable labor agents always inspect the work for which they are to furnish men unless they already know the character of the men or company with which they are dealing. The exploitation of immigrants seems to be carried on almost entirely by the padrones or leaders of the various gangs which seek work. Labor agencies claim that where they advertise for men to go to work in a certain place the padrones advise the immigrants not to take the jobs. The padrone then comes to the labor agent and tells him that he will supply a certain number of men, but that they can only pay, for example a charge of $1 instead of $2, the regular fee. The labor agent must have the men in order to fill his contracts, and consequently accepts the terms. The labor agent is also powerless to prevent the men from leaving their work before a sufficient amount has been earned to reimburse him for advancing their transportation. The padrones may also, in order to collect double fees or better terms, persuade their gangs to quit work for one contractor and secure employment with another. Though these methods, both the labor agencies and the contractors or employers in times of scarcity of labor incur heavy losses and undergo vexatious delays.

In the Middle West and Northwest labor agencies are almost exclusively used by the railways in securing labor. Especially is this true of races other than the Italian, who are secured through the padrone system. The agencies generally have contracts with the roads and send out the labor in an intelligent, systematic way, but it often happens that a number of small agencies having no contract with the roads or contractors will hear of work and all rush men to the place, with the result that many of the men are left on their own resources to get back to the cities where they can again apply to the agencies.

Early in the season the men present themselves to the agencies for registration, for which they are usually charged $2, the maximum legal fee. In the order they have registered they are shipped off in gangs when the demands come in from the railways. Before a month has passed some of the first gangs may begin returning and are then shoved through the machinery again. Sometimes they are not returned all the way to the city from which they originally started, but are transported from where they were discharged, or gave up their places on account of various hardships, or because the work ceased, to other points where they may be re-employed. This circulation is encouraged, for at each shift the men pay the agencies. When the supply of men runs low, toward the end of the season, the agencies sometimes co-operate. One may have an order for a large gang which it can not fill on short notice. It solicits help from other agencies and the two divide the profits. Some do this continually. One agency that handles Bulgarians exclusively has not been able to get large contracts from the railways. It must therefore divide its gains with some larger agency which has succeeded in getting contracts. On the other hand, there is every reason to believe that the large agency in its turn pays heavily for its contracts, so that the secondary agencies lose not so much as at first seems. There are two distinct movements during the year; in the spring the gangs move westward, especially northwestward, to points beginning in Chicago suburbs and extending up into Minnesota, the Dakotas, Iowa and Montana. In August and September a lull in the labor-agency business occurs. In October the men begin swarming back to Chicago, those who can afford it to winter in the colonies. The Bulgarians return to Granite City, Ill., although there is also a colony of them in Chicago. Then the agencies are busy again sending gangs southward into Kansas, Missouri, Mississippi and Louisiana. One agency, as an instance, has a permanent contract with three different railways. The southwest movement is not so heavy, partly because many of the immigrants prefer wintering in the cities, because the constructional work in the South is not so seasonal in its nature and because there are several large cities nearer than Chicago from which immigrant labor can also be drawn.

The padrone system is the outgrowth of the inability to speak English and the lack of knowledge of American methods and customs which prevail among the immigrant laborers who seek employment. Some form of the system is found among all non-English speaking races. It is most highly developed, however, and is most usually followed by the south Italians. In the majority of cases, the padrone is a labor agent, who agrees to furnish and control a certain supply of labor for a specified work,

in return for which he is to receive certain privileges, as for example, the commissary or housing privileges in a railway or other construction camp. In other cases, he acts merely as the representative of the laborers in negotiations with employers or other persons, and for this service each laborer in his gang regularly pays him a specified amount.

RACIAL DISTRIBUTION OF LABORERS.

Disregarding geographical lines, it may be said in general that foreign-born wage-earners constitute slightly more than three-fourths of the entire number of persons engaged in railway and other construction work. Native white Americans and native negroes each make up about one-tenth of the working forces. The remaining part consists of English, Irish, Germans and other wage-earners of the second generation, or of persons of native-birth but of foreign father. Thirty-seven races are represented among the immigrant wage-earners. Scarcely any English or Germans are found in the railway construction camps, but a small proportion of Irish, amounting to abou 3 per cent. of the entire operating forces, are found in supervisory and responsible positions. Of the recent immigrants, the south Italians, north Italians, Croatians, Poles and Greeks, in the order named, are employed in the greatest numbers. The south Italians as a rule constitute about one-third of the unskilled workers, the north Italians and Croatians each one-tenth, and the Greeks, Poles and Bulgarians about one-twentieth each. Other races which appear in considerable numbers are the Russians, Roumanians, Magyars and Herzegovinians. In all sections of the country, the south Italians form the highest proportion of laborers employed on railway construction work. The Bulgarians, Greeks and Roumanians are principally employed in the Middle West, the Northwest the South and the Southwest. The Slovaks, Russians, Poles, Magyars, Lithuanians and Herzegovinians are almost exclusively at work in the eastern states. The Croatians are found in largest proportions in the East and Middle West, and the north Italians in the eastern and southern states. About one-third of all the employees in the South are native negroes.

Most of the southern and eastern European construction workers are of recent arrival in the United States. About three-fourths of all the races combined and of all the Herzegovinians and Roumanians have been in this country under five years. Sixty-nine per cent. of the Croatians and the north and south Italians in the East, 86 per cent. of those in the Middle West and the Northwest, and 84 per cent. of the same races in the South and Southwest have been in this country for a shorter period than five years. The laborers of more recent arrival in the United States have usually been first employed in the East and the South and have afterwards moved westward.

WAGES AND LIVING CONDITIONS.

A study of more than 5,000 wage-earners in all sections of the country showed that the average daily earnings of native white Americans were $2.43, and of immigrants $1.68. The highest average daily wage of any race of southern or eastern Europe was shown by the north Italians. The members of this race earned on an average $1.86 each day, while no other recent immigrants had average daily earnings in excess of $1.59. The Irish of foreign-birth averaged $2.33 a day. Very few southern and eastern Europeans, as contrasted with native white Americans and British and northern European immigrants, appeared in the higher classification of earnings. More than three-tenths of the native white Americans and more than one-fourth of the Irish of foreign-birth, as against only one-twentieth of the recent immigrant employees, earned $3 or more each day. About one-tenth of the native Americans and foreign born Irish and practically none of the recent immigrants showed daily earnings in excess of $4. Three-fifths of the recent immigrant laborers in the East, the South and the Southwest, and more than four-fifths of those in the Middle West and the Northwest, earned as much as $1.50 each. On the other hand, of the southern and eastern Europeans in the Middle West and the Northwest, only 7 per cent. of those in the South and Southwest, and 20 per cent. of those in the eastern states earned $2 or more each day.

The recent immigrant laborers were marked by a high degree of illiteracy. More than two-fifths, or 44 per cent., could not read or write. The greatest illiteracy was exhibited by the south Italians, of whom one-half in the East and three-fifths in the South and the West could not read any language. Fifty-five per cent. of the immigrant wage-earners were married, but more than three-fourths of these had left their wives and families in their native countries. All of the married Bulgarians, Greeks and Roumanians had migrated to this country without their wives and children. About three-fifths of the immigrant employees were under 30 years of age.

As regards the small extent to which the southern and eastern Europeans exhibited any tendency towards progress and assimilation it was found that practically none of the recent immigrants, except the north and south Italians, and only one-tenth of each of these two races, were fully naturalized. Moreover, only about one-third of the southern and eastern European wage-earners could speak English. In the case of some races the proportion was much smaller, only 12 per cent. of the Russians and Roumanians, 8 per cent. of the Bulgarians, and 6 per cent. of the Greeks being able to speak the English language.

Housing and living conditions vary little among the various companies in the Middle West and the Northwest. Freight cars, fitted up inside with from eight to ten bunks, are used as sleeping quarters. Separate cars are used as kitchens and as dining rooms. The bunks in the sleeping cars have been roughly put together, four in either end of each car, leaving ample space in the middle even when two extra bunks are crowded in. There is usually a table in this clear space where the men play cards and sometimes eat instead of in the regular mess car. Even with ten men in one car, they could never be described as crowded. The kitchen car is fitted with a range, tables, an ice chest, and numerous lockers in which the provisions are kept. The cook or cooks sleep here in one end of the car, and sometimes an interpreter is with them. The mess car is always next to the kitchen. Through its entire length, in the middle, runs a plain board table, a bench of equal length on either side, with lockers on the walls where the tableware is kept. Usually these cars were found to be neatly kept, for this is th business of the cooks (about one to each thirty men) for they have no work other than this and their cooking. There was always drinking water in plenty, supplied in buckets by the water boys, iced when spring water was not available. The Greeks and Italians seemed the most unclean in their living arrangements. The Italians are fond of decorative effects, hanging out flags and gaily colored rags, and sometimes the outside of their cars are lined with growing plants in boxes. These camps are strung on sidings, ladders being raised to the open doorways. So long as the work is within several miles of the camp, the car is not moved, the men traveling to and fro on hand cars; but when necessary a switch engine appears and hauls the entire camp to the next siding, or switch, causing the men no other inconvenience than, in case of those who bake their own bread, the building of a new bake oven—a small cave in an embankment or hillside.

Each gang is a racial unit, living in separate cars and usually in a separate camp. Sometimes Bulgarians, Croatians, Roumanians and Italians were found in the same camp, but it seemed that Greeks could not live peaceably with any other race. Croatians and Bulgarians, speaking practically the same language, fraternize readily; but Bulgarians and Roumanians must be kept apart from Greeks, both of the former being secessionists from the church of the Greek patriarch.

Everywhere the men must pay their own living expenses. The companies pay the wages of the cooks, equal to those of the laborers. Fuel, sometimes old ties, sometimes coal, sometimes both, is supplied free. The cooking ranges and the kitchen utensils are bought by the men. Theoretically, the men may buy their provisions from whom they please. The average

amount put into the common living fund was from $6 to $10 a month. The Croatians seemed to live most generously; the Greeks and Bulgarians most plainly. But the reputation of the Croatians among the foremen for generous living may rest more on their propensities to use liquor; for only they, of all the races, are not sober, though their sprees are periodical rather than continuous. But even the Bulgarians, said to be the most sober, have acquired the universal habit of beer drinking. The men club together, each giving ten cents, and buy a keg of beer for a dollar.

The houses occupied by the laborers on construction work throughout the South are of cheap construction and built for only temporary use. The mild climate does not requires houses as closely built as are used farther north, and tents are often used when the work is of short duration. The houses most frequently met with are shanties built of rough lumber and covered with tar paper. In building them cheapness is the governing point. A framework of scantling is set up on which boards are nailed vertically, forming the sides, which may or may not be covered with tar paper. Sometimes there are no floors and the foundation on which the shanty rests is a pile of flat stones or of ends of planks placed under each corner. They are about 8 ft. high from the floor to the eaves, 14 ft. wide, and from 14 to 60 ft. long. They usually have a comb roof of about 4 ft. pitch, which gives more air space than the flat tops which are more rarely found. Bunks built one above the other against the walls serve as beds, while a stove in the center furnishes both cooking and heating accommodations. All bedding is supplied by the men, and consists in most cases of a pile of straw, obtained from a nearby farm, sometimes in a filthy case, but often lying loose in the bunk. From twenty to thirty men occupy a bunk house 50 ft. long. Cooking is done on the stoves in the houses in winter; in summer out of doors or in little huts built by the men themselves. These huts built by the immigrants are usually of sod, placed in a frame of poles, and are either square with a flat top, or cone shaped like an Indian tepee. Others are built of odd ends of plank, scraps of tar paper or tin. Some of the Italians build very attractive huts of discarded powder cans. By cutting the cans down the side seam after the ends are knocked out, small rectangular blocks of tin are obtained, and by nailing these over a frame of boards the appearance of a corrugated iron house is given. Where the work is double-tracking, box cars placed on a temporary track near the work and fitted up as camp cars are used. These cars have a stove in the center, a double deck of berths at either end, and windows about 18 in. square cut in either side. In the cases where a married man, usually a foreman, is among the immigrants, the house is of a better grade. Although built of the same material as the shanties they are more closely built and are usually lined with paper. The general plan followed is a three-room one-story house, one room being used for cooking and dining, and the remaining two as living and sleeping rooms.

The majority of immigrants do their own cooking, each man for himself, or else they form groups of five to ten when the men take it by turns to leave work one day to cook for the others in the group. There are a few boarding places on the American plan, but these are rare and are always where there is a foreign foreman with his family on the work. An occasional boarding group is found where all the men buy their own provisions, each man for himself, having it cooked by the woman who conducts the house, and who charges the men $2.50 for cooking and washing. This custom is found more widely among the Croatians. Of all the different methods, individual cooking is the most prevalent. The cost of living is about $10 per man for the Croatians for a month and the same for the Slovaks, and from $5 to $7 for the Italians. The Italians live mainly upon bread and macaroni and bologna sausage, which accounts for the extremely low cost of their maintenance. At their noon meal on the work a whole gang may be seen eating simply a loaf of bread and a pickle or a piece of bologna sausage. At night they cook a stew made of macaroni, tamales, and potatoes and a small scrap of meat. For breakfast they have bread and coffee and bologna sausage. When not working the majority of the Italians eat only two meals a day. The other foreign races eat meat for both supper and breakfast in addition to a good deal of canned food.

THE COMMISSARY.

The commissary on construction work in the South is an important part of the industry. In many cases the whole profit is from this source. In former years, when the negro was practically the only laborer, it was not unusual for a contractor to take work at a cost, or even less, depending on the commissary for his profits. As the foreign laborer has been substituted for the negro, this custom has become less and less prevalent, as its existence depends upon the expenditures of the laborers, and the negroes are more extravagant than many others. Many of the larger southern contracting firms have abandoned the commissary as a source of profit since employing foreigners and maintain it only as a convenience. This has given an opening for the padrones, who are becoming more and more nuemrous in Southern construction work. The negroes are by far the best customers in the commissary. They are generally unmarried men with no responsibilities, roaming from one place to another, spending their entire earnings in the commissary. They often cash their time at a discount and then spend the money before leaving the commissary. The Croatians are good livers in comparison with the other foreign races, and they do not stint themselves in food or drink. The negro spends his surplus above what is needed for food for gaudy clothes and patent leather shoes, but the Croatians spend theirs for beer or for such substitute for that beverage as may be had at the commissary. Although extravagant, they do not, however, spend as much as the negroes, who loiter about the commissaries looking for something for which to spend their money. The Croatians know what they want and buy it freely, but if there is a surplus of their wages it is saved. The Italians, living, as they do, very cheaply, buy little from the commissaries.

In a general way the laborers are required to patronize the commissaries. If a wholesale boycott of the commissaries by the laborers were to take place, there is no doubt that they would be replaced by others who would patronize the stores. In localities where other stores are convenient there is a good deal of buying at these other stores, especially when labor is more scarce than work, and the men feel more independent. The men, both negroes and foreigners, understand that they will be more likely to be employed on other work if they deal at the commissaries instead of other stores. In isolated districts where no other stores are convenient, the men must necessarily patronize the commissaries although the prices are high. The chief way of securing the patronage of the laborers is the method of paying off. The men are paid only once a month. This of itself has a great influence in the direction of extravagance. A man coming into camp on the first of the month will not be paid until about the 20th of the following month. He must have food and clothes and is credited for not only as much as is due him on the time books, unless he be an old employee who has worked for the company before and can be trusted. If he should leave before pay day his time is cashed with 10 per cent. deducted, or he may take it out in supplies at the commissary subject to no discount from what is due him.

The detention of laborers in the camps is practiced to some extent wherever the contractor advances transportation for men brought on the work. While the practice is generally applied to the transportation men, it is sometimes indulged in also when men who are leaving are badly needed to continue the work. The chief methods are (1) through the local authorities and (2) by armed guards. The method of having the escaping men arrested on the charge of violating the boarding-house law is the safest to the contractors and most frequently used. Laborers are frequently

brought to the work on free transportation, having made an agreement to work out their indebtedness. After getting to the neighborhood in which the work is being done, they leave the contractor that brought them in and work for another company where they do not have the cost of their transportation deducted from their wages. In order to protect themselves against this practice, the contractors have the men arrested and confronted with a jail sentence when attempting to leave. They are then willing to remain and work out their indebtedness. Often in the more isolated camps the men are closely watched by the foreman and other bosses, who carry arms, and are driven back and shut up in their shanties and held until they agree to return to work, or their baggage may be taken from them and held until they have worked themselves free from debt. These practices are more in evidence during the periods of special activity in construction work, as these men are more often offered transportation in advance, and after getting in the neighborhood are better able to find other work. In dull times, however, the men are glad to pay their own transportation and do not leave the work.

The order in which the labor is classed as to preference by the southern contractor is (1) negroes, (2) Croatians, and (3) all others except Italians. In point of numbers the Italians exceed by far any other foreign race on construction work in this region, with the Croatians coming second. The other foreign races are so sparsely represented that the comparisons are made between only these three. Negroes are everywhere preferred to members of any other race. They are good teamsters and are used as wagon drivers and in all places requiring the control of more than a single mule. Although they do not work regularly, it is said that while working only four-fifths of the time they do more work than the foreigners working full time. A contractor employing negro labor keeps a full camp at all times. After each pay day there is a considerable falling off of the negro labor for two or three days, during which time the workmen gamble, drink and spend their money in the commissary. After having spent all their money they return to work and work regularly until the next pay day. Another respect in which the negroes surpass the foreign labor is the ease with which they are handled on the work. They do not resent rough treatment as readily as the foreign laborers, nor do they unite to leave when one of their number is discharged. Still another, and probably the strongest reason for employing negro labor, is, as has already been stated, the inclination to spend the entire earnings in the commissary.

The maintenance of law and order rests solely with the foreman or walking bosses. Local authorities never interfere unless there is some infraction of the law affecting people outside of the camp. They are occasionally called in when the contractors wish to detain transportation men, but rarely or never to settle trouble in camp among the men. There is a characteristic feeling among these walking bosses that to ask for the assistance of the local authorities is to acknowledge their inefficiency.

In all camps where immigrants are employed beer, or some substitute which is practically the same thing, has to be supplied in order to keep the men. It is handled principally by the padrone or contractor, who has it shipped to the camps in barrel lots, consigned to different men in the camp so as to get around the prohibition laws. It is then sold at the commissaries with a profit. In many instances the men do actually order it for themselves by the keg or crate, and it is the existence of this practice that renders it possible for the commissaries to handle it without molestation from the authorities. When the sentiment of the neighboring population is too strong against this practice, a contractor sells an imitation beer as a substitute. This is often a cheap grade of beer in bottles bearing a label of a malt extract.

The National Railroad of Hayti now operates about 30 miles of standard gage steam railway. This system when completed will have a mileage of about 350 miles, connecting all the principal seaports with the capital and the interior of the island.

THE RAILWAY AS A MANUFACTURER.*

BY GEORGE G. YEOMANS,

Assistant to President, Wabash Railroad.

The practice of manufacturing their own materials was inaugurated by the railways a long time ago, when there were many good reasons for such action which do not exist today, and when they were able to derive a much greater profit from their shop work than is possible under present conditions. At that time, foundries and factories were comparatively few and small and were not so widely distributed over the country. Efficiency engineers had not been invented, manufacturing costs were relatively high, and manufacturing profits higher. Exorbitant prices were frequently charged, particularly by the makers of special articles which entered largely into the repair and maintenance of rolling stock; and there is no question but that considerable savings were effected by the railways in that day.

At the present time, factories have multiplied tremendously, both in numbers and in productive capacity. Improved methods and competition have acted together so to reduce manufacturing costs and profits in the class of articles ordinarily made in the railway shops that they can now be bought at prices which render the economy of making them very questionable.

The master mechanic or shop superintendent often has a very natural but false pride in attempting to demonstrate that he can perform any shop operation just a little better and cheaper than an outsider, and the result is, quite frequently, a good showing on paper which, while made with no intent to mislead, will not stand successfully under expert scrutiny.

I believe that as a general rule it is not economical for a railway to undertake the manufacture of articles that are purely incidental to its daily operations, and not in themselves of prime importance in the direct production of transportation. For example, while there might be a distinct advantage in the building of locomotives or freight cars in the railway company's shops if the work was carried on systematically and continuously, as it is in any commercial plant, it is doubtful whether the same advantage would be gained by the intermittent use of the shop facilities for that purpose. Still, there is more to be gained by the railways in the manufacture of these prime necessities of transportation than in the smaller and less important articles of everyday use, and, what is more to the point, there is a much greater chance of their gaining it.

It is true that the railways can buy just as good machinery as the manufacturer; that they can employ just as good workmen; that they can procure equally as good materials. There seems to be no reason why they cannot produce just as good an article, and at no greater cost than the commercial manufacturer, but, so far as my observation goes, they do not do so except in occasional instances.

Again, it is true that the railways must have shop buildings, equipment and organization in order to efficiently maintain their rolling stock. It would seem specially desirable for them to make the fullest possible use of these facilities and to manufacture practically everything they require. But we must not forget that the shops are primarily designed and organized for the maintenance and repair of the rolling stock, and not for manufacturing purposes.

Maintenance is the class of work for which the shops are designed and which they are prepared to handle to the best advantage. It does not necessarily follow that because a railway can build a locomotive economically in its own shops, it will derive a similar benefit from manufacturing the driving springs; nor does the fact that a box car can be built better and cheaper than it can be bought prove that the same

*Abstract of a paper read at the annual meeting of the Railway Storekeepers' Association, May 22-24.

is true of a hand car. Manufacturing, as such, must be a matter of secondary importance. Otherwise, the real work suffers.

If we analyze this a little further we find that in ordinary practice the repair work is very properly given the preference and that when the shops are crowded the manufacturing is pushed further and further into the background. Also, we find that it is just at this particular time that the road could secure the greatest advantage from making its own material, because business is generally good, manufacturers are crowded, deliveries are delayed and prices are high; so that at the very time when the roads could derive the greatest profit from manufacturing, they are in a measure prevented from reaping it, by the volume of their own legitimate shop business.

Another reason is found in the fact that closer and better supervision is naturally given to the work which is of prime importance, while the secondary work is more or less slighted. As a general rule, the shop superintendent and the general foreman have just a little more on their hands than they can manage to squeeze into the working hours. Some things have to be passed over hastily. This is never the work in which the mechanical department is specially interested—such jobs, for instance, as might result in an engine failure if not well done. It is always the boy tapping nuts, or cutting bolts with worn-out taps and dies, in one corner of the machine shop, or the apprentice forging a claw bar or a track chisel in the blacksmith shop.

The result of this lack of skilled workmanship and close supervision is usually quite noticeable upon a close inspection of the product and a comparison with the similar product of a commercial manufacturer. With the latter, his output—whatever it may be—is of prime importance. His living depends upon his being able to sell it in competition with a dozen other makers. He is concentrating his attention upon doing one thing well. He is specializing in a manner impossible in the average railway shop. His goods are subject to the careful inspection of discriminating buyers. Every incentive is present to produce a combination of good workmanship and low cost of production. Most of these incentives are lacking in the average shop, and it is not to be wondered at that, generally speaking, the workmanship and equality of the product does not compare favorably with that of the commercial manufacturing establishment. There is little doubt but that when the supply of material is apparently unlimited and its source is directly under the control of the users, less care is exercised in this respect than is the case when a more direct outlay is involved. Also, there is less likelihood of detecting the misuse or abuse of material in the process of manufacture when the producer and consumer are identical.

I know of several roads which in recent years have closed down and abandoned well equipped brass foundries and have contracted with commercial foundries for their requirements. I know of others which have leased their iron foundries to commercial operators, and of one road which, when the foundry it was operating burned down, did not replace it but is purchasing the castings it requires, with a resultant credit to its operating expenses. A spring shop built and put in operation when the price of elliptic springs was seven or eight cents per pound, and when the margin between the cost of the spring steel and the finished article was such as to admit of a considerable saving, is an entirely different proposition from the same shop today, when new elliptic springs can be bought for a price very slightly above the cost of the steel from which they are made.

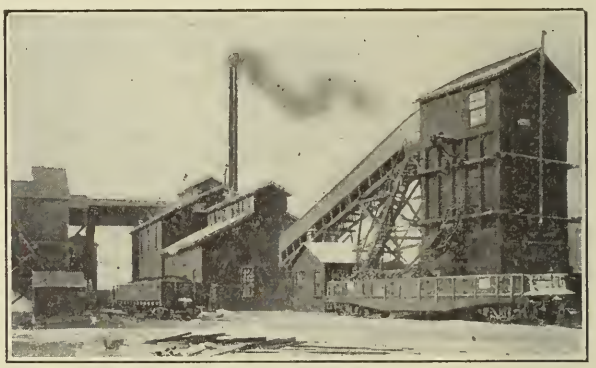
Whenever a railway company can re-work scrap material in such a way as to produce therefrom material that is expensive in first cost as compared with the value of the scrap, the practice of doing so is a real economy. For example, high grade scrap, such as is recovered from radial stays and similar material, can be piled, heated and hammered out under a heavy steam hammer into bars suitable for equalizers and for locomotive drawbars, at a cost from two and three-fourths to three cents per pound, and the product replaces material which if purchased new would cost at least five cents per pound. Besides this, no special machinery is required. The work may be done on a large steam hammer, which is a necessary tool, but which is not always kept fully employed with other work. But in the case of manufacturing ordinary bar iron, where the greatest possible saving between the value of the scrap and finished product is from $12.00 to $15.00 per ton, it often happens that the labor expended in selecting and handling the scrap and in re-working it exceeds the difference between its value and the cost of the new material.

This discussion is not intended to apply to those more or less isolated cases, where remoteness from available sources of commercial supply or other unusual causes exist, which make the manufacture of certain articles almost a necessity.

COAL BRIQUETTING PLANT.

BY CHARLES T. MALCOLMSON,
Roberts & Schaefer Company, Chicago.

The use of briquetted coal for power production in this country has been comparatively limited, owing largely to the fact that desirable grades of lump coal could be produced at a cost which made it impossible to place briquetted coal in competition. In Germany, Belgium, France and some other European countries where the coal supply is limited and the per ton cost of fuel at the mine is much higher than in this country, the industry of coal briquetting has been developed to a marked degree, and has become of considerable importance to the railways, The advantages of using coal in the briquetted form, and the increasing cost of lump coal are forcing a consideration of its merits upon power producers, and a number of plants for briquetting coal are now in commercial operation in the United States. The following description of the briquetting plant of the Standard Briquette Fuel Company, located on the Belt Line in Kansas City, Mo., will serve to illustrate the general features of such a plant.



Briquetting Plant.

The raw coal loads are weighed as they are delivered to the plant, the coal being unloaded by a screw and flight type of conveyor. This is necessary, as all of the coal is delivered in gondola cars. The conveyor has a capacity far in excess of that required at the plant, which allows for the shifting of cars and other delays incident to the unloading of wet or frozen coal. The cars are moved at the plant by means of a car puller. In this way the empties are returned to the storage track, on which they are loaded with briquets. Room has also been provided on the empty track for the storage of several cars of binder without interfering with the shifting of the coal cars



Concrete Pitch Storage Platform Showing Method of Weighing, Grinding and Conveying the Binder.

during the operation of the plant; in fact every precaution has been taken to prevent interruption of operation caused by irregularities in the arrival of raw coal and binder, and to provide ample means for the unloading of these materials at a minimum cost.

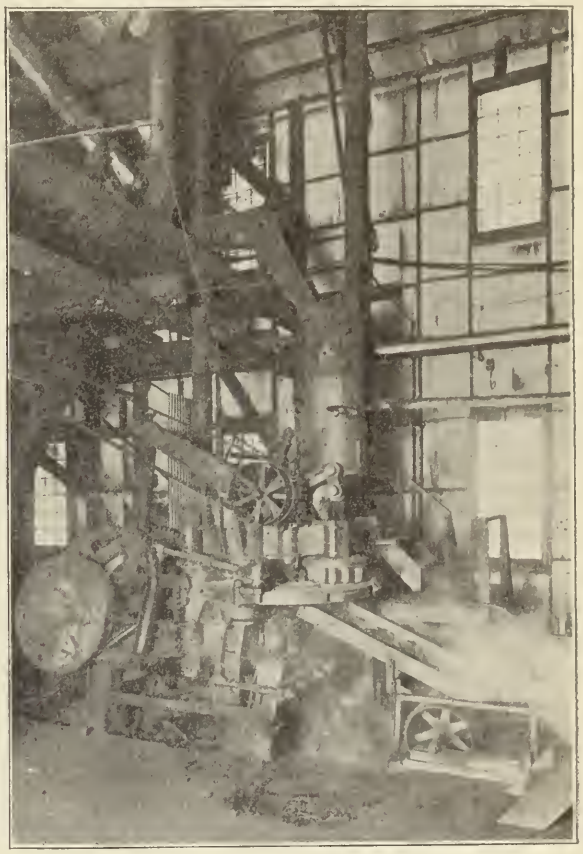
If the raw coal arrives at the plant without having encountered rain or snow in transit, it is taken directly to the raw coal bins from the car unloader by means of a flight conveyor. If, on the other hand it is necessary to dry the coal, it is delivered directly to a rotary drier of ample capacity for the needs of the plant. The dried coal is delivered either to the storage bin for raw coal or direct to the briquet machine building as may be required.



Steel Cooling Belt Carrying Briquets from Press to Storage Bin.

In the briquet machine building and at a proper height above the ground, a hoppered storage bin, steel lined and dust tight, receives the raw coal sufficiently dried for briquetting purposes. Under this bin is an automatic scale registering the amount of coal briquetted. From the scale the coal is delivered to a steel hopper and from thence to the measuring conveying and mixing equipment. The automatic scale is so arranged that the supply of coal to the mixing equipment is uniform and automatically regulated.

The binder used at this plant is pitch made from the distillation of coke oven tar. This pitch is sufficiently hard to be shipped and handled in bulk on the hottest days. The cost



Interior View of Briquetting Plant Showing Briquetting Machine in Operation.

of production and the uniformity of the briquets depends to a very large extent on the strict adherence of the tar distiller to the proper specifications for this binder and the Barrett Manufacturing Company is under contract to deliver this binder within five degrees of the melting point specified.

The pitch is shipped in box cars and is unloaded on a concrete platform at the rear of the briquet machine building. Located centrally on this platform is a pitch "cracker" or specially designed mill which breaks the pitch to the proper size with a minimum amount of dust. The mill is fed by hand from a wheelbarrow of pitch previously weighed and the cracked pitch is taken to the charging floor in the briquet machine building by means of a belt conveyor. The belt and crusher are properly housed, and the pitch platform is protected from the weather, as shown in the accompanying illustration.

All of the equipment used from the time the coal and pitch are brought together until the briquets are made, is absolutely dust tight, but further precaution was included in the installation of an exhaust system, including a fan and dust collector.

The fine thoroughly mixed and dry material is delivered to

a vertical cylinder or heater of the briquetting press. Here superheated steam is added to the mass, which is brought to the proper temperature and moisture content. The fluxed mass is discharged through a regulated gate to the "feed box" of the press, where by means of an agitator, the mass is cooled and the dies are filled.

The briquetting press shown in the illustration is of the Couffinhal type. Twenty-four briquets are made at each stroke of the plungers. A pressure of 2,500 lbs. per square inch is applied to the briquets through a double compression obtained by means of bell-crank toggles driven from a crank shaft, which in turn is actuated by a train of gears. The briquets are 3¼ in. in diameter and about 3 in. thick and weigh 16 ounces. The output of the press at its present speed is slightly over 8 tons per hour.

The ejected briquets fall on an inclined bar screen which delivers them to the cooling belt conveyor. This conveyor as shown in the illustration is of woven steel wire and runs directly from the press to the storage bin for briquets. Enough time elapses before the briquets are discharged from the conveyor to allow them to cool so that they may be handled mechanically. A "telegraph" takes the briquets from the cooling belt and delivers them into the 100-ton briquet bin with a minimum of breakage. This bin is provided with spouts for loading wagons on a standard wagon scale for local trade. The cars are loaded from this bin through a standard gate and apron and by the use of the car puller it is easy to load a car in ten minutes or as fast as the briquets will flow through the gate. When the car is loaded it rests on the track scales; its tare having been previously determined the load is weighed and hauled to the switch as the empty car is brought in.

Further improvement has been made in the addition of a cross conveyor taking the briquets from the cooling conveyor as it leaves the boiler room and delivering them direct to open cars without the use of the bin. This conveyor has been installed since the photographs illustrating this article were taken.

The power plant is located on the opposite side of the briquet machine building from the pitch platform. A horizontal return tubular boiler furnishes steam for the plant. All current for power and lighting purposes is furnished by a 250-volt d. c. generator direct connected to an automatic engine. Individual motor drives are utilized throughout except where it is found more advantageous to operate several drives from the same motor.

The buildings are of uniform mill construction, consisting of wooden frame, corrugated steel sides and composition roofing. All floors and foundations are of concrete, special care being taken to provide sufficient drainage so that all floors and platforms can be regularly washed.

The plant described above is one of a number of commercial plants designed and built by the Roberts Schaefer Company, Chicago, who furnished practically all the equipment which was used.

The Department of Public Works of Peru has contracted with the Reparticion to Alpas Railway to extend the line of the Supe-Barranca Railway to Alpas. This extension, which will be 16 miles long, will connect the Alpas estate with the port of Supe. It will thus be an important factor in developing the surrounding country, and in affording more adequate facilities for transporting the increasing agricultural and stock-raising products of the fertile valleys of Barranca and Pativilca. The rich mines of the famous provinces of Cajatambo and Bolognesi will also find, over this road, a convenient, cheap, and rapid outlet for their mineral products, while the mining industry in the zones adjacent to the large territory penetrated by this extension will be so vigorously stimulated that its rapid growth will be certain.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.*

F. O. Bunnell, engineer of tests of the Rock Island Lines, presented a paper on The Testing of Locomotive Fuel, during the third day of the convention, May 17. A brief abstract follows:

TESTING LOCOMOTIVE FUEL.

To determine the best fuel to use on a given road, it is first advisable, by means of laboratory determinations of approximate analysis, calorific value, etc., to determine the relative quality and efficiency of all the fuel either on the railway company's lines or those tributary to them. With this information and a map of the road, showing various division points, a territorial classification of the fuel can readily be made, and with the general traffic conditions, original cost of the fuel and cost of hauling in mind, it should not be difficult to determine, within reasonable limits, the most practical and economic fuel for use in a given territory; at all times, traffic conditions permitting, the quality of the fuel should take precedence over favorable geographical location. An inspector thoroughly familiar with the subject should be sent to examine every mine and to report on the kind of mining, accessories for producing coal, capacity of the mine, etc., including an examination of the coal in all entries and rooms, submitting samples of each kind of coal to the laboratory for analysis and test. Reports showing the result of tests, together with information concerning the mines, are rendered on a special form.

The reports, together with a sketch of the mine and a cross-sectional sketch of each vein, furnish at once valuable information as to the relative efficiency of the coal and the degree of uniformity in the quality of coal which could be maintained from a given mine on a run-of-mine contract.

Under any circumstances, with the information now at hand, it is not safe to rest with the knowledge of the source of supply of the fuel, its analysis and physical qualities as observed at the mine, or laboratory as the case may be, but to avoid the serious error often existing between the theoretical and practical, it is necessary after making the analysis and subsequently establishing a territorial classification of the fuels, to conduct a series of practical road tests, before the fuel most practical and economical for a given territory can be finally determined.

Road tests are also necessary to determine the relative evaporative efficiency of a given fuel under different furnace and boiler conditions and for the purpose of improving detail conditions in a given locomotive.

The spring and fall months of average seasons are preferable for such tests on account of more uniform weather conditions. Unless extraordinary operating conditions prevent, fuel tests should be made on the division where the fuel is to be used.

Passenger service is sometimes desirable on account of requiring less time and a fewer number of trips can be made than in freight service, in which it generally requires one or two additional trips to obtain a fair average on account of a greater number of stops and delays. In either case there should be no fuel taken on between terminals, and no cars should be set out or picked up en route. The train should be a fast schedule passenger or through freight and the tonnage hauled on each trip should be close to the official rating of the engine.

It is often desirable to use the same type of locomotive for all tests, in order that tests made on different divisions may be directly compared; if, however, a different class of engine is permanently used on a remote part of the system, the engine used for test should be that which is most generally used on the territory in which the fuel is to be used.

It has been estimated that scale deposits 1-16 in. thick on the sheets and flues of a locomotive boiler cause a loss in evaporative efficiency of 13 per cent., and scale ¾ inch thick a loss of 91 per cent. It is, therefore, evident the boiler should be practically

*The proceedings of this convention for May 15 and 16 were reported in the *Railway Age Gazette* of May 19, page 1149.

free from scale deposits. The fire box should be free from leaks; tires should not have more than average wear and the packing, valves, injectors, wedges, bearings, machinery, etc., should be in first class condition. The steam gage should be tested, the pop valve properly regulated, and the tender water tank and its connections with the engine should be water tight. The steam pipes and exhaust pipe joints should be subject to a water test securing absolutely tight connections and the exhaust tip should fit the exhaust stand properly.

If previous experience has not afforded opportunity to adjust the draft arrangement, or if a fuel of different character is to be tested, it may be necessary to make one or two trips over the division, using the engine and crew assigned to the test, in order that they may become familiar with the fuel and also to change the grates, size of nozzle, petticoat pipe arrangement, the size of stack or any other changes necessary to secure conditions normal to proper combustion of the fuel.

The number of cars on trips in a given direction, on account of frictional resistance, grades, etc., should be about the same, and the weight of the train should be close to the tonnage rating of the engine. It is important that both equipment and lading be as uniform as possible in every case.

The same engineer and fireman should be used on all trips. The fireman should see that the fuel is properly handled; when coal is used all large lumps should be broken and an even depth of fuel bed, free from holes, should be maintained by cross firing; heavy intermittent firing should be avoided, and the grates should be shaken lightly; when oil is used care should be taken to keep the temperature of the oil in the tank below the flash point or about 80 deg. F.

One inspector should be located at each terminal; these men receive the engine on arrival at its destination, superintend the weighing of the coal, taking any desired readings, and they stay with the engine until it again leaves the round-house when they are relieved by the traveling observers.

The data recorded en route, in addition to the weight of coal, water used and readings for oil consumed, should include the temperature of the oil in the tank taken about every twenty miles (all readings corrected to volume at 70 deg. F.); temperature of feed water at start and after taking water; temperature of the atmosphere, barometric pressure, and if a pyrometer is used the temperature of the furnace and smoke box of the locomotive should frequently be taken while going both up and down grades; the temperature of the steam in the boiler should also be frequently noted. If an electric pyrometer is used care should be taken to correct all readings for the temperature of the instrument and the cold-end temperature of the couple. A record of time should be taken for each stage or interval, including time of arrival and departure from each station, also all dead time and the cause for it. A complete log should be kept at 10 minute intervals (with particular reference to the grade) of steam pressure, cut off and throttle opening. The number of injector applications, number of times pop valve relieves, average rate of firing both coal and oil, condition of fire if coal is used, and excessive smoke escaping through stack should also be noted. In studying combustion with different types of boilers it is advisable to take samples of the gases escaping through the stack; such samples should be taken while on both up and down grades and should be sent to the laboratory for analysis. The amount of ash produced from the coal can be weighed at the end of each trip.

Calculation of results.—The total observed pounds of water should be corrected for all losses such as injector overflow, etc., at the average feed water temperature; the balance which was evaporated should be calculated to "Equivalent pounds of water evaporated into dry steam from and at 212 deg. F." A correction for quality of steam can be made if desired. The weight of coal used should be calculated both as "Pounds of coal as fed to firebox" and "equivalent pounds of dry coal." With the analysis known the coal can also be shown in terms of combustible. It is sometimes desired to correct the amount of coal used by excluding the coal necessary to run the engine light over the division. In cases where it is desired to make this correction, with the average locomotive, a correction to the amount of 50 lbs. of coal per engine mile is usually made.

For the immediate purpose of a fuel test the results are usually shown as: Pounds of water from and at 212 deg. F., evaporated per pound of dry coal, or gallons of oil (corrected to volume at 70 deg. F.); equivalent evaporation per car mile, and equivalent evaporation per ton mile. All recorded data should be reported either in its original form or as calculated in any desired equivalents. The items should include the detail of each trip together with the average of all trips and, for convenience, there should also be shown a scheme of calculation on which the various equations are based.

Discussion.—In the discussion of Mr. Bunnell's paper it was brought out that the Rock Island distributed its motive power with regard to the fuel conditions, thus using the same type of locomotive for the same kind of coal. J. Foster, master mechanic, St. Louis & San Francisco, favored the idea of keeping one class of fuel in a territory and using such types of locomotives as give the best results. J. S. Sheafe, engineer of tests, Illinois Central, claimed that by getting closer to the firemen and educating them in the proper method of firing better results would be obtained from the amount of coal fired. W. B. Landon, chemist, Erie, said that samples should come from the car and not the mine, so as to show the kind of coal used, not purchased. Others want better sampling of the fuel and more frequent engine and coal tests.

RELATION OF THE FUEL PROBLEM TO RAILWAY OPERATION.

Raffe Emerson, presented a paper on the Railway Fuel Problem in Relation to Railway Operation, at the Wednesday morning session, May 17. An abstract follows:

The railway fuel problem is one of great magnitude and importance, as our locomotives now burn about one-fourth of the coal production of this country and one-tenth of the production of the world. As much is burned in the 70,000 locomotives of the United States and Canada as in the 120,000 of all of the rest of the world. Economy or waste in locomotive fuel eventually touches everybody, and particularly railway owners (the stockholders). At least 20 per cent. can be saved net, as a whole, in the railway fuel expense in this country. This amount saved would mean the distribution of 40 million dollars yearly in dividends, or an additional one-half per cent.

The complete introduction of a comprehensive and effective fuel supervision on almost any individual railway will, in less than five years, result in a reduction of between 30 and 40 per cent. It is not a question of fact or condition, whether general or local. It is almost wholly a question of effective organization.

Three most able papers before the present meeting of the association point out specifically certain lines that such effective supervision must follow: the papers on Fuel Department Organization, on Locomotive Fuel Testing and on Mine-Run Coal. Speaking generally, the railways of the country pay about $2 a ton for fuel delivered on the company's line. This item, and a small charge of 5 or 10 cents for loading the coal on the locomotives is about all that is charged up in the primary transportation expense account, as "fuel for locomotives." But another $2 or so per ton is usually spent before that coal goes up in smoke. This other $2 consists of such items as: cost of moving coal upon company's lines, per diem for use of foreign cars, loss of earning power for company's cars, detention of locomotives from earning service while coaling, not to dwell upon other indirect losses of uncertain but very large extent due to low tonnage performance of locomotives because of inefficient combustion. Our problem is in reality of more than twice the financial magnitude indicated in the statistics of the mere purchase cost of fuel. Prof. Steel has well pointed out that we may find it of advantage to

pay a rather higher price for a grade of coal with less slack, than we now do for mine-run. From a practical railway view this is wise, and even though a road bought and paid for mine-run coal it would in many cases pay to sift out most of the slack, throwing it away if other profitable disposition, such as briquetting, could not be found for it, rather than permitting it to be shoveled into the fire box only to clog up flues and front end, choke the draft, reduce evaporative efficiency, and otherwise seriously impair the hauling and running power of the locomotive.

Actual road tests with tonnage up to the locomotives' hauling capacity will be of more value than arguments to show how far a road, from an operating and expense viewpoint, will be justified in screening the coal it receives. Conditions will vary according to quality of coal, price, and competitive grades of coal in the market. After road tests have determined what grades of coal can be bought to advantage, the purchase of coal upon the basis of such tests should effect a reduction up to 10 per cent. or more in the average purchase price, quality remaining equal. The next step to consider is the location of economical points of delivery to the company's lines. This phase of the problem has already been thoroughly worked out by J. G. Crawford, fuel engineer, of the Burlington. Scientific routing of coal will save several per cent. of the annual bill. When the best and most economical source of supply and delivery points have been determined, favorable traffic arrangements should be made wherever possible, for the advantageous moving of supply cars.

My own opinion in this matter, which is *not* shared by most of those with whom I have discussed it, is that a special lot of extra large capacity, steel car equipment should be exclusively reserved for handling the principal part of the coal supply. Such a policy, it can be demonstrated on paper, will effect large reductions in the cost of moving and handling the coal.

Practically all coal should be inspected at the mine, preferably sampled at the mine face, and the loading and weighing of the cars should be supervised. Efficient mine inspection will often eliminate most of the need for check weighing, when received on the company's line thus saving about one-half cent a ton. Yet check weighing is cheaper than continually paying for invoices 2 to 10 per cent. short. Overweights, except in case of water, are rare. The samples taken from the mine face should receive laboratory analysis, more as a check on quality than as a definite determination of compliance with contract specifications. Contracts, as stated before, should be based upon results of road tests. Rejections of coal should take place only at the mine tipple. Inferior coal that escapes the mine inspector should be accepted at a reduced price mentioned in the contract scale of specifications.

After coal is once on the road, its prompt movement, its needless congestion at one place with foreseeable scarcity at another and the avoidance of excessive per diem on foreign cars, must be carefully watched. Yet, while quick movement makes for economy and efficiency in handling the fuel supply, it must be borne in mind that a coal car, even a foreign coal car, is a cheaper form of coal storage than almost any stationary bin, trestle, fuel station, or storage ground that it is practicable to devise for railway purposes. A 50-ton coal car, costing $1,000, represents an investment of only $20 per ton capacity. Few storage facilities except the open ground will be so cheap, and coal storage on the open ground represents in deterioration and double-handling cost an expense or loss per ton equivalent to per diem on about three or four months' storage in cars. The ideal fuel station is that which nearly automatically can quickly transfer coal without crumbling from car to tender, and which needs the least storage reserve bin. A slightly higher operating cost is often justifiable to avoid too large an investment in fuel station capacity.

Fuel stations, except for fire-proofing safeguards, should be of temporary character, easily removed or added to, rather than of massive, permanent construction. In this way any change in the terminal, yard, or enginehouse layout can be most readily effected, while a minimum of investment is represented at all times in the fuel station. The mobile locomotive coaling and ashing crane, also useful for other yard, shop, and roadway service, is a practical device. But other forms of facilities are in many cases as good or better.

Even though cars furnish the cheapest and best form of storage for coal, discretion must be used as to the extent to which such storage is employed. Usually from three to five days' supply should be kept available at each fuel station. In districts almost adjacent to mines, and in good weather, a 36-hour supply might be the safe minimum, whereas in a remote desert or mountain region, in winter, a week or 10-days' supply would be advisable. A very highly efficient distribution could probably average a two-day minimum and a three-day maximum supply to be held available at each fuel station. The point is that the fuel and car distribution should be so worked out that the man in charge can know and direct daily the entire situation, foreseeing and preparing for every possibility of shortage or surplus, without special train movement. The movement of supply coal for 1,000 locomotives has been supervised by giving but 10 minutes' daily attention to the matter. Hundreds of dollars per diem may be saved each day by efficient distribution.

The average cost of handling coal at its destination ranges from eight or 10 cents per ton—an amount that can usually, with small investment be cut in two. Five cents a ton saved on 5,000 tons used per day means $250 saved per day. It would be a poor fuel manager who could not in almost any situation, by giving his close attention to the matter, save one cent a ton in the handling charge. An item that amounts to nothing in some instances and in others assumes considerable importance, is that of locomotive detention while coaling. Effective supervision will do much to reduce these detentions, wherever serious, without increased cost. The average time of locomotive detention at coaling stations in loss of earning power is about 10 cents, though in some cases it runs into dollars.

An unnecessary coal breakage of some 5 to 8 per cent. is not infrequent at the fuel station, and this means an average loss in fuel value of perhaps 10 cents per ton, besides the bad effect on the boiler efficiency of the locomotive. Prof. Goss has demonstrated that an average locomotive working under heavy load will absorb into the boiler less than half the heat in the coal. Much can be done by the mechanical department organization in providing the most modern designs of locomotives and parts, as well as in giving close attention to upkeep.

Important as are these details of current maintenance of engine condition the broad questions of design to secure highest thermal efficiency are of still greater moment. The fire box does more than half the heat work of the boiler and most fire boxes are inefficient as heat generators. Most flues of modern American locomotives are too long. Boiler pressures under present-day designs should be under 200 lbs.; the higher temperature range does not secure a heat efficiency to compensate for the greater maintenance expense and attendant disadvantages. Feed-water heaters and steam super-heaters should be employed. From 15 to 25 per cent. of fuel can be saved by their use besides securing a locomotive more responsive, faster and with greater hauling power.

After the coal is loaded on the tender of a locomotive, properly designed and maintained with reference to heat efficiency, the next step in fuel supervision is to train and stimulate the engine crew in the economical use of the fuel and steam at their hands. This problem, nearly half the battle for economy, is such an extensive and important one that it needs a treatise to itself. Engine crews should be instructed in firing and locomotive handling. Instructions should be given both on the foot plate and in the class or lecture room, or instruction car. Seventy-five per cent. of the instruction should be personal, individual, practical, on the road, and 25 per cent. in the theory of combustion and heat, academic and general. Fuel instruction books, if

required to be in the hands of all at all times, and if the men are frequently catechised as to their contents, which should be of a specific practical nature, are well worth while.

In connection with the fuel instructors—who may most conveniently be additional road foremen of engines—about one man to 50 engines in running service—a system of efficient supervision of their movements with full but quickly made reports covering every crew ridden with, is essential. These instructors can cover from two to ten crews a day, averaging five, and the moral effect is great, aside from the actual value of instruction. Large and direct results accrue from the payment of premiums to road foremen for efficient fuel performance on their divisions. In view of the attitude on the part of certain organizations with respect to engineers and foremen who would voluntarily increase their wages in return for better service rendered, a horizontal or pooled premium system has been developed, that eliminates the objections raised against the individual premium system. A properly developed premium system would effect a net fuel cost reduction of fully 15 to 20 per cent., irrespective of other economies, and should therefore be worthy of serious attention and trial. To have a premium system or to properly supervise the performance of individual crews there must be an indivdual record.

In conclusion, by the co-ordinate application of all the best methods known today, in the exercise of fuel economy, it can be predicted with certainty, that on any railway whose administration is willing to make a serious attempt at the solution of the problem, over 30 per cent. net reduction in fuel expense can be effected, and a less amount only in so far as the attempt is less serious and earnest.

Discussion.—F. O. Bunnell, engineer of tests, Rock Island Lines, said records of engine and firemen's performances as individual handlers and users of fuel were essential in securing their co-operation. This stimulates their interest and activity. The roads do not pay enough attention to the instruction of these men. A better inspection of coal at the mines would receive the support of mine operators.

Thomas O'Day, road foreman engines, Erie, said coal saving begins at mines. It must be clean and kept clean, and should be used intelligently, for example, an engine should not be fired too soon, so as to be left standing four or five hours before starting on a run. The Erie furnishes its firemen a pamphlet on firing, and holds conferences of enginemen each week, as part of its instruction system. Personal appeal and the showing how more attention to economy makes easier work for the engine crew are giving excellent results. It tries to exercise forethought in designing its engines with reference to the fuel to be used, and geographical placing and distribution is duly considered. This road is also making great strides in lessening smoke nuisance by proper firing.

Representatives of coal companies said that some slack will burn well in locomotives, especially the coking slack. This should not be condemned entirely, as more economical results are secured by using a coking slack than by using some kinds of lump coal. The general feeling of operators is that they are willing and eager to give roads the kind of fuel they want. Coal should be bought in times of light traffic and stored, and making the production more even would tend to reduce strike troubles.

C. F. Schraag (Chicago & Eastern Illinois) said that the individual performance record, as now used, is of little value. There is no way of comparing or making allowance for runs on which an unusual number of stops, layouts on sidings, switching, etc., had to be made or done; and no allowance for winter conditions, etc. This makes records of no value as standards of comparison. Again, they are usually available only after a long period of time has elapsed which largely decreases their values.

H. B. MacFarland, engineer of tests of the Santa Fe, said carelessness in drafting locomotives often causes poor performance. Thus should be watched closely as important economies can be effected thereby.

W. B. Landon, chemist, Erie, said slack is mixed with lump coal as standard and gives good results. Men are enthusiastic over forms and character of performance charts used. He also showed the Grand Trunk Pacific and 'Frisco are saving fuel by getting engines ready in the shortest possible time before they are to go out on their runs. The 'Frisco save 5 to 10 per cent. of cost of fuel for trips in this way.

ORIGIN AND PRODUCTION OF PETROLEUM, AND ITS USE AS LOCOMOTIVE FUEL.

The second session of Wednesday's meeting, May 17, was devoted to a paper by Eugene McAuliffe, general fuel agent, Frisco Lines, on Petroleum. The paper gave statistics as to the world's production for the nine years from 1902 to 1911, inclusive, and also showed the production in the United States from 1859 to date. Then followed a historical sketch of the use of petroleum, and a study of the geological conditions in which it is found, showing its distribution in the United States, and the areas of the various fields. The advantages of oil as compared with coal are set forth as follows:

Cost.—This item depends entirely on relative price at mine and well plus freight to point of consumption. In computing freight haul tariff rates must govern when moved over foreign lines, the actual cost of moving (not including what is known as fixed charges) ordinarily used in computing cost over home rails. In making these computations the fact that from 1,000 to 1,500 pounds of oil equal 2,000 pounds of coal must be taken into account.

Decreased cost of handling oil from cars to engines with practically no loss by depreciation due to such handling, all coal suffering in passage through coaling plants of whatever type.

The losses by depreciation suffered by coal do not apply to oil, neither does loss by theft in transit occur, oil reaching engine tenders unimpaired as to quality and undiminished in quantity.

Saving of time at terminals and increased mileage per engine, it being unnecessary to cut engines out for fire cleaning; the oil capacity of tender approximating 150 per cent. of that of coal, making longer runs possible.

Freedom from physical failure of firemen in extreme hot weather, the fireman's work being actually lighter than that of the engineer.

Stability of delivery, oil unaffected by labor conditions which has made the production of coal in some sections so uncertain as to necessitate the storage of immense quantities of coal at great expense, this condition occurring at frequent intervals.

Greater cleanliness in handling of passenger trains with almost absolute immunity from right of way fires, saving the cost of fireguards, reducing also claim department losses.

The drawbacks to the use of oil have been in the direction of uncertain supply. The expense of equipping the average locomotive to burn oil approximates $800; the cost of constructing steel storage tanks of large capacity approximates 25c. per barrel, the necessary terminal facilities, however, cost but about 50 per cent. of the amount required to handle coal, coaling facilities, however, usually in place, the oil facilities when installed representing a duplication. Frequently before the producer is able to judge his production sufficiently well to warrant the making of definite contracts, large quantities of "pot" oil must be sacrificed for want of storage or market facilities. After the production is reasonably well determined an interval of time is necessary to transform locomotives, these factors embarrassing both to the oil producer and the railway consumer. With the development of new fields and the purchase of large numbers of cars, together with the increased installation of oil burning apparatus this condition will prove less burdensome in the future than in the past.

The paper also gave rules for the guidance of engineers, firemen, and others whose duties include the handling of oil burning engines, together with some suggestions in the form of "Dont's" for enginemen and firemen, and closed with specifications for the purchase of fuel oil for railway use.

AIR BRAKE ASSOCIATION.

The eighteenth annual convention of the Air Brake Association was held at the Auditorium Hotel, Chicago, May 23-26. The convention was opened by prayer by Rev. Frank G. Smith and an address of welcome to the city was made by Maclay Hoyne, assistant corporation counsel, representing Mayor Carter H. Harrison. An interesting address was given by W. L. Park, vice-president of the Illinois Central, describing a visit to the Panama Canal in which he referred to the extensive use of compressed air for operating machinery in that great work. In the address of the president of the association, T. L. Burton, he referred to the past work of the association and to the reports of committees on improved methods which have since become standards of the Master Car Builders' Association. He also mentioned the fact that the requirements of the law in regard to hand brakes are creating some confusion, as seven or eight different kinds are in use on the roads entering New York City.

The report of the committee on Examination and Rating did not contain any definite recommendation for uniform rules for this purpose, but suggested that it would seem best for each road to frame a list of questions to cover its own requirements. The report on Brake Cylinders and Connections by H. A. Wahlert related almost entirely to the leather packing and lubrication of cylinders. It contains results of exhaustive investigations relating to these subjects. An abstract follows:

During the last year there has been a gradual introduction of the cup form of packing leather and a limited use of different types of packing expanders. The makers of brake cylinder lubricants have presented claims for their products which are intended to eliminate the brake cylinder leakage and restore the life of discarded packing leathers. Packing leather in freight car service, if properly taken care of, should last practically as long as the car, therefore nothing could be gained by using an expander in freight car cylinders to prolong the life of the leather packing. The test of a special type of packing expander failed to confirm the claims for its superiority and the admission must be therefore made that the leakage with the older leathers was through the fibre and pores of the material rather than between the leather and its contact with the wall of the cylinder. It is believed that the average packing leathers which are received from the manufacturers will, except when used in special service, develop leakage through the pores of the leather long before they are worn thin. It is possible that in switching and local passenger locomotives the leather may wear thin before it becomes porous by losing the filler and in such service some slight benefit might be derived from a special form of expander. The expander which is regarded with most favor is that used by the Union Switch & Signal Company for the switch movement cylinder. A careful study of the expander question has convinced the author that this type of expander can be made to exert a uniform circumferertial pressure on the packing leather and that none of the other types can do this.

Various tests were made with dry and lubricated leathers and with one of the well known makes of cylinder lubricants. Leakage tests were made with both flat and cup leathers and the results were decidedly in favor of flat leathers. This is due to the self-expanding, or stuffing box action of the flat leather, as it will cling to the walls of the cylinder to a much greater degree than the cup packing, in which this expansive effect is absent. On some special tests made with box cars built in 1907, it was found that at one clearing point, 10.4 per cent. of the brakes on these cars had to have packing leathers renewed, and it is evident from this that the life of the leather is not equal to the life of the car, but it should be remembered that the brake apparatus does not receive proper treatment and is allowed to lie exposed to the action of the elements, which, no doubt, is the cause of the rapid deterioration. Tests were also made with bark-tanned packing leather and with chrome-tanned, and it was found that an old bark-tanned leather leaked 60 lbs. in less than one minute. This same packing was lubricated on the pressure side with lubricator compound A, and the leakage was reduced about one-half. The same leather was then cleaned off and carefully lubricated with D compound and again tested and the leakage almost entirely disappeared, showing that the compaund D rendered the leather impervious. The results of temperature tests show that with a high dry heat and lubrication the chrome-tanned leather was affected by shrinkage while no such results were apparent with the bark-tanned.

Examination of a great many packing leathers, removed on account of being worn out and apparently rotted, would indicate the advisability of carefully considering the composition of lubricants employed for brake cylinders, as they contain ingredients of a destroying nature, the principle one being found in mineral oil. Natural mineral oil in itself is destructive to leather, but the process of refining it adds a certain amount of sulphuric acid and as much as 1½ per cent. of this acid was found in such lubricants. Animal fats also develop acids which are likewise destructive to leather. It follows that a good brake cylinder lubricant should be as free as possible from mineral oils and acids and contain as large a percentage as possible of pore-filling material in order to fill up the inequalities which exist in the structure of the leather and between the walls of the cylinders and the packing. A very desirable quality of a brake cylinder lubricant is its ability to resist temperature and adhere to the walls of the cylinder regardless of the position. It was found that packing which was otherwise in good condition indicated wall leakage taking place at the upper side of the piston, the cylinders being in a horizontal position; there is a general tendency for all brake cylinder lubricants to gravitate toward the bottom of the cylinder. The practice of using mineral oil for brake cylinder lubrication cannot be too strongly condemned.

The following sums up in tabular form the various conditions which cause packing leathers to leak.

Conditions Causing Packing Leather Leakage.

- Poor leathers—
  - Unsuitable material—
    - Improperly tanned.
    - High percentage of tanning filler.
  - Improperly treated—
    - Unsuitable filler.
    - Not long enough in bath.
    - Bath too high temperature.
- Leather improperly applied—
  - Leather bent back.
  - Leather cut in assembling cylinder.
  - Wrong side against cylinder.
- Loss of filler due to:
  - High heat.
  - Long service.
  - High pressure.
- Lack of lubricant.
- Excessive heat or excessive cold.
- Expander:
  - Failing to hold packing leather against cylinder walls.
  - Out of position.
- Unsuitable lubricant.
- Too long intervals between clearing, inspecting and lubricating.
- Wear due to:
  - Cut due to conditions of road bed.
  - Pitted expander.
  - Rough cylinders due to rust.
  - Lack of lubricant (dry cylinders).
  - Air pressure on flange of leather.
  - Cocked piston due to improper alignment of brake gear.
- Rotting due to:
  - Unsuitable lubricant.
  - Moisture with heat.
- Tearing due to:
  - Water in cylinders and consequent freezing.

The report also contains numerous tables, curves and drawings, which are of particular value in connection with the maintenance of air brakes.

Discussion.—It was recommended that the attention of the Master Car Builders' Association should be called to the needs of a special type of expander in air brake work and that further and more extensive tests should be officially made. Also that the proper construction and material for air brake packing should be a subject for committee report and that the committee should be instructed to take up the question with the manufacturers as well as the railways. No definite action was taken by the association to correct the causes of the undue amount of leakage and the defective cylinder packing generally used. It was also brought out that in various tests of brake efficiency the results do not take account of cylinder leakage, and possibly

the results would have been quite different had the cylinder packing been in good condition.

BRAKING POWER FOR FREIGHT CARS.

John P. Kelly, road supervisor, Nashville, Chattanooga & St. Louis, presented a paper at the Wednesday morning session, May 24, on the Adequate Braking Power for Freight Cars. An abstract follows:

I do not anticipate any decided opposition to my plea for an increase in the per cent. of braking power, now generally employed on freight cars, to something quite beyond what some of us may deem practical, on the ground of any fear of what may happen to the wheels in consequence thereof. To my mind the objections that will be raised will come from a serious consideration of what effect a braking power of 120 per cent. of the light weight of each car (about 35 per cent: loaded weight) would have in a train of 100 or more cars, all braking at this per cent., when they were wholly loaded or wholly unloaded, part loads and part empties, whether running at 10 or at 40 miles per hour, with either a service or an emergency application.

Long trains are subject to danger coming from what we term the "internal pressure" which acts during the progress of an application of the brakes either in a service or in an emergency, and which becomes sometimes great enough to cause the train to buckle and force the cars upon which the enormous pressure acts to move out sideways from the track.

The buckling of our long trains is a serious matter, even now while we are using only 70 per cent. braking power, although as equipment of steel construction increases this danger diminishes; but any change that we are to consider, either in per cent. of braking power employed or method of handling the brakes, must be with a view always to lessening the chances for damage in effecting stops. In short, it should be possible for the brakes to apply from any cause, either in service or in emergency, without danger of heavy shock or damage.

With all things in good condition, a fairly short stop may be made in emergency on level grade with the present 70 per cent. of the light weight; but we find conditions such as in fast freight service that a more powerful brake is desirable; in fact, where such fast freight trains are run on a fast schedule and following passenger trains the brake should be powerful enough to stop them in distances as short, as that of passenger trains.

When we come to consider heavy grade work where trains of heavy capacity cars are handled, and these with the usual 10 per cent. overload, the higher braking power will be of great advantage. Let us consider conditions on a 4 per cent. grade. On such a grade the proportion of the total weight tending to accelerate motion down the grade is 4 per cent. of the load or total weight of the car. Taking a car whose total weight is 150,000 lbs., the accelerating force is 6,000 lbs., and to neutralize this force a retarding force of 6,000 lbs. must be exerted. Now where the total brake force on such a car is but 70 per cent. of the light weight, based on a 60-lb. cylinder pressure, the car weighing 40,000 lbs., we have a total brake force of 28,000 lbs., and from this force we can count on from 15 to 18 per cent. of it as the retarding force, or from 5,200 to 4,640 lbs. I have not considered resistance due to flange, journal and curves, friction nor losses in braking power chargeable to the foundation gear.

Evidently here is a case where we must have more retarding power if we are to control the motion of the car, for the force of gravity equals 6,000 lbs., and the braking power or retarding power must be greater than this to control the motion.

Taking the braking power at 120 per cent. of the light weight, or 48,000 lbs., we should then have a retarding power of from 7,200 lbs. to 8,640 lbs., and, in addition to this, if we increase the brake pipe and reservoir pressure from 70 to 90 or 100 lbs., we have a brake which is capable of handling the train safely with a reasonable margin of safety on a grade of 4 per cent. On all grades of a less per cent. it would be quite possible, unless they were very long, to handle trains on them without the aid of pressure-retaining valves, something which it would be very desirable to do, for several reasons, among them the avoidance of the necessity for trainmen to go over the train to operate them and the prevention of the slid flat and hot wheels that are chargeable to their use.

The mixed load and empty train, say consisting of about 35 loads and 65 empties, won't break in two when the brakes are applied either in service or emergency application, for the following good and sufficient reason:

When we fix the braking power at 35 per cent. of the loaded weight, this means for the 100,000 lb. capacity car a braking power of about 120 per cent. of the light weight of the car. At 20 miles per hour the distance required to stop in with such a train could not be over, on a level track, 450 ft., and the time acquired not over 10 or 15 seconds; hence, as it requires about 6 seconds to put quick action through a train of 100 cars and as there is about 65 ft. of slack in the train, it is easily seen that the train could not break in two, because of lack of sufficient time for the rear brakes to get much more than fully applied. With the higher braking power the tendency would be to bunch the slack quicker, but more of it would be closed with fewer cars than is now the case, hence the shock which is now due to the rear running up on the front portion that is heavily braked would still run up, but against fewer cars braked heavily, and hence the shock would be in my opinion more yielding.

It is my belief, however, that if the higher braking power for freight cars should receive any attention the time of equalization between the auxiliaries and the brake cylinders should be increased so as to permit the rear brake on a 100-car train to commence to apply before the first brake is fully applied. This would increase the flexibility of the brakes both in service and in emergency applications, and no heavier brake gear would be needed to be employed than is now the case with the 70 per cent. brake. On different roads we find cars now running that are braked at nearly 100 per cent. of their light weight, based on 60 lbs. cylinder pressure, and these same cars are equipped with K valves. They are of course indiscriminately mixed in trains with other cars braking as low as 60 per cent. and having ordinary quick action triples. Now a five-pound service reduction made with conditions as existing above would produce a braking effect on one car of zero per cent. of its light weight, and on the other probably 25 or 30 per cent. of its light weight, yet these conditions exist today and are being got along with fairly well. How much better, then, would matters be if the loaded weight of the car was used as the base on which to fix the per cent. of braking power, if the per cent.. determined upon were 35 or more, as experiment might show could be successfully used.

With braking power of the per cent. given based as recommended above a proper regulation of the flow of air into the brake cylinder, as well as quick serial reduction in brake pipe pressure, will in my judgment improve conditions in freight service to such extent that runaways on grades will never be heard of again, and shock and break-in-two on our long trains will almost, if not entirely, disappear, while in many of the cases now requiring an emergency application to stop in time to prevent accident will then require only a service application.

Discussion.—There was considerable difference of opinion among the members as to whether high braking power should be used for freight trains. Some favored 100 per cent. for both passenger and freight, while others did not favor such a large increase over the present practice. Experiments made with steel cars having 90 per cent. braking power showed that even this was too high. A representative of the Pennsylvania thought the increase recommended by Mr. Kelly would result in considerable trouble with light cars, causing brake-in-twos. W. F. Walsh, of the Chesapeake & Ohio, suggested that improvement in the condition of the brakes themselves would give so much better braking that the additional power desired could be obtained with the braking power already used. W. V. Turner, of the Westinghouse Air Brake Company, agreed in the high

braking power for freight service and believed that some improvement in this direction is necessary. Several members of the association told of experiences in handling trains on heavy grades with Mallet locomotives where hand brakes were not necessary and remarkably good work was performed.

TRIPLE VALVE LUBRICATION.

Following Mr. Kelly's paper was one on Running Triple Valves Without Lubrication, by Lincoln Leonard, in which he made the following recommendations:

Clean all parts of the valves, care being exercised to remove all oil, grease or gummy deposit from the slide valve or seat, or the main piston and its chamber, after which the slide valve and its seat should be lubricated by the application of dry graphite (best quality). Also the surface of the bushing in contact with the slide valve spring, and between the graduating valve and its seat, moving it forward and backward until the material is properly distributed. This material should be rubbed on sparingly with a chamois skin or cloth. Main piston and its chamber should be lubricated with triple valve grease or oil. In lubricating these parts the piston should be pushed to its extreme release position and the grease or oil applied sparingly to the walls of the chamber, and the piston moved forward and backward several times, which would tend to better distribute the lubricant; care being exercised that no considerable amount of grease or other lubricant adhere to the piston rings or walls of the chamber. The emergency parts of the triple valve, such as emergency valve, piston and check valve, should be thoroughly cleaned but do not require lubrication. I would call attention to the importance of giving proper and intelligent treatment to the triple valve when it receives cleaning, repairs and testing.

Papers were also given on New and Worn Brake Shoes, by A. S. Williamson, on Controlling of Modern Passenger Trains, by W. V. Turner and other interesting subjects which will be abstracted in later issues of the *Railway Age Gazette.*

Among the exhibits at the convention the following concerns were represented: Allis Chalmers Co., Milwaukee, Wis.; Chicago Railway Equipment Company, Chicago; Crane Co., Chicago; Detroit, Leather Specialty Company, Detroit, Mich.; Detroit Lubricator Company, Detroit, Mich.; Joseph Dixon Crucible Company, Jersey City, N. J.; Emery Pneumatic Lubricator Company; Garlock Packing Company, Palmyra, N. Y.; Green, Tweed & Co., New York; E. F. Houghton & Co.; International Acheson Graphite Company, New York; H. W. Johns-Manville Co., New York; The Leslie Company; New York & New Jersey Lubricant Company, New York; Ward Equipment Company, New York, and Guilford S. Wood, Chicago.

TRAIN ACCIDENTS IN APRIL.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of April, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that its seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
4.	Rogue Riv. Val.	Jacksonville	rc.	F. & P.	1	5
16.	Southern	Russellville.	xc.	P. & F.	1	1
18.	M., Kan. & Tex.	Cherokee Jcn.	bc.	P. & P.	1	1
20.	N. Y., C. & St. L.	Buffalo.	xc.	P. & F.	1	6
23.	M., Kan. & Tex.	Alvarado.	xc.	P. & F.	2	0
29.	N. Y. N. H. & H.	Dorchester.	xc.	F. & F.	1	0
30.	Penn.	Dayton.	xc.	P. & F.	3	6

[1] Abbreviations and marks used in Accident List: rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Derailments.

Date.	Road.	Place.	Cause of derailmt.	Kind of Train.	Kil'd.	Inj'd.
*1.	St. Louis & S. F.	Lebanon.	unx.	P.	0	9
3.	Wabash	Topeka.	unx.	P.	0	5
9.	N. Y., N. H. & H.	Suffield.	d. track.	P.	0	6
11.	Mobile & O.	Muldon.	d. track.	P.	1	7
12.	Penn.	Foster.	b. truck.	F.	0	3
12.	Int. & G. N.	Navasota.	unx.	F.	1	0
13.	Southern	Ashley J.	flange.	P.	0	9
17.	Chi., R. I. & P.	White, Okla.	unx.	P.	0	3
17.	Atch., T. & S. F.	Needles.	unx.	F.	2	2
19.	Lehigh Valley	Auburn.	ms.	P.	0	11
19.	Ills. Cent.	Aberdeen Jcn.	washout.	P.	0	1
*22.	N. Y. C.	Little Falls.	malice.	P.	0	2
23.	Southern Pacific	Vincent.	unx.	P.	0	3
†*29.	Penn.	Martin's C'k, N.J.	unx.	P.	11	40
†29.	Atlantic C. L.	Odessa.	d. track.	P.	2	3
29.	Texas & Pacific	Saline Creek.	d. switch.	P.	0	8

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of Train.	Kil'd.	Inj'd.
27.	Balt. & Ohio	Silver Run, W.Va.	boiler.	P.	2	6
19.	Oregon S. L.	Shoshone.	boiler.	F.	2	1

The only accident in the foregoing list which is in any important sense peculiar, is the derailment at Martin's Creek, N. J., on the 29th. This derailment, the cause of which has not been reported and the worst results of which were due to fire, was reported in the *Railway Age Gazette* of May 5, page 1076. At last accounts the number of deaths resulting from this derailment was 12—eight passengers and four employees.

At Rocky Mount, N. C., April 27, on the Atlantic Coast Line, a passenger in a sleeping car was suffocated in a fire and two trainmen were considerably burned while rescuing 10 other passengers from the car; but this is not included in the train accident report as the car was standing at the station at the time. It appears that illuminating gas was leaking from a pipe on the outside of the car, and a trainman who went to see what was the trouble took with him a lantern from which the gas was ignited. At South Rocky Mount, one mile back, where the train (No. 86) had been stopped for a change of engines, and at which point the gas tank of this sleeping car had been connected by hose with a supply pipe, the train was started without detaching this hose. After running some distance, the hose was torn off, and, as the valve was open, the gas from the car reservoir escaped, producing a loud noise. As soon as the trainman got near the end of the hose, there was something like an explosion, causing the flames to sweep over the side of the car. Glass in the windows was broken, and the interior of the car was set afire.

At El Parue, Mex., on the 29th a passenger train was wrecked by the rebels who are fighting the government in that country, and three passengers and a train porter were killed. In South Africa, April 22, as heretofore recorded in the *Railway Age Gazette,* a passenger train plunged off a bridge into a gorge, 250 feet deep, killing 35 persons.

Electric-car accidents. Of the 18 accidents of this kind reported in the newspapers as occurring in the United States in the month of April, only one is charged with fatal results. This was a collision at Oak Park, Ill., on the 3rd. One person was killed and four were injured.

FOREIGN RAILWAY NOTES.

The Chilean railway from Osorno to Puerto Montt is expected to be open to traffic in June.

The branch of the Midland Railway from Algorta, Uruguay, to Fray Bentos will soon be opened to public traffic. There has also been constructed at this point a pier 140 yards long, enabling the largest ocean vessels to dock.

The Chilean government has granted concessions for the construction of 115 private railways, of which 24 have already been built and several are now under construction. The concessions vary from five years to perpetuity.

General News Section.

Mr. Bush, the new president of the Missouri Pacific, announces that the engineering officers of the road on the several divisions will be placed under the authority of the division superintendents, thus introducing the divisional organization.

The fashion of sending missionaries to the farmers has spread to the state of Maine. The Bangor & Aroostook is to run a train June 16-18 for professors from the University of Maine, who will take along a car of animals to demonstrate some of the lectures. It is proposed to give lectures in 31 towns.

Beginning July 1, the Wells, Fargo & Company Express will take over the business of the Pacific Express Company on the Missouri Pacific, the St. Louis, Iron Mountain & Southern, the Wabash, the St. Louis Southwestern and the Texas & Pacific, and arrangements are being made for the liquidation of the affairs of the Pacific company.

The officers of the Oregon Short Line have been making a series of "get acquainted" trips over its lines. They take a special train composed of sleeping, dining and observation car, making stops of varying lengths at all stations of any importance, and spend from three to five days on the line. All of the departments of the road are represented and the meetings with the people thus far are reported to have been very satisfactory.

At Rushville, Ind., on the Indianapolis & Cincinnati Traction Company's lines recently, there was an exhibition of the Gill selective system of train control. With this apparatus the train despatcher has control over a semaphore signal at each station along a line of railway. The electric apparatus, by which this control is effected, works over a single line wire; and after a signal has been set and locked in the stop position it cannot be restored by the station man or the train man to the clear position without the consent of the despatcher.

The British postmaster-general has announced in Parliament that the cable companies between England and America will make a reduction of 50 per cent. in the rates on ordinary cable messages, provided they are written in plain language, and provided also that the sender will take the risk of a delay, not exceeding 24 hours. The postmaster-general also reports that the use of wireless telegraphs for sending messages has increased largely within the past year. The number of ships equipped with wireless apparatus increased during 1910 from 130 to 290. The British government owns numerous aerographic stations on the coasts of the British Isles.

The New York State Public Service Commission, Second district, has approved the use of steam locomotives on the Newark & Marion Railroad in Wayne County, provided the engines use oil for fuel. The Newark & Marion, 10 miles long, was begun as an electric road, but thus far it has been operated by steam locomotives. Apparently these engines have been used hitherto without authority. The owners say that the amount of business to be had is not sufficient to warrant the installation of electric motive power. The commission requires the oil-burning apparatus to be ready by July 1 next. The company must obtain the consents of property owners, or if this cannot be done, it must apply to the courts.

The legislature of Wisconsin has adopted a workman's compensation law, to take effect September 1. Like the laws recently passed in New Jersey and one or two other states, this one applies only to cases where the employer voluntarily takes advantage of it; while for employers who do not signify their acceptance of the new law, the old law relative to assuming the risk of accident, contributory negligence, etc., is made more severe. As members of the industrial accident board, which is to administer the new law, the governor of the state has appointed Charles H. Crownhart, of Superior (chairman), and Prof. John R. Commons, of the University of Wisconsin. Joseph D. Beck, commissioner of labor and industrial statistics, is ex-officio a member of the commission.

In the first interview given out since he assumed the presidency of the Missouri Pacific, B. F. Bush made the following statement: "As soon as we show that the property warrants the expenditure, the Missouri Pacific will have all the money it needs to rehabilitate it and put it in the front rank of western railways." He said the prosperity of the railways depends absolutely on the people and that that of the people depends on the roads, and that, therefore, the most kindly relations should exist between them. He also believed the feeling against big transportation systems is not so bitter as it was some years ago, because of the fairer treatment they give the people and the people give them. The interview concludes as follows: "I believe in keeping the public informed of those matters which concern the public; in fact, the idea of publicity of corporation affairs will hereafter find an advocate in Missouri Pacific. In the matter of expenditures the Missouri Pacific is going to get its money's worth. There will be no waste, no matter how many millions of dollars we spend in rebuilding the road. Every cent will be watched, not for the purpose of seeing how little we can spend, but with the idea of getting full value for our money."

A testimonial dinner was given on May 17 at the Hotel Jefferson, St. Louis, Mo., in honor of C. S. Clarke, who recently resigned as first vice-president of the Missouri Pacific. Many prominent officers of the Gould lines, as well as business men of St. Louis and other cities, were present. B. F. Bush, the new president of the Missouri Pacific, presided at the dinner. On May 19 the Business Men's League of St. Louis formally welcomed Mr. Bush to St. Louis at a dinner at the Southern Hotel. More than 500 business men of the city were present and speeches were made by Rolla N. Wells, former mayor of St. Louis and now president of the Business Men's League; President Bush, Governor Hadley, of Missouri; E. C. Simmons, of the Simmons Hardware Company; Mayor Frederick H. Kreisman and David R. Francis. In the course of his address, Mr. Wells criticized some of the St. Louis papers for an unfair attitude toward the railways and particularly toward the Terminal Railroad Association of St. Louis. Mr. Bush gave assurance that the policy of the Missouri Pacific will be to give good service and promote the interests of the communities along its line, and he asked the support of St. Louis business men in this work.

The Lehigh Valley has ordered from the Western Electric Company 48 selectors for use in telephone lines for the train despatcher, which are being put up between Sayre, Pa., and Manchester, N. Y., 86 miles, and over the Ithaca branch, which parallels the main line for most of the distance between those points. The total length of telephone circuit to be put up, including three branches, will be 208 miles. For 15 miles out from Sayre the telephone line from the main road and for the branch run side by side and at Van Etten Junction, the end of this 15-mile section, there is a switch under the despatcher's control, by which, if either one of the telephone circuits should be out of order on this short section, the despatcher can make connections so as to use the remaining circuit to send messages over either the main line or the branch.

These new telephone wires are to be supported on the top cross arms of the poles of the company's telegraph lines, some of the telegraph wires being moved to lower arms to enable this to be done. During the day time, when business is heavy, a despatcher at Geneva attends to the trains on the two branches which diverge at that point, but at night the branch lines are cut into the main lines, so as to bring them into direct connection with the despatcher's office at Sayre.

Howard Elliott to the Manufacturers' Association.

In an address on "The Individual, the Corporation and the Government," delivered at the annual convention dinner of the National Association of Manufacturers, in New York City, on May 17, Howard Elliott, president of the Northern Pacific, said:

"Publicity of corporation affairs and reasonable regulation of the great business institutions of the country are desirable, but attempting to manage in detail such concerns, and continual and foolish interference with the judgment of the men trained in that management is unwise and un-American. Such policy tends to cripple the splendid initiative that has accomplished so

much up to the present time. With that initiative unimpaired and encouraged to act, far better results will be accomplished for the whole country than under the management of the government. Putting a government uniform on a railway employee does not make him energetic or infallible, and it will reduce his feeling of responsibility.

"The American people are strong enough to have any kind of railway ownership and management that they want, and, if they want government ownership, they can have it. I submit, however, that the management of business enterprises in this country by the government has not given evidence of thoroughness, efficiency and economy equal to that displayed by private individuals and it is not to the best interests of this country to have government-owned and government-managed railways."

Mr. Elliott discussed the subject of the valuation of railway property, referring to the Minnesota rate case as evidence that there was no water in the securities of the Northern Pacific, and quoting the combined statistics of valuation made in the States of Washington, South Dakota, Minnesota and Wisconsin by state commissions, showing a cost of reproduction of $958,316,613 and a capitalization of $796,054,276.

"There is every reason to assume," he said, "that a similar calculation and computation of the value of American railways as a whole will prove their value to be greater than their capitalization."

Referring to the great increase in savings banks deposits and the number of depositors, and in life insurance policies, Mr. Elliott said: "Every one of these depositors and every holder of a life insurance policy has a personal interest in seeing that justice is done to the railways—and the railways ask for nothing more than simple justice based on accurate knowledge of the real facts. Because a very few individuals have by superior brains, industry and even luck, made large fortunes, is it wise to condemn the splendid work of the American business man, destroy it and fly to socialistic evils that lead no one knows where?

"The great force of collectivism has created manufacturing institutions, railways, banks, insurance companies, labor unions, the government itself through the voluntary acts of individual citizens. These institutions, upon which modern society so largely rests, cannot be eliminated from our system of life.

International Railway Fuel Association.

At the last session of the convention of the International Railway Fuel Association, held at Chattanooga, Tenn., May 18, the following officers were elected: President, T. Duff Smith, fuel agent, Grand Trunk Pacific, Winnipeg, Man.; first vice-president, Daniel Meadows, assistant division master mechanic, Michigan Central, St. Thomas, Ont.; second vice-president, J. H. Hibben, fuel agent, Missouri, Kansas & Texas, Parsons, Kan.; and secretary-treasurer, D. B. Sebastian, fuel agent, Chicago, Rock Island & Pacific, Chicago. Members of the executive committee were elected as follows: W. C. Hayes, superintendent of locomotive operation, Erie, and retiring president of the association, New York, N. Y.; Raffe Emerson, engineer of track economics, Atchison, Topeka & Santa Fe, Topeka, Kan.; Robert Collett, fuel supervisor, St. Louis & San Francisco, St. Louis, Mo.; and J. McManamy, road foreman of engines, Pere Marquette, Grand Rapids, Mich., the latter succeeding C. F. Richardson, disqualified on account of having entered the coal business. These, with E. McAuliffe, fuel agent, St. Louis & San Francisco, and N. M. Rice, general storekeeper, Atchison, Topeka & Santa Fe, whose terms expire in 1912, constitute the executive committee for the ensuing year.

A resolution was adopted urging members of the associations to support the bill introduced in Congress by Representative Geo. E. Foss, of Illinois, to create a national arbitration tribunal to which controversies arising as to earnings, wages, hours and labor conditions of employees can be submitted. Chicago was chosen as the next meeting place, subject to the approval of the executive committee. The earlier proceedings of the association were reported in the *Railway Age Gazette* of May 19.

Railway Storekeepers' Association.

The eighth annual convention of the Railway Storekeepers' Association was held at the Hotel Pfister, Milwaukee, Wis., on Monday, May 22, with the largest attendance in the history of the association. The reports were received from the various officers and committees indicated hard work and research during the past year. The convention was formally opened on Monday afternoon with an address of welcome by Mayor Seidel, which was answered by W. R. Shoop (B. R. & P.). Following this an address was made by the president, J. H. Waterman (C. B. & Q.). The general discussion on The Need for a Standard Material Classification and Disbursements occupied the remainder of the day. The convention opened on Tuesday morning with the topical subject The Return of Cement Sacks, Carboys, etc. Several papers were read. The main subject of the day was The Railway as a Manufacturer. The paper read by G. G. Yeomans (Wabash) is abstracted in another column. Papers on the same subject were contributed by M. D. Frances (L. S. & M. S.), R. F. Whalen (A. T. & S. F.) and several others. A. E. Manchester, superintendent of motive power of the Chicago, Milwaukee & St. Paul, was present and took an active part in the discussion. The final reports of the committees were received and balance of the papers were read and discussed on May 24. The subject of discussion was The Standardization of Tinware. A paper by J. R. Mulroy (St. L. & S. F.), illustrated and described the various items of railway tinware. The following officers for ensuing year were elected: President, W. F. Jones (N. Y. C. & H. R.), New York; first vice-president, J. R. Mulroy (St. L. & S. F.), Springfield, Mo.; second vice-president, W. R. Shoop (B. R. & P.), Rochester, N. Y.; secretary-treasurer, J. P. Murphy (L. S. & M. S.), Collenwood, Ohio.

New York Railroad Club.

H. S. Hayward, president of the New York Railroad Club, has appointed a committee to nominate the officers for next year, their report to be made at the September meeting. This committee will be made up as follows: J. M. Barrett, superintendent of terminals, Erie; F. T. Dickerson, Jersey Central; B. P. Flory, superintendent of motive power, New York, Ontario & Western; M. E. Davis, Western Wheel Scraper Co., Aurora, Ill.; W. B. Albright, Sherwin-Williams Co., New York; H. H. Maxfield, master mechanic, Pennsylvania; H. L. Joyce, manager Jersey Central Marine Department; W. F. Jones, general storekeeper, New York Central; Nat. Duke, general freight agent, Delaware, Lackawanna & Western.

Western Railway Club.

The annual meeting of the Western Railway Club was held at the Auditorium Hotel, Chicago, May 16. The club was entertained with a vaudeville performance and a buffet supper. The following officers were elected for the ensuing year: President, C. B. Young (Burlington); first vice-president, T. H. Goodnow (Lake Shore); second vice-president; H. LaRue (Rock Island). The meetings will be adjourned until the third Tuesday of September.

Railway Signal Association.

The next meeting of the Railway Signal Association will be held at the Hotel Astor, New York, June 13-14. Papers will be read on Substitutes for Wood Trunking for Railway Signal Circuits by W. K. Sparrow, and on Apparatus for Charging Storage Battery by W. K. Ferguson, R. E. Russell and by E. E. Kimball. Reports will be received from all the committees.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren F. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

Officers of the Lehigh Valley says that the running of the Black Diamond Express as an all-parlor-car train has proved a complete success.

The Central Passenger Association has appointed a conference committee which will meet the day before each regular monthly meeting of the association to investigate requests made for special rates, with a view to facilitating the handling of business at the regular meetings. J. W. Daly, passenger traffic manager of the New York Central Lines west of Buffalo, has been made chairman of the committee.

In accordance with a plan under which traffic for the Lake Shore-Lehigh Valley and the Michigan Central-Lehigh Valley routes in certain territories will be solicited by the representatives of the roads immediately interested—the initial lines—the offices of these fast freight lines at Chicago; Columbus, Ohio; Detroit, Mich.; Peoria, Ill.; Kansas City, Mo., and Minneapolis, Minn., will be closed, May 31, and on June 30 the office at Des Moines, Iowa, will be closed. It is also announced regarding the adjustment of freight claims, that after June 1, the handling of claims through the line manager's office will be discontinued, and, in accordance with Freight Claim Association rules, they will be adjusted by the individual roads involved.

The Delaware & Hudson and the Erie announce a new freight route from New York to Chicago. It is by steamboat north to Albany, 142 miles; thence southwest by the Delaware & Hudson to Binghamton, 143 miles, and by the Erie the rest of the way (1,195 miles, New York to Chicago). For shipments by this route to Buffalo and from there by lake steamers the rates are to be on the basis of 52 cents, first class, New York to Chicago, which is 10 cents less than by rail and lake, and 23 cents less than all rail. Tariffs have been filed with the Interstate Commerce Commission to go into effect June 15. Press despatches from Washington say that the other roads carrying freight between New York and Chicago have complained or will complain of this new low rate and that the Interstate Commerce Commission is trying to find out if there is anything in the law which will allow it to suspend the new tariff.

Indianapolis Enterprise.

The merchants and manufacturers of Indianapolis, represented by "The Trade Association" of that city, "swung around the circle" recently in a train of five cars, of one of the interurban lines entering the city, for the purpose of getting new business and getting in personal touch with their customers in the surrounding towns. On this special train were over 200 veteran salesmen and merchants. Within a few weeks it is proposed to run a 12-car train, presumably over steam railways, to Kentucky and Tennessee for a three weeks' trip. The running of these trade-extension specials would seem to indicate that that method of stimulating wholesale trade is profitable. This item we take from the *St. Louis Republic*, which has sent a special correspondent to Indianapolis to find out why the Indiana capital is so successful in building up its business. This correspondent finds that the Indianapolis merchants believe it necessary to make these visits by special train every six months. Results are not to be expected from running a train once a year. The *Republic* correspondent attributes a large part of the prosperity of Indianapolis to the interurban lines, of which 25 enter the city. They have a large union station in the center of the city and bring people in from towns within a radius of 100 miles, which includes parts of Illinois and Ohio. Five hundred passenger cars arrive and depart daily, and there are 38 freight and express trains.

Traffic Club of Chicago.

F. A. Delano, president of the Wabash Railroad, in an address which he delivered at the last meeting of the Traffic Club of Chicago, held on May 24, spoke on Optimism in the Railway Situation. Mr Delano found many things in the situation to make railway men optimistic.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 95, giving a summary of car shortages and surpluses by groups from January 5, 1910, to May 10, 1911, says:

"The surplus totals 188,847, a decrease of 677 cars since our last bulletin. There were decreases in flats and coal cars of 2,110 and 1,200 respectively, which were practically offset by increases in box and miscellaneous cars of 161 and 2,472 respectively. The increase in miscellaneous cars is made up principally of coke cars in group 2 and refrigerator and stock cars in groups 6, 8 and 10."

The accompanying table gives surpluses and shortages by groups and the diagrams show total bi-weekly surplus and shortages from 1907 to 1911 inclusive.

INTERSTATE COMMERCE COMMISSION.

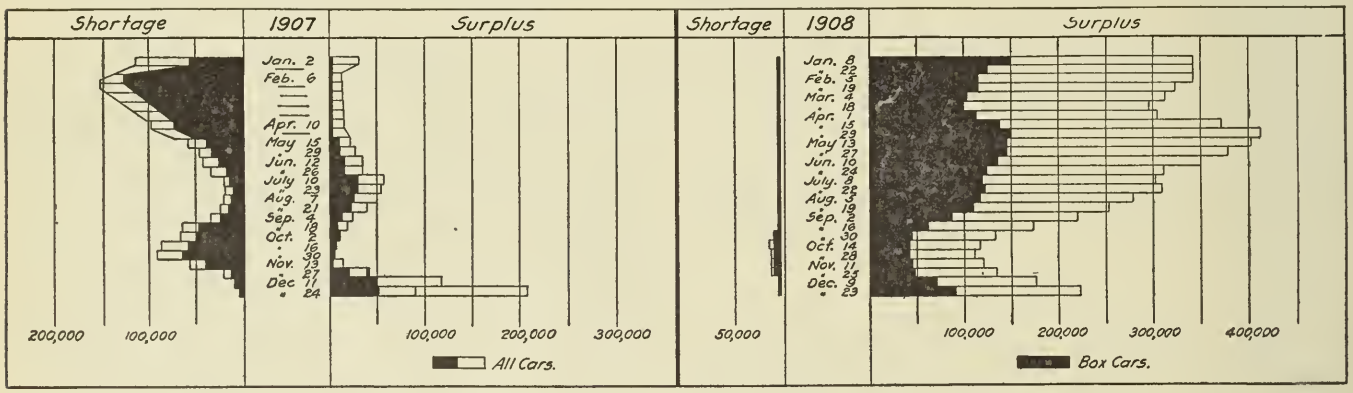
The commission has suspended until October 7 a tariff filed by the Galveston Wharf Company. The business of the Galveston Wharf Company was the subject of a recent decision by the Supreme Court of the United States; and this tariff was the first one that had ever been filed with the commission by the company.

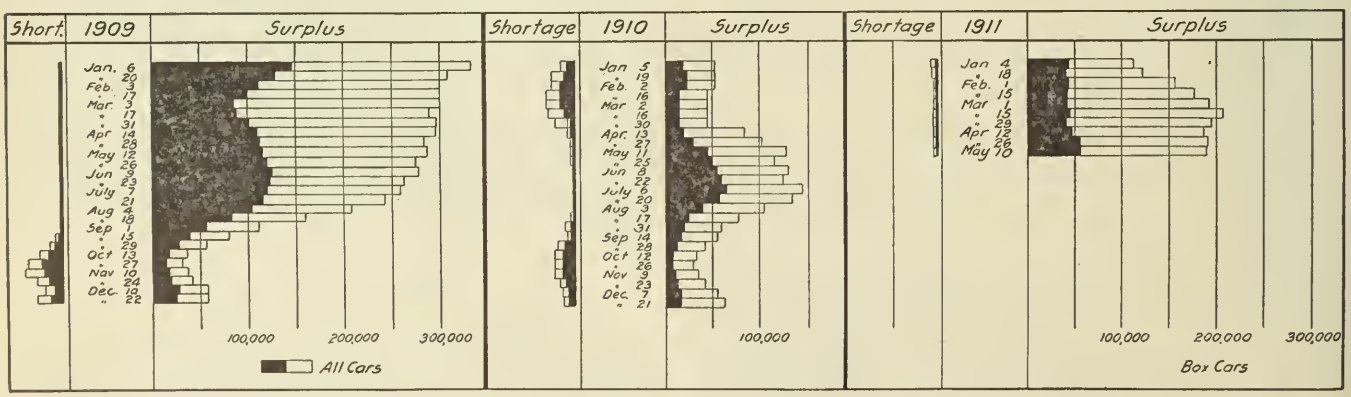
The commission has allowed the railways in Central Passenger Association territory to continue until May 1, 1912, those interstate passenger tariffs which call for fares based on a higher rate per mile than the intrastate fares on the same lines; most or all of the intrastate fares being limited to two cents a mile by state laws or orders of state commissions. The railways have declared their intention of testing before the courts the validity of the two cent laws and orders. The commission in its order says: "That the present condition of charging one

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—May 10, 1911	8	679	876	401	220	2,176	0	124	30	0	154
" 2.— " 10, 1911	25	2,249	138	21,290	9,235	32,912	35	0	10	0	45
" 3.— " 10, 1911	26	8,352	955	41,531	4,787	55,625	0	50	0	60	110
" 4.— " 10, 1911	10	3,679	147	5,064	1,941	10,831	16	69	0	0	85
" 5.— " 10, 1911	20	5,917	631	5,330	1,623	13,501	21	30	0	3	54
" 6.— " 10, 1911	26	11,774	1,124	4,724	7,432	25,054	83	0	24	3	110
" 7.— " 10, 1911	4	1,787	112	811	426	3,136	0	0	0	0	0
" 8.— " 10, 1911	16	7,921	316	2,516	4,265	15,018	0	0	0	0	0
" 9.— " 10, 1911	11	2,894	496	247	1,161	4,798	0	0	0	0	0
" 10.— " 10, 1911	22	7,527	2,531	2,222	10,090	22,370	0	2	0	4	6
" 11.— " 10, 1911	6	2,434	137	15	840	3,426	760	241	0	4	1,005
Total	174	55,213	7,463	84,151	42,020	188,847	915	516	64	74	1,569

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages, 1907 to 1911 Inclusive.

rate per mile for intrastate traffic and a higher rate per mile for interstate when the service performed is the same in both cases is indefensible; intrastate and interstate passengers are carried on the same train, in the same cars and are accorded equal privileges. It seems clear that eventually there must be established an actual distinction betwen the two services or a correction of the two scales of fares to an equality." The commission denies the request of the carriers to adjust their passenger fares in multiples of five in order to avoid the use of small coins in change.

The commission has given notice that by or before June 1 all carriers must cancel that rule in freight tariffs which provides that certain carload rates shall apply only when the consignor or consignee is the actual owner of the property. A carrier may not properly look beyond the transportation to the owner of the shipment as a basis for determining the applicability of its rates.

The Supreme Court of the United States on April 3, in the Delaware, Lackawanna & Western case sustained the commission's opinion on this subject. The Supreme Court said:

"The contention that a carrier, when goods are tendered to him for transportation, can make the mere ownership of the goods the test of the duty to carry, or what is equivalent, may discriminate in fixing the charge for carriage, not upon any difference inhering in the goods or in the cost of service rendered in transporting them, but upon the mere circumstance that the shipper is or is not the real owner of the goods, is so in conflict with the obvious and elementary duty resting upon a carrier and so destructive of the rights of shippers, as to demonstrate the unsoundness of the proposition by its mere statement. We say this because it is impossible to conceive of any rational theory by which such a right could be justified consistently either with the duty of the carrier to transport or of the right of a shipper to demand transportation. This must be, since nothing in the duties of a common carrier by the remotest implication can be held to imply the power to sit in judgment on the title of the prospective shipper who has tendered goods for transportation."

Saturday Afternoon Free Time.

Commercial Exchange of Philadelphia v. Pennsylvania Railroad et al. Opinion by the commission:

The counting of Saturday afternoons as part of the free time allowed for loading or unloading after placement and notice, under the uniform demurrage rules, not shown to operate in an unreasonable or unlawful manner in the Philadelphia territory. (21 I. C. C.)

Rehearing Denied.

In re Rates on Lumber Filed by the Vicksburg, Shreveport & Pacific. Opinion by Commissioner Meyer:

The commission is not empowered to regulate commerce, to suspend the operation of a schedule after it has gone into effect. (20 I. C. C. 16.)

Reparation Awarded.

Alpha Portland Cement Co. v. Pennsylvania Railroad et al. Opinion by the commission:

A joint rate of $2.75 per ton was not lawfully applicable to complainant's shipments of cement from Martins Creek, Pa., to Elizabeth City, N. C. (20 I. C. C. 640.)

Goodkind Brothers v. Chicago, Indianapolis & Louisville et al. Opinion by the commission:

The commission, as always, holds that in the absence of routing instructions, the shipper is entitled to have his shipment moved via the cheapest available route. (20 I. C. C. 17.)

Philip Goerres Cooperage Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

Rate of $1.35 per 100 lbs. on beer barrels and kegs from Milwaukee, Wis., to Sacramento, Cal., found unreasonable so far as it exceeds the class-D rate of $1 per 100 lbs., which rate is prescribed for the future. (21 I. C. C. 5.)

S. Samuels & Company v. St. Louis Southwestern et al. Opinion by the commission:

In June, 1909, there was no rate or combination of rates under which a shipment of cotton linters could lawfully be moved from England, Ark., to Houston, Texas. Nevertheless the initial carrier forwarded a shipment of that commodity via a circuitous route, over one portion of which there was a rate applicable to cotton linters. Over the remainder of the route no such rate was in force, and the carriers assessed a rate applicable on compressed cotton. (20 I. C. C. 646.)

Herman H. Hettler Lumber Co. v. Gulf & Ship Island Railroad. Opinion by the commission:

The complainant forwarded a carload of lumber from Woolam, Miss., to Owensburg, Ind., over defendants' lines and directed routing via Louisville, Ky. A combination rate of 27 cents was applied. At the same time defendants were parties to a tariff naming a joint rate of 24 cents from Woolam to Owensburg which reserved to the carriers the right to route all shipments of lumber and articles taking the same rates, but said tariff did not specify any particular routes; *Held,* That in the absence of routing directions in the tariff the joint rate of 24 cents was applicable via any junction points of defendants' lines, and that complainant was therefore overcharged to the extent of 3 cents per 100 lbs. (21 I. C. C.)

Complaint Dismissed.

National Refining Co. v. Cleveland, Cincinnati, Chicago & St. Louis. Opinion by the commission:

Rate of 13½ cents on petroleum and its products from Flat Rock, Ill., to Findlay, Ohio, not found to be unreasonable.

Western Mantle Co. v. Spokane, Portland & Seattle et al. Opinion by the commission:

Transcontinental tariffs provided a L. C. L. rate of $3 per 100 lbs. on "dry goods, n. o. s.," and a rate of $2.20 on "netting, cotton, n. o. s." Less-than-carload shipments by complainant were of knitted fabrics in tubular form, made wholly of cotton, for use as foundation material in the manufacture of gas mantles, and were not of the character of goods commonly known to the trade as "cotton netting." In the absence of a provision specifically covering the commodity, the defendants properly applied thereto the rate on "dry goods, n. o. s." (20 I. C. C. 643.)

J. C. Shaffer & Co. v. Chicago, Rock Island & Pacific. Opinion by the commission:

The provision in the uniform bill of lading that, "The amount of any loss or damage for which any carrier is liable shall be computed on the basis of the value of the property (being the bona fide invoice price, if any, to the consignee, including the freight charges, if prepaid) at the place and time of shipment under this bill of lading, unless a lower value has been represented in writing by the shipper or has been agreed upon or is determined by the classification or tariffs upon which the rate is based, in any of which events such lower value shall be the maximum amount to govern such computation, whether or not such loss or damage occurs from negligence," not found to have operated in an unreasonable or unlawful manner in connection with the shipment involved. (21 I. C. C. 21.)

STATE COMMISSIONS.

The Indiana Railroad Commission will not appoint a locomotive boiler inspector until September, the salary for this office, as provided for by the law of last session, being unavailable until October.

E. E. Smythe, for ten years previous to last November general freight agent of the Kansas City Southern, has been appointed tariff expert of the new public utilities commission of Kansas, with office at Topeka, Kan.

The Illinois railway commission bill, the provisions of which were briefly outlined in the *Railway Age Gazette* of April 21, page 957, has been passed by both houses of the state legislature. Although an attempt has been made to make the commission an elective instead of an appointive body, the bill as finally passed provides that the members will continue to be appointed by the governor. Sleeping car companies, express companies, interurban and electric companies generally are brought within the workings of the law.

COURT NEWS.

The Commerce Court has enjoined the Interstate Commerce Commission from enforcing its order in the case brought against the Delaware, Lackawanna & Western, known as the switch connection case. The commission has ordered the Delaware, Lackawanna & Western to make a track connection with the Rahway Valley Railroad at Summit, N. J.

The Supreme Court of the United States on May 15 sustained the decision of the lower court, in the eastern district of Missouri, imposing fines aggregating $10,000 on the Hannibal Bridge Company and the Wabash Railroad, for failing to comply with an order of the secretary of war, requiring them to make certain improvements in their bridge across the Mississippi river. The defendants had claimed that they were not subject to the law giving the war department authority over such structures, because this bridge was built under a special act of Congress.

The Interstate Commerce Commission has been directed to take jurisdiction of railways and other carriers in Alaska by a writ of mandamus issued by the Court of Appeals of the District of Columbia, which held that Alaska is a territory of the United States within the meaning of the act of Congress regulating commerce. The writ was issued in the case of the Humboldt Steamship Company, of Seattle, whose petition for an order requiring the railways of Alaska to file schedules or rates had been refused by the commission. The Court of Appeals held that the commission erred when it declined to entertain the petition.

The United States Circuit Court at New York City, May 23, held that under the law of the state of New York, a New York bank accepting a false bill of lading and delivering it to a foreign buyer is responsible for the amount of the note. The decision was by Judge Noyes and is the first of the cases brought in New York by foreign buyers of American cotton drafts to recover for fraudulent bills of lading brought to light at the time of the Knight-Yancey exposure last year. The suit was brought by Anthony S. Hannay of Liverpool against the Guaranty Trust Co. The amount involved in the case is $7,320. New York banks handled several million dollars worth of bills concerning which suits will be brought, but it is understood that the banks expect to recover from the railways. Judge Noyes says that the question turned upon which of the two parties should stand the loss as both were innocent and believed that the bills of lading were valid and that the cotton had been shipped. He said that if the drafts had contained no reference to the cotton which the spurious bills purported to represent, the Liverpool firms would not have recovered.

The Commerce Court, sitting at Washington, May 23, issued a temporary injunction restraining the Interstate Commerce Commission from interfering with certain lighterage allowances made by the railways on sugar shipped from New York to the West. The Commission held that these allowances, amounting to about $500,000 a year, were discriminatory against competitors in the sugar refining business not doing their own lightering and had issued an order against their continuance. The Commerce Court grants the injunction pending a hearing of the case before the court. The appeal from the Commission's order was taken on constitutional grounds. The American Sugar Refining Co. secured its allowances from the railways at New York many years ago. It was to receive two cents per 100 lbs. for cartage and different amounts for lighterage of sugar from the refineries to the railway terminals. It was charged that these allowances were in excess of the cost of the service and amounted to rebates. The Arbuckle refineries induced the roads to give them the same allowances, but the Federal Sugar Refining Co., at Yonkers, was never able to get allowances and complained to the Commission of the alleged discrimination.

The year 1910 was productive of excellent results for the Uruguayan railways, the passenger, freight, and baggage traffic having greatly increased as compared with the business handled in former years. This fact may be regarded as a reliable index of the progress, as well as the prosperity, and development of the republic.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. H. Richter, secretary of the Central of Georgia, with office at Savannah, Ga., has resigned, effective June 30.

Edward S. Harlan, of the Iowa Trust & Savings Bank, has been appointed receiver of the Atlantic Northern & Southern.

Henry Coke has been appointed general attorney of the Texas Midland, with office at San Antonio, Texas, succeeding C. W. Ogden, deceased.

William A. Webb, assistant to the vice-president of the Colorado & Southern, with office at Denver, Colo., has resigned, effective July 1.

J. N. Freeman has been appointed assistant secretary and assistant treasurer of the Eastern Railway of New Mexico and the Pecos River Railroad, with office at Amarillo, Tex.

H. I. Miller has been elected vice-president and a member of the executive committee of the Missouri Pacific, with office at New York. E. J. Pearson, chief engineer of the Chicago, Milwaukee & Puget Sound, has been elected first vice-president of the Missouri Pacific, in charge of operation, and John G. Drew, comptroller of the Great Northern, has been appointed auditor, both with offices at St. Louis, Mo.

Operating Officers.

The new superintendent of car service of the New York Central & Hudson River, is George H. Alexander, not Guy H. Alexander, as given in a sketch of his railway life, published last week.

V. E. Palacios, trainmaster of the National Railways of Mexico at San Luis Potosi, Mex., has been appointed superintendent, with office at Monterey, Mex., succeeding F. A. Lattig, resigned to accept service elsewhere.

A. G. Whittington, superintendent of the Fort Worth division of the International & Great Northern, at Mart, Texas, has been appointed superintendent of the Rio Grande division of the Texas & Pacific. J. P. Burrus, superintendent of terminals of the International & Great Northern, at Houston, succeeds Mr. Whittington.

Frank E. Robb, formerly superintendent of the West Pennsylvania division of the Pennsylvania Railroad, has been appointed general manager of the Tennessee & North Carolina. Mr. Robb was associated with the Pennsylvania Railroad for a number of years, but on account of ill health has been out of railway work for several years.

R. B. Ayers, superintendent of the Transcontinental division of the Texas & Pacific, at Texarkana, Tex., has been appointed superintendent of the Eastern division, with office at Marshall, succeeding H. A. Brown. R. C. Andrews, assistant superintendent, Marshall district of the Louisiana division, with office at Marshall, succeeds Mr. Ayers, and H. A. Brown succeeds Mr. Andrews. S. E. Carnahan has been appointed superintendent of terminals, at Fort Worth.

J. T. Wallis, whose appointment as superintendent of the West Jersey & Sea Shore and the Philadelphia & Camden Ferry Company, with office at Camden, N. J., has been announced in these columns, was born June 11, 1868, at New Orleans, La., and was educated at Georgetown College and Stevens Institute. He began railway work September 16, 1891, on the Pennsylvania Railroad, as a machinist's apprentice, at Philadelphia, Pa. In May, 1896, he was appointed assistant road foreman of engines on the Philadelphia, Baltimore & Washington, and in April, 1899, was appointed assistant master mechanic, at Jersey City, N. J., on the Pennsylvania Railroad. He was promoted in July, 1900, to assistant engineer of motive power, at Altoona, Pa., and in January, 1903, was made master mechanic, at Baltimore, Md., on the Philadelphia, Baltimore & Washington. Mr. Wallis was appointed superintendent of

motive power on the Northern Central, at Williamsport, Pa., in April, 1907, and for a short time in 1910 he was acting superintendent of the West Jersey & Sea Shore, at Camden, returning to the Northern Central as superintendent of motive power, in April, 1910, which position he held at the time of his recent appointment as superintendent of the West Jersey & Sea Shore and the Philadelphia & Camden Ferry Company.

Traffic Officers.

E. L. Abbett has been appointed commercial agents of the Lehigh Valley, with office at Columbus, Ohio.

C. M. Harwood has been appointed a traveling passenger agent of the Grand Trunk, with office at Detroit, Mich., succeeding F. W. Hopper, promoted.

I. M. Richards, agent of the Wabash Railroad at Mexico, Mo., has been appointed traveling freight and passenger agent, with office at Moberly, succeeding W. B. Jennings, deceased.

R. D. Moore has been appointed general freight and passenger agent of the Mississippi Central, with office at Hattiesburg, Miss., succeeding R. D. Reeves, who has resigned to go to the Illinois Central.

Charles E. Hall, soliciting freight agent of the Baltimore & Ohio at Cincinnati, Ohio, has been appointed contracting freight agent, with office at Cincinnati, succeeding F. M. Renshaw, resigned to go into other business.

C. Hanson, commercial agent of the International & Great Northern at Ft. Worth, Texas, has been appointed commercial agent, with office at Waco, Texas, succeeding J. W. Byars, transferred. J. D. Healy succeeds Mr. Hanson.

A. B. Stringer, soliciting freight agent of the St. Louis Southwestern at Ft. Worth, Texas, has been transferred to Gilmer, Texas, succeeding J. E. Woodfin, resigned. R. A. Dennison, secretary to the general freight and passenger agent at Tyler, Texas, succeeds Mr. Stringer.

L. E. LeFaivre, traveling freight agent of the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute at Atlanta, Ga., has been appointed traveling freight agent, with office at Memphis, Tenn., succeeding H. A. Wheeling, resigned. F. Allshouse succeeds Mr. LeFaivre

N. M. Leach, general freight agent of the International & Great Northern at Palestine, Texas, has been appointed general traffic manager of that road and the Texas & Pacific. Horace Booth, assistant general freight agent of the International & Great Northern at Houston, Tex., has been appointed general freight agent, succeeding Mr. Leach.

C. B. Ogle, traveling passenger agent of the Chicago, Burlington & Quincy at St. Louis, Mo., has been promoted with the same title to take the place of C. J. Rohwitz, appointed chief clerk in the passenger department, succeeding T. G. Roehm, resigned to go with the Chicago & Alton. J. T. Williamson, passenger agent at the union station, succeeds Mr. Ogle.

Byron C. Read has been appointed a commercial agent of the Chicago Great Western, with office at the Union Stock Yards, Chicago, Ill., succeeding H. E. Murray, live stock agent, resigned, and the office of live stock agent has been abolished. Phillip Ternes has been appointed a traveling freight agent, with office at Fort Dodge, Iowa, succeeding A. C. Hine, resigned.

W. B. Jerome, special passenger agent of the New York Central Lines, has been appointed general western passenger agent, with office at Chicago, in charge of all territory west of Chicago and St. Louis. I. P. Spining, whose appointment as general western passenger agent was announced in these columns in the issue of April 7, has been appointed general agent in the passenger department, with office at Chicago, in charge of the city of Chicago and suburban territory.

H. C. Clevenger has been appointed coal freight agent of the Pennsylvania Railroad, with office at Philadelphia, Pa. J. L. Eysmans, general freight agent of the Cumberland Valley Railroad, has been appointed division freight agent of the Buffalo & Allegheny Valley division and the Western Pennsylvania division, with office at Pittsburgh, succeeding Mr. Clevenger. R. R. Blydenburgh, division freight agent of the Erie division and the Buffalo & Allegheny Valley division, has been appointed general freight agent of the Cumberland Valley Railroad, with office at Chambersburg, and W. H. H. Willis, district freight solicitor of the Western Pennsylvania division, has been appointed division freight agent, with office at Erie, Pa, succeeding Mr. Blydenburgh.

Engineering and Rolling Stock Officers.

E. F. Mitchell, engineer of construction of the Missouri Pacific, at St. Louis, Mo., has been appointed chief engineer.

W. F. Drysdale has been appointed mechanical engineer of the Northern Railway Company (Costa Rica), with office at Limon, Costa Rica.

Murray Harris, district roadmaster of the Texas & Pacific, at Marshall, Tex., has been appointed roadmaster of the Eastern division, with office at Marshall.

D. D. Colvin has been appointed engineer of maintenance of way of the National Railways of Mexico, with office at Mexico City, Mex., succeeding Fount Rice, Jr., resigned.

P. F. Gentine, division engineer of the Missouri Pacific at Atchison, Kan., has been appointed supervisor of bridges and buildings, with office at Atchison, succeeding W. B. Wood, deceased. H. E. Boardman succeeds Mr. Gentine.

F. B. Hart has been appointed a roadmaster of the Southern Kansas Railway of Texas, the Pecos & Northern Texas, the Eastern Railway of New Mexico and the Pecos River Railroad, with office at Amarillo, Tex., succeeding J. H. Stinson.

John Moore James, who was recently appointed master mechanic of the Pennsylvania Railroad, at the West Philadelphia (Pa.) shops, was born September 10, 1875, at Wellsville, Ohio, and was educated in the public schools of Wellsville and the Ohio State University. He entered the service of the Pennsylvania Railroad in 1893 as machinist's apprentice in the Altoona (Pa.) shops, and in May, 1899, was appointed assistant foreman of car inspectors at Washington, D. C. The following January he was appointed foreman of the Anacosta shops of the Philadelphia, Baltimore & Washington, and, in May of the same year was made general foreman at Washington. In October, 1900, he was appointed general inspector of the Buffalo & Allegheny Valley division, and in January, 1902, was made assistant engineer of motive power on the same division. Mr. James was appointed master mechanic at the Olean (N. Y.) shops in December, 1902, and in November, 1908, was transferred in the same capacity to the Buffalo division, which position he held until his recent appointment as master mechanic at the West Philadelphia shops.



J. M. James.

F. S. Anthony, superintendent of machinery of the International & Great Northern at Palestine, Tex., has been appointed general superintendent of motive power and machinery of the Texas & Pacific, with office at Marshall, Tex. C. H. Seabrook, superintendent of motive power and equipment of the Trinity & Brazos Valley, at Teague, Tex., succeeds Mr. Anthony.

A. N. Willsie, whose appointment as division master mechanic of the Chicago, Burlington & Quincy, with office at Omaha, Neb., has been announced in these columns, was born April 24, 1864, at Galesburg, Ill. He received a common school education

and began railway work in April, 1880, as an office boy with the Burlington. He was later clerk and then timekeeper, and during the period from 1890 to 1899 was locomotive fireman and then locomotive engineer. He was next promoted to road foreman of engines, and in 1905 was transferred to the operating department as division superintendent. All of his railway work has been with the Burlington, and previous to his promotion as above, he was superintendent in charge of the Hannibal division at Hannibal, Mo.

J. M. Henry, whose appointment as master mechanic of the Pennsylvania Railroad, at Olean, N. Y., has been announced in these columns, was born in October, 1873, and began railway work in 1889 with the Pennsylvania Railroad as a messenger in the master mechanic's office, at Altoona, Pa. He was later an apprentice in the Altoona shops, and from 1894 to 1896 was a machinist engaged in special work. From 1896 to 1900 he took a mechanical engineering course at Purdue University and in 1900 he returned to the Pennsylvania Railroad as a draftsman. In 1901 he was appointed motive power inspector and then assistant engineer of motive power at Williamsport, remaining in that position until 1903, when he was appointed a master mechanic at Elmira, N. Y. In 1906 he was transferred in the same capacity to Sunbury, Pa., which position he held at the time of his recent appointment as master mechanic, at Olean, N. Y.

Isaac Biddle Thomas, whose appointment as superintendent of motive power of the Erie division of the Pennsylvania Railroad and the Northern Central Railway, with office at Williamsport, Pa., has been announced in these columns, was born June 26, 1872, at West Chester. He was educated at Friends High School, also at the Haverford Grammar School, and in 1892 was graduated from the Sheffield Scientific School, Yale University. He began railway work as machinist's apprentice in 1892 at the Altoona shops of the Pennsylvania Railroad, and from August, 1897, to April, 1899, was an inspector at the Altoona shops, and then was inspector in the office of the assistant engineer of motive power, at Altoona, remaining in that position until February, 1900, when he was made assistant master mechanic at Renovo. In October, 1901, he was appointed assistant engineer of motive power, at Altoona, and in August, 1903, was made master mechanic at the Pittsburgh shops. In February, 1906, Mr. Thomas was transferred in the same capacity to the Altoona machine shop, which position he held at the time of his recent appointment as superintendent of motive power.



I. B. Thomas.

Purchasing Officers.

J. F. Hibbard has been appointed stationer of the Kansas City Southern, with office at Kansas City, Mo., succeeding D. F. Long, resigned.

OBITUARY.

Arthur W. Tiddy, for the past five years traveling passenger agent of the Baltimore & Ohio, at Pittsburgh, Pa., died at his home in Crofton, on May 16. Mr. Tiddy had been in the service of the Baltimore & Ohio for the past 17 years.

Charles F. Choate, from 1878 to 1897 president of the Old Colony Railroad, now a part of the New York, New Haven & Hartford, and a prominent Boston attorney, died May 23, at his home in Southboro, Mass. Mr. Choate was born in Salem, Mass., in 1828, and was graduated from Harvard University and law school.

Railway Construction.

New Incorporations, Surveys, Etc.

Alton, Jacksonville & Peoria (Electric).—A contract has been given to Grommett & Johnson, it is said, for building from Godfrey, Ill., northwest to Jerseyville, and from Jerseyville to Calhoun county.

Bamberg, Ehrhardt & Waterboro.—According to press reports, work has been started on this line between Bamberg, S. C., and Ehrhardt, 14 miles. It is understood that the northern end of the line will eventually be extended west to Denmark. J. A. Wyman, president; W. M. Brabham and Thomas Black are vice-presidents, and W. D. Rhoad, secretary. J. F. Carter and H. A. Hughes, Ehrhardt, are interested.

Brownwood North & South.—This company, building from Brownwood, Texas, north to May, will continue the line to Rising Star, it is said, and eventually to a point in north Texas, probably at Vernon, about 170 miles. Grading work has already been finished from Brownwood to May. The Texas Grading Company, Fort Worth, are the contractors. John Mead, chief engineer, Brownwood. (August 19, p. 332.)

Canadian Northern.—Surveys are said to be made for the line between Montreal, Que., and Port Arthur, Ont., at the head of Lake Superior, at which place connection is to be made with the western lines. The route passes through the Algonquin-National Park region, along the great clay belt of Ontario to Temagami reserve, thence across the territory north of Lake Superior.

An officer is quoted as saying that the contracts for the entire line between Toronto, Ont., Ottawa and Montreal, Que., including the section from the latter city to Hawkesbury, has been let.

Canadian Pacific.—According to press reports, the Canadian Pacific is carrying out extensive improvements at Smiths Falls, Ont. The track will be raised on a section of 1.25 miles and in addition the roadbed of the main line will be widened and filled to the new level for double-track. The track on the Ottawa line will also be raised to the same height to permit the Canadian Northern tracks to pass under the tracks of the Canadian Pacific.

According to press reports, bids are being asked for to build a branch from Three Forks, B. C., to Bear Lake.

Chicago, Milwaukee & Puget Sound.—According to press reports, a line is being built under the name of the Milwaukee & Big Creek, from the mouth of the Big creek, Idaho, to the divide between the St. Joe and the Coeur d'Alene river valleys, 18 miles. Track laying has already been finished on about eight miles.

Cleveland, Cincinnati, Chicago & St. Louis.—A contract for relocating, improving and double-tracking about nine miles, between Kyle, Ohio, and Sharonville, has been let to the Walsh Construction Company, Davenport, Iowa.

Crystal City & Uvalde.—An officer writes that a grading contract has been given to Ward & Lee, Gardendale, Texas, for building an extension from Gardendale, Texas, to Dulls, about 25 miles. (May 12, p. 1133.)

Elgin, Joliet & Eastern.—According to press reports, this company is planning to build an extension from Porter, Ind., northeast to Michigan City, about 12 miles.

Frederick Railroad.—An officer writes that this company is making improvements, including the construction of about four miles of line, and some special work, also putting up an office building and a freight warehouse. The work is being carried out by the company's men, and is now well under way.

Grand Trunk Pacific.—According to press reports, this company will begin operating trains in June over the section from Fort William, Ont., at the head of Lake Superior, west to the foot of the Rocky mountains.

Hudson River & Eastern Traction.—This company has been

granted a franchise at White Plains, N. Y., and it is expected that work will be started soon on the extension from Ossining, southeast to White Plains, about 18 miles.

Kansas City, Mexico & Orient.—This company, it is said, has entered into a contract with residents of Alpine, Texas, to begin construction work on the section between that place and Fort Stockton, 63 miles, by July 1, and to complete the work within 18 months. A bonus of $25,000, also ground for a station and right-of-way through the town, have been given to the company.

Los Angeles & San Fernando.—Incorporated in California to build from Los Angeles, Cal., northwest to San Fernando, 25 miles. L. C. Brand and W. G. Kerckhoff are incorporators.

Maurepas & Northern.—An officer writes that the company expects to let contracts in the near future to build from Clio, La., northwest via Walker to Live Oak, about 60 miles. The line is to connect at Clio with boats operated by the company to New Orleans. There will be four short steel bridges and a terminal warehouse at Clio. The line is being built to carry lumber, also farm products. S. J. McKenzie, president and J. R. McKenzie, chief engineer, Adrian, Minn.

Mexican Roads.—The Yaqui Delta Land & Water Company has been incorporated at Dover, Del., with $12,000,000 capital, to build railways and telegraph lines from various points on the gulf of California in the United States to other points on the states of Sonora, Mexico, and Chihuahua. The incorporators include: R. D. Hanna and J. D. Campbell, New York, and J. E. Sweet, Yonkers.

Milwaukee & Big Creek.—See Chicago, Milwaukee & Puget Sound.

Missouri River & Northern.—An officer writes that it has not yet been definitely decided when bids will be asked to build from Chamberlain, S. D., on the Chicago, Milwaukee & St. Paul, northeast via Brule, Buffalo, Hand, Jerauld and Beadle counties to Huron, on the Great Northern and the Chicago & North Western, 82 miles. Maximum grades on part of the first five miles from Chamberlain, will be 2 per cent., and on the rest of the line 1 per cent.. Maximum curvature will be 3 deg. There will be considerable trestle work to be carried out. The line is being built to carry farm products, grain, live stock and cement, manufactures, coal and building material. The total estimated cost of the line is $1,864,217, including land for terminals at Chamberlain and at Huron, on which roundhouses and other buildings will be put up. A. E. Parsons, president, Darlington, Wis. The Missouri River Engineering Company, Mitchell, S. D., are the engineers.

Mountain Quarry Company Lines.—A contract has been given, it is said, to build from Auburn, Cal., via American river canyon to Cool, Eldorado county, eight miles, and construction work is to be started at once. It is understood that the line will eventually be extended east to Lake Tahoe.

Mt. Adams Electric.—This company proposes to build a line from a point on the Spokane, Portland & Seattle to White Salmon, Wash., 2.25 miles. The estimated cost of the work is $50,000. George A. Kyle, Portland, Ore., made the surveys.

New Orleans, Texas & Mexico.—See St. Louis & San Francisco.

Northern Electric.—This company, it is said, will build an extension from Chico, Cal., northwest to Los Molinos, about 30 miles.

Oregon-Washington Railroad & Navigation Company.—An officer writes in regard to the reports that a branch is to be built from the main line at a point on the Des Chutes river to Ashdown, Ore., 20 miles, that nothing but surveys are being made at present. (May 12, p. 1133.)

Pacific Electric.—An extension is to be built, it is said, from Santa Ana, Cal., to Anaheim, and another extension is to be built from Yorba Linda to Corona.

Pecos Valley Southern.—An officer writes that this company now has 41 miles of railway in operation from Pecos, Texas, south via Saragosa and Balmorhea to Toyahvale. It is the intention of the company to build an extension south about 50 miles to a connection with the Southern Pacific, but the route has not yet been definitely located. The prospects of building the extension are good. (May 12, p. 1133.)

Piedmont Railway & Electric Company.—An officer writes that this company is building 11 miles of line in North Carolina, which will connect Burlington, Graham and Haw River. The work is now about half finished. J. M. Cook, Burlington, is an incorporator and G. W. Hatch is the engineer.

Sacramento-Folsom (Electric).—Incorporation has been asked for in California by this company with $1,000,000 capital, to build between Sacramento, Cal., and Folsom, 22 miles, with a branch to Fair Oaks Bridge, four miles. The work is to be carried out within one year. F. V. Keesling and H. H. Grau, Sacramento, are incorporators.

Southern Railway.—To carry out the policy of double-tracking the main line at points where the traffic is heaviest, as well as on the Charlotte division, the construction of 32 miles of second-track between Atlanta, Ga., and Gainesville has been authorized. It is proposed to continue the use of the existing track from Armour, six miles north of Atlanta, to Crosskeys, five miles, as a single-track gauntlet. Double-track will be constructed from Crosskeys to Duluth, 15 miles. From Duluth to Suwance, five miles, the existing track will be operated as a single-track gauntlet, and 17 miles of double-track will be built from Suwanee to Oakwood. When these improvements are finished the company will have the equivalent of 46 miles of double-track from Atlanta north, which will greatly facilitate the movement of trains over that part of the system. The work is to be started at once.

St. Louis & San Francisco.—A contract is said to have been let to Johnson & Allhands, St. Elno, Ill., to build an extension of the New Orleans, Texas & Mexico, from Erwinville, La., into the Baton Rouge and Pointe Coupee parishes, seven miles.

Texas Roads.—According to press reports, P. M. Johnson & Co., St. Elmo, Ill., railway builders, are back of a project to build a line from the St. Louis, Brownsville & Mexico, at Bloomington, Texas, north to Victoria, about 10 miles. It is understood that an old grade that was built a few years ago from Bloomington, via Victoria to Cuero, will be used. Residents of Victoria have subscribed $30,000 in aid of the project, which is supposed to be backed by the Frisco interests.

Right-of-way is being secured, it is said, from Glen Rose, Texas, via Godley to Fort Worth. The plans call for building a line from Walnut Springs northeast to Fort Worth. The Godley Commercial Club is back of the project.

Ventura Railway.—Incorporated in California with $500,000 capital, to build from Hueneme, Cal., north to Oxnard, five miles. A number of branch lines are also to be built to different beet sugar ranches, in all about 30 miles. Robert Oxnard, J. D. Barry, San Francisco; A. M. Dupu, J. A. Griffel and R. B. Beck, Oxnard, are interested.

Watsonville Railway & Navigation Company.—An officer writes that this company has six miles of line in operation in California, and will start work in June on an extension from Watsonville, Cal., to Rowes Corners, thence to Corralitos and along the Santa Cruz road, returning to Watsonville. Another line is to be built along San Juan road, Driscoll's lane and Salsipuedes road, to a connection with the main line at Rowes Corners, and a branch may also be built to Pajaro and the Werner district. It was expected that the contracts for this work would be let on May 25. Concrete docks will be built at Port Watsonville. F. E. Snowden, president and general manager, 311 California street, San Francisco.

Wichita Falls Route.—Work will begin soon, it is said, on an extension of the Wichita Falls & Northwestern, from Hammon, Okla., north to Woodward, about 60 miles.

Wichita Falls & Northwestern.—See Wichita Falls Route.

A French company has been organized with a capital of $5,000,000 to build a railway from Cabildo, Chile, to Copiabo.

Railway Financial News.

Atlantic, Northern & Southern.—Judge W. R. Green has ordered the receiver to sell the road under foreclosure July 24.

Canadian Northern.—The lower house of the Canadian parliament has passed the bill to make the government guarantee principal and interest of the bonds of the Canadian Northern Ontario. The minister of railways, G. P. Graham, says that government-guaranteed bonds will be limited to $35,000 per mile.

Chicago & Eastern Illinois.—Stockholders are to vote on July 19 on the question of merging the C. & E. I. and the Evansville & Terre Haute. The C. & E. I. is to take over the preferred and common stock of the Evansville & Terre Haute, the C. & E. I. preferred to be exchanged on an 83.33 per cent. basis for both the preferred and common stock of the Terre Haute.

Chicago & North Western.—The Menominee extension first mortgage 7 per cent. bonds, of which $2,546,500 are outstanding, maturing June 1, are to be paid at presentation at the office of the treasurer in New York.

Cincinnati, New Orleans & Texas Pacific.—An additional $500,000 3½ per cent. bonds of the city of Cincinnati are to be issued to pay for the completion of the work on the Cincinnati terminals of the C., N. O. & T. P. The city has already issued $2,500,000 of these bonds and the C., N. O. & T. P., as lessee, is to pay the interest on the bonds and 1 per cent. per annum as a sinking fund.

Denver, Laramie & Northwestern.—The board of directors has been increased from nine to 15, and the new directors are S. H. Kent, Nathan H. Heft, B. A. Holcomb, Allyn Cole, O. D. Berroth and F. Conway.

Detroit & Mackinac.—A semi-annual dividend of 2½ per cent. has been declared on the $2,000,000 common stock. This is the second semi-annual dividend declared on the common stock, the first having been declared in the latter part of 1910. The preferred stock pays regular annual dividends of 5 per cent.

Evansville & Terre Haute.—See Chicago & Eastern Illinois.

Florida East Coast.—J. C. Salter has been elected an additional member of the board of directors, making the number of directors nine.

Missouri, Kansas & Texas.—The railway commission of Texas has given the M., K. & T. permission to issue $24,000,000 bonds on condition that the proceeds from the sale of $5,000,000 of these bonds are to be used in betterments on the road in Kansas. These bonds are part of the $107,869,000 bonds which the railway asked permission to issue, but which permission was not granted on the ground that the railway did not make specific enough statements of the purposes for which the bonds could be sold.

Missouri Pacific.—The company has arranged for the sale to Speyer & Co., New York, of $2,000,000 3-year collateral notes. The proceeds of this sale will be used to pay off the floating debt, understood to be in the neighborhood of $5,000,000, and to pay for improvements and betterments. The total authorized issue of these notes is $25,000,000. The notes are secured by $10,000,000 first and refunding mortgage 50-year non-convertible 5 per cent. bonds, series B; $8,500,000 3-year notes of the St. Louis, Iron Mountain & Southern, representing indebtedness of the Iron Mountain to the Missouri Pacific for advances extending over the years since 1905; $9,800,000 preferred stock of the Denver & Rio Grande and $15,000,000 common of the Denver & Rio Grande; and $5,000,000 stock of the Texas & Pacific. In addition, it is understood that the Gould estate has pledged itself to advance $3,000,000 to the Missouri Pacific whenever it is decided that the company needs it.

As noted in another column, H. I. Miller has been appointed vice-president and has been made a member of the executive committee and will act as an assistant to the chairman of the board.

New York, New Haven & Hartford.—The Massachusetts supreme court has held illegal the sale by the New Haven of the old Boston & Providence terminal site in Boston to the Park Square Real Estate Trust in exchange for $5,200,000 stock of the Real Estate Trust. The court holds that this would amount to a speculation in land, and that this is beyond the powers of the New Haven. This apparently does not interfere with the New Haven's selling its property outright to some other company.

Rutland Railroad.—A complaint in equity has been filed in the U. S. Circuit Court of Vermont by Andrew C. Spring, a stockholder, on behalf of all stockholders against the former directors of the company, in order to compel them to account for their holdings in the company. It is alleged that the directors organized the Champlain Construction Company, to which the Rutland awarded the contract for an extension of the latter's line from Burlington, Vt., to the Canadian border, that the construction company obtained $300,000 par value of Rutland preferred stock, but failed to complete the extension and compelled the Rutland itself to complete it. It is alleged that nevertheless the directors of the Rutland caused that company to pay the construction company the full agreed price.

It is alleged that in the acquisition of the Ogdensburg & Lake Champlain by the Rutland, the directors of the latter made a profit of upwards of $300,000. It is charged that the stock of the Bennington & Rutland was acquired by the Rutland directors for less than $400,000 and sold to the Rutland for $950,000, including $500,000 second mortgage bonds of the Bennington guaranteed by the Rutland. It is also alleged that in 1901 the directors caused the Rutland Company to sell $3,500,000 of its preferred stock at $90 a share under pretense of giving the stockholders equal rights of subscription, but in such a manner that few were able to subscribe, although the market price was then much above the subscription price.

St. Louis & San Francisco.—F. S. Moseley & Co., New York, have sold a new issue of $2,500,000 2-year 5 per cent. notes of June 1, 1911, at a price to yield 5½ per cent. interest on the investment.

See also Chicago & Eastern Illinois.

Western Maryland Railway.—This company has sold to a syndicate headed by Blair & Co., New York, $4,100,000 first mortgage 4 per cent. bonds to secure funds to retire $3,250,000 West Virginia Central & Pittsburgh bonds due July 1, 1911, and $650,000 Piedmont & Cumberland Railway first mortgage bonds due August 1, 1911. The authorized issue of first mortgage bonds is $50,000,000, of which $46,618,000 are now issued including the above $4,100,000; the additional $3,381,300 are reserved under the first mortgage to retire other underlying subsidiary liens.

FOREIGN RAILWAY NOTES.

The railway line from Iquitos, Peru, to Moronacocha has recently been opened to public traffic. Moronacocha is one of the most picturesque and popular pleasure resorts in the vicinity of Iquitos.

The first locomotive constructed in Chile for the Government Railways was tested by the railway management the first week in March, 1911, and pronounced entirely satisfactory. There are 10 more locomotives under construction in Chile.

The governor-general of Korea has asked for a domestic loan of $28,000,000 to be used for railway, road, and harbor constructions and improvement in Korea, and the Japanese Diet has granted this sum, fully recognizing the importance of improving the means of communication in the newly annexed country. The following railways are planned: A Pyongyang-Wonsan railway line and a Wonsan-Hamhyung railway line with a continuation to Hoyriong; furthermore, a parallel railway to the Seoul-Fusan railway from Taiku to Seoul; and, finally, in accordance with article 6 of the Japanese-Chinese convention of September 4, 1909, the Hoyriong-Kirin line. The whole building program will be completed by 1923.

Supply Trade Section.

H. O. Fettinger has resigned as representative of the Safety Car Heating & Lighting Company, New York, to go to the Clement Restein Company, Philadelphia, Pa., as manager of the railway department.

Henry B. Oatley has resigned his position as engineer in charge of superheater design for the American Locomotive Company, New York, to go to the Locomotive Superheater Company, New York, as mechanical engineer.

William C. Wilson, formerly with Bingham & Taylor, Buffalo, N. Y., and Reuben C. Hallett have gone to the Transportation Utilities Company, New York representatives of the Acme Supply Company, and the General Railway Supply Company, both of Chicago. Mr. Wilson and Mr. Hallett will be in the sales department.

At the annual meeting of the Bronze Metal Company, New York, last week, Otis Cutler and Joel S. Coffin were elected directors, in addition to E. H. Fallows, R. J. Davidson and Alexander Turner. The following officers were also elected: President, E. H. Fallows; vice-president and general manager, Alexander Turner; and secretary and treasurer, C. D. Johnson.

Robert T. Lincoln, president of the Pullman Company, Chicago, has resigned this position on account of poor health. At the meeting of the directors on May 18 Mr. Lincoln was made chairman of the board and John S. Runnells, vice-president and general counsel of the company, was made president. Charles F. Street was made assistant to the president. Mr. Runnells was born in Effingham, N. H., July 30, 1844. He graduated from Amherst College in 1865, and studied law at Dover, N. H. Before his connection with the Pullman Company he held the position of secretary to the governor of Iowa, and later was made United States district attorney for Iowa. In 1879 and 1880 he was a member of the Republican National Committee, and in 1880 was a delegate to the Republican National Convention. He has been general counsel for the Pullman Company since 1887, and vice-president and general counsel since 1905.



John S. Runnells.

Railway Appliances Association.

At the meeting of the executive committee of the Railway Appliances Association, held in Chicago, May 23, John N. Reynolds, who has been secretary and treasurer for the past nine years, resigned both positions, effective June 30. John N. Reynolds was re-elected treasurer and Bruce V. Crandall was elected secretary.

M. M. and M. C. B. Convention Exhibits.

After May 25, and until the conventions close, the office of J. D. Conway, secretary of the Railway Supply Manufacturers' Association will be located on Young's Million Dollar Pier, Atlantic City, N. J. All mail intended for Mr. Conway should be addressed to him in that way.

Circular No. 2, issued recently by Mr. Conway, gives information about the general arrangements, membership dues and badges, hotel accommodations and transportation, and other facts about decorating booths and installing exhibits necessary for those who will attend the conventions. Copies of this circular may be had by writing Mr. Conway.

TRADE PUBLICATIONS.

Stokers.—The American Stoker Co., New York, has published in Bulletin A-1 the names of about 20 companies and their repeat orders for stokers, extending over a period of years.

Cube Mixers.—The Municipal Engineering & Contracting Co., Chicago, Ill., has devoted a 60-page booklet to the advantages, descriptions and illustrations of the Chicago improved cube mixer.

Excavating Machinery.—The F. C. Austin Drainage Excavator Co., Chicago, Ill., has published a very full catalog of its line of special earth-handling machinery for land drainage and irrigation work. Photographs, diagrams, descriptions and tables are included.

Denver & Rio Grande.—The passenger department of this company has issued a booklet entitled Hotels and Boarding Houses on the Line of the Rio Grande System, containing a list of the names and rates of all hotels and boarding houses adjacent to the road in Colorado, Utah and New Mexico. This company has issued another booklet entitled The Thirteenth Convention of the International Sunday School Association, describing the route and giving rates to San Francisco, Cal., through the Rockies and the Sierras via the Denver & Rio Grande.

Varnishes.—The United States Metal & Manufacturing Company, New York, has published a small booklet entitled Two Thousand Years of Brightness, giving the history and an analysis of the composition of varnish. The booklet also describes the advantages of the varnish made by this company, particularly for railway use.

El Paso & Southwestern.—The passenger department of this company has issued a booklet describing the many attractive points in the region of the Sacramento mountains in New Mexico. The booklet is fully illustrated and gives complete information on the distances to these resorts and the accommodations and pastimes provided there.

Roofing.—The Barrett Manufacturing Company, New York, has published a card, of convenient size to be hung on the wall, giving on one side the full Barrett specifications for gravel or slag roofing over boards and over concrete. On the other side of the card is given a diagram showing approximately the increased costs of constructing steep roofs as against those of lesser pitch.

RAILWAY STRUCTURES.

ABERDEEN, WASH.—The Oregon-Washington Railroad & Navigation Company, the Chicago, Milwaukee & Puget Sound and the Northern Pacific, are planning for a union station to be built by the Oregon-Washington Railroad & Navigation Company.

ANACORTES, WASH.—The Great Northern has started work on a station at Anacortes. The estimated cost of the building is $35,000.

BRADY, TEX.—The Gulf, Colorado & Sante Fe will build a passenger station of brick and steel construction with tile roof.

BRYANT'S POND, ME.—The Grand Trunk is building a new blacksmith shop and quarry house at its granite quarry at Bryant's Pond. Part of the output of the quarry is to be used for a new station at Guelph, Ont.

CALGARY, ALB.—According to press reports, a contract has been given to J. McDiarmid & Co., for putting up new buildings for the Canadian Pacific at Calgary. The plans of the Canadian Pacific provide for grouping the irrigation, land and hotel buildings on a site between First street, East and First street, West. All of the buildings are to be of stone construction.

Chamberlain, S. D.—See Missouri River & Northern, under Railway Construction.

Clio, La.—See Maurepas & Northern under Railway Construction.

Fort Collins, Colo.—The Union Pacific will build one-story brick and steel passenger stations at Fort Collins and Schyler, Neb. The general contracts have been let to Geo. B. Swift Co., Chicago.

Frederick, Wis.—The Minneapolis, St. Paul & Sault Ste. Marie will build a bridge across the St. Croix river, connecting the states of Minnesota and Wisconsin. The plans have not yet been completed.

Hammond, La.—The Illinois Central, it is reported, will build a passenger station of pressed brick, to cost about $30,000.

Highland Park, Utah.—The Utah Light & Railway Company is putting up a new transformer station at Highland Park. The cost of the improvements will be about $20,000.

Hoquiam, Wash.—The Oregon-Washington Railroad & Navigation Company and the Northern Pacific are planning for a union station to be built by the Northern Pacific.

Huntsville, Ala.—The Southern and the Nashville, Chattanooga & St. Louis, it is said, will build a union station.

Huron, S. D.—See Missouri River & Northern under Railway Construction.

Joliet, Ill.—The Elgin, Joliet & Eastern will build a viaduct over Collins street, the estimated cost being $15,000.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company has been given a permit to build a new car repair and rebuilding shop at Fortieth street and Cold Spring avenue in Milwaukee. The building is to be two stories high, 180 ft. x 307 ft., of concrete and steel construction, to cost $90,000.

Moncton, N. B.—A bridge may be built over the tracks of the Intercolonial at Moncton, at a cost of $16,000.

Montreal, Que.—The Montreal Central Terminal Company's plans call for piercing a tunnel under the St. Lawrence river and building a large central terminus at Montreal for the railways entering the city. The project involves the construction of a tunnel above Isle Ronde, so that the Delaware & Hudson and the New York Central & Hudson River may enter the city from the south, the Grand Trunk from the west and the Canadian Northern from the north. The Canadian Pacific has not entertained the proposed undertaking. (May 12, p. 1136.)

Oroville, Cal.—The Northern Electric will build a new concrete station at Oroville, to replace the present frame structure.

Otis, Wash.—The Northern Pacific is having plans made for a freight house to be built at Otis Orchard.

Richmond, Va.—The contract for building the new reinforced concrete bridge at the site of the old Mayo bridge, across the James river, connecting Richmond with South Richmond, formerly known as Manchester, has been let to I. J. Smith & Co., Richmond, on plans drawn up by the Concrete-Steel Engineering Company, New York. The bridge is to cost $224,734. There will be 18 arches, each having a span of 71 ft., with four abutments and 16 piers. Seven of these arches cross the James river from Richmond to Mayo's Island and eleven from Mayo's Island to South Richmond. The total length of the bridge is to be 1,721 ft., with a roadway of 44 ft., and two sidewalks of 8 ft. each. Provision is made for water and gas mains, and conduits for telephone wires. The bridge is designed to carry 50-ton electric cars, and will be provided with two tracks.

Rock Springs, Wyo.—The Union Pacific will build a one-story roundhouse and power house of brick and steel construction. The general contract has been let to Geo. B. Swift Co., Chicago.

San Antonio, Texas.—The general offices and freight house of the International & Great Northern were partially destroyed by fire, the estimated loss being $18,000. A new freight depot will be built, to cost about $60,000.

Schleisingerville, Wis.—The Wisconsin Railroad Commission has ordered the Minneapolis, St. Paul & Sault Ste. Marie to build a new passenger station at Schleisingerville, it is said, before January, 1912.

Schyler, Neb.—See Fort Collins, Colo.

Scranton, Pa.—A contract has been given to the York Bridge Company for building the Mulberry street viaduct in Scranton. The total cost of the viaduct will be $225,000. The Scranton Railway Company and the Delaware & Hudson will pay part of the cost. The new viaduct will cross the Lackawanna river and the tracks of the Delaware & Hudson, the Delaware, Lackawanna & Western and the Central of New Jersey, and will carry two tracks for street electric lines.

Sewickley, Pa.—An agreement is said to have been made with the Pittsburgh Railways Company to permit that company to operate street railway cars over the new county bridge now under construction over the Ohio river at Sewickley. It is expected to have the work on the bridge, which is to cost $250,000, completed by August 1.

Youngstown, Ohio.—Work is expected to be resumed by A. Wishart & Sons, Sharon, Pa., on a new station for the Erie Railroad and the Pittsburgh & Lake Erie, in Youngstown. The work was stopped on the building after completion of the foundations several weeks ago, as it was decided that the station would not be big enough for the two roads. The new plans call for a two-story building.

FOREIGN RAILWAY NOTES.

The Department of Public Works of Uruguay has approved the plans for the first section of 30 miles of the Interior Railway, also known as the Pan American Railway, between Trinidad and Durazno.

At a meeting of the Russian Ministry of Ways and Communications, a programme was approved for the carrying out of surveys in respect of the construction and 8,660 miles of railways during 1911, 1912 and 1913. This will comprise 2,230 miles of railways in Eastern European Russia, 1,000 miles in the southeast, 1,470 miles in Central Russia, 710 miles in the southwest, 180 miles in South European Russia, 450 miles in the north, 230 miles in the Caucasus and 2,390 miles in Asiatic Russia. At a meeting held by the committee for new railways, projects were discussed in regard to the construction of the following new lines: Orsha to Nijni-Dnyeprovsk (on the Ekaterininsk Railway), distance 430 miles, estimated cost $215,000; from Poltava in the direction of Konot, distance 170 miles, estimated cost $12,160,000, with a branch line 85 miles long, estimated to cost $2,370,000; Poltava to Lozov, 120 miles, estimated cost $8,710,000, with a branch from a suitable point to Nijni-Dnyeprovsk 35 miles in length at a cost of $2,134,000; also a line from Novgorod-Syeversk to Nijni-Dnyeprovsk.

A railway from the Pacific coast to the rich Ferrobamba mines, situated in the province of Cotabambas, department of Apurimac, Peru, is one of the important lines that will be constructed in the near future. It has been suggested that this railway start at Port Lomas, traverse the pampa of that name, follow along the left bank of the Acari river to the Amato ranch, cross the river, and continue to San Pedro, in the province of Lucanas; from here the line will pass through the Quilcata pampa and proceed to the town of Pampachiri, Province of Andahuaylas, descending the canyon at that point, and touching at Talavera on the Apurimac river, crossing the river and proceeding to Ferrobamba. The entire distance from Port Lomas to Ferrobamba, over this route, is about 300 miles, and the maximum grades are estimated at from 3 to 3½ per cent. A railway constructed along this route would pass near the coal deposits of San Pedro, San Juan, Chilques, and San Cristobal, in the province of Lucanas. It would also pass through the rich gold, silver, and copper district of Querobamba, province of Lucanas. It is estimated that the construction of the railway along this route would not exceed $3,000,000, and that it would be of immense benefit to the provinces of Ayacucho and Apurimac.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Missouri Pacific, it is said, will order 12 locomotives instead of 75, as mentioned in the *Railway Age Gazette* of February 3.

The New York, New Haven & Hartford is said to have ordered 15 electric locomotives from the Westinghouse Electric & Manufacturing Company. This item is not confirmed.

The Buffalo Creek has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 24 in., the diameter of the driving wheels will be 51 in., and the total weight in working order will be 144,000 lbs.

The Duluth, Winnipeg & Pacific, which is building an extension for the Duluth, Rainy Lake & Winnipeg, has ordered 5 ten-wheel passenger locomotives from the Baldwin Locomotive Works, and 5 superheater consolidation locomotives from the American Locomotive Company. This order includes the 9 locomotives which the Canadian Northern, the parent company, was making inquiries for as mentioned in the *Railway Age Gazette* of May 12. The dimensions of these locomotives will be as follows:

Type	Consolidation	Ten-wheel
Weight on drivers	165,000 lbs.	129,000 lbs.
Total weight	186,000 lbs.	169,000 lbs.
Cylinders	23 in. x 26 in.	22 in. x 26 in.
Type of boiler	Extended wagon top	Extended wagon top
Working steam pressure	200 lbs.	200 lbs.
Heating surface, tubes	2,259 sq. ft.	1,746 sq. ft.
Heating surface, firebox	176 sq. ft.	183 sq. ft.
Heating surface, total	2,435 sq. ft.	1,929 sq. ft.
Tubes, outside diameter	2 in. 5⅜ in.	2 in. 5⅜ in.
Tubes, number	.....	185 26
Tubes, length	14 ft.	13 ft. 2½ in.
Firebox, length	114 in.	113 in.
Firebox, width	41¾ in.	40¼ in.
Grate area	33.1 sq. ft.	31.6 sq. ft.
Tank capacity	6,000 gals.	5,000 gals.
Coal capacity	12 tons	10 tons

The special equipment, which is the same for all the locomotives, is as follows:

Bell ringer	Gollmar
Boiler lagging	H. W. Johns-Manville Co.
Brakes	Westinghouse
Brake beams	Simplex
Brake shoes	Diamond S.
Couplers	Sharon
Draft gear	Miner
Headlight	Oil, 18 in. round case
Injector	Ohio
Journal boxes	McCord
Packing	King
Safety valve	3 in. Star
Sanders	Hanlon
Sight feed lubricators	Detroit
Springs	Wrought iron
Staying	Carter iron
Steam heat	Gold 2 in. pipes
Superheater	Locomotive Superheater Co.
Tires	Midvale, Interocean or Standard
Tubes	Detroit seamless
Valve gear	Walschaert

CAR BUILDING.

The Dayton & Troy Electric Railway Company, Dayton, Ohio, is in the market for 2 interurban cars.

The Northern Pacific will reinforce 500 25-ton freight cars, and is in the market for the center sills for this purpose.

The Live Poultry Transportation Company, Chicago, will build 108 special poultry cars at its shops at Detroit, Mich.

The Missouri, Kansas & Texas is in the market for 17 refrigerator cars, 39 gondola cars, 34 flat cars and 18 caboose cars.

The Duluth, Winnipeg & Pacific, which is building an extension for the Duluth, Rainy Lake & Winnipeg, has ordered 350 box cars and 150 flat cars from the Mt. Vernon Car & Manufacturing Company.

The Connecticut Company has divided an order for 73 electric street cars between the Wason Manufacturing Company and the Osgood Bradley Company. These cars will be operated on the lines controlled by the New York, New Haven & Hartford.

The Chicago, Burlington & Quincy, as mentioned in these columns, has ordered 1,000 gondola cars and 500 refrigerator cars from the American Car & Foundry Company. The refrigerator will have a capacity of 60,000 lbs.; inside measurements will be: 33 ft. 1½ in. long, 8 ft. 3¼ in. wide, 7 ft. 4¾ in. high; over-all measurements will be 40 ft. long 9 ft. 2 in. wide and 13 ft. 0¼ in. high. Bodies will be of wood and the underframes will have a steel center sill. The gondolas will have a capacity of 100,000 lbs. and will be all-steel; inside measurements will be: 40 ft. long, 9 ft. 6 in. wide and 4 ft. 4 in. high. All the cars will be built at St. Louis, Mo. The special equipment will be as follows:

Type	Gondola	Refrigerator
Bolsters (body)	Cast steel	.....
Bolsters (truck)	Simplex	Simplex
Brake beams	C. B. & Q. Standard	C. B. & Q. Standard
Brake shoes	Safety	Safety
Doors	Drop—12 per car	.....
Door fastenings	Pressed Steel Car Co.	Miner
Draft gear	Farlow	Miner spring
Journal boxes	McCord	.....
Paint	Nobrac	.....
Springs	Ry. Steel-Spring Co.	Ry. Steel-Spring Co.
Trucks	Andrews	Bettendorf
Wheels	Builder's	Builder's
Collapsible tanks.		Bohn ventilators

IRON AND STEEL.

The Chesapeake & Ohio is making inquiries for 900 tons of bridge steel.

The Missouri Pacific, it is said, will soon place an order for 40,000 tons of rails.

The Chicago City Railway Company has ordered 5,000 tons of girder rails from the Pennsylvania Steel Company.

General Conditions in Steel.—The steel industry continues to show an improvement over last month. The Steel Corporation is operating at about 63 per cent. of its capacity, but new orders scarcely justify more than 50 per cent. It is expected that the operations will drop to that figure in the early part of June, in spite of the slight impetus given by the increased orders of the railways, particularly for rails. The Republic Iron & Steel Company announced on May 23 that it had decided to sell bars at the best prices obtainable. This may bring about a general reduction of prices by all companies.

MACHINERY AND TOOLS.

The Atchison, Topeka & Santa Fe has issued a list, including the following machine tools:

3 28 in. x 14 ft. engine lathes;
2 24 in. x 10 ft. engine lathes;
3 18 in. x 8 ft. engine lathes;
1 30 in. x 14 ft. engine lathe;
1 56 in. x 18 ft. engine lathe;
1 90 in. drive wheel lathe;
1 32 in. shaper;
1 16 in. or 18 in. slotter;
1 18 in. x 8 ft. tool room lathe;
1 No. 3 universal milling machine;
1 oil burning furnace;
1 Jones & Lamson 3 in. x 36 in. flat turret lathe;
1 flue welding machine.

This company is also receiving bids on the following tools which were included in a list issued a short time ago:

1 36 in. x 18 ft. engine lathe;
1 18 in. x 8 ft. engine lathe;
2 20 in. x 10 ft. engine lathes;
2 28 in. x 14 ft. engine lathes;
1 twist drill grinder;
1 42 in. drill press;
1 14 in. sensitive drill;
1 4 ft. radial drill.

SIGNALING.

The Railroad Commission of Indiana has approved an installation of automatic block signals recently installed on the New York, Chicago & St. Louis, near Whitley, Ind., over a length of road of about eigth miles. The signals were made by the American Railway Signal Company, Cleveland, Ohio.

The New York Central has contracted with the Hall Signal Company for signals and apparatus to equip its passenger tracks

—two of the four main tracks—between Utica and Lyons, 95 miles, with automatic block signals. These signals will be three-position, upper-quadrant, normal danger, worked by electric motors. The current both for signal operation and for the track circuits is taken from a power line strung on the telegraph poles at the side of the road. The signals are placed on signal bridges. At interlockings, home signals are made three-position, upper-quadrant, semi-automatic. These automatic signals take the place of controlled manual block signals and the installation is a part of the work laid out two years ago under a comprehensive plans for the substitution of automatic for manual signals throughout the main line from New York to Buffalo.

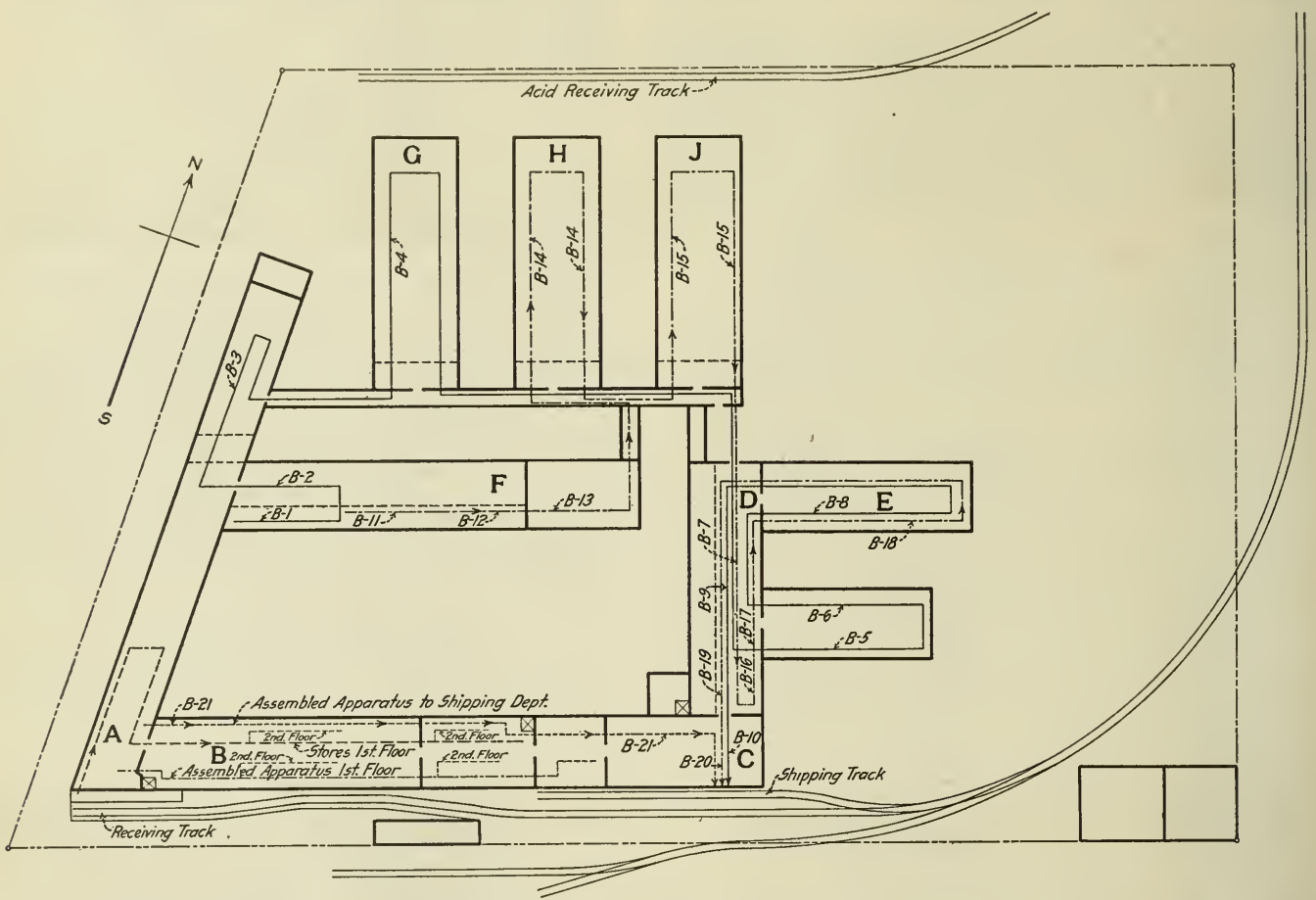
New Plant of the United States Light & Heating Company.

The United States Light & Heating Company, New York, organized two years ago, is a consolidation of the United States Light & Heating Company of New Jersey, the Bliss Electric Car Lighting Company and the National Battery Company. So closely allied are the various products of these companies that a new plant providing for the manufacturing of all the products has been built at Niagara Falls, N. Y., where the advantages of electric power and good shipping facilities could be had. Westinghouse, Church Kerr & Company, New York, were the contractors. A tract of 21 acres was purchased, one-third of which is covered by the plant.

The machines which perform the first operations are placed nearest the point at which the raw material enters the factory and those which perform the successive operations are arranged progressively so that the manufacturing process carries the product toward the assembling department without retracing ground and with the minimum amount of travel from operation to operation. A continuous narrow gage industrial railway, as shown in the accompanying lay-out of the plant, runs through all the departments and contributes further to reduce the labor in handling.

The first floor of building A is devoted entirely to stores which include rough castings, rolled stock and the like taken from the receiving track, adjacent to the south end and likewise finished parts, on which operations have been performed in the factory. The heaviest of the rough castings travel from the store room directly to the machine shop which is on the first floor of building B. Here the generator frames are turned, bored and faced; the lamp regulator frames and of shafts, pulleys, armature spiders, generator heads, bearings and brush rigs are machined and the armature discs and pole laminations are punched. Above the machine shop, the tool room and regulator department extend side by side lengthwise of the building. In the tool room are made the jigs, gages, dies and special tools; also the various machine tools are repaired and tempered. In the regulator department, the panels, lamp regulators and relays are assembled.

In the winding department on the second floor of building B just east of the tool and regulator departments, all the winding of coils for panels, regulators, relays and generators is performed.



United States Light & Heating Company's Plant, Showing Routing Systems.

ROUTING OF MATERIAL THROUGH PLANT.

B- 1 *Pig Lead Storage.*
B- 2 *Casting of Grids for Pasted Plates.*
B- 3 *Pasting of Plates.*
B- 4 *Electro-Chemical Formation—Pasted Plates.*
B- 5 *Stock of Finished Pasted Plates.*
B- 6 *Burning Groups of Pasted Plates.*
B- 7 *Preliminary Assembling of Batteries—Pasted Plates.*
B- 8 *Developing Charge given to Batteries.*
B- 9 *Finish Assembling of Batteries into Trays or Cases.*
B-10 *Shipping of Batteries and Plates.*
B-11 *Rolling Lead into Sheets—Plante Process.*
B-12 *Punching Blanks for Plante Plates.*
B-13 *Mechanical Process Plante Plates.*
B-14 *Electro-Chemical Formation of Active Material on Plante Plates.*
B-15 *Finishing of Plante Plates.*
B-16 *Grouping of Plante Plates.*
B-17 *Preliminary Assembling of Batteries.*
B-18 *Developing Charge given to Batteries.*
B-19 *Finished Assembling of Batteries—Plante Tanks Comp.*
B-20 *Shipping.*
B-21 *Axle Generator and Regulating App.*

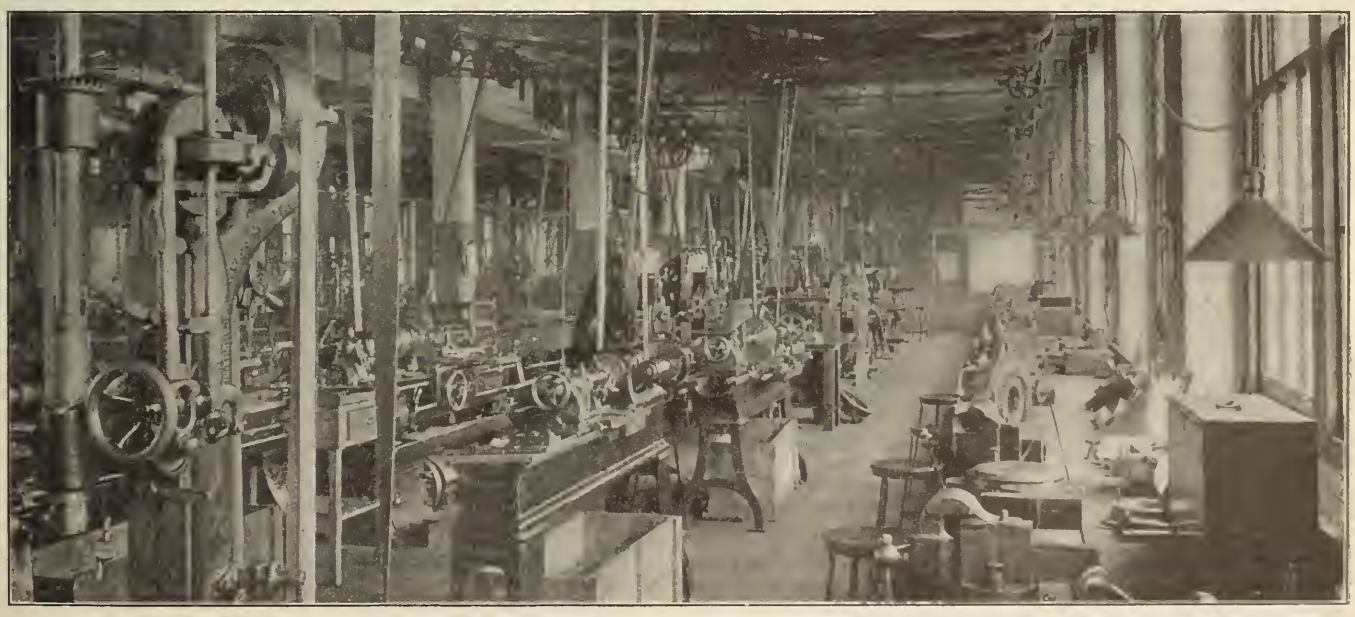


Experimental Room; Building A.

Automatic coil winders make the small magnet coils, the armature coils being shuttle wound and spread. The armature leads are soldered to the commutator tangs by means of a machine which enables the operator to tilt the armature at a convenient angle and to rotate the connections through a bath of molten solder. This method enables the operator to clamp an armature on the centers, solder the joints and then remove the completed armature in from three to four minutes.

On the first floor of building B, below the winding department, is the generator assembling department, beyond which and in building C is the testing department, where the complete equipments are tested prior to shipping. Here the panels are mounted upon racks equipped with motor speed controllers, so that the driving motors may be made to run the generators at varying speeds. This, together with the lamp banks and the storage batteries, which are connected with the generators, provides all the conditions that can possibly be obtained in a standard railway car installation. From the testing department the generators, panels, etc., travel on the industrial railway to the shipping department.

The National car lighting battery uses Plante plates, which are made from pig lead. The pigs pass through rolling mills and are converted into lead sheets. Punching machines punch out blanks which pass through automatic machines exerting a pressure normal to their surfaces and produce the leaves by displacement. The plates then pass to the forming department in building H and are immersed in acid baths, being connected as positives and negatives. A current, controlled from the forming switchboard, is sent through the plates and the active material is electro-chemically formed. The plates are then taken to the finishing department in building J and again immersed, and what might be called the refinement of the formation is accomplished. The next stage is the grouping of plates, that is, the assembling in groups of positives and negatives by burning on the straps, which is done on the first floor of building D. The groups are next assembled in tanks preliminary to the developing charge



Tool Room; Building B.

which is given in building E. The plates now return to building D and the finished assembling of the complete batteries is carried out. The tanks which are built complete on the third floor of building B meet the plate groups at this point. The plates are placed in positives and the batteries are finished complete with tops and connections. The batteries then travel directly to the shipping department.

On the second floor of building D are the chemical laboratory and the forming switchboard. This switchboard regulates the current used for various forming circuits in the forming and finishing departments. The rheostats are of the water type and are arranged in the room adjacent to the switchboard room. Inasmuch as none of the apparatus made in this plant is very heavy, complicated and expensive hoisting and conveying apparatus is not needed. At a few points chain hoists on overhead runways are conveniently arranged.

The company has developed a comprehensive system of jigs and gages so as to secure absolute interchangeability of parts. The factory includes three excellent laboratories, the electrical, the chemical and the battery laboratory; also an experimental department devoted to the development of apparatus. Electrical power is delivered to a sub-station from a transmission line at 11,000 volts, three phase and 25 cycles. In the sub-station the power is transformed by step down transformers and rectified by means of rotary converters of the latest split pole compensating field type. The direct current is delivered to the plant over a three wire 250 volt circuit, allowing for the standard 120 volt lamps throughout the entire factory. An oil burning system of heating has been applied both to the general heating of the plant and to all industrial processes where heat is required.

The plant is supplied with three sidings; one of these is used exclusively for the receiving of raw materials, another for the shipping of finished products and the third for the handling of acid, which in a large storage battery plant like this is an important item. Axle electric car lighting apparatus is a special product of this company and yet, with the exceptions of the machinery used in the battery processes, there is not a special machine in the whole factory.

Boiler Feed Water Softening Compound.

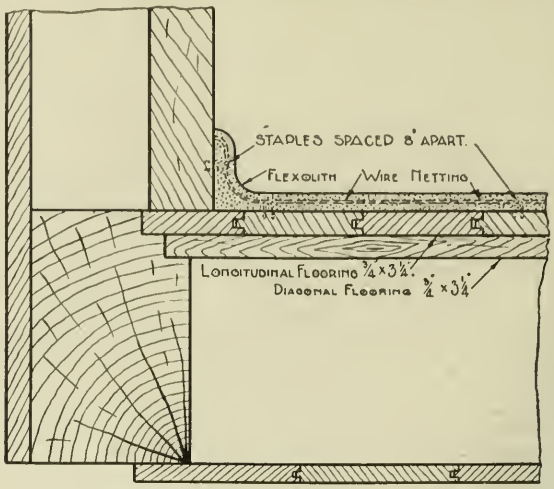
An effective compound for the softening locomotive feed water by the internal method, which eliminates the necessity of maintaining a special plant for the treatment of the water, has been placed on the market under the name of Atlas E, by the Atlas Preservative Company, of New York. The importance of removing incrusting solids from locomotive feed water is well appreciated, and any method such as the mere injection of a compound into the boiler should be seriously considered. With Atlas E the treatment is carried on wholly within the boiler and the resulting precipitated impurities are disposed of by blowing down a few inches of water each time steam is raised. The precipitated impurities which settle down while the locomotive is standing, the circulation having ceased, are thus effectively removed. This compound appears to get behind the existing incrustation, disintegrating and removing it from the plates and tubes, leaving them quite clean, the scale coming away in a broken-up or disintegrated form.

Tests were made with the Atlas E compound by placing an equally bright nail in each of two test tubes which contained a scale forming water. To one was added a few drops of this compound, and after eight months the nail immersed in the treated water was found intact with very little loss in weight, while the nail in the untreated water was almost eaten away. Reports from locomotive engineers have shown its value as a scale preventative and remover. A year's test with this compound on one railway in Argentina showed such results that it was adopted for general use. The advantages, as shown from the engineers' reports, are the less frequent washing out of the boiler, absence of priming, discontinuance of pitting, and effective water softening at a reasonable cost. Atlas E has no effect on fittings with which it may come in contact, and being non-vaporous cannot be carried over with the steam except through priming.

The Lobito Bay Railway in Africa is now 200 miles long and is expected to be opened to traffic for that distance shortly. Until this railway reaches Congo territory it cannot be connected with the Rhodesian or any other existing railways.

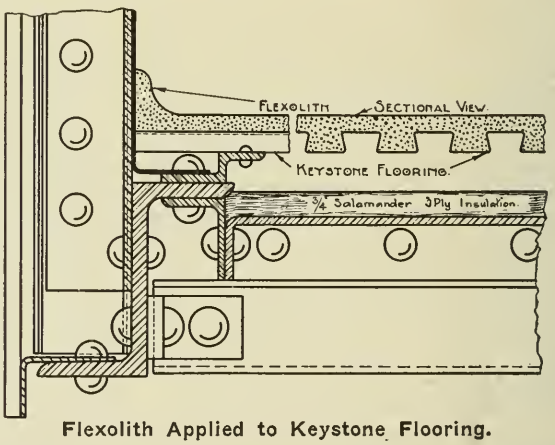
Composition Flooring for Wood and Steel Floors.

Flexolith is a composition which may be laid on steel floors or old or new wood floors in passenger cars. It is fireproof, non-absorbent and may be easily cleaned by flushing with a hose and



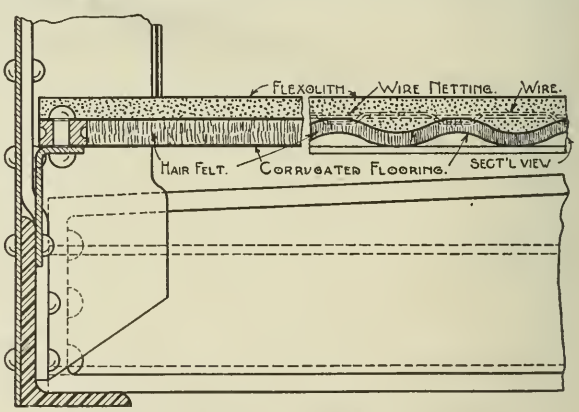
Flexolith Applied to Wood Flooring.

mopping, which allows the floor to be kept in a sanitary condition. When used on wood floors a heavy wire cloth is first firmly stapled to the boards, then the Flexolith is applied in a plastic state; it completely surrounds the wire cloth and makes a solid



Flexolith Applied to Keystone Flooring.

flooring. In baggage and express cars Flexolith is laid 1¼ in. thick and in passenger coaches ⅝ in. thick, the weight per square foot in the latter case being the same as that of 11/16 in. yellow pine flooring. The accompanying drawings show the construc-



Flexolith Applied to Corrugated Iron Flooring.

tion of the different kinds of flooring using Flexolith and special instructions are furnished by the General Railway Supply Company, Chicago, the sales agent for this product, relating to the consistency of the Flexolith mixture and its application under various conditions.

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THE Supreme Judicial Court of Massachusetts lays down the dictum that there is no absolute or fixed speed limit at which automobiles may be operated in that state. The court decides that if a jury finds that the rate of speed was reasonable and proper, having regard to traffic, use of the way and safety of the public, it should find for a defendant, no matter at what rate of speed he ran his machine. The decision was in the case of the Commonwealth vs. Cassidy. We notice it here merely to observe that the court by this common sense view has punctured a multitude of illogical laws, by-laws and decisions—provided the men who have made these by-laws will heed the court's deliverance. We call it a common sense view. It is common sense because it is unavoidable. Railway men take only a secondary interest in speed limits on highways, but it is, perhaps, their duty to their lay friends who now and then ask advice on the subject of speed limits, to demolish the widely prevalent view that speeds can be regulated by a statutory rule naming rates per mile. The state or municipality has a choice of only two methods: (1) Very severe punishment for every person who drives at dangerous speed, or (2) a policeman posted at every street corner and (where necessary) at frequent intervals elsewhere. The first method is necessarily harsh, and to be effective would have to punish many innocent with the guilty. The second is the method which the railways use to prevent collisions; the signalman has absolute authority over enginemen. On the streets this would be very costly.

THE letter from Mr. Melcher, in another column, on the arbitration of railway labor disputes is an expression of the views of a railway officer who has had as much experience in handling railway labor matters in recent years as has any other officer in the country. Mr. Melcher does not accept Mr. Delano's plan for the solution of the problem of devising means for satisfactorily settling such disputes; namely, the establishment of a permanent court of arbitration. He suggests that after such a court has rendered a few decisions both employers and employees would know its general attitude and one or the other would be indisposed to submit further cases of it. Doubtless there is a good deal in this view. Shippers and railway men know the general attitude of most of the members of the Interstate Commerce Commission and can predict with substantial accuracy before the hearings on important cases begin how most of them will stand when the time comes to decide the cases. Mr. Melcher, like all others who have written on the subject, agrees, however, that the Erdmann act as it now stands does not work satisfactorily, and Mr. Delano's suggestion that the proposed court of arbitration be composed of an even number of members would insure every case being decided by a majority of at leats two, which would tend to strengthen its opinions in the eyes of the public and perhaps in the eyes of the parties. The fact that all who have contributed discussions on the subject have agreed that the Erdmann act does not produce satisfactory results shows Mr. Delano's wisdom in starting the discussion, and indicates clearly that some concerted action should be taken to secure legislation that will remedy the defects of that law.

IT has been repeatedly asserted of late years that New England has reached her zenith as productive territory for railway business. The statement has had in it a minor element of truth as expressing the fact of growing competition of the cotton factories of the South and of rivalry of new western factories established because of nearness to western markets and centers of population. But the census returns now coming in and covering the last half decade bring out the striking fact that New England factory losses have been relative, and very far from absolute. They have only lost the indefinite gain which might have accrued but for western and southern rivalry, where their positive gains have been very large indeed. Thus the factory products of the state of Massachusetts have risen 33 per cent.

during the five years; and, taking the three largest cities in Connecticut, New Haven rises about 28 per cent., Hartford about 57 per cent., and Bridgeport about 48 per cent. The total factory product of Massachusetts and the three cities represents a value of approximately $1,650,000,000, on a gain of about 32 per cent. over five years ago. While some allowance must be made for a rise in value of factory products during the last five years, due to economic causes, it does not greatly impair the returns, the rise of manufactured goods being far below the lift in food products and, in some cases, showing an actual decrease. Moreover, one finds in Massachusetts, for example, an increase of 9 per cent. in the number of factories, and of 20 per cent. in the number of wage earners. The New Haven and Boston & Maine systems last year carried 12 per cent. of their total freightage as factory products and high-class freight, and at the higher rates which that class signifies. On the passenger side of the business there is the steady increase of population of the New England cities, which means directly increasing travel, as distinguished somewhat sharply from the people of the farm. The conclusion seems clear that, while New England may not compare as a railway feeder in the pace of her growth with a newly settled railway region of the West, her advance continues to be rapid. Her transportation problem ahead is to dispel farm stagnation and give the rural committees a start in the same progressive direction as that of the factory cities and towns.

THE HADLEY SECURITIES COMMISSION.

IN ENGLAND it is the rule, when an important question involving the general welfare of the community is before the public for discussion and possible legislation, to appoint a parliamentary committee of men of reputation and legislative or expert experience to make an exhaustive report on the subject. In this country generally the legislation comes first and the discussion afterward; and generally the discussion takes on a political character. In both the Republican and the Democratic party platforms in 1908 there was a paragraph advocating some legislation which should control the issuance of securities by railway companies. In the Mann-Elkins amendment to the act to regulate commerce provision was made for the appointment by President Taft of a commission of five men to make a thorough study of the advisability of further legislation on this subject, and to recommend what form this legislation should take. President Taft appointed President Hadley, of Yale University, as chairman of the committee, and President Taft and President Hadley together selected the other four members of the commission. They were Frederick Strauss, vice-chairman; B. H. Meyer, F. N. Judson, W. L. Fisher Fisher and W. E. S. Griswold, secretary.

A consideration of the personnel of the commission is of great importance. The breadth of the commission's inquiry, and the highly technical and delicate nature of some of the subjects to be dealt with made it imperative that the commission should combine to an unusual degree practical technical knowledge with scholarship. President Hadley's name, of course, needs simply to be mentioned to explain his contribution toward the commission. Frederick Strauss is a member of the banking firm of J. & W. Seligman & Company, New York. He, as a practical banker, has had actual experience in the technical details of financing on a large scale the issue of securities for railways, and for other corporations; he brought to the commission not only technical knowledge but a broad understanding of international money market conditions. Mr. Meyer was for a number of years chairman of the Wisconsin Railway Commission, and before that was a professor in Wisconsin University, and a student of railway and industrial economics. Mr. Fisher and Mr. Judson are both lawyers, who have had to deal with cases before the Interstate Commerce Commission, as well as cases in which the orders of the state commissions and interstate commission have been attacked before the courts. Mr. Fisher was one of the attorneys representing the shippers at the rate hearing.

The list of names of those called to testify before this commission makes an impressive array of legal, economic and financial experts. The commission held public hearings, at which the answers of the various witnesses were made a part of the record of the commission, and also held a great number of informal conferences, at which various men were asked to be present and to discuss in an entirely informal and frank way the questions that the commission undertook to study. It is worth while mentioning a few of the names of the witnesses, because possibly this is the best way to convey some idea of the breadth of the inquiry: Commissioner Clements, of the Interstate Commerce Commission; Commissioner Hall, of the Massachusetts Railway Commission; Jacob H. Shiff, of the banking firm of Kuhn, Loeb & Co.; Robert Lovett, president of the Union and Southern Pacific; Paul D. Cravath, corporation lawyer; W. M. Acworth, English economist; W. D. Williams, of the Texas Railway Commission; E. E. Williamson, who represented the shippers in their opposition to the rate advances; and Louis D. Brandeis. These are a few of the men who expressed their opinions on the subject of the regulation of the issuance of securities of railway companies. The securities commission was not represented by counsel, the various members of the commission questioning the men who appeared before them; the inquiries, therefore, took rather the nature of general discussion than of formal question and answer. There was nothing like a cross-examination of any of the witnesses.

Naturally from the great variety of types of witnesses there was a very great diversity of opinion, as to whether regulation was desirable at all; but there was a rather remarkable agreement between nearly all of the witnesses as to the desire on the part of the people to have some sort, at least, of either regulation or publicity. The reasons for this demand on the part of the people were quite plainly suggested by the general trend of the commission's inquiry. In some cases the commission wrote letters to men who were to appear before the commission, asking them a set of questions. These questions were not always worded exactly the same, but taken in connection with the questions that were asked at the hearings they indicate quite clearly the general scope of the work.

In the discussion of broad economic subjects the different phases of various questions were discussed together, and often in such a way as to superficially confuse the points that the commission had under consideration. It has seemed best, therefore, in commenting on the work of the commission, and in describing some of the points brought out by the men who testified, to treat these points separately. In another column in this issue, one of these general subjects is discussed and commented on. All that we are attempting to do here is to outline the scope of the commission's work and especially to try and show what underlay the demand for the appointment of the Hadley commission. Anything further would be simply a guess as to what the report of the commission would probably contain.

In following the testimony of the witnesses, it is important to bear in mind that the commission has two clearly differentiated objects in view in its inquiry. These objects are to decide: first, whether certain *laws* shall be passed; and, second, whether the power of regulating the issue of securities shall be *delegated* by congress to some commission, and how far congress shall restrict such commission as to what it shall do and how far it shall be left to its own judgment. This distinction between the two objects of the inquiry must be kept constantly in mind, as will be shown by the abstracts of the testimony, because many of the witnesses did *not* keep this distinction clearly in mind. It is quite conceivable that the commission may recommend some legislation which would put added restrictions on the issuance of railway securities, but would make the enforcement

of such restrictions dependent on action by the courts, and not recommend that congress delegate any of its discretionary power to a commission. On the other hand, it is conceivable that the commission may recommend that congress appoint a permanent committee whose duties will be so loosely defined that in practice it will have the widest discretion as to how far to go in the regulation of issues of stocks and bonds.

Let us now see what led to demand for a change in the present laws. As mentioned elsewhere, one of the important questions taken up by the commission is that of the legality of federal regulation: first, if it is to exclude a state regulation; and, second, if it is to be superimposed on state regulation; or whether it is better to leave the regulation of securities to state commissions entirely. These are the questions that were brought up by the demand for regulation, and are not questions which led the people to demand such regulation.

One cannot say that the commission took up the other questions in any particular order, and in these comments the order in which the questions are enumerated is not meant to indicate in any way the importance apparently attached to them by the commission or by the witnesses. The commission asked those who came before it as to the advisability of eliminating the issue of capital stock, except at par, for money or property of the actual value of the par of the stock issued. This question is one which has been discussed widely in the public press, as well as in arguments before the Interstate Commerce Commission and before the courts. The interest in this question is one of the factors which unquestionably led to the appointment of the commission. The sale of stock below par, or the issue of stock to be given to buyers of bonds, is one of the grievances that the commission was appointed to investigate. Another is the question of the advisability of the prohibition or regulation of the sale of bonds at a discount. Closely connected with the question of the sale of stock at less than par is the question of whether it would not be possible and advisable to issue stock certificates without a par value, as is done, for instance, in the case of the Great Northern Ore Certificates, which simply state on their face that the holder or owner is entitled to share at a given percentage in the profits of the corporation and to participate at a given percentage in the distribution of the assets of the corporation in case of liquidation. Also closely connected with this question is the question of whether it is advisable to have a law forbidding the sale of new stock at par to stockholders when the old stock is selling above par in the market, or whether, if a commission is appointed to regulate the issuance of securities, they should be instructed in any way as to what their attitude should be in a case of the kind defined above.

Another question studied by the commission, the discussion of which by the popular press was unquestionably partly responsible for the appointment of a commission, is the question of the capitalization of betterments, additions and extensions charged in the past to income, but which might have been charged to capital. One needs only to name the Chicago & Alton to recall how often this question has been discussed in the public press, and to appreciate the great interest which was taken in it by the public.

Discussion about the valuation of railways is another reason for the existence of the Hadley commission; and the advisability of physical valuation and the relation of value of property or capitalization of property to rates are subjects that the commission has carefully studied.

There were innumerable other points brought up in the meetings, but those that we have mentioned would appear to indicate fairly accurately that the popular demand for an investigation was brought about by three causes. In the first place, state commissions and politicians, whenever they have reduced the rates of railway companies below what the railways thought just have been met in the federal courts by the plea of the railways that a reduction in rates was a confiscation of property. In most instances the railway companies have attempted to prove that they were not earning or would not earn, under the reduced rates a fair return on the value of their property. Among other things that the supreme court has held should be taken into consideration in determining the fair value of a railway property is the amount of securities issued against it, and also the market price of the securities.

There was a feeling that if the railways were going to set up as a defense the value of their property that value ought to be determined beforehand and that the nominal capitalization of railways should correspond to the value on which a fair return is to be earned. The general public did not or does not understand the railways' theory of railway rates or railway capitalization, and probably does not want to understand it. But the public, or part of it, found in actual practice that a certain form of defense was used successfully before the courts; and there was a strong feeling that some sort of a weapon ought to be given to state commissions which would enable them to pin the railways down and no longer permit them to squirm out in some mysterious way from the effect of orders of the commission.

The second object of the public undoubtedly was to prevent fraud. As a matter of fact, in recent years, fraud in the issue of railway securities has played a very small part compared with the fraud practised in the issue of mining stocks and other corporations. It is true that once in a while people have suffered, as for instance, the investors in the securities of a certain little road which went into the hands of a receiver a year or so ago, but it is noteworthy that in this case the corporation was obliged to obtain the consent of the New York Public Service Commission to the issue of its securities and the loss to investors occurred in spite of the fact that the New York commission had wide regulating power. The law recently passed in Massachusetts, briefly noted in these columns recently, which puts a penalty on a distribution of false information in regard to corporations, is a step toward meeting this public distrust of promoters.

The third reason for the demand for regulation is a sort of an endless chain. The men who have been writing for popular magazines in a popular style, on the subject of railways, telling half-truths in a lurid way that will appeal to the popular imagination, want to get more information. At the same time they have educated public taste in such a way as to create an appetite for more high finance stories, so that while demanding more publicity so that more materials may be at hand to write fresh articles the magazine writers have succeeded in making the public bring pressure to bear on the state and federal governments for their own ends.

The last of these reasons for the appointment of the Hadley commission will be discussed more fully later. The question of preventing fraud is so interwoven with national characteristics that it is not in the power of any commission to solve it. There was a curious failure on the part of the English economists, who expressed their views to the commission to understand exactly what it was all about, because they failed to see why the present laws did not adequately cover the subject. They failed to see why, if a certain thing were unlawful or dishonest already, there is any need of further legislation in regard to it. They failed to understand that American business and social ethics puts a premium on, rather than punishes, successful dishonesty that can be practised through an evasion of the law. They could not understand why, if a certain group of promoters or speculators had imposed on the public once there should be any danger that the public would again trust the same speculators.

In all the mass of evidence that was taken it is hard to find a single suggestion that really appears practical for the prevention of fraud or imposition on the public so long as the public refuses to insist on the enforcement of existing laws and refuses to use the ample information that is now available in making an investigation of its own investment.

THE EASTERN RATE MIX-UP?

SOME of the eastern lines have complained to the Interstate Commerce Commission about reductions in rates which the Delaware & Hudson and the Erie have announced, and have asked the commission permanently to restrain the reductions if the rates be found unreasonably low. The interstate commerce act provides that if the commission shall find any rate "unjust or unreasonable, or unjustly discriminatory, or unduly preferential or prejudicial, or otherwise in violation of any of the provisions of this act, the commission is hereby authorized and empowered to determine and prescribe what will be the just and reasonable individual or joint rate or rates, charge or charges, to be thereafter observed in such case as the *maximum* to be charged, . . . and to make an order that the carrier or carriers shall cease and desist from such violation to the extent to which the commission finds the same to exist and shall not thereafter publish, demand or collect any rate or charge for such transportation . . . *in excess of the maximum rate or charge so prescribed.*" It seems plain from this provision that Congress did not intend to give the commission power to advance any rate *after* it had gone into effect.

The amendment made by the Mann-Elkins act, giving the commission power to restrain changes in rates, provides that "whenever there shall be filed with the commission any . . . new individual . . . rate . . . the commission shall have . . . authority to enter upon a hearing concerning the propriety of such rate, . . . and, pending such hearing and the decision thereon, the commission . . . may suspend the operation of . . . such rate . . . but not for a longer period than 120 days . . . ; and after a full hearing when completed, or after the rate . . . goes into effect, the commission may make such order in reference to such rate . . . *as would be proper in a proceeding initiated after* the rate . . . had become effective." Now, as the commission cannot, *after* a rate has become effective, issue any order regarding it except to reduce it or to prevent it from being advanced, and if after it has suspended a change which a railway proposes to make and has conducted hearings regarding it, it can only issue such an order regarding it as would be proper in a proceeding initiated *after* the rate had become effective, how can it be that it can restrain a reduction in rates? Since it cannot raise a rate or prevent its reduction, after it has gone into effect, how can it issue an order restraining a proposed reduction before it is put into effect? It might be that on a very broad interpretation it would be held that the commission could suspend any change in a rate, whether an advance or a reduction, pending investigation; but in view of the language of the law, it is inconceivable how anybody who can read English can believe that the commission, after such suspension and investigation, could issue an order preventing a rate from being reduced or requiring it to be advanced.

While the commission probably has not the power to suspend a reduction or compel an advance in rates, various incidents that recently have happened have added much force to the argument in favor of specifically giving it that power. Without such authority it will never be able effectively and salutarily to correct all unfair discriminations between localities, commodities and shippers, and to protect carriers against reckless competition of one another.

Meantime, what a spectacle the eastern roads present to the public only a few months ago they were concertedly appearing before the commission petitioning for advances in rates and saying that unless they got them some of them might be forced into bankruptcy. Now some of them are appearing before the commission petitioning it to prevent others from making unreasonable reductions in rates. The questions involved could easily have been settled without a resort to rate wars. They could have been submitted to arbitration as was the Michigan Central passenger differential question a few years ago. But certain of the roads preferred to run amuck and give the public the impression that, instead of being as hard up as they were saying they were a few months ago, they now have money to throw away. It is evident a good many railway men have not learned much from the experience of the last ten years. If railway managers find the work they are doing to educate public sentiment regarding railway affairs less fruitful than they could wish, they can discover one of the principal causes in the fact that things are constantly being done by some railway men which belie much that is said and written by other railway men who are participating in this educational work.

NEW BOOKS.

Railroad Traffic and Rates. By Emory R. Johnson, Ph.D., and Grover G. Huebner, Ph.D. D. Appleton & Company, New York and London. Cloth; two volumes, 5½ in x 8¼ in.; volume I, 524 pages; volume II, 448 pages. Price, $5.

Dr. Johnson, professor of transportation and commerce of the University of Pennsylvania, is already well known to the readers of the *Railway Age Gazette* by his previous works on railway subjects, and Dr. Heubner is one of his associates. In "American Railway Transportation," Prof. Johnson gives one of the best brief histories of the development of railways in America; in "Elements of Transportation," he analyzes the business and work of the railway world for the benefit of young students; and now, in this last thousand pages we have in great fulness, an account of the intricate and detailed work of the traffic manager, the general freight agent, the general passenger agent and their helpers. The prospectus says that the work has been written mainly to meet the demand of men in the railway service for complete and authentic information. The first 40 pages are filled with generalities which may not be very attractive to the young railway man, but he should read them with care, nevertheless, for the chapter will give form to ideas which in the average head are often vague. For the rest, the list of the headings of the chapters, which is condensed below, will sufficiently indicate the scope of the work; and we need only add that throughout the two volumes every paragraph is marked by accuracy, thoroughness and evidence of mastery of the subject. Moreover, proofs of the work were submitted to prominent men for criticism before the book was published, and a long list is given of the names of railway officers who have performed this service. The very numerous blank forms, shown in facsimile, are copies, in most or all cases, of forms in actual service on prominent railways; many of them from the Pennsylvania.

The work is the result of notes and studies made by the authors during the past five years, in their teaching of advanced students in the University of Pennsylvania; yet it is brought fully up to date. For example, the status of the Pullman Company, since the Interstate Commerce Commission has had authority over it, is clearly set forth, and articles are quoted from the *Railway Age Gazette* up to within a short time before the book was sent to the press.

The first volume contains 25 chapters, divided into three parts. Part 1 is general; Part 2 takes up organization and management of freight service; accounting; car service and efficiency; private cars; fast freight lines; and freight traffic associations; Part 3 covers freight classification, tariffs and rate-making. The list of forms, maps and charts in this volume fills three pages. Volume II contains 22 chapters, divided into four parts. Part 4 contains organization of the passenger department; tickets; accounting; the Pullman Company; the baggage service, etc.; Part 5 is on passenger classification and fares; Part 6, the express service and railway mail transportation; Part 7, the Interstate Commerce law, as amended in 1910.

The Anatolian Railway, whose western terminus is opposite Constantinople, Turkey, has contracted with a great petroleum company of Roumania for supplying its locomotives with oil. The oil will be delivered by vessels at the railway terminus. The change of the locomotives from coal-burning to oil-burning will be made 25 at a time, and will begin immediately. The Bagdad Railway will be an extension of the Anatolian system.

Letters to the Editor.

THE SUPPLY DEPARTMENT.

Ottawa, Ont., May 17, 1911.

To the Editor of the Railway Age Gazette:

In your editorial note on my little paper on The Supply Department, in your issue of May 12, you show, quite correctly, that my paper is largely an interrogation. It is. Mr. Pearce makes statements; he does not prove facts, and I question those statements. Beyond doubt the proper procedure would be to prove the statements wrong, but that is just the trouble. I could give my opinion on the matter, but that would not be proof, no more than are Mr. Pearce's opinions. So I merely question his statements for the time being, with the hope that such questioning may help lead us to the truth.

Before we can say that a thing is good or bad, we must compare it with something of like nature, and in this matter of the supply department the comparison has never been made. Each railway has gone ahead in its own way, carefully concealing its figures, and results obtained, from other roads, and quite frequently from themselves; so while we may each have our own opinion as to the best methods we lack proof. Has Mr. Pearce compared the results obtained under his ideal plan with results under other plans? Has he facts and figures to show? If he has, we want them; if he has not, then his statements must stand as his opinion, or theory, only, not as proven facts, and we have a right to question them. Not in any unfriendly spirit, but simply with a desire for the truth and giving him full credit for his splendid piece of work. An artist may paint a beautiful picture, requiring great skill in its production, and it detracts nothing from his credit as a painter that his conception is ideal, rather than practical.

E. J. Mc Veigh,
Storekeeper, Grand Trunk Railway.

ARBITRATION OF RAILWAY LABOR DISPUTES.

Chicago, May 29, 1911.

To the Editor of the Railway Age Gazette:

All railway officers, especially those who have been in actual contact with arbitration matters, must be interested in the discussion in your columns of the suggestion of Mr. Delano for the creation of a court of arbitration, which was made in his communication published in your issue of April 7.

We must remember that there are three parties to every controversy: two contending parties, and the public. We must remember, also, that there are three features which must enter into the adjustment of every dispute: first, some effort, in an informal way, to reconcile differences or draw the contending parties more closely together; second—in case of failure to secure settlement by conciliatory methods—an arrangement by which the differences will be submitted to arbitration; and, third, a complete understanding on the part of the public as to the merits of the controversy.

The public is entitled to have the information necessary to enable it to place the responsibility for failure to reach a settlement of a dispute which may result in interruption of a service so essential to its convenience and business prosperity as that of transportation.

A large majority of the disagreements which have occurred in negotiations regarding railway labor matters recently have been settled either through mediation and conciliation, as provided for in the Erdmann act; or by arbitration thereunder; or by some other form of arbitration agreed upon between the railways and the labor organizations.

Before suggesting improvements in methods that have been tried in the past, we should consider the results obtained by and the defects in those methods. The processes we have used have been well tried and we should not make radical departures therefrom without mature consideration. This leads up to consideration particularly of the Erdmann act.

The strength of the Erdmann act consists in the fact that it does not contemplate compulsory arbitration. Compulsory arbitration must be distasteful to both the railways and the employees, as, doubtless, there are many issues which neither would care to arbitrate.

The spirit of conciliation and mediation injected in the steps preliminary to settling a controversy or bringing about arbitration is another strong feature of the act. The situation at this stage would be improved if the law compelled the parties in dispute to desist from open hostilities until the matter in controversy has been carefully investigated and the facts definitely ascertained and placed before the public.

The statement that arbitration is desired by the weaker side is not quite true. The Erdmann act encourages the generous party, mindful of public interest, to arbitrate and settle its troubles without an interruption of service; but, at the same time, the Erdmann act may at times encourage weak negotiators to shirk responsibility.

The act might be strengthened by making it mandatory upon the chairman of the Interstate Commerce Commission, the commissioner of labor, or such officers as may be charged with such responsibility, to place themselves in communication with the parties to the controversy, and endeavor by mediation and conciliation to secure an adjustment of the controversy, or an arbitration of the points of difference.

The act should be broadened sufficiently to include the railway mechanical branches which are so closely associated with the transportation department. As at present framed it covers only controversies between railways and their employees *actually engaged* in *train operation* and *train service*. While it is obvious that trains cannot be operated without providing for the handling of engines and cars in shops and roundhouses, the act is not clearly and certainly broad enough to include car repairers, boilermakers, machinists and others of this class, and although it might be so interpreted it should be made somewhat more specific.

Under the present method both sides select their most efficient representatives. These two generally fail to agree upon a third man, and thus force the appointment of an "umpire." The third arbitrator is always a man of high principles, who accepts the service purely from a feeling of public duty, but who may not be properly equipped by experience or training to understand the problem in all of its intricate details. He may be misled as to the importance of what are apparently trivial details; or he may avoid the responsibility of a clean cut declaration of principles by a decision largely a compromise and based generally on purely the monetary considerations.

For the above reasons it would seem possible to improve the situation. A permanent court would permit of security in tenure of office; of the selection of experienced men, well equipped by special training, free from other duties and with sufficient opportunity for a study of the whole broad question; and of the elimination of political influence. Such a court would seem to be a practicable arrangement from the standpoint of the work which might be thrown upon it; for with the opportunities for breaches between the roads and the employees restricted by concerted action, and actual disagreements still further reduced by the preliminary processes of mediation and arbitration, it is probable that no more cases numerically would be presented than could be handled with reasonable promptness.

The suggestion for a permanent court of arbitration appears attractive from the standpoint of increasing the possibility for judicial and careful analysis of the whole situation. It is questionable if either side would assent to an arrangement comtemplating a permanent court composed always of the same individuals. A permanent court, having once decided against a party to a controversy, might not again be acceptable to that same party;

whereas, an arrangement by which the personnel of the court or board of arbitration could be changed would remove this objection; and doubtless a party would again be willing to submit its further case to arbitration.

It is not obligatory to take controversies to a court of law. Mr. Delano contends that it should be more obligatory to take controversies in railway matters to arbitration, and suggests that the proposed court of arbitration should bear the same relation to labor disputes that a civil court bears to disputes between individuals. Compulsory arbitration of labor disputes certainly appears inexpedient and is an impracticable suggestion; and it is therefore evident that we must turn to some arrangement compelling the parties to a controversy to desist from open hostilities until the facts are made public.

As a suggestion, the law might be amended to provide that the President of the United States shall, when a controversy arises which in his judgment threatens to interrupt the public service, investigate the causes through a special commission. This special commission should be required to hear the case, enter upon and inspect the premises involved, utilizing experts to examine accounts, books or official reports, or anything material to the investigation. After such investigation the special commission should be required to formulate a report setting forth the causes of the controversy; locate as far as possible the responsibility, and make recommendations for ending the disturbance and for the prevention of a recurrence thereof. This report should be transmitted to the President and the public.

By this process a thorough and impartial investigation of the cause of the controversy and all the facts concerning it could be brought to the attention of the public, which is so vitally interested in the issue.

To summarize, the Erdmann act might be amended to require a member of the Interstate Commerce Commission and the commissioner of labor to put themselves in communication with the contending parties and endeavor by mediation and conciliation to bring about an adjustment of the controversy; and, failing therein, to acquaint the President with the situation, hostilities to be suspended until a commisson could be appointed to investigate the subject and prepare a report as outlined above. A thorough investigation and public report would in themselves create a public opinion which neither side might care to disregard. It would provide the only compulsory feature which would be practicable to inject into such proceedings under the present conditions.

F. O. MELCHER,
Second Vice-President, Rock Island Lines.

COST OF RAILS AND WATER TRANSPORTATION.

Chicago, May 27, 1911.

To the Editor of the Railway Age Gazette:

Perhaps the chief reason among many for the renewed interest in inland waterways is the popular belief that great economies in freight transportation would be effected by their development. Hardly an article has appeared in the press, hardly a public speech has been delivered, that has not emphasized the cheapness of water borne traffic. Indeed, the cost consideration is of primary importance, and it merits the share of attention it has received. Obviously the transportation system which can serve the country efficiently at the least cost is the system which should be established. But while much space has been devoted to the discussion of this phase of the subject, there has been unfortunately a dearth of real argument in support of the contention that water transportation is incomparably cheaper than that by rail. From mere assumptions of the inherent cheapness of water transport supported by rate comparisons drawn from dissimilar conditions, the most important conclusions have not infrequently been deduced, conclusions which seem likely to be of determining force in shaping our future transportation policy. In view of the public interest in the transportation question at the present time it seems in place once more to direct attention to the comparative costs of canal and railway transit.

The popular argument that water transportation costs only a fraction of that by rail runs somewhat as follows: The average price received by all of the railways of the country for the calendar year 1907 was 7.82 mills per ton mile. On the Great Lakes the charge was .8 of one mill per ton mile, and on the Erie canal about 3 mills per ton mile. A dollar, then, will carry a ton of freight the following distances: By rail, 127 miles; on the Erie canal, 323 miles, and on the Great Lakes, 1,250 miles. It has been estimated that the cost of carriage on the Erie barge canal, now under construction, will be but .52 mills per ton mile. At that rate a dollar will carry a ton of goods nearly 2,000 miles. President Ransdell of the National River and Harbors Congress had conservatively estimated water traffic to be about one-sixth as costly as traffic by rail, while others have placed the saving at a still greater amount.

If these statements of the tremendous savings by water transportation be true, it is perhaps in point to ask, Why then, must our waterways be subsidized? Why must they be built by the government? Why is it that we are confronted with the sorry spectacle of broken down gang-planks, of deserted wharves, and boatless rivers and canals? Why has not private capital been lured into this remarkably profitable field of investments? If a deep waterway from the Great Lakes to the Atlantic ocean or to the gulf of Mexico would drive competing railways from the field, why have not our great business men seized the golden opportunity? Why did such men as Daniel Drew, Commodore Vanderbilt and James J. Hill forsake the waterway, business in which they had been engaged, for the railways? The reason that practically everywhere in this country private capital shuns investment in waterways can hardly be because they are exceedingly profitable. The United States government from 1802 to March 2, 1907, appropriated $69,000,000 for canals and *canalized* rivers. In addition to this the various state governments and corporations have spent $214,000,000 upon canals. In spite of these enormous aids, however, our water borne traffic has steadily declined for many years. It would seem on the face of things, contrary to the popular conception, we have witnessed a survival of the fittest.

Let us, however, analyze the cost comparisons of waterways and railways as they are commonly made. The average cost of carrying freight on the Great Lakes or on the Erie canal is compared with the average freight rates on all the railways in the country. Now, this average railway freight rate is of a most composite nature. The computation thereof makes no distinction between high class expensive freight, and bulky commodities traveling at low rates. It makes no allowance for the length of the haul, severity of gradients, or expensiveness of terminals. It does not consider whether the consignment be in train load, car load or broken lots. Speed, kind of cars, degree of care, refrigeration—none of the varying conditions under which freight traffic moves are distinguished. All factors go in a parity in determining the average freight rate charged by the railways. It ought to be apparent that unless the average waterway rate is determined in the same way, unless it is derived from a similar complexity of conditions, the comparison is imperfect. No one would regard it fair to prove by a comparison of the rates on a railway that carried only coal with those of a road that carried all classes of freight under all manner of conditions that the former road was the more efficient or the more economical. The lower rates on the former would be held to prove nothing. In like manner the low water rates quoted ought to be regarded as at least inconclusive proof of the advantages of water transportation. The waterways carry practically only low grade freight, which must travel at low rates if it travel at all. These rates are, however, compared not with the railway rates on similar freight but with the so-called average rate on all freight of whatever kind. It is from such a comparison that the conclusion has been reached that transportation by water is cheaper than by rail.

A comparison of water rates with those charged by the rail-

ways on bulky traffic would not reveal a similar disparity. In fact, it is admitted that the railways have taken even much of the bulky traffic away from the waterways. They are, however, accused of doing this by unfair competitive methods, that is, by arbitrarily lowering their rates at competitive points. Now, such a lowering of rates to a point so low that canals are unable to compete for the traffic must mean one of two things: that the railways are carrying the traffic on which this is done at a loss, or that they are able to carry such traffic more cheaply than can the waterways under existing conditions. The railways might, indeed, carry traffic for a time at a loss, in the hope of thereby destroying competition, after which rates might again be raised, but no road would of its own accord permanently carry goods at less than the actual cost of moving them.

It is recognized that the advocates of waterways contend that while it may very well be true that under existing conditions the railways can defeat the waterways, the situation would be far different if the latter were properly developed and systematized. In this connection it is well to observe, however, that the railways of the United States are at present taking traffic away from the waterways even when conditions are well nigh all that could be desired, as between Chicago and Milwaukee on Lake Michigan, New York and Albany on the Hudson, and even upon the Mississippi.

But to return to the question of comparative rates—if the comparison of cost given above had been based upon similar classes of goods moving under comparable conditions, it would still be necessary to ask if the term "cost" has the same meaning in both cases. Unless the same elements be included under "cost" as applied to water transportation that are included in transportation by rail, the conclusions drawn are worthless. The average freight rate which we have been considering was obviously meant to secure a reasonable profit upon the entire investment in the railways of the country. The cost of building the roads, cost of equipment, of maintenance, and of operation, that is, the actual hauling expenses, all were considered in the adjustment of the rates on the railway. Let us now pass to a consideration of what is included in the term "cost" as used in connection with the waterways.

It is said that a dollar will move a ton of traffic on the Great Lakes a distance of 1,250 miles, as against 127 miles on the railways. But since the Great Lakes constitute a highway ready made by nature, the rates charged there need be merely sufficient to yield a reasonable profit on the investment in the ships, in addition to meeting the expenses of operation. Naturally the rates under such conditions would be much lower than if they had also to earn a profit on a tremendous investment in the highway itself. A comparison of railway rates with the charges on canals, which, like the railways, are artificial highways, evidently affords a fairer basis from which to drawn conclusions.

It is contended that one dollar will move a ton of traffic on the railways only a distance of 127 miles, as against 333 miles on the present Erie canal; and that with the opening of the new barge canal this distance will be extended to about 2,000 miles. What is meant by cost as applied to the Erie canal? It was built by the state of New York and donated to private use. Any one who desires can build a boat and engage in the carrying trade free of charge on the state's highway. If he can earn in addition to the operating expenses a reasonable profit on the cost of a small boat or barge he is satisfied. Thus, whereas the railway rate is fixed to cover a profit upon the total cost of the highway's equipment, upkeep, and operation, upon the railways, the rate on the Erie canal has to cover no part of the enormous expenditures involved in the construction and maintenance of the waterway itself. Thus the cost item which is by all odds of chief importance is omitted from computation. The cost of building and maintaining a canal, as in the case of a railway, is always the chief outlay connected with the transporting of goods. Indeed, it is the tremendous amount of fixed capital involved that particularly distinguishes the transportation business. Consequently, in comparing the relative cost of two rival modes of transit, to omit the enormous construction and maintenance expenditures in the one case, and to include them in the other is to totally invalidate the conclusions drawn. Yet this is the method that has been commonly employed in proving water transportation less costly than transportation by rail.

The people of the state of New York have voted an appropriation of $101,000,000 for the deepening of the Erie canal from 7 to 12 ft. This is an expenditure of approximately $300,000 per mile for the mere improvement of a waterway upon which many millions of dollars have already been expended. When it is reflected that the average capitalization per mile of all the railways of the country is only $59,259, the enormous costs of canal construction stand out in bold relief. For the cost of deepening the Erie canal, four fully equipped railway systems could be constructed between Buffalo and Albany. If $101,000,000 were donated to the railways of New York state, might not railway rates, within the state be reduced to a point so low that waterways, however subsidized, could not compete therewith?

It is believed that savings through reduction in freight charges will speedily repay the people of New York for the present outlay upon their magnificent enterprise. In support of this belief estimates of the yearly savings have from time to time appeared. One particularly extravagant and laborious computation which has come to the attention of the writer shows that the vast saving of $250,000 a year will be ensured upon the opening of the enlarged canal. Unfortunately, or rather, perhaps, fortunately, no mention was made of the fact that at that rate it will require 400 years for the canal to pay for itself.

In our enthusiasm for waterways, largely occasioned by a long standing prejudice agains the railways, we are all too prone to hasten to conclusions while totally disregarding fundamental considerations, involved in the transportation problem. Transportation must be paid for by someone. If the state builds and keeps in repair a transportation system, donating its use to the public, the cost of construction and maintenance is paid for by the inhabitants of the state in the form of taxes. The remaining cost—of equipment and operation, plus a reasonable profit on this investment, is paid by the shippers of traffic to the carriers thereof. On the other hand, if the means of transportation are privately constructed, the entire cost is paid by the shippers who make use of the transportation agencies. In the former case, a large part of the cost is borne by the general public, the apportionment being dependent, not upon the benefits derived from transportation, but upon whatever system of taxation chances to be in use. In the latter case the cost is borne by the shippers according to the use made of transportation.

There are waterway schemes before this country involving an initial expenditure of approximately $2,500,000,000. This vast sum, together with the interest which would accrue from a long period of bonded indebtedness, would constitute an enormous taxation burden for the country to bear. If the national government subsidizes the waterways, the greater portion of the cost must be borne by the consumers of tariff protected commodities, regardless of benefits derived from transportation, inasmuch as customs duties are the chief source of federal revenues. If the state governments finance the schemes, the owners of real estate will in most cases bear the brunt of the expense, because such is the incidence of the general property tax so largely employed in raising state revenue.

Let us not be deceived and be led to believe that because the cost is divided, part going to the government in tax payments, and part to the traffic carriers in transportation charges, that the total burden of transportation is thereby lessened. Let us also not overlook from whom is to come the greater part of the cost, and to whom are to accrue the chief benefits.

H. G. MOULTON,
University of Chicago.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.

II.

Chicago, April 15, 1911.

My Dear Boy: Nearly every man entrusted with authority over his fellows flatters himself that he is a born organizer. Flattery is never more deceptive than when applied to one's self.

For every good organizer there are a hundred good administrators or managers. What often passes for good organization is first class administration. Yes, many a mother's son who reads this will exclaim at first blush, "That is just what I have been saying for a long time. It beats all how weak some organizations are. I am glad that my organization can stand the test of such criticism."

If elements of self-perpetuation are prime essentials of good organization, the Pharisee family are certainly entitled to bid in the preferred runs.

The corporation was evolved to supply a demand of society. Life, property, material, moral and spiritual welfare could not be left to depend upon the uncertain earthly existence of the leader or trustee. So, both rationally and empirically, by reason and by costly experiment, came the corporation to beat Death at his own game. Like all progress the corporation was resisted, because in the divine scheme of things the radicals never long outnumber the conservatives. Like all real progress the corporation idea won because it was needed. The corporation, whether governmental, religious, industrial or commercial, marks a distinct advance from feudalism by protecting the rights of the many against the caprice of the few. Because we have moved so fast might has often seemed to be right. Because the line of least resistance is the most attractive, we have sometimes backed down the hill and doubled when a good run with plenty of sand would have carried us over. Large corporations, including many railways, have often failed to attain maximum efficiency. Much of this can be traced to a neglect to carry out consistently in practice the sound working conception of the corporation. The corporation has helped society to emerge from political and financial feudalism. The interior organization and administration of most corporations, including government itself, are still too feudal in conception. The problem of to-day is so to eradicate this feudalism that the corporation can have the benefit of a free play of its constituent forces. Where feudalism exists the effective working strength is limited to the personal equation of the man at the head. The United States government is stronger than Washington, or Lincoln, or Taft. The Great Northern Railway measures its present acknowledged effectiveness by the man the Swedes call Yim Hill. The United States government grows stronger with every administration. The Great Northern Railway, too strong to be destroyed, faces a period of relative distress with the next dynasty. The Pennsylvania Railroad is stronger than such strong men as Scott, Cassatt and McCrea. Both the United States government and the Pennsylvania Railroad, although among the least feudal of large corporations, can still eradicate feudalism from their interior organization and administration. That, in good time, both will do so cannot be doubted. Inconsistencies between comprehensive conceptions at the top and narrow applications at the bottom are often overlooked. When disclosed and appreciated these incongruities soon give way under pressure of the broad policies above. We must build up from the bottom but tear down our false work from the top.

Organization is a branch of a larger subject, sociology, the science of human nature. Organization is not an exact science like mechanical engineering, for example. The variables in the human equation defy entire elimination. We check and recheck engineering conclusions. We compute and recompute material strains and stresses. We run and double back with the dynamometer car to try out our tractive power. We test and retest materials. We weight and measure our fuel and our lubricants. We do all this for material things, which, because more or less homogeneous, are the easiest to measure. When we come to the really hard part, the judging of human nature, the co-ordination of the heterogeneous human elements, our self-confidence denies the necessity for preconceived practical tests. Because he is our man, because he followed us from the sage brush or the mountains, he must be all right. "Just look at our results." Right there my boy, shut off and pinch 'em down a little. What are results? Does any one know exactly? One year they are operating ratio, another, train load, and later on, net earnings. In no storehouse do material things deteriorate to scrap value faster than does the intangible, indeterminate stock article, results. No, I am not a pessimist; I still see the ring of the doughnut on the lunch counter. But I do object to being fed on birds from year before last's nests. I believe the railways hatch out better results every year, but I also feel that improvement should and can be made even faster. It is largely a breeding problem. How best can we blend our numerous strains to produce a balanced output? Too often we try to do this by cutting off the heads of all the old roosters whose craws really contain too much good sand to be wasted. A change of diet to a balanced ration may be all sufficient.

The wonderful Nineteenth Century in the name of a proper specialization went too far. It overspecialized. The still more wonderful Twentieth Century will swing back to a balanced specialization. The medical colleges are learning that they can not turn out successful eye and ear specialists, the law schools that the constitutional or interstate commerce lawyer is the production of a later period. The successful specialist must first have the foundation of an all-round training. Broadly speaking, one applies everything of something only by learning something of everything. We all believe in specialization. Where we differ is as to the point where specialization stops and overspecialization begins. We all believe in religion. Where we differ is as to which is the main line and which the runaway track, as to which derail deserves a distant banjo signal and which an upper quadrant. Orthodoxy is usually my doxy. The great fear is always that the other fellow, being less orthodox than we, will try to put over some constructive mileage on us. Sometimes this causes us to make his run so long and his train so heavy that he ties up under the sixteen hour law and we miss supper hour going out to tow him in. An empty stomach discourages drowsiness and we may then stay awake long enough to realize that said other fellow was just as orthodox as anybody about trying to make a good run.

The corollary of specialization is centralization. The undesirable corollary of overspecialization. is overcentralization. Get out your detour map, approach this proposition by any route of reasoning you please and you will reach the same conclusion.

Railway administration today suffers most of all from overcentralization. Trace this to its source and you will find overspecialization of function, and its concomitant, an exaggerated value of certain constituent elements of administration. When in doubt, recall the ever applicable axiom that the whole is greater than any of its parts. Some people confuse the terms and ideas, concentration and centralization. Proper concentration in complete units by an earlier convergence of authority permits decentralization in administration. A lack of such early concentration makes centralization inevitable. Again, concentration of financial control is not incompatible with decentralization of administration among constituent controlled properties. When the big bankers have time to think out these propositions for themselves they will permit the railways to get closer to the people and hostile legislation will diminish if not disapear.

Organization as a science seeks to develop and to support the strong qualities of human nature . Organization likewise takes account of and seeks to minimize the amiable failings of human nature. Constitutional liberty insures the citizen protection against the caprice of the public officer. Administrative liberty demands an analogous measure of protection for the subordinate

from the whim of his corporate superior. An amiable failing of many a railway president is to be satisfied with having everybody under his own authority, and to forget that the official next below may be embarrassed by having only a partial control. The general manager who insists the hardest that his superintendents are best off under his departmental system will squirm the quickest under the acid test of having the chief supply, the chief maintenance or the chief mechanical official report to the president. The superintendent who finds himself with a complete divisional organization is oblivious to the troubles of a distant yardmaster with car inspectors. When your old Dad was a ninety dollar yardmaster some of his most important work was at the mercy of a forty-five dollar car inspector. The latter was under a master mechanic a hundred miles or more away, who in turn could usually and properly count on the support of the superintendent of motive power. The obvious inference was to relieve the yardmaster of responsibility for mechanical matters. From one viewpoint these mechanical questions are too highly technical for the yardmaster. From another they are matters of common sense requiring more good judgment than technical training. No, I would not put every yardmaster over the roundhouse foreman and the car inspectors. What I would do would be to make the position of yardmaster sufficiently attractive to impose as a prerequisite for appointment a knowledge of mechanical as well as transportation matters. Gradually I would work away from the switchman or trainman specialist to the all round man in whom I could concentrate authority as the head of an important sub-unit of organization. Instead of leveling downward, as the labor unions do, by assuming that the average man can learn only one branch of operation, I would recognize individuality and gradually develop a higher composite type. Because some car inspectors are not fitted to become yardmasters is no good reason for practically excluding all car inspectors from honorable competition for such advancement. When we build a department wall to keep the other fellow out we sometimes find it has kept us in. We blame the labor unions for these narrowing restrictions of employment and advancement. Look once more for the source and you will find it among our predecessors in the official class, a generation or more ago. These officials insisted upon planes of department cleavage which the men below were quick to recognize. Railway manhood has been more dwarfed by exaggerated official idea of specialization with resulting departmental jealousies than by the labor unions.

Therefore, my boy, let us get some of these inconsistencies out of our own optics before we talk too much about the dust that seems to blind the eyes of those who are exposed to the breezes of that world famous thoroughfare which faces old Trinity Church in New York.

Affectionately, your own

D. A. D.

FOREIGN RAILWAY NOTES.

It is estimated that the operating expenses of the Chilean railways will amount to $13,125,000 for 1911, against $12,750,890 for 1910.

The Cuban inter-oceanic railway between Port Limon, on the Carribbean, to Punta Arenas, on the Pacific, was formally opened to traffic on January 14, 1911.

The French government has introduced a bill authorizing the Tunisian government to contract a loan of $17,466,500. The principal object is to provide for extensive railway construction, one section of which, when completed, will be in position to carry 400,000 to 500,000 tons of minerals yearly from the Nefzas and Nebeur districts to the port of Bizerta. The Tunisian government is further desirous of constructing four new lines, which would greatly improve the railway system of the country. The cost is estimated at $46,320,000. Two of these proposed lines are of particular interest, as they are designed to join the south with the north, and would touch Tozeur and Gabes.

FEDERAL V. STATE REGULATION OF SECURITIES.

In one of the discussions before the Securities Commission, attention was called to the fact that Congress might pass a law fixing certain conditions which would have to be complied with by all corporations engaged in interstate commerce before they could issue new securities; or, on the other hand, Congress might pass a law which would provide for the appointment of a commission who would have the power to permit, or refuse to permit, the issue of stocks or bonds by any company engaged in interstate commerce; or, as a third alternative, Congress might pass a law which would either compel or permit companies engaged in interstate commerce to incorporate under a federal charter. With federal incorporation it would be, apparently, a comparatively easy task for the federal government to regulate the issue of securities.

From the legal standpoint, two questions involved here are: the question of the power of Congress to regulate the issue of securities by existing state corporations, and the closely related question of whether Congress has the power to compel, or permit, corporations now chartered under state laws to incorporate under the federal law. The relation of these two questions is so intricate that it could only be adequately defined by the Supreme Court of the United States. For instance, it is possible that a way could be devised by which federal incorporation could be compelled on the ground that the federal government has an inherent right to regulate the issue of securities by companies engaged in interstate commerce. On the other hand, it might be found that, while the federal government had no such inherent right, it could gain much the same thing by permitting incorporation under the federal charter, and so regulate securities.

There was a sharp and rather unusually clean-cut difference of opinion between the various witnesses before the Securities Commission as to the legality of federal regulation of securities. Judge Lovett, while expressing his opinions in the form of "doubts," outlined a case against the legality of such assumption of federal power. While acknowledging that court decisions have sufficiently clearly shown that the federal government has the power to regulate any action of an interstate commerce carrier which affects interstate commerce, he doubts strongly whether the act of issuing securities and of the attendant bookkeeping transactions have anything directly to do with interstate commerce. His position was that the states now had the power to create corporations which could engage in interstate commerce; that the United States has full and unlimited power to regulate such interstate commerce activity, but that the state retains its original power over its corporation as a corporation; that the issue of securities is a corporate act, not an activity of interstate commerce.

Edward M. Shepard and Francis Lynde Stetson agreed with each other and with Judge Lovett in believing that federal regulation of securities of state corporations would be illegal; Mr. Stetson insisting that even if it were legal it would be very impolite.

The opposite view, that is, that federal regulation is legal and feasible, was taken, among others, by Robert Mather, Walker D. Hines and Burton Hanson. "The power which can regulate commerce can regulate the operation of a corporation whose object it is to provide a channel for that commerce," Mr. Hines said. Railway corporations have as their sole object the provision and use of a channel for interstate commerce. Regardless, therefore, Mr. Hines thinks, of whether capitalization and the issue of railway securities have anything to do or not with freight rates and the direct activities of interstate commerce, the federal government has the authority to regulate the acts of these corporations.

One of the witnesses suggested that inasmuch as the refusal of the New York Public Service Commission, Second district, to permit the issue of securities by a New York corporation engaged in interstate trade might seriously affect interstate com-

merce in Ohio, that this was a regulation of interstate commerce, legal, possibly, as long as Congress did not itself take any steps which would come in conflict with such regulation. If, however, Congress assumed some of the powers that it had in this regard and passed any laws which would conflict with the laws of New York or the actions of the New York commission, the state laws or rulings would become void. Mr. Hanson cited the hours-of-labor law as an example. In the *State of Wisconsin v. the Chicago, Milwaukee & St. Paul,* the supreme court of Wisconsin held that where Wisconsin had passed certain laws fixing the hours of service of employees engaged in interstate commerce, and where these laws had come in conflict with laws passed by the United States regulating the hours of service of employees engaged in interstate commerce, the state laws were void. The basic difference between the legal view as explained by Judge Lovett and that as explained by Mr. Hines was as to the extent to which the acts of a company engaged in interstate commerce could be differentiated as between acts of state corporations and acts of interstate carriers.

The view taken by W. D. Williams, of the Texas state commission, who emphatically opposed *any* suggestion of substituting federal regulation for state regulation, was that while the state could forbid a company chartered under its laws to engage in interstate commerce, and while the United States could forbid a company from engaging in interstate commerce unless it submitted to federal regulation, the United States could do nothing to annul the laws of Texas regulating its own corporations.

The suggested passage of a law compelling or permitting incorporation by all interstate commerce carriers under a federal charter has already been mentioned. Compulsory federal incorporation was not discussed exhaustively. One gets the impression from reading the testimony that most of the witnesses who mentioned it had considerable doubts as to its legality. The law *permitting* federal incorporation, however, was favored by a number of those who discussed it. It is worthy of note here that while Judge Lovett doubted the legality of federal regulation he had few doubts as to its desirability. Most of the states have either already passed laws regulating the securities of common carriers or may be expected to pass such laws, and it is on this ground that a great many of the witnesses favored federal regulation as the lesser of two evils.

Those who believed that federal incorporation is not only desirable, but feasible, thought that such incorporation would be in the nature of a license to do interstate business; and Mr. Untermeyer, for instance, sketched a general plan for federal incorporation of such existing companies as desired to avail themselves of the privilege. His idea was to have a law providing that if three-quarters of the stock desired federal incorporation, all of the stock could be compelled to come in, and that the refusal of a part would give the majority a right to buy out the minority under a fair valuation. His plan permitted a federal corporation to hold all the stock of a state corporation but not any part of it. It provided for a compulsory sale by the minority stockholders of a state corporation in case three-quarters of the stockholders wished to sell their stock to a federal corporation.

The discussion of federal incorporation leads naturally to the question of the *advisability* of federal regulation; first, if it were to exclude state regulation; and second, if it were to be superimposed on state regulation. As to federal supervision added to state supervision, with a few important exceptions there was a fairly uniform opinion unfavorable to a further extension of the present law. Those strongly in favor of a rigid regulation, as, for instance, Commissioner Clements, seemed to think that federal regulation was so necessary that if it were found that it could not legally exclude state regulation, or that a law was passed which did not exclude state regulation, nevertheless it should be superimposed and much extended. Nearly all, however, of the witnesses who had had experience in being "regulated," regardless of whether they were bankers, railway men or lawyers, were strongly opposed to the conflict of adding federal regulation to state. Neither corporation lawyers nor state commissioners were agreed among themselves as to the success of regulation of interstate commerce carriers by state commissions. Paul D. Cravath was so impressed with the success of the New York Public Service Commission, Second district, that he asked a number of railway officers for whom he was counsel whether they would be willing to go back to the time before the Public Service Commission, if that were possible, and not one of them was in favor of such a retrogression. Walker D. Hines, from his experience with the Texas commission, gave the impression of holding up his hands and begging for anything but state regulation.

The principal points that were made in favor of state regulation were the advantages to be gained by the knowledge of local conditions and by the power to act promptly. Numerous instances of the benefits of such local knowledge and informal prompt action were cited by those who discussed the work of the Massachusetts commission, the New York Public Service Commission, Second district, and the Wisconsin commission; in fact, most of those who favored state regulation as opposed to federal regulation had had to deal or were familiar with the work of one of these three commissions, while those who were most bitter against the state's assumption of any more authority had had to deal with such commissions as that in Texas or that in Louisiana. Those who advocated the assumption of authority by the states valued the advantages to be gained by a sort of paternalism more highly than the uniformity to be gained by federal regulation.

All of the men who testified before the Securities Commission who had had to deal with the financing of short new lines, or in fact any new lines, were agreed in their distrust of state regulation and in their strong preference for uniform federal regulation. This question of financing new short lines came up again in the discussion of issuing stock and bonds below par and at a discount, but it is also of the greatest importance to consider it here in discussing the advisability of federal regulation. The preponderance of opinion among those who actually had to deal with financing of new short roads was that capital, with certain exceptions, could not be raised locally to build such roads. Testimony by members of the Wisconsin commission showed that their experience had been an exception. Wisconsin is a comparatively newly settled state, but it is rich—not rich in the sense that the French peasant is rich, but rich in the sense that its resources are being developed more rapidly than the expenditures of the country consume the wealth, and the surplus is therefore available for local investment in enterprises which do not become profitable for some little time. The consensus of opinion seemed to be that this happy condition does not exist in the rest of the country.

The rest of the country badly needs railways. It is not necessary to go to the testimony before the Securities Commission to discover the fact that people think they need more roads. The construction columns of the *Railway Age Gazette* are filled with plans and projects which are indefinitely delayed, or are never carried out, because of lack of capital. There was certainly no one who suggested before the Securities Commission that capital did not shun uncertainty, and the evidence tended strongly to show that a state commission, especially in the western states, with power to regulate the issue of securities, did not make for security of property rights. In other words, while conditions of operation might be local, and what would be appropriate in one place would be inappropriate and harmful in another, the financing of even a 25 or 50-mile intrastate line was often an international affair. There were two men whose testimony was based on expert knowledge, F. J. Lisman and Robert Brookings, who have had a very broad experience in the financing of small roads. Mr. Brookings is a St. Louis banker and is representative of capitalists in St. Louis who have done considerable of this sort of financing. F. J. Lisman has financed the building of

roads in nearly every part of the United States. It is worth while describing the Wisconsin method of financing these short roads, and then Mr. Brookings' and Mr. Lisman's methods.

In Wisconsin, when a community 50 or 60 miles from the nearest railway wants a line built, it first tries to persuade the existing line to build a branch. Failing in this, it raises capital locally to provide funds for by far the greater part of the cost of building such a line, and then possibly it sells to an eastern capitalist bonds representing as low as 10 per cent. of the total cash invested in the project. These bonds having behind them such a large equity, sell at a fairly reasonable price. The road possibly is not profitable for a few years, but the local men who put their money into it get a return through the increased value of their crops, their land and their town real estate. In time the road may become of enough value to attract the line with which it connects, and the large railway company then buys in the property from the original builders. Such a line as this is extremely cheaply built. It has the local people with it; it possibly has grants of right of way, timber for ties, and possibly of a certain amount of free labor for grading, etc., provided by the farmers.

From the testimony of both Mr. Lisman and Mr. Brookings, their method of building a new line is much the same as if they were local people, except that they have the capital back of them. They go in and build a line which a big railway company would not undertake to build, building it cheaply with the help of local enthusiasm and desire for an increase in real estate values, but they finance the project by the sale of securities of the company that they form to their *own* customers. Mr. Lisman testified that his customers included men in nearly all parts of Europe as well as in the United States. In nine cases out of ten the customers of these bankers buy securities from them, knowing comparatively little about the security itself but having implicit faith in the judgment of the banker. The banker, therefore, in selling his securities stakes his reputation and judgment on their soundness; and the testimony before the Securities Commission apparently showed strongly that bankers were unwilling to take the chances with their reputation that were entailed by the investment of other people's capital in states like Texas, with a radical state commission.

As to the financing of new short lines by existing large railway companies, it was pretty clearly shown in the testimony that these large companies were not willing to build lines as rapidly as the country through which they ran demanded. There seemed to be a general feeling that a railway company, with its great number of security holders who were dependent for their income on their investments, did not have the moral right to engage in speculative railway building on any very large scale, and it is really speculative railway building that the settlers in a new country want. In this connection it is worth while taking such a list as the Pocket List of Railroad Officials and running through it to see how great a number of short railway lines there are in the United States. There are many hundreds of lines 25 to 100 miles long scattered all over the country, and the development of the country has been immeasurably hastened by the building of these lines. A trip through Oregon, Texas or the southeastern states would be sure to convince any fair-minded man that there is still a field for more of these lines.

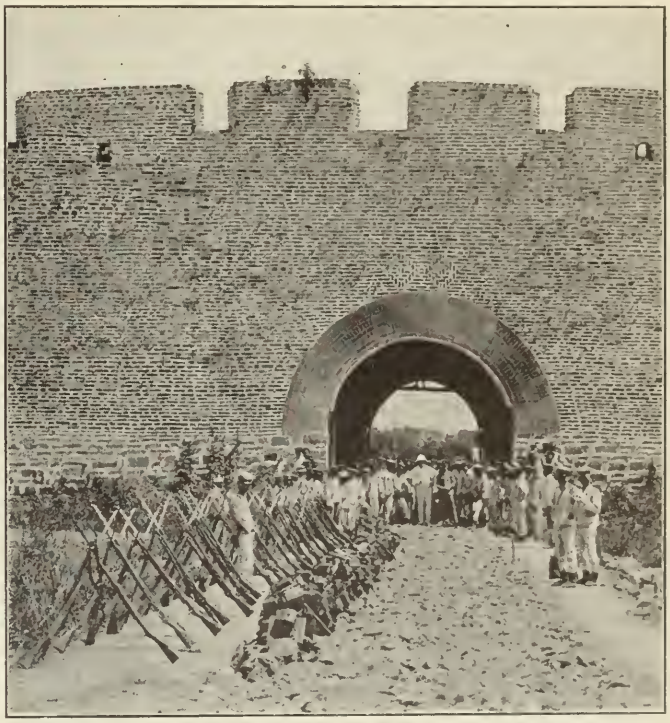
Regardless, therefore, of the difference of opinion on the general question as to the advisability of federal regulation of the issue of securities in place of state regulation, the testimony before the Securities Commission apparently indicated quite clearly: first, that new lines needed to be built; second, that in general these lines could not be built with local capital; and third, that uniform federal regulation will be far more likely to attract capital into such enterprises than would diverse and erratic state regulation. Moreover, the preponderance of evidence seemed to be that the issue on a large scale of securities by existing railway companies whose lines ran through a number of states was, if it were to be restricted at all, a national rather than a state question.

CHINA'S MOST MODERN RAILWAY.

BY LEWIS R. FREEMAN.

The Shanghai-Nanking Railway is known to foreigners in China as the best built and best equipped road in the Far East. To the Chinese it is known as their most expensive lesson in giving to foreigners full control of expenditures in enterprises for which they furnish the money. The Chinese are aggrieved in the matter because they feel that, for the sake of the 5 per cent. commission which went to the British corporation on all purchases made abroad, they have been put to an expense far greater than they could afford; "butchered to make a British holiday," as one of them expressed it.

The British are aggrieved that the Chinese are not more appreciative of the excellent road which has been built for them. They feel that the Imperial government is not giving them the support that it should in their strenuous but up to the present vain efforts to put the line on a paying basis. The Chinese, while admitting the superior construction, which should require few renewals of any description for many years to come, say that their country is poor and for that reason that half the



First and Only Railway Tunnel Through the Great Wall.

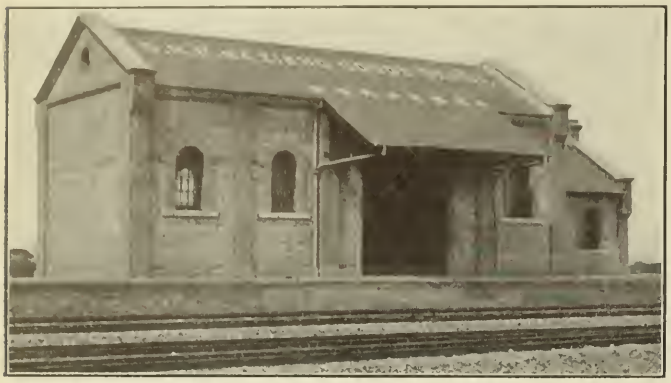
money expended on the railway would have given them a line quite commensurate with their wants, and still more so with their finances.

It is not the purpose of this article to discuss the much-mooted question of the expense of the Shanghai-Nanking Railway, which, though built through a practically level country, has cost about $55,000 gold a mile. It is well to note, however, that it is the one instance above all others which the Chinese cite in contending for full control of the expenditure of borrowed money, and it may be said with certainty that never again will foreigners of any nationality be given so free a hand in the construction of a railway in China.

The two points regarding the Shanghai-Nanking Railway about which there are no differences of opinion in any quarter are, its permanence of construction and the sincerity of the efforts of its foreign staff to make a financial success of it in the face of the most discouraging odds. This foreign staff numbers at present about fifty, and if honest and determined effort can make themselves count in Chinese railroading as in American it will not be

long before the line is paying good returns on even the large investment which it represents.

My first inkling of the character of the Shanghai-Nanking Railway was last September, when its general manager told me that it was going to put the Pacific Coast Commercial Commission through to Nanking over a roadbed as good as any in



Freight Station at a Small Town.

America and at a speed equal to that of the expresses between New York and Chicago. He said that if it were not for the many stops the special would have to make he wouldn't mind undertaking to do the 200 miles to Nanking in three hours and a half. As a matter of fact, we got up to 65 miles an hour in the middle of two long tangents. The train, with baggage vans, consisted of nine or ten cars, and in spite of the high speed at times attained it ran so quietly that it was possible to converse in ordinary tones, and so smoothly that one could write comfortably not only in the private cars but in the ordinary first-class compartments.

Although a good deal of trouble was encountered with the country people during the construction period on account of graves, labor difficulties and the disturbance of "feng-shui" (a term meaning literally "wind and water," to which an interminable lot of Chinese superstition is attached) the people have taken most kindly to the line as a means of travel, with the result that the passenger traffic has increased until it now exceeds



The Awakening of China; Some Reactionaries.

that of any other 200-mile stretch of line, single or double track in the world.

The passenger fares on the line are low, being approximately two cents, one cent and half a cent a mile for first, second and third class travel, respectively. A fourth or coolie class, carried in cattle cars provided with wooden benches, is charged about one-third of a cent per mile.

Over 95 per cent. of the passenger traffic is third and fourth class, and most of the remainder second class; yet in spite of this large proportion of low fares the passenger receipts of the line average almost ten times as much as those from freight. This shortage of freight has made it impossible for the road, in spite of vigorous and skillful management, to operate at a profit.

The country traversed by this railway, for the most part a great alluvial plain deposited by the Yangtse-Kiang, is one of the very richest in China, and in no part of the empire is there a greater movement of produce and other things from one section to another. Lying practically level, as it does, and almost even with tide-water, the country is a network of creeks and canals, by which all of the heavy carrying has been done for ages, in junks and sampans, either singly or in trains towed by launches. For goods requiring quick delivery, and for all goods between points where water communication is unusually circuitous, the railway quickly showed that it could compete with

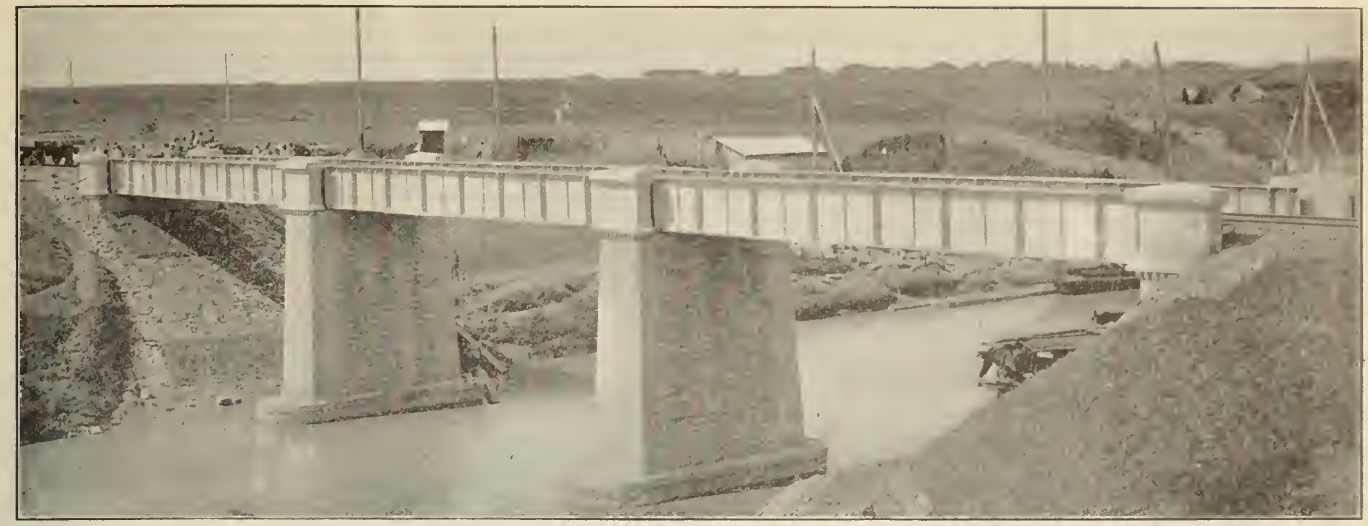


Embankment After Heavy Rainfall.

the low tariffs of the creeks and canals. Here, however was encountered the bête noir of all foreign merchants and shippers in China, "likin."

Likin, which might be traced back to the tribute paid in days past by the caravans to robber chiefs for safe-conducts, is a sort of internal tax levied on goods passing, not only between the provinces, but often also between certain districts within the provinces. It is levied according to no fixed scale, but rather follows the rule of the tourist hotel which maintains a sliding schedule of rates, according to the means or helplessness of its victims. It is one of the most fruitful sources of graft for corrupt Chinese officials, and as such will be painfully slow in eradication.

A large part of the income of officials resulting from likin comes in the form of bribes for "neglecting" to levy it. This is where the railway's trouble comes in. Every ton of freight going over its line shows on its records, so that a consignment passed without paying likin could easily be traced by the Peking officials, a thing which would be almost impossible under the hit-or-miss system of collecting—or failing to collect—that duty from junks. So the shippers, for the most part, have found it



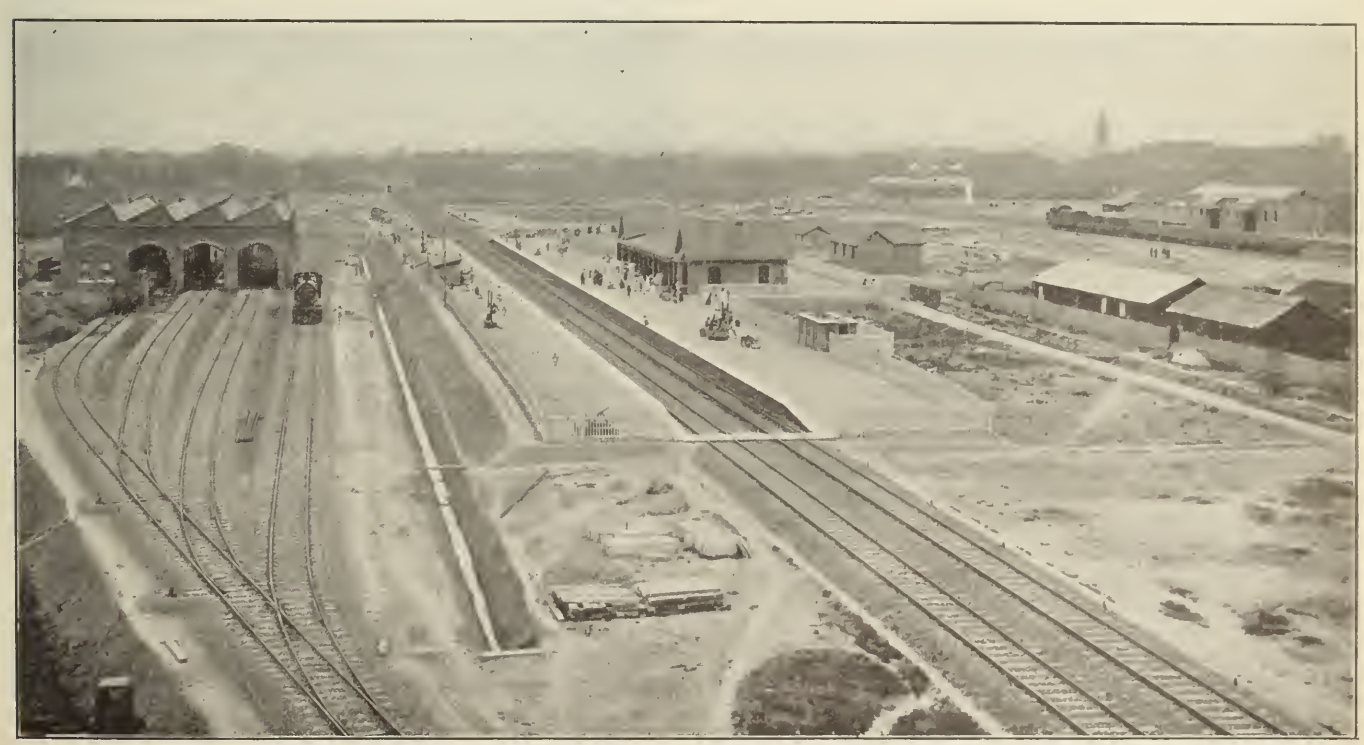
Girder Bridge Over Canal; Shanghai-Nanking.

more profitable to move their goods slowly by junks on the canals and creeks, taking their chance of avoiding likin by small bribes, than to move them quickly by rail and pay the full duty. A slight lowering of the likin tax to be paid on the railway through a ruling of the viceroy at Nanking had but little effect in improving the situation.

As a consequence of this pernicious likin tax, the Shanghai-Nanking presents the remarkable anomaly of a road with a remarkably heavy passenger traffic scarcely able to earn enough from freight to grease the wheels of the cars. A fraction of the freight which is passed free of likin, through bribery, at the barriers along the creeks and canals near the line would be enough to give the road a surplus instead of a deficit. This diversion might be accomplished by the abolition of likin altogether or the honest collection of it on the creeks and canals, either of which courses, if followed by the government, would reduce water freighting to a position of fair competition with the railways.

The Shanghai-Nanking, as mentioned, is principally remarkable for its modernity of construction. The following notes, except for occasional comments, are from the report of A. H. Collinson, M. I. C. E., the chief engineer of the line. It was built by the British and Chinese corporation, which furnished the money, for the Chinese government. From first to last, British engineers were employed, British materials used and British practice followed, until today the completed road, except for certain local provisions, has every ear-mark of a line in the heart of England itself. Westinghouse air brakes are used, but they were doubtless bought through London.

The preliminary agreement for the acquisition of a loan for the building of the Shanghai-Nanking Railway was signed in 1898, and the final one, providing for a loan of $16,250,000, in 1904. The final surveys and estimates were made during the summer of 1904, and construction was begun in the fall of that year. Considerable trouble was experienced in the initial stages over the acquisition of land, and little active work was done be-



Through Station on the Shanghai-Nanking.

fore the spring of 1905. Three years later the first train was run into Nanking, but the completion of some of the stations and other details extended into the present year.

The engineers were confronted at the outset by that most annoying of all Chinese engineering problems, the avoidance of graves, and this difficulty was magnified by the fact that the road had to run through the heart of the Taiping rebellion country, itself one great graveyard. Early in his examinations the chief engineers concluded that in locating the railway attempts to avoid all the countless graves and houses would mean a line too full of curves to allow any kind of fast or economical operation. The line was therefore built as straight as possible, avoiding only ancestral halls, tombs and monuments.

The total length from Shanghai to Nanking is 193 miles. The section to Soochow, 54 miles, has been constructed for double track, the extra cost over single track working out in the proportion of five-twelfths for the bridgework and two-fifths for the earthwork. Over 125 miles of the line has a grade of less than 0.1 per cent. The aggregate length of curves between Shanghai and Nanking is 19.8 miles, or 9.75 per cent.

From Shanghai to Tanyang the line crosses the highly cultivated alluvian plain of the Yangtse-Kiang valley, which is intersected with a net work of canals and creeks. Here the country changes, the line traversing an undulating and rising ground until it reaches a ridge or watershed at mile 144. From this ridge it descends on easy gradients to Chinkiang City, passing through an undulating country requiring heavy cuts and a tunnel.

From Chinkiang the alinement runs at the foot of the hills as far as Lungtan, avoiding the outer country subject to periodic innundations. From Lungtan the route runs through hilly country to within 1½ miles of Nanking, involving very heavy earth work both in cuts and fills. The summit is reached at mile 146, the rail level being 91 ft. above low-water mark at Shanghai. The terminus at Nanking is on an embankment, the only practicable site for the station yard being on low, swampy ground on the south bank of the Yangtse-Kiang. Since this was subject to innundation, it had to be raised an average of 15 ft.

The standard width of embankment for double track at formation level is 30 ft., and for single track, 17 ft. 6 in. Single track cuts are in general 25 ft. 6 in., and double track 38 ft. at formation level. The usual slope of the cuts is 1½ to 1, but in some cases this had to be increased to 2 and even 3 to 1. From Shanghai to Tanyang nearly all the embankments were made from side-cuts. Beyond that point portable light railway was largely used.

In the first 144 miles something less than 5,250,000 cu. yds. of earthwork of all classes was required; for the last 49 miles, about 5,000,000 cu. yds. The earth work for the latter, or hilly, section cost $375,000, an average of a little over seven cents a cubic yard. The work throughout was let by contract to native contractors at schedule rates, payments being made from measurements from cuts or in borrow pits. The slopes of most of the cuts were turfed to prevent erosion, but with only moderately satisfactory results. The rains at the Nanking end of the line are extremely heavy at times, one shower being recorded in the late summer of 1910 in which 9½ in. fell in eight hours. The force of the rain-drops alone on this occasion scoured most of the turfing from the slopes of the embankments and cuts.

The bridgework in the first 80 miles of line almost establishes a record in point of number of structures necessary, for in this comparatively short distance, 164 navigable creeks and canals are crossed, an average of more than two to the mile. From mile 80 on to Nanking the average is more than one to the mile. The total number of bridges is 303, and in addition there are 405 culverts.

With few exceptions the bridges which have been built for the double lines are entirely of brickwork in cement on concrete foundations. From Soochow, the end of the double line, to mile 144 the majority of bridges are constructed of coursed granite set in cement on concrete foundations, while for the rest of the way to Nanking the larger part of the sub-structure consists of concrete. Three types of bridge were generally adopted: abutments with splay wing walls, abutments with straight return wing walls, and pier abutments.

Wherever clearance would permit arched superstructure was adopted, but in the majority of cases steel girders had to be used. The majority of the creeks crossed were navigable, so sufficient clearance had to be given to allow boats to pass with their masts down. The clearance was invariably fixed from that of the lowest existing bridge on the creek.

Great difficulty was encountered in the construction of many of these bridges. The foundations, hardly without exception, were bad, as was to be expected in an alluvial plain, necessitating heavy charges for cofferdam, timbering and pumping work.



A Typical Cut on the Shanghai-Nanking.

Many of the foundations had to be piled, and in the smaller openings concrete inverts and apron walls were found necessary. The total cost of the bridges for the whole line was a little less than $1,000,000.

Following the custom of the country the main line is unfenced. As all fields are open in China, stock is never allowed to run at large unless attended. For this reason the lack of fencing causes very little inconvenience. All the important stations and shop yards, however, are surrounded by six-foot unclimbable wrought iron fencing.

The main line is laid with 85-lb. steel rails, 36 ft. long and five and a half inches high. Strangely enough the rail is almost exactly the height and contour of the Chinese pillow and nothing can prevent the tired laborer from stealing a mid-day nap with his head comfortably resting on one rail and his feet braced against the other. This forces the engineman to come to many an abrupt halt. The ties are of Australian jarrah, spaced 14 to a 36-ft. rail, or 2,060 to a mile. These ties cost from $1.50 to $1.75,

c. f. i. They are the first jarrah ties to be used in China, so their life is a matter of conjecture. As they have been used without impairment for from 20 to 25 years in similar climates, there appears to be no reason why, with good ballast, they should not do equally well in China, and justify their use in place of the lower priced but shorter lived Japanese ties.

The line is ballasted throughout with bottom ballast consisting of large stones about 12 in. x 6 in., 8 in thick, hand-packed. The top ballast is stone broken to pass a 2-in. ring. The ballast for the first 144 miles is Soochow granite, brought by junk from the quarries of the Tai Hu lake. For the remainder of the line the ballast was quarried from the hills in the vicinity of the railway and transported in wheelbarrows or on donkeys. The capital cost of the permanent way, including all materials, laying, lifting, boxing up and maintaining for an average of six months after the opening of traffic, varied from $13,000 to $17,000 a mile. The total charged to track is about $2,400,000.

The only tunnel on the line is the double track one through the Fort hill at Chinkiang, on a down grade of 0.3 per cent. into Chinkiang station. Many trial lines were run with the object of eliminating the tunnel altogether, but it was conclusively proven that the only other way to approach Chinkiang was by a switch-back, which would cost more than the tunnel. The tunnel is 1,320 ft. long. Nearly the entire length is through a shaly sandstone having streaks of graphite and pockets of China clay. The shaly nature of the rock necessitated the arching of the roof throughout its entire length, and also lining the side walls with brick in cement. No invert was deemed necessary.

In July, 1905, a trial shaft was sunk at about the center of the tunnel. By the end of August the shaft had reached a depth of 85 ft. Work was started in August in driving the bottom heading at the west portal. By the end of September the shaft had reached its full depth and water was found at rail level, 115 ft. from the surface. A bottom heading, 8 ft. 6 in. wide at the base and 6 ft. 6 in. high, was commenced in both directions. The small amount of water met with was easily dealt with, the progress being at the rate of about two feet a day, while four feet a day was made in the heading started from the west portal. At the close of the year 1905, 425 ft. of heading had been driven.

The headings from the shaft and west face met in May, 1906. During the nevt four months the progress of the work was more rapid, the Chinese miners who at first were unaccustomed to the labor having gained more experience under the foreign supervision. At the end of the following year 190 ft. of tunnel had been excavated and lined, and break-ups started between a second shaft and the east portal, giving in all six headings. The tunnel was completed in February, 1908.

The whole of the excavation and brick work in the tunnel was carried on by Chinese labor, and it is a remarkable fact that not one fatal accident occurred in the course of construction. Notwithstanding the fact that it was two years and a half in the building, the final cost of this tunnel was only $185,000. The lowest tender received from a European contractor for the work was $300,000.

The Shanghai-Nanking is the first that ever pierced the Great Wall of China and it aroused a great deal of hard feeling at the time. An accompanying illustration shows a detachment of troops guarding the tunnel against any possible outbreak.

The stations, shops and rolling stock of the Shanghai-Nanking Railway are quite up to the standard of the construction which has been described and whether or not the road is "too good" for the Chinese, as they now maintain, is a question which only the years to come can decide. If these years witness the progression in Chinese ideas that the present promises, it would seem a safe prophecy to say that it will not be long before they are congratulating themselves upon the fact that the Shanghai-Nanking was builded for the future.

The Choapa to Monte Osario Railway, Chile, was opened to traffic on January 5 last.

STUDIES IN RAILWAY ECONOMICS. VIII.*

BY W. M. ACWORTH.

For my own part I am quite unable to accept the principle of limitation of dividends as a reasonable basis for government regulation of railway rates. In the first place, it rests on two fallacies of theory. Many states in the union still retain on their statute book the old laws against usury inherited from England in an earlier stage of economic development. There is a legal rate of interest fixed, usually at 6 per cent., which may not be exceeded. Of course, in modern commercial business these laws are evaded by one method or another, but they really are on the statute books and could be pleaded in a case in court. And apparently the American public think there is a real analogy between a fixed rate of interest on a loan probably granted with ample security, and a dividend which fluctuates and may vanish altogether, and which merely represents the profit made by a shareholder from his own management of his own property.

The other fallacy is a more subtle one. A railway, according to English, and therefore American law, is a public highway, and as such, the charges on it are subject to public regulation. The Americans have pushed the English doctrine further, and are in the habit of speaking of railway companies, and other companies that furnish public facilities, as "public utility corporations." They seem to have ignored the fact that a railway performs the duplicate function of roadowner, and therefore toll taker, and also carrier along the road. Now, while the English legislature has always regulated the tolls of the owners of roads, whether canals or turnpikes, it has never attempted to regulate the carrier's charge.† The common law does indeed say that the carrier's charge must be reasonable. This, however, is only another way of saying that, if two parties have not agreed beforehand what shall be charged for doing a certain job, the court will fix it afterwards on a *quantum meruit*. The court might refuse to recognize an advertised scale of carriers' charges as evidence of a free bargain between the individual consignor and the monopolist carrier, and as it would lack the guidance of a scale fixed by a rival carrier it would no doubt decide the question of reasonableness with a freer hand than in an ordinary dispute between a tradesman and his customer. But there is nothing special in the principle. If the American courts and commissions are to judge the reasonableness of rates on the basis of the profits made by the company, they should logically begin by dividing rates after the French fashion into tolls (*péages*) and carrying charge (*prix de transport*), and confine their operations solely to the first portion. But I confess that the reduction in toll revenue would justify the companies in seeking a larger revenue as carriers so the change would not be of much practical utility.

From the practical point of view the contention seems to me equally unjustifiable. "Heads I win, tails you lose," is an excellent way of playing a game from the point of view of one side, but it is difficult to get the other side to take a hand in it. An investor in the United States can get 6 per cent. or something pretty near it, without taking risks; and a holder of railway shares takes risks by no means negligible. Men hardly middle-aged can remember Baltimore & Ohio shares being regarded as a proper investment of public funds; the company has since passed through a receiver's hands. Union Pacific shares have been quoted at 220; but also at 5 within 15 years; and so on. It is absolutely certain, with railway dividends limited to 6 per cent. or anything like it as a maximum, railway development in the states would come to an an abrupt stop. And, while it may be not

*Previous articles in this series appeared in issues of the *Railway Age Gazette* of January 6, January 13, January 20, January 27, February 3, May 19 and May 26.

†Of course, the British Parliament has, from very early days, fixed railway *maximum* rates. But these it has fixed on quite other principles, certainly not on the basis of a theoretically reasonable dividend. In the states some old companies have *maximum* rates, absolutely without practical importance today, in their original charters. But there are no *maxima* in Interstate traffic.

unimportant to a certain number of manufacturers and wholesale traders, though only rarely to the ultimate consumer, that a rate should be reduced, say from 70 cents to 65 cents, it is absolutely vital to every citizen of the United States that railway developments should continue.

Nor is this all. Even if we were to admit that rates giving a total return in dividend of over 6 per cent. were not reasonable, the practical difficulty of deciding what rates shall be reduced and by how much so as to bring the dividend down to 6 per cent. is insuperable. Imagine a case brought up before a law court which had accepted the theory, that rates, producing when all combined together, a net revenue of more than 6 per cent. were unreasonable. A railway is paying 8 per cent.; a particular trader claims that his rate between A and B for the carriage of coal—to take an unusually simple instance—is unreasonable and should be reduced. The court is now required to put the theory into practice. Let us see how it is to be done. Somebody may answer without reflecting: "to reduce 8 per cent. to 6 per cent. is to cut off one-quarter; you have only to bring down the coal rate from 4s. to 3s. and the thing is done." But, alas, the matter is not so simple. The dividend is only the ultimate result after working expenses, depreciation, betterments, renewals, interest, taxes, etc., have been provided for. "Well then," says the impatient critic, "be it so. The rate should be reduced not in proportion to one-quarter of the gross receipts, but in proportion to one-quarter of that portion which goes in dividends, which, in this case is 10 per cent. of the gross receipts." Now one-quarter of 10 per cent. equals 2½ per cent. In other words, the coal rate is to be reduced from 4s. to something slightly over 3s. 10¾d. If the matter stopped at this stage one might be permitted to doubt whether the gratitude of the coal owner, taking into consideration the trouble and expense of his legal proceedings, would not be a negative quantity. But in fact the matter is much more complicated than this. It is true that for all the traffic of the railway, carried under all sorts of conditions, at widely different rates for widely different distances, the result has been on the average a profit available for a dividend of 8 per cent. "But," says Albert Fink in words that ought to be stamped in gold letters on every railway commissioner's desk, "no traffic ever is conducted under average conditions." That the special coal traffic in question did not pay precisely 8 per cent. is almost a certainty; for where infinite variations are possible, mathematicians tell us that the chance of any particular figure being hit in a special case is as one to infinity. Indeed the probability is that the profit on coal has been a good deal less than 8 per cent.; for, as we have already seen, every reasonable scale of rates is calculated on the basis of letting off bulky goods of small value as lightly as possible, and looking to high class traffic as the main source of net revenue. To ascertain with any degree of accuracy the approximate cost and profit on any particular traffic is a laborious and difficult job, and to ascertain it with absolute accuracy is a simple impossibility. There is another point: The net profit made by carrying any particular traffic is a function of the volume of that traffic. Now the coal owner, if he behaves like other coal owners who complain to commissions, will undoubtedly claim that the unreasonable rate results in stifling his potential traffic; that is, that, if the rate were reduced, his traffic would largely increase. In other words, his claim really is that, if the railway company only knew its business and reduced rates, their profit, so far from falling to 6 per cent., would rise to 9 per cent. And then the unfortunate commission would have to decide on a further and more sweeping reduction, and so on *da capo*. In fact, the problem, "given that a dividend of 8 per cent. should be reduced to 6 per cent., what individual rates should be reduced and by how much?" is as insoluble as the old conundrum of our nursery days: "Given the tonnage of the ship and the number of the crew, to tell the captain's name."

But this is not all. It is quite easy to talk about limiting the company's profits to 6 per cent., or any other figure, on the fair value of the property. It is safe to say that a man's readiness to pronounce what a fair value is, is likely to be in inverse ratio to his knowledge of the subject. I must not attempt even to begin to discuss the innumerable variations that may be included in the phrase, "fair value." They range all the way from actual cash, honestly and intelligently expended on the property for capital purposes—though why a railway man alone among fallible mortals should be expected to be endowed with unerring judgment and impeccable virtue, it is difficult to conceive—through "reproduction cost" and "value as a going concern," up to "market valuation,"—each quite different from the other, most of them varying from day to day, and none of them precisely ascertainable. As for market valuation, it is sufficient to say, for example, that the valuation of the Pennsylvania Railroad, as a going concern, paying a 6 per cent. dividend, is one thing today and would be quite another thing tomorrow, if a bill limiting its dividend to 6 per cent. were introduced and passed by the State legislature. But even this is not all. Assuming, for the sake of argument, that it were possible to fix rates on an individual railway, with some reference to a maximum permitted dividend on an ascertained fair value of the property, what is to happen when two railways, each with quite a different fair value, quite a different operating cost, and quite a different burden of honestly incurred indebtedness, come into competition? That the Denver & Rio Grande, carrying over a difficult road, through the gorges of the Rockies, might have to take lower rates than the Union Pacific, in order to induce traffic to use its inferior road, one can understand. But it is impossible to conceive that anyone would pay more. To cut down the rates on the Union Pacific, therefore, to a point which would only permit that company to earn 6 per cent. as a maximum, means, in fact, to cut down precisely to the same extent the rates of the Denver road, and to condemn the Denver to all time to a lower scale of profit. Indeed, it would almost seem to be necessary, as some ingenious person has, I believe, suggested, that the Government should permit the strong road to earn more than its 6 per cent., but require it to hand over any surplus above that figure as a grant in aid of its weaker competitor. It requires, however, a strong belief in the superiority of railway men over ordinary frail human nature to believe that under such a policy, or indeed under any system of limitation of dividends, a surplus would long continue to emerge at all.

The assistant chief engineer of the Szechwan-Hupeh Railway, China, states that 50,000 coolies are now at work on this line. Eighty-five pound rails are employed for the main line, using 13 ties to the rail. Construction trains are running twice daily between the Ichang wharf and the track end, a distance of about 6 miles. More than 40 ballast cars are now in use carrying materials. With the exception of two cuts, the track could be laid some 20 miles. The Ichang station building is finished up to the roofing, and will be soon completed. The three storerooms are already occupied, the locomotive sheds built, and the head office building fairly started. Near the station are two 22-ft. wells, while the water tower will soon be completed. The coal yard is under construction. Four shafts have been sunk at the 6,200-ft. tunnel, 50 miles from Ichang. The presence of water renders the work difficult. Two 1,000-ft. tunnels are under way 25 miles from Ichang, and one 700 ft. long, about 15 miles from that city, is completed. The equipment for the machine shop, ordered from a German firm, has arrived and will shortly be installed in the newly built workshop. In order to secure more satisfactory transportation from Hankow to Ichang, another 500 h. p. tug and two 200-ton lighters have been ordered from a Shanghai engineering company. From the American Bridge Company, New York, eleven 100-ft. spans have been ordered. Two million superficial feet of Oregon pine logs and planks have also been contracted for.

THE APPRENTICE SYSTEM IN THE STORE DEPARTMENT.*

BY N. A. MEARS,

Storekeeper, Lake Shore & Michigan Southern.

On most roads, the store department has been made up of the likeliest young men of the locality, many of them without any higher education than part of the grammar grades, and secured by the weeding out process of holding and promoting the proficient common workmen about the shops and storehouse. The personnel of this association shows that the selection, in most cases, has been a wise one.

But with the coming of foreign labor on the railway, and the better education of the present times, we find that the best of the young men start with other employment, or go to it after a short stay in the store department, because the immediate scale of wages is somewhat higher, not looking ahead to see the opportunities which certainly are open to a man qualified in the store department work.

It is a common practice for a young man to put in an application for apprenticeship in the mechanical department and then seek employment in the store department at 16 cents to 18 cents per hour, which he gladly quits when the opportunity comes for him to start his assured apprenticeship at 7 cents per hour.

A young man will rise in a store department for a year or two, by studious application and the opportune vacancies just ahead of him, till he stops just high enough in the department to see that with all his knowledge he has only covered one-half or perhaps one-third of the foundation details that would make him eligible to further promotion. In order to keep in line he has to go back and familiarize himself with them. At this time he has about all the duties he can perform, and may even be putting in some overtime to keep an eye on the job ahead. As he realizes his position in the organization, the chances are ten to one he will take the first position that may be open to him, where he may make a little more money, even though he has to leave his place that he has worked up the line to hold.

And we find since we have acquired the foreign labor that there are less of these fellows available, who have, perhaps a small education, but lots of horse sense, and we have to do our best with the foreign laborer or the school boy just past the age limit allowing him to work.

There is quite a gap between these boys, usually office boys or messengers, and the place where we could use them as stockmen, shippers, etc., and to get them there I propose the apprentice system.

To get the best out of this system the head of the department should pass on each apprentice and know by card record his character, originality, executive ability, application and general deportment. He should guide the apprentice through his education by lectures, examinations and promotion after proper length of service, other points considered.

To outline an apprentice system in detail requires considerable local knowledge of the department to which it is to be applied, but I believe a general plan could be made up, even to rates for positions, and this outline would help us all in starting a system that would give the desired result.

For instance—the start might be made at office boy; to retail boy or shop messenger; next, caseman or storehouse helper; helper in the receiving or shipping departments; back to the office for experience in the requisition department; invoice work, and file and statement work. Then some time on the supply car, and by this time the boy or man will be ready to assume the first position of actual responsibility as stock clerk or assistant foreman. At this time, by carefully regulating the length of time spent in each branch of apprenticeship, the rate of pay at the start, the proper graduation of the increase in rate and responsibility, the apprentice is getting enough money to warrant his staying in the department. He also has experience to make him available for any position that may open and to make him feel that he knows enough about the positions ahead to expect them as they open and fill them with credit when promoted to them.

It may appear that an apprentice system would increase the payroll, but by reduction of present rates to make the starting rate low enough, an equal amount will be gained to increase the present rates for higher promotion or may even allow some saving. When you consider the cost of two or three hundred dollar men spending several hours in straightening out some inexperienced employees' mistakes, even an increase in the payroll on certain rates might cause a decrease in actual expenses by putting such wasted time on its proper work or even reducing the number of rates. And it is bound to reduce the grief and keep the organization ready at all times to properly handle the current work. Even an entire increase in the payroll would be warranted with the increased efficiency gained by having these properly educated men handling all branches of the work, minimizing the time lost in correcting errors.

This will result in getting the right kind of young men to start, having properly educated and experienced help on all classes of work and make an organization that can be depended upon. It will also do away with the large amount of unaccountable and annoying daily errors, which occur where we are doing the work with men who are only looking for pay day, and are replaced so often that it is almost impossible to keep them properly instructed or watched, to obtain the proper results.

*From a paper read at the meeting of Railway Storekeepers' Association, May 22.

STANDARD MATERIAL CLASSIFICATION AND DISBURSEMENT.

BY H. C. STEVENS,

Superintendent of Stores, National of Mexico.

In summing up for comparison of store department efficiency as between different roads, two important units are usable, the cost of handling, and the quantity of the stock carried as compared to monthly issue.

Under the present rules of the Interstate Commerce Commission, the first is now fairly comparable. Difference in this is generally governed by supervision, management of men, or mechanical facilities. If it is either of the first two the management wishes to know it. If it is in the latter, it should by all means be plainly before the management for full consideration in connection with possible additional facilities.

Were one to attempt a comparison of the second unit between roads, an investigation into the details comprising the figures as now available would at once convince him of the impossibility of a true comparison. Why is this? Simply because of lack of unity in methods. A few years ago the cost of handling was fully as incomparable; some roads omitted salaries of some officers and others certain portions of the labor, which other roads included. The rules of the Interstate Commerce Commission have changed this, so all are including practically the same items to cover this expense.

Shall we wait for the Interstate Commerce Commission to similarly formulate regulations covering the classifying and disbursement of railway stocks, or will the officers of the railways through their store and accounting department associations, promulgate and adopt a suitable method, which, after bearing the approval of the commission, will be universally placed in operation?

Such a practice would unquestionably bring valuable results in more channels than the one of affording comparison between roads. Men handling material accounting on one road would be familiar with the general routine covering the same feature of work on another road. There would be many men thinking and

*Paper read at the meeting of the Railway Storekeepers' Association, May 22.

working towards the improvement of one general plan, and a simplification in detail method or device in connection with the work on one road would be interesting to and could be beneficial to the other roads. At the present time, something which enables one road to get the final result in half the time and at less expense than previously secured is very probably of no use to another road, on account of the vast difference in method.

It is only a step further along the line of common standards, such as started by the M. C. B. and M. M. associations some years ago in connection with materials and devices, and furthered by the Interstate Commerce Commission in its regulation of accounting principles and practices.

For the uniform method by which the desired result must be accomplished, we can rely on a joint committee of the Storekeepers' and the Accountants' associations, with a representative of the Interstate Commerce Commission, each road to work out its own details. The important features are a careful grouping of the different classes of material, to be blended as closely as possible with the accounts to which generally disbursed, and a clear outline as to methods to be followed in the disbursement of and charges for material.

The reports of the store departments of some roads now include all materials, even stationery, while on others rails, ties, stationery and some other items are omitted, as they are not handled by the store departments. The grouping should be clearly segregated with this in mind, each final report to be on the group basis, so comparison can clearly be made one road with another to the extent to which each handles the same material irrespective of the groups which may be handled by one and not by the other.

On some roads scrap is not taken into stock until actually sold, when the transaction of debit is offset by full credit, showing a 100 per cent. issue, while in others it is taken into stock in the month in which it accumulates, regardless of when sold. Undoubtedly good practice is to take it in regularly, to avoid fictitious fluctuations in monthly charges and credits; but, regardless of which is preferable individually, one only is the better generally, and should not all follow the better general practice than the individually preferred practice?

Some of us are now charging material to the accounts when it is drawn or is on the ground for use regardless of when it will actually be used, while others are not charging it until it is reported actually used, or is taken from stock at the seat of use for immediate application. The first has the disadvantage of material frequently being transferred from the use for which drawn and applied for the benefit of some other work or account and no accounting made thereof; while to either of the latter there is no doubt attached some additional clerical expense. It is generally thought, however, that one of the latter will ultimately prevail on all roads so that all work will be charged positively with only the material used therein, and to accomplish this, no doubt some additional clerical expense is warranted.

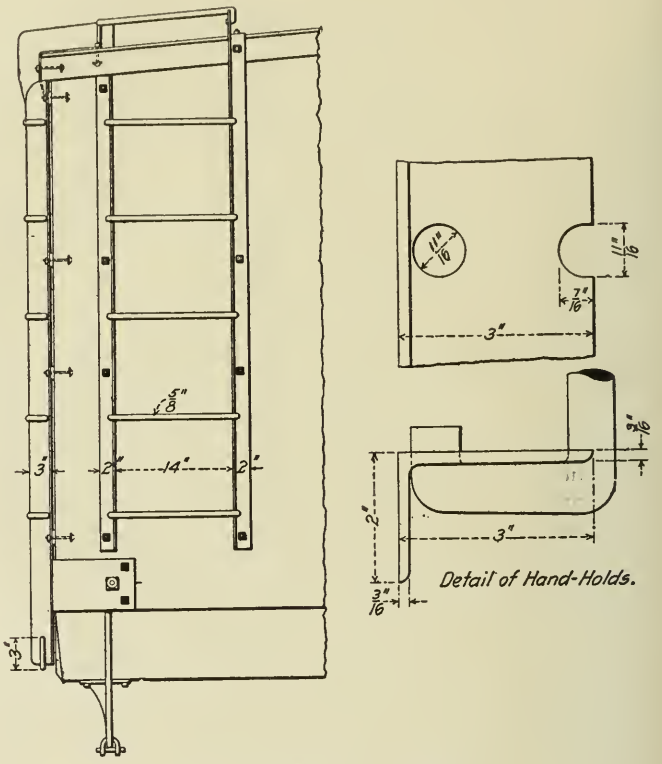
This is not intended, however, to designate the method. Let the method be whatever is concluded to be best, but when that concluded, let us see that it is uniformly followed, so that our general officers can have a true comparison of our actual operations, irrespective of the policies of our individual managements as to carrying large or small stocks, and instead of having a regulation forced upon us have a practical one of our own making which will meet the approval of the body which will no doubt prescribe for us in the next few years if we do not in the meantime cure ourselves.

It is to be hoped that the expressions of desire along this line from the general officers will be such as to insure conclusive action by the bodies above referred to within the next year or two.

The section of the railway from Alcones, Chile, to Pichilemo, comprised between Alcones and El Lingue, has been delivered to the state railways for exploitation.

THE SIMPLEX SAFETY CAR LADDER.

The Texas & Pacific and the Texas Central have ordered some of their freight cars equipped with iron ladders, designed and patented by M. F. Saling of Dallas; and we are informed that both of these roads have decided to make this design standard for their freight cars. Mr. Saling informs us that he is negotiating with a number of other large roads. The ladder consists of rungs made of 5/8-in. round iron, which are supported in vertical angle irons bolted to the side or end of the bar. The rungs are bent over and inserted into holes in the projecting part of the angle iron from the outside, so that when



Simplex Freight-Car Ladder.

the vertical pieces are fastened in place they hold the rungs firmly in position without bolts, rivets or welding. The upright bars are 2 in. x 3 in. x 3/16 in. The sill step and the hand-hold on the roof are fastened to the angle irons in a similar manner.

Mr. Saling informs us that the cost of this ladder is about the same as that of other designs made of metal, and will last through the life of several wooden cars. The engravings show a front elevation of an end ladder and a side elevation of a ladder on the side of a car, they also show the manner in which the rung or hand-hold is connected to and supported by the angle bar.

The British Government has a railway 227 miles long in Sierra Leone, extending from the coast at Freetown eastward nearly to Liberia. Parts of it have been in operation for ten years. Palm nuts are the chief freight down. Oil is made from the nuts and soap is made from the oil; for which, however, the local demand is insignificant. To facilitate loading, a special place for each station is set apart in the freight house at Freetown, and shippers are required to unload their goods accordingly. As their porters have the usual African education, which as yet does not include the alphabet, the space for each station has a distinct color; and when the shipper wants the porter to ship a keg of rum to Lago, for instance, he tells him to put in the "blue" bin, and he understand as well as if he had studied Greek.

Shop Section.

WE have sent announcements of the competition on how scientific management can be applied to a railway shop to a number of efficiency engineers and expect that some of them, at least, will take the opportunity of demonstrating whether it has any practical application to railway shop practice. From the general discussions which have taken place—varying all the way from the laying of bricks to the efficiency of a fire fly—its application to the locomotive or car repair shop is not very apparent, and we feel that a little more light should be shed on this particular phase of the subject. As judges in the contest we have been fortunate in securing three mechanical department officers who have proved more than ordinarily successful. They are H. H. Vaughan, assistant to the vice-president of the Canadian Pacific; G. W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, and T. S. Lloyd, superintendent of motive power, Delaware, Lackawanna & Western. A prize of $50 will be awarded for the best article and one of $35 for the second best. Such others as may be accepted for publication will be paid for at our regular space rates. In accordance with a suggestion made by one of the efficiency engineers, the manuscripts should be unsigned but should be sent to the editor with a letter, the letter and manuscript to be numbered by the editor and the manuscript to be forwarded unsigned to the judges.

RECLAIMING scrap material will be the subject of the competition to close July 15. This offers one of the most attractive and interesting subjects which has as yet been announced in our series of shop competitions. Hardly any two roads are working along the same lines in this most fruitful field for economy, but practically all of them are doing something, and many of them a great deal. What is being done at your shop or repair plant? Tell us about it fully, explaining just how it is done and what the possible savings are. Like a great many things, the reclaiming of scrap can possibly be carried too far. What are your ideas about the limits to which it may be extended? More complete announcements of this competition will be found in the April and May Shop Numbers. The best article will be awarded a prize of $35 and the second best a prize of $20. Articles not awarded a prize, but accepted for publication will be paid for at our regular rates.

ANOTHER general shop kink competition will be held to close September 15. Kinks of any kind used in the repair or maintenance of locomotives, cars or other mechanical department equipment will be eligible. Do not make the description so meager that the judges and editor will have to use their imaginations to fill in the details. Remember that the design of the piece which the kink is used on may be peculiar to your own road or shop and hardly be intelligible to outsiders. We have been asked to make our descriptions more extended. We can do it, if you will help us. A prize of $50 will be awarded for the best collection of three kinks and a prize of $25 for the next best collection. More than three kinks may be submitted, allowing the judges to base their decision on the best three in each collection. Kinks not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

C. C. LEECH, foreman of the Pennsylvania Railroad, Buffalo, N. Y., was awarded the first prize of $50 in the shop kink competition which closed May 15; and H. S. Rauch, apprentice instructor of the New York Central & Hudson River, Oswego, N. Y., was awarded the second prize of $25. Eight collections of shop kinks were submitted, all of them exceptionally good, and the judges found considerable difficulty in selecting the winners. In doing this consideration was given to the fact that some of the kinks which were submitted were quite similar to kinks which had been published in previous Shop Numbers. The remaining six contestants were: H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa.; E. L. Dudley, special apprentice, Baltimore & Ohio, Cleveland, Ohio; E. F. Fuller, shop superintendent, Southern Railway, Spencer, N. C.; William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; and W. H. Wolfgang, draftsman, Wheeling & Lake Erie, Toledo, Ohio.

BECAUSE so much has been said about the wonderful results obtained in the works of The Tabor Manufacturing Company, of Philadelphia, Pa., due to the introduction of the Taylor system, we reproduce elsewhere in this issue part of an article prepared by Mr. Lewis, its president, both as a matter of interest and because our readers may find some practical suggestions in it. It may be interesting to know the reason for introducing the Taylor system, in Mr. Lewis' own words: "At the same time we knew that machines had been built by others for less than they were costing us, and we felt confident that a way could be found out of our difficulties." It would be uncharitable to say that apparently the type of management formerly in existence was so bad that almost anything would be an improvement, and we shall not do so. The Tabor Manufacturing Company is a comparatively small concern, so that there should have been a fairly close bond between the workmen and those in charge, and yet Mr. Lewis frankly admits in the first part of the article, which is not reproduced, that it was a hard fight to install the new system. In a larger concern, the fight might have proved hopeless. Nor is any evidence presented to show that it is paying its men more or actually increasing its net earnings over that of other companies in a similar business and with fewer scientific methods are doing.

MR. BROMBACHER, the author of the article on Comparing the Efficiency of Railway Shops, would undoubtedly feel very badly if he should be classed with some of our leading efficiency engineers. For instance the methods of Taylor or Emerson would probably not meet with his approval. He believes in piece work—where it is properly installed—and cites the methods in use on the Lackawanna as being more or less ideal. We cannot altogether agree with him that reforms must come from the outside. Railway mechanical men realize that in many instances piece work methods are not what they should be—possibly due to conditions existing at the time they were installed or because piece work on some roads was or is in the hands of men who are not big enough to handle it. It is also a matter of sincere regret to find the accounting or auditing departments insisting that exceptional workmen, who can earn more than $4 or $5 a day, are overpaid and that the prices are too high. Again, it reflects a serious condition when the workmen keep young men from trying to exert their best efforts, because if they go beyond a $4 a day rate the price will be cut —for the men had found by bitter experience that that limit had been placed on their earnings by the management. Fortunately this practice is the exception, not the rule, and it is quite possible that piece work when so administered is not much of an improvement, if any, over day work. Under such conditions it is not piece work and really does more toward encouraging soldiering than do day work methods. However much our

good friends, the efficiency engineers, may criticize the lack of initiative on the part of the worker, they certainly cannot accuse him of being dull. Usually he is quick to appreciate and imitate the methods used by his employer. If he realizes that his employer is playing fair and is willing to pay a fair compensation for work done, and really knows what a day's work is, he will be entirely reasonable if a readjustment of prices is found necessary. One railway, in a territory where labor conditions generally are supposed to be anything but good, has recently revised a fair proportion of its piece work prices—many of them downward and without the addition of improved machinery—but the men are contented because they have been shown carefully why the prices were too high and exactly how by closer application and with very little more effort they can equal or increase their earnings under the former prices. The views of Mr. Brombacher, as an outsider, are interesting. It is really somewhat refreshing to have an efficiency or production engineer say something that has so little of the theoretical and so much of the practical in it.

THE reference in the article on Comparing the Efficiency of Railway Shops to what is designated as "ticker management," is not new to most of us. Laying off men by the hundreds or thousands to make a showing for the annual report is a losing proposition if there is work to be done, which a little later will cost a great deal more to perform, because the defects have become aggravated by not being promptly attended to, or because increased traffic, which could have been clearly foreseen, requires the work to be done under pressure, and consequently at a greatly increased cost in many cases. Truly, a short sighted policy, which is far-reaching in its results, affecting, as it does, the prosperity of the cities and towns on the system and the allied industries. If the executive officers or boards of directors could understand what it actually costs to tear down an organization for a few weeks or months and build it up again, they would surely not allow it. Have they been shown the cost? It should not be difficult to calculate it, at least approximately, by reducing it to the basis of unit output—such a unit would depend largely on the equipment handled, but could be arrived at by a careful study of the records and the work performed.

IF the makers of oxy-acetylene welding and cutting apparatus were looking for frank criticism they certainly got it in the discussion at the May meeting of the New York Railroad Club, when Prof. J. M. Morehead presented a very complete paper on Acetylene Welding. The main trouble seems to have been that the representatives of some of the companies rushed in to demonstrate the merits of their apparatus, when it was first introduced, without properly appreciating what they were up against. In other words, they attempted to demonstrate how easy it was to do certain things and failed miserably—at least so it appears from some of the remarks at the meeting. Undoubtedly most of these fruitless demonstrations were made some time ago in the early stages of the development of the apparatus in this country. The experience of several roads which are using it extensively at the present time certainly indicates that there is a broad field of usefulness for it in locomotive and steel car construction and repairs. That it has its limitations in the present state of the art must also be admitted. Prof. Morehead emphasized the necessity of the establishment of schools at which instruction could be given in the use of the oxy-acetylene torch. There are several such institutions in Europe. The courses cover only a month or two, during which time an average man can become more or less thoroughly conversant with the general run of work. Judging from the successful work covering a wide range of subjects which is being done by different railways it hardly seems possible that the statement which he made that 90 per cent. of the good welders in this country were in the room when he spoke, could have been intended as strictly accurate. If they were, they were not very aggressive or they would have come to his aid in the discussion—not that he really needed much aid for single-handed he made a good fight, even if he did not know whether a locomotive frame was made of cast iron or brass. That the oxy-acetylene welding and cutting process is giving a good account of itself in locomotive boiler shop work is indicated by the discussion of the subject at the Master Boiler Makers' Convention, an account of which will be found on another page of this issue.

FROM the report of the Master Boiler Makers' Association, given in abstract in this issue, it will be seen that the reports of the committees and the discussions on the floor were of a thoroughly practical nature. No attempt was made to go into the theories of boiler work, other than to determine the reason for the various phenomena that arose in practice and to devise means for overcoming such as are injurious. One feature, especially noticeable throughout the whole convention, was the close adherence of the members to the subject in hand; in this respect the proceedings show a marked improvement over those of a year ago, and cannot fail to be of value not only to the members, both present and absent, but, if they are carefully reviewed, will be full of suggestions to those officers who have the care of the locomotives and the operation of the road in hand. Particular attention is directed to the consensus of opinion among these men that bad water is responsible for the great majority of the troubles with locomotive boilers, such as leaky tubes, cracked sheets and the like—a point on which it is expected to present further information in the near future. The proceedings are, therefore, earnestly recommended to the careful consideration of all who have to do in any way with the locomotive boiler.

THE STABILITY OF LOCOMOTIVE YARD CRANES.

THE locomotive crane as used on yard tracks is being widely introduced and adapted to a variety of purposes where it is proving a most economical machine for handling heavy and bulky materials. It was first used about locomotive shops as a hand crane for lifting tires, driving wheels, axles, frogs, etc., and it gradually made its way into the stores department, where it was usefully employed in handling heavy scrap, lumber, castings and forgings. In time it proved desirable to operate the locomotive crane by steam power, and its capacity and range were thereby greatly enlarged. The application of the clam shell bucket made it available for handling coal and ashes at locomotive terminals, and the electro magnet in connection with the locomotive crane has effected remarkable economies in handling iron and steel in almost every form. These qualities have become so widely recognized that the locomotive crane is now in use on nearly all railways, and the number employed is growing rapidly.

Experience with these cranes thus far has shown that their stability can be relied upon under ordinary conditions, and where carefully handled, but they are sometimes liable to be overloaded, or are operated so rapidly that they are unbalanced and turned over with occasional personal injury or fatality. The balancing of this type of crane has not been standardized as to the location of the center of gravity or to the capacity with reference to various radii of swing, and there is some confusion among different crane builders as to the meaning of the figures used for guaranteed capacity through various ranges of swing.

To prevent overturning there must be some margin above the rated maximum capacity at any given radius; that is, if a crane is in equilibrium or just on the point of tipping with a load of 12 tons at 12 ft. radius, its guaranteed capacity should be stated as 10 tons at the same radius, thus allowing a margin or factor of safety of 20 per cent. With some builders this factor of safety is much less than 20 per cent.; perhaps only 5 or 10 per cent., and with others there is no margin. This is one of the items upon which there should be some general

agreement with the object of establishing a uniform standard for the guaranteed capacity.

Again, this type of crane must not be balanced too far to the rear, or there is liability of the crane tipping backward when on a sharp curve with the elevated rail on the same side as the load to be lifted and the boom released from the usual working fixtures. To prevent this the center of gravity of the whole crane should be 9 in. inside the outer rail, that is, the rail nearest the counterbalance.

The capacity of these cranes is usually stated as a certain lift at a radius measured between the center of the load and the center of the crane pivot post. But the moment tending to overturn the crane has a lever arm measured from the center of the load to the center of the rail, and the latter is about 2 ft. 6 in. from the center of the post. This distance should, therefore, be deducted from the radius in order to get the lever arm about the center of moments.

To illustrate the confusion in some guarantees for locomotive cranes, we may take the following from the catalog of one of the prominent builders: "A capacity of 5 tons at a radius of 30 ft., or a capacity of 10 tons at a radius of 20 ft." The load of 5 tons at a radius of 30 ft. acts with a lever arm of 30 ft. — 2.5 ft. = 27.5 ft., and 5 tons × 27.5 ft. = 137.5 foot-tons, the moment tending to overturn the crane. Again, 10 tons at a radius of 20 ft. acts with a lever arm of 20 ft. — 2.5 ft. = 17.5 ft., and 10 tons × 17.5 ft. = 175 foot-tons, showing that if the capacity at a radius of 30 ft. is correct, then the load for a 20-ft. radius, as given in the catalog, is too great and would hardly be safe.

In some instances irresponsible workmen have sought to extend the range of activity of their cranes by lengthening the boom and not reducing the load in proper proportion. This has sometimes resulted in accidents and should suggest methods of safeguarding this kind of machinery. The manufacturers should be interested in establishing these standards for capacity, as well as safety, but as they do not seem to realize their importance, the railways could perform a useful work through the Master Mechanics' Association in getting a committee report on the stability of locomotive yard cranes, with reference to their rated capacity and their safety.

MECHANICAL ARTICLES DURING MAY.

THE following articles of special interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of May 5:

The Supply Department. E. J. McVeigh, storekeeper of the Grand Trunk, does not agree with the type of store department organization advocated by H. C. Pearce, in a series of articles which recently appeared in this journal, and outlines what he considers to be a more effective organization. May 12, page 1103.

Federal Boiler Inspection Rules. A set of rules, agreed upon by the chief inspector of locomotive boilers and his assistants and a committee of railway mechanical department officers, giving the minimum rules and instructions for the inspection of locomotive boilers. If approved by the Interstate Commerce Commission, after a hearing which was held May 29, they will be obligatory upon any carrier failing to file its own rules and instructions. May 12, page 1105.

Chicago Great Western Locomotive Terminal at Stockton, Ill. A 12-stall brick engine house, a 90 ft. turntable, a reinforced concrete cinder pit and a concrete oil house are illustrated in the issue of May 12, page 1108.

International Railway Fuel Association. An account of the first part of the recent convention at Chicago, with abstracts of several of the papers which were read and the discussions which took place, including one on Fuel Investigation by the Government by Dr. J. A. Holmes, Organization of a Railway Fuel Department by T. Duff Smith of the Grand Trunk Pacific, and Purchasing Coal on a Mine-Run Basis by Prof. A. A. Steel. March 19, page 1149.

Comparative Tests of Mallet Locomotives; Norfolk & Western. Two types of Mallet locomotives of about the same tractive effort were received by this road last year. Exhaustive tests have been made as to their efficiency. A complete account of the results appears in the issue of May 19, page 1153.

The Operation of a Mechanical Stoker. An editorial drawing attention to the fact that the fireman has been taught to believe that failure to keep up steam is an unforgiveable sin. The mechanical stoker operates so easily that the tendency will be to use more coal than necessary and the fireman will have to be carefully educated in the matter of fuel economy. May 26, page 1192.

The Street Locomotive Stoker. An extensive description of this stoker which is now in service on the St. Louis & San Francisco; Atchison, Topeka & Santa Fe; Lake Shore & Michigan Southern; Norfolk & Western; New York Central, and Pennsylvania. May 26, page 1196.

The Railway as a Manufacturer. Abstract of a paper by George G. Yeomans, assistant to the president of the Wabash Railroad, which was presented at the recent meeting of the Railway Storekeepers' Association. May 26, page 1205.

Coal Briquetting Plant. Illustrated description of one of these plants by Charles T. Malcolmson. May 26, page 1206.

International Railway Fuel Association. Abstracts of papers and discussions on Testing Locomotive Fuel by F. O. Bunnell, engineer of tests of the Rock Island Lines; on The Relation of the Fuel Problem to Railway Operation by Raffe Emerson; and on The Use of Oil as a Locomotive Fuel by Eugene McAuliffe, general fuel agent of the Frisco Lines. May 26, page 1208.

Air Brake Association. Abstracts of papers and discussions on Leather Packings and Cylinder Lubrication by H. A. Wahlert; Braking Power on Freight Cars by John P. Kelly, and Triple Valve Lubrication by Lincoln Leonard. May 26, page 1212.

NEW BOOKS.

Machine Shop Primer. By Fred H. Colvin and Frank A. Stanley, associate editors of the *American Machinist*. Published by the McGraw-Hill Book Company, New York. Cloth, 6 in. x 9 in., 148 pages, 508 illustrations. Price, $1.00.

The object of this book is to provide a handy reference for students, instructors and apprentices who deal with the subject of machine work. It is a primer in the true sense of the word, and is to the beginner of machine work what the spelling book is to the child. The book is divided into three sections: The first part contains 508 numbered sketches of articles and tools pertaining to machine work; the second gives the names of these articles, and the third contains a dictionary of shop terms and explains the uses of the articles shown in the first section.

Letters to the Editor.

SAFETY APPLIANCES.

Wilkesbarre, Pa., May 8, 1911.

To the Editor of the Railway Age Gazette:

I have read with interest Charles L. Alden's article on Safety Appliances on page 1061 of the *Railway Age Gazette* of May 5, 1911, and his criticisms on freight car equipment relative to safety devices are particularly interesting to me. He states that 70 per cent. of the defects in the uncoupling device are due to the chain, and refers to the clevises as largely contributory. I can hardly agree with him that the chain, as a chain, is responsible for these defects, but unhesitatingly insist that the manner of applying the chain, as generally followed by many roads, has all to do with this condition. Clevises, split-links; links of all kinds as to length, size and material, etc.; and most of all the condition of this bungled-up mess of stuff called a chain being attached to a finger of the rod proper is the main cause of inoperative uncoupling devices.

The remedy for this crying evil is not in the elimination of the chain, but lies in the mechanical application and the elimination of the senseless number of parts, such as clevises, split-links, etc., and connecting the chain with a fixed body, such as the endsill or end of the car proper, thus insuring uniformity of length of chain under all conditions—not attaching it to a flexible finger as is the present practice.

A proper uncoupling mechanism must satisfy the following requirements: A uniformly operative device in lifting the pin and opening the knuckle; catching the coupler head if broken, by releasing the knuckle; and preventing the pin or lock block from working up, causing a break-in-two emergency stop; and most of all, a device so operated that trainmen's lives are not endangered in its operation. None of the lever types will perform these functions satisfactorily, because of their rigidity under abnormal conditions, which exist more or less of the time on all equipment.

J. G.

COMPARING THE EFFICIENCY OF RAILWAY SHOPS.

BY MAX H. C. BROMBACHER.*

The items in the annual reports of railways to the Interstate Commerce Commission, which refer to the number of miles that locomotives, freight cars and passenger cars have traveled during the year, are supposed to be calculated in compliance with the rules and regulations laid down by the Commission. The reports give the amounts of money expended on each of these three items; they also summarize the results by stating the cost per mile run for each of these items for the year. It would seem that the costs per mile run afford a substantially fair basis for the comparison of the relative efficiency of the managements of the various roads, subject, of course, to differences in grades and curves on the different roads, and also to differences as to the standards of maintenance of equipment, and to the amount of mileage.

In a recent article in which the figures were taken from reports issued by the Interstate Commerce Commission, the writer gave this data for the roads in the Eastern Traffic Association for the year ending June 30, 1910. The Delaware, Lackawanna & Western has as stiff grades and curves with as small a mileage as any road in this territory, and at same time maintains its equipment up to a standard second to none. Its costs of 6.76 cents per locomotive mile and of 0.60 cents per freight car mile were used as the basis of a computation of the amounts of money which the roads in the Eastern Traffic Association could save by raising the efficiency of their repair shops to the level of those of the Lackawanna.

This computation, therefore, was not based on the installation by the other roads of what has been called "scientific management" or "efficiency methods"; nor upon the engagement by the roads of Mr. Brandeis or any of the engineers who are so insistent in their objections to ordinary methods and to piecework practice. With all respect to these gentlemen, their motives and their attainments, the writer considers that the success of their idea of efficiency methods is problematical at best, as far as it concerns railway repair shops. A careful reading of some of the papers on that subject presented at the recent Congress of Technology at Boston, tends to confirm this belief. Wherein do these efficiency methods have any advantage over really intelligent piece-work practice; that they have advantages over ordinary or typical piece-work practice, cannot well be denied by anyone conversant with such practice. The computation above mentioned was based upon the different roads adopting the piece-work practice in vogue on the Lackawanna, which had previously succeeded in producing concrete results and for a period covering several years. The piece-work practice in the shops of the Lackawanna is a comparatively modern conception, and is as different from the ordinary or typical piecework practice, as day is from night.

As a result of the publication of the above-mentioned computation, it has been brought to the writer's attention that at least one road could not make the figures published by the Interstate Commerce Commission for the year in question, agree with its own figures as to the costs per mile run, and inferentially of its mileage; hence it would seem that an error had crept in somewhere. Perhaps this road reported more mileage than the Interstate Commerce Commission could credit it with under the regulations governing that subject; this would account for its lower figures as to the costs per mile run. The same road objected to the difference between its costs per mile run and those of the Lackawanna being considered as any fair measure of the difference in efficiency of the management of its repair shops; it seemed to consider such a basis of comparison as being misleading, and the conclusions based thereon to be erroneous.

While comparison on the basis of the cost per mile run is certainly not a flawless one, it is a tolerably fair one. As regards the objecting road, the comparison is more than fair to it; this road has nothing like the Lackawanna's grades and curves to contend with, nor does it keep its equipment in any better condition, and it has a very much larger mileage. It would seem as though the comparison was unfair to the Lackawanna—if unfair to anyone. There is no doubt that, among railway men, there is a difference of opinion as to whether the cost per mile run is a fair basis of comparison as concerns the relative efficiency of the management of repair shops. Some say it is unfair, because conditions are very different as regards the shops of one road and those of another; others claim that the cost of repairs per ton mile hauled would be a fairer basis.

If "conditions being so very different" precludes the cost per mile run from being used as a fair basis of comparison, it would seem that no fair basis of comparison could be found; certainly the cost of repairs per ton mile hauled is not flawless as a basis of comparison. If the engine is not loaded to its maximum point of efficiency the comparison is not fair, since the weight of the engine is a factor in the cost of repairs. Similar objections would be cited in respect to tractive effort as a basis of comparison. The writer published some piece work prices a short time ago which were taken from data furnished to the Interstate Commerce Commission by the railways. It would seem that the differences in prices for identical operations would account very fully for most any difference in the costs per mile and it seems unnecessary to look further for reasons to account for differences in this respect. These very differences in piece work prices afford some basis for comparison of the relative efficiency of the different managements of repair shops.

When the statement that "conditions are so very different," is looked into as an objection to the fairness of the cost per mile run, as a basis for comparison, it is very soon discovered to be a case of conditions for whose existence there is no reason compatible with sound economics. If the statement that conditions are very different be offered as the explanation for differences in piece work prices of from 5 per cent. to 500 per cent. on identical operations, an investigation of the earnings per hour of the operators at these widely varying prices will soon disclose a relatively similar absence of sound economics as the real explanation for this unique state of affairs. In the last analysis, the explanation in both cases will be shown to be a case of difference in grade of intelligence and knowledge of the human equation possessed by the different managers of the various roads. Lack of knowledge of the human equation is by no means monopolized by the so-called school of efficiency engineers; any quantity of railway executives are afflicted with that lack.

The conditions which are referred to sometimes consist of antiquated equipment and tools. When these deficiencies are cited as the explanation for differences in cost of from $.28 to $1.20 in turning a pair of standard coach wheels, and of differences in cost of from $1.50 to over $5 for unwheeling and wheeling a consolidation locomotive, the conclusion of the unbiased investigator may be that these conditions justify these differences in piece work prices. That he will admit that such differences in piece work prices go far toward explaining differences in costs per mile run, is fairly certain; and that he will conclude that the very existence of such conditions with the attendant results is, in itself, a grave indictment of the efficiency of the management, is beyond reasonable doubt.

None of these instances are culled from the realms of imagination. Nor are they taken from roundhouses; no reasonable person expects the roundhouse to be equipped with the very last word in the way of tools or of equipment. They are taken from machine shops at division points; also the lower price for turning standard coach wheels does not represent the very last word in the way of wheel lathes; it represents results on a fairly modern wheel lathe. On the same road the most up-to-date wheel lathes make for a reduction of nearly 40 per cent.

*Practical Production or Efficiency Engineer, New York.

below the low price of 28 cents per pair for turning 36 in. coach wheels. This condition is no reflection on the master mechanic in charge of the shops in question; he may have asked for the necessary tools and equipment, and have had his request refused. One master mechanic gave as a reason for paying $50 per pair for turning 36-in. coach wheels, that the wheels supplied him were so badly shelled that instead of taking off ¼ in. he was often compelled to take off as much as ¾ in. before he got a clean surface. Upon being asked why he failed to reject such poor castings, he replied that he was not allowed to reject them. This of course worked a double loss—the higher piece work price, and a shorter life for the wheels.

This is not the only instance where shop managers have attempted to explain that conditions for which they were not responsible, accounted for the differences in piece work schedules; nor is it the only instance where, after being pinned down they had admitted that the existence of such conditions constituted in themselves an indictment of the efficiency of the roads' management of its repair shops. They know as well as anyone where the trouble lies. They may not know what the cure is in all cases, but many of them admit that, by and large, the cost per mile run, is a fair enough basis of comparison of the relative efficiencies of repair shop management. They know that the conditions which are offered in explanation of differences in cost per mile run, as also differences between piece work schedules, are, in the last analysis, chargeable to inefficient management on the part of their superiors, and to ignorance of the human equation.

The following basis of comparison might be a shade more conclusive and more satisfactory than the cost per mile run. However, it is not flawless by any means. It will enable one to show that the cause of underlying differences is a difference in the respective grades of grey matter possessed by the different managements, plus or minus a knowledge of the human element. It is not expected that it will eliminate "conditions" as explanations of comparatively high costs; but it is hoped that it will make it possible to place the responsibility for the "conditions" beyond a reasonable doubt. That it may disclose the cause of high repair costs, in some instances, as being due to "ticker management," is not wholly impossible.

The idea is to divide the locomotives on each road into classes according to weight; this is based on the weight of locomotives being a factor in the cost of their repair. Keep tab on the age at which new locomotives first require repairs; on the average amount of money spent on locomotives by classes per annum; also on the amount of ton-miles hauled between repairs; also keep a record of the aggregate number of ton-miles hauled by each locomotive per year. This would give, is at least intended to give, the following data: Cost of repairs per average locomotive per year for each class of locomotive operated; number of times which the average locomotive requires repairs per year in each class; average number of ton miles hauled between repairs on the average locomotive of each class; and average number of ton miles hauled per year per locomotive for each class of locomotive. Repairs to include both roundhouse and shop repairs, and the number of times the average locomotive in each class is repaired to include roundhouse and shop items. Not the least of the benefits which may reasonably be expected from the tabulation of these items is that the management may discover "the error of its ways" in respect to the policy it has been following. For instance, take the case of a road where the management will not permit a thorough job of repairs being done on a locomotive, but holds the cost down to what will not permit more than what might be called a job of "galvanizing." It will find that in a year it has repeated the "galvanizing" process a number of times at an aggregate cost considerably greater than thorough work would have cost, and yet the aggregate number of ton-miles hauled per year is less than is expected; and certainly less than thorough work in the first instance would have resulted in. This is not an imaginary instance.

It would seem that even "ticker management," ignorant as it is of the details of a railway repair shop, would thus be brought to a realizing sense of what that kind of management is bound to contribute to the cause of waste. It is beyond reasonable doubt that the presentation of results in this form would result in the adoption of a more intelligent policy and the saving of a lot of money; incidentally, both the cost per mile run, as well as the cost of repairs per ton-mile hauled, would be reduced, and one "condition" making for waste would be eliminated. If the Interstate Commerce Commission were to make a rule to this effect, stockholders would be put in possession of information which would be explanatory of much in the way of the reasons for differences in dividends between roads. That the making of such a rule by the Commission is by no means impossible, is clear from the statements of some of the commissioners immediately after their refusal to sanction the proposed increases in freight rates.

Certainly the outlook for the first road which renews its application for permission to raise freight rates will be an investigation of its methods of management. That the repair shop management is a very important factor in the net income applicable for dividends is shown by the fact that the difference between the Lackawanna's cost per mile run of locomotives and freight cars, and those of some other roads, would, worked out on the basis of the locomotive and freight car mileage of the other roads, have resulted in the saving of a greater sum, net, than the proposed increase of rates would have produced in increased gross revenue.

If the Interstate Commerce Commission investigates these matters, it will find that the great differences between piece work schedules for identical operations are a large factor in the differences in cost per mile run; and it will find that high piece work prices do not mean relatively (proportionately) higher earnings to the operators in the shops with the high piece work schedules. On the contrary, it will discover instances where, on a difference of 50 per cent. in the cost of a standard every day job, the operators earns 10 per cent. less than the low cost shop operator earns; it will discover that the tool is the same in both cases, hence "conditions" cannot be offered as the scape goat. It will discover a difference of nearly 250 per cent. in piece work prices resulting in a difference of only 25 per cent. in the earnings of the operators; it will discover piece work schedules by which the men earn less, in some instances, than they do on day-work, and it will discover instances where roads with a comparatively large cost for repairs per locomotive per year, show a comparatively low number of miles run per locomotive per year; and with no excuse for this showing in the way of grades and curves at that.

Railroaders, at least some of them, claim that they do not need outside help to cure these "conditions"; and herein it seems to the writer that the old saw is overlooked which runs something to the effect that an outsider is more apt to see things than the insider. The very fact that such conditions exist, and have existed, indicates the unlikelihood of their being curable by the insiders; their idea may be based on the homeopathic idea that "like cures like." It may be correct as applied to repair shops, but that people who designed the piece work schedules and these short sighted policies of repairing locomotives, and who have "stood" for these conditions are capable of reforming themselves is beyond the faith of the ordinary man, guided only by reason and experience.

To sit still under this state of affairs; or, to sponge the outer fringes of the running sore, which it discloses, with an antiseptic solution in the shape of a committee to investigate, etc., is simply one way of looting a road.

The Danish railway minister has asked parliament to increase the rates on both passenger and freight traffic, aiming to increase net earnings by about $1,100,000.

SETTING OUTSIDE ADMISSION VALVES WITH WALSCHAERT GEAR.*

A design of Walschaert valve gear used with outside admission slide valves is shown in Fig. 1. The names of the various parts of the gear are as follows: *A*, valve; *B*, valve stem; *C*, combining lever; *D*, crosshead link; *E*, radius rod; *F*, reverse shaft; *G*, lifting link; *H*, reach rod; *K*, reverse lever; *L*, reverse link; *M*, eccentric rod; *N*, eccentric crank. The main pin is shown on the forward dead center, and the reverse lever is in its middle position, with the link block in the center of the link. A careful study shows that with a valve having outside admission the valve rod is connected to the combining lever at a point above the latter's connection to the radius rod. If the block is in the lower half of the link when in forward gear, the eccentric crank leads the main pin. If the block is in the upper half of the link when in forward gear, the eccentric crank follows the main pin.

Inasmuch as the position of the valve, when the piston is at the end of its stroke, is dependent on the combining lever only, it is evident that the lead given by the Walschaert gear is the same for all points of cut-off. This is the principal feature which distinguishes it from the Stephenson motion as far as steam distribution is concerned. All parts of the Walschaert motion should be correctly laid out and constructed from a diagram, and the gear designed to give the lead most desirable for the usual running speed. The parts having been correctly made, it is impossible to alter the lead without seriously deranging the motion. In this respect the Walschaert gear is less flexible than the Stephenson; but when the correct steam distribution is obtained it is less liable to derangement, and the engine is more easily kept "square."

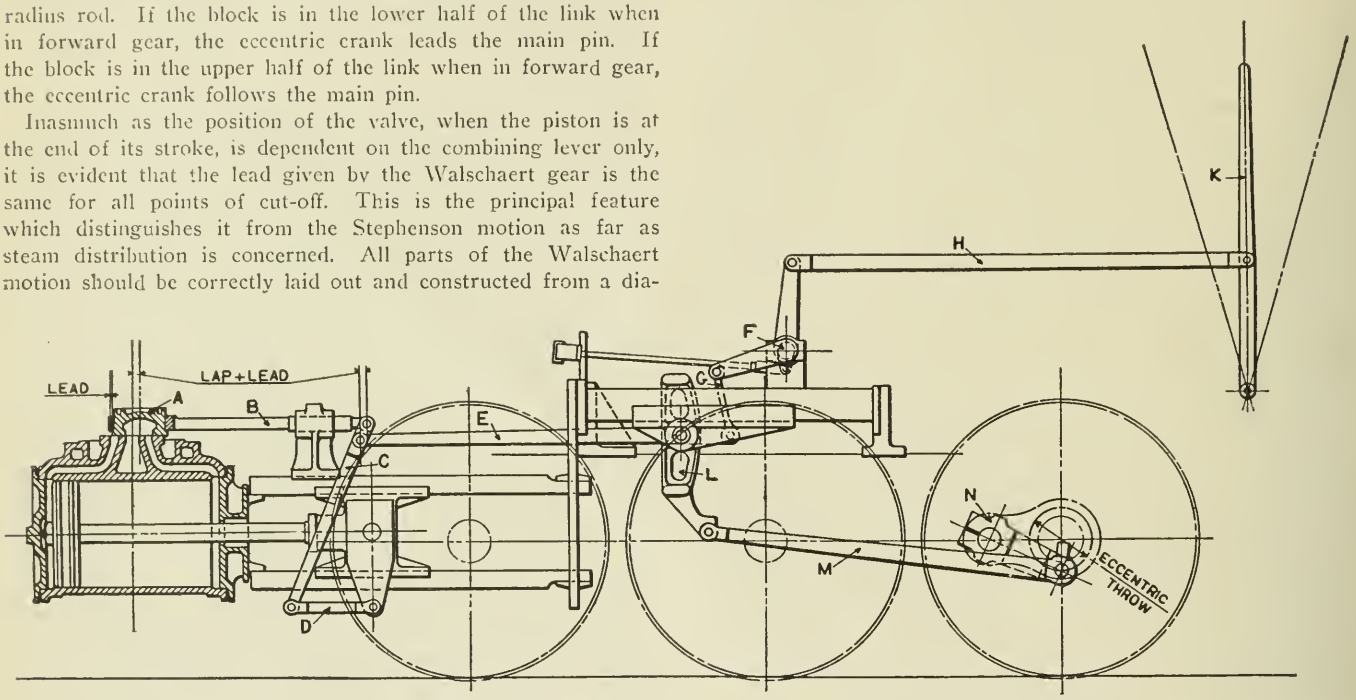


Fig. 1—Walschaert Valve Gear as Used With Outside Admission Slide Valves.

Assuming that all the detail parts have been checked with their respective drawings and that the main rod is up and the gear fully connected, the procedure of setting the valves is as follows:

1. Block the main driving boxes, allowing ½ in. over the central position for settling; viz.: add ½ in. to the dimension between the top of the frame and the center line of the driving journal, as given on the erecting diagram.

2. Obtain exact dead centers. Place the main crank approximately 6 in. or 8 in. below the forward dead center. Put a prick punch mark on any convenient place on the crosshead gib (Fig. 2) and scribe with a tram or a pair of dividers the line *A-A* on the guide. Then prick punch the point *A'* at any convenient place on the line *A-A*.

Next prick punch the engine frame at any convenient place ahead of the driving wheel (Fig. 3), and with a long tram scribe the line *B-B* on the tire. Prick punch the point *B'* at a definite position (say one inch from edge of tire) on this line. Now revolve the wheel backward until the main crank comes above the forward dead center, stopping it when the tram used in Fig. 2 reaches exactly from the point *O* on the crosshead to the point *A'* on the guide. Then re-tram the frame to the tire as in Fig. 4, using the same tram and the same point *P* as in Fig. 3. Scribe the line *C-C* and punch the point *C'* at exactly the same distance from the edge of the tire as previously used in locating *B'*. This operation will place the point *B'* (previously obtained) at a distance *Q* from point *C'*. Now prick punch the point *D* at a position exactly central between *C'* and *B'* and at the same distance from the edge of the tire that was used in their location (one inch was previously suggested). Now if the wheel be revolved forward until the long tram reaches exactly from point *P* to point *D*, the main crank will be on the exact forward dead center.

Proceed in like manner to obtain the exact backward dead center, reversing the operation and using the same points on the crosshead and frame, and a new point (forward of the crosshead) on the guide. The standard method used by the Baldwin Locomotive Works for marking these centers is shown on Fig. 5. The trial points are indicated by a single punch mark only, while the final points are indicated by three punch marks, the outermost ones (*D-D'*) being the actual tram points.

The points *S* and *S'*, as shown on Fig. 5, are indicated in a similar manner; the outermost punch marks representing the actual tram points used for marking the half stroke positions.

To obtain the points *S* and *S'*, set the crosshead on the forward dead center and measure back on the guides one half the piston stroke, as shown on Fig. 6. Then revolve the wheel forward until the crosshead moves from position *X* to position *Y*. Now with the long tram obtain point *S* by tramming from point *P* on the frame (Figs. 3 and 4), prick-punching point *S* at the same distance from the edge of the tire as point *D*.

The opposite half stroke point *S'* may be obtained by the same method, preferably revolving the wheel in the same direction (arrow on Fig. 5) so that the influence of lost motion in the parts may be minimized.

The four important points on the stroke are now definitely established on the wheel, and are ready to be used for valve setting. If desired, any other positions of the stroke can be marked on the wheel by using the long tram and the method of procedure described above.

With the ports exposed, place the valve with its steam edge

*From Record No. 70, published by the Baldwin Locomotive Works, Philadelphia, Pa., and entitled "Walschaerts Valve Gear."

cutting off the ports (at each end successively), and prick punch the valve stem at points F and F', obtained by tramming from any convenient place on the valve seat or shelf (Figs. 7 and 8). The distance between points F and F' will be equal to twice the lap of the valve. When the valve is leading (main crank on either dead center) the port should be open by an amount equal to the desired lead (Fig. 9). If the tram is used with the valve on its lead, then the distance between the point so found and the point F on the valve stem will be equal to the lead. (See dimension V on Fig. 9.)

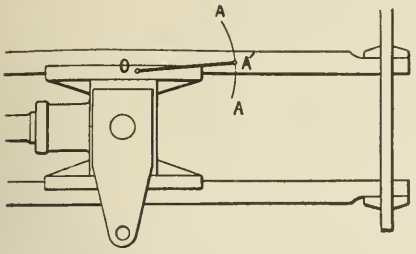


Fig. 2.

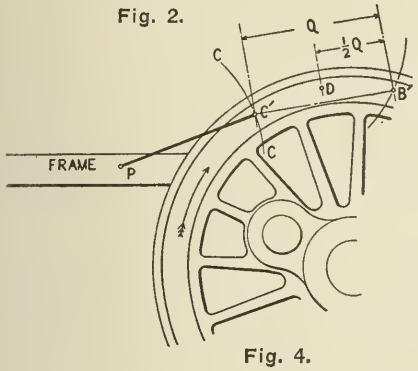


Fig. 4.

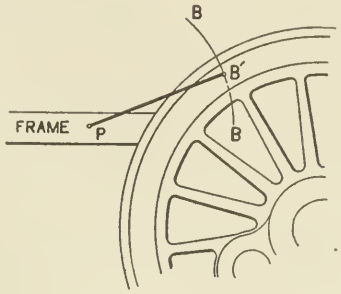


Fig. 3.

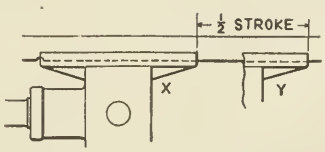


Fig. 6.

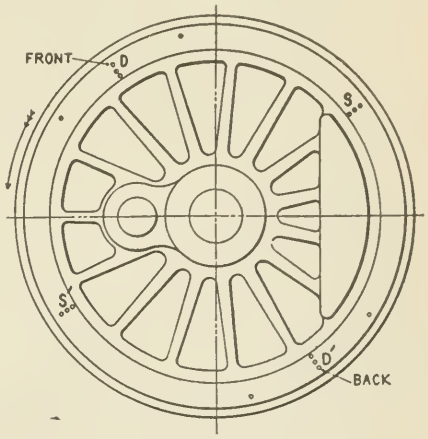


Fig. 5.

With this statement in mind, proceed as follows: Hook up the gear so that the link block is exactly central with the link. Place the train on the forward dead center, and tram to the valve stem. Revolve the wheel to the backward center, and again tram to the valve stem. Measure the distance between the points so obtained, and compare them with the specification. The distance should be equal to twice the sum of the lap and lead. Variation from the specified figures means that an error exists in the combining lever, the upper and lower arms of which are made respectively proportional in length to twice the lap and lead and to the stroke of the piston. (See Fig. 10).

Assuming that the distance L, as trammed on the valve stem, is found correct, the procedure is as follows: Place the gear in forward motion, with the link block at a point in the link that will give the specified maximum valve travel when the wheels are revolved in a forward direction (this position of the link block is obtained by experiment).

Place the main crank on the forward dead center, by tramming from P to D; and with the same tram as used for marking the valve stem (Figs. 7 and 8) scribe on the stem, measuring the distance between the point so obtained and the punch mark F. This distance should be exactly equal to the specified lead.

Revolve the wheel in a forward direction until the main crank is on the back dead center (tram from P to D'), and similarly scribe on the valve stem, measuring the distance between the points so obtained and the punch mark F'. This distance should be exactly equal to the specified lead.

Place the gear in backward motion and examine for lead at the front and back exactly as previously described, except that the wheel must be revolved in a backward direction. If all the points so found are exactly to specification, the valve setting is square. A check should now be made by placing the piston on the forward dead center, and moving the link block through its entire travel in the link. This should in no way disturb the position of the valve.

With the gear set for full stroke forward and full stroke backward, the maximum valve travel should be examined with the piston at half stroke; placing the wheel with the long tram between the points P and S and P and S' respectively (Fig. 5). The travel so measured will not be exactly square at the front and back, as the points S and S' represent half stroke measured from the piston travel, and do not take into consideration the angularity of the main rod.

Travel Irregularities.—The Walschaert gear has inherent peculiarities that frequently cause slight irregularities in the travel of the valve. If, in full gear, this irregularity does not amount to more than ¼ in. out of square between the front and back positions of the valve, it may be ignored, and the squaring of the travel may be considered as nearly perfect as the design will allow. In special cases it may be desirable to square the valve travel when the gear is hooked up to give the cut-off at which the engine is most frequently worked. Thus, on a passenger locomotive, the most satisfactory results may be secured when the travel is squared at one-third or one-half stroke cut-off. In such a case, a slight irregularity at full stroke will probably be unavoidable, but will not prove detrimental. In any event, the particular circumstances under which the engine is to work must determine at what point of cut-off the valve travel shall be squared.

In marking the forward and backward gear positions on the

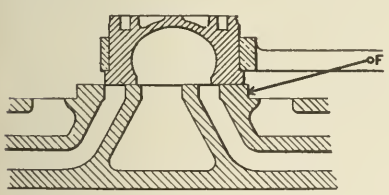


Fig. 7.

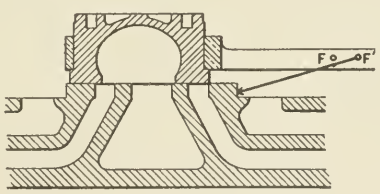


Fig. 8.

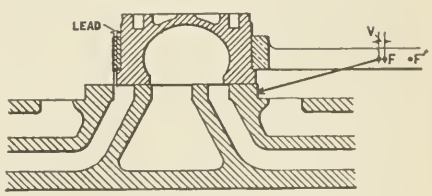


Fig. 9.

reverse quadrant of a "cold engine" an allowance must be made on each end toward the front of the quadrant to correct for expansion when the engine is under steam. The amount of such allowance is a matter of judgment, but ¼ in. to ⅜ in. can be considered sufficient for ordinary standard gage engines.

CORRECTIONS.

If, on trial, the valve gear is found to be out of square on the lead points, the following hypothetical cases will serve to explain the corrections that should be made. For example, suppose the specification calls for the following:

Maximum valve travel, 5½ in.
Eccentric crank throw, 11 in.
Constant lead, ¼ in.
Outside lap of valve, 1 in.
Link block below link center in forward gear.

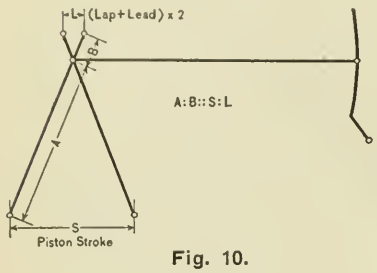


Fig. 10.

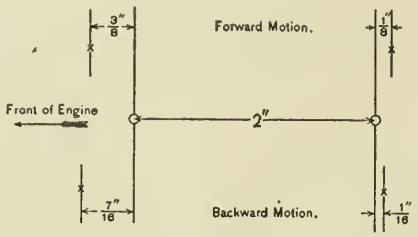


Fig. 12.

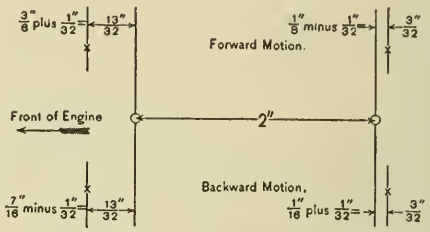


Fig. 13.

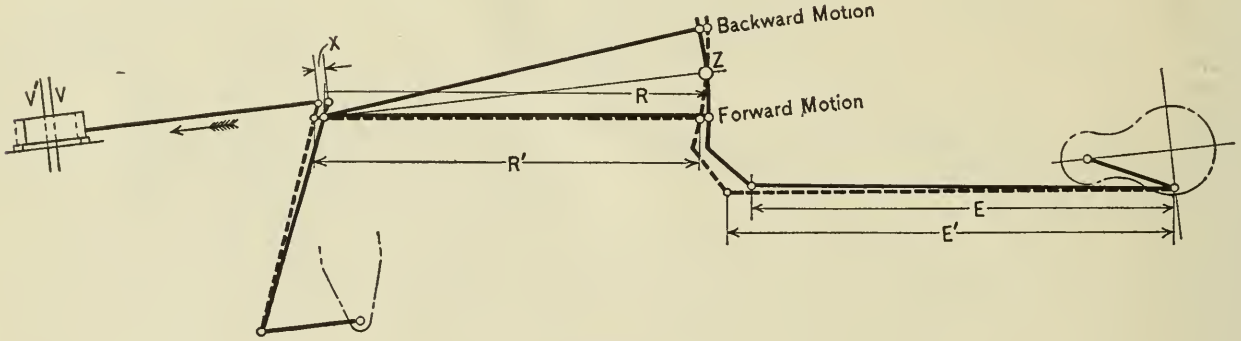


Fig. 11.

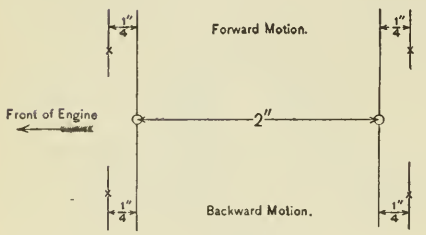


Fig. 14.

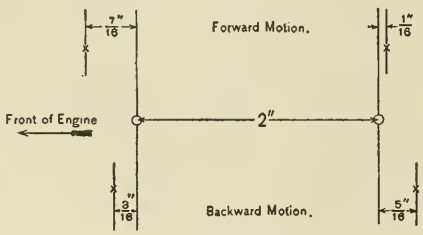


Fig. 15.

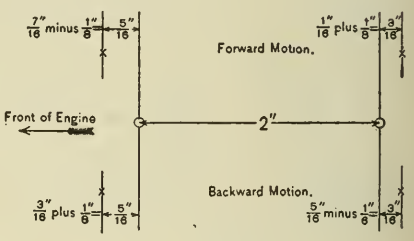


Fig. 16.

It is very important that the following dimensions check exactly with the drawings:

Length of combining lever between central fulcrum and upper and lower arm centers (Fig. 10, dimensions *B* and *A*).

Eccentric crank throw and length of crank arm. In the case under consideration the prick punch marks on the valve stem (Figs. 7 and 8) will be 2 in. from center to center (this is twice the valve lap).

A change in the length of the eccentric rod results in a change in the position of the valve, approximately in proportion to the eccentric throw and valve travel. In the present case, this is as eleven to five and one-half, or as two to one. In other words, a change of ¼ in. in the length of the eccentric rod will move the valve approximately ⅛ in. when the link block is in full gear and the main crank is on the dead center.

The influence of eccentric rod changes on the direction (ahead or back) of the movement of the valve is explained by reference to Fig. 11. An examination of this diagram will show that if the eccentric rod *E* is lengthened to *E'*, then the radius rod *R* will be moved ahead to the position *R'*, and the valve stem will be moved a distance *X* in the direction of the arrow, thus displacing the valve from position *V* to position *V'*.

The following rules can thus be formulated: If the link block is below the link center when running ahead, then *in forward motion* if the eccentric rod is lengthened, the valve is moved ahead. If the eccentric rod is shortened, the valve is moved back.

In backward motion if the eccentric rod is lengthened, the valve is moved back. If the eccentric rod is shortened, the valve is moved ahead.

If the link block is above the center when running ahead, then, in each case, the valve will be moved in the direction opposite to that stated above.

Corrections made to the link radius rod will have approximately full influence on the movement of the valve; viz.: any variation in the radius rod will produce approximately the same variation in the movement of the valve.

The link fulcrum *Z* (Fig. 11) is a fixed point; therefore the direction of movement due to changes in the radius rod will vary directly with such changes, and the following rules can be formulated: *In either forward motion or backward motion,* to move the valve ahead, lengthen the radius rod the amount desired. To move the valve back, shorten the radius rod the amount desired. This is true whether the link block is above or below the link center in forward gear.

With these facts in mind, two hypothetical cases will be considered.

HYPOTHETICAL CASE NO. 1.

Let it be assumed that on tramming to the valve stem with the main crank on the dead centers, the following irregularities in the lead are noticed for the engine under consideration. The dots on the diagrams represent the prick punch marks *F* and *F'* (Fig. 8) on the valve stem, while the crosses represent the irregularities in the lead when trammed to the valve stem (Fig. 12). The first procedure will be to divide the error between the forward and backward motions, as follows:

Error in forward motion—

Front, 3/8 in. — 1/4 in. lead = 1/8 in. error.
Back, 1/4 in. lead — 1/8 in. = 1/8 in. error.

} To square the lead the valve must be moved 1/8 in. ahead.

Error in backward motion—

Front, 7/16 in. — 1/4 in. lead = 3/16 in. error.
Back, 1/4 in. lead — 1/16 in. = 3/16 in. error.

} To square the lead the valve must be moved 3/16 in. ahead.

As the errors in the two motions occur in the same direction, it follows that the greater one partially neutralizes the effect of the lesser, and that the combined or average error will be the difference between the two; viz.: 3/16 in. minus 1/8 in. equals 1/16 in. average error.

To divide an average error of 1/16 in. equally about a central point, it will be necessary to move the valve one-half this amount, or 1/32 in. (in this case 1/32 in. back in forward motion). The eccentric rod must be shortened 1/16 in. (in the proportion of two to one) to move the valve 1/32 in. When this has been done the valve stem points will tram as shown in Fig. 13.

The errors in forward and backward motion have thus been equalized, and it remains only to square the lead, front and back, for both motions. The valve as now standing is 5/32 in. too far back to equalize the lead, viz.:

13/32 in. — 1/4 in. lead = 5/32 in. error front.
1/4 in. lead — 3/32 in. = 5/32 in. error back.

As the influene of the radius rod is direct, it follows that by lengthening this rod the amount required (5/32 in.) the valve will be squared, and can be trammed to the dimensions shown in Fig. 14. These dimensions are the ones required by the specification. The valve has thus been squared and the errors corrected by the following changes: Eccentric rod shortened 1/16 in. Link radius rod lengthened 5/32 in. A final trial of the valve and cut-off, etc., can now be made in the previously described manner.

HYPOTHETICAL CASE NO. 2.

Let it be assumed that on tramming for lead, results are obtained as represented by Fig. 15. Divide the error between the forward and backward motions, as follows:

Error in forward motion—

Front, 7/16 in. — 1/4 in. lead = 3/16 in. error.
Back, 1/4 in. lead — 1/16 in. = 3/16 in. error.

} To square the lead the valve must be moved 3/16 in. ahead.

Error in backward motion—

Front, 1/4 in. lead — 3/16 in. = 1/16 in. error.
Back, 5/16 in. — 1/4 in. lead = 1/16 in. error.

} To square the lead the valve must be moved 1/16 in. back.

As the errors in the two motions occur in opposite directions, it follows that they augment each other, and that the combined or average error will be the sum of the two, viz.: 3/16 in. plus 1/16 in. equals 1/4 in. average error. To divide this error equally about a central point, it will be necessary to move the valve one-half the amount, or 1/8 in. (in this case 1/8 in. ahead in forward motion). The eccentric rod must be lengthened 1/4 in. (in the proportion of two to one) to move the valve 1/8 in. When this has been done, the valve stem will tram as shown in Fig. 16.

The errors in forward and backward motion have thus been equalized, and it remains only to square the lead front and back for both motions. The valve as now standing is 1/16 in. too far back to equalize the lead, viz.:

5/16 in. — 1/4 in. lead = 1/16 in. error, front.
1/4 in. lead — 3/16 in. = 1/16 in. error, back.

To move the valve ahead 1/16 in. the link radius rod must be lengthened 1/16 in. and the lead will then be squared. When trammed for lead, the results will be as shown by Fig. 14. These dimensions are the ones required by the specification.

The lead has been squared and the errors have been corrected by the following changes: Eccentric rod lengthened 1/4 in. Link radius rod lengthened 1/16 in.

Trial of the valve travel and cut-off, etc., can now be made in the manner previously described. From the above it is evident, that the errors in forward and backward motion are equalized by changing the length of the eccentric rod; and the lead is then squared by changing the length of the radius rod. Theoretically the radius rod should not be changed; but the amount necessary is so slight, that it makes practically no difference in the movement of the valve.

With outside admission piston valves the arrangement of the gear is the same as that used with outside admission slide valves, and the method of setting is the same. The line and line positions of the valve, however, must be observed through peep holes, as in the case of the inside admission piston valve.

THE Y. M. C. A. PLAN OF INSTRUCTION FOR APPRENTICES AND SHOP EMPLOYEES.*

BY F. M. M. RICHARDSON.

Educational Secretary, Railroad Department, International Committee of Young Men's Christian Associations.

In September, 1906, the Young Men's Christian Association undertook to conduct the apprenticeship school of the Westinghouse Air Brake Company at Wilmerding, Pa., on company time. Conducting apprenticeship schools for corporations was not a new experience to the Young Men's Christian Association, but it was new to conduct one during the working hours. It meant that the apprentice received the same rate of pay for attending classes as for some productive work in the shop, and that he received special instruction better fitting him for the trade in which he was indentured. In the last five years considerable progress has been made in the development of such schools and the day plan has been successfully adopted by a number of industrial and railway corporations.

The first class of railway shop apprentices under the Association plan was opened in November, 1909, at the Pine Bluff shops of the St. Louis Southwestern. This was closely followed by the opening of classes on the Delaware, Lackawanna & Western at Scranton in January, 1910, and later with classes at East Buffalo and Kingsland, thus placing all the apprentices of that road under instruction. On the St. Louis Southwestern the work begun at Pine Bluff was extended to Tyler, Texas, at the end of the first year, thus including all apprentices on that system.

The plan of operation is based on the idea of uniform instruction over the lines of any railway system and is a part of the system educational work of the railway department of the International Committee of Young Men's Christian Associations. Where a Railway Association is located at a shop point the work is done in co-operation with that Association. The absence of such an Association does not, however, prevent the establishment of a school at any point, as the instruction is generally conducted in a room provided by the company on the shop grounds.

In considering a modern plan for the instruction of apprentices the first two questions to be met are those of cost and allowing time out of shop. The latter question is involved in the cost but its significance is in its relation to the working conditions prevailing in the shop, and it is summed up in the query, "To what extent would the output of the shop he affected by releasing the apprentice for a number of hours' instruction each week?" The question can best be answered by those who have tried the day plan of instruction and have found that the increased efficiency of the apprentice due to instruction more than offsets the loss of the several hours spent in the class room each week. There is still a tendency on the part of some to believe that while this may be true of the shop with a large number of apprentices, it cannot apply to the shop where but a few are employed and where the work of each apprentice counts as a definite part of the shop output. However, with a flexible plan like that of the Association the local conditions may be met so as to give to the shop a practicable working scheme for the instruction of the apprentices employed.

In one of the shops where the Association plan is in operation there are but fourteen apprentices, divided among four trades. Each apprentice attends one class session in one three-hour period, but the apprentices are divided into two classes, so that by this arrangement not more than half the apprentices in each department are out of shop at any one time. In another shop the group is divided into four classes, and thus only one-fourth of the apprentices in each department are out of the shop for one period of instruction once each week. An arrangement of this kind brings together the apprentices of the different trades for instruction in the same class period, but the class is small, making a splendid condition for individual instruction, which is the key to effective results. The instructor is thus permitted to meet

*Entered in the competition on the instruction of workmen and apprentices which closed April 15, 1911.

individual needs and to adapt the instruction to a constantly changing class, as new boys are enrolled to take the place of those just out of their time. While the classes referred to above are operated on the three hour class period the Association recommends four hours weekly in class groups not to exceed fifteen apprentices each, where the local conditions permit such an arrangement.

In determining the cost of any system of apprenticeship instruction three elements are to be considered, viz., the operating expense of the educational scheme, the wages paid for time spent under instruction, and the loss represented by what profit might have been derived from the product of the labor of the apprentices if employed productively in the shop for the same period as that spent in the classroom. Of these three elements the last is frequently regarded as negligible, while the real cost is figured on actual output represented in the items of operation and wages. The extent of the wage item in the estimated cost depends on the total number of apprentices employed, on the rate paid, and on the number of hours given for class instruction. This is a fixed cost so that any economy effected must come under the operating expense of the system of instruction measured by its effectiveness as a producer of results in the shop.

Few shops have apprentices enough to require the entire time of one instructor in the classroom where the apprentices are given but four hours instruction weekly. The average shop on this basis requires but part of one instructor's time each week, and the remainder of the week must be spent in some other phase of work or in instruction at other shops on the system. The Association has adopted the latter plan which permits the economic arrangement of using the traveling instructor, who gives his whole time to instruction and to matters relating to the apprentice school. On the Delaware, Lackawanna & Western with over two hundred apprentices at three shop points two instructors are able to handle all the classroom instruction. On another system for which plans have been drawn up to give instruction to the four hundred and fifty apprentices divided among twelve shop points, five instructors will be able to conduct the work of the classroom. Train schedules determine in part the number of instructors necessary to give the required instruction under a given set of conditions. On the small road and on systems having but a few shops the whole time of one man can be profitably used in giving instruction, because of the desirability of making the classes smaller and of combining the duties of shop instructor with the regular classroom duties. Every shop should have one man acting as shop instructor for all or part of his time, depending on the number of apprentices employed. The shop instructor's chief value lies in his ability to direct the effort of the apprentice in the application of the classroom instruction to shop practice, to give the necessary instruction on new operations and to detect lost motion on the part of the apprentice.

The problem of the small independent shop with apprentices enough for one small class requiring not over five hours of the time of an instructor each week is adequately provided for in the Association plan. Plans for such a shop have recently been submitted whereby an instructor will be furnished one morning weekly, and his work will be supervised by the educational secretary of the local Railway Y. M. C. A. Association for the actual cost of conducting the instruction.

Under the Association plan one organization comprehends the whole scheme of instruction, and thus each road adopting the plan is relieved of organizing a department to carry on the instruction. This removes the overhead charge of a department, and yet insures the necessary supervision, instructors, and instruction sheets prepared by experts employed by the Association. These instruction sheets conform to standards prevailing on the road where the instruction is to be given.

What a master mechanic thinks of apprenticeship under Association auspices is suggested in the following statement: "I am well pleased with the showing, and you cannot realize, unless you are placed in daily contact with the men you are teaching, the foundation you are laying for these young men. You are not only doing great good in preparing a path which will be much easier for them to travel, but you are benefiting the shop immensely." This statement, made in a letter acknowledging the receipt of a monthly report, comprehends the two fundamental principles underlying the Association plan of instruction, viz., moral value and practical results. Any test less than this would be unfair to both the company and to the Association, for the apprentice of today is the mechanic of tomorrow and on his development depends the efficiency and the moral tone of the mechanic of the future.

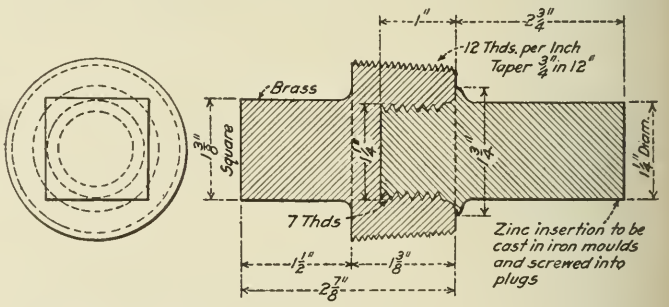
What the apprentices think of modern apprenticeship is suggested by the following quotations: "The school is the best thing the Delaware, Lackawanna & Western ever gave us." "It helps us in our work. We need lots of drawing, for we get lots of it on patterns." Another says "I am satisfied because there is great improvement in my arithmetic," while another replies, "I don't think we have any kick coming, as we are doing nicely."

The establishment of an apprentice school has a stimulating effect on other shop employees. In connection with one of the first schools to be opened an evening class was organized for journeymen, and the first man to enroll was a shop foreman. At another point an evening class for journeymen was organized at their request and the class filled up to its seating capacity. Where the apprentice instructor is not crowded in his day work this evening work may be handled by him, as is the case on the St. Louis Southwestern.

While these side lights indicate the educational influence produced by an apprenticeship class, the main issue on which an appropriation to conduct such schools must be justified, is the apprentice himself and his training and consequent increased efficiency. Naturally the offering of educational advantages to the apprentice permits the company to require that he be qualified by his previous schooling to take advantage of what is offered educationally. Incapacity and indifference likewise may operate as a means of elimination of unpromising material, and thus the school becomes a means of developing carefully selected men to supply the needs of the future for leading workmen in railway shops.

ZINC END ON WASHOUT PLUG.

Zinc is said to be particularly effective in preventing corrosion due to electrolysis, as it is electro-positive to iron and will protect iron or steel at its own expense as long as it is kept in contact with it. In accordance with this theory, the Chicago & North Western is using a zinc insertion on the inner end of brass washout plugs. The plug thus made is here illustrated.



Washout Plug With Zinc End Projecting Inside of Boiler.

The zinc is cast in iron molds and is screwed into the washout plug. The projecting end of zinc is 1¼ in. in diameter and 2¾ in. long. It is found that most of the zinc is eaten out in less than two weeks, and to that extent it has prevented corrosion and pitting by electrolytic action. We are promised the further results of this experiment, which aims to prevent the corrosion and pitting of locomotive boiler sheets and tubes.

ENGINE HOUSE KINKS; PENNSYLVANIA RAILROAD.

BY ROBERT G. BENNETT,
Motive Power Inspector, South Pittsburgh, Pa.

TIRE HEATING APPARATUS.

A portable fuel oil tire heating apparatus, designed for use at outlying engine houses and on the road, is shown in Fig. 1. If an engine failure occurs on the road, due to a loose tire, the tire heating apparatus is placed on a locomotive at the nearest engine terminal and is hurried to the spot at once. This is a great improvement over having the engine give up its train and go to the terminal light, while another engine is despatched to bring the train in. A workman familiar with the operation of the tire heater accompanies it, and with the aid of the crew places the apparatus on the ground near the tire that is to be heated. Compressed air is available by making a connection with the train line on the engine. A ring of 1-in. wrought iron pipe having 1/16-in. holes spaced 3 in. center to center on the inner side, is placed over the tire. A set of these rings of various diameters is kept on hand for the different size tires. The four small pins on the inner side of the ring, ½ in. long and ½ in. in diameter, keep the ring the proper distance from the tire.

The heater consists of an oil tank *A*, 18 in. in diameter. Compressed air for forcing the oil from the tank to the burner, and also for mixture with the oil to provide proper combustion, is supplied from the shop air line or from the train line, if on the road, through the connection *B*. When the heater is used on the road during very cold weather, steam from the steam heat line on the locomotive is connected with the pipe

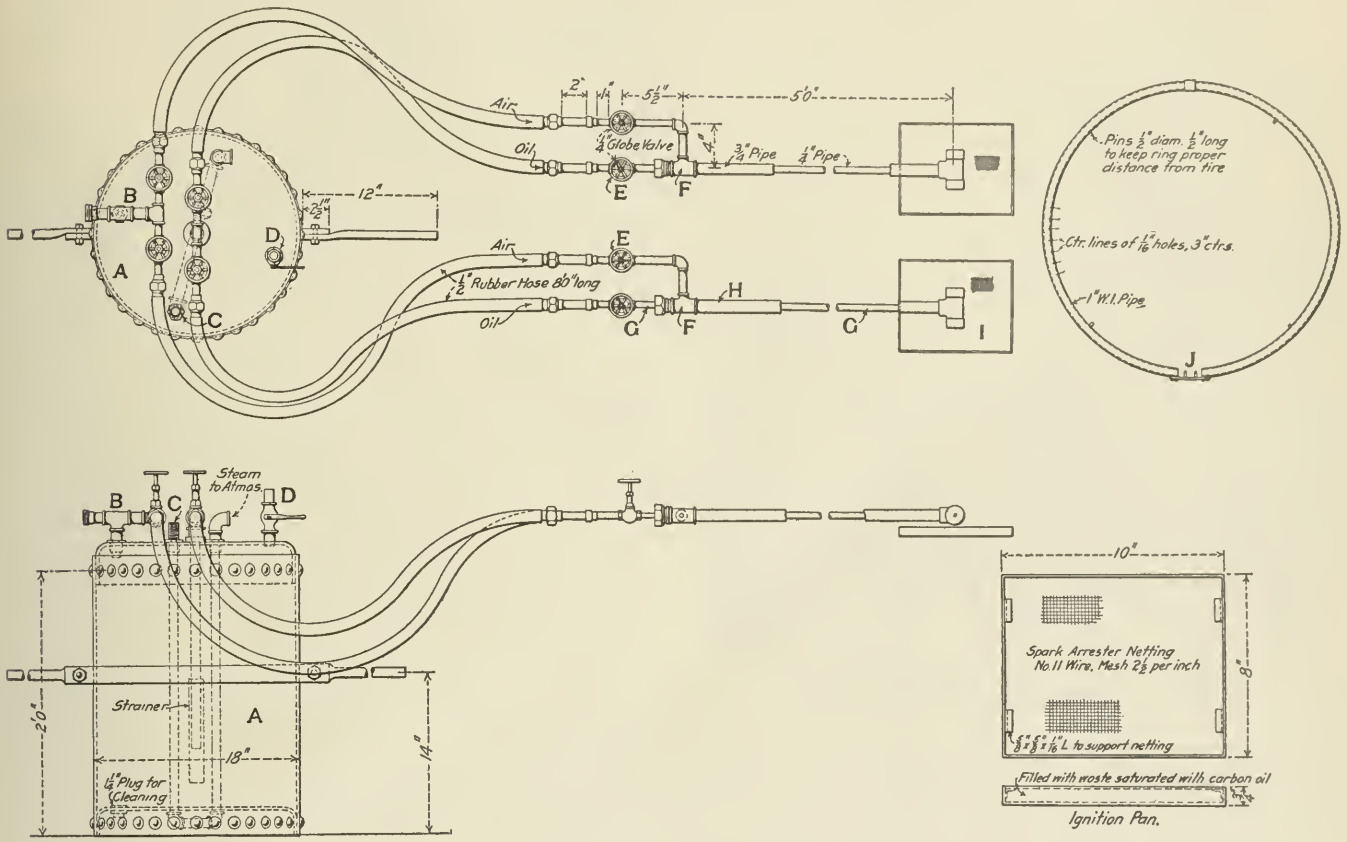


Fig. 1—Tire Heating Apparatus.

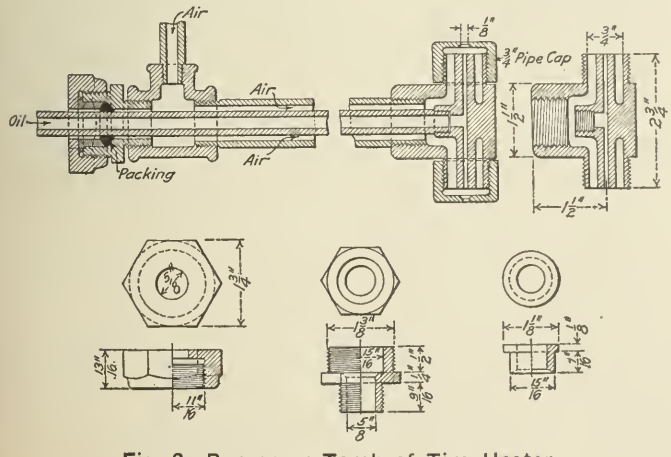


Fig. 2—Burner or Torch of Tire Heater.

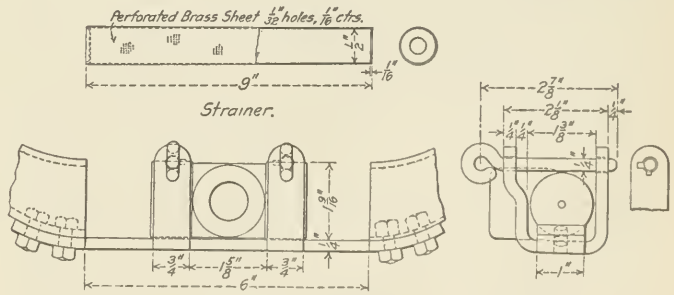


Fig. 3—Method of Clamping Burner to Ring and Detail of Strainer in Oil Tank.

C. The steam passes through this pipe, heating the oil, and is exhausted to the atmosphere. The tank is refilled with oil through the connection at *D*. The use of the cock at *D* makes it possible to reduce the air pressure in the tank slowly when it is opened for refilling. The apparatus has two burners for use in the engine house; only one is necessary when it is used on the road. Each burner is connected to the tank by two 8 ft. lengths of ½ in. air hose, one for the oil and one for the air.

The flow of the air and oil through these pipes is controlled by the ¼-in. globe valves *E*. The air after passing through the valve enters the ¾-in. wrought iron pipe *H* through the ¾-in. x 1¼-in. tee, *F*. The oil passes through a ¼-in. pipe, which extends inside of the ¾-in. pipe, as shown by the detail view of the burner, Fig. 2.

In lighting the burner, a piece of oily waste is burned on the pan *I*, igniting the oil as it leaves the burner. The burner is

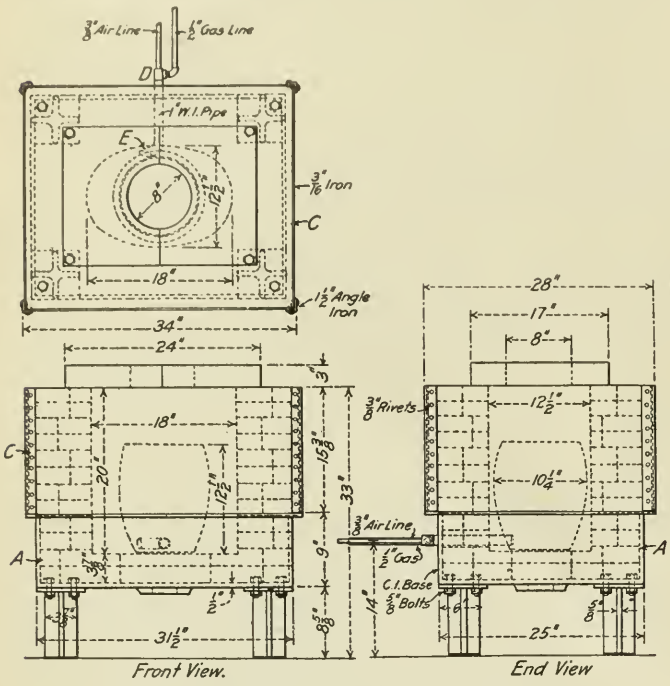


Fig. 4—Furnace for Melting Bronze.

clamped in the heater ring at *J*, as shown on the detail drawing, Fig. 3, and the flame from its two ends is forced into the 1-in. pipe and out through the 1/16 in. holes. Fig. 3 also shows a detail of the strainer that is placed in the oil tank, which consists of a perforated brass sheet with 1/32-in. holes spaced 1/16 in. center to center. A detail view of the ignition pan is shown on Fig. 1. Approximately 2½ gal. of oil are used per tire. It is mixed in the proportion of 3 gal. of fuel oil to 1 gal. of

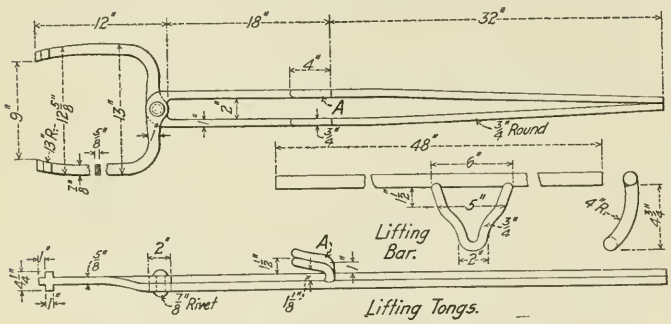


Fig. 5—Tongs and Lifting Bar for Removing Crucible from Brass Furnace.

carbon oil. About eight minutes are required to put on a tire with this apparatus.

SMALL FURNACE FOR MELTING BRONZE.

On many of the large locomotives which use the Stephenson valve motion, it is necessary for the valve rod to extend back through the guide yoke, and at this point a valve rod yoke bearing is placed through which the bronzed end of the valve rod travels. As is usual with such parts this bearing wears, and it is necessary to renew it often, consequently the use of the bronzed sleeve on the end of the rod. It is often of considerable advantage to be able to bronze the valve stem quickly at an engine house, in order that the engine may not be held out of service waiting for material or by having this work done at a larger shop. A small furnace for melting bronze for this class of work is shown in Fig. 4. It consists of a cast iron base *A*, measuring 24 in. x 30½ in. inside. This is mounted on four short legs, which are 8⅝ in. high. The inside of the base is lined with fire brick and asbestos. Above the base a heavy sheet iron casing *C* encloses the fire brick walls, holding them in position, and also assisting to retain the heat in the furnace. The opening for the crucible is elliptical and of the proper size

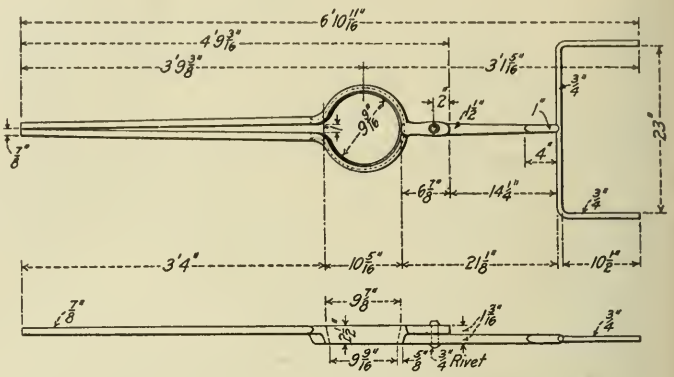


Fig. 6—Tongs for Pouring Bronze from Crucible.

to hold a No. 35 McCullough-Dalzell crucible and to allow sufficient room for the tongs, which are shown in Fig. 5, to grasp it. A ½-in. gas line and a ⅜-in. air line tap into a 1-in. wrought iron pipe line at *D*. This 1-in. pipe is curved at *E*, so that the flame will encircle the crucible. A cast iron cover or loose fire brick is placed over the top of the furnace while the contents of the crucible are melting. The lifting bar is designed to catch the tongs at *A* and to hold them fast to the crucible while the workmen lift it from the furnace. The contents of the crucible are poured by means of the tongs shown in Fig. 6. Prepared or iron molds may be used, either of which should be made in half sections so that they may be easily placed and centered about the piece that is to be bronzed.

STANDARDIZATION OF RAILWAY TINWARE.

The standardization of railway tinware from the viewpoint of the manufacturer was treated in a paper presented before the recent meeting of the Railway Storekeepers' Association by A. H. Handlan, Jr., of the Handlan-Buck Manufacturing Company. He said: "We established standards on railway tinware and introduced them some years ago. These patterns are standard on many of the systems throughout the South and West. However, changes have been made from time to time to suit the particular demands and requirements of the departments using tinware, and we now find ourselves manufacturing from a large variety of special patterns, comprising, for instance, 25 or more patterns for an ordinary engineers' torch, any one of which in all probability would really answer any road's requirements. Our pattern room contains a vast assortment of patterns—some that are obsolete, some used perhaps once in a year, others used daily—until our stock of patterns in the pattern room is greater than the stock of finished material in the store room. Please bear in mind, however, that this feature is not a serious objection of, or a burden to the manufacturer.

"Owing to special designs required by the railways, the manufacturer has been compelled to exact from them a contract specifying the approximate quantities of tinware required during a specified time, and an assurance that this amount will be specified for; further, if the railway should subsequently place its contract with another manufacturer, it is obligatory on its part to

take from the hands of the manufacturers any stock that was made up and specially stamped for it, whether one or more of these articles is obsolete or has been discarded as a standard by the railway. This understanding between the manufacturer and the railway is of necessity in order that a sufficient stock of these special patterns can be maintained in order that reasonably prompt shipment may be made. Under these conditions, there is naturally evidence of an unnecessary expense, the burden of which is borne by some one.

"Now comes the time when it seems most essential that the matter of standardization of tinware should be considered, and if possible, standards should be adopted that will serve the requirements of all railways. The manufacturer could furnish material cheaper for the reason that the goods could be turned out at less cost by making them in larger quantities. The metal worker can work faster and to better advantage on regular standard types than on special types; consequently, the manufacturer can arrive at almost the exact cost of the finished product instead of estimating it as is now done.

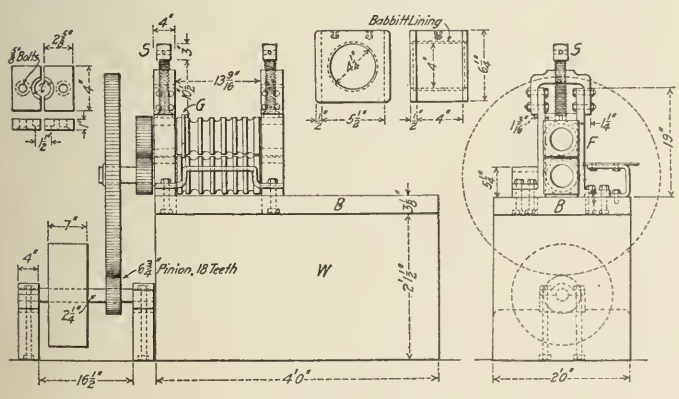
"I believe the railways will benefit greatly by standardization of tinware for the following reasons: The manufacturer would carry the stock. The manufacturer upon receipt of order, could label the standards specified, and ship at once—delays in shipment are expensive. The manufacturer would relieve the railway of the necessity of carrying two or three months' requirements. The manufacturer with the assurance of standards, would purchase raw material in larger quantities and cheaper. The railway could probably purchase at lower cost and standardization would insure uniform material."

REDUCING ROLLS.

BY C. C. LEECH.

Foreman, Pennsylvania Railroad, Buffalo, N. Y.

A machine for reducing the size of iron rods is shown in the accompanying illustration. The rolls are mounted in bearings which are supported by housings bolted to the cast iron bed *B* which rests on a wooden foundation *W*. Power is furnished from an overhead countershaft equipped with tight and loose pulleys and having straight and cross belts in order to reverse the motion of the rolls. The iron beds which are to be reduced are heated in a furnace conveniently located and the rolls are started. The rod is first entered in the largest groove and passes through it. The end which comes through last is seized



A Simple Reducing Rolls.

by an operator with a pair of tongs and the machine is reversed, the rod being started back through the next size smaller groove. This operation is repeated until the rod is reduced to the proper diameter. With this arrangement it is necessary to have an operator on both sides of the rolls, one reversing the machine for the other; provision might be made, however, for an automatic reversing arrangement. The bearings of the bottom roll are stationary, but the upper roll may be raised or lowered by means of the screws *S* that are attached to the top boxes which move in grooves in the supporting frame *F*. The projection *G* on the upper roll, which fits in a corresponding groove in the lower one, keeps the rolls in line with one another.

MASTER BOILER MAKERS' ASSOCIATION.

The fifth annual convention of the International Master Boiler Makers' Association was held at the Rome Hotel in Omaha, Neb., May 23-26, A. N. Lucas, of the Chicago, Milkaukee & St. Paul, presiding. The first day was occupied solely with addresses of welcome and responses thereto. It was on the morning of the second day that the real business was begun in a consideration of the question of apprenticeship.

BOILER MAKER APPRENTICES ON THE NEW YORK CENTRAL LINES.

The subject was opened by C. W. Cross, superintendent of apprentices of the New York Central Lines. He outlined the general methods of work, with which the readers of the *Railway Age Gazette* are already familiar, and emphasized the practice of giving the apprentice boys a good all-around training in the practical part of the work, changing them about frequently so they will have an opportunity for experience in all of it. The boys are worked with experienced mechanics, and in some cases alone, with their program of progress arranged in proper sequence to give them a full knowledge of the practical part of the work. The apprentices are also sent to a school on the shop property two mornings a week during working hours and white under pay. Here they are taught the principles of mechanical drawing and mathematics particularly suited to the work. After the early part of the course the school work is specialized to suit the several trades.

Care has been taken in arranging the course of instruction to avoid any impossible or finely figured standards and to keep in mind the traditions of the business with regard to methods of performing work, confining the instruction to fundamental principles on which all agree. For instance, an attempt would not be made to designate the best arrangement for a hydraulic riveter in a shop, realizing that a discussion of the relative merits of a riveter in a pit as compared with the elevated pattern could be carried on until every one was exhausted without any prospect of reaching a unanimous conclusion. All the work that is introduced is in accordance with the New York Central Lines standard practice, from which illustrations are selected. A system of reports is made by the shop instructors and the school instructors to the local shop officer which are in turn forwarded to the apprenticeship headquarters. Special emphasis is placed on the personal touch maintained between the instructor and the aprentices with a view to ascertaining the type of work or branch of service for which each boy is best fitted. It has been found necessary to use great care in selecting instructors, who must be men who are not only competent, but are willing to undertake the work for the love of it and their interest in the young men, as well as for the remuneration they receive.

A unique feature of this apprenticeship is the individual factor. No attempt is made to group the apprentices in classes, but rather to advance each one as much as possible, taking into consideration the personal characteristics and educational foundation as well as the physical qualifications of the apprentices. An effort is made to teach the student concentration of mind, realizing that many of the boys have not had discipline of that kind. An earnest effort is made to develop in the young man the habit of study.

The impression seems to prevail that the New York Central Lines is educating apprentices for other roads. It is a fact that we lose a large number of apprentices and graduates from the apprentice department; this is in a way a compliment to the apprenticeship system, but we would prefer to hold the boys in our service. It is well known that boilermakers are somewhat

of a nomadic nature, and this tendency to migrate cannot be stopped. A reasonable amount of changing from one shop to another is beneficial to a young man, as it develops his initiative and self reliance and gives him extended oportunties for observation of shop practice from which he can select the best methods of doing work, making him a more valuable employee and in many instances enabling him to secure promotion; however, care should be taken that he does not became a confirmed gypsy. Although the desertions from the service are somewhat of a menace, it is believed that conditions will improve due to the recent awakening of interest in industrial education. Inquiries and observations from all directions indicate that other railways and manufacturing establishments are now giving this subject the consideration it deserves, and in some instances have taken action in inaugurating some parts of the plan.

The fact is being demonstrated that no outside system of instruction, such as trade schools, correspondence schools, or even the Y. M. C. A., can fully meet the needs of apprentices, and that the control and direction of the instruction must be coincident with the control and direction of the shop. Indications point to the day not far distant when each road will have a fully equipped apprenticeship system organized as an integral part of its motive power department. Before such a movement can start the management must be convinced that for its own welfare in the future it must be provided with skilled, intelligent workmen trained in its own shops; men who can stand on their own merits and do the work which is needed; men who will command the respect of their employers, who can and will bring skill and judgment to their work so that they may command compensation commensurate with their increased ability. To supply the need we must train the hands and the minds of our recruits. The present emergency seems to compel us to take the school to the boy for the training of the mind. Our greatest work is in the shop. The boy is in the shop and we must move the school to him for we cannot move him to the school. We cannot wait for the educators to adapt themselves to our problem, but must take it in hand ourselves—hence the apprenticeship department.

It meets the need because the boys who come to us are those who must work every posible working hour in order to make a living. They cannot afford to go to school. Even if they could learn trades in a trade school they cannot afford to do so. It is a most direct and definite educational work. The boys know what they want to do in life and they are doing it. They are learning to use their hands under the direction of skilled teachers of their trades, and the training of the mind naturally associates itself with the training of the hand. Because the boy is making his place among men while acquiring his education and is educated in his work while at work, this type of school surpasses all others in directness, definiteness and in conservation and concentration of the attention of the mind of the boy. To these advantages another of great importance is added. The boy does not finish his school work and then find it necessary to establish himself in a working position. He is already in such a position and is fitting himself daily the better to fill it and prepare for advancement. He is already making friends of his superiors who are beginning to rely on him in the organization. Trade school boys and even technical school graduates do not enjoy this advantage. For these reasons the responsibility of those in charge is great because the possibilities of achievement are limited only by the scope of the plan and by the sincerity and ability with which the work is carried out. It may be narrow or it may be broad. It may be selfish or it may be generous.

In a few years much has been accomplished. It is reasonable to expect that the good results which are promised with certainty to those broad-minded enough to establish these schools and aprenticeships will lead to their multiplication. The movement was carried completely across the continent in two jumps by the New York Central Lines and the Atchison, Topeka & Santa Fe. A number of other roads have also inaugurated definite apprenticeship systems with educational features.

Mr. Cross was followed by his assistant, Henry Gardner, who presented in a very striking manner the methods and results obtained on the New York Central Lines. He showed through the medium of lantern slides, the character of the instruction papers that are used in the classroom work, their extreme simplicity and how they are adapted to the mind of the boy. They showed concrete ideas of fractions; they illustrated, in detail, the various kinds of hammers and chisels that are used; the reasons for using handles on some, and why those handles were put in tight or loose. They showed the way to use a file, and illustrated the kinds of staybolts that are used; the difference between a tube expander and a roller. Then there were illustrations of the various drawing sheets; starting with the simple methods and working up to the more complex, in which the problems of laying out were involved. Pictures of models were also given, which were used, first to give the boy an idea of what he was to make; and then, after he had laid out the sheet and cut it from paper, they served as a base about which to wrap it to see if it fitted.

In this drawing work they do not follow the practice of the schools and the text books of merely laying out the limit lines, but allowances are made for laps and all the thicknesses of sheets. Then, too, the boys are not allowed to use tools in the laying out in the drawing room that would not be available in the shop. The dividers, for example, are used for the determination of the center line of a sheet, and the T square is debarred.

The laying out progresses regularly and systematically until the whole scheme of boiler construction has been covered. And yet the steps from one point to the other have been so gradual, that there has been no cramming or straining on the part of the boys, and the end is reached easily and with certainty. It is an extensive application of kindergarten methods with results that are by no means of the kindergarten kind, as was shown by photographs of the work done by second, third and fourth year apprentices. These showed firebox sheets, wrapper sheets, tube sheets, back heads and domes laid out and ready for use on the locomotive by boys not yet out of their apprenticeship.

BOILER SHOP APPRENTICES ON THE SANTA FE.

F. W. Thomas, supervisor of apprentices of the Santa Fe, said: Boys wishing to learn the boiler maker's trade are numerous in one section and very scarce in another, depending on the class and personnel of the men in the shop. In some few localities we can get all the boys we can use, while in other places—the majority of places—there is a dearth of such applicants. If there is a good, steady body of men, accommodating, obliging, honest and moral in character, the boys will come. On the contrary you will experience the reverse when you have a rough, rowdy class of men, mixed with a large number of the foreigners.

The work in a boiler shop is hard, noisy and disagreeable. Its very noise robs the work of any sociability. While we do not expect the men to hold social levees, yet in all other trades there is a certain amount of visiting while the men are legitimately passing to and fro, in moving from one part of the shop to another in the discharge of their duties. Neither does the present day boiler shop offer much encouragement to the boy. Promotions to higher positions, nine times out of ten go to the machine shop. I do not know of more than one or two cases where the position of master mechanic and other higher positions are filled by boiler makers. The only conclusion to be drawn is that the machinist is better fitted for these jobs. It takes as much brains to make a boiler maker as it does a machinist, a blacksmith or a cabinet maker. In requires if anything a greater honesty. So much of the boiler shop work cannot be inspected as to its workmanship—as to its faithfulness.

I do not think the boiler shop and the boiler maker have kept pace with the machine shop and machinist in advancement, new inventions, education, research and personnel. The impression is prevalent that anyone with muscles and wind can drive

staybolts or rivets; anyone with a day's training can roll flues; anyone with a week's life in the shop can lay up a patch. You have stood by, and by your silence approved the implied assertion that anyone can be a boiler maker who is possessed with brawn and muscle. We must call a halt and come back to the fact that it is just as important to have brains and education in a boiler shop as in any other department of the organization; good men, intelligent men, mechanics, are needed badly in the boiler shop.

The Santa Fe system has 635 apprentices on the system; 629, or all but six, enjoy the benefit of our educational system. Where the shops are not of sufficient size to employ a regular resident instructor we have traveling instructors who spend at least two days a week with these boys. We appreciate the value and importance of shop instructors and we have been most liberal in providing these practical men. The foreman should be relieved of such duties; he has too many other troubles, and when the men are on some contract or merit system, it is not fair to require the foremen to show or help the apprentice. There is no shop where the instructor can be so valuable, no shop where the instruction is so badly needed as the boiler shop. This shop offers too many opportunities to slight work; to hide defects. An instructor devoting his entire time to the boys can eliminate a great deal of this. Where there are fifteen apprentices it will pay any boiler shop to employ a regular shop instructor. He can run the shop in the absence of the foreman. He can make himself invaluable to his employer and to his foreman by keeping his eyes on any particular job. With the help of his instructor the boy can go right along with the work. He is taught the name and the use of any shop tool or machine, the "ins" and "outs," and tricks of the trade early in the game, and need not waste valuable time in endless and expensive experiments. He begins to manufacture and produce the minute he enters the shop.

The school end of the instruction concerns such branches as are needed in his work, robbed of all frills and trimmings, simple in the beginning but gradually leading up as he advances in age to more difficult work, such as the spacing of holes, squaring up sheets, laying out with the least waste of material and time, triangulation, projectatory methods of laying out, ability to make a sketch, and to intelligently interpret a blue print, illuminated display drawings to explain the reason and necessity for lapping metal properly, spacing rivets and stays, importance of laying metal to metal and not depending on caulking. These are the things he needs in his chosen work, things he remembers, things of value.

It has been often said that the establishment of one of the justly famous hotels by Fred Harvey along the line of the Santa Fe improves the moral tone of the entire town. It has been equally evident in the improvement of the moral tone of our shops by the establishment of an apprentice school.

JACOBS-SHUPERT FIREBOX.

As the committee assigned to report on the radical departures that are being made in boilers and fireboxes had no report to make, the subject was turned over to A. W. Whiteford, the mechanical manager of the Jacobs-Shupert Firebox Company, to present the merits of the design which he represents. His talk was illustrated by lantern slides. With these he showed how the firebox was a machine-made structure. The channel units for the inner and outer sheets are received as flat plates, cut to size, from the mills. They are heated and with a single stroke of the press are formed into channels and bent to the shape required for the firebox. As they are all duplicates they are laid out for drilling with a template, it being possible for a second year apprentice to do this work. The same holds for the stay sheets, the back head and the back tube sheet. As for the riveting, it is all done with an hydraulic rivetter, the only portion of the work that follows present methods being that of connecting the firebox to the shell, which is done by hand or pneumatic rivetting.

The claims of superiority that were made for the box were that it was purely of a machine-made construction, and, therefore, cheap; and that it was far more efficient and economical than the ordinary boiler. In addition to which great stress was laid upon the higher degree of safety that could be obtained with it as compared to the ordinary firebox.

The speaker culled from Prof. Breckenridge's experiments to show the rate at which heat is transmitted from the firebox through the sheet to the water behind it, and showed the percentages of loss due to gases in the firebox, soot on the sheet, the sheet itself, the scale behind it, the film of steam beyond and finally the absorption by the water, claiming that an appreciable percentage of this loss was saved in the Jacobs-Shupert firebox by the cleaner condition in which the sheet was maintained both without and within. He claimed that the smoothness of the sheet enabled the currents of hot gases to sweep over it in such a way that soot was not deposited; also that the curve of the sheet of the units was such that it readily adapted itself to changing temperatures and, by an alteration of form, prevented the close adhesion of scale, breaking it up so that the water would have ready access to the metal. In this way, all the stresses of expansion and contraction set up in the ordinary boiler were nullified. He asserted that on an ordinary 6 ft. sheet the expansion was such that the stresses set up were nine times as great as it was considered safe for the sheet to bear.

In the matter of circulation, he showed that in the ordinary boiler the staybolts set up such eddy currents that the flow of water was greatly impeded, as evidenced by the large amount of scale that was deposited on all staybolts and stays. This was set down to the credit of the Jacobs-Shupert box, by inference.

As for safety, an absolute guarantee against explosion was offered. It was maintained that no matter how low the water might be, and no matter how hot the sheets might become, an explosion could not occur, so strong was the staying of the surfaces. It might be that the sheets would yield and even split, but the split would be purely local and could not extend, and the effect would be no more disastrous than the cracking or collapsing of a tube is at present. Tests were cited where the sheets had been both accidentally and purposely heated to a high temperature and water injected upon them without causing any trouble whatever.

Finally in the matter of efficiency and economy of operation the speaker claimed that tests had shown that boilers equipped with the Jacobs-Shupert firebox had given an increase of efficiency of 35 per cent. over the ordinary boiler, and that, therefore, on all counts of simplicity of construction, efficiency and economy it was in every way superior to the ordinary firebox.

Discussion.—Naturally, in the discussion which followed the soundness of some of these claims was questioned. As to the value of the mechanical method of construction there could be no doubt, though attention was called to the fact that comparative costs were wanting and that first cost rates were in need of more light. It was also conceded that in the matter of safety, that is strength of construction, the Jacobs-Shupert box was probably much superior to the ordinary firebox. The almost continuous stay sheet was certainly stronger than the staybolts and probably less likely to crack.

But when it came to the matter of expansion and its effects, doubts arose. It might possibly be granted that longitudinal expansion would be taken up by the curvature of the units and little additional stress in that direction be imposed. But how about the vertical stresses? When the back tube sheet came up, as it was known to do, what would be the effect of the rigid stay sheet that tended to hold it in on all sides, even though there might be a couple of sling stays at the top and center? Would not the expansion stresses, so set up, tend to crack the tube sheet at the center, and tend also to crowd the tube holes in the upper corners out of round?

As for circulation, it was, of course, allowed that the staybolts and braces did tend to the formation of eddy currents, but

the statement resulted in a boomerang of questions. If the small round staybolts set up so much resistance to the free flow of the water, how much more would be that set up by the square holes in the stay sheets? Here we have all the elements for the formation of the worst kind of eddies, and hindrances of the most serious kind to the easy flow of the water. Not only would the circulation be impeded, with the result that the quieting of the water would produce a serious settling of deposits, but these same sheets would offer the most serious of impediments to a thorough washing out of the boiler. On every count, then, the Jacobs-Shupert firebox seemed to be inferior to the common firebox in the matter of circulation.

The speaker was challenged to show any data whatever that could demonstrate in any way either the direction or velocity of the currents of water in a firebox. Much as such data was to be desired, and valuable as it would be, no one knew of any such experiments that had ever been made and any statements as to the character of the circulation of water in a locomotive boiler were purely a matter of deduction based on general principles and not on actual measurements made in the field.

Finally a flat issue was taken with the statement that the Jacobs-Shupert boiler would show an evaporative efficiency of 35 per cent. above that of the ordinary firebox. These figures are so far above the wildest claims of any advocates of all other locomotive improvements that they must be at fault. Even the greatest enthusiasts of compounding, of superheating, or of both and all other things combined, have hardly presumed to put the resultant saving as high as 35 per cent. It was suggested that possibly the gentleman had made a mistake and slipped a decimal point and that he really meant to say 3.5 per cent., but even this would have to be proved before it could be accepted. The result was, that while the apparent merits of the new type of firebox were admitted, the acceptance of all the claims made for it, was considered to require a better demonstration of their validity than had been given.

In closing the discussion Mr. Whiteford made no reply to the criticism on his assertions, but offered to furnish evidence to substantiate his statements, to all who might ask.

As no report was made on the standardizing of shop tools and equipment, or upon the standardizing of pipe flanges on boilers and templets for drilling them, these subjects were passed.

BRICK ARCHES.

Taken as a whole, the report of the committee and the tone of the discussion that followed were decidedly in favor of the brick arch for locomotive fireboxes, both on the score of boiler maintenance and the economical use of fuel, though there was some question as to the economy as a whole. One of the claims made for the brick arch was that it served as an efficient means of protecting the tube sheet from the drafts of cold air and thus prevented leakages.

There was some discussion as to its proper location relative to the tube sheet. At the opening of the discussion the opinion was expressed that a slight space should be left between the brick and the sheet to prevent an accumulation of cinders that would be apt to block the lower tubes. The width of opening to be left was variously placed at from 2 in. to 6 in., with somewhat of a preference for the smaller spacing. Then came a statement that the Lake Shore & Michigan Southern was using brick arches that were carried on arch tubes and were set up close against the tube sheet. In order to prevent an accumulation of cinders, the bricks are cut away at the corners and there is no difficulty whatever. The bricks are put in in short sections, so that a portion of the arch can be easily removed, if necessary, in order to do work in the firebox. Speaker after speaker then endorsed the use of the brick arch set close against the tube sheet.

There were a number of questions as to the effect of the brick arch on the side sheets. No evidence was produced to show that the side sheets were any more apt to crack when a brick arch was used than when it was not, and most of the men using it were decidedly of the opinion that it had no injurious effects. While some of the members maintained that no difficulty had been experienced, even when the arch had been set close against seams, there were others, and they constituted the majority of those who spoke, who thought that it would be best to allow a clearance between the brick and the seam of from ½ in. to ⅝ in. This would correspond with the average practice relative to side sheets and would insure a complete absence of all troubles at the seams. One case was cited where an arch had been set in tightly against a seam which started to leak and where the trouble had been stopped, not to reappear, by giving the clearance recommended.

This also holds true as to patches, and one member stated that he had used the brick arch long and successfully in patched fireboxes. It was further maintained that where a cracking of the side sheets did occur, it was probably due to bad water rather than the brick arch; as every one knows, bad water is a prolific cause of sheet cracking. In following up this argument it was maintained that the brick arch would actually tend to prevent the sheets from cracking, and that it was a good thing for such sheets. It was maintained that there were no more leaky staybolts with a brick arch than there were without it.

On one point there was a general agreement, and that was that it is not well to run the arch up too close to the crown sheet. If this is done, the intense heat of the flame, as it turns over the top of the brick, will be apt to cause a leakage of the cross stays. These conditions are apt to arise if the space is cut down to from 14 in. to 16 in., and it is well to always maintain a distance of at least 18 in. to 20 in., if trouble with the crown stays is to be avoided.

As for economy of operation, that is economy in the use of coal, it was generally acknowledged that the brick arch made such a saving possible. This was based on sound scientific principles, provided the arch was properly installed and worked. One speaker cited an instance where an engine had burned from 6 to 7 tons less coal on a round trip over a 160 mile division after the installation of the brick arch, and claims were made of savings of from 8 to 10 per cent. On the other hand, one case was mentioned where eight engines had been equipped with brick arches—all alike and all engaged in the same service. The arch was removed from one of them, and none of the other seven ever succeeded in equaling that one in the economical use of coal.

It was insisted, too, that to obtain any degree of success with the brick arch, it must be properly installed. It must not only be put in the proper position in the firebox, but the draft appliances in the smokebox must be adjusted to its use. It is impossible to use the arch without making changes in the location of the diaphragm and other parts. When this is done, the arch must be properly and efficiently maintained. If these precautions are taken it will be a success.

As for the use of the arch in shallow fireboxes, there was a difference of opinion. The representative of one road stated that it was using it on all locomotives, large and small and with deep and shallow fireboxes, with universal satisfaction. Another claimed that the arch had no place in a shallow firebox. The bed would be up against the bottom of it, the coal would not burn and trouble from lack of steam was without end.

As for ultimate economy no figures were given and the doubt was raised whether when the cost of the arch tubes and the brick and the labor required for maintenance and replacements were taken into consideration there would be a sufficient saving in coal consumption to pay for this cost. One speaker even stated that he knew of a case where it cost as much to maintain the arch tubes used with the brick arch as it had previously done to keep up the fire tubes.

Further, in the location of the arch, special attention should be paid to the character of the water used, as it has been found that the height of the arch, to give the best results, depends

largely on the water supply, and it should be raised or lowered accordingly.

The brick arch has been and is in successful operation with all grades and qualities of bituminous coals from the high class output of the Pittsburgh district, through the various degrees of Indiana, Illinois and Iowa coals, to the lignites of Wyoming. But for each a special adaptation must be made; an arrangement that will give the best of results on one road with one grade of coal and one class of service, will be the rankest of failures elsewhere, where conditions are different.

The whole discussion may be summarized in the general statement that a concensus of opinion of the members present approved of the brick arch as an economical device. That it should be properly installed and maintained; that it had best be set close against the tube sheet with a slight clearance between it and the side sheets; that it should be carried on arch tubes and be composed of short sections; that it should be kept well away from the crown sheet; and that the draft of the engine must be adapted to it, and that, if these conditions are complied with, it will be an economical adjunct to the locomotive.

OXY-ACETYLENE WELDING.

In the report on the Advantages and Disadvantages of Using the Oxy-Acetylene Process in Making Repairs to Boilers, M. F. Courtney, chairman of the committee, stated that attention was first directed to the matter on the Great Northern about five years ago, when it was used in an experimental way for the making of light boiler repairs. The work was successful, and it was decided to go into it more extensively, the tin and copper department being chosen to take it in hand, because it was thought to be along the lines in which that department was working and that brazing and soldering had much in common with this new process of welding.

The success was so great that a generating plant had to be installed. This was done and pipe connections were laid to all pits in the boiler and the machine shops. A corps of men was instructed as to the methods to be followed in making a successful weld. The success or failure of this device depends almost entirely on the intelligence displayed by the operators.

The manner of procedure in repairing a crack in the firebox is as follows: The crack is V'd its entire length at a bevel of 45 deg. In choosing the filler it was found that ¼ in. round best Swedish iron was the most satisfactory. The torch is applied, heating the sheet and filler together, the melted iron dropping into the groove until it is filled up; the torch is again passed over it, melting the surplus metal off and making a smooth solid weld. The average amount of this kind of welding which is done per hour is one foot. In this kind of work, the acetylene is supplied at a pressure of 4½ lbs., with the oxygen at 12 lbs. This proportion has given the best results. To put in a whole or half side sheet, or a patch of any dimensions, the procedure is the same as described above, the sheets being cut with an edge bevel of 45 deg.

A comparison of Swedish and Ewald iron as a filler may be of interest. Swedish iron with a cross section of 2.5 in. by .401 in. has a tensile strength of 34,500 lbs., while Ewald iron with a cross section of 2.5 in. by .402 in. has a tensile strength of 28,400 lbs. Seams welded as described have an efficiency of about 90 per cent.

The oxy-acetylene process is an admirable cutting agent, a ⅝-in. plate being cut at the rate of 22 ft. per hour. This cut is just as clean as if it had been made with a saw. In cutting, acetylene used at 4 lbs. and oxygen at 60 lbs. pressure.

Some of the work that is now done by this process consists of welding cracks in mud ring corners, of filling worn places on boiler sheets to their original thickness, filling staybolt holes and redrilling them again, welding links and motion work, and in general, repairing any fractures.

An interesting development of this process came to light some time ago during the construction of 600 track leveling gages of a new design. The carriage frames for these were made of ⅝-in. and 1-in. steel bicycle tubing, and necessitated the welding of 27,000 joints. The oxy-acetylene method was employed and better results were obtained than if the frames had been brazed.

Another interesting use is the welding of cast iron. A characteristic of cast iron is its free or uncombined carbon, which makes the welding so difficult. However, this is overcome by using a flux of the following formula:

Otho boracic acid, $H_3 B O_3$	15 parts
Chlorate of potash, $K C L O_3$	5 parts
Oxide of iron, $F E_2 O_3$	3 parts

This mixture is pulverized and kept perfectly dry. A filler is used composed of rods of cast iron rich in silicon. These act as a solder when melted; the rods are usually about ⅜ in. in diameter. The work done in cast iron consists of repairs made to the broken parts of machinery. Blow holes or defects in the cylinder or other castings are filled up, and cracked spokes on driving wheels are repaired, even to the extent of welding in complete new spokes when the old ones are broken out.

Discussion.—In the discussion there was the same enthusiastic endorsement of the process, but tempered with recitals of failures and the emphatic assertions repeated time and again that the work was not one for a novice to undertake; that for its successful accomplishment, skill and judgment were necessary, and that these could only be acquired through a long course of practice and experience. With these acquired there was practically no limit to the scope of what could be done. Pits on tubes could be filled; twenty-five tubes a day, averaging ten large pit holes each, could be repaired; cracks in tube sheets could be mended—cracks not only in the flanges but in the bridges; door plates can be replaced, and the rounding corners of the firebox repaired. The scope was almost universally comprehensive, and as speaker after speaker told of his successes, there came similar tales of failures and demands for information as to how the work was done.

The welding of cracks in the side sheets of the firebox seemed to be the most common feat, and yet some had had the sheets pull apart not only at the weld, but in the solid metal as it cooled. It then appeared that success was attained by providing against this contraction in one of two ways. One was to keep a stream of water running down the face of the sheet a couple of inches from the crack on each side. This limited the heated zone to a few inches, reduced the total contraction, and with it cut down the resultant stress.

The other method was that involved in the placing of a patch. A number of men said that they had had no difficulty with the longitudinal welds, while the vertical welds were more than apt to fail. Success was attained by putting a corrugation in the patch and arranging it so that a staybolt would come in the center of it. The bolt when drawn home would then pull the crest of the corrugation in, tending to put the sheet in compression and thus compensate for any contraction that might arise in cooling. At first the corrugation was given a height of ⅜ in., and a width of 1⅜ in., but it was found that this was not quite enough. It was increased to a height of ½ in., and a width of 2 in., which serves its purpose admirably and prevents all pulling apart of the weld or sheet. Another point to be observed is the sequence of doing the work. In putting in a patch in a side sheet, it is well to weld across the top first, then down the side 4 or 5 in. at a time, alternating from one side to the other.

One piece of work that seemed to be the easiest in which to attain success was that of filling staybolt holes when the holes had become too large, and then drilling afresh for the bolt.

As opposed to this was one job that had proved so much of a stumbling block to so many that it seemed, for a time, to mark the impossible. It was the welding of bridges in the tube sheet. One tale of woe followed another in rapid succession, of how as soon as one bridge was welded, two or three others in the vicinity would break. Water had been used for cooling;

the sheets had been packed with clay, asbestos and every conceivable precaution had been taken to no effect. One member, in describing his process, said that he merely V'd out the crack, cutting clear through and leaving a gap of a full ⅛ in. between the parts. He then welded by flowing in in the usual manner. Occasionally he had had a failure and an adjoining bridge had cracked. But the man who did not have a failure welded the bridge as any other crack, and then put a roller expander in the holes, starting two or three holes away from the repaired bridge, and rolling out the holes, circling around the mended bridge, and working in towards it, keeping the scale starting until the sheet was perfectly cold. This enlarged the holes slightly, but it prevented the secondary cracks from forming.

Then came the subject of welding in tubes. No one seemed to be able to make a success of it. One man had welded in a complete set of 391 tubes, that made four round trips and then failed so utterly that they had to come out and with them the tube sheets. Others had welded all the way from a few tubes to a half set, but without obtaining a satisfactory result. The method had been to either try to weld in the tubes as a whole, or to expand them in and weld on a bead, or to expand and bead by the usual manner and then weld the bead to the sheet, but none of these processes spelled success.

Finally, a member told of how, in building a new boiler he had welded in a full set of tubes that was a success in every particular and had now been running for several months. The work had been done by turning the boiler up on end, so that the tube sheet was horizontal. Then the torch had been applied and allowed to burn down deep into the metal. The depth of weld thus obtained was far greater than would have been possible with the sheet vertical. He attributed the failures in tube welding to this failure to get a sufficient depth of weld, and thought that the up ending of the boiler was the only way in which it could be done.

One point, however, on which the successful welders were agreed, was that old material was very much more difficult to weld than new, and that the welding of very old tube sheets, where the original structure of the metal had been changed and become coarsely granular, was almost impossible and had best not be attempted.

It was suggested in this connection that fewer failures would result if the metal were preheated to redness before the welding was started and then reheated and annealed after the work had been done, but this did not seem to meet with wide approval as a practicable scheme.

The result of the discussion indicated that there is hardly a line of boiler repairs that can not be successfully accomplished by the oxy-acetylene process in the hands of a skillful operator, and that for cutting out sheets, taking out fireboxes and work of that character there is nothing to equal it.

BEST METHOD OF APPLYING TUBES.

The report of the committee on The Best Method of Applying Tubes, the Best Method of Caring for Them While Engines Are on the Road and at Terminals, and the Best Tools to be Used, consisted of a series of recommendations bearing on these points.

The first to be considered was that of the preparation of the sheet. The recommendation was made that the hole should be thoroughly cleaned, and rounded on each edge with a fillet of not less than 1/16 in. radius. The ferrule should then be properly annealed and applied in the sheet flush with the fire side with a ferrule expander having a slight boss of about 1/32 in.; or it should be lightly rolled in. Care must be taken that the ferrule is not opened or belled out on the water side, but should hug the tube tightly when the latter is put in. In order to cover the expansion of the tube a width of 1 in. is recommended for the ferrule.

The end of the tube should be swedged down to a diameter ⅛ in. less than the body; it should be annealed and the ferrule should be of the proper thickness to make the tube a snug fit. The wear or enlarging of the hole should be taken up with copper until the hole is considered too large or the tube sheet bridges get too weak for further service. The tube should be driven in ¼ in. past the sheet for the bead and then be pinned out and expanded and rolled light by hand and then beaded; the tube should not be turned over other than it is by expander, which should be one of 30 deg.; the beading tool to be a standard tool. Tubes should be annealed on the front end and shimmed or opened up to fit the hole and beaded to stay 50 per cent. of the sheets.

In order to obtain the best results on the road an effort should be made to have the boiler fed as evenly as possible, and to so maintain the fire that cold air will be prevented from entering the firebox as far as possible. If water is to be put in while the engine is on the side track, it should be done in small quantities. Above all the fire should not be allowed to die out before water is fed.

While engines are at terminals the boiler should be filled with water while the fire is in good condition and the fire should be knocked out without the use of the blower. The engine should be equipped with grates in the way of a dump and shaker so that the dump on the outside grate frame can be opened and be held so, while the shaker is used to work the fire out. The ash pan should be cleaned and closed and the air pump be shut off so as not to form a suction through the firebox and the tubes. The fire door should be kept shut as much as possible at all times. When the engine is to be washed, it should be cooled down by blowing off steam at the dome and the water should then be drawn out after which it should be washed with hot water, of not less than 120 deg., and then filled with water at an even higher temperature.

When engines have work to be done in the firebox they should be cooled slowly, the steam being blown off at the dome, and, if it is necessary to put in water, it should be done at the top of the shell and as near to the front tube sheet as possible.

In raising steam, the fire should be started in ample time to permit getting the engine hot and to have a good fire covering all parts of the grates before the forced draft or blower is used.

The best tools recommended for the work are first the expander, the roller to be the last to be resorted to. A standard beading tool should be maintained at all times, and when the tube has been worked until too much metal has been forced out into the bead for the tool to cover, the surplus should be cut off. A light hammer should be used for expanding the tube, and care should be taken not to drive the expander pin any harder than is absolutely necessary in order to avoid the stretching of the bridges of the tube sheet and thus force it up.

Discussion.—In the discussion the chairman of the committee, D. A. Lucas, emphasized the desirability of a wide and heavy ferrule. He advocated using 60 lb. copper 1 in. wide, and to support his position showed sections of tubes and sheets where light and heavy ferrules had been used. In the latter the ferrule was apt to bell out on the inside forming a pocket for the entrance of scale and so preventing a full bearing on the tube. With the heavy ferrule there was a close contact well back of the sheet, thus cutting off at its very start the originating point of a leak, which is between the tube and the ferrule. An instance given to show the effectiveness of this ferrule was that of an engine, fitted with the usual thin and narrow ferrules, that only made 7,000 miles before the tubes had to be removed. A wide, heavy ferrule was then applied and the tubes made 96,000 miles before it was necessary to remove them. However, if the wide ferrule is opened or belled on the inside it fails to perform its proper functions and may as well not be used. It is necessary, therefore, to exercise the greatest vigilance in order to prevent this. If the tube does not enter readily, it is easy for the man in the firebox with his heavy bar to roll out the lip of the ferrule for the tube to enter. This should not be done. The ferrule should be made to fit the tube and the tube made to enter it properly.

If a ferrule is brazed to the end of the tube, its function is

destroyed. Leakages are caused by variations of temperature and by the tube shrinking away from the ferrule. If the two are brazed together, the tube will certainly carry the ferrule with it when it contracts and draw it away from the sheet. These were some of the arguments presented for the wide ferrule. On the other hand it was stated that the experiments had been made using wide and narrow ferrules in the same engine and that accurate records of their performances failed to show that there was any difference between them.

Attention was also directed to the origin of the copper ferrule. It came in with the disappearance of the copper tube sheet, when it was felt that there must be a soft filler to enter all of the inequalities of the tube and the sheet and so make a tight joint, and that possibly it might not be a necessity. But very little information was elicited regarding the steel ferrule, one member condemning it and another stating that, after six months' service, a set that had been put in was still all right.

An inquiry was made as to the practice of the Lake Shore & Michigan Southern of swedging down the firebox end of the tube. In reply it was stated to be the practice on that road to swedge a 2-in. tube down to a diameter of 1⅞ in. for a distance of about 4 in. from the end. The advantages claimed are that the tube sheet lasts longer because of the wider bridge that is obtained; that the better circulation so obtained prevents the sheet from bulging; that the increase of metal in the bridges gives an added strength to prevent stretching when the tubes are rolled; that a better draft is obtained by having a larger sectional area of tube at the center than at the end, and that there is less difficulty of clogging with cinders.

In the final analysis, however, it was generally agreed that leaky tubes and cracked sheets were due not to bad material and poor workmanship, but to bad water, improper spacing of tubes and irregular feeding. Of the three the most prolific cause of trouble was bad water. Cold air entering the ash pan and door should be avoided, but its influence was insignificant compared with the feed and the water. If good water were to be provided and that good water were to be fed regularly, the trouble with tube leaking would soon disappear. As an example of this, two boilers were mentioned. They were on the same run, yet the careful work of one engineer gave a tube life in one of 16 months as compared with 8 in the other.

STEEL VERSUS IRON TUBES.

From the report of the committee on Steel versus Iron Tubes and the Success in Welding Them, it appears that there is but little to choose between them and that that little is in favor of the steel tube. The steel tubes are apt to be a little more brittle and tend to break back of the weld when safe-ended. There is not, however, much difference in the mileage to be obtained. In a recent test in which sets of steel and iron tubes were compared it was found that at the end the total cost of the iron tubes was somewhat more than the steel, and that there had been fewer engine failures with the steel. More care is required to weld the steel than the iron tubes, and the steel tubes seem to collect more scale.

It was brought out in the discussion that in the case where the steel tubes had seemed to collect the most scale, they had been on the right hand side of the boiler where the greater amount of water had come from the injectors, so that the test could not be regarded as conclusively proving the point.

One of the objections raised to the iron tube was its tendency to split, and cases were given of iron tubes spliting back from 18 to 20 in. from the ends when an attempt was made to roll them out.

As a general rule the members were using steel for safe ends, even on iron tubes, though Swedish iron was also used. For the tubes themselves the seamless steel was preferred, both for the service it would render and the ease of welding. As for the difficulty of welding steel, every member who took part in the discussion disclaimed having had any trouble whatever.

Attention was called to the necessity of carefully cleaning the interior of tubes before expanding them, especially iron tubes. If this were not done it was found that the coarse particles of coal and cinder would be embedded in the metal or even driven all of the way through it, so as to cause a leak.

As for pitting it was generally conceded that steel tubes pit to a greater extent than iron, and yet a case was cited of a test on the Chicago & Northwestern where a boiler had been fitted with a half set each of steel and iron tubes, and that of these 6 steel and 49 iron tubes had been scrapped for pitting. On another boiler on the same road just the reverse had occurred. Generally speaking the longer the tube the greater the amount of pitting, and while some pitting would occur at the firebox end within 18 in. of the tube sheet, the most vulnerable and common point of attack was at the bottom of the lower rows of tubes at the front end.

One speaker maintained that pitting was accelerated by a variation in the regularity of the feed, due to a possible stagnation of the water at the bottom of the shell. The greater heat at the rear end of the tubes would tend to keep up a more active circulation at that point than would be likely to exist at the front end when the feed was shut off, and hence the increase of pitting at the front. The same explanation would hold for the difference in pitting at the top and bottom of the tubes.

It was stated that a great deal of the trouble with tube pitting could be avoided if the tubes were kept clean and free from rust before they were applied. On the whole the members seemed to agree with the committee that better service could be obtained with the steel tubes, that their heads retained their strength better and that they were less likely to leak.

BEST METHOD OF STAYING CROWN SHEETS.

The fact was recognized that the working of the tubes in the back sheet tends to make the latter rise and carry the crown-sheet with it, or to turn down the flange so that it makes an acute instead of a right angle with the face of the sheet. One of the means used to overcome this difficulty was to put a sort of ogee in the top of the tube sheet, running it out to the corners and omitting 29 tubes. Three sheets of this kind were put in engines four years ago. Two cracked, but the third is still in good condition. Another method suggested and used, was to turn the flange of the tube sheet back so that it made an obtuse angle with the face of the sheet when new, and to turn down the end of the crown-sheet to meet it. Then, as the top of the tube sheet was sent up by the work done on the tubes, the flange would be bent down, gradually approaching a right angle, but avoiding the acute angle bend that is the cause of so much trouble and cracking.

Very little was said about the sling stays that are used at the front end, as their presence was taken for granted, but it was stated that a good deal of trouble originated in having the T-bar for the stays too rigidly attached to the crown-sheet, and in a way that might cause their ends to be pressed down on the sheet by the slings.

Finally, there was a little discussion as to the proper radius for the flanging of the tube sheet. While it was conceded that too short a radius would be apt to cause cracking, it was recognized that the same trouble would occur if it were too long, and a great deal of trouble had been experienced where a 3-in. radius had been used. While no action was taken, a radius of about 1½ in. may be given as representing the prevailing idea of what is proper.

ELONGATION OF FLUE HOLES AND THE COMBUSTION CHAMBER.

The cause of the elongation of the flue holes in the sheets was recognized as due to the prossering of the tubes and the stretching of the metal of the sheets moving along the lines of least resistance. It was also claimed that the rigidity of the fastening of the sides of the back tube sheet had an influence in this matter, as indicated by the fact that the holes in the front tube sheet do

not elongate, nor do tubes elongate in the tube sheet of a combustion chamber.

The combustion chamber was barely touched upon and that merely to indicate that it was an undesirable adjunct from the boiler makers viewpoint.

The subject of the standardizing of blue prints was passed as there was no report.

COMMITTEE ON SUBJECTS.

The committee on subjects recommended a number for the meeting of 1912, the majority of which are merely repetitions of those discussed this year. The reason given for this being their great importance. These subjects are as follows: Best Method of Applying Flues, Best Method of Caring for Flues while Engines are on the Road and at Terminals and the Best Tools for This Work. Steel vs. Iron Flues, What Advantages and What Success in Welding Them and the Effect of Length of Tube on Maintenance. Best Method of Staying the Front Portion of the Crown Sheet on Radial Top Boilers to Prevent Cracking of the Flue Sheet in the Top Flange. Cause of Flue Holes in Back Flue Sheet Elongating and a Preventative for it and the Effect of the Use of the Combustion Chamber. What are the Advantages and Disadvantages of the Use of Brick Arches and Arch Pipes in Locomotive Fireboxes? What are the Advantages or Disadvantages of Using the Oxy-Acetylene Process in Making Repairs to Boilers? What Can Be Done to Produce Better Circulation in Marine Return Tubular and Vertical Boilers? Apprenticeship? When is a Locomotive in Its Weakened Condition? Feed Water, Location of Admission and the Results Obtained. Smoke Prevention, Spark Arresters and Grates. Superheating Steam and Its Relation to the Upkeep of the Boiler.

At the discussion on the revision of the constitution it was voted to drop the word "International" from the name, so that the association will be known in the future as the "Master Boiler Makers' Association."

ELECTION OF OFFICERS.

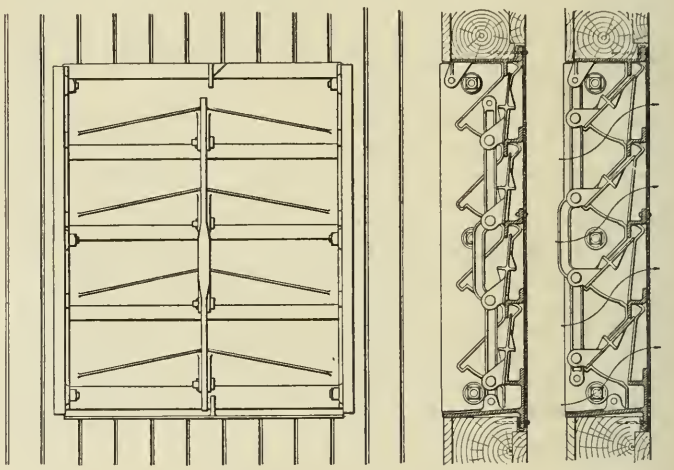
At the election held at the close of the meeting, the following officers were chosen: President, Geo. W. Bennett, N. Y. C. & H. R., Albany, N. Y.; first vice-president, James W. Kelly, C. & N. W., Oak Park, Ill.; second vice-president, M. O'Connor, C. & N. W., Missouri Valley, Iowa; third vice-president, Thomas W. Lowe, C. P .R., Winnipeg, Manitoba; fourth vice-president, J. T. Johnston, A. T. & S. Fe, Los Angeles, Cal; fifth vice-president, Andrew Greene, C. C. C. & St. L., Indianapolis, Ind.; secretary, Harry D. Vought, 95 Liberty street, New York City; treasurer, Frank Gray, Bloomington, Ill. For members of the executive committee: C. E. Rogers, E. W. Young, A. E. Shaw, J. A. Dornberger and C. L. Hemphill.

THE ALLEN CAR VENTILATOR.

The Atlantic Coast Line has specified a new type of end ventilator for the 1,400 ventilated box cars being built by the American Car and Foundry Company, New York, which overcomes the objections in the types of ventilators now generally in use on box cars. It was designed and a patent has been applied for by G. L. Allen, chief draftsman for the Atlantic Coast Line, Wilmington, N. C.

The ventilator now in general use consists of grating in the end of the car made with a wooden frame, vertical wrought iron rods and wire netting. It is closed by a wooden door sliding on a wrought iron track and is secured in the closed position by metal guides at the bottom of the door and a set of ordinary door fasteners. The objections to this style of ventilator, which it is believed the new ventilator will overcome, are: The high cost of maintenance, due to its being constructed principally of wood and secured by a number of bolts, forgings and castings; the cost of replacing lost doors; the fact that shifting loads, such as dressed lumber, easily break the grating and its wooden frame; when the ventilator is open the contents of the car are not protected from rain; in order to guard against accidental opening of the doors (due to defective fasteners) and the contents of the car being exposed to damage by rain or sparks, the wooden doors are often nailed in a closed position and the ventilator is thus rendered useless; and the interference of the door with the location of the brake step and the end ladder clearance as required by the recent safety appliance law. When lower ventilators are used they also interfere with the location of handholds required by law.

The Allen ventilator, as shown in the accompanying illustration, is simple in construction and is made of malleable iron. Its general appearance is neat, it being nearly contained within the thickness of the car wall and occupying a space only about 2 ft. wide in the middle of the end of the car. The essential features of the ventilator are: A main frame having flanges inside of the car on all four sides; Z-shaped horizontal bars cast integral with the frame, which lap over the top of the movable plates, strengthen the frame transversely and back up the wire netting; and movable plates, pivotally connected at the middle by an operating rod. The movable plates are not hinged or pivoted to the frame, but merely rest at their ends in recesses in the sides of the frame. The ventilator is held in open or closed position



Allen Ventilator Applied to a Freight Car.

by gravity and needs only to be pulled open or pushed closed, in each case exerting a slight lifting force on the handle. The holes which are shown in the ends of the operating rod and in the lugs at the top and bottom of the frame, are provided for sealing the ventilator.

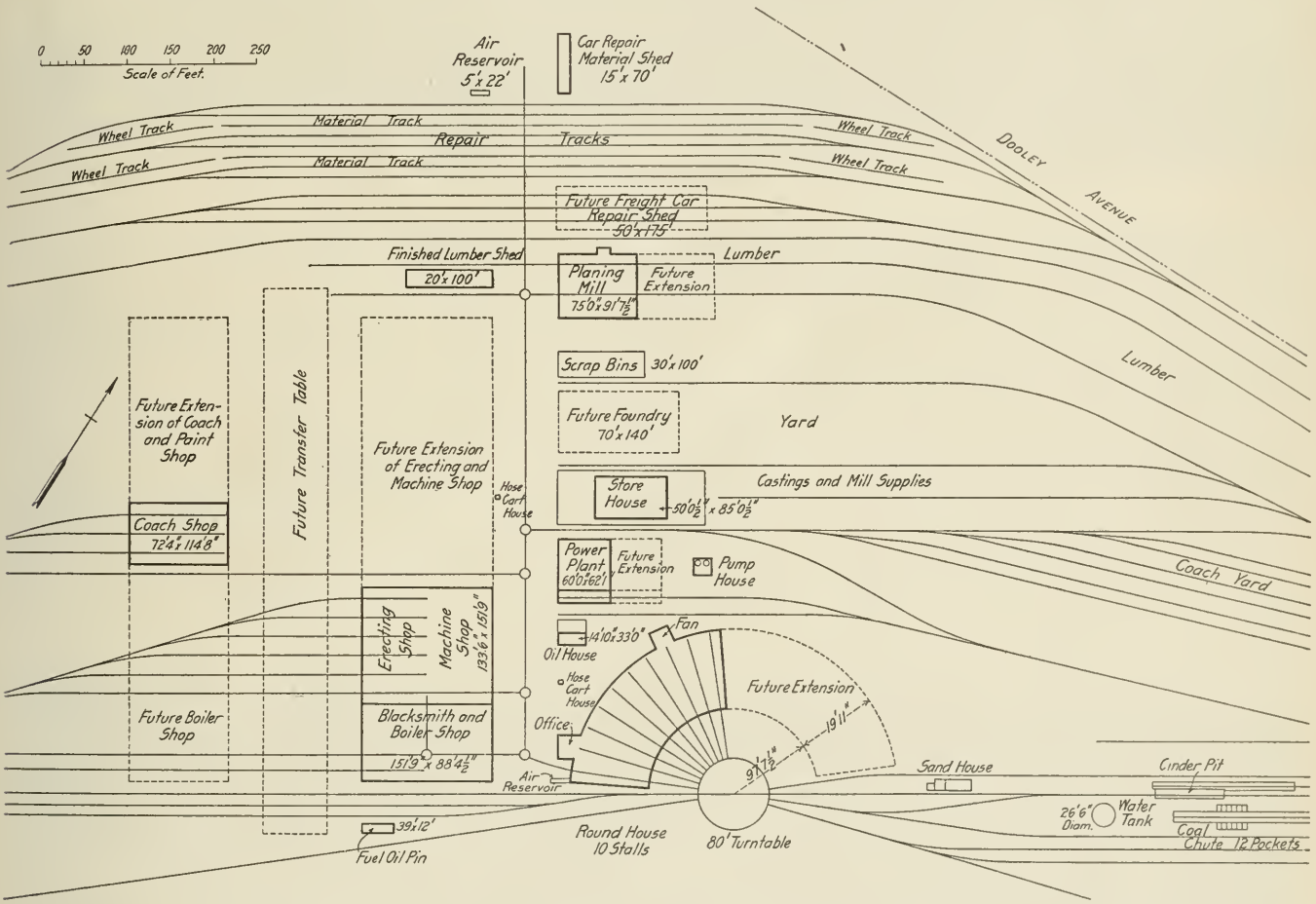
It does not interfere with any form of end bracing, whether horizontal or vertical, and being constructed of metal throughout is well adapted for use on cars of all-steel or composite design. The movable plates when in open position stand at an angle of 45 deg., their lower edges in line with the upper edges of the Z-shaped bars below them, thus making the ventilator rain-proof whether open or closed. The slanting plates also tend to deflect sparks. The ease with which the ventilators may be operated makes it possible for trainmen to manipulate them while the train is in motion. This is an advantage in case of through trains where the trainmen may pass from one car to another, and from the running board or roof of an adjoining car, open or close the ventilator by means of a rod fitted with a hook. The netting is applied on the inside, as is usual, being crimped over the ventilator flanges on all four edges and held securely in place by nails or bolts through the flanges and the netting.

A section of 50 miles of the River Mulatos to Potosi Railway, Bolivia, was opened to public service on March 1.

REPAIR SHOPS AND LOCOMOTIVE TERMINAL; KANSAS CITY, MEXICO & ORIENT.

The Kansas City, Mexico & Orient will eventually form an important link between Kansas City, Kan., Texas and the Mexican Pacific coast by a route 1,659 miles long, terminating at Topolobampo, Mexico. More than half of this, or 882 miles, is now constructed and in operation, 510 miles of which comprises the northern section between Wichita, Kan., and San Angelo, Tex. Wichita was selected as a site for the principal locomotive and car repair shops for the northern end of the system, and comprehensive plans have been made for developing here the principal facilities for rolling stock repairs which will be needed when the railway is entirely completed and in operation. A tract of land of about 760 acres has been secured about 3 miles from the center of Wichita and adjacent to the main line, and the buildings so far erected are mostly only of sufficient capacity for initial needs; but each one is so built and located that its enlargement can readily be effected as indicated on the general plan. The locomotive terminal for present needs includes a 10-stall roundhouse with an 80-ft. turntable, 12-pocket coaling station, sand house, 160,000 gal. water tank, and a cinder pit. The repair facilities which have thus far been provided include a locomotive repair shop building that includes a boiler and blacksmith shop, machine shop and erecting shop; a power house, a coach repair and paint shop, storehouse, planing mill, and two sheds for storing rough and finished lumber; also, an oil house, a pump house for the water supply system, and three hose houses.

Engine House.—The roundhouse is located far enough from the main line track to allow room for a freight yard of 8 tracks, when the full circle of the house is completed. The walls are



Arrangement of Locomotive and Car Repair Plant and Locomotive Terminal of the Kansas City, Mexico & Orient at Wichita, Kan.

the buildings indicated by the heavy lines on the plan have been erected.

The completed plant will include the general repair shops and the division locomotive terminal. The latter will ultimately consist of a 40 stall roundhouse with an 80 ft. turntable. The locomotive shop, when finally completed, will be more than 500 ft. long and will contain 20 erecting pits; it will include the machine shop and the erecting shop, in parallel bays. Directly west of the locomotive shop will be a 75 in. transfer table with a runway about 630 ft. long; and beyond this is to be another building about 500 ft. long, the northern portion of which will be the coach and paint shop, while the southern portion will be used as the boiler shop. To the north of the roundhouse are the power station, the storehouse, foundry, planing mill, and the freight car repair shed, with lumber sheds and scrap bins conveniently located.

of brick with a wooden roof supported on timber posts. The roof is nearly flat and is of wood sheathing with 4-ply tar and gravel covering. In each stall is a pit 61 ft. long built of reinforced concrete resting upon a reinforced concrete mat foundation extended to an extreme width of about 10 ft. The concrete pit side walls are 2 ft. thick. Each rail rests on one 8 in. x 12 in. stringer, and alongside it is a separate 12 in. x 12 in. jacking stringer. Two stalls are fitted with driving wheel drop pits, while the third one from the south end is fitted with a truck drop pit. The drop pits are built of reinforced concrete and are fitted with hinged rails. The smoke-jacks are of asbestos lumber. The house is heated by the indirect fan system, using exhaust steam, the fan being located in a small brick addition from which air is forced into a system of concrete and tile ducts radiating to the various pits. The capacity of the fan is sufficient to change the air in the roundhouse every 10

minutes. The artificial lighting is by means of 9 3-light clusters of 16 c. p. lamps and 33 single 32 c. p. lamps. Wall plugs are distributed about the pits and on the walls and posts for extension lamp cord connections.

Cinder Pit.—On the track north of the coal pocket is the cinder pit. Because of the difficult drainage and soft soil it is of somewhat special design. There is a single track slightly elevated, one rail resting on wooden blocks set in a concrete stringer about 5 ft. deep, the other on a 15-in. I beam carried on concrete posts; the whole is supported on a reinforced concrete mattress 15 ft. wide and 8 in. thick, the bottom of the mat being about 4 ft. below grade while the rails of the track are about 2 inch above grade. The cinder pit is brick paved on a cinder bottom and is only 6 in. to 9 ft. below the ground level.

Locomotive Shop.—This is a steel frame building, about 152 ft. x 220 ft., with brick walls and a wooden roof. The erecting shop and machine shop are in three parallel bays, with the boiler and blacksmith shop running across the south end of both and separated from them by a brick fire wall. The erecting shop pit walls are of concrete, 2 ft. thick and capped by 8 in. timber stringers.

The erecting shop is 132 ft. x 76 ft., and accommodates 6 erecting pits with separate entrances through the west wall of the building. The clear height of the roof trusses above the floor is 41 ft. 6 in. The shop is designed for a 120-ton traveling crane, the span between centers of the crane rails being 71 ft. 3¼ in. The crane runways are supported on steel columns. The roof is slightly pitched and without a monitor. The upper tier of windows on the west wall runs up practically to the eaves, providing ample light for the entire floor area. The side walls are of brick in the lower story, the upper portion being of plaster on special galvanized expanded metal.

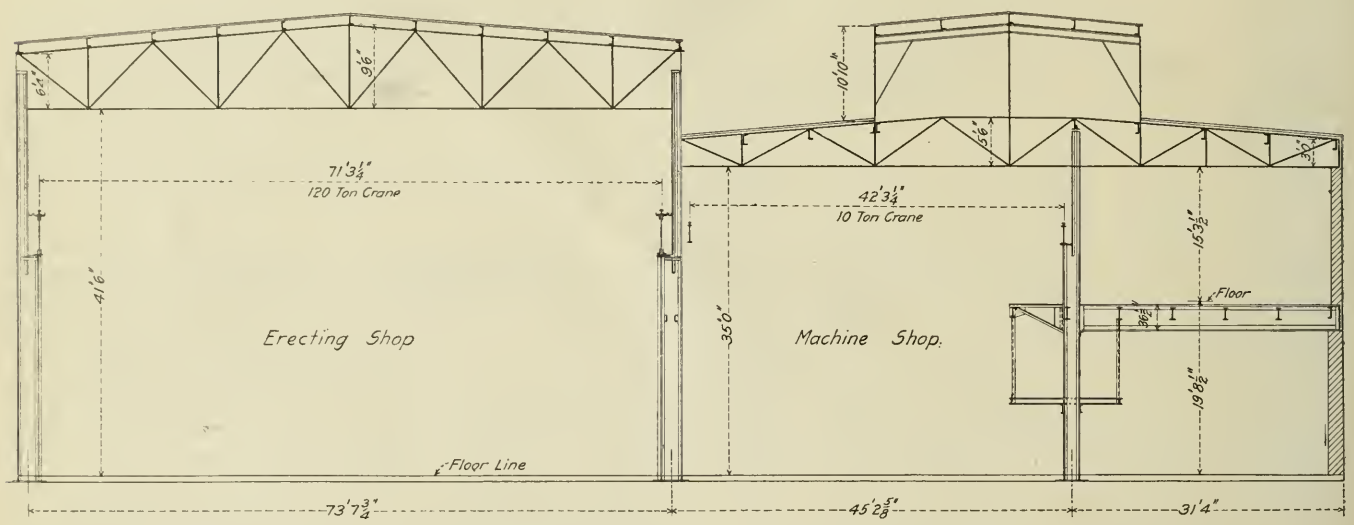
The machine shop is built in two longitudinal sections, that over the heavy machine floor being served by a 10-ton traveling crane running the entire length of the shop over the large tools, the other section having a gallery running its entire length, and without crane service. There is a small mezzanine gallery at each end of the latter, one containing a foreman's office and the other the men's lockers and lavatory. The machine shop has a monitor roof 10 ft. high.

The boiler and blacksmith shop is of but one story with deep roof trusses, there being a monitor roof 10 ft. high over each shop. There are two tiers of windows around the three sides of the shop and it is thus well lighted.

The artificial lighting of the main shop is accomplished primarily by 23 type P 700 c. p. Cooper Hewitt lamps and 18 type H-300 c. p., Cooper Hewitt, lamps, supplemented by a number of incandescent lamps run from wall plugs on the walls, columns and pits.

A portion of the machine tools were formerly used in another shop, and a number of modern ones were added for present needs. They are mostly operated from direct current constant speed electric motors in group drives. The driving wheel lathe is driven by an individual variable speed motor. Other motor driven machine tools are later to be added to the equipment. Due consideration was given to the merits of both the alternating and direct current systems for operating these shops, but the fact that direct current is necessary for the proper control of variable speed machine tools, the undesirability of having two systems in the present installation, and the general nearness of the shops to the power station, all influenced the decision in favor of direct current on the 220-volt, 3-wire system. There are five group drive motors, two being of 40 h. p., two 25 h. p., and one 13 h. p., all of the 220 volt open type.

Power House.—The power house is a brick and concrete building 60 ft. x 62 ft., and about 25 ft. high, with steel roof beams. Alongside the boiler room is an elevated coal track, carried on concrete piers, from which coal is dumped into a bin underneath that opens directly onto the firing floor. The coal cars are placed on this unloading track by locomotives over a pile trestle about 85 ft. long with a 5 per cent. inclination. The equipment of the power house consists of three Stirling water-tube boilers of 184 h. p. each, hand fired, and with individual guyed stacks; space remains for an additional boiler. There are two boiler feed pumps and one 900 h. p. feed water heater large enough to provide for the future as well as the present installation. In the engine room are two generating units of 150 k. w. and 75 k. w., respectively, direct connected to Ideal compound engines. Space is provided for an additional engine. The generators are of the Westinghouse 3-wire, 110 and 220 volt direct current type with balancing coils. There is also a 1,000 cu. ft. compound steam, 2-stage, air compressor of the Ingersoll-Rand make. A 4-panel switchboard controls the electrical distribution through the buildings on the three-wire system.



Cross-section Through the Erecting and Machine Shops at Wichita, Kan.; Kansas City, Mexico & Orient.

Oil House.—Between the engine house and the power plant is the oil house. It is also a completely fireproof structure of brick and reinforced concrete. It has a concrete platform with extended storage vault space beneath it and outside of the oil house proper. The basement accommodates oil tanks, mostly of 700 gal. capacity each, for the various oils and lubricants. A Bowser system of self-measuring oil pumps and indicators is provided.

Storehouse.—The next building to the north of the power house is the storehouse. It is a one-story brick building with



Locomotive Shop; Kansas City, Mexico & Orient, Wichita, Kan.

concrete foundations, plank floor and wooden roof construction, the roof being carried on a double row of timber posts. The building is 84 ft. x 49 ft., and is entirely surrounded by a loading platform which is about 6 feet wide on both long sides of the building and so extended lengthwise as to cover an area of about 42 ft. x 62 ft. beyond each end.

Coach and Paint Shop.—This building is so located to the northwest of the locomotive repair shop, that both it and the locomotive repair shop will eventually be served by the same transfer table when future operations may warrant its installation. Like the locomotive shop, only the initial bays of the building are now installed, and the north wall is of timber construction so as to admit of economical extension of the plant whenever required. At present the building consists of three bays each 20 ft. wide with storage space 8 ft. wide across one end, the present outside dimensions being 115 ft. x 74 ft. The building is of simple construction, having brick walls with high windows, and swinging doors in both side walls for three coach tracks which pass through it.

Planing Mill.—Beyond the storehouse and scrap bins is located the planing mill. It is a brick building 94 ft. x 78 ft., one story high, with a single row of timber posts down the center supporting a wide monitor-type roof on wooden trusses. The main windows are about 10 ft. x 16 ft. and four swinging doors are arranged to accommodate two tracks completely through the building. The building is heated by the direct system using exhaust steam from the power house; artificial light is supplied by six type E Cooper-Hewitt lamps. Live steam service is also introduced for heating glue pots. The planing mill is fitted with a number of new tools, among which are a 14 in. x 20 in. timber sizer, a 24 in. pattern maker's lathe, a 4-spindle wood borer, a 6 in. x 14 in. molder, a 2-spindle shaper, a jig saw, combination saw, a 24 in. pony planer, a self-feeding rip saw, and a cabinet mortiser and borer, besides a complete outfit of saw and knife



Interior of Heavy Machine Bay in Locomotive Shop; Kansas City, Mexico & Orient, Wichita, Kan.

grinding machinery, benches and vises. Several old tools from another shop are also used. The tools are belted to two line shafts run by separate direct current motors of 40 and 50 h. p. capacity, respectively, the line shafting being carried on the roof trusses.

Fuel Oil Supply.—At the south end of the locomotive shop in a concrete vault is a tank for fuel oil which is used at the furnaces in the blacksmith and boiler shops, and also in the roundhouse where it is used for lighting fires.

The construction work was begun in May, 1910. The design and construction were carried out by Westinghouse, Church, Kerr & Co. under the direction of E. Dickinson, vice-president and general manager; F. Mertscheimer, general superintendent motive power and car department; W. W. Colpitts, chief engineer, and A. F. Dickinson, superintendent. Master mechanic David Patterson is in charge of the operation of the shop.

AN OBJECT LESSON IN EFFICIENCY.

The Tabor Manufacturing Company has frequently been cited as an illustration of what may be accomplished by introducing efficiency methods in a shop, and the following extract from a paper presented before the Congress of Technology at the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology, by Wilfred Lewis, the president of the company, is thus of special interest.

In 1910 The Tabor Manufacturing Company turned out 2½ times as much value in finished product as it ever did under the old regime with the same force. Formerly for every ten men engaged as producers, or "chipmakers," as Mr. Dodge defines them, we had not more than one man connected with the shop as a non-producer. Now we have fewer men at the machines with three times as many non-producers turning out practically three times as much work, because prices are lower today than they were five or six years ago, and 2½ times the value means about three times the product.

It is not an easy matter to start any innovation in an open shop full of union men, and, as might be anticipated, the appearance of a man with a stop watch and tally sheet was at first strenuously opposed by the workmen. So also was the suggestion of a bonus for the successful performance of an allotted task. But the kickers were gradually converted or discouraged, better discipline was established, and a few of the men were soon earning 30 per cent. more wages than they could command elsewhere. In the beginning the men were suspicious and disinclined to believe that a good performance was not to be the signal for a cut in price, but they have since learned by experience that prices are fixed by the management upon definite knowledge of all the time elements involved in any piece of work and that the time allowed will not be changed so long as the method employed remains the same. In this way the management demonstrates its loyalty to the workmen and they in turn are glad of an opportunity to demonstrate their loyalty to the management, as they did last year.

We pay better wages for fuller and better results performed in a definite way, and yet there is no driving in the ordinary sense of the word. The tasks assigned to the workmen are easily within their ability to perform, and when new work is given out, as occasionally happens, at day rates, before the time on the job has been set, nobody wants to take it because there is no bonus attached for its quick and accurate performance.

But our wonderful increase in production is not due entirely to rapidity of performance, for in some instances very little gain in that direction has been made. A great deal is due to the functional foremen whose duty it is to prepare and guide the way of every piece of work going through the shop. The old notion that a man cannot serve two masters or take orders from more than one superior is denied by the new philosophy which makes it possible for a workman to have as many bosses as there are functions to be performed. There is no conflict of authority unless the functions overlap and even there, such conflict as may arise is salutary and to the interest of the company. A gang boss for instance covers one class of machines or work, and it is his business to see that every man is provided with at least one new job with all the tools and fixtures ready for its immediate performance as soon as the job upon which he is engaged has been completed. He also gives the necessary instructions about setting the work, explains the drawings and teaches the workman how to set his work when necessary. This man has nothing to do with the running of machines and does not interfere at all with the speed boss who also has supervision in his function over the same men as the gang boss and sees that each machine is run at its proper speed with feed and cut as per written instructions. He also teaches the workman and gives him such practical assistance as may be needed.

An inspector also helps the same set of men and sees that the work done is of the right quality and that the first piece made is up to the standard in all dimensions, fit and finish. He also makes further inspection from time to time to see that the standard is maintained. An over-zealous speed boss in his desire for a large output may impair the quality of the work done by exceeding the speed limit and there is therefore the possibility of a conflict between the speed loss and the inspector, but the inspector's requirements must be fulfilled and such a conflict cannot fail to be salutary, because rapidity of production when accompanied by inferior results is never to be desired, and in almost all cases some method is found by which high speed can be maintained and the best quality be preserved. It rarely happens that the superintendent or manager is called on to adjust a difficulty between the two functional foremen.

In the planning department, which is to the shop what the drawing room has been for many years to the superintendent, every new machine is chartered to show the progress of the work through the shop and every piece is provided with an instruction card for its proper manipulation showing the machine upon which it is to be done, the tools and fixtures required, the feeds and speeds to be used, the sequence of operations and the time allowed in detail for each and every elementary movement. As these operations are performed they are checked off in a route file from which can be seen at any time the exact conditions of the work and the time remaining for its completion.

An order of work clerk directs the progress of the orders to be filled in accordance with a schedule prepared by the manager in consultation with the sales department and he has before him in miniature a view of the whole shop, showing every machine or vise, the work being done on each, the work ready to be done and the work ahead in the shop which has not yet arrived at the machine. This is on a large board or wall plate which shows also what machines are manned and where a man can be conveniently shifted when there is no work ahead at his particular machine. By this means all the work in the shop is kept moving in proper balance at a normal rate of speed, men are taken on or laid off as the exigencies of business may require and no loss is sustained by the usual tendency of workmen to relax when, in times like these, orders are falling off and work ahead is hard to find. At such times we are, of course, obliged to curtail production, and the situation being apparent to all, no complaint is made against a reduction in time which we always prefer to a loss of well trained men.

A well equipped tool room in charge of a competent man is a sine-qua-non in any machine shop and here also one of our great improvements has been made. Formerly each workman was inclined to accumulate his own assortment of tools and fixtures which were stowed away in dark corners and kept in disorder and confusion. Now everything comes in perfect order (and the best of its kind) from the tool room as required, and goes back again when the job for which it was taken out is finished. Tools are ground to standard forms and not to suit the whims of individual workmen and the tool room is responsible for the condition of all tools sent out.

The drawing room is perhaps of all departments less affected by the new order of things than any other, and yet there is an indirect effect due to the atmosphere of activity which pervades the whole plant. Here the work is by its very nature more or less original and, of course, no time can be set for the completion of that which is not definitely known, and which grows into shape by a process of trial and error, until something satisfactory is attained. Designing is not therefore amenable to time study, and, depending largely as it does upon inspiration, there is no superior intelligence to direct its progress. It is in the nature of original research which flourishes and bears its best fruit under adverse criticism. A good designer is like a good composer, his work is creative and full of harmonies, and being an artist in his line he cannot be held to a time schedule. In original work, the incentive, therefore, must come from within rather than from without, and this is generally inborn with the ability to create. Copyists on the other hand, who always need direction, might be brought under the domination of time study and in many clerical operations this has been done, but we have not yet attempted to fix tasks in tracing or bookkeeping, and we do not pretend to say that our development is by any means complete. We have progressed, however, to a point which makes further progress comparatively easy, and in the face of stubborn opposition we have firmly established a successful business upon the principles of scientific management as laid down by Dr. Taylor. An application of the same principles to the management of the railways of this country has been estimated as capable of effecting a saving of a million dollars a day. This means increased production and higher wages at a lower labor cost and contains the key to the solution of the labor problem. Labor is made to share in the increased production realized and the reward of labor is made to depend upon the individual effort put forth in production. The Taylor system makes more room on top and gives a better chance to rise. Men thus schooled in efficiency are qualified for better service and learn to measure more accurately the value of time.

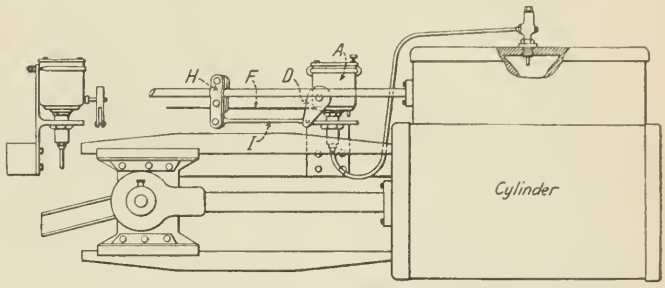
LUBRICATING LOCOMOTIVE VALVES AND CYLINDERS WITH GRAPHITE.

The Long Island has for some time been operating an eight-wheel passenger locomotive equipped with a device for lubricating the valves and cylinders with a mixture of extra fine crystalline graphite and oil. As a result the surfaces soon became coated with a thin film of graphite, reducing the friction between the parts, as compared with the use of oil, and also considerably increasing the number of miles run per pint of lubricant. While no fuel tests have been made, those in charge of the locomotive believe that less coal is required per unit of output. Tests of European locomotives equipped with the same device are said to show a fuel saving of 5 per cent. and upward.

The device, or pump, is automatic in action; is placed near the cylinder, one on each side, as shown on the illustrations; and is operated by a connection with the valve rod. It does not require any attention on the part of the engine crew except for adjustment at the beginning of the run. Nor does it require much attention on the part of the engine house force except for the occasional replacing of a small leather washer. The device is in successful use on a large number of locomotives in Europe; one road having about 900 locomotives has, after a protracted trial, issued instructions for its application to all the locomotives as they pass through the shop.

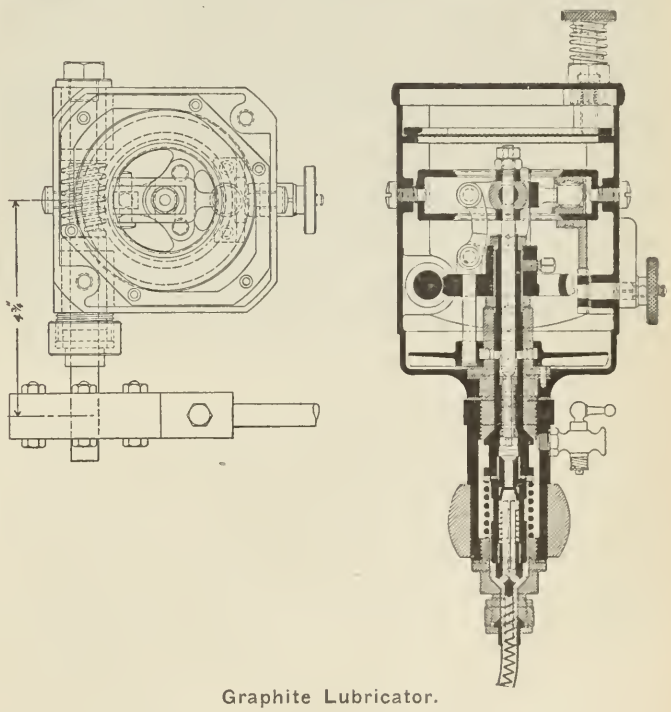
Attempts have been made in the past to use graphite for locomotive cylinder lubrication, but without success because of the difficulty of feeding it to the cylinders properly. The trouble has been to keep the graphite in suspension in oil or other fluids. In the device in use on the Long Island, which is controlled by Knowles & Wollaston of London, Eng., who have established a New York office, this is accomplished by stirring or agitating the mixture continuously until it reaches the steam chest. It does this in the following manner:

The pump, which is enclosed in a brass casing *A*, is securely fastened in place, as shown. The lubricant, to the extent of three pints, is introduced by removing the top of the casing. As indicated on the sectional drawing a fine screen is fitted in the top of the device through which the lubricant must pass. Directly underneath the screen is a circular box-shaped casting supported



Application of Graphite Lubricator to Locomotive.

on two pivots. A short arm projects downward from this casting at the right; at its lower end is a toothed sector which meshes with a small pinion on the end of a shaft that extends through the casing and has a knurled nut at its outer end. By turning this nut the pivoted box casting can be set at an angle with its horizontal position, a pointer on the outside indicating the amount of this angle. With the box in a horizontal position the stroke of the pump is zero. As the box is inclined more and more the stroke is increased. Within the box at the right is a crosshead enclosing a spherical knob which is formed on the



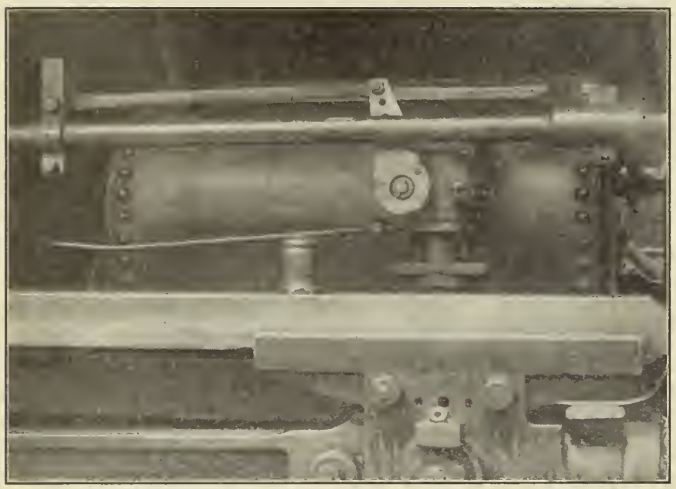
Graphite Lubricator.

end of a forked lever that rotates and rises, according to the inclination at which the box may be set. The forked lever is connected at the other, or left, end to a short link; to the right of this and near the middle of the lever it carries between the forks a truncated sphere, through which the end of the pump ram passes. The pump ram works in a rotating casing to which a worm wheel is attached that is driven by the worm. This worm is driven by the ratchet *D*, through the connecting rod *I*, which is fastened to the clamp *H* on the valve rod.

The pump barrel works within a gland screwed into the bot-

tom of the casing; this gland extends through the casing and carries on its upper side a short cylindrical casing. Within the main casing this gland provides a seat for a two-vaned propeller which stirs up the graphite and oil. Returning to the short curved link, which is attached to the end of the forked lever, it will be seen that it is pivoted from a bolt passing through the worm wheel, and extending down into a hole formed for its reception in the boss of the propeller. The rotation of the worm thus drives the worm wheel, the propeller, the link and forked lever, the pump ram and the pump barrel. In addition, the ram has a rising and falling motion due to the inclination of the guide-box.

Within the lower cylindrical casing the pump barrel, which bears against the lower surface of the fixed gland through an inclined shoulder, has screwed into it a valve casing. This casing is in turn closed by a nipple through which two holes lead to the delivery pipe. A non-return valve provided with a small leather washer at its upper end is held up against its seat in the valve chamber by a spring. The end of the nipple protrudes in the shape of a spigot just within the copper delivery pipe. A spiral spring extends through the delivery pipe from an extension spigot to the point of delivery into the steam chest and is rotated by its attachment to the spigot. The rotation of this spring keeps the lubricant stirred up during its entire passage through the pipe. A strong spring bears against the lower end of the pump casing and takes up wear, preventing leakage from the



Application of Graphite Lubricator to Long Island Locomotive.

upper chamber. This is quite important when the jars and shocks to which the apparatus on the locomotive is subjected is considered. The lubricant finds its way from the reservoir to the interior of the pump barrel through a hole drilled in the boss of the propeller. This admits the mixture to an annular channel formed on the inner surface of the boss. Two ports in the stationary gland then conduct it to a similar channel on the inner surface of the gland, and from this passage it escapes to the interior of the barrel through two other ports drilled through its walls. In this way the lubricant has an uninterrupted access to the barrel at all periods of its revolution. A small hollow piston is carried on the reduced lower end of the ram, and is given 1/32-in. vertical play between a cone seat and a winged nut on the extreme end of the ram. During the up stroke of the ram the lubricant thus has free admission past the conical seat to the under side of the piston; on the down stroke the cone and piston close up so as to pump the mixture past the non-return valve. On the lower cylindrical chamber an air cock is provided for use when starting up.

There can be but very slight wear on the parts because they move slowly and are always flooded with the lubricant. Because of the exposure of the device arrangements have been provided to heat it by steam during cold weather through the pipe *F*.

It must be thoroughly understood that pure crystalline graphite only is suitable for cylinder lubrication. Amorphous graphite contains impurities which are difficult to eradicate and make it entirely unsuitable for the purpose. Even the crystalline graphite must be carefully refined to give successful results.

Compared with practical results from lubrication with oil alone, the new surface conditions of cylinders, valves and pistons continuously maintained by use of the mixture fed by this device, would seem to assure less liability of scoring, a reduction of internal friction, and a corresponding increase in effective horse power without expenditure of additional fuel.

BORING, TURNING AND MOUNTING CAR WHEELS AND AXLES.

BY W. H. MARKLAND,

General Shop Inspector, Altoona Shops, Pennsylvania Railroad.

Boring car wheels, turning axles and mounting the wheels on the axles are questions that for some reason have not received the attention in railway shops that work of a similar character is receiving in other shops. A careful study has been made with the idea of improving the methods, and, incidentally, if possible, reducing the costs. Many experiments and tests were made and a few devices were introduced which may be of interest to the railways generally. Some of the devices that will be mentioned were described in the report of the committee on mounting pressures for various size axles and kinds of wheels, which reported at the Master Car Builders' Convention, 1910.

The majority of axles and wheels machined in railway shops are for repair work, i. e., fitting new wheels to old axles or refinishing cut journals. It must, of course, be recognized that safety is of the utmost importance and that wheels must be fitted to the axles in such a manner as to insure their not working loose in service. However, the question of the cost of work of this nature is also a consideration. The fact that in no case has a wheel been reported loose when mounted by the methods described below, would indicate that the system is entirely safe. Considered as a whole, it is also more economical than most of the previous methods.

In comparing the cost of wheel and axle work, especially repair work, the life of the axle must be considered. As an illustration, the useful life of an axle depends on the size when new and worn, or turned to unsafe limits. For axles used under 100,000 lb. capacity cars, the finish turned parts differ in size about ¼ inch when new and ready for scrap. Careless turning may reduce the diameter an amount equivalent to a long period of service. The ¼ in. difference in diameter between the new and the scrap axle, which constitutes its useful life, may be compared to a tube with a wall ⅛ in. thick. A calculation will show that this metal, considering the new and the scrap value of the axle, is worth about 50 cents per pound, also that each .001 in. in diameter of the tube is worth about 4 cents. Suppose two axles are to be repaired. One is carelessly turned 1/32 in. smaller than the other, and its value is reduced to $1.28 less than the other. While the diameter may not be the cause of scrapping the axle, or one journal may be cut, or the collar worn, removing the smallest amount of metal possible is of the utmost importance. The question of a slight increased cost in machining should be secondary to that of saving the metal.

Dents or marks on the journals often necessitate removing considerable metal. Unless care is exercised when handling mounted wheels, there is a possibility of the flange of one wheel striking the journal of an adjacent axle; also in handling axles with bars there is a possibility of denting and scratching them. A good rule to follow in loading mounted wheels and axles on cars for shipment is never to load different size wheels and axles adjacent to each other without blocking between. This will also apply when they are stored on tracks. If wheels and axles of the same size are placed so that one wheel will strike

the adjacent axle inside of the wheel the journal will not be effected, and if reasonable care is exercised there should be no necessity for placing guards on the journals. Where bars or chains are used for handling finished axles, many dents and scratches may be avoided by covering the bars or chains with o'd air brake hose. A dented journal should call for an investigation.

To properly machine axles and wheels several points must be considered to obtain the best results, such as the speed of turning, centers in axles, lathe centers, turning tools, micrometer calipers, lathe centers in line, boring bars, etc. With any fairly good lathe or mill the work can be well done if the tools are kept in a good state of repair.

The importance of true, properly ground and properly fitting lathe centers cannot be overestimated. No lathe center in any shop should receive more attention, for during their life axles may be turned several times and on different lathes. If the



Fig. 1—Machine for Grinding Lathe Centers Accurately.

angle of the centers is not uniform, the center in the axle will be badly and unevenly worn and it will be difficult to do good work. For instance a few axles were found to be turned about .010 in. out of round. Investigation showed that the lathe on which they were turned had centers of about 85 deg.. while the axles were centered 60 deg. As a result the axle only rested on the lathe center at the end or it had a line bearing. This line bearing soon wore unevenly, allowing the axle to work back and forth, and was responsible for the eccentricity of the axle. An examination of the centers in axles will often show the results of turning on lathe centers of different angles; the axle centers will have the appearance of having been made with a very badly ground centering tool.

Several of the modern axle lathes have only dead centers and grinding in place is not possible. In many cases they are too large for the average tool room grinder, and as a result the centers are not given the necessary attention. Recognizing the fact that where ready means are provided for grinding centers they will be kept in better condition, the grinding machine shown in Fig. 1 was designed. It will only grind to a 60 deg. included angle, being made thus purposely to prevent possibility of being set wrong. The machine is not expensive and would be a desirable addition to any shop. While the savings due to its use cannot be stated in dollars, there is no question but that the better work will justify its cost. Center gages are cheap and should be frequently tried on centers; if the latter are not the proper shape, or are rough, they should be repaired at once.

Another important point is the necessity of keeping lathes in proper alinement to insure turning a journal or wheel seat the same diameter for its entire length. In some shops a burnisher is used to smooth the journals and a heavy strain is exerted on the lathe that is liable to wear the lathe shears and make frequent repairs necessary to insure satisfactory work. The importance of keeping the lathe in proper alinement can be appreciated when we consider that to mount a steel wheel having a 7 in. bore, or a cast iron wheel of the same size, the axle must be .007 in. and .015 in. approximately larger than the wheel bore; each .001 in. variation will affect the mounting pressure about 10 per cent. If the wheel seat is turned tapered it is not possible to properly caliper it except for the average diameter which will rarely be a true indication for the mounting pressure. If turned tapered, an extra strain may be exerted on one part of the wheel with possibility of no pressure on other parts. Wheels have been removed that only had a bearing for part of their length owing to taper turned axles; while the wheels did not come loose in service, it is a condition which—if known to exist, would be bad for the peace of mind.

By proper care in maintaining lathes this can be avoided. Accurate turning, which will follow, will result in saving in labor when mounting the wheels on the axles. A satisfactory test for lathe alinement is to take two or three light cuts for the entire length of the wheel seat and then measure the diameter with micrometers. There should never be a difference in diameter exceeding .002 in. In every case after repairing lathes to this standard the results have been so much better that the method cannot be too strongly recommended.

Tests made to determine the speed at which axle lathes should be run, developed the fact that 45 r. p. m. was about the limit for car axles, the limit being the chattering of the axle rather than the capacity of the cutting tool, as most any high speed steel will stand this speed with a stream of water flowing on the tool when taking light cuts, such as are generally necessary for repair work. The questions of slow speed and coarse feed, and fast speed and fine feed were also considered. For good work the fast speed and fine feed are more desirable, because of avoiding large humps and hollows. A broad-faced tool fed slowly may look satisfactory. However, there is always a possibility of the workmen not setting the tool nose square, which is liable to result in the wheel having only a few points for bearing. The burnishing wheel or other finish will have to push down or remove the high spots, whereas with fine a feed the humps and hollows will be much smaller. The latter method is decidedly the better. The final cuts should never be taken with a feed less than 16 pitch.

Proper inspection of axles is, of course, important, but to be of value and to keep a shop up to the proper standard, limits should be established. Inspection for diameters cannot well be made with machinists' calipers on account of its being too slow and involving too much of the personal element. Micrometer calipers are more satisfactory for calipering axles as they are generally handled in repair shops. To reduce the time required for making micrometer caliper measurements, the calipers shown in Fig. 2, were designed by the writer. These, in addition to the ordinary micrometer have an arm set at right angles with object to be measured, also the stops *A* that may be turned so that the distance from the top to the center of the axle shall be approxi-

mately the radius of the axle. This admits of quickly setting the caliper in place. One set of stops is approximately correct for 6¾ in. to 7 in. axles, another 6¼ in. to 6½ in. for axles. These

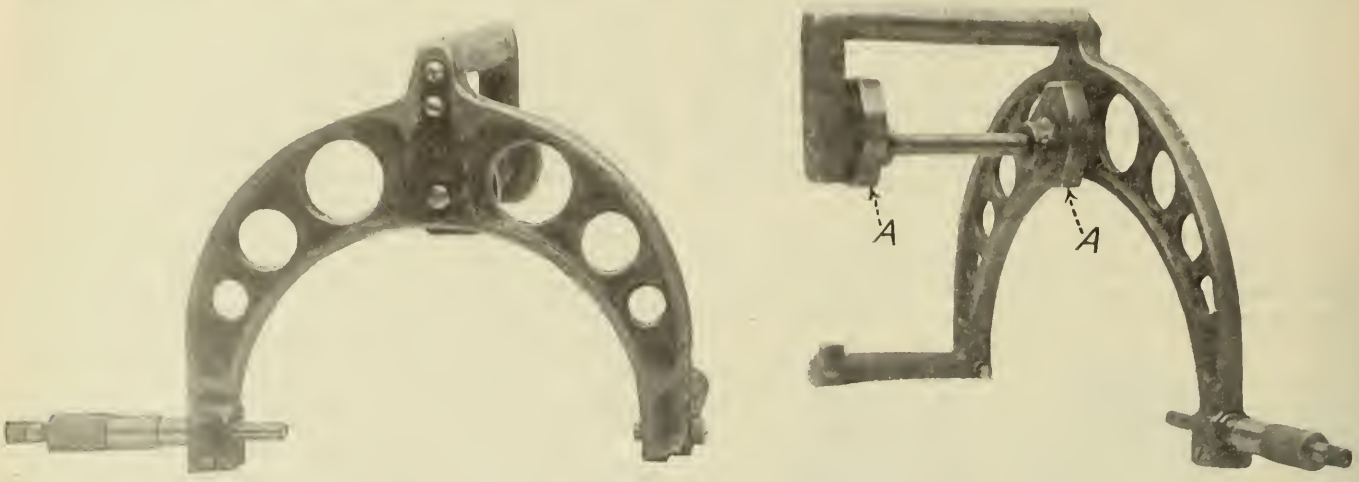


Fig. 2—Calipers for Car Axle Journals.

stops can be made for any desired diameter within the range of the micrometer screw. In service the caliper is placed over the axle with the arm and the stops *A* resting on the axle. The micrometer is then screwed down until the ratchet clicks, it is



Fig. 3—Boring Bar for Car Wheels.

then removed and the reading is taken. This caliper obviates all "feeling" for measurement, such as is necessary with the ordinary micrometers and reduces the possibility of error. In practice, six measurements can readily be made and read in one minute. Exact readings to .001 in. can be made and recorded very much quicker than by machinists' calipers. The latter are only of value for mounting wheels when they must be compared or adjusted to calipers previously set to some particular wheel bore.

A method of inspection that has worked out very well in practice is as follows: Each wheel seat is calipered about 1 in. from the dust guard seat, at the middle, and about 1 in. from the other end. These readings to agree within a limit of .003 in., the average size being chalked on the axle for information when mounting the wheels. Should these readings vary more than .003 in., the axle is rejected and re-turned. The journal is inspected in a similar manner, but without recording the sizes. No particular trouble can result from the two ends of the axles not being similar, and any attempt to make them alike will result in many cases, in the removing of unnecessary metal.

By boring wheels to suit the axles the lathe operators do not

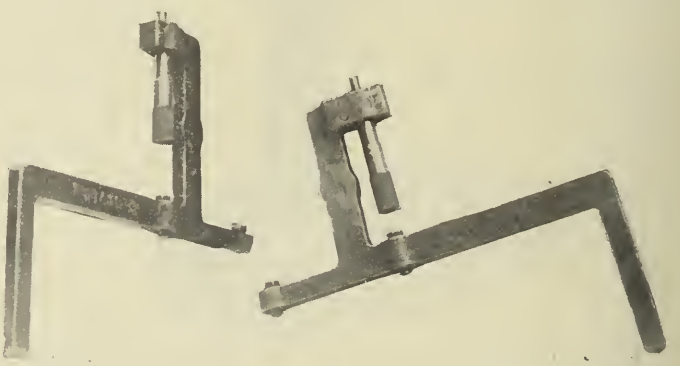


Fig. 4—Special Micrometer Caliper for Boring Wheels.

have use for calipers, as will be explained later, except for the maximum or minimum sizes, which is somewhat novel for lathe work. The question of turning all new axles to one exact size and re-turning repaired axles to snap gages, varying by 1/16 in. or 1/32 in. was carefully considered. A large number of axles that had been turned apparently to uniform sizes were calipered, and showed quite a variation when measured by micrometers—in some cases as much as .010 in. This would be too great for mounting wheels bored to one size. Better work than this is of course possible, but is also expensive.

Investigation developed the fact that with proper boring bars wheels may be bored to varying sizes to suit the axles cheaper than axles can be turned to suit the wheels. To accomplish this called for a boring bar that should be readily adjustable to varying sizes to suit the different axles. It should have a micrometer

adjustment and an index plate that readily indicates the size of the bore in thousandths of an inch; it must be quickly changed from one size to another, and adjustment must be possible to compensate for the wear of the cutters in order to obviate the necessity of grinding them to very accurate measurements. It must have roughing cutters for the first cut and finishing cutters for the finishing or second cut; and all in one boring tool. This necessary refinement for a boring bar is new in some respects for wheel work. Fig. 3, shows a bar that was designed by the writer to meet these requirements. Other bars have also been designed for this purpose, so that there should be no difficulty in obtaining a satisfactory boring bar.

A brief description of the bar shown in Fig. 3 may help to illustrate the points necessary for a satisfactory boring tool. The roughing cutters at the lower end are held by set screws and are only adjustable by loosening these screws. This is satisfactory for large shops boring many wheels to approximately one size. However, for small shops where sizes are changed often, more ready means for adjustment is desirable

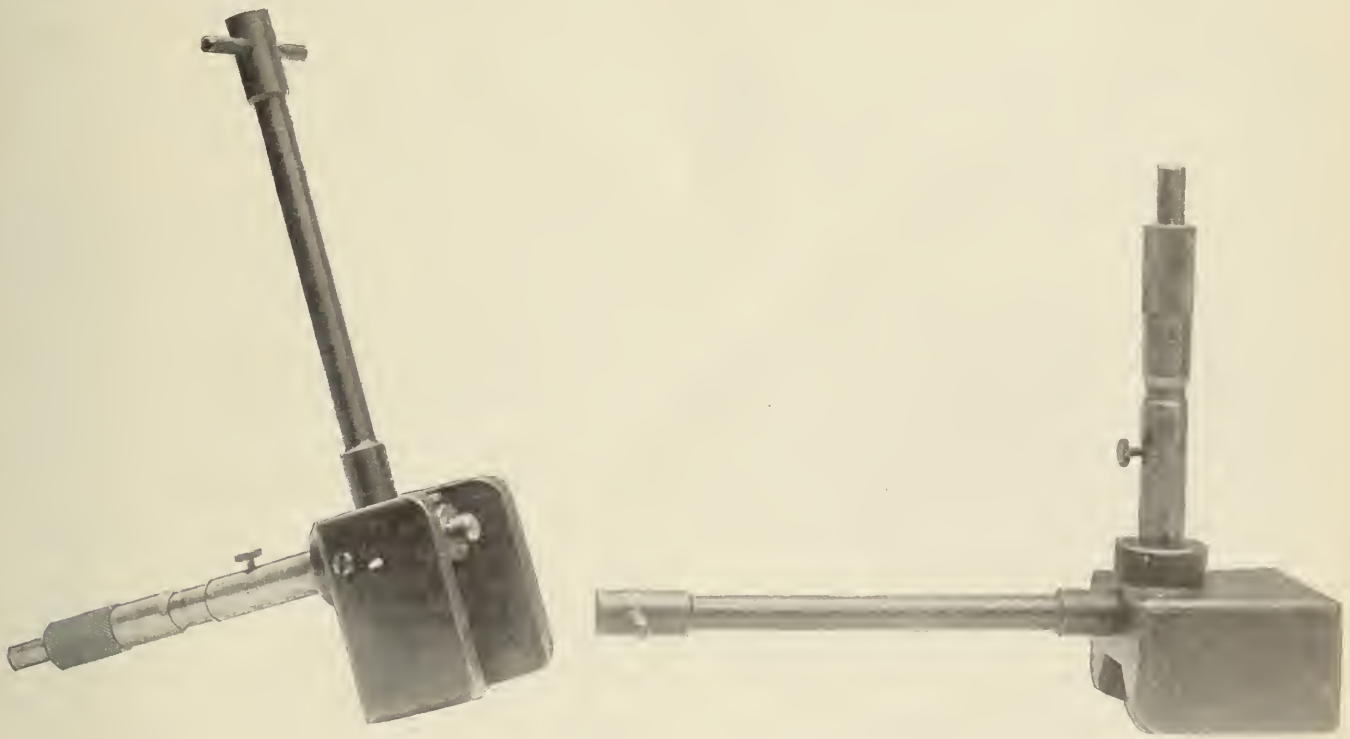


Fig. 5—Tubular Inside Calipers for Boring Wheels.

The finishing cutters, shown above the roughing cutters, are adjusted by a wrench turning a micrometer screw. On this screw is a dial graduated into 100 divisions, each division equaling .001 in. in diameter in adjusting the finishing cutters. This number of divisions was chosen to allow large spaces between the divisions so that they might be easily read. In case an adjustment of over .100 in. is required, the micrometer screw is turned more than one turn. The index plate is held to the micrometer screw by two screws. By loosening these it can readily be revolved in reference to the micrometer screw. This enables the setting of the index plate to indicate the size of the bore and to compensate for the wear of the cutters. The finishing cutters also have an adjustment by which they may be adjusted true with the bore in the wheel, this being desirable to avoid too close grinding of the cutters, and also on account of the ram of the boring mill and the table not always being in line. One of the finishing cutters may be ground fully 1/16 in. longer than its mate, or the bar may be 1/16 in. out of line, and be compensated for by this adjustment.

Without doubt wheels should be bored with a true hole free from all ridges or roughnesses. Ridges in the wheels are very objectionable, because of the uneven stress on the wheel when mounting, which may start a crack. Because of the eccentricity of the rough bore of steel wheels and the core of cast iron wheels there will always be some motion of the boring bar when boring, even with the most rigid construction. That is, the bar will follow the hole; when the roughing cutters start to go out at the bottom of the hole the bar will vibrate less than when cutting higher up in the hole, which is apt to leave a ridge in the bore. If the finishing cutters are cutting at the same time, they will make a ridge when the roughing cutters go through the hole.

The safe way to bore a wheel is to take a light finishing cut independent of the roughing cut. This is a point well understood in ordinary machine work, but strange to say, for wheel work the scheme of rough and finish boring all at one time is advocated on account of greater output from the machines, while it is true that many wheels are bored very satisfactorily by this plan, the method as a whole is undesirable because of stray wheels going into service having ridges in the bore. Actual trials on cast iron wheels showed that after rough boring it was necessary to enlarge the bore .040 in. to insure truing the bore of all wheels. This with the boring bar and the boring mills in a good state of repair.

To bore wheels to accurate sizes it is desirable to allow a pre-determined amount of work for the finishing cut in order to insure an equal amount of work for the cutters and also a uniform pressure on the various parts that will naturally have more or less give or lost motion. For cast iron wheels the finishing cut can with safety be set at .040 in.; for steel wheels at about .020 in. A practice followed with excellent results with the boring bar shown in Fig. 3, has been to set the roughing cutters to the smallest size bore required in ordinary limits, i. e., when boring wheels from 6⅞ in. to 7 in. they would be set 6⅞ in. As each wheel has rough bores the finishing cutters were set .040 in. less than the size required. The wheel was then bored with both sets of cutters cutting at one time. After this cut was completed the bar was raised and the finishing cutters were set out to the required size and the second cut was taken with the finishing cutters only cutting. As an illustration of the accuracy that may be attained, wheels were called for bored to the following diameters: 6.982, 6.842, 6.928, 6.922, 6.940,

6.848, 6.809, 6.810, 6.822 and 6.796 in. All the wheels were bored in the order called for within a limit of .001 in. No caliper readings were taken except to prove sizes after the wheels were removed from the mill. All changes in sizes were accomplishd by turning the index wheel to the size called for. The boring was done as fast as the cutting tools would permit.

With a satisfactory boring bar, having an accurate micrometer adjustment for the finishing cutters, wheels may be bored to any size required to an accuracy of .001 in. and as many wheels can be turned out as by any other method. Because of the accurate wheel boring, which is an accomplished fact, it is certainly advisable to bore the wheels to suit the axles on account of less cost for labor and removing the smallest possible amount from the axles.

A satisfactory manner of setting the finishing cutters is as follows: A trial cut is taken and calipered with micrometer calipers; the index can then be set to the size shown by the micrometer readings. Fig. 4 illustrates a special micrometer caliper that was designed by the writer for wheel bores. The principal novelty is in the extra arm to insure the caliper being set square with the center line of the wheel. Fig. 5 shows an application of a tubular inside micrometer caliper for same purpose. Readings may readily be made by either of these calipers and the size chalked on the wheel in 30 seconds. With these calipers a satisfactory test for the wheel bore is that it shall not be over .001 in. taper or out of round. This can be lived up to with fairly good tools. The bore should also be smooth and the finishing cut be taken with a feed of tool of at least 4 per inch.

The question of mating wheels to axles to obtain the proper mounting pressure has always been and will continue to be a problem. Many theories were investigated which appeared to have a bearing on the subject, one of them being that the hardness of the wheel had everything to do with the mounting pressure. There may have been some truth in this, but the writer was unable to find it from the advice of men several years in the business. Wheels made from the same run of metal will generally mount at about the same pressure when having the same draw, provided other conditions are similar. There are a number of conditions that will affect the mounting pressure even if the apparent draw is similar. One is the kind of lubricant employed. A test with cast iron wheels showed that the mounting pressure would average about five tons higher using plain oil than with white lead and oil. The turning and calipering of the axle has some influence. If a tool is used that throws up a slight burr or fin, the calipers will read the top of this and not to the solid metal, which is liable to cause mounting at low pressure. The trouble of wheel or axle galling cannot in all cases be guarded against and may cause considerable variation in the pressure, especially on steel wheels.

For accurate mounting of the wheels to a uniform pressure, no method of measurements and inspection has been devised to equal the micrometer method, and with the calipers described above, where the readings can be made quickly with but few possibilities of error, there should be no reason to continue the use of machinists' calipers. While it is true that an expert can caliper very satisfactorily with machinists' calipers, there will always be a personal element or equation that will not exist with the micrometer described. One result will generally follow where micrometers are used and a careful inspection is insisted on. The wheel seat will be turned fairly true. With these conditions and the draw, or the mounting pressure, carefully checked the wheel will have ample bearing on the axle and will not work loose.

A large number of measurements were taken to determine the proper draw or the amount the axle should be made larger than the wheel. No general rule can be given for it, because of wheels from various mills and foundries differing. However, by measuring the draw with the micrometer and noting the mounting pressure on a few wheels, the proper draw for any lot of wheels can be arrived at that will be a fairly true indication of the proper mounting pressure.

A plan for mounting wheels on axles that has worked very satisfactorily is as follows: Each axle when turned is calipered and the size of the wheel seat is chalked on it near the wheel seat. From these sizes a list is made for the boring mill operator, deducting the necessary amount to be allowed for draw. The wheels are then bored and the size is chalked on the wheel, after being proved by micrometers. The wheels and axles are then mounted, the sizes chalked, giving the necessary information as to which should go together. This plan avoids hunting among a lot of wheels and axles to find mated pairs and also results in a minimum amount of calipering.

The micrometers which are illustrated have Brown & Sharpe micrometer heads, the frame having been made special. To the best of the writer's knowledge it has never been patented. The tubular inside micrometer caliper, Fig. 5, was made by Brown & Sharpe

Recording gages on mounting presses cannot be too strongly recommended; they are a check by which the superintendent can easily detect any bad or careless work. However, a recording gage is not always a true indication of the mounting pressure, because of the throw of the needle at each impulse of the pump or press. This is more noticeable with pumps having only one ram or piston. For accurate work, the average throw of the needle should be considered.

The question of grinding repaired axles in place of turning is worthy of consideration. At first thought it may not appear inviting, because of the apparent greater cost of the machinery and the possibility of costing more for labor than turning; however, considering other phases the question looks promising. Its advantages will be that a wheel seat once ground will not be injured enough in mounting and dismounting the wheel to require re-grinding each time, unless the wheel galls or scores the axle. That is, when compared to turning, the surface will be smoother and not have tool marks that generally push off when mounting the wheel. From experience with journals used in other machinery, we have every reason to believe that car journals would be ground better than the average of lathe turning and burnishing or filing. The sides of the collars and fillets are difficult to grind properly. The makers of grinding machinery, however, say this is not a hard problem. By grinding, the probabilities are that less metal will be cut away than by any turning method on repaired axles. This should prolong their life. When re-turning there is always a possibility of the workmen cutting deeper than absolutely necessary, in order to get below the glazed surface and insure the removal of all low spots. With grinding, there will be no incentive to cut deeper than absolutely necessary. Actual tests appear to indicate that by grinding only one-half as much metal will be removed as compared to turning; that is, where an axle may be reduced some .30 in. by turning, a similar axle will only be reduced .015 in. by grinding. As explained above, each .001 in. diameter costs about four cents, at which rate the value of the axle would be reduced 60 cents more by re-turning than by grinding.

LARGE TESTING MACHINE AT BUREAU OF STANDARDS.

A large 2,300,000 lb. Emery testing machine is now being erected at the Washington laboratory of the Bureau of Standards and some of the largest pieces have recently been put in place. These were manufacturd at the works of the Fore River Shipbuilding Company, of Quincy, Mass. The straining press, piston and cylinder head were assembled and forwarded in one piece, the shipping weight being 22½ tons. It was carried across the city on a heavy four-wheel truck drawn by 26 horses, and at the grade on Massachusetts avenue the number was increased to 30. The machine is being installed in the engineering building,

one of the new structures recently erected for the Bureau of Standards.

Some of the important dimensions of the machine are as follows: The main straining press has a diameter of 32 in. Its piston has a stem 22 in. in diameter, and a stroke of 60 in. The two screws connecting the power and the scale ends are 12 in. in diameter by 49 ft. 8 in. long, 30 ft. 8 in. of each being threaded. The pitch of the thread is 1½ in. and the depth ⅝ in. The finished weight of these screws is about 17,800 lbs. each. In the design of the machine one screw is located directly over the other, their axes being horizontal. This arrangement gives convenient access to all parts of the material under test, introducing a feature of great practical value. The center line of the machine is 44 in. above the laboratory floor. Hydraulic power will be used for operating the machines. A central power plant of three accumulators is being installed. The dead weights used aggregate about 200,000 lbs. Two 10-ton traveling cranes form a part of the equipment of the large machine and a 2-ton crane is provided for the smaller one.

SHOP KINKS; LAKE SHORE & MICHIGAN SOUTHERN.

BY A. G. PANCOST.
Draftsman, Elkhart, Ind.

DRIVING WHEEL TIRE CART.

Driving wheel tires are not only difficult to move about an erecting shop or engine house by hand, but often cause more or less serious accidents when handled in that way. A simple and convenient cart for handling these tires safely is shown in Fig. 1. While the tire is held in an upright position the cart is

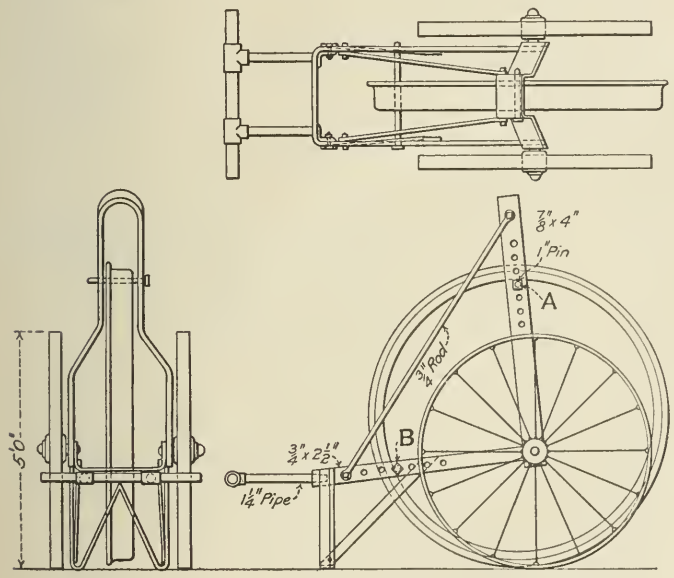


Fig. 1—Cart for Transporting Driving Wheel Tires.

pushed over it and the handle is lifted, thus lowering the upper part of the frame, and a bolt is placed under the tire at A. The handle is then lowered, lifting the tire from the floor and swinging it backward toward the handle. A second bolt B is then passed through the frame inside of the tire, which keeps it from swinging back and forth as it is being moved about.

PORTABLE GASOLINE HEATER.

A convenient portable gasoline heater is shown in Fig. 2. It consists of a 50 or 60-gal. tank, supported on a platform of ½ in. steel, 30 in. wide, and mounted on two pairs of wheels, the front pair being arranged to swivel so that the truck may easily be turned. The vaporized gasoline passes through the piece of ¼-in. pipe, 8 ft. long, into the burner, which is made by drilling several small holes in the side of a brass T and plugging the ends. The hose from the air line and the hose to the burner are each about 30 ft. long. The tank may easily be transported

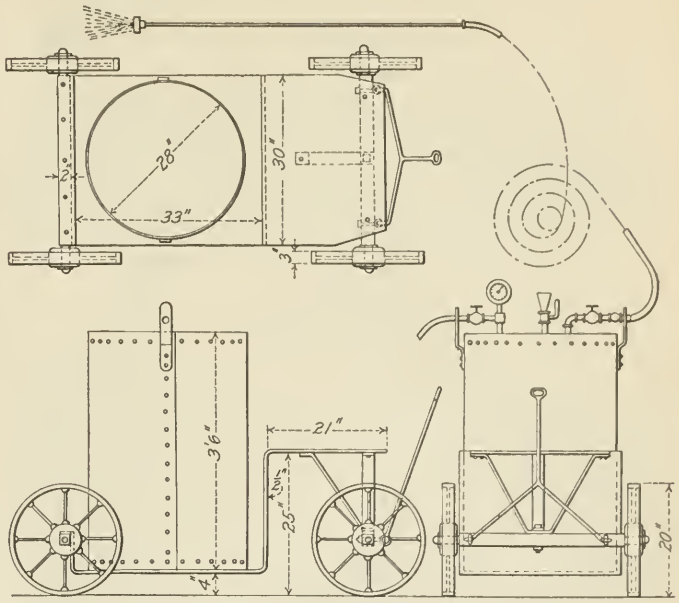


Fig. 2—Portable Gasoline Heater.

about the shop or be taken outside of the building for refilling when necessary.

PORTABLE LAMP STANDARD.

The patience of the workman is often tried when working underneath an engine or in a poorly lighted part of the shop with only an electric bulb attached to an extension cord, and no means of holding or adjusting it to get the light just where it is most needed. The upright or standard shown in Fig. 3 consists of a rod or pipe set in a cast iron base. Near the top of this rod a wrought iron strap is riveted fast, as shown. The two ends of the strap clamp the vertical adjusting rod by means

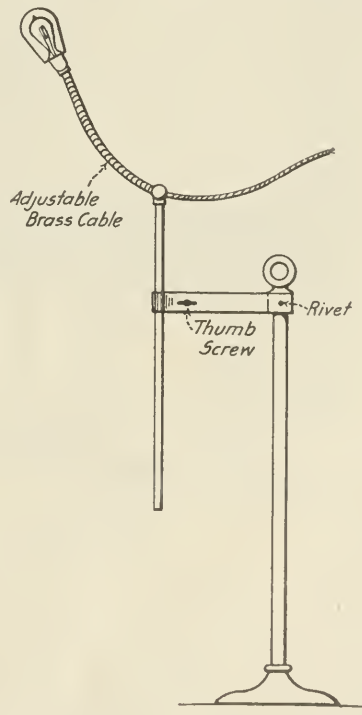


Fig. 3—Portable Lamp Standard.

of the thumb screw. The ball at the top of the adjusting rod, through which the electric wires pass, is connected to a flexible

or adjustable brass cable through which the wires go to the lamp. The lamp may be equipped with a reflector for intensifying the light and directing it where needed. One of these furnished to every repair pit would prove a great convenience.

WATER SHIELD ON TENDER.

Where track troughs are used, trouble often occurs on fast trains because of the breaking of the air hose connections at the rear of the tender, due to the force of the surplus water which does not enter the scoop but passes by and strikes the hose. In the winter much inconvenience and delay is often caused to trains

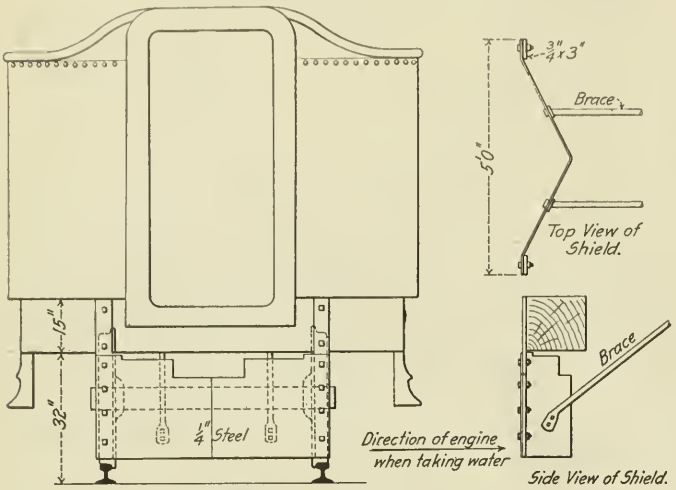


Fig. 4—Water Shield On Tender.

at terminals because of this surplus water freezing around the steam and air connections, making it necessary to use picks or hammers to break the ice away before the engine can be uncoupled. To overcome this difficulty, a sheet steel shield may be suspended from the rear of the tender and directly in front of these connections, as shown in detail in Fig. 4.

SETTING WALSCHAERT VALVE GEAR.

First measure the valves, valve seats and combination levers and see that they agree with the drawings. Place the main wheels on rollers and adjust the main rod to equalize the travel of the crosshead between the striking points. Assemble the parts of the valve gear, using temporary adjustable union links. Find the exact front and back dead centers of the main crank pin in the usual manner and mark them on the wheel with a tram from the frames. Mark the guides showing the travel of the crosshead. Place the engine on one dead center and with a convenient tram mark the guides, or some other stationary part, from the center of the front pin of the eccentric rod, as indicated by a

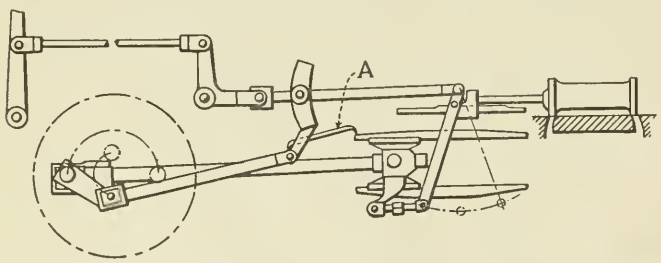


Fig. 5—Setting Walschaert Valve Gear.

tram A in Fig. 5; move the engine to the other center and repeat this operation. These marks should coincide; if they do not, move the eccentric crank on the main pin, so that the front end of the eccentric rod will move a distance equal to one-half the difference between the two marks. Try again and repeat until correct. To save time, the operations for finding the dead centers and the correct positions of the eccentric cranks may be performed at the same time. If it is found necessary to move an eccentric crank, it is advisable to use a temporary fastening and make it permanent after the valves are set.

Place the engine on either center and move the reverse lever to the extreme backward and forward positions, using a tram, as shown by B in Fig. 6, to mark the distance from the center of the front pin in the radius arm to a fixed point on the engine. If these two marks do not coincide, the eccentric must be adjusted an amount equal to half the distance between the tram marks, multiplied by the ratio of the link arm radius to that of the link block.

Disconnect the front end of the eccentric rod and place the link block in the exact center of the link. This point can be found by oscillating the link while placing the reverse lever in

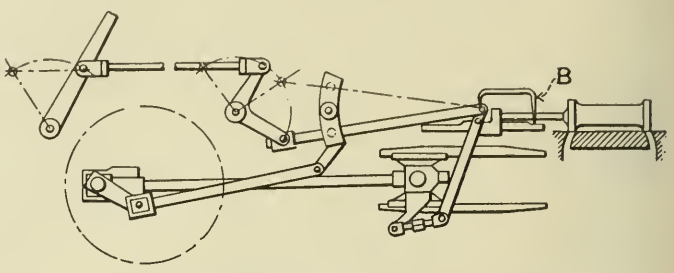


Fig. 6—Setting Walschaert Valve Gear.

different positions until a point is found where no motion is transmitted to the combination lever. The link blocks on both sides of the engine must be in the center of the links with the same position of the reverse lever; if not, adjustment must be made in the lifting device to bring this about. Get the port marks on the valve stem or other convenient part in the usual manner, showing the opening of the steam and the exhaust edges of the valves; also mark the point half way between these two marks.

Place the crosshead in the middle of its travel, and with straight

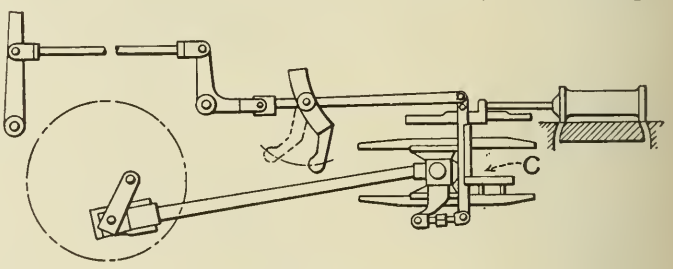


Fig. 7—Setting Walschaert Valve Gear.

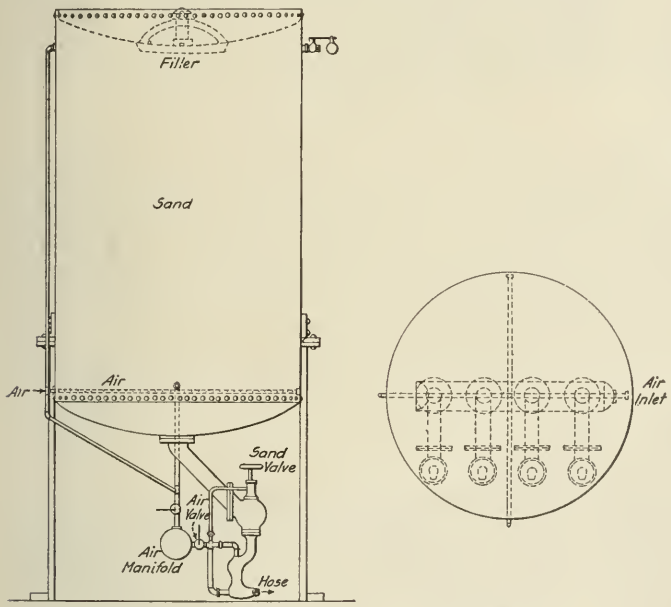
edges on the lower guides and a square, as shown at C, Fig. 7, adjust the temporary union link until a straight line through the center of the upper two holes in the combination lever is square with the guides. Tram the position of the valve; if it is not central with the ports, adjust the valve stem to make it so and move the port marks accordingly. To save time, only the port marks need be changed at this time and the valve stem can be adjusted later.

The valves should now be run over to find the different valve events. The lead should be equal at both ends and the same for all positions of the reverse lever. The port opening may be found to be greater at one end than at the other, causing the other events to be unequal; if so, adjust the union link to make the different events alike at both ends, or nearly so; this should not affect the lead to any extent. The valves may be considered correctly set when the cut off and the release in the forward gear at 25 per cent. cut off do not vary more than 1 in. between the extreme of the four positions; the temporary adjustments should now be made permanent. The three sketches, Figs. 5, 6 and 7, should be placed in the hands of all workmen interested in the setting of Walschaert valve gear, or where the workmen may easily refer to them.

SAND BLAST APPARATUS.

It is often desirable to use two or more sand blast nozzles at the same time, when cleaning steel cars and tenders for repainting and other purposes. These may be taken from individual sand tanks, or two or more nozzles may be supplied from a single outlet on one tank, the current of air and sand being subdivided by Y fittings. These methods are open to objections, because of the time required to refill the individual tanks, and, when Y's are used, the stopping of one nozzle means stopping the other as well, or of re-adjusting the flow of sand. To overcome these objections and provide a sand blast of large capacity, the Drucklieb multiple injector sand blast apparatus has been designed. It consists of a vertical cylindrical tank of boiler steel, with a concave head and a convex bottom, supported on substantial steel channel legs.

The tank is filled through a large inlet in the top, which is closed by a heavy cap that can be quickly removed and replaced.



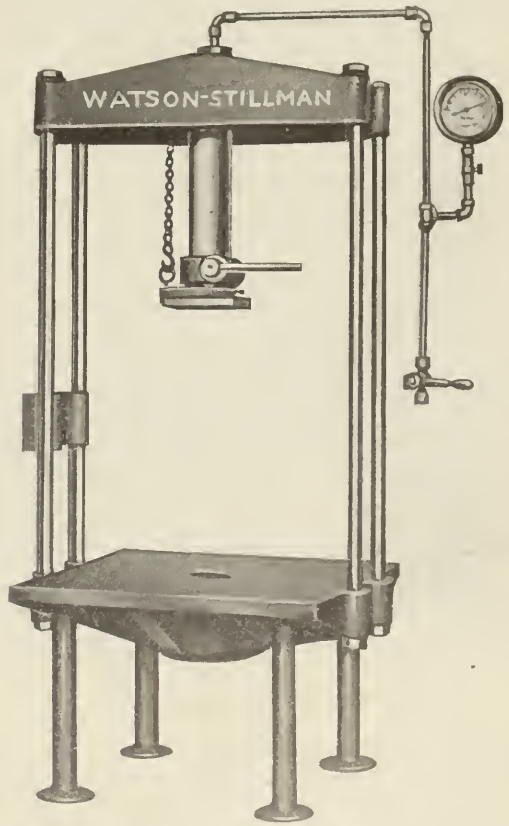
Multiple Injector Sand Blast Apparatus.

The tanks are made to hold 2,000, 4,000, 6,000 and 16,000 lbs. of sand, with one, two, three or four flanged outlets, as desired, riveted to the bottom. To these outlets are attached special sand pipes leading the sand by gravity by the Drucklieb injector sand blast apparatus, its flow being started, regulated and stopped by a special sand valve, so constructed that the pressure or crowding of the sand into the valve chamber cannot clog it. This valve has a central downward air jet, which causes the sand to flow evenly and regularly through the annular space between the valve and its seat. Below the sand valve chamber is a Drucklieb mixing chamber, in which the flowing sand is further mixed with air admitted through the mixing and forcing apertures, the full mixing being effected before the mixture reaches the delivery hose.

Compressed air is piped into a horizontal riveted steel manifold or air receiver placed below the sand tank; connections to each outlet are made to the three inlets of each mixing chamber, all being controlled by one lever handle, quick opening gate valve. A connection is also made from the manifold to the uper and lower part of the sand tank to balance the pressure therein, and insure the free flow of the sand. The manifold also acts as an air separator, and means are provided for carrying off any moisture. Each outlet has the usual complement of rubber hose, nozzle holder and steel nozzles. The several nozzles may be started together or one at a time, and may be regulated and stopped at will, without interfering with one another. The sand is regulated by the sand valve and the air by the gate valve, both of which are near the ground and convenient to the operator. The sand outlets may be located to suit conditions, but are usually in line, facing in one direction. They can, however, be made to face to any point of the circumference of the sand tank and may be attached to a closed tank of any required capacity from which the sand will flow. The capacity of the tank is large enough to insure a long period of operation without refilling; the regulation is close and economical, and the several sand blast jets are sharp and effective. The Drucklieb multiple injector sand blast is made and sold by J. M. Betton, 178 Washington street, New York, who a year ago assumed the sand blast business, established by C. Drucklieb in 1905.

HYDRAULIC PRESS.

The hydraulic press shown in the accompanying illustration is especially adapted for pressing in bearings and bushings, and for general machine shop work; it is made by the Watson-Stillman Company, New York. The platens are approximately 3 ft. square and 5 ft. apart, but these dimensions may be varied to suit requirements. A hole through the platen permits bearings or bushings to be forced out when desired. The weight shown at the left is a counterbalance for the ram which may be handled independently of the pump by means of a rack and pinion operated



30-Ton Hydraulic Press.

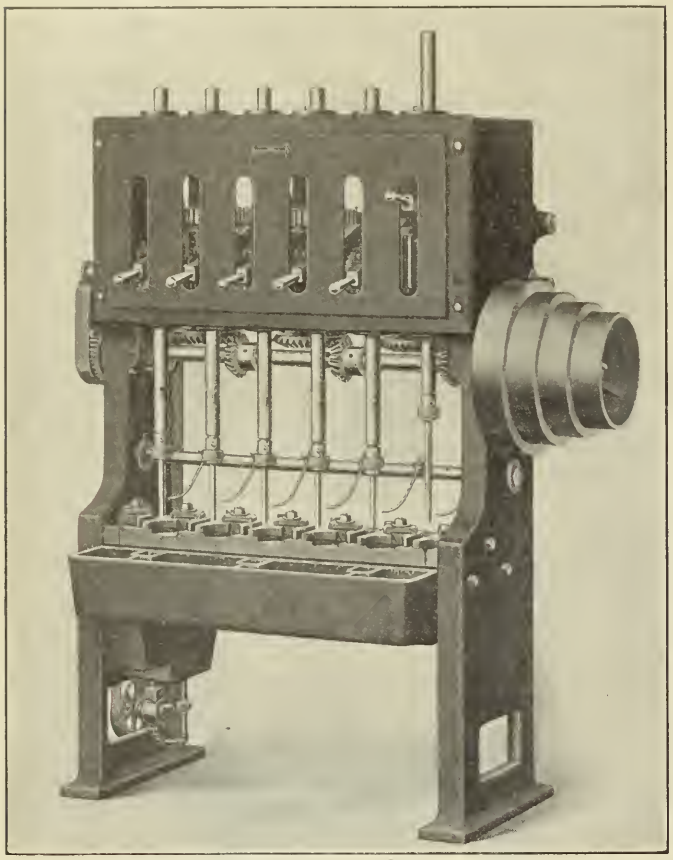
by a lever. This arrangement allows rapid manipulation of the press in adjusting it to the work.

The capacity of the press reaches its maximum of 30 tons under a hydraulic pressure of 6,250 lbs. per square inch, which may be produced by using either a hand or belt-driven pump attached to the pipe. The length of stroke of the ram is 18 in., and its diameter is 3½ in. The long stroke increases its range of the work and is the special feature of the press. The illustration gives the impression that the press is light for its capacity, but the platens are strongly ribbed and a high grade of material is used throughout. The press is supported from the floor by four legs, thus making it more convenient to work on.

SEMI-AUTOMATIC NUT TAPPING MACHINE.

A new design of a semi-automatic nut tapping machine, as shown in the accompanying illustration, is being made by the National Machinery Company, Tiffin, Ohio. Rough hot pressed nuts are tapped as readily as cold punched nuts, and the objections to the entirely automatic tapper, due to sticking, etc., are overcome. The spindles are raised and lowered automatically, and the operator, not having to manipulate a foot lever can increase the output from 60 to 80 per cent. above that of the ordinary foot lever machine. The number of revolutions of the tap spindles per raising and lowering may be varied to correspond to the number of threads on the tap. This eliminates the considerable amount of time which is lost by the tap running idle in the nut after it is tapped.

The variations in the revolutions of the tap spindles are secured through a single lever operating quick change speeds on the cam shaft. The raising and lowering of the tap spindles is accomplished by six three-step cams carried on a horizontal shaft in the rear of the spindle housing. These cams engage with hardened steel rolls carried in the spindle lever. The cam shaft shifts laterally so that the various cam shaft faces or steps may be engaged, and in this way the time the tap remains raised may be altered to meet the needs of the operator feeding the machine.

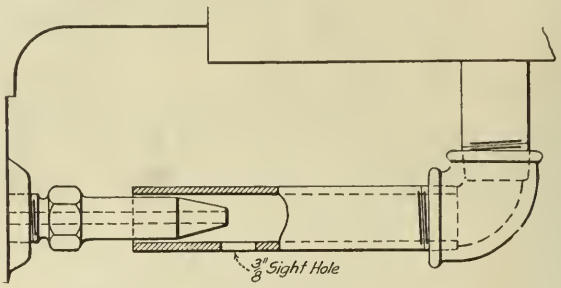


Semi-Automatic Nut Tapping Machine.

The life of the tap is somewhat longer than is generally the case with the foot lever taps, as the cam movement causes the tap to be lowered gradually and does not drop it into the hole with the weight of the spindle back of it, which causes broken taps and stripped threads. An automatic socket is provided which allows the tap to be removed or inserted while the machine is running and ejects the tap automatically when the shank becomes filled with tapped nuts. The machine is built with six spindles for 1 in. nuts, and with 10 spindles for 1½-in. nuts.

VERTICAL TURRET LATHE.

A vertical turret lathe which presents a practical solution of the problems in heavy lathe work has recently been placed on the market by the Bullard Machine Tool Company, Bridgeport, Conn. At first glance the machine has the appearance of a vertical boring mill, but, on closer inspection, the peculiar characteristics will be noted which give it the name of a vertical turret lathe; for although it may perform a certain number of boring-mill operations its chief service is that of a heavy duty lathe. The fact of its dual service gives the machine shown herewith the classification of the Maxi-Mill type.



Sight Feed for Lubrication System.

The vertical turret lathe was designed to meet the present and future demands for a machine of power, rigidity, continued accuracy, convenience of operation, safety of operator and low cost of maintenance. It is readily seen from the construction of the machine that all of the points have been comprehensively considered. The rigidity is apparent from the size of its body and the substantial construction of the carriage ways for both the cross and vertical heads, which have wide as well as long bearings, assuring permanency of alinement; its continued accuracy is a matter of its component parts which are carefully designed with this in view; the convenience of operation is only too evident when the labor of adjusting heavy work on the ordinary lathe is considered; the safety of the operator is provided by the arrangement of the controlling levers and feed adjustments at the side of the machine away from the rotating work, and also by the way in which the work is held; it rests directly on the table, thus eliminating the danger of falling out of the

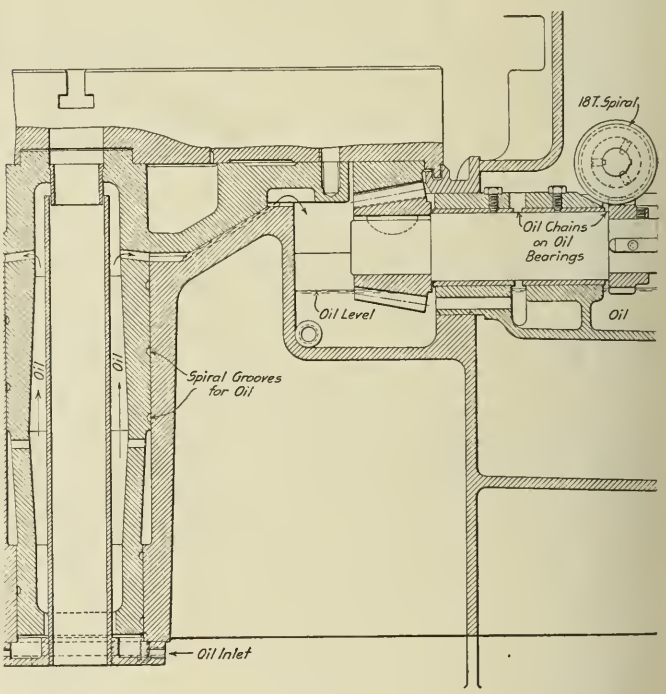
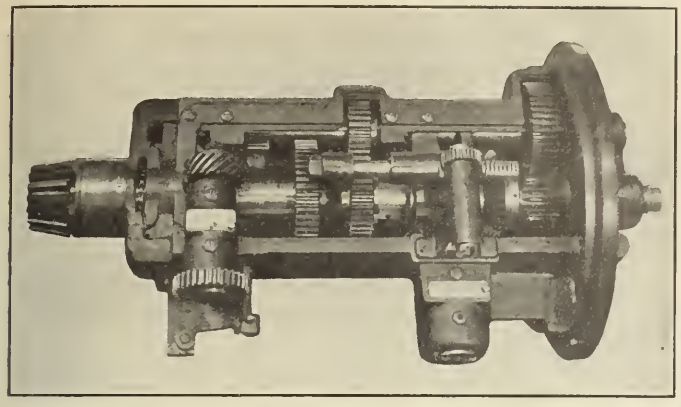


Table Spindle Showing System of Lubrication.

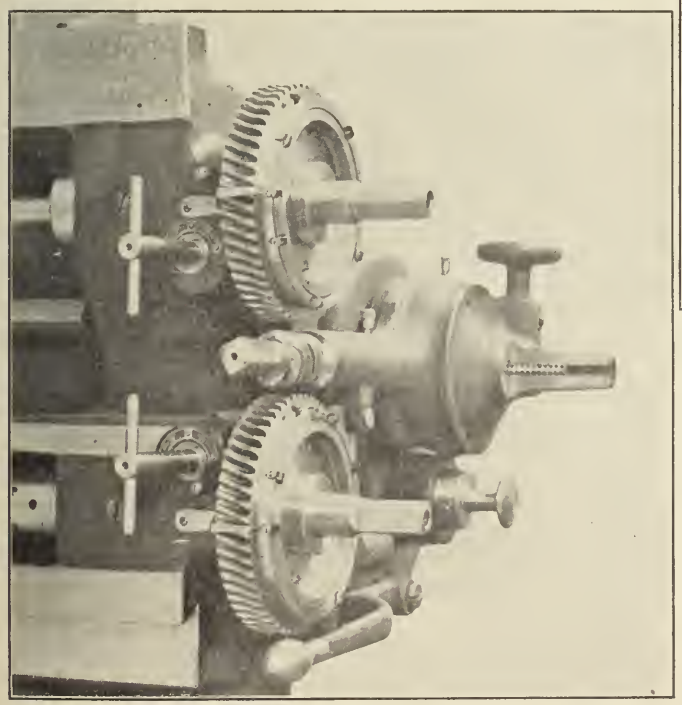
machine, as sometimes happens where the work is clamped to the face plate of the horizontal lathe.

The special features in the construction of the machine are in the speed control, the turret and the system of lubrication. The clutch and brake are both operated by the lever *E*, which engages one after disengaging the other. Any one of four pri-



Sliding Gears for Speed Changes.

mary speeds may be selectively engaged by means of another lever *F*, and secondary speeds are obtained by the lever *G*. The controling levers are positively interlocked in the casing *H*, and the clutch must be released and the brake engaged before a speed change can be made. Likewise, a complete engagement of the gears for any speed is necessary before the brake can be released and the clutch re-engaged. This interlocking provides a safe guard against breakage, due to careless handling, and does not materially interfere with the rapid change of speeds. The operating levers and handles are in a position convenient to the operator, which is conducive to a greater output. The turret on the machine illustrated is 16 in. in diameter; it has five faces

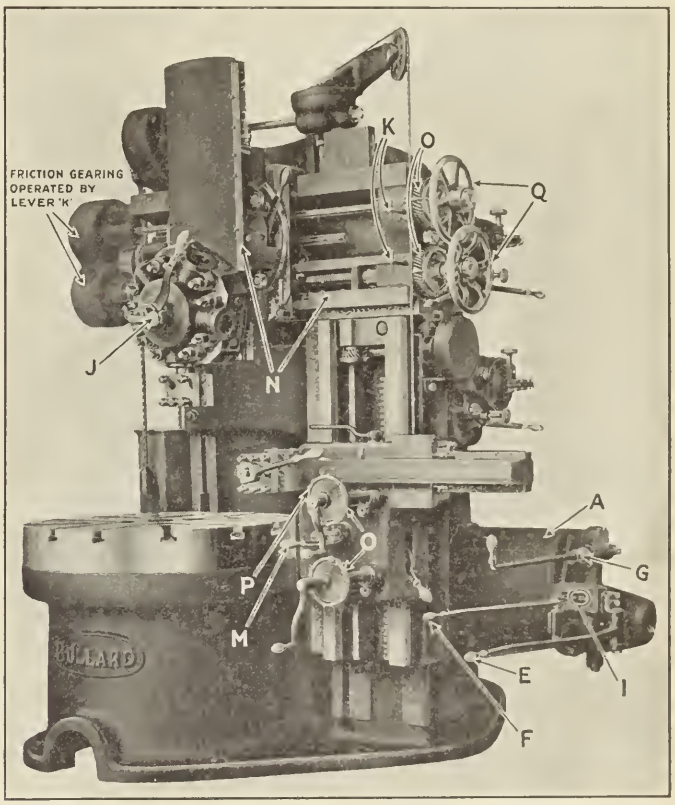


Feed Gears with Micrometer Dials and Observation Stops.

with tool holes 2¾ in. in diameter, in which are placed split steel bushings. Half-boxes, secured to the turret by two binder bolts, bear on the split steel bushings and securely hold the tool shanks. However, as no frictional binder is sufficient to resist the twisting of the tool under a heavy cut, a pin of large diameter is located at the inner end of the turret holes, which fits in a slot in the end of the tool and acts as its driver.

The lubrication is accomplished by means of a continuous flow system starting from the reservoir *R*, located at such a height as to insure sufficient head for the free flow of oil. The system has been carefully arranged, and it is claimed that the power efficiency is materially increased through the reduction of frictional loss in the gears and bearings, that the cost of maintenance is thereby decreased; that the productive time is increased since the oiling is automatically performed, and that the chances of burning bearings are greatly reduced.

The base of the machine forms an oil reservoir to which all of the oil is returned after passing through the various bearings and gear boxes. A submerged pump, geared to the main driving shaft, delivers the oil back to the reservoir, the excess oil being returned back to the base. The oil sights in the ducts are unique in that the free flow of oil is clearly indicated in two ways—by the size of the oil column passing the opening, shown in

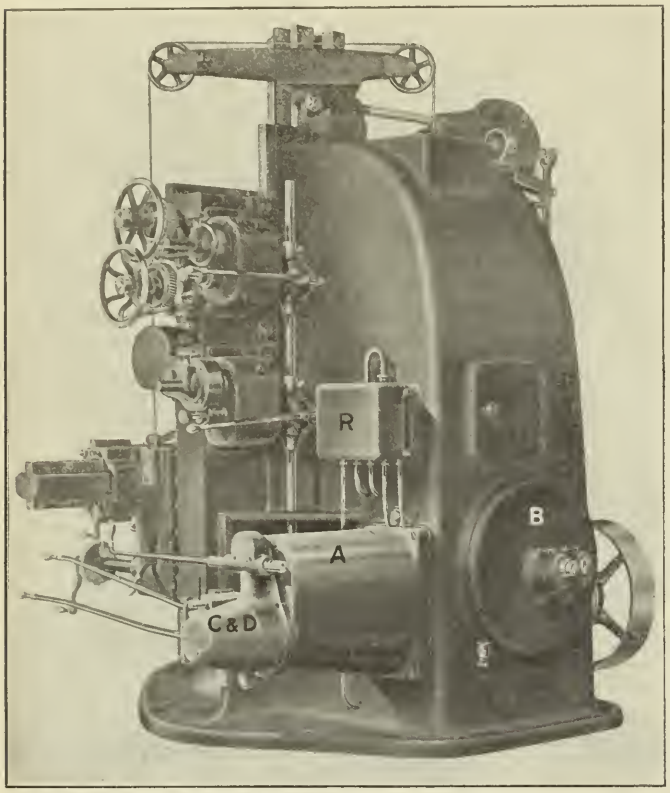


Maxi-Mill Type Vertical Lathe.

the sketch, if the pipe is clear, and by the overflowing at the opening if the pipe becomes plugged. The sketch of the table spindle and driving gears clearly shows the arrangement of the oiling system in those parts. The flow of oil to the bearings is regulated to .02 quarts per square inch per minute.

The machine illustrated will take work 44 in. in diameter and 32 in. in height under the cross-rail, the maximum distance from the table to the turret face being 43 in. The base and column are cast integral and are of box construction, internally braced. The table is 40½ in. in diameter and has parallel T-slots, as well as the ordinary radial slots. The table spindle is of the standard Bullard type, having an angular thrust bearing of large diameter. It is driven by bevel gears of special tooth form which have proved to be superior to the spur drive, giving smooth cuts and eliminating the chattering caused by the poor meshing of spur gear teeth. With the main driving pulley running at 360 r. p. m., the following 12 speeds are mechanically obtained: 3.1, 4, 5.5, 7.1, 11, 16, 20, 27, 34, 46 and 60 r. p. m. The number of table revolutions per minute may be read from the direct reading indicator, *I*, attached to the interlocking device.

The cross-rail has an exceptional width of face and bears on the full width of the column face. The side-rail has the form of an inverted L and is fastened to the column and bed by five binding bolts, so located as to give the greatest rigidity. Both the cross and side-rails form a unit having a vertical adjustment, by power, of 14 in. There is one head on each rail and the heads are independent of each other as regards the direction and amount of feed, being operated joinly on work of small diameter without interference. An absolutely accurate center stop is provided for the main head, which is so designed that it may be carried beyond the center 3 in. The swivel base of the main head has a diameter equal to the full width of saddle, and is secured by numerous binding bolts, which obviate the usual weakness of these parts. An angular adjustment up to 45 deg. on either side of the vertical is obtained by a sytsem of gearing. The turret slide has an exceptionally broad bearing on the swivel base and is provided with the narrow type of guide bearing, special provision being made for maintaining alinement with the



Vertical Turret Lathe.

center of the table. The vertical head may be rapidly moved in all directions by power, independent of the feed works or table drive, the handles *K* throwing them in and out of the mesh. Vertical and cross motion in either direction may be engaged singly or simultaneously, the operating mechanism for each being independent of the other. A safety device prevents damage resulting from careless handling.

The side head has a vertical movement of 28 in. and a horizontal movement of 21 in., the maximum distance from the table to the underside of the cross-slide being 25 in. A quick hand movement is provided in all directions, and also a means of making fine adjustments independent of the feed works. This head is provided with a four-faced turret tool holder in which 1½-in. x 1¼-in. tool steel may be used. The feeds for both heads are positive and independent of each other, having eight changes, ranging from 1/96 to ½ in. in all directions. The changes are obtained by turning a knurled wheel, located convenient to the operator, and the amount of feed per revolution is indicated on a direct reading index plate on each feed box. The feed is engaged and disengaged, or changed from vertical to cross feed on the main head by engaging the centrally located drop worm with the worm gears, *O*, on the end of the feed rod. These same operations for the side head are governed by a plunger operated by the lever, *M*, located in the side head saddle. The graduated scales and micrometer dials are provided with adjustable observation stops which bear numbers corresponding with those on the faces of the turrets and are invaluable in the duplication of various sizes.

Hand wheels *Q* are provided instead of crank handles for tool adjustments, thus eliminating the danger of the operator being hit when the rapid power feed is applied. The wheels are free to make a partial revolution on the sleeves before becoming engaged with them, which allows a hammer action, similar to the tapping of the hand on a crank handle and thus provides a means for fine adjustment. The thread cutting attachment for the vertical head is arranged for cutting 2, 3, 4, 5, 6, 8, 10, 11½, 12, 14 and 16 threads per inch, and will be supplied if desired. The mechanism is so arranged that the power rapid traverse may be used in returning the slide and the thread cutting feed may be again engaged without splitting the thread.

Alloy steel gears are used, with the single exception of the table gear, which is of such proportions that it cannot be successfully heat treated. A special alloy having the requisite wearing qualities in an unhardened state is, however, used in this gear. All the gearing is immersed in oil and the high speed journals are bronze bushed and self-oiling. Special attention has been given to the safety of the operator in designing the machine. The counterweights and gearing are entirely encased, the latter being readily accessible to the operator. If the machine is to be driven by belt, a driving pulley 24 in. in diameter is provided. A motor may be applied, however, and should be of 10 h. p., with a constant speed not exceeding 1,200 r.p.m. The machine being self contained, no expensive foundation is required, and the bolt holes in the base are for shipping purposes only. It weighs 18,500 lbs., and its projected floor area is 85 in. by 93 in.; its maximum height is 12½ in. from the floor.

The manner in which the railway development of Indo-China, Siam, and other portions of Southeast Asia is to be realized in the immediate future is apparent from the fact that a considerable portion of the loan now being negotiated by the government of Indo-China is to be used in the construction of a system of railways connecting French China with Siam, just as the railways to the north have been connecting that country with China proper and extending into China as far as Yunnanfu. The Indo-Chinese government purposes to build a railway from Battambang to Pnompenh. From Pnompenh connection is now made with My Toh by the Mekong river, a deep stream of easy navigation, and My Toh is already connected with Saigon by rail. Later the Pnompenh-My Toh section will also be joined by a railway, thus completing the line from Saigon to Battambang. The importance to Siam lies in the fact that from Battambang the railway will be extended up to the Siamese frontier at a point only about 75 miles distant from Patriew. Siam then may, if she desires, build this small connecting link from Patriew to the frontier and thus by a comparatively small sum of money reap the benefits of through rail connection with Saigon. This section of the line will pass along a level valley requiring no expensive or difficult engineering works. The mutual advantages to be gained from this railway are apparent. Saigon will have not only connection with Bangkok, but also with Singapore and Penang (for no doubt the branch line to Penang will be built), thus shortening by several days the mail and passenger route between Saigon and Paris. Bangkok will be on a fair way to become a great railway center. With trains arriving daily from Singapore and Penang on the southern line, from Upper Siam on her northern line, and from Saigon on her eastern line, it will have unrivaled opportunities for becoming one of the great ports of the East. Singapore and Penang will also benefit by the great influx of trade and increased traffic.

General News Section.

The Cleveland, Cincinnati, Chicago & St. Louis and the Vandalia have withdrawn from the Illinois and Iowa Demurrage Bureau.

A new hospital, built by the Southern Pacific Company, and costing $200,000, was dedicated at Houston, Tex., last Saturday. The building is of brick and masonry, three stories high, with a roof of terra cotta tiling.

The Order of Railway Conductors, at its convention in Jacksonville, Fla., last week, increased the pay of its officers, making the salary of the president $8,500; that of the senior vice-president and the general secretary $5,000 each; and those of the other vice-presidents $4,500 each.

A second conference will take place on June 6 between the officers of the railways in Kansas and the members of the Public Utilities Commission of that state to discuss the commission's plan for making a valuation of the roads and the information it has asked of them. The first conference was held on May 11.

Boiler makers and certain other shop men employed by the Southern Railway and its controlled companies, said to number 18,000 in all, after conferences with President Finley, say that they have the promise of an increase of pay amounting to two or three cents an hour. They had asked for five cents an hour and, according to the newspapers, had threatened to strike.

By an order issued by Judges Grosscup and Kohlsaat, at Chicago, to the clerk of the United States Circuit Court, all sleeping car rebate checks granted to patrons of the Pullman Company and the Great Northern Railway between July 12, 1910, and January 31, 1911, while cases involving rates of this company were pending, will be paid from the funds which were deposited with the court by these companies when the cases were tried.

The Wells, Fargo & Company Express has been formally notified by the state of Texas that unless it pays $24,000 in taxes levied against it in that state, proceedings will be instituted for the forfeiture of its charter to do business there. The company has offered the state $200 for a permit to continue to do business in the state, but refuses to pay the tax, on the ground that the fixing of that amount on its annual earnings in Texas is unconstitutional and unjust.

The Hudson & Manhattan, running trains between New York and Jersey City under the Hudson river, announces that by October 1 trains will be run through between New York and Newark, about 9 miles. The underground line is to be connected with the Pennsylvania, about one mile west of Jersey City, and the Pennsylvania tracks are to be used from that point to Manhattan Transfer, a mile east of Newark. From Manhattan Transfer an independent line will be used to reach a new station at Saybrook place, near Broad street, Newark.

The nineteenth annual report of the Texas railway commission shows that during the fiscal year ending June 30, 1910, payments for personal injuries by the railways in that state aggregated $2,360,293, or about 2.45 per cent. of the gross earnings of the roads. Of the 234 persons killed in 1909 eighty were employees, compared with 69 employees killed in 1910, while the number of persons employed increased from 57,909 in the former to 61,908 in the latter year. Although there was a decrease of 11.69 per cent. in the number of deaths and of 1.79 per cent. in the injuries, the amount paid for personal injuries was 7.76 per cent. greater in 1910 than in 1909.

In a race extending over four days, and participated in by three or more contestants, Pierre Vedrine last week flew from Paris, France, to Madrid, Spain, a distance of about 766 miles. Although stops were made, lengthening the time from start to finish, the actual time spent in motion was only 12 hours, 18 minutes, equal to more than 62 miles an hour. Vedrine won a prize of $20,000 offered by a Paris newspaper and one of $10,000 offered in Spain. In crossing the Guadarrama mountains Vedrine rose to a height of about 6,500 ft. and encountered dangerous whirlwinds; and at one time he was compelled to descend in order to avoid attacks of eagles.

The Business Men's League, of St. Louis, 800 strong, recently inspected the railway terminals of the city, the Terminal Railroad Association taking the visitors around on a special train. President McChesney, of the Terminal Railroad Association, told his guests that the heaviest month's business ever handled by the terminal was that for March, 1910, when 297,966 cars were interchanged by it, and that the heaviest day's business was on March 23, when it moved 10,567 cars. The passenger trains run to and from the union station in the year ending June 30, 1910, numbered 108,833, an average of 298 trains a day, the total being an increase over the preceding year of almost 7,600 trains. Number of passenger cars 521,266, an average of 1,538 a day.

Accident Record—Correction.

An officer of the Baltimore & Ohio writes: "I note on page 1214 of your issue of May 26, in the report of accidents, that on the Baltimore & Ohio, near Silver Run, April 27, a boiler of the engine of a passenger train exploded, killing two and injuring six. This accident was greatly exaggerated by the newspapers; the facts are that the right back parallel rod of the engine was broken while the train was running about 25 miles an hour; the broken rod knocked off the air drum and badly damaged the right side of the cab; the engineman received a severe cut under the chin and was slightly scalded on the head, but no other persons were injured."

Resignation of Colonel Dunn from the Army.

Lieutenant Colonel Beverly W. Dunn, after 32 years' service, has resigned his place in the army to devote his time wholly to the Bureau of Explosives. This resignation is due to the refusal of President Taft to reverse the action of the war department, which decided that Col. Dunn should not be permitted to retire with the pay allowed by law to retired officers who have served 30 years.

The duty Lieut.-Col. Dunn is performing as chief inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, has proved to be of unquestionable value to the general public in securing a maximum of safety in the transportation of dangerous articles upon railways and steamships. The extent of the protection needed is indicated by the fact that statistics show that, on an average, a railway passenger passes a car loaded with explosives every fifty miles of his journey. Recognition of this danger led the government in May, 1907, to detail Lieut.-Col. Dunn, then in the ordnance department, to take charge of the bureau; and this detail was renewed March 25, 1909. The expenses, amounting to over $100,000 a year, are paid by the members of the bureau (railway companies, steamship companies, express companies and manufacturers of explosives). Colonel Dunn's services are peculiarly valuable because, in order to be effective, the bureau must be so organized that its work can be continuous. New problems constantly arising can be properly met by close study of technical conditions followed by frequent conferences with all parties concerned. The work is at present in an acute situation, as the inspections made by the bureau have shown a constantly increasing number of articles to be so dangerous as to require that they be placed under its supervision as promptly as possible. The same native qualities which made Col. Dunn of value to the bureau, at the outset, also make him of value to the ordnance department, and the chief of that department has always been opposed to his present assignment. He was therefore subject to recall to the work of the ordnance department at any time. In this state of uncertainty the executive committee of the bureau, on February 7 last, endeavored to get the war department to permit Col. Dunn to retire, so that he could continue to perform the important duties for which he had been detailed without severing his official connection with the army. This application was refused and Col. Dunn was ordered to return to duty on June 1, 1911. Feeling from his knowledge and experience in the two fields of duty that the work of the chief inspector of the bureau of explosives was of much greater importance and usefulness to

the country than any future service in the ordnance department. Col. Dunn tendered his resignation from the army to take effect October 1, 1911. It has been accepted and according to custom, leave of absence allowed from June 1 to that date. He thus gives up $3,300 a year (retired officer's pay) in order to keep up without interruption his valuable service to the railways.

Pennsylvania Legislature.

The legislature of Pennsylvania, which adjourned on May 25, passed a Full Crew Bill, which is now in the hands of the governor. The bill requires a flagman and two brakemen on freight trains of over 30 cars; and on passenger trains consisting of over three passenger cars and a baggage car, a brakeman and a flagman. The same rule applies to mail and express trains of over four cars, and requires that on such trains the rear car shall have suitable heating apparatus.

The penalty for violation of this law is $100, but whether or not this would apply to a conductor, engineman or trainman is not clear. The principal sections of the law apply to any "railway company, its officers or agents . . . ." The penalty section reads "any railway company, its officers or agents, officers of the court, receiver, or any person or persons operating a railway violating, etc., . . . shall be guilty of a misdemeanor . . . ."

The bill for a public utilities commission, which was one of the governor's principal measures, was rejected. It was passed by the house by a very large majority, but in the senate it was defeated by a vote of 29 to 17; the main argument being that the committee had not had time to properly consider so important a bill. The governor hopes for a senate more in sympathy with his views at the next session, and has announced that he shall introduce his bill again at the convening of the new assembly in 1913.

An Employers' Liability Bill also passed the house by a large majority, but was killed in the senate. This bill was similar to that which has been passed in New Jersey, but went into great detail in describing the indemnities to be paid by employers to injured employees and the dependents of employees killed.

The Louisiana Health Train.

The Louisiana State Board of Health has been running a "health exhibit train" around the state, giving lectures and in other ways stimulating public opinion to demand purer food, better doctors and cleaner homes. From one of the announcements of a recent trip it appears that stops were made at prominent points on the St. Louis Southwestern, the Texas & Pacific and the Houston & Shreveport. The board of health has a car of its own and two other cars are furnished free by the management of the New Orleans & Northeastern. It appears that the special trains in all cases are hauled free by the railways. Dr. Oscar Dowling, of Shreveport, president of the board of health, gives us the following particulars of his enterprise:

The first "health train" was started November 5 last, from New Orleans for Shreveport. This train consisted of a 75-foot passenger coach with all the seats removed. In this coach there are arranged normal anatomical specimens and pathological specimens illustrating the effects of consumption. There is also a school exhibit, an oral dental hygiene exhibit and model sanitary closets; exhibits showing sanitary plumbing, a slaughter pen, a dairy, cooking apparatus, heating and ventilating systems, waste plant, and a vacuum cleaner; a department of pure food, and illustrations of the fly evil, with numerous charts. In each window of the car there is a transparent picture representing insanitary conditions as found by one of the state inspectors. There are exhibits furnished by the Anti-Tuberculosis League and the Russell Sage Foundation Fund.

The board carries two machines for illustrating lectures. In one of these moving pictures are shown illustrating "The Man Who Learned," "The Pesky Fly," "The Gymnastic Fly," and "The Red Seal." The other is devoted to subjects pertaining to general sanitation, the hookworm, etc.

In each town visited talks are given to the school children and to the public, special stress being laid on social hygiene. When the special train arrives at a town two of the force remain on the train to explain the exhibits; one goes to the schools, and two others make sanitary inspections of the dairies, markets, butcher pens, hotels, restaurants, bakeries, stores, court house, jail, and railway stations.

The state officers demand that all incorporated towns have city boards of health. Where a town is not thus organized the benefits to be derived by such an establishment are set forth.

This "health train" is to be taken to Los Angeles for the meeting of the American Medical Association, June 26. It will return via Omaha, Denver and Chicago.

Prizes to Stimulate Scientific Agriculture.

In line with the policy of the railways in the northwestern part of the United States and in Canada to arouse popular interest in the products of the American soil generally, and especially to interest farmers in the advantages of their own territory, several of the roads have offered prizes to be given in connection with the American Land and Irrigation Exposition, which will be held in New York City, November 3 to 12, next. A circular issued by the Northern Pacific outlines the purpose of the exposition and gives a list of the prizes offered.

Howard Elliott, president of the Northern Pacific, has assigned 160 acres of land, about 18 miles northwest of Terry, Mont., to be awarded by popular allotment at the exposition and also offers a prize of $500 in gold for the best 25 boxes of apples. James J. Hill, chairman of the Great Northern, offers a $1,000 prize silver cup for the best 100 lbs. of wheat grown in the United States in 1911. Sir Thomas G. Shaughnessy, president of the Canadian Pacific, offers $1,000 in gold for the best 100 lbs. of hard red, spring or winter wheat raised by any farmer in North or South America. A. J. Earling, president of the Chicago, Milwaukee & St. Paul, offers a $1,000 prize cup for the best 100 lbs. of white oats raised in the United States. A. E. Stilwell, president of the Kansas City, Mexico & Orient, offers a $1,000 cup for the best exhibit of late commercial potatoes grown in the United States in 1911.

Other prizes offered include a $1,000 cup by the International Harvester Company of America for the best corn grown in the United States; a $1,000 cup by the American Land & Irrigation Exposition, through a donation of Paul Ledyard Van Cleve, of the Sweet Grass Land & Cattle Co., of Montana, for the best alfalfa exhibit; a $1,000 cup by Horace Havemeyer for the best sugar beets; a $1,000 cup by Adolphus Busch for the best hops grown in the United States; a $1,500 cup by Col. Gustav Pabst for the best bushel of barley grown in the United States; and a $1,000 cup by Col. Robert M. Thompson for the best short-staple cotton. The circular referred to includes detailed information regarding the conditions under which the awards will be made.

A "Frisco" Line from Memphis to Baton Rouge.

The St. Louis & San Francisco has made a contract with the St. Louis Iron Mountain & Southern, by which the line of the Iron Mountain from Memphis, Tenn., southward to Baton Rouge, La., on the west side of the Mississippi, will be used as a joint line for the benefit of both companies. B. F. Yoakum, chairman of the board of directors of the St. Louis & San Francisco, says that under the contract the Iron Mountain will at once begin to improve this line, throughout its entire length of 380 miles, by laying 85-lb. rails and ballasting the track with broken stone. This line will make a direct connection between the Birmingham line of the Frisco which runs from northwest to southeast through Memphis, and its line between New Orleans, La., and Houston, Tex., which runs through Baton Rouge.

The terms of the contract provide that it shall run 90 years, during which time the St. Louis & San Francisco will use the tracks of the Iron Mountain and Texas & Pacific between Memphis and Baton Rouge, La., 380 miles. (Texas & Pacific about 100 miles of territory, to Baton Rouge.) After this track has all been relaid with 85-pound rail, the cost to the owners will be in round numbers $15,000,000. On this investment the Frisco will pay an amount equal to 2¼ per cent. per annum or approximately $337,500; and will share the maintenance on a car mileage basis after the standard rail has been laid. No new equipment has been ordered and the Frisco contemplates only the purchase of 15 or 20 steel passenger cars in the near future. Frisco had surveyed a route close to the west bank of the Mississippi parallel to this route, and, it is said, would have begun its construction had not a change come in Missouri Pacific management.

The Illinois Railway Law.

The law recently passed by the legislature of Illinois to stiffen the railway law of the state and increase the power of the Board of Railroad & Warehouse Commissioners may be comprehensively described by saying that it gives to the commissioners powers quite similar to those exercised by the Interstate Commerce Commission in federal matters. Fourteen sections of the old law are amended and retained, and seventeen new sections are added.

The chairman of the commission is to receive a salary of $6,000; each of the other commissioners $4,000; the secretary $3,500; and the commissioners may appoint other necessary employees. Passenger and freight tariffs may be filed with the commission as soon as issued. The commissioners are to investigate accidents not only when persons are killed or injured, but also in case of injury to property; and if they see fit they may make complete reports of accidents to the governor. In the examination of railway records the commissioners and other agents are to have the right to enter any car office, etc., during business hours to examine the books and affairs of the company.

Section 20, which is the first new section, gives the commission jurisdiction over all common carriers within the state, including express companies, steamboat lines, private line companies, etc. Street railways are excluded; but what to do with a road that is part street and part something else is not indicated. The term "railroad" includes bridges, power stations, terminal facilities, etc.

Section 24 makes it the duty of every common carrier to provide and furnish transportation at reasonable rates upon an order made by the commission; an order first having been given.

Section 25 is copied from section 4 of the Federal law on the Long and Short Haul section.

Section 26 requires every common carrier to furnish all reasonable, proper and equal facilities.

By section 27 the commission is empowered to establish through rates and joint classifications, but to make a through rate the commission must have found that it is necessary for the accommodation of the public and that it will not give to one carrier an unfair advantage over another. The shipper shall have the right to route his freight. The commission is empowered to make rates for demurrage, etc.; to compel physical connection and to establish switching limits and switching rates; but a car transfer from one road to another over an intermediate road shall not come within the term "switching."

Section 30 empowers the commission to inquire into the management of all common carriers, and it may make and enforce orders to secure the safety and accommodation of the public.

Section 32. After due hearing the commission must make a schedule of reasonable maximum rates for each common carrier. The commissioners may revise tariffs which they have issued. Any common carrier unlawfully neglecting or refusing to obey an order of the commission shall be liable to a fine of $500.

Section 35. Any aggrieved party may appeal to the circuit court of San Gamon county within 20 days.

Transportation and Car Accounting Officers.

The regular summer meeting of the Association of Transportation and Car Accounting Officers, which will be held at the Hotel Cape May, Cape May City, N. J., June 20-21, will be opened at 10 a. m. on Tuesday, June 20. G. P. Conard, 24 Park place, New York, is secretary.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

Beginning June 4, the Rock Island Line will run between Chicago and Colorado points an additional fast train, leaving Chicago daily at 6 p. m. and arriving in Denver early the following evening; eastbound it will leave Denver daily at 3.45 p. m. and arrive in Chicago early the next evening.

In accordance with announcements previously made, through passenger service from Chicago to Puget Sound over the Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound was inaugurated on May 28, the all-steel train, "The Olympian," leaving Chicago for the coast at 10.15 p. m., and "The Columbian" leaving Seattle for Chicago at the same time.

Sixty-five members of the wholesale merchants' board of the Chamber of Commerce of Cleveland, Ohio, last week made a trip by special train to advertise their business in 25 towns in western Pennsylvania, including Butler, Oil City and Ridgway. These three are the only places at which the train stopped over night. Other stops varied from 30 minutes to 2 hours.

It is announced that the reduced freight rates which the Delaware & Hudson and the Erie have advertised from New York to the West by way of Albany, are to be met by the New York Central, which will arrange for a boat line on the Hudson river to take freight at the lower rates, presumably the same as those offered by the Erie, the boats to deliver the freight to the New York Central at Albany.

Four hundred members of the Indiana Trade Association, Indianapolis, will visit thirty southern Indiana towns on June 19, 20 and 21, to boom their business. The party will be made up of manufacturers and jobbers and will travel on a special train made up by the Pennsylvania, consisting of six compartment sleepers, two diners and a combination baggage and day coach. All meals will be served on the train. Night meetings will be held at cities where the boomers make their longest stops. L. W. Cooper is president and LeRoy Snyder, secretary.

In the Federal Court at Boston, May 26, a number of prominent milk contractors were indicted by the grand jury for engaging in a combination in undue restraint of trade and commerce; and the New York, New Haven & Hartford Railroad Company was at the same time indicted for giving illegal rates. The shipments of milk, on which are based the charges of illegal transportation rates, were made at Willimantic, Conn., and the milk was destined to Dorchester, Mass., which is a part of Boston. The Elm Farm Milk Company is also indicted for receiving the rebates. The tariff prescribed a rate, per car load, for cars of 840 cans, and it is charged that for this particular shipper the company repeatedly carried a much larger number of cans in a car for the same price.

Traffic Club of New York.

The last meeting of the Traffic Club of New York was held at the Waldorf-Astoria on May 31. Gerrit Fort, passenger traffic manager of the Union Pacific, addressed the meeting, taking for his subject, Come West, Old Man, Come West. Robert A. Bartlett, captain of Peary's ship on the trip to the Pole, delivered a new illustrated lecture on Hunting Big Game in the Arctic.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in submitting the accompanying figures showing consolidations of statistical bulletins for the calendar year 1910, and for convenience in comparison, the compilations for previous yearly periods, says:

"It is interesting to note the similarity in the performance for the years 1907 and 1910, the latter being the first year since 1907 when traffic conditions were such as to make the yearly comparisons of any value. The principal averages are shown in the following table:

	1910.	1907.	Percent Inc.	Percent Dec.
Cars owned per mile of road	9.57	9.18	4.25	....
Percent home cars on line	58.0	58.0	....	....
Percent loaded mileage	70.0	70.3	....	.43
Miles per car per day	23.7	24.0	....	1.25
Tons per loaded car	21.6	20.3	6.40	....
Ton miles per car per day	360	331	8.76	....
Earnings per car per day	$2.41	$2.45	....	1.63

"There was an increase of 4.25 per cent. in the number of cars owned per mile of road, and this, in connection with the fact that there was a larger surplus equipment in 1910 than in 1907, should be kept in mind in comparing the "per car" averages.

"The distribution of cars by groups shows quite a difference in conditions in 1910 from those obtaining in 1907. In the former year the roads showing an excess of cars in use over the number owned were principally in New England and in the West and Southwest. In 1910 the New England roads used very few cars more than their total ownership. This is due partly to a large increase in cars owned, partly to lighter traffic, and partly to equal interchange arrangements that enabled the distributing roads to relieve themselves of the excess of equipment that naturally results from the character of their traffic.

"The Pacific coast roads used fewer than their ownership, while the roads in group 6, comprising the lines in the West and Northwest, reported a considerable excess used throughout the year. It is also to be noted that the roads of the Southeast which were borrowers of cars up to and including 1907, have so materially added to their equipment that they are now creditor roads.

"For the purpose of analyzing the ownership and use of equipment as between the various sections of the country, together with the tonnage handled, the following table covering the years 1905 and 1910 has been prepared. The comparisons are expressed in percentages of the grand totals of the various items. With the exception of the 'ton miles of freight handled,' which item is taken from the Interstate Commerce Commission reports, the averages used are from the consolidated bulletins:

	Groups I-II-III-IV-V		Groups VI-VII-VIII-IX-X		Groups I-II-III	
	1910.	1905.	1910.	1905.	1910.	1905.
Mileage operated by reporting roads (percent of grand total)	40.48	42.49	51.49	48.79	23.86	26.40
Freight cars owned (percent of grand total)	62.88	62.03	32.24	33.76	46.52	48,09
Railroad cars on line (percent of grand total)	61.52	61.33	33.85	34.54	45.99	48.07
*Tons freight handled one mile (I. C. C. reports) (percent of grand total)	61.68	63.03	38.33	36.97	48.62	50.39

	Groups IV-V		Group VI		Group IX	
	1910.	1905.	1910.	1905.	1910.	1905.
Mileage operated by reporting roads (percent of grand total)	16.98	16.09	24.52	27.01	3.70	2.35
Freight cars owned (percent of grand total)	16.36	13.94	17.87	20.08	1.16	1.02
Railroad cars on line (percent of grand total)	15.53	13.26	19.29	20.03	1.38	1.07
*Tons freight handled one mile (I. C. C. reports) (percent of grand total)	13.06	12.64	18.38	18.34	3.27	2.91

*I. C. C. figures are for fiscal years ending June 30.

"It will be noted that in 1905 the roads in groups 1 to 5 (inclusive) including the territory east of the Ohio and Mississippi rivers and the states of Indiana, Ohio and Michigan, while operating 42 per cent. of the mileage reported, owned 62 per cent. and used 61.33 per cent. of all cars in service, and handled 63.03 per cent. of the total tonnage in the country. In 1910 this group of roads operated 40.84 per cent. of the mileage, owned 62.88 per cent., and used 61.52 per cent. of the cars, and handled only 61.68 per cent. of the tonnage. The increase in the per cent. of cars used was slightly less than the increase in per cent. of cars owned. An examination of the totals for groups 1, 2 and 3 and groups 4 and 5 discloses the fact that the decreases in per cent. of mileage and in tons handled were in groups 1, 2 and 3, while in groups 4 and 5 the percentage of mileage, cars owned, cars used and ton miles handled all show some increase, although the increase in the tons handled is not so great as the other items. Groups 6 to 10, inclusive, show increases in the per cent. of mileage owned and in the tonnage handled, but report decreases in the per cent. of cars owned and cars used. Group 6, which includes the largest car owners in this territory, shows a decrease in the percentage of cars owned and in mileage operated. There is also a slight decrease in the per cent. of cars used and a slight increase in the per cent. of ton miles handled. Group 9, which has apparently always been under equipped, shows an increase in the per cent. of cars owned, but somewhat greater increase in the per cent. of cars used. The per cent. of mileage operated and the per cent. of tonnage handled in this group both show increases."

FREIGHT CAR BALANCE AND PERFORMANCE.

YEAR 1905. Groups.	Roads Reporting. No.	Roads Reporting. Mileage Operated.	No. Revenue Freight Cars Owned.	Percent Ry. Cars on Line. Home.	Percent Ry. Cars on Line. Foreign.	Percent Ry. Cars on Line. Total.	Excess on Line Over Number Owned.	Percent Cars in Shop.	Av. Cars on Line Per Frt. Engine Owned.	Av. Miles Per Car Per Day.	Percent of Loaded Mileage.	Average Ton Miles. Per Car.	Average Ton Miles. Per Loaded Car.	Average Ton Miles. Per Car Per Day.	Average Daily Earnings. Per Car Owned.	Average Daily Earnings. Per Ry. Car on Line.	Average Daily Earnings. All Cars on Line.
*1	6	4,695	33,709	63	92	155	18,550			18.8					$3.45	$2.22	$2.14
2	18	21,978	441,227	66	30	96	.....			22.5					2.30	2.39	2.18
3	23	24,569	291,302	54	42	96	.....			24.8					2.06	2.14	2.01
4	9	14,437	83,611	67	37	104	3,062			23.8					2.26	2.18	2.12
5	15	16,829	138,432	61	27	88	.....			26.7					2.14	2.42	2.33
6	21	52,453	320,052	76	23	99	.....			26.9					2.50	2.55	2.46
7	2	3,287	15,204	58	76	134	4,197			32.3					5.37	4.05	3.62
8	11	14,927	96,393	63	33	96	.....			22.4					2.26	2.37	2.23
9	7	4,573	16,323	69	34	103	484			23.1					2.78	2.70	2.40
10	12	19,570	90,259	66	43	109	8,763			54.0					8.07	7.35	6.30
11	4	14,284	62,719	75	22	97	.....			31.6					2.68	2.78	2.50
12	2	2,649	4,313	80	22	102	127			21.0					7.71	7.51	7.40
Grand Total	131	194,251	1,593,544	66	33	99	.....			24.8					$2.47	$2.50	$2.34
YEAR 1906.																	
*1	8	7,124	53,760	67	80	147	24,289			18.9					$3.47	$2.30	$2.15
2	28	24,110	511,258	63	31	94	.....			23.9					2.30	2.48	2.28
3	28	23,660	332,785	50	42	92	.....			24.0					2.11	2.24	2.11
4	11	15,597	105,824	64	46	110	10,672			20.3					2.21	2.13	1.95
5	19	17,672	145,536	58	35	93	.....			26.0					2.31	2.54	2.43
6	26	53,068	337,317	67	30	97	.....			25.7					2.63	2.68	2.58
7	3	3,248	15,596	40	59	99	.....			47.4					5.69	5.70	5.53
8	15	20,974	110,672	57	36	93	.....			24.7					2.38	2.62	2.28
9	12	6,701	19,642	67	63	130	6,026			28.1					4.15	3.34	2.93
10	15	21,301	97,012	59	58	107	7,049			31.1					4.19	3.96	3.58
11	5	10,392	60,231	64	25	89	.....			31.4					2.39	2.70	2.55
12	5	3,511	7,441	85	28	113	866			25.8					....	....	....
Grand Total	175	207,358	1,797,074	61	37	98	.....			25.0					$2.53	$2.61	$2.44
YEAR 1907.																	
*1	6	5,569	47,187	63	80	143	29,494	2.78	102	17.2	73.7	10.5	13.8	183	$2.85	$2.16	$2.00
2	24	31,248	620,102	58	36	94	.....	5.13	69	24.2	67.8	15.4	23.1	375	2.39	2.54	2.34
3	25	18,659	305,154	53	36	89	.....	6.14	74	22.9	68.2	16.1	23.6	370	1.99	2.25	2.12
4	12	17,639	129,757	58	45	103	4,506	7.59	63	18.5	69.9	12.9	18.5	239	2.06	2.00	1.95
5	19	17,524	156,255	53	38	91	.....	4.58	67	24.5	71.6	14.3	17.8	323	2.26	2.48	2.37
6	21	53,956	361,658	66	31	97	.....	4.57	59	25.3	73.5	13.5	19.2	337	2.57	2.70	2.57
7	3	3,315	16,001	32	90	122	3,565	5.20	52	40.7	71.7	13.2	20.7	545	6.15	5.03	4.78
8	15	22,089	129,112	54	38	92	.....	7.93	54	23.4	71.0	12.3	17.5	289	2.65	2.87	2.73
9	12	7,358	22,247	53	104	157	12,776	4.81	69	23.9	67.8	10.8	15.9	259	4.42	2.79	2.63
10	18	21,993	105,467	59	63	122	23,425	5.64	64	27.4	70.2	12.9	18.4	353	4.52	3.74	3.48
11	5	13,289	77,045	63	34	97	.....	5.84	51	27.5	76.7	12.4	16.2	339	2.45	2.52	2.40
12	4	2,652	7,041	94	27	121	1,447	4.61	65	25.7	70.1	10.7	15.4	265	4.04	3.36	3.34
Grand Total	164	215,291	1,977,026	58	40	98	.....	5.47	65	24.0	70.3	14.2	20.3	331	$2.53	$2.61	$2.45
YEAR 1908.																	
*1	6	6,503	70,706	77	35	112	8,532	6.84	73	15.7	70.4	10.2	14.5	160	$2.14	$1.91	$1.85
2	26	34,675	664,379	72	23	95	.....	8.64	68	21.2	64.9	14.8	22.9	315	1.93	2.03	1.91
3	22	16,699	279,346	78	23	101	4,360	8.95	79	17.7	63.9	14.7	23.1	269	1.54	1.53	1.45
4	11	19,643	134,315	72	21	93	.....	8.55	57	19.3	66.1	12.9	19.4	248	1.72	1.86	1.82
5	19	18,638	171,287	72	22	94	.....	9.09	66	20.8	68.1	13.4	17.9	278	1.84	1.97	1.89
6	19	54,467	370,352	80	21	101	2,069	5.83	61	21.6	72.2	13.3	18.9	280	2.07	2.08	1.94
7	2	3,533	15,761	40	66	106	969	6.03	41	40.3	71.5	14.6	20.5	618	5.60	5.25	4.85
8	15	21,915	138,006	74	24	98	.....	14.60	57	19.2	67.6	13.0	19.5	249	2.19	2.22	2.11
9	12	7,669	26,165	60	70	130	7,971	5.93	54	24.0	65.6	11.4	17.3	277	3.77	2.86	2.68
10	21	23,133	113,049	57	37	94	.....	6.74	49	27.8	69.4	14.3	20.6	398	3.62	3.84	3.55
11	4	16,246	97,913	79	17	96	.....	7.71	47	24.6	73.4	13.1	17.8	320	2.08	2.18	2.09
Grand Total	157	220,521	2,081,279	74	24	98	.....	8.39	63	21.0	67.6	13.9	20.7	294	$2.06	$2.10	$1.99
YEAR 1909.																	
*1	6	6,471	74,755	71	41	112	8,600	5.57	77	16.4	72.2	10.4	14.4	169	$2.32	$2.08	$2.00
2	24	33,037	660,651	67	29	96	.....	6.64	68	23.3	66.9	15.5	23.1	360	2.19	2.29	2.15
3	20	15,104	228,893	72	28	100	.....	6.87	78	20.3	67.8	15.8	23.3	331	1.82	1.84	1.77
4	10	17,637	146,631	66	25	91	.....	8.06	54	23.0	67.3	14.5	21.6	334	2.02	2.21	2.17
5	17	18,782	173,583	67	25	92	.....	8.91	64	22.3	71.9	13.8	18.4	309	2.00	2.18	2.10
6	18	54,455	365,762	77	27	104	13,731	5.90	64	22.8	72.3	13.6	19.2	303	2.31	2.24	2.14
7	2	3,548	16,630	42	75	117	2,888	4.66	47	37.8	76.1	15.7	20.5	603	5.92	5.04	4.66
8	14	22,019	132,545	68	33	101	1,479	13.04	56	20.9	70.7	13.9	20.0	293	2.64	2.61	2.47
9	11	7,868	26,628	54	81	135	9,246	5.59	53	26.0	67.5	11.5	17.1	298	4.11	3.03	2.85
10	21	23,565	115,586	56	41	97	.....	5.74	52	29.0	71.3	14.5	20.3	419	3.95	4.08	3.81
11	4	15,949	99,119	76	19	95	.....	9.40	47	26.4	75.0	13.6	18.1	360	2.35	2.46	2.38
Grand Total	147	219,045	2,058,450	69	30	99	.....	7.13	63	23.0	69.6	14.6	21.0	335	$2.34	$2.38	$2.26
YEAR 1910.																	
*1	6	6,287	76,082	51	53	104	2,729	4.56	74	16.8	74.1	11.2	15.1	187	$2.36	$2.27	$2.19
2	24	32,279	692,089	56	41	97	.....	5.48	70	23.5	67.9	16.1	23.8	379	2.28	2.36	2.23
3	19	14,195	215,535	57	45	102	4,014	7.33	81	21.9	69.3	16.0	23.1	352	2.07	2.03	1.94
4	11	18,812	173,554	55	36	91	.....	6.58	53	24.6	67.1	15.8	23.6	389	2.15	2.37	2.32
5	19	18,699	172,240	50	35	85	.....	8.07	60	25.9	72.5	14.5	18.9	372	2.18	2.54	2.44
6	18	54,202	378,038	69	42	111	41,658	5.37	71	22.0	74.1	13.9	19.8	302	2.56	2.30	2.22
7	3	3,911	17,317	36	80	116	2,733	4.78	46	40.2	70.1	15.7	21.2	666	6.78	5.86	5.37
8	13	22,354	133,760	57	42	99	.....	9.11	57	22.2	70.0	14.3	20.8	318	2.72	2.74	2.59
9	12	8,168	24,516	65	78	143	10,500	5.34	58	26.4	67.5	12.0	17.6	317	4.08	2.93	2.74
10	19	25,152	128,203	49	46	95	.....	5.58	53	29.9	71.2	14.9	21.9	447	4.14	4.39	4.09
11	5	16,963	103,057	66	29	95	.....	6.08	46	27.5	77.9	14.4	18.4	395	2.69	2.77	2.69
Grand Total	149	221,022	2,114,391	58	41	99	.....	6.11	65	23.7	70.0	15.1	21.6	360	$2.51	$2.53	$2.41

*(1) New England. (2) N. Y., N. J., Del., Md., Eastern Pa. (3) Ohio, Ind., Mich., Western Pa. (4) Vt., W. Va., N. C., S. C. (5) Ky., Tenn., Ga., Ala., Miss. (6) Ia., Ill., Wis., Minn., Dakotas. (7) Mont., Wyo., Neb., Dakotas. (8) Mo., Ark., Kans., Colo., etc. (9) Texas, Louisiana, New Mexico. (10) Ore., Idaho, Nev., Cal., Arizona. (11) Canadian Lines. (12) Mexican Lines.

INTERSTATE COMMERCE COMMISSION.

Reparation Denied.

Anaconda Copper Mining Co. v. Chicago & Erie et al., and eight other cases. Opinion by Commissioner Meyer.

Former action not modified. (21 I. C. C., 40.)

Carter White Lead Co. v. Norfolk & Western et al. Opinion by Commissioner Clark.

Following the decision in *Stowe-Fuller Co. v. Pennsylvania Company*, 12 I. C. C., 115, maintenance rates on coke, based on the use to which coke is put, are condemned. Following the *Anaconda Copper Mining Co.* case, 21 I. C. C., 40, reparation is denied on shipments of coke to Omaha; and following the *Metropolitan Paving Brick Co.* case, 17 I. C. C., 197, reparation is denied on shipments of coke to Chicago. (21 I. C. C., 41.)

Raymond B. Scudder v. Texas & Pacific et al. Opinion by the commission:

Where two cars are shipped under one bill of lading, the car-

rier cannot compel the consignee to accept one car until the arrival of the second, and therefore cannot assess demurrage charges until it tenders the equipment required for the entire shipment covered by the bill of lading. In this case, however, complainant accepted two bills of lading for shipping two cars of sugar; therefore, the rule allowing a rate for a carload applying on the entire lot, although it may be less than two or more full carload lots, did not apply in this case. (21 I. C. C., 60.)

Complaint Dismissed.

Northwestern Leather Company v. Oregon Railroad & Navigation Company et al. Opinion by the commission:

Rates of $1.30 per 100 lbs. on dry hides and $1 per 100 lbs. on green hides, from San Francisco, Cal., and Los Angeles, to Manistique, Mich., and Sault Ste. Marie, not found to be unreasonable. (21 I. C. C. 66.)

Wright Wire Co. et al. v. Pittsburgh & Lake Erie et al. Opinion by the commission:

Rate of $3.40 per ton on iron and steel rods from Struthers, Ohio, to Palmer, Mass., and Worcester, as compared with rate of $3 from Monessen, Pa., for a longer haul over the same line in the same direction, not found to constitute a violation of section 4 of the act as it existed prior to June 18, 1910. (21 I. C. C. 64.)

Reparation Awarded.

Mountain Ice Company et al. v. Delaware, Lackawanna & Western et al. Opinion by Commissioner Prouty:

The complainants ask reparation in certain shipments of ice. The serious question in these cases is the application of the statute of limitations, and the first branch of that question, did the filing of these complaints interrupt the running of the statute?

The averments in the original complaints herein cannot be construed as the filing of claims for reparation; but the supplemental complaints, when taken in connection with the original complaints, constitute filing of claims for reparation, within the sixteenth section, sufficient to interrupt the running of the two-year period.

A complainant should state seasonably and with sufficient definiteness whether he will claim reparation, so that the commission and the defendants may be advised of the nature of the claim; but every rule of convenience and of justice requires that, having made this statement in those general terms, the matter may be held in abeyance until the main question has been decided and the parties know whether any reparation will be awarded, and if so, on what basis.

In all shipments made by the Mountain Ice Company, except those to a particular consignee, that company and not the consignee is entitled to reparation, as the ice was sold for a delivered price, and by the terms of contract of sale the freight money was to be paid by the ice company. *Nicola, Stone & Myers Co. case,* 14 I. C. C. 199. In the other cases reparation should be awarded to the consignees. (21 I. C. C. 45.)

Advanced Rates on Grain Justified.

In re the investigation of advanced rates by carriers on grain, grain products, etc. Opinion by Commissioner Clark.

These investigations were instituted by the commission under the provisions of section 15 and involve the propriety of advances in rates on wheat and coarse grain from North Dakota and South Dakota producing points to primary grain markets, such as Minneapolis, Duluth, Milwaukee, Chicago, Omaha and points taking the same rates. The C. M. & St. P., and the Chicago & North Western bore the principal burden of the defense. The proposed advances would give the Milwaukee a total increase in revenues derived from wheat of $125,764, or an average increase of 1.519 cents per 100 lbs., and on coarse grains a total of $113,834, or 1.492 cents per 100 lbs. Many of the same arguments used in the western advance rate case were used by the roads, but they also claimed that there were peculiar circumstances which differentiated this case from the western case. The commission did not attach much weight to the complications showing that neither North Dakota nor South Dakota grain contributes its proper proportion to the payment of interest and dividends. Fundamentally this statement proceeds on what the commission considered to be an erroneous theory; that is, that certain portions of the system of a railway can be segregated from the whole and the expenses and earnings be charged and credited to such portions on a mileage pro rata basis.

Here is a somewhat peculiar situation and one which perhaps differs from that in any other section of the country. The traffic from that portion of South Dakota which is involved is mainly grain. It goes to the great grain markets, Minneapolis, Chicago, Duluth and Omaha. Minneapolis and Duluth are premium wheat markets to the extent of from three to seven cents per hundred pounds, and this naturally, like a magnet, draws to them the greater volume of the grain. Within reasonable limits the amount of the rate is not so material to Minneapolis and Duluth so long as the present adjustment to Minneapolis, Duluth and Chicago is maintained. The lack of through tonnage in South Dakota affects the volume of traffic, increases the average train load, increases operating expenses, and is therefore reflected in net earnings. Canadian competition on the north holds down the North Dakota rates and is reflected to some extent in South Dakota, but South Dakota appears to contend that the full force of that competition should be accorded to South Dakota.

It has never been the view of the commission that the prosperity of a shipper, a locality or a state was a reasonable excuse for the imposition of rates conditioned on such prosperity; but when coincident with very substantial reductions in rates, the price of the commodity has nearly doubled in value and claims for loss and damage have materially increased, two of the essential factors of a reasonable rate, value and risk, have been changed in favor of the carriers' contention that the proposed advances should be allowed.

The commission is of the opinion that the carriers have sustained the burden of proof which the statute imposes on them, and that, with certain exceptions, the proposed advances to Minneapolis, Duluth, Milwaukee and Chicago are not unreasonable. The details of a general rate adjustment like this are many and they involve features of direct and cross-country competition with which the traffic officers of the defendants are more familiar than is the commission. Acting in a spirit of cordial co-operation, they probably can work out tariffs that will be more satisfactory all around than an adjustment prescribed in detail by the commission would be.

The proposed advances, however, to Omaha are unreasonable, and the commission fixes rates somewhat lower than the present rates. (21 I. C. C., 22.)

STATE COMMISSIONS.

The California State Railroad Commission has issued a formal order forbidding the sale of reduced rate tickets to students of schools and colleges, on interurban and steam railways; effective June 1. (Does not apply to city trolley lines.)

COURT NEWS.

Judgments aggregating $1,350 have been rendered against the Chicago, Indianapolis & Louisville by Judge Anderson in the Federal Court at Indianapolis, on complaints of having violated the Federal law against keeping telegraph operators on duty for more than nine hours consecutively. The complaints charged forty violations of the law. A penalty of $200 on the first paragraph of each action was imposed, and a penalty of $25 on each of the other offenses charged.

The Supreme Court of Indiana has sustained the Marion Superior Court in its decision approving an order of the State Railroad Commission, fixing a charge of $3 a car for switching freight at Bloomington. Claim had been made that rates for switching ought to be fixed on a tonnage basis and certain traders had complained that the charges at Bloomington were exorbitant. The railway company, the Chicago, Indianapolis & Louisville, had attacked the validity of the law creating the commission, arguing that the legislature, contrary to the constitution, had conferred judicial powers on the commission.

In the Federal Court at Philadelphia, May 25, a suit by the government against the Philadelphia & Reading to determine whether freight passing through this country is subject to rates prescribed by the Interstate Commerce Commission, was decided

in favor of the railway. The government contended that the railway company had agreed with a firm in Hamburg, Germany, to transport beet sugar from the initial point to its destination for a through rate of 50 cents per 100 lbs. The cargo arrived in Philadelphia and was then shipped to its destination in Canada, at an inland charge of 55 cents per 100 lbs. At the time, the published inland rate was $1.32 per 100 lbs. The prosecution hinged on the question whether the initial point of transportation was Philadelphia or in Germany. If the starting point was in this jurisdiction, then, according to the government, there had been a violation of the interstate commerce law, as the charge of the railroad was lower than the published rates. Counsel for the railway company denied this contention, and was upheld by the court, which decided that the starting point was in Germany.

The Supreme Court of the United States has sustained the hours of service law for railway employees passed by Congress in 1907. The decision was announced by Justice Hughes, in the suit instituted by the Baltimore & Ohio. The court was unanimous. Justice Hughes said that the words of the statute were plain that only interstate carriers and persons engaged in interstate commerce were affected by the statute. Because the interstate employees sometimes engage in intrastate business did not defeat the law. As to the authority of the commission to issue the order putting the law into effect, the justice said that the entire question of authority had been settled by legislation in 1910. The justice found no other objection to the order or to the law itself. The Baltimore & Ohio attacked the law as unconstitutional on the ground that it applied to intrastate as well as interstate railways and employees. The road alleged that Congress could not and did not attempt to delegate to the commission the power to require reports of violation of the law; and that the labor and expense necessary to make the reports constituted a taking of the road's property without due process of law, and therefore in violation of the Constitution; also that it compelled self-incrimination by officers and employees in violation of the Constitution. This decision affirms that of the Circuit Court for the District of Maryland.

The Commerce Court, at Washington, May 25, heard the case of the Norfolk & Western, et al., vs. The United States; concerning freight rates from Roanoke to Winston-Salem, from Lynchburg to Durham, and from Cincinnati to Winston-Salem and Durham. The hearing on the application for temporary injunction was completed and the application was taken under advisement. A hearing was given also in the case of the Atchison, Topeka & Santa Fe et al., vs. United States; known as the "Pre-icing case," a suit to set aside an order of Interstate Commerce Commission reducing from $30 to $7.50 per car the charge for refrigeration of citrous fruits where such fruits are pre-cooled and pre-iced by the shipper. Mr. Lamb concluded his argument for the interveners and Mr. Robert Dunlap concluded for the petitioner. The case was taken under advisement.

On May 26 the court took up the case of the Omaha & Council Bluffs Street Railway Co., and the Omaha & Council Bluffs Railway & Bridge Co., vs. Interstate Commerce Commission; involving an order of the Commission dated November 27, 1909, reducing from fifteen cents to ten cents per passenger the fare between Council Bluffs, Ia., and Omaha, Neb. An order temporarily restaining the commission from enforcing its order was granted by the United States Circuit Court for the District of Nebraska in April, 1910. The case was heard on the demurrer of the Interstate Commerce Commission and the motion of the United States to dissolve the restraining order and injunction issued by the circuit court. The case was taken under advisement by the court. At the close of the arguments in this case the court adjourned until the first Monday in October.

In the Federal court at New Orleans, May 17, F. M. Durselin and C. H. George were convicted of conspiracy to defraud, and of using the mails for frudulent purposes, in connection with shipments of lumber to Germany. As announced in the newspapers the charge was that the defendants shipped lumber of one grade and forwarded bills of lading calling for a higher grade; but from a correspondent who is acquainted with the facts we learn that to class this as a "bill-of-lading fraud" would be an error. The facts in the case are these: the shippers, Durselin & George, bought a number of cars of lumber from various lumber mills and consigned the freight to themselves at New Orleans. The railway companies in billing the cars simply showed them to contain pine lumber. After the cars had reached New Orleans, Durselin & George sold them to Laurao Petersen, of Hamburg, Germany. The lumber was shipped from New Orleans by vessel and was billed to order, notify Petersen, at Hamburg. The ocean bill of lading issued by the steamship company described the shipments as pitch pine lumber, whereas the specifications which accompanied the invoice and bill-of-lading described the lumber as heart rift pitch pine flooring and heart face pitch pine flooring. There was considerable difference between this description and the lumber which was actually shipped; so that in fact, the shippers received one-third more money from the consignee at Hamburg than what the lumber was really worth. The failure of consignee to wait until the freight was received before paying the draft is explained by the statement that he had full confidence in the shippers. A steamship will frequently issue a bill-of-lading for a certain consignment, and hand it to the shipper, who in turn mails it at once to consignee. It is carried by the U. S. mail to New York and thence by steamer to Germany, and arrives at destination perhaps a week ahead of the goods. Shipments are frequently shut out by one steamer and taken by another steamer of the same line at a later date. Petersen had done considerable business with this firm for two years prior to this transaction and had never had any occasion to question the quality of the goods shipped; so, in this case, he did not wait until the shipment arrived, but immediately took up the draft. When the shipment reached destination, the lumber did not come up to specifications and invoice and the matter was taken up by him with the shippers. They made no reply to his communication, and finally he came to America and made a demand for his money. It appears that the shippers were in financial straits about that time and could not make restitution and the matter was placed in the hands of the Federal authorities, who had the men indicted and tried, and they were sentenced to one year in the Federal penitentiary at Atlanta, Ga.

American Tobacco Company Ordered Dissolved.

The Supreme court of the United States on Monday last issued a decision, similar to that of two weeks earlier in the case of the Standard Oil Company, holding the American Tobacco Company to be an illegal monopoly and combination in restraint of trade. The decision, like the former one, was by Chief Justice White, and the court was unanimous; but Mr. Justice Harlan dissented, as before, from the reasoning of the majority in regard to the application of the "rule of reason" to the interpretation of the Anti-Trust law. Justice Harlan especially condemns the delegation to the lower court of discretion to ascertain whether new conditions cannot be created, in harmony with the law. The decision differs from that in the Standard Oil case in that the disintegration of the trust must be carried out under the direction of the lower court, the acts of the several constituent tobacco companies to be reported to the court for approval. For this work a period of six months is allowed, this to be extended to eight months if the court shall find such extension necessary. On this point the decision says:

" . . . That the court below, in order to give effective force to our decree in this regard, be directed to hear the parties, by evidence or otherwise, as it may be deemed proper, for the purpose of ascertaining and determining upon some plan or method of dissolving the combination and of recreating out of the elements now composing it a new condition which shall be honestly in harmony with and not repugnant to the law.

"That for the accomplishment of these purposes, taking in view the difficulty of the situation, a period of six months is allowed from the receipt of our mandate, with leave, however, in the event, in the judgment of the court below, the necessities of the situation require, to extend such period to a further time, not to exceed sixty days.

"That in the event, before the expiration of the period thus fixed, a condition of disintegration in harmony with the law is not brought out, either as the consequence of the action of the court in determining an issue of the subject, or in accepting a plan agreed upon, it shall be the duty of the court, either by way of an injunction restraining the movement of the products of the combination in the channels of interstate or foreign commerce, or by the appointment of a receiver, to give effect to the requirements of the statute. . . ."

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1911. (SEE ALSO ISSUES MAY 12 AND 19.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$98,539	$33,622	$143,359	$24,705	$22,184	$4,332	$49,096	$6,130	$106,447	$36,912	$219	$4,681	$32,450	—$10,257
Ann Arbor	301	113,104	32,575	154,799	12,577	23,425	4,109	56,860	6,782	103,753	51,046	—2,535	14,265	34,246	—2,957
Arizona Eastern	364[1]	103,131	34,479	145,729	61,009	12,065	1,851	37,079	2,869	114,873	30,856	25	6,943	23,938	—78,943
Atlantic & St. Lawrence	167	105,901	23,121	142,889	14,625	22,823	4,719	79,342	3,885	125,394	17,495	.....	8,452	9,043	—21,503
Buffalo & Susquehanna *R. R.*	265	160,792	8,441	174,653	27,991	32,012	1,606	66,328	6,115	134,052	40,601	.....	2,600	38,001	—
Buffalo & Susquehanna *Ry.*	91	35,288	6,759	44,102	5,390	30,164	442	20,806	2,123	58,925	—14,823	31	1,400	—16,192	—
Carolina, Clinchfield & Ohio	236[2]	135,238	10,212	148,300	13,090	18,559	6,151	31,201	8,125	77,126	71,174	.....	5,500	65,674	28,485
Carolina, Clinchfield & Ohio of S. C.	18	8,789	1,386	10,308	670	77	886	2,072	490	4,195	6,113	.....	200	5,913	—
Charleston & Western Carolina	341	156,414	25,252	190,709	29,842	21,004	2,993	63,414	4,162	121,415	69,294	.....	4,475	64,819	95
Chicago, Peoria & St. Louis	255	117,996	20,709	145,166	18,070	30,590	7,114	63,928	6,420	126,122	19,044	.....	4,500	14,544	—7,381
Colorado Midland	338	97,033	19,647	125,506	21,918	34,322	5,440	66,478	5,179	133,337	—7,891	—1,101	8,500	—17,432	—22,785
Detroit, Grand Haven & Milwaukee	190	116,913	34,174	170,779	16,872	30,345	7,056	98,337	4,613	157,223	13,556	—34	3,009	10,513	—46,578
Detroit, Toledo & Ironton	441	96,080	11,075	123,465	30,341	5,588	2,605	63,306	5,995	107,835	15,630	.....	6,712	8,918	9,106
Duluth & Iron Range	191[3]	131,675	29,117	170,370	45,951	43,943	556	80,037	10,932	181,419	—11,049	—4,348	6,717	—22,114	41,692
Duluth, Missabe & Northern	316[4]	91,994	37,775	134,489	72,807	83,055	1,983	85,847	11,818	255,510	—121,021	—1,770	5,478	—128,269	—48,150
Georgia Southern & Florida	395	123,175	61,991	209,997	21,317	39,870	5,799	83,841	8,684	159,511	50,486	.....	9,157	41,329	14,768
Grand Trunk Western	347[5]	395,589	113,546	542,316	54,996	90,308	18,756	243,078	12,302	419,440	122,876	—1,632	31,697	89,547	—58,974
Gulf & Ship Island	307	136,142	29,393	176,580	23,068	30,483	1,258	51,565	8,369	114,743	61,837	.....	5,165	56,672	—8,066
Louisiana & Arkansas	255	113,459	14,359	132,508	19,451	17,735	2,193	34,779	4,649	78,807	53,701	.....	2,825	50,876	2,006
Louisiana Ry. & Nav. Co	350	107,987	18,027	134,243	19,077	20,060	4,747	53,445	5,853	103,182	31,061	.....	4,400	26,661	—295
Louisiana Western	207	117,607	59,520	185,386	17,952	23,190	6,859	55,420	7,561	110,982	74,404	749	6,577	68,576	28,970
Midland Valley	324	78,301	36,291	121,408	21,511	18,657	2,430	34,841	6,413	83,852	37,556	2,757	5,475	34,838	—16,228
Kansas City, Mexico & Orient	740	109,526	29,077	146,598	32,405	34,300	8,315	71,623	7,964	154,607	—8,009	.....	6,750	—14,759	—17,073
Minneapolis, St. Paul & S. S. Marie	3,764[6]	1,258,165	347,877	1,718,857	181,818	268,079	51,859	709,361	44,376	1,255,493	463,364	—2,952	96,373	364,039	—357,193
New Orleans Great Northern	282	114,999	28,514	154,313	22,955	20,810	3,097	47,317	6,773	100,952	53,361	—66	1,890	51,405	—1,163
Northwestern Pacific	376	90,499	108,330	221,277	51,781	46,880	3,173	95,445	9,678	206,957	14,320	.....	12,700	1,620	—24,553
Northern Central	469	859,809	168,682	1,081,368	162,512	192,240	14,060	516,801	28,702	914,315	167,053	103	36,740	130,416	—23,713
St. Joseph & Grand Island	319	92,156	34,018	137,575	21,013	21,952	6,392	60,195	6,735	116,287	21,288	61	5,711	15,638	57,145
San Antonio & Aransas Pass	727	178,016	72,599	269,537	88,231	49,192	5,129	131,151	11,297	285,000	—15,463	.....	11,000	—26,463	—72,017
Santa Fe, Prescott & Phoenix	364[7]	97,602	37,506	148,716	25,506	16,990	2,863	39,135	5,857	90,351	58,366	.....	103	58,262	—3,104
Tennessee Central	294	99,152	27,237	132,708	19,189	12,592	5,406	42,623	8,166	87,976	44,732	.....	3,980	40,752	26,352
Texas & New Orleans	458	239,817	90,286	348,906	64,636	69,285	7,748	131,830	10,354	283,853	65,053	1,125	12,257	53,921	—24,721
Trinity & Brazos Valley	463	96,687	29,433	131,628	27,917	24,260	9,052	74,073	11,008	146,310	—14,682	.....	3,500	—18,182	—16,763
Vicksburg, Shreveport & Pacific	171	68,023	37,440	118,492	22,858	20,287	2,939	37,876	4,665	88,625	29,867	—132	6,418	23,317	4,560
Western Maryland	543	493,452	58,329	575,701	55,695	69,024	7,338	189,527	13,083	334,667	241,034	39	21,000	220,073	—66,578
Western Ry. of Alabama	133	73,735	36,849	120,553	30,193	18,187	5,239	34,232	7,846	95,697	24,856	—117	4,339	20,400	—9,088
NINE MONTHS OF FISCAL YEAR, 1911.															
Alabama & Vicksburg	143	$887,553	$378,852	$1,368,913	$185,673	$225,946	$33,973	$459,246	$49,004	$953,842	$415,071	$411	$42,107	$373,375	—$1,500
Ann Arbor	301	1,007,466	371,768	1,471,069	177,189	182,521	35,679	503,901	65,057	964,347	506,722	—1,557	125,996	379,169	50,871
Arizona Eastern	364[1]	853,408	297,978	1,231,999	284,980	110,736	17,292	342,328	34,501	789,837	442,162	—54	55,819	386,289	—101,019
Atlantic & St. Lawrence	167	732,397	222,996	1,054,242	208,999	199,744	37,884	550,712	30,663	1,028,002	26,240	.....	76,071	—49,831	—282,969
Buffalo & Susquehanna *R. R.*	265	1,122,950	73,461	1,247,266	239,616	244,754	15,337	457,459	48,837	1,005,003	241,263	.....	21,471	219,792	—
Buffalo & Susquehanna *Ry.*	91	416,453	85,960	524,814	61,873	258,281	6,661	221,249	25,570	574,034	—49,219	29	14,529	—63,719	—
Carolina, Clinchfield & Ohio	236[2]	1,098,560	119,307	1,251,409	118,680	172,447	50,087	274,374	74,798	690,386	561,023	1,983	49,500	513,506	266,139
Carolina, Clinchfield & Ohio of S. C.	18	62,059	13,387	77,640	5,488	664	8,327	20,572	4,818	39,869	37,771	.....	1,800	35,971	—
Charleston & Western Carolina	341	1,139,927	275,303	1,480,690	260,321	171,061	28,016	493,133	34,768	987,299	493,391	.....	40,275	453,116	128,472
Chicago, Peoria & St. Louis	255	1,052,317	235,565	1,352,653	198,410	288,500	65,352	612,128	53,001	1,217,391	135,262	.....	40,500	94,762	—138,882
Colorado Midland	338	1,077,081	254,420	1,500,040	197,957	325,800	45,126	664,968	50,390	1,284,241	215,799	—5,005	74,882	135,912	—114,542
Detroit, Grand Haven & Milwaukee	190	902,084	419,173	1,531,522	207,663	203,408	57,928	778,479	41,060	1,288,538	242,984	—340	27,081	215,563	—187,851
Detroit, Toledo & Ironton	441	1,175,073	126,399	1,419,548	289,484	205,544	24,953	754,744	51,103	1,325,828	93,720	—73	60,408	33,239	11,117
Duluth & Iron Range	191[3]	5,212,014	237,541	5,536,170	579,560	502,881	4,383	1,249,864	115,518	2,452,206	3,083,964	3,132	270,069	2,817,027	—1,143,120
Duluth, Missabe & Northern	316[4]	7,454,961	358,310	7,870,356	883,622	841,179	15,382	1,281,956	130,214	3,152,353	4,718,603	45,744	394,747	4,369,000	—1,560,056
Georgia Southern & Florida	395	1,004,549	605,575	1,847,912	198,211	371,238	54,265	691,139	80,713	1,395,566	452,346	.....	84,475	367,871	—2,705
Grand Trunk Western	347[5]	2,948,881	1,427,379	4,681,168	462,495	691,533	163,892	2,025,339	116,836	3,460,095	1,221,073	—11,172	285,276	924,625	—277,168
Gulf & Ship Island	307	1,108,400	311,632	1,524,856	188,817	266,413	14,503	436,327	71,665	977,725	547,131	.....	44,924	502,207	50,810
Louisiana & Arkansas	255	910,993	143,379	1,095,932	173,479	150,810	21,791	292,365	40,478	678,923	417,009	.....	24,275	392,784	49,309
Louisiana Ry. & Nav. Co	350	989,021	180,965	1,278,512	217,211	157,091	44,275	524,347	55,020	997,944	280,568	.....	39,600	240,968	73,505
Louisiana Western	207	1,013,650	505,836	1,593,634	202,395	223,275	57,196	471,424	67,846	1,022,136	571,498	800	63,103	509,195	—17,878
Midland Valley	324	639,069	308,700	1,005,512	183,110	154,788	19,845	292,893	63,773	714,409	291,103	11,488	49,280	253,311	—22,481
Kansas City, Mexico & Orient	740	1,052,086	327,607	1,460,709	287,053	298,422	70,523	668,470	70,470	1,394,938	65,771	.....	45,612	20,159	—61,578
Minneapolis, St. Paul & S. S. Marie	3,764[6]	11,651,880	3,719,584	16,442,908	1,681,006	2,346,754	393,047	6,191,362	371,641	10,983,810	5,459,098	86,857	904,165	4,641,790	—2,471,961
New Orleans Great Northern	282	885,872	279,437	1,270,066	188,793	175,388	27,653	364,479	47,198	803,511	466,555	—824	17,510	448,221	63,565
Northwestern Pacific	376	1,052,841	1,246,842	2,492,124	451,465	373,641	25,959	943,596	83,314	1,877,975	614,149	.....	97,300	516,849	—65,934
Northern Central	469	7,373,469	1,725,937	9,657,827	1,672,251	1,839,291	149,867	4,557,923	227,865	8,447,197	1,210,630	5,110	297,613	918,127	—951,766
St. Joseph & Grand Island	319	848,127	348,107	1,302,068	269,503	184,097	58,414	563,710	56,660	1,132,384	169,684	349	53,324	116,709	24,638
San Antonio & Aransas Pass	727	2,244,792	840,628	3,269,538	631,758	429,716	45,188	1,181,131	90,936	2,378,729	890,809	.....	89,000	801,809	—44,255
Santa Fe, Prescott & Phoenix	364[7]	857,567	325,476	1,267,107	222,881	118,994	25,363	391,308	51,118	809,664	457,443	.....	947	456,496	—31,395
Tennessee Central	294	770,744	295,756	1,130,713	161,432	118,653	43,997	251,707	72,960	748,749	381,964	.....	35,821	346,143	40,839
Texas & New Orleans	458	2,005,774	813,604	2,992,877	532,246	520,586	65,458	1,179,355	86,955	2,384,600	608,277	5,296	110,768	502,805	—177,206
Trinity & Brazos Valley	463	1,269,386	288,429	1,620,228	293,751	266,099	72,977	734,715	100,451	1,467,993	152,235	.....	32,685	119,550	4,862
Vicksburg, Shreveport & Pacific	171	685,403	376,542	1,155,950	181,396	191,613	29,881	350,202	41,089	794,181	361,769	.....	53,618	307,424	59,228
Western Maryland	543	4,424,348	745,076	5,396,847	605,832	644,534	81,822	1,874,391	119,940	3,326,519	2,070,328	—2,813	177,000	1,890,515	—
Western Ry. of Alabama	133	568,644	349,799	1,000,274	191,099	168,636	46,317	268,221	52,838	727,111	273,163	—1,783	39,052	232,327	6,041

Mileage operated on March 31, 1910.—[1] 312 miles; [2] 225 miles; [3] 168 miles; [4] 293 miles; [5] 336 miles; [6] 3,533 miles; [7] 257 miles. — indicates deficits, losses and decreases.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Wichita Falls Route has ordered 4 freight locomotives and 1 passenger locomotive from the Baldwin Locomotive Works. These locomotives will be used on the Wichita Falls & Northwestern.

The Guelph Radial, Guelph, Ont., has ordered one 27-ton locomotive with four No. 101-B-2 railway motors and type K-28-B control from the Westinghouse Electric & Manufacturing Company.

The New York, New Haven & Hartford, mentioned in an unconfirmed item in the *Railway Age Gazette* of May 26 as having ordered 15 electric locomotives from the Westinghouse Electric & Manufacturing Company, has ordered 15 electric switching locomotives from this company.

CAR BUILDING.

The Midland Valley has ordered 5 passenger cars from the American Car & Foundry Company.

The Isthmian Canal Commission is in the market for a number of gasolene passenger cars. Circulars No. 634.

The E. R. & R. G. Hutchins Company, Chicago, is in the market for 3 forty-ton flat cars for the Booth-Kelley Lumber Company.

The Wabash-Pittsburg Terminal is said to be figuring on specifications for 500 all-steel hopper cars. This item is not confirmed.

The Missouri, Kansas & Texas, mentioned in the *Railway Age Gazette* of May 26 as being in the market for 17 refrigerator cars, 39 gondola cars, 34 flat cars and 18 caboose cars, has ordered this equipment from the American Car & Foundry Company.

The Pennsylvania, mentioned in the *Railway Age Gazette* of May 12 as being in the market for 41 coaches and 20 baggage cars, has ordered this equipment. The Pressed Steel Car Company will build the coaches and the American Car & Foundry Company will build the baggage cars.

The Canadian Pacific, mentioned in the *Railway Age Gazette* of May 12 as being in the market for 1,500 box cars and 400 gondola cars, has ordered 500 box cars and 400 gondola cars from the Pressed Steel Car Company and 500 box cars from the American Car & Foundry Company.

IRON AND STEEL.

The Cleveland Short Line has ordered 1,000 tons of girder rails from the Lorain Steel Company.

The Wabash Pittsburg Terminal has ordered 500 tons of rails from the Carnegie Steel Company.

The Harriman Lines have ordered 12,000 tons of bridge material from the American Bridge Company.

The Columbus Railway & Light Company, Columbus, Ohio, has placed an order for 1,100 tons of girder rails with the Lorain Steel Company.

The Chicago & North Western has ordered 7,400 tons of bridge material from the American Bridge Company and 650 tons from the Cambria Steel Company.

The Buffalo, Rochester & Pittsburgh has ordered 400 tons of bridge steel from the Lackawanna Bridge Company and 160 tons of bridge steel from the American Bridge Company.

General Conditions in Steel.—The price reductions made last week by the Republic Iron & Steel Company were more than met on Monday by the Steel Corporation, its subsidiaries and nearly all the steel manufacturers of the country, when they reduced prices on steel products, exclusive of rails, wire and tin plate. The new prices are f. o. b. Pittsburgh and became effective June 1 for shipment prior to October 1. Since the reduction last week, orders, instead of increasing, have fallen off nearly 50 per cent. The outcome is extremely problematical. The new schedule of prices is lower than that of 1909.

Supply Trade News.

Ambrose L. O'Shea has been made a director of the Gold Car Heating & Lighting Company, New York, succeeding W. W. Butler.

The Isthmian Canal Commission will receive bids until June 22 on miscellaneous supplies, including cargo-handling and locomotive cranes, electric cable and cable terminals. Circular No. 634.

The W F. Bossert Manufacturing Company, Utica, N. Y., has completed an order to equip the Susquehanna division of the Erie with 27 triplelock switch stands. This stand was adopted after a rigid test for several months.

The Greenlee Brothers Company has removed its general sales offices from Chicago to Rockford, Ill., where the factory and accounting departments are located. The Chicago office is in charge of James A. Lounsburg, the vice-president.

J. J. Ross has been made manager of the western railway department of the U. S. Metal & Manufacturing Company, New York, with office in Chicago. Mr. Ross was formerly connected with the Featherstone Foundry & Machine Company, Chicago, and also with J. V. Dowling & Company.

The Nova Scotia Car Works, Halifax, N. S., has been organized to take over the business of the Silliker Car Company, which is now out of existence. Sufficient new capital has been added to the business to make extensions to the plant and provide adequate working capital. The capacity of the plant, when extensions are completed, will be 20 cars per day.

The Sprague Electric Company, New York, will, on June 1, be merged with the General Electric Company, Schenectady, N. Y. The manufacture and sale of the lines of apparatus and supplies heretofore handled by the Sprague Electric Company will be continued by the Sprague Electric Works of the General Electric Company under the same organization, with D. C. Durland in charge as general manager. All correspondence should be sent to the Sprague Electric Works at the same New York address as in the past.

The Baldwin Locomotive Works, Philadelphia, Pa., laid off about 1,200 men on May 27 because of a scarcity of work. Unless business improves more men will be let out. Alba B. Johnson of the company said: "Up to this time we have been turning out about forty locomotives a week, but for the next two weeks will be making only thirty a week. If business falls off we will find it necessary to reduce further our working force. If there is a substantial increase of business the men already laid off will be taken back."

The General Electric Company, Schenectady, N. Y., has received the following orders from the Omaha & Council Bluffs Street Railway Company, Omaha, Neb.: Three 1,000 kw. 600-v. rotary converters; two 1,050 kw. 3-phase transformers; three 350 kw. single phase transformers; 20 double motor GE-80 car equipments; 5 double motor GE-201 car equipments, and 5 straight air brake equipments with CP-27 compressors. Two of the 1,000 kw. rotary converter equipments will be installed in the new South Omaha substation, while the third is for installation in the power plant.

The Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, has recently shipped a carload of Falls hollow staybolt iron to the Buenos Ayres Great Southern, Buenos Ayres, Argentina. This company has also recently furnished a large quantity of its Falls hollow staybolt iron to the Cordoba Central, Rosario, Argentina; the Northern Railway of Limon, Costa Rica; the American Railroad Company, Porto Rico; the Guayaquil & Quito, Guayaquil, Equador, and the Guantanamo & Western, Guantanamo, Cuba. The company has orders on hand for shipment to the Central of Peru, Lima, Peru; the Salvador Railway, La Union, Salvador, and the Guatemala Central, Guatemala. An order is expected from the Korean Railway, Korea, for a carload of Falls hollow and staybolt iron.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently received an order from the Toledo Railway & Light Company, for 100 type 310 C, box-frame, interpole, street railway motors. This company has also received

an order from the New York, New Haven & Hartford for four quadruple equipments of No. 409 alternating current railway motors with unit switch control, and one from the Takaski Water Power Electric Company, Japan, for two double equipments of No. 12A street railway motors with type 210D controllers. The latter order was placed through Takata & Company, the Westinghouse company's representatives in Japan. The company has also received orders from the Hummelstown & Campbellstown Street Railway, the Nashville Railway & Light Company, the Cumberland Electric Railway Company, the Frederick Railroad Company, and the Connecticut Company.

TRADE PUBLICATIONS.

Ditching Machinery.—The F. C. Austin Drainage Excavator Company, Chicago, has devoted a small illustrated booklet to the advantages of its ditching machinery.

Sewer Excavators.—The Municipal Engineering & Contracting Company, Chicago, describes and discusses the Chicago sewer excavator in a newly published booklet. Illustrations and tables are included.

Northern Pacific.—This company has published a small booklet entitled Lewiston-Clarkston and the Clearwater Country, Idaho-Washington, enumerating the many products and resources of this fertile country. A great deal of information is included regarding the climate, topography and the general advantages of this region.

Woodworking Machinery.—Greenlee Bros. & Company, Rockford, Ill., have published an unusually full, cloth bound 200-page catalog on railway car shop wood-working machinery and tools. This catalog is made up of separate circulars illustrating and describing each particular machine or tool, and these circulars will be superseded from time to time by new ones.

Car Lighting.—The Gould Coupler Company, New York, has published bulletin 11 A, on the Gould simplex system of electric light for railway cars, and bulletin 11 B on the installation, operation and maintenance of this system. The first bulletin describes and illustrates this system of car lighting and the second gives full instructions, including photographs and diagrams, for the installation and operation of the system.

Tachometers.—Schuchardt & Schutte, New York, have published a folder describing their No. 4 tachometer, calling attention to its value for increasing general shop production. This indicator will give the revolutions per minute or, by using the measuring disc, periphery speeds in feet per minute at a glance without the aid of a stop watch. It is constructed on the principle of the circular pendulum and is encased in a shell of aluminum alloy. One, three or four ranges of speeds can be provided as desired, the four ranges registering from 100 to 12,000 r.p.m.

Southern Railway.—The industrial department of this company has just issued its pamphlet describing the agricultural and commercial resources of Virginia. This is one of the series of pamphlets being issued by the Southern Railway, each describing the resources of one of the southeastern states. Although the fruits are "delicious" and the sheep grazing "splendid," the pamphlets describe conditions in a rather more scientific way than many publications issued by the traffic department of railways, and the pamphlet describing Virginia contains a considerable fund of valuable information in regard to topography and soils, horticulture, truck raising, and the timber and mineral products of the state.

The Germans who are building the northern section of the railway from Tientsin, China, to Nanking, have completed about 290 miles of it, leaving about 125 miles of their part of the line to be built. The line runs across the great flood plain of the Hoang-ho, where stone and gravel are rare, and all along the line at short intervals are brick kilns, the product of which is used not only for masonry constructions, but for ballasting the road bed. The embankments have in many places suffered from the gales of wind, which frequently have made breaches in them. Protection is now sought by plantations of willows and locust trees. Last December 82 German engineers were employed on this work.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Samuel M. Perry has been elected secretary and treasurer of the Denver, Northwestern & Pacific, with office at Denver, Colo.

J. J. Bernet, general superintendent of the Lake Shore & Michigan Southern, at Cleveland, Ohio, has been appointed assistant to the vice-president of the New York Central Lines, with office at Chicago.

J. G. Drew, who has been appointed general auditor of the Missouri Pacific, with office at St. Louis, Mo., as was previously announced in these columns, was born February 12, 1864, at Hammondsport, N. Y. He began work in January, 1881, as a station clerk for the St. Joseph & Western, now the St. Joseph & Grand Island, at Seneca, Kan. He was then consecutively, telegraph operator, agent, superintendent's chief clerk, general manager's chief clerk, general bookkeeper and chief clerk to the auditor, and for seven and one-half years from January, 1892, was auditor of the same road. In June, 1899, he was appointed assistant comptroller of the Great Northern, and three years later was promoted to comptroller, which office he resigns to become general auditor of the Missouri Pacific.

Col. David C. Dodge, formerly for a number of years connected with the Denver & Rio Grande and the Rio Grande Western, has been elected vice-president and general manager of the Denver, Northwestern & Pacific, with office at Denver, Colo. Mr. Dodge was born at Shirley, Mass., November 17, 1837. He began railway work in 1853 and was connected with engineering and construction work on different roads in Illinois and Wisconsin until 1857. He then entered the traffic department of the Chicago & North Western, and in 1872 went with the Denver & Rio Grande as traffic manager. He was afterwards promoted to general superintendent and to general manager. He was general manager of the Denver & Rio Grande Western and its successor, the Rio Grande Western, for 15 years from 1886, and during part of that time was also vice-president and general manager of the Mexican National. He was also first vice-president of the Colorado Midland for a year from July, 1900.

Frank S. Gannon, formerly president of the Norfolk & Southern, has opened an office at 2 Rector street, New York City, and will devote himself to technical work in examinations and appraisals of railway properties and as advisory counsel. Mr. Gannon was born at Spring Valley, N. Y., and began railway work in November, 1868, as a telegraph operator on the Delaware division of the Erie Railroad. He later served on the New Jersey Midland, now a part of the New York, Susquehanna & Western; the Long Island Railroad; the Baltimore & Ohio; the New York City & Northern, now a part of the New York Central & Hudson River, and the Staten Island Rapid Transit Railroad. In January, 1897, Mr. Gannon was elected third vice-president and general manager of the Southern Railway, and from March, 1902 to November of the same year he was third vice-president of the same road. In May, 1903, he was elected vice-president of the New York City Railway, and between 1905 and 1909 he was vice-president of the Atlantic & North Carolina and president of its successor, the Norfolk & Southern, now the Norfolk Southern.

Operating Officers.

N. G. Pearsall has been appointed superintendent of the Louisiana division of the Texas & Pacific, with offices at New Orleans, La., succeeding Page Harris, promoted.

Donald Brice, roadmaster of the Duluth, Rainy Lake & Winnipeg, has been appointed assistant superintendent in charge of maintenance of way, bridges and water service.

Frank P. Brown, agent of the Pullman Company at Galveston, Tex., has been appointed district superintendent, with office at San Antonio, Tex., succeeding O. S. Newell, retired.

C. D. Fisher, superintendent of District No. 3 of the Canadian Northern at Dauphin, Man., has been appointed superintendent

of District No. 5, with office at Saskatoon, Sask., succeeding J. Irwin, transferred to District No. 3 in place of Mr. Fisher.

T. A. Forbes, assistant superintendent of the dining and sleeping car department of the Great Northern at St. Paul, Minn., has been appointed superintendent of the dining and sleeping car department, with office at St. Paul, succeeding George L. Bonney, resigned. John Lambert succeeds Mr. Forbes, with office at Seattle, Wash., and the position of agent, dining and sleeping cars at Seattle is abolished.

John W. Everman, whose appointment as general superintendent of the Texas & Pacific, with office at Dallas, Tex., has been announced in these columns, was born in New York City on February 1, 1861. He graduated from the public schools of Philadelphia in 1876, and began railway work in 1879 in the ticket department of the Pennsylvania Railroad. In January, 1880, he went with the Texas & Pacific, since which time he has been in the continuous service of that company. He held various positions until May, 1892, when he was appointed assistant general superintendent, and was promoted to assistant general manager in April, 1894, which latter office he held until his recent appointment to the new position of general superintendent.



J. W. Everman.

J. W. Mulhern, whose appointment as general superintendent of the Denver & Rio Grande, with office at Salt Lake City, Utah, has been announced in these columns, was born November 25, 1863, at Naples, Ill. He received a common school education and began railway work in 1881 with the Chicago, Burlington & Quincy as a track laborer. He was then promoted consecutively to brakeman, freight conductor and passenger conductor on the St. Louis division of the Burlington, to trainmaster on the Hannibal & St. Joseph, now part of the Burlington, and in December, 1902, was appointed superintendent of terminals at Kansas City, Mo. Two years later he was made superintendent of the Hannibal division and had charge of the heavy transportation incident to the World's Fair at St. Louis in 1904. From December, 1905, to July, 1908, he was superintendent of the Galesburg division, and on the latter date was appointed superintendent of the Illinois lines of the Chicago & Alton, which office he held until he was made assistant to the second vice-president and general manager of the Western Pacific in May, 1910. A month later he was appointed superintendent of the Western division, with office at Sacramento, Cal., which office he resigns to become general superintendent of the Denver & Rio Grande.

Traffic Officers.

C. T. Chapman, traffic manager of the Toledo & Western, with office at Toledo, Ohio, has resigned to accept service elsewhere.

W. F. Rothwell has been appointed general agent of the Rock Island Lines, with office at Milwaukee, Wis., succeeding William A. Hughes, deceased.

C. A. Solly, depot and ticket agent of the Chicago, Milwaukee & Puget Sound at Tacoma, Wash., has been appointed commercial agent, with office at Victoria, B. C., a new office.

F. E. Landmeier, traveling passenger agent of the Chesapeake & Ohio at Kansas City, Mo., has been appointed western passenger agent, with office at St. Louis, Mo., succeeding E. B. Pope, deceased.

C. F. Norton, traveling freight agent of the Trinity & Brazos Valley at Dallas, Tex., has been appointed general agent, with office at Corsicana, Tex., succeeding B. H. Stephens, resigned to go into other business.

C. O. Sullivan has been appointed traffic manager of the Western Ohio, with office at Lima, Ohio, succeeding C. C. Collins, resigned to accept a similar position with the Lehigh Valley Transit Company at Allentown, Pa.

L. A. Casey, traveling freight agent of the San Pedro, Los Angeles & Salt Lake, at Los Angeles, Cal., has been appointed district freight and passenger agent, with office at San Francisco, succeeding L. A. Bell, resigned.

J. E. Woodfin, soliciting freight agent of the St. Louis Southwestern at Gilmer, Tex., has been appointed general agent of the Denver & Rio Grande, with office at Fort Worth, Tex., in charge of Texas, Oklahoma and Arkansas territory.

W. E. Creamer, general agent of the Wabash at St. Joseph, Mo., has been appointed westbound agent, with office at Kansas City, Mo. R. V. Miller, contracting agent at St. Louis, Mo., succeeds Mr. Creamer, and J. H. Wack, secretary to the general freight agent at St. Louis, succeeds Mr. Miller.

J. W. Hunter, division freight agent of the Southern Railway at Selma, Ala., has been appointed an assistant general freight agent, with office at Mobile, Ala., a new office. J. B. Erwin, commercial agent at Mobile, succeeds Mr. Hunter, and R. M. Kendrick, soliciting agent at Mobile, succeeds Mr. Erwin, with office at Mobile.

H. W. Koch has been appointed commercial agent of the Minneapolis & St. Louis and the Iowa Central, with office at St. Louis, Mo., succeeding Raymond Kelly, resigned to engage in other business. This corrects the statement made in our issue of April 28, page 1,015, that W. M. Hardin had succeeded Mr. Kelly. J. S. Bock has been appointed a traveling freight agent at St. Louis.

Engineering and Rolling Stock Officers.

J. M. Kerwin has been appointed roundhouse foreman of the Rock Island Lines at Silvis, Ill., succeeding T. Kilpatrick, promoted.

E. J. Pearson, chief engineer of the Chicago, Milwaukee & Puget Sound, the Tacoma Eastern, the Milwaukee Terminal and the Idaho & Western, with office at Seattle, Wash., having resigned to become vice-president of the Missouri Pacific; C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul at Chicago, has been appointed also consulting engineer, with office at Chicago, and E. O. Reeder, assistant chief engineer of the St. Paul at Chicago, has been appointed chief engineer, with office at Seattle, Wash., of the four roads mentioned above. A photograph of Mr. Loweth and a sketch of his railway career were published in the *Railway Age Gazette* of December 9, 1910, page 1129, at the time of his promotion to chief engineer of the Chicago, Milwaukee & St. Paul.

E. G. Stradling, whose appointment as signal engineer of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., has been announced in these columns, was born at Indianapolis, Ind., on September 5, 1880. He received his preparatory education in his native city and graduated as a mechanical engineer from Purdue University in 1905. He has been connected with the engineering department of the Baltimore & Ohio Southwestern and the St. Louis, Iron Mountain & Southern, and was for a time employed with the General Railway Signal Company. He also spent some time in the signal department of the Illinois Central, and for two years from 1906 was signal foreman on the installation of block signals for the Union Pacific. He was then appointed signal inspector of the Chicago, Indianapolis & Louisville, from which position he is now promoted as above.

OBITUARY.

Charles A. Wright, president of the Keweenaw Central, and a prominent financier and mining man, died at Hancock, Mich., on May 17. Mr. Wright was the chief promoter and one of the builders of the Copper Range Railroad.

In January last work was commenced on the electric line from Antofagasta, Chile, to Mejillones. The railway will run along the coast for a distance of 56 miles.

Railway Construction.

New Incorporations, Surveys, Etc.

Akron, Canton & Youngstown.—Plans have been made to build from Akron, Ohio, southeast to Mogadore over part of the route of the old projected line from Akron, via Canton to Youngstown. H. B. Stewart, president, Canton.

Atchison, Topeka & Santa Fe Coast Lines.—According to press reports, a branch is to be built from Berry Station, Ariz., which is six miles east of Kingman, to the foot of Stockton Hill, about eight miles. The line is to be built to carry ore from the mines. It is expected that S. E. Bright, San Bernardino, Cal., will carry out the grading work.

Bakersfield & Ventura.—See Ventura County (Electric).

Bamberg, Ehrhardt & Walterboro.—An officer writes that a contract has been let to the Ajax Construction Company, of which James A. Williams is president, Bamberg, S. C., to build from Bamberg to Ehrhardt, 14 miles. There will be two wooden trestles over streams and a swamp. It is proposed to extend the line from Bamberg to either Denmark, seven miles, or Jennings siding, four miles. The line is being built to carry merchandise, coal, cotton, etc. J. A. Wyman, president, Bamberg, and F. W. Frederick, chief engineer, Orangeburg. (May 26, p. 1222.)

Canadian Northern, Ontario.—Contracts have been let, it is said, to complete the 250-mile Toronto-Ottawa line, as follows: To J. P. Mullarkey, Montreal, Que., for the section between Mile 164 and Mile 180, and between Mile 200 and Mile 250. He will also do the track laying and ballasting on the 20-mile section between Mile 180 and Mile 200, for which contract for the grading and timber work has been let to Ewan Mackenzie, Toronto, Ont. A contract has also been let to A. Sinclair, Toronto, to complete the section between Toronto and Belleville. (May 26, p. 1222.)

Chicago, Rock Island & Pacific.—According to press reports, surveys are now being made for a branch from Walco, Ark., one mile south of Malvern, to which place a spur has already been built south through a lumber belt, to Caruder. This line is to be about 50 miles long, and it is understood, will eventually be extended south to Eldorado or to some point on the Crossett line.

An officer writes that the contract for building under the name of the St. Paul & Kansas City Short Line, from Carlisle, Iowa, south to Allerton, has been let to the McArthur Brothers Company, Chicago. (April 14, p. 924.)

Citrus Southern (Electric).—An officer writes that as soon as a permanent survey is made bids will be asked to build from Kissimmee, Fla., and St. Cloud, in Osceola county, north via Conway, Orlando, Winter Park, Maitland, Altamonte Springs, Longwood and Lake Mary to Sanford, in Orange county about 50 miles. The plans call for putting up a dock at Sanford, also one at Kissimmee. The company expects to use gasolene-electric cars. T. K. Miller, president, Orlando.

Clear Lake Railroad.—Incorporated in California with $500,000 capital and office at Lakeport, Cal., to build from the Northwestern Pacific, at a point near Hopland, east to Lakeport on Clear Lake, with branches from Lakeport north to Upper Lake and south to Kelseyville, in all about 30 miles. The directors include: L. H. Boggs, Kelseyville; S. E. Brooks, Hopeland; C. M. Hammon, Upper Lake; M. S. Sayre, H. V. Keeling and M. M. Gopcevic, Lakeport.

Colorado Interurban Railway.—An officer writes that this company was organized to build an electric line from Denver, Colo., north via Derby and Brighton to Fort Lupton, 27 miles, thence north via Platteville, La Salle and Evans to Greeley, with a branch from Fort Lupton, northwest to Longmont, thence to Estes Park. It is proposed to eventually build an extension from Longmont, north via Loveland to Fort Collins. The right-of-way will be 60 ft. wide throughout the entire main line, and on the branch to Longmont, most of which has been secured. Contracts have not yet been let for the work. Irving Hale, president, First National Bank building, Denver.

Copper River & Northwestern.—According to press reports, surveys are to be made at once for an extension from Mile 191 to the White river country, Alaska, about 60 miles.

Dermott, Selma & Northern.—Incorporated in Arkansas, to build from Dermott, Ark., to Selma, 15 miles. The incorporators include: L. A. Smith, A. Eirener, W. H. Roane and R. Maxwell.

El Paso, Mountain Park & Oklahoma Central.—See Oklahoma Pacific.

Eureka & Palisade.—This narrow gage line, now in operation from Palisade, Nev., south to Eureka, 84 miles, it is said, will be made standard gage.

Hudson Bay Railway.—According to press reports, bids have been asked for building a section of 180 miles of the line projected from La Pas, Keewatin, north to Hudson Bay. It is expected that contracts for other sections will be let in July. Surveys for the first 250 miles have been made. It has not yet been definitely decided whether the line will be built to Fort Churchill or Port Nelson, on Hudson bay. It is expected that the work will be started this summer and finished during 1914.

Hudson River & Eastern (Electric)—The New York Public Service Commission, Second district, has granted permission to this company to build from Sherman Park, N. Y., via Mount Pleasant and North Castle to White Plains, Westchester county, about 18 miles. The company can now build the line from Ossining to White Plains. (May 26, p. 1222.)

Hugo & Northwestern.—The chamber of commerce of Hugo, Okla., is interested in this company, which proposes to build from Hugo, via Atoka to Lehigh.

Idaho Northern Railway.—An officer is quoted as saying that an extension is to be built during the next two years, from the present terminus at Emmett, Idaho, through Long valley to the Payette lakes, about 100 miles. Bids have already been asked for work on a section of about 28 miles from Emmett, northwest.

Kansas City, Mexico & Orient.—An officer writes that a grading contract has been let to Roach & Stansell, Memphis, Tenn., for work on the section from Mertzon, Tex., southwest via Fort Stockton, to Alpine, 196 miles. (May 26, p. 1223.)

Kittitas Electric.—This company has been granted a franchise to build from Roslyn, Wash., southeast to Cle Elum. The line is to be extended southeast and a terminal point established at Ellenburg or at Kittitas. Paul L. Richards, Ellensburg, is interested. (See Washington Roads, May 5, p. 1085.)

Minneapolis, St. Paul & Sault Ste. Marie.—According to press reports, a large force of men are at work on the line from Frederick, Wis., north to Duluth, Minn., Foley, Welch & Stewart, St. Paul, is the contractor. It is expected to have the line ready for operation this coming fall. Track is now being laid on the bridge over the St. Croix river on the cut-off from New Richmond, Wis., west to Withrow, Minn. It is expected that the bridge will be opened about June 1. The St. Croix river bridge is part of the plan of straightening the Chicago division or old Wisconsin Central line, on which much work was done last year. The cut-off will shorten the line into Minneapolis by 12 miles, and passing over the St. Croix river at a height of 190 ft. will make an easy grade and avoid the high grades over which the Wisconsin Central operated. (April 21, p. 970.)

Mississippi Roads.—Members of the chamber of commerce of Natchez, Miss., are interested in a movement to have the Louisiana & Arkansas build from Jena, La., to Natchez, Miss., also to have the Southern Railway & Navigation Co. complete its line from Jeffris, Concordia parish, La., to Natchez, Miss.

Nevada-California-Oregon.—An officer writes that work is now under way by McLean & Francisco and Lloyd C. Wisemon, both of Alturas, Cal., building a 13-mile extension from Alturas, via Davis Creek and New Pine Creek, Ore., to Lakeview. (May 5, p. 1085.)

Oklahoma Pacific.—This is the new name of the El Paso, Mountain Park & Oklahoma Central, organized in 1903. The new company is to have a capital of $6,000,000, and proposes to build from a point west of Cheyenne, Okla., east to Oklahoma City, about 275 miles, with a branch from the main line south to the Texas border, in Comanche county. B. K. Kelly, president, Mountain Park; G. M. Hohl, vice-president, Hobart.

L. K. Rhodyback and A. Osborne, Mountain Park, and Sam Bretch, Hobart, are directors.

Pacific Electric.—A contract is said to have been let by this company to Robert Sherer & Co., Los Angeles, Cal., for building an extension from Glendale, Cal., northwest to Burbank, about five miles. It is expected that the work will be finished within 60 days.

Pine Brook (Electric).—It is understood that a line is to be built from Caldwell, N. J., west to Fox Hill. Connection is to be made with the Public Service Railway Company at Caldwell and with the Morris County Traction Company at the western terminus. The company has a capital of $110,000. Surveys are to be started at once. A. Dallas is said to be interested in the project.

Quincy & Terre Haute (Electric).—An officer writes that this company expects to let contracts in about two months for work from Quincy, Ill., southeast to Pittsfield, 56 miles. This is the first section of the line which has been surveyed to Taylorville. The plans also include putting up some station buildings and repair shops. The line is being built to carry live stock, grain and dairy products. William C. Fick, president, Quincy.

St. Louis Iron Mountain & Southern.—See an item under General News, regarding this company.

St. Paul & Kansas City Short Line.—See Chicago, Rock Island & Pacific.

San Pedro, Los Angeles & Salt Lake.—According to press reports, this company, now building from Moapa, Nev., southeast to St. Thomas, will build an extension northeast up the Virgin river to St. George, Utah. (May 12, p. 1133.)

Southern Pacific.—An officer writes that a grading contract has been given to the Utah Construction Company for double-tracking work from Lucin, Utah, west to Montello, Nev., 18 miles.

Syracuse, Watertown & St. Lawrence.—This company has asked the New York Public Service Commission, Second district, for a certificate of convenience and necessity, and for authority to exercise franchises granted to it. The company proposes to build a line from a connection with the Syracuse & South Bay Electric, in Cicero, Onondaga county, N. Y., to Brewerton, 6.33 miles. The authorized capital stock of the company is $1,250,000, and the estimated cost of building the line is $300,000. C. D. Beebe and William Nottingham, Syracuse, are interested.

Ventura County (Electric).—An officer writes that this company will operate a line from Oxnard, Cal., south to Hueneme, with several small branches, and will take over the property of the Bakersfield & Ventura. The plans call for building extensions, aggregating about six miles. R. Oxnard, president, San Francisco.

Washington Roads (Electric).—Bids have been asked for building a line, it is said, from Oxbow, Wash., near Seattle, to Lake Burien. W. H. Coughlin, Seattle, is interested.

Waukegan, Rockford & Elgin Traction Company.—An officer writes that this company was incorporated in Illinois with $1,500,000 capital, to build from Waukegan, Ill., west via the Fox Lake district, McHenry, Woodstock and Belvidere to Rockford, about 70 miles. Also, to build from Elgin, through the Lake district of Lake county to the Illinois-Wisconsin state line, where connection is to be made with a Wisconsin corporation, which is to extend through Twin Lakes, Wis., Powers Lake and Lake Geneva. Work is nearing completion on the first section of 15 miles. P. Ryan, Janesville, Wis., is the contractor. Charles H. Patten, president, Palatine, Ill., and H. J. Farmer, chief engineer, Waukegan.

Western Kentucky (Electric).—This company is being organized to build about 215 miles of railway lines, from Owensboro, Ky., south and southeast of that place. The work will include putting up a bridge over the Ohio river from Owensboro to Rockport, Indiana. E. J. Noonan, chief engineer, and E. F. Wheaton is fiscal agent, 204 Owensboro Banking Co. building, Owensboro.

Willamette Valley & Coast.—An officer writes that this company proposes to build from Patten, Ore., one mile north of the Washington-Yamhill county line, west for six miles to Cherry Grove. Grading is now under way by Boynton, Church & McCoy, Portland, and it is expected that two miles of track will be laid by July 1. Maximum grades will be 1 per cent. and maximum curvature 3 degrees. The line is being built to carry lumber, farm products and fruit, and will use steam as the motive power, which may later be changed to electricity. A. Lovegren, president, 330 Railway Exchange, Portland, and M. E. Reed, chief engineer, Portland.

RAILWAY STRUCTURES.

Beech Grove, Ind.—Work on two additional roundhouses at the Cleveland, Cincinnati, Chicago & St. Louis shops at Beech Grove is to be started this week. After all the improvements at Beech Grove are finished there will be 90 tracks between the shops and the main tracks.

Centerville, Iowa.—The Chicago, Burlington & Quincy is taking bids on a passenger station of brick construction, with tile floors, slate roof, hot water heat and hardwood finish. The estimated cost is $25,000.

Centralia, Wash.—The Oregon-Washington Railroad & Navigation Co., the Great Northern and the Northern Pacific have approved plans, it is said, for the construction of a passenger station, freight sheds, repair shops and a roundhouse at Centralia.

Edmonton, Alb.—A contract has been given to Phelan & Shirley for grading the approach to the Canadian Pacific high level bridge from the Strathcona side. The contract calls for the removal of about 58,000 cu. yds. of earth.

Kissimmee, Fla.—See Citrus Southern under Railway Construction.

Lethbridge, Alb.—Bids have been received for an overhead bridge at Lethbridge, for the Canadian Pacific. There will be a 350-ft. steel span, two 60-ft. steel girders and a 450-ft. timber approach.

Macon, Ga.—The Macon, Dublin & Savannah will build a pressed brick office building and passenger station.

Ottawa, Ont.—The Grand Trunk will build new steel coal chutes, with a bunker capacity of 350 tons, to cost about $15,000.

Pensacola, Fla.—An officer of the Louisville & Nashville writes that contracts have been given to the American Bridge Co. for furnishing the superstructures, and to the Foster-Creighton-Gould Co., Nashville, Tenn., for erecting the same, in connection with the reconstruction of the bridges over the Choctawhatchee and Apalachicola rivers, on the Pensacola division.

Port Arthur, Ont.—The Canadian Pacific will let contracts in a short time for the erection of water tanks to operate by gravity, the water supply being drawn from the small lakes in the vicinity.

Regina, Can.—The Canadian Pacific and the Canadian Northern will build a union station 316 ft. by 62 ft. The main building will be three stories high with a one-story annex on either side.

Sacramento, Cal.—The Western Pacific has given a contract to Hyde, Hayes & Co., San Francisco, it is said, for a new 215-ft. dock at Sacramento.

Sanford, Fla.—See Citrus Southern under Railway Construction.

Sweetwater, Tex.—The Atchison, Topeka & Santa Fe will build a passenger station to cost about $25,000.

Toronto, Ont.—The Dominion railway board has decided that a bridge is to be built at the junction of King and Queen streets in Sunnyside, to abolish the present grade crossing. The cost of the improvement, including land damages, will be about $175,000.

Troy, Ala.—The Atlantic Coast Line, it is said, will build a new freight house at Troy.

Railway Financial News.

Atchison, Topeka & Santa Fe.—See Garden City, Gulf & Northern.

Chicago, Burlington & Quincy.—See Great Northern.

Chicago, Milwaukee & Puget Sound.—Stockholders have voted to authorize an increase in the capital stock from $100,000,000 to $200,000,000. This additional stock will not be issued, and will be authorized only, in order to comply with the laws of Montana, which require that the capital stock of any corporation shall be equal to the amount of its authorized bonds. The Puget Sound has $200,000,000 bonds authorized, of which about $123,000,000 are issued. Recently Kuhn, Loeb & Co., and the National City Bank, both of New York, offered $25,000,000 of these bonds, and the company at the time agreed that during the present calendar year no further bonds would be sold in the market.

Denison, Bonham & New Orleans.—A press despatch says that all of the outstanding securities of this company have been sold by the Southern Railway Construction Co., of Denison, Tex., to E. D. Steger. The road runs from a point on the Missouri, Kansas & Texas, five miles southeast of Denison, to Bonham, 24 miles.

Denver, Northwestern & Pacific.—Colonel D. C. Dodge, John F. Campion and Charles Boettcher have been elected additional directors. It is said that subscriptions are being successfully raised for a fund to take care of the $11,000,000 construction company notes on which the principal is overdue.

Garden City, Gulf & Northern.—A press despatch from Topeka, Kan., says that this property has been sold to the Atchison, Topeka & Santa Fe. The road runs from Garden City, Kan., to Scott City, 40 miles.

Great Northern.—This company has filed a mortgage securing $600,000,000 bonds. Mr. Hill's explanation of the new arrangement follows:

"The Great Northern Railway, as of date May 1, 1911, has executed its first and refunding mortgage, securing a total authorized issue of $600,000,000 bonds.

"The size of the mortgage is explained by the fact that the outstanding obligations of the company, which are to be refunded, amount approximately to $330,000,000. Included, however, in the figures last named is the direct and contingent obligation of the company in the Burlington joint 4s, maturing in 1921, and aggregating $222,400,000. Covering a future of fifty years, approximately $270,000,000 in bonds therefore will be available for general corporate purposes and double tracking and additional mileage. Since its beginning thirty-two years ago the Great Northern has expended between $350,000,000 and $400,000,000 out of capital and earnings. The provision made for the future in consideration of the rapidly growing territory which Great Northern lines serve would seem intelligently conservative. In no other part of the country has nature more generously bestowed those three great sources of all national wealth—the farm, the forest and the mine—and nowhere else is there more room for such development as follows the occupation of a new country by an intelligent population.

"The railway company evidently has made ample financial provision to enable it to keep its facilities and extensions equal to all demands that a rapidly growing country may make upon it and at the same time to maintain the highest and most efficient standard of service. Future issuance of bonds against property acquired is safeguarded by the restrictions usually found in mortgages of this kind."

"I am getting old and will quit the railway business after a while. I want to leave the road in good financial shape, so it can make all the improvements needed," is the way Mr. Hill summed up his reasons for making the mortgage.

Hudson Companies.—It is announced that Harvey Fisk & Sons, New York, have sold in London sufficient Hudson & Manhattan first mortgage 4½ per cent. bonds to complete all the work in progress, including the connection with the Pennsylvania Railroad for joint service to Newark, and to pay the $2,817,500 notes due October 15, 1911.

Lake Erie & Pittsburgh.—The company has received permission from the secretary of state of Ohio to increase its capital stock from $100,000 to $6,000,000. The road is 27 miles long.

Michigan Central.—J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, are offering $16,00,000 Detroit River Tunnel 4½ per cent. bonds of 1911 1961, guaranteed principal and interest by the Michigan Central, at 102, yielding about 4.40 per cent. interest on the investment. The bonds will be secured by a first mortgage on the Detroit river tunnels and approaches, on the terminal property in Detroit and on the union station now being built in Detroit.

New York, New Haven & Hartford.—The Rhode Island company, a subsidiary of the N. Y. N. H. & H., has leased for 999 years the Providence & Danielson (electric) and the Sea View Railway (electric).

Oregon Short Line.—This company has taken over the following branch lines in Idaho and Wyoming, aggregating 315 miles: Yellowstone Railroad, 70 miles; St. Anthony Railroad, 53 miles; Salmon River Railroad, 86 miles; Wyoming Western, 23 miles; Minidoka & Southwestern, 74 miles; Boise City Railway & Terminal, eight miles.

See also Oregon-Washington Railroad & Navigation.

Oregon-Washington Railroad & Navigation.—The Union Pacific has sold to Kuhn, Loeb & Co., New York, and Baring Brothers & Co., Ltd., London, $25,000,000 first and refunding mortgage 4 per cent. bonds of the Oregon-Washington Railroad & Navigation, guaranteed unconditionally principal and interest by the Union Pacific. The bankers are offering these bonds at 93. The mortgage securing these bonds is to be a first lien on about 567 miles of railway owned, on undivided interests in about 67 miles of railway jointly owned, and on trackage rights on about 139 miles, while on about 1,133 miles of railway owned it will be subject only to the $23,380,000 Oregon Railroad & Navigation Company 4 Per Cent. Consolidated Mortgage Gold Bonds, which are not to be extended, and for the refunding of which an equal amount of the new bonds is to be reserved.

In addition to the $25,000,000 bonds sold to Kuhn, Loeb & Co., the Union Pacific has in its treasury $15,000,000 Oregon-Washington Railroad & Navigation first and refunding 4 per cent. bonds.

Pennsylvania Railroad.—In the application to list on the New York Stock Exchange the $41,261,600 stock representing the 10 per cent. allotment made to shareholders, the company says that $15,237,500 was used to pay maturing obligations and the balance for substantial additions, betterments and improvements to the property.

St. Louis & San Francisco.—See an item in regard to trackage rights in General News.

St. Louis, Iron Mountain & Southern.—See an item in regard to trackage rights in General News.

South Side Elevated.—Directors of the four Chicago elevated roads, the South Side Elevated Railroad, the Metropolitan West Side Elevated Railway, the Northwestern Elevated Railroad and the Chicago & Oak Park Elevated Railroad, have agreed to a plan by which all the roads and the union loop will be merged under the control of Blair & Co., New York, June 15 being the date set for the transfer.

Texas Central.—The company has arranged to register $798,000 first mortgage 5 per cent. bonds, due April 1, 1923, secured on the extension from Leon to Gross Plains, 41 miles.

Union Pacific.—See Oregon-Washington Railroad & Navigation Co.

Western Maryland.—This company has sold to a syndicate headed by Blair & Co., New York, $4,100,000 first mortgage 4 per cent. bonds. The proceeds are to be used to pay $3,250,000 West Virginia Central & Pittsburgh 6 per cent. bonds, due July 1, 1911, and $650,000 Piedmont & Cumberland first mortgage 5 per cent. bonds, due August 1, 1911.

Worcester, Nashua & Rochester.—Stockholders are to vote on June 6 on the question of selling the franchises and rights of this company, whose property has been leased by the Boston & Maine since 1886, to the B. & M. The majority stock was bought by the B. & M. in 1910 from the New York Life Insurance Co., for $160 per share, and it is understood that the B. & M. now owns about 80 per cent. of the outstanding $3,099,800 stock.

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THE improvement of the passenger terminals of the Pennsylvania Railroad at Philadelphia, decided on last year, as explained in the company's annual report (*Railway Age Gazette,* March 10, page 449), will cost from $20,000,000 to $25,000,000, according to the report of the special committee entrusted with the preparation of the plans. The larger part of this money is to go for the electrification of the passenger lines within the suburban district (which extend in six different directions); but the most radical change, as affecting the public, is that indicated by the announcement that through passenger trains will be dealt with at West Philadelphia, where a new station is to be built. The great Broad street station, with its costly approach line, is to be devoted mainly or wholly to local and suburban passenger service, the least profitable part of the traffic. For 30 years and more the people of Philadelphia have kept up a persistent and almost continuous contest to prevent the Broad street station, in the heart of the city, from being "put on a branch," and the railway company has spent millions of dollars to meet the people's wishes in the matter, but it looks as though those wishes were doomed at last to be overborne by the sheer force of the enormous increase in traffic.

THE granting of local self-government to the leased Boston & Albany, as announced by the president of the New York Central a month ago, went into effect last Monday, Mr. Hustis being appointed a vice-president of the New York Central. The other promotions and changes in title are given in our news columns. The extent of the authority given to Mr. Hustis is indicated by the clause in the agreement with the New Haven road, which says that he is to appoint such assistants and subordinates as may be necessary. In other words, he has a free hand in organizing his staff. Officers of the operating, traffic, mechanical, purchasing and accounting departments, who have heretofore reported to a superior in New York City, will now report to Vice-President Hustis. The only specific reason for this change mentioned in the vice-president's interview in the *Boston Transcript,* is that better relations with the shippers along the line are expected to result, but probably there are other and undefined relations that will be ameliorated. The New York Central has to treat the Massachusetts stockholders and citizens as the British Empire treats the people of Canada or South Africa—let them have their own way as fully as a prudent regard for their own prosperity will permit. Mr. Hustis says that the details of the trackage and other contracts with the New Haven will now be speedily arranged, this work having been deferred, apparently, until the men who must do the negotiating should have complete authority. The division of authority under the new organization is outlined in an official circular as follows, the officers indicated by a star being, practically, the same as heretofore, both as regards the incumbents and the duties:

Traffic Manager. In charge of freight and passenger traffic; also matters having to do with mail and express traffic.

**Counsel.* In charge of legal matters, real estate, taxes and insurance.

**General Superintendent.* In charge of transportation, including movement of trains, operation of yards, stations, block signals, etc.

**Chief Engineer.* In charge of engineering, maintenance of way and structures.

Auditor. In charge of accounting and all statistical matters.

Superintendent Motive Power and Rolling Stock. In charge of motive power and equipment, including locomotive and car shops, and tools and machinery in connection with the motive power and car departments.

Purchasing Agent. In charge of purchases of materials and supplies as may be designated by the vice-president.

Superintendent Car Service. In charge of car accounting, demurrage and freight car distribution.

WHILE the returns for taxation of the railways of the country for the year 1910 show some variation, and are incomplete, there can hardly be a doubt that they will be upwards of $110,000,000 as contrasted with $82,377,619 in 1908, and $90,790,949 in 1909. Their increase for 1910 is, absolutely, considerably more than double that for the previous year, which was itself a year of exceptional increase. New tax laws require time—usually from a year to eighteen months, in the case of states—for their operation, and thus their full sweep with the result of the actual additions was not reached until 1910. To the state increments the federal corporation tax must, of course, be added; and now that it has passed its constitutional test one can hardly doubt its fixity. Indeed, the prophecy does not go far astray that counts this new federal impost as a kind of elastic "plug" to fit future annual holes in the treasury budget, which holes have not in the past shown tendencies to smaller diameters. However, that may be, the sharp upward curve of railway taxation, chiefly by states, deserves attention. It has been

obscured by the more pressing factors of operation, maintenance improvements, wages and new financing. But the tax item has certain vivid qualities of its own. It is inexorable and hard to combat in the courts. It is easily increased by legislatures, with their constantly waxing tendency to stiff taxation from the individual to the corporation. It has a kind of inherent trait of never going backward; and it lends itself to a variety of forms that obscures its burden until the tax bill actually comes in. In the immediate future, however, some of the railway companies have one minor consolation: A good many of them are taxed on market values of stock. As states by adverse legislation beat down market values of railway shares, they must beat down the basis of taxation too. And, as an ultimate dictum, valuations cannot be indefinitely reduced and taxation indefinitely expanded. There is a ratio between the two which courts must recognize, even if state legislatures and commisisons do not.

THE RAILWAYS OF THE WORLD.

THE census of the railways of the world which the *Archiv für Eisenbahnwesen* compiles yearly is brought down to the year 1909 in its last issue. There were then in the whole world 625,698 miles, not including street railways, trolley lines and other light structures. The *Archiv* gives the mileage in each country. We present it for the grand divisions of the old and new worlds, as follows:

	Miles.		Miles.
Europe	204,904	North America	277,015
Asia	61,800	South America	42,329
Africa	20,809	Australasia	18,849
Old World	287,513	New World	338,185

Thus of the totai mileage, 54 per cent. is in the new world, North America alone having 10,000 miles more than Europe and Asia together, which latter have over 1,250 millions of inhabitants, against 115 million in North America.

More than half of the railways of the world have been built since 1886—an average of 13,600 miles per year.

This rate of growth has been, on the whole, comparatively stable of late years. The increase was 14,144 miles in 1909 and 62,800 miles for the four years then ending. Even these figures, however, do not adequately show the enormous absorption of capital in these implements of production, for in this country of late years, and in Europe for a much longer period, much more has been expended in improving existing railroads than for additions to mileage.

The mileage added in the different continents in 1909 and in the four years then ending has been:

	1909.	Four years.		1909.	Four years.
Europe	2,528	12,359	North America	4,143	25,057
Asia	2,986	11,197	South America	1,816	8,273
Africa	1,789	4,518	Australasia	882	1,396
Old World	7,303	28,074	New World	6,841	34,726

We see here that in the last year more railway was built in Asia than in Europe, and in the last four years nearly as much. Here British India, with Ceylon, has more than half the mileage, but Russia built most in 1909, opening a line 1,258 miles long in Central Asia. China had in 1909 no less than 5,277 miles of railway, and 3,050 miles of it were built in the last four years. Japan, with the lines it has built in Coréa, has a little more than China, but it opened but 45 miles of new line in 1909. China now seems to be one of the great fields for railway building.

There is notable activity in Africa. In the older civilized parts —Algiers, Tunis and Egypt, the additions have not been great in the last four years, but in that time the British South Africa Union, as it is now called, has increased its mileage by 44 per cent. and 2,729 miles, and it has now more railroad than any other two countries in Africa. A number of lines have been built from the coast inland by the Germans, French and Portuguese, as well as by the English, through districts where there is no white population to speak of. A number of these lines have been mentioned in notes in these columns.

In North America, Canada and Mexico have increased their mileage proportionately more than the United States, but our mileage is already so great, that a small percentage makes a large amount. As has been said, the great railroad work here has been the improvement of old lines.

In South America the 8,273 miles added in the last four years is an increase of more than 24 per cent. It should be said that Central America and the West Indies are reckoned with South America, which is geographically incorrect. Except in Cuba, the mileage is inconsiderable. The islands together have 3,340 miles of line, and 1,160 miles more than in 1905. The Argentine Republic has more than a third of the railways in South America, and its mileage grew from 12,425 in 1905 to 15,854 in 1909. Brazil comes next, with 10,444 miles in 1905 and 13,000 (exactly) in 1909. Argentina receives a large immigration; Brazil much less; the other South American countries scarcely any.

For about 88 per cent. of the European railways and 81 per cent. of the others the *Archiv* gives figures for the capital invested in them, which is an average of $121,900 per mile in Europe, and $66,300 for the rest of the world; but as it makes the capital of the United States railways $73,880, instead of $59,259, the true amount, this latter must be taken with a grain of salt, amounting in this country to $3,573,000,000. Allowing for this the average for the non-European lines is about $9,750 less than $66,300, or $56,550 per mile. Reckoning the capital of the lines not reported at these rates, the world's total investment in railways in 1909 amounted to about $51,600,000, which is about $33 for each inhabitant thereof.

THE RAILWAYS AND THE EXPRESS COMPANIES.

THERE was good reason in the earlier history of the railways of the United States why they should turn the handling of express over to separate companies. Most of the roads were then short lines. The small packages which form express traffic needed expedited movement; and if each of the numerous small roads had handled them itself the time lost in transfers at junctions would have seriously impaired the service. The expense of handling express matter would also have been greater if each road had had its own wagons and teams for collection and delivery and its own employees for handling it both en route and at terminals. In the early days the handling of express by separate companies also was a protection to the earnings of the railways. Their freight and passenger rates and revenue were constantly demoralized by excessive competition, and the same thing would have happened to their revenue from express if it had been dealt with as merely a part of their regular traffic.

The reasons for having express handled by separate companies are neither so numerous nor so strong now as they were formerly. Most of our railways have grown from short lines into great systems, and some of the Hill lines, the Canadian Pacific and some other roads, now own absolutely the express concerns that operate over their lines. The day of cut-throat competition is past, and, of course, express rates, if the railways handled express themselves, would not now be any more subject to the vicissitudes of competition than freight and passenger rates are.

There are, however, still reasons why express should continue to be dealt with by distinct organizations. There are but two railways in the United States, the Atchison and the Chicago, Milwaukee & St. Paul (with its subsidiary, the Puget Sound), which extend as far east as Chicago and as far west as the Pacific coast. There is but one, we believe—the Wabash—which extends both east of Chicago and west of the Mississippi river. If each railway did its own express business there might be caused some added delay, trouble and expense in making transfers at junction points between different railway systems. Additional expense would also be caused by the necessity for each railway to provide its own facilities for handling express at terminals. At Chicago, for example, which is entered by 26 roads, there would be a very

great multiplication of express offices, of facilities for collection and delivery, etc. This would involve economic waste and this loss we may be sure ultimately would have to be met by the rates charged.

But it does not follow that express should continue to be handled under such contracts or by the same companies as now. The present system of dividing the gross earnings from express between express companies and the railways over whose lines they operate seems to have grown objectionable. If any spokesman of the express companies can make a good defense of it the *Railway Age Gazette* will be very glad to give space to it. But we have never yet seen nor heard such a defense. The service rendered by the express companies is mainly a terminal service, that of collection and delivery. The division of the earnings from short hauls on a percentage basis may work out fairly; for when the haul of the railway is relatively short the service rendered by the express company in collecting and delivering a package may equal in cost and value the service rendered by the railway in transporting it. But what justification can there be for dividing equally the revenue derived from handling a package from New York to Chicago, from Chicago to Galveston, or from New York to San Francisco? The cost and value of the service rendered by the railway increases almost in proportion to distance, for there is relatively little railway terminal expense to be covered. But the only service rendered by the express company, besides that of collection and delivery, is that of providing a messenger—who often is also the railway's baggage man—and that of assuming the risk of damage to goods while in transit. It is, therefore, plain that the service rendered by the express company does not increase in proportion to distance; and it would seem to follow that the revenue it derives should not so increase.

As the *Railway Age Gazette* has said before (May 12, 1911, page 1,097), no evidence has been adduced that the revenue the railways, as a whole, derive from express business is in the least excessive.

The evidence available seems to prove the opposite. On the other hand, the statistics on the subject, if we read them aright, do tend to show that the express companies are deriving very great, if not excessive, returns for the service that they render. But so long as the earnings from the express business are divided on a percentage basis it is impossible to regulate express rates without affecting not only the revenues of the express companies but also those of the railways.

It seems to follow that a different basis for compensating the railways for handling express matter ought to be adopted. Probably a change ought to be made so that the railways will be paid either in proportion to the ton mileage of express matter that they handle, or in proportion to the space that express occupies in their cars and the distance that it is hauled; in other words, in proportion to foot mileage. And when the change is made it ought to be so made that the railways will derive a very substantially larger revenue from the business than they do now. It might then be found that the existing rates for handling express matter are not too high, but merely that the part of the revenue which the express companies are now receiving is too great.

With respect to the organizations by which express should be handled in future (1) the railways might organize a single company all of whose stock they would own and which would be operated without profit, the entire earnings in excess of direct expenses going into the treasuries of the roads; or (2) they might organize, say, three or four companies, each of which would operate over the railways owning it, thereby retaining the competitive element in the express business; or (3) they might leave the business in the hands of the present companies, but under arrangements and contracts which would secure to the roads a larger part of the earnings and under arrangements which would give to railway managers greater and more direct influence over the rates of the companies and over their relations with the public.

It may seem to some that it would be unjust to those who have invested in the securities of the express companies for the railways to now supersede them with organizations of their own. But the contracts between the roads and the express companies are for definite periods of years; railways have a right to refuse to renew them when they expire and have constantly exercised this right; and those who have express stock have bought it with a full knowledge of these facts. Therefore, the railways are under no obligation, either legal or moral, to allow the existing companies to operate over their lines a day after existing contracts expire. Furthermore, the express companies have made large investments in the securities of the various corporations; and if their contracts with the railways were not renewed the stock of their stockholders would not by any means be rendered valueless.

One thing is certain; the time has come when the railways and express companies must do something in regard to express rates. Attacks are being made on them all over the country. All the express companies have done to defend them has been to set up that the commissions lack jurisdiction. But, as has just been shown in Illinois. it is very easy for a legislature, after the courts have held that a commission lacks jurisdiction, to give it jurisdiction, and when the struggle for public control of any public ultility has been needlessly prolonged the last state of that public utility is pretty sure to be worse than was its first state.

Furthermore, the agitation for the establishment of a federal parcels post goes on apace, and is steadily gaining strength; and all the pleas about jurisdiction that near-sighted attorneys for the express companies may make, and that Bourbon managers may permit, will not, in the long run, prevent reductions in rates either by the competition of a parcels post or by action of legislatures and commissions. If the railways and the express companies will now meet the situation frankly and fairly they may get the state and the federal governments to act reasonably. If they do not we probably shall have a repetition of the results that were produced by the failure of the railways to meet frankly and reasonably the demand six years ago for legislation to give the Interstate Commerce Commission limited power to fix rates. If the officers of public utilities want the public to be reasonable in dealing with them they must be reasonable in dealing with the public. The express companies have not yet shown any signs of reason, nor have they shown even common sense, in dealing with the public.

NEW BOOKS.

Notes on Plate-Girder Design. By Clarence W. Hudson, C. E., Mem. Amer. Soc. C. E., Professor of Civil Engineering, Polytechnic Institute of Brooklyn, N. Y. 75 pages, 6 in. x 9 in., Illustrated. John Wiley & Sons, New York. $1.50.

The instruction given in engineering courses on the design of plate-girders is usually limited to a few recitations in the general bridge course supplemented by more or less drafting room practice, and in many cases the subject is not given the attention which it deserves on account of the growing importance of this class of structures in present-day engineering practice. The book by Prof. Hudson is a collection of notes which he has worked out in his own experience in teaching the subject of plate girder design, and is intended to be given to the average class in one recitation a week for one semester of the college year. The theories involved in these notes and the details of design are taken up in a thorough manner, but the author has kept well in mind the fact that the notes are for class room instruction and has made them as brief as is consistent with perfect clearness to the student. The book should prove of value for the purposes for which it was written, namely to serve as a class text book.

The first 95 miles of the railway from Dean Funes, Argentina, to Laguna Paiva, counting from the first station mentioned, have been opened to public service.

Letters to the Editor.

ARBITRATION OF RAILWAY LABOR DISPUTES.

In the letter from Mr. Melcher, printed last week, Mr. Delano was quoted as saying that it should be more obligatory to take controversies in railway matters to arbitration than to take controversies between individuals to a court of law. It should have read that he contended it should be *no* more obligatory, etc.

SETTLEMENT OF FREIGHT CLAIMS.

To the Editor of the Railway Age Gazette:

This subject has been one of the most difficult to overcome, or even improve, on account of the long and vexatious delays on the part of the carriers in the adjustment of claims. In great measure, this is due to the tedious and inefficient methods employed in the handling of claims, resulting in a large amount of unnecessary correspondence, checking percentages, tariffs, etc., in cases of overcharge, and long arguments as to liability in cases of loss and damage. In the meantime there is perfect indifference to the general public, waiting patiently for reimbursement. This troublesome question has engaged the attention of the Interstate Commerce Commission, and conferences have been held by Professor Adams with members of the Freight Claim Association, but no practical solution has yet been evolved.

It is evident that to fairly and squarely meet the situation, decided changes should be made in the conduct of this branch of the service, breaking away entirely from the present prevailing methods, and establishing new principles on the basis of quickly accomplishing the desired results with the least possible delay and red tape.

In order to meet the requirements of the Interstate Commerce law, all railways are now revising waybills in respect to rates, classification and computations, thereby bringing claims for overcharge under the immediate control of the freight accounting officer for adjustment. These adjustments could be made by correction in the station accounts, and refund made by the station agent who handled the original transaction (in exactly the same manner as undercharges are now handled), all of which could be accomplished with a minimum amount of labor and within a short time after the overcharge is discovered. Adjustment of these items in "interline" accounts would be a simple proposition, as in most cases they could be adjusted in the current month's accounts, dispensing with much unnecessary correspondence, checking, recording and voucher work.

The situation in respect to loss and damage claims is somewhat different, but in view of the fact that the amounts paid for this class of claims have increased to such an enormous extent within the last few years, due, it is claimed, to the use of automatic drawbars, inefficient service from the employees on account of labor affiliations, and other causes, there cannot be much doubt that in order to meet the new conditions, the investigation of these claims ought to be transferred to the operating department. The amounts paid are charged to transportation expenses, the loss or damage is caused by employees responsible to and a part of that department, and only an officer of that department, with the necessary authority, can have the facilities at his command to thoroughly and promptly investigate these claims. Moreover, with a competent force of inspectors and the co-operation of division superintendents, he can eliminate in a great measure the conditions under which these losses or damages occur. He can cure the evil, if anybody can. It is not so much promptness in settling claims that concerns the public, as it is the importance of some measures being adopted to prevent the losses.

Efficiency is the watchword of the day, and the most approved methods must be utilized, in a direct and forceful maner, if any improvement is to be made in this important branch of the service.

ASSISTANT GENERAL AUDITOR.

TO CULTIVATE AN ESPRIT DE CORPS.

Buffalo, May 22, 1911.

To the Editor of the Railway Age Gazette:

How is the train service of the railways of this country to be improved in efficiency so that the constant stream of complaints which reach the ear of the public, in connection with accidents and on other occasions, may be diminished? I have just given a second reading to a letter touching on this subject which appeared in your issue of March 31 last, and it seems to me that the suggestions offered by your correspondent in that letter ought to receive serious attention. In the second column of his letter, last paragraph, in succinct language he points out what the railway officer ought to do; but there he stops. He throws no light on the question of how to do it. He says that the railway officer having charge of the rank and file must know his men's weaknesses and strength and know the conditions under which they work. Whether officers really do study their men, as he intimates, must on many roads seem questionable, but that the study ought to be made no one doubts. The railway officer, and in particular the division superintendent, must have the highest possible standards and must live up to them. But how is he going to work to carry out this beautiful ideal? It is my observation that usually the division superintendent is but a cog in a great machine. Perhaps your correspondent did not think so when he used the term "cog," but men even higher than division superintendents say that they often feel that way. To know his men's weakness and strength sufficiently well to cure their weaknesses and increase their strength, the superintendent must get acquainted with them as individuals. Knowledge of men as a body—that is, knowledge of their salient characteristics—is measurably well accomplished now, I judge. The superintendent can do this through trainmasters and road foremen of engines. But this is not enough. Inefficient service seems to be due in large measure to ignorance, to laziness, or to feelings of petty unfriendliness which can be got at only by some little actual contact between man and boss; contact sufficient to engender some real candor, if not confidence. Candor cures a lot of things; even, sometimes, the misunderstandings among the employees as to why the company cannot advance wages, and the superintendent's or trainmaster's conceited notion that a partial or insincere defense of the company will "go down" with the intelligent employee.

I call the division superintendent a cog because he is so helpless. He cannot get acquainted with his men because to do so takes months of time, and he is frequently called away by other duties. He cannot use his judgment in important matters until he has consulted the general superintendent; and the general superintendent must consider a dozen other superintendents before he decides, besides being cramped by the general policy of the company, which forbids the establishment of new regulations or the expenditure of money except where it is certain that there will be no disturbance of uniformity. Getting acquainted with the men means a good deal. A superintendent of my acquaintance, who had under his supervision a number of tug boats, told me recently how, in order to cure apparently incurable delays in the marine service and attain a reasonable measure of efficiency, he had to go and stay with the tug boat men night and day for a long time. I believe it was a month. He had to sleep on one of the boats. Such work as this cannot be done by a superintendent who is overworked or who, not being overworked, has a tendency to shirk unpleasant tasks.

Reluctance to exercise individual judgment seems to be largely due to over-cautiousness in expenditures. Why should not every superintendent have power to spend from 1 to 3 per cent. of the amount of his train-service pay-rolls for any object, looking to the improvement of the train service, which may approve itself to him? Could not he spend a good part of such money for special gratuities with good results?

As to whether the desired improvement in the administration

of a division could be better accomplished by having more numerous and more powerful trainmasters or by reducing the size of the divisions, I do not know. Perhaps nobody knows. But can anyone say that one or both of these remedies ought not to be tried?

You told several years ago of the policy of President Vreeland of the street railways in New York City, of keeping in touch with his men by always being present at the informal evening gatherings of their associations. Is not this a thing which should be imitated in the steam railway service? To the distant observer even Mr. Vreeland's praiseworthy course would seem to be rather superficial, but he does better than most superintendents do. Possibly a good deal of improvement could be made even by superficial measures.

And what shall the superintendent do with the employees' unions? No doubt the unions are going to continue indefinitely their present policy of dealing with the officers through committees. The majority of the rank and file do not care to try individually to negotiate with a superior. The grievance committees must magnify their office and they have a constant tendency to try to go over the heads of the division officers and get as near to the president of the road as they can. But, surely, the superintendent has a duty to get acquainted with his men in some way. Will it be necessary for him to try to cultivate those of his employees who are not members of unions? Will he have to go so far as to appoint men known to be opposed to unionism? The trade union spirit seems to be disposed even to discourage intimacy of individual members with superior officers. The members of the Train Dispatchers' Association are somewhat intimate with their superiors and the association is opposed to strikes. But this policy has been attacked by members of the association who believe that no union is of any value unless it is ready at any time to fight for higher pay.

It seems to me that great good can be accomplished by the superintendent who will have the originality and independence to start a campaign of education by temporarily—that is to say for six months or a year—spending nearly all of his time out on the road getting very well acquainted with his train and station men. To do this would necessitate the employment of more assistant superintendents, no doubt; but it is to be hoped that the results would be so satisfactory that those assistants would find themselves in permanent situations. Some other superintendent might furnish an example which would be worthy of wide imitation, by carrying out Mr. Vreeland's method. To do that, however, would require ingenuity and even, perhaps, genius, for it would be necessary constantly to devise new subjects to be taken up at meetings; and the superintendent would have to be alert to take advantage of any developments that might result.

I am not a railway officer. I look at this matter from the standpoint of a public officer anxious to formulate the requirements which the public ought to impose on the railways. Can some of your readers enlighten me? G. M. H.

The Belgian parliament has approved the construction of a railway line, which, in connection with navigable rivers, will complete a route to the west side of Lake Tanganyika, to be built only when the German Central African line shall have been completed to the eastern side of Lake Tanganyika, which will probably be within a few years. Then there would be a complete trans-African line, the various sections of which are as follows: Matadi to Leopoldville, 249 miles by rail; Leopoldville to Stanleyville, 1,000 miles by river; Stanleyville to Ponthierville, 79 miles by rail; Ponthierville to Kindu, 200 miles by river; Kindu to Kongolo, 221 miles by rail; Kongolo to Kabalo, 47 miles by river; Kabalo to Lukuga outlet, 167 miles by rail; Lukuga outlet to Kigoma, 93 miles by river; Kigoma to east shore of Tanganyika, 110 miles by rail; across lake, 50 miles; and Tanganyika to Dar-es-salam, 700 miles by rail. The time given for such a journey is 32 days going east (up stream) and 22 going down, which is more than a steamer would require to go round the Cape.

MAINTENANCE OF EQUIPMENT COSTS.

BY C. J. MORRISON.*

In point of importance, maintenance of equipment ranks second among the items entering into railway operating expense. In 1901 it ranked third. The relative proportion of the main divisions of expense averaged for the large railways in the years 1901 and 1910 as follows:

	1901. Per cent.	1910. Per cent.
Maintenance of way and structures	22.3	20.5
Maintenance of equipment	18.6	23.2
Conducting transportation	55.0	53.0
General expense	4.1	3.3

Of all the main divisions of expense shown above, maintenance of equipment is the only one which has increased in ratio to total operating expense during the ten year period ending with 1910. This increase is very marked and in strong contrast to corresponding reduction in the other three main operating divisions of expense. The relative proportion of the four divisions

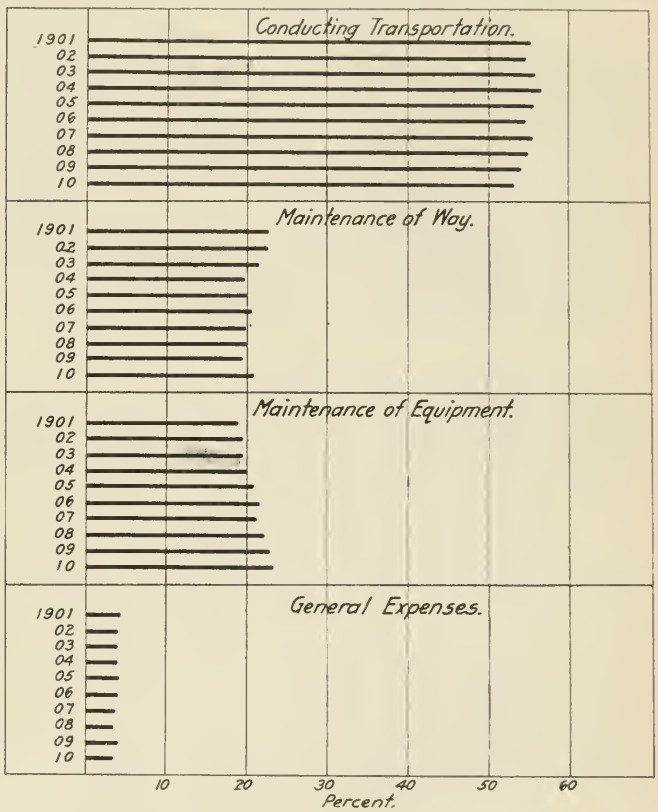

Fig. 1—Percentages of Operating Expenses; Averages of Large Roads.

of expense to the total cost of operation for the period between 1901 and 1910 is shown graphically in Fig 1.

The component charges entering into maintenance of equipment, such as labor, material, etc., are also common to the other operating items, maintenance of way and conducting transportation. The assertion therefore that higher labor and material costs are responsible for the increasing ratio in the cost of maintenance of equipment to total operating expense does not hold when the same test is applied to conducting transportation and maintenance of way.

That a definite relation exists between increasing cost of maintenance of equipment and decreasing transportation charges is clearly reflected through analysis of conditions. Locomotives and cars are growing larger in capacity, obviously reducing the power units required to handle a given amount of traffic. It is logical to assume that the purpose of this policy was directed to-

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ward reducing cost of transportation. Reports reveal the truth of this assumption and the actual fact that through the medium of larger motive power and rolling stock, the cost of transportation has been greatly reduced.

Repairs to locomotives are approximately proportional to their weight. With the advent of heavier power, higher maintenance

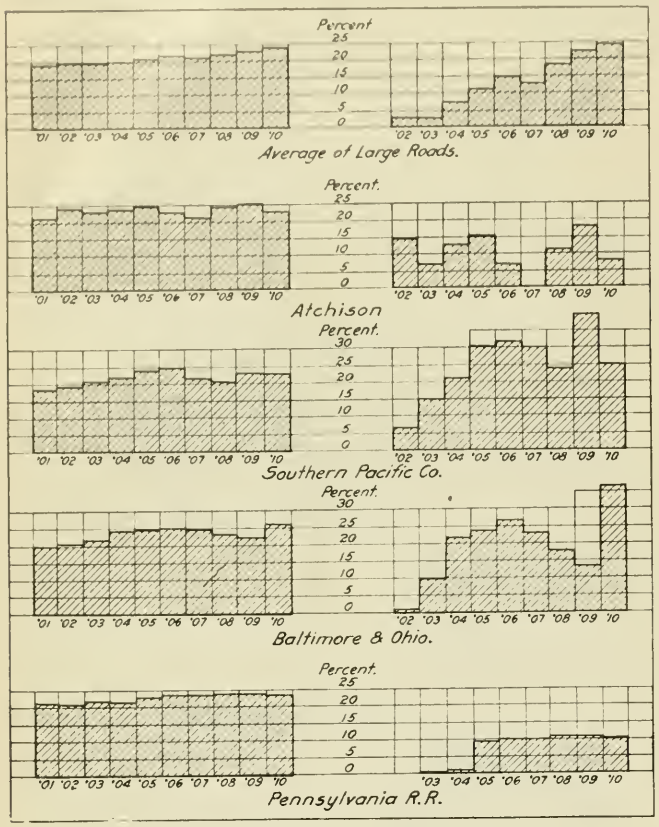

Fig. 2—Maintenance of Equipment Ratios.

Ratio of maintenance of equipment to total operating expense. *Percent. increase of maintenance of equipment to total operating expense over year 1901.*

costs are expected, not only per locomotive but also per mile run. The same is equally true of cars. Thus improved transportation efficiency is purchased at an increased cost of mechanical department operation.

The ratio of maintenance of equipment to total operating expense on the large roads for the past ten years is shown graphically in Fig. 2. The per cent. increase in maintenance charges to the total compared with the year 1901 are also included with similar information for four representative roads.

In 1901 equipment on the large roads was maintained for 18.6 per cent. of total operating expense. During the following decade

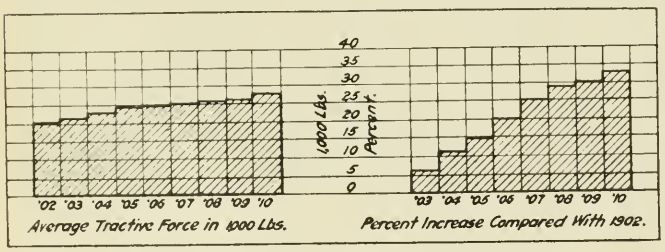

Fig. 3—Average Tractive Force; All Roads.

the percentage increased steadily, reaching 23.2 per cent. in 1910, an increase of nearly 25 per cent. over the figure in 1901. The same conditions in varying degree are reflected in the records of the representative railways shown. The Southern Pacific maintained its equipment in 1910 for 22.7 per cent. of total operating expense, an increase of 25.4 per cent. over 1901; similarly the Atchison for 23 per cent., an increase of 8.0 per cent.; the Baltimore & Ohio for 26 per cent., an increase of 32 per cent.; and the Pennsylvania Railroad for 26 per cent., an increase of 10.2 per cent. over 1901.

As previously stated, repairs to locomotives are approximately proportional to their weight. Likewise, an almost fixed relationship exists between weight of locomotives and tractive force. The latter unit then can be taken as a measure of the size or weight of locomotives. The average tractive force of locomotives from 1902 to 1910 with the per cent. increase compared with the year 1902 is shown in Fig. 3.

There is also a remarkable similarity in the increase of capacity of freight cars and tractive force of locomotives for the period between 1902 and 1910. During this time the capacity of freight cars has increased 28.6 per cent. and the tractive force of loco-

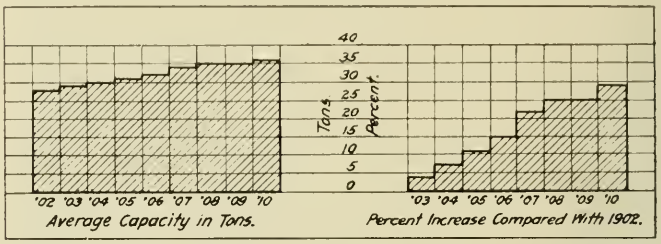

Fig. 4—Average Capacity of Freight Cars; All Roads.

motives 32.8 per cent. Cars and locomotives have steadily grown larger in approximately the same ratio from year to year.

The average capacity of freight cars from 1902 to 1910, with the per cent. increase compared with the year 1902, is shown in Fig. 4.

A comparison of locomotive tractive force and freight car capacity with the ratio of maintenance of equipment to total operating expense for the period between 1901 and 1910 (Figs. 2 and 3) establishes the close relationship between maintenance costs and size of equipment. Cost of maintaining locomotives or cars is approximately proportional to tractive force or capacity.

Maintenance charges for large equipment are greater per unit on account of increased size of locomotives and cars, more extensive shops and terminals, heavier machinery and modern facilities for handling and repairing, increased wear and tear on equipment

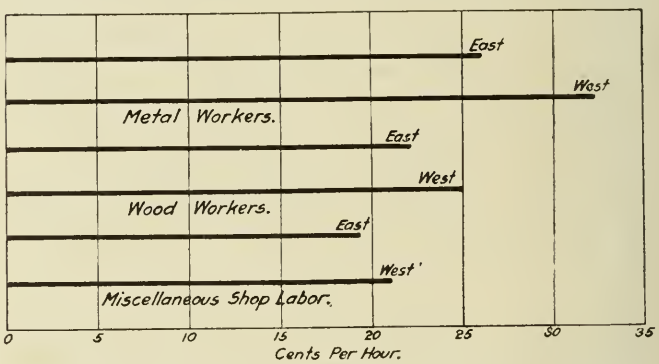

Fig. 5—Average Wages on Eastern and Western Roads in 1910.

from heavier trains and the various other items coincident with operation of heavier power.

Operating conditions on the railways east of Chicago are along fixed and tried lines, while the West is still in a more or less new condition. Labor in the West is scarce and generally of poor quality. It is therefore necessary to pay higher wages in order to attract the better class of labor from the East.

As the labor charge constitutes more than half the equipment maintenance expenditures, the higher wages paid on western roads will be reflected directly in the total when comparisons are made with eastern roads. Metal workers, wood workers and miscellaneous shop labor include most of the employees in the

locomotive and car shops and fairly represent the general labor situation.

The total figures taken from the Interstate Commerce Commission reports separated into eastern and western roads are shown in chart form in Fig. 5, with actual figures as follows:

Wages Per Hour.

	Eastern Roads.	Western Roads.	Per cent Increase Western over Eastern Roads.
Metal workers	$.265	$.327	23
Wood workers	.226	.253	12
Miscellaneous shop labor	.197	.215	9

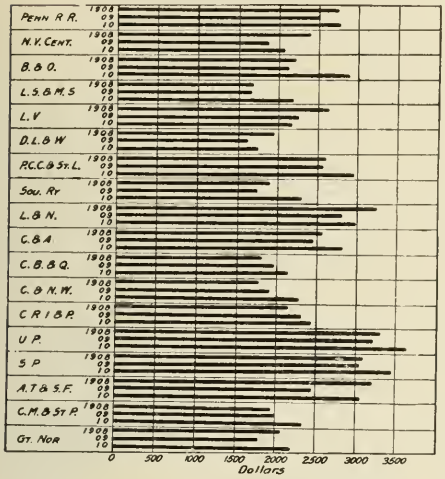

Fig. 6—Repairs to Locomotives Per Locomotive.

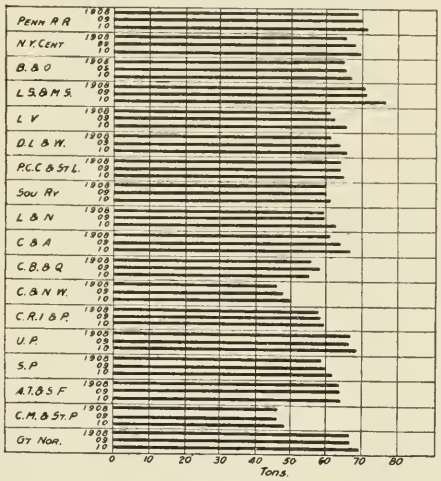

Fig. 7—Average Weights on Drivers.

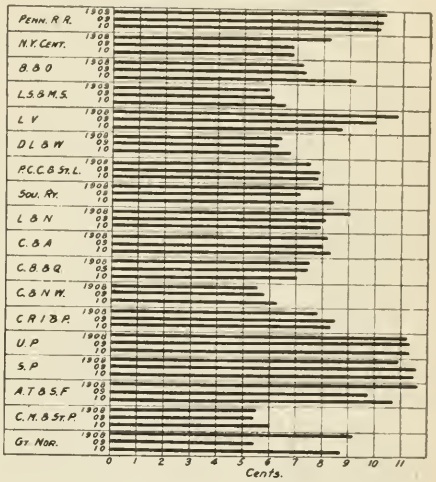

Fig. 8—Locomotive Repairs Per Locotive Mile.

This marked increase of 23 per cent. in wages paid metal workers on western roads is a most important item, and should be given due weight when comparisons are made between eastern and western roads.

Locomotive Maintenance.

The most logical unit for measuring maintenance of equipment costs is the gross ton mile, but this is not available, is not kept by some roads, and is not required by the Interstate Commerce Commission. In the absence of this information the analysis will be continued with such data as is available.

More than one-third of the total maintenance of equipment expenditure is charged to repairs and renewals of locomotives. These costs should therefore be carefully studied and the proper unit of comparison adopted before conclusions are drawn.

The prevailing unit, in comparing locomotive maintenance costs, is the locomotive or locomotive mile. In order to illustrate the great difference existing on various roads, a chart (Fig. 6) is presented showing the cost of repairs per locomotive for the years 1908, 1909, 1910.

It is noticeable that there is a general increase on most roads and on the western roads in particular.

The extremes on the eastern roads are noticed on the L. & N. and the P. C. C. & St. L., which expend about $3,000 per locomotive as against the Lackawanna with an expenditure of less than $2,000. Of the western roads the Union Pacific and Southern Pacific show an annual cost of about $3,500 per locomotive as compared to approximately $2,000 each on the Burlington, the North Western and the St. Paul. In order to form an idea of the relative performance it is necessary to know the average weight of the locomotives on each road which is shown in Fig. 7. Even with this data it is almost impossible to draw definite conclusions as to relative performance.

The repair costs on a locomotive mile basis are but little better for comparison. The accompanying illustration (Fig. 8) presents figures for representative roads and shows that the costs of repairs on the Pennsylvania Railroad and the Lehigh Valley are about 10 cents, while on the Lake Shore and the Lackawanna they are but 7 cents. Of the western roads the Union Pacific and the Southern Pacific expend more than 11 cents, while the North Western and St. Paul cost about one-half as much.

To fully interpret these results it is necessary to know the mileage made per locomotive, which is presented in Fig. 9.

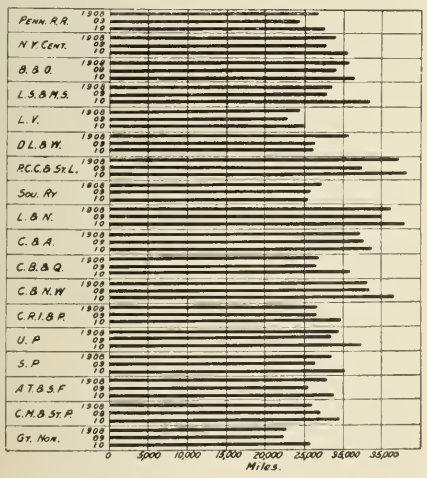

Fig. 9—Miles Per Locomotive, All Classes.

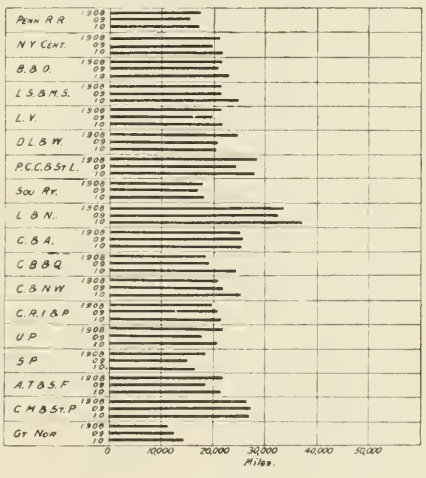

Fig. 10.—Miles Per Freight Locomotive.

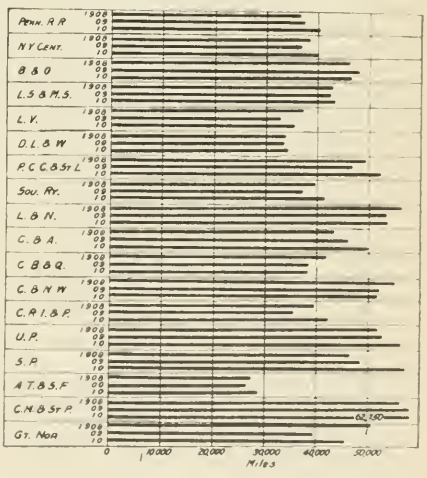

Fig. 11—Miles Per Passenger Locomotive.

The Interstate Commerce Commission does not demand locomotive maintenance costs divided into freight, passenger, etc., which undoubtedly should be done if comparisons are to be made on an equable basis. The mileage of freight and passenger locomotives, however, is given and charts are presented in Figs. 10 and 11. Of the eastern roads the P. C. C. & St. L. makes more than 25,000 miles per freight engine, while the Pennsylvania Railroad makes but 17,000 miles. The St. Paul makes more than 26,000 miles and the Great Northern less than 15,000 miles per freight locomotive, while the other roads show large differences.

but based on the work done, the watt-hours. It is therefore reasonable to expect to show locomotive costs on a similar basis. Tractive force or draw bar pull is the usual term used to express the power of a locomotive. The work unit (which may be called the tractive mile) is:

$$\frac{\text{Average tractive effort in lbs.} \times \text{average mileage per locomotive.}}{1{,}000{,}000}$$

By the use of either of the above units (tractive force or tractive mile) a fair basis of locomotive maintenance costs can be made.

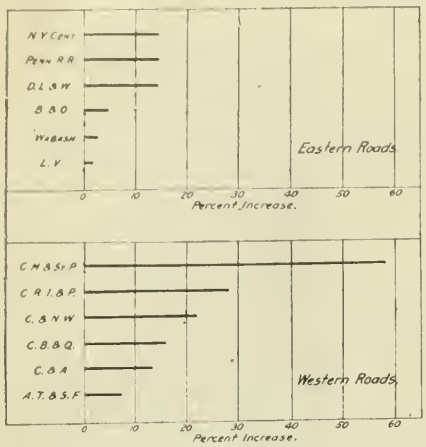

Fig. 12—Repairs and Renewals of Locomotives Per Locomotive; Five Years Ending 1910 Compared With Previous Five Years.

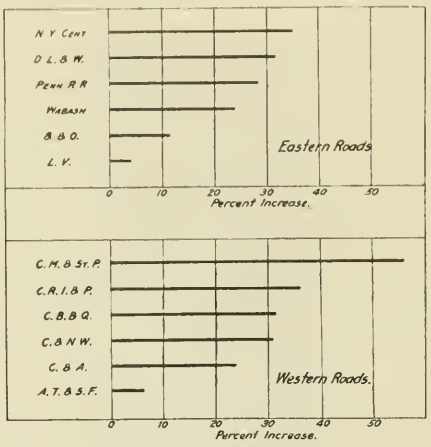

Fig. 13—Repairs and Renewals of Locomotives Per Locomotive Mile; Five Years Ending 1910, Compared With Previous Five Years.

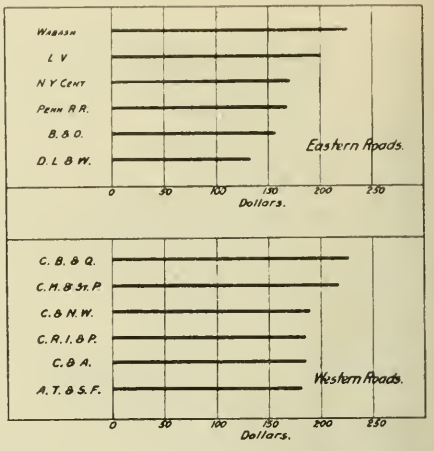

Fig. 14—Repairs and Renewals of Locomotives Per Ton of Tractive Force; Five Years Ending 1910.

A chart illustrating miles run by passenger locomotives (Fig. 11) shows the extremes to be the St. Paul with 60,000 miles, as against the Atchison with less than 30,000 miles per passenger locomotive. There are probably local conditions that cause this high mileage on the St. Paul and the low mileage on the Atchison, but goes to show that all the conditions should be known and understood before conclusions are drawn.

It is thus seen that the locomotive and the locomotive mile

The gross ton mile data is not available, but fortunately the Interstate Commerce Commission recently prepared statements on 20 roads used in the recent rate hearing which presented detailed information heretofore unpublished. This data is very full and complete and covers ten years ending 1910. Comparisons were made by five year periods.

Charts are herewith presented giving exhibits of six eastern and six western roads showing locomotive maintenance costs.

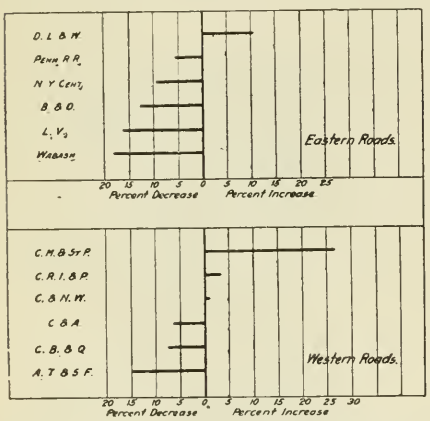

Fig. 15—Repairs and Renewals of Locomotives Per Ton of Tractive Force; Five Years Ending 1910, Compared With Previous Five Years.

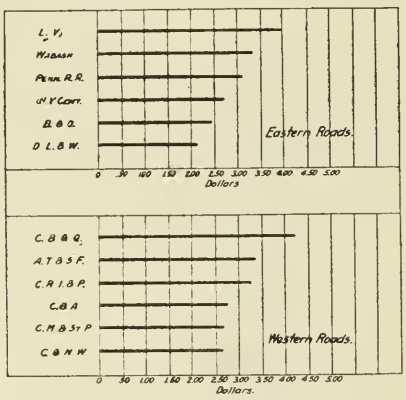

Fig. 16—Repairs and Renewals of Locomotives Per Work Unit; Five Years Ending 1910.

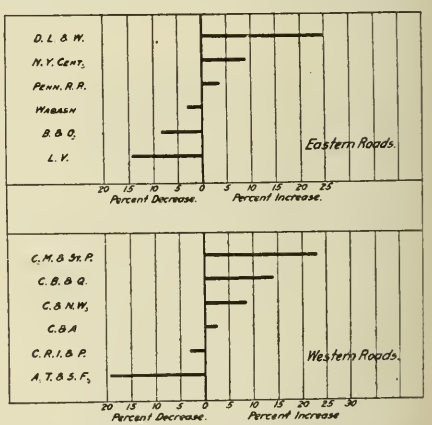

Fig. 17—Repairs and Renewals Per Work Unit; Five Years Ending 1910 Compared With Previous Five Years.

are most unsatisfactory units to use when computing locomotive maintenance costs.

A unit should be used which takes into consideration the power developed and the work delivered by the locomotive. The engine which propels the steamship is rated in horsepower and the performance is calculated in horsepower-hours. Electrical power units are similarly rated in watts and the work performed is given in watt-hours.

Maintenance costs are not calculated as so much per dynamo

The average cost of repairs and renewals on locomotives per locomotive for five years ending 1910 compared with five years ending 1905 is presented in Fig. 12. It is noticeable that maintenance charges on this basis have increased on all roads.

Repairs and Renewals on Locomotives Per Locomotive.

Eastern Roads.	Aver. 5 Yrs. Ending 1905.	Aver. 5 Yrs. Ending 1910.	Per cent. Increase.
N. Y. Central	$2,150	$2,430	14.0
Penna. R. R	2,340	2,640	12.8
D., L. & W	1,480	1,690	14.2
B. & O	2,370	2,440	3.0

Eastern Roads.	Aver. 5 yrs. Ending 1905.	Aver. 5 yrs. Ending 1910.	Per cent. Increase.
Wabash	2,530	2,580	2.0
Lehigh Valley	2,670	2,690	1.0
Western Roads.			
C., M. & St. P.	$1,365	$2,150	57.5
C., R. I. & P.	1,840	2,330	26.6
C. & N. W.	1,660	2,010	21.1
C., B. & Q.	2,320	2,620	13.0
C. & A.	2,300	2,595	12.8
A., T. & S. F.	2,600	2,720	4.6

Fig. 13 illustrates the increase in repairs and renewals on locomotives per locomotive mile during the above mentioned period.

the five years ending 1910 over the five years ending 1905. The Lackawanna, on the other hand, while showing the least expenditure per ton of tractive force, actually increased its costs in the five year period ending 1910 over the previous five years. The western roads show a more nearly equal expenditure, but a wider variation in comparing the two five year periods. The St. Paul shows an increase of 26.2 per cent. in the five year period ending 1910 over the five year period ending 1905, while the Atchison shows a decrease of 16.9 per cent. during the same period.

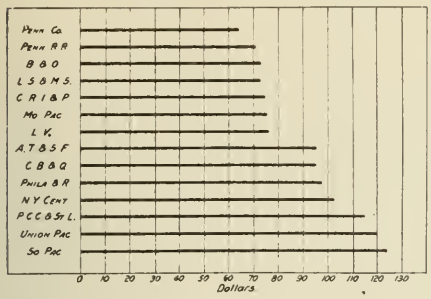

Fig. 18—Maintenance of Freight Cars Per Car in 1910.

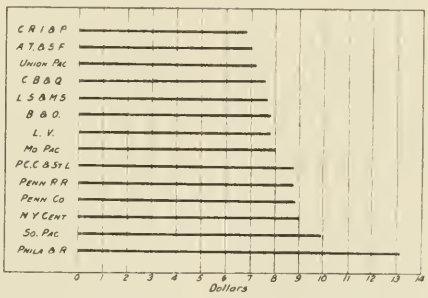

Fig. 19—Mainteance of Freight Cars Per 1,000 Freight Car Miles in 1910.

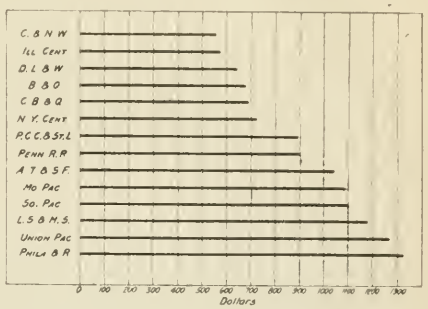

Fig. 20—Maintenance of Passenger Cars Per Car in 1910.

REPAIRS AND RENEWALS ON LOCOMOTIVES PER LOCOMOTIVE MILE.

Eastern Roads.	Aver. 5 Yrs. Ending 1905.	Aver. 5 Yrs. Ending 1910.	Per cent. Increase.
N. Y. Central	5.65 cents	7.81 cents	38.2
D., L. & W.	4.24 "	5.49 "	29.5
Penna. Railroad	7.72 "	9.78 "	26.7
Wabash	6.23 "	7.65 "	22.8
B. & O.	6.98 "	7.67 "	10.0
Lehigh Valley	10.37 "	10.80 "	4.2
Western Roads.			
C., M. & St. P.	3.46 cents	5.36 cents	55.0
C., B. & Q.	6.78 "	9.07 "	33.6
C., R. I. & P.	6.20 "	8.22 "	32.6
C. & N. W.	4.34 "	5.68 "	31.0
C. & A.	6.28 "	7.76 "	23.6
A., T. & S. F.	9.73 "	10.19 "	4.7

The New York Central shows an increase of 38 per cent. and the St. Paul an increase of 55 per cent., while the Lehigh Valley and the Atchison increased less than 5 per cent.

The costs when calculated on the basis of tractive force averaged for five years ending 1910, are shown in Fig. 14.

The locomotive maintenance costs computed on the tractive mile or work unit basis (Fig. 16)show that the Lehigh Valley costs are highest, but that it has decreased their costs 14.5 per cent. (Fig. 17). The Lackawanna is just the reverse in that their costs are lowest per work unit, but it has increased 24.6 per cent. during the past five years as compared with the five year period ending 1905. On the western roads there is not the variation noted on the eastern roads in actual costs. However, in comparing the two five year periods the extremes are the St. Paul, with an increase of 23.2 per cent., and the Atchison, with a decrease of 19.5 per cent.

FREIGHT CAR MAINTENANCE.

Freight car maintenance constitutes approximately 7 per cent. of the total operating expense and 30 per cent. of the total cost of maintenance of equipment.

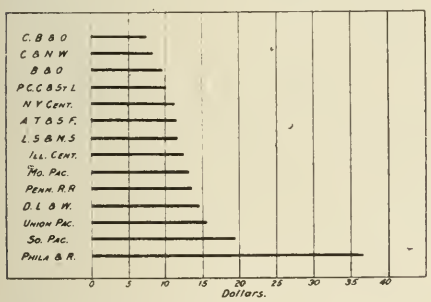

Fig. 21—Maintenance of Passenger Cars Per 1,000 Passenger Car Miles in 1910.

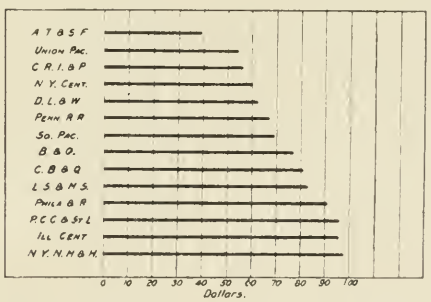

Fig. 22—Maintenance of Shop Machinery and Tools Per Pound of Tractive Force in 1910.

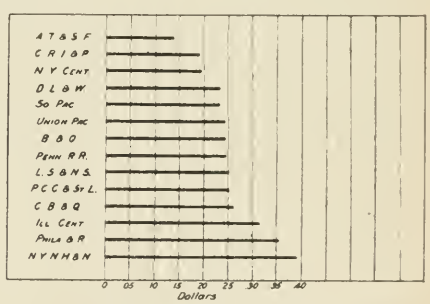

Fig. 23—Maintenance of Shop Machinery and Tools Per Work Unit in 1910.

REPAIRS AND RENEWALS ON LOCOMOTIVES PER TON TRACTIVE FORCE.

Eastern Roads.	Aver. 5 Yrs. Ending 1905.	Aver. 5 Yrs. Ending 1910.	Per cent. Increase.	Per cent. Decrease.
D., L. & W.	$121.00	$133.00	10.0	....
Penna Railroad	181.00	169.00	....	6.6
N. Y. Central	191.00	170.00	....	11.0
B. & O.	182.00	158.00	....	13.2
Lehigh Valley	241.00	200.00	....	17.0
Wabash	280.00	228.00	....	18.5
Western Roads.				
C., M. & St. P.	$172.00	$217.00	26.2	....
C., R. I. & P.	180.00	185.00	2.8	....
C. & N. W.	189.00	191.00	1.0	....
C. & A.	198.00	186.00	....	6.1
C., B. & Q.	246.00	223.00	....	9.3
A., T. & S. F.	219.00	182.00	....	16.9

A comparison of the performance by five year periods (Fig. 15) for the eastern roads points out the fact that while the Wabash and Lehigh Valley spent the most money per ton of tractive force they made a decrease of more than 15 per cent. during

A common method of comparison of maintenance of freight cars is "per car owned," and a chart (Fig. 18) is given herewith showing the cost per car on a number of representative roads. On the roads illustrated the cost per car varies from $65 on the Pennsylvania *Company* to $122 on the Union Pacific system and $126 on the Southern Pacific. The average capacity varies from a minimum of 31 tons on the Atchison to a maximum of 44.8 tons on the P. C. C. & St. L.

The remarkably low cost on the Pennsylvania Company, as compared with the high cost of the Union Pacific, in place of reflecting economy in one case and extravagance in the other, serves as conclusive evidence that the maintenance per freight car owned is useless as a comparative unit.

Upon the Interstate Commerce Commission records for the fiscal year 1910, the Union Pacific reports 441,540,857 freight car

miles and 26,043 freight cars owned; while the Pennsylvania Company reports 401,108,276 freight car miles and 54,248 cars owned. The Pennsylvania Company, with 108 per cent. more freight cars than the Union Pacific has 9 per cent. less mileage, which condition can exist either from an excessive number of cars or by a very large amount of interchange, which latter is probably correct as 80.3 per cent. of the freight car mileage on the Union Pacific was from foreign cars.

The interchange of traffic renders maintenance costs per freight car owned of little value for comparative purposes. Other conditions also modify the usefulness of this unit. The cost of freight car maintenance is proportional to age of the equipment, its present condition, class of traffic handled, and total weight in transit and business hauled. In addition, the physical characteristics have considerable influence as repairs are more extensive in mountainous districts where heavy grades and curvature prevail than on the plains where grades and curvature are slight in comparison.

It is clear from the foregoing that costs per car owned cannot be used as a basis for comparing maintenance of freight cars on different roads. For roads operating in the same general territory the ton mile is an equable basis of comparing maintenance, but on account of the variation in operating conditions on roads in different sections of the country it is not adaptable as a unit for universal comparative purposes.

A satisfactory basis for analysing maintenance of freight cars is the gross ton mile, but as these records are not kept by the Interstate Commerce Commission the information is not available. As the gross ton mile includes the weight of the car, whether loaded or empty, and the miles hauled, it is obvious the unit is proper for comparing maintenance costs.

The commission presents data on the revenue ton mile, which is not a satisfactory basis of comparison, as it does not include the empty car mileage or that of cars engaged in transporting company material. Obviously the omission of this traffic renders the information incomplete. The mileage of empty cars is a large item. For instance, in 1910, on the Union Pacific, it was 23.4 per cent. of the total car mileage, 29.6 per cent. on the Atchison, 33.7 per cent. on the Pennsylvania Railroad, and 35 per cent. on the Philadelphia & Reading. Empty cars in service are subject to the wear and tear of traffic and depreciation the same as cars in revenue service. Likewise cars carrying company material are in the same service as revenue freight when maintenance is considered. Company material is an extensive traffic item. For example, during the fiscal year 1910 the net ton miles of company material on the Southern Pacific was equal to 20 per cent. of the revenue ton miles, while on the Atchison it was 32 per cent.

It is unfortunate that data on gross ton miles is not available in view of its value as a unit for comparing maintenance of freight cars on different roads. Without this information an analysis of maintenance costs cannot be carried to a positive conclusion, but a unit of comparison, namely, cost per 1,000 freight car miles is presented (Fig. 19) for the leading roads for 1910 as the most definite data available. The figures given indicate approximate costs of maintenance without the accuracy of the gross ton mile unit.

PASSENGER CAR MAINTENANCE.

The charges for passenger car maintenance are less than 10 per cent. of the expenditure for maintenance of equipment or about 2 per cent. of the operating expense, and therfore of minor importance when considering total operating expenses.

The demands of the traveling public, local conditions, size of equipment all have a bearing on the repair costs and comparisons among different roads are generally of but little value.

Unfortunately, the Interstate Commerce Commission records do not contain any data with reference to the size, capacity or weight of the passenger coaches for the different railways. Since it is quite evident that coaches 70 feet in length, with steel underframes, and six wheel trucks, will cost more to maintain than coaches 55 feet long with wooden underframes and four-wheel trucks, it is practically impossible with the data at hand to effect accurate comparisons.

As in the case of freight car maintenance, the usual method of comparison is on a basis "per passenger car" and the accompanying chart (Fig. 20) shows the maintenance cost on this basis for a number of roads. These figures vary from $656 on the Lackawanna to $1,344 on the Reading, and $562 on the North Western to $1,286 on the Union Pacific.

The mileage made is another common basis of comparing passenger car maintenance costs. The accompanying chart (Fig. 21) shows some interesting comparisons of roads operating in the same territory.

The maintenance cost on the Reading per 1,000 car miles is $37.05, $10.12 on the P. C. C. & St. L., $19.42 on the Southern Pacific System, and $7.60 on the C. B. & Q.

These figures are more interesting in connection with the maintenance on roads operating in the central states, the Burlington at $7.60, the Northwestern at $18,36, the Illinois Central at $12.57 and the Missouri Pacific at $13.20. Again, roads operating from the west and southwest, the Atchison at $11.67, Southern Pacific system at $12.89 and the Union Pacific system at $15.83.

Comparisons of this nature can be drawn on this basis among the different railways, but as has been mentioned above, these figures are only of relative value.

Passenger car maintenance costs are in direct relation to the weight and the distance carried. The ton-mile is therefore the most satisfactory basis, as in the case of freight cars, but this figure is not demanded by the Interstate Commerce Commission and therefore is not obtainable.

SHOP MACHINERY AND TOOLS.

The items of locomotives, freight cars and passenger cars constitute about three-fourths of the charges to maintenance of equipment. The remainder is made up of superintendence, electric, floating and power plant equipment, injuries to persons, shop machinery and tools, stationery and printing, and other expenses. The only item which is worth considering is that of shop machinery and tools, and this expenditure amounts to about 3 per cent. of the total maintenance of equipment.

The charges to this account should be in direct relation to the size of and to the service rendered by the locomotive. The expenditures in the freight and passenger departments are small and of but little consequence.

Therefore the locomotive tractive force is the fair basis to use for comparative purposes. Charts are presented illustrating costs on representative roads for maintaining shop machinery and tools on a tractive force basis (Fig. 22), and also the work unit.

In treating the subject of maintenance of equipment expenditures, it has been impossible to separate charges for labor from material charges. This is exceedingly unfortunate as a thorough and complete analysis cannot be made without knowing the proportional charges between labor and material. It is to be hoped that the Interstate Commerce Commission will see the importance of this information and ask the railways to furnish it in the future. This completes the analysis of maintenance of equipment costs. Much of the data is presented in entirely original form, not only for the purpose of rendering consistent comparisons of costs on various roads, but also to point out the uncertain value of the accustomed standards of measurement.

During the year 1910 the number of persons ticketed over the Siberian Railway between the European cities and China, Japan and other eastern Asia points was 4,852 adults and 170 children, the receipts from whom were $615,300, an average of $125 per passenger. This is much the largest travel the road has ever had, the increase over 1909 having been 36½ per cent., though it was reduced in the latter part of the year by the prevalence of plague in Manchuria. But it is after all a light movement, equivalent to but 69 persons each way daily. The earnings are at the rate of about $153 per mile for the Siberian Railway, which receives, however, only a part of them.

NEW RAILWAY LAWS IN OREGON.

The State Railroad Commission of Oregon, C. B. Aitchison, chairman, has issued a circular giving a brief statement of the laws enacted by the last legislature of that state, and ordered to go into effect May 20, 1911 (except as noted).

Chapter 27 forbids the transportation of explosives on cars intended for passengers.

Chapter 29 requires shelters for car repairers at division terminals and at other points where five or more repairers are regularly employed. Five months is given in which to comply with this chapter.

Chapter 56 authorizes transportation of soldiers and military equipment free or at reduced rates.

Chapter 57 continues orders of the commission in effect where a railway changes owners or operators.

Chapter 68 prohibits knowingly transporting or causing to be transported within Oregon of any woman or girl for the purpose of prostitution and imposes penalty.

Chapter 77 amplifies and strengthens the rate law (section 6886).

Chapter 93 amends the Long and Short Haul law by inserting "under subtsantially similar circumstances and conditions," and by allowing the commission to authorize exceptions.

Chapter 96 provides for the inspection and sealing of track scales by the commisison.

Chapter 125 imposes a penalty for wilful injury to bridges, railways, telegraphs, etc., or wilful arrangement of telephone or telegraph wires to interfere with their efficiency.

Chapter 135 prohibits drinking and intoxication on any engine, car, train or depot, except dining cars, etc.

Chapter 136, to regulate the transportation of live stock, prescribing minimum rates of speed, the installation of suitable stock corrals at junction points, for the giving of notice of delays to shippers, and amends the 28-hour law by permitting a separate request to be signed by the shipper extending the time of confinement to 36 hours and otherwise conforming the section generally to the Federal Act.

Chapter 137 prohibits employment of certain railway employees over 14 hours and certain others over 9 hours.

Chapter 139 requires that bonded employees, when discharged, shall be given a written statement of reasons, if they so request; the commission is to investigate the reasons for discharge in "cases involving moral turpitude."

Chapter 150 amends the law concerning fencing of new railways; allows the commission to authorize and regulate farm crossings; to decide what kinds of fence shall be used; and suspend the fence law as to any particular portion of a railway.

Chapter 154 prohibits the transportation of ginseng unless labeled to show certain facts as to the growth and purity of the ginseng.

Chapter 174,, Section 2, Paragraph 11 prescribes the manner in which vehicles shall be operated in passing railway or street cars operated in any city, town or village.

Chapter 190 prohibits the transportation of certain kinds of fish taken from the Rogue river.

Chapter 219 requires frogs, switches and guard rails to be blocked by July 1, 1912; and requires that flagmen of passenger trains must be able to read, write and speak the English language; and be 21 years of age.

Chapter 271 confers upon railway corporations the right to appropriate the right of way, roadbed or tracks of other railway corporations in canyons, passes, or defiles.

Chapter 278, section 10, requires smoke-stacks of engines running near forest or brush land to have adequate spark arresters between June 1 and October 1.

Section 11 requires builders of railways to destroy inflammable material along the right-of-way, as directed by the State Board of Forestry.

Attention is called to the fact that the commission is required by law to report to the attorney-general violations of any of these acts. Copies of the full text of these acts can be had from the secretary of state at Salem, for $1.45 each.

ISSUE OF STOCK BELOW PAR AND SALE OF BONDS AT A DISCOUNT.

One question that the Securities Commission, which has now been at work for over a year on preparing its report to President Taft, has had to consider is whether or not the commission should recommend a law forbidding the issue of stock at less than par or the selling of bonds at a discount by carriers engaged in interstate traffic. Some of the men whose opinions on this question were sought by the commission made little or no distinction between the issue of stock below par and the sale of bonds at a discount, but the majority of bankers and those having to do directly with the sale of railway securities recognized a clear distinction.

The common practice in the past has been to make the asset side of the balance sheet correspond with the liability side. Stated more simply than it is ever worked out in practice, if $1,000,000 stock is issued and $2,000,000 bonds are sold to acquire a given piece of line, that line is carried on the balance sheet at a valuation of $3,000,000. This has been quite generally the practice, even if the stock were issued at 70. Now, by this misrepresentative bookkeeping there are three classs of people who *might* be injured. In the first place, prospective stockholders who bought stock in the open market believing that the par value of the stock was the actual amount invested in the property; second, the creditors, including the bondholders, who might believe that the par value of the stock represented an equity in the property protecting their credit; and third, the shippers might be charged an unreasonable rate so that dividends could be earned on the par value of stock which was issued at less than par.

It was almost the unanimous opinion of all of the witnesses that the capitalization of a railway had little, if anything, to do with any particular rate; and it was the general opinion of the greater number of the witnesses that the total capitalization of any one road had very little direct bearing on the aggregate of rates which such a railway could charge. As a protection, therefore to shippers, the prohibition of the sale of stock at less than par is not a necessity. President Delano from his observations believed that in many cases where overcapitalization became an unduly strong motive for earning more, an attempt was made to do this by cutting rates and not by raising them.

The protection of the bondholder or other creditor is quite a different question. If the bondholder's equity is really only $700,000 instead of $1,000,000, the margin of safety of his bonds is less by just the difference between $700,000 and $1,000.000. This, however, is true only immediately after the issue of the stock, for as soon as a road begins to operate the equity behind the bonds is changed. It is quite conceivable that in the case of two competing roads, one of which had sold its stock at 70, and the other at par, the $700,000 might have been so much more wisely spent than the $1,000,000 that, after the two roads had been in operation a year, the road that had only $700,000 invested in it from the proceeds of its stock sale would be earning half as much again as its competitor. One therefore is led to the conclusion that the par value of stock is only a momentary value which changes with market conditions and with operating and traffic conditions. The prospective buyer of bonds of a road already in operation, to be injured by a former sale of stock at less than par would have to close his eyes to all the conditions which affected his property, except a study of the misleading balance sheet which would show an unduly large equity in money derived from the sale of stock. On the other hand, if a new line were to be built, any misrepresentation as to the amount of money spent on the line

would be in the nature of a fraud against the prospective bond buyer. In this case the bond buyer's judgment is influenced not by actual conditions, but by what he thinks ought to result from the expenditure of a certain amount of money.

It came as a surprise to many of the witnesses who testified before the commission that anyone in the present day of enlightenment and *Everybody's Magazine* should attach any consequence to the par value mark on a certificate of stock. The commission, however, pointed out to one of the surprised witnesses that the Supreme Court of the United States still attaches some significance to this nominal figure. Most of the witnesses acknowledged that to a certain class of investors the fact that they could buy at $50 or $60, something whose nominal value was $100 made such a purchase more attractive to them than if the stock certificate had been stamped $50 or $60.

As the law stands at present, in many states, it is illegal to issue stock below par; but, under the common law, if stock has been issued and sold below par and is resold to an innocent third party, there is no redress either for the state or for the creditors of the company. The law recognizes that the $100 stamped on the stock does not mean that that is its value, but it should mean that that is the amount received by the company originally.

One of the remedies suggested for the nominal deceit practiced in issuing stock below par was the passage of a law which should permit the issue of stock without a par value; that is, certificates would be issued, each one stating the percentage of the total profits and assets of the company represented by that certificate. These certificates without a par value could be sold at any price which they would bring and the asset side of the balance sheet would then only need to show the amount actually received from the sale, and the participation certificates would automatically adjust themselves on the liability side so as as to always balance. As things are now, the capital assets and capital liabilities, as shown on the balance sheet, are inflexible, except through changes in the profit and loss account. This would still be true if stock were issued without a par value; but there would be this difference. As it is now, if a road has sold its stock at less than par, neither the asset side nor the liability side tell a true story, because the asset side has been made arbitrarily to correspond to the liability side. If stock were issued without a par value, the asset side would, unless there were a fraud, tell the truth, and from this a correct liability side could be worked out in terms of dollars and cents. This discussion applies particularly to the financing of new roads or the new purchase of property.

Assuming for a moment that the issue of stock without a par value would be desirable for new roads or new security issues, there remains the question of whether it would be desirable and practicable for companies which now have stock with a par value to call this in and issue new stock without the dollar mark in its place. The majority of bankers and corporation lawyers who had made any study of the question did not think there would be any insurmountable or even any very great practical difficulties in the operation of a law which would permit the conversion of par value stock into non-par value stock. Judge Lovett was asked what should be done to the asset side of a balance sheet in case the company made such a conversion of its stock. He said that in his opinion the asset side should be changed so as to show at what price the stock was taken over. To take a concrete case, if a company's stock were selling at 80, and there were $1,000,000 par value outstanding, the asset side of the balance sheet would show an investment of $800,000 and 10,000 participation certificates might be issued, each one to be exchanged for $100 par value of old stock. In the case therefore of companies whose stock was selling below par the asset side of the balance sheet would be reduced, and in the case of companies whose stock was selling above par the asset side would be increased. Such a process as this would seem to give the Interstate Commerce Commission its long sought valuation. It would not be a physical valuation, but it would be a market valuation. It would serve equally well as a peg from which to start accounting along the lines prescribed by the commission.

Those who favored forbidding the issue of stock below par did so on the ground that it was a deceit. Those who thought that such a law would do very much more harm than good based their opinion in part on the belief that unless new lines could be financed through the issue of stock either as a bonus to be given with bonds or to be sold at very much less than par, a serious check would be given to speculative railway building. This need for speculative building was somewhat fully discussed in the comments on the testimony before the commission as to the advisability of federal or state regulation (*Railway Age Gazette*, June 2). As was stated before, most of the witnesses agreed that speculative railway building was highly desirable for the development of the country. It was pretty clearly shown that it is impossible to induce money to invest in a speculative venture without holding out the hope of a return quite disproportionate to any rate of interest that could properly be paid on a bond. Investors and speculators have certain well understood prejudices and conventions that cannot be disregarded. One is that a bond carrying a very high rate of interest is to be distrusted. Roughly speaking a man who buys a 10 per cent. 5 year $1,000 bond at par makes a profit in five years of something over $500, and a man who buys a 5 per cent. 5 year $1,000 bond at par and gets $1,000 par value of stock as a bonus which is worth $260 at the end of five years, makes a profit of something over $500; but experience has proved that the latter method of financing is practicable and the former one is not practicable.

There was one question that the commission repeatedly asked those who testified before it and to which apparently it got no very satisfactory answer from any one witness, although from the importance of the question it is probable that the commission will feel itself bound to make some definite recommendation in regard to it. Given a railway company in the following situation: Through former bad judgment, mismanagement or some other cause, there is a bonded debt amounting to 75 per cent. of the present value of the property; in addition, there is stock outstanding with a par value of 50 per cent. of the present total value of the property. Assuming, now, that the company finds itself imperatively in need of more money to double-track a portion of its line, what can the management do? It will be noted that this situation has a good many points in common with the situation in which a receiver finds himself; and in the case of a receiver he applies to the court for permission to issue securities, which through the authority of the court become senior to all the securities now outstanding. It was the general opinion of most of the witnesses that in a case of this kind a road would not be able to issue junior bonds at any price that would be fair either to present bondholders or present stockholders; and if it were not allowed to issue stock below par there would really have to be a voluntary reorganization or the road would, in all probability, have to be put in the hands of a receiver.

Some of the dangers that might lie in issuing stock without a par value are the opportunities which it would open for stock manipulation; and the difficulties that a company might have in authorizing new stock. For instance, if a company sold 10,000 participation certificates originally at $75 per certificate and later needed money but could only sell additional certificates at $50, there might be considerable difficulty in getting present certificate holders to authorize an additional issue of certificates. It would appear, however, as if this difficulty could be overcome by offering the new certificates to certificate holders pro rata, giving them the chance to average down the cost of their holdings. As a practical consideration, Marvin Hughitt suggested that if the par value were removed from stock certificates, the small investor would be less likely to find stocks attractive,

because he would fail to understand what he was buying. When he buys a certificate marked with a par value of $100 he feels that in some way he is buying a tangible $100 worth of property, while if he were to buy simply a participation certificate—an interest in the general business of the company—he would be getting something rather beyond his comprehension.

The sale of bonds at a discount presents a question quite different from that of the issue of stock below par. From the company's point of view, the yield on the investment is the only thing in which it is interested. In other words, the price it has to pay for its money is what determines the sale of securities at any given time. It makes no difference wherether a 4 per cent. bond is sold at a discount or a 5 per cent. bond at a slight premium, if the company has to pay 4¾ per cent. for its money it is in the same financial position whether it issues a 4 per cent. bond or a 5 per cent. bond. The discount is taken up over a series of years and to all intents and purposes is the same as interest.

The price which a company will have to pay for its money cannot be fixed or, in fact, influenced by a law or by the action of a commission.

A railway company has to bargain for its money in much the same way that any man would go about mortgaging his real estate. Its object is to get the greatest amount of money for the least interest payment possible, consistent with mortgaging its assets in such a way as to make future financing as easy as possible. It was the unanimous testimony of all of the bankers that market conditions for money are such that sometimes a road could get a loan at an actually lower interest by selling a 4 per cent. bond at a discount than it could by selling a 5 per cent. bond at a premium, or vice versa. Most of the witnesses conceded that the sale of bonds is such a delicate and highly technical operation that it could be much more advantageously carried out by a board of directors free from the immediate supervision of a commission or the restriction of any laws.

The members of the New York Public Service Commission and of the Massachusetts commission did not concur in this view. In both Massachusetts and New York the law provides that the commission may fix a minimum at which bonds can be sold. The members of the New York commission cited an instance in which a certain railway had come to them and asked permission to issue bonds at a certain figure, say 79, and that the commission had refused to permit the issue of these bonds unless the company could get a higher price, say 83, for them, and that the commission by standing firm had succeded in actually getting the higher price for the company for its bonds. One is led to surmise that this was a particular case, in which the bankers who were to buy the bonds were already so deeply interested in the other oustanding securities of the company that they were in a position which permitted the Public Service Commission to coerce them to a quite extraordinary degree.

The question of publicity was viewed quite differently by different witnesses. It was conceded, however, by most that there ought to be a certain amount of secrecy about any business transaction of this kind while the negotiations were still pending, but that it was desirable and only right that eventually full publicity should be given to the whole transaction. The differences in opinion as to publicity lay largely in the question of how soon after the negotiations for security sale had been closed the company should be compelled to make public its record and as to the amount of detail that should be required.

"Happy Arabia," known now as Yemen, is to have a railway, extending from the Red Sea at Hokeidah, which is about 150 miles north of the outlet of that sea, into the interior 73 miles to Obal. It is hoped to eventually continue it further to the plateau east of the coast range, but to do this a pass 9,500 ft. above the sea must be reached. A harbor also is to be constructed 10 miles north of Hokeidah, which is about 500 miles south of Mecca, which will be the terminus of the nearest line.

CHICAGO PASSENGER TERMINAL OF THE CHICAGO & NORTH WESTERN.

The new passenger terminal of the Chicago & North Western in Chicago was opened for traffic Sunday, June 4, and since 6 a. m. of that date all the through and suburban trains have been operated into and out of the new station. The terminal includes two new approaches, the north approach being about one mile long and the west approach about 1¼ miles long, in addition to the station building and train shed, which occupy the blocks between Madison street and Milwaukee avenue and Clinton and Canal streets.

The station proper is 320 ft. x 218 ft., and is four stories high. In addition to the main entrance on Madison street, there are six other public entrances, giving easy access to all parts of the building from any direction. The walls are gray Maine granite and the column shown in the photograph of the Canal street entrance is marble. The inner vestibule of the Madison street entrance is shown herewith. The entrance to this vestibule is



Canal Street Entrance.

through three large arches, each containing five bronze and glass doors. Corresponding doors lead from the vestibule into the public court. This court is ample in area to accommodate travelers while transacting all business incident to a journey. The ticket office contains 33 selling windows and is provided with every facility for serving the traveling public promptly. In addition to the ticket office, the other conveniences grouped around this court include a lunch room, public telephone booths, drug store, telegraph offices, information bureau, parcels check room, automobile and cab booths and baggage room. The broad stairway shown at the left, in the view of the public court, leads to the main waiting room on the floor above, a general view of which is shown. As an example of the care that has been taken to include every possible convenience in the design of this station, the lights on all stair landings should be pointed out. These lights can be seen in the photographs at the landing in the stairway leading from the ground floor to the main waiting room. Strong reflectors are provided which throw a

bright light on the landing, a point which is usually obscured by shadows.

The waiting room is treated as a Roman atrium with a barrel vault roof. The pilasters and the entire order up to the spring of the vaulted ceiling are of dull finished, light pink Tennessee marble. The columns are of Greek Cippolino marble of a delicate green hue. The ceiling is of self-supporting tile construction with ribs of terra cotta, ornamented with symbolic designs. The lighting includes clusters of high power incandescent lights supported on solid bronze fixtures and a complete system of in-



Inner Vestibule on Madison Street.

direct lighting, concealed behind the cornices. The large clock shown at the end of the waiting room is one of thirteen located in different parts of the station and controlled from one master clock. The ventilation of this room, as of every other part of the building, is effected by a forced draft system which completely changes the air in the building every 20 minutes. The mahogany settees in the waiting room are all numbered for the convenience of patrons in making appointments in this room.

A separate waiting room for ladies is provided at the west end of this floor, a corner of which is shown in a photograph. Adjoining this ladies' waiting room is the main dining room. The architectural treatment of these rooms harmonizes with the general scheme of the interior and the lighting is by the indirect system, which supplies a soft, light without any shadows. The service in the dining room is from a kitchen on the floor below, the equipment of which is equal to that of the kitchen in any metropolitan hotel. At the east end of the main waiting room is the barber shop, newsstand, smoking room and public and pay toilets. On the third floor are provided ladies' rest rooms, dressing rooms, wash rooms and baths, a ladies' tea room, and the nurse's and matron's rooms. Adjoining the latter room is a physician's office and emergency department. The facilities for hospital and emergency service are very complete and are furnished free of charge. On the same floor are the men's lounging room, men's barber shop and bath rooms. This service is designed so that a suburban patron can change to evening



Ticket Office.

dress and keep his evening appointments without the necessity of going home.

From the main waiting room entrance is had directly to the train shed concourse. This concourse is as substantially built as any other part of the building and will be heated in winter to a temperature of 60 deg., allowing passengers to wait for their trains in comfort. The train announcing boards, shown on the left, are operated by a perforated ribbon somewhat similar to a piano player record, by which only the names of towns at which a train stops are displayed on the board. The balcony at the right of the picture is for the train announcer. The heavy sliding doors at the left of the picture open into the train shed. This shed is the Bush type. There are 16 tracks in the shed, which covers an area of 265,800 sq. ft. As shown in the photograph, the floor construction is concrete throughout, allowing the space between the tracks to be flushed and kept in a perfectly clean and sanitary condition. Belt conveyors are pro-



Public Court on Ground Floor.



Corner of Women's Waiting Room.



Main Dining Room.

vided between tracks on to which mail sacks are thrown direct from incoming mail cars. These conveyors carry the mail to the post office sub-station below the train shed. In addition to the post office the space under the train shed includes baggage and express rooms, cab and automobile stands and quarters for immigrants. The facilities for the immigrants are very complete, including a lunch room where good food is served at a low price, complete baths and toilet for men and women and wash rooms, including steam dryers whereby the immigrant women may do the washing for their families and have it dried while they wait.

A suburban concourse midway between Randolph and Washington streets, and extending the complete width of the station, furnishes entrance to the main shed without requiring suburban patrons to go through the station proper.

The original studies on the plan of this terminal were begun



Main Waiting Room, Looking East.



Concourse, Looking East.

in December, 1905, under the direction of Marvin Hughitt, at that time president and now chairman of the Chicago & North Western. The work of making detail plans and of wrecking buildings on the new right of way was begun in November, 1906. The raising of the Chicago & Oak Park elevated, which crosses the station tracks on Lake street, was begun in June, 1908. In September, 1908, construction work on the approaches was started, and in November, 1908, construction work on the station buildings was commenced. The approximate cost is as follows:

Real estate and legal expenses	$11,560,000
Station building and train shed	6,380,000
Power station building and equipment	810,000
Elevated approaches	5,000,000
Total	$23,750,000

For the benefit of those who may desire to refer to previous descriptions of special features of this terminal the following list of articles have appeared in the *Railway Age Gazette* is given:

General description of the arrangement of station building prepared from architects' studies, August 14, 1908.



Train Shed.

Complete description of the Bush train shed, July 16, 1909. Photographs showing progress, February 11, 1910.

Description of the raising of the Oak Park elevated, the building of subway bridges and approach, with especial reference to their waterproofing, further details of the arrangement of the station and complete description of the power house with its equipment, July 15, 1910.

Details of construction, with progress photographs, March 23, 1911.

STUDIES IN RAILWAY ECONOMICS.

IX*.

BY W. M. ACWORTH.

Let us assume then that Lord Collins is right in saying that—at least when a Law Court has to decide the question—"the reasonableness of the charge must be measured by reference to the service rendered and the benefit received, which is unaffected by the prosperity or misfortune of the parties to the contract." "The affluence or indigence of the person rendering or receiving the service is beside the question." Let us see how this has been worked out in practice before the English Commission Court. The English commission has indeed so far been spared the task of deciding what is a reasonable rate *per se*. Parliament has fixed by statute the maximum rates and charges which the companies are entitled to make, and the court presumes that all charges within that maximum, provided that they have not been increased since 1892, are, apart from the question of undue preference, reasonable. It is only where a change has been made since 1892 that the court has jurisdiction to decide as to the reasonableness of the increase.

"The main element," says Lord Collins, "in such determination must be the expense to the carrier." But, with great respect, it would seem that, if "the service rendered and the benefit received are unaffected by the prosperity or misfortune of the parties to the contract," if "the affluence or indigence of persons receiving the service is beside the question," the expense to the carrier becomes not only "the main element," but the sole element in deciding whether an increase is reasonable. And so the decisions of the court in particular cases have worked out in practice. The companies have again and again endeavored to put in force an increase, and have succeeded or failed according to whether they could or could not prove that the expense of working the particular traffic to which the increase was applicable had increased. The companies' total net revenue may or may not have increased; the trade in the particular article on which an increase is proposed may be in the heights of prosperity or the depths of adversity; it matters not. Provided the company can satisfy the court that the ratio of operating expenses in the case of that particular traffic, has increased from causes of a not merely temporary nature, sanction to an increase of rate, proportionate to the increase of expense, almost automatically follows. Of all obligation to consider the question from a commercial or economic aspect the court almost ostentatiously washes its hands. "We are not a court of conciliation, or a tribunal of honor; we are not made judges of prudence or of generosity." Railways are "as traders, entitled like other traders to push their business to the best advantage." Far be it from me to presume to say that this is not good law, or even that, acting as a court of law under the statute that conferred the jurisdiction, it would have been possible for the railway commission to adopt any other course. But, regarding the question from the economic standpoint, and considering not what the law is, but what it ought to be, an economist is entitled to say that it is bad economics, and, I add, bad business.

It is surely unnatural that a tribunal of appeal should refuse to take into consideration the very matters that would be uppermost in the mind of the person who had to decide in the first instance. And, assuredly, the first thing that a railway manager takes into account, and ought to take into account, is the ability of the traffic to bear the rate; which is really "its effect upon the trade of the persons who have to pay it." To charge what the traffic will not bear, at least beyond the point which leaves the railway some profit on the transaction, is to sin against the first canon of railway rate making. But this, says Lord Collins, "is a question of railway management, which in my judgment lies outside our province." The result of a manager increasing rates from one set of considerations, and a court deciding as to the reasonableness of the increase from another set of considerations, is curiously unreasonable. The court has in more than one case sanctioned increases made by the railways in coal rates. That an increase in the cost of carrying coal has therefore been proved we may take for granted; but it by no means follows, either that the coal trade is in a good position to bear the increase, or that the companies, if left to themselves, would have tried to recover their loss in net revenue by increasing the charges on coal. It is much more probable that they would have followed the line of economic least resistance, and have put up their rates for silks and cigars and grand pianos, where there would have been no fear of killing the goose that laid the golden eggs. Indeed, it is quite conceivable that the very fact that the companies' expenses in carrying coal have increased is economically a reason why coal rates should be reduced. Take this case: The cost of raising coal in England has been increased by the introduction of the statutory eight hours' day for miners. This has raised the cost of locomotive coal to the companies, and so increased their working expenses. But, simultaneously, it has weakened the competitive position of English coal in foreign markets and, accordingly, a coal trader with a diminishing demand, bound to cut his profits or lose his trade altogether, is less able than before to pay even the old rates, let alone the new ones. Economically speaking, a railway should rather reduce these rates and thus help the trader to recover his imperilled position and so to balance a profit on a large tonnage against his smaller profit per ton. But can a legal decision be justified which puts a railway manager between the devil and the deep sea—which compels him either to accept a reduced net revenue or to raise it at the point of maximum resistance? Of course, the position may in practice be worse than this; for permission to raise increased revenue by advancing rates on traffic which the manager knows cannot bear an increased rate, and on that alone, is tantamount to a refusal to permit any increase of revenue at all.

But, though it is easy to see the economic unsoundness of the present position, it is difficult to see how a court of law could avoid it. It is clear that when a railway company has justified its claim for new net revenue, it ought to raise that revenue from the traffic that can best bear it. But how by legal procedure, with its definite parties, and precise issues, and sworn evidence, can that fact be ascertained? It is equally impossible to bring all the traders of the country before the court and to decide questions vitally affecting their interests in their absence. The moral would seem to be that, if the real question is one that cannot from its very nature be properly decided in a law court, a law court is not the proper body to decide it. On the other side of the Atlantic they seem to be gradually working out a system of regulation which is much more logical in theory, and which is likely in the long run to be much more satisfactory in practice.

*Previous articles in this series appeared in issues of the *Railway Age Gazette* of January 6, 13, 20, 27, February 3, May 19 and 26 and June 2.

The longest regular locomotive run without a stop in Germany is now between Berlin and Hamburg, 178 miles, which is made by two trains daily, one in 3 hours and 20 minutes and one in 3 hours 22 minutes. The longest locomotive run without a stop in France is 163 miles. The longest run without a stop in England is 224 miles. The English run is made by engines which take water while running.

CONTROLLING MODERN PASSENGER TRAINS.*

With the introduction of heavy (125,000 lbs. to 150,000 lbs.) passenger cars, the brake force required to control such cars with approximately the same effectiveness as is obtainable with the apparatus used on lighter cars became so great as to exceed

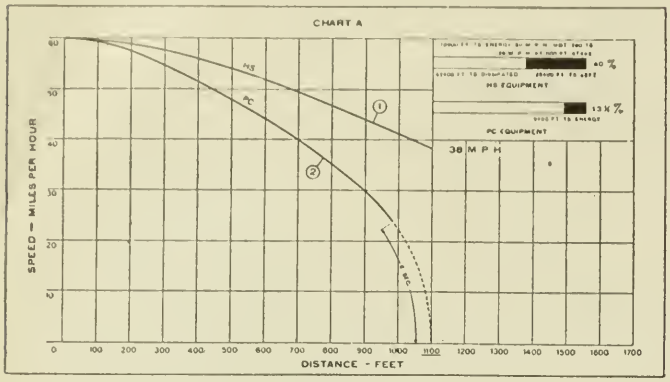

Fig. 1.

the capacity of a single brake cylinder even with the highest brake cylinder pressure and greatest multiplication of its power by leverage that could be permitted. The increased speed, the weights of trains and the economy of time necessary for the highest operative efficiency under modern severe traffic demands, together with the increase in length of trains and the much greater volume of air which must be handled through the brake pipe, have imposed conditions which the type of brake adequate for past conditions has been unable to meet satisfactorily.

While a high maximum emergency stopping power is required to insure the safety of passengers and rolling stock, the ordinary service functions and automatic safety and protective features became hardly secondary in importance. The necessity for a different treatment in the application of braking or retarding forces on modern heavy passenger cars than that heretofore practised is outlined in the report of the committee on Train Brake and Signal Equipment of the M. C. B. Association, 1910, and in a paper before the New York Railway Club, April 16, 1909, entitled Development of Air Brakes for Railroads, as follows:

Increased unbraked locomotive weight.

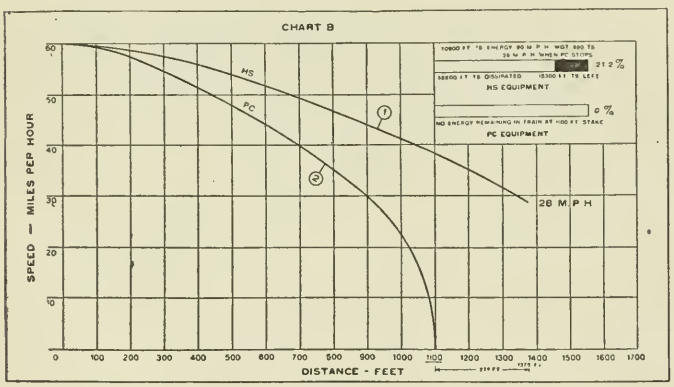

Fig. 2.

Increased train momentum.

Increased brake rigging deflection and false motion, due to severe stresses in car members and other causes, which greatly increase the piston travel.

Increased brake leverage ratio, with consequent increased piston travel and lower maximum cylinder pressure.

*Abstract of a paper presented before the Air Brake Association by Walter V. Turner of the Westinghouse Air Brake Company; also an account of the discussion.

Increased time to obtain brake effectiveness, on account of large cylinder volumes.

Decreased brake shoe coefficient of friction due to greater brake shoe pressure and speeds.

Possible breaking down of the brake shoe under the severe conditions imposed.

Capacity of single cylinder type of brake equipment exceeded.

Excessive amount of air used when releasing and recharging.

Some of the operating conditions involved in the committee's considerations which are not directly mentioned in the report are greater frequency in trains, increased number of parallel tracks and higher speeds with the same distances between signals as formerly. These introduce problems which are primarily for the operating department to solve but must be given no less consideration by the mechanical department. As a result of a thorough consideration of these conditions by the representatives of various roads and others, interested whose conclusions were confirmed and recommendations tested by one of the most significant series of brake tests ever held, viz., the Lake Shore emergency brake tests of 1909, certain requirements were established as essential in modern high speed, heavy passenger train service. On this basis the PC passenger brake equipment was developed to meet the requirements referrd to, by combining th ordinary functions of the quick action triple valve with such other operative features as were found necessary.

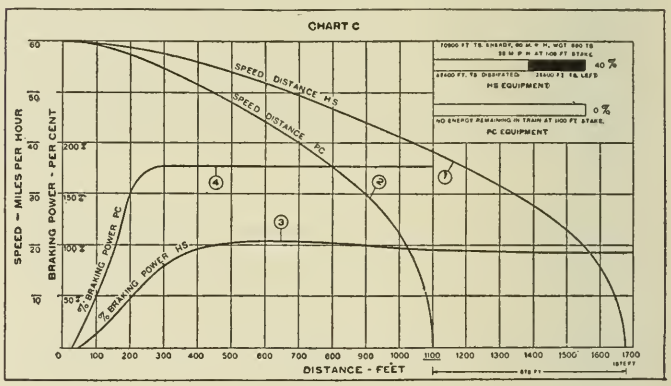

Fig. 3.

These novel characteristics and functions are described in the report and papers above referred to.

As a contrast to the PC equipment, let us take, for example, a modern train equipped with two old style equipments per car, of which, unfortunately, there are a number in service. A 10-car train equipped with 16-in. cylinders requires a volume of 150,000 cu. in., if the old size of auxiliary reservoir is employed. Moreover these triple valves have large feed grooves, which, combining as the triple valves go to release, make it impossible to raise the brake pipe pressure at a greater rate than the auxiliary reservoir is increasing; that is, as each triple valve goes to release, the rate of rise becomes less and less. Therefore, the succeeding triple valves are less likely to go to release position, and it will be appreciated that when 19 triple valves of the 20 on such a train have gone to release position, that the twentieth one must be in the best of condition, as regards ring leakage, if it is to release. The fact that it is not already released indicates that the ring condition required does not exist. From what has been said it will be seen that unless the car itself carries an air supply that will raise the auxiliary reservoir pressure at the same rate as the brake pipe is being raised until almost the maximum pressure has been reached, that an immense volume and large pump capacity must be a part of the engine equipment and that extreme care in manipulating the brake valve by the engineer will be required if the release of the brakes is to be insured and reapplication prevented. A large volume of air carried under the car may be said to be a panacea for the prevention of stuck brakes, so called.

A prolific source of trouble in this direction comes from the practice of running double header trains. The pump on the leading engine may be capable of furnishing an air supply ample for the operation of such trains as the single locomotive can handle, but was never intended to satisfy the extra demands imposed by the double header train. If the pump capacity is not sufficient to meet these demands, or if means are not available for utilizing the pump supply on both locomotives, it is plain that trouble from "stuck brakes," failure to release, etc., will result. The only safe way to permit the main reservoir and pump on the second engine to be utilized in assisting the head engine in releasing and recharging is to provide a main reservoir pipe and connections by which the main reservoir on the first and second engines can be connected, thereby enabling the engineer on the head engine to utilize the air stored in the main reservoirs of both engines.

Another fact which should not be lost sight of is that the engineer, if not familiar with the characteristics of the PC equipment, may make excessive reductions and so cause quick action to take place, with resultant wheel sliding. This does not mean any shortcoming in the equipment (quite the contrary) but a very dangerous and improper operation on the part of the engineer, since he is gaining no additional braking power by such an operation, but is blowing away through the reducing valves and safety valves the additional air which should be held in reserve and is absolutely necessary if an emergency should arise. Of course after such an application of the brakes the same condition exists as in an emergency. That is, at least 90 lbs. of air must be in the brake pipe before a release can be obtained.

With the greatly increased sensitiveness to release, as demanded by the changed conditions already referred to, which tend to produce a very slow rate of rise of brake pipe pressure when releasing and recharging, especially toward the end of a long train of heavy cars having large reservoirs, it becomes necessary to provide the maximum sensitiveness to an increase in brake pipe pressure, in order to insure all valves in the train responding as intended. The elimination of the graduated release feature is specially provided for in the construction of the valve. During the transition period when graduated release equipment is likely to be handled in the same train with cars not equipped with a graduated release brake, especially where long trains are handled and the air supplies from the brake pipe are likely to be limited in any way from any cause, it is usually best to cut out the graduated release feature until all cars are furnished with this type of brake. All that is required to change the PC equipment from the graduated to a direct release brake or vice versa, is the loosening of a bolt and turning of the direct and graduated release cap on the front of the control valve head until the desired position is indicated, the bolt being then retightened. It should be further stated that all functions mentioned have been so combined that the requirements of interchangeability with existing equipments have been fully satisfied.

As an illustration of what was accomplished by the improvements just outlined, the curves on charts A, B and C contrast the performances of the quick action automatic brake with high speed reducing valve and the passenger control equipments. The stops shown are from a speed of 60 m. p. h., with a representative train of one locomotive and six modern passenger cars, the total weight of the train being 590 tons. Fig. 1 represents the PC train stopped at the 1,100 ft. mark, and the high speed train passing it at a speed of 38 m. p. h. (63 per cent. of its initial speed) at which point 40 per cent. of its original energy still remains to be overcome before the train is stopped. It will be noted that the latter portion of the curve 2 is dotted to indicate that the train with the high speed brake equipment reached the 1,100 ft. point six seconds before the train with the PC equipment came to rest at that point.

Fig. 2 shows that when the PC equipment train has come to a standstill the high speed equipment train has run 275 ft. farther and is still running at the speed of 28 m. p. h., representing 22 per cent. of the original energy. Curves 1 and 2 of Fig. 3 illustrate the relative drop in speed as the trains approach the stopping point and show finally that the train with the high speed brake equipment ran 575 ft. further than that equipped with the PC brake. Curves 3 and 4 show the relative percentage of braking power developed on the train by the two equipments and illustrated at once why the PC train stopped in the least distance and time. The three cardinal advantages of the PC equipment are vividly illustrated by these curves, namely:—The much higher percentage of emergency braking power obtained; the rapid rate at which maximum braking power is obtained; the maintenance of maximum braking power throughout the length of the stop.

Two brake cylinders are used per car; only one cylinder operates during service applications, but both are brought into play when an emergency application is made. This gives the necessary increased braking power for emergency applications, not by an increased pressure in one brake cylinder (as in previous equipments), but by bringing the same brake cylinder pressure to act upon the pistons of two brake cylinders instead of one. This means that double the maximum service braking power is obtained in emergency applications.

Discussion.—L. H. Albers of the New York Central referred to the Toledo tests, which demonstrated conclusively that the ordinary passenger brake equipment was not equal to the demands of modern service and heavy cars. The P. M. and L. M. Westinghouse equipment requires about 14 seconds for full application on a ten-car train making a stop from 60 miles an hour, while the new PC equipment with 180 per cent. brake power fully applies the brake in 3 seconds. An important feature is that the maximum retarding force is retained to the end. This brake also allows a leverage of 6 to 1 to be used, so that 18 in. cylinders are sufficient, and such leverage insures proper brake beam clearance. The importance of sufficient brake beam clearance is demonstrated by the fact that dynamometer tests have shown that an increased tractive effort of 35 per cent. is required for operating trains where the leverage is such that the brake shoe clearance is small.

The new equipment also secures uniform brake power on all cars. This is important, as the lack of this uniformity is the prime cause of shocks and wheel sliding. The PC equipment is also more easily released as a differential of 6 lbs. in the release valve is required for its operation. The PC equipment has been in service on the fast trains of the New York Central for over a year, and its operation has been very satisfactory. When the equipment was put on in winter time and the men were not entirely familiar with it, there was some difficulty from slow release, which was traced to the graduated release of the old valves. The re-designing of the release valve has removed all these troubles. It is understood that the Pullman Company is now fitting its cars with the PC brake equipment.

For some time the earnings of the German railways have been increasing and the gain in 1910 was, for that country, very large. The fiscal year of most of them ends with March, and the returns for last year have recently been published. The increase was just about 7 per cent., passenger earnings growing only 2¾ per cent., but freight earnings more than 8 per cent. The lines so reporting include more than three-fourths of the whole German system. In the month of March the total of all German lines had an increase of more than 7 per cent., a decrease of nearly 9 per cent. in passenger earnings, having been counterbalanced by an increase of 10½ per cent. in freight earnings. The Easter travel came in March last year and not till April this year, which accounts for the large decrease in travel. In Germany everybody goes somewhere in the Eastern holidays. The indications are that on the whole Germany has fully recovered from the depression of 1907.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

III.

Chicago, April 22, 1911.

My Dear Boy:—Did it ever occur to you how easily a bright lawyer could tangle up many an able railway official on the witness stand? Nowadays we have to spend more or less valuable time testifying about service, rates, capitalization, valuation, practices, methods, and a score of other things that become of public interest. Whether this is just or unjust, necessary or unnecessary, is beside the question. It is a condition, not a theory, that confronts us. The wise railway man, therefore, so orders his official life that it may endure the scrutiny of both the persecutor and the prosecutor, of both the inquisitor and the investigator, of both the muckraker and the political economist. It sometimes happens, since men are only boys grown tall, that public hearings are accompanied by stage settings for dramatic effect; that trifling inconsistencies are magnified into egregious errors. Let me picture part of such a hearing with a general manager on the stand:

Question: You testified, Mr. General Manager, on the direct examination that your road is well managed and has a highly efficient organization, did you not?

Answer: Yes sir, we think we have one of the best in the country.

Q. Would you mind telling the able members of this Honorable Commission in just what your superiority consists?

A. Not at all, sir. In the first place we have a great deal of harmony and work very closely together.

Q. Did you ever know a railway official who did not claim the same thing for that part of the organization over which he presided?

A. (Hestitating.) Well now that you mention it, I can't say that I ever did. (Sudden inspiration.) But you know there is a great deal of bluffing in this world.

Q. (Drily.) What style of anti-bluffing device has your company adopted?

A. Of course you are speaking figuratively. Such a thing isn't possible. We have a pretty good check in the fine class of men we have developed.

Q. Then it is sort of a breeding process?

A. Yes sir, that's it.

Q. To go a little further, has your company any patents on improving human nature?

A. No sir, we don't claim that.

Q. Is it not a fact that your officials and employees are average citizens recruited and developed about like those of other roads?

A. That is hardly a fair way to put it, but I suppose they are.

Q. Why isn't it fair?

A. Because it leaves out of account the acknowledged efficiency that comes from having men well treated and contented, and better instructed than others. Some farms make more money than others because the old man gets more work out of the boys.

Q. Then your road has officials who can radiate more divine afflatus than others?

A. I didn't say that. We do the best we know how.

Q. What is organization?

A. Why organization is — let me see — why, organization is the name we use for the men—the people, the forces we hire to run our road. It is hard to give a concise definition. I might ask you what law is.

Q. That's easy, law is a rule of conduct. Now tell me, please, who run the road?

A. Why the officers run the road, the men do the work.

Q. Did you not just say that you hire men to run the road?

A. I didn't mean that,

Q. Then in your business you are not very accurate. You say one thing and mean another.

A. No sir, we may have more sense than you think we have. We spend a lifetime at this business and must learn something about it.

Q. Will you please tell this fair-minded commission just how you run the road, just how you attempt to minister to the needs of the intelligent people of this great commonwealth?

A. Now, sir, it is a pleasure to testify. You are getting away from definitions and technicalities and down to practical facts where I feel more at home. I will be glad to tell you all about it. In the first place a railway is such a big affair that we divide it into departments.

Q. Excuse me, what is a department?

A. A department is — well, — I can make it clearer by describing what it does. As I was saying, we divided it into departments, and a department is — well — a department is —why, something so different from everything else that we put it off by itself and hold the head of the department responsible for results. We are very particular not to interfere with the details of the departments.

Q. Pardon me, but the present members of this exceptionally able commission, inspired further I may say by the example of our patriotic governor, are accustomed to give profound consideration to these great questions. (Modest pricking up of ears of commission, with determined composite expression bespeaking relentless performance of a dangerous duty.) Please, therefore, tell us what your department does.

A. As I testified on the direct examination mine is the operating department; as general manager I have charge of operation.

Q. What does that include?

A. It includes transportation, and maintenance and new construction. It handles the business the other fellow gets.

Q. Who is the other fellow?

A. The traffic department.

Q. Of another company?

A. Why, no, of our own. It is just another department. It deals with the public, it gets the business, it makes the rates; excuse me—it recommends rates to honorable bodies like this commission.

Q. Then you in the operating department don't deal with the public?

A. Yes, sir, we do, more and more every year.

Q. Is the traveling freight agent in your department?

A. No sir, he is in the traffic department.

Q. Then you have no control over him?

A. No sir, no direct control, but as I said before we all work very closely together on our road.

Q. It is claimed that there has been discrimination in car distribution in this state, because a traveling freight agent promised more cars to some shippers than the latter were entitled to according to the supply available. How about that?

A. I am unable to say.

Q. Getting back to your narrative, please resume the interesting description of your department.

A. As I was saying, we have several departments, each under a superintendent or other officer. We have a general superintendent, a chief engineer, a superintendent of motive power, a superintendent of transportation, a superintendent of telegraph, a signal engineer, a superintendent of dining cars, and a general storekeeper, all of whom we call general officers in charge of departments.

Q. I thought you said you are the head of the operating department.

A. Yes, sir; that's right.

Q. I don't quite understand. You say that there are eight departments in your department?

A. Yes, sir; that is what we call them. It always has been so.

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Q. Then when is a department a department?

A. You see these are really not departments; they are just parts of the operating department which is really a department.

Q. Then, why not have definite designations?

A. I don't know. We have never thought it necessary. We are getting good results and giving good service to the public.

Q. What are results?

A. I am not sure; the longer I live the less certain I am about these things.

Q. I am glad to hear that. This impartial commission has been constituted because some railway officers tried to dictate what was best for this enlightened commonwealth. Now, tell us, please, what you think of the plan the United States government has of making the "bureau" the next unit of organization below the "department"?

A. I have never given government organization much attention. The part of the government that concerns me most is the Interstate Commerce Commission, which seems made up mainly of inspectors.

Q. Have you ever studied the organization of the federal courts, and of the army and the navy?

A. I can hardly say that I have studied their organization, but I have observed them some.

Q. Then you and your road do not give much attention to organization?

A. Perhaps not to theories. We are very practical. I never could see where a railway is like the government. They are very different.

Q. Is not human nature the same in its basic characteristics whether employed by a railway or the government?

A. I suppose that it is, but many things about a corporation are different.

Q. Is not the government the largest of employing corporations with its citizens as the stockholders?

A. Perhaps so. I would rather go on and tell you something practical about our work.

Q. Pray do so.

A. You see I am the responsible head, so that I insist upon being consulted about all important matters, and leave only routine affairs to be acted on by my subordinates.

Q. What are important matters, and what are routine affairs?

A. Why, the important things are those that I handle personally, and routine, well, routine is what comes along every day and is so well understood that it does not require my personal attention.

Q. Do you think any three men could agree upon what should be considered routine business?

A. I don't know. I had never thought of it that way. Many things have to be left to discretion. That is where judgment comes in.

Q. Whose judgment?

A. The judgment of the man handling the matter; in this case, my own.

Q. You have been here all day. Who is handling matters in your absence?

A. My chief clerk.

Q. You did not mention him before. What officer is he?

A. He is not usually counted as an officer, but is considered the personal representative of an officer.

Q. Does he sign your name?

A. Yes, sir; but puts his initials under my name.

Q. Suppose he forgets to put his initials. Could you swear to the signature in court?

A. I don't know. You understand that is only for routine business.

Q. Does he sign your name to your personal bank check?

A. No, sir; he does not.

Q. Then the company's business with the citizens of this state receives less careful attention than your own personal affairs?

A. No, sir; the company's business comes first with me. I am a poor man today.

Q. When you are away your chief clerk has to sign instructions to the general officers in your department?

A. Only routine matters.

Q. Does he receive a higher salary than they?

A. No, sir; a lower.

Q. What determines relative salaries?

A. Qualifications and experience.

Q. Then you have the less qualified and the less experienced man instructing higher officers.

A. It might seem so, but in our case we are very fortunate. My chief clerk is an unusual man, and is very considerate and diplomatic. He knows that I do not stand for inconsiderate requirements of others.

Q. From whom do you receive your instructions?

A. From our president.

Q. Always personally?

A. Not always; his chief clerk is authorized to represent him.

Q. Is his chief clerk as considerate for you as your chief clerk is for your subordinate officers?

A. That is a very delicate question. I would rather not answer unless the commission insists.

(Hearing adjourned for day. General counsel sends cipher telegram to president stating indelicacy of state officials is almost unbearable; that bankers and business men should petition governor to stop destroying credit of railways.)

All of which, my dear boy, is not as bad as it sounds, but, through difficulty of explanation, points the way to desirable improvements in railway administration.

Affectionately, your own,

D. A. D.

VESTIBULE TRAP DOOR.

The trap door for car vestibules, shown in the accompanying illustration, is made by the O. M. Edwards Company, Syracuse, N. Y. It is a new type in which the ribs, formerly used on the under side, have been eliminated. These ribs are more or less objectionable where the door raises outside of the vestibule door,



Vestibule Trap Door.

especially when the trap door is used at low station platforms. It is necessary for the porter to clean off the bottom of the door so as to prevent the soiling of clothes in getting on and off the car and with the ribs it is difficult to clean the door quickly. The makers claim it is amply strong without the ribs.

General News Section.

The Lower House of the legislature of Florida has rejected the Davis Railway Commission bill which had been passed by the Senate unanimously.

The Southern Pacific has substituted a motor car for its steam locomotive and cars running between Reno, Nev., and Fallon, 62 miles. One round trip is made daily. Fallon is on a branch 16 miles from the main line.

The Lehigh Valley Transit Company, Allentown, Pa., has raised the pay of its 500 conductors and motormen one cent an hour; this in recognition of the fact that during the past year the company has carried 24,000,000 passengers without a fatal accident.

The new union passenger station at Worcester, Mass., which has been under construction for the past three years, was opened for business last Sunday. It is used jointly by the Boston & Albany, the New York, New Haven & Hartford, and the Boston & Maine.

The Pittsburg & Lake Erie has ordered from the Western Electric Company 15 telephones, selectors and auxiliary apparatus to equip two train despatching circuits; one from McKeesport, Pa., to Brownsville, 40 miles; and one from McKeesport to Connellsville, 43 miles.

A new three-story Railroad Y. M. C. A. building has just been opened at Waterville, Me. The building is of brick and contains a dormitory with 57 chambers, besides the usual facilities, including a restaurant, which is open to the general public. J. B. Northcott is secretary.

The educational bureau of the Union Pacific has been enlarged so that its facilities will be available for the employees of the Illinois Central throughout the lines of the Illinois Central system. D. C. Buell, the chief of the bureau, will continue to have charge of its operations on both the Union Pacific and the Illinois Central.

The Rock Island Lines are furnishing employees with printed instructions on "How to Save a Nickel a Day." The second bulletin on this subject, which has just been issued, is directed particularly to freight handlers, calling their attention to little mistakes which are common in freight houses and which result in loss and damage claims.

Near Niagara Falls, N. Y., one night last week, robbers stopped a freight train of the Erie Railroad, by threatening the engineman with a gun, and stole merchandise from several cars, to the extent, it is said, of a carload in all. It is said that there were six men in the gang and that they carried away their booty hastily in wagons.

George F. Samuel, formerly assistant city engineer of the City of Chicago, has been appointed engineer of track elevation for the city. Mr. Samuel has been engaged in municipal work since his graduation from the University of Michigan in 1885, and has been connected with the City of Chicago since 1888. He has been in charge of construction of waterworks tunnels and pumping stations.

Three cent fares now prevail on the street cars of Cleveland for all journeys, the city council having ordered a reduction to this amount and the directors of the Cleveland Railway voting to obey the order under protest. Hitherto, the fare for single rides has been three cents, but for a ride including a transfer, it has been four cents. The same regulation is continued, but the extra cent paid for the transfer is refunded to the passenger on the second car.

L. S. Berg, of New York City, president of the New Orleans, Mobile & Chicago, was seriously injured in a derailment near Vergas, Minn., on the night of June 2, and his wife was killed. Mr. and Mrs. Berg were in their private car, attached to train No. 109 of the Minneapolis, St. Paul & Sault Ste. Marie, which was ditched at a washout about 11 p. m. Eight of the eleven cars in the train ran off the track and three cars were completely destroyed by fire.

Negotiations between officers of the Southern Railway and representatives of blacksmiths, boilermakers, sheet metal workers and other employees in the shop car departments, have resulted in increase in wages ranging from 1½ cents to 3 cents an hour. It is said that this settlement affects about 8,000 men, including employees of lines controlled by the Southern; and that when the increase is granted by other lines in the southern states, which is confidently expected, 9,000 more will have the benefit of it.

A "harmony" dinner was given at St. Joseph, Mo., on May 31, by the Commercial Club and the Business Men's League of that city, the purpose being to bring about more harmonious relations between the roads serving St. Joseph and its business men. Speeches were made by B. F. Bush, president of the Missouri Pacific; H. U. Mudge, president of the Rock Island Lines; Gardner Lathrop, general solicitor, Santa Fe; O. M. Spencer, general solicitor, Burlington, and C. S. Gleed, president, Missouri & Kansas Telephone Company.

The Maine Central has just received a new steamboat which is to be used on the Bar Harbor route this summer. She is named the Moosehead, and is so much more powerful than the older boat that new and faster schedules will be adopted for that route. The Moosehead cost about $130,000, and was built at the Bath Iron Works. Her dimensions are: Length over all, 194 ft. 11 in.; length on load water line, 185 ft. 2 in.; beam over guards, 36 ft. 8 in.; beam molded 30 ft. 6 in.; depth molded, 16 ft. 6 in.; draft, about 10 ft.

The governor of Pennsylvania has approved a bill passed by the last legislature, making train wrecking a felony, punishable by death in the event that the wreck causes death. He has also approved a bill making it a felony to take brasses or air brake appliances from engines or cars. The railways have asked the governor to veto the full crew bill, and he gave them a hearing this week. Officers of the Pennsylvania say that the full crew bill, if it becomes a law, will compel the expenditure of $2,000,000 annually on that road unnecessarily; and on the Reading $700,000 would be the annual expenditure necessary to comply with the law.

The Santa Fe is equipping an exhibit train which will be use to demonstrate to the public the development that has been made in railroading during the past 30 years. The train will include a Mallet locomotive of the heaviest type and a locomotive of the type used 30 years ago; an all-steel passenger coach of the latest model and a wooden passenger coach used in the 80's; an automobile box car of the latest design and an old-fashioned box car, a flat car for exhibiting old and new switches, couplers, brakes and other railway appliances, and an exhibit showing a section of dirt track laid with 52-lb. rail beside a section of rock-ballasted track laid with 90-lb. rail. The train is being equipped at the company's shops in Topeka, Kan., and will make stops in practically every city on the main line.

The very high speed at which train No. 48 of the Michigan Central is scheduled from Windsor, Ont., opposite Detroit, to Bridgeburg, Ont., opposite Buffalo, was noticed in the *Railway Age Gazette* of April 28, page 1004. General Superintendent S. W. Brown informs us that up to May 31 this train has left Detroit and Windsor on time every night and has arrived at Bridgeburg and Buffalo on time every night except in one instance, when it was delayed at St. Thomas 46 minutes by the derailment of a freight train. On that occasion No. 48 arrived in Buffalo 33 minutes late. This train, leaving Detroit, is composed of five cars. At St. Thomas, 112 miles from Detroit, the dining car is set out, and from there to Buffalo the train consists of four cars, though on two occasions it has had an additional sleeping car. The cars in the train are all Pullmans, weighing about 70 tons each. The engines are of the Pacific type, weighing 239,000 lbs. each; cylinders 22 in. x 26 in.; steam pressure 200 lbs. per sq. in.; and diameter of driving wheels 74 in. The distance from Windsor (tunnel station) to Bridgeburg is 227.85 miles, and the rate of speed is 62.14 miles an hour, which includes a stop of five minutes at St. Thomas. Excluding the stop the average rate is 63.6 miles an hour.

F. A. Delano on Some Reasons for Railway Optimism.

In the course of a talk to the Traffic Club of Chicago on May 24, F. A. Delano said:

"The railways have been going through pretty hard conditions in the last four years, and most railway officials are not talking in a very optimistic way. At the same time, there is, to my mind, a good deal to be optimistic about. . . . The most recent occurrence which has taken place, and, perhaps, the most serious disappointment the railways have had, has been the refusal of the commission to grant a general advance in rates. And yet I am inclined to think that this refusal is really a blessing in disguise. I question if it would have helped the railways to have been granted an advance in rates, for a number of reasons. First, because the gross results to be expected from that advance were greatly exaggerated in the public mind, and, second, because if we had been granted all that was asked for, or even half what was asked for, the demands of labor for added wages, and of the public for added service and facilities, would have more than eaten up the entire gain. In the same way, while railway men felt deeply hurt that a Boston lawyer should come out and state that we were not entitled to an advance in rates until we had adopted modern efficiency methods and thereby greatly lowered our cost of operation, it must be admitted that Mr. Brandeis stated an important economic fact, viz., that the proposition that wages of railway employees should be advanced; that, therefore, rates should be advanced, so that the railways might still be able to earn a fair return on their capitalization, proposed a deadly cycle which, in the long run, would certainly prove intolerable.

"And, though efficiency in railway operation is no new thing to intelligent railway managers, there never was a time when managers were studying harder than now how they may increase their efficiency. Let no one imagine it is an easy task. There are a great many difficulties in adopting efficiency methods, and we need public support in that, as in many other things. . . . And so, I say, without the least hesitation, that a little more public sympathy—a little more consideration from the general public for the difficulties which railways have to contend with, is far more needed than an increase in rates; and yet that there may be no misunderstanding as to my position, I desire to say that I believe that railways should receive increases in some of their rates; in other words, that rate adjustments should be made by leveling up rather than leveling down, as has been done so often in the past. Either that, or the railways must do something to resist the constantly increasing cost of wages and materials, for railways have suffered as much as any single interest by reason of the diminished purchasing power of money.

"One answer to this difficulty is, as suggested by Mr. Brandeis, not lower wages, but increased efficiency by a more thorough study in the matter of intelligent direction of human effort; another is to gradually reduce our import tariff (note that I say 'gradually') in order that we may raise the purchasing power of our money more nearly to the standard of European countries.

"In these matters railway men are not in a class by themselves. They are vitally interested in the common welfare and must realize that in the long run they must stand or fall on the prosperity of the nation as a whole.

"In the matter of price-making on railways, I assume it is evident to everyone that there is to be less flexibility in the future than there has been in the past. Naturally, railway traffic men hesitate to reduce rates because it is out of their power to advance them. State and federal commissions are authorized to reduce rates, but, through a mistaken notion of our law-makers, are not authorized to advance them, although we all know that just as serious discriminations may be brought about by the fact that some rates are too low as by the fact that other rates are too high. Generally speaking, the advocate of government regulation are seeking to discover some mathematical rule or formula by which rates can be made, and unless traffic men can propose sound reasons to the contrary, there is little doubt that we are constantly approaching a time when rates will be made on some mathematical formula like that of the distance tariff.

"There is a great deal to be hopeful for in the improved attitude of railway officials to the public, which I believe will result eventually in a better attitude of the public toward the railways. In the early days, as was inevitable, the investment of private capital in railway enterprises, many of which were more hazardous fifty years ago then the average gold mine is today, led to the contention that railway property, being private property, was just as much entitled to all the return it could make as any other private property. Railway officials representing the owners of the railways have been compelled to recede from this position. They may claim as much as they will that the public has not fairly listened to both sides of the case; that while many exaggerated statements have been made of the fortunes won in successful railway enterprises and of the occasional profits from 'watered' stock, nothing has been said of the vast fortunes lost and the money sunk in railway enterprises. In no country in the world has private capital been enticed into railway enterprises as it was in the United States, and in no country has so much capital been wiped out. I think I can safely offer to prove that for every dollar of watered stock earning a dividend I will show two dollars of capital entirely wiped out and earning nothing. But what is the use? The public have made up their minds and the courts have laid down the doctrine. 'Railway property is private property,' the courts say, 'but it is affected with a public use,' and this doctrine is a dictrine which will undoubtedly be extended as time goes on, to many other forms of capital. There is no doubt in my mind that the 'trust' problem can only be ultimately settled by applying the doctrine which has already been applied to the railways; in other words, that while the butcher, the baker or the candlestick maker may fix prices at will so long as their business is subject to the ordinary laws of competition, yet just as soon as by reason of monopoly or combination the laws of trade no longer apply, then their business will have to become subject to public supervision and, if necessary, control. Hence the railway man ought to feel somewhat jubilant that he has gone through the mill and, in the language of the noble art of self-defense, 'although somewhat disfigured, is still in the ring.' Other public service corporations are in the same boat and the turn of the banker, the manufacturer and the merchant is coming next. Indeed, why shouldn't the newspapers have a taste of it?

"Another hopeful aspect of the situation lies in the fact that if it is true that the railways are public service corporations, or, as stated in the language of the courts, 'quasi-public institutions,' it follows that railway officials are quasi-public officials and, so long as they conduct themselves properly as quasi-public servants, are entitled to the consideration of the public, as well as public abuse and condemnation where they fail in their duties.

"Then, again, while railway management is under peculiarly strict supervision, that supervision has its good side. As every railway official knows, inspectors from the Interstate Commerce Commission have the right to come into your office any hour of any day, and without previous notice or warning, ask for papers, go through your files and documents, memoranda, etc., and see how you are transacting your business, and send evidence of your methods to be looked over by the authorities at Washington. At first one resents the idea, but on maturer consideration I firmly believe that this is a good thing. It will make men more careful in their public conduct and they will realize that a quasi-public servant must so conduct his business that anyone properly authorized may come in and see what he has done and how he has done it. Furthermore, such supervision is going to help the man who wants to conduct his business fairly—and will relieve him to some extent, at least, of the difficulties incident to unfair competition and shady business methods."

Expediting Traffic on Single Track.

That automatic block signals are of assistance in expediting traffic on single as well as double track is a fact too well known now to need demonstration. Yet one of the ways in which they do so has as yet escaped the attention of many engineers and operating men. This method was discovered by the trainmen of a western road, where three-position signals are used. By observing the performance of the signals from the rear of the trains it was not long before they found out that the signals governing in the opposite direction to that in which their train was running indicated with considerable accuracy the position of a following train. From the discovery of this fact to its practical application to their work was but a step. When an eastbound inferior train is to be passed by a following train, the conductor observes the westbound signals from the rear end of his train on entering a station (the train running in on the main track). If the outgoing westbound signal clears to the vertical position when the rear end of this train passes it, the conductor knows that the following train is at least two block

sections back, and so he proceeds to the next station; where the observation is repeated. If, however, the signal remains at stop or clears only to the diagonal position, he sees that he has no time to spare and he pulls through the station and backs into the passing track. It is said that since this method of procedure has been in vogue the improvement in running time of trains has been remarkable. Where the block sections are long enough to provide a sufficient time interval, and where the arrangements are such that the time table rules regulating the conduct of fast trains as related to slow trains can be safely suspended, the advantage is obvious. There is also a great saving in delays, due to breaking in two, as a break, if it occurs, will happen on the passing track, when pulling out, and not on the main line when preparing to pull in.

Collision on the Burlington.

In the butting collision near Indianola, Neb., on the Chicago, Burlington & Quincy, May 29, four enginemen, one express messenger and five passengers were killed, two passengers were so badly injured that they have since died and about 20 other persons were injured. The collision was between westbound passenger train number nine and eastbound passenger train number twelve. The collision is said to have been due to a misunderstanding of the train despatcher's orders.

An Accommodating Car.

The Altoona, Juniata & Northern, operating the Wopsononock Railway, opened the summer passenger season May 30, when 100 people appeared at the station to be hauled up the mountain, though no advertising had been done. This road runs from Altoona to the high mountain back of the city. It has been run through the winter as a coal carrier, but without passenger service. An open passenger car that had been converted into a closed work car was re-converted into an open pasenger car to accommodate the passengers on Memorial Day. It is quite possible that the road will build or buy one or two more passenger cars.

Rear End Collision on the New Haven.

Two enginemen, two firemen and a brakeman were killed in a rear end collision on the New York, New Haven & Hartford, which occurred near Fairfield, Conn., shortly before midnight on June 6. The statement issued by the New Haven office is as follows:

Extra 338, running east on track No. 2—the inside eastbound track—stopped to fix a hot box. Engineman of freight train from Harlem River to Holyoke and Midway, known as H. Y. 2, also running east on the inside eastbound track, failed to observe the Fairfield signal, which was against him, and ran into the rear of freight train, blocking the two westbound tracks. The two westbound freights, running one on each westbound track, ran into the wreckage. Based on the present information at hand, the man responsible for starting the wreck was killed. In addition, the fireman and brakemen on this train were also killed, and the engineman on one of the westbound freights that ran into the wreckage was killed.

M. M. and M. C. B. Conventions.

O. F. Ostby, chairman of the enrollment committee of the Railway Supply Manufacturers' Association, has issued a notice to the effect that those who attend the M. M. and M. C. B. conventions at Atlantic City next week, will be able to register at any time after noon Tuesday, June 13; and that the registration booth will be kept open until 10 o'clock that night. He urges that all who can, register that day so as to avoid possible congestion the opening day of the convention.

A special train, the M. M. Special, will leave Chicago over the Pennsylvania Lines at 3 p. m. Monday, June 12, and will arrive at Atlantic City before noon the following day, without change. This train will be composed of all steel equipment, made up of sleeping, dining, library, observation and smoking cars. The fare for the round trip from Chicago will be $29.50. Stop-over privileges will be allowed at Philadelphia, Washington and Baltimore; it will be necessary, however, to make it known at the time of purchasing tickets if stop-over is desired at the points named.

The Central of New Jersey will run a special train from New York to Atlantic City on Tuesday, June 13, leaving Twenty-third street at 3:30 p. m. For the return trip this train will leave Atlantic City at 3 p. m. on Wednesday, June 21, arriving in New York at 6 p. m.

The sessions of the conventions will be held in the Greek Temple on the Million Dollar Pier. The program is as follows:

M. M. ASSOCIATION.

Wednesday, June 14.

Opening exercises.
Discussion of reports of:
- Advisory Technical Committee.
- Mechanical Stokers.
- Revision of Standards.
- Smoke Preventing Devices for Firing Up Locomotives at Terminals.
- Best Construction of Locomotive Frames.

Thursday, June 15.

Discussion of reports on:
- Main and Side Rods.
- Piston Rods and Crossheads.
- Repair Equipment for Roundhouses.
- Water Treatment.
- Lubrication of Locomotive Cylinders.
- Consolidation.

Individual paper on Locomotive Performance Under Different Degrees of Superheated Steam, by Professor C. H. Benjamin.
Discussion of report on Safety Valves.

Friday, June 16.

Discussion of reports on:
- Safety Appliances.
- Design, Construction and Inspection of Locomotive Boilers.
- Contour of Tires.
- Steel Tires.
- Flange Lubrication.
- Minimum Requirements for Headlights.

Resolutions, Correspondence, etc.
Election of officers.

M. C. B. ASSOCIATION.

Monday, June 19.

Opening exercises.
Discussion of reports on:
- Revision of Standards and Recommended Practice.
- Train Brake and Signal Equipment.
- Brake Shoe Equipment.

Tuesday, June 20.

Discussion of reports on:
- Rules for Loading Materials.
- Rules of Interchange.
- Prices for Labor and Material for Steel Cars.
- Coupler and Draft Equipment.
- Car Wheels.
- Safety Appliances.
- Revision of Code of Tests.
- Freight Car Trucks.
- Refrigerator Cars.

Wednesday, June 21.

Discussion of reports on:
- Consolidation.
- Springs for Freight Car Trucks.
- Lumber Specifications.
- Train Lighting and Equipment.
- Train Pipe and Connection for Steam Heat.

Resolutions, correspondence, etc.
Election of officers.

American Institute of Electrical Engineers.

The twenty-eighth annual convention of the American Institute of Electrical Engineers will be held at the Hotel Sherman, Chicago, June 26-30. On Tuesday, June 27, at 10 a. m., the

Power Station session will be held. The Electric Lighting session will be held at 8.30 p. m. on the same day. On Wednesday, June 28, at 10 a. m. the Railway session will be held. At this session a paper will be read on Some Data from the Operation of the Electrified Portion of the West Jersey & Seashore Railroad, by B. F. Wood. W. S. Murray will read a paper on The Analysis of Electrification; and E. F. W. Alexanderson will read a paper on Induction Machines for Heavy Single-Phase Motor Service. The Industrial Power session will be held at 2.30 p. m. on the same day. There will also be a parallel meeting at 2.30 p. m. of the Telegraphy and Telephony sessions. On Thursday, June 29, at 10 a. m. the High Tension Transmission session will be held; and on Friday, June 30, a general session will be held at 10 a. m. At a simultaneous meeting the High Tension Transmission session will be continued. The Educational session will be held at 2.30 p. m. on the same day. All of the papers may be found in the April, May, June and July issues of the *Proceedings*. The Entertainment Committee has prepared an attractive program, including a dance at 9 p. m. June 26; luncheons and excursions. Ralph W. Pope, New York, is secretary.

American Society for Testing Materials.

The fourteenth annual meeting of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, N. J., June 27-July 1. The annual address by the president, Henry M. Howe, has for its subject the American Society for Testing Materials. The program includes 58 papers. The following are of especial interest to railway men: Measured Strains on Engineering Structures, by James E. Howard; Flue Sheet Cinders, Cause of Formation in Locomotives, by Robert Job; Studies on Steel Tires, by Robert Job and Milton J. Hersey; Ductility in Rail Steel, by P. H. Dudley. There are six papers on corrosion of iron and steel and preservative coatings; seven papers on cement and concrete; seven papers on various subjects relating to steel, including one on Recent Developments in Testing of Boiler Tubes, by F. M. Spelter; five papers on bitumen; five papers on testing apparatus and methods; and a paper on the Brinell Ball Test Applied to Wood, by W. K. Hatt.

Air Brake Association Officers.

At the annual convention of the Air Brake Association held in Chicago, May 23-26, the following officers were elected: President, W. P. Huntley (C. & O.); first vice-president, T. A. Wahlert (T. & P.); second vice-president, W. J. Hatch (C. P.); third vice-president, L. H. Albers (N. Y. C.); secretary, F. M. Nellis (Westinghouse Air Brake Company); treasurer, Otto Best (N. C. & St. L.). Executive committee: J. F. Slatterly (D. & R. G.); T. W. Dow (Erie); and C. H. Weaver (L. S. & M. S.).

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held on Wednesday, June 7, in New York, the following papers were presented: Two Earth Dams of the United States Reclamation Service, by D. C. Henny, M. Am. Soc. C. E.; and Steel Centering Used in the Construction of the Rocky River Bridge, Cleveland, Ohio, by Wilbur J. Watson, M. Am. Soc. C. E. These papers were printed in *Proceedings* for April, 1911.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

An officer of the Long Island Railroad says that during the past year the conductors of that company have taken up on the trains 140 commutation tickets presented by persons who had no right to use them.

It is announced that the Denver & Rio Grande and the Western Pacific will soon put on a new limited train between Denver and San Francisco, which will run in about one hour less than the fastest schedule now in effect, and will have through sleepers received at Denver from the Rock Island and the Burlington.

According to a press despatch from Waycross, several hundred citizens, gathered from fourteen counties of southern Georgia, have organized a Good Roads Association, with a president and eight vice-presidents. Furthermore, the association plans to run a good roads train, following the example of the agricultural college. So the railway example has had an effect.

Notice has been given in New England that the allowance of 72 hours free time before the collection of demurrage on cars containing coal, grain and lumber, which was tentatively authorized by the Interstate Commerce Commission, and which was to have been discontinued June 1, will be continued until September 1. But on cotton, the free time has now been reduced from 96 hours to 48 hours.

The proposed establishment of a low-rate freight route from New York to the West, via Albany and Binghamton, over the Delaware & Hudson, was the subject of a hearing by deputies of the Interstate Commerce Commission at New York last week, and at the close of the hearing it was announced that the roads interested had agreed to withdraw the low-rate tariffs. It was found that other roads intended to make reductions, to meet those of the proposed route, and the Delaware & Hudson asked leave to withdraw the new tariffs.

Total March Earnings and Expenses.

Logan G. McPherson, director of the Bureau of Railway Economics, in Bulletin Number 13, giving a summary of revenues and expenses of steam roads in the United States for March, 1911, says:

"For the month of March, 1911, total operating revenues decreased from the same month of 1910 nearly $11,000,000, which was equivalent to $64 per mile or 6.2 per cent. This decrease was chiefly in freight revenue. Operating expenses also declined as compared with a year ago, the decrease amounting to 3.0 per cent. This is the result of reductions amounting to 13.8 per cent. in maintenance of way and 4.7 per cent. in maintenance of equipment, combined with increases in other accounts, transportation expenses increasing six-tenths of one per cent. and general expenses 8.1 per cent. The operating ratio was 69.4 per cent. as compared with 74.7 per cent. in February, 1911, and 67.1 per cent. in March, 1910.

"Net operating revenue showed a decrease of $43 per mile or 12.8 per cent. This decrease was due to a decline in revenues without a correspondingly large decrease in expenses. Net revenue per mile per day was $9.55 as compared with $7.68 in February. There was an increase in taxes of 2.6 per cent., and operating income, which is net revenue with outside operations included and taxes deducted, showed a decline of $44 per mile or 14.7 per cent.

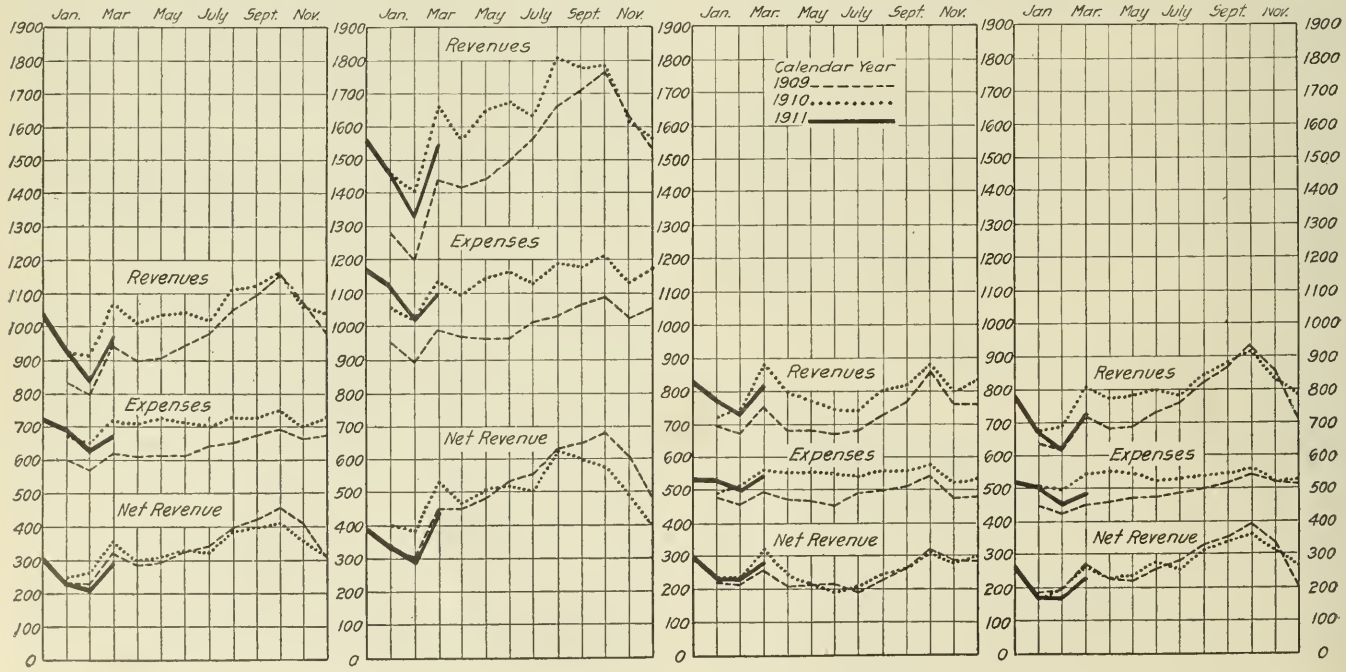
"Increase in total operating revenues was confined to the southern group of roads, where it was only three-tenths of one per cent. But in the South there was a decline in freight revenues as in every other geographical group. In the South alone was there any increase in passenger revenues.

"In operating expenses the South showed a total increase of 4.3 per cent., but in maintenance of equipment and traffic expenses there were decreases of 1 per cent. and 1.5 per cent., respectively, transportation expenses increasing 9 per cent. In the East, there was a decline of 1.2 per cent. in total operating expenses, there being decided decreases in both maintenance accounts. In the West, there was again a decrease in transportation expenses heavier than that noted last month, and at the same time maintenance of way expenditures on Western roads were one-fifth less than in March of last year.

"The operating ratio increased in all three groups, the greatest increase being in the Eastern group, where it rose from 68.3 per cent. in March, 1910, to 71.5 per cent. in March, 1911. The South showed nearly the same increase, that is, from 63.5 per cent. to 66.1 per cent. In no group was there any increase in net revenue. The East shows a decline of 15.4 per cent, the South of 6.8 per cent., and the West of 11.4 per cent. Operating income shows corresponding results, a decrease of 18.3 per cent. in the East, of 8.5 per cent. in the South, and of 12.4 per cent. in the West.

"For the nine months of the fiscal year 1911, there is a slight increase of operating revenues for all roads of nine-tenths of one per cent. over the corresponding period of 1910. However, expenses increased 5.5 per cent., with the result that net revenue shows a decrease of 7.9 per cent. This decrease runs as high as 13.2 per cent. in the Eastern group, and was 4.0 per cent. in the West, with practically no change in the South. In operating income there was a decline in every section.

"The calendar year to date makes an unfavorable showing as



Comparative Chart of Earnings and Expenses in 1909, 1910 and 1911.

compared with last year, because in addition to slightly increasing expenses, there is the fact of declining revenues. Operating revenues for these three months for all roads declined 3.2 per cent., all the decrease being in freight revenue. Expenses increased three-tenths of one per cent., with the result that net revenue shows a decrease of 11.3 per cent. and operating income of 13.6 per cent. As has been the case during the nine months of the fiscal year, the heaviest decline in operating income is found in the Eastern group, but a decrease appears in every group."

The accompanying chart shows the variations in revenues and expenses in the separate months, the accompanying tables gives important averages:

Per cent. of total operating revenues:	March 1911.	March 1910.	Fiscal year ended June 30, 1910.
Maintenance of way and structures	11.4	12.4	13.4
Maintenance of equipment	15.9	15.6	15.0
Traffic expenses	2.1	2.0	2.0
Transportation expenses	37.3	34.7	33.4
General expenses	2.7	2.4	2.5
Total operating expenses	69.4	67.1	66.3

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 95-A, giving a summary of car shortages and surpluses by groups from January 1, 1910, to May 24, 1911, says:

"A large decrease in the coal car surplus, with lesser decreases in box and miscellaneous cars, brings the total surplus down to 168,233, a total decrease of 20,614 cars. The box car decrease is 4,013 coal and gondolas, 16,108, and miscellaneous cars 5,936, with an increase of 5,443 in flat cars. The change in miscellaneous cars is principally in coke cars in group 2 (Eastern), and stock cars in groups 6 (Northwestern), and 10 (Pacific). The decrease in coal cars is chiefly in groups 2 (Eastern), and 4 (Middle Atlantic), while the improvement in the box car situation is most marked in groups 4 (Middle Atlantic), and 5 (Southern), with some decrease in this class reported for group 8 (Middle Western)."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts show balance and performance bi-weekly from 1907 to 1911 inclusive.

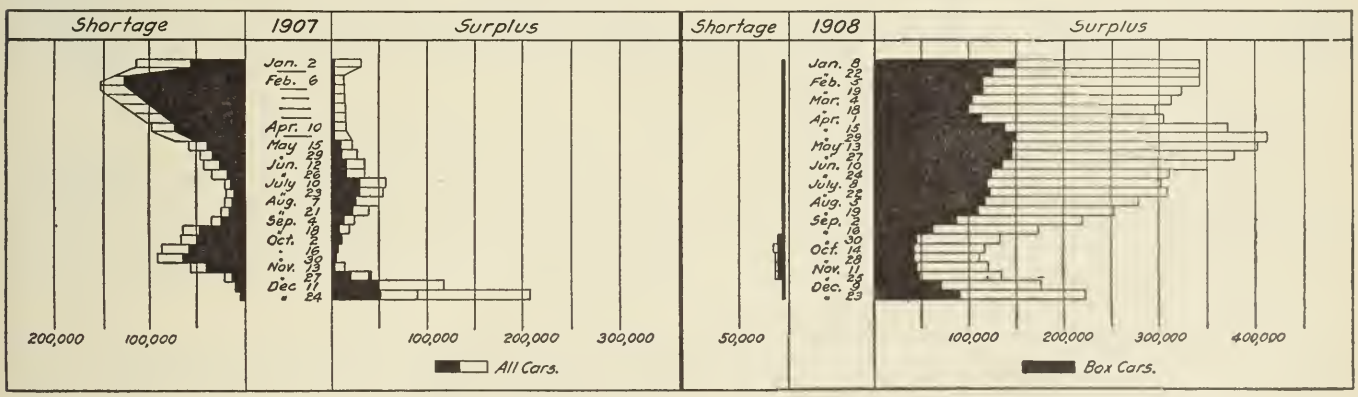
Traffic Agreement Between Frisco and Santa Fe.

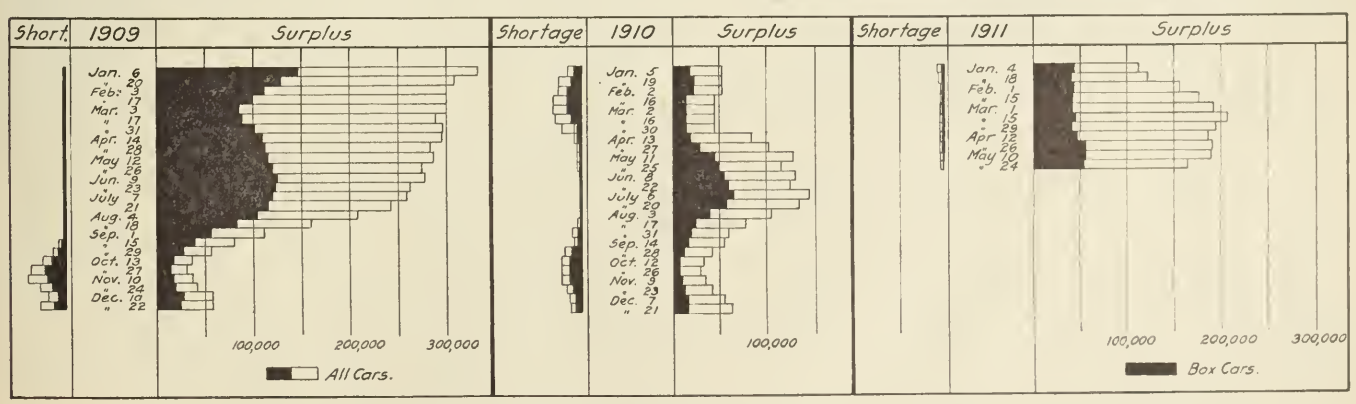
The St. Louis & San Francisco and the Atchison, Topeka & Santa Fe have made an arrangement, effective at once for freight service, and effective on November 1 for passenger service, under which through trains will be run from St. Louis to San Francisco. The road of the Frisco will be used between

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses Box.	Surpluses Flat.	Surpluses Coal, gondola and hopper.	Surpluses Other kinds.	Surpluses Total.	Shortages Box.	Shortages Flat.	Shortages Coal, gondola and hopper.	Shortages Other kinds.	Shortages Total.
Group *1.—May 24, 1911	8	551	534	245	274	1,604	50	123	164	0	319
" 2.— " 24, 1911	25	2,408	2,895	10,984	6,809	23,096	0	0	0	14	14
" 3.— " 24, 1911	26	8,886	1,599	39,433	4,793	54,711	0	0	0	44	44
" 4.— " 24, 1911	10	2,154	2,569	1,863	1,428	8,014	0	110	0	0	110
" 5.— " 24, 1911	19	3,603	858	5,211	1,629	11,301	12	0	0	1	13
" 6.— " 24, 1911	26	11,637	908	3,470	5,187	21,202	0	0	0	5	5
" 7.— " 24, 1911	4	2,051	133	1,142	649	3,975	0	0	0	0	0
" 8.— " 24, 1911	16	6,019	284	4,658	4,190	13,151	0	0	0	13	13
" 9.— " 24, 1911	11	2,285	523	357	980	4,145	0	0	2	1	3
" 10.— " 24, 1911	21	9,157	2,454	2,665	9,310	23,586	0	2	0	4	6
" 11.— " 24, 1911	6	2,449	149	15	835	3,448	191	110	0	7	308
Total	172	51,200	12,906	68,043	36,084	168,233	253	345	148	89	835

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.





Car Surpluses and Shortages, 1907 to 1911 Inclusive.

St. Louis and Avard, Okla., and the Santa Fe west of there. The equipment will be provided and operated jointly by the two companies. The following are given as the mileages between St. Louis and the Pacific coast over the various routes, including the new one:

Route.	St. Louis-Los Angeles. Miles.	St. Louis-San Francisco. Miles.
Frisco-Santa Fe	2,034	2,315
Rock Island-Southern Pacific	2,058	2,542
Wabash-Santa Fe	2,084	2,395
Wabash-Union and Southern Pacific	2,717	2,287
Missouri Pacific-Denver & Rio Grande-Western Pacific	.....	2,467

The Frisco will arrange connections via Springfield from Memphis and Birmingham, and will likewise arrange for service out of New Orleans by its New Orleans & Mexico line, connection being made with the Santa Fe at Houston.

Cotton Crop Conditions.

The crop reporting board of the department of agriculture estimates that the area planted to cotton this year (1911) in the United States, including that already planted and expected to be planted, is about 104.7 per cent. of the area planted to cotton last year, equivalent to about 35,004,000 acres, as compared with 33,418,000 acres indicated by the bureau's revised estimate of last year's planted area, an increase of about 1,586,000 acres, or 4.7 per cent.

The condition of the growing crop on May 25 was 87.8 per cent. of a normal condition, as compared with 82.0 per cent. at the corresponding date in 1910, and 80.9 per cent., the average condition for the past ten years on May 25.

Details by states follow:

States.	Revised Figures Indicating Thousand Acres Planted in 1910.	Area Planted in 1911; Preliminary Estimate. Per Cent. Compared with 1910.	Area Planted in 1911; Preliminary Estimate. Thousand Acres.	Condition May 25, 1911.	Condition May 25, 1910.	Condition May 25, Ten-year Average.
Virginia	34	109	37	93	90	85
North Carolina	1,511	105	1,587	83	84	83
South Carolina	2,626	103	2,705	80	78	81
Georgia	4,970	103	5,119	92	81	82
Florida	268	106	284	95	80	86
Alabama	3,633	105	3,815	91	83	80
Mississippi	3,420	101	3,454	86	82	80
Louisiana	1,075	104	1,118	91	76	79
Texas	10,350	105	10,868	88	83	80
Arkansas	2,375	103	2,446	87	81	81
Tennessee	783	105	822	83	86	83
Missouri	103	112	115	86	87	85
Oklahoma	2,260	116	2,622	87	84	84
California	10	123	12	95	90	..
United States	33,418	104.7	35,004	87.8	82.0	80.9

INTERSTATE COMMERCE COMMISSION.

The commission has suspended the rates on oil cake and oil meat of northwestern railways until October 7, when the commission will give a hearing as to proper rates.

The commission has dismissed the case involving suspension of increased rates on fruits and vegetables from Chicago, over the Chicago, Milwaukee & St. Paul, and the Chicago & Northwestern, which were filed some time ago and were suspended until June 1. The commission takes no action concerning these rates and allows them to go into effect.

Refusal to Suspend a Rate Cut.

In re request for suspension of reduced rates on packing-house products and fresh meats from Fort Worth, Tex., to Mississippi River crossings and points east thereof. Opinion by the commission:

In this matter the committee is called upon to postpone the effectiveness of certain reductions in rates. The ground of the request is that the reductions are discriminatory as against the complainants.

We understand the Texas & Pacific Railway initiated the reductions, and certain other lines met its action. They are to become effective on June 18, 1911. They consist of reduced proportional rates on packing-house products and fresh meats from Fort Worth, Tex., to St. Louis, Mo., the reduction on fresh meats being from a rate of 38½ cents to a rate of 35½ cents, and the reduction on packing-house products being from a rate of 33 cents to a rate of 32¾ cents. As fresh meats and packing-house products from Forth Worth move largely to points beyond St. Louis, and as such proportional rates are used in combination to make up through rates to such points beyond, the effect is to reduce the existing rates from Fort Worth to northern and eastern points generally by the amount of 3 cents per 100 lbs. on fresh meats and one-fourth of a cent on packing-house products.

The packing houses at Fort Worth are operated by the Armour and Swift interests. The requests for suspension comes from packing houses recently established at Oklahoma City, Okla., by Nelson Morris & Company and Schwarzschild & Sulzberger. A case is presented in which there is active competition between carriers operating to make a substantial reduction in rates. The commission is asked to suspend such reduction because it will be to the relative disadvantage of Oklahoma City. The latter point is situated on the lines of carriers which serve both cities and which, therefore, are not inclined to extend the reduction of rates beyond the point of actual competition. These carriers (Atchison, Topeka & Santa Fe Railway; Chicago, Rock Island & Pacific Railway; and Missouri, Kansas & Texas Railway) have met the cut in rates made by the Texas & Pacific interests at Fort Worth, but are not inclined to extend this cut to Oklahoma City. It is to be added that the carriers beyond St. Louis are indifferent as between the two cities, earning the same compensation on shipments from either.

No question under the fourth section is present, inasmuch as the rates from Oklahoma City to the territory covered by the proposed reductions are still 4 cents less on dressed beef and packing-house products than the corresponding rates from Fort Worth.

It is urged by the carriers making the reduction and by the Railroad Commission of Texas and the Fort Worth interests that the commission has no power to suspend reductions in rates; and that no proper occasion for the exercise of such power has been shown on this application.

Upon these contentions the commission now decides that it has the power to suspend reductions of rates in any case where such suspension will operate to prevent an apparent discrimination. In our view, however, a prima facie case clearly and affirmatively persuasive should be presented before the power to suspend is exercised. We can not say that this has been done upon the present application. Inasmuch as each rate and each adjustment of rates urged upon this hearing will, possibly, become the subject of formal proceedings, it is deemed inadvisable to engage at the present time in a more exhaustive discussion thereof. The application for suspension of the reduction of rates is denied. (21 I. C. C. 68.)

STATE COMMISSIONS.

The Railroad Commission of Louisiana has adopted a rule providing that in constructing freight tariffs and classifications and passenger fare schedules, applying between points in the state of Louisiana, the rules and regulations adopted by the Interstate Commerce Commission shall be observed by railways and express companies.

The New York State Senate has confirmed Governor Dix's nomination of J. Sergeant Cram as a member of the New York Public Service Commission (New York city district), succeeding Edward M. Bassett. Mr. Cram has held various city offices under Democratic administrations and has acted as personal attorney for Charles F. Murphy.

The New York State Public Service Commission, second district, has ordered the Delaware & Hudson to restore train No. 6, which formerly stopped at Fort Ann about 5 p. m.; this to accommodate the people of Fort Ann; and the company is ordered not to discontinue it again until the commission finds that the travel does not justify the service and so declares. In connection with this order the commission allows the road to discontinue stopping train No. 2 at Fort Ann on flag signal. And then it introduces a new wrinkle, in the shape of a requirement that train No. 7, northbound, shall stop at Fort Ann to leave passengers, provided there are four of them who wish to be left. To a woman with two children this rule would be annoying; however, she might borrow a neighbor's child. One 4 years and 364 days of age would cost no fare and she would "get even" with the road.

REVENUES AND EXPENSES OF RAILWAYS AS REPORTED TO THE INTERSTATE COMMERCE COMMISSION.

MONTH OF APRIL, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,550[1]	$4,959,248	$1,839,331	$7,548,804	$978,001	$1,291,426	$162,294	$2,216,506	$164,680	$4,812,907	$2,735,897	.....	$258,967	$2,476,930	$125,607
Atlantic Coast Line	4,495[2]	1,923,512	682,677	2,835,441	317,203	387,822	42,639	956,338	78,239	1,782,241	1,053,200	.....	115,000	938,200	—150,003
Boston & Maine	2,243	2,070,558	1,155,171	3,504,661	392,014	535,949	41,185	1,636,216	98,931	2,704,295	800,366	$7,322	172,261	635,427	—274,921
Central of New Jersey	631[3]	1,657,088	386,105	2,163,093	199,886	299,584	29,190	585,794	43,344	1,157,798	1,005,295	—28,457	48,487	928,351	—527
Chesapeake & Ohio	1,948	1,889,799	398,627	2,414,616	323,347	476,397	46,951	715,478	59,795	1,621,968	792,648	3,235	93,250	702,633	—260,680
Chesapeake & Ohio of Indiana	285	99,712	15,271	121,717	30,350	30,334	4,367	65,158	5,020	135,229	—13,512	—22	3,790	—17,324	—
Chicago & Northwestern	7,744[4]	3,605,601	1,338,526	5,518,495	760,342	765,888	97,092	2,429,629	137,871	4,190,822	1,327,673	—1,090	245,000	1,081,583	—244,567
Chicago & Alton	1,025[5]	670,228	301,839	1,059,642	81,321	106,697	50,550	411,866	33,265	683,699	375,943	—2,553	37,000	336,390	98,486
Chicago, Burlington & Quincy	9,091[6]	4,209,436	1,590,597	6,423,310	1,223,990	1,047,032	130,818	2,145,550	187,279	4,734,669	1,688,641	—13,375	249,856	1,425,410	124,746
Chicago, Milwaukee & Puget Sound	1,980[7]	953,962	147,922	1,131,598	102,543	114,122	26,380	471,426	16,636	731,107	400,491	—3,466	50,307	346,718	—274,234
Chicago, Milwaukee & St. Paul	7,511	3,292,631	996,750	4,771,762	541,190	637,493	100,708	2,110,681	108,952	3,499,024	1,272,738	12,575	226,616	1,058,697	—306,718
Chicago, Rock Island & Pacific	7,548[8]	3,067,779	1,418,530	4,808,163	760,212	766,706	155,324	1,986,706	137,299	3,806,247	1,001,916	—7,906	206,732	787,278	368,133
Chicago, St. Paul, Minneapolis & Omaha	1,744	742,044	309,187	1,131,479	131,731	145,928	27,192	465,560	32,173	802,584	328,895	—1,193	62,287	265,415	—118,593
Cleveland, Cincinnati, Chic. & St. Louis.	1,979	1,590,485	578,521	2,399,154	300,431	429,195	82,177	1,047,240	56,679	1,915,722	483,432	—6,889	80,000	396,543	—2,862
Delaware, Lackawanna & Western	930	2,128,205	613,409	2,928,106	328,099	467,135	69,082	859,790	64,356	1,788,462	1,139,644	27,548	138,023	1,029,164	—371,598
Denver & Rio Grande	2,556[9]	1,317,230	386,385	1,782,269	186,265	325,290	49,054	629,624	48,445	1,238,678	543,591	—651	74,600	468,340	—135,955
Erie	1,994[10]	2,803,125	682,178	3,765,325	316,138	659,987	88,291	1,323,391	85,439	2,473,245	1,292,079	—91	120,631	1,171,357	28,819
Great Northern	7,329[11]	3,142,963	1,053,106	4,548,315	1,037,899	641,019	75,217	1,425,830	89,079	3,269,094	1,279,221	15,862	220,584	1,074,499	—140,614
Gulf, Colorado & Santa Fe	1,537[12]	514,403	214,715	809,392	172,345	147,062	18,575	384,403	30,553	752,938	56,454	.....	25,715	30,739	145,793
Lake Shore & Michigan Southern	1,663	2,476,758	809,935	3,764,571	627,098	580,331	103,064	1,348,680	85,668	2,744,841	1,019,730	—7,085	135,000	877,645	57,167
Lehigh Valley	1,431	2,728,927	360,465	3,187,411	245,824	447,191	78,130	969,530	64,874	1,805,549	1,381,862	—15,476	101,300	1,265,086	—115,362
Louisville & Nashville	4,591	2,947,179	896,842	4,127,362	763,340	791,229	85,226	1,452,831	98,403	3,191,029	936,333	5,858	175,000	767,191	—271,079
Michigan Central	1,805[13]	1,574,134	550,029	2,366,386	290,742	375,849	87,411	1,017,903	51,343	1,823,248	543,138	—2,753	110,000	430,385	—191,573
New York Central & Hudson River	3,591	4,775,955	2,379,697	8,285,450	1,035,007	1,417,625	194,317	3,052,448	204,484	5,903,881	2,381,569	12,749	405,681	198,637	379,031
New York, New Haven & Hartford	2,040	2,627,397	2,070,897	5,155,362	531,093	613,935	27,846	2,008,220	157,716	3,338,810	1,816,552	99,637	287,000	1,629,189	120,018
Norfolk & Western	1,990[14]	2,434,723	310,929	2,836,584	363,260	544,106	46,497	868,658	59,325	1,881,846	954,738	—1,085	115,000	838,653	—275,618
Northern Pacific	6,028[15]	3,352,016	1,306,112	5,008,952	621,278	626,849	95,606	1,684,125	92,254	3,120,112	1,888,840	15,290	250,448	1,653,682	120,405
Oregon Short Line	1,646[16]	907,644	387,185	1,406,433	196,990	128,023	23,573	363,948	37,839	750,373	656,060	—1,765	58,716	595,579	—374,885
Pennsylvania *R. R.*	3,977[17]	9,188,988	2,585,565	12,617,244	1,621,969	2,002,503	168,724	4,561,077	329,484	8,683,757	3,933,487	—115,592	531,228	3,286,667	461,621
Pennsylvania *Co.*	1,416	2,737,899	625,747	3,719,327	407,241	568,157	65,718	1,345,187	86,017	2,472,320	1,247,007	—5,099	185,311	1,056,597	427,721
Pere Marquette	2,334	861,873	275,300	1,242,662	171,321	216,996	36,305	603,472	35,508	1,063,602	179,060	3,625	47,280	135,405	—199,239
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	1,962,839	611,696	2,924,923	276,360	469,523	62,030	1,090,048	66,467	1,964,428	960,495	—929	134,519	825,047	205,747
Southern Ry.	7,038	3,180,307	1,207,936	4,804,413	553,599	673,170	127,843	1,764,491	151,978	3,271,082	1,533,331	—3,234	184,437	1,345,660	42,962
Southern Pacific *Co.*	6,187[18]	3,933,571	2,575,608	7,067,544	924,056	755,981	145,624	2,038,157	229,316	4,093,134	2,974,410	—60,456	357,156	2,556,798	—333,783
Texas & Pacific	1,885	719,396	290,523	1,077,757	177,937	233,135	21,360	527,012	40,977	1,000,421	77,336	112	38,031	39,417	—121,913
Union Pacific	3,473[19]	2,536,492	828,926	3,772,622	682,012	375,904	92,660	1,049,711	103,420	2,303,707	1,468,915	—4,972	152,686	1,311,257	—54,612

TEN MONTHS OF FISCAL YEAR, 1911.

Atchison, Topeka & Santa Fe	7,550[1]	$49,465,353	$18,982,907	$74,797,443	$10,619,218	$11,788,382	$1,485,054	$21,876,580	$1,578,880	$47,348,114	$27,449,329	.....	$2,459,784	$24,989,545	$2,276,134
Atlantic Coast Line	4,495[2]	18,237,918	6,560,696	26,702,011	3,338,898	3,875,997	451,623	8,692,080	693,507	17,052,105	9,649,906	.....	994,000	8,655,906	—98,188
Boston & Maine	2,243	21,347,568	12,926,226	37,072,239	4,678,821	5,102,829	415,727	17,618,124	919,701	28,735,202	8,337,037	$49,742	1,795,433	6,591,346	—2,099,718
Central of New Jersey	631[3]	15,324,219	3,917,192	20,299,520	2,049,221	3,083,117	309,097	5,902,034	400,563	11,744,032	8,555,488	37,960	862,747	7,730,701	—291,113
Chesapeake & Ohio	1,948	20,518,792	4,390,751	26,016,611	2,992,431	4,940,781	449,560	7,772,107	604,633	16,759,512	9,257,099	—9,509	833,873	8,413,717	—1,441,946
Chesapeake & Ohio of Indiana	285	1,008,534	222,150	1,296,745	315,889	291,751	57,513	711,787	50,847	1,427,787	—131,042	79	37,900	—168,863	—
Chicago & Northwestern	7,744[4]	41,004,522	15,920,442	62,560,500	7,978,287	7,825,633	1,045,910	26,108,375	1,369,125	44,327,330	18,233,170	—29,659	2,627,000	15,576,511	—225,154
Chicago & Alton	1,025[5]	7,657,482	3,584,416	12,135,384	1,512,062	1,922,987	404,228	4,579,977	344,624	8,763,878	3,371,505	—19,250	362,600	2,989,656	—663,575
Chicago, Burlington & Quincy	9,091[6]	48,961,510	18,991,465	74,328,216	9,581,684	12,087,219	1,325,826	24,214,608	1,873,215	49,082,552	25,245,664	—91,525	2,494,383	22,659,756	3,087,067
Chicago, Milwaukee & Puget Sound	1,980[7]	10,541,015	1,223,701	12,081,784	795,520	1,253,590	291,987	4,389,443	143,350	6,873,890	5,207,894	10,642	428,227	4,790,309	—
Chicago, Milwaukee & St. Paul	7,511	37,930,805	11,737,006	54,753,053	6,808,876	7,631,329	1,061,492	23,939,453	921,219	40,362,369	14,390,684	142,222	2,209,468	12,323,438	—2,307,261
Chicago, Rock Island & Pacific	7,548[8]	34,771,994	16,237,659	54,250,899	7,730,252	7,560,491	1,577,187	21,060,251	1,385,614	39,313,795	14,937,104	—97,017	2,187,778	12,652,309	1,182,414
Chicago, St. Paul, Minneapolis & Omaha	1,744	9,015,244	3,782,750	13,689,104	1,459,616	1,577,738	236,745	5,253,379	301,669	8,829,147	4,859,957	—13,752	600,320	4,245,885	323,878
Cleveland, Cincinnati, Chic. & St. Louis.	1,979	16,824,985	6,627,578	25,773,447	3,291,806	4,457,863	842,586	11,001,629	582,450	20,176,334	5,597,113	—73,910	813,548	4,709,655	—1,760,417
Delaware, Lackawanna & Western	930	21,489,488	6,283,287	29,626,398	3,099,797	4,383,128	602,487	8,993,615	599,426	17,678,453	11,947,945	200,847	1,359,136	10,789,656	—2,211,841
Denver & Rio Grande	2,556[9]	14,448,558	4,270,831	19,579,333	2,205,866	3,460,960	479,235	6,780,920	494,245	13,421,226	6,158,107	—27,776	713,600	5,416,731	—215,917
Erie	1,994[10]	29,727,800	7,527,195	40,186,540	4,376,760	6,787,699	968,359	13,448,452	823,215	26,404,485	13,782,055	—202,993	1,172,096	12,406,966	274,988
Great Northern	7,329[11]	35,922,564	11,035,071	50,659,686	7,198,061	6,506,897	827,529	15,192,356	951,197	30,676,040	19,983,646	148,173	2,632,601	17,499,218	—1,463,138
Gulf, Colorado & Santa Fe	1,537[12]	7,057,032	2,588,596	10,360,175	1,864,859	1,571,426	240,965	4,075,456	322,492	8,075,198	2,284,977	.....	322,674	1,962,303	431,628
Lake Shore & Michigan Southern	1,663	26,388,517	9,423,244	40,588,783	6,489,433	6,362,238	1,003,790	14,573,127	798,328	29,226,916	11,361,867	—54,531	1,450,182	9,857,154	—3,704,871
Lehigh Valley	1,431	25,710,948	3,725,031	30,480,157	2,958,691	5,097,903	814,913	9,938,001	646,846	19,456,354	11,023,803	—265,686	965,600	9,792,517	—961,190
Louisville & Nashville	4,591	33,101,012	9,761,030	45,607,227	7,483,558	7,950,901	945,344	14,742,218	907,985	32,030,006	13,577,221	24,574	1,451,800	12,149,995	—2,252,452
Michigan Central	1,805[13]	16,186,798	6,259,999	25,034,124	3,535,421	3,685,177	768,342	10,592,396	496,018	19,077,354	5,956,770	—38,015	1,135,020	4,783,735	—2,125,698
New York Central & Hudson River	3,591	48,751,574	25,661,982	83,627,417	11,441,013	14,549,081	2,006,931	32,262,658	2,218,023	62,477,706	21,149,711	73,465	3,959,133	17,264,043	—2,102,863
New York, New Haven & Hartford	2,040	25,066,947	21,731,282	51,400,905	5,577,068	6,007,771	287,021	20,449,989	1,521,316	33,843,165	17,557,740	1,153,223	3,034,000	15,676,963	—405,973
Norfolk & Western	1,990[14]	25,149,023	3,499,915	29,710,665	3,453,470	5,539,785	490,140	8,952,221	605,441	19,041,057	10,669,608	—7,851	1,090,000	9,571,757	—1,382,592
Northern Pacific	6,028[15]	36,617,918	14,540,075	54,760,720	6,475,267	6,702,210	909,248	18,288,359	857,066	33,232,150	21,528,570	407,811	2,704,129	19,232,252	—1,944,589
Oregon Short Line	1,646[16]	11,673,890	4,055,316	16,813,577	2,156,924	1,798,460	277,602	4,155,607	426,477	8,815,070	7,998,507	—17,247	685,477	7,295,783	—1,532,490
Pennsylvania *R. R.*	3,977[17]	94,855,627	27,602,312	131,071,435	16,350,311	24,340,632	1,870,901	48,546,878	3,375,458	94,484,180	36,587,255	—1,092,976	4,630,987	30,863,292	—6,406,498
Pennsylvania *Co.*	1,416	31,975,315	6,940,868	42,493,503	4,995,259	7,371,610	784,087	15,327,694	846,098	29,324,748	13,168,755	—59,603	1,883,002	11,226,150	—2,282,138
Pere Marquette	2,334	9,007,617	3,306,231	13,362,968	1,743,733	2,104,770	389,770	6,133,562	348,419	10,720,254	2,642,714	—56,253	570,202	2,016,259	—1,487,913
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467	22,305,684	6,795,291	32,718,118	3,931,707	6,043,437	725,881	12,416,624	657,814	23,775,463	8,942,655	—8,918	1,366,290	7,567,447	—1,734,104
Southern Ry.	7,038	33,573,463	13,445,422	50,906,012	6,279,298	8,100,308	1,287,960	17,273,789	1,482,801	34,424,156	16,481,856	60	1,824,776	14,657,140	480,867
Southern Pacific *Co.*	6,187[18]	44,427,011	26,561,615	76,301,427	9,492,568	9,618,358	1,626,153	20,929,711	2,318,670	43,985,460	32,315,967	164,714	2,869,982	29,610,699	—3,599,138
Texas & Pacific	1,885	9,299,979	3,458,311	13,710,436	1,632,864	2,602,583	212,657	5,648,044	371,203	10,467,351	3,243,085	—2,934	503,420	2,736,731	—811,989
Union Pacific	3,473[19]	30,361,730	9,234,664	43,330,129	4,566,790	4,979,933	1,002,518	11,327,393	1,066,829	22,943,463	20,386,666	—51,517	1,549,067	18,786,082	—1,398,496

Mileage operated on April 30, 1910.—[1] 7,459 miles; [2] 4,483 miles; [3] 668 miles: [4] 7,638 miles; [5] 998 miles; [6] 9,028 miles; [7] 1,462 miles; [8] 7,393 miles; [9] 2,517 miles; [10] 1,961 miles; [11] 7,129 miles; [12] 1,518 miles; [13] 1,746 miles; [14] 1,951 miles; [15] 5,849 miles; [16] 1,509 miles; [17] 3,947 miles; [18] 6,076 miles; [19] 3,411 miles. — Indicates Deficits, Losses and Decreases.

The Railroad Commission of Louisiana, finding that its order now in effect provides that, if the products from the sugar cane are not shipped by the same railway, the rate shall be 100 per cent. higher than the rate when the product is reshipped by the carrier bringing in the sugar cane, and believing this to be an unreasonable provision in the tariff, has ordered that on joint through shipments of sugar cane, the rates as authorized by the commission, and now in effect, will apply when the product is shipped out by the carrier delivering the sugar cane, deducting 10 per cent. from the sum of each line's local rate.

The Railroad Commission of Louisiana has adopted the rule providing that all tariff publications or supplements thereto must indicate increases made in existing rates, rules, or classifications, by the use of black-face type or by the use of a uniform symbol throughout the schedule. All tariff duplications or supplements thereto which are filed with the commission after June 1, 1911, must also indicate reductions made in existing rates, rules, or classifications, by the use of italic type or by the use of a uniform symbol throughout the schedule. Clear explanation of the use of distinctive type or symbol must be made in the tariffs or classifications.

COURT NEWS.

The Interstate Commerce Commission has begun to enforce the ash pan law. At Indianapolis, Ind., last week a suit was filed asking penalties aggregating $400 for violation of the law. The suit was entered by the United States District Attorney against the Chicago, Indianapolis & Louisville. The complaint alleges that the company operated trains March 18 and 29, with locomotives, the ash pans of which were so constructed that it was necessary for an employe to go under the engine to empty them. Similar suits will be filed against other railways.

A verdict for $62,638.49 in favor of seven coal companies against the Pennsylvania Railroad, which was charged with discrimination in favor of the Berwind-White Coal Company and others, was rendered by a jury in the United States Circuit Court at Philadelphia, May 25. The plaintiff most heavily interested was the Mount Carbon Coal & Coke Company. Originally the suit was brought by eleven coal companies, but four were subsequently eliminated when they failed to show evidence of direct damage. The case had been on trial for two years. The charge of the coal companies was that it cost them $1.55 a ton to ship coal to South Amboy, which, with the ligtherage charge, made their bills to delivery points in New York harbor $1.73, whereas at Harsimus pier, Jersey City, used exclusively by the Berwind-White Company, the total charge has been only $1.61½. The plaintiffs asked the court to award them 11½ cents as overcharge on each ton shipped.

The Appellate Division of the Supreme Court of New York in the suit of Robinson against the New York Central & Hudson River, has sustained the demurrer for the plaintiff against the company's claim that for a piece of baggage lost the owner could recover only $150, that being the limit printed on the ticket. In this case the baggage lost was worth $550 and the court evidently holds that the owner may rightfully recover the whole amount. The notice to the public says that baggage valued at more than $150 may be insured for its full value by the payment of an extra charge, but the plaintiff claims that he should have been asked the value of his baggage by the station man who checked it. This claim the court apparently sustains. It appears that on the tariff sheet, under the instructions to baggage men, there is a clause notifying them not to ask the value of baggage; that the clause relative to insurance applies only in cases where the passenger voluntarily states in value of his baggage. This clause has been printed in the instructions for the benefit of agents who act also as agents for express companies, where the practice is to ask shippers the value of the articles shipped. The decision of the Supreme Court was by a vote of 3 to 2.

The Board of Communications has accepted a Chinese merchant's petition for the right to construct a railway from Canton, China, to Heungshan, the length of which will be over 68 miles.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Charles E. Field has resigned as general claim agent of the Chicago, Indianapolis & Louisville.

W. L. Chew has been appointed general claim agent of the Texas & Pacific, with headquarters at Dallas, Tex.

James H. Hustis, assistant general manager of the Boston & Albany, with office at Boston, has been appointed vice-president, effective June 5, and that road is now operated separately from the New York Central & Hudson River, under the direction of Vice-president Hustis, who reports directly to President W. C. Brown. Mr. Hustis was born January 11, 1864, in New York City, and was educated in the public schools. He began railway work in 1878 with the New York Central as office boy for General Superintendent J. M. Toucey. In 1891 he was appointed trainmaster of the Harlem division; in 1893 assistant superintendent, and in 1900 superintendent of the same division. The same year he was appointed to the River division; in August, 1902, to the Rome, Watertown & Ogdensburg division, and in October, 1906, he went to the Hudson division. In March, 1907, he was appointed general superintendent of the Western district, with office at Syracuse; and then, in October of the same year, he went to the Boston & Albany as assistant general manager, which position he has held until now.



J. H. Hustis.

William A. Cormier, who has been appointed auditor of the Boston & Albany, with office at Boston, was born at Spencer, Mass., and entered the service of the Boston & Albany at that place as freight clerk in 1880. In 1883 he went to the Chicago & Alton; a year later he came back to the Boston & Albany, and was ticket seller at Palmer; and then two years later went back West, working in the office of the auditor of ticket accounts of the Chicago, Rock Island & Pacific. He returned to the Boston & Albany in February, 1887, and was statistical clerk in the office of the general ticket agent. From there he went to the freight office at East Albany; and in 1889 resigned to take a place with the auditor of disbursements of the New York Central. He has been in that department ever since holding the position of assistant auditor of miscellaneous accounts since February 1, 1910.



W. A. Cormier.

M. C. Markham, assistant to the first vice-president of the Missouri Pacific, has been appointed assistant to the president, with headquarters at St. Louis, Mo.

G. R. Martin, assistant comptroller of the Great Northern, has been appointed comptroller, with headquarters at St. Paul, Minn., succeding J. G. Drew, resigned.

J. L. Terry has been appointed assistant to the vice-president and purchasing agent of the Denver, Laramie & Northwestern, with office at Denver, Colo., succeeding J. U. Mock, resigned.

W. S. Trowbridge has been appointed assistant auditor of the Boston & Albany; W. J. Turck has been appointed auditor of freight accounts, and M. R. Crocke has been appointed auditor of passenger accounts, all with offices at Boston, Mass.

M. J. Murphy, assistant secretary and assistant auditor of the Chicago & Western Indiana and the Belt Railway, has been elected secretary and auditor, succeeding M. J. Clark, and W. S. Kies, general solicitor, has been appointed general counsel, both with offices at Chicago.

J. W. Kendrick has resigned as vice-president in charge of operation of the Atchison, Topeka & Santa Fe. His duties have been assumed by W. B. Storey, Jr., vice-president in charge of construction, whose jurisdiction has been extended over the operating department, and whose headquarters will be at Chicago.

John J. Bernet, whose appointment as assistant to C. E. Schaff, vice-president of the Lake Shore & Michigan Southern and other New York Central Lines west of Buffalo, N. Y., with headquarters at Chicago, has been announced in these columns, was born February 9, 1868, at Brant, Erie Co., N. Y. He began railway work with the Lake Shore & Michigan Southern on October 19, 1889, as telegraph operator, and was promoted to train dispatcher at Buffalo, N. Y., on March 12, 1895, remaining in that position until April 2, 1901, when he was made trainmaster of the eastern division. On March 6, 1903, he was appointed assistant superintendent of the eastern division and was promoted to the superintendency of that division on February 1, 1905. He was made assistant general superintendent on November 22, 1905, and the following October, was appointed general superintendent, from which position he was recently promoted to assistant to the vice-president of the New York Central Lines west of Buffalo, including the Lake Shore & Michigan Southern; Michigan Central; Cleveland, Cincinnati, Chicago & St. Louis; Lake Erie, Alliance & Wheeling; Dunkirk, Allegheny Valley & Pittsburgh; Lake Erie & Western; Peoria & Eastern; Cincinnati Northern; Chicago, Indiana & Southern; Indiana Harbor Belt; Toledo & Ohio Central and Zanesville & Western.



John J. Bernet.

Operating Officers.

William A. Webb, assistant to the vice-president of the Colorado & Southern, has been appointed general manager of the Texas Central, with headquarters at Waco, Tex.

John M. Eagan has been appointed superintendent of the Mississippi division of the Illinois Central, with office at Water Valley, Miss., succeeding Jacob G. Neudorfer, resigned.

R. H. Howard, engineer maintenance of way of the New Orleans Great Northern, has been appointed general manager, with headquarters at Bogalusa, La., succeeding N. G. Pearsall, resigned.

A. S. Ingalls, assistant general superintendent of the Lake Shore & Michigan Southern, has been appointed general superintendent, with office at Cleveland, Ohio, succeeding J. J. Bernet, promoted. See Executive, Financial and Legal Officers.



L. A. Anthony.

L. A. Anthony, car service agent of the Boston & Albany, at Springfield, Mass., has been appointed superintendent of car service. Mr. Anthony was born March 10, 1858, at Scotland, Conn., and in 1878 was appointed record and mileage clerk of the Railway Clearing House Association, at Boston, Mass. He was later assistant chief clerk, and then chief clerk in the mileage department of that association, with which he remained until its dissolution. In August, 1890, he was appointed car service agent of the Boston & Albany, which position he held at the time of his recent appointment as superintendent of car service. For the last few years he has been treasurer of the Railroad Young Men's Christian Association, at Springfield.

Traffic Officers.

Benn C. Leavenworth has been appointed agent of the Star Union Line at Grand Rapids, Mich., succeeding E. J. Keate, deceased.

S. L. Hall has been appointed a traveling passenger agent of the Lake Tahoe Railway & Transportation Company, with office at Los Angeles, Cal.

H. M. Biscoe, assistant freight traffic manager of the Boston & Albany, has been appointed traffic manager, with office at Boston, Mass. Mr. Biscoe was born July 3, 1869, at Westboro, Mass., and was graduated from Yale University in 1892. He began railway work the same year in the ticket auditor's office of the Boston & Albany. In 1893 he went to the Central Vermont, where he had a position in the general freight office. He remained in that position until March, 1896, when he went back to the Boston & Albany and was appointed clerk in the general traffic manager's office. From April, 1898, to May, 1905, Mr. Biscoe was foreign freight agent of the same company at Boston; following which he was appointed general freight agent. Since February 15, 1910, he has been assistant freight traffic manager of the road, reporting to the general traffic manager at New York City.



H. M. Biscoe.

J. H. Brown has been appointed general freight and passenger agent of the Gulf & Ship Island, with office at Gulfport, Miss., succeeding J. L. Hawley.

I. M. Griffin, division freight agent of the International & Great Northern at Ft. Worth, Tex., has been appointed assistant

general freight agent of the Texas & Pacific, with headquarters at Dallas, Tex.

W. F. Gleason, having resigned as general freight and passenger agent of the Ocean Shore, the office has been abolished and the duties assumed by L. H. Landis, general manager, whose headquarters are at San Francisco, Cal.

G. B. Harper, traveling industrial and immigration agent of the Illinois Central, at Memphis, Tenn., has been appointed assistant industrial immigration commissioner, with office at Memphis. Frank Henius succeeds Mr. Harper.

J. A. Dolan, general agent of the Erie Railroad, at Denver, Colo., has been appointed assistant general eastern passenger agent, with office at New York, and H. W. Hawley has been appointed division passenger agent, with office at Cleveland, Ohio.

R. W. Drew, district freight agent of the Canadian Pacific at Saskatoon, Sask., has been appointed division freight agent at Nelson, B. C., succeeding W. R. Haldane, resigned. W. H. Allisson succeeds R. W. Drew as district freight agent. D. C. MacDonald has been appointed division freight agent of the Saskatchewan division, with office at Regina, Sask.

J. M. Ball, general agent of the freight traffic department of the International & Great Northern at San Antonio, Tex., has been appointed division freight agent at that place, and J. W. Daly, general agent of the freight traffic department at Galveston, Tex., has been appointed division freight agent at Galveston. John G. Worrall has been appointed division freight agent with office at Houston, Tex.

Richard Van Ummersen, assistant general freight agent of the Boston & Albany, has been appointed general freight agent, with office at Boston. Mr. Van Ummersen was born in 1874 at Boston, and was educated in the public schools of Cambridge. He entered the service of the Boston & Albany in July, 1891, and held various positions in the ticket auditor's office, until he went to the general freight office, in February, 1896. For a time he was in this department as claim agent, and was later appointed tariff clerk, and then rate clerk, which position he held until June, 1900, when he was appointed chief clerk. Six years later he was appointed division freight agent, with office at Worcester. In November, 1907, he returned to Boston as assistant general freight agent, which position he held at the time he assumed his new title of general freight agent.



R. Van Ummersen.

A. S. Hanson, general agent, passenger department of the Boston & Albany, at Boston, Mass., has been appointed general passenger agent. Mr. Hanson began railway work in 1872 with the Illinois Central, at Chicago, and since 1879 has been with the Boston & Albany. He was for many years general passenger agent of that road, and when the New York Central took control of this property he was made general agent, which position he held at the time of his recent appointment as general passenger agent.

C. Hanson, commercial agent of the International & Great Northern at Waco, Tex., has been appointed division freight agent, with office at Ft. Worth, to succeed I. M. Griffin. J. W. Byars, commercial agent at Dallas, Tex., has been appointed division freight agent, with headquarters at Waco, Tex. Frank J. Burke, commercial agent at Denver, Colo., has been appointed division freight agent at Dallas, Tex. J. S. Houston, general agent of the International & Great Northern at St. Louis, Mo., has been appointed assistant general freight agent of that road and the Texas & Pacific, with headquarters at St. Louis.

Robert D. Moore, whose appointment as general freight and passenger agent of the Mississippi Central, with office at Hattiesburg, Miss., has been announced in these columns, was born at Atlanta, Ga., and began railway work about 1888 in the claim department of the Southern Railway, at Washington, D. C. He was later transferred to the general freight office, and then went to the Illinois Central in the general freight office, at Louisville, Ky. For the past four years Mr. Moore has been in the service of the Atlanta, Birmingham & Atlantic, with office at Atlanta, Ga., and was assistant general freight agent when he left the service of that road on March 1, of this year.



F. E. Pettengill.

F. E. Pettengill, who has been appointed freight claim agent of the Boston & Albany, with office at Boston, was born in Worcester, Mass., and has been in the service of the Boston & Albany over 30 years. His first position with a title was that of station agent at Webster in 1884, but before that he had been a brakeman and also a clerk in the accounting department. He was appointed station agent at Chatham in 1888; and at Pittsfield in 1898; local freight agent at Springfield in 1902, and special agent of the transportation department, reporting to the assistant general manager, in 1909. From this place he is now promoted to freight claim agent, with office at Boston, as above noted.

The following changes and appointments have been made by the Southern Railway: E. H. Shaw, assistant freight traffic manager, has been transferred from Washington, D. C., to Atlanta, Ga.; J. A. Smith, Jr., division freight agent, Charleston traffic division, has been transferred from Charleston, S. C., to Augusta, Ga.; Howell Peoples, division freight agent, Atlantic Traffic division, has been transferred from Atlanta to Macon; I. L. Graves, general freight agent, at Memphis, Tenn., has been appointed coal freight agent, at Atlanta, and W. A. Turner, general freight agent, at Chattanooga, Tenn., succeeds Mr. Graves. L. L. McCleskey, assistant to general freight agent, has been appointed assistant general freight agent, with office at Atlanta, and his former position has been abolished. C. E. Bell, chief clerk in the general freight office at Atlanta, has been appointed assistant general freight agent, at Atlanta. D. Cardwell, division freight agent, at Columbia, S. C., has been appointed assistant general freight agent, with office at Columbia, and G. K. Caldwell succeeds Mr. Cardwell. E. C. Morgan, commercial agent, at Chattanooga, Tenn., has been appointed district freight agent, with office at Chattanooga, and Taylor Williams, soliciting freight agent, succeeds Mr. Morgan. H. G. Duke has been appointed a freight soliciting agent, with office at Selma, Ala., succeeding W. R. Wyatt, transferred. E. P. Johnson has been appointed traveling freight agent, at Jacksonville, Fla., succeeding T. E. King, resigned to go into other business. Marcus M. Emmert, rate clerk in the office of the freight traffic manager, at Washington, has been appointed commercial agent, at Lynchburg, Va.; R. L. Potts has been appointed freight soliciting agent, at Raleigh, N. C.; H. D. Luckett, chief clerk to the division freight agent, at Asheville, N. C., has been appointed commercial agent, at Charleston, S. C.; H. S. Du Val, commercial agent, at Augusta, has been appointed traveling freight agent, at Albany, Ga., succeeding Thomas O'Connor, resigned, and the office of Harvey Kidwell, traveling freight agent, at Atlanta, has been transferred to Macon.

Engineering and Rolling Stock Officers.

P. B. Motley has been appointed engineer of bridges of the Canadian Pacific, with office at Montreal, Que.

W. H. Penfield has been appointed assistant chief engineer of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding E. O. Reeder.

Kenneth B. Duncan, assistant engineer of the Gulf, Colorado & Santa Fe at Galveston, Tex., has been transferred to Topeka, Kan., as assistant engineer of the Santa Fe system.

J. E. Hickey, mechanical superintendent of the Mexico North Western, at Madera, Chihuahua, Mex., has been appointed superintendent of motive power and equipment, with office at Madera.

R. D. Smith, assistant superintendent of motive power of the Boston & Albany, has been appointed superintendent of motive power and rolling stock, with office at Boston. Mr. Smith was born in New York City, and was educated in the public schools of New York and Albany. He entered railway service in 1872 as machinist apprentice with the Delaware & Hudson Canal Company and served with that company as machinist, locomotive fireman and locomotive engineer until 1881. He was then engaged with the Chicago, Burlington & Quincy at Aurora, as machinist, and was foreman of shops at Aurora, from 1883 until 1885. From April, 1885, to July, 1888, he was general foreman of the Chicago, Burlington & Quincy shops at Chicago, and in July, 1888, was appointed master mechanic of the Chicago division of the same road, remaining in that position until April, 1902, when he was appointed superintendent of motive power of the Burlington lines west of the Missouri river. In October, 1906, he was appointed mechanical expert for the New York Central's western lines, and was in charge of steel car construction until August, 1907, when he was appointed assistant superintendent of motive power of the New York Central at New York. On October 1, 1907, he was put in charge of the locomotive and car department of the Boston & Albany, with the same title, and has been in that position until his present appointment as above noted.



R. D. Smith.

E. Z. Hermansader, assistant master mechanic of the Chicago, Milwaukee & St. Paul at Green Bay, Wis., has been appointed master mechanic at Dubuque, Ia., succeeding Walter Liddell, resigned.

J. H. Stinson, roadmaster of the Southern Kansas, Pecos & Northern Texas, Eastern of New Mexico and Pecos River, at Amarillo, Tex., has been transferred to Canadian, Tex., as roadmaster of the Southern Kansas.

F. L. Ellingwood has been appointed superintendent of building construction of the Canadian Pacific, with headquarters at Montreal, Que. Mr. Ellingwood is at present in charge of the extension being made to the Windsor street station in Montreal.

E. L. Crugar has been appointed assistant chief engineer of the Toledo, St. Louis & Western, and the Chicago & Alton, with office at Chicago, Ill. Mr. Crugar formerly was resident engineer of the Chicago & Alton at Bloomington, Ill.

B. H. Briggs, roadmaster of the Erie division of the Buffalo, Rochester & Pittsburgh, has been promoted to roadmaster of Division 2, with office at Springville, N. Y., succeeding Henry Ware, retired under the pension rules, and J. C. Horning, extra gang foreman, has been promoted to roadmaster of the Erie division, with office at Mount Jewett, Pa.

J. D. Maupin, master mechanic of the Trinity & Brazos Valley, has been appointed superintendent of motive power, with office at Teague, Tex., succeeding C. H. Seabrook, resigned. The position of master mechanic heretofore held by Mr. Maupin is abolished. L. M. Jacobs, roundhouse foreman, has been appointed general foreman, and J. W. Ward, succeeds Mr. Jacobs as roundhouse foreman.

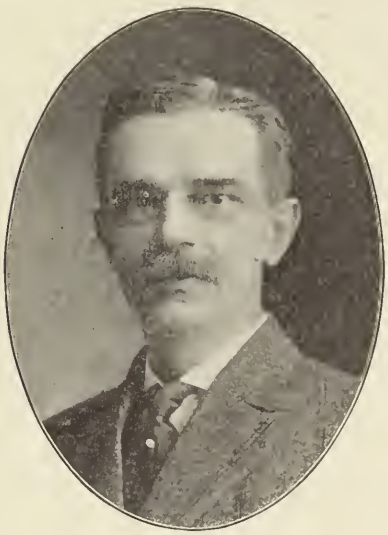
F. S. Anthony, whose appointment as superintendent of motive power and rolling stock of the Texas & Pacific, was announced in the *Railway Age Gazette* of May 26, was born in Reading, Pa., in 1859. He served as machinist apprentice in the shops of the Philadelphia & Reading, at Reading, Pa., and subsequently until 1894 was with the Atchison, Topeka & Santa Fe at Nickerson, Kan., and Arkansas City, Kan. He was then for four years mechanical department foreman of the Illinois Central at Chicago. In 1898 he was made master mechanic of the Plant system and Atlantic Coast Line at Savannah, Ga., and in 1904 was appointed master mechanic of the Lehigh & Northeastern. In February, 1908, he became master mechanic of the International & Great Northern at Palestine, Tex., being promoted to the position of superintendent of machinery in November, 1909, which position he resigned on June 1 to become superintendent of motive power and rolling stock of the Texas & Pacific, with headquarters at Marshall, Tex.

Purchasing Officers.

J. E. Sargeant has been appointed purchasing agent of the St. Louis Southwestern, with office at St. Louis, Mo.

F. D. Reed, assistant to the vice-president of the Rock Island Lines, in addition to his present duties, has been appointed purchasing agent, with headquarters at Chicago, to succeed J. M. McCarthy, resigned. W. R. Owen has been appointed assistant purchasing agent.

E. H. Bankard, purchasing agent of the Baltimore & Ohio Lines, with headquarters at Baltimore, Md., has recently had his authority extended over the Cincinnati, Hamilton & Dayton.



F. A. Ryer.

Frederic A. Ryer, who has been appointed purchasing agent of the Boston & Albany, with office at Boston, was born in New York City in 1860. He received his education in the public schools and at the College of the City of New York, being a member of the class of 1881. Mr. Ryer began railway work on February 15, 1887, as a clerk in the purchasing department of the New York Central & Hudson River, and since that time has filled the position of clerk in the various departments of that office, later becoming chief clerk, then lumber agent, and finally assistant to purchasing agent, which position he has held until now.

OBITUARY.

Captain Danforth O. Lombard, formerly timber agent of the New York, New Haven & Hartford, and for 23 years in the purchasing department of that road, died on May 29, in Guilford, Conn., at the age of 73 years.

Charles L. De Fuentes, for over 10 years chairman of the Louisiana Railway Commission, died at his home in New Orleans on June 1. Mr. De Fuentes was the first chairman of the Louisiana Commission, which was organized in 1898. He served continuously as chairman until a little over a year ago, when he resigned the chairmanship, but retained his membership on the commission until the expiration of his term in December of last year.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk Pacific has ordered 15 Pacific type locomotives, 20 consolidation locomotives and 10 switching locomotives from the American Locomotive Company. This company is now in the market for 81 locomotives.

The Toledo & Indiana Traction Company has ordered one electric locomotive from the Baldwin Locomotive Works. The electrical equipment will be furnished by the Westinghouse Electric & Manufacturing Company.

The Imperial Government Railways of Japan have ordered 6 eight-wheel locomotives from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 26 in.; the diameter of the driving wheels will be 72 in., and the total weight in working order will be 115,000 lbs.

The Imperial Steel Works of Japan has ordered 2 six-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 14 in. x 24 in.; the diameter of the driving wheels will be 53 in., and the total weight in working order will be 75,000 lbs.

CAR BUILDING.

The Chicago, Burlington & Quincy is in the market for 5 all steel postal cars.

The Missouri, Kansas & Texas will build 249 box cars at the company's shops at Parsons, Kan.

The Chilean Government is said to be making inquiries for 10 coaches. This item is not confirmed.

The Texas Traction Company, Dallas, Tex., has ordered 4 motor and 4 trailer cars from the American Car Company.

The Michigan United Railways Company, Lansing, Mich., has ordered 7 city cars and one interurban car from the McGuire-Cummings Company.

The Atchison, Topeka & Santa Fe has ordered 10 baggage cars from the Pullman Company and 15 baggage cars from the American Car & Foundry Company.

The New York Central Lines are in the market for 6 dining cars, of which 3 will be for the Lake Shore & Michigan Southern, and 3 for the New York Central & Hudson River.

The Northern Texas Traction Company, Fort Worth, Tex., was mentioned in the *Railway Age Gazette* of May 5 as having ordered four interurban motor cars from the St. Louis Car Company. The capacity of these cars will be 54 persons. The weight will be 72,000 lbs. The inside measurements will be 40 ft. long and 8 ft. 6 in. high; the over-all measurements will be 52 ft. long, 9 ft. wide and 13 ft. high. Both the bodies and the underframes will be of wood. The special equipment will be as follows:

Axles	Hammered steel
Bolsters, body	Steel
Bolsters, truck	Steel
Brakes	Westinghouse
Brake shoes	M. C. B. cast iron
Brasses	Standard
Couplers	Van Dorn
Curtain fixtures	Forsythe
Curtain material	Pantasote silk
Doors	Side
Heating system	Consolidated
Journal boxes	M. C. B.
Lighting system	Electric
Paint	Pullman body color
Platforms	Steam coach type
Roofs	Monitor
Seats	Heywood Brothers & Wakefield
Seat covering	Tan leather
Side bearings	Wrought iron plates
Springs	Full elliptic
Trucks	Baldwin
Ventilators	28
Vestibules	Stationary round front
Vestibule trap doors	O. M. Edwards
Wheels	Rolled steel
Window fixtures	O. M. Edwards
Other special equipment	G. E.—73 motors Hunter destination signs

IRON AND STEEL.

The Delaware & Hudson has ordered 2,000 tons of rails.

The Northern Pacific is negotiating for 50,000 tons of rails.

The Missouri Pacific is said to have ordered 40,000 tons of rails.

The Coney Island & Brooklyn has ordered 1,300 tons of rails.

The Missouri, Kansas & Texas has ordered 52,000 tons of rails.

The Louisville & Nashville is in the market for 1,700 tons of bridge material.

The Isthmian Canal Commission will receive bids until July 18 on rails. Circular 635.

The Fernwood & Gulf has ordered 1,000 tons of rails from the Tennessee, Coal, Iron & Railroad Company.

The Baltimore & Ohio has ordered 23,050 tons of rail. This order will be divided as follows: 13,050 from the United States Steel Corporation; 7,500 from the Cambria Steel Company; and 2,500 from the Bethlehem Steel Company. The greater part of this order will consist of 100-lb. and 90-lb. rails.

General Conditions in Steel.—The Steel Corporation produced more steel in May than in April, although the contrary was expected. Last month production was at the rate of about 11,000,000 tons a year. Shipments were about the same as in the previous month. May earnings of the Steel Corporation are now expected to slightly exceed those of April and the earnings for the current quarter in all probability will be greater than in the first quarter. Since the first of the month there has been a slight improvement in the steel industry, but no marked improvement is looked for until the end of the month.

MACHINERY AND TOOLS.

The Illinois Central recently issued a list of machine tools which includes the following:

For Burnside shops—Chicago:

1 72-in. radial drill.
1 cold saw cutting off machine.
1 1½-in. steel heading and forging machine.
1 power pipe machine.
1 48-in. x 14-ft. milling machine.

For Paducah, Ky., shops:

1 22-in. x 8-ft. high speed engine lathe.
1 22-in. x 10-ft. high speed engine lathe.
1 36-in. x 14-ft. high speed engine lathe.
1 18-in. x 8-ft. cone lathe.
1 30-in. shaper.

For Mattoon, Ill., shops:

1 18-in. x 8 ft. engine lathe.
1 20-in. x 8-ft. engine lathe.
1 10,000-lb. pneumatic geared hoist.

For Centralia, Ill., shops:

1 30-in. x 12-ft. engine lathe.

In connection with the plan to unify the government railways and to establish so-called "network of transportation lines," 101 applications have been made to build narrow-gage railways in Japan. The number of licenses issued under the above applications has now reached 47, and additional applications are continually being received. The estimated cost for the construction of the narrow-gage railways for which licenses have been granted is $21,000,000, according to the press of Tokyo. In addition, a considerable number of locomotives and cars are required for the government railways already constructed, and orders for the same are being placed through the representatives in Japan of foreign manufacturers and sales agents. In case the railways in Japan are broadened to the standard gage, there will be extensive demands for railway equipment of various kinds. In a general sense, orders for railway equiment are actively sought by representatives or agents of foreign manufacturers now located in Japan. Manufacturers not having such connections in Japan may either desire to investigate the possibilities of his field through a special representative or by communicating with the Railway Bureau, Department of Communications, Tokyo.

Supply Trade News.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Ann Arbor for a third 70-ft. motor car. There are now 109 of these cars in service in the United States.

The New York office of Knowles & Wollaston, London, Eng., manufacturers of the K. & W. graphite lubricator, has been moved from 50 Church street, to 18 East Thirty-fourth street.

Walter B. Leach, who has for several years been general manager and treasurer of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., has been elected president, succeeding William Prescott Hunt, deceased. Mr. Leach is now president and general manager. Frederic B. Goff has been made treasurer of the company.

The Chambers throttle valve, made by the Watson-Stillman Company, New York, has been specified on 63 new locomotives for the Southern Railway; on 30 for the Queen & Crescent; on 8 for the Mobile & Ohio; on 25 for the Seaboard Air Line; on 35 for the Atlantic Coast Line; and on 5 for the New Orleans & Northeastern.

Fairbanks, Morse & Company, Chicago, have delivered a passenger motor car to the Alaska Northern, Seward, Alaska, and have received an order from that company for another car. The car has a capacity of 35 passengers, with separate compartments for express and baggage. The motive power is a 4-cycle gasolene engine, mounted on the truck.

The report of J. G. White & Co., New York, for the year ended February 28, shows that the total surplus at the end of the year was $485,529, as compared with $391,394 a year before. Deferred charges and plant and tool equipment, less depreciation, was $148,902; as compared with $331,160 for 1910. Securities owned increased from $1,765,816 in 1910 to $2,317,959 in 1911. The investments of the company were successful and new business was large in spite of adverse conditions.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has received an order from the Seattle-Everett Traction Company, Bellingham, Wash., for a quadruple equipment of No. 304 railway motors. This company has also received an order from the St. Joseph Railway, Light & Power Company, St. Joseph, Mo., for 10 single equipments of No. 307, split frame, interpole railway motors. The Pittsburgh Railways Company has ordered 53 quadruple equipments of No. 306-CD box frame railway motors from this company, and the San Antonio Traction Company has placed an order for 20 double equipments of No. 92-A interpole railway motors. The Parkersburg, Marietta & Interurban Railway Company, Parkersburg, W. Va., has ordered 2 quadruple equipments of No. 306 split frame, interpole railway motors. The North Jersey Construction Company, Paterson, N. J., has placed an order for 2 quadruple equipments of No. 306 interpole railway motors. The Great Falls & Old Dominion, Washington, D. C., has ordered 4 quadruple equipments of No. 93-A railway motors, and the Cincinnati Traction Company has ordered a quadruple equipment of No. 303 railway motors. The Boise Railway Company, Boise, Idaho, and the Union Street Railway Company, New Bedford, Mass., have each ordered 2 double equipments of No. 101-B motors. The Lehigh Valley Traction Company, Allentown, Pa., recently placed an order for 4 quadruple equipments of No. 304 interpole railway motors. The Alton, Jacksonville & Peoria, Alton, Ill., has placed an order for 5 quadruple equipments of No. 304 interpole railway motors, and the Boston Elevated recently ordered 20 equipments of No. 301 interpole railway motors.

TRADE PUBLICATIONS.

Telephones.—The Western Electric Company, Chicago, has published bulletin No. 1080 on Railroad Telephone and Selective Apparatus in which apparatus to fill every requirement of this service is listed. A four-page insert is devoted to the selector, with photographs of the installations of this apparatus on three large trunk lines. The selector and selector sets for local and common battery signaling are described in detail, and the advantages of the standard Western Electric telephone and selective equipment are pointed out. Prices and full information on the various types are included.

Railway Construction.

New Incorporations, Surveys, Etc.

Akron, Canton & Youngstown.—An officer writes that a contract has been given to the P T. McCourt Co., Akron, Ohio, for work on a section of eight miles from Akron to Mogadore. The plans call for a line from Akron to Youngstown, about 46 miles. H. B. Stewart, president, Canton, and F. E. Bissell, chief engineer, 317 Everett building, Akron. (June 2, p. 1296.)

Angelina & Neches River.—An officer writes that a contract has been let to J. S. Moore, to build an extension northeast to Chireno, Tex., about 15 miles. The line is already in operation from Keltys, east to Naclina, 20 miles. (May 12, p. 1132.)

Bismarck, Bellevue Valley & Western.—An officer writes that contracts are to be let this month, or as soon as surveys, which are now being made, are completed. The projected route is from Bismarck, Mo., west via Caledonia and Belgrade to Sunlight, 20 miles. The line is eventually to be extended to Salem. There will be two steel bridges, each about 150 ft. long. The line is being built to carry timber products, ore, fruit, grain and livestock. E. E. Evans, president, Bismarck, and H. Rohwer, chief engineer, 700 Fullerton building, St. Louis.

Buffalo Southern (Electric).—An officer is quoted as saying that an extension of this road will be built to East Aurora, N. Y.

Canadian Northern.—According to press reports, bids will be asked for at once to build around the north shore of Lake Superior, from Stillwood, Ont., which is 40 miles west of Sudbury, northwest, thence west to Port Arthur, about 550 miles. It is expected that it will take about three years to complete the work. (May 26, p. 1222.)

Canadian Pacific.—According to press reports, this company has completed surveys for a line from Wilkie, Sask., northwest through the Cold Lake country, Alb., to a connection with a line projected from Fort McMurray.

Central Terminal Railway.—Application has been made by this company for a charter in Illinois, with $2,000,000 capital and office at Chicago, to build from Forest Park, Cook county, Ill., to Chicago. The incorporators include: D. R. M. McLennar, C. E. Vroman, J. C. Vroman, F. S. Munro and J. W. Hiner, all of Chicago.

Centralia Electric Light & Traction Company.—Incorporated in Washington to build from Centralia, Wash., to Rochester, 15 miles. W. Copping and N. W. Mills, Centralia, are incorporators.

Chehalis & Cowlitz.—Construction work has been started, it is said, on a line to connect Chehalis, Wash., and Cowlitz. The company expects to have the work finished by November 1. G. Robinson and H. C. Hoffman, Chehalis, are interested. (March 31, p. 813.)

Chicago, Rock Island & Pacific.—An officer writes that, although surveys are being made between Malvern, Ark., and Camden, the company does not intend to build an extension to Eldorado, or any other point than between the two places named above. (June 2, p. 1296.)

Colorado & Red Canyon.—Under this name a line is to be built from Hotchkiss, Colo., southeast to Crawford and Maher, about 10 miles. A line is also projected from Cedaredge to a point on the Denver & Rio Grande near Austin. G. R. Harper, Milwaukee, Wis., and E. P. Priest, Delta, are interested.

Conewago & Southern.—A contract is said to have been given to S. S. Johnson, Millersburg, Pa., to build from Biglerville, Adams county, southwest to Cashtown, eight miles. It is expected to begin the work by July. H. W. Hamblin, president, Harrisburg, and D. M. Sheely, treasurer, Cashtown. (May 19, p. 1186.)

Cumberland Valley.—According to press reports, an ordinance has been passed authorizing this company to construct a high line through Chambersburg, Pa. Construction work is to be started soon.

Great Northern.—Plans are being made by this company, it is said, to build a branch from Wenatchee, Wash., up the Columbia river, at a cost of about $5,000,000.

Hampden Railroad.—An officer writes that the company expects to begin work in about 90 days on this 20-mile line, projected from Springfield, Mass., and Holyoke to Bondsville. R. D. Gillett, president, Westfield. (September 23, p. 558.)

Hudson & Manhattan.—It is announced that this company will be operating trains over the new extension from New York to Newark, N. J., about nine miles, by October 1. The underground line is to be connected with the Pennsylvania Railroad about one mile west of Jersey City, from which point the Pennsylvania tracks are to be used to Manhattan Transfer, which is one mile east of Newark. From Manhattan Transfer an independent line will be used to reach a new station at Saybrook place, near Broad street, Newark.

Illinois Central.—According to press reports this company is laying second track on its western line to accommodate increased business of the Minneapolis, St. Paul & Sault Ste. Marie, which uses the Illinois Central for Chicago entrance. Third and fourth tracks are also being laid south to Madison.

Indianapolis, Chicago & Meridian (Electric).—Incorporated in Indiana with $100,000 capital and offices at Indianapolis, Ind. The plans call for building a line from Indianapolis north to Sheridan, thence via Flora, Monticello, Francesville, Valparaiso, Hobart, Wheeler, Gary and Hammond, into Chicago, about 175 miles. The directors include: J. C. Billheimer, J. A. Shafer, M. J. Moreland, H. Holton and M. B. Keller.

Lehigh Valley Transit Co.—According to press reports, this company is now at work building two cut-offs, one at Perkasie, Pa. and another at Sellersville. When these improvements are finished the distance will be shortened about five miles, as compared with the existing line. The work includes putting up a large station at Perkasie.

Liberty-White,—According to press reports, plans are being made to secure right-of-way for the extension which has been projected for some time from Holmesville, Miss., southeast to Tylertown, 12 miles. It is understood that the company will also build an extension from Liberty, west to a point on the Mississippi river.

Louisville & Nashville.—According to press reports, contracts have been given to the Callahan Construction Company, for double-tracking work and improving the line between Berry, Ky., and Falmouth, on 11 miles. The work involves the excavation of about 300,000 cu. yds., mostly rock, and a considerable amount of concrete masonry work. A contract for similar work on another section has been let to McKinney, Huff & Spradlin, Knoxville, Tenn. This improvement work is to be continued to Cincinnati, Ohio. It is expected that other contracts will be let soon.

Macon, Dublin & Savannah.—An officer writes that this company will build two miles of new tracks and will put up a steel bridge with a draw span, also a new freight station, at Macon, Ga. The improvements will cost about $250,000. Plans for the freight station have not yet been completed.

Mexico North Western.—The construction plans of this company, which were interfered with by the recent revolution, it is understood, will now be carried out. Work has been continued on the extension between Nueva Casas Grandes, Chihuahua, Mex., and Madera, 121 miles, and this section will soon be finished and put in operation. This will provide a new route between Juarez and Chihuahua, 470 miles. In carrying out the plan of extending the system, a line is to be built from Minaca, west to Tonichi, Sonora, where connection is to be made with the Yaqui River division of the Southern Pacific, about 100 miles, with a branch from this line at El Tigre, Chihuahua, south to the Pacific port of Agiabampo, Sonora, about 125 miles. From a point about 60 miles north of Madera a branch is to be built northwest to Agua Prieta, Sonora, opposite Douglas, Ariz., about 120 miles.

New Mexico Roads.—The El Paso (Tex.) Coal Company is planning to build a railway, it is said, from Roswell, N. Mex., to the White mountain district, at an estimated cost of $2,000,000.

Northern Pacific.—This company has commenced construction work, it is said, on a line around Lake Union, Seattle, Wash. The line will be an extension from the present tracks to Fremont.

North Yakima & Valley.—An officer writes that work is now under way on an extension towards Granger, Wash., 17 miles, and track has already been let on 11 miles. The line is being built to carry fruit and other farm products.

Pittsburgh & Lake Erie.—An officer writes regarding the reports that improvements are to be made on the Ferrona branch, that this company has recently taken over one-half control of the above branch and will probably make some improvements, but definite plans have not yet been made for the work.

Portland, Eugene & Eastern.—This company will build a line from Eugene, Ore., to Monroe, it is said, to connect with the Corvallis & Alsea.

Quebec & Great Northwestern.—The Canadian parliament has passed a bill permitting this company to build from the city of Quebec, Que., westerly to the terminus of the Gatineau Valley branch of the Canadian Pacific, at Maniwaki, thence westerly to New Liskeard, Ont., near the town of Cobalt, continuing west through the silver and gold belts of Porcupine and Montreal rivers and the clay belt to Port Arthur, on Lake Superior. There is to be a branch from Ottawa City to connect with the Grand Trunk Pacific near Lake Abittibi, crossing the main line about 75 miles west of Maniwaki. This branch will be about 300 miles long. The company plans to build, in all, about 1,500 miles, and expects to have most of the survey finished this fall, so as to begin construction work next year. There will be a number of steel bridges and trestles. The line will carry general merchandise, lumber and grain. Phillip O'Reilly, 74 Sparks street, Ottawa, Ont., is the promoter. Dr. R. Chevrier, P. Clarke, E. J. Daly, all of Ottawa, and J. Bourque, Hull, Que., are incorporators.

Sacramento-Sierra.—An officer writes that rights-of-way have been secured to build from Sacramento, Cal., east into the timber belt of the Sierra Nevada mountains, passing through the Sacramento county fruit district to a point in Eldorado county. Some of the grading work has been finished. J. M. Graham, engineer, Berkeley.

San Antonio & Rio Grande.—This road, which is now in operation from San Juan, Tex., on the St. Louis, Brownsville & Mexico, north to Chapin, 10 miles, is to be extended, it is said, north to Falfurrias, about 60 miles, where connection is to be made with the San Antonio & Aransas Pass G. C. Moore, Cambridge Springs, Pa., who recently bought ranch lands in that section, is said to be interested in having the extension built.

San Joaquin Delta (Electric).—Incorporated in California with $500,000 capital, to build from Stockton, Cal., west to Antioch, about 30 miles. The directors include: E. L. Wilhoit, L. H. Woods, W. P. Plummer and F. A. West, all of Stockton.

South Atlantic Transcontinental.—Announcement has been made that the promoters have secured $11,000,000 of French capital to finance this proposed line. The projected route is from the coal fields of Tennessee, via Knoxville, Tenn., Waynesville, N. C., Asheville and Rutherfordton to Southport. C. J. L. Lantry, Chicago, is interested.

Southern Pacific.—This company is said to have started construction work on a branch from Calexico, Cal., west to San Diego, about 100 miles.

Tennessee, Alabama & Georgia.—See Tidewater Development Company.

Texas Roads (Electric).—The Stone & Webster interests, which control the interurban lines between Dallas, Tex., and Denison and Fort Worth, have recently signed a contract, it is said, which will insure the building of a new interurban line from Dallas south to Waxahachie, about 30 miles. It is understood that the work will be started as soon as the right-of-way is secured.

Tidewater Development Co.—This company has been organized in Alabama to take over the property and rights of the

Tennessee, Alabama & Georgia, operating a line from Chattanooga, Tenn., to Gadsden, Ala. Plans are being made by the new owners to build from Tuscaloosa, northeast to Birmingham, about 50 miles, thence to Gadsden, 60 miles. Work has already been started, it is said, between Gadsden and Birmingham. J. M. Dewberry is said to be back of the project.

Wichita Falls Route.—An officer writes that contracts are to be let at once to build an extension of the Wichita Falls & Northwestern, from Hammon, Okla., north to Trail, 35 miles. The line will be built to carry cotton, livestock and agricultural products. (May 26, p. 1223.)

Wichita Falls & Northwestern.—See Wichita Falls Route.

Willamette & Molalla.—An officer writes that contracts are to be let in about 60 days to build from the Willamette river, Ore., up the Molalla valley, 12 miles. The company expects to use steam for the motive power, also electric motor cars. Maximum grades will be 0.5 per cent., and maximum curvature 3 deg. There will be two steel bridges about 150 ft. long. The line is being built to carry agricultural and dairy products, lumber and livestock. M. J. Lee, president, and F. Bryant, chief engineer, both of Canby.

RAILWAY STRUCTURES.

Chewelah, Wash.—The Great Northern, it is said, will build a new station at Chewelah.

Cos Cob, Conn.—An officer of the New York, New Haven & Hartford writes that improvements are being made to the power house at Cos Cob. A contract for erecting the power house building has been let to F. T. Ley & Co., Springfield, Mass. The enlarged power house will furnish single-phase current for the operation of the electrified part of the New York division, including the section now operated between Stamford, Conn., and Woodlawn Junction, N. Y., and, in addition, for the Harlem River six-track branch and the New York, Westchester & Boston, a subsidiary now under construction. Three-phase current will be supplied to substations for street railway power and general lighting at Stamford, Conn., Greenwich, Port Chester, N. Y., and Mamaroneck. Full contracts for machinery and apparatus have not yet been awarded.

Cumberland, Md.—According to press reports, the Western Maryland will build a new passenger station at Cumberland. It is expected that the station will be finished about the time the new extension to Cumberland is completed.

Des Moines, Ia.—The Chicago, Burlington & Quincy is preparing to build a large new freight house.

El Segundo, Cal.—The Atchison, Topeka & Santa Fe Coast Lines will build a station at El Segundo, near Manhattan Beach. It is said that a branch is to be built to that place.

Eugene, Ore.—The Southern Pacific, it is said, will build a new freight house at Eugene.

Frederick, Md.—The Baltimore & Ohio has given a contract to Edward Brady & Sons, of Baltimore, Md., for extensive improvements at Frederick, Md., involving an expenditure of about $50,000. The plans provide for a modern freight house 200 ft. long and 40 ft. wide, covered with corrugated iron, which will be equipped with rolling steel doors, making 95 per cent. of the sides available for door opening. The new building will be located just north of the present freight house, which was built in 1831, and is to be removed. At the Carroll street end of the building, or west end, there will be an office for the agent, with booths for check clerks. Standard scales will be installed for weighing, and wagon scales will be located next to Carroll street. The new terminal will have a total capacity of 140 cars.

Grand Rapids, Mich.—Construction work on the new Pere Marquette roundhouse, reported in the *Railway Age Gazette* of May 5, is now well under way. The structure will be of brick with concrete foundation, 400 ft. in diameter, containing 43 stalls, and will cost about $150,000.

Hammett, Idaho.—The Oregon Short Line, it is said, will build a new station at Hammett.

Hartford, Conn.—Application has been made by residents of Hartford to the Connecticut Board of Railroad Commissioners to secure the construction of new bridges over the tracks of the Central New England on Edwards and Woodland streets.

Kenton, Ore.—See North Portland, Ore.

Kingston, Ont.—Plans have been made by the Grand Trunk, it is said, for building a new passenger station, also a new freight house, at Kingston.

Los Molinos, Cal.—The Southern Pacific has started work, it is said, on a new freight station at Los Molinos.

Macon, Ga.—The Southern Railway and the Georgia, Southern & Florida will carry out in the immediate future a project for the enlargement and improvement of the freight handling facilities at Macon. The Southern Railway has bought land as a site for a new freight yard south of the present yards, 600 ft. x 7,000 ft., south of Turpin street, containing about 100 acres. A new yard will be constructed along modern lines, to have a capacity of 750 acres. The Southern Railway and the Georgia, Southern & Florida will have joint freight house and team track facilities at the present site of the G., S. & F. freight terminals. The improvements include putting up a modern outbound freight house, the enlargement of the present inbound freight house, construction of a team yard, with a capacity of 80 cars, an interchange platform and a cotton platform to take care of the business of both companies.

See Macon, Dublin & Savannah under Railway Construction.

Norfolk, Va.—The Old Dominion Terminal Company, Norfolk, is planning to put up four creosote timber piers at Norfolk. The piers are to be respectively 300 ft. x 60 ft.; 800 ft. x 80 ft.; 800 ft. x 222 ft., and 1,100 ft. x 222 ft. No estimate of the cost has yet been made.

North Portland, Ore.—The Oregon-Washington Railroad & Navigation Company, it is said, will build new freight stations at North Portland and at Kenton.

Oakland, Cal.—According to press reports, the Southern Pacific will start work at once removing the old Sixteenth street station preparatory to the construction of a new station at Oakland. The suburban and main line tracks will also be rearranged. (March 31, p. 816.)

Perkasie, Pa.—See Lehigh Valley Transit Co., under Railway Construction.

Russellville, Ky.—Work has been started, it is said, on a new passenger station for the Louisville & Nashville, at Russellville. The cost of the improvements will be about $25,000.

Sacramento, Cal.—A contract has been given by the Northern Electric for the steel work of the bridge over the Sacramento river at M street in Sacramento, to the Duncanson-Harrelson Co., San Francisco, at $65,795. The Missouri Valley Bridge & Iron Company is pushing work on the piers for this structure. It is expected to have the bridge open for traffic this summer.

Silsbee, Tex.—The Atchison, Topeka & Santa Fe will erect a six stall roundhouse to cost about $20,000.

South Chicago, Ill.—The Baltimore & Ohio will build a single leaf, double track Strauss bascule bridge over the Calumet river. The structure will have a span of 235 ft.

Stillwater, Okla.—The Atchison, Topeka & Santa Fe, it is said, will build a combined passenger and freight station at Stillwater, for which plans have been approved.

Wilkesbarre, Pa.—An ordinance has been passed authorizing the city officials of Wilkesbarre to pay part of the cost of the right-of-way and construction of a steel reinforced concrete combined highway and street railway bridge over the tracks of the Pennsylvania Railroad, the Lehigh Valley and the Central of New Jersey. The bridge is to be built from South Washington street to South Welles street, between South and Ross streets.

In a discussion over the budget of the railways in Alsace, Germany, and Lorraine, it was shown that since 1904 the wages of trainmen have been increased 22.4 per cent., of trackmen 18.9 per cent., of shopmen, mostly paid by the piece, 24.8 per cent.

Railway Financial News.

Atchison, Topeka & Santa Fe.—See an item in regard to through service in Traffic News.

Athens & Tellico.—A press dispatch from Knoxville, Tenn., says that it is reported that on July 1 the Athens & Tellico will be taken over by the Louisville & Nashville and will become a part of the Knoxville division of the L. & N. The Athens & Tellico runs from Athens, Tenn., to Tellico, 24 miles, crossing the main line of the L. & N. at Englewood.

Atlantic Coast Line.—J. P. Morgan & Co., New York, are offering $3,000,000 Atlantic Coast Line unified mortgage 4 per cent. bonds at 93.

Bartlett & Florence.—This road has been sold under foreclosure to J. L. Bailey for $41,000.

Boston & Maine.—The Board of Railroad Commissioners of Massachusetts, in its report to the legislature on the investigation which the legislature asked it to make in regard to the reduction of the B. & M. dividend, says in part: "Under the best and most favorable anticipated conditions the earnings of the Boston & Maine for the year ending June 30, 1911, will be considerably less than the earnings for the year ended June 30, 1910." This result, which speaks for itself, is probably sufficient reason why the dividend has been reduced.

Canadian Pacific.—This company has sold in London $6,161,000 additional consolidated 4 per cent. debenture stock. The proceeds of the sale of this stock are to be used to pay for 553 miles of branch lines in Manitoba, Saskatchewan and Alberta.

Chesapeake & Ohio.—See Kanawha & Michigan.

Chicago & North Western.—This company has made an application to list $7,500,000 additional general mortgage 4 per cent. bonds on the New York Stock Exchange.

Chicago, Milwaukee & Puget Sound.—Stockholders have voted to authorize an increase in the capital stock from $100,000,000 to $200,000,000. The increase in stock is made necessary by the statutes of Montana, which require the authorization of twice as much stock as bonds of any railway operating in that state.

Eureka & Palisade.—A press despatch says that this property has been "redeemed" by the stockholders. The road runs from Palisade, Nev., to Eureka, 84 miles.

Great Northern.—J. P. Morgan & Co., the National City Bank and the First National Bank, all of New York, are offering $20,000,000 of the first and refunding mortgage 4¼ per cent. bonds of May 1, 1911-July 1, 1966, at 102, yielding 4.15 per cent. on the investment. These bonds are part of the total authorized issue mentioned in these columns last week of $600,000,000 bonds. In addition to the present issue of $20,000,000 bonds, $25,000,000 are held in the treasury of the company; $332,162,000 are reserved to retire existing securities; $122,838,000 are reserved for general corporate purposes, including the acquisition of new lines and the purchase of stocks and bonds of other companies, and $100,000,000 are reserved to buy new lines and terminals at not to exceed $3,000,000 in any one year.

International & Great Northern.—All the bondholders, with the exception of one holding less than 100 bonds, have deposited their securities under the reorganization plan, and the plan is to become operative when the property is sold on June 13. T. J. Freeman, the receiver, has obtained from the railway commission of Texas approval of a waiver of the customary 60 days' notice of increase of capital stock.

Cumings & Marckwald, who represented the undeposited second mortgage bonds, and who were making preparations to bid against the Goulds at the foreclosure sale on June 13, announce that they have sold all of their bonds to the third mortgage committee, of which Alvin Krech is chairman, at a satisfactory price.

Kanawha & Michigan.—An initial dividend of 4 per cent. has been declared, payable June 30, on the $10,000,000 stock of the Kanawha & Michigan. A majority of this stock is owned by the Chesapeake & Ohio and the Lake Shore & Michigan Southern jointly.

Lake Erie & Pittsburg.—This company has filed a mortgage of $15,000,000, to run fifty years. Bonds of this new issue will be sold to the extent of about $7,500,000 to reimburse the Lake Shore & Michigan Southern and the Pennsylvania for the amount so for expended on the line.

Lake Shore & Michigan Southern.—See Kanawha & Michigan.

Long Island.—This company has made an application to list $1,600,000 additional refunding 4 per cent. mortgage bonds on the New York Stock Exchange.

Louisville & Nashville.—J. P. Morgan & Co., the National City Bank and the First National Bank, all of New York, are offering $10,000,000 Atlanta, Knoxville & Cincinnati division 4 per cent. bonds of 1905-1955 of the Louisville & Nashville at 93½, yielding 4.30 per cent. interest on the investment. These bonds are secured by a mortgage on the entire main line between Cincinnati and Atlanta. On 205 miles of this division they are a direct first mortgage, and on 546 miles they are a mortgage subject to prior lien outstanding at the rate of about $15,000 per mile.

See also Athens & Tellico.

Maxton, Alma & Southbound.—This company has taken over the operation of the Alma Railroad and has filed a tariff with the Interstate Commerce Commission taking over all of the tariffs and agreements, etc., of the Alma Railroad.

Missouri, Kansas & Texas.—Speyer & Co., New York, have sold to a syndicate of French bankers 100,000,000 francs ($20,000,000) consolidated mortgage 5 per cent. 30-year bonds of 1910-1940. The bonds are all to be in denominations of 500 francs each.

Narragansett Pier Railroad.—The directors have authorized the lease of the Narragansett Pier Railroad to the Rhode Island Company, a subsidiary of the New York, New Haven & Hartford for a period of 99 years. The Narragansett Pier Railroad is operated by steam, and runs from Narragansett Pier to West Kingston, 8½ miles.

National Railways of Mexico.—Gross earnings, which are not given in our table of roads reporting to the Interstate Commerce Commission, for April, 1911, amounted to $4,763,789, comparing with $5,780,270 in April 1910. Operating expenses totaled $3,416,311 this year as against $3,252,278 last year. Net earnings amounted to $1,347,479 this year and $2,527,991 last year.

New York, New Haven & Hartford.—Two per cent. of the New Haven company's investment in the Grand Central station at New York is to be deducted from the yearly rentals of the office buildings which have been erected over the tracks, and this sum will be made into a sinking fund, with which it is planned eventually to liquidate the entire investment.

St. Louis, Brownsville & Mexico.—This company has asked the Texas railway commission for permission to issue $1,340,000 bonds for improvements on the line now in operation and for the construction of new branch lines totaling 67 miles. These bonds when issued will be pledged under the St. Louis & San Francisco-New Orleans, Texas & Mexico division mortgage.

St. Louis & San Francisco.—See an item in Traffic news in regard to through service.

See also St. Louis, Brownsville & Mexico.

The Russians control the railways in the northern part of Manchuria, and the Japanese those in the southern part, together with their termini on the sea, New Chang, Dairen and Port Arthur. China now talks of having one line of its own in its own territory from Kirin, the eastern terminus of a branch of the Charbin-Port Arthur line, east by south to Hun-chun, which is about 90 miles west of Vladivostock on the Ginmeu river, close to the north border of Korea, where navigation to the sea is almost always open. Such a line would be 220 miles long over a difficult country.

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THE EXHIBIT 1361

TWENTY years ago the Master Mechanics' Association met at Cape May. The president was John Mackenzie and the secretary Angus Sinclair. A resolution was adopted which provided for an agreement with the M. C. B. Association for the latter to meet on the second Wednesday in June and the Master Mechanics' Association on the Monday following; also a resolution authorizing the secretary and other officers to have the association incorporated under the laws of the State of New York. Probably the most interesting discussion related to compound locomotives. S. M. Vauclain gave a description of the early four-cylinder compound locomotives which he designed, with some account of their performance and fuel economy. A. M. White, of the Schenectady Locomotive Works, described the first two-cylinder compounds, as designed by A. J. Pitkin. Others taking a prominent part in this discussion were D. L. Barnes, M. N. Forney, J. N. Lauder and C. E. Smart. The following year a committee was appointed with George Gibbs as chairman, to investigate the relative economy of compound and simple locomotives and the most valuable form of compound locomotives. A committee on Electricity in Railway Service reported that it was used experimentally for car lighting and had just been introduced in operating the motors for the traveling cranes in the Baldwin Locomotive Works. The committee regarded the subject as so much in its infancy that there would be no necessity for a report on electricity for some years to come. Iron and steel axles was one of the more prominent subjects for discussion, as at that time steel axles were breaking in great numbers. The Pennsylvania Railroad had used steel axles for passenger engines for several years, and had recently adopted steel for both freight and passenger engines and for both passenger and freight cars. In passenger service only open hearth steel was used, but for freight car service they accepted both open hearth and Bessemer steel. Mr. Lauder explained that in England driving axles were made with the wheel fit one inch larger than the journal and with large fillets, and he recommended such a design for American practice. The president congratulated the members on the large attendance at the convention, 107 members having answered the roll call.

THERE has always been more or less trouble about getting the advance copies of the committee reports to the members of the association in time to enable them to study them over and digest them before the convention. Two years ago the M. C. B. Association adopted an amendment to its constitution providing that the executive committee could use its discretion about printing committee reports not in its hands by May 1. The following year there was a noticeable improvement in this respect, but this year conditions are worse than ever. Some of the reports were received too late to be printed at all and the others reached the members too late to be of any real use to them before leaving home for the convention. The secretary is not to blame; he has worked hard and has done his best to make up for the shortcomings of the various committees. The work of the association is too big to be trifled with in this way. Men who are trusted and honored with places on the committees should appreciate the necessity of prompt and thorough action and of upholding the dignity of the associations. It is time that some more decided action was taken to prevent a repetition of this year's failure. It is time also to make a radical move toward improving the appearance of the illustrations in the proceedings. The drawings from which they are made should be in the hands of the secretary early enough to enable him to have them re-drawn so that they could be properly reproduced. While this would involve some extra expense it would meet with the hearty approval of all those who have occasion to use the reports or proceedings.

AN interesting experiment and one of far-reaching importance is being made in the interchange bureau at the Union Stock Yards, Chicago, and has been in operation during the past year. It is under the direction of the Superintendents' Association, and aims to combine the work of car inspection and the making of records required by the transportation department for cars in interchange. The examination of car door seals and the record of car numbers are made by the car inspectors, and after the men are accustomed to the work it is found that the reports are delivered in better shape than they were when made by special men employed in the transportation department. The bureau is organized in accordance with modern business methods, employing card catalogs and a sufficient number of typewriters and telephone

stations, so that the business moves with despatch and the reports are delivered more promptly than before. It was found that a principal cause for delay was due to lost motion in the railway mail delivery, and that is being corrected. The car inspectors at first objected to the new work, but as they have become accustomed to it the duplex operation works smoothly. The expense of the bureau has been regarded as rather high by some of the lines, but it is found that the total expense to the railways is not as high as before. The mechanical department is charged with about 50 per cent. of the expense and the transportation department with the balance. The cost has been about 7 cents per car for both services inspection and car record—and it is found that inspection alone costs more than half this amount at most large interchange points.

MINE-RUN COAL FOR LOCOMOTIVES.

THE impression given by Prof. A. A. Steel, professor of mining at the University of Arkansas, in a paper presented before the International Railway Fuel Association, at Chattanooga, was that a mine-run basis of payment to coal miners is demoralizing and constantly tends toward the production of an undue proportion of fine coal and impurities which are hard to remove. It is attended by a lack of discipline, and the quarreling between the operators and the miners has been largely increased by the mine-run basis of payment. Under its working the miners are learning to blow the coal to pieces by putting in shots which are much wider and longer than those used in the older and more careful methods. They dislodge more coal with each shot, and these heavy shots so jar the tight mass of coal that it becomes little more than a heap of slack.

As a result of four years of uncontrolled mine-run operation in Arkansas, the miners supplying the railways now use from 10 to 20 per cent. more powder per ton of coal than formerly. They use augers one-third longer, dislodge about 1.75 times as much coal, and use nearly twice as much powder in each hole. This heavy shooting has more than tripled the amount of slate, and has increased the proportion of slack from less than 30 per cent. to about 45 per cent. of the weight of coal produced.

Comparative tests show that so long as locomotive coal is nearly free from slate there is small loss in efficiency as the size of lump coal is reduced, provided the pieces are not small enough to fall through the grates or be carried through the tubes by the increased draft required for small sizes of coal. When mine-run coal is burned the large lumps must be broken into smaller pieces before firing, and this requires extra labor by the fireman. The breaking of these lumps by hand also produces an undue proportion of slack. The most economical coal for railway use is, therefore, that which can be crushed so as to yield the largest proportion of pieces between, say, 1 in. and 3 in. across, and the least proportion of slack less than ½ in. across.

Estimates made by the fuel agent of one of the large western roads showed that half a million dollars could be saved in the fuel bill if mine-run coal were used instead of lump coal, and it was decided to test two carloads of each kind of coal from two different mines to find the comparative value from the equivalent evaporation per pound of coal fired. The tests were made on a large locomotive with its wheels blocked and the valves placed so that all the steam would blow through the exhaust and out of the stack as fast as made. The rate of combustion was about 1 1/3 tons per hour to represent a low rate of combustion and 3 tons per hour for the maximum rate of firing ordinarily found in service. The results showed a slight advantage—less than 2 per cent.—in favor of lump coal at the slower rate of combustion. At the higher rate of combustion the lump coal gave an evaporation 6 to 8 per cent. less than mine-run coal. As a result of this test the road in question has decided to use mine-run coal, and it will be interesting to ascertain if these economies are found in the actual operation of the locomotives, and if the total saving as estimated is actually realized. In the test the steady blower action of the steam flowing directly through the stack might not take up the finest particles of coal in the mine-run grade as readily as the intermittent blast produced when the engine is in motion. It is possible also that the coals tested were of a harder grade and from coal fields where the methods of mining did not pulverize the coal to the extent found elsewhere.

Judging from the effects in other districts, it appears that when the railways agree to make a wholesale use of mine-run coal the tendency will be to encourage the miner in more careless habits, and he will take advantage of the easier means of throwing down larger masses by the use of larger powder charges, and the proportion of fine slack coal will be increased.

The advantages of a uniform quality of coal for locomotives have been emphasized by everyone who has discussed the subject, and surely mine-run methods are not likely to produce a uniform grade of fuel. It will be found in the end that true economy will aim to secure coal of good quality and uniform grade by paying the miner on a lump coal basis, or, at least, more for lump coal than for slack, and in some states the mine-run law should be repealed. The railways are vitally interested in a restoration of sane methods of mining, and the most effective means they can use in their campaign for good coal is to make it to the interest of the operator to produce good coal.

PROGRAMME OF THE WEEK.

WEDNESDAY, JUNE 14.

Prayer	9.30 A. M. to 9.35 A. M.
Address of President	9.35 A. M. to 9.50 A. M.
Intermission	9.50 A. M. to 9.55 A. M.
To allow those who wish to retire to do so, although all are requested to remain.	
Action on minutes of convention of 1910	9.55 A. M. to 10.00 A. M.
Report of Secretary and Treasurer	10.00 A. M. to 10.15 A. M.
Assessment and announcement of dues; appointment of Committees on Correspondence, Resolutions, Nominations, Obituaries, etc.	10.15 A. M. to 10.25 A. M.
Election of Auditing Committee	10.25 A. M. to 10.30 A. M.
Unfinished Business	10.30 A. M. to 10.35 A. M.
New Business	10.35 A. M. to 10.45 A. M.
Discussion of Reports on:	
Advisory, Technical	10.45 A. M. to 11.00 A. M.
Mechanical Stokers	11.00 A. M. to 11.30 A. M.
Revision of Standards	11.30 A. M. to 12.00 M.
Smoke Preventing, Devices for Firing-up Locomotives at Terminals	12.00 M. to 1.00 P. M.
Best Construction of Locomotive Frames	1.00 P. M. to 1.30 P. M.
Adjournment.	

THURSDAY, JUNE 15.

Discussion of Reports on:	
Main and Side Rods	9.30 A. M. to 10.00 A. M.
Piston Rods and Cross Heads.	10.00 A. M. to 10.30 A. M.
Repair Equipment for Round-Houses	10.30 A. M. to 11.00 A. M.

Water Treatment	11.00 A. M. to 11.30 A. M.
Lubrication of Locomotive Cylinders	11.30 A. M. to 12.00 M.
Consolidation	12.00 M. to 12.30 P. M.
Individual Paper on Locomotive Performance under Different Degrees of Superheated Steam, Prof. C. H. Benjamin	12.30 P. M. to 1.00 P. M.
Safety Valves	1.00 P. M. to 1.30 P. M.

Adjournment.

FRIDAY, JUNE 16.

Discussion of Reports on:	
Safety Appliances	9.30 A. M. to 10.30 A. M.
Design, Construction and Inspection of Locomotive Boilers	10.30 A. M. to 11.00 A. M.
Contour of Tires	11.00 A. M. to 11.15 A. M.
Steel Tires	11.15 A. M. to 11.30 A. M.
Flange Lubrication	11.30 A. M. to 12.00 M.
Minimum Requirements for Headlights	12.00 M. to 12.30 P. M.
Resolutions, Correspondence, etc	12.30 P. M. to 12.40 P. M.
Unfinished Business	12.40 P. M. to 12.45 P. M.
Election of Officers Closing Exercises	12.45 P. M. to 1.30 P. M.

Adjournment.

ENTERTAINMENT.

WEDNESDAY, JUNE 14.

Grand March, 9.00 A. M.—From Marlborough-Blenheim Hotel to Convention Hall, Million Dollar Pier.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Band Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Reception, 9.00 P. M.—By the President and Officers of the Master Car Builders' Association, in the Blenheim Exchange, Marlborough-Blenheim Hotel. "The Southern Singers."

THURSDAY, JUNE 15.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Band Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

44th Annual Ball, 9.30 P. M.—Of the Master Car Builders' Association, Entrance Hall, Million Dollar Pier. (Vollmer's Orchestra.)

The Galena Signal Oil Company's booth will be used as a rest room for the Officers and their guests.

FRIDAY, JUNE 16.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Six Kirksmith Sisters, 3.00 P. M.—Brighton Casino, in Grand Concert of vocal and instrumental music.

Band Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Euchre, 9.00 P. M.—Bridge, for both ladies and gentlemen and their guests attending the conventions. Solarium, Marlborough-Blenheim Hotel.

SATURDAY, JUNE 17.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Base Ball Parade, 2.00 P. M.—Million Dollar Pier to special trolley cars.

Base Ball Game, 3.00 P. M.—East v. West, Pennsylvania Railroad Company's Inlet Park Base Ball Grounds. Free trolley cars for those wearing the official badge. Music by Railway Supplymen's Band.

All Star Vaudeville Show, 9.00 P. M.—At Apollo Theatre. Direct from Keith & Proctor's Fifth Avenue Theatre, Percy G. Williams Colonial Theatre, Hammerstein's Victoria Theatre, New York City.

Under the direction of the United Booking Offices of America, Putnam Building, Times Square, New York City. Personal supervision—Frances Rockefeller King.

SUNDAY, JUNE 18.

Concert Marlborough-Blenheim Hotel Orchestra.

Prelude and Intermezzo from "Cavalleria Rusticana"	*Mascagni*
The Last Hope	*Gottschalk*
Grand Fantasie, "Carmen"	*Bizet*
CELLO SOLO	
Nocturne	*Chopin*
MR. LEO SACHS	
a Humoreske	*Dvorak*
b The Lost Chord	*Sullivan*
VIOLIN SOLO	
Paraphrase, "Die Meisetersinger"	*Wagner*
MR. J. KINSBERGER	
Fantasie, "Rigoletto"	*Verdi*
Ave Maria	*Gounod*
SUNDAY EVENING, 8 O'CLOCK.	
Overture, "William Tell"	*Rossini*
PIANO SOLO	
Fantasie, "Faust"	*Gounod-Liszt*
MR. HENRY GRUHLER	
Fantasie, "Tannhauser"	*Wagner*
CELLO SOLO	
Hungarian Rhapsody	*Popper*
MR. LEO SACHS	
Meditation from "Thais"	*Massanet*
VIOLIN SOLO	
Gypsy Airs	*Sarasate*
MR. J. KINSBERGER	
American Fantasie	*Herbert*

INFORMAL DANCING.

In addition to the grand balls of the two associations on Thursday evening of this week and Tuesday evening of next week, there will be informal dancing in the solarium of the Marlborough-Blenheim on Wednesday evening of this week and Monday evening of next week, following the receptions by the officers of the associations.

FRIDAY EVENING'S CARD PARTY.

The card party on Friday evening will be given in the solarium of the Marlborough-Blenheim. Two games will be played, euchre and bridge, and 50 prizes will be given, 25 to ladies and 25 to gentlemen. The lady making the highest score in bridge and the lady making the highest score in euchre will draw for the first and second prizes; similarly, the gentlemen making the highest scores in the two games will draw for the first and second prizes, and so on until all the prizes are awarded.

CURTIS AND STEARNS LEAVE THE LOUISVILLE & NASHVILLE.

Theodore H. Curtis, president of the Master Car Builders' Association, has resigned as superintendent of machinery of the Louisville & Nashville, effective July 1. He will be succeeded by C. F. Giles, now assistant superintendent of machinery, and Mr. Giles will be succeeded by C. H. Rae, now general master mechanic. G. H. Hedgcock, Chief Clerk in the motive power department, also will become an assistant superintendent of machinery.

W. A. Stearns, mechanical engineer of the Louisville & Nashville, also has resigned, effective July 1, and will take a position with the American Steel Foundries at St. Louis as assistant to the chief mechanical engineer.

Mr. Curtis is quoted in the Louisville, Ky., papers as stating that he is retiring from railway service to promote the sale of inventions that he has perfected. He arrived at Atlantic City on Tuesday.

Mr. Curtis was born at Terre Haute, Ind., August 12, 1866, and entered railway service at the age of 20 as a draftsman on the Cincinnati, Indianapolis, St. Louis & Chicago, now a part of the Big Four. He served in the drafting rooms of that road and the Brooks Locomotive Works, the Pittsburgh Locomotive Works and the New York, Chicago & St. Louis. He remained on the last-named road until 1897, being its chief draftsman eight years. In 1897 he was made mechanical engineer, which place he held for two years. Then he went to the Erie in the same capacity. On January 1, 1901, he was appointed mechanical engineer of the Louisville & Nashville and in August, 1903, was promoted to the position from which he now retires. He was elected second vice-president of the M. C. B. Association in 1908, first president in 1909 and president in 1910.

Charles J. Giles, who succeeds Mr. Curtis as superintendent of machinery of the Louisville & Nashville, was born at Rowlesburg, Va., November 2, 1856, and entered railway service as an apprentice in the shops of the Baltimore & Ohio at Wheeling in 1873. He served in the shops of that road, the Texas & Pacific, the Pennsylvania and the Louisville & Nashville. In 1882 he was made foreman on the L. & N. In 1887 he was promoted to the position of master mechanic at Birmingham. He next held a similar position at Pensacola, and on October 11, 1902, became master mechanic at the main shops of the company at Louisville. He was appointed assistant superintendent of machinery on February 1, 1904.

TRANSPORTATION.

The transportation committee provides roller chairs for all members and guests wearing official badges, from June 14 to June 21, inclusive. These chairs start from the main entrance of the Million Dollar Pier, from the Marlborough-Blnheim hotel and from the Chalfonte hotel The transportation committee will give every attention to those wearing official badges. The hours during which the chairs will be furnished daily are as follows:

From	
The Pier	9.00 A. M. to 6 P. M.
Marlborough-Blenheim	9.00 A. M. to 6 P. M.
Chalfonte Hotel	9.00 A. M. to 6 P. M.
To both Grand Balls	8.30 P. M. to 10 P. M.

Unoccupied chairs may be stopped at any point on the Boardwalk, except between the Marlborough-Blenheim and the Million Dollar Pier, and they may be used in either direction, but must be reported at the first checking station passed.

Convention chairs are not allowed to wait for passengers more than fifteen minutes.

Reed's or Shill's chairs may be had after hours for a continuous trip in any one direction for 25 cents per person. When the station manager is notified in advance, hourly riding can be arranged for on the regular rate basis. Private chairs may be secured at special rates through the transportation committee only.

Kindly report to the transportation committee by chair number any inattention on the part of the pusher.

TAXICAB AND GARAGE SERVICE.

Arrangements have been made with the Bergdoll Taxicab Company, main office New York Avenue and Boardwalk, branch office at the Shelbourne Hotel, for taxicab service for members and guests, at the following rates:

Twenty-five cents for each person to any part of the city. Two dollars and fifty cents per hour for six persons or less.

Garage Rates: 75 cents per night, without service; $1.50 per night, with service; $7.00 per week, with service.

Regular taxicab rates will apply unless you wear your badge in plain sight.

TELEPHONES ON THE PIER.

A Bell telephone will be placed between each two exhibit booths on the pier. These are available for free local service for exhibitors.

Long distance calls can also be made from these stations.

OFFICE OF SUPPLY ASSOCIATION.

The office of J. D. Conway, secretary of the Railway Supply Manufacturers' Association, is at the Boardwalk end of Machinery Hall. He has no regular office hours, but is supposed to be on the job all the time.

M. M. RECEPTION TO-NIGHT.

The annual reception by the president and other officers of the Master Mechanics' Association will be given in the Blenheim Exchange, Marlborough-Blenheim Hotel, at 9 o'clock this (Wednesday) evening. The officers and their ladies will form the receiving party. The Southern Singers, composed of four young women—a first and second soprano, a contralto and a baritone—will give a concert thirty minutes before the receiving line forms. Two orchestras, one in the Exchange and one in the ball room, will furnish instrumental music. Punch will be served from a table in the west sotarium. The reception will be followed by informal dancing.

M. M. ASSOCIATION OFFICERS FOR 1910-1911.

President—C. E. Fuller, A. G. M., U. P.

First Vice-President—H. T. Bentley, A. S. M. P., C. & N. W.

Second Vice-president—D. F. Crawford, G. S. M. P., Penna. Lines.

Third Vice-President—T. Rumney, M. S., Erie.

Treasurer—Angus Sinclair.

Executive Members—T. H. Curtis, S. M., L. & N.; G. W. Wildin, M. S., N. Y. N. H. & H.; F. F. Gaines, S. M. P., C. of G.; C. A. Seley, M. E., C. R. I. & P.; J. F. Walsh, S. M. P., C. & O.; D. R. MacBain, S. M. P., L. S. & M. S.

Secretary—Jos. W. Taylor.

STANDING COMMITTEES.

Advisory Technical.—G. W. Wildin (Chairman), M. S., N. Y. N. H. & H.; A. W. Gibbs, G. S. M. P., Penna. R. R.; W. A. Nettleton, G. S. M. P., C. R. I. & P.

Revision of Standards.—T. W. Demarest (Chairman), S. M. P., Penna. Lines; J. D. Harris, H. T. Bentley, A. S. M. P., C. & N. W.

Mechanical Stokers.—T. Rumney (Chairman), M. S., Erie; E. D. Nelson, Engr. Tests, Penna. R. R.; C. E. Gossett, M. M., M. & St. L.; J. A. Carney, S. S., C. B. & Q.; T. O. Sechrist, M. M., C. N. O. & T. P.

SPECIAL COMMITTEES.

Smoke Preventing Devices for Firing up Locomotives at Terminals.—E. W. Pratt (Chairman), A. S. M. P., C. & N. W.; J C. Mengel, M. M., Penna. R. R.; R. W. Bell, S. M., I. C.; J. B. Kilpatrick, A. S. M. P., C. R. I. & P.; E. F. Jones. M. M., C. & W. I.

Best Construction of Locomotive Frames.—H. T. Bentley (Chairman), A. S. M. P., C. & N. W.; F. J. Cole, C. E. E., American Locomotive Co.; L. H. Fry, Baldwin Locomotive Works; G. S. Edmonds, M. M., D. & H.; E. D. Bronner, S. M. P., M. C.

Main and Side Rods.—W. F. Kiesel, Jr., A. M. E., Penna. R. R.; H. Bartlett, G. S. M. P., B. & M.; G. Lanza. Mass. Institute of Technology; H. B. Hunt, American Locomotive Co.; W. E. Dunham, Supervisor M. P. & M., C. & N. W.

Piston & Cross Heads.—J. A. McRae (Chairman), M. E., M. C.; H. C. May, M. M., L. & N.; R. L. Ettenger, C. M. E., Southern; B. P. Flory, S. M. P., N. Y. O. & W.

Repair Equipment for Roundhouses.—C. H. Quereau (Chairman), Supt. E. E., N. Y. C. & H. R.; W. H. Fetner, M. M., C. of Ga.; H. P. Meredith, A. E. M. P., Penna. R. R.; A. G. Trumbull, A. M. S., Erie; J. A. Carney, S. S., C. B. & Q.

Water Treatment.—H. E. Smith (Chairman), Chemist, L. S. & M. S.; L. H. Turner, S. M. P., P. & L. E.; F. O. Bunnell, Engr. Tests, C. R. I. & P.; J. J. Conners, M. M., C. M. & St. P.; J. E. Mechling, M. M., Vandalia.

Lubrication of Locomotive Cylinders.—C. H. Rae (Chairman), G. M. M., L. & N.; T. R. Cook, A. E. M. P., Penna. Lines; P. M. Hammett, S. M. P., Maine Central; S. T. Park, S. M. P., C. & E. I.; J. F Walsh, S. M. P., C. & O.; Jos. Chidley, M. M., L. S. & M. S.; J. F. DeVoy, M. E., C. M. & St. P.

Consolidation.—D. F. Crawford (Chairman), G. S. M. P., Penna. Lines; H. H. Vaughan, Asst. to V. P., C. P.; G. W. Wildin, M. S., N. Y. & H.

Safety Valves.—F. M. Gilbert (Chairman), M. E., N. Y. C. & H. R.; I. B. Thomas, M. M., Penna R. R.; W D. Robb, Supt., Grand Trunk; M. H. Wickhorst, Engr. Tests, C. B. & Q.; W. J. Tollerton, A. G. S. M. P., C. R. I. & P.

Safety Appliances.—T. H. Curtis (Chairman), S. M., L. & N.; M. K. Barnum, G. S. M. P., I. C.; C. B Young, M E., C. B. & Q.

Design, Construction and Inspection of Locomotive Boilers.—C. A. Seley (Chairman), M. E., C. R. I. & P.; T. H. Curtis, S. M., L. & N.; D. R. McBain, S. M. P., L. S. & M. S.; C. E. Chambers, M. M., C. R. R. of N. J.; D. F. Crawford, G. S. M. P., Penna. Lines; F H. Clark, G. S. M. P., B. & O.; R. E. Smith, G. S. M. P., A. C. L.

Contour of Tires.—W. C. A. Henry (Chairman), S. M. P., Penna Lines; J. A. Pilcher, M. E., N. & W.; O. C. Cromwell, M. E., B. & O.; A. C. Adams, M. M., N Y. N. H. & H.; O. M. Foster, M. M., L. S. & M. S.

Steel Tires.—L. R. Johnson (Chairman), A. S. M. P., C. P.; J. R. Onderdonk, Engr Tests, B. & O.; C. H. Hogan, D. S. M. P., N. Y. C. & H. R.; R. L. Ettenger, C. M. E., Southern.

Flange Lubrication.—M. H. Haig (Chairman), M. E., A. T. & S. F.; T. W. Heintzleman, S. M. P., S. P.; D. J. Redding, M. M., P. & L. E.

Minimum Requirements for Headlights.—D. F. Crawford (Chairman), G. S. M. P., Penna. Lines; A. R. Ayers, A. M. M., L. S. & M. S.; C. H. Rae, G M. M., L. & N.; F. H. Scheffer, S. M., N. C. & St. L.; Jos. Roberts, M. M., U. P.; Wm. Moir, M. S., Minn. & Int.

THE ANNUAL BALL GAME.

The annual ball game will take place at the Inlet Park grounds Saturday afternoon. Eastern and Western teams, composed of both railway men and supply men, will play. The captains will be: Western team, Harry S. Hammond, Pressed Steel Car Company, Pittsburgh; Eastern team, Fred M. Nellis, Westinghouse Air Brake Company, Boston. The umpires will be: For Western team, H. E. Passmore, division master mechanic, Toledo & Ohio Central; for Eastern team, W. E. Cade, Frank A. Barbey Company, Boston.

The rules governing eligibility for players which have been prepared by the base ball committee definitely state just what qualifications are necessary. They are as follows:

(1) Teams to be composed of 12 men in uniforms—8 railway supply men, 4 railway men.

(2) Supply men must be in the sales department, or those who call on railways or car companies and solicit business.

(3) No one who is in the shop end alone shall be allowed to play.

(4) No one to be allowed to play who comes to Atlantic City for the base ball game alone. He must be in attendance as a representative of a supply company and registered as such.

(5) Railway men to play must be members of either the M. M. or M. C. B. Association. Men working in the shops cannot play.

(6) Members' names and occupations, firm and railway names included, to be submitted to J. Will Johnson, chairman of the entertainment committee.

(7) If for any reason a change in team is necessary, names shall be submitted and passed upon by the sub-chairman of the base ball game, as well as J. Will Johnson.

(8) No player shall be eligible who has not been employed as salesman for at least one year by a railway supply company, or who has not been a member of the M. M. or M. C. B. Association for at least one year.

(9) No variation from these rules will be permitted.

(10) Pittsburgh, Pa., will be in the Western territory, and Buffalo, N. Y., in the Eastern.

The base ball committee is composed as follows: Charles A. Knill, chairman; Fred M. Nellis, Thomas Farmer, Jr., Herbert Green, W. S. Furry, Frank Martin, Harry S. Hammond.

PROGRESS IN LOCOMOTIVE SUPERHEATING.

Since the 1910 convention of the Master Mechanics' Association, the number of locomotives using highly superheated steam has rapidly increased. A year ago, there were approximately 6,000 locomotives in the world equipped with superheaters of which less than 1,000 were in use on American railways. Today there are approximately 9,000 engines so equipped, either in operation or under construction, of which nearly 2,000 are being used on the railways of this continent.

In England and on the continent the fire-tube superheater is used to the practical exclusion of all other designs. From a theoretical point of view this type seems to offer more of the advantages, with few, if any, of the disadvantages found in many of the other types, which were tried experimentally for a short time and then abandoned. In this country a somewhat similar experience has been had, and the type of superheater so extensively used abroad has come prominently to the front within the period mentioned. A survey of the last year's production of locomotives shows that there was

a predominating use of the fire tube design, and its adoption strongly confirms the claims made for its efficiency and simplicity.

There has been a remarkable application of highly superheated steam to the larger and more powerful types of engines commonly used in this country. This is particularly true of the Mallet type, for a large number of engines of this class, built during the last twelve months have been equipped with superheaters, the majority of these being of the fire-tube type arranged to superheat the steam about 200 deg. before its passage to the high pressure cylinders. A number of engines have been equipped with intermediate or receiver superheaters, intended to superhat the steam before its entrance to the low pressure cylinders only, the high pressure engine using saturated steam.

The tendency in the past year has been particularly rapid toward the use of highly superheated steam as compared with moderately or slightly superheated steam which had been used in a number of earlier installations. Experience has shown that a number of the anticipated troubles with highly superheated steam have failed to materialize under actual service conditions, with the result that steam superheated to 200 deg. or 250 deg. has been accepted by a large majority of railway men as best suited to meet the requirements. The theoretical advantages of steam superheated this much have been, of course, universally admitted, but anticipation of operating troubles has, previous to the past year, held back a number of those who admitted its great possibilities. Now that it has been shown that these troubles can be, and have been avoided, it is safe to predict that its use will be taken up in an increasing degree.

The wide extent to which highly superheated steam has been applied is shown by the following list of roads which have applied superheaters and the number and types of engines in operation or under construction:

	Number of Superheater Locomotives Ordered.	Type of Engine.
Baltimore and Ohio	10	0-8-8-0
Boston & Albany	1	2-6-6-2
Boston & Albany	10	4-6-2
Canadian Pacific	About 125	
Chesapeake & Ohio	24	2-6-6-2
Chesapeake & Ohio	1	4-6-2
Chesapeake & Ohio	2	4-8-2
Chicago & Alton	20	2-8-2
Chicago & North Western	25	4-6-2
Chicago & North Western	30	2-8-0
Cleveland, Cincinnati, Chicago & St. Louis	2	4-6-2
Chicago, Indianapolis & Louisville	1	4-6-2
Chicago, Milwaukee & St. Paul	2	4-6-0
Chicago, Milwkauee & St. Paul	5	2-8-0
Chicago, Rock Island & Pacific	50	4-6-2
Chicago, St. Paul, Minneapolis & Omaha	6	4-6-0
Chicago, St. Paul, Minneapolis & Omaha	2	4-6-2
Delaware & Hudson	1	2-8-0
Delaware & Hudson	1	4-6-0
Delaware & Hudson	4	0-8-8-0
Duluth, Winnipeg & Pacific	5	2-8-0
Erie	1	4-6-2
Florida East Coast	5	4-6-2
Illinois Central	40	2-8-2
Illinois Central	5	4-6-2
Lake Shore & Michigan Southern	20	4-6-2
Lake Shore & Michigan Southern	10	2-8-0
Minneapolis, St. Paul & S. Ste. Marie	21	2-8-0
Minneapolis, St. Paul & S. Ste. Marie	16	4-6-2
Missouri, Kansas & Texas	7	4-6-2
Northern Pacific	18	4-6-2
New York Central & Hudson River	31	4-6-2
New York Central & Hudson River	25	2-6-6-2
Pennsylvania Railroad	2	4-6-2
Pennsylvania Railroad	1	2-8-8-2
Pittsburgh and Lake Erie	5	4-6-0
Pere Marquette	25	2-8-0
Pere Marquette	5	4-6-2
St. Louis & San Francisco	12	2-8-0
Seaboard Air Line	1	4-6-2
Seaboard Air Line	1	2-8-0
Southern	58	2-8-2
Southern	2	4-6-2

Another line from the station of Cholm on the Privislinsk Railway to the station of Tchernui Ostroff on the South Western Railway: total, with branch, 210 miles. The construction or cost of the first line is estimated at $23,500,000, and of the second at $17,500,000. The committee will decide on the desirableness of these lines at a subsequent session.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.

Section 1, Article 11, of the by-laws of the Railway Supp'y Manufacturers' Association says: "The government and management of the affairs of the association shall be vested in an executive committee which shall be elected from among the members of the association or the regularly designated representatives of members."



E. L. Adreon.
President.

The executive committee is composed of the president, the vice-president, the treasurer, and nine others; all twelve representing the seven geographical districts into which the United States is divided by the by-laws.

The president, E. L. Adreon, is first vice-president of the American Brake Company, St. Louis, and has been identified with that concern and with the Westinghouse Air Brake Company for the last 23 years. Mr. Adreon was born in St. Louis on December 23, 1847, and was educated at Wyman's University. At the age of 30 he was elected comptroller of the city of St. Louis, and served two terms, of four years each. In 1887 Mr. Adreon was made secretary and treasurer of the American Brake Company, becoming general manager a year later. In addition to his duties as vice-president of the American Brake Company, he finds time to fill the offices of southwestern manager of the Westinghouse Air Brake Company and Westinghouse Traction Brake Company, and is secretary and treasurer of the Westinghouse Automatic Air & Steam Coupler Company; president of the Emery Pneumatic Lubricator Company, and vice-president of the Broadway Savings Trust Company, St. Louis.



B. E. D. Stafford.
Vice-President.

B. E. D. Stafford, vice-president, is general manager of the Flannery Bolt Company, Pittsburgh, Pa., and knows more about staybolts in a minute than most men do in a year. "Staff" was born in Brooklyn, N. Y., in 1866, and was educated in the public and night schools. When but 15 years old he took up patent office drawing, and soon became an expert penman. In order to better himself for mechanical drawing Mr. Stafford decided to get some practical knowledge of the machine, tool and screw making trades; and within a few years ranked as one of the few expert operators in America of the universal type of milling machine and the automatic screw machine. At the age of 21 he was made foreman of the tool shop of a large manufacturer of cotton machinery at Hopedale, Mass., and built



Charles P. Storrs.



Edward M. Grove.



W. W. Rosser.



L. R. Phillips.
Chairman, Exhibit Committee.



Albert C. Ashton.
Chairman, Finance Committee.



E. H. Walker.
Chairman, Badge Committee.



Arthur C. Langston.



J. R. Blakeslee.



Lucian C. Brown.

Members of the Executive Committee of the Railway Supply Manufacturers' Association.

most of the automatic machinery for the plant. Later he became a specialist in reducing shop costs; and in 1895 was engaged by B. M. Jones & Company to demonstrate the uses of self-hardening steels. Five years later he was employed as a staybolt iron salesman by the Ewald Iron Company. In the fall of 1904 Mr. Stafford was engaged by the Flannery Bolt Company to develop and market the Tate flexible staybolt for locomotive firebox service. During the more than six years that he has been identified with that concern, Mr. Stafford has done much to advance the methods of locomotive firebox construction.



Herbert I. Lord,
Treasurer.

The treasurer of the association, H. I. Lord, is general manager of sales of the Detroit Lubricator Company, Detroit, Mich. Mr. Lord was born in Boston, Mass., September 17, 1875, graduated at high school in 1894, and studied at the Massachusetts Institute of Technology for three years. In May, 1897, he left college to accept employment with the Boston branch of the American Radiator Company; and after serving as manager of the specialties department and, later, superintendent of western branches of that concern, he resigned at the end of 1906 to take the position he now occupies.

John D. Conway, secretary, while not a member of the executive committee, devotes all of his time to the affairs of the association, with office in the Oliver Building, Pittsburgh, Pa. Mr. Conway was born in Beaver County, Pennsylvania, December 15, 1863. At an early age he learned telegraphy, and before reaching his majority he had worked for the Pennsylvania Lines at Newburg, Ohio, for some two years. In 1885 he was employed by the Pittsburgh & Lake Erie as a telegraph operator, and was soon after transferred to the mechanical department, where he served for nearly 20 years as assistant to the superintendent of motive power. Mr. Conway was secretary of the Railway Club of Pitsburgh from 1901 to 1909.



J. D. Conway,
Secretary.

The pictures of the nine members of the executive committee who are not officers appear on a preceding page.

The seven geographical districts are made up as follows:

First District (New England states).—One member, Albert C. Ashton, Ashton Valve Company, Boston, Mass.

Second District (New York and New Jersey).—Three members, Charles P. Storrs, Storrs Mica Company, Owego, N. Y.; E. H. Walker, Standard Coupler Company, New York City, and Lucian C. Brown, United Equipment Company, New York City.

Third District (Pennsylvania, Maryland, Delaware, District of Columbia and West Virginia).—Two members, B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa., and E. M. Grove, McConway & Torley Company, Pitsburgh, Pa.

Fourth District (Ohio), Indiana, Michigan, Kentucky and Tennessee).—Two members, H. I. Lord, Detroit Lubricator Company, Detroit, Mich., and J. R. Blakeslee, Ajax Manufacturing Company, Cleveland, Ohio.

E. M. Grove, McConway & Torley Company, Pittsburgh, Pa.

Fourth District (Ohio, Indiana, Michigan, Kentucky and Tennessee).—Two members, H. I. Lord, Detroit Lubricator Company, Detroit, Mich., and J. R. Blakeslee, Ajax Manufacturing Company, Cleveland, Ohio.

Fifth District (Illinois, Wisconsin, Iowa and Minnesota).—Two members, L. R. Phillips, National Tube Company, Chicago, Ill., and W. W. Rosser, T. H. Symington Company, Chicago, Ill.

Sixth District (Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi).—One member, A. C. Langston, Jenkins Brothers, Atlanta, Ga.

Seventh District (states west of the Mississippi River, including Louisiana, but excepting Iowa and Minnesota).—One member, E. L. Adreon, American Brake Company, St. Louis, Mo. It will be noted that the seven Geographical Districts as given above are quite unequal in size.

With each annual meeting four members of the executive committee retire and their successors are elected for three-year terms. Messrs. Grove, Stafford, Phillips and Langston will retire at the close of this convention; Messrs. Ashton, Storrs, Lord and Adreon have one more year to serve, while Messrs. Blakeslee, Brown, Rosser and Walker will remain in office until 1913.

While the executive committee is responsible for the conduct of the supplymen's interest in these conventions, the degree of success with which the executive committee's plans meet depends to a quite large extent on the several working committees. This year's committee's are:

ENTERTAINMENT COMMITTEE.

J. Will Johnson (chairman), Pyle-National Electric Headlight Company, Chicago; Ross F. Hayes, Curtain Supply Company, New York; W. J. Walsh, Galena-Signal Oil Company, Chicago; H. E. Oestereich, Wendall & MacDuffie, New York; Philip J. Mitchell, Philip S. Justice & Company, Philadelphia, Pa.; Leonard J. Hibbard, L. J. Hibbard & Company, New York; J. C. Younglove, H. W. Johns-Manville Company, Chicago; Thomas Farmer, Jr., Consolidated Car Heating Company, New York; E. S. Toothe, Nathan Manufacturing Company, New York; Frank Martin, Jenkins Brothers, New York; Charles P. Williams, Chicago Railway Equipment Company, New York; Charles A. Knill, Charles H. Besly & Company, Chicago; F. B. Ernst, American Steel Foundries, New York; C. A. Dunkelberg, S. F. Bowser & Company, Fort



J. Will Johnson,
Chairman, Entertainment Committee.

Wayne, Ind.; Ralph G. Coburn, Franklin Railway Supply Company, Chicago; Edwin H. Janes, Talmage Manufacturing Company, Cleveland, O.; H. A. Neally, Joseph Dixon Crucible Company, Boston, Mass.; George R. Carr, Dearborn Drug & Chemical Company, Chicago; William Miller, Adreon Manufacturing Company, Chicago; Herbert Green, Burton W. Mudge & Company, Chicago; C. W. Wardell, Welsbach Company, Gloucester, N. J.; J. Soule Smith, American Steel Foundries, Chicago; L. B. Sherman, *Railway Age Gazette*, Chicago; William S. Furry, Ohio Injector Company, Chicago; Fred M. Nellis, Westinghouse Air Brake Company, Boston, Mass; J. P. Landreth, Garlock Packing Company, Chicago; Harry S. Hammond, Pressed Steel Car Company, Pittsburgh, Pa.; and E. E. Silk, Bettendorf Axle Company, Chicago.

The entertainment committee is, in turn, divided into the following sub-committees.

Door.—In charge of entrance at all entertainments, Messrs. Hayes (chairman), Knill, Williams, Green and Furry.

Marshals.—To escort officers of the two associations and their ladies to all formal receptions and to the two balls. Messrs. Coburn (chairman), James, Landreth and Nealley.

Social Squad.—To look after the comfort of the officers of the two associations and their families, and all guests. Messrs. Hibbard (chairman), Toothe, Dunkelberg, Martin, Carr and Green.

M. M. Reception.—In charge of M. M. reception, Wednesday evening, June 14. Messrs. Toothe (chairman), Ernst, Miller, Coburn, Oesterreich, Smith, Mitchell and Silk.

M. M. Ball.—In charge of M. M. ball, Thursday evening, June 15. Messrs. Walsh (chairman), Farmer, Janes, Smith, Hammond, Younglove, Miller, Mitchell, Nellis, Wardell, Sherman, Ernst and Hibbard.

Afternoon Entertainments.—In charge of all afternoon entertainments. Messrs. Dunkelberg (chairman), Sherman, Furry, Martin and Landreth.

Euchre; Bridge.—In charge of card parties, Friday evening, June 16. Messrs. Younglove (chairman), Hammond, Hayes, Walsh, Oesterreich, Mitchell, Coburn, Carr, Landreth, Nealley, Williams, Knill and Silk.

Base Ball.—In charge of base ball game and grounds, Saturday afternoon, June 17. Messrs. Knill (chairman), Nellis, Farmer, Green, Furry, Martin and Hammond.

Vaudeville.—In charge of vaudeville show, Saturday evening, June 17. Messrs. Williams (chairman), Miller, Wardell, Janes and Smith.

M. C. B. Reception.—In charge of the M. C. B. reception, on Monday evening, June 19. Messrs. Ernst (chairman), Nellis, Sherman, Hayes, Knill, Carr, Hammond, Walsh and Silk.

M. C. B. Ball.—In charge of M. C. B. ball, Tuesday evening, June 20. Messrs. Farmer (chairman), Walsh, Ernst, Dunkelberg, Coburn, Nealley, Landreth, Toothe, Younglove Hibbard, Miller, Hammond and Silk.

Introduction.—To promote sociability at the two grand balls and at all dances. Messrs. Martin (chairman), Miller, Dunkelberg, Carr, Smith, Wardell, Coburn, Toothe, Farmer and Sherman.

Informal Dancing.—In charge of all informal dances. Messrs. Oesterreich (chairman), Hayes, Younglove, Hibbard, Janes, Nellis and Furry.

Ushers.—In charge of seating guests and distributing programs at all entertainments. Messrs. Mitchell (chairman), Nealley, Williams, Knill, Landreth, Green and Wardell.

ENROLLMENT COMMITTEE.

Oscar F. Ostby (chairman), Commercial Acetylene Company, New York; C. W. Beaver, Yale & Towne Manufacturing Company, New York; B. Palmer Claiborne, Dressel Railway Lamp Works, Richmond, Va.; R. S. Cooper, Independent Pneumatic Tool Company, New York; W. S. Hammond, Jr., Consolidated Car Heating Company, Chicago; Arthur E. Hooven, *Railway & Engineering Review*, New York; E. W. Irwin, Oxy-Acetylene Appliance Company, New York; H. F. Jefferson, United & Globe Rubber Manufacturing Companies, Pittsburgh, Pa.; H. L. Leach, H. W. Johns-Manville Company, New York; J. G. Mowry, Patton Paint Company, New York; C. S. Parker, Parker Car Heating Company, Ltd., Detroit, Mich.; M. S. Simpson, Pressed Steel Car Company, Pittsburgh, Pa.; C. L. Woodruff, Lowe Brothers Company, Chicago; and C. B. Yardly, Jr., Jenkins Brothers, New York.



Oscar F. Ostby,
Chairman, Enrollment Committee.

TRANSPORTATION COMMITTEE.

Joseph H. Kuhns (chairman), Republic Rubber Company, Chicago; J. F. Schurch, Railway Materials Company, Chicago; E. A. Stillman, Watson-Stillman Company, New York; Fred Elliott, Acme Paint Company, Detroit, Mich.; G. P. Berger, Gould Coupler Company, Chicago; William T. Hawley, U. S. Light & Heating Company, New York; George S. Stuart, Franklin Manufacturing Company, Franklin, Pa.; LeRoy S. Peabody, Railway Steel-Spring Company, New York; G. A. Nicol, H. W. Johns-Manville Company, Baltimore, Md.; C. O. Taylor, Ball Chemical Company, Chicago; S. D. Gloss, Atlantic Insulated Wire & Cable Company, New York; W. P. Underhill, L. C. Chase & Company, New York; Carter Blatchford, Spencer-Otis Company, Chicago; George H. Porter, Western Electric Company, Chicago; W. R. Parker, John Lucas & Company, Chicago; and George W. Brown, United Equipment Company, New York.



Joseph H. Kuhns.
Chairman, Transportation Committee.

Albert C. Ashton (chairman), Ashton Valve Company, Boston, Mass.; A. C. Langston, Jenkins Brothers, Atlanta, Ga.; and L. C. Brown, United Equipment Company, New York.

EXHIBIT COMMITTEE.

L. R. Phillips (chairman), National Tube Company, Chicago; E. H. Walker, Standard Coupler Company, New York; and W. W. Rosser, T. H. Symington Company, Chicago.

BADGE COMMITTEE.

E. H. Walker (chairman), Standard Coupler Company, New York; F. A. Craig, Westinghouse Air Brake Company,

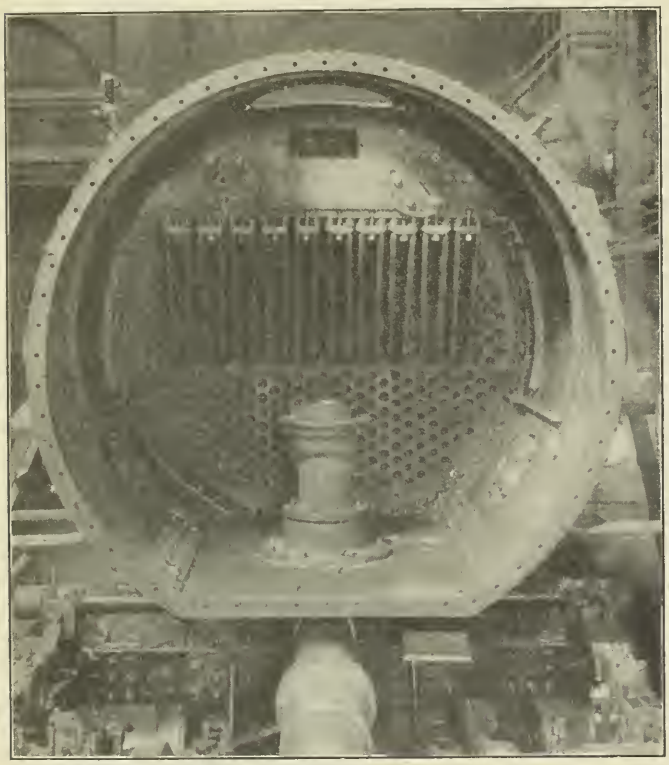
Pittsburgh, Pa.; and J. Will Johnson, Pyle-National Electric Headlight Company, Chicago.



We show a "life size" result of the work of the badge committee. The several classes are designated by the colors of the enameled portions, as follows: Red, supplymen; white, ladies, guests of supplymen; dark blue, ladies, guests of railway men; light green, men's complimentary; and light blue, ladies' complimentary.

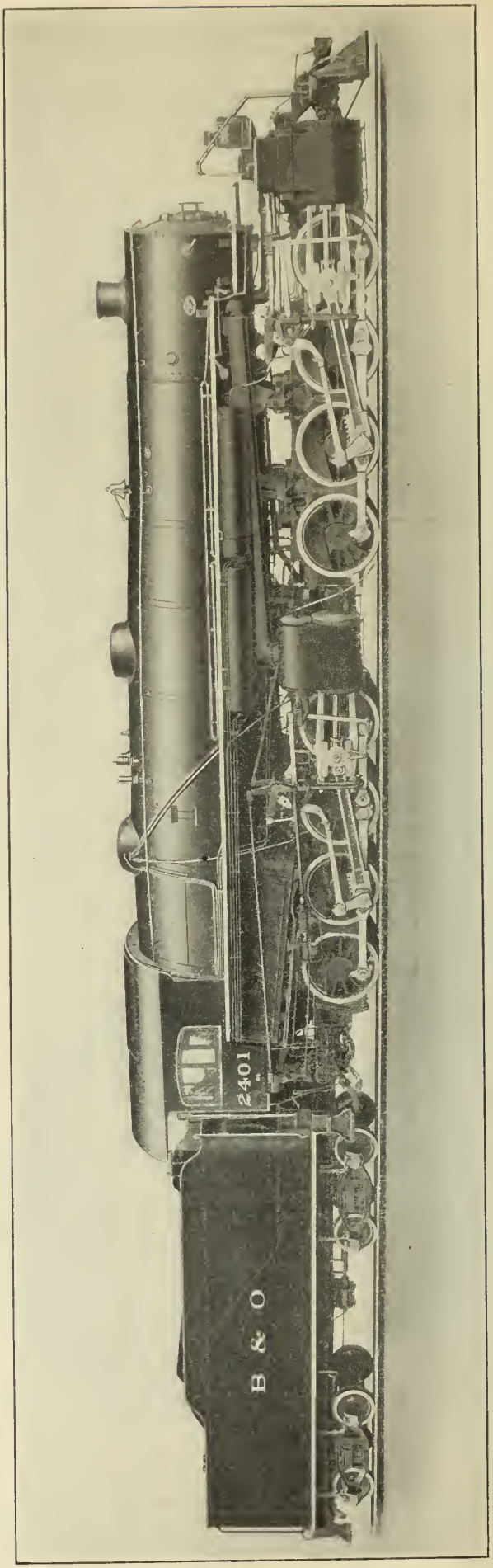
HEAVY MALLET LOCOMOTIVES; BALTIMORE & OHIO.

A still further development in the construction of Mallet locomotives has recently been made by the American Locomotive Company in an order of ten locomotives built for the Baltimore & Ohio. In 1904 this road received a Mallet of the 0-6-6-0 wheel arrangement from the same builders which was considered an experiment, it being the first Mallet locomotive built in this country. The locomotives of the last order follow the same general design with an increase of 47 per cent. in tractive effort and a 40 per cent. increase in weight. They are the heaviest locomotives of this class that the builders have yet

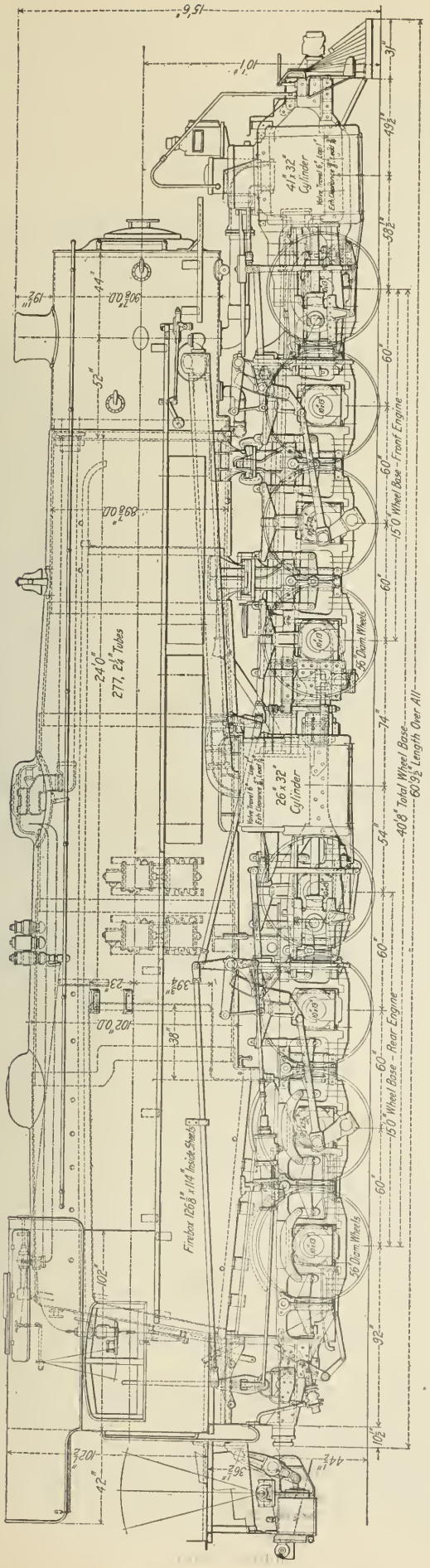


Superheater Section; Baltimore & Ohio Mallet Locomotive.

made and are to be used in pusher service on the grades shown on the accompanying profile. With a consolidation locomotive of 40,700 lbs. tractive effort at the head of a train, the Mallets have pushed 2,035 tons over the grades above mentioned and have exceeded their capacity of 1,750 tons at 12 m.p.h. over these grades by about 10 per cent. The general construction is similar to the Mallets which were built for the Delaware & Hudson in the early part of 1910 and which were described in the *Railway Age Gazette* of May 27, 1910. Although their tractive efforts are the same and the boilers of the later locomotives are built lighter, their total weight is greater by some 20,000 lbs. The chief difference between these locomotives is that the Baltimore & Ohio Mallets have a Schmidt superheater of 38 sections. This gives a superheating surface of 1,002 sq. ft., or an increase



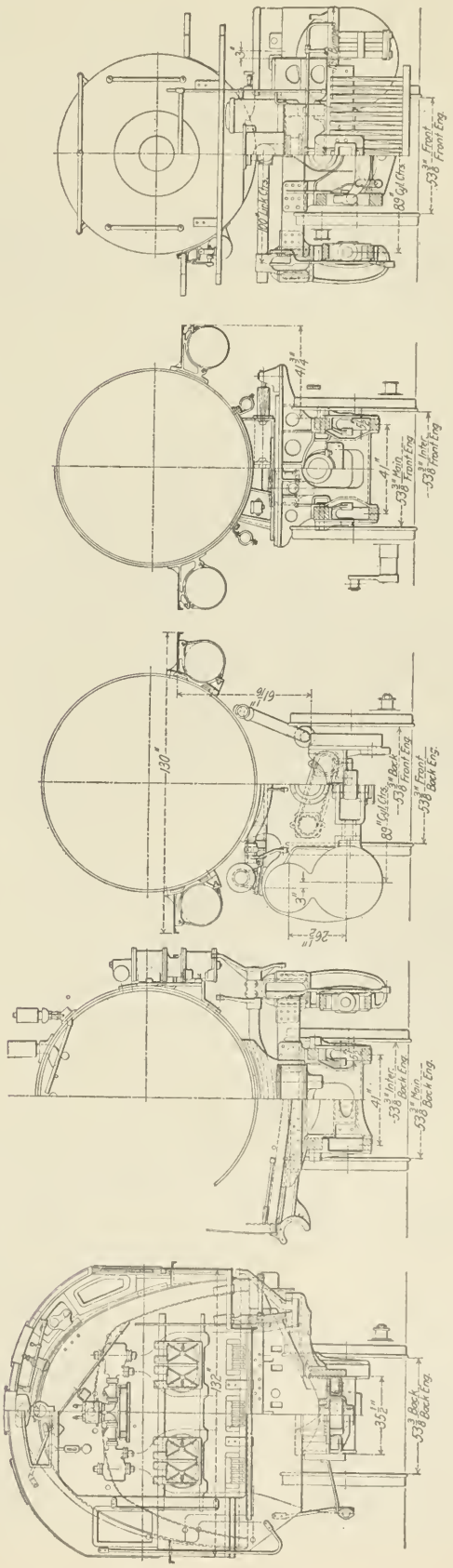
Heavy Mallet Locomotive for Pusher Service; Baltimore & Ohio.



Mallet Locomotive; Baltimore & Ohio.

of 400 sq. ft. of total equivalent heating surface. As in the Delaware & Hudson order the locomotives contain a feed-water tube sheet 54 in. back of the front tube sheet; it extends 25 in. above the centre line of the boiler. The feed water is fed to the boiler in front of this auxiliary tube sheet and must move up over it before getting back into the hot part of the boiler.

It is interesting to note a few of the differences between



Sections of Mallet Locomotive; Baltimore & Ohio.

the old and new Mallets for this road. In this order the cylinders were increased to 26 in. and 41 in. x 32 in. from 20 in. and 32 in. x 32 in., the greatest change being in the low pressure cylinders; the boiler pressure was reduced from 235 lbs. to 210 lbs; the boiler diameter was increased to 90 in. from 84 in.; the grate area to 99.9 sq. ft. from 72.2 sq. ft. and the heating surface to 7,030 sq. ft. from 5,586 sq. ft., making a decrease in the ratio of heating surface to grate area of only 8 per cent. One locomotive of the last order is equipped with the Crawford underfeed stoker which was described in the *Railway Age Gazette* of June 10, 1910. This feature increases the weight of the locomotive 7,500 lbs. and decreases the capacity of the tender about 300 gallons. The general dimensions and important ratios of the locomotive equipped with the automatic stoker are as follows:

General Data

Type	0-8-8-0
Service	Freight
Fuel	Bit. Coal
Tractive Effort	105,000 lbs.
Weight in working order	468,500 lbs.
Weight of engine and tender in working order	650,000 lbs.
Wheel base, driving	40 ft. 8 in.
Wheel base, engine and tender	77 ft. 2¾ in.

Ratios

Total weight ÷ tractive effort	4.46
Weight on drivers ÷ tractive effort	4.46
Tractive effort x diam. drivers ÷ heating surface	1,064
Tractive effort x diam. drivers ÷ equivalent heating surface	836
Total heating surface ÷ grate area	55.4
Total equivalent heating surface ÷ grate area	70.4
Firebox heating surface ÷ total heating surface, per cent.	5.81
Firebox heating surface ÷ total equivalent heating surf., per cent.	4.57
Weight on drivers ÷ total heating surface	84.7
Weight on drivers ÷ total equivalent heating surface	66.7
Volume both cylinders, cu. ft.	29.95
Total heating surface ÷ vol. cylinders	184.5
Total equivalent heating surface ÷ vol. cylinders	235.
Grate area ÷ vol. cylinders	3.33

Cylinders

Diameter	26 in. and 41 in.
Stroke	32 in.

Valves

Kind	Piston and slide

Wheels

Driving, diameter over tire	56 in.
Driving, journals, main, diam.	10½ in. x 13 in.
Driving, journals, others, diam.	10 in. x 13 in.

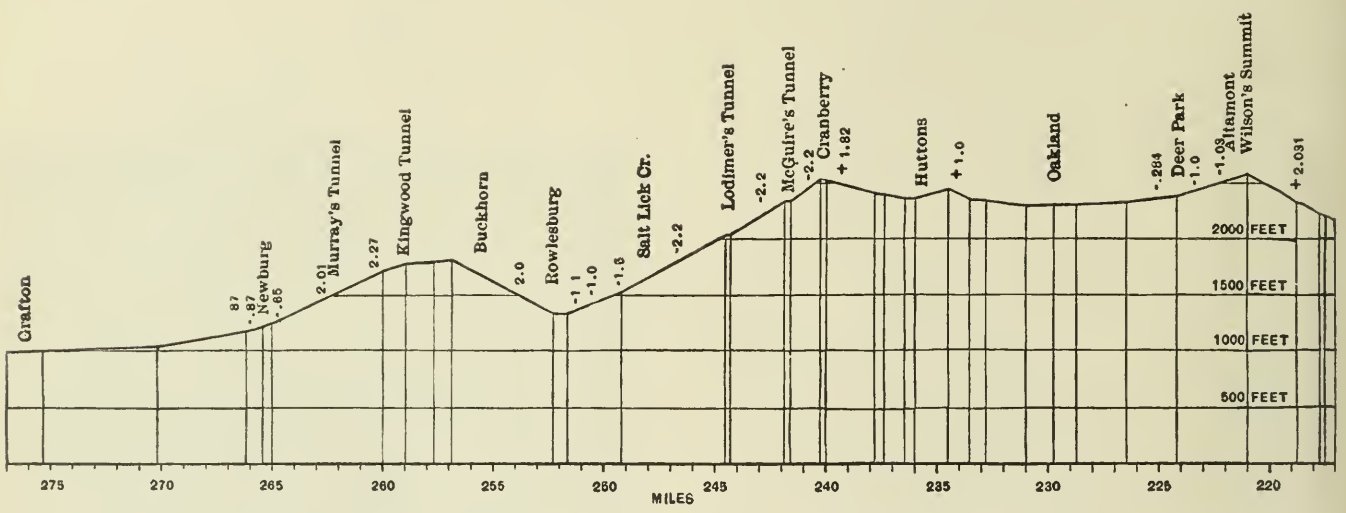
Boiler

Style	Conical Connection
Working pressure	210 lbs.
Outside diameter of first ring	90 in.
Firebox, width and length	114 in. x 126 3-16 in.
Firebox, plates, thickness	⅜ in.
Firebox, water space	5 in., 4 in., & 4½ in.
Tubes, number and diameter	277—2¼ in. 38—5½ in.
Tubes, number and diameter (superheater)	157—1¾ in.
Tubes, length	24 ft.
Heating surface, tubes	5,205.5 sq. ft.
Heating surface, firebox	321.4 sq. ft.
Heating surface, total	5526.9 sq. ft.
Heating surface, superheating	1,002 sq. ft.
Heating surface, total equivalent*	7,029.9 sq. ft.
Grate area	99.9 sq. ft.
Center boiler, above rail	10 ft. 1 in.
Top smokestack, above rail	15 ft. 6 in.

Tender

Tank, style	
Frame	10 in. & 15 in. chan.
Wheels, diameter	33 in.
Journals	6 in. x 11 in.
Water capacity	9,200 gal.
Coal capacity	16 tons

*Total equivalent heating surface equals total heating surface (5,526.9 sq. ft.) plus 1½ times superheating surface.



Profile of Grades, on Which Mallet Locomotive is Used; Baltimore & Ohio.

U. S. MAIL.

Mail addressed care of the secretary's office, Million Dollar Pier, will be taken care of and delivered when called for at his office.

WEAR YOUR OFFICIAL BADGE.

The various committees particularly desire that all members and guests of the associations shall constantly wear their official badges. Their purpose is to show the organization to which the wearer belongs; to insure him privileges and protection, and to save him money and annoyance. Too much stress cannot be laid upon the importance of wearing the badges at all times and on all occasions.

GOLF.

The Country Club of Atlantic City has extended the privileges of its club house to all members and guests of the associations during their stay at Atlantic City. Admission to the grounds will be by official badges. The club has also extended the use of its links for a charge of $1 per day, and tickets may be obtained from the store at the club. The club is located at Northfield and cars going to it run at half-hour intervals by the Shore Fast Line Electric, starting from Boardwalk and Virginia avenue, and by the Atlantic City & Suburban Traction Company, starting from Florida avenue and Boardwalk. The running time to the club is about 20 minutes.

BATHING ACCOMMODATIONS.

Accommodations for bathing may be had by all members and guests of the Conventions, wearing the official badges, at the following rates, including suits:

Reed's Baths.—(Boardwalk under Hotel Dennis) twenty-five and fifty cents per person.

Brighton Casino.—(With indoor swimming pool) fifty cents per person.

Free admission will be given to Brighton Casino (including concert, reading and writing rooms) to members and guests wearing official badges.

These rates apply only to those wearing official badges.

LIST OF EXHIBITORS.

Last year with an exhibit space of 71,453 sq. ft. it was necessary to turn away thirty-five firms which had applied tor space. This year the total exhibit space on the pier has been increased about 5,000 sq. ft., but even with the increase it has been found impossible to accommodate 70 applicants for space. The general arrangement of the exhibit space is shown on the accompanying diagram. There are about 260 exhibitors this year as compared to 228 in 1910, and 200 in 1909. The increase in space over last year is largely due to a rearrangement of the booths in the Annex, including a new aisle extending between booths 528 and 660. The arrangement of the booths and the decorations are quite similar to those of last year.

Acme Supply Company, Chicago, Ill.—Pressed steel shapes, steel doors, Acme vestibule diaphragm, "Tuco" friction curtain, "Tuco" pinch bar curtain, vestibule curtains and casings, steel deck sash. Represented by H. H. Schroyer, W. L. Conwell, R. M. Campbell, D. Dunbar and Wilson Gephart. Spaces 571, 572.

Adams & Westlake Company, The, Chicago, Ill.—Steel window frames, train indicator lamps, car lighting fixtures, white ajax metal washstands, signal lamps, sliding door locks, lanterns and parcel racks. Represented by E. L. Langworthy, F. N. Grigg, Wm. S. Hamm, Wm. J. Piersen and George L. Walters. Space 633.

Ajax Manufacturing Company, The, Cleveland, Ohio.—Complete line of machine made forgings. Represented by J. R. Blakeslee, J. A. Murray, A. L. Guilford and Henry Gaul. Space 315.

American Arch Company, New York, N. Y.—Security sectional arches. Represented by LeGrand Parish, Chas. B. Moore, M. C. Beymer, J. L. Nicholson and George Wagstaff. Space 408.

American Balance Valve Company, Jersey Shore, Pa.—Samples and models of semi-plug piston valves, balance slide valves and valve gear models. Represented by J. T. Wilson, Frank Trump and C. C. Young. Space 623.

American Brake Company, The, St. Louis, Mo.—American automatic slack adjuster, in conjunction with exhibit of The Westinghouse Air Brake Company. Represented by E. L. Adreon, R. E. Adreon, F. E. Schwentker and J. A. Hance. Spaces 27, 29, 31, 136, 138, 140, 142, 144 and 146.

American Brake Shoe & Foundry Company, Mahwah, N. J.—Locomotive driver brake shoes, flanged brake shoes for steel tired and rolled steel wheels, unflanged brake shoes for cast iron wheels, combination driver brake heads and reinforcing parts which go with these shoes. Represented by W. G. Pearce, W. S. McGowan, F. L. Gordon, J. B. Terbell, F. W. Sargent, E. L. Janes, A. H. Elliot, E. B. Smith, R. C. Augur, G. R. Law, J. H. Yardley, F. H. Coolidge, R. E. Holt, W. L. Boyer, L. R. Dewey and J. G. Tawse. Space 410.

American Car & Foundry Company, New York, N. Y., will have booths Nos. 609 and 610 for social purposes only. Represented by Scott H. Blewett, L. W. Martin, W. A. Williams, C. D. Terrell, Olive Runnells, Willaim C. Dickerman, John McEwen Ames, Clark D. Eaton, A. E. Ostrander and William F. Lowry. Spaces 609, 610.

American Engineer & Railroad Journal, New York, N. Y.—Samples of publication. Represented by J. S. Bonsall, E. A. Averill, R. H. Rogers and F. H. Thompson. Space 22.

American Locomotive Company, New York, N. Y.—Reception booth with photographs of locomotives. Represented by James McNaughton, H. F. Ball, G. M. Basford, J. D. Sawyer, J. E. Dixon, W. P. Steele, H. B. Hunt and Wm. Dalton. Spaces 422, 424

American Mason Safety Tread Company, Boston, Mass.—Safety treads, safety car step and Karbol'th flooring. Represented by Henry C. King, L. H. Myrick, M. H. Eddy. Space 544.

American Nut & Bolt Fastener Company, Pittsburgh, Pa.—Bartley fasteners, new Bartley self-locking fasteners, new Bartley nut, bolt and bond wire fasteners. Represented by Milton Bartley, Edwin M. White, Christopher Murphy and Robert Spencer. Space 320.

American Radiator Company, Chicago, Ill.—Radiators, boilers, heaters for cars, tanks, shops and depots; special valves, regulators, regitherms, steam and hot water heating and ventilating apparatus. Represented by Jas. H. Davis, T. H. Huddleton, J. H. Ives and F. C. Reeder. Spaces 300, 302 and 304.

American Rolled Gold Leaf Company, Providence, R. I.—Gold leaf for car striping. Space 23.

American Steel Foundries, New York, N. Y.—Andrews side frames, cast steel bolsters, Simplex bolsters, brake beams, Davis cast steel wheels, Simplex couplers, Susemihl roller side bearings, springs and miscellaneous castings. Represented by William V. Kelley, R. P. Lamont, George E. Scott, R. H. Ripley, W. J. Lynch, J. C. Davis, T. D. Kelley, J. V. Bell, G. F. Slaughter, W. Ross Gravener, George C. Murray, Theodore Cook, P. J. Kalman, D. T. Harris, J. W. Dalman, A. R. Brunker, W. A. Blanchard, A. S. Crozier, T. H. Hopkirk, W. M. Rogovine, R. E. Janney, P. M. Armendariz, G. G. Floyd, F. B. Ernst, C. E. Bauer, J. Soule Smith, and Louis E. Jones. Space 168.

American Tool Works Company, The, Cincinnati, Ohio.—Motor driven 24-in. "American" High Duty Engine Lathe, 24-in. Back Geared Crank Shaper, 3-ft. Back Geared Radial and 6-ft. Triple Geared Plain Radial. Represented by J. B. Doan, Herman W. Schatz, Edward Connors and Frank Schweer. Spaces 105, 107 and 109.

American Vanadium Company, Pittsburgh, Pa.—Vanadium ores and alloys. Vanadium steels, both wrought and cast; and vanadium cast iron. Specimens of vanadium steel and iron. Locomotive parts such as side rods, piston rods, crank pins, axles, frames, springs, tires, wheels, tubes, safe ends, cylinders, bushings and piston rings. Vanadium steel and iron automobile parts, such as crankshafts, gears, axles, frames, springs, steering arms, cylinders, etc. Vanadium machinery steels; vanadium high speed tool steels. A large vanadium cast steel yoke, tested by the government, several of which are to be used on the Panama canal. Represented by Jas. J. Flannery, Jos. M. Flannery, Geo. L. Norris, C. L. Hastings, W. J. Bird, Geo. E. Lees and E. M. McIlvain, Pres., The Universal Vandium Company. Space 211.

Anchor Packing Company, Philadelphia, Pa.—Fibre packing and mechanical rubber goods. Tauril sheet packing, throttle and air pump packing. Represented by L. E. Adams, W. R. Haggart, Chas. Barnes, B. J. Miller, H. T. Helmer, W. R. Green, E. Swiler, J. E. Edmonds, Bert Adams, John Cropp, Wm. Jones and J. H. Murray. Space 428.

Armstrong-Blum Manufacturing Company, Chicago, Ill.—"Marvel" automatic high speed saws and hack saws. Represented by Francis J. Blum and George J. Blum. Space 125.

Armstrong Bros. Tool Company, Chicago, Ill.—Grinding machines, tool holders, ratchet drills, lathe dogs, clamps. Represented by James W. Barber and Paul Armstrong. Space 127.

Atlas Car & Manufacturing Company, Cleveland, Ohio.—Two cars. Represented by T. A. Mathews. Space, on track.

Automatic Ventilator Company, New York, N. Y.—Full size and miniature demonstrating models. Represented by George H. Ford, Frank A. Barbey, L. J. Hibbard and W. J. Fleming, Jr. Space 317.

Baldwin Locomotive Works, Philadelphia, Pa.—Jointly occupying space nine with The Standard Steel Works Company as an office for pier headquarters. Represented by Grafton Greenough, Edward B. Halsey, Charles Riddell, George F. Jones, Fred W. Weston and Carl H. Peterson. Space 9.

Berry Brothers, Limited, Detroit, Mich.—Railroad varnishes, fossil gums, including Kauri, Zanzibar and Manilla copals, shellacs, crude and bleached; finished natural wood panels, finished coach panels in colors and finished metal panels, showing coach finishing, and rubbing varnishes, locomotive black, locomotive finishing, coach and freight car japans, hand rail black, smoke stack black, front end black, etc. Represented by D. W. H. Moreland, H. P. Stephenson, George M. Kerr, James S. Stevenson and Walter E. Paye. Space 36.

Besly & Company, Charles H., Chicago, Ill.—New Besly pattern makers' disc grinder, helmet spiral circles, temper taps, oil and babbitt. Represented by Charles A. Knill, William A. Allen and Edward P. Welles. Space 166.

Bettendorf Axle Company, Bettendorf, Iowa—One fifty-ton capacity single center sill underframe and trucks, one forty-ton capacity double center sill underframe and trucks, one Bettendorf truck and truck bolster. Represented by J. W. Bettendorf, J. H. Bendixen, G. N. Caleb, F. K. Shults, A. F. Macpherson, E. E. Silk, W. G. Ransom, J. G. Hope, C. J. W. Clasen and C. G. Stalpe. Spaces 209 and 210.

Bird & Company, J. A. & W., Boston, Mass.—Rex refrigerator

car felt, freight car roofing, insulation, Ripolin enamel paint Represented by F. E. Cooper. Space 618-620.

Bowser & Co., Inc., S. F., Ft. Wayne, Ind.—Oil storage systems compete, long distance self-measuring pumps, power pumps, automatic registering oil meters, filtering systems for lubricating oils, oil storage tanks of all sizes and shapes, with pumps for handling and measuring all kinds of lubricating, paint and other oils, including gasolene, etc., suitable for storehouses, machine and paint shops, round houses, engine rooms, signal towers, automobile garages. Represented By C. A. Dunkelberg, W. T. Simpson, F. T. Hyndman and E. H. Barnes. This company is exhibiting at space 30.

Buckeye Steel Castings Company, The, Columbus, Ohio.—"Buckeye" cast steel bolsters and side frames, cast steel journal boxes, pivoted coupler yoke and "Major" car couplers. Represented by S. P. Bush, J. C. Whitridge, C. B. Goodspeed, Geo. Groobey, A. H. Thomas, F. L. Allcott and G. T. Johnson. Space 661.

Buffalo Brake Beam Company, New York, N. Y.—Brake beams for all classes of cars, locomotives and electric equipment, meeting Master Car Builders' standards and railway companies' requirements. Represented by S. A. Crone, Edwin Strassburger, Thomas E. Carliss, Roland C. Fraser and C. E. Barrett. Space 418.

Bullard Machine Tool Company, The, Bridgeport, Conn.—42 in. vertical turret lathe, maxi-mill type, and 64 in. maxi-mill; both in operation. Represented by E. P. Bullard, Jr., S. H. Bullard, J. W. Bray, D. B. Bullard, R. H. Snider, J. H. Van Yorx and Wm. B. Price. This company is exhibiting at space 100.

Burroughs Adding Machine Company, Detroit, Mich.—Burroughs adding machines. Represented by F. A. Willard and Ward Gavett. Spaces 327, 329 and 331.

Buyers' Index Company, Chicago, Ill.—Railway supply index-catalogue and purchasing agents' buying list. Represented by H. E. Frame, Lloyd Simpson and Alex. Smith. Space 646.

Camel Company, Chicago, Ill.—Security door fixtures for automobile cars, stock cars, coke cars, ventilated box cars, furniture cars and plain box cars. Represented by J. M. Hopkins, P. M. Elliott and W. W. Darrow. Space 595.

Carborundum Company, The, Niagara Falls, N. Y.—Carborundum grinding wheels, aloxite grinding wheels, aloxite and carborundum cloth, carborundum brand garnet paper, carborundum and aloxite grains, carborundum fire sand for furnace lining. The grinding wheels will be demonstrated on grinding machines under actual shop conditions. Represented by George R. Rayner, R. S. Marvin, R. H. Hogg, C. C. Lathrop, W. C. Rankine and C. C. Schumaker. This company is exhibiting at spaces 102 and 104.

Carey Company, Philip, Cincinnati, Ohio.—Special application of asbestos and magnesia to railway use, insulating paper, car roofing, sill covering, roofing for round houses, train pipe covering, lagging. Represented by D. R. Warfield, N. S. Kenney and G. A. Huggins. Space 577.

Carnegie Steel Company, Pittsburgh, Pa.—Schoen steel wheels for engine truck, tender, passenger train car, freight car and street car service; three sets high record service wheels mounted on axles; slick gear blanks, cut and uncut; nickel plated samples of structural shapes and plates; concrete reinforcing bars and other bar mill products; rails, ties and track accessories; nickel plated and full size samples of United States steel sheet piling and symmetrical interlock channel bar piling; kegs hooped with patent steel hoops; track bolts and spikes; soft welding and threading steel for locomotive and car parts, frame bolts, motion pins, nuts, etc., pieces tested and not tested; standard steam railway track on steel cross ties fitted with Duquesne joints; portable track made of light rails and steel cross ties; vanadium steel locomotive springs and locomotive side rods, vanadium steel wheel, vanadium steel street car axle and miscellaneous samples of vanadium steel parts. Represented by John C. Neale, W. G. Clyde, John McLeod, I. W. Jenks, L. C. Bihler, R. B. Woodworth, N. M. Hench, H. W. Maxson, Lee H. Bowman, George F. Goddard, F. C. Deming, Charles C. Cluff, B. S. Yarnall, W. N. Jeffress, H. W. Summers, Walter C. Scott, F. E. Spencer, C. B. Friday, John Hornbrook, K. E. Porter, W. H. H. Carhart and L. S. Sitts. Spaces 411, 551 and 552.

Carter Iron Company, Pittsburgh, Pa.—Carter special staybolt, bar iron, iron chains and ball-bearing chains. Represented by R. A. Carter, Christopher Murphy, H. C. McNair, N. S. Faucett and Henry F. Gilg. Space 32.

Chase & Co., L. C., Boston Mass.—Goat branch car plushes in plain and prize effects. Angora mohair showing process of manufacture. Chase's car seat duck. Represented by R. R. Bishop, Jr., and W. P. Underhill. Space 10.

Chicago Car Heating Company, Chicago, Ill.—Car heating apparatus. Represented by E. H. Gold, E. E. Smith, J. Vogel, F. F. Coggin, B. A. Keeler, A. G. Delany and E. A. Schreiber. Spaces 224, 226, 228 and 230.

Chicago Pneumatic Tool Company, Chicago, Ill.—Pneumatic tools, hammers and appliances, compressors and electric drills. Represented by Thomas Aldcorn, W. P. Pressinger, C. E. Walker, James McCabe, G. A. Barden, Geo. A. Rees, L. Summers and H. Kimman. Space 648.

Chicago Railway Equipment Company, Chicago, Ill.—Brake beams of the "P C" creco "E L" creco, diamond specia', diamond, national hollow, sterlingworth, ninety six. Monarch and special types monitor bolsters, creco roller side bearings, brake slack adjuster, journal box and lid. Automatically adjustable brake heads, removable leg brake head. Creco sliding third point brake beam support. Represented by E. B. Leigh, Arthur Wyman, F. T. DeLong, B. F. Pilson, Raymond H. Pilson, G. N. Sweringen, C. P. Williams, Edwin F. Leigh, Ralph Wiggin and Chas. A. Maher. Spaces 585, 586, 587 and 588.

Chicago Steel Car Company, Chicago, Ill.—Models of steel underframes and tank cars. Represented by J. E. Chisholm and H. C. Priebe. Space 520.

Chicago Varnish Company, Chicago, Ill.—Car sides, showing application of "Ce Ve" process of quick painting of cars. Represented by O. H. Morgan, Geo. S. Bigelow, Fred L. Olds and B. K. Buckman, Jr. Spaces 546 and 626.

Chisholm & Moore Manufacturing Company, The, Cleveland, Ohio.—Chain hoists and trolleys. Represented by H. E. Dickerman. Space 163.

Cleveland Twist Drill Company, The, Cleveland, Ohio.—A drill press in operation giving practical demonstration of Cleveland high speed drills and reamers. Also exhibit typical of our complete line of small tools. Represented by E. C. Peck, A. L. Beardsley, W. E. Caldwell and R. D. Botley. Space 123.

Cochrane-Bly Company, Rochester, N. Y.—One No. 6 8 in. capacity cold saw cutting-off machine, one No. 2 4½ in. capacity cold saw cutting-off machine, one No. 11 automatic saw sharpener, one No. 2 die filing machine. Represented by R. B. Dow. Space 147.

Coe Brass Manufacturing Company, The, Ansonia, Conn.—Extruded metals in great variety of intricate designs for car trimming and ornamentation; also for use in electrical apparatus, art metal work, etc. Represented by Arthur S. Brown, William W. Cotter and William H. Rippere. Space 518.

Coe Manufacturing Company, W. H., Providence, R. I.—Coe's XX ribbon gold leaf, Coe's ribbon aluminum leaf, gilding wheels and gilding brushes. Represented by E. J. Arlein, Benj. A. Smith and Stuart H. Swallow. Space 328.

Colonial Steel Company, Pittsburgh, Pa.—High speed tool steel and tools made from same. Represented by H. C. Poole and C. E. Bulings. Space 369.

Commercial Acetylene Company, The, New York, N. Y.—Acetylene car lighting equipment, acetylene locomotive headlight equipment, acetylene signal equipment, acetylene marine signal with sun valve, acetylene tanks for welding, tank cut open showing asbestos packing. Represented by F. A. Barbey, H. G. Doran, R. J. Faure, O. F. Ostby, E. T. Sawyer and R. B. Steward. Spaces 201, 203, 205 and 207.

Commonwealth Steel Company, St. Louis, Mo.—Catalogues, photographs. Represented by H. M. Pflager, George E. Howard, Boone V. H. Johnson and Frank S. Barks. Space 313.

Consolidated Car Heating Company, Albany, N. Y.—Steam traps, end valves, inlet valves, thermostatic control of steam heat, steam couplers, electric heaters. Represented by Cornell S. Hawley, Thomas Farmer, Jr., W. S. Hammond, Jr., and H. L. Hawley. This company is exhibiting at spaces 579 and 580.

Cooper-Hewitt Electric Company, Hoboken, N. J.—With the Westinghouse Air Brake Company. Spaces 27, 29, 136, 138, 140, 142, 144 and 146.

Crane Company, Chicago, Ill.—Locomotive safety valves, locomotive blow off valves, ash pan blower valves, special locomotive cab valves, Crane system of steam traps, non- and direct return for returning the condensation to boiler, motor operated steel gate valves for superheater steam, special ferro steel gate valves with clean-out pocket for creosote and zinc-chloride for timber treating plants, Crane railroad unions, malleable and cast iron fittings, brass globe and gate valves for steam, water and hydraulic service. Represented by F. D. Fenn and G. S. Turner. Spaces 597 and 599.

Crosby Steam Gage & Valve Company, Boston, Mass.—Muffled safety valves, open safety valves, globe and angle valves, spring seat, Johnstone blow off valves, air pump throttle valves and blower throttle valves. Crosby improved loco-

motive gages, thermostatic water back gages, standard test gages, hydraulic gages, hydraulic press recorders, wheel press recorders and recording revolution counters. Crosby fluid pressure scales for testing gages to 25,000 lbs. Indicators with continuous diagram drums, indicators with lanza continuous diagram appliance. Represented by John J. McCormick and M. D. Johnson. Space 635.

Crucible Steel Company of America, Pittsburg, Pa.—Rex "AA" high speed tools of various designs, railroad springs, drill rods. Fractures showing heat treatment of steel. Heavy turnings made at high speeds, milling cutters, expanding reamers, dies, chisels, saws, rex "AA' inserted tooth high speed saw. Represented by Fred Baskerfield, W. D. Wintersmith, W. K. Krepps, J. T. Stafford and E. A. Jones. Space 322.

Curtain Supply Company, The, Chicago, Ill.—Ring curtain fixtures, car curtains, car curtain materials, "CSCO" and "Rex" diaphragms, all metal rollers, steel sash balance roller, automatic releasable handles and roller bearing hooks. Represented by W. H. Forsyth, R. F. Hayes and S. W. Midgley. Spaces 593, 594 and 596.

Dahlstrom Metallic Door Company, Jamestown, N. Y.—Metallic doors and steel trimming for the interior of steel cars, moldings. Represented by J. A. Westman, C. Carlson and H. E. Van Orden. Space 384.

Damascus Brake Beam Company, The, Cleveland, Ohio.—High speed passenger beams, freight beams of both solid and truss types, all steel freight beams, adjustable brake heads, forged steel brake heads, forged steel fulcrums. Represented by P. T. Handiges, Geo. L. Polk and Albert Waycott. Space 653.

Davis-Bournonville Company, New York, N. Y.—Large oxy-acetylene welding and cutting equipment such as is suitable for railroads and large manufacturing plants, navy yards, etc. Represented by Chas. F. Gessert, Wm. Joyce, H. R. Swartley, Jr., Wm. W. Barnes, Hugh L. Adams and W. R. Nixon. Spaces 1 and 2, pier end.

Davis Solid Truss Brake Beam Company, Wilmington, Del.—Davis solid truss brake beams, solid steel brake shoe backs, universal air brake combined auxiliary reservoir and cylinder, brake beam testing machine, brake beam deflectometer and special appliance for testing brake beams. Represented by Nathan H. Davis and Thomas C. Davis. Spaces 500, 502 and 504.

Dearborn Drug & Chemical Works, Chicago, Ill.—Booth arranged in the form of a lodge and garden. Represented by R. F. Carr, G. R. Carr, G. W. Spear, J. D. Purcell, A. W. Crouch, I. H. Case, P. G. Jones and H. G. McConnaughy. Spaces 6 and 8.

Detroit Hoist & Machine Co., Detroit, Mich.—Pneumatic turntable tractor, electric turntable tractor, pneumatic motor hoists and pneumatic motors. Represented by J. C. Fleming and F. B. Fleming. Space 121.

Detroit Lubricator Company, Detroit, Mich.—No. 22 3-feed lubricator, No. 22 3-feed lubricator (sectional), No. 32 4-feed lubricator, No. 42 5-feed lubricator, No. 52 6-feed lubricator, No. 62 7-feed lubricator, No. 0 1-feed lubricator, No. 5 2-feed lubricator, No. 7 2-feed lubricator, No. 11 2-feed lubricator, Detroit transfer filler, 1-feed, 2-feed and 4-feed air cylinder lubricators, Detroit air pump lubricator, Detroit emergency valve, automatic steam chest plugs, boiler valves, guide cup, rod cup, Detroit force feed oilers. Represented by Herbert I. Lord, F. W. Hodges and A. D. Homard. Space 596.

Dickinson, Inc., Paul, Chicago, Ill.—Smoke jacks, chimneys and ventilators. Also cross sectional drawings showing various engine houses equipped with Dickinson smoke jackets. Represented by J. A. Meaden and A. J. Filkins. Space 231.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Dixon's pure flake lubricating graphite, graphite greases, silica-graphite paint, pipe joint compound, pencils, crucibles, belt dressings, graphite engine front finish, air brake graphite, etc. Represented by H. A. Nealley, J. A. Tucker, Wm. Houston, L. H. Snyder and H. W. Chase. Space 24.

Dressel Railway Lamp Works, The, New York, N. Y.—Headlights, engine classification lamps, tail lamps, switch lamps, station lamps. Represented by F. W. Dressel, Robt. Black, H. S. Hoskinson, F. W. Edmunds, B. P. Claiborne and E. W. Hodgkins. Spaces 382 and 383.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Barrett track jacks, automatic lowering jacks, geared ratchet screw jacks, Duff bearing screw jacks, Bethlehem forged steel hydraulic jacks. Represented by T. A. McGinley, G. F. Freed, E. A. Johnson and G. A. Edgin. Spaces 548 and 628.

Durbin Automatic Safety Car Coupler Company of Canada, Limited, Sarnia, Ontario.—Automatic safety car coupler. Represented by J. F. Durbin, C. T. Hunn and V. S. Durbin. Space 325.

Eagle Glass & Manufacturing Company. Space 656.

Edison Storage Battery Company, Orange, N. J.—Storage batteries for car lighting, signaling and ignition. Details of manufacture of batteries fully shown. Represented by H. G. Thompson and H. L. Davisson. Space 209.

Edwards Company, The O. M., Syracuse, N. Y.—Window fixtures, sash balances, extension platform steel trap-doors, tin barrel shade rollers, padlocks, steel office furniture and filing devices. Represented by O. M. Edwards, E. W. Edwards, 2d, Edward F. Chaffee, G. G. Norris, W. A. Le Brun, C. H. Rockwell, W. C. Bradbury and T. P. O'Brian. Spaces 649 and 651.

Electric Controller & Manufacturing Company, Cleveland, O.—Lifting magnet, operated from electric crane; automatic motor starters, controllers, electric brakes in operation. Represented by F. R. Fishback and R. G. Widdows. Spaces 162 and 164.

Electric Storage Battery Company, The, Philadelphia, Pa.—Car lighting batteries, Exide vehicle batteries, chloride accumulators. Represented by H. E. Hunt and E. L. Reynolds. Space 407.

Emery Pneumatic Lubricator Company, St. Louis, Mo.—Automatic method of lubricating triple valves and brake cylinders. Represented by E. A. Emery and N. J. McAloney. Space 608.

Enterprise Railway Equipment Company, Chicago, Ill.—Steel car on the exhibit track.

Faessler Manufacturing Company, J., Moberly, Mo.—Boss roller flue expanders, universal roller flue expanders, ball bearing roller flue expanders, arch flue expanders, improved sectional beading expanders, pneumatic sectional tube expanders, rapid beading expanders, perfect flue cutting machine and cutters, patch bolt countersinking tools. Represented by J. W. Faessler and C. F. Palmer. Space 615.

Fairbanks, Morse & Company, Chicago, Ill.—One No. 28 all-steel gasoline motor car for one, two or three passengers, two-cycle two-cylinder direct connecting engine, one No. 26 section gasoline motor car with two-cycle two cylinder gasoline engine. Track jacks, ball bearing jack and hydraulic jacks. Represented by A. A. Taylor, G. J. Akers, E. M. Fisher, A. C. Dodge and F. H. Douglas. Spaces 550 and 630.

Flannery Bolt Company, Pittsburgh, Pa.—Tate flexible staybolts, radial and crown staybolts, Tate, installation tools for applying the Tate bolt, staybolt tests. Represented by B. E. D. Stafford, W. M. Wilson, Barton H. Grundy, George E. Howard, Joseph M. Flannery, Thomas J. Leahey, Tom R. Davis, James J. Flannery and J. Rogers Flannery. Space 528.

Flower Waste & Packing Company, New York, N. Y.—Flower's resilient car journal box packing. Represented by Frank D. Waller and George T. Hanchett. Space 426.

Ford & Johnson Company, The, Michigan City, Ind.—Perfection car seats, parlor car chairs, fibre rush furniture, pressed steel pedestals, seating material. Represented by W. E. Murphy, B. H. Forsyth, C. A. Vandeveer, W. F. La Bonta and G. T. Paraschos. Space 364.

Forsyth Brothers Company, Chicago, Ill.—Forsyth high capacity buffing device, draft gear, deck sash ratchets, Chaffee centering device, Forsyth one-piece metal doors, metal sash, metallic adjustable weather strips, pressed steel unit car side construction. Represented by G. H. Forsyth, A. H. Sisson and W. M. Wampler. Spaces 632 and 634.

Fort Pitt Iron Works, Pittsburgh, Pa.—Space 650.

Foster Company, The Walter H., New York, N. Y.—Hydro-pneumatic radial drill, all geared multi-spindle drill, pneumatic stay bolt nipper. Represented by Walter H. Foster, Herbert L. Kenah and A. L. Kendall. Spaces 111 and 113.

Franklin Manufacturing Co., The, Franklin, Pa.—Asbestos pipe coverings, asbestos and magnesia pipe and boiler coverings, smoke jacks, corrugated sheathing, shingles, rope and wick packing, throttle and air pump packing, asbestos "Carline" for lining steel cars, wool and cotton waste and perfection journal box packing. Represented by R. J. Evans, H. S. Hayden, G. S. Stuart, L. B. Melville and E. R. Rayburn. Space 11.

Franklin Railway Supply Company, New York, N. Y.—Booths on Young's Pier will be fitted up for receiving visitors, where we will have on file 300 daily newspapers from motive power centers throughout the United States, Canada and Mexico. Among the track exhibits we will show a car equipped with the Franklin flexible metallic car roof. Represented by J. S. Coffin, S. G. Allen, C. L. Winey, R. G. Coburn, W. L. Allison, W. H. Coyle, J. S. Coffin, Jr., and John L. Mohun. Space 406.

Frost Railway Supply Company, The, Detroit, Mich.—Harvey friction spring gears, Detroit metal weather strip. Represented

by Harry W. Frost, George A. Cooper and George L. Harvey. Space 582.

Galena-Signal Oil Company, Franklin, Pa.—Reception booth for guests. Represented by W. E. Amann, E. H. Baker, B. H. Grundy, F. A. Guild, Wm. Holmes, M. J. Hurley, Geo. L. Morton, W. J. Walsh, Jno. A. Wilson, E. W. Hayes, H. Hillyer, E. G. Johnson, J. A. Roosevelt, F. B. Smith, P. H. Stack, J. G. Arn. W. E. Brumble, J. W. Bunn, J. J. Bunn and D. L. Eubank. Space 38.

Garlock Packing Company, The, Palmyra, N. Y.—Air pump and throttle packings, metal and fibrous valve rod packing, accumulator and air compressor packing, hydraulic packing, air pump gaskets, superheat sheet packing. Represented by H. N. Winner, Phil. Arnold, T. P. Dunham and F. S. Bulkley. Space 510.

General Electric Company, Schenectady, N. Y.—Train lighting steam turbine, gasolene electric generating set, centrifugal air compressor, portable air compressor, mercury arc rectifier, railway motor, induction motor, CVC motor, with controlling panel, drum controllers, contactor panel, starting rheostat, steam and air flow meters, bracket fan motor, A. C. and D. C. portable breast drills, crane motor, single phase commutator motor, adjustable speed motors, fractional H. P. motors, train lighting lamps, electric heating and cooking devices, arc lamps, Mazda lamps, gas electric car. Represented by J. G. Barry, W. B. Potter, A. W. Jones, C. E. Barry, Frank Rhea, J. W. Ham, H. C. Chatain, R. E. Woolley, C. Fair, W. J. Clark, H. D. Hawks, C. C. Pierce, R. E. Moore, M. O. Kellogg, C. A. Raymond, H. L. Monroe and A. L. Totten. Spaces 350 to 363, inclusive.

General Railway Supply Company, Chicago, Ill.—Metallic steel sheathing, National steel vestibule trap-doors, Resisto insulation, Flexolith composition flooring, Imperial car window screens, Perfection sash balances, Eclipse deck sash ratchet, National standard roofing, National vestibule curtain catch. Represented by F. L. Wells, H. U. Morton, W. L. Conwell, W. S. Humes, J. F. Oelerich and R. M. Campbell. Spaces 573 and 574.

Gold Car Heating & Lighting Company, New York, N. Y.—heating, lighting and ventilating apparatus for passenger and refrigerator cars. Represented by E. E. Gold, E. B. Wilson, A. B. Strange, W. E. Banks, W. H. Stocks, J. M. Stayman, G. F. Ivers, F. H. Smith, E. J. Ronan, J. O. Brumbaugh, F. O. Bailey and F. A. Purdy. Spaces 301 to 311, inclusive.

Goldschmidt Thermit Company, New York, N. Y.—Complete appliances for making thermit welds. Appliances for butt welding wrought iron and steel pipes. Specimen welds showing amalgamation of metal obtained. Metals and alloys produced free from carbon by the thermit process. Photographs of important repairs executed by the thermit process. Samples of thermit, nickel thermit and chromium thermit. Represented by William C. Cuntz, G. E. Pellissier, H. D. Kelley, Dr. E. A. Beck. W. R. Hulbert, H. S. Mann and J. G. McCarty. Space 339.

Gould Coupler Company, New York, N. Y.—M. C. B. couplers, Gould malleable iron journal boxes, freight friction draft gears, passenger friction on draft gears, "Hartman" ball bearing centre plates and side bearings, Gould cast steel side frames, passenger cast steel end sill with friction buffer, passenger couplers, Moritz coupler, cast steel truck bolsters, Gould cast steel freight car end sill with friction back of coupler horn, friction draft gear and coupler, Gould draft beams with coupler and friction striking plate, Gould steel draft frame, friction gear and friction striking plate, Gould locomotive tender coupler with base casting and friction back of coupler for buffing, steel draft frame combination spring gear, friction striking plate and coupler, Gould steel platform with double operated passenger coupler, combination spring gear for passenger cars, combination spring passenger buffer, Gould "Simplex" system of electric lighting. Represented by F. P. Huntley, Geo. G. Milne, C. E. Rood, W. F. Richards, Dr. C. W. Gould J. S. Keeler, Geo. R. Berger, W. M. Lalor, W. F. Bouche, M. R. Shedd and J. W. Jepson. Spaces 637, 639 and 641.

Greene, Tweed & Company, New York, N. Y.—Palmetto packing, round and square, for high steam pressures. Palmetto packing, twist. Palmetto packing, in sets for railroad service. Manhattan packing, for low steam and hydraulic pressures. Favorite reversible ratchet wrench. Represented by F. E. Ransley and B. M. Buckley. Space 606.

Greenlaw Manufacturing Company, The, Boston, Mass.—Flexible metallic hose for use between engine and tender or between cars for conveying steam, air or oil, flexible joints for roundhouse purposes. Represented by H. A. Royce, George L. Toppan and W. A. Greenlaw. Spaces 316 and 318.

Grip Nut Company, Chicago, Ill.—Grip nuts, monogram bolt locks. Represented by E. R. Hibbard, J. W. Hibbard, W. G. Willcoxson, Ed. Wilhelm, J. W. Cuddy and E. A. Maguru. Space 600.

Hale & Kilburn Company, Philadelphia, Pa.—Walkover car seats, all-steel car seats, reclining car seats, parlor car chairs, steel car interior finish, doors and sash, steel construction in various forms. Represented by V. von Schlegell, A. F. Old, C. W. Laskay, Thos. Dunbar, B. F. Pilson and R. H. Pilson. Spaces 412 and 414.

Hammett, H. G., Troy, N. Y.—Trojan metallic packing, Trojan and Sansom bell ringers, triple valve bushing roller. Represented by H. G. Hammett, A. O. Van Dervort and E. C. Sawyer. Space 365.

Harrington, Son & Company, Inc., Edwin, Philadelphia, Pa.—Hand operated portable chain hoists, including Harrington peerless hoists, screw hoists and differential hoists. Represented by Roger Sherron, A. M. Harrington, R. F. Scott, W. J. Somerset, M. W. Christian, and J. A. Slaughter. Spaces 141 and 143.

Hewitt, H. H., New York, N. Y.—Cars trucks. Represented by S. J. Sill. Spaces 153 to 161, inclusive.

Hobart-Allfree Company, The, Chicago, Ill.—Allfree cylinders and valves for locomotives. Newton divided car replacers, Freeland derailers. Represented by E. H. Allfree and W. H. England. Space 506.

Home Rubber Company, Trenton, N. J.—Various kinds of packing for locomotive use. Represented by A. R. Foley. Space 321.

Hunt Company, C. W., New York, N. Y.—"Industrial" Railway, rolled steel and cast plate track, turntables, shop cars, special cars for handling wheels and axles, coal valves, coal tubs, locomotive coaling station models and photographs, hoisting and transmission rope, gravity bucket coal conveyors, motion pictures of cargo handling cranes. Represented by A. C. Summers, J. D. Flack and J. A. Allen. Spaces 154 to 160, inclusive.

Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Parts of locomotive castings made of Hunt-Spiller gun iron and which have been in service and show the stability and wearing qualities of this product, these parts being piston valve packing, cylinder packing, piston valve cages, crosshead shoes, eccentrics and straps, driving boxes, driving box shoes and wedges, piston heads, side rod bushings. Represented by W. B. Leach, Frederic Parker, J. G. Platt, V. W. Ellet and A. J. O'Connor. Spaces 565 and 566.

Hutchins Car Roofing Company, Detroit, Mich.—Car roofs and car doors. Represented by D. W. Hawksworth, Carter Blatchford, H. S. Waterman and W. D. Thompson. Space 631.

Illinois Steel Company, Chicago, Ill.—With the Carnegie Steel Company. Represented by W. H. H. Carhart. Space 411.

Independent Pneumatic Tool Company, Chicago, Ill.—Thor piston air drills, reversible flue rolling, reaming, tapping and wood-boring machines, close-quarter drills, grinders, pneumatic chipping, calking, flue beading and riveting hammers, pneumatic staybolt drivers. Represented by James B. Brady, W. O. Jacquette, John D. Hurley, F. W. Buchanan, R. S. Cooper, J. P. Bourke, T. J. Carroll, Geo. A. Gallinger, R. T. Scott, W. R. Gummere, F. H. Charbono, H. F. Finney, R. Mapelsden, V. W. Robinson, G. C. Wilson, Chas A. Brose and Walter A. Johnson. Spaces 576 and 578.

Industrial Supply and Equipment Company, Chicago, Ill.—Exhibit on track.

International Correspondence Schools, Scranton, Pa.—Demonstration by apprentices of apprentice class work in classes on various railways. Represented by W. N. Mitchell, E. M. Sawyer, C. M. Drennan, J. F. Cosgrove and G. B. Moir. Space 43.

Jacobs-Shupert U. S. Fire Box Company, Coatesville, Pa.—Fire box mounted on flat car on the exhibit track. Represented by A. W. Whitford.

Jenkins Bros., New York, N. Y.—Jenkins Bros. iron body and brass globe, angle, checks and gate valves, regular and extra heavy; brass and iron body blow-off valves; Jenkins "96" packing pump valves, gasket tubing and car heating discs. Represented by Arthur C. Langston, B. N. Neely, H. D. Gordon, C. B. Yardley, Jr., Chas. B. Ohlsen and Frank Martin. Space 602.

Jessop & Sons, Inc., New York, N. Y.—Tool steel. Space 416.

Johns-Manville Company, H. W., New York, N. Y.—Asbestos roofings, wool felt roofings, water-proofing materials, pipe covering felts, air-pump throttle, coil, spiral and sheet asbestos packings, high and low pressure pipe coverings and pipe covering felts, high temperature fire brick cements, pipe covering and boiler cements, electrical materials, boiler laggings and cements, vitribestos pipe coverings, transite

asbestos shingles, asbestos wood, asbestos smoke jacks, sanitor seats and tanks, under-ground electrical conduit, steel car insulation, refrigerator car insulation, car roofings, locomotive cab roofing, underground sectional conduit for steam lines, air brake expander rings. Represented by J. E. Meek, J. C. Younglove, F. M. Gilmore, H. A. Waldron, H. L. Leach, C. W. Gearhart, G. A. Nicol, H. G. Newman, Geo. Christenson and P. C. Jacobs. Spaces 591 and 592.

Joliet Railway Supply Company, Joliet, Ill.—Brake beams and side bearings. Represented by H. M. Perry. Space 603-605.

Jones & Laughlin Steel Company, Pittsburgh, Pa.—Beams and channels, spikes, tin and black plate, chains, cold rolled bars and shapes, wire and wire products, cold-twisted square bars, angles, bars and special shapes. Represented by J. K. Barker, A. A. Wagner and F. S. Slocum. Space 420.

Joyce-Cridland Company, The, Dayton, Ohio.—Jacks. Represented by Geo. W. Llewellyn, Chas. D. Derby, N. Kohl and P. J. Ford. Spaces 522 and 524.

Kennicott Company, The, Chicago, Ill.—Photographs of all Kennicott products to date. Represented by Chauncey J. Blair, Chauncey B. Blair, Cass L. Kennicott and G. E. Pratt. Space 650.

Kerite Insulated Wire & Cable Company, New York, N. Y.—Kerite insulated wires and cables. Represented by R. D. Brixey, Azel Ames, P. W. Miller, J. A. Renton, B. L. Winchell, Jr., and Geo. A. Graber. Spaces 611 and 613.

Keystone Drop Forge Works, Chester, Pa.—Keystone connecting link, Keystone safety shackle hook and a full line of Standard and Special drop forgings. Represented by Geo. H. Berlin, Chas. F. H. MacLaughlin and Wm. J. McDevitt. Space 604.

King Fifth Wheel Company, Philadelphia, Pa.—Roller-bearing pivot plate. Space 622.

Kirby Equipment Company, Chicago, Ill.—Franklin MCB dust-proof journal boxes and lids, samples of globe cold drawn seamless steel tubing for locomotive and stationary boilers, also for all mechanical purposes. Represented by T. B. Kirby, F. W. Renshaw, C. A. Carscadin and Harry W. Frost. Spaces 583 and 584.

Knight Pneumatic Sander Company, Huntington, Ind.—Sanders for steam and electric locomotives and motor cars. Represented by D. L. Shaeff. Space 644.

Landis Machine Company, Waynesboro, Pa.—One double head 1½-in. Landis bolt cutter, one single head Landis bolt cutter, pipe threading die heads, solid adjustable die head, automatic open die head for terret lathes, bolt cutters and die heads. Also a quantity of samples consisting of results on our machines. Represented by Ira D. Grove, J. W. Willis, H. L. Fisher and S. F. Newman. Space 115.

Landis Tool Company, Waynesboro, Pa.—One 16 x 72 plain self-contained grinding machine with gap, one No. 2 (12 x 32) Universal grinding machine. Represented by J. H. Hollinger. Spaces 108, 110 and 112.

Lehon Company, The, Chicago, Ill.—Roofrite plastic car roofing, waterproof canvas for passenger coach roofing, cab and caboose roofing, insulating paper, mule-hide roofing, staylastic paint, damptite waterproofing compound. Represented by Tom Lehon. Space 13.

Linde Air Products Company, The, Buffalo, N. Y.—Oxy-acetylene welding and cutting apparatus, single and duplex acetylene generator, stationary type, portable self-contained oxy-acetylene welding and cutting plant, portable oxy-coal gas cutting apparatus for wrecking trains, locomotive boiler repaired by oxy-acetylene welding under hydraulic test pressure, with numerous other samples of locomotive and steel car construction and repair by oxy-acetylene welding. Represented by G. E. Kershaw, J. A. Warfel, E. E. Radcliffe and G. M. Bailey. Space 660.

Locomotive Improvement Company, The, Clinton, Iowa.—Full sized driving box showing Markel's removable driving box brass, lateral motion plates, flangeless shoes and wedges, also a quarter sized model showing these three devices, models for jigs for forming brasses and wedges, model of solid back end of main rod. Represented by L. W. Barker. Space 15.

Locomotive Superheater Company, New York, N. Y.—Model of Schmidt superheater in model locomotive boiler. Represented by S. Hoffman, George L. Bourne, H. B. Oatley, W. A. Buckbee and C. D. Hiferty. Space 408.

Lucas Machine Tool Company, Cleveland, Ohio.—Horizontal boring machine power forcing press. Represented by W. L. Cheney and J. A. Leighton, Jr. Space 150.

Lunkenheimer Company, The, Cincinnati, Ohio—Regrinding valves, "Renewo" regrinding renewable seat valves, puddled semi steel valves, cast steel valves, iron body brass mounted valves, pop safety valves, water gages, gage cocks, oil and grease cups. Represented by Lane Thompson, Joseph H. Hewetson and W. M. Hood. Space 366.

Lupton's Sons Company, David, Philadelphia, Pa.—Lupton steel sash for side walls, Pond continuous sash for monitors and sawtooth roofs, Pond operating device, Lupton rolled steel skylight. Represented by Clarke P. Pond, C. F. P. Buckwalter and James E. German. Space 508.

McClellon, J. M., Boston, Mass.—McClellon locomotive boilers. Represented by J. M. McClellon and D. S. Reynolds. Space 526.

McConway & Torley Company, The, Pittsburgh, Pa.—McConway steel tired wheel, Buhoup flexible truck, Buhoup 3-stem passenger coupler, Pitt passenger coupler, Janney "X" and Penn freight couplers, steel castings. Represented by Stephen C. Mason, E. M. Grove, Wm. McConway, Jr., Geo. W. McCandless, H. C. Buhoup and I. H. Milliken. Spaces 617, 619 and 621.

McCord Manufacturing Company, Chicago, Ill.—Metal sash and window fixtures. Represented by D. W. McCord, Morrill Dunn, J. A. Lamon, R. L. McIntosh, W. J. Schlacks, H. E. Creer and B. S. McClellan. Space 657.

McCord & Company, Chicago, Ill.—Malleable iron, cast steel and vanadium grey iron journal boxes. Pinless lid and outside metal dust guard journal boxes, National equalizing wedges, draft gears, spring dampeners and operating locomotive force feed lubricator lubricating driving box. Represented by D. W. McCord, Morrill Dunn, J. A. Lamon, R. L. McIntosh, W. J. Schlacks and H. E. Creer. Space 655.

McGraw Publishing Company, New York, N. Y.—Publisher of *Electric Railway Journal, Electric World and Engineering Record.* Photographs of offices and printing plant; sample copies of its publications; bound copies convention souvenir number and convention daily issues of *Electric Railway Journal;* copies of Electric Railway dictionary, a new book devoted exclusively to electric cars and their equipment. Represented by Hugh M. Wilson, Henry W. Blake, Joseph A. Kucera, Rodney Hitt, C. A. Babtiste, W. K. Beard, Harold W. McGraw and D. S. Gordon. Space 7.

Main Belting Company, Philadelphia, Pa.—A belt conveyor and elevator, showing an acid heat and water-proof conveyor. Represented by J. D. McIlwain and W. E. Fawcett. Space 640.

Manning, Maxwell & Moore, Inc., New York, N. Y.—Hancock inspirators, Hayden & Derby injectors and ejectors, Metropolitan injectors, Hancock valves, Ashcroft steam gages, Consolidated pop safety valves, general jet apparatus, machine tools, Celfor drills. Represented by Robert Bole, L. M. Brigham, P. M. Brotherhood, J. N. Derby, C. B. Flint, W. O. Jacquette, H. Little, Chas. L. Lyle, M. A. Sherrett, Chas. L. Brown, Jos. A. Bush and J. J. Faas. Spaces 114 and 132.

Massachusetts Mohair Plush Company, Boston, Mass.—Car seats, mohair car plushes, frieze plushes and friezettes. Represented by William W. Melcher. Space 20.

Matthews-Davis Tool Company, St. Louis, Mo.—Davis expansion boring tools. Represented by E. E. Davis and J. W. McKeen. Space 647.

Michigan Lubricator Company, Detroit, Mich.—Locomotive lubricators from two-feed to five-feed automatic drain valves. Represented by Frank P. Smith and Cullen Corlis. Space 658.

Midvale Steel Company, The, Philadelphia, Pa.—One rolled steel wheel for passenger service, one rolled steel wheel for freight service, one steel tired wheel for passenger service, one driving axle for locomotive. Represented by H. M. Deemer, W. Aertsen, T. W. Illingworth, A. E. Goodhue, Charles Tietze, W. P. Barba, Ernest Harrah, Samuel Griffith, James Thompson and W. S. Edger. Space 37.

Mid-Western Car Supply Company, Chicago, Ill.—Anderson draft gear. Ward brake shoe. Represented by James E. Forsyth and D. O. Ward. Space 330.

Milburn Company, Alexander, Baltimore, Md.—Milburn acetylene lights and the new Alexander acetylene generator for headlights and train lighting. Represented by A. F. Jenkins, C. R. Pollard, J. W. McCawley and Frank Coffin. Space 18.

Moore & Company, Benjamin, Brooklyn, N. Y.—Paint vehicles for railroad paints, mixed paints and varnishes. Represented by Woodruff Sutton, W. C. Belcher and R. C. Bergman. Space 19.

Moran Flexible Steam Joint Company, Louisville, Ky.—Flexible joints, automatic barrel fillers, brass ball unions, pivot joints. Represented by C. H. Jenkins, W. W. Goodwin, Mrs. T. W. Moran and Frankel Moran. Space 21

Mudge & Company, Burton W., Chicago, Ill.—Garland System of passenger car ventilation, full size models showing application of Garland ventilators to monitor and arch roof cars. Ventilator registers and operating devices. Represented by Burton W. Mudge, Herbert Green, Thomas H. Garland and George W. Bender. Spaces 625 and 627.

Nathan Manufacturing Company, New York, N. Y.—Injectors, steam valves, boiler washer and tester, oil cups, whistles, engine and boiler fittings, lubricators, boiler checks, steam fire extinguisher, water gages and safety valves. Represented by Alfred Nathan, J. S. Seeley, Chas. R. Kearns, Otto Best, N. W. Anthony, Edw. S. Toothe, J. C. Currie, W. O. Taylor and Edw. Laterman. Spaces 589 and 590.

National Lock Washer Company, The, Newark, N. J.—Models showing complete car window curtains, and curtain and window fixtures; also National lock washers, with rib, for car construction. Represented by F. B. Archibald, R. L. Brown, W. C. Dodd, J. H. Horn, Daniel Hoyt and John B. Seymour. Space 4.

National Malleable Castings Company, The, Cleveland, Ohio.—Tower, Climax, Sharon, Latrobe car couplers, and repair parts for Tower, Climax, Sharon, Latrobe, Melrose, Munton and Chicago couplers, knuckle pins. Represented by S. L. Smith, F. R. Angell, R. T. Hatch, C. A. Bieder, L. S. Wright, K. R. Johnston, J. H. Jaschka, B. Nields, Jr., E. O. Warner, R. H. Pilson, J. H. Merrill, Jr., Geo. V. Martin, O. W. Loomis and Jas. A. Slater. Spaces 530, 532, 536, 612, 614 and 616.

National Tube Company, Pittsburgh, Pa.—Two booths, one used as a reception booth. In the other is shown Kewanee unions, union ells and tees, flange unions, high duty metal valves and cast and malleable iron fittings, also apparatus used in testing Kewanee unions. Represented by L. F. Hamilton, B. F. Bart, J. E. Fleming, J. G. Bateman, J. A. Dillon, C. R. Cumming, J. T. Goodwin, J. O. Ramsey, G. N. Riley, L. R. Phillips, P. J. Conrath and W. S. Bitting. Spaces 26 and 212.

Nelson Valve Company, Philadelphia, Pa.—Gate, globe and check valves, open-hearth steel valves, electrically operated valves. Represented by Carlisle Mason, R. E. Thomas and W. J. Spencer. Space 152.

Newhall Engineering Company, George M., Philadelphia, Pa.—Photographs of wrecking, locomotive, station cranes, etc., manufactured by Industrial Works, of Bay City, Michigan. "NB" air brake hose connection, Vance steam trap. Represented by David Newhall, Morton L. Newhall, A. F. Baumgarten, William L. Brown, William Waring and J. A. Coutts. Spaces 378, 379, 380 and 381.

New York Air Brake Company, New York, N. Y.—Apparatus shown in section as follows: Two engine brake valves, style L, two engineers' brake valve, style B3, two slide valve feed valves, style J, two straight air brake valves, two air signal valves, two automatic control valves, two quick action triple valves, style K, one enameled reservoir, one automatic connector head. Represented by F. M. Whyte, B. Pratt, W. T. Henry, H. F. Bickel, N. A. Campbell, O. E. Moore, G. O. Hammond and C. E. Leach. Spaces 330 to 338, inclusive.

Nickel-Chrome Chilled Car Wheel Company, Pittsburgh, Pa.—Two 33-in. car wheels, "M. C. B." 1909 tread, one 33-inch nickel-chrome tire, one 36-inch nickel-chrome tire, samples nickel-chrome alloy, sample fracture through chill tread of a car wheel. Represented by Robert C. Totten and Stephen D. Barnett. Space 542.

Niles-Bement-Pond Company, New York, N. Y.—New model of the Pond car wheel lathe driven by electricity. Represented by E. L. Leeds, Malcolm Imbrie, D. H. Teas, J. T. McMurray, J. P. Illsley, Geo. F. Mills, J. K. Cullen, D. J. Normoyle and E S. Cullen. The lathe is in a special booth on the boardwalk opposite the pier. Space 37.

Norton, Inc., A. O., Boston Mass.—High speed ball bearing jacks. Represented by A. O. Norton, J. O. St. Pierre, R. L. Skidmore, R. D. Bates and H. J. Wilson. Space 575.

Pantasote Company, The, New York, N. Y.—Samples of Pantasote curtain and upholstery materials, made-up Pantasote curtains, samples of Agosote in different shapes and sizes, painted and unpainted samples of Agosote veneered, section of a car showing Agosote as headlining and interior trim. Represented by J. M. High, W. A. Lake and A. S. Barrows. Space 400.

Parker Car Heating Company, Limited, The, London, Ontario.—Parker anti-freezing and hot water systems of railway car heating, simplified and new "E.T.O." equipments, stop valve, steam gages, regulator valve for controlling unit system in sleeping cars. Automatic auxiliary and discharge traps, half moon thermostatic traps and trainline valves. Represented by Thomas Parker, J. M. McEvoy and C. S. Parker. Spaces 216 and 218.

Parkesburg Iron Company, Parkesburg, Pa.—Knobbled charcoal iron boiler tubes and arch pipes. Represented by H. A. Beale, Jr., George Thomas, 3rd, W. H. S. Bateman, C. L. Humpton, J. A. Kinkead, L. P. Mercer, J. H. Smythe and H. C. Hunter. Space 388.

Parsons Engineering Company, Wilmington, Del.—Full size model of locomotive fire box with equipment of heater pipe and nozzle showing method of installing the Parsons system of combustion on locomotives. Represented by John H. Parsons, Wm. H. Savery, Harry Morris and J. A. Carey. Space 514.

Pennsylvania Flexible Metallic Tubing Company, Cleveland, Ohio.—Interlocking joint four-wall metal hose. Represented by J. M. Odenheimer, W. A. Johnson and B. C. Willis. Spaces 324 and 326.

Pilliod Brothers Company, Toledo, Ohio.—Pilliod locomotive valve gear. Wire locomotive ash pan. Represented by J. C. Pilliod and H. J. Pilliod. Space 367.

Pilliod Company, The, New York, N. Y.—Baker locomotive valve gear. Represented by R. H. Weatherly, F. E. Pilliod, A. Pilliod, R. F. Darby, K. J. Eklund and F. S. Wilcoxen. Spaces 563 and 564.

Pittsburgh Equipment Company, Pittsburgh, Pa.—One Pennsylvania 70 ton bolster, one Cudahy complete underframe consisting of two truck side frames, interlocking journal boxes and spring planks, one double I-beam truck bolster, one interlocking draft carrier, one pair of Stickel draft carriers, one pair of Stickel draft carriers, one insulated rail joint, one body bolster. Represented by H. V. Seth and John Allison. Space 405.

Pneumatic Jack Company, Inc., Louisville, Ky.—Twelve in. diameter by 3¼ in. lift, pneumatic journal jacks, tandem cylinder, capacity 7½ to 11 tons. 18 in. diameter by 12 in. lift, pneumatic car jacks, tandem cylinder, capacity 17 to 25 tons. Represented by A. T. Macdonald, L. J. Dittmar and J. S. Leake. Space 234.

Pocket List of Railroad Officials, New York, N. Y.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Chas. L. Dinsmore and Harold A. Brown. Space 7.

Post & Company, Inc., E. L., New York, N. Y.—Zero metal and babbitt metal for railroad use. Represented by F. O. Ketcham and P. H. Rebhorn. Space 624.

Pressed Steel Car Company, Pittsburgh, Pa.—Photographic display of steel passenger and freight cars, mine cars and pressed steel specialties. Represented by O. C. Gayley, N. S. Reeder, C. A. Lindstrom, J. F. MacEnulty, J. H. Mitchell, C. E. Postlethwaite, L. O. Cameron, J. G. Bower, G. T. Merwin, J. C. Anderson, J. S. Turner, W. H. Wilkinson, M. S. Simpson, H. S. Hammond and G. W. Ristine. Space 659.

Pyle-National Electric Headlight Company, Chicago, Ill.—Reception booth. Represented by R. C. Vilas, W. A. Vilas, J. Will Johnson and Mark A. Ross. Space 34.

Pyrene Manufacturing Company, New York, N. Y.—Chemical fire extinguisher. Represented by E. N. Davidson and Thomas Areson. Space 645.

Railway Age Gazette, New York, N. Y.—Publishers of the Railway Age Gazette, The Signal Engineer, the Daily Railway Age Gazette, and books germane to the railway industry. Represented by Edward A. Simmons, Lucius B. Sherman, Henry Lee, Frank S. Dinsmore, John N. Reynolds, Cecil R. Mills, Samuel O. Dunn, Bradford Boardman, Roy V. Wright, William Forsyth, George L. Fowler, Robert E. Thayer, William E. Hooper, E. S. Faust, Harold D. Horton, William D. Horton, W. W. Newcomb, Lewis I. Randolph, T. E. Crossman. Space 1.

Railway Appliances Company, Chicago, Ill.—Snow flangers, vestibule diaphraghms, vestibule casings, vestibule curtains, curtain handles, car replacers, skid shoes, automatic tongue lift and truck brake. Represented by Percival Manchester, W. W. Hoit, E. R. Packer and B. T. Lewis. Space 312.

Railway List Company, Chicago, Ill.—Railway Master Mechanic, Monthly Official Railway List, Railway Engineering and Maintenance of Way. Represented by W. E. Magraw, L. F. Wilson, J. M. Crowe and Warren Edwards. Space 35.

Railway Materials Company, The, Chicago, Ill.—Steel back brake shoes for locomotive drivers and all other classes of steam and electric railway service. Designs of Ferguson shop furnaces for all blacksmith and boiler shop purposes. Represented by T. B. Cram, Geo. Hoeffle, E. C. Folsom, C. H. True, J. F. Schurch and W. M. Simpson. Space 581.

Railway & Engineering Review, Chicago, Ill.—Represented Willard A. Smith, Arthur E. Hooven, P. G. Stevens and John M. Lammedee. Spaces 12 and 14.

Ralston Steel Car Company, Columbus, Ohio.—An all-steel, flush floor, drop bottom gondola, 50 tons capacity. Represented by J. S. Ralston, J. E. Tesseyman, F. E. Symons, H. H. Hale, W. T. Sheldon, S. Rea, W. F. La Bonta, J. R. Forney, H. Tesseyman, Wm. Mahaney and Geo. H. Glover, Jr. Space on track.

Reliance Electric & Engineering Company, Cleveland, O.—Reliance adjustable speed motors, of the armature shifting type, with automatic starting equipment; Reliance speed

dial, G. & E. crank shaper driven by Reliance adjustable speed motor. Represented by H. Morley Hitchcock, A. W. Ray, D. G. Darling, E. A. Lewis and S. C. Potter. Spaces 137 and 139.

Remington Typewriter Company, New York, N. Y.—Remington typewriters with Wahl adding and subtracting mechanism. Represented by A. T. Rose and E. S. Maulsby. Space 416.

Restein Company, Clement, Philadelphia, Pa.—Belmont air pump and throttle packings, corrugated tender hose and steam hose, flexible metallic connections for between engine and tender. Represented by Clement Restein, H. O. Fettinger, Norman B. Miller and W. J. Cromie. Space 16.

Rock Island Manufacturing Company, Rock Island, Ill.—Vises of different types. Represented by C. E. Shields and W. M. Briggs. Space 656.

Rockwell Furnace Company, New York, N. Y.—Furnaces for railway shops. Space 2.

Royersford Foundry & Machine Company, Inc., Royersford, Pa.—Power punch and shear, Sells roller bearing shaft hanger box. Represented by Y. C. Freed, John D. Sells and A. Loomis. Spaces 129 and 131.

Rubberset Company, Newark, N. J.—Paint and varnish brushes. Represented by A. L. Holtzman and T. B. Denton. Space 310.

Safety Car Heating & Lighting Company, New York, N. Y.—Car Heating and lighting apparatus, car lighting by Pintsch gas, axle light and vapor light, latest designs of Pintsch mantle lamps and electric fixtures, car heating by thermo jet direct steam and hot water with thermo jet control. Represented by R. M. Dixon, A. C. Moore, C. B. Adams, J. S. Henry, Wm. St. John, J. G. Van Winkle, H. D. Donnell, J. M. Wallis, W. L. Garland, M. F. Elliott, Geo. H. Chadwell, Robt. C. Shaal, J. A. Dixon and Geo. E. Hulse. Space, stairway platform.

Scarritt-Comstock Furniture Company, St. Louis, Mo.—Scarritt automatic and reversible coach seats and Scarritt reclining chairs. Represented by C. C. Taylor. Space 306.

Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.—Steel castings. Space 25.

Sellers & Company, Inc., William, Philadelphia, Pa.—Locomotive injectors and accessories, turret rest and face plate drivers, locomotive wheel lathe, turret rest and face plate drivers for car wheel lathe, hangers and couplings for shafting. Represented by Strickland L. Kneass, John D. McClintock, Charles T. Wilson, Edward L. Hölljes, C. B. Conger and W. W. Storm. Spaces 567 to 570, inclusive.

Sherwin-Williams Company, Cleveland, Ohio.—Reception booth. Represented by E. M. Richardson, W. B. Albright, Thos. Madill and R. L. Graves. Space 33.

Simplex Railway Appliance Company, New York, N. Y.—With the American Steel Foundries exhibit. Space 168.

Sipe & Company, James B., Pittsburgh, Pa.—Oils. Space 636.

Smith Premier Typewriter Company, The, Syracuse, N. Y.—Machines for correspondence, billing and way-billing. Represented by H. A. Johnstone. Spaces 333 and 335.

Sprague Electric Works of General Electric Company, New York, N. Y.—Flexible steel armored air brake hose, pneumatic hose, steam hose, hydraulic and water hose, hose fittings, flexible steel conduit, flexible steel armored conductors, outlet boxes and fittings, electric fans. Represented by A. C. Bakewell, D. C. Durland, H. H. Hornsby and H. W. Uhl. Space 386.

Standard Coupler Company, New York, N. Y.—Standard steel platforms and buffing mechanism. Sessions-Standard friction draft gears. Represented by Geo. A. Post, A. P. Dennis, E. H. Walker, R. D. Gallagher, Jr., C. D. Jenks and Geo. A. Post, Jr. Spaces 385 and 387.

Standard Steel Car Company, New York, N. Y.—Reception space only. Represented by J. M. Hansen, J. B. Brady, R. L. Gordon, H. G. Macdonald, W. A. Libkeman, A. Christianson and E. G. Huyett. Spaces 557 and 558.

Standard Steel Works Company, Philadelphia, Pa.—Driving tire, steel tired wheels, rolled steel wheel driving wheel centers, driving axles, forgings, rings and springs. Represented by Charles Riddell, C. F. Dodson, J. E. Buckingham, W. T. Bentley, C. H. Peterson, H. P. Knight, George F. Jones, W. B. Keys, A. R. Green, H. G. Pearce, J. C. Sellers, Jr., and F. W. Weston. Space 9.

Storrs Mica Company, Owego, N. Y.—A new form of ruby mica lantern globes shown in lantern frames of various leading manufacturers, white mica lantern globes and mica headlight chimneys. Represented by A. P. Storrs and Charles P. Storrs. Space 601.

Street, Clement F., Schenectady, N. Y.—One locomotive stoker. Represented by Clement F. Street, N. M. Lower and Chas. F. Gernert. Space 403.

Strong, Carlisle, Hammond Company, The, Cleveland, O.—Samples of Randall graphite lubricator and sample bearings, showing the installation of Randall graphite sheet lubricator. Represented by B. E. Carpenten, Charles F. Pierce and R. L. Woodward. Space 314.

Summers Steel Car Company, Pittsburgh, Pa.—Summers balanced side bearing truck, Summers all-steel box car under balanced side bearing trucks. Represented by E. W. Summers, J. M. Summers and Frederic Schaeffer. Space 149.

Symington Company, The T. H., Baltimore, Md.—Farlow draft gear, Symington journal boxes, flexible dust guards. Represented by T. H. Symington, E. H. Symington, W. W. Rosser, D. F. Mallory, W. A. Garrett, D. L. Symington, B. S. Johnson, I. O. Wright, J. F. Symington, C. J. Symington, T. C. deRosset and A. H. Weston. Spaces 559 to 562, inclusive.

Templeton, Kenly & Company, Limited, Chicago, Ill.—Simplex car jacks, coach jacks, locomotive jacks and track jacks. Represented by A. E. Barron, F. A. Barbey, W. B. Templeton and J. H. Hummel. Space 319.

Topping Brothers, New York, N. Y.—Full line of Burrows' ball bearing jacks and "Quick Lift" jacks, also "The Mechanigraph" for preparing pencil drawings for blue printing. Represented by W. R. Burrows, W. C. Burrows, C. L. Crabb and W. C. Douglas. Spaces 402 and 404.

Trill Indicator Company, Corry, Pa.—Engine indicators of the continuous card type, using an unlimited amount of paper; also ouside spring and inside spring indicators of the single card type, reducing wheels and cord take-ups and planimeters of the direct reading type. Represented by W. L. Trill and Leonard T. McElroy. Space 638.

Tyler Company, The W. S., Cleveland, Ohio.—Draftac spark arrester, steel stack netting, iron, steel, brass, copper, phosphor bronze and galvanized double crimped wire cloth. Represented by L. D. Winters, M. P. Reynolds and W. P. Cahall. Space 642.

Underwood & Company, H. B., Philadelphia, Pa.—Portable cylinder boring bar, rotary boiler tube cleaner, belt driven pipe bender and straightener (Model), new heavy type valve seat rotary planer. Represented by A. D. Pedrick and D. W. Pedrick, 2d. Spaces 165 and 167.

Union Draft Gear Company, Chicago, Ill.—Cardwell friction draft gear. Cardwell rocker side bearings. Represented by J. R. Cardwell, L. T. Canfield, W. G. Krauser, J. W. Hathaway and J. E. Tarelton. Space 409.

Union Fibre Company, Winona, Minn.—Exhibition refrigerator car on tracks of the Philadelphia & Reading Railway on Mississippi avenue, near convention pier. In booth, model of Brown's collapsible tank for refrigerator cars and model of refrigerator car, showing the method of insulating refrigerators with linofelt. Represented by H. W. Leeds, J. H. Bracken and S. E. McPartlin. Space 236.

Union Manufacturing Company, New Britain, Conn.—Complete line of Chucks. Represented by A. F. Corbin, M. L. Bailey, H. H. Wheeler, C. S. Neumann, E. I. Stevens and J. W. Carleton. Spaces 117 and 119.

Union Spring & Manufacturing Company, Pittsburgh, Pa.—Coil and elliptic springs, Kensington all-steel journal boxes, pressed steel journal box lids, pressed steel spring plates and steel castings. Represented by A. M. McCrea, L. G. Woods, C. S. Foller, H. B. Darlington, A. C. Woods, T. B. Arnold, W. F. LaBonta, H. F. Ayres, A. Pancoast and G. H. Channel. Spaces 538-540.

United Engineering & Foundry Company, Pittsburgh, Pa.—High speed steam-hydraulic forging press in operation on car, Mississippi avenue next to boardwalk. Headquarters, space 28, in main building. Represented by J. A. Eden, Jr. Space 28.

United States Light & Heating Company, The, New York City, N. Y.—Axle electric car lighting apparatus. Axle driven generators, truck suspensions, generator regulators, lamp regulators, storage batteries for car lighting, signals, telephones and central stations. Represented by D. W. Pye, J. Allan Smith, A. H. Ackermann, W. L. Bliss, W. A. Turbayne, W. P. Hawley, Frank Engel, C. C. Carpenter, C. L. Lane, W. G. Davis, E. F. Oates and A. Russell. Spaces 374 to 377, inclusive.

U. S. Metal & Manufacturing Company, New York, N. Y.—"Empire" pressed steel truck bolster, "Owen-Cochran" pressed steel journal box, feasible drop brake staff, Diamond tapered steel poles, Columbia lock nuts, "Galco" artificial lumber, Anglo-American varnish, shop cleaner, St. Louis Surfacer and Paint Company panels, M. C. B. repair card box, Detroit car door. Represented by B. A. Hegeman, Jr., Chas C. Castle, J. J. Ross, F. C. Dunham, E. D. Hillman and H. A. Hegeman. Space 337.

United States Metallic Packing Company, The, Philadelphia, Pa.—King type metallic packing for locomotive piston rods

and valve stems, and the same type for locomotive air pumps, United States multiangular metallic packing for locomotive piston rods and valve stems, Gollmar bell ringer, Leach pneumatic track sander, indestructible oil cup. Represented by Elliott Curtiss, Morris B. Brewster, C. B. Ford, John S. Mace, C. L. Mellor and Harry M. Woy. Space 643.

United States Radiator Corporation, Detroit, Mich.—Cast-iron heating boilers, cast-iron radiators, wall radiators, cast-iron tank heaters, car heaters, packless steam and water radiator valves. Represented by Frederick W. Herendeen, George C. Blackmore, George W. Barr, M. D. Keyes and Joshua Naylor. Space 308.

Universal Safety Tread Company, Boston, Mass.—Universal safety tread for car steps, stations, platforms and stairs, a new metal rack for cars. Represented by F. W. Langford and A. L. Whipple. Space 607.

Van Dorn & Dutton Company, The, Cleveland, O.—Hard Service (portable) electrically operated drills and reamers, V. D. & D. gears and pinions. Represented by F. W. Sinram, Franklin Schneider, A. N. Frecker, Robert Tinsley, North Storms, J. D. Granville and A. K. Baxter. Spaces 133 and 135.

Van Dyck Churchill Company, New York, N. Y.—Higley cutting off saw. Space 103.

Ward Equipment Company, New York, N. Y.—Car heating apparatus, steam heat equipment for locomotives, passenger car ventilators, yard plugs and car receptacles for charging storage batteries on electrically lighted cars. Ward steam couplers, end train line valves, unotherms and improved car heating material of all kinds. Represented by John E. Ward, George B. Culver, C. E. Lowell and Peter Fink. Spaces 553 to 566, inclusive.

Warner & Swasey Company, The, Cleveland, O.—Number 3A hollow hexagon turret lathe. Represented by A. C. Cook and W. E. Marshall. Space 145.

Welsbach Company, Gloucester, N. J.—Various kinds of railway lamps for use on platforms, stations and office lighting. Represented by Sidney Mason, Townsend Stites, F. N. Hamerstrom, T. J. Little, Jr., and C. W. Wardell. Spaces 42 and 44.

West Disinfecting Company, New York, N. Y.—Liquid soap dispensers, deodorizing machines, fumigating machines, automatic sprinklers, spraying machines and fluids used in above. Represented by Geo. L. Lord and H. E. Daniels. Space 516.

Western Railway Equipment Company, St. Louis, Mo.—Acme brake slack adjusters, car door fastenings, Downing card holders, Western brake jaws, brake pins, Western bell ringer, Acme pipe clamps, Western sill and carline pockets, fish hook tie plates, Linstrom syphon pipes, Republic draft gear, tie dating nails, interchangeable car doors, Linstrom eccentrics, Hoerr car doors, Western flush car doors, Security dust guard, Western angle cock holders, Economy slack adjusters, St. Louis flush car doors. Represented by Louis A. Hoerr and S. H. Campbell. Spaces 370, 371, 372 and 373.

Western Steel Car & Foundry Company, Hegewisch, Ill.—Exhibit with the Pressed Steel Car Company. Space 659.

Western Wheeled Scraper Company, Aurora, Ill.—Thirty cubic yard 100,000 pounds capacity Western air dump car for railroad construction and betterment work. Represented by M. E. Davis and J. B. Rhodes. Space, track.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Empty and load brake demonstration rack, PC equipment demonstration rack, centrifugal dirt collector demonstration rack, PC equipment illuminated chart, Westinghouse brake test truck, Westinghouse enameled main reservoirs, galvanized annealed steel hose clamp, centrifugal dirt collector for 9½-inch compressor. Represented by A. L. Humphrey, W. V. Turner, E. A. Craig, F. H. Parke, H. E. Chilcoat, Robert Burgess, Joseph R. Ellicott, F. V. Green, F. M. Nellis, C. H. Larimer, S. J. Kidder, T. R. Brown, E. H. Dewson, F. H. Whitney, W. S. Bartholomew, C. J. Olmstead, E. L. Adreon and C. P. Cass. Spaces 27, 29, 31 and 136 to 146, inclusive.

Westinghouse, Church, Kerr & Company, New York, N. Y.—With the Westinghouse Air Brake Company exhibit.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Alternating current and direct current motors, complete with control apparatus, for constant and varying speeds. Represented by Charles Robbins, J. H. Klinck, J. C. McQuiston, C. G. Tarkington, F. H. Herzsch, R. F. Moon and H. L. Vogel. Space 27-29-31 and 136 to 146; even numbers.

Westinghouse Lamp Company, Bloomfield, N. J.—Tungsten and carbon lamps for all standard voltages and of all standard sizes. Represented by B. F. Fisher, Jr. Space 27-29-31-136 to 146; even numbers.

Westinghouse Machine Company, East Pittsburgh, Pa.—25 K. W. turbo-generator outfit. Represented by L. L. Brinsmade and E. H. Sniffin. Spaces 27, 29, 31 and 136 to 146, inclusive.

Westinghouse Traction Brake Company, Pittsburgh, Pa.—With the Westinghouse Air Brake Company exhibit.

Wheel Truing Brake Shoe Company, Detroit, Mich.—Abrasive brake shoes for truing locomotive driver wheels and car wheels. Represented by J. M. Griffin. Space 629.

Williams All-Service Car Door Company, Clinton, Ill.—A box car door. Represented by M. L. Evans and W. H. Hastings. Space 401.

Wilson Remover Company, New York, N. Y.—Paint and varnish remover. Represented by J. MacNaull Wilson and J. Whitney Wilson. Space 222.

Wood, Guilford S., Chicago, Ill.—Wood's flexible nipple end protector. The monogram train pipe bracket. Represented by Guilford S. Wood, D. J. Jennings and S. G. Rea. Space 512.

Wood Locomotive Fire Box & Tube Plate Company, The Wm. H., Media, Pa.—One Wm. H. Wood patent loco fire box, full size, with balanced corrugated formation. Section of flanging. Represented by Wm. H. Wood and Fred H. Snell. Space 214.

Yale & Towne Manufacturing Company, The, New York, N. Y.—Chain blocks, trolleys, electric hoists and hardware. Represented by R. N. Hodgkins, T. J. White, W. J. Nahrwold, C. W. Beaver, A. W. Patterson, Jr., H. H. Ricketts, Forbes Liddell and H. C. Spaulding. Spaces 151 and 368.

Zug Iron & Steel Company, Pittsburgh, Pa.—Staybolt, engine bolt and forging irons. Represented by John H. McCloy and A. M. Brown. Space 232.

THE SPECIAL TRAIN FROM CHICAGO.

The Pennsylvania M. M. and M. C. B. special train from Chicago left that city at 3 p. m. on Monday and arrived in Atantic City at 3.47 p. m. yesterday. The train was in charge of E. K. Bixby, district passenger agent of the Pennsylvania Lines at Chicago. It was a double-header, and contained one parlor-baggage car, nine sleepers, two diners, and one observation car. Despite the fact that it had 13 cars and arrived on June 13, those on it had a very pleasant trip. Among those on board were the following:

H. L. Adams, Chicago Welding Company, Chicago; George T. Anderson and wife, Whipple Car Company, Chicago; R. W. Bell and wife, supt. machinery, Illinois Central R. R., Chicago; A. S. Barrows, Pantasote Company, Chicago; R. T. Bryden, Wadsworth-Howland Company, Chicago; George L. Bourne, Locomotive Superheater Company, Chicago; L. W. Barker, Locomotive Improvement Company, Clinton, Iowa; F. J. Bingham, White Enamel Refrigerator Company, Chicago; Chauncey B. Blair, The Kennicott Company, Chicago; M. C. Beymer, American Arch Company, Chicago; A. L. Beardsley and wife, Cleveland Twist Drill Company, Chicago; R. L. Brown, National Lock Washer Company, Chicago; F. J. Blum, Armstrong Blum Company, Chicago; S. L. Beam, M. S. A. T. & S. F. Railway, Los Angelos, Cal.; W. C. Bell, National Boiler Washing Company, Chicago; J. W. Cyr, S. M. P. C. B. & Q. Ry., Chicago; W. H. C. Carhart, Illinois Steel Company, Chicago; George R. Carr, Dearborn Drug & Chemical Works, Chicago; C. A. Coons, American Arch Company, Omaha, Neb.; J. B. Cram, Railway Materials Company, Chicago; J. J. Dale, Celfor Tool Company, Chicago; T. Dunbar, Hale-Kilburn Manufacturing Company, Chicago; F. T. DeLong, Chicago Railway Equipment Company, Chicago; J. F. DeVoy, Asst. S. M. P. C. M. & St. P. Ry., Milwaukee; L. L. Dawson and wife, S. M., Fort Worth & Denver City, Childers, Tex.; H. F. Daniels, West Disinfecting Company, Chicago; A. G. Delaney, Chicago Car Heating Company, Chicago; Seeley Dunn, Bullard Car Door Equipment Company, Chicago; C. F. Dodson, Baldwin Locomotive Works, Chicago; W. W. Darrow, The Camel Company, Chicago; J. F. Dunn and wife, S. M. P., O. R. S., Salt Lake City; A. Christensen, Aurora Metal Company, Aurora, Ill.; P. M. Elliott, The Camel Company, Chicago; S. W. Edwards, Ohio Injector Company, Chicago; E. C. Cook, The Railway

Journal, Chicago; T. E. Eanils, Little Giant Lubricator Company, Chicago; M. S. Curley, O'Mally Brass Company, Memphis, Tenn.; J. R. Cardwel, Union Draft Gear Company, Chicago; C. C. Farmer, Westinghouse Air Brake Company, Chicago; P. J. Ford, Crerar, Adams & Co., Chicago; Frank W. Furry, Ohio Injector Company, Chicago; W. S. Furry, Ohio Injector Company, Chicago; C. E. Fuller and family, G. S. M. P., Union Pacific R. R., Omaha; J. P. Gowing, Pratt & Lambert, Chicago; E. H. Gold, Chicago Car Heating Company, Chicago; Allan Goodhue, Midvale Steel Company, Chicago; Wm. Gill, M. M., Iowa Central Ry., Marshalltown, Iowa; F. M. Gilmore, Johns-Manville Company, Chicago; C. E. Gossett, M. M. M. & St. L. Ry., Minneapolis, Minn.; A. H. Gairns and wife, Central Locomotive & Car Works, Chicago; H. H. Gilbert, G. E. Mathson Company, Chicago; E. A. Gilbert and wife, W. H. Miner Company, Chicago; O. C. Hayward, Tousey Varnish Company, Chicago; George L. Harvey, Frost Railway Supply Company, Chicago; C. A. Hardy, Whiting Foundry Equipment Company, Chicago; M. H. Haig, M. M. A. T. & S. F. Ry., Topeka, Kan.; W. J. Hosciet, Rodger Ballast Car Company, Chicago; E. R. Hibbard, Grip Nut Company, Chicago; I. C. Hicks, M. M. A. T. & S. F. Ry., San Bernardino, Cal.; J. H. Hummel, Templeton Kenly & Co., Chicago; C. J. Holland, American Steel Foundries, Chicago; G. J. Hatz, M. M. U. P. R. R., Omaha; J. G. Hatz and wife, Bettendorf Axle Company, Devenport, Ia.; P. C. Jacobs, Johns-Manville Company, Chicago; K. R. Johnson, National Malleable Castings Company, Chicago; E. A. Johnson, W. H. Miner Company, Chicago; W. L. Kellogg, S. M. P. C. H. & D. Ry., Cincinnati; H. P. Knight, Baldwin Locomotive Works, Chicago; C. L. Kennicott, The Kennicott Company, Chicago; J. S. Luscombe, M. M. T. & O. C. R. R., Becyrus, O.; John Lammedee, Railway & Engineering Review, Chicago; E. F. Leigh, Chicago Ry. Equipment Company, Chicago; J. R. Mitchell, W. H. Miner Company, Chicago; Thomas Madill, Sherwin-Williams Company, Chicago; L. P. Mercer, Parkesburg Iron Company, Chicago; A. E. Manchester, G. S. M. P. C. M. & St. P. Ry., Chicago; G. A. Murphy, Hewitt Supply Company, Chicago; G. B. Moore, American Arch Company, Chicago; J. P. Moses, Joseph T. Ryerson & Son, Chicago; E. S. McClellan, McCord Mfg. Company, Chicago; W. E. Magraw, Railway List Company, Chicago; W. N. Mitchell, International Correspondence School, Scranton, Pa.; C. F. McClune, International Correspondence School, Scranton, Pa.; C. J. Nash, Westinghouse Air Brake Company, Chicago; G. P. Nichols, G. P. Nichols & Co., Chicago; J. L. Nicholson and wife, American Arch Company, Chicago; J. G. Neuffer, S. M. P., Chicago Great Western Ry., Chicago; J. T. O'Connor, W. H. Miner Company, Chicago; Edward O'Mally, The O'Mally Brass Company, Chicago; J. N. Moore, B. M. Jones Company, Chicago; George H. Porter, Western Electric Company, Chicago; W. J. Pierson, Adams & Westlake Company, Chicago; E. W. Pratt, A. S. M. P. Chicago & Northwestern Ry., Chicago; R. W. Rusterhalz, Ingersoll-Rand Company, Chicago; G. W. Ristine, Jr., Pressed Steel Car Company, Chicago; W. E. Robertson, W. H. Miner Company, Chicago; W. A. Smith, Railway & Engineering Review, Chicago; P. G. Stevens, Railway & Engineering Review, Chicago; C. E. Shields, Rock Island Mfg. Company, Rock Island, Ill.; W. M. Simpson, Railway Materials Company, Chicago; C. A. Seley, M. E. C. R. I. & P. Ry., Chicago; W. J. Schlacks, McCord & Co., Chicago; C. W. Seddon, S. M. P. D. M. & N. Ry., Proctor, Minn.; E. C. Schmidt, Professor of Railway Engineering, University of Illinois, Urbana, Ill.; C. A. Schroyer, wife and daughter, S. C. D. C. & N. W. Ry., Chicago; R. T. Scott, Independent Pneumatic Tool Company, Chicago; G. N. Sweringen, Chicago Railway Equipment Company, Chicago; J. F. Schurch, Railway Materials Company, Chicago; E. E. Silk, Bettendorf Axle Company, Chicago; North Storms, Tinsley Railway Supply Company, Chicago; Gustav Thurnauer, Aurora Metal Company, Aurora, Ill.; C. H. Tobias, Union Draft Gear Cimpany, Chicago; W. J. Tollerton, A. G. S. M. P. C. R. I. & P. Ry., Chicago; W. White, National Boiler Washer Company, Chicago; R. T. Walbank, Glidden Varnish Company, Chicago; J. H. Waterman, Supt. Tie Preserving, C. B. & Q. Ry., Chicago; H. A. Waldron, Johns-Manville Company, Chicago; A. C. Woods, Railway Spring & Mfg. Company, Chicago; W. J. Walsh, Galena Signal Oil Company, Chicago; L. F. Wilson, Railway List Company, Chicago; C. L. Woodruff, Lowe Bros. Company, Chicago; D. O. Ward, Mid-Western Car Supply Company, Chicago; W. M. Wilson, J. Rogers Flannery & Co., Chicago; Edward Wilhelm, Grip Nut Company, Chicago; Wm. Wilcoxson, Grip Nut Company, Chicago; J. C. Younglove, Johns-Manville Comany, Chicago; B. B. Young, M. E. C. B. & Q. R. R., Chicago; J. D. Ristine, Mamolith Carbon Paint Company, Chicago; C. E. Rose, Automatic Machine Company, Chicago.

THE NEW YORK SPECIAL TRAIN.

A special train on the Central of New Jersey brought a large party for the Conventions from New York City yesterday afternoon. The train consisted of a combination parlor and baggage car and four parlor cars. It left New York at 3.40 p. m. and arrived in Atlantic City at 6.45 p. m. Among those who came on it were the following:

H. F. Armstrong, Davenport Locomotive Works; Thomas Arnold, Taylor & Arnold, Ltd.; Fred Atwater, Columbia Nut & Bolt Company; E. A. Averill, *Am. Eng. & R. R. Journal;* A. R. Ayers, M. E., L. S. & M. S. Ry.; Frank A. Barbey, Frank A. Barbey Company; H. F. Beckel, New York Air Brake Company; E. Bjerregaard, Official Ry. Guide; R. M. Brower, American Brake Shoe & Foundry Company; Lucian C. Brown, United Equipment Company; T. R. Brown, Westinghouse Air Brake Company; Geo. H. Bryant, Thos. Prosser & Son; E. G. Buchanan, Carbon Steel Company; Chas. C. Castle, U. S. Metal & Manufacturing Company; C. E. Chambers and wife, S. M. P., C. R. R. of N. J.; Jos. Chidley, M. M., L. S. & M. S. Ry.; Frank F. Coggin, Chicago Car Heating Company; C. W. Cross, Supt. Apprentices, New York Central Lines; H. M. Deemer, Midvale Steel Company; Geo. Donahue, Corona Manufacturing & Supply Company; Jos. R. Ellicott, Westinghouse Air Brake Company; J. T. Flavin, M. M., C. I. & S. R. R.; Geo. L. Fowler and wife, C. B. Friday, Carnegie Steel Company; A. L. Graburn, M. E., Canadian Northern; Frederick V. Green, Westinghouse Air Brake Company; H. D. Hawks, General Electric Company; B. A. Hegeman, Jr., U. S. Metal & Manufacturing Company; John M. High, Pantasote Company; Mrs. High and Miss May Hedley; S. Hoffmann, Locomotive Superheater Company; A. W. Horsey, District Master Mechanic, Canadian Pacific, and A. Sutherland Horsey; Judson A. Lamon, McCord & Company; C. E. Lester, general foreman, Erie; D. R. MacBain, S. M. P., L. S. & M. S.; Misses Helen and Grace MacBain; W. W. Melcher, Massachusetts Mohair Plush Company; P. H. Minshull, Gen. For., N. Y. O. & W., Mrs. Minshull; John F. Muldoon, Corona Manufacturing & Supply Company; C. S. Myers, Railway List Company; W. M. Perrine, M. M., C. of N. J., Harold Perrine; T. B. Purves, Jr., C. H. Overeau, Supt. Elec. Equip., N. Y. C. & H. R.; Robert Radford, Sec. Standard Steel Works Company; O. H. Reynalds, Jessop Steel Company, Mrs. Reynalds; Geo. W. Rink, Mech. Engr., C. of N. J., Mrs. Rink; Wallace H. Robb, Canadian Manager Anchor Packing Company; T. Rumney, Genl. Mech. Supt., Erie; Thomas S. L. Seaman, American Brake Shoe & Foundry Company; N. E. Sproul, Supt. Shops, Atlantic Coast Line, Mrs. Sproul, Lester Sproul, Mrs. E. Buchanan, F. H. Thompson, *American Engineering & Railroad Journal;* F. H. Smith, Gold Car Heat-

ing & Lighting Company; G. L. Van Doren, Supt. Shops, C. of N. J.; Harry D. Vought, New York and Central Railroad Clubs, Mrs. Vought; Frank H. Waller, Flower Waste & Packing Company, and Divine Bros. Company; R. H. Weatherly, The Pilliod Company, Mrs. Weatherly; V. S. Yarnall, Carnegie Steel Company.

M. M. REGISTRATION.

Allen, C. W., Shelburne.
Allen, G. S., Resident M. M., P. & R. Ry., Penhurst.
Aldcorn, Thos., Chicago Pneumatic Tool Co., Marlborough-Blenheim.
Ball, H. F., American Loco. Co., Marlborough-Blenheim.
Bechhold, H. G., Young's Hotel.
Bell, J. Snoden, St. Charles.
Bentley, H. T., A. S. M. P.-C. & N. W. Ry., Marlborough-Blenheim.
Berry, A. O., Supt. Shops, L. S. & M. S., Traymore.
Billingham, R. A., S. M. P., Pitts., Shawmut & Northern R. R., Traymore.
Bingley, W. J., M. M., West Maryland Ry., Monticello.
Bohan, W. J., Mech. Engr., Northern Pacific R. R., Dennis.
Brazier, F. W., Supt. Car Dept., N. Y. C., Marlborough-Blenheim.
Canfield, J. B., M. M., Boston & Albany R. R., Penhurst.
Carroll, J. T., S. M. P., B. & O., Traymore.
Casey, Fred A., V. P., The Ashton Valve Co., Marlborough-Blenheim.
Chenowith, Edwin G., M. E., Erie R. R., Young's.
Chisholm, J. E., Monticello.
Cole, Thos. J., M. M., Erie R. R. Co., Schlitz.
Crawford, D. F., G. S. M. P., Penna. Lines (West).
Curley, M. S., M. M., Frisco Lines, Marlborough-Blenheim.
Cyr, J. W., S. M. P., C. B. & Q. Lines, East, Dunlop.
Dawson, L. L., S. M. P., Ft. Worth & Denver City Ry., Brighton.
Depue, G. T., M. M., Erie R. R., Lexington Hotel.
Dunlap, W. H., M. M., L. & N. R. R., Seaside.
DeVoy, J. F., M. E., C. M. & St. P. Ry., Shelburne.
Edward, J. B., M. M., Col., Newberry & Laurius R. R., Strand Hotel.
Ettinger, R. L., C. M. E., Southern Ry., Dennis.
Flory, B. P., S. M. P., N. Y. O. & W. R. R., Marlborough-Blenheim.
Fogg, J. W., M. M., B. & O. C. T. R. R., Chalfonte.
Forsyth, Wm., The Railroad Age-Gazette, Traymore.
Foster, O. M., M. M., L. S. & M. S. Ry. Co., Traymore.
Fuller, C. E., A. G. M., Union Pacific Ry., Marlborough-Blenheim.
Gairns, A. H., M. M., Oregon Short Line R. R., Chalfonte.
Gaines, F. F., S. M. P., Central of Georgia R. R., Dennis.
Gill, Wm., M. M., Iowa Central R. R., Rudolf.
Gossett, Chas. E., M. M., Minn. & St. L. Rv., Dennis.
Gould, Jos. E., S. M. P., Norfolk & Southern Ry., Dennis.
Hagan, C. H., S. M. P., N. Y. C. & H R. R. R., Marlborough-Blenheim.
Hancock, Geo. A., S. M. P., St. L. & S. F. Ry., Marlborough-Blenheim.
Hatz, G. J., M. M., U. P. Ry., Haddon Hall.
Hayes, John F., M. M., Grand Rapids & Indiana Ry., Young's.
Heiser, W. F., M. M., C. & E. I. R. R., Strand.
Hicks, I. C., M. M., A. T. & S. F. Ry., Dennis.
Hyndman, F. T., M. S., Marlborough-Blenheim.
Irvine, I. B., Gen'l Treasurer, P. S. & N. Ry., Bingham.
Kapp, W. F., Supt. Shops & Machy., R. F. & P. Ry., Marlborough-Blenheim.
Kellogg, W. L., M. M., P. M. R. R., Haddon Hall.
Kight, H. R., M. M., West Maryland R. R., Monticello.
Kilpatrick, R. F., Chalfonte.
Kinney, W. H., Gen. For., N. Y., Ontario & Western Ry., Traymore.
Leach, H. L., Marlborough-Blenheim.
Leach, W. B., Marlborough-Blenheim.
Lewis, W. H., S. M. P., Norfolk & Western Ry., Marlborough-Blenheim.
Luscombe, J. T., M. M., Toledo & Ohio Central Ry., Young's.
McCarthy, M. J., S. S., C. C. C. & St. L. R. R., Marlborough-Blenheim.
McCuen, J. P., Gen. Inspector, C. N. O. & T. P. Ry., Dennis.
McCuen, R. E., M. M., L. & E. R. R., Dennis.
McRae, J. A., M. E., Michigan Central R. R., Chalfonte.
Manchester, A. E., S. M. P., C. M. & St. P. Ry., Traymore.
Meade, P. J., G. F., Atlantic Coast Line R. R., Vaugh Cottage.
Miller, I. A., S. M. P., Florida East Coast Ry., Windsor.
Mills, J. H., M. M., Can. Pac. Ry., Haddon Hall.
Monahan, J. J., M. M., Louisville & Nashville R. R., Dunlop.
Montgomery, H., S. M. P. & E., Bangor & Aroostook R. R., Dennis.
Murrian, W. S., S. M. P., Southern Ry., Dennis.
Nelson, C. B., A. M. M., L. S. & M. S., Traymore.
Neuffer, J. G., S. M. P., C. Gt. W. Ry., Brighton Hotel.
Pratt, E. W., A. S. M. P., Chgo. & N. Western Ry., Marlborough-Blenheim Hotel.
Platt, John G., Dennis Hotel.
Parish, LeGrand, Marlborough-Blenheim Hotel.
Rae, Clark H., G. M. M., Louisvile & Nashville, Ky., Chalfonte Hotel.
Reid, H. G., M. M., Can. Pac. Ry., Haddon Hall.
Scheffer, F. H., Supt. Machy., N. C. & St. L., Runnymede Hotl.
Sedgwick, E. V., Young's Hotel.
Seidel, Geo. W., Supt. Silves. Shops, C. R. I. & P. Ry., Traymore Hotel.
Seley, C. A., M. E., C. R. I. & P. Ry., Chalfonte Hotel.
Shoemaker, H., M. M., Dela. Lack. & Western R. R., Windsor Hotel
Small, Fred F., M. E., Pacific Electric Ry., Marlborough-Blenheim Hotel.
Smith, E. J., M. M., Atlantic Coast Line R. R., Windsor Hotel.
Smith, John L. G. F., P. S. & N. Ry, Bingham Hotel.
Smith, L. K., A. M. M., Wabash R. R., Shelbourne Hotel.
Smith, R. D., S. M. P. & R. S., Boston & Albany R. R., Dennis Hotel.
Smith, W. T., M. M., C. & O. Ry. Co., Dennis Hotel.
Smith, Willard A., Dennis Hotel.
Stearns, W. A., M. E., Louisville & Nashville R. R., Chalfonte Hotel.
Stocks, W. H., Chalfonte Hotel.
Street, C. F., Marlborough-Blenheim Hotel.
Sullivan, J. J., G. M. M., L. & N. Ry., Young's Hotel.
Taylor, G. W., S. M. P., San Antonio & Aransas Pass Ry., Shelbourne Hotel.
Taylor, Joseph W., Secy., A. R. M. Assn., Marlborough-Blenheim Hotel.
Terrell, C. H., of M. M. Assn., M. M., C. & O. R. R., Haddon Hall.
Thomas, J. J., Jr., S. M. P. Mobile & Ohio R. R., Dennis Hotel.
Tinker, J. H., Dir. M. M., C. & E. I. R. R., Strand Hotel.
Tonge, John, Minn. & St. Louis Ry. Co., Dennis Hotel.
Turner, J. S., Sales Agent, Pressed Steel Car Co., Marlborough-Blenheim Hotel.
Walsh, J. F., S. M. P., C. & O. Ry., Marlborough-Blenheim Hotel.
White, A. M., American Loco. Co., Traymore Hotel.
Wightman, D. A., Dennis Hotel.
Warthen, J. O., M. M., Danville & Western Ry. Co., Monticello Hotel.
Yergens, W. F., M. M., Erie R. R., Schlitz Hotel.

M. C. B. REGISTRATION.

Billingham, R. A., S. M. R., Pitts, Shawmut & Northern R. R., Traymore Hotel.
Bohan, W. J., Mech Eng., Northern Pacific, Dennis Hotel.
Brazier, F. W., Supt. R. S., N. Y. C. & H. R. R. R. Co., Marlborough-Blenheim.
Chenowith, Edwin G., M. E., Erie R. R., Young's Hotel.
Cyr, J. W., S. M. P., C. B. & Q. Lines East, Dunlop Hotel.
Dawson, L. L., S. M. P., Ft. Worth & Denv. City Ry., Brighton Hotel.
DeVoy, J. F., M. E., C. M. & St. P. Ry. Co., Shelbourne.
Ettinger, R. L., C. M. E., Southern Ry Co., Dennis Hotel.
Flory, E. P., S. M. P., N. Y. Ontario & Western Ry., Marlborough-Blenheim Hotel.
Fuller, C. E., Asst. Gen. Mgr., U. P. R., Marlborough-Blenheim Hotel.
Gaines, F. F., S. M. P., Central of Georgia Ry., Dennis Hotel.
Gould, Jos. E., S. M. P., Norfolk & Southern Ry., Dennis Hotel.
Hancock, Geo. A., S. M., St. Louis & San Francisco R. R., Marlborough-Blenheim Hotel.
Kapp, W. F., Supt. Shops & Machy., R. F. & P. Ry., Marlborough-Blenheim Hotel.
Kellog, W. L., S. M. P., Cin. Ham. & Dayton Ry., Haddon Hall.
Lewis, W. H., S. M. P., N. & W. Ry. Co., Marlborough-Blenheim Hotel.
Luscombe, J. T., M. M., Toledo & Ohio Cent. Ry., Young's Hotel.
McFeatters, F. R., M. C. B., Supt. Union R. R., St. Charles Hotel.
McIlvain, J. D., S. M. Supt. Grand Trunk, Seaside Hotel.
McRae, J. A., c/o M. C. R. R., Chalfonte Hotel.
Manchester, A. E., S. M. P., C. M. & St. P. Ry., Traymore Hotel.
Monahan, J. J., M. M., L. & N. R. R., Dunlop Hotel.
Montgomery, Hugh, Bangor & Aroostook R. R., Dennis Hotel.

Neuffer, J. G., S. M. P., Chicago Great Western Ry., Brighton Hotel.
Pratt, Edward W., A. S. M. P., Chicago & Northwestern Ry., Marlborough-Blenheim Hotel.
Rae, Clark H., G. M. M., L. & N. R. R., Chalfonte Hotel.
Ramsdell, T. M., M. C. B., C. & O. Ry., Chalfonte Hotel.
Seley, C. A., M. E., Chicago, R. I. & P. Ry., Chalfonte Hotel.
Small, Fred F., Supt. Mech. Dept., Pacific Electric Ry., Marlborough-Blenheim Hotel.
Smith, R. D., S. M. P. & R. S., B. & A. R. R., Dennis Hotel.
Willard, A. Smith, Editor Railway Review, Dennis Hotel.
Stearns, W. A., M. E., Louisville & Nashville R. R., Chalfonte Hotel.
Stewart, A. F., M. M., Chesapeake & Ohio Ry., Traymore Hotel.
Sullivan, J. J., M. M., N. A. T. & D. N. C., Decatus, Ala.
Taylor, Geo. W., S. M. P., Antonio & Aransas Pass. Ry., Shelbourne Hotel.
Taylor, J. W., For. Car Shops, Corvallis & Eastern Ry., Marlborough-Blenheim Hotel.
Terrell, C. H., S. M. P., C. & O. R. R., Haddon Hall.
Tonge, John, Minn. & St. Louis Ry. Co., Dennis Hotel.
Thomas, J. J., Jr., Southern Ry. Co. in Miss.
Walsh, F. J., G. F., Chesapeake & Ohio Ry., Marlborough-Blenheim Hotel.
Watts, A. H., M. M., Cin. Nor. R. R. Co.

GUESTS.

Alwine, E. S., Secy. to Pur. Agt., Southern Ry., Dennis Hotel.
Anderson, H. A., Special Agt. Pur. Dept., Penn. R. R., Marlborough-Blenheim Hotel.
Baxter, E. K., D. P. Agt., Penn. R. R.
Campbell, C. S., Genl. Supt., U. S. Ex., Chelsea Hotel.
Cratzer, Curtin A., City Ticket Office, Penn. R. R.
Eddy, W. J., Gen. Tool Rm. Insp., Erie, Schlitz Hotel.
Ewan, H. F., Agt., U. S. Exp., Devenshire Hotel.
Fuller, Charles Edw., Jr., Marlborough-Blenheim Hotel.
Fuller, Mary, Marlborough-Blenheim Hotel.
Hall, Wm. B., Genl. Storekeeper, D. & R. G. R. R., Chalfonte Hotel.
Hatz Herbert, Haddon Hall.
James, Robert R., Traymore Hotel.
Ladd, Geo. T., Crawford, D. T., Gen. S. M. P., Penn. west of Pitts., Brighton Hotel.
Mayer, F. A., Genl. Master Boiler Maker, Southern R. R.
Miller, G. A., Jr., Florida East Coast, Windsor Hotel.
Mills, Malcolm, M. M., C. P. R., Haddon Hall.
Murphy, James T., City Ticket Agt., Penn. R. R.
Nunn, A., Mach. Inspector, Erie, Schlitz Hotel.
Nelson, L. B., A. M. M., L. S. & M. S., Traymore Hotel.
O'Reilly, Wm. H., M. P. Asst., Santa Fe, Haddon Hall.
Ramsdell, T. M., Jr., Son of M. C. B., C. & O., Chalfonte Hotel.
Taylor, G. W., Marlborough-Blenheim Hotel.
Town, Col Thos. J., Berkshire Inn.
Waterman, J. H., Supt. Timber Preservation, C. B. & O. R. R., Haddon Hall.
Wynn, F. S., Pur. Agt., Southern, Dennis Hotel.

INVITATIONS TO ARMY AND NAVY OFFICERS.

In accordance with a resolution adopted by the Railway Supply Manufacturers' Association last year, handsomely engraved invitations to attend this year's conventions and see the exhibits were sent by Secretary Conway to the engineer officers of the United States army and navy. Those invited included Brigadier-General William H. Bixby, chief of engineers of the army, and army engineer officers having the ranks of colonel, lieutenant-colonel, major, captain and assistant engineer, the secretary of the navy, officers of the bureau of marine engineers, etc., including the chiefs of the bureaus of yards and docks, of ordnance, of construction and repairs, of steam engineers, of navigation; and Rear Admirals Wainwright, Potter and Ward, and to Captain Fletcher, serving as aides, respectively, for operations for personnel, for inspections and for materials. Others invited were: Colonel George W. Goethals, chairman of the Isthmian Canal Commission; Lieutenant-Colonel H. F. Hodge, also of the commission; and the purchasing agents of the commission.

A large number of replies to the invitations have been received, all expressing hearty appreciation of them, and some indicating an intention to attend.

Conventionalities.

Harry Finnell certainly looks gay in his white flannel pants.

J. F. Dunn, superintendent motive power of the Oregon Short Line, has his wife and daughter with him this year.

C. E. Postlethwaite writes, "I expect to arrive at Atlantic City on Tuesday next.—C. E. P." Has anybody here seen Posty?

Mrs. A. Fenton Walker, one of the "old timers," will leave for Scotland after the close of the conventions to visit her family.

C. A. Seley, mechanical engineer of the Rock Island Lines, arrived early yesterday afternoon, and immediately started in to "do the exhibits."

Among those registered at the Chalfonte are Mr. and Mrs. Robert T. Scott. Mr. Scott is with the Indepenedent Pneumatic Tool Company.

B. P. Flory, superintendent of motive power of the New York, Ontario & Western, and Mrs. Flory, spent yesterday afternoon on the pier greeting friends.

J. F. Walsh, general superintendent of motive power of the Chesapeake & Ohio, was an early arrival, registering at the Marlborough-Blenheim.

B. A. Hegeman, Jr., with his son, Harold, motored to Atlantic City from New York on Sunday. They are staying at the Marlborough-Blenheim.

Alex. Brown got here Monday, wearing the identical straw hat which supported his proud brow as he and Stewart walked into Maxims on the now famous night of June 17, 1910.

Mr. and Mrs. John D. Hurley were among the first to arrive. They are stopping at the Marlborough-Blenheim. Mr. Hurley is vice-president of the Independent Pneumatic Tool Company.

F. W. Brazier, superintendent of rolling stock of the New York Central, has come down a little early to rest up and get in good trim for some lively work in the convention next week.

J. P. McCuen, who has retired from railway service as superintendent motive power of the Queen & Crescent since last year, could not pass up the conventions. He arrived yesterday afternoon.

Secretary Joseph W. Taylor, of the M. M. and M. C. B. Associations, arrived Tuesday morning and registered at the Marlborough-Blenheim. He predicts new records of attendance for both conventions.

J. T. Carroll, superintendent of motive power of the Baltimore & Ohio, at Pittsburgh, Pa., has brought Mrs. Carroll with him this year. He is looking forward to trying out some of the new Mikados.

F. F. Gaines, superintendent motive power of the Central of Georgia, was among the early arrivals, and started in to make a time study of the motions made by the bears in the cage at the front of the pier.

Chauncey J. Blair, president of the Kennicott Company, expected to attend the conventions but was unexpectedly

called to Europe on important business matters. He sailed from New York on Tuesday.

Arthur S. Goble, for several years in the testing department of the Chicago & Northwestern, has resigned to accept a position with the Standard Steel Works Company. Mr. Goble will make his headquarters in New York.

Edward B. Leigh, president of the Chicago Railway Equipment Company, is expected to reach Atlantic City Saturday and will be accompanied by Arthur Wyman, assistant to the president of the same company.

Staff and Cooper got here early. Staff is always early, because he carries his B. E. D. with him. But the same cannot be said of Cooper, who frequently pays excess for the impediments bestowed upon him by nature.

W. A. Stearns, mechanical engineer of the Louisville & Nashville, arrived yesterday and is looking forward with considerable pleasure to his work with the American Steel Foundries, after July 1, as assistant to the chief mechanical engineer.

C. A. Schroyer, superintendent car department of the Chicago & Northwestern, is another one of the car builders who came early to get in good shape for some lively work next week. He is accompanied by his wife and daughter.

Rosser, who got his diploma as a lion tamer a year ago, has been made manager of western sales of the T. H. Symington Company, with headquarters in Chicago. Rosser arrived at the pier in a roller chair early on Monday morning.

S. L. Bean, mechanical superintendent of the Santa Fe, at Los Angeles, Cal., and I. C. Hicks, master mechanic at San Bernardino, Cal., came in on the Chicago special yesterday. They hold the record for long distance travel to this convention.

M. J. McCarthy, superintendent of shops of the Big-Four at Beech Grove, Ind., who is attending the conventions, reports the new car shop buildings almost completed and ready for the equipment. They will probably be placed in operation next fall or winter.

Mr. and Mrs. D. C. Noble spent Sunday afternoon and evening greeting the early arrivals. Mrs. Noble looks forward with distinct pleasure to these annual gatherings. She knows so many of us and so many of us know her that time passes all too rapidly.

G. W. Seidel, superintendent of the Silvis, Ill., shops of the Rock Island, is here. He is quite enthusiastic over the addition of a number of large jib cranes in the locomotive shop, thus making it possible for the two traveling cranes to be used to better advantage.

C. E. Fuller, superintendent of motive power and machinery of the Union Pacific and president of the Master Mechanics' Association, was the first one to get off the Chicago Special yesterday afternoon and is in good shape to take up his strenuous duties. He has his family with him.

Lou Phillips, of the National Tube Company, chairman of the exhibit committee, and Mrs. Phillips were early arrivals from their Chicago home. Mr. Phillips has seen a lot of hard wandering during the past three months for the exhibit committee and deserves much credit.

D. A. Wightman, who for more than 20 years was superintendent of the Pittsburgh Locomotive Works, and has attended the Master Mechanics' Association meetings since the early days of its organization, is here. Mr. Wightman is living in retirement on a country place near Providence, R. I.

H. J. Bentley, assistant superintendent of motive power and machinery of the Chicago & Northwestern, and first vice-president of the Master Mechanics' Association, arrived yesterday. Mr. Bentley says that the new stripping and erecting shops at Chicago are being placed in operation with excellent results.

Robert F. Carr, president of the Dearborn Drug & Chemical Works, was an early arrival and is, as usual, a guest of the Marlborough-Blenheim. Mrs. Carr will not attend the conventions this year on account of the recent death of her father, Mr. Smiley, one of the leading members of the Chicago bar.

If you don't happen to find Heap Big Chief Johnson when you want him, inquire at Armory Hall. The Chief is the best entertainment committee chairman that we have had for the last two years; but it does seem as though he should pay less attention to his pet hobby of drilling a lot of near musicians.

Since the 1910 conventions, that promising young man of sterling worth, A. C. Moore, of the Safety Car Heating & Lighting Company, has been elevated to the position of general manager of the concern. There is no doubt but what he will succeed, because he possesses those qualities which make for success.

It is quite in order to congratulate Walter B. Leach. At a meeting of the board of directors on May 31 Walter was elected president and general manager of the concern he has so ably served as general manager and treasurer for some years past. It is a distinct pleasure to record a promotion so thoroughly deserved.

We would, indeed, be ungrateful were we not to record the presence of Scott Blewett. If you will bathe in the sunlight, whether the day be gloomy or bright, sit down and talk for a while with Mr. Blewett. Get him to tell you about the early days of these great conventions. It will do you good—and you will be inclined to find less fault if things do not seem to be as you think they should be.

Charles C. Castle, manager of the railway deparment of the U. S. Metal & Manufacturing Company, arrived at the Marlborough-Blenheim on Tuesday evening. Mr. Castle is president of the American Electric Railway Manufacturers' Association; and since the annual convention of the American Electric Railway and Allied Associations will be held on the Steel Pier in October next, undoubtedly Mr. Castle will be able to get some ideas from the booth and pier decorations of the M. M. and M. C. B. Conventions that will be useful this fall.

Charlie Storrs is looking rather glum this year. And we don't blame him. In the first place, Mrs. Storrs is not here—and everyone knows what a tremendous help and comfort Mrs. Storrs has been as the wife of one of the ablest chairmen of one of our most important committees. Again, Charlie must feel like a fish out of water in the absence of an assignment on some committee where hard work counts. Not that he is a gentleman of leisure as a member of the Executive Committee from the great State of New York; but in that capacity the work is spread over a period of months and therefore does not appeal to Charlie as real labor.

The Exhibit.

Many new and improved devices are exhibited this year by the Gold Car Heating & Lighting Company, New York, in spaces 301-311. That company appears to have made the most of its time since the last convention, simplifying and perfecting its electric and steam heating apparatus.

A full line of the Columbia lock nut is exhibited at booth 337 by the United States Metal & Manufacturing Company, New York. The popularity of the Columbia lock nut seems to be maintained whether business is booming or not, for during the past year, which has been one of the dullest in railway buying since 1907, this company reports an increase in the sales of this nut to railway consumers.

The Storrs Mica Company, Owego, N. Y., has changed the location of its space from the main building to the annex, where at space 601 it is exhibiting a new device in the mica line. It has but recently perfected a new form of lantern globe. Its exhibit consists chiefly of ruby globes, shown on a number of hand lamps of various well-known lanterns. The makers claim that the heat-resisting properties of the mica which have been thoroughly proven for several years, as applied to headlight chimneys, will show the same economical results when applied to lantern globes.

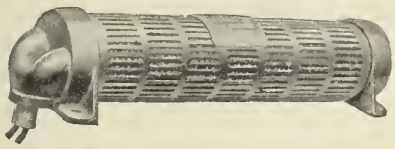
RESISTANCE TUBE FOR BLOCK SIGNALS.

The Consolidated Car Heating Company, New York, during the past year has brought out a new resistance tube for



Resistance Tube with Fuse Ferrules.

signal work. A form of this new tube is shown in the accompanying illustration. A resistance coil is wound on an asbestos rope, and after being impregnated with a heat-resisting varnish it is wound on a porcelain helix. It will be noted that fuse ferrules are provided on the ends of these tubes, which are intended for clipping-in like the ordinary barrel type of fuse, thus making its installation easy and quick. These tubes are also completely armored with conjunction box connections as shown. They have a wide

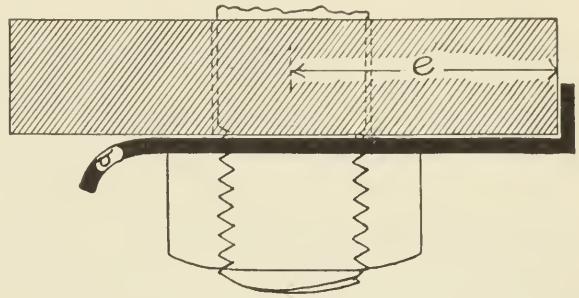


Armored Resistance Tube.

application in multiple unit control and electric pneumatic air brake service as well as for block signal work. The main advantage is claimed to be in the length of large wire which it is possible to use in a small space on account of the peculiar construction of the tube.

POSITIVE NUT LOCK.

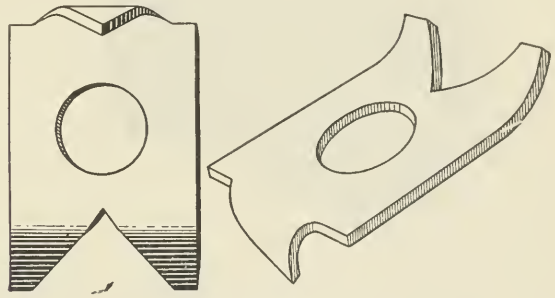
The Jones Positive Nut Lock Company, Chicago, recently has improved its nut lock by turning up the flanges, or slotted ends, nearly at right angles to the body of the lock. This feature, included in the process of manufacture, is accomplished by a round bend across the flanges, as shown in an accompanying illustration. This materially facilitates the application of the device, a hammer being the only tool required for driving the flange of the nut lock against the nut. The nut lock, for use on wood, has always been made with the flanges elevated so as to be readily driven over against the nut with a hammer, but lately the width and



Application of Nut Lock.

thickness of this device have been very much increased, giving it greater stability and ample bearing surface, as shown.

Miscellaneous bending and forming machines and eight large power punch presses are used in making the nut lock. One of these machines weighs 6½ tons, and has a capacity



Jones Positive Nut Lock.

of 84 tons. This machine is used for making some heavier sizes of nut locks, and also a steel sprocket chain for conveyor machinery. The company's policy of carrying at all times a stock exceeding 200 tons has enabled it to make prompt deliveries.

PNEUMATIC TOOLS.

The Chicago Pneumatic Tool Company, Chicago, is exhibiting for the first time a complete line of the Boyer and Keller riveting and chipping hammers cut in section so as to illustrate their methods of operation. This company is also exhibiting in section one of its new ball bearing Little Giant piston air drills as well as its new type of Close Quarter drill.

THE CARBORUNDUM EXHIBIT.

There are two particularly prominent features of the exhibit of the Carborundum Company, Niagara Falls, N. Y., booths 103-104. One is the display of the grinding wheels made from the new material called Aloxite, for all kinds of tool grinding, saw gumming and other classes of steel grinding. The other feature of the exhibit is the installation of a set of grinding machines upon which the cutting powers of both the Carborundum and Aloxite wheels are shown. It is the idea of the men in charge of the exhibit to show these wheels under conditions as near to actual shop conditions as possible. All kinds of material will be ground and everything will be done to show visitors just what Carborundum, Aloxite and Somite wheels

can do in their shops. In addition to the complete showing of Carborundum, Aloxite and Somite grinding wheels, the Carborundum Company will exhibit Carborundum brand garnet paper, Aloxite cloth, Carborundum cloth, Carborundum fire sand, Carborundum grains, etc.

BAY STATE PLUSH.

The Massachusetts Mohair Plush Company, Boston, Mass., manufacturer of Bay State car plush, has been making plushes for 25 years, and needs no introduction. It is exhibiting, in space 20, some well-known models of car seats, covered with materials that are right up to the minute. If you feel that it is too hot to talk plush, just go to space 20 and let the plush talk for itself.

FORCE FEED LUBRICATOR.

The accompanying illustration shows a four-feed Detroit force feed lubricator, made by the Detroit Lubricator Company, Detroit, Mich. This lubricator is driven by a belt from the engine

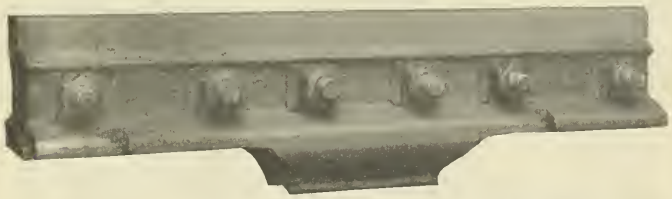


Detroit Force Feed Lubricator.

and supplies oil to the bearings in proportion to the speed of the engine. Thus when once regulated the bearings get their required supply of oil, being taken care of automatically for different speed.

SELF-LOCKING NUT AND BOLT FASTENER.

The new Bartley self-locking nut and bolt fastener for angle bar joints, frogs and crossings is shown in the accompanying illustration. This device was patented by Milton Bradley, president of the American Nut & Bolt Fastener Company, Pittsburgh, Pa. It is shown, together with the Bartley combined nut, bolt and bond wire fastener, at the company's exhibit in space 320. This fastener is easily

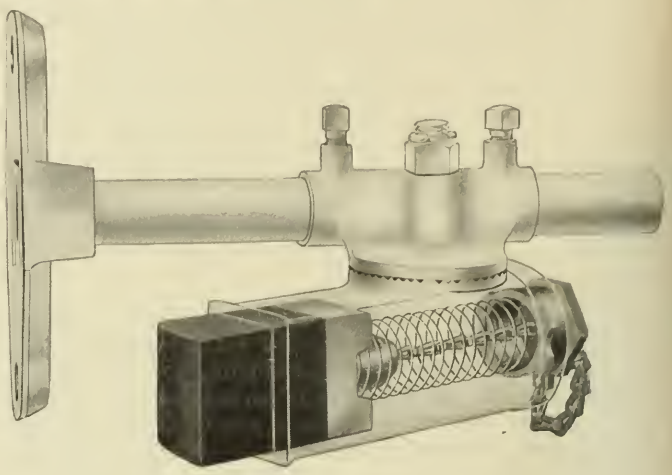


Bartley Self-Locking Nut and Bolt Fastener.

applied, being put on in front of the nut, which forces it up against the angle bar. The nut has a full bottom bearing against the fastener and the splice bar, so that it is claimed that there is no wear either on the nut or on the splice bar, while with spring fasteners there is only about ¼-in. bearing on the angle bar, and as they are much harder than the bar, the vibration will cause them to cut the angle bar. This fastener can be removed with a wrench as easily as the spring fastener.

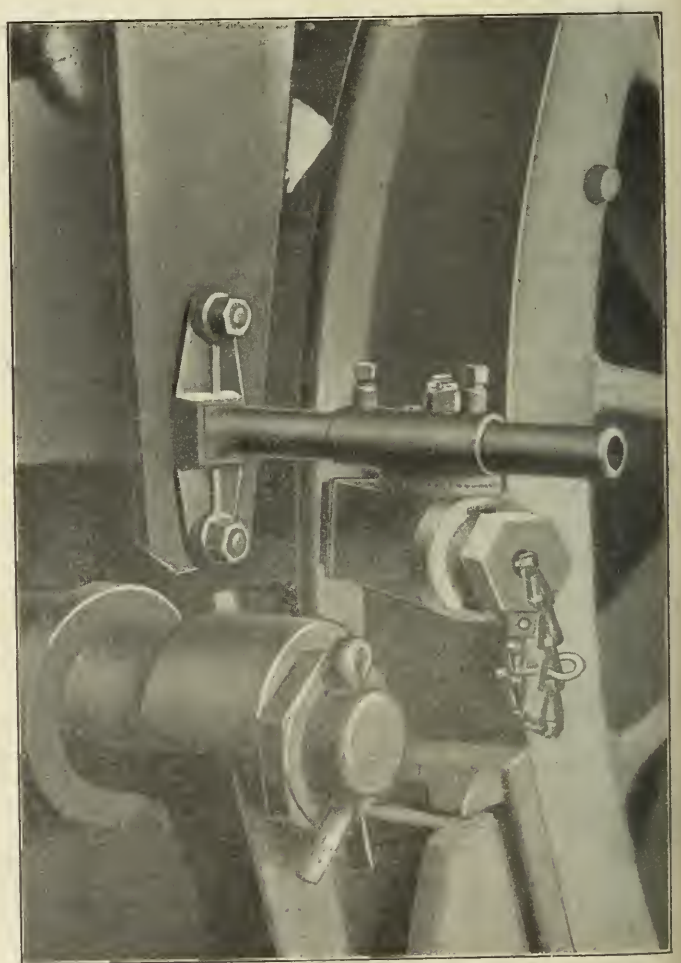
COLLINS WHEEL FLANGE LUBRICATOR.

The Collins Metallic Packing Company, Philadelphia, Pa., has brought out an improvement on its wheel flange lubricator. It differs from the previous device in being equipped with a continuous feed, which obviates the necessity of



Collins Wheel Flange Lubricator.

attending to the lubricating stick every 200 or 300 miles, as was necessary before. It requires little time to insert a new stick, and there is an indicating device on the back of the lubricator which can be seen at a distance of 10 ft. from the locomotive so that at a glance it may be determined the amount the stick has worn. It is claimed that the stick



Collins Lubricator Applied to a Locomotive.

under varied tests has given service of from 3,000 to 6,000 miles, depending upon the curvature of the road and the class of power to which the device is applied; also, that a saving is made not only in flange wear but also in rail wear. The lubricating device itself is a substantial affair and will ordinarily last as long as the locomotive. The lubricant is applied directly to the flange and does not get on the tread of the wheel, causing the locomotive to slip. It is used on railways in this country and in Porto Rico, Australia, Canada and Mexico.

EXHIBIT OF THE AMERICAN STEEL FOUNDRIES.

The exhibit of the American Steel Foundries, Chicago, this year occupies booth 168, at the extreme end of Machinery Hall. All of the products made at the various plants of this company are arranged so far as possible to show them as they would appear in actual service. The most noticeable feature of the exhibit is the complete truck, occupying the center of the booth, which is intended for 70 or 75-ton freight equipment. The parts of the truck made by the American Steel Foundries are the Andrews cast steel side frames, the Davis cast steel wheels, the Ajax trussed brake beams and the Simplex bolster springs. This truck has been designed to meet the demand of railways for a truck which can be used with an axle having 6 in. x 11 in. journals, either for new equipment or under 50-ton cars where it has been found possible to increase materially the carrying capacity of the car by the substitution of heavier and stronger trucks. In this truck the same general plan of construction has been followed as in the Andrews 50-ton truck which has been adopted as standard by a number of large railways.

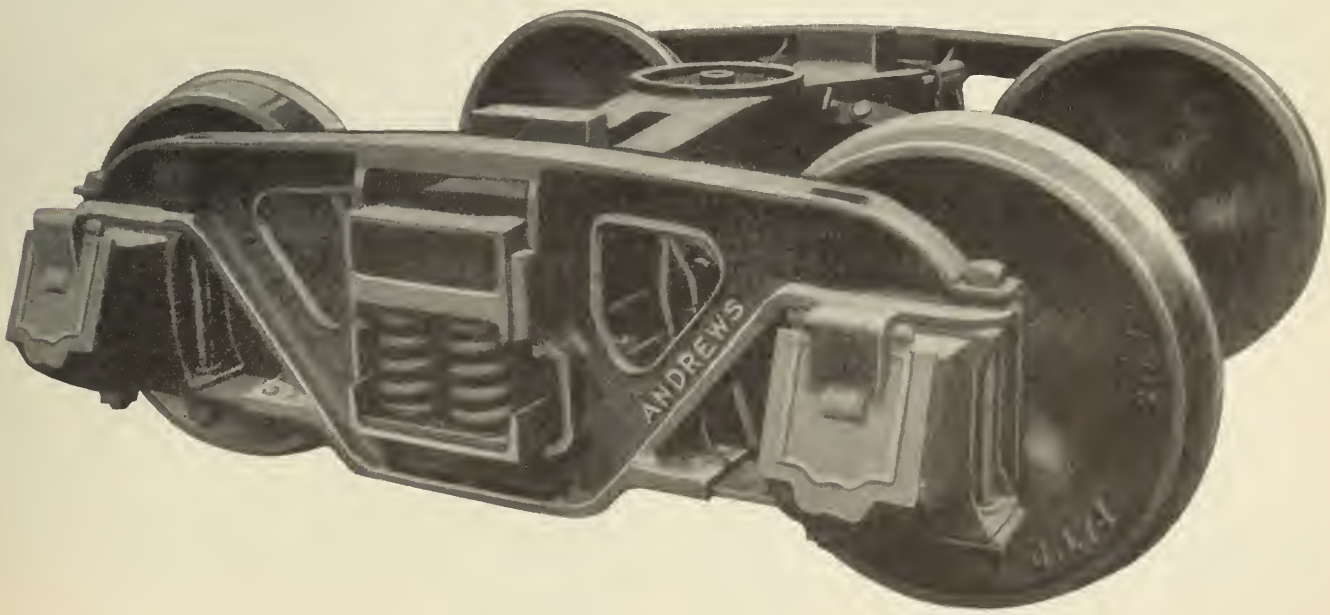
A wheel suitable for engine truck service and a 33-in. freight car wheel from which sections have been cut, and the plate distorted to show the strength and uniformity of the material from which they are made, are also being exhibited. At the left of the center of the booth are shown Simplex cast steel couplers in operative position, suitable for all classes of equipment. At the back of the booth are shown brake beams for various kinds of service, including the new cast steel Vulcan beams recommended for use under steel passenger cars equipped with P. C. or L. N. air-brake apparatus. Other products shown are the Susemihl side bearings, body bolsters, Economy draft arms and the new Samson truck bolster, intended for use under heavy engine tenders.

The walls of the exhibit are hung with photographs showing large and difficult miscellaneous castings recently produced by the American Steel Foundries and also a large picture in colors showing the manner in which the Davis wheels are cast.

CHARCOAL IRON TUBES.

The Parkesburg Iron Company, Parkesburg, Pa., believing there was a large field for high grade of charcoal iron tubes, erected, in 1908, an electrically-driven tube mill for the exclusive manufacture of charcoal iron tubes. The capacity of the mill is 18,000 tons, or approximately 800,000 tubes per year. The company believes that in the boiler tubes ordered, if a genuine charcoal iron of heavy enough gage for the purpose required is specified, these tubes will give better average results than those obtained 20 years ago. The two elements which it is vital to have as low as possible in a good tube are manganese and sulphur. In the case of manganese, which should be low to prevent electrolysis, this element in charcoal iron will run from a trace to .02 per cent., whereas in steel it will average between 0.25 and 0.35 per cent. This high per cent. in steel is necessary, as the steel ingots will not roll to good advantage if the manganese content is too low.

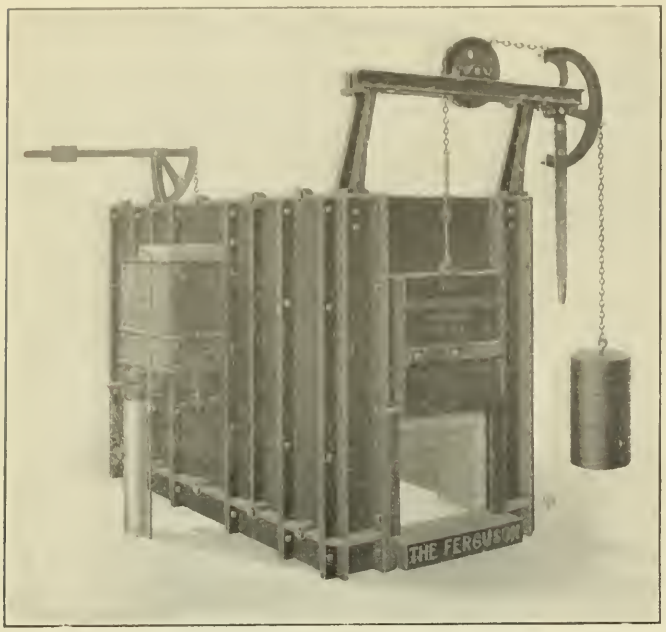
The sulphur in steel or iron will not only prevent good welding but will cause red shortness. This element in genuine charcoal iron is almost invariably between .01 and .02 per cent., although it is becoming a more and more difficult matter, commercially, to secure steel running lower than .03 per cent. sulphur on account of the diminishing supply of low sulphur ore. Genuine charcoal iron tubes at present are made from the same materials and in the same manner as those of 20 years ago, and in most cases they are now superior, owing to the closer inspection demanded at this time, the greater metallurgical knowledge employed in converting and the use of Swedish iron blooms made from the best ore in the world. An interesting accelerated corrosion test has been made of samples of ingot iron, charcoal iron and steel, where one-half of each sample, after immersion in acid, shows successively greater attacks on the metal in the order mentioned above. One set of these samples has during the past few months been exposed to the elements and in the untreated portion scarcely any corrosion took place with the charcoal iron, whereas both ingot iron and steel were considerably attacked. There is a much larger output of charcoal iron tubes to-day than in 1890 or 1900.



70-Ton Truck; American Steel Foundries.

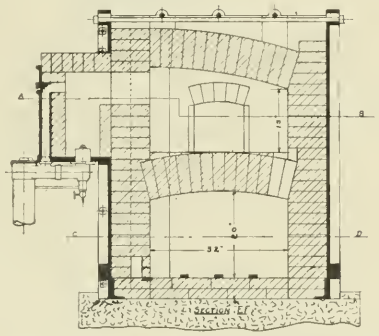
FERGUSON SPRING AND CASE HARDENING FURNACE.

The accompanying illustration shows a new design of combination spring fitting and case hardening furnace of the Ferguson type. This furnace is placed on the market by

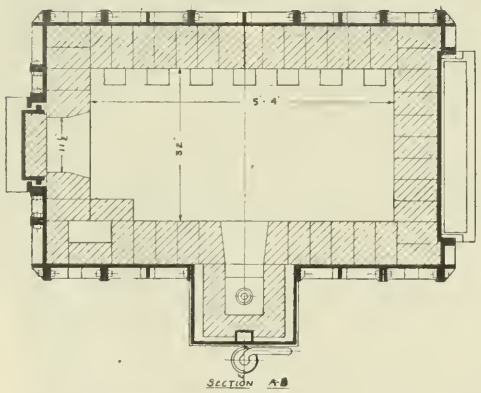


Combination Spring and Case Hardening Furnace.

the Railway Materials Company, Chicago, to meet the requirements of the smaller shop. It is operated on the Ferguson principle, the combustion of the oil taking place en-



Section of Spring and Case Hardening Furnace.

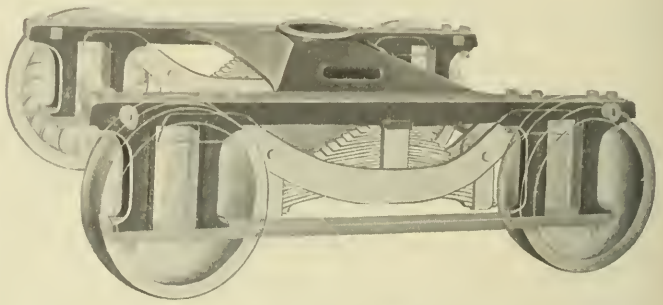


Plan of Spring and Case Hardening Furnace.

tirely within the combustion chambers, which insures a clean, even heat in both furnace compartments. The spring fitting compartment is of sufficient size to heat all of the work that may be handled by one spring fitter, and the case hardening compartment, located at the floor level, is 32 in. wide by 64 in. deep. The principal merits of this furnace are the small amount of floor space occupied; its low case hardening door, doing away with the usual lifting of the case hardening boxes; its complete operation with but one burner, and its arrangement of doors for the two compartments, allowing it to be used as two independent furnaces.

ENGINE AND TENDER TRUCKS.

The Commonwealth engine and tender trucks, made by the Commonwealth Steel Company St. Louis, Mo., embody

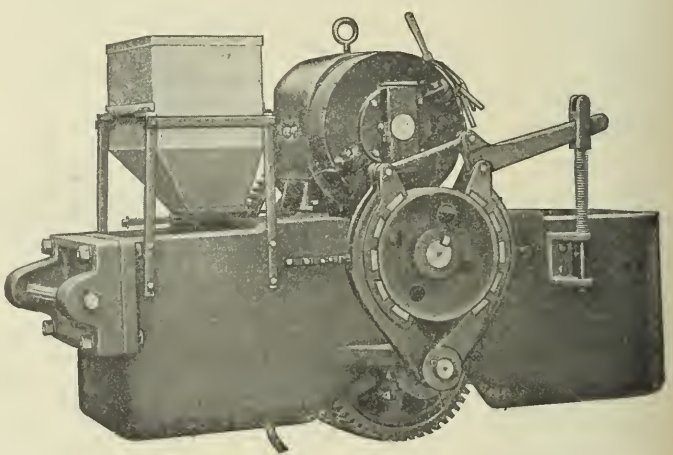


Commonwealth Truck.

strength and adaptability in design. They eliminate a great many parts as compared with built-up construction, maintain alinement and ride easily.

TRACTORS FOR OPERATING TURNTABLES.

The turntable tractors made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., and shown in the accompanying illustration, combine the advantages of time saving and low operating cost, while the cost of installation is claimed to be in most cases below that of any other power. The control is so simple and easily learned that skilled help is unnecessary. Only one attendant is required and his presence is needed only



Westinghouse Electric Tractor for Turntable.

when the table is actually in use. There are safety devices to give protection from injury in case of accident due to careless operation. The economy claimed for electric tractors is shown by the reported experience of a railway that formerly used hand operation:—The annual cost of hand operation was $2,628, whereas the annual cost to operate the tractor was only $1,410. The saving in cost, however, was considered of small importance in comparison with the increased efficiency and speed of the service rendered.

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THE EXHIBIT 1391

IT is an easy matter for a common council to pass a smoke ordinance, prohibiting the production of smoke. But if we are to believe the report of the committee and the discussion on the prevention of smoke at roundhouses and terminal,s it is quite another, if not impossible, matter to live up to these requirements. People who know nothing about this matter have been prolific inventors of smoke preventatives for years. The man who does not have to deal with the problem always knows exactly what the man who does have to deal with it ought to do. But the man who builds the fire in a locomotive and those responsible for the whole subsequent train of events, are absolutely at a loss as to how to stop smoke production. There are numerous suggestions as to how the production might be reduced, but none as to how it could be prevented. The spectacle is similar to those presented by numerous other attempts at railway regulation. A municipal council of uninformed politicians decrees that the railway locomotives and roundhouses shall emit no smoke, and the august convention of the American Railway Master Mechanics' Association says that it knows of no means by which the requirement can be met. We all know that the way to prevent the bagging of trousers at the knee is not to wear the trousers. So to prevent smoke in roundhouses and terminals, don t build fires in the fire-boxes. Certainly, an easy remedy to apply or not to apply, and, according to the discussion of yesterday, apparently the only one which, if applied, will be at all efficacious.

MR. FULLER'S suggestion that more attention should be given to the education of apprentices is a splendid one. The M. M. Association now has a code of apprenticeship rules which was revised in 1908. It covers the general or basic principles of modern apprenticeship and possibly needs revision again. The difficulty is that its application thus far has been to large systems such as the New York Central and the Santa Fe. Both of these systems have strong central organizations in charge of the department which are in the hands of capable men who give all their time and energies to the development and supervision of the work. This system is not feasible on the smaller roads and it is extremely desirable that more information should be available as to just how these principles may be applied to the best advantage in such cases. It is quite possible under these circumstances that the standard rules may have to be considerably modified. The important thing is that the apprentices should be given individual instruction in both the theory and practice of their trades and that this be done during working hours while the boys are under pay. The association could accomplish much good by having available in its proceedings a full record of the various methods which are giving good results on roads both small and large and in various parts of the country, for an apprentice system to be a success must be specially suited to the class of boys it is intended to develop.

ONE of the notable features of the discussion on mechanical stokers yesterday morning, was in the general attitude of the convention on the subject and the marked change in this attitude, as compared with a year ago. At that time, and for several years previous, there had been a groping for information, an air of expectancy and hopefulness that something would be developed that would be productive of satisfactory results, coupled with an air of disappointment that the results obtained had been so meagre, and an underlying dissatisfaction with existing stoker conditions. It is interesting, then, to note the great advances that have been made during the past year. The situation seems to have cleared. Men who were skeptical then admit a change of opinion, and are now supporters of the stoker. Experience tells of success in maintaining steam pressure, of the cutting down of coal consumption until hand firing is bettered, of the reduction in smoke consumption and the apparent seating in the saddle of at least three stokers that can be relied on for efficient and economical work. The bugaboo of excessive coal consumption has disappeared, and the stoker is looked upon as a means of not only relieving the fireman of the main burden of his physical exertion, but of adding to the efficiency of the locomotive by increasing the work that it can do. The strength of the fireman has, heretofore, put the limit on the work of the engine. With this limit removed, the engine is to be required to do more than it has ever done before. In short, the report and the attitude of all who took part in the discussion, accepted the stoker as an accomplished fact; not an achievement on which "finished" can be written, for the development is not yet at an end, but one on which such a dependence can be placed that for those who wish to reduce the work of the fireman or increase the amount of work done by the locomotive, such a means is at hand if they

choose to use it. As to the details of what the stoker should do, there are still differences of opinion, but these are of minor importance compared with the general acknowledgment of stoker efficiency that has been made. The locomotive stoker seems, at last, to be coming into its own, and unless the indications are very misleading, the probabilities are that the comments on the subject a year hence will include a statement of a wide application of these machines to the heavy locomotives of the country.

PROBABLY the most valuable part of the report on mechanical stokers for locomotives is the recommended specification which defines the various requirements which automatic stokers should fulfill. These are stated briefly, and should be further elaborated, as they will have an important influence on the future development of the stoker. One item requires that the stoker should be mechanical from tender to grate, which implies a conveyor to relieve the fireman from handling coal. While in the discussion some thought this too radical a provision and not entirely necessary, the general opinion was that the conveyor should form an essential part of a locomotive stoker, and as several are already in successful operation, it cannot be regarded as a hardship to make this a definite requirement in the stoker specification. The fifth item requires that the stoker shall "distribute the coal over the grate in such a manner as to call for no assistance from the fireman other than regulation of supply, and possibly the adjustment of the mechanical appliances for distribution." This paragraph is not entirely clear and should be revised. It seems to imply that the stoker has been so fully developed that the distribution is automatic and requires scarcely any attention on the part of the fireman. It was shown in the discussion that one of the principal difficulties with some stokers is that they bank the coal, which means irregular distribution over the grate. It can hardly be expected that this be entirely accomplished mechanically and automatically under varying conditions of draft, speed and track, and it is not too much to require that the fireman shall take an active part in the portion of the work of maintaining an even fire. It is best that he should, and that the responsibility for coal distribution on the grate be divided between the machine stoker and the fireman. There will then be less waste of fuel and a greater certainty of maintaining full boiler pressure.

PRESIDENT FULLER called attention forcibly, in his address yesterday, to the need for greater uniformity in legislation affecting railway operation, and also in the practice of the various railways themselves. Until a short time ago railway legislation was almost entirely restricted to the regulation of traffic. The original safety appliance law was in effect, but it left the railways much latitude as to standards and practice. Recently, however, the law makers, both in Congress and the state legislatures, have begun industriously to regulate matters concerning all the branches of the operating department, including the mechanical. The result is both federal and state laws regarding these matters, which commonly make different, and often conflicting, requirements. The recent decision of the United States circuit court in the Minnesota case clearly holds that where state laws and federal laws regulating railways conflict, the former must yield. As Mr. Fuller indicated, federal is generally preferable to state regulation. The railways can obey one master; they cannot obey over 40 masters if they give different orders; and experience has shown that the states will make different requirements from each other and from the federal government. It is greatly to be hoped, therefore, that this decision will be upheld by the United States supreme court. Uniform practice by the railways themselves is hardly, if at all, secondary in importance to uniformity in the legislation regulating them. The mistake sometimes has been made by various railway associations of adopting as standard practices and devices which had not been, and which were not subsequently, accepted and used with any approach to unanimity by the individual lines. This has got the roads in many difficulties When anything is adopted by a railway association such as the Master Mechanics' or the Master Car Builders', the public and the law makers are going to assume, naturally, that the practice recommended is the best practice. So assuming, they will naturally condemn any railways which do not use the recommended standards and are apt to pass laws to require all to use them or to impose still more stringent requirements. It seems beyond question that it is expedient for the roads, first, to be conservative and painstaking in adopting standards, and then to make their practice as nearly uniform as the widely varying conditions in this big country will permit. The public and the regulating authorities look upon the railways as a single system; and in order to deal effectively with public opinion and the regulating powers, the railways must, to a very large extent, deal as a unit with them. It is generally conceded that no body of men ever did more effective or salutary work for the railways than the Special Committee on the Relations of Railway Operation to Legislation has done during recent months; and its effectiveness has been mainly due to the fact that it has exercised a strong influence to bring about uniform practice by the various lines it has represented, and in dealing with public authorities has been able to speak for its constituent lines as a whole. The mechanical officers should be especially able to appreciate the work that this committee has done, because the good results it has obtained have been largely in connection with the safety appliance standards adopted by the Interstate Commerce Commission and the locomotive boiler inspection law recently passed by Congress. As Mr. Fuller indicated, experience should have taught to railway officers the lesson in the words "United we stand; divided we fall," so that they will not soon forget it.

PRESIDENT FULLER ON RAILROAD EFFICIENCY.

PRESIDENT FULLER in his address referred to the remarkable vogue that the subject of railway efficiency has had during recent months. Until recently hardly anybody in the United States would have questioned that the railways of this country were one of its most efficiently managed industries, if not its very most efficiently managed. Then Mr. Brandeis asserted before the Interstate Commerce Commission that by scientific management they could save $1,000,000 a day, and put on the witness stand a number of men who had been employed by railways to promote efficiency to testify that there was almost no such thing; and immediately every anti-railway agitator in public life and every muck-raking newspaper and magazine writer discovered how disgracefully incompetent railway managers are; and they have been talking and writing about it ever since. Mr. Fuller's able chief, J. Kruttschnitt, in his recent lecture on "The Efficiency of Railway Service," at Harvard University, and other railway officers in public utterances, have now, by giving the facts, convinced a large part of the public that railway managers and management are not so incapable as they have been painted; and it is possible to discuss the subject somewhat more intelligently and dispassionately.

The facts of the matter, briefly stated, are, first, that there has been a great increase in the economy and efficiency of management during the past ten years, and that the railways, as a whole, probably are the best managed concerns in the country; and, second, that there is plenty of room for very important additional increases in economy and efficiency. As a very prominent railway president said recently: "Of course, we can save $1,000,000 a day; we have done it, and can do it again if the public will give us time and opportunity; but we can't do it while you mop your brow." It is the very purpose of such conventions as are being held in Atlantic City to save that $1,000,000 a day, and more, too, if possible; and if the critics of the railways knew a little more about the

splendid work that has been and is being done by the Master Mechanics' and Master Car Builders' Associations, the American Railway Engineering Association, the Signal Association and numerous other organizations of railway operating officers, they would take a very different view of railway management.

There is one point, however, in which the *Railway Age Gazette* believes the various railway operating and technical organizations, including the M. M. and M. C. B. Associations, have been and are remiss. Sixty per cent. of the expenditures of the railways are for labor; the problem of getting the best results from these expenditures is one of the greatest that confronts railway managers; and yet the various leading associations give hardly any attention worth mention to it. The best methods of handling all classes of workmen employed in the mechanical department ought to be prominently considered at these conventions every year; and yet they are hardly considered at all. The cold fact of the matter is, that railway officers are afraid of the labor problem. The labor leaders have most of the operating executives so completely whipped that they entirely lack the courage to discuss wages and conditions of employment in public, except in the most general terms; and naturally other officers are loath to rush in where their superiors fear to tread. But the question of the proper relations between the railways and their employees, whether in the mechanical or any other department, will never be solved by whispering about it in a corner. The facts about the existing relations must first be made as public as any other facts about the railway business, and then they must be dispassionately studied and fearlessly discussed. These are necessary preliminaries to the solution of the labor problem on the railways; and they will serve to make its solution easier. Without them its satisfactory solution will be impossible.

LOCOMOTIVE FRAMES.

THE report on locomotive frames indicates that we are making little progress in preventing the breakage of frames. They continue to fail in about the same proportion as in years past. One road reports that as many as 39 per cent. of the engines passing through its shops have broken frames. The failures appear to be progressive, increasing with the time of service of the engine, indicating that, after frames which are defective have been eliminated, good frames will break in time with a clean, solid fracture due to constant bending action. As might be expected, the failures are more frequent with long locomotives such as consolidations and decapods. This seems to indicate that what is needed in these long frames is a more uniform flexibility; as splices add to local stiffness the fewer splices there are the more flexible the frames will be. The committee therefore recommends the type of frame which dispenses with splices as far as possible.

As a result of the study of European practice the committee concludes that there is no advantage in plate frames for American locomotives, but it is interesting to find that the Baldwin Locomotive Works has used plate frames with angle iron flanges for the new electric freight locomotives of the New Haven road. These engines will develop a greater horse power than any single steam unit built heretofore, but the electric engines are not subject to the stresses due to the reciprocating action of pistons and crossheads.

The report finds that there is a general agreement that cast steel is superior to forged wrought iron frames, not only on account of the difficulty in welding up the latter, but because cast steel is stronger than wrought iron. The specification for the steel castings submitted to the association in 1904 is not adapted to obtain a very strong casting; the material is much like soft rolled steel in its composition, having 0.28 carbon and a minimum tensile strength of 55,000 lbs. A much stronger casting would be obtained if the tensile strength requirement were increased to 75,000 or 80,000 lbs. and the carbon to 0.45 or 0.50. The principal objection to such material would be made by the locomotive builders, as it would be harder to plane and slot, but the material would have much greater strength, and that seems to be what is required to resist the heavy stresses to which locomotive frames are subjected. In the use of a hard and strong steel for locomotive frames it would be necessary to round all the corners, have ample fillets and not allow any sharp edges, as this is liable to start small cracks which gradually develop into larger ones which finally produce fracture.

It is strange that advantage has not been more frequently taken of efficient sections like the I-beam for cast steel frames, for it is easily possible to obtain such shapes in cast metal, but the prevailing practice is similar to that for wrought iron in using rectangular sections. Mathematical formulæ are of little use in designing frames except as a mere matter of making sections proportional to maximum thrust and factors based on extended practice, and the committee wisely recognizes this fact by including in the report only very simple formulæ for such calculations.

GIVING MECHANICAL STOKERS A FAIR CHANCE.

THERE is a curious inconsistency in the attitude that railway officials are assuming towards the mechanical stoker for locomotives. They admit the desirability of the machine on heavy locomotives and certainly they have been most lavish in the opportunities which they have given to designers to develop their ideas in practical service; and when these designs have been worked out, orders have been given to place them on locomotives for regular work. But there the interest ceases. It is then that there seems to be a total forgetfulness of all past experience and practice. They seem to think that the stoker is endowed with some supernatural power, or the fireman with a superhuman intelligence that will produce results regardless of all adverse conditions. It is apparently a matter of no moment that everyone, designers, roundhouse foremen, traveling engineers, engineers, and firemen are agreed that the stoker should have fine coal to work with. Fine coal will be furnished if convenient, and if not, on goes lump and an engine failure is attributed to a defective stoker.

For years there has been a systematic training of the fireman for hand firing. His intelligence and knowledge of the locomotive is carefully scrutinized before he is given a through run. Yet he is called in turn, assigned to an engine, and learns when he climbs aboard, to leave the roundhouse, that the engine is equipped with a stoker. He knows nothing about it. His engineman is equally ignorant, and his only chance to get posted lies in the few minutes between leaving the house and taking his train. Of course, the stoker does not do well and he can thank his lucky stars and innate brightness if he does not have a failure.

Why, then, not follow past practice and precedent? Why not teach the men the use of a machine just as they are taught the other parts of the locomotive? Surely the experience with the air brake is a case in point. The same process was followed there. Men were given trains to handle with air, without instruction or training, with the result that after break-in-twos and "failure of the air brake" had become almost epidemic the upper officers came to a realizing sense that the trouble was with them and not with the men, because they were expecting impossibilities. They were expecting men to do by instinct what they could only do after experience and training. So the air brake instruction car was established, and now there is no official so foolish as to expect an engineer to handle his air properly until he has had a course of instruction.

Why, then, not use this past experience and apply it to the stoker? It acts differently from hand work. It acts differently with different kinds of coal, with different weights of train, on

different grades, and through the whole gamut of possible variations in the demands on the firebox. So why not give a man an instruction that will at least put h'm in a posit'on to have some faint inkling of what he is expected to do, and what the machine can do for him?

Again, experience has taught us that a roundhouse force is necessary at every division point to make running repairs to the locomotives; and not only the locomotive but the appurtenances connected therewith. The engine is inspected, the air brakes are tested, and the boiler is looked after with the tenderest care. But the stoker? Oh, that's all right. That will take care of itself. It is a matter of no importance whether its engine is lubricated or not. It should need no attention. Doesn't the fireman wash and feed and take care of himself? Surely a stoker that is to take his place must do as much as that, and if it fails then it is a failure as a stoker.

There is just this to be learned and practiced. A stoker is a machine. It needs the same attention that any other machine will need if it is to be kept in proper working trim. And until the upper officials wake up to the fact that a stoker needs all of this; that it must be inspected, cared for and repaired; that it must be kept in first class condition; that it must be furnished coal it can handle; that the men who operate it must be instructed in its use; and that it will wear out and deteriorate like other machines, general satisfaction in its operation must not be expected.

Was there ever such a trite set of platitudes as the above, printed in any paper before? Certainly there would have been great hesitation in printing them here, had not personal investigation found them to exist in all their—shall we say—flagrancy.

TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

Discussion of reports on—	
Main and Side Rods	9.30 A. M. to 10.00 A. M.
Piston Rods and Cross Heads.	10.00 A. M. to 10.30 A. M.
Repair Equipment for Roundhouse.	10.30 A. M. to 11.00 A. M.
Water Treatment	11.00 A. M. to 11.30 A. M.
Lubrication of Locomotive Cylinders	11.30 A. M. to 12.00 M.
Consolidation	12.00 M. to 12.30 P. M.
Individual Paper on "Superheat," by Prof. C. H. Benjamin	12.30 P. M. to 1.00 P. M.
Safety Valves	1.00 P. M. to 1.30 P. M.

Adjournment.

ENTERTAINMENT.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Band Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

44th Annual Ball, 9.30 P. M.—Of the American Railway Master Mechanics' Association, Entrance Hall, Million Dollar Pier. (Vollmer's Orchestra.)

The Galena Signal Oil Company's booth will be used as a rest room for the officers and their guests.

MASTER MECHANICS' BALL TO-NIGHT.

The forty-fourth annual ball of the Master Mechanics' Association will be given on the Million Dollar Pier at 9.30 to-night. Headquarters for the officers of the association will be established during the evening in the booth of the Galena-Signal Oil Company at the east (ocean) end of the ball room, and the line of march will be formed in front of this booth. The grand march will be led by President and Mrs. Fuller and other officers of the M. M. and M. C. B. associations and their ladies, and will be personally conducted by J. Will Johnson, chairman of the entertainment committee.

An interesting feature is the scheme that has been adopted to enable dancers to find their partners. Twelve stations called by the names of twelve cities, and indicated by signs, will be in different parts of the ball room; and opposite the musical selections on the dance program are blank spaces on which dancers may enter the names of the stations at which they will meet their partners for the various dances.

Vollmer's Orchestra will furnish the music, and there will be 19 regular dances. Punch, lemonade and ice water will be served from tables at both the east and west ends of the ball room.

TRANSPORTATION FOR RETURN RAILWAY TRIPS.

Secretary Taylor yesterday read the following communication from the Pennsylvania Lines:

"Kindly notify the railway members of the Master Car Builders and Master Mechanics Associations wishing transportation home over the lines of the Pennsylvania Railroad Company or the Pennsylvania lines West of Pittsburgh that such transportation will be provided if they hand you their names. Owing to the requirements of the law this transportation must be limited to bona fide railway officials only, and cannot include members of belt lines, car lines, or switching roads operated by industries."

Members wishing to avail themselves of this transportation will present their credentials to the secretary and he will see that they have their transportation arranged by Friday morning.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.

In accordance with section 4 of article IV of the by-laws of the above association, the executive committee by proclamation has named the hours between 10 A. M. and 12 M., Friday, June 16, for the election of members of the executive committee, and ballot boxes will be open between the above hours to receive votes for members of the executive committee from the districts.

This election shall be held in the office of the executive committee, uptown side of the Million Dollar Pier, next to the enrollment booth.

Members are to be elected from the following districts:

Third District—Pennsylvania, Maryland, Delaware, District of Columbia, West Virginia, two members in place of E. M. Grove, McConway & Torley Company, Pittsburgh, Pa., and B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa.

Fifth District—Illinois, Wisconsin, Iowa, Minnesota, one member in place of L. R. Phillips, National Tube Company, Chicago, Ill.

Sixth District—Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, one member in place of A. C. Langston, Jenkins Brothers, Atlanta, Ga.

Election will be by ballot. A separate ballot box will be provided for each of the above districts. Official blank ballots will be provided. Ballots may be cast at any time between 10 A. M. and 12 M., on the date above mentioned.

One vote only shall be cast by each member, corporation, copartnership, or individual; same to be cast only by the properly accredited delegate of such member.

Each voting delegate shall deposit his ballot in the ballot box marked for the district within which the home office of his company is located. Every voting delegate should see that the person for whom he votes for executive member is a resident of the district in which he votes, and is a representative of a member of the association.

THE EXECUTIVE COMMITTEE.
J. D. Conway, Secretary.

Proceedings.

The first session of the forty-fourth annual meeting of the American Railway Master Mechanics' Association was held on June 14. President C. E. Fuller (U. P.), called the meeting to order at 9.30 A. M. The president, past presidents and members of the executive committee of the Master Mechanics' Association and also of the Master Car Builders' Association took chairs on the platform. Rev. Newton W. Cadwell, pastor of the Olivet Presbyterian Church of Atlantic City, opened the exercises with prayer.

Mayor Franklin P. Stoy welcomed the convention to Atlantic City.



C. E. Fuller.

President, M. M. Association.

H. T. Bentley (C. & N. W.), first vice-president, responded to the mayor's welcome.

ADDRESS OF PRESIDENT FULLER.

On this, the occasion of the opening exercises of the forty-fourth annual convention of the American Railway Master Mechanics' Association, it is my privilege and sincere pleasure to extend to you a hearty welcome. It is an especial pleasure that we are permitted to gather for the sixth time in this beautiful spot, so happily called the "Venice of America." Its hospitality has been proven and has left only the most pleasant recollections.

I will not take up your time in dwelling upon the work of the association in the past, but will confine my remarks to the events of the year and to some of the problems which confront us.

The American Railway Master Mechanics' Association stands for progress, as evidenced by its growth and accomplishments since its inception; and at our annual conventions, or birthday celebrations as we might call them, we review the work of the past and look forward to the future with brighter hopes and renewed vigor.

The year 1910-1911 has been a memorable one in so far as it relates to government legislation affecting the railways in general, and the mechanical department in particular. During this period federal laws have been enacted regulating safety appliances for railway equipment; also laws regulating the inspection and care of locomotive boilers. In some states there has been additional legislation, the full crew and caboose bills and headlight bills, while in addition to the federal legislation there has been in some parts of the east state legislation with regard to boiler inspection. In view of the federal and state legislation on the same matters, it would seem every possible effort should be made to have the state laws either withdrawn or amended to agree with the government legislation.



H. T. Bentley.

First Vice-President, M. M. Association.

In the matter of safety appliances your committee, in conjunction with the Master Car Builders' Association, has had this work in hand and has given a great deal of time to it, conferring with the government officials as well as representatives of the railway employees, and a set of rules was formulated covering the requirements.

In my opinion this association should insist on the Interstate Commerce Commission furnishing necessary drawings specifying in detail the location for safety appliances.

Your committee also gave considerable time and work to the boiler bill, and in conference with the government officials arrived at rules governing the same.

As the work of your special committee on the Safety Appliance and Boiler bills has now been completed and as both of these have to do exclusively with technical matters which can properly be handled by mechanical men, it would seem the future work in connection with these matters should be taken over by the association, and I would recommend the appointment of a committee to handle it. In this connection I cannot too strongly recommend that the members of this association conform promptly to the requirements of the Safety Appliance and Boiler bills, which

will indicate to the commission that the railways of America are ready to comply with the law if the requirements are clearly known.

It also appears to me that the requirements of the Safety Appliance act as well as the Boiler bill should be embodied in and adopted as the standards of this association.

In view of past legislation on matters pertaining particularly to the mechanical department, it would seem to me that the policy and work of this association should be more clearly outlined than ever before.

Our experience emphasizes the necessity for looking forward and taking such steps toward uniformity as will enable this association to take the initiative in these matters. I believe this is an opportune time for members of the association to get away from a great many of their personal opinions and get together and agree on the best standards and practices to a greater extent than ever before, and having arrived at such standards they should be followed. Uniformity and Unity should be the keynote of our future endeavors. The present conditions, so far as railway operation is concerned, have brought out in the columns of the various technical journals and elsewhere the thoughts of many master minds; and, while the trend of my remarks may not be along entirely original lines, I have selected such thoughts as seem to me to be the most pertinent to our needs.

In reviewing these articles and considering the situation and problems to be met, the small word "Unity" stands out above all others. Unity is the strength and support of any organization. The framers of the constitution of the great country realized it as we must realize it. We talk of scientific management and efficiency, but we must remember that there is nothing truer than that much quoted but golden sentence, "United we stand; divided we fall." Unity means harmony and coöperation, and by united effort will the desired results be obtained.

With united strength we can lead, not follow. This association stands alone and unique—the strongest mechanical organization in the world; yet our work is not being felt as it should be felt, owing to the fact that some of the individual members do not follow and carry out the recommendations of the association. This association for years has had committees on the most important matters and the work should not become lost or buried.

It is not my intention to criticize, and I hope my remarks will not be so taken as this is far from my thought or purpose, but I am very much afraid that our work is to a certain extent lost sight of, due to the fact, that the association has not taken advantage as it should of that which has been done, and has not adopted recommended practices nor have such practices been printed in the proceedings, as they should be from year to year.

Recent discussion and events have brought rather prominently to public view the question of efficiency and economy in railway operation, but it is far from a new subject so far as those engaged in railway work are concerned. As railway officials, efficiency and economy have been our constant watchwords. Much has been done. The installation of the most modern rolling stock and shop equipment has brought about greatly increased efficiency in railway operation. The commercial feature of our operations has been watched with consequent increased efficiency in shop management.

Publicity has not until recent years entered very largely into railway operations and the public has not been fully informed of the efforts and accomplishments of the railways along the lines of efficiency and economy. Railways have a very deep interest in having the public correctly understand the achievements which have been made. Every published statement reflecting credit on the railways whether relating to their good intentions or their able management strengthens them in the public esteem and tends to promote a calm and wise solution of the problems of



D. F. Crawford.

Second Vice-President, M. M. Association.



T. Rumney,

Third Vice-President, M. M. Association.

governmental regulation. There is among us no disposition to evade discussion of our efficiency.

So far as the mechanical department is concerned, our efforts have not been sufficiently brought to the light of public recognition. We have been content with the satisfaction which comes from appreciation expressed by those best in position to judge. The operation of American railways has been praised by the highest authorities abroad as the most efficient and economical in the world. We have spent our lives in learning all we could from any quarter whatsoever which might be useful in promoting efficiency and increasing economy.

What is the purpose and significance of this convention? This is the fourty-fourth annual meeting of the American Railway Master Mechanics' Association. During a span of nearly half a century the railway companies of this country have delegated the responsible heads of their mechanical departments to attend these annual meetings. Here each of us in turn gives his best thought and the result of his own experience to the others. Here the standard of efficiency and economy in the performance of every function incident to the manufacture and maintenance of cars and locomotives has been advanced by comparison of experience and of views. Here we have had the suggestions of men not our members. It has mattered not to us what was the source of help.

The public should know that of all the enterprises of the country no other approaches the railways in systematic and persistent study of efficiency and economy.

In addition to this mechanical organization the officials connected with the maintenance of way have their engineering association which meets annually and whose purposes are similar to ours. Our foremen of the various branches of the work have their organizations meeting annually to exchange ideas and improve the efficiency of their members.

The entire territory of the United States is divided into sections, each having its territorial railway clubs and organizations for the furtherance of research and efficiency along specific lines. The existence of these organizations comprising the efficient managers and department heads of the railways, all endeavoring to systematize and improve operating methods is cited simply as additional evidence of what the railways are doing to bring about improved methods and increased efficiency.

From the foregoing you will readily appreciate there is very much that the American Railway Master Mechanics' Association can do along the lines indicated.

I see no reason why this association should not have as a part of its recommended practices, mechanical plans for large and small terminals, units embodying the best practices, so that if conditions are such that these plans in their entirety are not feasible or practicable it will be possible to take therefrom the best available features under which shop lay-outs can be designed. There are a good many of the railways that do not employ large and expensive engineering forces and such plans would be of infinite value to such members.

A very pertinent subject in connection with the matter of increased efficiency, to my mind, is the education of our apprentices, in fact of all our employees. By what better method can we hope to increase our efficiency than by setting a high standard for the young men we are educating, from whom we must be able to draw our foremen and shop managers? Progress has been made by some of the individual lines not only in the way of educating apprentices, but also giving other employes similar advantages by instituting plans of broad scope with educational bureaus open to all employees. It is my opinion that in line with these efforts our association should adopt a recommended apprentice system for apprentices to the various trades as well as for the technical graduates, commonly called "special apprentices."

On the recommendation of my predecessor a committee was appointed in connection with the establishment



J. W. Taylor.

Secretary, M. M. Association.



Angus Sinclair.

Treasurer, M. M. Association.

of a permanent technical bureau within our association. Such a bureau cannot help but be a valuable asset of this association and I cannot too strongly endorse the wisdom of this plan, which I hope will be carried out at an early day. I have indicated the work which has been accomplished by the special committee which conferred with the government officials in the matter of safety appliances and the boiler bill. This simply illustrates what can be done and the value of a centralized bureau to handle subjects which are of a mechanical nature is, it would seem to me, very apparent.

By invitation this association had a representative in attendance at the annual meeting of the Conservation Congress. The aim and work of this congress are something in which every member of this association is vitally interested, and I believe it should have our coöperation and support in every way possible.

The question of consolidating this association with our sister association, the Master Car Builders', has been discussed for some years, and there has been considerable agitation of the matter for the last three years. Committees have been appointed, but up to the present time the proposition has not been settled. It has been the opinion of a great many of the members that the consolidation of the two associations was not feasible and practicable and I leaned to this opinion, but the more I have studied the subject the more I have become impressed with the idea that the union of these two associations will enable us to carry on the work in a far more satisfactory manner. Those of us who have worked in both associations realize what an extra amount of work and time two associations mean for the individual members, and I personally feel the time is ripe for this consolidation or union of the two associations, and I believe the committee should be so instructed to perfect plans so that this consolidation can be accomplished as quickly as possible.

There are a number of important matters confronting railways at this time which should receive our earnest attention and coöperation. We have under consideration and have had committees appointed to investigate during the past year some fifteen subjects comprising important mechanical problems of to-day, and I trust that the reports of the committees will be carefully analyzed and freely discussed to obtain the full benefit of the able work which has been done.

I would call particular attention to the report of the committee on Design and Construction of Locomotive Boilers. In my opinion this association should arrive at such standards for boiler design as will be adopted and followed by all members.

Before closing, it seems fitting that mention should be made of the efforts of the Railway Supply Manufacturers' Association, which is entitled to a hearty vote of thanks for its magnificent display and the opportunity afforded members of this association to inspect the many new machines and appliances. Gathered about these conventions there has grown up year by year this imposing exhibit with many miles of mechanical displays representing the most complete exhibit of its kind to be found anywhere in the world. Immediately accessible are inventors and designers ready and willing to discuss the merits of their devices. Our sessions are so scheduled that several daylight hours every day can be devoted by the delegates to the study of the very latest suggestions in the way of modern equipment and appliances by which we are enabled to bring about increased efficiency and economy. I desire to urge on every attendant at this convention that he take full advantage of this opportunity.

In conclusion I wish to express my sincere appreciation of the coöperation and assistance of the officers of the association, committees and individuals who have assisted in preparing reports and otherwise rendered efficient service in the work of the association. To you all I extend my heartfelt thanks.

ASSOCIATION BUSINESS.

Secretary Taylor presented his report, which showed that the active membership in June, 1910, was 952; since that time there were transferred to honorary membership, 6; deaths, 11; resignations, 13; dropped for non-payment of dues and mail returned, 1; being 31 deductions from the list as it appeared in June, 1910. During the year there were 78 new members elected and one member re-instated, making the total membership at the present time, 1,000. The associate membership is 20, the same as in 1910. The honorary membership is 43, being an increase of 6 since 1910. The total membership is now 1,063. The following deaths have been recoded: Active members: D. F. Van Ripper, H. H. Johnson, J. B. Gannon, A. J. Dunn, David Brown, Wm. Buchanan, H. S. Bryan, G. J. DeVibiss, P. G. Thomas, J. P. Picciolo and S. K. Hatah. The secretary presented the treasurer's report which showed an income of $6,036.90, and expenses of $5,940.77, leaving a balance of $96.13.

The recommendation of the executive committee that the dues for the ensuing year be fixed at $5 per vote was adopted.

C. H. Rae (L. & N.), J. W. Fogg (B. & O. C. T.), and M. J. McCarthy (C. C. C. & St. L.) were elected members of the auditing committee.

Prof. Louis E. Endsley, Purdue University, and E. A. Averill, managing editor of *American Engineer and Railroad Journal,* were made associate members of the association.

The following committees were named to prepare obituaries: T. Rummey, on D. F. Van Ripper; J. W. Taylor, on H. H. Johnson; G. W. Wildin, on J. B. Gannon; Angus Sinclair, on David Brown; J. J. Conolly, on H. S. Bryan; M. A. Kinney, on G. T. DeVelbiss; C. E. Chambers, on P. G. Thomas, and J. W. Taylor, on J. Piccoli.

The association has four scholarships at the Stevens Institute of Technology. The expenses of the student at the school is taken care of by the fund that we have there, but it does not include boarding. There are no vacancies at the present time and there will not be any until September, 1912. The scholarship at Purdue University given by Joseph T. Ryerson & Son, for which they appropriate five or six hundred dollars a year, takes care of the school expenses as well as boarding the student. The present student graduates this spring, and the Ryerson people are willing to extend this another four years if the association desires to coöperate with them. The executive committee accepted this offer.

The President: In connection with these scholarships there has not been the number of applicants for the scholarships that would be naturally expected in an organization having a membership of a thousand or over, and we would remind the members that it exists.

ADVISORY TECHNICAL.

The committee made a report progress, there being many things which have come up during the past year which have prevented it from making any definite recommendations at this time, among which are the possibility of a consolidation of the two associations, and other matters of like nature. Such a committee is desirable, but the attention of the executive committee is called to the fact that if the committee on advisory technical follows the line of work as it is supposed to do, and if the committee that the president has recommended is appointed, they will both be doing nearly the same work and one or the other should be eliminated.

MECHANICAL STOKERS.

The committee reports that such progress has been made in the development of mechanical stokers as to warrant railways installing a limited number upon large locomotives at least, and thus lend their aid in the perfection of a device which the committee has concluded is a necessary appliance to heavy tractive-power locomotives. The committee is of the opinion that it behooves the members of this Association to participate actively by utilizing such stokers as have been developed, and, by actual application, assist in the solving of the many problems which must naturally present themselves during practical operation. The benefits to be derived might properly be again referred to, viz.: Utilization of the maximum boiler capacity of locomotives. Reduction of black smoke, because of the possibility of maintaining a thin, level fire. Application of coal in more minute quantities. Improved life of flues and fire boxes. The reduced labor required should make the positions of firemen more attractive, which will carry therewith obvious benefits to the railways.

The requirements for mechanical stokers, as recommended by your committee, in brief, are: That they should be capable of firing coal in excess of the maximum requirements of the locomotive. That the fire-box door be free of any attachment which would prevent the fireman from giving such attention as fires may require. That they be entirely mechanical from tender to grate and capable of handling bituminous run-of-mine coal, which will include a coal crusher,

mechanically operated, on the tender. They should distribute the coal in the fire box in such a manner as to call for no assistance from the fireman other than regulation of supply and possibly the adjustment of the mechanical appliances for distribution and maintain an ideal fire for economic coal consumption without emission of black smoke in objectionable quantities.

Previous reports of the committee have directed attention to various mechanical stokers under development, and a summary upon each is presented, with such remarks as are believed pertinent to the subject.

Crawford Underfeed Stoker.—This stoker is in service on the Pennsylvania; its operation has been satisfactory; it is completely mechanical and aims to cover every requirement set forth.

Barnum Underfeed Stoker.—This machine is in the process of development and so far has been used as a distributor only, requiring coal to be shoveled into the hopper. The reports from the Chicago, Burlington & Quincy indcate that the mechanism operated satisfactorily, burning an inferior grade of fuel, showing economic results. It is in successful operation on a six-wheel switch engine and a prairie freight engine. A method of crushing coal on the tank and delivering it to the hopper on the engine is now being developed which will make the device meet all the requirements enumerated.

Strouse Overfeed Stoker.—The manufacturers have increased the scope of the apparatus, which formerly consisted of a distributor only, by adding a conveyor from tender. Satisfactory service has been obtained with regular crews, but the development to date does not permit of complete report.

Street Overfeed Stoker.—There are ten machines in service, including four on the Lake Shore & Michigan Southern, one on the New York Central and the remainder distributed on five other railways. The stoker is designed to meet every requirement suggested by the committee, and is successful in its operation.

Hanna Overfeed Stoker.—The stoker has been developed only as a distributor. Consequently, it falls short of the requirements set forth, inasmuch as run-of-mine coal can not be handled, and shovelling from tender to a hopper is necessary. The device distributes coal into the fire-box very satisfactorily and is rendering good service on the Queen & Crescent, operating on Mallet, consolidation and Pacific type locomotives.

The Hanna stoker is a coal distributor of the overfeed type, using steam jets. The coal is shovelled into a hopper and then pushed up a conduit by means of a short screw. From the conduit the coal falls over a ridge plate onto the fuel-distributing plates, in front of the steam jets. Two wings move over the ridge plate in such a way that the coal is distributed in a cycle over the grates. These wings are also adjustable so that coal may be concentrated on any portion of the grates. They are actuated by a set of levers, connecting rods and ratchets from the main shaft of the stoker. The motive power is furnished by a small two-cylinder reversible engine. The entire device is self-contained and bolts rigidly onto the back boiler head of the locomotive. No mechanism is provided to crush all classes of coal or to convey the coal from the tender to the hopper.

Hayden Stoker.—The original design failed in two particulars, unreliability and poor design of conveying mechanism and the burning out of coal-distributing plate. The modified distributor developed independently from the conveyor avoids the distributing coal plate in the fire box and is giving satisfactory service on the Erie.

Dickinson Overfeed Stoker.—This is a further development of the principle involved in the Hayden stoker and seeks to fulfill the requirements of the committee. It is in operation on the Erie and giving satisfactory results in regular freight train service.

Brewster Underfeed Stoker.—One of the above was recently applied to a locomotive on the Erie, but owing to modification being required the time was too limited to permit of the results being included in the committee's report. The stoker is designed to meet all requirements previously mentioned.

It consists in part of a screw which is placed in the bottom of the tender and covered with movable steel plates, so arranged that a gradual flow of coal is admitted to the screw. The coal is conveyed by means of this screw through flexible coupling to a point below the grates. It is then carried upward through the grates by means of a second screw to the steam jets which are on a level with the bottom of the fire-box door. The blasts from the jets, which work intermittently, are adjustable to meet any condition of fuel or size of fire box.

The grates are divided into four divisions, two on each side, and by means of a cam—one section at a time—they are tilted slightly forward to advance the fire and agitate the grates sufficiently to keep clear of ashes. The whole arrangement is operated by a small double-cylinder engine, located on the left side of the locomotive, below the cab.

Summary Remarks.—Tests comparing inferior fuel used with mechanical stokers to regular supply for hand firing, thus taking advantage of difference in present fuel values, should not be accepted as proof of economy, as such relations would not maintain with the extension to any appreciable number of mechanical stokers.

The progress during the past year has been sufficiently marked to lead the committee to believe that it can present a final report at the next convention upon at least several of the stokers which have already been developed sufficiently to perform actual continuous service.

This report is signed by:—T. Rumney (Erie), chairman; E. D. Nelson (Penn.), C. E. Gossett (M. & St. L.), J. A. Carney (C. B. & Q.), and T. O. Sechrist (C. N. O. & T. P.)

DISCUSSION ON MECHANICAL STOKERS.

C. B. Young (C. B. & Q.): For perhaps four months we have had the Barnum stoker in successful operation on switch engines in Chicago, and it produced no smoke, it has burned inferior coal and keeps up with other switch engines of the same class. The road engine has not been quite so successful as the switch engine, but has been doing pretty good work, and we are now developing for the road engine some modifications, embodying slight differences, which are necessary from the application of the stoker to the switch engine.

H. T. Bentley (C. & N. W.): I suppose the stoker has been put on the switch engine just to keep close observation of it, to enable you to watch its performance more closely, but it seems to me a switch engine is not a desirable engine upon which to put a stoker.

C. B. Young (C. B. & Q.): The stoker was put on the switch engine to avoid the smoke nuisance in Chicago and it is doing it.

George A. Hancock (St. L. & S. F.): I should like to relate an experience with the stoker on the St. Louis & San Francisco with a Mallet engine. It meets the requirements of the committee. The fuel economy is about in line with the report of the committee. The whole economy depends entirely on the fireman. The conveyor apparatus is entirely satisfactory. We have been troubled with the crusher, but that is on account of foreign substances, such as stone and slag on the stoker; outside of that, with the heavy engines, it is far superior to hand firing and the firemen after becoming experienced in the use of the stoker become expert in its use and bring about very satisfactory results. I think it will be easier on the flues. I think it is what we want for a heavy engine.

T. O. Sechrist (C. N. O. & T. P.): We have eight engines equipped with the Hanna stoker. One of these engines, a Mallet compound, has been equipped for 14 months, and during that time we have had two failures. These failures were due mostly to the carelessness of the crew assigned to the engine, but during all the rest of the trips that this engine has made, the performance of the stokers have been entirely successful and satisfactory, and we have had at least 24 representatives of foreign roads riding on this engine. The same thing holds good in case of the Pacific type and consolidation engines equipped with the Hanna stoker. However, it does not meet with the full requirements set forth by the committee as it does not convey the coal from the tender to the fire box.

As far as the stoker being a distributer, I differ a little with the other members of the committee. I think that the stoker can be classed as a stoker only; the conveying and crushing part is only a small matter to apply in conjunction with the stoker. On the trip from Oakdale to Danville, Kentucky, which is a very extremely mountainous country, with grades 60 ft. to the mile, and curves of 6 per cent., at no time have we failed on account of steam on any of the engines equipped with stokers, and at the end of a 137-mile run the fire will be perfectly level. Any time there is trouble with the draft blast it can be overcome by adjusting the steam blast, which is equipped for a high and low pressure blast, and this applies to the back end of the fire box as well as the front. The Mallet engine consumes about 6,000 lbs. of coal per hour while the consolidated engine will run along about 4,500 lbs., and the Pacific type engine will run about the same as the Mallet.

George L. Fowler (*Railway Age Gazette*): I rode one of the engines on the C. N. O. & T. P. the other day from Oakdale to Somerset. We had the full tonnage with a consolidation engine, and about 920 tons was hauled up a 60-ft. grade. In one case, I think, we ran five miles up a 60-ft. grade from the start to the stop in 11 minutes. The engine was not only kept hot during the whole period of

the run, but the steam never dropped below 125 lbs. The fireman on the engine had made only three round trips prior to that on a locomotive and these three had been on this stoker engine. The only information and instructions he had ever received concerning the stoker had been from his engineer in a desire to help him out. A run of 137 miles was made, winding up the last part of the run from Somerset to Danville with a tonnage of 1,200 behind the engine, the total coal consumed on the whole run, my estimate would be, was about 14.5 tons, certainly not more than 15 tons.

It seems to be a comparatively easy thing to make a stoker that will keep up steam. I have seen the Kincaid stoker and the Hayden stoker, and all others, keep up steam under ordinary conditions, but it has been by the use of an excessive quantity of coal. I think that a great deal of the excessive coal consumed by the present stokers on the market is due to the fact that it is such an easy thing to put coal in the fire-box.

The stokers do not handle heavy, lumpy coal with the same facility that they do the crushed coal.

We noticed the very marked difference on that run, from Oakdale to Danville, in the case of the coal we took on at Somerset, the coal put on at Oakdale being a fine coal, and during the run to Somerset, 117 miles, the fire was just as smooth and as fine as could be desired. Two buckets of the fine coal and one bucket of rather lumpy was put on at Somerset and the moment the lumpy coal was put into the fire-box, the blast was not strong enough; the coal backed up against the back sheet, and in the next few miles it was necessary to use the hook three times. The moment the lumpy coal was disposed of, the fire flattened out and there was no trouble whatever after that.

In adopting the use of the stoker the men should be given some idea of what they are going to use, what the stoker is for, how it works, and then have the roundhouse forces take care of the stokers. Give the stoker the proper kind of coal, and if you do that, with any of the three stokers now on the market, there is no reason why an engine should not be fired perfectly. I think that the firing can be done more economically with the stoker than it can be done by hand firing.

I believe the smoke runs between 2 and 3 on the Ringlemann chart, when the engine is working heavy and the fire is being constantly fed by the stoker, but the moment there is any let up the smoke drops right down to practically between 1 and 2, if not down as low as 1; but there is smoke, and constant smoke, with both the Street and Hanna stoker when they are working heavily, but other engines not equipped with the stoker showed greater smoke. I should judge on the ordinary engine, with hand firing and working hard, that the smoke would run between 3 and 4, while with the stoker engine it was between 2 and 3, perhaps nearer 2 than 3.

C. E. Chambers (C. of N. J.): It was my privilege to make a trip on one of the Pennsylvania engines equipped with a Crawford stoker. We had a tonnage train of coal cars; there was no hand firing done at all and there was almost no smoke, except just when the stoker was placed in operation; at that time there would be a discoloration of the steam coming from the stack, but not anything that you would term smoke, such as would come from a soft coal engine. It was about the most gentlemanly job of firing I ever saw; a man could put on a white shirt, and the only evidence that anything was going on was the disappearance of the coal in the center of the tender.

As to steam pressure, you would have thought that they had fixed the pointer. I could not see that it varied one pound at any time. There was not one hitch during the entire time that we were on the engine—nothing occurred which could be considered as unfavorable to the operation of the stoker, except that possibly once or twice the coal blocked the shovel temporarily because of lumps. The tonnage was 1,700 or 1,800, but they said it would have been the same with 3,500 or 4,000 tons.

Geo. L. Fowler: Last year I gave some memoranda in regard to the operation of the Crawford stoker, and that was the reason I did not speak of it this morning. At that time I compared the smoke coming from the Crawford stoker to the average conditions of the Pittsburgh atmosphere. I rode the engine from Pittsburgh to Crestline, and there was no smoke whatever; when I returned I was asked how the steam pressure ran, and I said I did not know; that I thought they must have been monkeying with the gage, because the pointer did not move throughout all the trip.

D. F. Crawford (Penna.): We have made all told 2,000 trips with the stoker. Of these about 1,600, representing very roughly 160,000 miles, have been made with what might be called the improved stoker. There are at present about 20 locomotives equipped. There are 19 in regular service and we have 10 or 12 more under way. The stokers have all been applied, with the exception of three, to 11-6 consolidation locomotives. Two of the stokers are placed on a larger consolidation locomotive and one on a switch locomotive.

The stokers up to three or four months ago were in the hands of regular crews; in some cases a man rode with them. He was called a stoker instructor, and was simply a fireman who had been taught what the different parts consisted of and what was expected to be done with them. It was his duty to teach the other firemen how to handle the stoker. About three or four months ago five or six of the locomotives were assigned to one division and were turned over to the pool. Out of 1,500 or 1,600 trips that the latest stokers have made, about 800 of them have been 100 per cent. stoker fired; that is, no coal was put in by the shovel at all. One thousand trips have been about 90 per cent. stoker fired or over, and the average of all trips is somewhere about 90 per cent.

The stoker has been on the testing plant at Altoona. We have made a number of tests with the Salinville coal, which we use regularly, and we have succeeded in firing 6,300 pounds of coal per hour. We have fired that successfully and maintained the steam pressure with it; the performance was in every way satisfactory. I agree fully with the conclusions of the committee as to the desirable points of the stoker. I disagree with Mr. Sechrist, who said that the conveyor should not be used. The stoker is not complete unless it does the whole job. The first stokers that we had were without the conveyor, and they did not appeal to me as meeting the situation.

Something has been said about coal economy. From the results obtained on our testing plant I think we will do as well, or even better, than the best hand firer. On some of the tests that we have made the stoker has shown conclusively that it will save coal as compared with the average hand firing. However, I do not look to coal saving in itself as being the important point of the stoker. To me the important point is to be able to rate your locomotive not on the size of the cylinders, but on the pounds of coal that it burns. Our consolidation locomotives are probably using from 3000 to 4000 lbs. of coal per hour in regular service over a continued run. We want to rate those engines at 5000 lbs. of coal per hour, and make the train behind the engine a 5000 lbs. of coal per hour train and do what such a train ought to do. We do not have to build any heavier or bigger engines. All we have to do is to burn more coal and use the engine that we have up to its adhesive ratio.

One of our consolidation locomotives was put in switching service in one of the large cities where they have a smoke inspection bureau in operation with well trained observers.

One of these trained observers took notes and made observations of this engine at different times for a period of 40 hours. He made a total of 9,754 smoke observations, of which 9,550 were No. 0; 570 were No. 1; 20 were No. 2; 10 were No. 3, and four were No. 4. In other words, 8½ per cent. of the smoke was eliminated on this engine engaged in switching service. One difficulty is that west of Pittsburgh we use the Ohio coal, and east of Pittsburgh the coking coal, and we have had some little difficulty with the latter.

C. F. Street: I have put 10 of these machines in service. There are two or three matters on the general stoker situation that I would like to bring up. The first is this: The main object of putting a stoker on a locomotive is to increase its capacity. As Mr. Crawford has said, the capacity of firing is about 2½ to 3 tons per hour. With the stoker you can jump up to 5 tons of coal per hour, and with the increased capacity you at once increase your tonnage. The master mechanic of one road where my stoker is running said that if they equipped their locomotives with the machine he would be able to increase the hualing capacity of the locomotives from 15 to 20 per cent. That is the key to the whole proposition. You get a stoker that will do that and the question of fuel economy immediately becomes secondary. You can afford to burn considerable more coal per unit of work. Another point is the increased speed that the locomotive is able to attain. It will work on grades which the hand-fired locomotives cannot. I can put any kind of stoker on a locomotive and it will run at a speed of 20 to 30 miles an hour, with any kind of tonnage, and work like a watch. Load the locomotive down with all it can haul, bring it to a grade and slow down from 5 to 8 miles an hour, and you have a very different proposition: The stoker for passenger locomotives looks so easy that it seems to me a shame not to use it, as the conditions are ideal.

There is no question but what the scatter type of stoker will do. By applying it a great deal of the smoke will be

eliminated. A great part of the trouble is that your firemen are not given full and definite instructions as to how to use a stoker. There is no piece of machinery that you put into the hands of a man and do not give him some sort of instructions as to its use. I have put stokers in where the fireman has never seen one before. Of course, you furnish the fireman a pamphlet descriptive of the stoker, but how many of the firemen read it. These men should be given full instructions. You would not think of putting a man on a train to handle an air brake without giving him instructions. Look at the schooling that you put your engineers through before they are allowed to run a locomotive. When it comes to the stoker it is going to be necessary to have some man, or to have a department, or a set of men, who shall make it their business to instruct the firemen in the proper handling of the stoker.

The question of whether the crusher shall be on the tank or not is very material. I am building a machine now that will take the coal by a conveyor from the tank, and put it into the firebox without the use of a crusher.

I made up my mind that a stoker in order to be successful would have to handle any quality of coal that was given it, and take anything from poor slack to the best lump coal. Here is an excerpt from a report from a railway company that had a man on an engine watching the operation of the stoker: "We received 1.700 pounds of coal, only 5 per cent. lumps; the slack was composed mostly of sand and mud, and we could easily make a mud ball of this coal, but still the engine done well on it." The keynote of this whole question is increased tonnage and increased speed.

M. H. Haig (A. T. & S. F.): I did not intend to say anything on this subject because my experience is not at all complimentary to the stoker, and I have found it quite difficult to believe my ears this morning. I might give you a history of its operation on the Santa Fe. Three types have been applied on locomotives operating through a territory where the ruling grade is about .6 of one per cent. Every opportunity has been given to the stoker representatives to instruct the firemen.

Mr. Fowler claims that the coal should be selected to suit the stoker. I do not think that is practicable. The stoker must be selected to suit the coal. The three stokers we have in operation are the Hanna, the Street and the Strouss. In hand firing these locomotives they used about 14 tons of coal per 100 miles. They hauled about 2,000 tons, largely in refrigerator cars, and it was found that the stokers—especially the Street and the Hanna—required from 18 to 20 tons over the same distance. The stokers have made very few trips without having to run for coal. The Strouss stoker has been more successful in respect to economy. However, the firemen claim that they have to work as hard using these stokers as they did in firing by hand because of the labor required in lifting the coal up to the hopper. The Strouss stoker is a noisy appliance, and not a very pleasant device to have in the cab, but it has done the work. The trouble with the Hanna and Street stokers has been that they bank the coal near the back end of the firebox, and that has caused some trouble.

As to providing coal suitable to the stoker, at the request of the Hanna representatives different kinds of coal were provided; the firemen were given lump coal and slack coal. It was claimed that the lumps were too large, and they were given slack coal, and it was claimed that there was trouble with that —that it banked.

J. F. Devoy (C., M. & St. P.): I have just completed a year's experience with the Strouss stoker, and as I have nothing complimentary to say about it, I am not going to say anything at all about the stoker. I agree with Mr. Crawford that a conveyor is an absolute necessity for the reason that it will lessen the work of the fireman. The actual work involved in lifting the coal is 50 per cent. more when firing with a stoker than when firing by hand. A conveyor on any sort of a stoker is thus an absolute necessity. My real object in rising to speak at this time, however, is to question the Ringlemann chart system. In Chicago it is almost an absolute impossibility to live up to the smoke law. The Ringlemann chart was never intended to be used for any such purpose; it was gotten up originally by an eminent engineer for the purpose of judging a smoke from a factory stack, in which there was no mixture of steam, and it should only be used for that purpose. The greatest amount of smoke emitted from a stack is usually at the starting of the engine. The greatest amount of steam is mixed with the smoke when the greatest amount of work is done, or when the greatest amount of coal is burning. Therefore, the Ringlemann chart is misleading in judging the smoke or the color of the smoke emitted from a stack, due to the fact that you are judging 75 per cent. steam and not smoke. The committee should define at what time the Ringlemann chart should be used, for it is misleading.

As to whether a stoker will save coal or not, the results of our one years' experience show that hand firing saved 9 per cent. over firing by a stoker.

C. F. Street: You say that by hand firing you save 9 per cent. in coal. Was the speed at which the machine was operating taken into consideration in arriving at that conclusion?

J. F. Devoy: My remarks are based on our experience of 12 months in which an exact record of the coal consumed was kept; that is, the average performance of the locomotive in both directions over a single division. The figures were 10.71 pounds per 100 ton miles for the stoker fired locomotive and 10.54 pounds for the locomotive not equipped with a stoker.

W. C. Hayes (Erie): My views have changed somewhat from those I expressed at the last convention. I said then that I did not think stoker firing could be compared in any way with hand firing, and that if we undertook to expend the same effort in educating the firemen that we did in developing the stoker we would get better results, which would more than overbalance anything that could be obtained from mechanical stoking. Since that time the development of the stoker on the Erie has brought about a change in my opinion, and I think now that perhaps we are on the right track to enable Mr. Rumney to say that he will be able to complete his report to this association in a satisfactory way by the time of the next convention and show a stoker that will deliver the goods.

E. W. Pratt (C. & N. W.): I would like to ask those who have had most experience with mechanical stokers what is the low limit per hour in the amount of coal to be supplied the fire box. What would they recommend in that respect? Would it be 4,000 or 3,000 lbs. per hour? Below what point would they consider it inadvisable to apply mechanical stoking?

D. F. Crawford: I have not worked on the low limit. I have been working on the high limit, trying to raise it all the time. As I understand Mr. Pratt's question, he asks whether it would be economy to put a stoker on a locomotive using a comparatively small quantity of coal. We have not, because we do not expect to have locomotives in service, except perhaps small switching locomotives, where we would apply the stoker from the smoke preventive viewpoint. In all the cities through which our lines run there are now smoke ordinances. I would not recommend putting a stoker on a light passenger engine.

J. F. Devoy: The daily record of our trains that I referred to shows a consumption of 3,500 lbs. of coal per hour. This is equivalent to 72 lbs. of coal per square foot of grate per hour.

Mr. Steele (American Locomotive Works): I think where the coal consumption runs above 5,000 lbs. of coal per hour a mechanical stoker would greatly relieve the labor of the fireman and would permit an increase in the work of the locomotive.

C. E. Gosset (M. & St. L.): The Strouse stoker will do well when it is working. We have had numerous troubles due to its failing and found it necessary to discontinue our experiments because of the number of failures that we experienced. As long as we had the stoker in the hands of a regularly assigned crew who were thoroughly familiar with its different parts and how to take care of it we obtained very good results, but when the machine was turned over to a different crew our troubles began and finally they became so numerous that we discontinued our experiments.

M. H. Haig: I would like to ask some questions of those gentlemen who have operated stokers successfully. Have they ever had any trouble with the Hanna and Street stokers banking the coal under the door? Have they ever had any trouble with particles of the coal being carried through the flues and out of the stack? Did they have to provide a special quality of coal? In the case of the Street stoker I do not think it is necessary to provide a special coal.

T. O. Sechrist (Q. & C.): We use the regular nut and slack when we can get it. We take by preference about 90 per cent. of slack. The crews prefer the slack coal, as they claim that makes them less trouble. As far as carrying the fine particles of coal through the flues is concerned, I believe that is all due to the handling of the blast. If you use high pressure blast, of course it occurs. We had that trouble at first, but we have overcome it, and I have not heard a word of complaint on any engines that we now have equipped with a stoker.

We have not experienced any trouble due to the banking of the coal around the fire door; I have made at least 100 trips with the stoker and have not observed any trouble of that kind.

J. Christopher (T. H. & B.): What is the experience of those using the stoker as to the front end filling up, as compared with hand firing? Is it necessary to clean out the front end more frequently?

T. O. Sechrist: We have been using the stoker for the past 14 months, and at first we did experience that trouble. We have

had no trouble along that line lately. We have not had any occasion to inspect engines on account of the filling up or on account of coal being drawn through the tubes, and we have watched that matter pretty closely, thinking that perhaps the coal might bank up around superheated pipes.

G. A. Hancock (St. L. & S. F.): Regarding the Street stoker, I would say that we have had a great deal of trouble of the same nature that Mr. Haig spoke about. I think possibly 10 per cent. of the trouble is caused by faulty firing, and the minute the fireman becomes accustomed to the stoker it works better. We have had some smoke trouble on heavy service, but on light service it has been comparatively small.

C. F. Street: In answer to Mr. Haig's query regarding coal going through the flues to the stack. On my first machine I had a great deal of trouble with the coal being carried through to the stack unconsumed. As I said before, the first machine I ever built is now here on the pier, and it has a screen for screening the fine coal out and depositing it across the back end of the grate, where it does not get into the fire-box. I have two of these engines working. On the question of banking, I have put in a division across, so that the rolling of the locomotive has no effect on the distribution of the coal in the fire-box, and I am arranging to rebuild the machines that I have out and put this device in them. The experience that I have had with these machines shows that the two points of difficulty pointed out will be entirely eliminated.

Angus Sinclair: A very important point in locomotive operation is the condition of the flues. If the mechanical stoker has a tendency to cause more flue trouble than is experienced with hand firing, or the reverse, why, it is very important. I suppose those who have had experience with stokers are able to tell whether there is less flue trouble, or more flue trouble, using mechanical stokers than there is in hand firing.

T. O. Sechrist (Q. & C.): We have had no flue trouble with our stokers, but we have had with all our locomotives that are not equipped with mechanical stokers.

D. F. Crawford: My experience is favorable to the use of stokers. We find very little difference between hand stoking and mechanical stoking, but whatever difference there is between the two is in favor of the mechanical stoker. Our flue troubles are not the flue troubles that we used to have. There is nothing like so much flue trouble or flue leakage today as we had formerly. I am afraid to say whether it is due to the stoker or due to the difference in practice in our engine houses, but I am inclined to think it is due to the latter.

T. Rumney: Mr. Sechrist expressed the opinion that a conveyor is not necessary, and that it is a very small matter anyway. All I can say about that is that I wished we had found it to be so. We have been four years trying to get a conveyor, and we are only able now to say that we have a conveyor. I think Mr. Street has had some trouble, and I am sure Mr. Crawford has had from what he has told me in the past. Some of the tests that have been made show that we got within 1.2 per cent. economy, taking time into consideration. That is, we considered the work, checked by the dynamometer horse power, and by fuel hours, per ton mile. The committee took into consideration the fuel burned and gave credit to the locomotive for the tonnage drawn in a given time or in a given distance.

The reference that Mr. Crawford made to the rating is precisely the line upon which the committee has been viewing the question: that is, making the modern locomotive better and more powerful, and not seeking to economize in fuel consumption in order to make a good showing on a fuel basis, but figuring on a ton mile basis; and, on a ton mile basis, it is almost equal to hand firing. Of course, in every case, the hand firing was fairly good, and the stoker was new.

All the experience that I have had with the mechanical stoker shows that there is very little smoke either with a scatter, Street, Hayden, or Dickinson type, and I know that the Crawford stoker is nearly smokeless.

In respect to the reference that has been made to the underfeed stoker and the scatter feed stoker: There might be some advantage in the scatter feed type in that the smoke would always be visible, more or less. But I do not know about this, as we have not made any experiments in that line.

REVISION OF STANDARDS.

D. F. Crawford: Mr. Demarest, of the Pennsylvania Lines, is chairman of this committee, but an emergency occurred during the last month which has prevented him from giving the subject his attention.

SMOKE-PREVENTING DEVICES FOR FIRING-UP LOCOMOTIVES.

The committee sent out a circular of inquiry and many of the largest railway companies who have terminals located within the large cities where the restrictions are most severe were included in the 33 replies received; hence, we believe that this subject has been more thoroughly canvassed than might otherwise appear. The various reports and the experience of the individual members of the committee would lead to the following recommendations:

The best results are obtained by filling up locomotive boilers with hot water previous to firing up; the temperatures reported vary from 110 deg. F. to over 200 deg. F., but the higher is preferred on account of aiding combustion and lessening the time required to raise steam in the boiler. Where hot water is not available, the temperature of water in the boiler may be raised by injecting live steam below the water line; but on account of the loss of time the heating of the water, either before or while the boiler is being filled, is recommended.

Two roads reported the use of large fans, connected with the smoke jacks above the roundhouse roof, as a means for producing draft. One of these roads advises that this device was used and tested for a considerable length of time, but was found unsatisfactory and abandoned The other road is still experimenting along this plan in connection with a smoke-washer, and is not yet ready to report upon its results



E. W. Pratt.

Chairman, Committee on Smoke Preventing Devices.

except as to its difficulty in the maintenance of the plant—the material parts having been eaten out several times during the year's experiments. All other roads report the use of a roundhouse steam blower and the locomotive blower used exclusively.

From the reports it would appear that almost every combination of wood, fuel oil, shavings, cobs, coke and bituminous coal had been used, with more serious objections to some than others. Several roads reported extensive trials of coke, but its use has been almost entirely abandoned because the ashes and gases emitted from the smoke jacks are much more objectionable than smoke when roundhouses are located near viaducts or high buildings; furthermore, it is almost impossible for employees to work in the roundhouse when engines have to be moved from under the smoke jacks to do necessary work, and also the cost of coke is greatly in excess of other fuels in most sections of this country. While the smoke from wood varies considerably in accordance with the size, quality and amount used, still it is more generally employed for kindling fires than any other fuel where the greatest effort is being made to prevent smoke at such times.

The plan of raising steam to nearly working pressure by means of wood or coke alone has been tried by many roads, but abandoned when it was found that the same results could be obtained by adding bituminous coal carefully to wood fire after the temperature in the fire-box had been somewhat raised.

In general the conclusion is that although there are many devices for reducing the amount of smoke from locomotives after steam is raised and the engines are working, and while it is possible by great care and attention on the part of the roundhouse force to reduce the amount of smoke emitted during this period, there is no practical way to entirely eliminate all smoke while firing up locomotives at terminals.

The report is signed by:—E. W. Pratt (C. & N. W.), chairman; J. C. Mengel (Penn.), R. W. Bell (I. C.), J. B. Kilpatrick (C. R. I. & P.) and E. F. Jones (C. & W. I.).

DISCUSSION ON SMOKE PREVENTING DEVICES FOR FIRING-UP LOCOMOTIVES.

A. E. Manchester (C. M. & St. P.): The recommendations of the committee are directly in line with our best efforts, the filling of boilers with hot water. The only point that they do not refer to is time. It is decidedly of advantage to take sufficient time so that the work of bringing an engine up to steam pressure is done slowly. We have found nothing better than kindling wood to start a fire with, a good liberal allowance of it, and then to feed the coal in slowly and have the coal well broken up as it is fed into the fire box and use the force blowers to assist the fire to burn readily. With us, following these methods, we have found it largely a question of keeping our men up to their work and not let them hurry it. Just as soon as you begin to hurry the men, why, they begin to do the very things that produce smoke and cause trouble.

W. C. A. Henry (Penn.): Our experience has been pretty much covered by what is stated in the remarks of Mr. Manchester. The point where smoke is objectionable is in using shavings saturated with oil. Where smoke is objectionable to the city authorities we have taken old ties for firing up, and by not hurrying very much we have been able to make a very considerable reduction in the quantity of smoke emitted, yet at the same time there is smoke.

J. W. Fogg (B. & O. C. T.): I think our best results have been secured in using kindling wood where you have the roundhouse men thoroughly drilled. If they get careless in the roundhouse, why, it does not eliminate the smoke nuisance. We have found that if we apply kindling wood and then apply the coal very lightly we get good results.

T. H. Curtis (L. & N.): About eighteen months ago we equipped one of our roundhouses with a smoke washing device which had been recommended to us by the smoke department of the city. This device consisted of a duct connecting the smoke jackets in the roundhouse through and to a fan, and from there to a large tube into which was injected a spray of water, and the washing of the smoke precipitated the carbon and made it very much less objectionable. We constructed these ducts of steel, and before we got the thing fairly installed or running more than six or eight weeks the first duct was found to be entirely eaten out, due to the combination of the gases and moisture. We renewed the duct with wood. Then when we looked at the fan we found that the fan blades were eaten out and the fan housing had begun to go, and that the whole thing was practically a wreck.

R. D. Smith (B. & A.): We are working under very strict conditions in relation to smoke in the city of Boston. We have in all of our important terminals hot water wash-outs. I find that the recommendations of the committee are about in line with the best practice as we have found it in our experience. A great deal depends on the fellow that is doing the firing in the roundhouse, and whether you are in a hurry for the engine or not. With the hot water wash-out system, where you can fill and wash out with hot water, we find that firing with ordinary kindling wood is about all that we can do. We object, however, to using old ties or old discarded wood for firing of locomotives. The reasons for that are the likelihood of spikes and nails being in the ties and getting into the fire-box, getting caught in the grate and causing engine failure. So we try to keep away from the use of old wood unless it has been looked over carefuly.

S. L. Bean (A., T. & S. F.): We have very little trouble with smoke. We employ all kinds of men to build the fires—Japanese, Mexicans and Indians. We obtain very good results, especially at the prominent terminals. At Los Angeles we probably handle two-thirds of our locomotives in firing up, and by handling the oil carefully it can be so regulated as to avoid the emission of smoke.

M. J. McCarthy: I might say that the practice with us is about the same as that recommended by the committee. While we do have some black smoke necessarily, we find that by paying great attention and care to the operation of firing we can do away with the most of it.

Angus Sinclair: There is no question but what leakage used to frequently occur, and fractures too, by reason of very violent fires being started up to begin with, as, for instance, when they sought to get up steam in a hurry. This trouble might be experienced with locomotives where you were firing with oil if you were to start the fire too violently at the beginning, and the query in my mind was whether it was not better for the sake of safety to fire up gradually.

S. L. Bean: I would say that of course it is necessary to be careful in handling the oil. Not only that, but if you allow your atomizer to work too strongly at the start the oil will drip and there may be danger through that of a conflagration.

C. E. Chambers (C. of N. J.): We use old ties, as much as we can get them, and have never had any trouble, as Mr. Smith spoke of, with the nails or spikes. We at one time used fuel oil, but for the last three or four years we have used gas tar, which is a bi-product recovered from the manufacture of pintsch gas. We use that for firing our locomotives, and we sometimes fire them with coal alone, and sometimes with wood. The latter process makes a great deal of smoke, and where you are held strictly to account by ordinances aimed at the smoke nuisance, it is not so desirable.

C. E. Gossett (Iowa Cent.): I have tried all manner of schemes that I could think of, or have seen in print, in order to obviate this trouble, and I have come to the conclusion that there are but two points we can consider, the first is to not hurry your men in firing up the engine, and the second is to use as much wood as you can get—the more wood the less smoke.

J. F. DeVoy (C. M. & St. P.): I have made efforts by personal observation and inspection to get our engine men to control the volume of smoke in firing up by care to the method in which they do the firing. I have found no fault with the Ringelmann system, and I have stated to city inspectors when an engine passed by, under full head, working full, that in my honest opinion there was not ten per cent. of smoke, and the inspector has called that steam. I simply want this committee, or the other committee to define how far the Ringelmann chart shall be used in connection with the locomotive.

Mr. Borton (St. Louis Ter.): We fire up 125 engines right in the city, and the smoke question is a live one there at the present time. We find, however, that our experience is about in line with the report of the committee. We have not been able to find a way to eliminate the smoke during the firing up of the engines. We have used old ties, generally with very considerable trouble, on account of the spikes and bolts and things of that sort. We have, however, a device which is being put into use called the Parsons system of combustion, and we expect to eliminate the smoke to the extent of about 50 per cent. The Parsons system of combustion is a very practical device on the road, and eliminates from 80 to 95 per cent. of the smoke.

John Tonge (Minn. & St. L.): I wish particularly to say that your expressions here will have considerable weight in these law suits which are pending, based on the Minneapolis ordinance, and the weight of your opinion will be in favor of the railways. I have no doubt that the railroads will follow this matter to the supreme court of the United States if the state courts of Minnesota say that we must use smokeless coal in order to obviate this difficulty. The smoke inspectors are very arbitrary—they say they do not care what railroad is concerned, that we have got to comply with the ordinance, and they are going to compel us to eliminate the smoke emitted from the engines. The commercial club of that city will get together, get the business men together, and they even go so far, gentlemen, as to say and to intimate if you do not do so and so we will ship our goods by another railroad. So I say, what you say here to-day, whatever evidence you can give us on this subject will assist us very greatly.

A. E. Manchester (C., M. & St. P.): I think we might perhaps live under some of the laws that are being enacted if we were given an opportunity to have them interpreted by the Supreme Court of the United States as to the "reasonableness" or "unreasonableness" of these laws, especially the ordinances against smoke.

E. W. Pratt: Mention was made by one member of the use of the air blower, and I judge that is merely to induce a draught. There seems to be no reason in the minds of the committee why an air blower for inducing draught would be any better than a steam blower, nor quite as good. Mr. Bentley described our smoke washer, with which we are still experimenting, but I might add that in order to reduce the concentration of the sulphuric acid in the water that is used to wash the smoke, it takes about a half a million gallons of water a day, which at seven cents a thousand gallons represents about thirty-five dollars a day for water.

The ordinances of several of the cities contain the words dense smoke, which the railway men generally call black smoke, and which is interpreted as smoke through which objects are

not readily discernible. A large locomotive generally develops 1,500 h. p. and perhaps has a stack 22 in. x 24 in. in diameter. While the velocity of the gases and smoke is greater than a chimney or stationary stack would be, there seems to be a good deal of feeling that the density of the smoke from that small diameter of stack would be greater, especially when mixing that smoke with steam or condensed steam, which is a combination not readily penetrated by the vision.

With regard to the use of the Ringelmann chart, and its use in viewing moving trains, it is practically impossible for an observer, unless he is on the train, which they seldom are, to see a locomotive stack at the same angle. They see an engine and a train approaching, when, no matter which direction the wind is in, they get an oblique angle through the trailing smoke, and then they later see the locomotive receding and get about the same angle, whereas we all know if you see a stack approaching and look through the smoke, it looks very much more condensed than it does when you stand at one side and see a train moving at right angles to you.

The replies of the committee indicated that where wood was rather scarce the use of old ties, and especially scrap car wood, was the general practice.

BEST CONSTRUCTION OF LOCOMOTIVE FRAMES.

The committee, called upon to make a report on locomotive frame construction, has given the subject very earnest consideration. Lawford H. Fry was unable to meet with the committee on account of living in Paris, but sent information showing the practice and experiences of various foreign railways. At the convention in 1904 this subject was ably handled by a strong committee, and notwithstanding the great increase in size of locomotives, the committee's recommendations still hold good and the frames still break. Cast steel, made to a rational specification, careful foundry manipulation, adequate and suitable annealing, was spoken of as one of the remedies for frame breakage at that time, and it still is the favorite material, if properly designed, made and annealed. The clip binder was then, and is now, more used than probably any other type, the bolt and thimble style having been discarded in modern practice, owing to stretch of bolts. The specifications suggested by the committee of steel-casting manufacturers, and submitted to the Association in 1904, are as follows:

Material:

Acid open-hearth steel.....{.28 per cent. carbon. .05 per cent. phosphorus. .05 per cent. sulphur. .60 per cent. manganese.

Frames will be rejected that show:
Less than .20 per cent. or over .35 per cent. carbon.
Over .06 per cent. phosphorus.
Over .06 per cent. sulphur.
Over .70 per cent. manganese.
Tensile strength per square inch, not less than 55,000 lbs.
Elongation in 2 in., not less than 15 per cent.
All frames to be annealed.

After seven years it would be interesting to learn from the members if these specifications are entirely satisfactory, or, if not, what changes should be made to make them so. While the breakage of a frame is a serious handicap, especially during busy seasons, yet the work of repairing has been simplified so that it is now possible to weld them in place with Thermit, oil, etc., and what used to be a two weeks' job, when all wheels had to be removed and frame taken to blacksmith shop, can now be repaired in place by dropping one pair of wheels and using oil, etc., and engine returned to service in a few days.

The committee herewith submits conclusions and recommendations:

1. That frame breakage is even more general and serious than was first believed, very few roads being free from this trouble. The longer the wheel base of engine, ordinarily, in combination with a roadbed having comparatively short curves, and with frames poorly designed or of inferior metal, or engines not properly kept up, the greater the trouble will be with frames breaking. This latter factor may not be reflected until after the engine has been put in good condition, and then a frame may finally break as a result of the previous poor condition of the engine.

2. The committee believes that with frames properly designed, if made of a good quality of cast steel, thoroughly annealed, with suitable cross bracing and engines kept up in reasonably good shape, breakage will practically be overcome.

3. That a cast-steel, one-piece frame, properly designed, of good material and thoroughly annealed, is better than a wrought-iron frame, because of the difficulty in welding up the large section in a perfectly satisfactory manner, and also because, in casting, bosses, lugs, etc., can be added without the necessity of bolts and studs.

4. That a bar frame is better than a plate frame, this being the opinion of people who have used both; the plate frame causing about as much trouble with breakage in Europe as bar frames do in this country.

5. The strap binder appears to be the favorite form of tying frame jaws together, although the cast-steel box binder, with adjustable wedges, has a number of friends, on account of its simplicity and ease with which it can be handled. The toes at base of jaws should be of sufficient depth and size to give plenty of metal to anchor to, whichever binder is used.

6. Cases have been reported where frame breakage was directly traceable to expansion of boiler, not being properly taken care of by the use of sliding shoes; these shoes, if too tightly fitted or cramped in bolting, or if not lubricated, may prove unsatisfactory. Supporting a boiler by means of vertical plates, if of sufficient strength, provides a satisfactory means of taking care of expansion without imposing undue strains upon the frames.

7. The committee recommends to steel manufacturers the necessity of making a study of locomotive-frame casting, and its proper annealing, as a number of roads are using wrought iron, but would prefer steel if they could secure reliable castings.

8. As a general proposition, frame breakage does not ordinarily occur until engine has been in service two years or more, the older the engine the greater the trouble; they have broken earlier than this, however, on account of flaws, poor welds, or other defects.

The following is an abstract of replies to questions:

The breakage of locomotive frames appears to be very general, from the nature of replies received, as twenty-four representative roads out of twenty-five stated that they were having trouble in this direction; one road, with only fifty-nine engines, reported no trouble; another says, having some trouble, but nothing serious, while a third replies that, with cast-steel frames, considerable difficulty is experienced.

The absence of frame breakage reported by the Trinity & Brazos Valley, having fifty-nine engines, is explained by Mr. Seabrook, the superintendent of motive power, and a part of his reply follows:

"We attribute our success in preventing frame breakage to engine-house attention. The engines are entirely looked after by the engine-house force. Engineers are not held responsible for the inspection of engines underneath. When an engine arrives at the engine-house, the inspector makes a very thorough inspection, and every bolt that shows any indication of working is immediately removed, the holes reamed out and a new bolt applied. Whenever it is possible, our practice is to equip each bolt with two nuts. This engine inspector also looks after the setting of wedges and keying up the rods, reporting the work that is necessary to the engine-house foreman, who assigns the men to make the repairs. The age of engines runs from four to twenty-five years; the worst curve on the road is 9 deg. 30 min."

The committee found the frame breaking difficulty was being solved in a number of ways. The binder and bolt appear to be responsible (when not kept tight) for considerable trouble; some roads report that they watch this very closely. Another road is applying new and heavier section to frames that are breaking. Reinforcing frames and lengthening splices is reported as being helpful. Where wedges are not kept properly in place there will be more liability to frame breakages than where they are kept snug. Splices working will cause strains to be thrown on other parts of frame, and probably cause breakages. Extending the short top-splice back over the front-pedestal jaw has relieved some roads of trouble. The adoption of the Walschaert, or other outside valve gear, has probably done more to overcome trouble than anything else, on account of allowing additional bracing and stronger frames. Some roads have increased the thickness of metal in both rails of frames and have applied heavier cross braces. One reply indicated that the movement of driving boxes so that top of the box would strike the frame was a bad thing for the frame, and for the engine crew. Revised valve setting, so as to reduce compression, is reported to be helpful. It is stated that applying hammered-iron sections has also overcome the difficulty.

The committee also received a number of replies to the question: "Have you any data as to age of frame at time of breakage?" and found that few breakages occurred in less than two years from date the engine was built, but after

that the breakages became more frequent as age increased; cast-steel frames appear to be more unreliable than forged frames, some of the latter running from four to eight years before giving trouble. On some roads the change of valve gear from inside to outside, when accompanied by suitable cross bracing, has apparently overcome the difficulty, but in other cases it has been aggravated.

The replies received indicate that all of the heavier power is more liable to breakage than the lighter engines, which would seem to indicate that the strength of frame has not increased in the same ratio as the power of the engine. The Atlantic, Pacific, Mogul and consolidation types seem to be giving lots of trouble on the different roads, and engines with inside valve gear appear to be more troublesome than with outside gear; this being probably due to their age and the larger number in service. Cast steel and wrought iron are about equally used for frames, the former breaking due to poor castings, defects, shrinkages, etc., while the greatest difficulty with the latter is in getting sound welds. To show the extent that frame breakages occur, one road in the United States had thirty-nine per cent. of the total number of engines passing through the shops with frames broken, so they had to be welded—those, of course, being bar frames—whereas one English road with 1,545 engines, having slab frames, had over ten per cent. of this number broken; but it was stated that frames could now be welded with oxy-acetylene in two or three days, whereas before it used to take them several months to make repairs. It is stated on excellent authority that cast steel does not have as great a life as wrought iron in locomotive frames. On one road the breakages were tabulated, and show that of a certain number of engines the life of the wrought-iron frame averaged 5.9 years, as compared with 5.5 years for cast steel, and that, on account of the great difficulty in getting homogeneous metal, uniformly annealed, wrought iron was preferred. A large number of breaks occur from checks started in key ways, and it is suggested that proper fillets be made instead of leaving sharp corners. Switch engines appear to be particularly free from trouble on account of frames breaking, which may be due to the fact that their frames may be heavier in proportion to the work they have to perform. Only one reply stated that switch engines were in some cases giving trouble, and this was from a switching association. Frame splices, as a general proposition, give lots of trouble, on account of working, and several roads are now using a front-frame section which is welded on to the center of front jaw after the old part with splice has been cut off.

One of the members, replying to the question, "Do you have more frames break with inside than with outside valve gear?" gave some very interesting data on a large number of consolidation locomotives, all built about the same time; of 228 with inside or Stephenson gear, 16 per cent. gave trouble in one year (November, 1909, to November, 1910), whereas, with the Walschaert gear, 172 passing through shops in same period, 18 per cent. of them had to have frames welded, and it is probable that the design was responsible for this condition. A number of roads are using vanadium-steel frames experimentally, but on account of the short time they have been in service it is not possible to state positively results obtained. One road reports a vanadium-steel frame broken after being in service eighteen months, and another in four months, while another states that two vanadium-steel frames broke in four months. Where power is kept up in absolutely first-class condition and proper care is exercised in regard to frame bracing—pedestal binders or caps kept up, frame bolts and cylinder keys a proper fit, and by giving attention to driving-box shoes, wedges and brasses, and machinery in general, so as to avoid excessive pounds—there will be less liability to trouble with frame breakages

The question of cross bracing has been given considerable thought, and it was found that it was possible, perhaps to have the frame so rigidly braced that trouble would occur, but that where a bracing was used that permitted a small amount of flexibility, it was better for the engine as a whole, and the frames in particular. It is recommended in cross bracing, that ties be fastened full length of pedestal jaw, vertically on rear pedestal, of each driving wheel, or as close an equivalent to this design as governing conditions will permit. The thickness of bosses on cast-steel cross-tie braces is to be not less than 1½, preferably 2, times the diameter of bolt used in fastening. All bolts, where possible, to have heads next to castings, to insure full bearing on bolt.

Diameter of bolt at thread = nearest ⅛-in. to $\frac{\text{Width of Frame}}{4}$.

Where size of bolt comes in even sixteenths, the smaller diameter will be used. Body of bolt to be 1-16 in. larger.

As outside gears, with inside cross bracing, have been in use a comparatively short time, it is a difficult matter to say just what effect the cross bracing has had on frame breakage, but replies received in answer to our question No. 12 would seem to indicate that it is beneficial, and the committee believes it advisable, but is not yet prepared to say what design is best suited for all classes of power. The four-cylinder, balanced locomotive will be less liable to frame breakage, because of more uniform turning movement than a two-cylinder engine, but there is not sufficient data to confirm this theory. The fact that all these engines are comparatively new makes it difficult to get much information about them.

It is the committee's recommendation that a one-piece frame be used on all engines with piston valves, preferably with cast-steel filling between cylinders and bumpers, but on slide-valve engines it is usually necessary to resort to a two-piece frame, because of lack of strength at cylinders. For engines having trailing trucks, a slab, spliced to main frame at rear of back drivers, is generally used, and apparently with satisfactory results. The question of quickly and adequately draining cylinders, so as to overcome undue strains on frames and other parts of machinery, does not appear to have had the consideration it deserves; locomotive designers and builders should consider this matter carefully, particularly on piston-valve engines. The opening of cylinder cocks by hostlers and engineers, and leaving them open until cylinders are properly heated, should be insisted upon.

With cast steel, a design can often be used that would be impossible in wrought iron. Some of the trouble experienced with cast-steel frames has been due to the attempt to make them exactly the same as if of wrought iron, instead of taking advantage of the greater possibilities of designing and making a satisfactory frame where cast steel is used. Some designs of frames, such as those having ribs of different thicknesses, or pedestal fits of increased width, would be almost impossible to make of wrought iron. Very heavy frames over 5 in. in width are extremely difficult to make satisfactorily of hammered iron, and for these reasons cast steel appears to be the only suitable material.

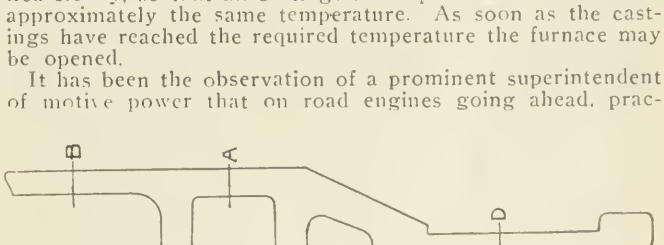
Herewith is a comparison of specifications suggested on page 406, in the 1904 Proceedings, with those issued by the American Society for Testing Materials:

1904.	American Society for Testing Materials.
Tensile strength, 55,000 lbs. min.	60,000 lbs. min.
Elongation in 2 in., 15 per cent.	22 per cent. min.
Reduction in area, not specified	30 per cent. min.
All frames to be annealed	All steel casting to be annealed, unless otherwise specified.
Bending test, none specified	A piece 1 by 1½ in., bent cold around a bar 1-in. diameter to 120 deg.
Size of test piece, none specified	Specifically mentioned.
Test coupon, none specified	To be attached to each frame for test purposes.

The committee suggests that, wherever possible, the specifications recommended by the American Society for Testing Materials be used, as a casting better suited to the requirements will be furnished. As an additional safeguard, it would be better to specify how frame castings should be annealed, and the following is recommended:

Steel-frame castings to be annealed must be heated uniformly to 850 deg. C. (1,500 deg. F.). The heat must be applied slowly, so that all castings in all parts of the furnace are approximately the same temperature. As soon as the castings have reached the required temperature the furnace may be opened.

It has been the observation of a prominent superintendent of motive power that on road engines going ahead, practically all of the time, the right frame breaks more frequently on the right-lead engine, and on left-lead engine the left frame is more susceptible to breakage.



Calculated Sections of Locomotive Frame.

The following aproximates rules will produce sections for

bar frames either in wrought iron or cast steel, suitable for modern locomotives:

$A=\frac{T}{2{,}500 \text{ to } 2{,}700}$	$B=\frac{T}{3{,}000 \text{ to } 3{,}200}$	$C=\frac{T}{4{,}300 \text{ to } 4{,}500}$	$D=\frac{T}{1{,}600 \text{ to } 1{,}800}$

T—Piston thrust (area of cylinder multiplied by boiler pressure).
A—Square inches of sectional area of frame, top of pedestals.
B—Square inches of sectional area of frame, top rail between pedestals.
C—Square inches of sectional area of frame, lower rail between pedestals.
D—Square inches of sectional area of frame, integral single rail at back cylinder-keying lug.

The width of frames is usually made in proportion to the weight and power of the engine. Frames of 6 in. are not uncommonly used for very heavy engines.

Most of the important bolts in a frame are vertical. Therefore it is often advisable to increase the width rather than make up the section entirely in depth, because the section is not cut away so much when large bolts are used, and for that reason, where 1⅜ or 1½ in. bolts are used, frames of greater width can be more economically employed than the narrower sections.

Frame breakages do not usually occur for some time after the locomotives are placed in service, and in a general way it may be stated that many breakages do not occur until the engines have been in service for at least two years. Probably three or four years is the time when the greater number of fractures commence to occur, and from that time on in increasing numbers.

PLATE FRAMES.

A more or less vague impression appears to exist in this country that plate frames are freer from breakage than bar frames. Plate frames are more readily repaired than bar construction, with the possible exception of thermit welds, because a plate on one or both sides can be bolted or riveted which will usually satisfactorily reinforce the broken section. On account of their relatively thin sections, plate frames in some instances are also repaired by means of oxy-acetylene blow-pipe welds. The general tendency in the design of railway rolling-stock is toward simplicity and the elimination of bolted parts, making or casting pieces together and working away as much as possible from built-up construction. Compared with the bar frame, which is used exclusively in the United States at present, plate frames are essentially a built-up construction, and in the erecting of an engine using such frames the alignment is much more difficult, involving more care and time, so that the erection of an engine is a longer process than when bar frames are used. This and other causes render plate-frame construction undesirable, as a possible substitute for bar frames.

Furthermore, it is a fact that the one-piece, integral-bar frame construction, when made of suitable material, is as free, if not freer, from defects or breakages than plate frames. From personal observation of a great many locomotives in the principal European countries and from reports obtained from railway men abroad, the facts seem to be that plate frames often break, especially on the older classes of engines, and that unless made exceptionally heavy above the pedestal they may be expected to show partial or complete fractures after a certain period of service.

One English railway reports that the frequency of broken plate frames is almost exactly ten per cent. per year.

It may be interesting to give extracts from an article written by Mr. I. Valenziani, of the Italian State Railways, published in *l'Ingegneria Ferroviaria* for November 1, 1910, which has a bearing on the subject. He says:

"Many European railways have purchased American locomotives, and among the details which were largely appreciated in Europe must be included the bar frames, which have two great advantages over the plate frames; namely, the very much greater ease of examination and adjustment of parts lying between the frames, and the greater ease and rapidity with which the various parts can be attached to the frames during the construction of the locomotives.

"In Europe bar frames are rather more expensive than plate frames to construct, and an extension of their use is attributable rather to this than to any technical reason."

As an interesting addition to the data contained in this paper, we herewith submit extracts from a report that was made by a representative of a locomotive company, who had been specially detailed to look into the subject of frame failure, but as a committee we do not agree with all his deductions.

"The number of frame failures which occur in the operation of locomotives in service is the cause of very serious delays, and represents at least twenty per cent. of the expenditures necessary to keep an engine in service.

"A comparison of the types of locomotives in service, which were built prior to the past three or four years, shows that the bracing of the frames has not been carried out as we now believe to be necessary for good service. In an effort to overcome the number of failures, the sections of frames have been made heavier and splices increased in section and bolting power, but with several exceptions the bracing of frames seems to have received less attention than it deserves. Experience shows that many engines with increased frame sections fail almost as much as they did with the lighter frames.

"The first conclusion is that a good design of bracing is more important than heavy frame sections. Another factor is the condition in which the engine is maintained, as shown by several of the detail reports by roads having engines of exactly the same design on different divisions, some of which give little or no trouble, while other divisions report trouble constantly.

"An investigation carried out on one road several years ago proved that the frame at first pedestal vibrated 1-16 in., both vertically and horizontally, and that in rounding a curve the bottom of the frame was deflected more than the top, which is the natural conclusion when we consider that the frames are usually braced only to the guide yoke, and knees at the top rail, and a light wrought-iron brace at the bottom rail. It is this twisting action on the frame which causes so many failures in the front leg of the first pedestal, and in the lower rails of the splice connections in consolidation engines, where the distance from the cylinder saddle to the pedestal is short. It seems to make no difference how heavy the frame rails are made, because if no other changes are made the frame will break just the same."

The report is signed by:—H. T. Bentley, (C. & N. W.), chairman; F. J. Cole (A. L. Co.), L. H. Fry (Baldwin), G. S. Edmonds (D. & H.) and E. D. Bronner (M. C.).

DISCUSSION ON BEST CONSTRUCTION OF LOCOMOTIVE FRAMES.

T. H. Curtis (L. & N.): I cannot give you any light on how to construct frames to keep them from breaking, but I will mention that the Louisville & Nashville have 150 consolidated locomotives with the *Stephenson* link motion. These locomotives were not troubled with frame breakage, but we built some fifty or more locomotives with the same frame, the locomotives are practically interchangeable, except that these last engines were equipped with the Walschaert valve gear. We have been troubled a great deal by the breaking of the left frame near the front pedestal, in the case of these engines. I have looked the engines over and cannot see any reason for the breaking of the frame. It breaks in a very strong place, and everything seems to be in a good condition, and I know that the engines are well kept up. In fact, the engines equipped with the Walschaert valve gear receive the same care as those equipped with the Stephenson link. Therefore, I attribute the trouble to the Walschaert valve gear. As to why it should cause this breakage of frames I cannot give any reason.

I will also say that of the engines that have the Stephenson link, that there were about 25 of them that had a very large plate bolted on the back of the cylinder and extended backward about four or five feet. We had a great deal of trouble with these frames breaking until we removed the plates, until we removed what made the frames stiff we had trouble.

In designing locomotive frames we have always used at least 2.5 in. of a lip on the bottom of the inside to hold the binder up tight. I think this is important, to hold the binder and the frames solid together, and it is necessary to stop the breakage of frames. I have found someone believed in the binding question to such an extent as to have the binding extend the whole length of the frame. As long as we have locomotives we will have the breakage of frames, as they will wear out, but I believe with proper bracing and care, by keeping the engine up, by giving it proper attention in the round house, we will save ourselves a great deal of the frame breakage.

H. T. Bentley: We have had a number of engines on our road, not very heavy, ten wheel freight engines, but have had a tremendous lot of trouble with the Stephenson Link engines breaking their frames, and we had a number of Walschaert valve gear engines, same general type and same size frame, but with the addition of cross bracing between the frames, and since that time we have not had a single case of frame breakage with that particular engine. It has been in service five or six years, and it would begin to show some difficulty, if difficulty was likely to be experienced.

We have an extract in our report from an engineer of the Italian State Railways. He is trying the plate frames, the bar frames, and he states conclusively that the bar frame has some advantages over the plate frame, namely, that it is easier to manufacture, more convenient to erect, very much easier for

inspection, and generally speaking the American Standard bar frame is preferable from every standpoint. I think where the committee has gone on record to say that a good deal of the trouble of frame breakage is absolutely preventable should lead the steel manufacturers to get together and see if they cannot do something to help the situation out. The use of cast steel for frames is very satisfactory, if we can get good steel castings, and get them properly annealed.

R. L. Ettinger (So.): We have a great many cast steel frames which have been satisfactory. Probably as many as 250 of the heavy engines have cast steel frames, with an alloy in them, and with these frames we have not had any breakage at all. Some of the simple engines have had the frames broken. We have not had any epidemic of broken frames.

E. W. Pratt (C. & N. W.): How long have the 250 frames been in service?

Mr. Ettinger: About six years, the oldest of them. The first, I think, we got about six years ago.

Wm. Forsyth (*Railway Age Gazette*): Since the committee has come out definitely in favor of cast steel frames, it seems to me that there ought to be a good specification for the casting, just as Mr. Bentley said. This specification of 1904 is for a low-strength steel. It is a steel whose chemistry and strength correspond very closely with ordinary boiler steel. It is soft. The committee further recommends as preferable to this the specification of the American Society for Testing Materials, which has a strength 5,000 lbs. greater. Now, that specification of the American Society for Testing Materials is one which applies to steel castings generally. It is not specially for locomotive frames, and I believe it would be a good idea if the association was to request the American Society for Testing Materials to investigate this subject and have a committee frame a special specification for cast steel locomotive frames and present it to this association. If it is in order, I will make that as a motion.

The motion carried.

R. D. Smith (B. & A.): We have had considerable trouble with steel frame breakages on consolidation type engines with narrow fire-boxes, and we have lately come to the conclusion that the trouble has been not so much in the vertical stresses as the horizontal stresses, due perhaps to the long overhang and the fact that the breakages all occurred through the bolt holes. It is usual, when we have troubles of that sort, to think if we had a little more material in the frame it would be better, and we have added a little more material top and bottom, and we have gone to adding some on the side, to better bracing, and we have used the frame as recommended by the committee. Just what the results of this will be we do not know yet, because we have just changed our patterns and ordered our first set of frames which have been strengthened in this way, but it has been my thought that the failures were caused by the horizontal stresses due to the swinging, as well as the horizontal stresses due to the excessive overhang in some of these frames. I quite agree with what Mr. Forsyth has said, that we should have some specifications for steel for frames, and we have also gone over the rules as recommended by the committee on page nine, and we quite agree with them.

J. Christopher (T. H. & B.): It would appear that the question of the quality of the steel is the chief point. It occurred to me it would be a good idea for them to determine the radius of the gillets at the pedestals and consider those points, in making their recommendations, as well as the quality.

C. A. Seley (C. R. I. & P.): The most perplexing frame breakage which has occurred to us lately is in the forward pedestal on the Pacific type engine, new engines, massive frames, massive binders everything put up in good shape, and we have had a number of breakages starting from the rods, extending upward, a perfectly straight break, through to the inside of the jaw, through six or eight inches of solid metal, apparently. It is a perfectly clean break. Why they should break, I cannot figure out.

R. D Smith: I believe that a well designed steel frame will not break if the boxes wedges and shoes are kept up. If more attention is given in the roundhouse to keeping up these features that go to hold our frames together, like the binders and bracing, we will not have so much trouble with them.

B. P. Flory (N. Y. O. & W.): We have a lot of fifteen simple engines, and in the case of every one of these engines we have had broken either one or both of the frames on the top rail underneath the rocker bars. We came to the conclusion that the cause of the frames breaking was the probability of their not being sufficiently braced. They did not have the frame bracings on the bottom rail at all, and we put one on there and since that time we have not had any of them break.

I was very glad to see the committee recommend the cast steel one-piece frame. I note, however, on page 7, that the committee says, "But on slide-valve engines it is usually necessary to resort to a two-piece frame, because of lack of strength at cylinders." That has not been my experience, as for probably four or five years I have used the one-piece cast steel frame in the slide valve cylinders and have had practically no difficulty with it.

E. W. Pratt (C. & N. W.): If there are any of the members who find it necessary to make a two-piece frame, a vertical splice would give very much less trouble from breakage than a horizontal splice. The splicing bolts at that point give us a great deal of trouble, and I have heard others say the same.

Mr. Chambers (C. of N. J.): We have not had any trouble at all, which you would term serious, in frame breakages for several years. We had a type of twelve wheel locomotive 105 tons, and it gave a great deal of trouble from frame breakages right over one box, but we designed a cast steel section, cut off back and forward of the pedestal, and have had no trouble with the rest of the frame anywhere. Out of possibly fifty-one locomotives, we may have had 35 breakages on the right side, and may have had only one on the left, so it was not necessary to put a cast steel section on the left side.

We have ten heavy locomotives, equipped with the Walschaert gear, which have been in service, I think, for about four years. We have not had any frame breakages in any of these engines, and I was a little surprised to hear Mr. Curtis say that in his opinion the Walschaert gear had anything to do with the trouble. I think more than likely it is due to frame construction. These engines had better frame bracings than the link motion engines. That might have had something to do with it.

T. H. Curtis: I ask Mr. Chambers if the engines were both framed on the right hand side? I wish to call attention to my remarks to the engines with the Walschaert gear, in which the frames were broken, that it was only the right hand frame in these engines which were broken, and not the left.

Mr. Chambers: These were in all cases the right hand lead.

C. D. Young (Penn.): We had a great deal of trouble with the breaking of frames on consolidation locomotives, the same size as Mr. Chambers' engines to which he referred. They were equipped with the Stephenson gears. On the lines West I think there were about 400 engines, and the frame breakages ran up to over a thousand. We followed them in 1906 with the outside gear engine, identical in every respect, excepting the gear, frames the same section, but being cross braced, the idea being to carry the cross bracing back from the cylinders just as stiff as you could to the ash pan, and outside of manufacturers' defects and poor castings, I believe we have not had a broken frame which could be attributed to poor construction. I believe that the Walschaert valve gear has solved half of the broken frame trouble, because you can cross brace frames making a rigid structure back of the cylinders, and tie the two frames together, reducing the lateral vibration.

Mr. Pratt suggested the vertical splicing in preference to the horizontal splicing. We had so much trouble on the first consolidation engines that we made a number of experimental designs to increase the horizontal splice. That did not seem to do much good. The frames still broke, it simply carried the break a little further back. Most of the earlier breaks were right at the splice, ahead of the front driving box, and when we increased the weight of the splice, it went over back in the frame and broke over the front driving box, or between the front driving box and the intermediate wheel. We built the splice ahead of the front drivers, a vertical splice, using about twenty-four short bolts. We have about twenty of these engines running, they have been running about three years, and none of the frames have broken.

J. F. Enright (D. & R. G.): We are not experiencing the trouble with broken frames which the other roads seem to be. It is possibly due to the fact that our engines come in for class repairs oftener than engines operated on level roads. Our three, four and five engine trains make the operation severe on the engine, or the engine ahead of the train engine. Judging from our experience, the one-piece frame for the piston valve engine, is in my opinion the best design of frame that has been put on a locomotive. We have a number of that design in passenger service with the Walschaert gear, and with one exception I do not recall a broken frame on these engines. And that exception was the main pedestal, just about midway between the binder and the top of the frame, at the back end or the wedge side.

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T. Rumney (Erie): We have tried to do everything that has been recommended by the Association from time to time, and we have conferred with the builders of locomotives in making various designs, to strengthen up and stiffen up the frames in every way that they could. We have put in large fillets, used single frame—that is, the one-piece frame—and endeavored to brace the frames as much as possible. We have some engines running that have not broken a frame in two years, and we have some types of engines running that have not broken over two or three frames in about thirty engines in about four years, but on the same type of frames, on other engines with cast steel frames have broken, so that it is pretty hard to determine where we do stand. We have some alloy frames with vanadium that have run, one for four years and no trouble, and no trouble, either, with the engines built at the same time with cast steel frames—apparently we have not reached the point in the case of these engines where the breakage is likely to occur.

C. E. Chambers: I would like to add a word for the benefit of the members—on those engines in which we had the frames break, the front wheel type of engine, the frame broke just forward of the jaw. We had a splice just in front, before it touched the jaw. After a time we used a cast steel section, using the same kind of splice, and since then, about a year ago, we went further ahead, just back of the cylinder and cut-off where the frame is a single bar and made the section cover that point, and we have a one-piece frame, which has been very successful, doing away with the trouble of splicing the top.

A. E. Manchester (C. M. & St. P.): I do not see any difference between the serviceability of the iron and steel frames. We have 175 consolidation engines with 56-in. wheels. The first few years that these engines were in service they were kept entirely in a moderately slow speed, but very heavy service, the engines hauling from 3,000 to 5,000 ton trains. Later on a condition developed due to the particular weight and length of these engines, and we had to transfer them to another district where the speeds were high. In the slower heavy service we had practically no broken frames at all, but when we turned the engines over to the fast service we had a great many broken frames. We cannot entirely balance the engine according to rule, and I believe that that was one of the things that caused the trouble with these engines, the matter of gravity and high speeds.

The President: I wish to say that we have had a lot of trouble with broken frames. Most of our troubles have been with Pacific type engines. We have had consolidated engine frames break, but I do not think it makes very much difference whether they are running on a division of 200 miles, with tangent track, or on a division that has no tangent track; it seems to be about the same thing. The breakage occurred mostly in the top rail either under the guide yoke or at the pedestal or even up close to the cylinder—we have extended the top rail of the frame back from the rear of the front pedestal far enough to get it solid in back of the back leg. We have done away with the guide yoke bracket entirely, making the frame, the leg on it, as a guide yoke bracket. We have forty engines; it is true they are lighter engines and have smaller wheels, which have been in service twelve years, and we have not a record of a broken frame.

We commenced changing the Pacific type of engines to this design about two and a half years ago. We have not had a broken frame on the Pacific type of engine as equipped with this frame. We feel that the guide yoke bracket, about twenty inches high, to get the guide yoke up high enough with the cast iron bracket bolted, which was not always tight, but was frequently loose, was largely responsible for the trouble which we had.

R. W. Bell (Ill. Cent.): About ten years ago on the Illinois Central we had a great many frame breakages and we started a systematic campaign to ascertain the way in which our engines were taken care of in the roundhouse. We found that our frames broke on the ends that were neglected, wedges that were down, wedges that were not kept in condition, brasses not taken care of, and we started a campaign of education of our roundhouse force, and after we introduced better methods of caring for the engines, our frame breakages were reduced to a minimum. I think the greatest causes of frame breakages are loose wedges. It is true, that the design of the frame has something to do with it, but I think if the engine is kept up in a state of high efficiency, all the rods and boxes in proper order, you will find that the frame breakages will be greatly reduced. That is our experience. We have 1449 engines, and since last July our frame breakage has been one per cent.

D. J. Redmig (P. & L. E.): We had a lot of consolidation locomotives in which the frames broke at the head of the front jaw, and we came to the conclusion that the principal reason was that they had a light sheet, running from the guide yoke up to the boiler, and it was fastened against the boiler, and we would always find the bolts tieing this sheet to the guide yoke and the boiler loose on the frame of the yoke. By putting in double sheets and double anchors against the boilers and putting in a cast iron section between the top and bottom rail, ahead of the front jaw, to take up the vibrations set up by the piston thrust at the back end of the guides, we nearly eliminated the breakage of these frames, and it seemed to me if anything could be added to the report of the committee it would be some suggestion as to the proper bracing.

George W. Rink (C. of N. J.): I believe the bracing is an important part of the locomotive. I have an idea that sufficient metal is not applied vertically to the bolt holes in the braces. Where you find a bolt with anywhere from three-quarters of an inch to one inch of metal through the bracing, the same should have at least an inch or an inch and a half of metal, and the frame bracing should extend from the top rail to the lower rail, so as to brace cross-wise, in other words, use a brace in the shape of the letter X. I believe that would be far preferable to using a large flat brace lying on the top rail. We have found occasion to apply to engines originally built with such a brace an additional brace to the lower rail and extending a sheet from the top frame casting to the lower additional bracing. What I have just described applies principally to the front furnace supports.

I believe the use of a sheet connecting the mud ring into the supporting casting is a good idea. As far as the thickness of the sheet is concerned, I believe the thinner the sheet is the better, as far as flexibility is concerned. My attention was called the other day to an eight wheel engine that had the front jaws broken on both sides. This engine had a frame of about four by seven. It had no underhung springs. The wedge required lining up and it was neglected, and I can attribute the cause of that breakage to the fact that the wedges were not properly lined up.

We have a large number of cast steel frames in service, a number of frames made of .40 per cent. carbon steel, introduced on our latest switching engines, and as far as these switching engines go we have had no trouble. The particular engine Mr. Chambers referred to had a cross spring from one driver box to the other, and the frame was cut out a trifle on an angle, which weakened the frame at that point. When we got out the new cast steel section we added two inches to the depth of the frame at that point, and have had no trouble.

H. T. Bentley: I agree with Mr. Bell, of the Illinois Central, and Mr. Seabrook, of the St. Louis Southwestern, who report having had no trouble, due to getting a better grade of steel. It has been stated to me that the committee has done an injustice to the vanadium steel frames, insofar that we did not state how many frames were in service when we stated how many were broken, and to try to straighten that out I will try to give the result of the information I got at the time this report was compiled: One set, none, broken; five sets, none broken; one set, none broken; three sets, one broken; one Mallet, four frames, none broken; three sets, none broken; two hundred and thirty sets, none broken.

Mr. Chambers spoke of the one piece frame eliminating the splice. I think that is the *European* practice. Everyone knows what troubles they have had with splices, and they have gone into the practice of making sections and welding the section in the center of the front jaw, and I think it is a good thing to do; that is the practice we are using.

COMPLAINTS.

The committee on arrangements announces that it will be glad to undertake to adjust all complaints of any nature during the conventions. The committee is composed of E. L. Adreon, chairman; C. E. Fuller and T. H. Curtis. Its office is with the secretary of the Railway Supply Men on the Million Dollar Pier.

RAILWAY CLUB SECRETARIES.

The annual meeting of the Society of Railway Club Secretaries will be held at the Hotel Brighton, at 10 o'clock Saturday morning. The dinner will be held at 7.30 in the evening in the garden of the Hotel Windsor, unless the weather is unfavorable, in which case it will be held inside. There will be no past-prandial oratory, but a special programme is being prepared.

THE M. M. RECEPTION LAST NIGHT.

The annual reception by the officers of the Master Mechanics' Association was given in the Blenheim Exchange, Marlborough-Blenheim Hotel, last night, and was attended by a large crowd. President and Mrs. Fuller headed the receiving line. The Southern Singers, a quartette of young women, gave a concert thirty minutes before the receiving line formed, and following the reception there was informal dancing. Two orchestras furnished the music, and punch was served in the west solarium.

The receiving party was as follows: Mr. and Mrs. C. E. Fuller; Mr. and Mrs. H. T. Bentley; Mr. and Mrs. T. Rumney; Mr. and Mrs. A. Sinclair; Mr. and Mrs. T. H. Curtis; Mr. D. R. MacBain and Miss MacBain.

The ladies of the party were gowned as follows: Mrs. Fuller, white bordered satin; carried white roses; Mrs. Bentley, black silk trimmed with jet; carried orchids; Mrs. Rumney, white chiffon embroidered in blue; carried lilies of the valley and pink pea roses; Mrs. Sinclair, gray satin with point lace; carried pink carnations; Mrs. Curtis, chantilly over yellow satin; and Miss MacBain, blue marquisette hand-embroidered with pink roses; carried pink roses. The reception was probably the most successful that has been held at Atlantic City. The reception sub-committee was composed of Edward S. Toothe, chairman; F. B. Ernst, C. A. Dunkelberg, Frank Martin, George R. Carr and Herbert Green.

BALL GAME RESULTS IN FORMER YEARS.

The ball game has been an annual event since 1903, and of the eight games that have been played six have been between east and west. This year, on next Saturday afternoon, for the seventh time east and west will meet on the diamond, and it is interesting to glance back over the scores that have been made in past years. They are as follows:

	West	East
1903	5	11
1904	11	7
1905	17	18
1906	17	7
1907	23	1
1910	0	15

It will be seen that each section has won three games. The games in 1908 and 1909 were between the railway men and the supply men. In 1908 the supply men won, 25 to 19; in 1909 the railway men won, 14 to 12.

The most exciting game in the series was that in 1905, when the score was 18 to 17.

THE BAND MYSTERIOUS.

J. Will Johnson, chairman of the entertainment committee, seems to understand the advantages of shrouding in mystery certain features of the entertainment program until the pyschological moment arrives for letting them burst forth in all their glory. He is understood to have a supply man's brass band concealed about his person somewhere, which has been practicing regularly since last year's conventions, but he refuses to let it be seen or heard, or to disclose the identity of its membership until it shall take its place in the parade to the base ball grounds Saturday afternoon. It is said to have been tuning and tooting somewhere in Atlantic City Tuesday night, but Mr. Johnson evidently keeps it in a noise-proof room. Some knockers say it has taken all year for the bloomin' bunch to learn ten pieces, and that the chairman is keeping it locked up for fear it will give its program prematurely and be unable to repeat on Saturday. Perhaps the fact is that he thinks if he did not refuse to let it play now, the rest of the convention crowd would refuse to let it play Saturday.

M. M. REGISTRATION.

Appler, A. B., M. E., Delaware & Hudson Co., Marlborough-Blenheim.
Arden, D. D., M. M., Savannah & Slatsbro, Baltimore.
Arp, W. C., S. M. P., Vandal a R. R., Marlboro.
Ayers, A. R., M. E., L. S. & M. S. R. R., Shelbourne.
Basford, Geo. M., Associate, American Locomotive Co., Marlborough-Blenheim.
Bawden, Wm., M. M., Terminal R. R. Assn. of St. L., Watkins.
Bayley, J. J., M. M., Southern Ry., Sterling.
Bean, S. L., M. S., A. T. & S. F. Ry., Marlborough-Blenheim.
Bell, R. W., Supt. Mach., Ill. Central R. R., Dennis.
Bennett, W. H., M. M., Penna. R. R., Traymore.
Blunt, James G., Supt. Gen. Draw. Rm., Amer. Loco. Co., Traymore.
Booth, J. K., Gen. For., Bessemer & Lake Erie R. R., Traymore.
Booth, J. S., M. M., Carolina & N. W., Ten Eyck.
Bowden, J. F., M. M., Balto. & Ohio R. R., Elberon.
Bowles, C. K., Tidewater & Western R. R. Co., Sterling.
Brown, M. G., M. M., Gulf & Ship Island R. R., Haddon Hall.
Burk, C. H., Loco. Supt., Mexican Ry., Shelbourne.
Burton, T. L., Gen. Insp., P. & R. R. R., C. R. R. of N. J., Marlborough-Blenheim.
Butler, F. A., M. M., B. & A., Young's.
Chambers, C. E., S. M. P., C. R. R. of N. J., Dennis.
Chidley, Joseph, M. M., Lake Shore & Mich. Southern Ry., Marlborough-Blenheim.
Christopher, Jacob, M. M., Toronto Hamilton & Buffalo Ry., Young's.
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Cross, C. W., Supt., App., N. Y. C. Lines, Traymore.
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Davis, John E., M. M., Hocking Valley, Monticello.
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Dillon, S. J., M. M., Penna. R. R. Co.
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Dow, Geo. N., C. M. I., L. S & M. S. Ry., Chalfonte.
Duffey, G. J., M. M., Lake Erie & Western Ry., Marlborough-Blenheim.
Dunham, W. E., Supvr., M. P. & M., Haddon Hall.
Dunn, Jas. F., S. M. P., Oregon Short Line R. R., Chalfonte.
Eden, E. S., M. M., Central New England Ry. Co., Rudolph.
Elliott, J. B., M. M., Balto. & Ohio R. R., Elberon.
Enright, J. F., S. M. P., Denver & Rio Grande R. R., Chelsea.
Endsley, Prof. L. E., Asso. Prof. Mech. Engineering, Purdue University, Chalfonte.
Figner, W. H., M. M., Central of Georgia Ry., Chalfonte.
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Flavin, U. J., M. M., C. I. & S. R. R., Marlborough-Blenheim.
Fowler, Geo. L., Dennis.
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Hayward, H. S., S. M. P., Penna. R. R. Co., Chalfonte.
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Hunter, H. S., M. M., Phila. & Reading Ry.
Jackson, O. S., M. M., Chgo, Terre Haute & So. Eastern Ry., Dunlop.
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James, J. M., M. M., Penna. R. R., Marlborough-Blenheim.
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Kadie, C. H., M. M., Southern Ry.
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Kinney, M. A., S. M., Hocking Valley Ry., Traymore.
Kirkpatrick, James, M. M., B. & O. R. R. Co., Elberon.
Knight, W. Edward, S. M. P., Cuba R. R., Pennhurst.
Kyle, C., M. M., Canadian Pacific Ry., Haddon Hall.
Lovell, Alfred, Traymore.
MacBain, D. R., S. M. P., L. S. & M. S. Ry., Marlborough-Blenheim.
MacDowell, Wm. G., 1st V. P., Norfolk & Western Ry., Dennis.
McGuire, J. J., Gen. For., B. & O., La Balle Inn.
McIlvaine, C. L., Asst. Engr. M. P., Penna. R. R. Co., Chalfonte.
MacKenzie, John, Dunlop.
McLean, J. E., M. M., Kansas City So., Dennis.
McNaughton, Jas., Amer. Loco. Co., Marlborough-Blenheim.
McNulty, F. M., S. M. P. & R. S., Monongahela Connecting R. R., Chalfonte.
McPherson, T. J., M. M., Peoria & Pekin Union Ry.
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May, Walter, M. M., C. C. C. & St. L. Ry., Chalfonte.
Maxfield, H. H., M. M., Penna. R. R., Chalfonte.
Minshull, P. H., M. M., N. Y. O. & W. R. R. Co., Traymore.
Meister, C. L., M. E. (Ch. Draftsman) Atlantic Coast Line, Shelbourne.
Moll, George, M. M., Phila. & Reading R. R., Jackson.
Murray, F. H., M. M., Erie R. R., Pt. Jervis. Lexington.
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Pilcher, John A., M. E., Norfolk & Western Ry., Traymore.
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Purvis, T. B., Jr., Young's.
Querean, C. H., N. Y. C. & H. R. R. R., Traymore.
Quigley, Joseph, M. M., C. & G. S. Ry., Dennis.
Redding, D. J., Asst. S. M. P., Pittsburgh & Lake Erie R. R. Co., Traymore.
Reid, W. L., Gen. Wks. Mgr., Am. Loc. Co., Marlborough-Blenheim.
Reynolds, O. H., Dennis.
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Rink, Geo. W., M. E., C. R. R. of N. J., Dennis.
Rogers, Robert Hunter, Gen. Insptr., Erie R. R., Rudolph.
Rollings, E. O., M. M., L. & N. R. R., Westminster.
Rose, W. G., M. M., C. H. & D., Watkins.
Rumney, Thos., M. S., Erie R. R., Holmhurst.
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Schmidt, Prof. E. C., Haddon Hall.
Sechrist, T. O., M. M., C. N. O. & T. P. Ry., Dennis.
Seddon, C. W., S. M. P. & C., D. M. & N. Ry., Traymore.
Sinclair, Angus, Editor Loco. Engineering, Haddon Hall.
Sinnott, W., M. M., Baltimore & Ohio R. R. Co., Pennhurst.
Slayton, C. E., M. M., Asst. Supt., St. Joe & Grand Island Ry.
Slayton, F. T., S. M. P., Virginia Ry.
Sneck, Harry, M. M., Buff. Roch. & Pitts. R. R.
Snell, E. J., M. M., N. Y. C. & H. R. R. R., Pennhurst.
Sprowl, N. E., M. M., Atlantic Coast Line R. R., Young's.
Staley, H. F., M. M., Caro, Clinchfield & Ohio Ry., Traymore.
Stewart, A., M. S., Southern Ry., Marlborough-Blenheim.
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Stubbs, G. W., M. M., Gulf Line Ry., Arlington.
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Taylor Wm. H., M. M., N. Y. S. & W. Ry. Co., Dennis.
Thayer, F. C., G. R. F. E., Southern Ry., Penhurst.
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Thomas, W. H., Honorary Member, Dennis.
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Tuma, Frank, M. M., Erie R. R., Traymore.
Turner, Calvin G., M. M., Phila., Balto. & Wash. R. R. Co., Chalfonte.
Van Buskirk, H. C., S. M. P., C. & S. Ry., Chalfonte.
Van Doren, G. L., Supt. Shops, Cent. R. R. of N. J., Dennis.
Wagstaff, Geo., Amer. Arch. Co., Chalfonte.
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Watson, R. B., Engr. of Tests, Erie R. R., Traymore.
Watters, J. H., Asst. M M., Georgia R. R., Traymore.
Wells, M. E., A. M. M., Wheeling & Lake Erie R. R., Mt. Vernon.
Wells, Reuben, Ex-Pres. M. M. Assn., Dennis.
Wildin, G. W., Mech. Supt., N. Y., N. H. & H. R. R. R., Chalfonte.
Wilson, Charles, M. M., Lehigh Valley R. R., Alberon.
Wood, L. L., S. M. P., E. & T. H. R. R., Youngs.
Wright, R. V., Mech. Dept., Editor R. R. Age Gazette, Chalfonte.
Whyte, F. M., New York Air Brake Co., Marlborough-Blenheim.
Young, C. B., M. E., Chgo., B. & Q. R. R., Traymore.
Young, Charles D., A. E. M. P., Penna. Lines, W., S. W. System, Brighton.

M. C. B. REGISTRATION NOTICE.

Secretary Taylor announces that arrangements have been made for registering the members of the M. C. B. Association any time this week, instead of waiting until next week.

M. C. B. REGISTRATION.

Anderson, Geo. T., Supt., N. Y. Desp. Ref. Lines, Chalfonte.
Appler, A. B., M. E., Dela. & Hudson Co., Marlborough-Blenheim.
Arp, W. C., S. M. P., Vandalia R. R., Marlborough-Blenheim.
Baron, Jacob, Kentucky & Indiana Bridge & R. R. Co., Young's.
Beamer, James A., M. M., Penna. R. R., Chalfonte.
Bell, R. W., Supt. Mach., Ill. Cent. R. R., Dennis.
Baker, J. E., Past Pres. M. C. B., Chalfonte.
Burton, T. L., Gen. Insp., C. R. R. of N. J., Marlborough-Blenheim.
Chamberlain, J. T., Life Member M. C. B., Young's.
Chambers, C. E., S. M. P., Cent. R. R. of N. J., Dennis.
Christopher, J., M. M., Tor. Ham. & Buff. Ry., Young's.
Combs, S. W., Master Car Bldr., Cuba Railroad Co., Traymore.
Combs, W. B., M. M., Macon, Dublin & Savannah R. R., Young's.
Cromwell, O. C., M. E., Balto. & Ohio R. R., Marlborough-Blenheim.
Curtis, Theo. H., S. M., Louisville & Nashville R. R., Marlborough-Blenheim.
Dillon, S. J., M. M., Penna. R. R.
Dunn, J. F., S. M. P., Oregon Short Line R. R., Chalfonte.
Edenk, E. S., M. M., Cent. New Eng. R. R. Co., Rudolph.
Enright, J. F., S. M. P. & C. D., Denver & Rio Grande R. R., Chelsea.
Fowler, Geo. L., Dennis.
Garstang, Wm., S. M. P., C. C. C. & St. L. Ry., Marlborough-Blenheim.
Goodrich, Max, M. M., New York & Ottawa R. R., New Holland.
Grewe, H. F., Wabash, Pittsburgh Terminal Ry., De Lamar.
Hainen, J., S. M. P., Southern Ry., Dennis.
Hayward, H. S., S. M. P., West Jersey & Seashore R. R., Chalfonte.
Henry, W. C. A., S. M. P., Penna. Lines West, Chelsea.
Hill, Rufus.
Hoffman, C. M., S. M. P., St. L. B. & Mex.

James, J. M., M. M., Olean Shops, Penna. R. R. Co., Marlborough-Blenheim.
Joughins, G. R., S. M. P., Intercolonial Ry., Chalfonte.
Kadie, C. H., M. M., Southern Ry., Pennhurst.
Kiesel, W. F., Jr., Asst. M. E., Penna. R. R., Chelsea.
Knight, W. Edward, S. M. P., Cuba R. R., Pennhurst.
McNulty, F. M., M. M., Monongahela Connecting R. R., Chalfonte.
Needham, H. S., A. E. M. P., Penna. Lines, Haddon Hall.
Passmore, H. E., M. M., Toledo & Ohio Central Ry., Chalfonte.
Pilcher, John A., M. E., Norfolk & Western Ry., Traymore.
Pfafflin, Louis, M. M., Indianapolis Union Ry., Biscayne.
Purves, T. B., Jr., Youngs.
Rink, Geo. W., M. E., Central R. R. of N. J., Dennis.
Robider, W. J., M. C. B., Central of Georgia Ry., Chelsea.
Schroyer, C. F., M. C. B., C. P. & W. R. R., Young's.
Schmoll, G. A., S. M. P., Baltimore & Ohio R. R., Traymore.
Seddon, C. W., S. M. P. & C., Duluth, Missabe & Nor. Ry., Traymore.
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Sinclair, Angus, Editor, Locomotive Engineering, Haddon Hall.
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Slayton, F. T., S. M. P., Virginian Ry.
Stewart, A., G. S. M. P. & E., Southern Ry., Marlborough-Blenheim.
Tawse, Robt., S. M. P., D. T. & I. & Ann Arbor R. R., Iroquois.
Thomas, H. T., M. M., Detroit & Mackinac Ry., Pennhurst.
Van Buskirk, H. C., S. M. P., Colorado & Southern Ry., Chalfonte.
Wildin, G. W., Mech. Supt., N. Y. N. H. & H. R. R., Chalfonte.
Wood, L. L., S. M. P., E. & T. H. R. R., Young's.
Wright, R. V., Mech. Dept. Editor, R. R. Age Gazette, Chalfonte.
Young, Charles D., A. E. M. P., Penna. Lines West, Brighton.
Young, C. B., M. E., C. B. & Q. R. R., Traymore.

GUESTS.

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Borup, O. V., Draftsman, B. & O., Kenderton.
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Carey, W. S., Secy. to S. M. P., P. R. R., Russell.
Chambers, Jas. A., Dennis.
Christopher, Byron, Young's.
Christopher, Thomas, Young's.
Carfield, W. D., Agt., Phila. & R. Ry.
Cozad, Wm., Shop Specialist, Erie, Schlitz.
Craven, G. W., Supt. Schofield Iron Wks., Chalfonte.
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Cromwell, H. C., Draftsman, B. & O., Kenderton.
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Davis, J. E., M. M., C. Col. O. Hocking Valley, Monticello.
Davis, M. J., Asst. M. M., P. R. R., Chalfonte.
Degnan, T. S., D. & H., Edgewater.
Dittoe, W. P., Pur. Agt., N. Y. C. & St. L., Chalfonte.
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Endsley, Louis E., Professor Rwy. Mech. Engineering, Chalfonte.
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Fetner, W. W., Chalfonte.
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Francis, J. R., Chemist, Big Four, Runnymede.
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Haines, W. S., M. M., Erie R. R., Schlitz.
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Hawkins, Geo., Dennis.
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Henszey, R. E., Jr., M. E., Traymore.
Hill, J. P., Div. Stk., Penna. R. R.
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Howaldt, George, Marlborough-Blenheim.
Horsey, A. Southerland, Can. Pac. Ry., Haddon Hall.
Jackson, U. S., Supervisor Track and Line, Atlantic & West Shore Line, Edgewater Hall.
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Kauffman, G. B., Pass. Agt., Atl. City R. R.
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Knight, Charles, Pennhurst.
Knight, William, Pennhurst.
Knotlauch, G. A., P. & R., Pennhurst.
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Lester, C. E., Genl. Foreman, Erie R. R., Young's.
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Lyon, A. N., Gen. Supt., K. & M., Haddon Hall.
McAlister, W., Retired M. M., B. B. & W. R. R.
McElveney, J. A., D. & H., Edgewater.
McKelvey, W. D.,Gen. Fman., P. R. R., Dunlop.
McLean, E., M. M., K. C. Southern, Dennis.
McNoldy, H., For. Mach. Shops, Penn. R. R., Dunlop.
McSweeney, J. F., Foreman, Mt. Clare Shops, Whittle.
Mack, J., Boiler Insp. Public Service, Young's.
Mathias F., Mach Shop Foreman, B. & O., Schlitz.
Metzler, Chas T., Elberon.
Morningstar, E. E., Draftsman, B. & O., Kenderton.
Morton, R. C., Draftsman, B. & O., Kenderton.
Mulroy, R, Genl. Storekeeper, S. & L. & D. F. Lines, Dennis.
Murray, David, Master Painter, Penna. R. R., Pittsburgh, Bouvier.
Nichols, L. T., Gen. Mgr., C. & N. W. R. R., Monticello.
Norris, W. B., Genl. Foreman, Alt. Shops, P. R. R., Dennis.
Norton, A. W., Draftsman, B. & O., Kenderton.
Perrine, Harold, Cent. R. R. of N. J., Pennhurst.
Pfaff. Dr.
Powell, J. H., Trav. Engineer, N. Y. P. & N. R. Ry., Westminster.
Randolph, V. C., Supt. Loco. Operation, Erie R. R., Schlitz.
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Rhett, E. M., Elec. Eng., Central of Georgia Ry. Co., Marlborough-Blenheim.
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Singleton, W. T., M. C. B., Flor. East Coast Ry., Windsor.
Smith, C. B., D. & A. Telephone Co.
Sprowl, Lester C., M. M., A. C. L.
Staley, A. E., C. C. & O. Ry., Traymore.
Staley, F. W., C. C. & O. Ry., Traymore.
Stauffer, H. C., Div. Fgt. Agt., P. & R., Young's.
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Stuart, E. M., P. & R. Ry., Pennhurst.
Swerley, Richard, Haddon Hall.
Telford, A., Pur. Agt., C. N. & P. T. R. R. of Ga., Marlborough-Blenheim.
Telford Elliott A., Q. & C., Marlborough-Blenheim.
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Van Blaseun, C. B., Gen. For., Chgo. Junction, B. & O., Elberon.
Van Doren C. E., Central of N. J., Dennis.
Vought, Harry D., Secy., New York & Central Ry. Clubs, Windsor.
Walters, W. H., P. R. R., Continental.
Warthen, H. J. Jr., Wash.-Sou., Sterling.
Webel C. C., Shaftsman, B. & O., Kenderton.
Weidner, O. O., Asst. Supt., P. & R. Rwy.
Whittsitt, W. B. Shaftsman, B. & O., Kenderton.
White, R. H., Eng. of Mach., Am. Loc. Co., Traymore.
Wibel. W., Asst. Purchasing Agent, National Ry. of Mexico, Marlborough-Blenheim.
Williams. J. E., Jr., Pur. Agt., Terminal Ry. Asso., Dennis.
Wilson J. M., P. & R., Elberon.
Wilt, W. L., Chief Clerk, T. W. Temarest; S. M. P., Penna. Lines (West), Dennis.
Wine, W. E., Draftsman, Atlantic Coast Line R. R. Windsor.
Wood, A. L., Associate Prof. R. R. Mech. Eng., Penn. State College, Edison.
Zexcher, F. B., Supt. Augus Shops, C. P. R., Young's.

SUPERHEATED STEAM ON PASSENGER LOCOMOTIVES.

The fact that the maximum capacity of a locomotive is increased when highly superheated steam is used makes the application of superheaters to passenger engines a very attractive proposition. The past year has witnessed a striking advance in this respect. It has been proved conclusively that the increase in equivalent boiler capacity, as a result of using superheated steam for engines in this service, has permitted an augmented tonnage rating and made possible considerably higher average speeds with heavier trains when using engines of aproximately the same weight. The results obtained on the New York Central, Lake Shore and the Chicago & North Western with Pacific type passenger engines equipped with Schmidt superheaters have been entirely satisfactory from this point of view.

The claims of 20 per cent. to 25 per cent. economy for many different varieties of money-saving devices capable of application to steam locomotives have been so common that this figure has seemed to be almost a "standard quantity." When superheaters were first successfully applied abroad figures of this size were prevalent, and much doubt was felt as to whether they could be supported under the conditions in this country. During the past year, however, extensive tests in regular service have shown that this figure has been equaled, and even surpassed, and that coal economies of 30 per cent. to 35 per cent. have been obtained. To this striking economy is to be added the advantages of increased capacity at higher speeds. What this means in favor of superheated steam engines for American conditions is plainly apparent. In this connection the following extract from the Locomotive Superheater Company's catalogue may be of interest:

"The Chicago & North Western has made careful tests of the Pacific type engines with and without superheater.

"The principal dimensions of these two classes of engines are as follows:

Type	Boiler Pressure lbs.	Cylinders in.	Diameter Drivers in.	Weight on Drivers lbs.	Weight of Engine lbs.
4-6-2 Saturated Steam ...	200	23 x 28	75	154,000	247,000
4-6-2 Superheated Steam ..	175	25 x 28	75	154,500	250,500

"The tests included careful records of time, coal, water and drawbar pull for four round trips each of the saturated and superheater engines between Chicago and Elroy, between January 20 and February 4, 1911. Owing to traffic conditions, the trains were two cars heavier going north than coming south, and the grades were also heavier. The main results of the tests are shown below. Attention is called to the increased economy of the engine in the heavier northbound service."

	Saving in per cent. Coal H. P. H.	Water H. P. H.
Northbound	34.9 per cent.	36.7 per cent.
Southbound	26.4 per cent.	32.1 per cent.

A special interdepartmental committee has been called by the Ministry of Ways of Communication to consider the requirements of the Russian State Railway system in respect to new locomotives during the next few years, and also to consider the advisability of replacing the existing relatively weak engines with others of a heavier and more powerful type. The proposition before the commission is to remove during the next ten years all the engines of an old type, amounting to something like three thousand in all, and to replace them with 1,200 locomotives of up-to-date capacity. The proposition is a comprehensive one and should be read along with the important tests that have been made of recent years on the Russian railways with cars of large capacity.

SOME GLIMPSES OF PAST CONVENTIONS.

"Lest we forget" is our excuse for printing the series of pictures (none of which have heretofore been published) that appear in connection with the several instalments of this article. And while on the subject, it will not be amiss to recall some of the events not described by the photographic reproductions.

The early evening of June 18, 1901, found the old band of conspirators, Harry Frost, Hugh Wilson, Bert Waycott, Dan Noble, Jim Hopkins, Fred. Casey, et al, hard at work on the back porch of the Grand Union. They were writing the annual slate—only this time politics was not their sole concern. The conference resulted in the birth of the present splendid business organization of railway supplymen, now on its second ten-year lap.

But what a contrast between the multi-colored, courtyard circus of 1901 and the substantial miniature world's fair of 1911! We wonder what inspired the following, which appeared in the *Daily Railway Age* of June 26, 1901. "The view of the Grand Union court from the upper windows of the main part of the hotel certainly is a pretty picture. It is not the kind of beauty with which Saratoga is most familiar—not the kind that has adorned the ballrooms this week and



On the Veranda of the Grand Union Hotel, Saratoga Springs. 1900.

last, and will be still more numerously in evidence in July and August. Nevertheless, the various pavilions, thick set and contrasting architecture, the shining machinery, the constant flitting of visitors, and above the patches of blue sky peering though the boughs of the noble trees, make a display of modern industrial life in the midst of unusual surroundings, to come into contact with which not even gay Saratoga need blush. Glance at the scene from the windows of the grand stairway, and if you are of a reflective disposition it will appeal to you." If it was written after one of the famous night concerts over which Alex Brown did not preside, no more need be said; but if the words were penned in sober thought, the mystery is indeed deep.

Among the disasters of 1901 were the weather and the loss of Johnnie Chamberlain's umbrella. Of the two, the former was the more serious; but the latter was most heart rending. It seems that John owned an umbrella which, while neither uncommon in design nor especially fine in texture, was valued highly for its service record. Umbrellas being in great demand, and said service record being clearly indicated by numerous surface markings, the members and guests of the convention were not surprised when a charge



One of the Side Shows, Saratoga, 1901.



John Chamberlain and His Recovered Umbrella, Saratoga, 1902.



J. H. Mitchell and L. H. Turner, Saratoga, 1902.



The Main Circus, Saratoga, 1902.



W. C. Arp and D. F. Crawford, Saratoga, 1902.



En Route to Saratoga, 1903.

of theft was made against a certain second-story man, whose record as a breaker-in at previous conventions had been far from enviable. Some months later the despoiler of John's peace of mind got religion; and when John returned to Saratoga, just one year later, the umbrella, fully recovered, was found in its accustomed resting place in his room.

The 1902 convention passed into history as one of the tamest on record. Even the badger used by the Hodcarriers for their annual initiation failed to show signs of ferocity.

The two principal events of the 1903 gathering at Saratoga were (1) the celebration of the escape of the forces under Generals West, Marden and Blewett from Mackinac island, and (2) the first annual baseball game. For the benefit of those who are still too young at this convention game to be classed as old timers, your executive committee of 1902-03 wended its way to Buffalo, N. Y., early in the winter of 1902, to contribute its share of advice to the joint committee of the M. M. and M. C. B. associations appointed to decide where the 1903 convention should be held. "Everyone" was tired of Saratoga. "They" wanted a change. In due course hotel owners from several well-known resorts were admitted to the meeting room and invited to submit proposals. At the moment we don't recall whether it was the eloquence or the souvenir packs of playing cards, both of which were handed out with equal liberality; but, somehow, the men having to do with the destinies of a certain hostelry located on a prominence in Lake Huron known as Mackinac Island won the day. The news spread. From one end of the land to the other railway men and supplymen alike began to consult maps and gazetteers. After learning the exact location and the proper pronunciation they found that ice and fog had been seen around those parts as late as the middle of June. Next, Dame Rumor awoke. It was whispered that a supplyman had been found who had once visited Mackinac Island and knew that the convention could not be accommodated. The wise ones again consulted their books of reference. "The island is about three miles long and two wide. It is rocky, and covered with trees, shrubs and flowers." Then it must be true. Scott Blewett got some letters—and some telegrams. He also got busy. Finally, a council of war was held at St. Louis, with the result that Mackinac Island was abandoned and Saratoga was again taken by storm.

The other event of 1903 was the first annual baseball game, at Geyser Spring Park. We went in trolley cars, and took the band along to keep folks from going to sleep while the players were at work. When it was all over it was said that the West had won by two runs. The score was 11 to 7.

THE NOMINATION OF A PRESIDENT.

The nominating committee of the Railway Supply Manufacturing Association, consisting of Le Grand Parish, chairman; R. R. Bishop, A. L. Humphry, H. W. Frost, W. J. Schlacks, A. C. Langston and H. M. Pflager, met in the committee room on the pier Wednesday morning and decided on naming B. E. D. Stafford, of the Flannery Bolt Company, Pittsburgh, Pa., as candidate for president, and Samuel G. Allen, of the Franklin Railway Supply Company, N. Y., as candidate for vice-president.

FOREIGN RAILWAY NOTES.

A new law has been submitted by the same ministry asking for the provision dur'ng the first half of the year 1912 of rolling stock, rails, fish plates, etc., of a total value of $15,768,000.

A series of new railways has just been carefully considered by the Committee on New Railway Lines in Russia, particularly the following series: Voluinsk (with branch) connecting the station of Zhmerinku on the South Western Railway through Dubno with the station of Cholm on the Privislinsk Ra lway: length 265 miles with branch from Lyachobtyni to Ozhenia, distance 40 miles.

UNIVERSITY OF ILLINOIS DINNER.

The annual dinner of University of Illinois men attending the conventions will be given at the Shelburne on Saturday evening, at 6 P. M. All University of Illinois men desiring to attend are requested to arrange for reservations with P. G. Stevens, at the booth of the *Railway and Engineering Review.*

STEEL COACHES FOR THE LACKAWANNA.

The Delaware, Lackawanna & Western received in May five 60-ft. steel coaches from the American Car & Foundry Company, New York. These cars are for suburban service and were built at the Berwick shops from the builders' designs. They weigh 100,250 lbs., the body weighing 72,570 lbs., and the trucks 27,680 lbs. The principal members of the underframe are the two 10-in. I-beam center sills extending full length of the car between the buffer beams, and the 6-in. x 6-in. side sill angles; the buffer beams made up of 10-in. channels, and the body end sills built up of 3/16-in. pressed steel diaphragms cut in between the longitudinal members and stiffened by a 6-in. channel passing under the center sills and inclined upward at the end, being riveted to the webs of the diaphragm sheets. The platform arms are 8-in. channels extending to a point back of the bolster. The bolsters are the double type built up of ¼-in. pressed steel diaphragms with heavy top and bottom cover plates. Four cross-bearers transmit the floor loads to the side framing. Two sets of diagonal braces between adjacent cross-bearers are employed to secure rigidity to the underframe. The floor support angles of 2-in. x 1½-in. section are laid with the upper leg horizonal and are riveted by angle connections to the floor beams which consist of 3-in. x 2-in. angles running from center sill to side sill.

The sides of the car are framed in the form of a plate girder, designed to support the entire vertical load of the car without undue deflection. The side sill angle above mentioned constitute the lower flange of the girder and extends in one length from body end sill to body end sill. The belt rail forms the upper flange and the outside sheathing plate the web of the girder. The belt rail is built up of one 5-in. x 4-in. steel angle in one length from corner post to corner post, one 4-in. x ½-in. steel bar riveted to side sheet and one 4-in x 4-in. tee riveted to horizonal leg of 5-in. x 4-in. angle.

The side plates consist of 5-in. x 3-in. rolled steel angles extending in one piece from ramp carline to ramp carline and secured thereto with suitable connections and riveted to side posts, corner posts and letter board. There are ten wide posts on each side of car consisting of 3-in. x 2-in. rolled steel angles in pairs extending from side sill to plate and riveted thereto, and to the side girder sheets, splices and 5-in. x 4-in. belt rail angle. The chipple posts, built of 3-in. x 2-in. rolled steel angles, are provided in the spaces between the wide posts, extending from side sill to belt rail and riveted thereto. The corner posts are built up of two 3-in. x 2-in. angles with 3/16-in. pressed steel cover plate extending around and over the side and end sheets. The door posts consist of 3½-in. x 1¾-side and end sheets. The door posts consist of 3½ in. x 1¾ in. pressed steel channels inserted between end and sill webs and extending to transverse pressed steel channel over door header. The carlines are 1¾-in. x 1¼-in. rolled steel angles placed in pairs over each wide and cripple post. They are bent to

conform to the contour of the roof and run in one continuous length from side plate to side plate. The deck plates are 3-in. x 3-in. rolled steel angles and are attached to each pair of carlines with malleable iron connections. The eaves moulding is a 3/16-in. pressed steel plate. The ramp carline is a 4½-in. x 3-in. rolled steel angle curved to suit the contour of the hood and is securely attached with malleable iron connections to the side plate at each end. Roof sheets are of 1/16-in. rolled steel plates with splices at the carlines. The side girder sheets are 3/16-in. rolled steel plates; the side sheets at ends of the car above the belt rail and the letter board are of ⅛-in. patent level stock, the letter board having inside splices and welded joints. The window frames are pressed from 3/32-in. sheet steel forming the sash guide and also serving as pier covers; the sash rest or belt rail capping is a special section drawn from the same material; the top rail of the frame consists of an ⅛-in. pressed steel plate. The deck sash frames are pressed in one piece from 3/32-in. sheet steel, and are made to accommodate the swinging sash and also the stationary sash at ventilator frames. The step skirting and risers are of ⅛-in. steel plates and the threads are of 3/16-in. plates. The outer edge of step skirting is flared and finished with a drawn brass nosing. The platform plate and step treads are covered with the standard Mason safety tread and outer edges finished with Mason tread in brass. The Standard Coupler Company's buffer attachments are used.



60-Ft. Steel Coach; Delaware, Lackawanna & Western.

The flooring is an insulated cement floor and consists of galvanized steel sheets buckled downwards between supports to provide space for one layer of 3-ply special Salamander hair felt covered with cloth. One layer of double thickness Resisto insulating materials is then laid. Above this is laid the Keystone section of corrugated flooring resting on and riveted to the floor supporting members, and is covered with the American Car & Foundry Company's standard Acandolith cement flooring to a depth of ⅝-in. above the corrugations. The ceiling is finished with Agasote headlining, 3/16-in. thick in lower deck and ¼-in. thick in upper deck, attached to light wood furrings bolted to carlines. The inside finish is of quartered oak throughout. The wainscoat from floor to sash rest, the inside window stools and stops are of solid oak, while the post panels, deck sash panels, frieze board, saloon bulkhead, stationary seat backs and paneling around the diamond window at end of the car is a built-up 5-ply section with 1/16-in. quartered oak finishing surface. The ornamentation, molding and inlay conforms with the usual practice of the Lackawanna.

The sides and ends of the car are insulated with one layer each of 3-ply Salamander hair felt applied next to outside sheets and double thickness Resisto just back of inside finish. The roof is insulated with two layers of double thickness Resisto applied to underside of roof sheets and just above the headlining. The end doors are metal, and saloon door is quartered oak frame with 5-ply venere panels. All sash are of quartered oak, the lower sash of double windows are glazed with 3/16-in. polished plate glass and the wide upper sash and diamond windows are glazed with leaded art glass.

The car is equipped with 32 Hale-Kilburn Walkover seats with four cross and three longitudinal seats, upholstered in crimson plush and having a seating capacity of 78 passengers. Continuous basket racks with bar bottoms have been applied on each side, and these as well as the window fixtures and all other hardware and trimmings have a dark statuary bronze dull finish. The double windows are provided with Pantasote curtains equipped with the National Lock Washer Company's automatic fixtures. Six automatic ventilators are attached to deck sash on each side of car. The car is lighted by the Commercial Acetylene Company's system and is provided with six Safety Car Heating & Lighting Company's center lamps and one bracket lamp in saloon. The Gold combination direct air vapor system of heating is used. Gould Coupler Company's No. 65 long shank cast steel couplers are used with uncoupling handles. The draft rigging is the Miner tandem with class *G* springs.

The brake system is arranged for high speed brakes with a braking power equal to 90 per cent. of light weight of car with a cylinder pressure of 60 lbs. per sq. in. The car is equipped with the Westinghouse schedule P-1612 brakes, with high speed automatic reducing valves, centrifugal dirt collectors, automatic slack adjusters and train signal. The cars are mounted on 4-wheel trucks, having 8-ft. wheel base, 12-ft. 2-in. length of truck frame, and measuring 3 ft. from the top of the truck frame to the rail. The truck frame, truck bolster and spring plank are cast steel of the Commonwealth Steel Company's design. The axles are the standard M. C. B. with 5-in. 9-in. journals fitted with 36-in. steel tired wheels. The journal boxes are Taylor's malleable iron M. C. B. standard, and Magnus Metal Company's journal bearings are used. Pedestals are cast steel, and the wedges, dropped forged. The equalizers are of 2⅛-in. x 6-in. re-hammered iron. The equalizer springs are 3-coil having 8-in. outside diameter, 10-in. free height and 8¾-in. height under free load of car. The bolster springs are quintriple elliptic 40-in. centers, 6 leaves. The trucks are equipped with the Westinghouse brake beams.

The principal dimensions of the car are as follows: Length over end sills, 60 ft. 7½ in.; length over buffer beams, 66 ft. 11½ in.; center to center of bolsters, 46 ft. 7½ in.; width over side sills, 9 ft. 10⅝ in.; height from bottom of side sill to top of plate, 7 ft. 10½ in.; height from bottom of side sill to top of roof, 10 ft. 9¾ in.

Conventionalities.

Stephen C. Mason arrived with the thunderstorm on Tuesday evening.

T. N. Hibbitts, superintendent motive power of the Lehigh Valley, will not get to the convention until to-morrow.

Sterling Campbell is the inventor of a device for reducing noise in hotel dining rooms. It is a noiseless soup spoon.

Staff has discovered that gold teeth can be removed by the freezing process. Ask him to tell you the story. It's rich.

J. F. Deems, general superintendent motive power of the New York Central, motored down from New York with Mrs. Deems.

William Marshall is like a bad penny—he always turns up. Mrs. Marshall is with him and they are staying at the Marlborough-Blenheim.

G. I. Evans, mechanical engineer of the Canadian Pacific, is stopping at the Traymore. Mrs. Evans is with him, this being her first convention.

A number of folks have been asking about the contents of a green cloth bag that George Bryant was carrying under his arm yesterday morning.

W. S. Bartholomew, Western Manager of the Westinghouse Air Brake Company, is at the Traymore. Mrs. Bartholomew and the children are with him.

C. H. Quereau, superintendent electrical equipment of the New York Central, has brought his golf clubs with him, and expects to make good use of them.

John Howard, superintendent motive power of the New York Central, who has not missed a convention for a number of years, will be unable to attend this year.

H. W. Jacobs, assistant superintendent motive power of the Santa Fe, has been delayed in getting to the convention, but has wired that he will arrive this afternoon.

Did you see the flying leap made by Tom Purves and Johnnie Chamberlain, when they broke into the front rank of the M. M. march, as the line was nearing the pier?

Mr. and Mrs. S. D. Anderson, accompanied by Mrs. George Jacoby, of New Orleans, are stopping at the Traymore. This is Mr. Anderson's seventeenth consecutive convention.

C. H. Hogan, assistant superintendent motive power of the New York Central, arrived Tuesday evening. Since the last convention has been promoted and transferred from Depew to Albany, N. Y.

C. E. Chambers, superintendent motive power, Central of New Jersey, certainly enjoys the tri-daily gatherings of a party of seven in the northeast corner of the dining hall, in the Hotel Dennis.

The Mudge family, including Mr. and Mrs. Burton W. Mudge and Burton W. Mudge, Jr., and Mr. and Mrs. Herbert Green, arrived Tuesday afternoon. They are saying at the Brighton.

Fred. Casey is here, greeting his old friends. He is accompanied by Mrs. Casey, who used to attend these conventions regularly, and Miss Casey. They are registered at the Marlborough-Blenheim.

T. S. Lloyd, superintendent motive power of the Delaware, Lackawanna & Western, is just returning from a trip abroad and expects to get to Atlantic City before the convention adjourns

J. H. Manning, superintendent motive power of the Delaware & Hudson, expects to be down later in the week. He is attending the graduation exercises at Rennselaer Polytechnic Institute where his son is about to be graduated.

J. H. Bracken and H. W. Leeds, although not carrying a bale of "Linofelt" around with them, are here in the interests of their company. Both gentlemen are accompanied by their wives, and are stopping at Haddon Hall.

The two Jays, Keegan and Gardner, are due here on Saturday. As Gardner's aeroplane will carry but one passenger, he has decided to fly from Chicago alone. Keegan will swim down from New York. Both are expected to make record time.

M. H. Haig, mechanical engineer of the Santa Fe, is one of the very few younger men who have nerve enough to take an active part in the discussions on the floor of the convention. More of the young men should follow his good example.

W. L. Kellogg, superintendent motive power and car department of the Cincinnati, Hamilton & Dayton, one of the earnest committeemen of both associations, arrived Tuesday and, with Mrs. Kellogg, is stopping at Haddon Hall.

L. H. Turner, superintendent of motive power of the Pittsburgh & Lake Erie, will not be here this year. We don't know what attraction is keeping him at home, but we have a suspicion that it is his splendid farm near Leavittsburg, Ohio.

George M. Basford arrived yesterday and probably will stay until Friday afternoon. He has a week's boat trip on Lake Champlain planned for the near future, and even the attractions of the conventions can't prevent him from keeping that appointment.

H. S. Hayward, superintendent of motive power of the New Jersey division of the Pennsylvania and president of the New York Railroad Club, is registered at Chalfonte. H. H. Maxfield, master mechanic at Trenton, N. J., is at the same hotel.

George A. Hancock, general superintendent motive power of the St. Louis & San Francisco, arrived Monday evening. One of the seven Mallet locomotives on his road is equipped with a mechanical stoker and is giving good results burning Kansas and Illinois coals.

The Bentleys bid fair to have a long run at the conventions. W. H. Bentley, who was recently appointed to the sales staff of the Standard Steel Works, is attending his first convention, while his father, H. T. Bentley, of the Chicago & Northwestern, has for many years been a familiar figure.

It was during the night of the last thunderstorm. Wilkinson, in walking around the room, disturbed Turner, who asked, "What are you looking for, Billy?" "Nothing," says Billy. "Well," says Jack, "I think you'll find that in the bottle that did have—er—cologne in it."

W. White, well-known in railway mechanical circles on account of his having held important positions with the Pennsylvania, the Illinois Central and the Lake Erie & Western, is here with his wife and son, Stuart White. Mr. White is now president of the National Boiler Washing Company.

J. A. Pilcher, mechanical engineer of the Norfolk & Western, registered yesterday. The report of the tests of the Mallet locomotives made under his direction during the past year has been one of the most important contributions to the data concerning the performance of big locomotives.

J. L. Replogle, assistant to president of the Cambria Steel Company, is here for a day or two only. Mr. Replogle and his wife, and Mrs. McMillen, his mother-in-law, will sail for Europe on the Lusitania on June 21. They will spend some

two months touring through England, France, Germany and Switzerland.

J. F. DeVoy, assistant superintendent motive power of the Chicago, Milwaukee & St. Paul and president of the Western Railway Club, arrived Tuesday and is stopping at the Shelburne. Judging from the session yesterday morning, he has brought his voice with him and is going to see that it is properly exercised.

Although apprenticeship is not down on the program for discussion, C. W. Cross, superintendent of apprentices of the New York Central Lines, is on hand. Two more apprentice schools have been opened by these lines during the year, making 12 in all. The new schools are at Kankakee, Ill., and Gibson, Ind., on the Chicago, Indiana & Southern.

Frederick T. De Long, vice-president of the Chicago Railway Equipment Company, whose son was recently voted by his college mates the most handsome man in his class at Yale, arrived on the Pennsylvania Special Tuesday. Mr. De Long was not accompanied by his son, although father and son are often together and resemble each other in many ways.

Yes, it looks like consolidation. The linotyper man thinks so; at least in setting up the program of the week, printed in yesterday's *Daily*, he credited the M. C. B. Association with the responsibility for the M. M. reception and ball of this week. And yesterday morning Mayor Stoy welcomed the "M. C. B." Association to the city. The two associations cannot withstand the power of the press backed up by the majesty of city government.

A number of bets on the ball game were placed yesterday, at ten to one in favor of the East, by a few insiders who had been "tipped." It seems that in looking over the bats for the Western team brought to Atlantic City by Captain Hammond, it was discovered that one had an imperfection in the form of a knot. As this unfortunate accident will give the Eastern team a decided advantage, it is likely that the odds will not differ much from now on.

That there is more than one "C. & N. W. Ry." is recalled by the M. M. registration list. L. T. Nichols, who registers as "general manager, C. & N. W. Ry.," is general manager, not of the Chicago & Northwestern, but of the Carolina & Northwestern, a road of 133 miles in South Carolina, and his headquarters are at Chester, in that state. Mr. Nichols arrived Tuesday.

Miss Irene Carr, sister of Robert F. and George R. Carr, and Frederick Loyd Baker were married at Oak Park, a suburb of Chicago, on Saturday evening, June 10. The bride, who has attended several of the M. M. and M. C. B. conventions, is well known in Chicago social circles. Mr. Baker, the groom, is a railway man. He is manager of the Empire Freight Line in Cleveland, Ohio. Mr. and Mrs. Baker are now enjoying a wedding trip in Colorado, and on their return will reside in Cleveland.

F. H. Clark attended the conventions last year as president of the Master Car Builders' Association and general superintendent motive power of the Burlington. This year he comes as a past president and with a different railway connection, he having, since the last convention, gone to the Baltimore & Ohio as general superintendent of motive power. He was tempted away from the Burlington by his former chief on that road, Daniel Willard, who is now president of the Baltimore & Ohio. Mr. Clark has seen hard service during the last year; not only in his official position, but in the General Committee on Safety Appliances, which represented the railways of the country in the conferences preceding the adoption by the Interstate Commerce Commission of its safety appliance standards.

The Exhibit.

A large western road has just specified Boss nuts for use as all second nuts in the construction of 500 refrigerator cars to be built by the American Car & Foundry Company.

The United States Radiator Corporation, Dunkirk, N. Y., has just issued a full catalog of its heating apparatus. In addition to detailed information and descriptions of the products of this company, the catalog includes 32 pages of tables and data that are in daily demand by heating engineers..

The Standard Steel Works Company, Philadelphia, Pa., had a lot of fun getting its exhibits installed on Tuesday. Among the products that the concern has brought here to show railway officers is a steel crusher ring which weighs 3,850 lbs., measures 120 in. in diameter (outside) and 9 in. across the face. It took 18 men and some cussing to get the casting into space 9 in the entrance hall.

The J. Rogers Flannery Company, Pittsburgh, Pa., is represented at the convention by B. E. D. Stafford, vice-president; Tom R. Davis, mechanical expert; W. M. Wilson, sales representative for Western territory; Geo. E. Howard, sales representative for Eastern territory; Thomas J. Leahey and Barton H Grundy, (Commonwealth Supply Company, of Richmond, Va.), sales representatives for the Southeastern territory.

The Cambria Steel Company, Johnstown, Pa., wanted to make an extensive exhibit, but was unable to get space. The following representatives are here, however, ready to answer questions: J. L. Replogle, assistant to president; Ralph V. Sage, steel car engineer; M. G. Baker; W. S. Ottinger, and W. W. Whitney. The company builds steel cars and makes Coffin process axles, wire rods, sheet bars, shapes and plates, and blooms and billets.

The ruby mica lantern globes shown by the Storrs Mica Company, Owego, N. Y., at space 601, are of the standard deep ruby color required for railway hand lamps and are claimed to have the advantage of much greater durability than the glass globes. A further advantage claimed for them is their reliability, which is a matter of considerable importance, as failure of a red hand lantern caused by a broken glass globe is sometimes a mighty serious matter.

The methods of the railway apprentice instruction classes conducted by the railway department of the International Correspondence Schools, of Scranton, Pa., are shown in booth 43 in the main building. W. N. Mitchell, general manager, and other officers of this department are in attendance. With them are apprentices from different railway shops in the United States and Canada, doing the work as it is done in the regular classes in the repair shops. Drawings and class studies are shown.

The Independent Pneumatic Tool Company, Chicago, is showing a complete line of Thor air tools at its exhibit in booths Nos. 576-578. The Thor close-corner drill is of unique construction and compact design. It was placed on the market several years ago by the Independent company. The Thor exhibit also includes center spindle piston air drills, reversible flue rolling, reaming, tapping and wood-boring machines, staybolt drivers, riveting, chipping, flue beading hammers and pneumatic grinders.

The T. H. Symington Company, Baltimore, Md., is showing full size models of the Farlow draft rigging in combination with the Westinghouse and the Sessions friction draft gears. One of the principal claims of superiority of Farlow attachments in combination with friction draft gears, over the ordinary attachments, is that the Farlow draft keys positively limit the travel of the friction device within its extreme travel, and distributes excessive shocks in excess of the capacity of

the friction gear to the draft sills at six points through the three draft keys; besides affording more protection to a friction gear than is possible with the riveted yoke attachments. The excess blow is transmitted to the sills in a manner that will prevent their buckling or spreading immediately behind the follower plate stops.

The Chicago Railway Equipment Company presents an unusually attractive exhibit this year in its display of brake beams. The beams are stacked like muskets and the supports are decorated with flags of various nations. A tasteful display of flowers, adds much to the general attractiveness of the display. The Monitor bolster, Creco stack adjuster, Creco journal box and lid, and the new Creco sliding third point brake beam support are also shown. The brass sign of the Creco trade mark harmonizes with the surroundings.

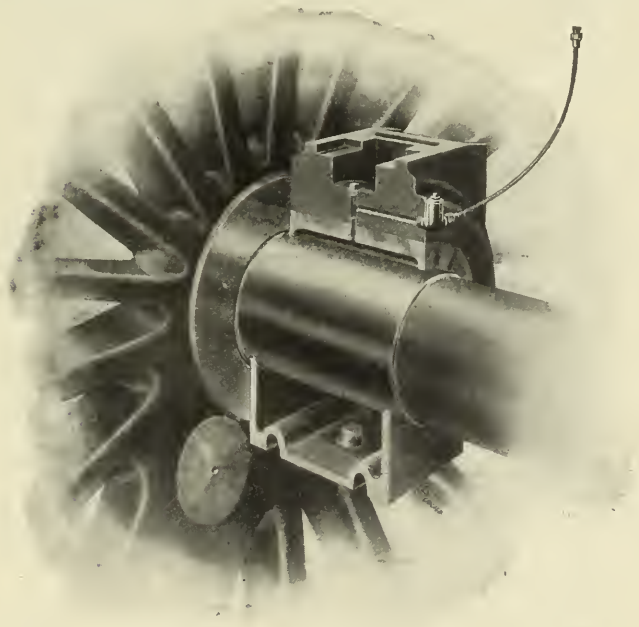
The United States Light & Heating Company, New York, has issued a little folder, Light on Atlantic City, for distribution at the convention. It contains a lot of interesting statistics about Atlantic City and gives lists of all the past presidents of the American Railway Master Mechanics' and Master Car Builders' Associations. All one side of the folder is devoted to a map of Atlantic City, showing the location of the important hotels near the Million Dollar Pier.

CYCLONE VENTILATOR.

The Gold Car Heating & Lighting Company, New York, has on exhibition at its booth, spaces 301 to 311, its cyclone ventilator, which ventilates and excludes cinders, smoke, rain and snow from the car. This ventilator is adaptable for use on refrigerator cars as well as all classes of passenger cars.

DRIVING BOX LUBRICATION.

The system of driving box lubrication advocated by McCord & Company, Chicago, by sealing the top of the driving box, utilizes the cumulative pressure generated by the revolving journal in the cavity in the crown of the brass to separate

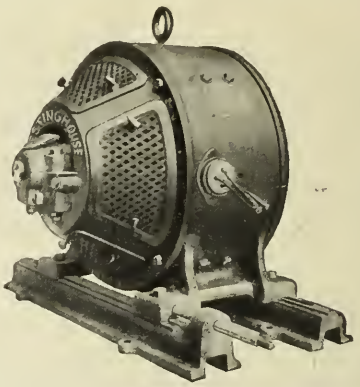


McCord System for Lubricating Driving Boxes.

the bearing surfaces of the journal and the brass. In addition, by pumping a film of engine oil through this cavity into the bearing, the journal is run like a floating bearing. Engine oil, on account of its adhesive and cohesive qualities, is a good lubricant for driving journals. There is a growing tendency to return to engine oil as a driving box lubricant. The McCord system provides a positive method of delivering the oil to the driving box. The cost of driving box lubrication with a force feed of engine oil is claimed to be as low as with any other lubricant, and a saving is made in the reduced wear of journals and brasses, in addition to reducing the internal friction of the locomotive, which decreases the coal consumption. An instance is cited wherein the wear on driving journals, after 100,000 miles run, could not be measured with a micrometer.

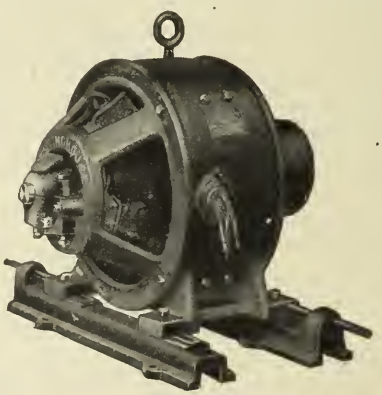
MOTORS FOR RAILWAY SHOP DRIVE.

The motors shown herewith are made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., being designed for railway shop drive. They are made in a wide variety of styles, characteristics, and speeds so that proper applications can always be made. The type S direct-current motors



Westinghouse Motor for Shop Drive.

are used for machine tool work. They can be obtained for constant speed, varying speed, or adjustable speed service, and are made shunt, compound, or series wound according to the service for which they are intended. Special modifications are made for hoisting and for operating bending rolls. The direct-current crane motors are compact and develop a high torque. For alternating-current circuits, the Westinghouse motors are made in four types: Type CCL, with squirrel cage rotors, for general constant speed work, as in operating wood-working



Westinghouse Motor for Belt Drive.

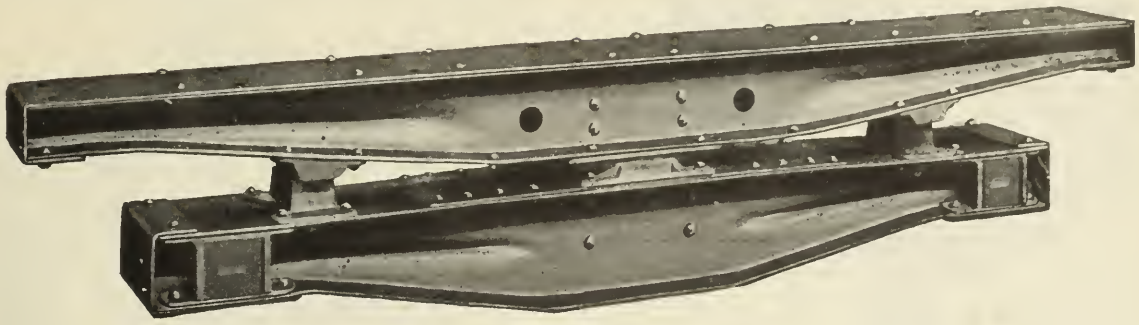
machines; type MS, with squirrel cage rotors, for severe constant speed service; type HF slip ring motors for constant speed service where high starting torque and low starting current are necessary; and type MW, slip ring motors, which are used for severe intermittent, varying speed services, such as operating cranes, hoists, elevators, etc.

DETROIT TRANSFER FILLER.

The Detroit transfer filler, made by the Detroit Lubricator Company, Detroit, Mich., consists of a reservoir of about three pints' capacity with two valves, one near the bottom controlling the admission of water and the other at the top on the opposite side controlling the oil exit. Although both connections are at the top, the water is conducted through a passage drilled in the wall to the bottom of the transfer filler before being released. A filler plug is provided at the top and a drain cock at the bottom, and a gage glass shows when all the oil has left the transfer filler. This transfer filler allows the lubricator to be filled at any time, regardless of whether the locomotive is working under steam, drifting or at rest. All that is necessary is to open the water inlet and oil outlet valves. Immediately, the water which has replaced the oil in the oil reservoir of the lubricator and the oil in the transfer filler change places. There is no necessity of shutting off the boiler pressure or closing the water valve and feeds. Frequently the location of the lubricator and the presence of cut valve seats have made methods of filling a lubricator wasteful and bothersome processes. The Detroit transfer filler is constructed with the idea of eliminating delay, trouble and waste in refilling the lubricator. It may be attached to any lubricator.

MANUFACTURE OF BETTENDORF BOLSTERS.

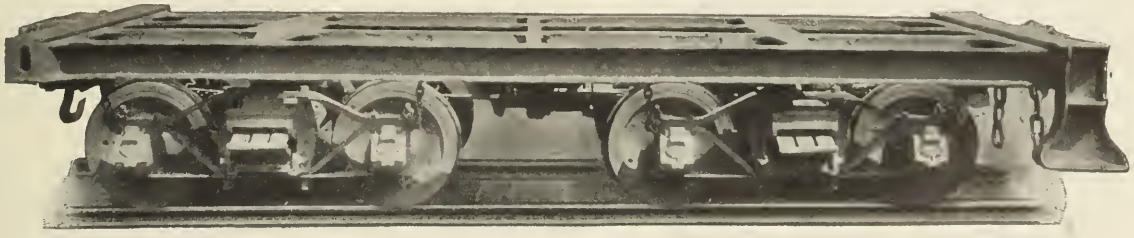
The bolsters shown in the accompanying illustration are made by the Bettendorf Axle Company, Davenport, Iowa. They are built of commercial I-beams to which are riveted steel cover plates, malleable iron side bearings, column guides and center plates. The I-beam flanges are punched, full length of the bolster, by one stroke of a hydraulic press. The webs of the beams are then pressed or corrugated to reduce the ends for proper clearance over, and free entrance into the truck frames. After shaping the beams the webs are punched for train pipe holes and king bolt bearings. The king bolt bearings are then riveted in position and the beams are ready to receive the cover plates, side bearings, center plates and column guides, which are riveted in position on hydraulic riveting machines. Truing the bolsters is the next operation, which is performed in an hydraulic press especially designed for this purpose. In this operation the proper relation between the center plates and side bearings, side bearing and spring seats, and distance over column guides is obtained. and the bolster is then ready for inspection. The I-beams are corrugated to permit the ends to clear and enter any design of truck frame, and are shaped cold in hydraulic presses to prevent forging stresses. Commercial rolled beams are used in order to obtain maximum strength with minimum weight. The points in favor of these bolsters, built of commercial sections, are that they are strong, that they possess no superfluous metal, and that their ability to carry the load is independent of workmanship.



Bettendorf Bolsters.

COMMONWEALTH CAST STEEL TENDER FRAME.

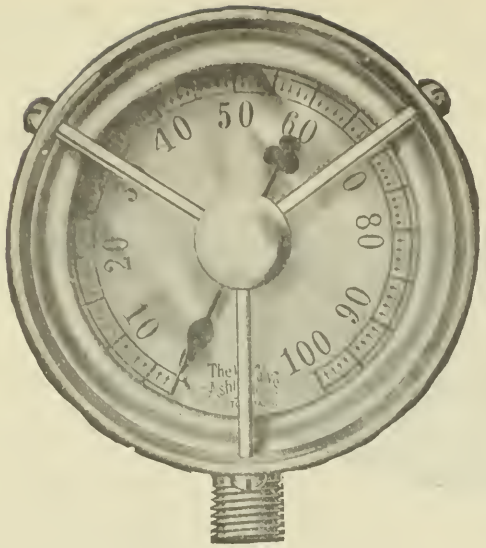
The Commonwealth Steel Company, St. Louis, Mo., booth 313, enlarged the field for steel castings when it brought out the one-piece locomotive tender frame several years ago. This casting is a splendid contribution to the steel founder's art, and its adoption has steadily increased on account of its great strength and simplicity of construction. The protection and firm foundation afforded the cistern, and the facility for securing proper distribution of metal and its non-corrosive qualities, have also contributed largely toward its success. The Commonwealth Steel Company claims that it far surpasses in strength and durability any type of built-up construction.



Commonwealth Tender Frame.

PROTECTED AIR GAGE.

The accompanying illustration shows a protected air gage made by the Ashton Valve Company, Boston, Mass. It has been devised to meet the requirements of a practical gage for use in conjunction with the common rear-end train brake cock. With such a gage, rear-end train brakemen having in charge the backing of trains can know at a glance the exact pressure on the brake system, assuring confidence of perfect control. The protected face of the gage makes the instrument durable and entirely suitable for such service. The glass and dial are set considerably below the protecting bars. Therefore small projections on the railings of cars, such as lugs or bolts, which would break the glass and do other damage, are prevented from penetrating this gage. The crossbars may be struck with sufficient force to bend



Protected Air Gage.

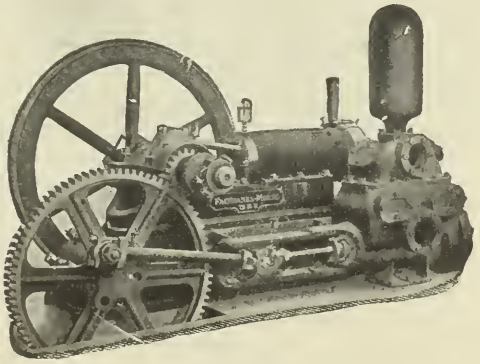
them without affecting the glass, and should they finally require replacing it can be done at slight expense.

ABOUT VALVE MODELS.

The custom at conventions is to show models which are 1-4, 1-6 or 1-8th size. With this great reduction in the size of all of the parts of a machine it is very difficult to show detail construction, and if the makers of the machine are trying to show advantages in construction the lesson of the model is largely lost. Furthermore, if the machine is such a device as a valve gear and is intended to show valve events. the inaccuracies of construction in the model are apt to produce different valve events than what would be obtained on a full sized gear. Even though the model might exactly reproduce the valve events, it is very hard to catch the valve at cut-off, release, etc., without the aid of a magnifying glass. For these reasons the display of a reduced size valve gear has not been attempted this year by the Pilliod Company, New York. Instead, it has one of its stock gears mounted on a frame under the same conditions that it put up on the locomotive. This is full size, and will show just what valve events the gear is capable of producing.

OIL ENGINE FOR FEED WATER PUMP.

Fairbanks, Morse & Company, Chicago, has put on the market an oil engine connected to a pump for supplying water to locomotive water stations. The oil used is a distillate from crude oil, being purchased at a price varying from three to six cents per gallon. This is seven to nine cents cheaper than gasolene, which has been the customary fuel. The Illinois Central is using this arrangement at one of its water stations

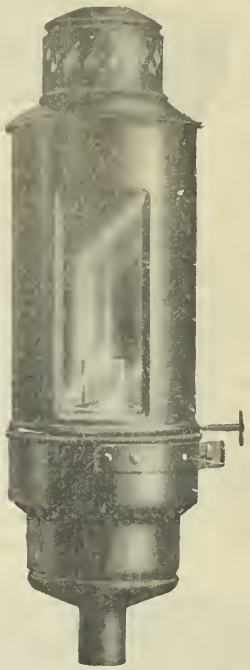


Combined Oil Engine and Pump.

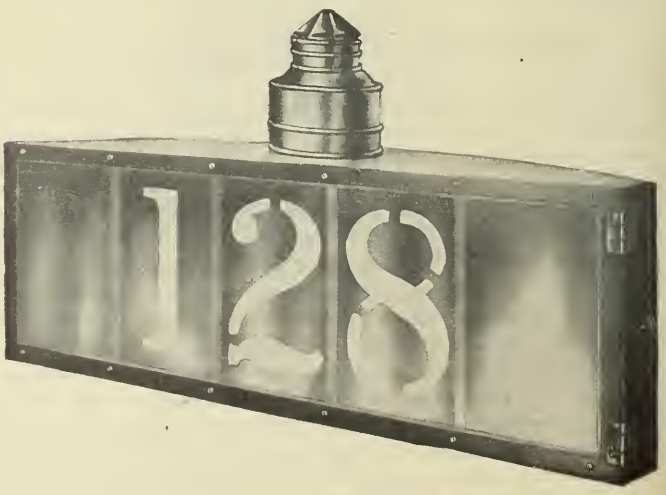
ADLAKE LAMPS.

Among the lamps exhibited by the Adams & Westlake Company, Chicago, are the Adlake small train indicating lamp and the new gage lamps Nos. 17 and 18.

The train indicating lamp is claimed to facilitate train movement by insuring more accurate handling of orders. A glance reveals the number of the train to the operator, passing engine or train crew, from any position in front of the engine or beside it, or from the front or rear of caboose on freight trains. It saves confusion by making it unnecessary to remember two numbers—that of the engine and that of the train—as is the case heretofore when the engine number is the indirect index to the train number, necessitating frequent comparison. The engine numbers displayed from the side of the headlight are often obscured, making quick reading of identification numbers difficult, and can only be read from a position directly opposite. The indicating lamp identifies the train before or at the time

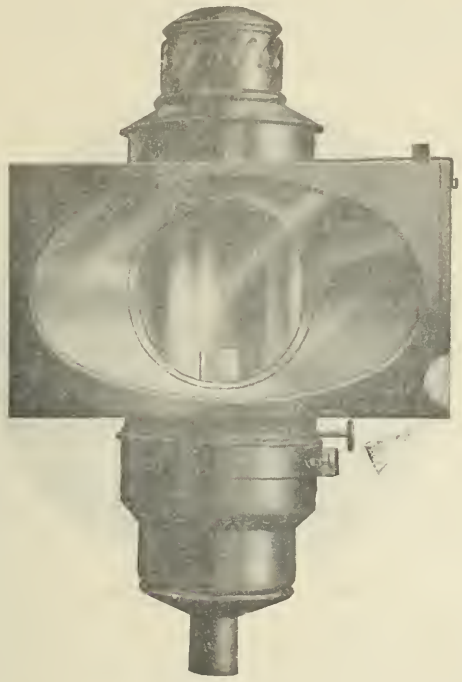


Water Gage Lamp.



Adlake Train Indicating Lamp.

the engine passes, as well as from the rear, an obvious advantage. The gage lamps, Nos. 17 and 18, have interchangeable parts and are equipped with an outside wick regulator. With this outside wick regulator the maximum of illumination should always be obtained, because the broad side of the flame is always toward the glass.

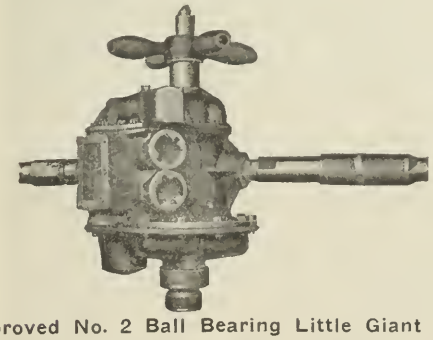


Steam Gage Lamp.

The lamps are simple in operation. All parts are interchangeable except those containing the glass-holder. The glass is removable and is held in place by a retaining spring and no soldering is required. The lower part of the body is made of heavy pressed sheet steel, reinforced by a malleable iron bottom. They have nickel-plated reflectors, removable oil pots and take No. 1 ratchet burners.

BALL BEARING LITTLE GIANT DRILLS.

The accompanying illustration shows the new improved No. 2 ball bearing Little Giant drill, recently introduced by the Chicago Pneumatic Tool Company, Chicago, which will be found in the company's exhibit. This drill is the same in



Improved No. 2 Ball Bearing Little Giant Drill.

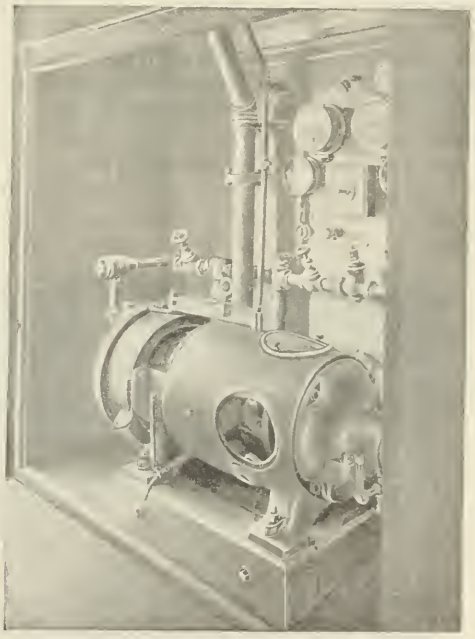
general appearance as the company's C drill. It has the same diameter and stroke of piston, the same diameter of valves and areas of ports. With the exception of the pistons and valves, all other moving parts are made heavier and stronger. On account of ball bearings of a new type, it will operate at light pressures. The friction of this machine is so small that the spindle may be rotated by simply blowing into the air handle. Although this tool has been tested with a 2-inch drill, drilling at the rate of ⅝ in. per minute in hammered steel, the makers rate it for a 1¼-in. drill. When used for this work, the makers claim it cannot be stalled, but will work up to the limit of a high speed twist drill

THE FIRST CONVENTION AEROPLANE.

The convention of the M. M. and M. C. B. associations have seen a great many new and novel things. The railway supply manufacturers are often original and resourceful, but it has remained for C. H. Williams, Jr., representative of the Creco brake beam, to be the first man to attempt to bring an aeroplane to these conventions, and he is going to do this with the help of the *Railway Age Gazette*. The arrival of the Creco aeroplane is slated for Saturday morning. A telephone message from our New York office, received just as we were going to press, indicates that the Creco aeroplane will be ready to leave New York some time during Thursday night. It should be sighted over the Million Dollar Pier early Friday morning. Like the Creco brake beam, it can be depended upon for night or day travel

CURTIS TURBINES FOR TRAIN LIGHTING.

Curtis turbo generator sets, made by the General Electric Company, Schenectady, N. Y., installed on a locomotive or in a baggage car, as shown in the illustrations, meet the demands of train lighting service. These sets consist of a Curtis turbine direct connected to an electric generator, and form compact, sturdy units, simple in construction and requiring little attention. The operation of the train lighting set involves only the opening of a steam valve when it is desired

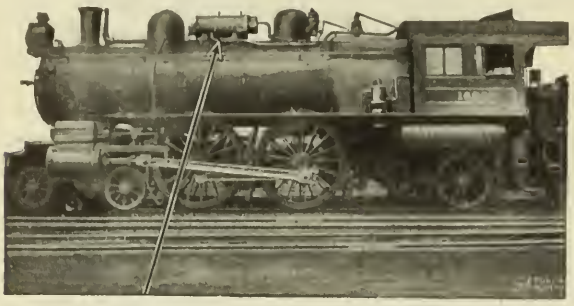


Generator Set Installed in Baggage Car.

to put the turbine in operation, and closing the valve to shut it down. Each car is illuminated with a steady light which is of good quality, due to the voltage regulation of the turbine. This service permits the use of electric cooking and heating utensils in buffet and sleeping cars, and of electric toilet articles in drawing and sleeping cars.

For suburban service, no auxiliary equipment is required, and the Curtis turbine affords a simple and economical equipment, dispensing with battery boosters and regulators. Electricity is furnished for lighting the whole train, including

passenger compartments, toilet rooms, and platforms of passenger cars, interior of baggage cars, cab of locomotive and portables, if desired. Over 300 Curtis turbines are now in



Turbo-Generator Applied to Locomotive.

use on such railways as the Chicago, Burlington & Quincy, the Great Northern, the Northern Pacific, the Union Pacific, the Chicago, Milwaukee & St. Paul, and also on many smaller roads.

DAVIS CAST STEEL WHEELS.

The Davis cast steel wheel is included in the exhibit of the American Steel Foundries, Chicago. The process of making these wheels was invented by J. C. Davis, assistant to the first vice-president of this company, who introduced ferro-manganese into a stream of molten steel as it passed from the ladle to the mold, making a cast steel wheel which has a hard, tough manganese tread and flange, with a plate and hub of ordinary soft steel. To accomplish this result, the wheel is cast in a mold which is caused to revolve during the pouring period. The first of the metal to enter the mold is treated with the ferro-manganese and is followed, without interruption, by ordinary soft steel. The manganese being much heavier than steel, is thrown by centrifugal force to the outer parts of the mold, where it is absorbed in the steel, while the soft steel remains in the center, forming the plate and hub. As manganese steel is one of the hardest and toughest metals known, with great ability to resist shocks and blows, it is a valuable material for the wearing surfaces of the wheel.

As the Davis wheel is a one-wear wheel it is not necessary to remove it from service several times during its life to be turned, in order to secure its full mileage. This feature avoids delays to equipment when the wheels are being changed and avoids the expense of handling and the cost of turning which is necessary before the wheel can be returned to service. Davis wheels before shipment are rough bored to within ⅛ in. of the finished size and are also ground on the tread and throat of the flange. The wheels are ground not only to make them as truly circular as possible, but to



Davis Cast Steel Wheel.

give them a polished surface and general accuracy which reduces to a minimum the chances of uneven wear after the wheels go into service.

The makers claim that Davis wheels in heavy engine tender service are averaging about 30,000 miles per 1/16 in. of wear; that the flange is about four times as strong as the flange of a cast iron wheel, thus eliminating the danger of broken flanges; and that on account of the strength of the metal used in the manufacture of these wheels it has been possible to reduce the weight of the standard 33-in. wheel to about 600 lbs. each, showing a saving in weight of 1,000 lbs. per car when compared with cast iron wheels for 50-ton equipment, and more than this amount when compared with steel tired or solid rolled steel wheels.



Pouring Davis Cast Steel Wheels.

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GENERAL NEWS SECTION 1435

MR. WALDRON'S description of his new automatic stop, which we print in another column, is of interest by reason of his long and intimate experience in that field. The Interborough uses a mechanical trip stop and probably has had a longer and more extensive experience with stops than any other road. Knowing all of the demands that are or ought to be made on a stopping apparatus, and familiar with the responsibility of keeping such an apparatus in a state of highest efficiency, Mr. Waldron assures his readers, so far as assurance can be given on the basis of experience with a single installation, that the new arrangement meets all requirements. Details of the scheme are patented, and we have taken the liberty of calling it "Waldron's Stop." This experiment of Mr. Waldron serves as a reminder that the field of usefulness of automatic stops is perhaps expanding. For underground railway lines the mechanical stop which he has used for the past six years answers satisfactorily; but the extension of tunnel and elevated lines several miles out into the suburbs, with tracks laid on the surface of the ground, which is now an actual condition to be dealt with on two lines in the New York City district, brings in the problem of snow and ice; and so a non-contacting device becomes a desideratum. If the surface portions of such underground and elevated lines are operated without automatic stops we at once have the inconsistency of trusting the engineman more fully on one part of his run than on other parts.

A NEW YORK railway has asked the New York State Public Service Commission, Second district, for leave to discontinue its station at W, and establish a new station at L, 1¼ miles south of there, but has been refused. It appears that the only reason offered by the road for desiring to relocate the station was that the proposed new situation was on a straight and level piece of road, whereas, at W, northbound trains approach the station through a rock cut and around a sharp curve. The new location "would be better adapted to the safe operation of trains." But the citizens all with one consent, protested against the change of location, and the commission finds in their favor, declaring that the road had not substantiated its claim that the new place would be safer. The natural conclusion of the reader will be that the road had reasons which do not appear in the published report; but aside from that, there is a little moral in the incident; and that is that with the spirit of inquiry that prevails in the New York (and other) commissions nowadays it is a waste of time for a railway company to offer assertion in the place of demonstration. Another moral is that a railway is bound to make all of its stations safe. If L is safe, W is less safe; and that is a condition that needs to be changed. In view of the large number of curves and cuts on the railways of America it would seem that the only satisfactory rule of operation would be one that gives the highest possible safety at all points. And there is no lack of examples of this best practice; as, for instance, in the dark subways and tunnels of New York City, with their high speeds and frequent trains, or in the snow sheds of the Sierras, with their steep grades and sharp curves.

THE New Haven, Middletown & Willimantic Railway, a line about 50 miles long, was opened in 1870. It fell into financial trouble, defaulted on the interest of its first mortgage bonds of $3,000,000, and was reorganized as the Boston & New York Air Line in 1875, preferred stock being offered for the bonds and common stock for the overdue coupons. In the year 1906 after the contract for the sale of the road to the New Haven Company had been made, but before it was ratified, a holder of a large amount of the old defaulted coupons of a date some 34 years previous, presented them and demanded common stock. It was refused, and now suit has been joined on the demand in a Connecticut court—the matter being complicated by the fact that many of the Boston & New York Air Line records have been destroyed by a fire. One cannot, of course, prejudge a case of the kind, yet its interesting and im-

portant elements are obvious and its outcome of legal value, especially should the case be appealed. It raises such points of law as the time factor in railway reorganizations, the rights of the original security holder as against a corporate and—in a sense—public interest, and the old question of the scope of the theory of "sleeping on rights," whether running against the corporation or the security holder. More remotely the case bears on the whole general subject of compulsion in exchange of one set of railway securities for another, whether in a reorganization or otherwise. There have been legal rulings on the subject varying with differing conditions and with the statutory law. But rarely, if ever, a case like this in Connecticut with the corporate records extinct and nearly 40 years after the original default which led to reorganization, to the common stock issue and to the present case at bar.

THE Interstate Commerce Commission will find very few lawyers who are familiar with the Mann-Elkins act and the circumstances in which it was passed, who will agree with it that it has authority to suspend a reduction in rates. Nothing was said in the discussion of the Mann-Elkins Act in Congress to indicate that Congress had the slightest intention to give the commission such power. Until the Mann-Elkins Act was passed it had no authority over any rate until it had gone into effect. The sole intention of those who advocated the provision empowering the commission to suspend changes in rates was to enable it, while it was investigating advances, to prevent them from being put into effect. Not only does every one who followed the progress of this legislation know this to be true, but the language of the legislation itself plainly indicates what Congress meant. The Hepburn act authorized the commission, when it found rates already in effect to be unreasonable or unduly discriminatory, to fix the maximum reasonable rate to be charged in future, and the Mann-Elkins act, after authorizing it to suspend new rates pending investigation of them, says: "And after full hearing, whether completed before or after the rate, fare, charge, classification, regulation or practice goes into effect, the commission may make such order in reference to such rate, fare, charge, classification, regulation or practice *as would be proper in a proceeding initiated after the rate, fare, charge, classification, regulation or practice had become effective.*" In other words, all it can do, after it has suspended a proposed reduction—assuming it can do so at all—and given a full hearing regarding it, is to fix the maximum rate to be charged, leaving the road or roads concerned perfectly free to go ahead and make the very reduction which it has temporarily suspended. There is no doubt, as already has been said in these columns, that the language of the law is susceptible of the construction that it empowers the commission to *suspend* any change in rates; but everybody who followed the Mann-Elkins act through Congress, including every member of the commission, knows that this is not the construction Congress intended to be put on it. The commission has tried to write into the law what was not there before, or at least what was not intended to be put there. If in future the courts, by judicial legislation, shall take away authority from it which it may think Congress meant to give it, complaints from it on that score will come with very bad grace. The *Railway Age Gazette* would like to see the commission have the power it claims it has. It should be given the additional power of fixing minimum rates where a road has made or tried to make rates that are or would be unreasonable or unfairly discriminatory because too low. But no friend of good government can regard with equanimity the disposition shown by the commission in this case to seize on any sort of authority it may think it would be convenient for it to have, in disregard of the manifest intention of Congress.

WITH the revival of Wall street activity and some signs, not as yet too conclusive, that genuine investment activity has revived also, the future of railway financing grows interesting. The last three years have seen the post-panic period of 1908, the quick but transitory revival that followed it and the succeeding depression coming with the great increase of railway wages, the assertiveness of organized labor and a certain renewal of governmental activity—to which has been added state legislation of a more or less restrictive character. With lighter streaks now on the general horizon and a better feeling as to railway stability, what form will be predominant in railway financing, belated by past adversity? Will it seek stock, bonds, the intermediate form of convertible bonds, or the short term note? The latter has become a popular security on the ground of its early maturity into cash which the investor wisely deems a good thing to have come in during a period of perturbations of the investment market. For the same reason, the railway corporation dislikes the short note as being a temporary expedient to bridge a gap calling soon for new cash for its redemption. Then there is, finally, the big, general, blanket mortgage, as illustrated by the plan of President Hill, which form of mortgage has the advantage of final security combined with flexible adjustment to maturing obligations—and almost every large railway has large equities not only in the whole system but in many of its component parts. While each railway corporation is a law unto itself in this question of future financing, the outlook points to the general mortgage, the convertible bond and new stock, in that order, with considerable stock issues contingent on the revival of good earnings. With growing competition in bonds of the tractions and minor industrials it does not look, however, as though the railway corporations would be able to borrow money more cheaply; on the other hand, it seems likely that at the old rates they will be able to borrow more readily. This is not merely because investment funds are likely to come out but because the Standard Oil and Tobacco decisions have reduced on the railways the federal stress now shifted to the large industrial combinations. The Sherman act was not aimed at the railways, but for many years they bore most of its brunt and were a lightning rod for the big industrial concerns. Pending the many future legal interpretations of the adjective "reasonable," the situation becomes reversed and the railways are not so much of a federal target, with corresponding financial betterment as borrowers.

UNIFORM ACCOUNTING FOR MATERIAL AND SUPPLIES.

THE need of more uniform methods of accounting for the material and supplies used by railways has been commented on in several recent articles which have appeared in these columns, notably in the paper presented at the last meeting of the Railway Storekeepers' Association by H. C. Stevens of the Mexican National Railways. The greatest drawback to increased efficiency in the supply department at present is the absence of any means of making a reliable comparison of the operating results obtained by the departments on different roads. The first step necessary toward making such a comparison possible is the adoption of absolute uniformity in the methods by which the results arrived at are set forth. This does not necessarily mean that each detail of routine must be the same, but that a few general principles should be laid down and rigidly adhered to by all.

No one is more keenly alive to the desirability of such action that are the members of the Railway Storekeepers' Association; the men who are on the firing line every day and a part of the nights. The association has made this a prominent feature of its work ever since its organization, and has labored faithfully for the desired end. As a necessary basis for uniformity of practice in this respect it has worked out and agreed on a thoroughly practical classification of material and has recommended its adoption by all the railways. It has adopted the report of its Committee on Recommended Practices which laid down the following fundamental principles to be followed in accounting for material:

First.—That disbursements be considered the unit of comparison by which the stocks of material on hand shall be measured, using for a basis the average issue for the twelve

months preceding the time at which comparison is to be made.

Second.—That disbursements shall include only material actually used or disposed of; that it be recognized that such small items as station and track supplies, issued in small quantities for current requirements may be charged out directly when issued, but that, generally speaking, no material or supplies shall be charged out until actually used or otherwise disposed of.

Third.—That transfers of materials from the store department to other departments, or from one store to another, be not considered issues except in so far as such transfers affect individual stores.

Fourth.—That labor expended in maintenance or construction of equipment be excluded from material disbursements.

Fifth.—That material in process of manufacture, including the labor expended on it, be included in material stocks until actually used in the finished state.

Sixth.—That scrap be taken into the material account as soon as delivered to the storekeeper, and carried in that account until disposed of.

Seventh.—That temporary track and material suspense accounts be excluded from material stock balances.

There seems to be no sound objection to the adoption of these general principles of supply department accounting by every railway which is desirous of knowing all of the facts concerning the material in its possession. The Storekeeper's Association already has secured the co-operation of the Master Mechanic's, the Master Car Builders' and the American Railway Engineering Associations in the adoption of uniform specifications and grading rules for lumber used by the railways. It has asked for the co-operation of the Association of Railway Accounting Officers in its efforts to secure a uniform method of accounting. That such co-operation would be in the interest of increased efficiency, seems certain; but only the chief executive officers can definitely state whether or not it shall be given.

TURBINE LOCOMOTIVES.

THE mechanical simplicity of the turbine steam engine makes it an attractive motor for any service to which it can be economically applied. It is being used extensively in power houses, and is rapidly making its way into marine service. The conditions under which an engine works in propelling a ship are in some respects similar to those required for locomotive service. There is the heavy torque in starting, the operation under variable speed, and the necessity for reversing; all of which are found in locomotive operation. Once under way the steamship continues at nearly uniform speed for days and nights for a full week, and the most economical performance should be obtained at this speed. The locomotive must work continually under variable speeds and loads and any substitute for the reciprocating engines must show an equal or better economy when working under these conditions.

The principal feature which would make the application of the turbine to the locomotive advantageous is the possibility of much higher speed with smooth running. With the motions all rotary and in perfect balance, high velocities can be obtained without oscillation, and if the application can be worked out in a practical way it might be worth while to obtain high speed in this way even if a slight loss in economy attended the operation. Such construction, working smoothly, should have a longer life and a lower maintenance cost than the present reciprocating engines.

These considerations have made the turbine locomotive an attractive field for invention, and a number of patents have been taken out to cover various methods of application. In Milan, Italy, the project has been carried so far as to equip a small locomotive with specially designed turbines and its performance has been successful. The peculiar feature of this turbine is the use of movable blades, which are operated in series. Four sets of such blades are used and at high speed the steam strikes the first set of blades only, while at intermediate speeds two sets or three sets can come into play. The reversing mechanism is a special and unique feature of this motor. The rotors have two sets of blades which are of opposite curvature. When running in one direction the steam passes over the blades at the outer circumference from left to right; when running in the opposite direction steam passes over the other sets of blades from right to left. In either case the loss of energy due to the blowing action of the second set of blades only amounts to a small fraction of the total, and the experiments show it to be 2 to 3 per cent.

Locomotive conditions require the engine to be started under maximum load, to accomplish which the steam must act on all the blades at once, and in this way the maximum turning moment is obtained with the least expenditure of steam. The Milan experimental turbine locomotive started well under load both on curves and gradients, and the consumption of steam has not exceeded 38 lbs. per horse power hour for revolutions in either direction. The spiral worm and wheel speed reducing mechanism has been worked out so successfully for large powers that it seems probable that it will be applied to the locomotive so that high velocities can be employed for the turbine, enabling it to work at economical speeds when the engine is operating at moderate speeds.

FEDERAL TAXATION OF RAILWAY RENTALS.

A NOVEL and important point is raised under the federal corporation tax law recently declared constitutional by the United States Supreme Court. The federal authorities claim the right to tax railway rentals of leased lines as a separate form of net profit. To illustrate the case, if a lessee railway company pays rental of say $100,000 a year for a leased line—assuming, of course the underlying charges—the $100,000 is treated by the government as net income and the regular tax of 1 per cent., or $1,000, is imposed. This particular branch of the general tax as well as the general tax itself on the net income of the main company was paid under protest last year by the New York, New Haven & Hartford, which—as probably also other railway corporations—will carry the matter to the courts. The fundamental tax has been validated by the highest tribunal in the land. Now arises the case of the validity of a tax within the tax, and some nice questions of technical law and equity spring from it.

Taking up first the question from the viewpoint of the federal taxing authority, there is to be emphasized the main object of the law; namely, the impost and collection of the 1 per cent. tax on net revenue of a railway—or other corporation—before that net revenue reaches the share owner for distribution as a dividend. Rental of a railway in some respects takes the outward form of such net revenue. Moreover, it is the revenue of a lessor corporation which has not lost its corporate identity, or usually has not done so. Leased lines of railway have their own separate boards of directors, presidents, treasurers and secretaries. They meet once a year, and while their doings are in most cases perfunctory and formal they are by no means necessarily so. They are, for instance, charged with safeguarding the provisions of the lease as against the policy and acts of the lessee. Again—still viewing the case from the federal standpoint—the rental is the only objective of taxation which the taxing power can reach. For, in well nigh every case of a leased line, operation and its returns are merged with those of the lessee corporation. Unless separate accounts are kept of the leased line and the present system readjusted, and bookkeeping and returns of operation much amplified, the taxing power has nothing but the rental as a test of the net income of a leased line to be used as a basis of the tax. Otherwise it must either insist on separative leased line accounts or see the rental pass and be merged in the general account of the lessee, and, very likely, entirely disappear, and the tax with it.

On the other hand, look at the case from the viewpoint of a lessee railway company! The federal corporation tax is obviously one on a "business," and the lessee has taken over the

whole business of the lessor. Practically, and so far as concerns operation and returns, the leased line is merged. Its segregated character as an operating corporation has quite vanished. But the matter does not stop there; for the rental may or may not intrinsically represent a form of taxable revenue to the lessee, whatever it may be for the lessor shareholders. A railway lease may be highly profitable or very unprofitable. It may be taken by a lessee to keep a line from a rival. It may be taken upon a branch line with decided loss on the branch line business, but with offsetting gain—or the hope of it—from business fed to the lessee. But under the federal ruling there is no discrimination between the lease profitable and the lease unprofitable. In the first case the tax would be too small; in the latter, too large. To take extreme hypothetical examples, if the lessor pays a rental of $100,000 and gets a profit of $100,000 in addition from the leased line the tax should be $2,000 instead of $1,000. But if it loses $100,000 in operation of the leased line the federal government is actually taxing a deficit of that amount and not an income. It shows clearly the radically unscientific nature of the separate rental tax.

On the technical side of the question may be cited the opinion of the Supreme Court in the Minneapolis Syndicate case, where it was held that a corporation holding title to the real estate on which it had given a long lease and did nothing except receive rent and disburse it as dividends to stockholders was not doing business and not liable to the tax. But that is a precedent for the courts to apply, and we are considering here more the equities than the law of the rental tax.

It is a broad truism in the records of state and local taxation of American railways that it has taken about every shape that the wit or selfishness of man could devise. The federal taxation of railway rentals at least suggests a starting point of like complexities in federal taxation also. It opens also a somewhat wide vista in the future. The federal tax is now 1 per cent. on net income and is valid. It is a flexible tax. Its machinery is already in operation. Exigencies of the federal treasury may readily increase it. As applied to railway rentals it can be evaded by substituting merger for lease. Should the rental tax be sustained and, especially, should the rate much increase, a new incentive in railway policy arises in favor of mergers as contrasted with rentals—in favor, that is to say, of purchasing lines or acquiring them by exchange of securities rather than leasing them under a rental indefinitely and perilously taxable. This applies equally to existing and future railway rentals. It is one suggestive aspect of the corporation tax law in its bearing on the railways—and there are others.

NEW BOOKS.

Electric Railway Dictionary. By Rodney Hitt, associate editor, *Electric Railway Journal.* Published by the McGraw Publishing Company, New York. Leather, 8¾ in. x 12 in. Price, $5.

The publication of this dictionary is in accordance with a resolution adopted by the American Electric Railway Association at its Atlantic City Convention, October 14, 1908. The editor was assisted by a supervising committee composed of H. H. Adams, of the Metropolitan Street Railway Company, New York; Paul Winsor, of the Boston Elevated Railway; and Richard McCulloch, of the United Railways of St. Louis. The book contains definitions of the technical terms used in the electric railway field; and the nomenclature of the manufacturers has been retained in most instances so that little trouble will be experienced in consulting the book in connection with catalogs and other manufacturers' literature. There are 1987 illustrations showing different types of electric cars and many of their important details. The first part of the book contains the definitions arranged in alphabetical order, and the remaining part the illustrations, which make possible their logical arrangement and permits of easy reference to the definitions. Where more than one name is commonly applied to a part, the preferred name is defined and the other names are also given in their proper places with a cross reference to the preferred name.

Letters to the Editor.

THE PAY OF OFFICERS AND EMPLOYEES.

Chicago, May 6, 1911.

To the Editor of the Railway Age Gazette:

The editorial in your issue of May 5 on the inequality of the rates of pay of subordinate railway officers, as compared with those of train and enginemen, calls attention to a very prevalent injustice. Several western roads last spring found it necessary to raise the salaries of their yardmasters and assistant yardmasters following the increases granted to the switchmen, in order to keep the pay of these yardmasters above that of the switchmen. It is often difficult to get a road conductor to accept the position of yardmaster with the attendant grief that position brings. Many trainmasters are receiving less than the higher paid conductors working under their supervision. Such conditions discourage trainmasters; and it is frequently the case that passenger conductors on preferred runs will not accept the position of trainmaster. Notwithstanding the fact that the trainmaster is in line for promotion, his chance for promotion is often regarded as outweighed by the greater responsibility, and insecurity of the position.

The case of a trainmaster on a western road who was promoted from passenger conductor, and who went back to his run shortly before his rights in the train service expired, because of his increased responsibility and "raw-hiding" as trainmaster, probably has been duplicated many times.

The same condition exists in the engine service. Many enginemen are receiving wages closely approximating those of the master mechanics and largely exceeding those of the road foremen of engines; yet the engineman can step down from his engine at the end of perhaps a six-hour run, knowing that he is certain of at least eight hours' rest without interruption. The same cannot be said of his superiors, who are subject to call at any hour. While one cannot blame organized labor for getting all it can for its work, yet the salaries of those in positions of responsibility should be made more commensurate with this responsibility.

One who got less.

RIGID VS. NON-RIGID FREIGHT TRUCKS.

Chicago, May 2, 1911.

To the Editor of the Railway Age Gazette:

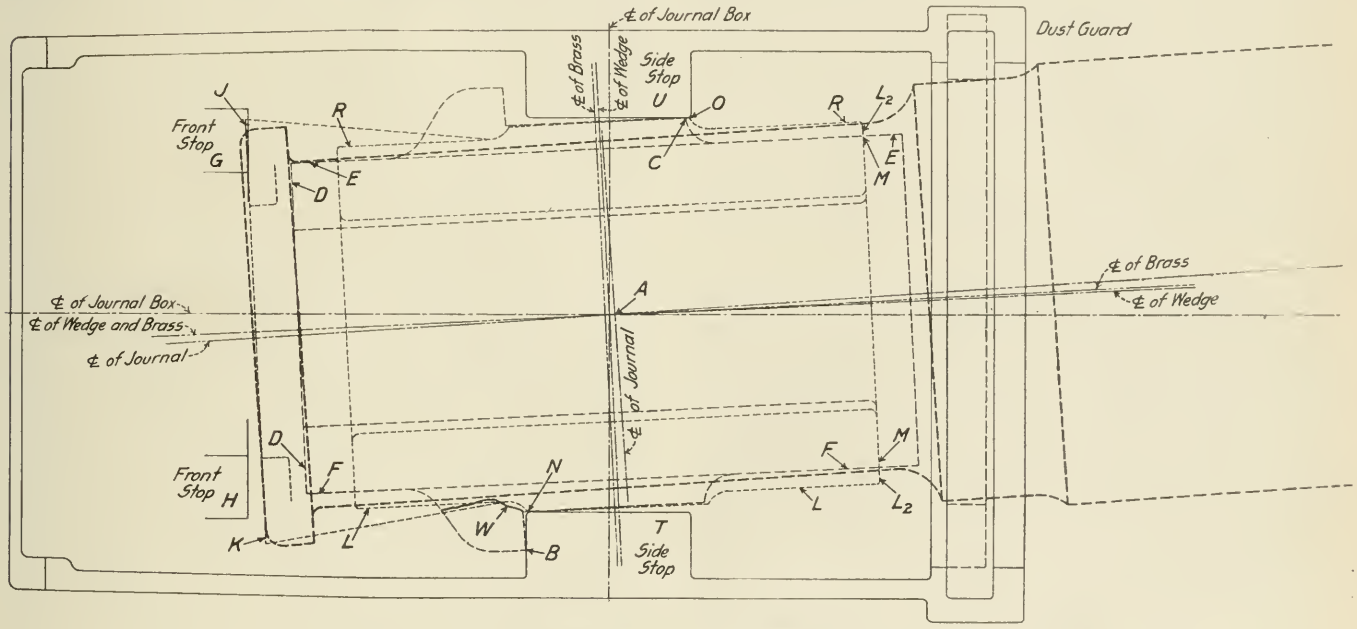
The recent discussions on rigid vs. non-rigid freight trucks have not been clear as to whether the trucks were rigid or non-rigid in a vertical or a horizontal plane. A few years ago trucks rigid in the horizontal plane, as well as in the vertical plane, had considerable vogue, but there are not very many of them purchased now. The rigid trucks in the horizontal plane were condemned, for the reason that when one of the wheels found a low spot in the track it did not carry its proportion of the load because the other three wheels determined the horizontal plane of the truck. We may assume, therefore, that in all the recent discussions on rigid and non-rigid trucks, the vertical plane is considered; that is, that the truck should be so constructed as to hold the axles perpendicular to the side frames.

The recent report of Professor Louis E. Endsley, of Purdue University, shows that the total movement of some of the non-rigid trucks that ran out of square, was as much as 5.61 in., half of which, 2.8 in., is the amount the truck ran out of square. Since then, however, we have found trucks with a total movement of 6¼ in. of the side frames, or 3⅛ in. out of square. To determine the position of the standard M. C. B. parts, such as the brass, wedge and journal in the journal box, and in an effort to determine how much the journal box and contained parts play in resisting the trucks running further out of square, we laid out the plan view of a journal box and the contained parts with the truck 5¼ in. out of square, as illustrated here-

with. It will be noted that there is not room enough for the contained parts in the standard M. C. B. journal box with the truck so far out of square. The distance between the centers of the journals as measured on a line perpendicular to the side frame is reduced about ¼ in., due to the angularity of the axle. This causes the brass to take up the play allowed between the rear of the wedge and the flange on the brass, which forces the wedge toward the front stops. The wedge laps over the front stop *G* at the point *J* about 1-32 in. The brass laps over the collar of the journal at the point *D* about 1-16 in., and the side lug on the brass binds the wide stop *T* of the box at point *B*. Both wedge and brass bind at *N* and *B* on the side stop *T*, and at *C* and *O* on the side stop *U*. The lines *EE* and *FF* of the brass are considerably out of parallel with the lines of the journal.

We infer from this that a truck would not run so far out of square without something in the journal box yielding by springing or breaking, and from the information gained through laying out the drawing, we concluded that if these trucks really ran out of square excessively, and if the truck depended on the cramping of these parts to resist its running more out of square, the parts that were called upon to resist this excessive movement must show it by excessive wear or breakage. On inspecting a number of these trucks, we found the brasses in a large percentage of cars with the lugs broken off as shown by line *W*. Some of the trucks seemed to have no other means of holding them square except the angularity of the journal causing a binding of the brass and wedge between the side stops of the box and the binding of the wedge on the front stop *G* of the box. This, if the brass, wedge, or the front stop of the wedge do not break, must cause excessive end wear of the journal collars and brass, and a diagonal wear of the brass or bearing on the journal, all of which must tend toward the increased liability of hot boxes and excessive frictional resistence. From the number of brasses found with broken side lugs, it is fair to assume that a large proportion of these trucks depend on this resistence in limiting the distance they run out of square. It is interesting to note that on the inspection of a large number of cars whose trucks were constructed in a manner that was meant to hold them square, only one brass was found with the side lug broken off, and that was on a truck the spring plank of which was made of two angle irons securely riveted to the arch bar columns, and where one of the angle irons had broken, which made it a flexible truck.

W. J. SCHLACKS,
McCord & Company.



Truck Journal Box and Contained Parts With Truck 5¼ In. Out of Square.

ORGANIZATION OF THE SUPPLY DEPARTMENT.

Chicago, June 8, 1911.

To the Editor of the Railway Age Gazette:

The discussion of Mr. Pearce's admirable papers on the supply department (recently republished by you in book form) which has been started by Mr. McVeigh, and commented upon editorially in your columns, is both timely and instructive, and should bring out a good deal of valuable information on a subject of which far too little is known.

That so little definite knowledge exists in regard to the best methods of organization and operation of the modern railway supply department does not seem strange when the recent origin of this department and its rather uncertain status and haphazard growth are considered.

Even today there is no unanimity of opinion among the chief executive officers as to where the responsibility for the conduct of that very important branch of the service should be lodged. Mr. Pearce and Mr. McVeigh do not agree on that point, although they have both seriously studied the question from the standpoint of practical experience. They also differ on the more vital question as to the respective merits of the divisional or the departmental form of organization as applied to the supply department.

Mr. Pearce's papers are by far the most valuable contribution to the literature on this subject which I have seen—and yet Mr. McVeigh's questions are pertinent, and his position is well taken. In an article appearing in your columns some time ago [July 30, 1909], I tried to point out the widely varying results which were apparently being secured by the supply departments of different prominent railways, and commented on the lack of uniformity in methods which precluded any really intelligent comparisons being instituted.

Mr. McVeigh very properly makes this lack of comparable evidence the basis of the issues which he raises, and claims that in the absence of definite data our best efforts must be merely statements of opinion, and in this he is right.

On the other hand, until the conditions have been so shaped that such a comparison can properly be made, the preponderance of the opinions of those who have made a careful study not only of the practical details, but of the general results obtained under various methods, must act as a guide for future development.

Venturing, therefore, another expression of opinion on the divergent views outlined above, I believe that the form of organization advocated by Mr. Pearce is calculated to produce the best

results for the railway as a whole. It must not be forgotten that the different branches of the railway service vary so widely in their nature that no hard and fast rules can be laid down which will apply to all with equally good results. Divisional organization may be the ideal form for some branches, but would be totally inadequate when applied to others. I do not believe that Mr. McVeigh would advocate divisional organization applied to the treasury department; and yet unapplied material is simply money in another form.

Admitting that the divisional organization is the best that has been devised for the operating or transportation department, it does not necessarily follow that it is equally good for the supply department. The division superintendent is primarily an operating or transportation official. His responsibility begins and ends with the limits of his division; he is not concerned with the results obtained on any division but his own. The responsibility of the supply department must be co-extensive with the limits of the entire road which it serves, and in order to secure the best results for the whole railway it must act as a unit and not as a series of independent units.

Carrying Mr. McVeigh's scheme of organization only one step farther, we have each division purchasing its own supplies direct, under the supervision of the superintendent—a condition which I do not believe he would seriously advocate, and yet it is the logical result of his line of reasoning. As it is, he seems to advocate the buying of supplies for each division separately, but through one purchasing agent. Apparently his greatest objection to Mr. Pearce's scheme is with respect to the duplication of work entailed by the operation of one general store, through which all supplies must move to the division stores. In taking this position Mr. McVeigh is undoubtedly correct, and I am not sure that Mr. Pearce intends to be taken literally in this regard.

Unfortunately the title "General Storekeeper" is not so distinctive as it might be. It does not necessarily imply that the man on whom it is conferred should be in direct charge of one enormous storehouse to which all material used by the railway must be shipped, and through which it must pass to its final destination. It means, rather, that the official so designated is in general charge of all storekeepers. Personally, I do not think that he should be directly attached to any storehouse, but should properly be located at executive headquarters, just as I believe the superintendent of motive power should not be directly attached to any shop, although on almost every railway there are one or two shops which are larger and more important than any of the others. So there are necessarily one or more storehouses which are of greater importance than the majority, and which necessarily serve in a greater or less degree as magazines of supplies for the smaller divisional stores as well as for outlying points.

These larger and more important storehouses may, if you please, be termed general stores; and it does not detract in any way from the value of the departmental organization that there should be more than one such storehouse on the railway. The local conditions and geographical situation should be determining factors as to the number of these more important depots of supplies, which it will be economical to have, but it is not likely that it would be necessary or expedient to have one of them located on each division, and to that extent I cannot agree with Mr. McVeigh. On the other hand, it is hardly probable that on a railway of any size the operation of the supply department could be so economically conducted if an attempt were made to handle all of the material used by the railway through one general store, and to that extent Mr. McVeigh's contention has a great deal of weight.

We have heard a great deal lately about the "rule of reason," and it certainly applies with as much force to any scheme of organization as it does to the interpretation of the law.

GEORGE G. YEOMANS,
Assistant to the President, Wabash Railroad.

DISTANCE AND FREIGHT RATES.

BY J. F. STROMBECK.

Much needless controversy as to how rates shall vary with the distance freight is carried has resulted from a failure properly to analyze freight rates. Some theorists, as well as shippers, insist that the farther a shipment is hauled the higher in all cases should be the rate charged for the service, because, it is said, it costs the carrier more to transport the shipment. From a superficial knowledge of freight rates this seems to be perfectly sound reasoning. On the other hand, traffic managers earnestly insist that because a shipment is carried an additional hundred miles, or even more; that need not necessarily call for an increase in the rate. But they do not make it clear to the public why this can be so. They feel by intention, and rightly so, that their views are correct, but that does not satisfy the shipper or the theorist. He is not willing to depend upon the intuition of one who, as he is firmly convinced, is fixing freight rates in the interest of the carriers. Thus, on the one hand, there is a false idea as to transportation costs, which results from a superficial knowledge of the subject; while, on the other hand, there is a correct, though probably not always exact, practice, in justification of which convincing arguments are not offered. It is the purpose of this article to attempt to show by sound economic reasoning that while rates should increase with distance, they need not necessarily do so; and not only this, but that under certain conditions it is reasonable and just that a consignment be carried a longer distance at a lower rate than that for a shorter distance.

One thing which is fundamental, and of supreme importance, is a clear conception of railway expenditures. Besides dividend payments, these expenditures may be divided into two classes, which may conveniently be termed constant and variable. Constant expenditures are those which, *broadly speaking and only within certain limits*, do not vary with the amount of traffic carried. They include expenditures for maintenance of way necessitated by the rusting of rails, the rotting of ties and the washout of roadbed; for repairs and renewals of fences and road crossings; for repairs to stations necessitated by the action of the elements of nature; expenditures to replace cars and locomotives that have become out of date; a large part of station expenses; wages of switchmen, flagmen, watchmen, etc., the expenses of the general office; fixed charges, including interest on funded debt, interest on interest bearing current liabilities, rents paid for lease of roads, taxes, etc. Variable expenditures are those expenditures, again broad speaking—which vary with the amount of traffic carried. An increase in the tonnage carried means an increase in these expenditures. They include such items as expenditures for coal, water, etc., for wages of engineers and trainmen, for repairs to rolling stock, and interest on money invested therein, for repairs of roadbed and track made necessary by wear from hauling, and other similar items.

These two kinds of expenditures represent two kinds of transportation costs. The constant expenditures which go on whether any traffic is hauled or not may conveniently be termed indirect costs, because they are not directly connected with any particular shipment. The variable expenditures may, on the other hand, be called direct costs, because they are very closely related to the movement of the traffic. It is very important that these two kinds of cost be kept distinct. It is true, to be sure, that in practice it may become very difficult to separate them with any degree of exactness, but they must be clearly recognized in order to justify any freight rate adjustment.

This point may be further elucidated by a reference to the old turnpikes. The owner of the turnpike charged a toll for the use of the road. This toll was used to pay for the maintenance of the turnpike and interest on the investment, and is analogous to the indirect costs of rail transportation. The wagon driver who used the turnpike made a charge for conveying the freight,

and this charge is analogous to the direct costs of rail transportation.

Thus, a rate is made up of two parts; the indirect, and the direct costs. Dividend payments, for the sake of simplicity, may well be included in indirect costs.

The rate must cover all of the direct costs, or the traffic is carried at a loss, except under certain exceptional conditions. It should contribute a certain amount toward the indirect costs; this amount, as far as possible bearing a fair relation to the amounts which other rates contribute to indirect costs. It is not possible, however, for all shipments to contribute like amounts, but as long as a shipment contributes anything at all toward indirect costs, the carrier is ahead, because of hauling that shipment.

Before considering the effect of distance upon a rate, it will be necessary to make a further division of the rate. The direct costs are of two kinds, those that remain constant irrespective of the distance the shipment is carried, and those that increase directly as the distance increases. The former of these are terminal charges. The cost of loading and unloading less than carload freight, switching carload freight at terminals, billing and other office work, is the same irrespective of whether a shipment moves one or two hundred miles. This is true, of course, only where there is no transfer of goods in transit. The costs, which increase as the distance increases are those for the mere hauling between the stations. After a train is out of the yards the cost of hauling increases directly, and in the same proportion as the distance it runs. A two hundred mile run costs just twice as much as one of but a hundred miles.

This analysis has shown, then, that a rate may be considered as covering three items: (1) terminal expenses; (2) cost of hauling between stations, and (3) indirect costs.

Distance affects the direct costs from the fact that the farther a shipment is hauled the greater is the number of unit distances upon which to distribute the terminal expenses. These expenses per unit distance vary inversely and in the same ratio as the distance. The hauling expenses vary directly and in the same ratio as the distance. Distance affects the indirect costs in that the further a shipment is carried the greater are the number of unit shipments upon which the indirect costs must be distributed.

A concrete case will illustrate the above. Take a certain well equipped railway with 1,000 or more miles of road. This railway secures a carload shipment, which it hauls 200 miles, and on which it earns a gross revenue of $40. Of this amount, say, $20 are required to cover the direct costs, divided $5 for terminal costs, and $15 for cost of hauling, and the other $20 are available for indirect costs. A duplicate shipment is offered for a haul of 1,000 miles. It is assumed that the extra distance does not necessitate any transfers in transit, or additional switching movements. The question is, how much should the carrier receive for hauling the second shipment? The terminal charges, $5, are the same in both cases. The cost of hauling between stations, varying directly, and *in* the *same* ratio as the distance, must be multiplied by 5, making $75. The total direct costs are then $80. These must be earned or the shipment will be carried at a loss. How about the revenue to cover the indirect costs? In the case of the first shipment $20 were earned. The second shipment, being carried five times as far as the first, ought to earn more toward indirect costs than the first, but it is possible that the freight is of such a nature that a charge of over $100 on it will prevent it from moving. If that be true, it is surely better for the carrier to accept the shipment at $100 and earn the $20, than to refuse to haul it. In that event, for each unit distance the second shipment is carried, the road will get only ⅕ as much as the first shipment; but the total will be the same, and the $20 earned on the second shipment will be just as good to the railway as that earned on the first. In the one instance there are 1,000 units of distance over which to distribute the $20, while in the other there are but 200.

Thus, the amount for indirect costs that must be earned per unit distance carried may vary universely and in the same ratio as the distance without reducing the net revenue to the carrier.

This can be carried still farther—so far in fact, that the indirect costs per mile may decrease in a greater ratio than the distance increases. The shipment in question may be offered for a haul of 1,100 miles. But it was said that the maximum charge that it will bear is $100. If the carrier will not haul it for this he can not haul it at all. What is he to do? He figures $5 for terminal expenses. The extra 100 miles mean an addition of $7.50 to the cost of hauling, making a total of $82.50, and a total of direct costs amounting to $87.50. This leaves $12.50 to be applied to indirect costs. Not a very large sum to be sure, but it certainly seems to be good business on the part of the carrier to accept this shipment.

It is evident that at some point, which in the case in question is between 1,200 and 1,300 miles, the cost of hauling becomes so great as to prevent any amount from being left over for indirect costs, and when that point is reached the rate must be increased almost in the same ratio as the distance; for by that time the terminal expenses have become very insignificant. If the traffic can not bear a higher charge it is no longer subject to transportation.

Frequently a shipment can not bear as high a charge to a distant point as to a nearer one, because of water competition at the more distant point. In all such cases, it is both possible and profitable for the rail carrier to meet the water competition as long as the increased distance is not so great that the increased cost for hauling alone consumes all of the revenue which should be applied to indirect costs.

The proposition may possibly be made still clearer by using a rate, for illustration, instead of total charges on a given shipment. The distance from A to B is 100 miles, and the rate is 50 cents per 100 lbs., divided as follows: 5 cents for terminal expenses, 15 cents for hauling, and 30 cents for indirect costs. Problem: Find a rate from A to C, a distance of 500 miles, with no transfers en route, which will be as profitable to the railway as the 50 cent rate from A to B. The terminal costs, namely 5 cents are the same for both. The cost of hauling, increasing in the same ratio as the distance, is 75 cents. To be as profitable as the first, the second rate must include 30 cents for indirect costs. The rate from A to C will be the sum of 50 cents, 75 cents, and 30 cents, or $1.10. The rate per mile is 5 mills in the first and only 2.2 mills per mile in the second case.

The reader has probably already noticed that all rates have not the same amount of elasticity, and will not lend themselves to the same amount of variation according to increase or decrease of distance. This is true, because the relation between terminal expenses, cost of hauling, and indirect costs varies greatly in different rates. In the first place, rates on low grade commodities as a rule, provide only a small amount for indirect costs, leaving a large part of the rate to cover the regularly increasing cost of hauling. On the other hand, a large part of the rate on high class freight represent indirect costs and the rate is therefore very elastic. Then again, the terminal expenses are a larger per cent. of the L. C. L. than of the C. L. costs. As has already been seen, rates for long distances are very apt to contribute only a small part to indirect costs.

In conclusion, it can, then, he said that while long hauls do not necessarily compel low rates per mile, they often justify them, and much freight, such as coal, lumber, etc., which will not stand high charges can thereby be made to move long distances only by making low rates per mile. This is so because whatever a rate contributes toward indirect costs is a net gain to the railway.

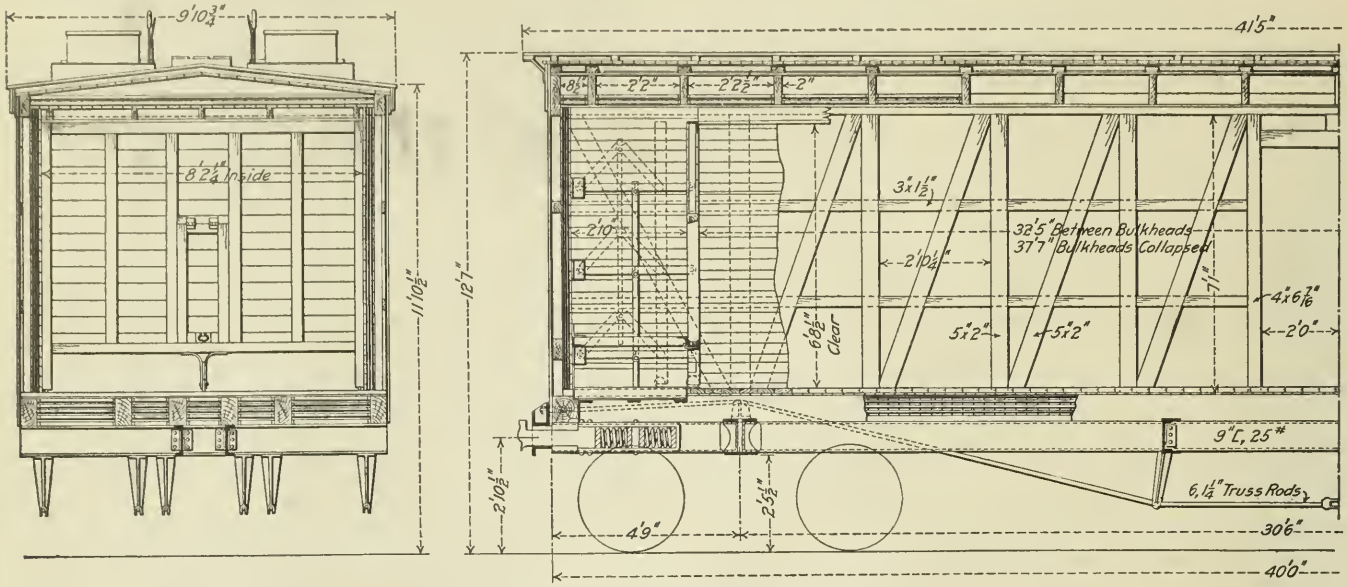
The Brazilian government has extended by 18 months the time specified for the completion of the Itu-Cratheus section of the Sobral Railway.

FORTY-FOOT REFRIGERATOR CAR.

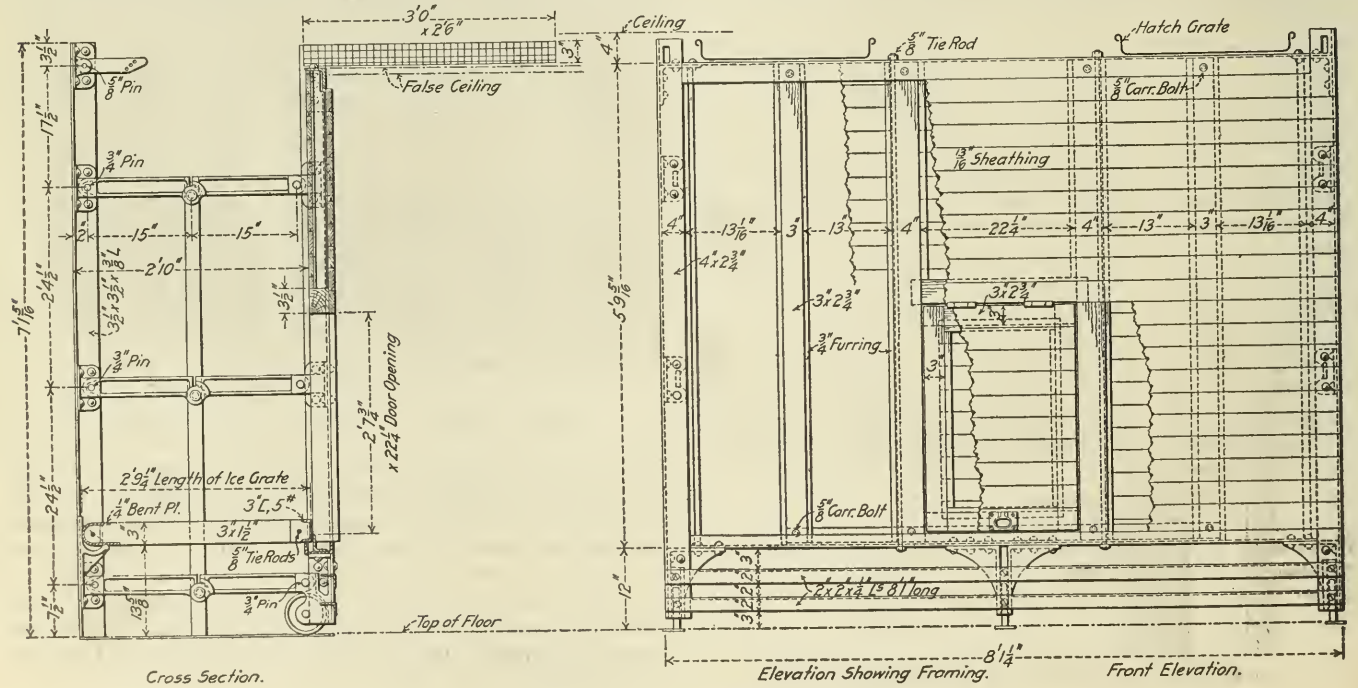
The refrigerator car built by the Union Fibre Company, Winona, Minn., and briefly described in the *Daily Railway Age Gazette* of June 17, 1910, has rendered such good service during the past year on the Harriman and other lines that a more detailed description of its special features are given herewith. The car has four layers of Linofelt insulation, which is one more than is ordinarily used, and is equipped with Brown's collapsible ice tank, which is easily handled by one man; also a weather-proof ventilator and a non-splashing drip pan. The general plan of the car and detailed drawings of these fixtures are here illustrated. In order to determine the value of an extra layer of insulating material this car is equipped with four layers instead of three, and the drawing shows how these four layers are applied. The insulation itself, Linofelt, is made from de-gummed flax fibre, chemically prepared and combed and felted by machinery into a flexible felt ½ in. thick. This flax fibre felt is quilted between two layers of thick waterproof paper, weighing 90 lbs. per 1,100 sq. ft., making the finished quilt ½ in. thick, weighing 42 lbs. per 100 sq. ft. The rows of stitches are 5 in. apart, and the edges are bound to prevent fraying.

By the use of Brown's collapsible ice tank the loading space of the car when not under ice may be increased 16 per cent., the total increase in the length of the loading space when the tanks are collapsed being 5 ft. 2 in. Ordinarily, a refrigerator car is moving under ice only one-fourth of the time, and the remainder of its journeys are made under ventilation or are return trips. On return trips merchandise which does not require icing may be loaded in the car and the value of its full loading space may be utilized. The heavy lines in the general plan of the car show the tank in open position, and the dotted lines show the tank partially collapsed. The bulkhead is held in position by hinged bars which extend from the end wall of the car to the bulkhead and lie close to the side walls. The head rests on the floor on three heavy steel rollers, one on each side and one in the center, and in the middle is a removable door.

To collapse the tank it is first necessary to remove the ice.



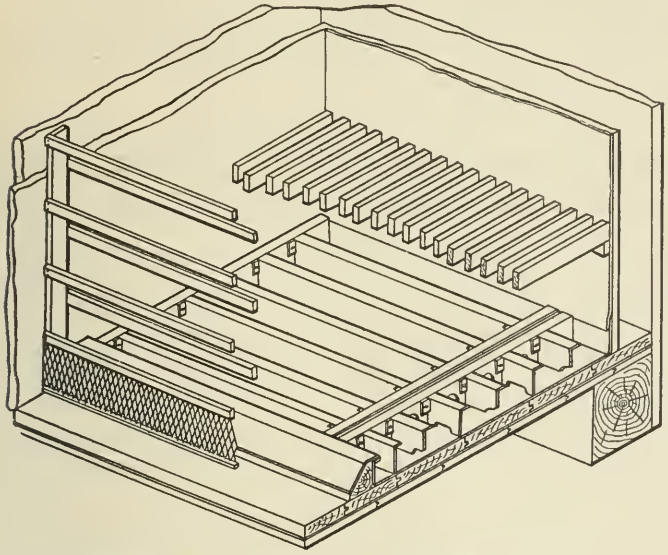
Refrigerator Car Showing Collapsible Ice Tank.



Collapsible Ice Tank for Refrigerator Car.

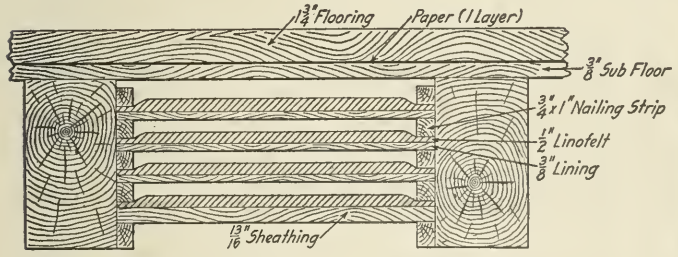
The ice racks are then folded against the back wall and are held by gravity hooks. After lifting the jointed rods of the bulkhead from the inside, to unlock them, the head may be pushed back to the end wall where it is also held by gravity hooks. Everything is so arranged that this change may easily be made by one man.

The non-splashing pans which are used under the ice racks



Non-Splash Drip Pan for Collapsible Ice Tank.

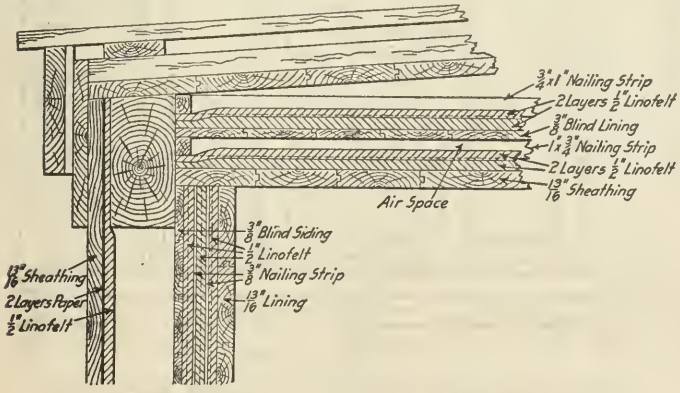
consist of a number of iron gutters parallel to each other. The top of each gutter wall curves over toward the end of the car, and there are holes between each, so that the water may move freely from one to the other on its course to the drain. When the tank is collapsed the iron straps which join the gutters together on top form a level loading surface, thus eliminating



Linofelt Insulation for Refrigerator Car.

the use of lumber and labor to prepare the loading floor. This drip pan is illustrated in detail.

The car is also fitted with the Leeds ventilators. The ventilator of a refrigerator car should admit a sufficient volume of air and at the same time exclude rain and cinders. It should also be designed so that it can be opened and closed quickly with little effort. The illustration shows the ventilator with the top



Roof and Wall Insulation for Refrigerator Car.

removed, and the observer is supposed to be looking directly down into the ice tank. The plug *K* is operated by a lever at the side, and this may be adjusted at different inclinations by a latch so as to admit larger or smaller volumes of air into the car. The ventilator is faced with the angle pointed in the direction in which the car is moving. This angle *A* deflects the air



Leeds Ventilator for Refrigerator Car.

into passages *BB*, and, striking the partition plate *P*, the current is turned back and downward into the car. The opening *O* in the corner is a drain, and water or cinders naturally flow out through it, as it is the lowest point, and the floor in front of the baffle plates slopes sharply down to the drain.

The entire frame of the ventilator is made of light sheet iron and is bolted directly to the hatch cover and plug, forming a single unit with that apparatus. A hole is cut in the hatch plug directly under the opening in the ventilator, and the closing or opening of this hole is a function of the plug *K*. Four ventilators are used on each car, one over each ice plug. The

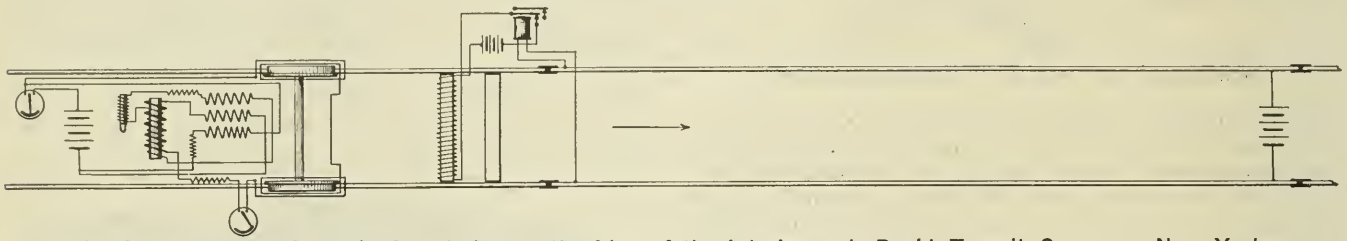


Leeds Ventilator With Cover Plate Removed.

object of the Leeds ventilator is to provide a device which will force the air into the car free from dust, cinders and rain. It is particularly valuable in connection with the collapsible tank, but may be applied to solid bulkhead cars or ventilated box cars. It is not necessary to cut the roof of the car to apply the ventilator, because it is combined with the hatch cover; one movement opens the ice box for re-icing, which obviates the necessity of pulling the plugs from the hatches, and there are no mechanical parts to get out of order and require repairs.

WALDRON'S AUTOMATIC STOP.*

The Railway Signal Association has adopted ten rules which are to be the Mosaic Law which must be followed by the designers of automatic stops and cab signals in the future. As a matter of fact, these ten commandments cover the ground very thoroughly and they can be taken as a safe guide by all inventors who care to enter this field; and if closely followed they will lead such inventors into the promised land, wherein the fruits of their toil will be gathered in harvests of gold. The Block Signal and Train Control Board of the Interstate Commerce Commission, believing in taking a hand in the commandment business, has also laid down ten guiding rules for designers of automatic stops and cab signals to follow. These rules are in substance the same as those prepared by the Railway Signal Association, but the men of this Board, like those men in ancient times who established new religions, made a few departures in form from those of the signal association; but to be sure of followers the cardinal principles had to be left unchanged. Therefore, the Mosaic Law as promulgated by the authorities on automatic stops and cab signals in the railway world demands that all be so constructed that they can be operated on any railway, in any clime, in all seasons, on any right-of-way, at all speeds, and for all classes of traffic; they must at all times conform to the physical conditions of the track which is protected and all parts of the apparatus must be constructed on the closed circuit principle. These rigid requirements practically limit the field to but one class. In that class, the parts of the apparatus on the moving vehicle and the parts of the apparatus along the right-of-way must at all times have an electric and magnetic connection between them which will be immediately influenced by the conditions of the track protected, as well as the conditions of the apparatus itself; inasmuch as the failure of any part of said apparatus must immediately give indication of such failure by applying the brakes on the train or car. The object of this paper is to give a brief description of an automatic train stop and cab signaling system designed to meet the rigid requirements stated.



Circuits for Automatic Train Stop Tried on the Line of the Interborough Rapid Transit Company, New York.

A careful study was made of all known automatic stops and cab signals to see whether those which had already been developed would meet the requirements of the Railway Signal Association. The strong and the weak points of each system were carefully considered. Each part of each system was carefully considered as to its capabilities of meeting the requirements. It was found that many inventors had perfected splendid devices. Some excelled in one direction, others in other directions. But there seemed to be no one device, nor could a combination be made out of all known devices, which would make one system to fulfill all the requisite characteristics. In all cases, there seemed to be a link which was missing. Some inventors were heading in the right direction, but they stopped before reaching that which they desired to accomplish. They stopped because they had convinced themselves that what they sought after could not be obtained. Several inventors realized that if they could use induced currents they could accomplish that which was desired, the construction of an automatic train stop on the closed circuit principle; but to accomplish these desired results they found there was an air gap which they could not bridge. This air gap appeared so formidable to them that they turned back. It was therefore evident that the air gap between the apparatus on the right-of-way and the apparatus on the moving vehicle would be the starting point for new discoveries. This air gap would have to be bridged by an induced current which would not be interrupted unless there was danger ahead, in order to build up an automatic stop and cab signaling system, on the closed circuit principle. I am glad to say that this gap has been bridged and an automatic stop and cab signaling system has been developed which works on a closed magnetic circuit between the right-of-way and the moving vehicle.

The closed circuit on the track is maintained by locating between the ties and below the rails and insulated therefrom, at the beginning of each block, an electro-magnet and a permanent magnet, the latter superimposed on the other; the electro-magnet receiving its energy from a battery controlled by the track circuit in the block which it protects. This energy amounts to about 2½ watts. When the block ahead is occupied or the track obstructed, the track circuit being interrupted, no energy will pass through this electro-magnet. This magnet would then be in condition for stopping a train; and if a train at that time should attempt to pass by it, the brakes of the train would be applied automatically.*

The part of the apparatus placed on the locomotive or motor car consists, first, of one small coil of wire around each wheel of the front pair of wheels, arranged horizontally. These coils are parallel to the rails and can be four or more inches above the rails, but must be below the car axle. The coils are fastened to the car truck and clear the wheels a sufficient distance to permit free movement of said wheels as well as the convenient change of brake shoes. Next there is a small transformer, an impedance coil, a solenoid coil which is attached to the valve in the train line pipe, and a small battery with an E. M. F. not exceding 100 volts. The battery, transformer, impedance coils, solenoid coil and wheel coils are connected in series on a closed circuit. There are no moving contacts in any portion of this apparatus. In normal operation, current from the battery flows through the transformer, impedance coils, solenoid coil and the wheel coils in series, then back to the battery. The solenoid coil being thus energized, its armature is attracted and the valve in the train line pipe remains closed. When a locomotive or car suitably equipped passes over one of the magnets between the rails, and the track ahead is clear for it to proceed, the electric energy in the track coil (which is immediately under the permanent magnet) counteracts the effective force which the permanent magnet would exert on the apparatus on the vehicle, to the extent that the energy in the solenoid coil on the moving vehicle is not opposed, but rather is assisted. The armature of the solenoid coil is therefore held in the attracted position; the brakes are not applied. But when the track ahead is occupied, the track circuit shunted, and the track coil de-energized, there is nothing to oppose the force exerted by the permanent magnet. If an engine should then pass, the permanent magnet would generate in the wheel-coil circuit a flux tending to change the potential in that circuit. This energy from the permanent magnet is in opposition to the current flow in the apparatus on the vehicle. This opposition is strong enough to counteract the holding effect

*A paper read before the Railway Signal Association, New York City, June 14, 1911, by J. M. Waldron, Signal Engineer, Interborough Rapid Transit Company.

*The use of an overlap, which would be a feature of this arrangement in regular service, would require additional connections, not shown in the drawing.—Editor.

which the battery on the vehicle exerts on the armature of the solenoid coil, with the result that the coil is de-energized, its armature falls and the air brakes are applied.

This counter electro-motive force is alternating, with its frequency determined by the speed at which the train or car is moving. After this apparatus is once regulated to permit all movements being made over the track magnets when the speed of such movements do not exceed, say, five miles an hour, it remains permanently at that adjustment. There is an efficient margin of 50 per cent. provided on both sides of that which is considered the best working condition of the apparatus. At any speed exceeding 5 miles an hour, the operation is positive. The higher the speed at which the train is traveling, the more propronounced is the effect on the solenoid coil which controls the air brake valve. The current consumption of the apparatus on the locomotive does not exceed one watt.

The batteries for supplying current on the train or car are small. In fact, a few cells of dry battery would be sufficient to make a round trip from New York to Chicago and have considerable energy left. The parts of the apparatus on the train are quite small. In fact, that which has been constructed and which was used in making experiments, is contained in a box 12 in, long by 12 in. wide by 5 in. deep. These dimensions can be materially reduced by careful designing. As the apparatus is designed, steel bridges, steel viaducts or grade crossings will have no effect whatever upon its correct working. Tests covering a period of several months have been made with a motor car equipped with this device, with the desire to locate any defects which might be in it, but so far, I am very glad to say results have been entirely satisfactory.

ORGANIZATION OF A TRAIN DESPATCHER'S OFFICE.

BY STEPHEN H. BROWN,
Great Northern Railway, Spokane, Wash.

A great deal has been said and written about the train despatcher and his duties. That the work of the despatcher is of great importance cannot, of course, be denied. That the duties are irksome is true only where they are made irksome. And that they become irksome is, perhaps, due more to carelessness than otherwise.

In the Standard Code may be found various rules for the government of division officers and employees. Some managements require that the chief train despatcher report to the trainmaster; others that he be under the direct control of the superintendent. Many different views are entertained as to the wisdom of having the trainmaster exercise supervision over the train despatcher's office, and it seems impossible to harmonize the conflicting opinions. It has been said in the columns of the *Railway Age Gazette* that competent men avoided taking up the responsibility of the chief despatcher's office, and the reason here stated was, I believe, one of the chief objections advanced. As a matter of fact, the duties exacted of a chief despatcher may be made to coincide with those of other interests of the division in a way that will make the office attractive to its incumbent and of immense value to the division. It has been my observation that many chief despatchers enmesh themselves in a labyrinth of red tape from under which it is hard to extricate themselves, and this is another reason so many men prefer to work an eight-hour trick rather than risk being buried under the volume of work that appears to beset the man under whose direction they labor.

In the organization of a train despatcher's office, particular attention should be given to the method of filing the important papers that demand attention.

The train sheet, which should properly record the operations of the district represented by it, ought to be closely scrutinized by train despatchers as well as the chief despatcher in order to see that it is made complete before being filed. At the end of each month, train sheets should be fastened together securely on one end, and with them should be bound a copy of the current time table. The time table will be of special benefit in the years that follow in settling quickly questions as to the time at which trains were due at the different stations on the division. A very satisfactory method of binding train sheets is to secure them with brass paper fasteners, the ends of which after being firmly hammered flat, are covered with a stiff piece of paper, large enough to cover the points.

As the clerical force of the chief despatcher's office is seldom equal to the requirements of the business, the filing system must be at once comprehensive and simple. Select the important subjects, and under these headings file all business pertaining to the subjects indicated by the heading. Fifteen or twenty pigeon holes will readily accommodate the business in this way, and will permit of a ready reference to the files at all times. At the end of the month, the pigeon holes should be emptied and the contents of each placed in a wrapper marked with the subject it represents.

Car tracing files should be arranged so that they can be readily referred to. A simple method of doing this is to have numbers ending in 1 kept together, likewise those ending in 2, and so on down the line to those ending in 0. This arrangement will answer satisfactorily the purposes of the ordinary despatching office.

The pigeon holes should be about six inches wide, three or four inches high and eight and one half inches deep. In a pigeon hole of this size, ordinary letter paper, folded horizontally through the center, and regular telegraph forms will lie flat. It would be quite impossible to name a list of subjects for everybody, but the following will usually apply to train despatchers' offices:

Passenger equipment	Accidents
Special train service	Yard reports
Passenger equipment—bad order	Work train service
Engines	Cars used in work service
Engine failures	Live stock
Engine reports	Perishable freight
Company coal	Time freight
Company sand	Delayed business
Company wood	Situation reports
Operators	Car Situation reports
Operators' applications	Miscellaneous

In filing matter taken from these pigeon holes at the end of the month, it is only necessary to use a simple wrapper upon which the subject and the month may be written. These records may be kept in the office for a reasonable time, where they will be readily accessible, after which they can be stored in record rooms in such a way that they can be reached with no other delay than that necessary to get to them and untie the string. For the car tracing file, the pigeon holes should be the same width and depth, and each of the ten necessary for the car tracers should be divided by a horizontal shelf a couple of inches from the top above which the live tracers should be kept and the discard filed below for reference. If proper care be given to the marking of this business, there is no reason why a record five or ten years old should not be located as easily as one for the current month.

Frequently the argument is advanced that a chief despatcher is too high priced a man to give attention to such details of his office as looking after the files. This does not appear to me to be good logic. If the records are worth keeping at all, they are worth keeping in such a fashion that they may be used whenever needed to settle cases of doubt. Message files ought to be as closely supervised as are the other records in order that the business of each day shall be kept by itself and in a way that will make it possible to refer to it quickly when necessary.

If a man in charge of a train despatcher's office will deal with absolute fairness with every interest with which he comes in contact and does not permit personal feeling to enter into any of his business relations, there is no reason in the world why the office of chief despatcher should not be made one of the most attractive on a railway, nor is there any reason why the chief despatcher himself should not command the respect and support of his superiors as well as of his subordinates.

An engine was to be moved to a point 100 miles distant from the shops for service on a branch, this engine to be exchanged for one that had been used in its place while repairs were being made. In order to make the change, the chief despatcher suggested to the master mechanic that the engine be used on a local passenger train whose terminal was the point from which the branch diverged. The master mechanic objected to the arrange-

ment, saying that he feared the engine might lose a lot of time. But the chief despatcher put the engine on the passenger train, and the result was as the master mechanic had predicted, the delay being somewhat greater than either had anticipated. The chief despatcher, immediately after the performance of the engine became known to him, wrote a letter to the superintendent, advising him of the facts as stated above, and wound up his letter with a paragraph stating that the intent of the letter was to take from the shoulders of every other individual interested, except himself, all responsibility for the movement. A carbon copy of this letter was addressed to the master mechanic and to the roundhouse foreman for their information. The incident was closed without further correspondence and the mechanical department officers thereupon reached the conviction, if they had not previously done so, that the man responsible for the combination was, above everything else, fair.

Another chief despatcher had in his force two men, one of whom was his brother-in-law, and the other a man between whom and himself the choice had fallen at the time of his appointment. On the division over whose destinies he presided, an allowance of four days every two months was made for despatchers to learn the road. Mr. Brother-in-law spent one of his periods in visiting his family—and was paid in full. The other fellow spent a portion of one of his four days in a business trip which could have been made without lying off; but by keeping on the road night and day for the rest of the time, completed his tour of the division within the prescribed four days. From the pay check one day was deducted. In this case the chief despatcher established a reputation for duplicity that is characteristic of the unfair man.

Train despatchers should be given the benefit of all information in the way of tonnage statistics, overtime statements and performance sheets that reach the chief despatcher, and their interest and enthusiasm invited, to the end that everyone will feel a personal pleasure in producing commendable results.

A convenient and effective method of keeping in touch with the engine situation on the division is that used by the line with which it is my good fortune to be identified. Simple wooden plugs are used to represent the engines: white for freight and pink for passenger engines.

These plugs have ¾ in. faces to carry the number and ⅛ in. points to fit holes of corresponding diameter in the board.

Headings of Engine Board.

Spokane Division.

		In Service.					Out of Service.										
			Freight.				In Shops.				Waiting Shop Entry.						
							Pass.		Freight.					Stored.			
Kal. Div.	Cas. Div.	Pass.	Through	Local	Switch	Work	Light Repairs	Heavy Repairs	Light Repairs	Heavy Repairs	Pass.	Freight	Switch	Pass.	Freight	Switch
KP	PG	A	B	C	D	F	H	I	J	K	M	N	O	R	S	U
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The headings speak for themselves. Each Friday a check of the board is made and forwarded to the proper officers of the road. A daily check is made showing changes. This also goes to interested officers, the general superintendent transportation, St. Paul; the superintendent motive power, St. Paul; the general master mechanic, Spokane.

A train despatching office usually is a place of activity, and it is well to be busy. Work is in a class by itself. Work, however, doesn't necessarily mean drudgery. *Be busy but not a busybody,* might be suggested as a good motto for the train despatcher—and others. Reading on duty, for pleasure, is not recommended as a proper pursuit. Studying rules when otherwise unoccupied or keeping in line in one way and another with railway affairs results in mutual benefit to the railway and the employee.

The writer gets out of life an immense amount of good fellowship and no small amount of fun. If anything is to be said that ought to be said—even if it is unpleasant to say—out with it and be done. Then at once get back to good cheer and profit by the lesson—if there be a lesson.

Don't sulk. Don't nag. Don't dismiss anybody (or any subject, that ought not to be dismissed.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

IV.

Tucson, Arizona, April 29, 1911.

My Dear Boy: After the commission kicked for rest, the general manager tied up in his caboose. Nobody was allowed to run around him and he was marked up first out the following morning. The commission not having any agreement about initial overtime, the attorney acting as yardmaster handed him a switch list and told him to dig out these loads:

Question: How many letters a day do you write?

Answer: I don't know, a great many.

Q. How many a day go out of your office?

A. I can't state exactly, probably a hundred or more.

Q. Then you do not see them all?

A. No, that would be impossible in such a large office.

Q. Does the chief clerk see them all?

A. I think he does.

Q. You are not sure then?

A. No, not entirely. I have had no complaints about that.

Q. Is the only way you know about how things are going to have a complaint come in?

A. Not exactly. I try to keep ahead of the game.

Q. Are the offices of your subordinates run in this same haphazard manner?

A. I do not admit that it is haphazard. The general method is the same.

Q. Who is in charge of the distribution of cars?

A. My superintendent of transportation.

Q. To whom are his instructions given?

A. To the division superintendents.

Q. Does he give his instructions personally?

A. The important instructions he gives personally. Of course he cannot do it all alone. You understand that his department deals with individual cars and has an enormous amount of detail.

Q. How many men are authorized to sign his name and initials?

A. I don't know.

Q. Then you do not regard this as an important matter?

A. Not as important as some others. That is a matter for which the superintendent of transportation is responsible. I look to him.

Q. Do you think every man charged with duties should be allowed to select his own type of organization and decide as to his own methods?

A. As far as possible, yes.

Q. Then why not let each conductor make his own train rules, and each station agent keep his own kind of accounts?

A. Because confusion would result.

Q. Is it not a fact that on most American railways six or eight clerks are signing the name or initials of the superintendent of transportation?

A. I don't know; very likely.

Q. Does not a similar condition exist in a smaller degree in most railway offices.

A. Yes sir, that is the system.

Q. Then who are running the offices, the officials or the clerks?

A. I always supposed the officials. You see we could not afford so many officials.

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Q. Has it ever occurred to you that by having more officials you might get along with fewer clerks?

A. No, sir.

Q. Who sign for the train orders on your road?

A. Our conductors.

Q. Have not conductors and operators been discharged for signing each other's names?

A. Yes, sir. We must maintain discipline. If the train orders are not respected, accidents will result.

Q. Then you have one policy for one class of employees, and allow your officials and clerks to be a law unto themselves?

A. Not exactly. As I said before we cannot afford so many officials.

Q. Whose initials are signed to your train orders?

A. The superintendent's.

Q. Why?

A. Because it has always been that way on our road. It makes the order stronger.

Q. If initials make an order stronger, why not sign yours, or the president's or God Almighty's?

A. That would be ridiculous.

Q. Then it is not ridiculous to sign the superintendent's initials when he is at home or in bed?

A. No, that is different. We wish to emphasize the fact that the superintendent is in charge of the division.

Q. Then why not put the superintendent's photograph on all the orders? Would that strengthen him with the men?

A. No, of course not.

Q. You have been talking about the superintendent; is he the same as the superintendent of motive power?

A. No, you do not quite understand. The superintendent has charge of a division and the superintendent of motive power, like the superintendent of transportation, has charge of a department.

Q. Then the word superintendent doesn't always mean the same thing?

A. No, sir, but no confusion results. You see the heads of departments are general officers while the superintendent is a division officer.

Q. Which superintendent?

A. The division superintendent.

Q. Is it not a fact that on some roads there is a question as to which has authority in certain matters, the division superintendent or the superintendent of motive power?

A. I believe so, but we do not have any such trouble.

Q. (Producing copies of letters furnished by discharged office employee.) Does not this correspondence indicate a heated difference of opinion between your superintendent of motive power and a division superintendent which had to be settled by you?

A. Oh, yes; I recall, I had forgotten that. That will not happen again.

Q. What guaranty have you against similar friction?

A. I have that all straightened out. Everybody is lined up and understands that I insist upon harmony with a big H.

Q. To prevent confusion and, therefore, to save money why not make titles sufficiently distinctive in rank to prevent conflict of authority?

A. We have not thought it necessary. I do not go as much on titles as some people. The old fashioned way is good enough for me. A rose by any other name would smell as sweet.

Q. How, then, if you ordered roses for a funeral, would you guard against the corpse being handed lemons?

A. By sending a note or a card.

Q. Signed by your chief clerk?

A. No, sir.

Q. Do you think it is honest to have your chief clerk signing your name while you are away at this hearing?

A. There is no intent to deceive.

Q. Do you not unconsciously try to convey the idea that you are in one place when you are really in another, or that you are acting when it is really an entirely different man who is taking action?

A. Perhaps so. I had never looked at it in that way. It is a generally recognized custom.

Q. You do not seem to regard the office part as very important, as you permit a lot of clerks to take final action all day long.

A. The office is not as important as the road. I try to give the most attention to the important matters on the road.

Q. You feel that by doing so the office will in a large measure take care of itself?

A. That is it exactly.

Q. Do you not think that most railway administrative offices have grown too large to take care of themselves?

A. You see, we keep in close touch with our offices on a railway, because when away we have a telegraph or telephone wire at our command.

Q. What good does a wire do you if you are tied up in a hearing or a conference for two or three hours at a time?

A. I fear that I have not made clear to you just how valuable a man I have trained into a chief clerk.

Q. I fear that you have not. You seem to believe the old system is all right. Do you think the last word has been said or that your road has hit upon the best system?

A. The last word on these important subjects will never be said, but we have been getting along very well.

* * * *

I shall not continue further in this letter the catechismal method, unless you accuse me of forgetting that you long ago graduated from the kindergarten. So you did; but when in doubt get back to early methods. After reading recently an article on scientific management, I had to recall my catechism to feel certain that handling pig iron is not the chief end of man. We all, you and I included, sometimes show up smaller than we really are, because we seem to think only in the narrow terms of the things to which we are closest. It once fell to the lot of a young official to escort over his road some of its directors, bankers from New York. Being an enthusiast for his section of country, being an operating man with an instinct for developing traffic, he talked of progress, of the economic and social welfare of the people. When he spoke of sugar planting, or of cotton growing, of blooded stock and dairy yield, the bankers asked, "How much does it cost to raise an acre?" or "What percentage of profit do they make?" He returned from the trip feeling that money must be the god, that his directors could think only in terms of dollars and cents. It dampened his ardor for a time. Then he was so fortunate as to ride for a few days with some of the really big modern bankers. He found himself listening with open mouth to their wonderful expression of practical sociological truths. He marveled at their recognition of the human element, and he understood better why the board sometimes turned down his recommendations. His only lament was that he could not see more of them. There, my boy, is the great misfortune, there is a problem to be solved. There is too much Boston, New York, Philadelphia and Chicago. The directors seem too far away. It is a step forward that the overlords of transportation are bankers who have won their way rather than hereditary descendants of once reigning families. Some method must be evolved to make for more elastic control. Annual inspection trips will not overcome that rigidity in administration at which the public chafes and from which it seeks relief in drastic laws. An interesting and hopeful phase of present development is the election to directorates of trained railway executives like L. F. Loree and H. I. Miller. The professionally equipped railway director is a desirable evolution. Supply always follows demand, and the broad solution will be a composite made up of many elements of progress which perhaps have not yet unfolded themselves to any of us.

It is a great game, this transportation business. The more

you study it, however, the more you discover that it is amenable to the same underlying principles on which rest the great and small activities of the human race. Like all professions it has its distinct technique. Like all professions it suffers from the inborn tendency of human nature to segregate itself behind an exaggerated class consciousness. "We are a little different," or "You do not quite understand our peculiar local conditions," are the arguments with which ultra-conservatism has opposed progress in all ages, are the obstacles which make so interesting all real contests for principle.

I make no apologies for taking you in this letter from the witness stand of the west to the financial chancelleries of the east. When both the banker director and the general manager learn that signatures on letters and tram orders must be as sacred as when signed to bank checks, we shall be winning back a little of that old time sense of personal responsibility which is so needed for improving composite efficiency today. What better epitaph could any man desire than this, "He helped to teach corporations to remember that lasting composite strength comes only from intelligent recognition of individual manhood?"

Affectionately, your own,

D. A. D.

THE RAILWAY SIGNAL ASSOCIATION.

The regular meeting of this association was held in New York City, at the Hotel Astor, on Tuesday and Wednesday of this week, with an attendance of about 150. Two meetings were held each day, with President C. E. Denney in the chair.

Mr. Rudd, chairman of Committee No. 1 on Uniform Signaling, spoke of the recent report of the Committee of the American Railway Association on signal indications, and said that his committee would probably soon be able to submit a report in which all the members will concur. The Sub-Committee on Symbols, of Mr. Rudd's committee, J. C. Mock, chairman, presented such changes as have been made in the proposed standard symbols. Suggestions for further changes were offered by members, and the standard symbols will be presented by the committee in October for adoption. Committees 2, 3 and 4 submitted progress reports, that of No. 4 including specifications for hard fiber, and impregnation treatment of coils, and changes in the specifications for channel pins. Some changes in the standard cell were offered by Subcommittee 4 of Committee No. 4 on Automatic Block. Specifications for concrete were submitted by the chairmen of Committees 2, 3 and 4. It was suggested that these should be made to conform more closely to the specifications for concrete of the American Railway Engineering Association.

At Wednesday's meeting the secretary read Mr. Sparrow's paper on Substitutes for Wood Trunking. In the discussion some difference of opinion were brought out as to details of construction of conduits, and some interesting comparisons of the life and applications of clay conduit and other types.

The paper on Apparatus for Charging Storage Batteries was read and discussed at the afternoon meeting.

Committees 10, 11, 12 and the special committees on Storage Batteries, on Promotion of Signaling Education, and on the Recording of Signal Failures, presented progress reports. Good progress on the Manual of Recommended Practice is being made and a full report is expected in October.

On Tuesday, J. M. Waldron, read a paper describing a new automatic train stop, which he has installed on his road—the Interborough Rapid Transit Company, New York City. This paper will be found in another column. It was received with marked interest, and Mr. Waldron answered numerous questions.

The committee reports presented at this meeting, though mostly informal were fully and freely discussed, and many helpful suggestions were made for the benefit of the committees. The plan of continuing the meeting through two days proved a good one, as it gave time for proper consideration of the reports, which contained much valuable detail.

THE COMMUNIPAW EXPLOSION.

In a special report presented at the meeting of the American Railway Association in New York City, May 17, Col. B. W. Dunn, chief inspector of the Bureau of Explosives, described the circumstances of the explosion which occurred at the Communipaw dock of the Central of New Jersey on February 1 last, when 25 persons were killed and great damage done, and the whole of the lower part of New York City shaken. (Reported in the *Railway Age Gazette*, February 3, p. 259.) The explosion occurred in connection with the unloading of boxes of dynamite from a car which had come from the Kenvil plant of the Du Pont Powder Company, and the car and its lading had been inspected by one of the agents of the bureau. Some of the 670 boxes in the car were unloaded January 26 and again others on January 28. On February 1, men from the steamer Katherine W. started to unload the remainder, consisting of 300 boxes of 75 per cent. Forcite gelatin dynamite, each box containing 50 lbs. From a Polish laborer who was looking for work on the dock that day and who was hired to help in the unloading, but who, after a few minutes, left the work because he thought it was not being conducted with proper regard for safety, Col. Dunn learned that the boxes were pushed down an inclined plank 1 ft. wide and 14 ft. long with such lack of care that they sometimes turned partly around because of the roughness of the upper surface of the plank, although no box fell off the plank during the time that this man was at work. One of the men in the car wanted a hook. The captain refused it because the use of a hook would be dangerous, but the man insisted on having one because it was too cold to take off his gloves and a small hook was then passed to him. The Pole, after protesting, left the work because the captain insisted on speed in handling the boxes, and he was vigorously ridiculed by the crew for leaving. The explosion occurred about 10 or 15 minutes after he had left the place.

Col. Dunn concludes that there was no explosion inside the freight car and that the whole trouble started on the deck of the boat, which contained, besides the dynamite, 10,000 lbs. of black powder and two cases of blastings caps. The captain of the steamer was in charge of the unloading. There is nothing to show that he did not follow the practice that had been used on this boat for years. The railway company received, transported and delivered the car to the consignee strictly in accordance with the federal regulations, but prompt removal by the consignee, which the regulations require, was not enforced. This rule is being violated frequently at many points in the United States and a railway has no effective power to enforce it. The only recourse is to apply to the courts. The present explosion, however, was not due to failure to observe this rule. The gelatin dynamite was frozen at the time. Adjacent to the car which was demolished was another car containing 2,000 lbs. of dynamite which did not explode. The cause of the explosion cannot be stated definitely. Fragments of the boiler of the vessel were widely scattered and it is possible that the explosion of this boiler caused the explosion of the dynamite. The evidence, however, is conflicting.

The crew of the vessel handled the dynamite without proper care, but they paid the penalty with their lives, and Col. Dunn goes on to discuss the defects of the system of which they were the victims. For years the Katherine W. has been transporting explosives around New York harbor without efficient regulation, and when the railways began to improve their methods of handling explosives, four years ago, they tried to extend the improvement to water transportation in the harbor, but did not succeed in doing so. The Katherine W., carrying explosives, apparently has been navigated in times of dense fogs as freely as though it were an ordinary barge with non-explosive freight. Col. Dunn recommends that the strict regulations now in effect on the railways be made effective in the harbor. Incidentally, he calls attention to the fact that some of the states have established regulations somewhat inconsistent with those of the federal government.

SAFETY ON THE ILLINOIS CENTRAL.

Vice-president W. L. Park, of the Illinois Central, reports that for the first year of the operation of the new methods in discipline, established by him in May, 1910, the number of train accidents has been reduced, as compared with the preceding year, almost 25 per cent., while the damage to property has been reduced almost 50 per cent. The total property damage, by train accidents, in the year ending April 30, 1910, was $404,431; while in the year which has just closed it was $204,024. Mr. Park divides the train accidents into two classes, avoidable and unavoidable, and the total of accidents, of damage and of persons killed and injured in the two classes are as follows:

Train Accidents—Illinois Central and Controlled Lines.

	Year ending April 30, 1911.	Year ending April 30, 1910.	Decrease.
Accidents, avoidable	193	232	39
Damage to property	$133,654	$241,759	$108,105
Persons killed	6	13	7
Persons injured	75	439	364
Accidents, unavoidable	75	124	49
Damage to property	$70,370	$162,672	$92,302
Persons killed	4	3	(Inc.) 1
Persons injured	48	70	31

This is a highly creditable record. A comparison of the number of accidents or the numbers of persons killed or injured on one road for one year could hardly be accepted as conclusive, but the item of money damages, which is affected by every accident of any consequence, is a pretty fair criterion; and in this statement before us makes a remarkable showing. Moreover, this great improvement in safety has not been brought about by any important lessening of dangerous environment or conditions. The number of trains run increased both in passenger and in freight service; and the total train miles increased 2.87 per cent.; engine miles increased a slightly smaller per cent. and car miles, both freight and passenger, increased about 4 per cent., showing improved economy in both services; and this improvement is shown still further by the statement that the freight ton mileage increased from 20,353.7 millions to 21,588.7 millions, or about 6 per cent. As already observed, the records of the numbers of accidents and of casualties must be taken for longer periods if one is to attempt to draw from them any conclusion as to what improvement has been made. This is shown by some of the figures for individual months. For example, in July the number of persons injured in avoidable accidents fell off from 43 to 0, but the property damage fell off only about 50 per cent. In November the number of persons killed increased from 0 to 2, while the record of injured decreased from 13 to 1; but the property damage increased from $16,469 to $34,950. Unavoidable accidents show similar contrasts. In April the number of these was eight in both years; but the property damage fell off from $58,784 to $6.675; while the casualties in the later year were zero in both columns.

Mr. Park has made these statistics the subject of a circular to officers and employees, commending them for the efforts that they have made toward bringing about such gratifying results. Besides the surprise checking and other efficiency tests introduced by Mr. Park, two other prominent measures were adopted: First, a modification of record discipline; and second the granting of annual passes to the older employees. "Brown's Discipline" has been in effect on the Illinois Central since 1902, but in revising the regulations in May, 1910, Mr. Park systematized the cancellation of demerits as follows: A reprimand is cancelled by a clear record of three months; five demerits by a clear record of six months; ten by nine months; thirty by one year; and sixty by eighteen months. The annual passes to enginemen, firemen, conductors, trainmen, agents and operators are given as follows:

Five to 10 years' service: Good on division on which employed.
Ten to 15 years' service: Good on grand division on which employed.
Fifteen or more years' service: Good on system; also in favor of wife.
Pensioned employees and their wives: Good on system.

After this year the granting of these passes will depend on the employee being able to show a clear record.

MIKADO AND PACIFIC TYPE LOCOMOTIVES; BALTIMORE & OHIO.

An order for 50 locomotives was recently completed for the Baltimore & Ohio by the Baldwin Locomotive Works. Forty were Mikado locomotives, while the remaining 10 were of the Pacific type. These engines are the heaviest of their types thus far completed by the builders, and are made as nearly interchangeable as possible. The following parts are interchangeable: Boilers, cylinders and heads, pistons and rods, crossheads, piston valves, throttles, dry pipes and steam pipes, smoke stacks, smoke-box fittings, grates, trailer trucks, driving boxes, shoes and wedges, driving springs, cabs, back foot plates; throttle and reverse levers; cast steel cross ties; furnace bearers; sand boxes, bells and headlights, and various smaller details and fittings.

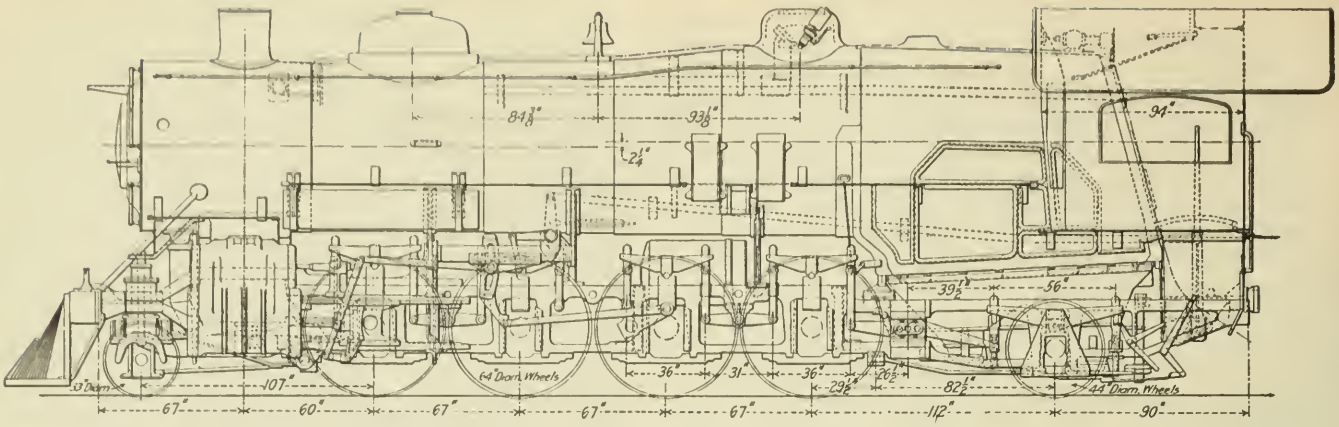
The cylinders of these locomotives are 24 in. x 32 in. and the steam pressure is 205 lbs. The tractive effort developed by the Pacific type is 43,400 lbs., which gives a factor of adhesion of 3.84; the Mikado develops 50,200 lbs., giving a factor of adhesion of 4.37. The boiler is of the wagon-top type, 78 in. in diameter at the front end and 86 13-16 in. in diameter at the dome ring. The dome is formed of a single piece of flanged steel plate. The longitudinal seams are welded at the ends and have diamond welt strips inside. The fire-box is radially stayed and flexible staybolts are freely used, especially in the throat and upper corners of the sides. The mud ring is supported on sliding shoes in front and a buckle plate at the rear. Surge plates are placed in the boiler barrel at the water level, one immediately in front of the fire-box, and the other about 7 ft. back of the front tube sheet. The injectors are placed on the back head and discharge into an internal pipe which delivers the feed near the front end of the barrel.

The steam distribution in both engines is controlled by inside admission piston valves 14 in. in diameter. The valves are driven by the Walschaert gear, and are set with a lead of ¼ in. The cylinder castings are arranged for double frame rails 5 in. wide, and are keyed to the frames at the front only. Each cylinder casting is secured to the corresponding bottom rail by 6 horizontal and 6 vertical bolts, and to the top rail by 4 vertical bolts. The castings are built with heavy walls, and are secured to the smoke box and to each other by double rows of 1¼-in. bolts.

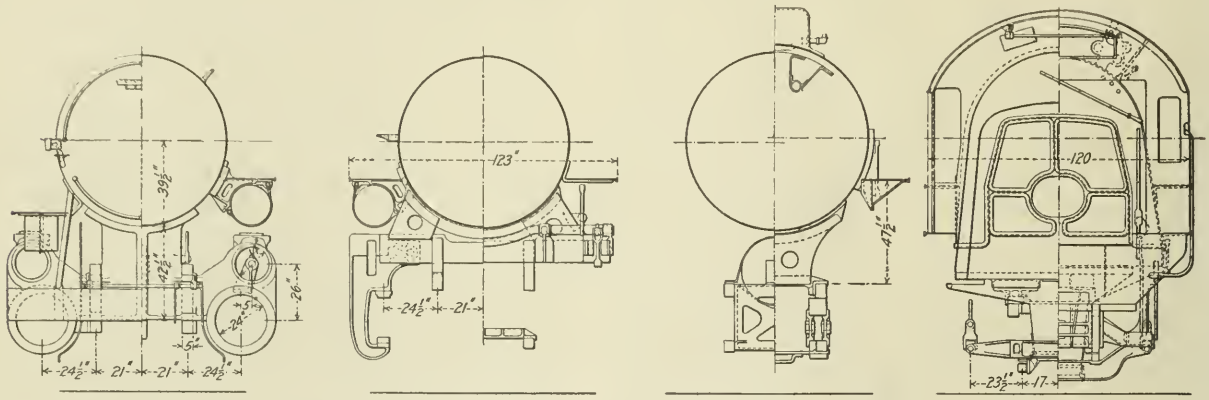
The frame construction is most substantial throughout, the main frames being 5 in. wide, and the separate rear sections 3½ in. wide. The main and rear driving pedestals in both classes are braced transversely by deep steel castings, which are interchangeable on the two types of locomotives. The top front rail on the Mikado is of cast steel and is formed in one piece with a vertical lug, to which the guide bearer is bolted, while on the Pacific type the guide bearer is secured to the frames by separate cast steel knees. The shoes and wedges on both locomotives are of cast iron lined with brass, and the driving boxes have brass faces which bear against the cast steel wheel centers.

The trailing truck used in both designs is of the Hodges type, with outside journals, its general design being shown in the accompanying illustration. A feature of this truck, as used in the present case, is a centering spring, consisting of 8 plates, each measuring 4 in. x ⅜ in. This spring is placed in a vertical position, being riveted at the top to a casting which spans the frames; it is held at the bottom in a clamp which is bolted to the truck frame. The truck spring links are jointed, to take up the side swing when the engine is curving. Waterscoops, operated by compressed air, are used on 25 of the freight tenders and provision is made for subsequently applying them to the tenders of the passenger locomotives, if desired. The center sills are 15-in. channels and the side sills 10-in. channels, with wood bumpers front and back. The tenders for the Pacific type locomotives have equalized trucks, while the trucks used under the freight tenders have one-piece cast steel side frames. Rolled steel tender wheels are used in both cases.

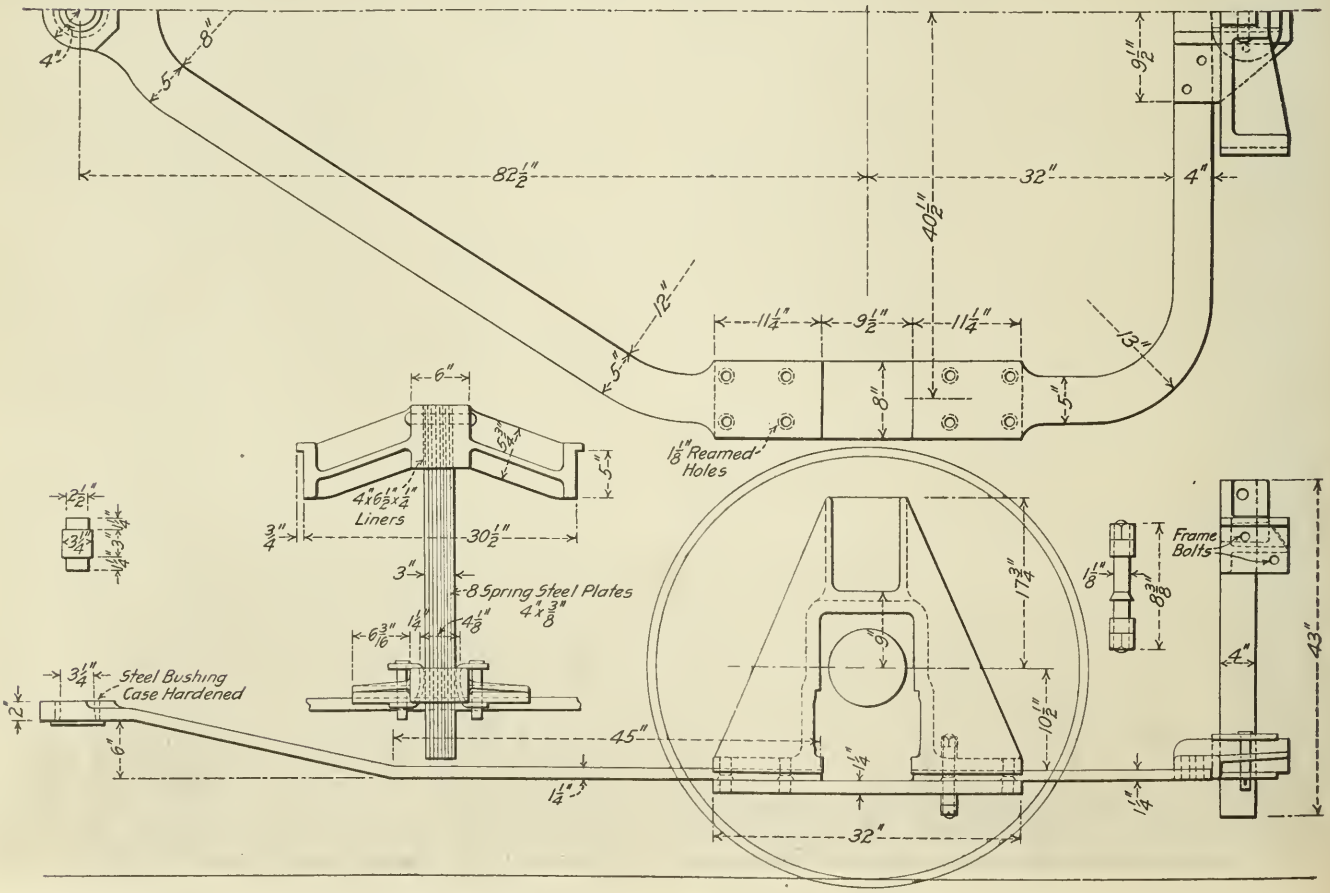
These engines rank among the most powerful single expan-



Heavy Mikado Locomotive for the Baltimore & Ohio.



Cross-sections of Mikado Locomotive; Baltimore & Ohio.



Hodges Type Trailing Truck; Baltimore & Ohio.

sion locomotives thus far constructed and the principal ratios entering into the two designs show clearly how well the weight has been utilized. For each sq. ft. of heating surface, the Mikado locomotives weigh 54.7 pounds, and the Pacific type about 2 pounds less. The horsepower output is limited by the boiler capacity, and the advantage possessed by these two designs, in this important respect, is thus established, as the engines are comparatively light in proportion to the heating surface provided. The following are the principal ratios and dimensions of the two types of locomotives:

General Data.		
Type	2-8-2	4-6-2
Service	Freight	Passenger
Fuel	Soft coal	Soft coal
Tractive effort	50,200 lbs.	43,400 lbs.
Weight in working order	274,000 lbs.	263,800 lbs.
Weight on drivers	219,000 lbs.	166,200 lbs.
Weight of engine and tender in working order	450,000 lbs.	440,000 lbs.
Wheel base, driving	16 ft. 9 in.	13 ft.
Wheel base, total	35 ft.	34 ft. 8 in.
Wheel base, engine and tender	71 ft. 2⅝ in.	70 ft. 10⅝ in.
Valves.		
Kind	Bal. piston	Bal. piston
Wheels.		
Driving, diameter over tire	64 in.	74 in.
Driving, thickness of tire	4 in.	4 in.
Driving, journals, main, diameter	11 in. x 13 in.	11 in. x 13 in.
Driving, journals, others, diameter	9½ in x 13 in.	9½ in x 13 in.
Engine truck, diameter	33 in.	33 in.
Engine truck, journals	6 in. x 10 in.	6½ in x 12 in.
Trailing truck, diameter	44 in.	44 in.
Trailing truck, journals	8 in. x 14 in.	8 in. x 14 in.
Boiler.		
Style	Wagon top	Wagon top
Working pressure	205 lbs.	205 lbs.
Outside diameter of first ring	78 in.	78 in.
Firebox, width and length	84 in. x 120 in.	84 in. x 120 in.
Firebox, plates, thickness	⅜ in.	⅜ in.
Firebox, water space	5 in.	5 in.
Tubes, number and diameter	389—2¼ in.	389—2¼ in.
Tubes, length	21 ft.	21 ft.
Heating surface, tubes	4,789 sq. ft.	4,789 sq. ft.
Heating surface, firebox	228 sq. ft.	228 sq. ft.
Heating surface, total	5,017 sq. ft.	5,017 sq. ft.
Grate area	70 sq. ft.	70 sq. ft.



Pacific Type Locomotive; Baltimore & Ohio.

Ratios.		
Total weight ÷ tractive effort	5.45	6.08
Weight on drivers ÷ tractive effort	4.36	3.83
Tractive effort × diam. drivers ÷ heating surface	640	640
Total heating surface ÷ grate area	71.7	71.7
Firebox heating surface ÷ total heating surface, per cent.	4.55	4.55
Weight on drivers ÷ total heating surf.	43.65	33.1
Total weight ÷ total heating surface	54.7	52.7
Volume both cylinders, cu. ft.	16.76	16.76
Total heating surface ÷ vol. cylinders.	299.5	299.5
Grate area ÷ vol. cylinders	4.18	4.18
Cylinders.		
Kind	Simple	Simple
Diameter	24 in.	24 in.
Stroke	32 in.	32 in.
Tender.		
Tank, style	Water bottom	Water bottom
Wheels, diameter	33 in.	36 in.
Journals	6 in. x 11 in.	6 in. x 11 in.
Water capacity	9,500 gal.	9,500 gal.
Coal capacity	16 tons	16 tons

In 1910 the gross earnings of the Shantung Railway were 9.4 per cent. greater and its working expenses 5.5 per cent. greater than the year before, resulting in an increase of 10.9 per cent. in net earnings, which permitted a dividend of 6½ per cent. on the common stock. About 56 per cent. of the tonnage carried was coal, which accounts for the whole increase in freight traffic. There was a decrease in passenger traffic, which was affected by the presence of the plague a little further north.



Mikado Locomotive; Baltimore & Ohio.

FUEL ECONOMY ON THE CHICAGO & ALTON.

An interesting example of the economy of fuel gained by the use of superheaters and the provision of ample heating surface is shown by a comparison of the coal consumption of mikado superheater locomotives and non-superheater consolidation locomotives on the Chicago & Alton. The mikado locomotives were built by the American Locomotive Company to replace the consolidation locomotive on the Chicago division. The figures are given for two sets of engines of each type, with slight differences in construction, which are indicated in the table giving the principal dimensions. The tractive effort of the consolidation locomotives is 43,305 lbs. for 57-in. drivers and 39,800 lbs. for 62-in. drivers. For the mikados it is 51,590 lbs. The cylinders of the consolidation locomotives are 22 in. x 30 in. and the boiler pressure is 200 lbs. On the mikados the cylinders are 28 in. x 30 in., an increase of nearly 62 per cent. in cylinder volume, but the boiler pressure is reduced to 160 lbs. The grate area of the mikados is also materially increased and is 50 per cent. larger than that of the consolidations. The tubes in the mikados are 4 ft. longer than those in the consolidations, and 30 of these are 5¼ in. in diameter, to provide for the smoke tube superheaters of the Cole side header type.

All of these locomotives have been running regularly in freight service between Bloomington and Chicago, 121 miles. The only important grade is .3 per cent. for 5 miles and the average speed over the division is 12 miles per hour. The consolidation locomotives were used in this service in 1909 and until the mikados were received in May, 1910, so that the comparison between the two classes of engines is for similar service on the same division and for very nearly the same months. The coal per 100 ton-miles is taken from the monthly performance sheet and includes all coal charged up against the engine—that used for hauling the train, that used at the terminal for firing up and that used while the engine was standing awaiting the train. All the engines were on full tonnage rating from Bloomington to Chicago, but on account of traffic conditions they never got a full tonnage train from Chicago to Bloomington. For this reason, the coal per 100 ton-miles may be regarded as high when compared with engines working steadily with a full rating. The figures for coal consumption are the average for the month for 20 mikado locomotives and for 10 each of the consolidations.

Principal Dimensions and Fuel Consumption of Consolidation and Mikado Locomotives on the Chicago & Alton.

	Consolidation Locomotives.		Mikado Locomotives with Superheaters.	
	Nos. 420 to 429.	Nos. 430 to 439.	Nos. 800 to 809.	Nos. 810 to 829.
Cylinders	22 in. x 30 in.	22 in. x 30 in.	28 in. x 30 in.	28 in. x 30 in.
Drivers	57 in.	62 in.	62 in.	62 in.
Weight on drivers	184,860 lbs.	203,500 lbs.	212,300 lbs.	215,200 lbs.
Engine in working order	207,360 lbs.	228,000 lbs.	269,000 lbs.	273,700 lbs.
Tractive effort	43,305 lbs.	39,800 lbs.	51,590 lbs.	51,590 lbs.
Heating surface, tubes	3,036.7 sq. ft.	3,175 sq. ft.	2-in., 2,493.7 sq. ft. 5¼-in., 820 sq. ft.	2-in., 2,493.7 sq. ft. 2⅜-in., 840 sq. ft.
Heating surface, total	3,251.5 sq. ft.	3,372 sq. ft.	3,525.7 sq. ft.	3,545.7 sq. ft.
Grate area	33.6 sq. ft.	33.6 sq. ft.	49.5 sq. ft.	49.5 sq. ft.
Average amount of coal consumed per 100 ton-miles	Nov., 1909—23.13 lbs. Dec., 1909—31.74 lbs.	Nov., 1909—22.35 lbs. Dec., 1909—28.82 lbs.	Oct., 1910—16.94 lbs. Dec., 1910—18.75 lbs.	Dec., 1910—20.16 lbs.

Comparing the coal consumption of the two types of engines for this service, we find for the month of November, 1909, the average for all consolidation locomotives was 22.74 lbs. per 100 ton-miles, while that of the mikados for October, 1910, was only 16.94 lbs., a reduction of more than 25 per cent. For the month of December, 1909, the consolidations averaged 30.28 lbs., while the mikados used an average of only 19.43 lbs., a reduction of over 35 per cent. in fuel per 100 ton-miles. The figures would indicate that the mikados with superheaters might be expected to save 30 per cent. of the fuel used in the winter months by the large consolidations. Taking the actual number of pounds of coal used by the 20 consolidations in December as 10,000 tons, a saving of 30 per cent. of this by the mikados equals 3,000 tons per month, which, at the low figure of $2 per ton, represents a saving of $6,000 per month due to the use of the 20 mikado engines with superheaters.

BREAKING-IN-TWO OF FREIGHT TRAINS.

The discussion of the cause of breaking-in-two of freight trains at the recent meeting of the Air Brake Association proved to be the most important topic considered at the convention.

F. B. Farmer advocated the prompt inspection, reporting and repair of draft rigging in the yards before the trains are finally made up; the removal of porous hose; and such manipulation of the brakes as will prevent undesired quick action. He advocated making only one reduction in applying the brakes, so as to avoid the rough handling due to several applications. Other members favored a first reduction sufficient to reduce the speed of the train down to about 8 miles an hour and then a further reduction for the stop. The paper explained that trains break in two on account of the shock caused by irregular brake power throughout the train, and said that regardless of the condition of brakes it was possible to make smooth stops by careful manipulation in brake handling. It was also explained that irregular brake power is produced by differences in piston travel on different cars.

As a supplement to Mr. Farmer's paper, M. E. Hamilton gave an interesting account of dynamometer experiments made on the Santa Fe for the purpose of determining the best distribution of empty and loaded cars in a train to prevent trains parting. He found that good results could be obtained in the average freight train by placing about 12 empty cars in front, then 10 loaded cars, and following them with 20 empty cars, the important thing being not to have loaded cars either at the front or rear.

T. J. Langan, of the Delaware, Lackawanna & Western, has been consistently working in this direction, but has made it a rule that the number of empties next the engine should not exceed ten. He stated that he thought the original cause of weak draft gears was due to the damage in hump the yards, where the cars are thrown together at speeds of from 3 to 8 miles an hour with shocks amounting to from 300,000 to 600,000 lbs. In order to prevent the excessive speeds in the operation of the hump yard they had made it a rule to require the men who ride the cars to stay on them until the couplings are made, and that the speed at the time of the automatic coupling should not exceed 2 miles per hour. In consultation with the transportation officers, it was found that it was impossible to entirely stop the abuse of the cars at humps, and Mr. Langan, therefore, concluded that the only remedy for damaged couplers and draft gear thus produced was the use of friction draft gear which would absorb a large percentage of the shock.

The president of Brazil issued a decree on March 29, 1911, authorizing the finance minister of Brazil to issue bonds to the amount of $15,000,000. The proceeds of this issue will provide funds for the payments due to the contractors of the Madeira-Mamore Railway, the Sao Luiz-Caxias Railway, the extensions of the Sobral and Rio Grande do Norte Central lines, and various other connecting lines under construction in the states. The bonds will be of the par value of $500, and will bear 5 per cent. interest, payable semi-annually. Amortization will be at the rate of ½ per cent. per annum.

Maintenance of Way Section.

CONTRIBUTIONS should be sent in promptly for the contest on how the roadmaster can promote efficiency. Several good papers have been received already. This subject is of such general interest to all men engaged in maintenance of way work—roadmaster, engineer and superintendent—and has received so much attention, that the number of contributions should be large and a variety of ideas should be brought out. Nearly every progressive maintenance officer has worked out some plan which has bettered conditions in his department. A free exchange of ideas on this live topic will be of much value to every one engaged in this class of work. A first prize of $35 will be given for the best article received on this subject, and the second prize will be $20. We will pay our regular space rates for all others published. All contributions must be received by the civil engineering editor of the *Railway Age Gazette,* 417 South Dearborn street, Chicago, not later than July 1.

SEVERAL good kinks were submitted in the general competition just closed, describing methods of handling bridge maintenance. To draw out more in this line we announce a contest on bridge kinks, to close August 1; it will include methods of handling problems, either of repairs or renewals, commonly met with in the maintenance of timber or permanent bridge structures. In this class of work the methods of operation have to be carefully worked out in advance, and the plan of procedure adopted carefully followed during the work. Much greater preparation and precision are required than in ordinary track work, for when the track is once disturbed by a bridge renewal the definite amount of work outlined must be done before the track can again be put in service; and any hitch in the program will tie up traffic. The ways of handling this sort of work vary greatly and afford much opportunity for originality and ingenuity. A first prize of $25 and a second prize of $15 will be awarded for the best two contributions, while all others published will be paid for at our regular space rates. All contributions must be in the hands of the civil engineering editor of the *Railway Age Gazette,* 417 South Dearborn street, Chicago, by August 1.

THE judges of the track kink competition which closed June 1, were H. J. Slifer, general manager of the Chicago Great Western; E. P. Bracken, assistant general manager of the Chicago, Burlington & Quincy, and W. H. Finley, assistant chief engineer of the Chicago & North Western, who have carefully gone through the twenty-four contributions received, of which thirteen are given elsewhere. The contribution on Picking Up an Unloading Plow, by A. M. Clough, supervisor of track of the New York Central & Hudson River at Batavia, N. Y., was awarded the first prize of $25, and the second prize of $15 was awarded to G. Le Boutillier, division engineer of the Pennsylvania Railroad at Cincinnati, Ohio, for his contribution on the Monkey Bar. Other kinks which were accepted for publication were submitted by C. F. Green, supervisor of bridges and buildings, Southern Pacific, Sacramento, Cal.; M. Ganley, roadmaster, Santa Fe, Argentine, Kan.; E. Keough, roadmaster, Burlington, Aurora, Ill.; J. M. Sills, district engineer, St. L. & S. F., Springfield, Mo.; R. Huber, roadmaster, Burlington, Brookfield, Mo.; H. H. Cleveland, roadmaster, Santa Fe, Wellington, Kan.; Robert H. Orwig, supervisor, Cumberland Valley Railway, Chambersburg, Pa.; B. P. Kyle, El Paso & Southwestern, Douglas, Ariz.; M. Joyce, roadmaster, Chicago & North Western, West Chicago, Ill., and A. M. Clough, supervisor of track, New York Central, Batavia, N. Y. While no doubt some of these kinks may not be new to part of our readers, we believe they are worth publishing if they are new to a large number. It probably would be possible to get descriptions of very few good new track devices or methods which are new to all, but if economies can be gained by a more general use of any device not now known to a large number it is deemed worth describing. The matter submitted was, as a whole, very good and the contest highly successful.

THE work being done by the Educational Bureau of the Union Pacific for the education of the maintenance of way employees of that road deserves general attention. While the results of it may not appear as quickly as those of a prize or a bonus system, they are apt to be more permanent; and experience has been that the work of a student in one of the courses shows a marked improvement within a short time. The taking of a course is optional with the employee, and the benefits secured by him are proportionate to the labor that he expends on it. Most track men have but an elementary education and usually have no chance to study further if they desire. It very frequently happens that the best track man in a gang cannot be promoted to a foreman because he is unable to make out the necessary reports; while many foremen who can handle all sorts of difficult track work dread the clerical work. While the educational work benefits the company by helping to develop a class of men eligible for promotion, the men are benefited to a greater degree by being made eligible for promotions which otherwise they could never get. It is encouraging in these days of pessimistic ideas concerning track work to note the enthusiasm with which track men on the Union Pacific are studying, and hear them say that by it they are learning many new things about track work which are helping them in their everyday labor. The fact that the railway company gives these courses free of charge ougth to develop a bond of common interest and tend to revive the old spirit of loyalty which was formerly common among track men, but which is seen but occasionally now, and then only among men of the "old school."

IN this day of specialization we are too apt to confine ourselves entirely to our own narrow field. This point is emphasized by a division engineer in his talk to maintenance employees, which is given in another column. Intelligent and trained men are necessary in charge of signal systems, of bridge structures, of elaborate stations and other buildings, and of electric transmission systems; and there is danger that in the training of these men they will be developed into mere signal or bridge maintainers instead of broad railway employees maintaining signals or bridges. Will such employees notice a signal at "proceed" at the entrance to a block in which a train is standing, or will they notice a cut beginning to slide toward the track? Do they know what clearance is required to insure that a train can pass under some nearby part of a structure? If they do know these things, do they know what measures to take to remedy bad situations and how to report them? Many railway officers are working individually to meet the tendency towards excessive specialization, but, generally speaking, the railways are not doing enough to broaden their men. It is not essential that a bridge carpenter be able to put in a frog, or that a section man be able to test for wire failure, but the bridge man should recognize defective or unsafe track when he sees it, and the section man should notice and remove a fallen limb from a telegraph wire. Any employee in the maintenance of way department, whether he be a carpenter, lineman or tinsmith, should recognize and be able temporarily to repair, or at least protect, any dangerous condition he may find, until a skilled workman is able to reach it. To

make sure that employees have this general knowledge it is the practice on one road to require all men in the maintenance of way force who are employed in independent work near the track, such as carpenters or linemen, to pass an examination on such operating rules as affect safety. In addition to this, meetings are held at intervals at which the different rules are discussed and their necessity explained, in this way securing greater co-operation between the employees of different departments. To encourage the men to look beyond their own work a number of roads are making special mention or giving merit marks to those who do something out of their regular prescribed duties. For example, on the Rock Island a section foreman was recently credited with 10 merit marks for detecting a broken arch bar on a passing train, and on the Canadian Pacific a section foreman was given three marks for making temporary repairs to a copper telegraph wire.

COST DATA.

MANY engineers or roadmasters have no definite idea of what the piece of work they may be doing is costing them. They know they are expected to handle it as it has been handled before, and they may perhaps make some changes where the possibility of improvement is evident, but they do not know how much of a saving may have resulted. On most railways few, if any, of the men actually in charge of work see any figures regarding its cost. The time rolls and charges for material are sent to the general auditor's office, where the charges are entered under the headings prescribed by the Interstate Commerce Commission, and no definite detailed cost data is secured even here With this state of affairs there is not a great deal of incentive for a man to try to lower the cost of any work below the general average, for neither he nor any one else will know the resulting saving. If, on the other hand, foremen were advised each week or month just what their work during the preceding period had cost, they would have these figures continually in mind and would try to lower them by a better arrangement of forces or the adoption of methods. They would know that both good and poor management would show at once in their records and that their work would be judged accordingly by their superiors.

The unit costs of similar work done by different men made up on a small report and sent to all would tend to stimulate each to keep his costs down. Such data would also uncover many leaks that are now unnoticed, for attention would at once be called to any figures that were unusually high and the causes would no doubt be ascertained. The results obtained by any two men's work side by side will vary widely, and the poorer man can always be shown his weakness far more clearly and forcibly by a definite comparison of figures than by any general criticism.

Any work done without a knowledge of its cost is sure to be expensive, for when the man in charge does not have the expense he is incurring constantly impressed on him, many unnecessary items will escape his attention.

It sometimes happens that a supervising officer will require a certain piece of work to be done a certain way simply because it is his way, although there may be other methods equally good. Such unreasonable restrictions are an indication of narrowness, and have a bad effect upon subordinates. It is difficult enough to get men to think without unnecessarily discouraging such action. If a subordinate gets the same results by a method different from that to which his superior is accustomed, he should be encouraged to continue to use it; for when he relies on his own initiative he may discover methods better than any previously tried. He who studies his work carefully is also thereby better equipped to handle other work. The increased clerical labor involved in an adequate tabulation of cost data is small and will be repaid many times over by the stopping of leaks and the better results secured.

AVAILABLE SUPPLY OF SECTION FOREMEN.

A ROADMASTER on a main line division of a road that has a reputation for maintaining its track at a very high standard says that on his territory there are just four men who are not now section foremen who would be available for promotion to that position in case of necessity, and that none of them has shown a capability for the work. This roadmaster frankly says that he sees no way to supply the demand for section foremen that must arise as his present foremen leave the service. His only hope is that in some way he may be able to keep these men on their sections as long as he is responsible for the division, and beyond that he does not concern himself. This condition is by no means peculiar to the road referred to. It is safe to say that a majority of the roads of the country have no available supply from which to draw competent foremen, and are now facing a serious problem on this account. While the roadmaster is directly responsible for the appointment of section foremen and should keep in mind the necessity for training men for that position, the present situation is one that should also have the consideration of operating and maintenance of way officers in general.

The reasons for the lack of available men for foremen's positions are so well known to maintenance men that they require little comment. Briefly, the situation is about this: A section foreman capable of efficiently maintaining high grade track must be intelligent and experienced, industrious and reliable, and have the ability to handle men. The natural qualifications required were found in a high degree in the Irish and German track men who a few years ago were found on American railways in large numbers. Men of this class, however, have been drawn into other lines of work because the rate of pay of track men has not increased as rapidly as that of laborers in other lines. Native Americans, or the descendants of these old track men, make good foremen as a rule, but the necessity for spending several years as laborers before they can become foremen prevents the most desirable men of this class from going into track work. The men who can do section work at prevailing rates of pay are, for the most part, immigrants from southern Europe and Mexico. These people come in groups, live in poor quarters, and either return to their homes after collecting a small amount of money or drift into some commercial line as they become acquainted with American customs. The number of immigrants that can be made into good section foremen by the usual methods is very small. In some cases, however, where special efforts are made to interest the men in track work and to teach them the details of proper maintenance, good foremen are secured.

The natural result of the difficulty of obtaining competent foremen is that incompetent men are filling these positions in many cases. One roadmaster can no longer rely on any one foreman on his division to cut the rail and install a switch; when such work must be done he sends two foremen to work together. Within the past month a serious wreck on a western road was caused by the neglect of a section foreman to send out a flagman a sufficient distance from the point where rail was being relaid. Similar instances of inefficiency on the part of foremen have led some roads to experiment with systems of training section foremen. The Union Pacific has tried a "school gang," in which prospective foremen are placed and instructed by competent men in all branches of maintenance. By this system the men are fitted for foremen's duties in a much shorter time than is common, and on that account a better class of men is secured.

All consideration of this problem, however, must lead to the conclusion that the real cause of the scarcity of good section foremen is the low rate of pay which is offered on American roads for this work. There does not seem to be the necessity for increasing the pay of section men as long as they are immigrants who are willing to work for present wages, but until the pay offered section foremen is made materially greater and more consistent efforts are made to train them, the problem of securing efficient foremen will continue to be serious.

ENGINEERING ARTICLES SINCE MAY 19.

THE following articles of special interest to engineers and maintenance of way men, and to which readers of the engineering and maintenance of way number may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since May 19:

Enginering Law.—Review of a book on the law of contracts as applied to engineering practice. May 26, page 1193.

Recent Immigrant in Railway Construction and Maintenance of Way Work.—W. J. Lauck, who made the industrial investigations for the Immigration Commission, gives the results of his investigation as applied to railway labor. May 26, page 1201.

China's Most Modern Railway.—The Shanghai-Nanking Railway is the best example of modern railway building in China, on which permanent construction has been made. The article on page 1241 of the issue of June 2 gives the interesting features of the construction work and the conditions surrounding the building of this road.

Notes on Plate Girder Design.—Review of a text book on the design of plate girder structures. June 9, page 1301.

The architectural features of the new passenger station of the Chicago & North Western in Chicago were described and illustrated in the issue of June 9, page 1311.

EFFICIENCY IN TRACK WORK.

BY AN EX-TRACK INSPECTOR.

The recent editorial remark in the *Railway Age Gazette*, that the maintenance of way methods of twenty years ago must be cast aside, compels anyone interested in this important department of railway work, to pause and consider if track supervision has not deteriorated to almost the same extent as track labor, and if it would not be well to *return* to the methods of twenty years ago.

That track labor has deteriorated, both in efficiency and intelligence, is a grim fact, and the railways have themselves to blame for the fact that while cost has gone up, efficiency has gone down. It was not in their power entirely to keep down the cost any more than it is in our power to keep down the cost of living, but it was in their power to maintain efficiency and by maintaining efficiency, they would at least have obtained better results for their outlay. It is a question if they would not have secured better results with a smaller increase of expenditure than they are forced to make today if they had adopted a more liberal policy when the signs of the times pointed to the fact that such a policy was due. However, they did not do this, and they have, and must continue to pay for their mistake. They have lost men by a mistake in policy, and it was inevitable that in losing them they should lose some of their better methods.

To illustrate, twenty-six years ago a Canadian railway was running what was then claimed to be the second fastest train in the world, a train running north out of London, England, holding first place. The road this train ran on was new, was cheaply built, had little ballast, was only three-quarters tied, and was laid with 56-lb. rail, with stub switches. It was made up of four cars, baggage, second class, first class and Pullman, and the engine was the same class as is used today on many four-car trains. There was also the usual number of local passenger and freight trains. To maintain such a track under such traffic required better men and more scientific methods than are in vogue today on 99 per cent. of our most up-to-date railways. I doubt whether, with the men of today and under our present methods, any of us would dare to run such a train over such a road for one trip; yet the train I have reference to ran for two years, and never once met with an accident.

The men who made this possible were sons of Canadian farmers, and they were paid $1.00 per day, the foreman getting $1.25. There were three men and a foreman to each section of seven miles. The method used was as follows: In the first place, the track was put in almost perfect line, surface and gauge by a small extra gang under an engineer and foreman, the former giving line and surface with his instrument. Then it was left to the roadmaster and section crews. Independent of the roadmaster, there was a track inspector, who rode over the line each day on the fast train, and it was his business to pick out and note all spots not riding smoothly. The two worst spots on each section he reported to the foreman, either by throwing a note from the end of the train, or by wire, and it was the foreman's business to attend to these at once. At the end of the trip the inspector compiled his report, sending one copy to the roadmaster and one to the general manager. It was the roadmaster's duty to see that the spots were attended to promptly, and the manager's office could check him each day, and see that he did it. A spot reported two days in succession called for an explanation. The roadmaster laid out his season's work and proceeded with it, but the daily inspection of section and attention to the spots reported by the inspector had precedence over regular work. This took up from two to four hours of the section crews' time each day, the remainder being put on the regular work of putting in ties, surfacing, lining, etc.

This may not appeal to some people as being unusual, or likely to give extraordinary results, but it did give such results. Ride over one hundred miles of ordinary railway, on the rear end of a fast train, and count the number of "rough" spots. Then subtract twenty-eight of the worst of these from your total, and think what a vast improvement this would make in the riding of that one hundred miles of road. Two rough spots taken out each day means twelve taken out of each section each week, and it does not need a diagram to show that the day will soon come when a rough spot will be hard to find. As a matter of fact spots worth reporting will soon be hard to locate from the end of a smooth-riding Pullman car and then the inspector should go up on the engine and begin all over again, for the engine will indicate many when the car will not show one.

If such methods, with the men we had in those days, could do so much with such a road, what could they do with our roads as they are today? But the men are gone, and so very largely are the methods, and there is every indication that we must go back to the methods and train the men up to them. It will cost money, but that is the price we must pay for following a short-sighted policy, by which we first killed the enthusiasm of our competent men, and then lost the men. At one time it was a question of money only, and not very much money. Now it is a question of both time and money, and much money.

As to the idea of offering premiums, or cash prizes, it is not new, and at best can only be of temporary benefit. I have had experience with it, and I think I know that men generally regard it as an attempt to get several hundred dollars' worth of work done for $50. Even so, it may speed things up for a time, but the final result is sure to be dissatisfaction, leading to a distrust of the company's sense of fair dealing and leaving a poor foundation on which to build for the future. Educational courses are a step in the right direction. They are necessary, and will do more than instruct the men. They will restore the enthusiasm that has been lost and that we miss so much. Then, with a more liberal policy in operation and closer and more effective supervision, we may soon more than make up what we have lost.

In using the term "liberal policy" I do not mean increase of pay for men, but much more than that, for there are things that count more than a small increase. When we have roadmasters and section crews interested in this work, they will lay out their season's operations with a liberal hand and do all possible to reach the point aimed at, which is, to get their track in the best possible shape against the time when winter closes down on them. For years it has been the policy to reduce the working force in the fall, just about the time the roadmaster and foreman are making their best efforts to reach their goal, and they are balked in their laudable desire to give their company the best

possible results for the money paid out. It is this kind of thing coupled with failure to receive material when it could be best used and the too-frequent removal of crews from their sections to lay new sidings, or do other extra work that cools enthusiasm and lowers efficiency.

There is a great lesson in the old story of the foreman who, when told that the pay car would be along tomorrow, replied, "To h—— with the pay car; did you see anything of that car of joint ties I am looking for?" We don't have to make an effort to keep up interest in the pay car, but let us do all we can to keep up an interest in "joint ties."

A TALK TO MAINTENANCE EMPLOYEES.*

BY A DIVISION ENGINEER.

You have been asked to come here where you can sit comfortably and quietly and think for an hour with me. One of the dangers of our work is that we get so engrossed in doing the specific thing that has been assigned us, carrying out instructions and getting our eight or ten hours of work completed, that we become machines and have a limited point of view. I think that if we make appointments with ourselves at intervals of six months or a year and try to consider where we are drifting and what we are trying to do, and spend the rest of the time getting things done, we have the greatest efficiency possible. You have been instructed and are daily instructed in your duties. I want now to tell you what they mean, how they count and the relative importance of our different duties.

The most important duty and the first rule in the book is that of safety. To promote safety every foreman on this division has been examined physically to see whether there is any tendency to heart disease, apoplexy or other bodily failure which would be dangerous for him or the patrons of the road. You have all been examined on color sense, eyes and hearing. You have passed a written examination covering the rules of safety and have had explained to you just what each one means. I want to emphasize the importance of having a knowledge of these rules so clear to you that action is automatic. If you will occasionally devote an evening or a Sunday to reading over the rules and refreshing your memory, you will be a more valuable man to the company and may save loss of life or damage to property.

These rules are useless unless they are enforced with common sense. For instance, a short time ago one of our bridge inspectors was sent to examine the construction of a bridge and see if some signal attachment could properly be made. At a point 2 ft. from that which he examined, the lower chord of the bridge was so corroded that it was in a dangerous condition and might have fallen on the track. The bridge inspector never noticed this. He did what he was told to do and did it correctly and then went to the station and waited 10 or 15 minutes for a train, instead of spending that 10 or 15 minutes thinking about what he was really sent out for and seeing whether there was any reason, other than the form of construction, which would prevent the attachment. That man knew enough to know that the bridge was dangerous, if he had been alert and noticed it, and the fact that he did not notice it indicates that he was not alert. This affects his chances not only of promotion, but also of staying on the road in any responsible capacity. That is, the rules represent the minimum action that is necessary; in additon to this you are asked to use judgment and common sense and to be alert; and you are asked to think.

Whenever we have reduced force, owing to a less amount of work being authorized, I have had a complaint from some foreman who did not believe that he, who had been in the service twenty years satisfactorily doing the work assigned to him, should be allowed to go while another man with less experience, who had only been on the road three or four years, was kept on the pay-roll. I have tried to explain to such a man (and I confess without much success) that the reason that they were allowed to go and men of less experience kept was that we believed that the latter men were thinking; that they were more liable to qualify for further responsibilities and promotion and that it was easier for us to teach them their duties than it was for us to teach the older employees to do more than their duty. This same principle applies when we increase force, owing to more work being authorized. In such cases we feel it is a personal criticism of ourselves if we have to employ additional foremen or inspectors to do such work instead of promoting men who have had a chance to earn the right to such promotion.

Prompt reports are necessary for modern railway operation. Men who decide what trains should run and, in the event of trouble, what help is necessary, are in a small room next to us and cannot see farther than across the street. Unless they know what is going on they are helpless, and while conditions seem obvious to those of us who are on the ground in any wreck or break-down they are not obvious to the man in the despatcher's office, unless he is told clearly and concisely, without prejudice, what the conditions are, what help should be given and when the tracks should be clear or the engine be in condition to run. You should remember that you are representatives of the railway while on the right-of-way. You will not be criticized for reporting a condition that has already been reported. Your way of stating it may add something to the knowledge of the despatcher, or it may be that he would appreciate the opinion of another man to strengthen his reasons for action.

Everything that affects operation should be reported to the train despatcher. After that, tell your immediate superior what you have done. If you get the use of the track and then protect it by the proper flags and torpedoes it is your business to yourself to report when you have completed your work on the track and it is again ready for the usual service. You are in a better position than any one else to tell when that work was completed if you did it. A few years ago a foreman got the use of a track for three-quarters of an hour and told the despatcher that the track would be all right after that. Then he finished his work and went home. The despatcher did not dare to put the track in service until he got a report of the actual completion of the work. He could not find the foreman. It was at night and he had to get hold of a roadmaster and wait until he had got there and walked all the tracks that had been put out of service and pronounced them in good condition before he could let trains operate over them. That foreman held up traffic on that track for two hours because he just did his own work and did not think what it meant, or stop to recall the rules.

If these generalities and incidents are suggestive enough to make one out of fifty of you try to think and develop yourself, our hour has not been wasted. If all of us in passing over the right-of-way feel responsible not only for the work assigned, but also for the safe conduct of transportation and the protection of company property, we shall give the patrons of this road a protection and a seucurity that will increase travel, reduce cost and make the work safer for ourselves, who are on the trains a large portion of the time, and for our families and friends who may be traveling. We shall increase our own usefulness and I believe in time get not only the pleasure of doing good work, but also a chance for more responsibilities and a happier life.

*Last winter this engineer gathered together, several times a week, as many men as he could comfortably take care of in his office and made them this talk, after which they asked him questions.

DEVELOPMENT OF PORTLAND CEMENT INDUSTRY.

The development of the Portland cement industry in this country is shown by the following figures of production for the past ten years:

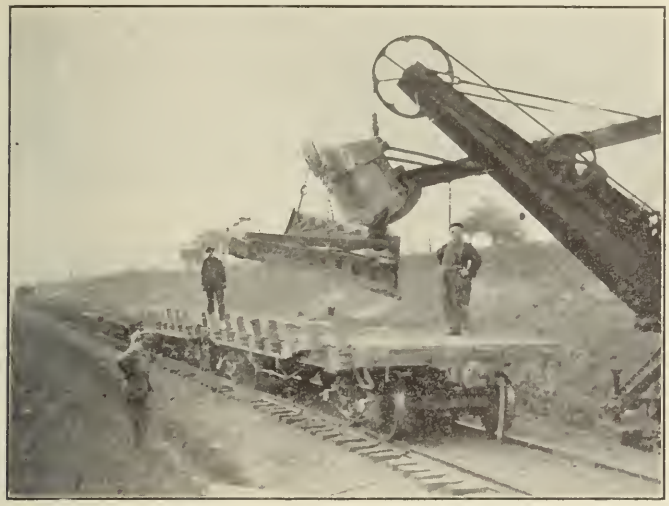
1901	10,711,225	1906	46,463,424
1902	17,230,644	1907	48,785,390
1903	22,342,973	1908	51,072,612
1904	26,505,881	1909	62,508,461
1905	35,264,812	1910	73,500,000

TRACK KINK COMPETITION

FIRST PRIZE—HANDLING AN UNLOADING PLOW.

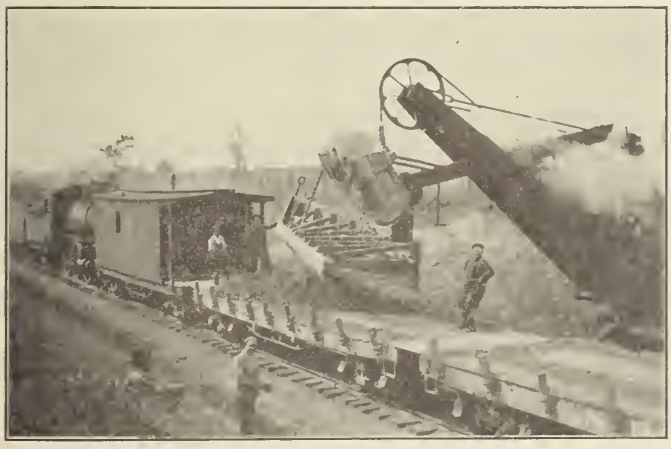
BY A. M. CLOUGH,
Supervisor of Track, New York Central, Batavia, N. Y.

In double tracking operations on the New York Central & Hudson River the following method of handling the unloading plow was used where a steam shovel was widening a cut, the material being unloaded a short distance from the shovel.



Lowering Plow.

The nearest siding was about three miles away. Instead of running to this switch, each time a train was unloaded, to shift the plow to the rear of the train, hooks and chains were arranged on the plow so as to balance it, and it was picked up by the steam shovel, a 70-ton Atlantic type, and held while the train pulled along underneath it, being placed on the last car ready to plow off another train. It required 30 minutes to run to the switch after unloading a train and switch the cars, including the



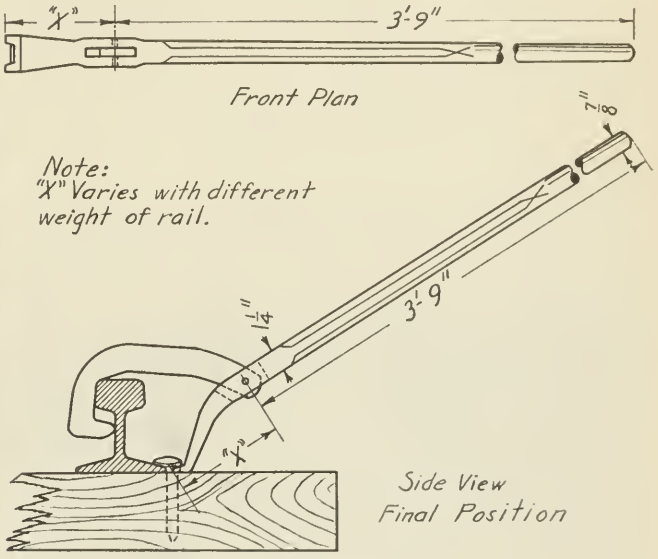
Unloading Plow.

turning back of two heavy aprons. Six trains were loaded and unloaded each day and the elimination of this switching resulted in a total saving of three hours for the train equipment and steam shovel. Practically no time was required to change the plow in this way, as the train stopped at the shovel just a few seconds to allow it to pick up the plow and then moved slowly along and stopped again while it dropped the plow down in the same interval and started loading at the forward end of the train.

SECOND PRIZE—RAIL MONKEY BAR.

BY G. LE BOUTILLIER,
Division Engineer, Pennsylvania Lines West, Cincinnati, Ohio.

This monkey bar is used when relaying rail to hold the new rail against the line of spikes which has not been drawn, as shown in the sketch. Ordinarily three men with lining bars are required to hold this rail to place while it is being spiked, but



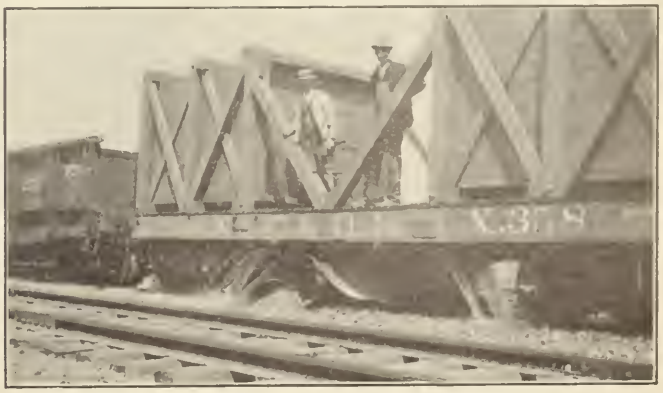
Monkey Bar.

by the use of this tool one man can do the work for the ordinary number of spikers. It has been used locally on the Cincinnati division and was made by the local blacksmith, the main bar being an old lining bar properly shaped. It has been found to work satisfactorily and result in a saving of labor.

SPRINKLING STONE BALLAST.

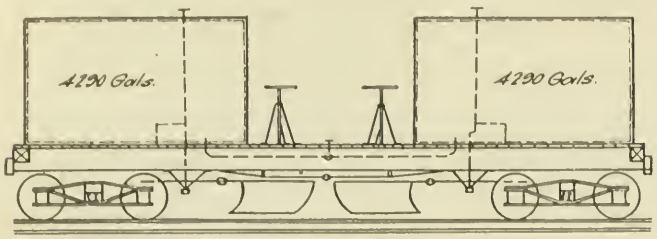
BY A. M. CLOUGH,
Supervisor of Track, New York Central, Batavia, N. Y.

When stone ballast is being laid the dust fills the cars to the discomfort and annoyance of passengers in coaches and dining cars. To eliminate this trouble a Rodgers ballast spreader has been equipped with two tanks of 8,000-gal. capacity, which are filled with water from the water columns near the work. They are provided with a sprinkling ar-



Sprinkler in Operation.

rangement similar to an ordinary street sprinkler, and while the stone is being unloaded and plowed out, the spinkler is operated with excellent results. The white stone dust is



Sprinkling Car.

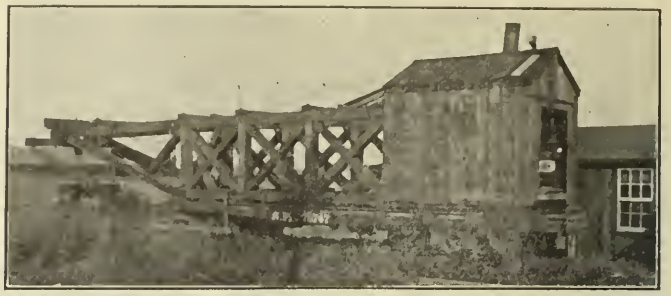
washed down to the subgrade and the stone left clean and blue and perfectly dustless.

RAISING A TRESTLE.

BY C. F. GREEN,
Supervisor Bridges & Buildings, Southern Pacific, Sacramento, Cal.

In the raising of 8,000 ft. of a six-stringer trestle approach to a steel girder bridge over the Yuba river at Marysville, Cal., which has just been finished, a special derrick car was rigged up and used successfully. The trestle had to be raised 7 ft. above the old caps, and is 14 ft. above the water, which varies from 4 to 8 ft. in depth. The work had to be done under a traffic of twelve regular and two extra trains during the day of 12 hours, and was handled with a derrick built by bridge carpenters at a cost of $215. A self-propelling pile driver was used as a work engine, being protected by flags, and a gang of 16 men was required, the wages for a 10-hour day amounting to $40.

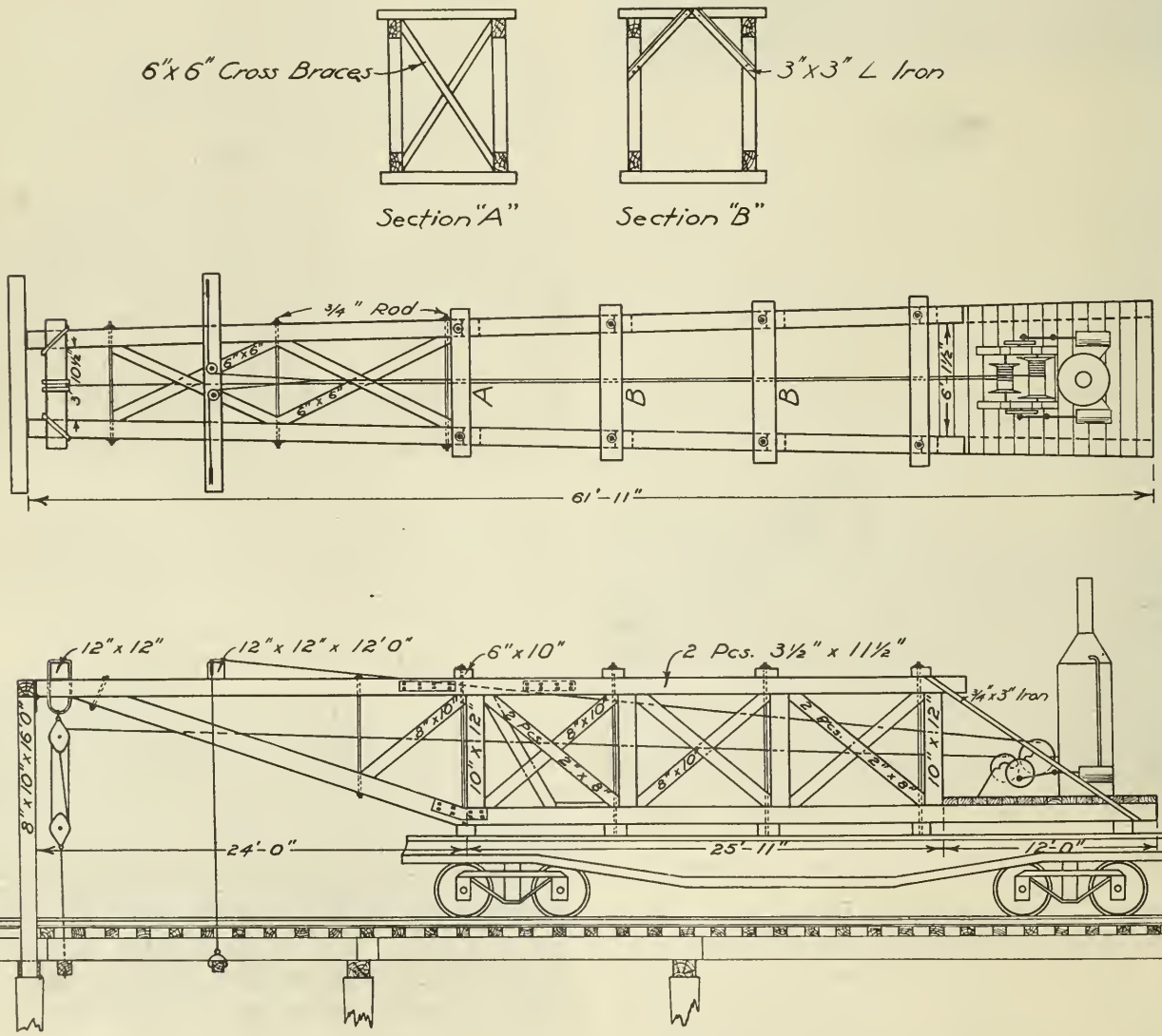
The derrick was built on a steel flat car and a double drum donkey engine was used. It was found that the weight to be lifted was too great for the front trucks of the car, and it was



Derrick Car.

necessary to put two legs under the overhang of truss with large hinges at the upper ends.

A single block was placed on the upper chord about 6 ft. back of the hinged legs, and a line with timber hooks on one end was run through the block to a gypsy on the donkey engine. This line was used to hoist these legs up, while moving the derrick,



Derrick Car for Raising Trestles.

catching them with timber hooks. This line was also used to hoist the blocking in place.

To hoist the deck of the trestle there were used a double three shive block with a ¾-in. wire cable attached to the head of the truss at the end of the overhang, and a piece of 12 x 14 Oregon pine, of a length sufficient to reach from outside stringer to outside stringer, and with a 2 in. eye bolt through its center long enough to come up through the ties and between the rails. After the piece of 12 x 14 timber was placed under the stringers a shackle pin from the lower block shackle was passed through the eye bolt, and the trestle was raised 18 or 20 in., off caps or blocking, for two bents of 15-ft. centers. This tackle is shown



Derrick Car in Service.

herewith fast between the rails, and the side line is raising a piece of timber with the timber hooks for blocking.

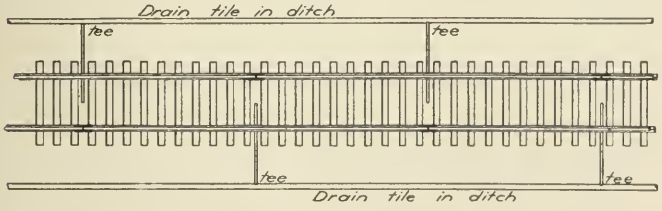
With this outfit two bents were raised and blocked every five minutes and made ready to move ahead. They were also raised, cribbed and shinned for a runoff to let trains pass in eight minutes.

One day was spent in cutting, cribbing and placing the material convenient to the work, and the next day in raising the trestle. Working in this way 1,120 ft. of trestle was raised one foot high at a cost of $80 for labor, or 7 1-7 cents per lineal foot of trestle. This method has the advantage that when not in use the donkey engine can be slid off the car and put to other use, leaving no money tied up in dead tools.

DRAINING SUBGRADE.

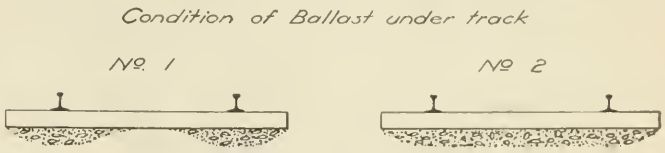
BY R. HUBER,
Roadmaster, Chicago, Burlington & Quincy, Brookfield, Mo.

The following method has been used to drain wet cuts and fills in northern Missouri: Test holes were first dug to find the bottom of the ballast. Levels were then run over the track by the engineer in order to provide for an ample fall and to be sure that the drain tile was placed low enough to drain the subgrade. Trenches were dug 18 in. below the ballast on each



Method of Placing Tiles.

side of the track from 5 to 6 ft. from the ends of the ties and 6-in. tile laid. T-connections were placed every rail length on each side, staggered, and drains laid to the center of the track. This tile was first laid at the ends of the tie, but the soil was so slippery that it was impossible to maintain the tile this way. Previous to the placing of this tile the track continually got out of surface and alinement, and there were places where slow orders were necessary three months out of the year. After the tile had been in 60 days—it takes about that length of time for the track to



settle after the tile has been placed—no slow order has been necessary, because of defective track; and some of the tile has been in three years.

DERAILING GUARD RAIL.

BY R. P. KYLE,
El Paso & Southwestern.

At many points, such as ore loading chutes, empty cars are shoved in on a spur and dropped down by hand as fast as they are loaded. Very often in dropping these cars the laborer uses poor judgment and they are derailed. Being very heavy, it is



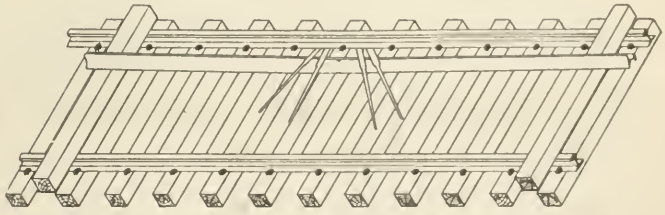
Derailing Guard Rail.

necessary to unload them before they can be re-railed. This guard rail opposite the derail keeps the truck up next to the rail, and makes it very easy to place a frog and pull the car back on the track.

METHOD OF BREAKING RAIL.

BY J. M. SILLS,
District Engineer, St. Louis & San Francisco, Springfield, Mo.

Cut ½ in. to ¾ in. into one edge of the base of the rail with a chisel at the point where the rail is to be broken.



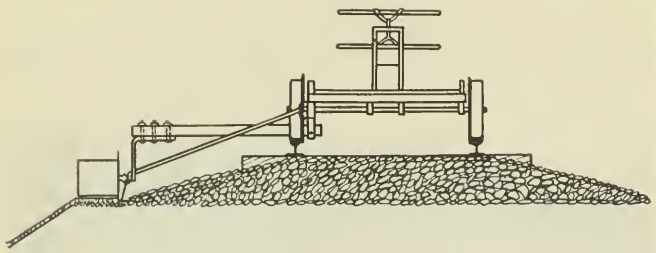
Then place the rail on two ties about 20 ft. apart with the notched edge down, as shown in the figure. With four or

five men bearing down heavily on bars placed across the rail, as indicated, place the chisel on the base exactly above the place where it is cut and hit with the maul. Usually one stroke is sufficient to make a clean break. If it is necessary to make the cut close to the end of the rail, fasten another rail to the one which it is desired to cut by means of angle bars, and proceed as before. The resulting break is even more perfect than can be obtained by sawing.

SOD LINE TRIMMER AND ROLLER.

BY A. M. CLOUGH,
Supervisor of Track, New York Central & Hudson River, Batavia, N. Y.

A sod line trimmer and roller saves a lot of hard, tedious labor where a sod line is maintained on the shoulder of first-class track. It is made to attach to an ordinary hand car, is adjustable to any gage, and can be unshipped in a few seconds. It consists of a sharp cutting disc attached to a



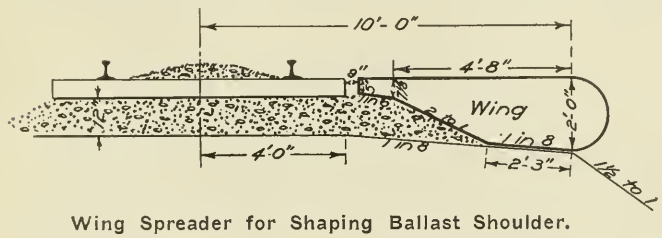
Sod Liner, Trimmer and Roller.

roller and cuts the sod clean as it is pushed along. A small plow inside the cutting disc plows in any sod trimmed off far enough so it can easily be removed with a shovel. A section gang of six or eight men can do more of this work with this tool in a day than fifty men with spades.

WING SPREADER FOR SHAPING BALLAST OF EMBANKMENT SHOULDER.

BY H. H. CLEVELAND,
Roadmaster, Atchison, Topeka & Santa Fe, Wellington, Kan.

This device is a wing to be used on a dirt spreader for shaping a ballast shoulder of sand, gravel, cinders or other low material. It can also be used for renewing the subgrade shoulder of the embankment without disturbing the ballast shoulder. In renewing the subgrade shoulder the dirt can be unloaded on to the ballast shoulder in the ordinary way. If this wing is properly adjusted at an angle of 50 or 60 degrees and run over the embankment it will clean this dirt off the ballast shoulder and place it on the subgrade, at the same time pushing the surplus



Wing Spreader for Shaping Ballast Shoulder.

dirt over the embankment, without disturbing the ballast. In dressing up the ballast shoulder, if the wing is placed at an angle of 50 or 60 degrees and the machine backed up this wing will gather the scattering ballast from the subgrade and place it on the ballast shoulder without mixing it with the dirt, if the wing is properly handled. With this device an amount of embankment could be shaped up that would require a large number of men. Also, it is not necessary to remove the ballast shoulder, with the resulting expense and loss of ballast when widening an embankment.

RATCHET WRENCH FOR TRACK WORK.

The Burlington is experimenting with a ratchet wrench for putting on and taking off nuts on track bolts in connection with the relaying of rail. The wrench being used is a common ratchet wrench secured from the machine shops, and will remove the nuts in less than half the time required with the common stiff wrench. It is advisable, however, to start and tighten the nuts with the common wrench because of the heavy pressure necessary. This wrench is, of course, especially adapted to use



Ratchet Wrench for Track Work.

in connection with rail renewal or when putting on nut locks, but it cannot be advantageously used by the section man in tightening bolts. The wrench being used experimentally fits only the hexagonal nuts, but any wrench can be adapted. It can be made to fit square nuts on one end and hexagonal on the other. The wrench is being used under the direction of Roadmaster R. C. Violett, who finds the results so far very satisfactory.

PLACING TIES.

BY ROBERT H. ORWIG,
Supervisor, Cumberland Valley, Chambersburg, Pa.

The usual practice in placing crossties in the track is for two or three (generally three) men to pull the ties under the rails with picks or tongs. When the tie is approximately in its proper position, one of the men measuring with a mark previously made on his pick handle or with a rule, to see if the end of the tie is the correct distance from the line rail. It usually is not, and the other men are standing idle while this measuring is being done, then move the tie to its proper position.

When the spikers come to spike the rail to the new tie, one of them will again measure the distance from rail to edge of tie to be sure it is correct, as frequently the ties are moved before they are spiked. Assuming that he finds the distance correct, he and his two assistants have lost five seconds each, or a total of fifteen seconds. Adding this to the forty-five seconds lost by the tie men makes a total of one minute lost for each tie, apparently an insignificant amount of time; but when it is considered that at least 60,000,000 crossties are used by the railways of the United States, the amount of time lost would be 1,000,000 hours, which at 16 cents per hour makes $160,000.

To save this time, let the foreman make a chalk mark on each tie the proper distance from the line and where the outside base of the rail will come. This can be done with-

out any loss of time by any of the men. When the tie men pull the tie in the track, they stop when the base of the rail is at the chalk mark. When the spikers see the chalk mark they go ahead with their work and do no useless measuring; if the tie has been shifted they can readily tell it and make proper adjustment.

Another advantage gained by having the foreman mark each tie with a piece of chalk is that he can then personally see and mark his ties so that the heart of the tie will be down and the good ends where they should be. This is a matter of more importance than probably most foremen appreciate.

USING A MOTOR CAR FOR PUMPING.

In putting down a concrete cesspool into a formation of quicksand at Missouri Valley, Iowa, on the Chicago & North Western, the small steam engine which was being used to run a 4-in. centrifugal pump suddenly went to pieces. No other motive power was available, and as there was a small motor car not in use at the time, it was quickly arranged to put this in place of the defunct steam engine.

The car had a 6 h. p. vertical engine connected to the front wheel of the car by a chain drive. A piece of ⅛-in. steel 6 in.



Using a Motor Car for Pumping.

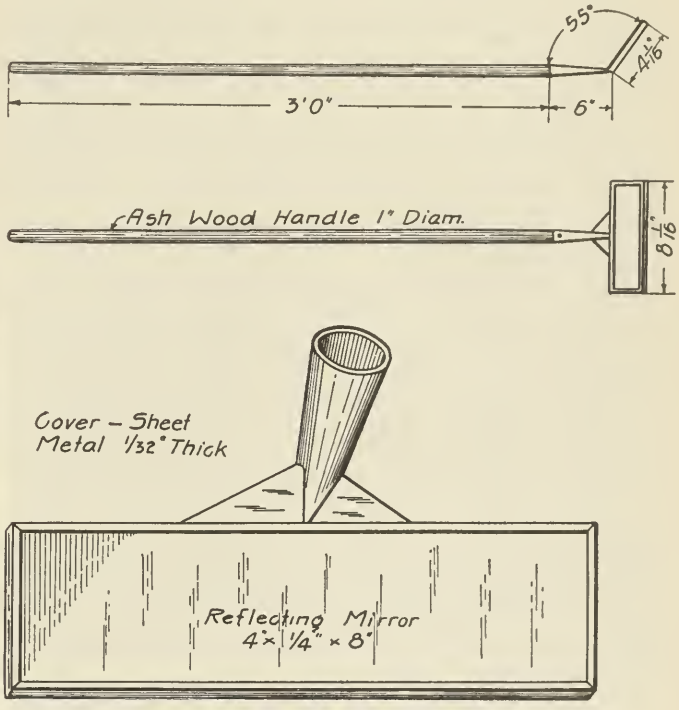
wide and ⅛ in. shorter than the circumference of the track wheel at the base of the flange was obtained. This was put through the rolls in the boiler shop and bent to form a cylinder, and joined by a lap joint with countersunk outside rivets. This cylinder was forced on the driving wheel to form a belt wheel. The car was run up to and lined with the pulley on the 4-in. centrifugal pump and shored from the pump foundation and the engine started. The delay to the gang on the excavation was not over five hours.

USING NATIONAL JEALOUSIES TO PROMOTE LABOR EFFICIENCY.

The general foreman in charge of the track forces during the construction of the Baltimore & Ohio yard at Chicago Junction, Ohio, secured very good results by mixing nationalities of his forces. Although a force of about 260 men was employed he recruited his labor from as many different nationalities as possible and tried to have but one gang of any one nationality. By working a gang of one nationality beside a gang of another race he was able to maintain a spirit of rivalry and increase the output of work. If he told a gang of Italians that if they did not do better work he would bring in some Austrians, he made it a sort of national issue with these men, and each gang worked harder than usual to outdo the others, because of their national hatred of each other. Probably the greatest benefit was in the elimination of serious labor difficulty and securing a closer control over the man. There was no danger of a serious walkout, as might occur if all or a large proportion of the men were of one nationality, for if one gang struck or was discharged, no men of any other race would go out in sympathy with them. In this way the general foreman was able to enforce better discipline than if he had had continually to fear that his men might go out at any time.

MIRROR FOR RAIL INSPECTION.

On one of the large railway systems which is making a careful study of its rail failures, instructions were issued to division engineers to have all rail then in track inspected to determine its condition. Since many rail failures occur at the junction of the head and web, to make a thorough inspection it is necessary



Mirror for Rail Inspection.

for the inspectors to get down low enough to enable them to look up at the under side of the head. To avoid this very slow and laborious work, some of the men employed in this inspection devised a method for making this inspection while standing erect. A mirror 4 in. x 8 in. protected around the edges by a 1/32-in. sheet metal cover was attached to a wooden handle 3 ft. long. By holding this mirror along the rail the inspector can see in it the reflection of the under side of the rail head and note its condition.

METHOD OF APPLYING STONE BALLAST.

BY M. JOYCE,
Roadmaster, Chicago & North Western, West Chicago, Ill.

All the old ballast should be removed as far as to the bottom of the ties, between the tracks and to the outside edge of the track shoulder. This old ballast should go towards widening narrow embankments and raising side tracks. All band ties should be removed. Great care should be taken that all ties be properly spaced and straightened so as to have an equal bearing under the rails. All track dug out should be filled in with the new ballast every day to prevent the possibility of it getting out of line in its skeleton state.

The amount of ballast dumped should be regulated to suit the

raise, and both grade and center stakes should be furnished in every case, and no less than eight inches of stone be placed under the ties at any place; except at approaches to permanent structures, such as bridges, which cannot be raised. Track should be lined to center in every instance after the first raise. The proper dumping and distribution of the ballast is a very important factor in the saving of labor in carrying out the work in general. It should not be necessary to borrow or handle any surplus stone by reason of improper distribution.

A gang of men composed of a foreman, a track raiser and 32 laborers on the first raise should be able to put up 4,000 ft. of track daily with a raise of from eight to ten inches. This work is carried out in the following manner:

Using two track jacks to get the track to grade on the first raise, the stone is shoved equally under that part of the tie under the rail and outside, doing little or no tamping whatever. The track is filled in between the rails from the dump cars the same day the track is raised to prevent it from settling too much. The traffic passing over the tracks will pack the ballast much better than tamping picks on the first raise and by so doing a large amount of labor will be saved. There is no possibility of the rails getting bent; in fact it has been found that track put up on the first raise in this way settled more evenly than track of the same character tamped with tamping picks.

After a period of ten days it will be found that this track has settled about two and one half inches under heavy traffic and is ready for the second raise. In this raise the surface and level should be made as perfect as possible and that portion of the tie under the rail, all that outside and about one foot inside should be tamped solid with the tamping picks. It is not advisable to tamp the tie through, except that portion mentioned above, because the track will get center bound and out of line in the course of three or four months. The ballast will settle enough at this point to answer the requirements. A foreman, a track raiser and about 32 laborers should comprise the gang on the second raise. The amount of track this gang should raise each day should average about two thousand feet with proper distribution of the stone. The dressing gang should be composed of a foreman and about twenty men; if possible these men should be left permanently at this work as the longer a man is at this class of work the more he can accomplish. This gang should be able to dress about 1,500 ft. under fair conditions if the stone is properly unloaded.

DEVICE FOR UNLOADING RAIL.

BY M. GANLEY,

Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

The following device has been used with good success to prevent damage to rail in unloading. Cut 12 or 15 in. out of the base in the middle of an 18-ft. piece of rail. Bend the rail where this piece has been cut out so as to form the letter A, then bend 12 in. at each end of the rail so as to form a sort of runner. Two heavy plates 12 in. long and 8 in. wide should be riveted on the base of this rail at such points that when this A is hung on a pin in the drawbar of the car, the knuckle having been removed from the drawbar and a round pin with a high head on it inserted, and the two ends of the rail are resting outside of the track rails, these riveted pieces form slides on top of the track rails. Two pieces of rope 18 to 20 ft. are required, each with a hook in one end to place in the bolt hole of the rail being unloaded and with a loop on the other end for a man to put a bar through and hold against the tie. As the train moves forward a rail length the rail is pulled out of the car and drops on to the A rail, sliding down it clear of the main track. The train then stops until a new hold is secured on another rail, when the operation is repeated. It is possible to unload from 7 to 16 cars of rail per day by this method, according to the amount of traffic that is being moved. Two men are required at each end of each rope with six men in the car and two men following up with lining bars adjusting rail.

EDUCATIONAL WORK IN THE TRACK DEPARTMENT; UNION PACIFIC.

The educational work being done by the Educational Bureau of Information of the Union Pacific is of special interest to maintenance of way men, for an important part of the work of the bureau is devoted to the employees of the track and signal department. In no other department has labor deteriorated so much, and nowhere else does the need for improvement exist to such an extent as in the track department.

The Educational Bureau was organized in September, 1909, and its purposes and methods were fully described in the *Railway Age Gazette* on September 3 and November 26, 1909, and June 10, 1910. Up to the present time 30 courses of instruction have been prepared and over 3,000 students have been enrolled, although up to December 15 of last year no attempt was made to increase the enrollment, except by issuing formal announcement at the time the bureau was organized. Students who are too busy with their regular work to prepare their lessons promptly are given all the time they desire to enable them to qualify on advising the bureau to this effect. This is frequently necessary with track foremen who find it difficult to make much progress during the summer months, when their gangs are large and the night labor they have to do on time rolls and reports is heavy. Opportunities are offered those employees already having a good education, such as technical graduates in the engineering or motive power departments, to take courses in the operating or other departments, or courses in advanced reading are arranged.

The different lessons are prepared under the supervision and with the aid of the department for which they are intended, in this way embodying the standard practice of the Union Pacific. The student knows that the methods outlined in these courses are the approved ones on his road and show him the way he should do his work. For this reason these courses have an added value to the employee over any course or books written for general use. The track papers were first written by the division engineers and assistant division engineers (general roadmasters), and after being very thoroughly discussed by them, were submitted to other track men and engineers for criticism. As they finally appear they represent the result of a number of men's work. They are written in simple language that any one with an elementary education can read and understand, special attention being given to the adopted viewpoint of the student in the preparation of the lessons.

The lessons are printed in large, clear type on a heavy white paper, and are bound with a brown paper cover. Each consists of from 20 to 40 pages, 8 ins. by 10½ ins. in size. The text is fully illustrated with views showing the work being done according to the approved practice so that the student can see for himself as well as study from the text.

The track course is divided into nine lessons, eight of which are already prepared, and the copy for the last is now practically ready for the printer. These lessons are decidedly practical and give the student directions as to how to do the common track work. The first lesson is on track tools and describes the various tools and their uses and abuses. This is followed by a lesson on the book of rules for the maintenance of way and structures. The third lesson is on ballast, and gives a description of the various kinds of ballast used on the Union Pacific with the qualities of each, and the proper handling of it on the track. Instruction is given regarding unloading it, raising and dressing the track, and the size of gangs necessary.

Following this is a paper on ties, giving the kinds of ties used and general instructions for handling and renewing them. Rails and fittings are discussed in the fifth paper, in which the proper methods of loading and unloading rail and relaying it in the track are discussed, and instructions are given on methods of figuring the amount of material needed for any piece of work.

The next lesson is on the maintenance of roadway and track, and covers the common duties of the track laborer in seasonal

sequence as far as it is possible to do so, starting with the repairing of all tools and the opening of ditches in the spring and touching on the other duties as they develop through the season. The more special problems, such as the maintenance of tunnels and station grounds and the handling of snow, are covered in the next lesson, while the eighth paper gives instructions on the laying of new main or second track, from the unloading of the material to the ballasting.

The last paper in the course, now nearly ready, will be on crossings, frogs and switches.

In addition to these nine lessons, the track course includes one lesson from the accounting course on the section foreman's accounting for labor and material, one on the use of the employee's time card, and one on signals. Another paper will soon be prepared for students in both the track and signal courses on gas engines, for the benefit of the men using motor cars. A course is also being prepared on reinforced concrete construction for the instruction of the bridge men both in the office and field. In addition to the track men those desiring the civil engineering course are required to take the track course as preliminary preparation.

Upon completion of the track course most of the men will take up the block signal course, which consists of about 33 lessons. The first three lessons describe the types of signals in use on the Union Pacific and explain their operation. The next 12 papers are on electricity and magnetism, which are treated in a simple way. The remainder of the course deals directly with the signals and signal appliances in use on the Union Pacific.

A large number of track men have already completed all the lessons ready in the track course and started on the signal course. As track work and signal maintenance are so closely related, this block signal course will be of great value to the section men. On one roadmaster's district the section forces have already taken over the work of the signal maintainers, and the double track automatic block signals are now maintained by section forces.

The track course has been translated into Japanese for the benefit of the 600 Japanese in the track department and a special branch of the bureau is maintained for their benefit at Cheyenne, Wyo., where all these students are enrolled. Here the students may send in their replies in Japanese if they prefer, many of them being unable to write English. Some of the lessons are printed in both English and Japanese in the same book, the same material being placed on facing pages, so that the student may learn English while studying his lesson. The Japanese are among the best students enrolled, and the proportion of them taking the course is large. It is also planned to issue the Book of Rules in Greek soon for the use of the employees of this nationality, of whom there is a large number on the track.

In the preparation of the track and block signaling courses the mathematics necessary have been given to the student only as he needs them to pursue his studies, instead of being given to him as a complete course before being allowed to take up his other work. In this way the student's interest in the course is maintained and at the same time he gets full value out of his mathematics by studying them as he actually needs them. In the preparation of the lessons it is assumed that the student has a knowledge of addition, subtraction, multiplication and division, but no more. He requires no further mathematics for the completion of the track course; it is not until he reaches the seventh lesson in block signaling that he needs any more. At this point he encounters a problem involving the area of a circle. If he sticks at this point, the first mathematics lesson dealing with the properties of the circle is sent him to study. After completing this he is able to proceed in the signaling course until he meets with a problem involving squares, when the second mathematics lesson is sent him. If he can handle these problems without the lessons he is allowed to proceed.

The total number of men enrolled in the bureau to June 1, exclusive of Japanese, was 2,833, of which number 640 have left the service, leaving 2,193 students enrolled and in service. Of this number 376 are delinquent, leaving 1,817 or 82 per cent. enrolled and in service in good standing, comparing very favorably with commercial correspondence schools, where the average percentage in good standing is said to be about 40 per cent. These students are sending in about 1,050 answers to lessons per month. In addition, from the 600 Japanese employees, of whom over 80 are section foremen, over 160 are enrolled as students in the Japanese department.

A study of the first 1,800 enrollments in all courses, exclusive of the Japanese students, was made in February and showed the following percentages of Education Bureau students to all employees in the various departments:

	Percent.		Percent.
Engineering Department	13	Trainmen	6.5
Accounting Department	20.5	Motive Power Department	5
Station Service	13	Track Department	16
Engineers and Firemen	6.5	General Office Clerks	27

This showing of 16 per cent. of the track men enrolled with the bureau is remarkable when one considers their general lack of education, and that many of them are foreigners other than Japanese who, owing to their deficient knowledge of English cannot avail themselves of the advantages of the Educational Bureau. Out of 132 signal maintainers in service at the time of this report 84, or nearly 64 per cent. of those in the service, were taking courses. A further study of these first 1,800 enrollments gives the following additional data:

Class of Employees.	Percent. of Total.	Percent. in Good Standing.	Average Lesson Papers Answered Per Man.
Engineers, firemen, conductors, brakemen, operators and shopmen	23.2	70	6.9
Station men, including clerks (not including operators)	16.0	77	5.7
Division clerks	10.6	84	6.8
General office clerks	10.1	76	6.4
Track men	9.4	73	6.8
Signal men	8.5	83	8.0
Accounting department clerks	8.1	77	3.8
Officials	7.7	90	6.6
Engineering parties	2.2	77	9.6
Shop apprentices	2.0	77	8.3
Draftsmen	1.2	73	9.3
Bridge and building men	1.0	63	3.2
Grand total	100	76	6.9

Some question was raised as to how the union men would regard this educational work. It is worthy of note that the labor union men form 23.2 per cent. of the total enrollment.

A very important consideration in this work is the low cost at which it is being conducted. Even with the large amount of preparatory work which is being done, the total cost will approximate but about $10.00 per student for this year, which is very low when compared with any other similar work.

Conversations with some 20 section foremen distributed over 150 miles of track disclosed the fact that a majority of them are taking either the track or signaling course and others expect to begin in the near future. A number of these foremen also point with pride to men in their gangs who are also carrying on studies. However, owing to the fact that almost the entire force of laborers is composed of either Greeks or Italians and that few of these men can read English, it is impossible for many of them to carry the courses. The fact that so many section foremen, many of them beyond middle age, are studying their lessons after working hard all day on the track, is evidence of their belief that they are getting benefits from their courses. The knowledge of the men that the railway is providing these courses for their benefit cannot fail to create a spirit of loyalty and at the same time awaken ambition to do better work. The roadmasters say they can notice the effect of the courses in a decided improvement in the work of the foremen, while on the one district where the signals are maintained by the section forces, a number of the foremen said they would not have been able to do this work without the aid of the block signal course.

The benefits of the courses are not confined to those studying in their own line of work, for any employee can take any course he wishes if he is able to pursue the studies to advantage, and the services of the bureau are for the benefit of any student who

may desire to prepare for another department. For instance, one section foreman is studying to be a fireman, while another is taking a course in railway operation, desiring to become a brakeman.

We are indebted for the information in the foregoing, and for opportunities afforded for studying the work of the bureau, both in the office and on the track, to D. C. Buell, chief of the Educational Bureau of Information.

KINDS OF WOOD BEST ADAPTED FOR CROSS TIES.*

BY F. J. ANGIER,

Consulting Timber Treating Engineer, Chicago, Burlington & Quincy.

The demand for cross-ties is steadily increasing; the supply is as steadily decreasing. With the supply of the standard white oak tie nearly exhausted, the question is—where and from which kinds of wood is the ever increasing demand to be met? In 1900 first-class white oak ties were bought about 50 cts. each; today they are costing about 80 cts.

The railways of the United States require annually upwards of one hundred million ties for renewals. The Burlington alone uses about three million each year, and these cost approximately $2,000,000. In a statement made recently by W. F. Goltra, tie agent of the New York Central Lines, he shows that cross ties represent 8 per cent. of the cost of all material and supplies used by the New York Central Lines for maintenance, and that the increase in cost of ties in eleven years has been 53 per cent.

No doubt the time will come when there will be a satisfactory substitute for the wooden tie. It may be made of iron or steel, or of concrete, or of a combination of these; or, it may be possible to make it from corn-stalks, or of some substance which can be grown in a single season by the farmers of the country. No substitute now known can be called a complete success. The railways are still using the wooden tie, and doubtless will continue to do so for a number of years to come.

The inferior oaks, which a few years ago were hardly considered at all for cross ties, are now made as good, or better than the old standard white oaks, by giving them a preservative treatment. The first cost of the inferior oaks, plus the cost of treatment, is even less than the present cost of white oak. What is true of the inferior oaks, is also true to a greater or less extent of many other kinds of wood, among which might be named the beech, hickory, elm, maple, pine, fir, birch, hemlock, and tamarack. Our knowledge of wood preservation has advanced far enough for us to say absolutely that these woods can be chemically treated and made to last many years beyond their natural life. We can now treat a tie so that it will resist decay for 10, 15, 20 or more years, but it is certainly unwise to spend one cent more than is absolutely necessary to preserve the wood from decay beyond its mechanical life. If a tie will be destroyed by rail and spike wear in ten years, we surely must not use a preservative treatment to prolong its life for fifteen years. If better mechanical appliances could be employed, such as screw spikes, and possibly larger tie plates, and if more care could be taken as to the drainage of roadbed, and proper selection of different kinds of wood for use under heavy and light traffic, the mechanical life could be materially increased, and the timber treating department could meet this by preserving the tie so it will resist decay for the increased period.

Up to a year ago all treated ties, with the single exception of oaks, were shipped out as soft woods and were used indiscriminately in the track. This meant that pine, cottonwood, poplar, soft maple, etc., were used with the harder woods. Beech, hard maple and hickory have greater spike-holding power than white oak and it seems nothing less than inexcusable ignorance to place ties made of such wood in side tracks, and to put the soft woods in main line. I am glad to say that this practice is rapidly being done away with on the Burlington.

*Read before the annual meeting of the Burlington Association of Operating Officers.

Through our endeavors of the past year or two we have learned of many of the characteristics and properties of the woods we purchase for cross ties, and under date of March 15, 1909, the general managers issued a circular classifying our ties as "hardwoods" or "softwoods." All ties shipped from the treating plants are now loaded in separate cars and billed out as "hardwoods" or "softwoods," and in addition every tie has stamped on the end a large letter "H" or "S," which is to designate "hardwood" or "softwood." With this arrangement there should be no excuse for mixing them in the track.

You may be interested to know how our classification was made. For the past two or three years many thousands of ties, comprising about twenty-five kinds of wood, have been treated in the experimental laboratory at the Galesburg plant. The specific gravity and density of the woods were determined, as well as other properties. In addition to our own experiments it was desired to get the opinion of our experienced men as to the rail resisting and spike wearing properties of different kinds of wood, and the following letter was written to every division superintendent, roadmaster, and to many other officials on the Burlington, as well as to managers of timber treating plants on other roads:

"The attached list shows the principal kinds of wood used for ties on the Burlington system. There is quite a difference of opinion as to which will be classified as hardwoods and which softwoods. From a commercial point of view all broad leaf trees are considered hard woods, and all needle bearers are considered soft woods. This would throw out such woods as pine, cedar, fir, hemlock, tamarack, etc., in the soft woods and the oaks, beech, hickory, ash, elm, maple, etc., in the hard woods. However this classification does not answer our purpose. We wish to classify these woods as to their rail and spike wearing qualities. In other words we wish to know what kinds of ties you would order to put on a curve where you wish to have the greatest spike holding power, and the least cutting by the rail. The beech tie is probably just as good or better than a red oak tie for this purpose, and there are perhaps other woods, such as hickory, and perhaps hard maple, which you could not hesitate to put on a curve. In order to get the opinion of as large a number as possible who have had years of experience along this line, you are requested to make a cross in one or the other of the last two columns on the attached sheet giving your ideas as to what you would call a hard wood tie and a soft wood tie."

Fifty-two replies were received. These were carefully tabulated with the results given herewith in Table 1:

Table 1.—Classification of Ties.

Kind of Wood.	Percentage Received at Galesburg Tie Plant.	Classification.	Summary of Replies to Circular Letter. Hard.	Soft.	Don't Know.
White Oak	.26	Hard	52	..	..
Red Oak	44.52	"	49	3	..
Pin Oak		"	51	1	..
Beech	6.65	"	41	8	3
Hickory	1.05	"	51	..	1
Ash	.86	"	39	10	3
Hard Maple	3.48	"	47	3	2
Soft Maple		Soft	7	43	2
Slippery Elm	5.54	"	18	32	2
White Elm		"	18	32	2
Birch	.85	"	20	26	6
Chestnut	Not treated	"	18	32	2
Tamarack	.24	"	2	47	3
Hemlock	2.25	"	..	49	3
Tupelo Gum	19.49	"	2	42	8
Red Gum		"	6	38	8
Red Fir	Used only at Sheridan Plant	"	3	46	3
Loblolly Pine	8.54	"	1	48	3
Lodgepole Pine	Used only at Sheridan Plant	"	..	49	3
Sycamore	.16	"	4	44	4
Cedar	Not treated	"	..	..	..

This shows that the majority of our superintendents, roadmasters and others, classify the oaks, beech, hickory, ash and hard maple as hard woods, and the balance as soft woods. It has been argued that some of those to whom the circular letter was sent were not familiar enough with the different kinds of wood to make a classification along the lines suggested. This

may be true, and some replied that they did not know about certain kinds of wood, and in all such cases the replies were either omitted entirely or placed in the column, "don't know." Many of the answers received were from men of long experience in railroading, and who have had practical experience in the use of timber and ought to be in a position to know. From a more theoretical point of view, Table 2 will show the spike holding power of different kinds of wood. Some of these tests were made at the University of Illinois, and others in our own laboratory at Aurora:

Table 2.—Holding Power of Spikes.

Kind of Wood.	Maximum Resistance in Lbs. Pull. Untreated.	Treated.	Resistance in Per Cent. of That of White Oak. Untreated.	Treated.	Where Test Was Made.	
White Oak	7,870	.....	100	...	University of Illinois	
Water Oak	.....	6,780	...	86	"	"
Black Oak	.....	7,230	...	92	"	"
Red Oak	6,460	7,730	82	98	"	"
Burr Oak	.....	9,210	...	117	"	"
Ash	.....	7,730	...	98	"	"
Chestnut	5,190	5,200	66	66	"	"
Elm	7,290	7,500	93	96	"	"
Beech	8,180	8,900	104	113	"	"
Poplar	4,920	5,670	62	72	"	"
Loblolly Pine	3,630	4,210	46	55	"	"
Sweet Gum	5,040	5,300	64	67	"	"
Hemlock	5,633	4,200	72	53	Aurora	Laboratory
Soft Maple	6,513	5,887	83	75	"	"
Hard Maple	10,177	8,960	129	114	"	"
Hickory	10,153	10,433	129	133	"	"
Cypress	3,163	2,840	40	36	"	"
Birch	6,337	5,907	80	75	"	"
Cottonwood	2,810	2,743	36	35	"	"
Northern Hard Maple.	10,393	.....	132	...	"	"
White Cedar	1,467	.....	19	...	"	"

These tests, very largely, bear out our classification. Two exceptions, however, have been made by our purchasing department, viz.: elm and chestnut are classified as hard woods. The classification in use now is as follows:

HARDWOOD TIES.

For use without treatment: White oak, burr oak, chestnut, locust, black walnut, mulberry, sassafras.

To be treated: Red oak, black oak, pin oak, water oak, turkey oak, Spanish oak, blackjack, beech, hickory, ash, elm, hard maple, cherry.

SOFT WOOD TIES.

For use without treatment: Cedar and cypress.

To be treated: Shortleaf pine, loblolly pine, bull pine, lodgepole pine, douglas fir, tamarack, hemlock, gum, tupelo, birch, sycamore, soft maple, hackberry, butternut.

ADDITIONAL MOTOR CAR DATA.

Since the publication in our issue of May 19 of the tabulation of data collected concerning the use of motor cars for section forces, information has been received from the Chesapeake & Ohio and the Missouri, Kansas & Texas.

On the Chesapeake & Ohio no section motor cars are used, but 14 Fairbanks, Morse & Co., and 8 Buda inspection cars have been in service from three months to six years. The cost of repairs to these cars averages about $2.25 per month, the cars being kept in repair by the men who operate them. The cost of fuel averages about $1.80 a month.

On the Missouri, Kansas & Texas 32 Fairbanks, Morse & Co. inspection cars and one section car are in service, having been used from two to twelve years. The inspection cars are used by the roadmasters, bridge and building foremen, traveling storekeepers and division linemen. Repairs are made by company machinists and their cost averages about $4.25 per month. The one section car in service causes a saving of about 75 cents per day on a four-man, or $1.20 with a six-man gang, as compared with hand cars.

The Chicago Great Western reports a recent incident illustrating one advantage of section motor cars. Following a severe storm a short time ago about 170 miles of wires went out of service. With the use of motor cars the trouble was located at the different points and cleaned up in 45 minutes.

THE NEED FOR BETTER CONSTRUCTION OF SUB-GRADES.

BY EMMET KEOUGH,
Roadmaster, Chicago, Burlington & Quincy, Aurora, Ill.

Although our present methods of construction of new railway grades are in many ways superior to earlier construction and a great saving in time is made with modern improved machinery, it is doubtful if we find our modern tracks as easily maintained as were those built by earlier methods of construction.

In the days when grading was all done with teams, the dumps were fairly well settled as the dirt was put in place, and as the track was surfaced on dirt and filled in to a crown in the center of the track, the rain water was easily turned to the ditches or side of dump. Thus, there were no low spots or pockets in the center of the grade for water to stand in and make a soft roadbed.

It is found under modern grading methods, on account of the loose piling of the material in dumps and the application of ballast as soon as track is laid, that instead of a crown being formed in the center of the roadway to turn the water to the side ditches, the water which falls on the roadbed is actually pocketed in a basin at the bottom of the ballast. If the dirt is of the bad clay or vegetable variety, the water cannot penetrate the sub-grade to any extent but will lie there, keeping the surface of the sub-grade soft and making it difficult to maintain good track. On account of the track going down in such places it becomes necessary to add more ballast from time to time. It is generally found that these soft places appear here and there along the line even though the material composing the sub-grade is all alike. This is most likely due to the fact that the sub-grade was a trifle lower at these soft places when first constructed and certainly did not improve with age. In fact, experience shows that many roads find it harder to maintain certain pieces of track ten or fifteen years after the road is constructed than during the first year. This is generally attributed to our present heavy rolling stock, but the fact often is that the grade is actually in worse condition than when first put up, on account of the great holes in it at different places. These holes are generally irregularly shaped pockets under one or both rails. What were probably only small depressions when the road was new, are often found to be ten or fifteen feet in depth, extending fifty or one hundred feet along the roadway. Extreme cases cause an unusual bulging of the sub-grade at these places.

In some places (generally cuts) we find the cross section of roadbed in the shape of the letter "W." This is no doubt due to the fact that our trackmen in picking up these rough places in track, in their hurry to get over them, tamp only the ends of ties. This crowds the dirt toward the center of the track as well as to the outside with the above results as to contour of sub-grade. Such cases are found where the track is ballasted shortly after the track is laid. In all cases it is found necessary to add ballast often as the road gets older, although the actual elevation of track continues the same, the old ballast having been crowded down and out.

The result of such conditions is a continual fight to keep track in shape to prevent hard riding and accidents. After these places get to be three to five feet deep it is found that even frost is of little benefit, as the soft places are too deep to be affected and it becomes necessary to block up on top of ties to make the track passable. In fact, the actual cost of maintaining one good-sized slide is often more than that for an entire mile of track, to say nothing of the extra cost of derailments, etc., resulting from them.

There is another bad grade condition which causes an equal amount of trouble and generally is more dangerous, as it is found along bluffs and often around curves or along waterways, etc. This is a ledge of soapstone or other rock

in the sub-grade pitching at an angle of 30 to 40 deg. Track over such places is hard to keep in proper alinement and surface, as it often slips several feet in a short time. The writer has seen a few such places where the track would work out of line from a few inches to four or five feet each season. These cases are often considered incurable, little more being done than to have track men patch them up while sliding, maintain a night watchman and line back with an extra gang of men in the spring. It is only time and money wasted to be working "on top" of these places as the remedy is only temporary and the track is at all times dangerous, some of it exceedingly so.

The question arises as to how to make permanent repairs in such cases. This is being done to good advantage by different roads. It is possible to apply enough cinders, burnt clay or other porous material above the sub-grade to absorb any ordinary rain so that little or none of it will reach the sub-grade to soften it. This material can not always be had in sufficient quantities to obtain the results sought and the track cannot always be raised enough to allow this, and generally drainage is resorted to in the case of pockets in dumps. This is done in various ways. Some merely tap into the side of the pocket and fill in with rip-rap, cinders, tile, etc. This is generally found to help conditions, but is not a cure, as the water is drawn from a considerable distance on either side of the pocket, and the sub-grade is considerably softened while the water is slowly working along the grade to the drain. Probably the most successful method is to ditch lengthwise with the track along the ends of the ties, going down deep enough to tap the bottom of the deepest pockets. The ditch thus made can be filled with cinders or other porous material and a small tile can be placed in the bottom. The material should be well tamped to prevent the track from getting out of line and surface while the material is settling. This kind of a ditch not only taps the holes in sub-grade but prevents the water from entering the ballast which falls along the sides of the track, therefore reducing the surface area of grade top as far as water is concerned.

The case of sloping soapstone under the surface is best treated, where conditions will allow, by drilling into this material at the foot of the dump or fill fifteen or twenty feet away from the track, at intervals of every ten or fifteen feet along the line of the track. Blast this soapstone enough to break it up into a rip-rap effect. While this will not stop the slide at once, it will do the work as soon as the grade under the track slides down against the roughened surface of the broken stone. Such treatment has been successfully tried in a few places to the knowledge of the writer, and while very successful is also a cheap method.

The matter of good sub-grades is one of primary importance to the maintenance man, and should be given more consideration than mere time and yardage, as is generally the case. Where the dirt obtainable for sub-grades is porous, it is less important that extra precaution be taken to make a solid, well-drained grade. Where the opposite is the case much money can be saved for the operating department by paying special attention to securing proper compactness of the grade or to its drainage. Then, too, in the case of second or extra tracks it would be an easy matter to put in the tile as the grade is being built, as the extra top surface forms more area for water to stand in and softens the grade. Parting lines of old and new grades, as we all know, should always be broken along the old grade with a plow to allow union of the two grades, but the doing of this is the exception, rather than the rule.

Other forerunners of slides are the team ways made when a dump is being built, which are allowed to be filled out to full grade without breaking the hardened surface.

There are various ways of preparing a good sub-grade, any of which cost more than is generally considered customary for such work, but the time is rapidly coming when it will be found that it is necessary to give proper time and attention to building a good foundation, before we can expect first-class track.

PRESERVATION OF TRESTLE STRINGERS AND CAPS BY HOUSING.*

BY HUNTER M'DONALD.
Chief Engineer, Nashville, Chattanooga & St. Louis.

In 1893 the writer had charge of the renewal of a number of combination spans which had been in service about twenty years. The main and second braces and top chords were of yellow pine, and since their original construction all had been carefully covered with weatherboarding on the sides and tin on the tops, the latter carefully fastened to sheathing, with air space beneath, and soldered. All of the timber upon removal was found to be sound, and was used again for trestle stringers.

The value of such protection had been previously observed, and in 1887 the plan of protecting intermediate sills on double-deck trestles with sheets of galvanized iron was adopted. The

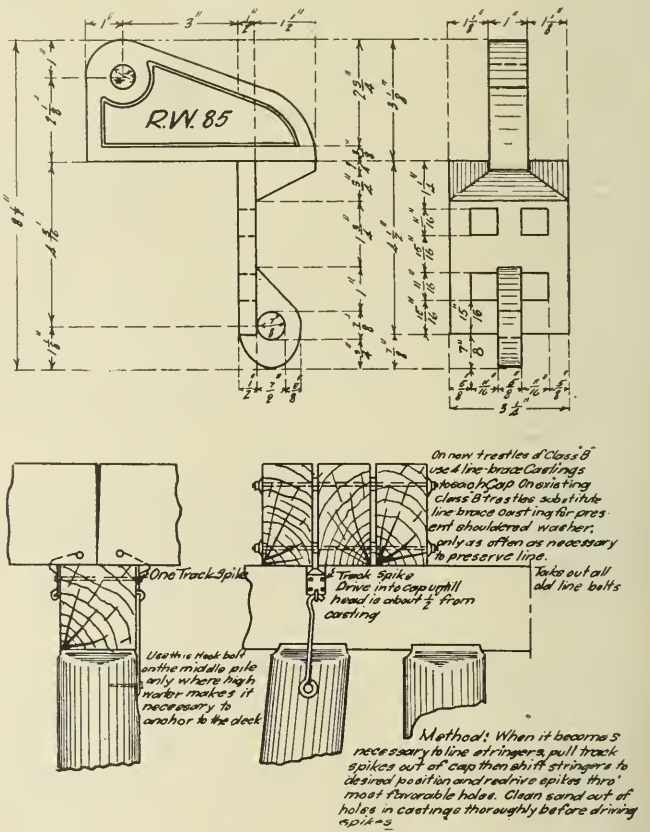


Fig. 1.—Line Brace Casting.

sheets extended about three inches over the sides and six inches over the ends, and the posts of the upper section were held in place by allowing the drift bolts, passing through the cap into the posts below, to extend about six inches above the cap, through the galvanized iron protection and into the feet of the upper section posts. In a number of instances the top caps were similarly protected about the same time.

The intermediate caps were found to be sound in 1906 when the trestles were filled. The top caps, although the housing had not been well maintained and the stringers rested directly on the galvanized iron, with drift bolts through it, did not require renewal until 1908.

About 1900 the writer had occasion to notice a large pile of

*From a paper presented to the Engineering Association of the South.

stringers which had been removed from the trestles on the Cincinnati Southern Railroad. These stringers were put in place about 1879, and had been protected with galvanized iron according to the designs of Mr. G. Bouscaren, chief engineer. The ties rested directly on the stringers, holes being made at frequent intervals in the galvanized iron in order to confine the ties to position. Col. G. B. Nicholson, chief engineer of the Cincinnati Southern Railroad, was present with the writer at the time these stringers were examined and told him that the galvanized iron had not been carefully removed as it rusted out, nor had any great effort been made to keep it from creeping or leaking. Trestles which were still covered were examined, and many leaks found in the iron and many sheets found out of position. The condition of the stringers removed showed remarkable preservation, rot occurring only in local spots—around bolt holes—and at points where the protection had been improperly maintained. This examination convinced the writer

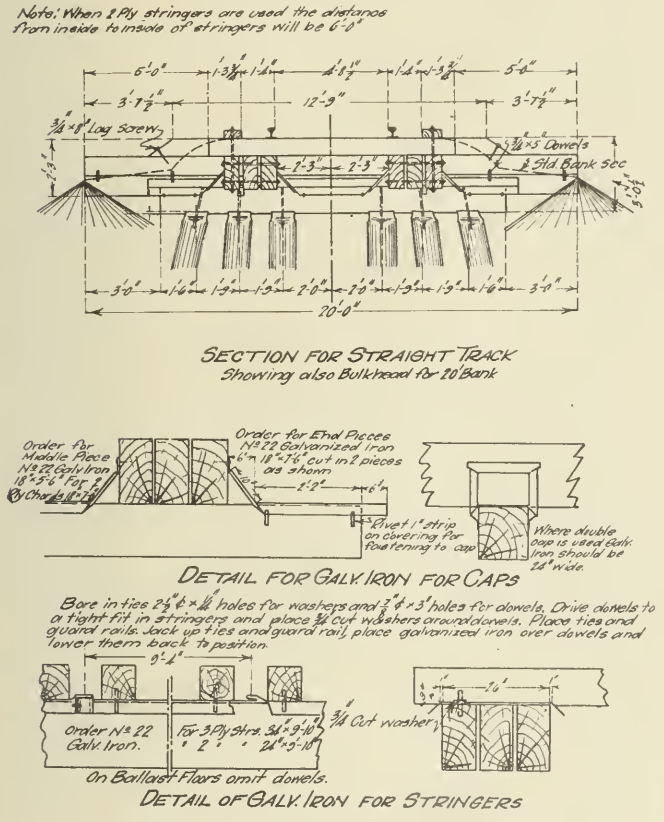


Fig. 2—Details of Housing—Open Deck Trestle.

that, whether the galvanized iron was properly maintained or not, the results obtained fully justified its use, and since 1900 stringers and caps when renewed on the lines under his charge have been so protected.

At that time the standard trestle consisted of two 8 x 16 stringers on each side, packed one inch apart, each pair being spaced six feet apart on the inside. The chords were confined to the caps by what were called "stag bolts"—that is, drift bolts driven slantingly through their sides into the caps. The ties were 8 in. x 9 in. x 10 ft., and each was doweled to the chord by ¾ in. x 5-in. dowels, two dowels to each tie passing into alternate members of the chord on each side. Holes were bored into the tie and the dowels driven in to a tight fit, the corresponding holes in the stringers being a loose fit. The guard rail was directly over the outside member of the chord. Two bolts to each span on each side passed through guard rail, tie, and stringer.

The galvanized iron was applied to the caps in the manner already described, and that on the stringers by jacking up the ties, the dowels following them, inserting the iron under them and lowering them again. The weight of the ties caused the dowels to perforate the sheet iron and settle snugly to place after a slight blow with a hammer. It was supposed that the dowels and guard-rail bolts would confine the iron permanently to position, but subsequent observation showed that the iron at many points crept, always outward, no matter whether on sharply elevated trestles or not. The creeping was very slow, and slots were torn in the iron by every dowel and bolt. Careful observations were made with a view of determining the cause of this creeping, but so far the exact cause has not been ascertained. No doubt it is due to different causes at different points. There are many trestles on which no creeping occurs, others where isolated sheets are found to creep, and others where nearly all the sheets creep. It is believed to be generally due to imperfect bearing of the ties on the stringers, longitudinal vibration of the structure, and vertical movement of stringers on the cap or caps on the piles. The problem of remedying this, and also the leaking of water through the dowel and bolt holes, has been continuously studied, with the result that the method of housing hereafter described has been adopted and has been found to be almost entirely successful, both as to leaking and creeping.

To dispense with the drift bolts through the stringers into the caps, which are not only destructive to the timber, but cause much expense in adjustment for line and surface, a malleable casting, called a "line-brace casting," has been devised. Its form and method of application are shown in Fig. 1.

The line-brace casting serves as a packing ring, and also as an anchor for the chord to the cap. The chord members are packed only one inch apart to prevent the nesting of sparrows between them.

The four holes in the bottom part of the casting admit of fine adjustment and shimming where necessary, new wood into which to drive the anchoring spike being always available. This device has been found after long test to be entirely effective, even where heavy floods have overtopped the trestle and deposited driftwood against and under it.

The covering of the cap, instead of being continuous over the entire length as formerly, is made in three pieces, flaps being turned up on the sides of the chords under the overhanging sheet-metal chord cover. Figure 2 shows the present standard open-deck trestle, and the details of the housing. These covers are fastened to the cap by nailing through strips of galvanized iron riveted to the underside of each cover piece at four points. This arrangement permits direct bearing of the stringers on the caps and ready removal of sheets for the purpose of adjustment. In place of two, the plans show three stringers on each side, which is now the standard on lines of heavy traffic. The addition of the third member to each chord was begun in 1905, and the iron applied in 1900 was found in many cases to be rusted out. The timber underneath the iron was found in as good condition as when covered in all cases where protection had been placed over new timber; but where timber had already been in place a few years before being covered the rotting begun in the open was found to continue under the cover. Upon removal of the covering all chord members beginning to show decay are marked with white paint on the underside and all defective coverings replaced.

In the present plan the dowels are driven to a tight fit into the stringer instead of the tie, thus perforating the sheet iron upward instead of downward. Before driving the dowels the holes are filled with creosote, which is allowed to soak in. It was found necessary, in order to secure perfectly cut holes in the iron, to cut the upper end of the dowel in a lathe instead of by shearing.

After many experiments to determine the best way to prevent leaking through the dowel holes, it was found that this leaking was generally due to the churning of the ties and to capillarity, and that shearing the dowels was sufficient.

The plan now in use is to bore, with an extension bit, a recess in the bottom of the tie concentric with the dowel hole

¾ in. deep and 2 in. in diameter. Before putting the sheet iron on the stringers cut washers 1½ in. in diameter are dropped over each dowel in the stringer. When the sheet iron is settled home by the weight of the ties, the washer forces it up into the recess in the tie, secures a better hold on the iron to prevent creeping, and to a great extent destroys capillarity by creating an open space instead of tight contact around the hole in the iron. The water must be forced up an incline in order to enter the hole.

The sheets of iron are connected to each other by bending and lapping and riveting at one point on each side of the joint where it overhangs the stringer. The sheets are ordered in such lengths as to bring the joints between instead of under the tie. This method has been found almost universally effective to prevent creeping, and has reduced the leaking very greatly. No remedy has been found for leaks around the guard-rail bolts, but all holes in the stringers are carefully plugged at the bottom after framing and filled with creosote, which is allowed to soak in.

It is still found necessary occasionally to stop creeping by bending the iron downward on the inside of the chord, nailing it to the stringer and flaring the lower edge of the iron to keep the drip off the sides. Small squares of galvanized iron or washers are used when this plan is resorted to in order to keep the nail heads from pulling through the iron.

The method of covering the caps has proved entirely satis-

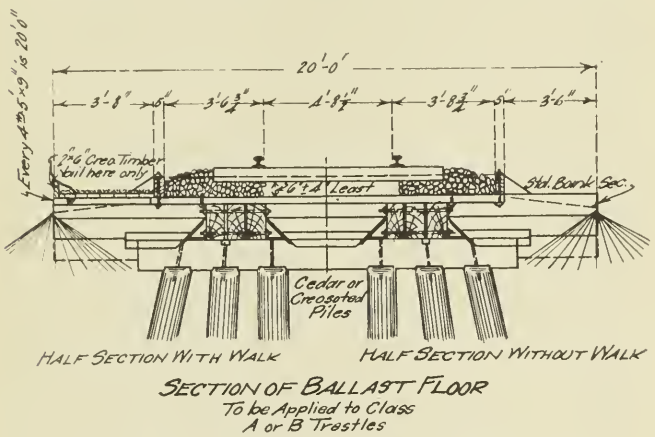


Fig. 3—Ballasted Floor for Trestle.

factory; gum and red-oak caps in use five years show no signs of decay. No caps put on since 1900 and properly covered have required renewal. Caps next to the bulkhead and those subject to frequent overflow on low trestles are of creosoted pine, as housing does not prevent decay in these.

When the use of sheet iron on the stringers was begun in 1900, no attempt was made to secure metal of great durability. Failure of many sheets appeared in about three years at points where switching was done or much sand used. Under ordinary road traffic it lasted about five years, and on branch lines of light traffic even longer. No failures of the metal on the caps due to rust have yet occurred. Later on effort was made to secure greater durability, and after considerable investigation it was decided to use a charcoal iron made by an eastern mill, the galvanizing upon which was found to be much heavier than on the ordinary galvanized (steel) iron purchased on the market. The difficulty with this iron was found to be that it would not stand short bending, the cracking causing leaks.

Attention having been called to the remarkable purity and claims for consequent durability of certain sheet metals manufactured by a new refining process, investigation was made of their qualities, and the results seemed to warrant the adoption of one of them, which took place in 1908.

Ballasted floors on trestles are meeting with much favorable consideration at present on account of the low cost of maintenance and decreased danger from fires, but it has not been heretofore considered advisable to use this plan without treating piles, caps and chords. On account of the success attained in the preservation of chords by housing, a plan for ballasted floor similar to that shown in Figure 3 has been adopted on the lines of which the writer has charge. The creosoted flooring on top of the stringers is confined to place by lag screws passing upward through a casting which also engages the packing bolts passing through the upper part of the chord. By this method all perforation of the chord covering is avoided. The chord covering can be renewed when required by jacking up the flooring from the caps below, and at the same time the members of the chord can be inspected on top. The cap covering is the same as for the open deck. This plan is much cheaper than one consisting of a larger number of creosoted stringers with planks spiked on top of them, and has the advantage of immediate conversion of present open-deck trestles to ballasted floors and admits of more ready inspection. It is believed to be able to take care of derailed equipment as successfully as any other plan. Driving spikes into creosoted timber penetrates the outer surface and admits moisture to the untreated interior, and will no doubt hasten the decay of the timber.

It requires seven and one-third square feet of the galvanized iron to cover caps and stringers for every lineal foot of trestle with twelve-foot spans. The best quality of iron will cost about .042 cents per square foot, or .308 cents per lineal foot of bridge. The labor cost for open decks, including the boring of recesses in the ties, is about .087 cents per lineal foot of bridge, making the total cost of covering per lineal foot of bridge about .395 cents.

If the stringers and caps of open-deck trestles were creosoted instead of covered, the extra cost for treatment would be about $10 per thousand, B.M., or 75 cents per foot of bridge. To secure the full benefit of treatment, the framing should be done in advance, which is often quite difficult, in view of the varying span lengths, and cutting has often to be resorted to. If not done in advance, decay is likely to set in. Assuming that creosoted stringers will last twenty years, and that the galvanized iron on untreated stringers will last only five years, it would seem the best policy to use the creosoted timber. On the other hand, the creosoted timber should be protected against fire, and a covering which will answer this purpose will also protect the timber from decay.

For ballasted deck trestles the protection from fire is afforded by the ballast, and for all new work there seems no doubt but that the best plan is to use creosoted stringers and caps. However, for present conditions, where all stringers are already in place and sound, it seems most economical to cover the present stringers and to continue to renew the covering until new stringers are required. All patching should be done with creosoted stringers. Just what effect the placing of the creosoted timber on top of the galvanizing covering is likely to have on the durability of the latter is a matter for future determination. It is also a question whether black iron painted with two coats of red lead applied immediately after mixing would not be more economical than the galvanized iron for the open-deck trestle.

SUMMER SCHOOL IN TRACK WORK.

The educational bureau of the Union Pacific has an agreement with the University of Cincinnati whereby a certain number of students in civil engineering spend four months each summer for four years as laborers in track work. The University of Cincinnati has specialized in this combined practical and theoretical training for several years, the mechanical engineering students spending alternate weeks in school and machine shop, working in the latter place as common laborers. This same plan is now being worked out for those civil engineering students desiring railway work. They spend the four months from June 1 to October 1 as laborers in the track department of the Union

Pacific, and work on a level with other laborers, drawing the same rates of pay and subject to the same discipline. Special provisions are, however, made for separate cars for them to live in. A four-year course is outlined, in which the students spend the first summer as laborers in either section or extra gangs; the following year they are made assistant section foremen on track work, while the third summer they work as chain men or rodmen in the engineering corps; in the fourth year they are allowed to specialize along the line of work they intend to follow, such as the track or engineering department.

Last year eight students came from the university. Four were placed in the yard gang in the Omaha yard, and four in the steel gang, the intention being to reverse them after two months. As an indication of the way in which the boys entered into the work, it is interesting to note that at the end of the two months when the boys were sent from the yard to the steel gang the foreman of the steel gang kept all of them, successfully standing off the instructions of his superiors and protesting that they were the best men he had in the gang, and that he could teach them as much as they could learn anywhere else. Seven of these boys returned June 1 of this year, six being made assistant foremen on the district where motor cars are used and where the section forces maintain signals, while one goes firing on a locomotive. In addition, six new students will start in as laborers in an extra gang. In this way at the end of the four-year course these students will have a practical as well as a theoretical training in railway civil engineering. This co-operative plan originated with Dean Herman Schneider of the University of Cincinnati, who worked in conjunction with D. C. Buell, chief of the Educational Bureau of Information, Union Pacific Railway.

INCREASE IN USE OF CREOSOTED TIMBER.

The approximate increase in the use of creosoted timber for ties and bridge material during the last four years is shown in a table included in the last volume of the proceedings of the Wood Preservers' Association, which gives the amount of each class of timber treated by plants in the United States during that period. The following figures are extracted from that table:

	Per cent. Increase, 1908 over 1907.	Per cent. Increase, 1909 over 1908.	Per cent. Increase, 1910 over 1909.
Creosote Treatment.			
Cross Ties	67	3	49
Piling	37	27	18
Bridge Timbers	20	135	1
Switch Ties	132	70	33
Bridge Ties	..	..	15
Zinc Chloride Treatment.			
Cross Ties	12	7	14
Piling	..	..	..
Bridge Timbers	53	..	..
Switch Ties	103	44	45
Bridge Ties	..	..	..
Zinc Creosote Treatment.			
Cross Ties	39	17	22
Piling	180	..	..
Bridge Timbers	..	..	..
Switch Ties	..	68	..
Bridge Ties	..	..	..

PROTECTION OF SHOULDER ON NEW EMBANKMENT.

The common practice of allowing surfacing gangs to dig into the shoulder of a new embankment to secure material with which to surface the track after this bank has been carefully brought to grade by the contractors is not allowed on the extensions which the Chicago & North Western is building in South Dakota. A line is carefully stretched along each shoulder of the embankment in advance of the surfacing gangs and the foreman is required to secure all material outside these lines. In this way the shoulder is maintained as built and does not require widening the first year or two.

RAINY LAKE REVISION OF LINE OF THE CANADIAN NORTHERN.

The Canadian Northern is now making a revision of its line across the "narrows" of Rainy lake near Fort Francis, Ont., which is unusual in several respects. The present line between Winnipeg and Port Arthur was built in 1900, being one of the first built by the Canadian Northern. It crossed Rainy Lake on a pile trestle two miles long. The bottom of this lake is similar in many ways to the muskegs so common in this section, and in building the trestles in this soft bottom many piles 80 ft. long were used, even these frequently going down one foot at the last blow of the hammer. In spite of these unfavorable conditions



Unloading Bridge from the Lake.

very little difficulty has been experienced in maintaining the structure, but it was necessary to take precautions continually to guard against trouble.

The greatest difficulties resulted from the ice. In the fall when the lake froze over the water was usually considerably above the late winter stage, and as it gradually fell it was necessary to keep the ice cut away from the piles to avoid its carrying them down with it and throwing the track out of surface. When the ice went out in the spring the side pressure was very great, although no actual damage from this source was met with until a year ago, when one section of the trestle was pushed quite badly out of line. While but comparatively little trouble had been met, there was always danger, and it was decided to build a new line on solid embankment when the trestle required renewal.

In making the location survey for this new line soundings were taken through the water and mud to rock over a large area adjacent to the projected line. This work was started during



Unloading Bridge.

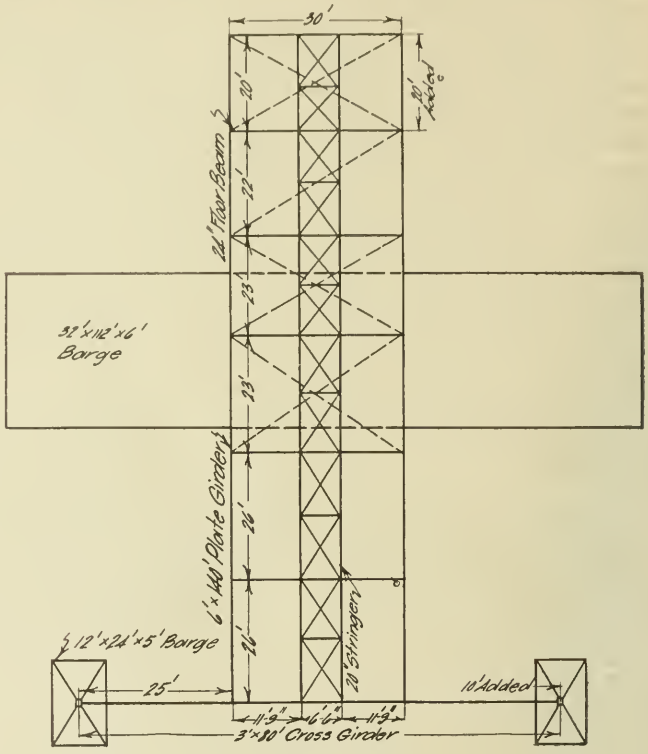
the winter but only fair progress was made. Much difficulty was experienced in driving down the sounding rods, as they became quickly coated with ice. The following summer the sounding was continued, a scow 22 ft. by 34 ft. by 2 ft. deep being used, on which a hand driver with 75-lb. hammer was erected. This scow had a well in the center, through which the sounding rod, composed of extra heavy 1¼-in. steel pipe in 10-ft. sections, was passed. Much more satisfactory results were obtained from this summer work than from soundings in the ice and better progress was made, a maximum of 28 soundings being secured in one day. The soundings were taken in water as much as 40 ft. in depth, while below these the mud extended to a maximum depth of

50 ft. over the rock. This mud varied from a soft ooze to a compact clay in which the sounding rod would penetrate but ⅛ in. with a 4 ft. drop of the hammer. Following the taking of the soundings a contour map of the lake bottom was made. By means of this map a new line was located over the summit of a submerged hill rising nearly to the surface of the water and at another place along a submerged side slope, very materially reducing the yardage. While introducing more curvature and lengthening the line about 900 ft., the new line was adopted because of the greatly decreased quantities of fill necessary as compared with any other line, and also to secure bridge openings at right angles.

The new line is 15,814 ft. long and provides two openings for logs and navigation; 800,000 cu. yds. of rock were required for a double track embankment, divided principally between three fills 1,000 ft. long and requiring over 100,000 yds. each and one 3,000 ft. long requiring 400,000 yds. About 95 per cent. of this rock is secured from an 80-acre borrow pit on an adjacent island.

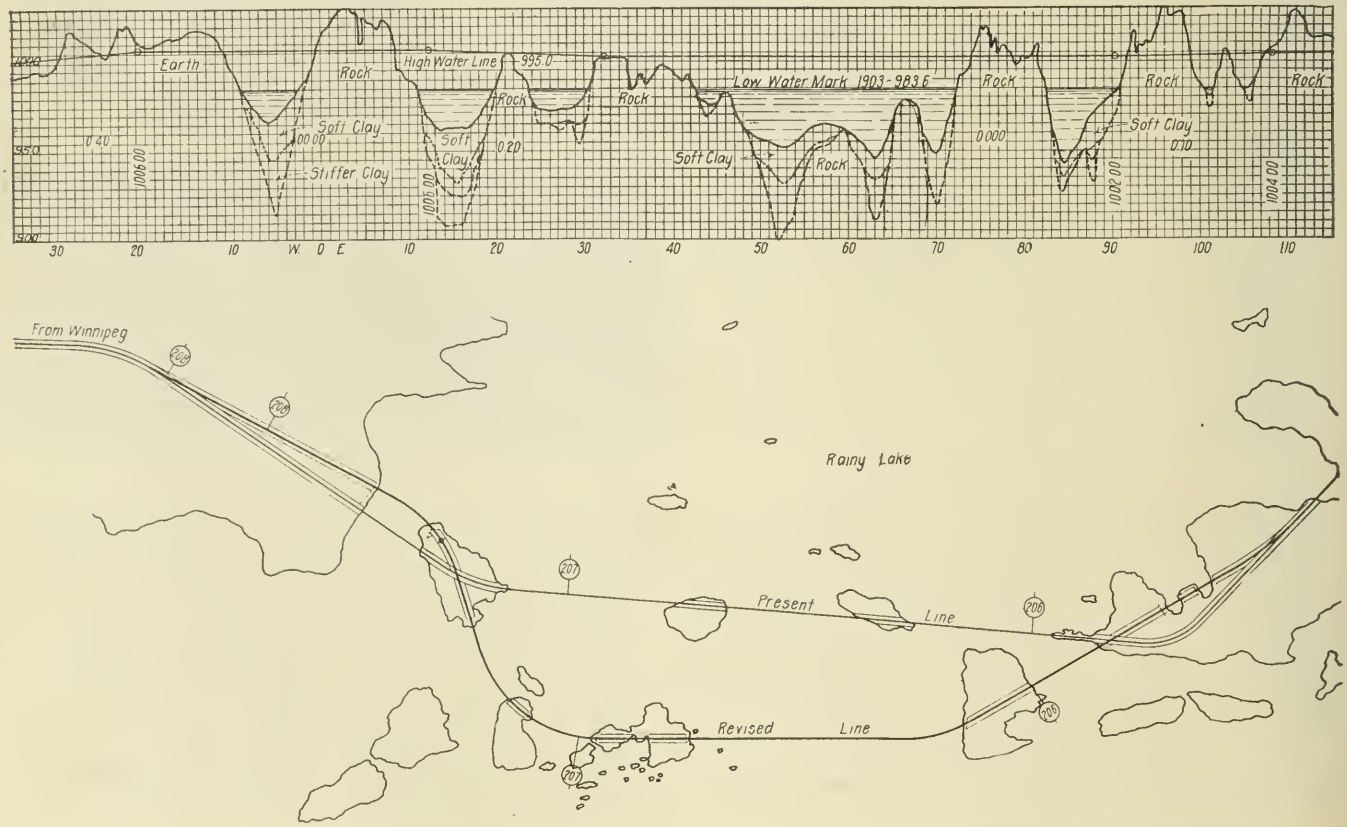
The contractors are using 25 tappet air drills for putting down the holes in the rock, these being drilled up to 30 ft. deep in the first lift and from 20 ft. to 25 ft. in the second lift. Air is furnished by a pair of "R. P. 2" type Canadian-Rand compound air compressors compressing 1,046 cu. ft. of free air per minute to 100 lbs. pressure. These compressors in turn are run by two 200 h. p. motors, securing power from the Rainy River Falls Development at Fort Francis, 2½ miles distant. The holes are heavily sprung and loaded with a combination of dynamite, virite and black powder, 300 shots being commonly fired at once. Two 95-ton Bucyrus shovels load the rock into 12-yd. standard gage side dump cars, which are pulled by four-wheel, 35-ton switching engines.

The contractor has devised an unusual arrangement for building the fills. The first fill was made in the ordinary way, by side dumping from a trestle and raising the tracks. A great deal of difficulty was encountered owing to the many heavy settlements of the fill carrying the trestle down with it. This settlement was especially severe in the shallow water, where there was much mud. To escape from the necessity of a trestle he placed two 6-ft. plate girders 140 ft. long across a barge 32 ft. by 112 ft. by 6 ft. deep, with one end of these girders resting on a 3-ft. plate girder 80 ft. long, which was supported in sliding braces on two smaller barges 12 ft. by 24 ft. by 5 ft. deep. The 6-ft. girders



Bridge Plan.

were placed 30 ft. center to center and were connected by seven floor beams 24 in. deep braced diagonally and spaced 20 to 23 ft., except at the two end panels, where they are spaced 26 ft. apart. On these floor beams two 20-in. stringers were placed spaced



Plan and Profile Rainy Lake Revision; Canadian Northern.

6 ft. 6 in. center to center and connected with double sway braces. On these stringers a standard gage track was laid extending on to the adjacent bank over two log stringers which reached over the end of the bridge. Cars are pushed out on to this bridge and dumped in the two shore panels. They are then pushed out on to the cantilever to allow others to be dumped, the cantilever acting as a tail track. As the two small barges at the shore end are placed at wide centers, the entire equipment can be pushed farther into the lake as the fill progresses. In completing the fill to grade it will be necessary to lengthen the cross girder, substitute larger barges for the 12 ft. by 24 ft. barges, and raise the entire bridge.

This arrangement has proven entirely successful, the only objection being that the 12 ft. by 24 ft. barges are not large enough and not far enough apart to enable the higher dump to be built at once. The barges are anchored to rock by steel cables and no difficulty has been experienced with the 3 ft. or 4-ft. waves which are encountered. To show the advantage of this floating equipment and the impracticability of filling from a trestle on this work, on one end of the 3,000-ft. fill 1,200 cars were dumped without moving the barges, the top of the fill repeatedly reaching the level of the girders and suddenly settling, leaving the bridge stringers in mid-air and forcing the mud to within 20 ft. of the surface in front of the barges where there had previously been 40 ft. of water. A comparison of the excavation and fill quantities has shown that the rock has settled to the rock on the lake bottom.

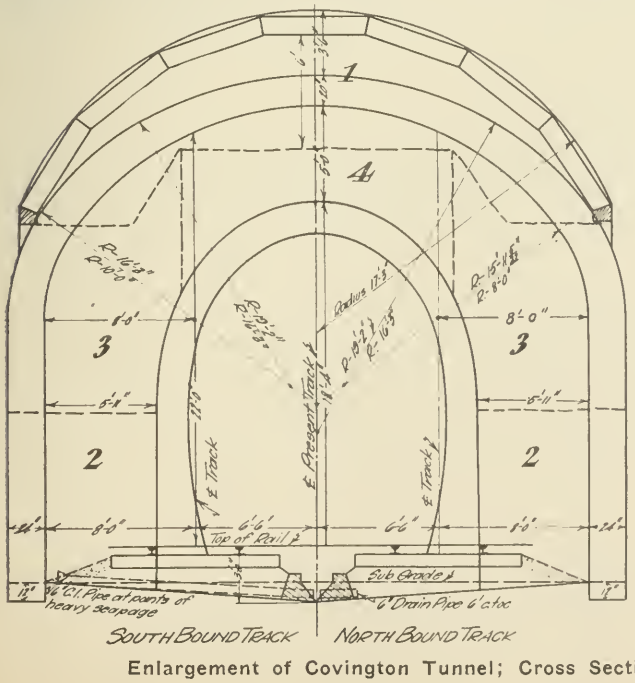
The contractors for this work are Johnson & Carey, St. Paul, Minn., who are working under the direction of W. H. Macleod, general manager and chief engineer of the Canadian Northern; W. L. Mackenzie, bridge engineer, and B. S. Remington, assistant engineer in charge of the work, to whom we are indebted for the foregoing information.

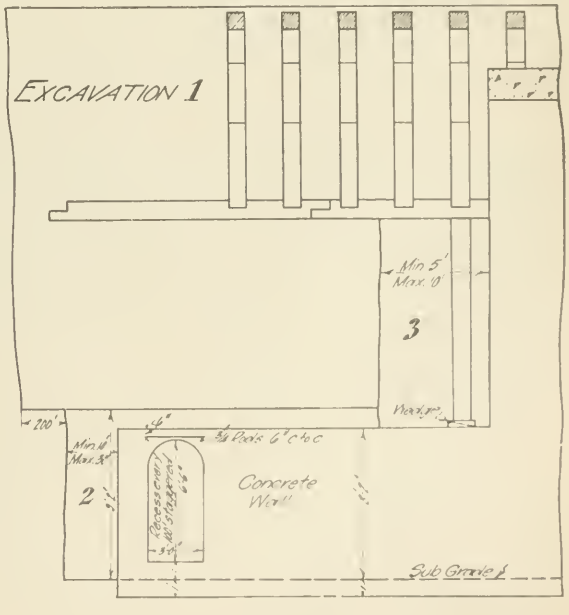
ENLARGEMENT OF THE COVINGTON TUNNEL.

The enlargement of the Covington tunnel, just south of Cincinnati, Ohio, on the Louisville & Nashville, was made necessary by the double-track work which the company is now doing from Cincinnati south. The Louisville & Nashville has two single track lines out of Cincinnati, its northern terminus. One, the Louisville, New Orleans & Memphis line, leaves the L. & N. and Pennsylvania union station, crosses the Ohio river on the L. & N. bridge, and runs southwest across the state of Kentucky. The other, the Cincinnati-Atlanta line, leaves the central union station, crosses the Ohio on the Chesapeake & Ohio bridge at a point about 1¼ miles west of the L. & N. bridge, and runs south by east, crossing the New Orleans and Memphis line at Latonia, Ky., four miles from Cincinnati. The traffic on both these lines is very heavy, but it is particularly so on that portion of the Atlanta line from Cincinnati to Latonia, since the company's terminal yards are located between these points, and, in addition to all passenger and freight movements on the Atlanta line, much of the interchange freight traffic for the Louisville line and a great many movements in and out of the yards are handled over this portion of the road. The scheduled movements alone number 122 in 24 hours.

In order to handle this traffic it became necessary to build double-track for a considerable distance south of Cincinnati, and as a step in this work, the single track tunnel at Covington, 3½ miles south of Cincinnati and a half mile north of Latonia, had to be enlarged to permit double track operation through it. The present tunnel is 754 ft. long, and is through a hill known locally as Kenton hill, in a thinly settled portion of the city of Covington. The north portal is very close to the south end of the Covington yard and from the south portal the track crosses a deep ravine on a heavy fill. The original tunnel was built between 1848 and 1852, by a railway corporation which by re organization became the Kentucky Central, and was lined with stone and brick.

The work of enlarging the bore is being carried on without interruption to traffic, the order of work being approximately as shown in the drawing. At present the first excavation is completed. It is the intention to complete the excavation and place the new concrete lining before disturbing the old tunnel ring, and it is not expected that traffic will be interrupted even by slow order until the actual tearing out of the old lining is begun. The excavation in the top heading is carried on from both ends, soft slate being encountered for the greater part of the length and a stiff clay near the south end. This clay is loaded by shovels into small push cars which are run out to the portal and dumped down chutes into narrow gage cars on tracks on either side of the main track. The excavated material is carried out in these cars and used for widening the fill. The contractor has 12 men in the heading, two outside to dump the material, a foreman and a water boy. Working two shifts of 11 hours each, he drove 88 lineal ft. in working 27 days during March. The face of the heading driven has an average area of 8 sq. yds. The timbering consists of seven 12 in. x 12 in. arch blocks spaced 30 in. and 36 in. center to center and 2-in. lagging. For

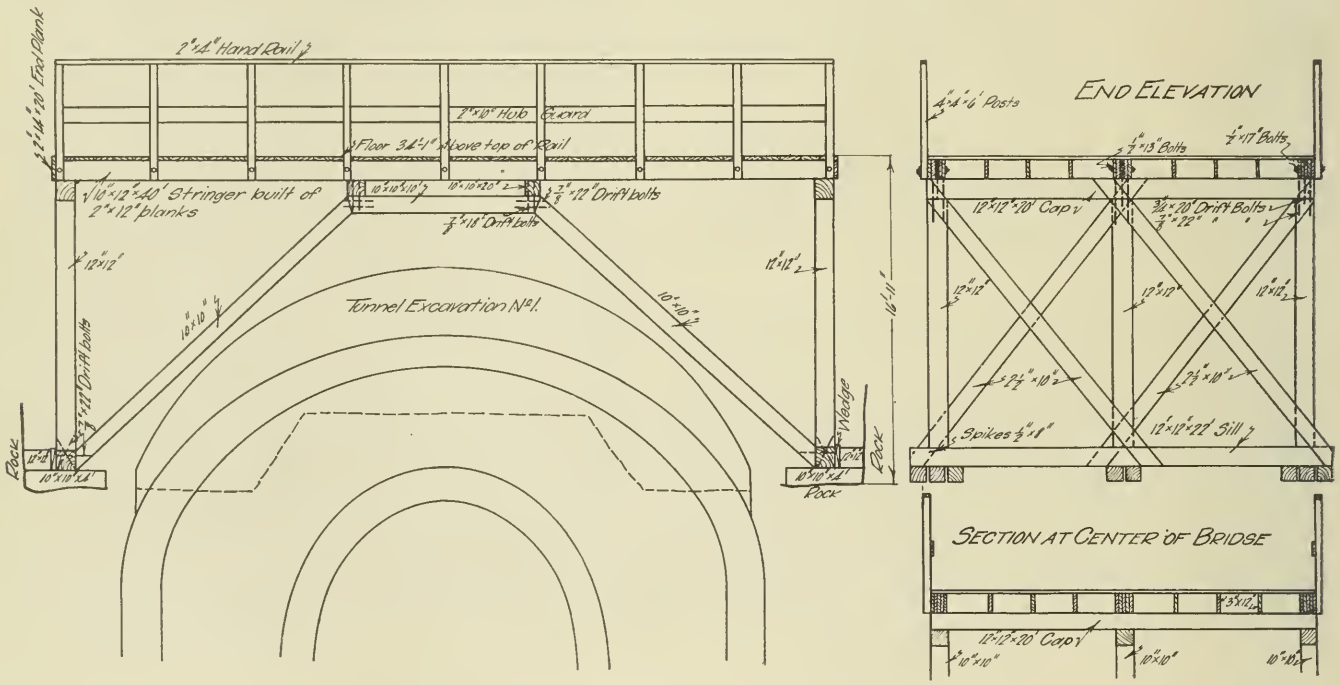




Enlargement of Covington Tunnel; Cross Sections of Old and New Tunnels, Showing Order of Work.

a portion of the distance in the clay heading the lagging was driven ahead of the timbering. The clay was comparatively easy to handle when dry, but became very sticky when wet, causing the contractor considerable difficulty in timbering under a surface hole which was encountered in a season of wet weather. From the surface topography, it seems probable that this hole is at the end of the section originally built in open cut, or else is the result of a serious cave-in after the completion of the tunnel. The natural drainage of the surface water to this hole keeps the clay below it constantly wet, and it was a very difficult matter to support this weight of wet clay in the heading. A slight cave-in warned the contractors of the difficulty, but more serious trouble was avoided by adding intermediate arch blocks, so as to reduce the spacing to 18 in. center to center, and by adding a 3-ring arch below the other timbering for a short distance.

The Bank Lick turnpike crosses over the tunnel very close to the south portal, and in enlarging the bore, care was taken to prevent any sliding that would endanger highway traffic. This traffic was first diverted to the half of the road away from the tunnel portal, while two excavations were made in the other half of the road, in which to place the supports for a temporary



Temporary Highway Bridge Over Tunnel Portal.

bridge, as shown in the drawing. When this bridge was completed, traffic was turned over it and maintained on it until the excavation for the tunnel was carried well under the road. Traffic was then temporarily diverted to the half of the road that had been undisturbed, the bridge was removed, and the holes filled, restoring the road to its original condition. The danger of slides at this point was possibly not great enough to warrant the expense necessary to care for traffic as outlined above, but it served very well to allay any fears of the traveling public and did much to secure the good will of the local community.

The soft slate in the north heading is interspersed with occasional ledges of hard limestone 2 in. to 6 in. thick. This material is broken up by charges of from a half to one stick of 60 per cent. dynamite. The drilling is done with Howell's mining drills, operated by two men, or by Nixon ratchet drills, where it is necessary to drill in cramped positions. It has been found possible in this work to drill 2-in. holes in the slate at the rate of about 1 ft. in 2 minutes, but it is impossible to use the drills at all in the limestone ledges. The holes are drilled to a depth of about 5 ft. In "shooting down the face" it is customary to take out a vertical wedge in the center of the heading and then blow in the roof and sides. The rock is handled in two mule cars running on narrow gage tracks in the heading. The cars are equipped with detachable bodies which are picked up by a derrick just outside the portal and dumped into a chute having a capacity of about three cars of stone, from which the material is removed in dump wagons and used to fill a deep ravine on private property. The contractor uses 12 men and a foreman in this heading and four men outside, making a progress of 155 lineal ft. in 27 working days during March, and 160 lineal ft. in 25 days during April. The average area of this heading is 7½ sq. yds. Both headings are wired for electric light, power being secured from a local lighting company.

The engineer in charge for the railway is keeping a very complete and accurate record of the progress of the work in the tunnel. A rubber stamp, showing the outline of the 7-ring timber arch, is used to stamp the sheets on which the inspectors' record the measurements of daily progress. Horizontal and vertical measurements are taken at every joint in the timbering, and at other points where the outline is irregular. From each inspector's record a cross section is plotted in a standard cross section book, and from this the quantity of material moved outside of the ring is calculated. Accompanying each cross section, the total computed area outside the ring and the area of packing and "falls" are recorded. This area of packing and "falls" is obtained by subtracting from the total area the area of the cross section of the 2-in. lagging which is driven outside the arch ring. As the side drifts are excavated, similar cross sections will be plotted in the same book, so that when the work is completed each page will show the exact area of the section excavated at a given point. The progress profile of excavation along the center line in both headings is plotted each day, using the center rib of the timber arch as the base for measurements above and below. The portions of this profile that represent the work completed each month are colored to indicate clearly the general progress. On the same sheet with this progress profile is plotted a curve using lineal feet of heading as abscissae and elapsed time in days as ordinates. The slope of this curve representing the rate at which the work is progressing. The work is being done under the direction of W. H. Courtenay, chief engineer, and J. E. Willoughby, engineer of construction of the Louisville & Nashville, by Thrasher & Gunter, Chattanooga, Tenn. E. L. Trowbridge is the assistant engineer for the company in direct charge of the work. We are indebted both to the railway company and the contractor for the above information.

General News Section.

The New Jersey Legislature has passed, and the governor has signed, a law requiring railways to pay their employees twice a month.

According to an Arizona paper, the lines controlled by the Southern Pacific, in Mexico, suffered the loss of 200 bridges during the recent activities of the rebels in that country.

The hospital department of the Illinois Central, which has been in operation on the eastern lines of the road for a number of years, will from July 1 be extended over the entire system.

The Illinois railway commission bill recently passed by the legislature of that state, and outlined in the *Railway Age Gazette* of June 2, page 1287, has been signed by Governor Deneen.

The governor of Illinois has vetoed the bill which had been passed by the legislature, making the members of the State Railway Commission elective; but he says that the other measure, enlarging the powers of the commission, will have his approval.

The efficiency tests on the Pennsylvania Railroad now include inspection of the conduct of track repairmen, who are cautioned if they stand on a track while a train is passing (on an adjacent track); and if they walk on main tracks in the same direction as the current of traffic.

In San Diego, Cal., H. S. Heady, has secured a verdict in a local court for $171, being the amount of a month's salary, against the Atchison, Topeka & Santa Fe, on the ground that the road, in discharging him without giving him a hearing, had violated an agreement.

The Lehigh Valley is using Western Electric selectors for calling the different points on its telephone line in the Jersey City terminal freight yards, the yardmaster's office being equipped with calling apparatus like that used by train despatchers. In other words the yard telephone line is operated in the same way that a telephone train wire is operated.

It is claimed in Paris that Jules Vedrines, who recently flew from Paris to Madrid, attained, on one day, the prodigious speed of 155 miles an hour; traversing the distance from Dijon to St. Lauren—les-Macon—77.5 miles, in 30 minutes. He was pushed by a violent wind, which at times forced his machine into an erratic course, including frightful drops of a thousand feet.

With a view to impressing on its employees the importance to themselves and the company of their systematically keeping out of danger, the Atchison, Topeka & Santa Fe is holding at points along its lines where a considerable number of employees have their headquarters, a series of "safety" meetings at which addresses are being made by J. D. Hamilton, claims attorney of the road.

Pending the outcome of the 2-cent fare litigation in Nebraska, a written contract has been agreed to and signed by representatives of 13 Kansas railways, and the atttorney-general of that state providing for the continuation of 2-cent fares in Kansas for an indefinite period. If the cases in Nebraska are decided in favor of the railways, the Kansas roads will renew their contest for higher rates.

The Board of Public Utility Commissioners of New Jersey, having investigated the derailment at Martin's Creek on April 29, when eight or more persons were killed, finds that the derailment was due to imperfect track; the outer rail of the curve having been left insecure, so that the proper super-elevation was not maintained. Repairmen were at work on the track up to a short time before the derailment occurred. The commission finds also that no flagman was sent out to warn the approaching train to reduce speed.

Figures compiled by H. G. Askew, a statistician representing 32 of the Texas roads embracing approximately 93 per cent. of the mileage in the state, show that during the nine months ending March 31, 1911, the operating revenue of the roads was $80,208,710, an increase of 5.84 per cent. over the corresponding period of the previous year, while the total operating expenses aggregated $60,270,180, an increase of 7.83 per cent. After deducting operating expenses and making expenditures amounting to $23,995,700 from total operating revenue and all other receipts a deficit of $2,293,899 was shown.

A special demonstration train, called the "reclamation special," carrying lecturers representing the U. S. Reclamation Service and the Geological Survey, was sent out from Chicago on June 14 by the Illinois Central for a trip over the lines of that road and the Yazoo & Mississippi Valley in Kentucky, Tennessee, Mississippi, Alabama, Louisiana and Arkansas. The train will make stops at 61 cities and towns, where lectures will be delivered, and a study will be made of the swamp country with a view to determining the best method of draining it and disposing of the water to greatest advantage.

In Massachusetts a law has been passed requiring railways to extend the term of season tickets when a passenger desires to take a vacation of a week or more. The passenger must deposit his ticket with the railway company, and when it is returned to him, the time will be extended for a number of days, equal to the time that he has not used the ticket; but he must not ask this concession oftener than once in three months. Another law in the same state requires railways to refund cash fares paid by season ticket holders when they happen to make a journey without taking their ticket with them.

Referring to the application of the full crew law on "mixed trains," Attorney-General Honan, in an opinion to Chairman Wood of the Indiana railway commission, has laid down conditions under which prosecutions may be brought by the commission against railways accused of violations of the law. He holds that in cases where the evidence shows that a train is operated chiefly as a passenger, express or mail train the prosecution should be brought under the section of the full crew law applying to such trains, while if it shows that the train is operated chiefly as a freight train prosecutions should be based on that part of the law relating to freight train operation.

An effort is being made by the Chicago & Western Indiana to force the Chicago & Eastern Illinois to bring its passenger trains entering Chicago into the Dearborn street station over the tracks of the former road, instead of into the La Salle street station, as it has been doing since its acquisition by the Rock Island in 1904. The object is to make the C. & E. I., which is one of the five joint owners of the Western Indiana, assume a greater proportionate share of the expenses of maintenance and operation of the latter road, which expenses, according to contracts between the five roads, are shared on a wheelage basis. This is a revival of a suit brought by the other four roads—the Erie, Wabash, Grand Trunk and Monon—against the Eastern Illinois, which was dismissed by Judge Carpenter in 1907 for want of equity.

The strike at the shops of the Baldwin Locomotive Works, Philadelphia, which was begun by the boilermakers more than a week ago, has resulted in the stopping of work in all departments in a large part of the plant, but the company maintains a firm attitude, and, according to a recent statement, more than half of the employees are still at work. Of the 10,000 who struck, more than 2,000 returned to work within a few days. The machine shop at 16th and Spring Garden streets is working full force, but the strikers continue to make strenuous efforts to get these men out and have had some little success. Several hundred molders and coremakers left their work at the Eddystone shops on Wednesday of this week. Philadelphia papers say that the company will, if necessary, sub-let its pending contracts rather than submit to the strikers.

To find Texas taking an attitude less radical than that of New York would be a surprising discovery, but something of that kind is suggested in a news item from Austin, which says that the attorney-general of Texas has handed to the state railway commission an "interpretation" of the stock and bond law to the effect that a railway company has the right to issue and sell its stock without commission approval or regulation. The law simply requires the company to file with the commission a list of its stockholders. More surprising still, it is said that the mem-

bers of the commission have unanimously agreed to follow the new ruling, although Chairman Mayfield expressed himself as hesitating to depart from a policy so long adhered to by the commission—the policy of holding all issues of stock and bonds illegal unless approved beforehand by the commission.

The Latest Form of Train Accident: Cars Dented.

Progress toward perfection in railway operation has now reached that stage where, by a look into the future, one may discern the possibility of partly abolishing the term "accident"—the first four letters of the word, at least. Following is a recent press despatch from Navada City, Cal.:

"Constable Harvey of Truckee arrived here this morning with two prisoners. . . . Harvey and his prisoners were caught in a train wreck in the snow sheds the other side of Summit. A broken flange derailed a coach and the steel car in which they rode was thrown from the track and dented. Had it been a wooden car many people would have been injured and possibly killed. The snow sheds were torn badly."

British Accident Record.

The report of accidents on the railways of Great Britain and Ireland for the year ending December 31, 1910, shows 23 passengers, 9 employees and two other persons killed in train accidents; and 1,111 passengers, 113 employees and 7 other persons injured. Other accidents to trains and connected with the operation of trains, such as persons on the track being run over, bring the totals up to 1,062 persons killed, and 8,342 injured; as compared with 971 killed and 7,592 injured in the year preceding. The most notable difference between the two years is in the first item—that of passengers killed in train accidents; the record for 1909 showing only one, as compared with 23 in 1910. Accidents to persons where the movement of cars and engines was not concerned, when added to the figures given above, make the totals for the last year 121 passengers, 420 employees and 580 other persons killed and 4,080 passengers, 25,131 employees and 893 other persons injured.

Cost of Omnibus Operation in London.

The London General Omnibus Company now operates over 1,000 automobile omnibuses, which during the year 1910, earned a profit of £59,400; but the company still has a large number of horse-drawn omnibuses, on which a considerable loss is sustained. At the recent Good Roads Congress, held at Brussels, where these facts were brought out, a statement was presented showing the comparative cost of operation of "autobusses" and trolley cars; from which it appears that trolley cars cost 9.28 pence per car per mile, while autobusses cost 8.99 pence per mile; and the dividends paid by the trolley car line amounted to 2.01 pence per car per mile, while the dividends paid by the autobusses amounted to only about half a penny a mile. The statements in detail show that an allowance has been made for depreciation; and that rents, taxes and insurance have been properly charged. From this it would appear that the omnibus, in spite of its smaller carrying capacity, and apparently greater loss, due to friction and wear and tear, is the more economical mode of transportation; but there still remains a large difference unnoticed in the fact that the roadway used by the omnibuses is maintained entirely by direct taxation of the public. In the trolley-car accounts 0.43 pence per car mile is allowed for keeping up the roadway. How much ought to be allowed for maintenance of the roadway used by the buses does not appear.

New York City Subways.

The joint committee of the Board of Estimate (of the city), and the New York State Public Service Commission, this week made a report presenting its compromise plan for the extension of subways in Manhattan, Bronx, Brooklyn and Queens boroughs, New York; the work of the committee having been to harmonize, so far as possible, the conflicting plans presented to the Public Service Commission by the two rival operating companies—the Interborough Rapid Transit and the Brooklyn Rapid Transit companies. The committee report will be the subject of a public hearing by the Board of Estimate next week, Thursday. The committee proposes to allow the Interborough to build a part of the desired extensions and the Brooklyn Rapid Transit a part. In case these companies do not accept the scheme now offered, the committee recommends that the city proceed at once itself to build the "tri-borough route," laid out by the commission last year. The principal features of the present report are as follows: The Interborough to extend its present line northward from Forty-second street through Lexington avenue and southward from Forty-second street through Seventh avenue; also to build extensions in Brooklyn through the Eastern Parkway and Nostrand avenue; and in Queens to Corona and Astoria, by way of the Belmont tunnel; the Brooklyn Rapid Transit to extend its line through Manhattan avenue in Brooklyn and over the Manhattan bridge; from Brooklyn borough hall, by tunnel to Liberty street, Manhattan; and then northward, mainly through Broadway, to Fifty-ninth street; and east through Fifty-ninth street over Queensborough bridge. The plans proposed in the committee's report provide for 88 miles of new construction, the estimated cost of which is given as below.

Total cost of new system	$257,600,000
City's contribution	131,400,000
Interborough contribution	75,800,000
B. R. T.'s contribution	50,400,000
Total available credit of the city	300,000,000
Miles of new roads to each company	44

Estimated time to build subways and complete elevated improvements, two to four years.

Chinese Bonds Offered in New York.

The American syndicate which for months has been negotiating for the control of a Chinese government loan for the construction of railways, announces that subscriptions will now be taken for about $7,500,000, being a part of an issue (first series) of $30,000,000 to be offered in New York, London, Paris and Berlin. The loan is the "5 per cent. Hukuang railways sinking fund gold loan of 1911," and the American bankers are J. P. Morgan & Co.; Kuhn, Loeb & Co.; the First National Bank and the City National Bank.

Local Freight Agents.

The American Association of Local Freight Agents, formerly the Association of Local Freight Agents' Associations will hold its annual meeting at the Coates House, Kansas City, Mo., June 20 to 24. Among the subjects to be discussed are: How to Secure Friendly Co-operation of Shippers and the Public; Uniform Waybill and Freight Bill Forms On All Roads; Auditor's Revision of Billing in Local Offices at Large Terminal Points; Final Decision Regarding Correct Charges Should Be Made at Billing Station; Elimination of Waybills By Forwarding Freight on Shipper's Dray Tickets; Federal Livestock Regulations; and Why Continue Demurrage Associations?

The president of the association is C. A. Witzel (B. & O.), Cleveland, Ohio, and the secretary is R. O. Wells (Ill. Cent.), East St. Louis, Ill.

American Association of Demurrage Officers.

The 22nd annual convention of the American Association of Demurrage Officers will be held at the International Hotel, Niagara Falls, N. Y., June 22. One of the principal discussions at the meeting will be on the National Uniform Demurrage Rules, with a view to bringing out the experience of all the members. The president of the association is J. F. Roach, St. Louis, Mo., and the secretary is A. G. Thomason, 294 Washington street, Boston, Mass.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; June 26, 1911, Boston, Mass.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March. May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The traffic department of the Pennsylvania announces that the missionary work done by the pamphlets which it has circulated among the farmers, has resulted in the establishment of a Farmers' Club at Price, Md.

The shipments of coal over the Carolina, Clinchfield & Ohio for the five months ending May 31, amounted to 43 per cent. more than for the corresponding period of 1910. New mines are being opened in the Virginia coal regions served by this road.

Several changes in its train schedules have been announced by the Chicago Great Western resulting in reductions in the time between Chicago and St. Paul. Between Fort Dodge, Iowa, and Oelwein, motor cars have been substituted for two steam trains.

An additional first-class train, to be known as the "Centennial State Special," will be put on by the Chicago & North Western on June 18 to run from Chicago to Denver, leaving Chicago daily at 10 a. m., and arriving in Denver at 1:15 p. m. of the next day. Plans are also being made for a new first-class train to leave Chicago at the same time for Portland and other points in the northwest.

Shippers at Kansas City and St. Joseph, Mo.; Omaha, Neb.; and Sioux City, Iowa, have protested to the Interstate Commerce Commission against the action of the Santa Fe and other roads in the Middle West in cancelling their "return shipment rates," which was done following a decision of the commission that return shipments of damaged or unaccepted goods, which it had been the habit of the roads to carry at 50 per cent. of the regular charge, must be made within ten days at most.

Beginning June 18 through trains will be run by the Chicago, Burlington & Quincy in connection with the Denver & Rio Grande and the Western Pacific between Chicago and San Francisco. The "Colorado Limited" of the Burlington, which leaves Chicago daily at 9:45 a. m. and arrives at Denver at 1 p. m. of the next day, will be used in this service, the time for arrival at Salt Lake City being 4:15 p. m. of the third, and at San Francisco 10 p. m. of the fourth day. Returning, the train will leave San Francisco at 6:30 p. m., reach Salt Lake City at 3:30 a. m. of the third day, Denver at 9:05 a. m. of the fourth day, and arrive in Chicago at 2 p. m. of the fifth day.

General Review of Crop Conditions.

The United States Department of Agriculture bulletin says: "The month of May was not, on the whole, very favorable for crop growth, drouthy conditions having prevailed over a great portion of the United States. In consequence the average condition of crop growth in the United States on June 1 was 2.8 per cent. below the average condition on that date. Some relief from the favorable conditions came at the close of May and first part of June. A comparison of the conditions of various crops on June 1, with their average growing condition on June 1 of recent years (past ten years for most crops) is shown as follows (100 representing average conditions and not normal):

"Cotton 108.5, sugar beets 103.2, apples 102.5, raspberries 101.8, spring wheat 101.1, watermelons 100.6, pears 99.7, cantaloupes 99.6, blackberries 99.5, sugar cane 99.5, barley 99.2, winter wheat 98.5, rye 98.2, oats 96.9, alfalfa 96.1, onions 95.5, lima beans 92.5, cabbage 91.0, pastures 90.2, hemp 89.0, clover hay 84.6, all hay 85.1, peaches 83.5.

"The above figures relate only to relative growing conditions, not taking into account changes in acreages. Taking into account both acreage and condition, indications are for about 9.9 per cent. larger wheat crop than was produced last year, and 10.2 per cent. larger than the average of the past five years; oats crop 13.3 per cent. less than last year but 4.8 per cent. more than the average of the past five years; barley 8 per cent. more than last year, and 5.3 per cent. more than the five-year average. Total areas have not been estimated for the other crops, except that the rye area planted is about 1.2 per cent. less than last year. Clover (for hay) acreage 6.3 per cent. less and sugar cane acreage 0.4 per cent. more than last year. The average condition of all crops,

by states, on June 1, was approximately as follows, 100 indicating the average (not normal) for recent years on June 1:

"Maine 93.7, New Hampshire 84.2, Vermont 89.0, Massachusetts 82.3, Rhode Island 86.2, Connecticut 79.0, New York 83.9, New Jersey 81.6, Pennsylvania 88.1. Average for above division 86.2; conditions compared with June 1, 1910, 87.0 per cent.

"Delaware 81.1, Maryland 84.7, Virginia 85.3, West Virginia 80.2, North Carolina 97.2, South Carolina 98.0, Georgia 109.1, Florida 108.8. Average for above division 98.7 per cent.; condition compared with June 1, 1910, 98.0 per cent.

"Ohio 97.5, Indiana 96.3, Illinois 92.6, Michigan 95.7, Wisconsin 98.8. Average for division 93.6 per cent.; compared with June 1, 1910, 96.7 per cent.

"Minnesota 102.6, Iowa 101.2, Missouri 86.6, North Dakota 100.6, South Dakota 96.5, Nebraska 98.7, Kansas 85.3. Average for division 95.9 per cent.; compared with June 1, 1910, 102.0 per cent.

"Kentucky 93.4, Tennessee 95.1, Alabama 111.3, Mississippi 106.2, Louisiana 110.8, Texas 107.7, Oklahoma 85.4, Arkansas 104.6. Average for division 102.2 per cent.; compared with June 1, 1910, 100.2 per cent.

"Montana 100.3, Wyoming 97.7, Colorado 88.4, New Mexico 111.4, Arizona 107.1, Utah 95.8, Nevada 93.3, Idaho 102.3, Washington 103.1, Oregon 103.2, California 96.3. Average for division 99.1 per cent.; compared with June 1, 1910, 96.1 per cent."

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 98, covering car balance and performance for February, 1911, says:

"The general performance was strikingly similar to that for January, such changes as there were in the various averages being slight. The miles per car per day averaged 22.6, including surplus cars. The average for active cars is 24.6. Ton miles per car per day, while practically the same as January in the average for all cars, shows an increase in the active car average from 352 in January to 359 in February.

"The homeward movement still continues, the proportion of Home cars on line increasing from 58 per cent. in January to 61 per cent. in February. The loaded mileage, however, shows an increase from 67.2 per cent. to 67.8 per cent., indicating that the return movement had practically spent its force.

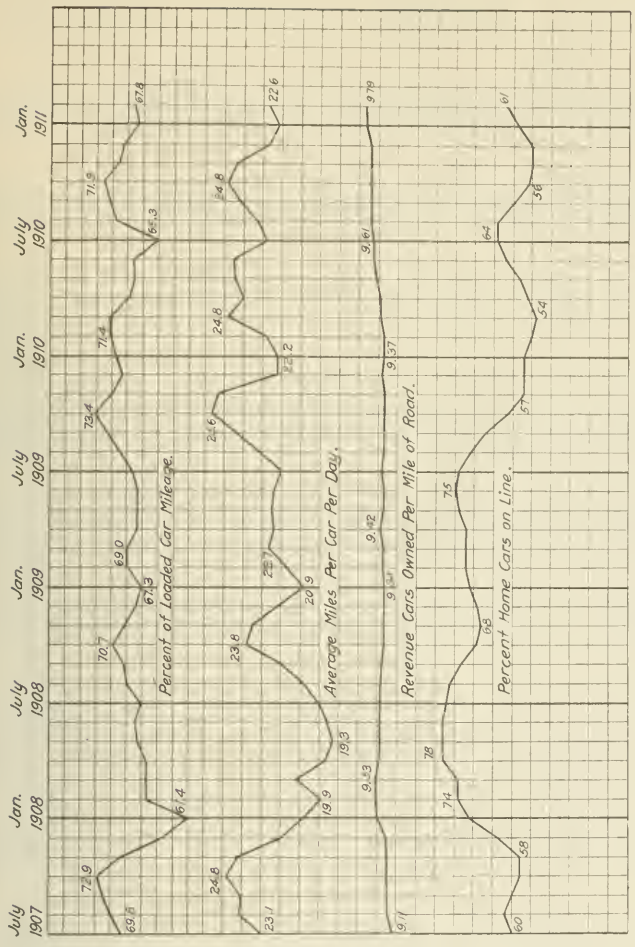
"While comment has been made in previous bulletins on the decrease in the proportion of loaded mileage that invariably follows a recession in traffic, very little has been done to analyze this decrease. One reason for this is that the details of loaded and empty mileage as between home, foreign and private cars are not reported by all roads. We have, however, drawn off such figures as are available in order to secure a comparison between October, 1910, and February, 1911, and the results are shown in the accompanying small table.

	Feb., 1911.	Oct., 1910.	Increase, Per Cent.	Decrease, Per Cent.
Home Cars on Line	641,520	603,082	6.37	.....
Foreign Cars on Line	418,068	478,445	.....	12.62
Private Cars on Line	32,347	30,450	6.22	.....
	1,091,935	1,111,977	.....	1.81
Ratio Home Cars to Total R. R. Cars	.61	.56	8.93	.....
Average Miles per Car per Day:				
Home Cars	17.4	20.5	.....	15.12
Foreign Cars	28.1	28.3	.....	.71
Private Cars	52.5	57.0	.....	7.89
All Cars	22.5	24.8	.....	9.27
Percent. of Loaded Mileage:				
Home Cars	66.5	71.9	.....	7.51
Foreign Cars	71.1	78.0	.....	8.85
Private Cars	66.1	67.3	.....	1.78
	68.7	74.6	.....	7.91

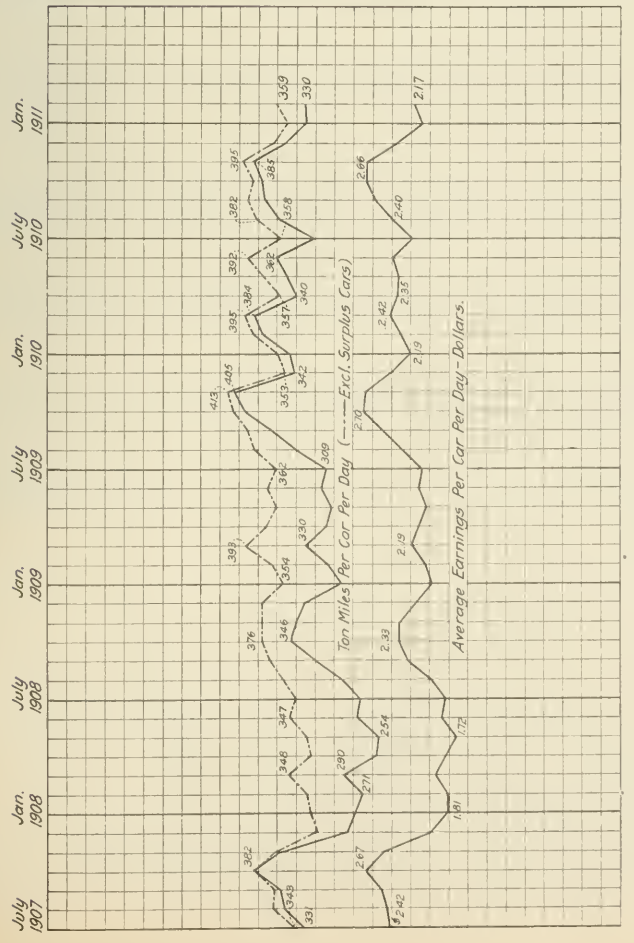
"It will be noted that while the average miles per car per day for all cars shows some decrease, the average for foreign cars was practically unchanged, the decrease being entirely in home and private cars, which is a natural result of the lessened traffic, and the increase in surplus equipment. The fact that there was practically no decrease in the daily movement of foreign cars indicates that these cars were being moved instead of stored, and as shown by the loaded mileage percentage, a con-

Car Balance and Performance in February, 1911.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill, Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Idaho, Nev., Ore., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	76,407	720,943	221,799	182,233	172,971	389,975	18,317	137,810	28,605	142,588	106,182	2,197,830
Average number of system cars on line	42,568	438,178	138,040	106,524	95,204	268,256	6,843	85,305	21,523	65,306	73,414	1,341,161
Railway-owned cars: Average foreign on line	35,960	253,899	94,905	78,702	66,326	116,810	11,467	56,616	21,085	52,902	34,044	822,716
Total Railway-owned cars on line	78,528	692,077	232,945	185,226	161,530	385,066	18,310	141,921	42,608	118,208	107,458	2,163,877
Excess	2,121	.....	11,146	2,993	.....	.....	1,426	4,111	14,003	.....	1,276	.....
Per cent. of cars on line to total owned:												
Home	56	61	62	59	55	69	37	62	75	46	69	61
Foreign	47	35	43	43	38	30	63	41	74	38	32	37
All railways	103	96	105	102	93	99	100	103	149	84	102	93
Private cars on line	2,967	43,015	11,743	4,354	6,327	13,879	*1,292	6,623	3,127	12,047	3,046	108,420
Total, all cars on line	81,495	735,092	244,688	189,580	167,857	398,945	19,602	148,544	45,735	130,255	110,504	2,272,297
Per cent. of cars in shop	4.72	5.34	5.86	5.90	6.88	6.77	5.57	6.92	4.66	5.71	6.23	5.90
No. of freight engines owned	1,110	10,631	2,921	3,070	2,600	6,326	495	2,763	748	2,637	2,151	35,452
Average cars on line per freight engine owned	73	69	84	63	64	63	40	54	61	49	51	64
Total freight-car mileage	37,770,877	465,587,145	136,138,701	117,415,990	113,047,511	247,426,824	19,307,907	84,121,244	32,163,894	105,198,493	76,031,931	1,434,210,517
Average miles per car per day	15.6	22.6	19.9	22.1	24.1	22.2	35.2	21.2	25.1	28.8	24.6	22.6
Per cent. loaded mileage	72.5	64.4	64.7	66.5	71.5	70.0	74.6	67.2	62.6	70.7	77.9	67.8
Ton-miles of freight, including company freight	420,280,615	7,166,877,885	1,781,178,583	1,772,909,706	1,238,472,148	1,949,367,475	301,710,050	1,117,659,901	353,561,307	1,501,056,593	1,087,682,326	18,690,156,679
Average ton-miles, including company freight:												
Per car-mile	11.1	15.4	13.7	15.1	14.8	13.2	16.3	13.3	11.0	14.4	14.3	14.4
Per loaded car-mile	15.4	23.9	21.2	22.7	20.5	19.4	21.8	20.0	17.5	20.4	18.3	21.4
Per car per day	184	348	279	334	361	311	601	282	276	415	351	336
Gross freight earnings	$4,714,015	$41,213,559	$10,498,218	$11,235,897	$11,132,008	$23,654,882	$2,222,726	$9,695,523	$3,011,526	$13,208,515	$7,146,810	$137,733,681
Average daily earnings: Per car owned	$2.20	$2.04	$1.69	$2.20	$2.30	$2.17	$4.45	$2.51	$3.76	$3.31	$2.42	$2.24
Per railroad car on line	2.14	2.13	1.61	2.17	2.46	2.19	4.47	2.44	2.55	4.00	2.40	2.28
All cars on line	2.07	2.00	1.53	2.12	2.38	2.11	4.17	2.33	2.35	3.63	2.33	2.17



Car Performance in 1907 to 1911 Inclusive.



Car Earnings and Mileage in 1907 to 1911 Inclusive.

siderable portion of this movement was not productive of revenue. Analyzing the loaded mileage percentages we note that in October, which may be taken as fairly representative month, foreign cars made a much higher proportion of loaded mileage than home cars, the comparison being 78.0 per cent. of foreign against 71.9 of home. This is quite logical, as interchange traffic as a rule is largely handled in cars that are suitable for general service, while cars handling commodities that tend to lower loaded percentage, remain as a rule on their home lines. In February, however, while both home and foreign cars show a decrease in loaded percentage, the foreign percentage is less than the October loaded percentage for home cars. While a portion of this decrease is probably attributable to an empty movement which would eventually be necessary in any event, it seems incredible that such a large decrease as this should be necessary, and as the private car loaded mileage is practically unchanged, the natural inference is that a large portion of the empty mileage which caused this change in the loaded percentage, is excess mileage brought about by the return of cars to their owners in order to save per diem.

"It will be noted that while the home cars or line increased about 40,000, or 60 per cent., the decrease in foreign cars amounted to 60,000. These figures if taken for all roads in the country should of course equal each other, but when taken for a portion of the roads there is room for a considerable discrepancy. In the present instance this difference is due to the fact that several of the larger roads omitted from this tabulation did not reduce the equipment on line to such an extent as did roads selected for this comparison."

The accompanying large table shows car balance and performance for February, and the charts show car performance and earnings in 1907 to 1911 inclusive.

INTERSTATE COMMERCE COMMISSION.

The Commission on June 12, dismissed the proceedings in its suspension of advances in rates on agricultural implements and other articles in South Western Freight Association territory, the railways having filed new tariffs, providing for the continnuance of the old rates.

The commission on June 9 issued a number of orders, permitting the continuance of fares which do not conform to the long and short haul rule. The Baltimore & Ohio Southwestern is permitted to charge higher rates out of Cincinnati, Ohio, to points in Illinois and Missouri than the combinations of the locals until May 1, 1912, owing to the state 2-cent fares in Ohio, Indiana and Illinois. The same permission is granted the Mobile & Ohio between various points on its line. The Missouri Pacific and the St. Louis, Iron Mountain & Southern are permitted to continue the present charges for passenger fares and excess baggage rates, owing to the state laws of Nebraska. The Coast line of the Atchison, Topeka & Santa Fe is permitted to continue the present charges on excess baggage. The International & Great Northern is permitted to continue charging the higher rates to intermediate points in Texas because of a circuitous route. Likewise the Live Oak, Perry & Gulf is permitted the higher fares to intermediate points on account of the circuitous route. The Oregon-Washington Railroad & Navigation Company was ordered to discontinue on September 1, 1911, the charging of higher fares in disregard of the long and short haul clause, which have been maintained in order to have the fares multiples of five. The same is denied the Missouri Pacific and the Yazoo & Mississippi Valley railways.

Complaint Dismissed.

Decarie Incinerator Co. v. Minneapolis & St. Louis et al. Opinion by the commission:

Rate of $1.65 for transportation of a carload of parts of a garbage incinerator from Hopkins, Minn., to Sacramento, Cal., not found unreasonable. (21 I. C. C. 71.)

Florida Mercantile Agency v. Pennsylvania Railroad et al. Opinion by the commission:

Commodity rate of 60½ cents per 100 lbs. on fresh meat and dressed poultry in carloads from Jersey City, N. J., to Jacksonville, Fla., not found to be unreasonable. (21 I. C. C. 85.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1911. (SEE ALSO ISSUE JUNE 9.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$234,038	$81,031	$349,040	$51,489	$93,110	$9,942	$116,654	$11,389	$282,576	$66,464	—$337	$13,241	$52,886	—$62,987
Atlanta, Birmingham & Atlantic	662	141,270	45,272	200,018	29,894	37,259	15,239	88,221	9,267	179,880	20,138	.....	10,500	9,638	—17,130
Baltimore & Ohio—System	4,439[1]	5,339,870	1,132,065	6,888,218	650,076	1,045,777	151,438	2,506,007	143,779	4,497,077	2,391,141	—38,311	225,894	2,126,936	334,666
Bangor & Aroostook	627[2]	205,279	45,551	264,224	41,887	33,986	2,266	76,080	9,125	163,345	100,879	.....	2,525	98,354	—15,210
Bessemer & Lake Erie	205	418,751	22,434	446,704	59,898	123,556	6,531	142,996	8,002	340,983	105,721	.....	6,000	99,721	—140,369
Buffalo, Rochester & Pittsburgh	572	586,109	80,092	685,448	144,342	143,825	9,665	234,103	12,396	544,331	141,117	—649	16,000	124,468	108,343
Central New England	277	246,224	25,875	286,259	41,004	22,393	1,523	86,948	6,367	158,235	128,024	118	19,000	109,142	—992
Central of Georgia	1,915	555,362	260,580	897,784	143,547	175,043	32,997	346,045	43,173	740,805	156,979	6,328	45,470	117,837	9,396
Central Vermont	411	226,384	69,651	321,172	28,224	71,588	7,042	143,092	8,883	258,829	62,343	371	12,750	49,964	—7,370
Chicago & Eastern Illinois	966	710,213	155,976	923,263	91,608	126,019	24,191	353,154	32,707	627,679	295,584	558	28,500	267,642	156,158
Chicago & Erie	269	311,000	55,243	425,346	35,535	87,718	17,317	202,869	10,451	353,890	71,456	.....	11,388	60,068	9,924
Chicago Great Western	1,495	670,703	214,360	962,521	147,214	130,836	46,980	387,773	29,973	742,776	219,745	127	33,940	185,932	—18,600
Chicago, Indiana & Southern	329	292,834	19,874	320,252	46,242	64,483	8,168	115,563	8,927	243,383	76,869	944	13,900	63,913	13,470
Chicago, Indianapolis & Louisville	617	336,237	130,032	517,097	63,706	68,471	16,300	178,396	13,867	340,740	176,357	.....	22,500	153,857	—3,643
Chicago, Rock Island & Gulf	471[3]	179,926	51,555	246,028	32,022	17,969	8,665	92,432	8,576	159,664	86,364	—64	9,502	76,798	62,765
Cincinnati, Hamilton & Dayton	1,014[4]	549,620	116,626	750,603	80,541	144,459	17,501	345,962	18,859	607,313	143,290	.....	32,303	110,987	70,858
Cincinnati, New Orleans & Texas Pacific	337	564,524	114,553	724,703	93,751	176,185	18,403	243,586	18,972	550,897	173,806	—1,378	21,800	150,628	—131,513
Cleveland, Akron & Columbus	212	149,042	41,585	201,987	39,075	35,273	2,297	67,045	3,730	147,420	54,567	.....	8,560	46,067	556
Colorado & Southern	1,173[5]	442,108	119,107	600,930	65,669	130,039	10,712	196,135	20,874	423,429	177,501	—2,455	24,700	150,346	7,848
Cumberland Valley	162	178,070	48,736	236,165	56,579	29,676	4,784	75,602	6,127	172,768	63,397	130	5,141	58,386	—39,696
Delaware & Hudson Co.—R. R. Dept.	819[6]	1,501,693	203,332	1,754,927	134,530	262,617	23,449	610,500	46,907	1,078,003	676,924	—992	43,866	632,066	—132,432
Duluth & Iron Range	191[7]	233,594	23,502	269,348	75,230	46,103	785	76,776	12,979	211,873	57,475	—7,443	10,723	39,309	—124,717
Duluth, Missabe & Northern	316[8]	191,270	40,835	237,476	84,876	71,782	1,686	85,722	13,031	257,097	—19,621	—1,242	9,600	—30,463	—249,560
Duluth, South Shore & Atlantic	612	154,608	69,433	236,707	45,464	27,380	7,540	92,421	6,466	179,271	57,436	371	18,000	39,807	—29,022
El Paso & Southwestern Co	901	448,000	80,387	558,432	67,552	76,005	10,316	160,948	19,968	334,789	223,643	—606	20,076	202,961	—67,076
Elgin, Joliet & Eastern	831[9]	612,417	10	647,441	56,220	109,109	4,124	213,426	12,652	395,531	251,910	.....	19,600	232,310	—1,847
Florida East Coast	583	323,262	153,978	575,489	36,920	51,096	4,921	145,382	8,824	247,143	328,346	—2,090	15,500	310,755	—2,462
Fort Worth & Denver City	454	200,492	140,610	364,855	27,889	61,217	5,646	109,641	14,607	219,000	145,855	—368	10,522	134,965	10,242
Galveston, Harrisburg & San Antonio	1,338	546,599	261,681	854,766	121,061	118,830	29,578	336,887	26,981	633,337	221,429	—3,232	29,697	188,500	47,820
Georgia	307	158,300	65,885	242,260	24,563	35,627	10,286	116,785	7,022	194,283	47,977	.....	2,100	45,877	—6,241
Grand Rapids & Indiana	587	251,561	109,037	389,916	53,819	67,776	11,718	182,303	14,953	330,569	59,347	—1,017	23,351	34,979	—11,918
Hocking Valley	350	383,310	62,484	480,577	49,995	69,395	8,588	170,384	20,138	318,500	162,077	.....	24,950	137,127	56,481
Houston & Texas Central	789	283,232	122,050	437,428	58,630	53,617	17,484	219,288	22,119	371,138	66,290	—1,622	17,816	46,852	29,790
Illinois Central	4,574[10]	3,106,570	959,694	4,648,972	617,676	977,229	100,778	1,774,939	109,557	3,580,179	1,068,793	—9,213	241,524	818,056	29,930
Iowa Central	559	224,003	38,103	275,123	40,308	41,802	6,786	114,780	8,628	212,304	62,819	.....	9,659	53,160	22,780
Kanawha & Michigan	175	180,166	27,260	213,921	23,343	47,014	1,990	62,521	7,893	142,761	71,160	3	6,984	64,179	47,069
Kansas City Southern	827	511,258	128,834	730,220	65,491	104,099	26,144	261,536	37,881	495,151	235,069	.....	34,612	200,457	—65,985
Lake Erie & Western	886	306,907	61,264	392,470	70,985	84,342	11,673	177,304	11,936	356,240	36,230	.....	18,500	17,730	—35,820
Long Island	395	301,272	467,457	809,629	114,600	99,994	11,309	372,375	20,349	618,627	191,002	33,799	53,333	171,468	—12,570
Maine Central	932	459,449	193,945	700,535	87,883	113,366	7,231	270,724	22,400	501,604	198,931	1,398	41,311	159,018	—17,729
Minneapolis & St. Louis	1,027	242,738	82,264	352,623	40,311	58,929	10,452	157,018	12,978	279,688	72,935	—114	18,648	54,173	—18,005
Minneapolis, St. Paul & S. S. Marie	3,764[11]	1,119,812	379,181	1,622,691	209,284	266,855	42,186	671,626	42,271	1,232,222	390,469	344	104,441	286,372	—312,114
Missouri, Kansas & Texas	1,737[12]	830,708	342,438	1,300,259	176,095	200,157	38,577	453,073	42,000	909,902	390,357	1,477	58,500	333,334	—
Missouri, Kansas & Texas of Texas	1,348	371,953	268,177	704,083	119,030	93,015	26,173	446,574	31,504	716,296	—12,213	—2,720	22,852	—37,785	—53,764
Mobile & Ohio	1,114	670,148	105,841	917,962	104,430	152,496	29,531	349,590	34,553	670,600	247,362	—854	25,460	221,048	—30,318
Morgan's La. & Tex. R. R. & S. S. Co.	404[13]	236,040	107,017	365,147	54,428	54,605	12,784	128,280	13,741	263,838	101,309	—1,549	18,756	81,004	28,771
Nashville, Chattanooga & St. Louis	1,230	745,773	211,025	1,026,780	162,703	171,744	35,752	377,500	24,969	772,668	254,112	—926	25,278	227,908	13,493
New Orleans & North Eastern	196	203,957	46,186	274,128	25,745	36,731	8,817	106,346	11,656	189,295	84,833	181	9,250	75,764	—25,426
New York, Chicago & St. Louis	562	724,416	148,744	907,675	102,035	107,901	50,848	393,655	18,392	672,831	234,844	—2,367	29,600	202,877	—77,385
New York, Ontario & Western	546	577,140	93,723	697,780	78,116	117,920	10,822	294,967	15,439	517,264	180,516	—5,895	17,500	157,121	—82,814
New York, Philadelphia & Norfolk	112	213,108	35,138	267,929	36,181	50,309	3,926	107,733	11,822	209,971	57,958	.....	7,500	50,458	—39,540
New York, Susquehanna & Western	152	188,932	47,709	264,007	16,756	21,314	1,477	90,062	3,960	133,569	130,438	4,601	11,771	123,268	50,543
Norfolk Southern	608	192,686	55,796	261,831	24,303	28,905	4,899	83,654	12,829	154,590	107,241	—102	5,900	101,239	—
Northern Central	469	871,334	172,453	1,102,356	143,350	182,902	14,976	498,477	22,529	862,234	240,132	255	36,740	203,637	—33,834
Peoria & Eastern	351	157,007	49,991	226,662	44,346	46,108	7,264	111,204	5,831	214,753	11,909	.....	9,500	2,409	—54,201
Philadelphia & Reading	1,022	3,135,475	561,904	3,857,997	392,137	681,331	38,597	1,172,513	95,424	2,380,002	1,477,995	76,205	84,075	1,470,125	—285,373
Philadelphia, Baltimore & Washington	713	756,844	631,017	1,552,413	198,493	214,955	35,157	677,112	33,087	1,148,804	403,609	.....	47,395	356,214	60,696
Pittsburg & Lake Erie	215[14]	979,306	117,519	1,130,946	136,987	146,247	16,986	285,409	22,288	607,917	523,029	—415	30,000	492,614	45,933
Rutland	468	153,265	90,456	273,957	28,406	45,098	7,689	106,991	5,795	193,979	79,978	.....	9,806	70,172	2,302
St. Louis & San Francisco	4,732	1,902,861	825,082	2,969,588	258,457	432,042	77,945	1,174,572	102,354	2,045,370	924,218	.....	153,814	770,414	—25,991
St. Louis, Brownsville & Mexico	501	108,806	46,899	167,689	26,624	10,925	2,971	60,877	8,694	110,091	57,598	.....	4,500	53,098	19,153
St. Louis Southwestern	797[15]	402,653	95,302	525,365	57,931	104,622	24,689	144,798	22,706	354,746	170,619	—323	27,429	142,867	—5,305
St. Louis Southwestern of Texas	703	169,310	68,083	257,219	68,615	79,329	10,996	128,785	16,528	304,253	—47,034	—226	10,000	—57,260	8,345
San Antonio & Aransas Pass	727	183,460	76,768	277,488	72,610	52,125	5,295	148,502	10,680	289,212	—11,724	.....	14,500	—26,224	—50,540
San Pedro, Los Angeles & Salt Lake	1,105[16]	492,945	232,990	773,344	141,183	140,156	33,990	289,915	17,442	622,686	150,659	—5,673	28,619	116,366	236,255
Seaboard Air Line	3,046[17]	1,259,264	407,579	1,881,488	216,415	258,483	59,127	666,076	56,435	1,256,536	624,952	452	72,000	553,404	—21,892
Spokane, Portland & Seattle	551[18]	294,438	145,596	461,157	56,958	31,853	8,790	105,627	10,149	213,377	247,780	832	42,260	206,413	41,796
Texas & New Orleans	458	194,846	85,026	296,362	62,938	61,915	7,508	130,820	9,281	272,462	23,900	165	12,257	11,808	—33,576
Toledo & Ohio Central	444	280,734	40,621	334,907	65,050	56,677	7,949	127,535	9,856	267,067	67,849	—141	20,344	47,355	106,056
Toledo, St. Louis & Western	451	244,199	30,432	293,477	25,988	41,240	9,487	110,051	8,690	195,456	98,021	.....	14,550	83,471	—7,270
Vandalia	827	504,959	181,851	778,477	126,743	137,181	24,214	323,418	20,326	631,882	146,595	.....	27,401	119,194	122,223
Virginian	474[19]	278,490	18,692	307,652	37,628	54,208	4,964	75,831	7,939	180,570	127,082	4,265	17,600	113,747	47,940
Wabash	2,515	1,566,225	548,180	2,294,262	333,857	406,868	75,297	1,003,793	67,806	1,887,621	406,641	—2,364	79,892	324,385	43,956
West Jersey & Seashore	353	155,022	298,187	479,944	66,366	45,282	11,281	190,716	9,832	323,477	156,467	—1,556	23,228	131,683	103,677
Wheeling & Lake Erie	457	453,318	42,606	533,697	62,912	116,299	6,872	188,345	13,978	388,406	145,291	1,108	20,337	126,062	22,155

REVENUES AND EXPENSES OF RAILWAYS.

TEN MONTHS OF FISCAL YEAR, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$2,516,045	$933,859	$3,774,937	$484,121	$881,924	$102,981	$1,166,012	$94,037	$2,729,075	$1,045,862	—$6,543	$135,558	$903,761	—$68,367
Atlanta, Birmingham & Atlantic	662	1,729,051	507,545	2,381,836	294,057	371,382	150,543	878,619	91,912	1,786,513	595,323	.....	110,145	485,178	75,561
Baltimore & Ohio—System	4,439[1]	56,019,916	12,719,321	73,165,258	8,331,782	13,337,138	1,642,692	27,755,916	1,528,337	52,595,865	20,569,393	—123,023	2,190,576	18,255,794	—2,068,292
Bangor & Aroostook	627[2]	1,964,720	529,902	2,638,947	433,969	315,548	32,876	816,817	107,260	1,706,470	932,477	.....	23,199	909,278	—122,549
Bessemer & Lake Erie	205	5,522,827	298,467	5,910,362	708,667	1,347,237	76,173	1,715,480	112,565	3,960,122	1,950,240	.....	86,209	1,864,031	—869,416
Buffalo, Rochester & Pittsburgh	572	6,504,518	891,002	7,666,032	814,576	1,445,806	111,165	2,479,989	131,830	4,983,366	2,682,666	—237	180,000	2,502,429	43,077
Central New England	277	2,195,065	292,379	2,629,111	483,183	224,242	18,164	771,850	50,159	1,547,598	1,081,513	119	130,000	951,632	—54,866
Central of Georgia	1,915	7,252,454	2,915,061	11,118,982	1,484,414	1,835,725	326,021	3,569,504	407,588	7,623,252	3,495,730	64,681	457,428	3,102,983	145,453
Central Vermont	411	2,158,477	870,870	3,271,978	378,983	499,574	70,704	1,518,508	80,936	2,548,705	723,273	5,262	111,867	616,668	—36,456
Chicago & Eastern Illinois	966	8,052,680	1,770,914	10,461,984	993,963	1,768,055	236,624	3,859,833	331,386	7,189,862	3,272,122	—10,991	281,129	2,980,002	84,661
Chicago & Erie	269	3,344,921	658,209	4,408,471	470,579	909,640	200,270	2,011,651	97,316	3,689,456	719,015	.....	113,425	605,590	—166,624
Chicago Great Western	1,495	7,360,002	2,370,918	10,525,489	1,178,531	1,572,426	465,264	4,268,161	350,355	7,834,737	2,690,752	1,849	332,696	2,359,905	—
Chicago, Indiana & Southern	329	2,758,666	236,517	3,078,241	423,542	614,796	86,609	1,195,064	89,387	2,409,393	668,843	—1,070	136,293	531,472	—289,774
Chicago, Indianapolis & Louisville	617	3,351,692	1,309,476	5,114,869	658,380	723,895	167,077	1,826,704	148,361	3,524,417	1,590,452	.....	225,000	1,365,452	—135,909
Chicago, Rock Island & Gulf	471[3]	1,747,101	590,804	2,495,432	365,382	186,905	90,052	906,182	81,990	1,630,511	864,921	—2,530	67,678	794,713	73,210
Cincinnati, Hamilton & Dayton	1,014[4]	5,715,694	1,391,340	7,923,497	662,308	1,422,097	235,660	3,654,908	213,879	6,188,852	1,734,645	.....	308,048	1,426,597	—69,266
Cincinnati, New Orleans & Texas Pacific	337	5,848,396	1,408,818	7,653,190	817,897	1,559,544	203,485	2,260,644	180,295	5,021,865	2,631,325	—16,110	217,016	2,398,199	—257,148
Cleveland, Akron & Columbus	212	1,597,867	481,284	2,223,429	397,306	374,393	29,741	744,056	38,899	1,584,395	639,034	.....	88,000	551,034	70,419
Colorado & Southern	1,173[5]	6,015,859	1,317,952	7,767,534	879,990	1,521,831	118,389	2,464,217	222,337	5,206,764	2,560,770	—14,418	247,000	2,299,352	—232,625
Cumberland Valley	162	1,896,992	535,619	2,547,300	374,671	336,650	46,809	816,270	66,846	1,641,246	906,054	2,723	55,448	853,329	—109,060
Delaware & Hudson Co.—R. R. Dept	819[6]	14,393,695	2,469,426	17,384,388	1,312,191	2,471,368	221,395	6,125,300	415,782	10,546,036	6,838,352	—1,003	455,572	6,381,777	—359,737
Duluth & Iron Range	191[7]	5,445,609	261,043	5,805,519	654,790	548,983	5,169	1,326,641	128,497	2,664,080	3,141,439	—4,311	280,792	2,856,336	—1,267,837
Duluth, Missabe & Northern	316[8]	7,646,231	399,145	8,107,833	968,498	912,961	17,067	1,367,679	143,245	3,409,450	4,698,383	44,501	404,347	4,338,537	—1,809,616
Duluth, South Shore & Atlantic	612	1,657,711	795,003	2,590,504	383,821	294,940	98,014	1,004,580	69,351	1,850,706	739,798	6,678	177,871	568,605	—109,201
El Paso & Southwestern Co.	901	4,907,782	810,020	6,016,673	754,100	806,455	106,934	1,726,921	225,133	3,619,543	2,397,130	11,041	189,403	2,196,686	—32,891
Elgin, Joliet & Eastern	831[9]	6,283,821	79	6,657,677	810,027	1,318,372	40,679	2,168,334	164,302	4,501,714	2,155,963	.....	165,400	1,990,563	—772,350
Florida East Coast	583	1,822,540	1,281,304	3,567,519	424,045	462,526	66,527	1,117,391	78,909	2,149,398	1,418,121	—2,090	142,641	1,273,390	265,779
Fort Worth & Denver City	454	2,818,519	1,425,452	4,459,568	426,849	725,686	59,430	1,402,234	147,144	2,761,343	1,698,225	—12,229	102,087	1,583,909	—175,803
Galveston, Harrisburg & San Antonio	1,338	6,395,638	2,385,403	9,251,904	1,212,134	1,406,132	282,298	3,406,378	284,869	6,591,811	2,660,093	—25,522	300,212	2,334,359	112,816
Georgia	307	1,847,895	745,298	2,761,845	340,558	410,974	104,735	1,123,050	72,148	2,051,465	710,380	.....	20,513	689,867	6,451
Grand Rapids & Indiana	587	2,607,039	1,418,306	4,336,296	559,739	723,393	121,285	1,921,525	147,377	3,473,319	862,977	—1,418	239,534	622,025	—252,773
Hocking Valley	350	4,919,958	733,092	6,021,715	762,023	965,721	88,570	1,976,541	174,971	3,967,826	2,053,889	.....	277,940	1,775,949	—411,451
Houston & Texas Central	789	3,706,030	1,394,803	5,454,204	763,311	656,516	182,667	2,221,162	216,692	4,040,348	1,413,856	—6,518	182,951	1,224,387	26,219
Illinois Central	4,574[10]	34,142,298	10,883,560	51,168,558	6,191,729	10,289,519	1,109,765	17,806,479	1,107,396	36,504,888	14,663,670	—41,761	2,209,994	12,411,915	1,944,680
Iowa Central	559	2,378,029	464,174	2,971,970	350,832	491,676	70,774	1,235,152	86,443	2,234,877	737,093	.....	97,698	639,395	46,466
Kanawha & Michigan	175	2,213,757	296,490	2,566,912	265,790	461,409	22,540	716,945	70,346	1,537,030	1,029,882	—64	75,900	953,918	360,002
Kansas City Southern	827	6,177,554	1,386,975	8,444,915	844,095	1,110,830	264,659	2,857,427	318,776	5,395,787	3,049,128	.....	292,652	2,756,476	300,592
Lake Erie & Western	886	3,618,841	753,761	4,624,289	755,279	880,186	150,705	1,821,394	123,556	3,731,119	893,170	.....	186,262	706,908	—426,506
Long Island	395	2,582,042	5,194,100	8,172,872	975,913	1,151,594	163,056	3,964,780	228,384	6,483,727	1,689,145	553,078	474,754	1,767,469	—538,820
Maine Central	932	4,549,232	2,450,160	7,470,294	1,141,724	1,120,460	73,051	2,883,142	258,249	5,476,626	1,993,668	13,469	374,789	1,632,348	—536,181
Minneapolis & St. Louis	1,027	3,034,215	1,023,126	4,341,933	448,812	564,929	110,215	1,740,172	148,755	3,012,883	1,329,050	— 422	194,565	1,134,063	16,126
Minneapolis, St. Paul & S. S. Marie	3,764[11]	12,771,691	4,098,765	18,065,599	1,890,291	2,613,609	435,232	6,862,988	413,912	12,216,032	5,849,567	87,200	1,008,605	4,928,162	—2,784,075
Missouri, Kansas & Texas	1,737[12]	9,659,985	4,045,711	14,663,914	1,894,283	2,101,242	376,681	4,935,317	437,215	9,744,738	4,919,176	1,929	580,583	4,340,522	—
Missouri, Kansas & Texas of Texas	1,348	5,542,816	3,170,470	9,289,286	1,404,249	698,558	232,402	4,474,898	346,439	7,156,546	2,132,740	—8,655	224,954	1,899,131	380,074
Mobile & Ohio	1,114	6,755,758	1,202,140	9,277,454	1,076,312	1,603,160	323,837	3,226,436	345,466	6,575,211	2,702,243	—13,418	251,000	2,437,825	38,080
Morgan's La. & Tex. R. R. & S. S. Co.	404[13]	3,009,186	1,023,220	4,287,731	583,529	516,836	114,422	1,489,097	136,781	2,840,665	1,447,066	—14,279	194,357	1,238,530	—2,862
Nashville, Chattanooga & St. Louis	1,230	7,284,977	2,376,976	10,314,117	1,566,391	1,903,486	353,636	3,659,235	246,897	7,729,645	2,584,472	— 10,411	231,845	2,342,216	—92,344
New Orleans & North Eastern	196	2,257,681	521,396	2,983,448	296,089	445,293	92,039	1,068,231	115,442	2,017,094	966,354	—1,285	88,387	876,682	—45,457
New York, Chicago, & St. Louis	562	7,703,227	1,303,790	9,349,122	1,015,084	1,221,742	496,910	3,954,871	162,714	6,851,321	2,497,801	—17,259	305,720	2,174,822	—867,994
New York, Ontario & Western	546	6,037,622	1,383,189	7,706,358	912,983	1,220,757	113,164	3,062,883	174,939	5,484,726	2,221,632	—48,041	175,000	1,998,591	43,018
New York, Philadelphia & Norfolk	112	2,220,191	350,416	2,776,680	322,523	477,535	42,986	1,078,826	112,819	2,034,689	741,991	.....	76,650	665,341	—146,344
New York, Susquehanna & Western	152	1,701,175	495,586	2,465,379	259,817	227,240	19,494	905,347	41,271	1,453,169	1,012,210	9,676	117,258	904,628	180,139
Norfolk Southern	608	1,648,307	628,121	2,439,448	272,390	285,375	48,583	760,378	136,558	1,503,285	936,163	3,518	59,800	879,881	—
Northern Central	469	8,244,803	1,898,390	10,760,183	1,815,601	2,022,193	164,843	5,056,400	250,394	9,309,431	1,450,752	5,365	334,353	1,121,764	—985,601
Peoria & Eastern	351	2,184,768	596,865	2,997,119	400,271	505,514	60,898	1,281,593	59,499	2,307,775	689,344	.....	95,878	593,466	—188,173
Philadelphia & Reading	1,022	29,262,033	5,820,363	36,715,601	3,145,479	6,835,431	422,516	11,860,177	685,819	22,949,422	13,766,179	235,396	842,104	13,159,471	—974,145
Philadelphia, Baltimore & Washington	713	7,863,162	6,347,936	15,784,299	2,337,028	2,512,960	288,535	6,688,295	368,646	12,195,463	3,588,836	.....	483,025	3,105,811	—91,552
Pittsburgh & Lake Erie	215[14]	11,433,342	1,321,825	13,148,845	1,575,846	1,310,231	149,350	3,189,740	239,560	6,464,727	6,684,118	—3,874	276,576	6,403,668	—1,598,102
Rutland	468	1,551,829	960,398	2,838,048	366,218	445,735	71,417	1,119,061	70,016	2,072,447	765,601	.....	104,285	661,316	—50,225
St. Louis & San Francisco	4,732	22,626,225	9,501,299	34,567,878	4,419,052	4,692,163	850,625	12,342,852	1,012,162	23,316,854	11,251,024	.....	1,455,244	9,795,780	620,167
St. Louis, Brownsville & Mexico	501	948,682	501,783	1,573,645	414,594	124,024	23,997	573,656	80,226	1,216,497	357,148	.....	47,500	309,648	42,709
St. Louis Southwestern	797[15]	5,156,857	1,168,180	6,613,254	712,627	1,044,233	265,780	1,646,627	226,676	3,895,943	2,717,311	—6,497	207,519	2,503,295	127,070
St. Louis Southwestern of Texas	703	2,532,219	853,550	3,600,683	905,096	742,269	107,926	1,593,949	168,459	3,517,699	82,984	—2,084	95,726	—14,826	104,476
San Antonio & Aransas Pass	727	2,428,252	917,395	3,547,027	704,369	481,840	50,483	1,329,634	101,616	2,667,942	879,085	.....	103,500	775,585	—94,795
San Pedro, Los Angeles & Salt Lake	1,105[16]	4,059,396	2,231,506	6,706,968	1,233,867	1,119,144	312,739	2,523,110	173,443	5,362,303	1,344,665	49,742	269,392	1,025,531	326,752
Seaboard Air Line	3,046[17]	12,401,337	3,974,829	18,241,917	2,347,172	2,456,485	604,765	6,168,919	510,921	12,088,262	6,153,655	—8,179	674,000	5,471,476	244,132
Spokane, Portland & Seattle	551[18]	2,715,451	953,762	3,863,563	451,116	281,548	48,149	1,006,767	99,034	1,886,614	1,976,949	—5,462	345,000	1,626,487	883,383
Texas & New Orleans	458	2,200,620	898,631	3,289,240	595,184	582,501	72,966	1,310,175	96,237	2,657,063	632,177	5,481	123,025	514,613	—210,782
Toledo & Ohio Central	444	3,494,775	535,838	4,233,455	599,317	589,521	68,019	1,458,072	82,050	2,796,979	1,436,476	—563	191,189	1,244,724	196,134
Toledo, St. Louis & Western	451	2,561,522	386,447	3,143,860	393,597	457,718	88,976	1,120,440	92,856	2,153,587	990,273	.....	142,250	848,023	—156,220
Vandalia	827	5,928,106	2,021,904	8,854,862	1,155,623	1,616,769	273,565	3,563,354	198,111	6,807,422	2,047,440	.....	277,893	1,769,547	—7,877
Virginian	474[19]	2,650,694	212,516	2,948,266	336,494	503,675	51,396	799,902	76,782	1,768,249	1,180,017	48,412	149,356	1,079,073	699,034
Wabash	2,515	16,983,766	6,183,396	24,996,547	2,835,904	4,029,871	766,369	10,048,570	755,151	18,435,865	6,560,682	—18,435	761,089	5,781,158	—802,249
West Jersey & Seashore	353	1,519,933	3,237,786	5,071,206	796,808	614,728	150,940	2,137,237	106,555	3,806,268	1,264,938	—51,033	229,548	984,357	103,335
Wheeling & Lake Erie	457	4,746,641	509,531	5,630,964	626,643	1,136,215	81,074	2,033,294	137,207	4,014,433	1,616,531	28,668	206,309	1,438,890	—148,718

Mileage operated on April 30, 1910—[1] 4,460 miles; [2] 546 miles; [3] 530 miles; [4] 1,036 miles; [5] 1,249 miles; [6] 843 miles; [7] 168 miles; [8] 293 miles; [9] 781 miles; [10] 4,550 miles; [11] 3,533 miles; [12] 1,724 miles; [13] 348 miles; [14] 191 miles; [15] 773 miles; [16] 979 miles; [17] 3,013 miles; [18] 420 miles; [19] 444 miles. — Indicates Deficits, Losses and Decreases.

Rates on Kanite Reduced.

William H. Blumenstein v. Philadelphia & Reading et al. Opinion by the commission:

Following Masurite Explosive Co. v. P. & L. E. R. R. Co., 13 I. C. C. 405, defendants ordered to cease from charging, in official classification territory, their first class rates on kanite in carload quantities, and double first class rates on kanite in L. C. L. quantities; and to substitute therefor second class rates on carload quantities, and one and one-half times first class rates on L. C. L. quantities. (21 I. C. C. 90.)

Reparation Awarded.

Franklin, Stiles & Franklin v. Southern Express Co. Opinion by the commission:

Defendant's contention that express rates should be a certain percentage higher than freight rates not sustained, as there is no material evidence of record as to the reasonableness of either the express rate or the freight rate.

The alleged erroneous publication of a rate which remains in effect for more than eight years is not a justification for its increase. Advanced rate found unreasonable, rate for the future prescribed, and reparation awarded. (21 I. C. C. 88.)

Rates on Cement Reduced.

Maritime Exchange et al v. Pennsylvania Railroad. Opinion by the commission:

Martins Creek, Pa., is one of a group of cement-producing points, known as the Lehigh cement district, from all of which the rate on cement to Philadelphia, Pa., is the same via all routes, $1.35 per net ton, except as recently modified by the defendant. The defendant's line of road from Martin's Creek to Philadelphia passes through the state of New Jersey for a part of the distance, and the traffic between these points is subject to the jurisdiction of the commission. Upon a complaint attacking defendant's local rate on cement from Martin's Creek to Philadelphia, and also bringing in issue the proportional rate to Philadelphia on cement transhipped to Wilmington, N. C., and points south thereof. For the future the rate on cement from Martins Creek, Pa., to Philadelphia via the line of defendant should not exceed $1.10 per net ton. The restriction by defendant of the 80-cent proportional rate, Martins Creek to Philadelphia, to cement carried by water to Wilmington, N. C., and points south thereof, does not result in undue prejudice to Philadelphia. (21 I. C. C. 81.)

STATE COMMISSIONS.

The California commission has ordered the Atchison, Topeka & Santa Fe to interchange traffic with the Oakland & Antioch Electric Railway at Bay Point, where the lines of the two companies connect. The commission has not laid down any general rule for this procedure, but announces that similar petitions will be decided upon the merits of the several cases. This order, directing joint rates between a steam and an electric road, establishes a new rule in California; and if carried into effect throughout the state will remove the isolation of many electric lines.

The New York Public Service Commission, Second district, has dismissed the complaint in the case in which residents of Ossining ask that morning train No. 94, southbound for New York, be required to stop at Ossining. This train carries a Pullman car and baggage car. The commission says that proof does not indicate that morning train service from Ossining to New York is inadequate either in number of trains, seating capacity, or in schedule running time or methods of operation. The baggage facilities for morning trains at Ossining are adequate. The demand for provision of a parlor car in this service is not supported by proof that such a car would be patronized, beyond that which is afforded by the expressed belief of a single witness for complainants. Testimony of that description is insufficient to overcome the presumption against such use by daily riders over a distance of thirty-one miles. If such proof were adduced, it might afford a reason for requiring a parlor car to be hauled in the existing train service, but it would not in itself be ground for specific order requiring the stoppage of an additional train, though respondent might exercise its option in that respect.

The New York Public Service Commission, Second District, has denied the application of the Delaware & Hudson for consent to discontinue the station at Wrights, Town of Putnam, Washington County, and to establish a new station at or near Luthers Siding, one and one-quarter miles south in the same township. A hearing was had upon the application at Wrights, at which there was a large attendance of the people of the town, as well as residents of Orwell, Vermont, which is situated directly across Lake Champlain from the present station. The company's contention was that the present station was not well located, especially for northbound trains, being just around a sharp curve through the rocks, and that the proposed new point of location is on a straight, level stretch of ground better adapted to the safe operation of trains. Commissioner Huppuch, who heard the case, recommended the denial of the application, and in the opinion submitted by him, it is held that a railway station long established, which is a recognized institution in a locality, should not be removed to a new location unless it appears that the new location is consistent with public convenience and that the contention that the operation of trains would be facilitated by the removal of the station to a point where there is a level stretch of track, there being no direct evidence that operating conditions at the present location are dangerous to life or property, is not sufficient to warrant the granting of the application.

COURT NEWS.

In the United States Circuit Court of Appeals at Philadelphia, June 13, Judge Young filed an opinion sustaining the verdict of the lower court, imposing fines of $40,000 each on the Bethlehem Steel Company, the Philadelphia & Reading, and the Lehigh Valley, for violating the law in the collection of demurrage charges.

The Supreme Court of New Jersey has held unreasonable the ordinance of Jersey City requiring drivers of business wagons to have licenses from the city. This ordinance was enforced during the strike of the wagon men of the express companies last autumn, to the great embarrassment of the express companies. Two suits were brought before the court, one in which the driver arrested for working without a license was engaged in interstate commerce, but the court set aside the conviction of the men in both cases, without finding it necessary to pass on the question of interstate commerce.

The Appellate Division of the Supreme Court of New York, in an opinion by Justice Clarke, holds that the Public Service Commission, First District, in rejecting the reorganization plan of the Third Avenue (surface street) Railroad Company, has exceeded its powers. The decision reverses a decision of the commission, and the result will be to leave in effect the plan of reorganization of this property, which was submitted by the bondholders' committee, December 3, 1909. The court says:

"Upon the facts as they appeared before the commission it would seem that it was bound to approve the issue of the stocks and bonds by the new corporation in accordance with the plan of reorganization, and the power of the commission was confined to a determination of the question as to whether the proposed issue was authorized by sections 8 and 9 of the Stock Corporation law and the agreement for the purchase and sale and adjustment of foreclosure."

The opinion dealt principally with the question as to whether or not sections 9 and 10 of the Stock Corporation law were repealed by the Legislature in 1907, when the Public Service Commission laws were created. On this point Justice Clarke said:

"The main question here presented has not heretofore been considered in any court. It is, have the statutory provisions for the reorganization of railroads, which have existed since 1853 and are now embodied in section 9 to 12 of the Stock Corporation law, been repealed by implication by the provisions of the public Service law?

"It is claimed that the reorganization statute has been repealed by the Public Service Commission act, not directly, but impliably. If the statute has been repealed then I know of no statute under which a reorganization of a railroad can be had. Certainly there are no provisions of the Public Service act which can be availed of. If the provisions for adopting the plan by the purchasers and making it the basis of a new charter are of no effect, then the whole scheme of reorganization is gone, because the adoption of said plan is the very gist of that scheme."

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. B. Blanchard has been elected secretary of the Martinique & Lake Superior, with office at New York.

C. B. Ferry has been appointed assistant secretary of the Chicago, Milwaukee & St. Paul, with office at New York, succeeding J. M. McKinlay, deceased.

F. H. Parker, auditor of freight receipts of the Great Northern at St. Paul, Minn., has been appointed assistant comptroller, succeeding G. R. Martin, promoted.

B. Campbell, vice-president of the New York, New Haven & Hartford, has been elected vice-president also of the Central New England, with office at New Haven, Conn.

F. H. Parker, auditor of freight receipts of the Great Northern, at St. Paul, Minn., has been appointed assistant comptroller, and E. J. Willis has been apopinted acting auditor of freight receipts.

William Lee Karnes, assistant secretary of the Kansas City, Mexico & Orient of Texas, has been elected treasurer of the Kansas City, Mexico & Orient, with office at Kansas City, Mo., succeeding E. E. Holmes, resigned.

E. H. McHenry, vice-president of the New York, New Haven & Hartford and the Central New England, at New Haven, Conn., has been appointed vice-president also of the Boston & Maine, with office at New Haven, effective July 1.

J. H. Allen has been elected vice-president and general manager of the Anderson & Saline River, and R. L. Rutherford has been appointed treasurer, both with offices at Pine Bluff, Ark. R. M. Morris has been appointed secretary and general freight agent, with office at St. Louis, Mo.

H. I. Miller, first vice-president of the New Orleans Great Northern, at Bogalusa, La., has been elected president, with office at New York, succeeding C. W. Goodyear, deceased. M. E. Olmstead, general counsel, with office at Harrisburg, Pa., has been elected first vice-president, succeeding Mr. Miller, with office at Harrisburg, and A. M. Trueb, assistant to vice-president, has been appointed assistant to president, with office at Bogalusa. Mr. Miller is also receiver of the Buffalo & Susquehanna, and in addition was recently elected vice-president of the Missouri Pacific.

W. B. Storey, Jr., vice-president of the Atchison, Topeka & Santa Fe, in charge of construction, whose jurisdiction has been extended over the operating department, as has already been announced in these columns, was born November 17, 1857, at San Francisco, Cal., and was graduated in 1881 from the University of California. He began railway work in 1877, as axman on the Southern Pacific, giving up this work at the end of a year to go to college. He returned to railway work in 1881, and until 1893 was rodman, levelman, transitman and assistant engineer of the Southern Pacific. In 1893 he was made assistant engineer of the United States Hydraulic Mining Commission, and from 1895 to 1900, was chief engineer and general superintendent of the San Francisco & San Joaquin Valley, now a part of the Santa Fe. In 1900 he was appointed chief engineer of the Atchison, Topeka & Santa Fe, at Topeka, Kan., becoming chief engineer of the entire system in September, 1906, with office at Chicago; and since September, 1909, he has been vice-president, in charge of construction, with office at Chicago. Mr. Storey has been in charge also of the operating department during the absence of J. W. Kendrick, vice-president in charge of operation, who was granted a six months' leave of absence in December, 1910.

G. R. Martin, who has been appointed comptroller of the Great Northern, with office at St. Paul, Minn., as was previously announced in these columns, was born July 3, 1864, at Evans Mills, N. Y. He attended the U. S. Military Academy at West Point for a time, entering with the class of 1883. He graduated with the master's degree from the College of Law of the University of Minnesota, and he is also a member of the bar of the state of Minnesota. Mr. Martin began railway work in 1885 with the Chicago & North Western as a telegraph operator and agent, and until July, 1890, was employed in the operating department of that road and the Minneapolis, St. Paul & Sault Ste. Marie. He then entered the accounting department of the Great Northern, and in August, 1894, was promoted to assistant auditor of disbursements. Three years later he was transferred to the operating department, and was consecutively special superintendent of the Great Northern; general superintendent of its subsidiary, the Montana Central, and assistant general superintendent of the Great Northern. In March, 1899, he was appointed auditor of disbursements, and was promoted to general auditor in November, 1902. For the first five months of 1905 he was on special duty in the president's office, and was made assistant to the comptroller in May of that year. He was promoted to assistant comptroller in January, 1906, from which office he is now advanced to comptroller.

Operating Officers.

J. G. Grossheim has been appointed superintendent of the Portland & Southeastern, with office at Portland, Ore.

H. D. Earl, who was recently appointed superintendent of the St. Louis Southwestern, at Mt. Pleasant, Tex., and R. L. Garner, who was appointed assistant superintendent of the same road, at Tyler, Tex., have had their jurisdiction extended over the Eastern Texas Railroad.

P. E. Block, vice-president, general superintendent and general freight and passenger agent of the Weatherford, Mineral Wells & Northwestern at Weatherford, Tex., has been appointed general superintendent of the Gulf, Texas & Western, with office at Jermny, Tex., succeeding F. J. Bechely, resigned to accept service with another company.

A. S. Ingalls, assistant general superintendent of the Lake Shore & Michigan Southern, the Lake Erie, Alliance & Wheeling and the Dunkirk, Allegheny Valley & Pittsburgh, having been promoted to general superintendent, F. H. Wilson, assistant general superintendent at Chicago, has had his jurisdiction extended over all divisions, and his office will be moved to Cleveland, Ohio.

N. B. Walton has been appointed assistant to general superintendent of the Grand Trunk Pacific, with office at Winnipeg, Man.; G. S. Cooke has been appointed superintendent of the lines from Winnipeg to Watrous, Sask., with office at Melville, and H. McCall has been appointed superintendent of the lines west of Edmonton, Alta., with office at Edson. The office of trainmaster of the first, second, third, seventh and eighth districts is abolished.

Nathan Gregg Pearsall, whose appointment as superintendent of the Louisiana division of the Texas & Pacific, with office at New Orleans, La., has been announced in these columns, was born at South Florence, Ala. He received a common school education and began railway work in February, 1879, as a brakeman on the Memphis & Charleston, now part of the Southern Railway. He was then consecutively freight conductor and passenger conductor on the Mexican Central; construction train conductor and passenger conductor on the Louisville, New Orleans & Texas, now part of the Yazoo & Mississippi Valley, and division superintendent of the Texas & Pacific at New Orleans. He was then out of service for a time, and in February, 1898, went with the Interstate Transportation Company at New Orleans. He was afterwards general manager of the Avoyelles Railway, now part of the Texas & Pacific; and in June, 1899, was appointed manager of the East Louisiana Railroad, and later general manager of its successor, the New Orleans Great Northern, having been with the latter road during its construction and up to the time of his appointment as above.

Traffic Officers.

Stewart Starr has been appointed traveling freight and passenger agent of the Brinson Railway, with office at Sylvania, Ga.

W. J. Lloyd has been appointed acting general agent of the Erie Despatch, at Denver, Colo., succeeding J. A. Dolan, transferred.

J. G. Kensett has been appointed a traveling freight agent of the Atlantic Coast Line, with office at Greenville, S. C., succeeding W. A. Cooper.

T. P. Clemow has been appointed traveling freight and passenger agent of the Great Northern, with office at Billings, Mont., succeeding B. S. Merritt.

T. H. Daly has been appointed a traveling passenger agent of the Canadian Pacific Lines west of Revelstoke, B. C., with office at Vancouver, B. C.

W. B. Harahan has been appointed a traveling freight agent of the Missouri, Kansas & Texas, with headquarters in New York City, succeeding T. P. Buchanan, resigned.

C. S. Browne has been appointed traveling freight agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal., succeeding L. A. Casey, promoted.

W. A. Clay has been appointed freight traffic manager of the Anderson & Saline River, with office at Pine Bluff, Ark. (See an item under Executive, Financial & Legal officers.)

W. F. Greaves, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis at Dallas, Tex., has been appointed general agent, with office at Nashville, Tenn. C. W. Smith, commercial agent at Kansas City, Mo., succeeds Mr. Greaves, and F. M. Cole succeeds Mr. Smith.

R. T. Haskins, freight traffic manager, at New York; L. H. Kentfield, general freight agent; A. B. Smith, general passenger agent, and F. C. Coley, first assistant general passenger agent of the New York, New Haven & Hartford, with offices at New Haven, Conn., have been appointed also to the same positions on the Central New England.

S. H. Babcock, manager of the traffic bureau of the Commercial Club of Salt Lake City, has been appointed traffic manager of the Denver, Northwestern & Pacific, with office at Denver, Colo., succeeding to part of the duties of William F. Jones, auditor and general traffic manager.

J. E. Blain, chief clerk to the commercial agent of the New Orleans & Northeastern, the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific at Shreveport, La., has been appointed a traveling freight agent, with office at Shreveport, succeeding Charlton Barksdale, resigned.

Fay Thompson, district passenger agent of the Chicago, Rock Island & Pacific at Atlanta, Ga., has been appointed division passenger agent, with office at Oklahoma City, Okla., succeeding H. M. Brown, appointed district passenger agent at Philadelphia, Pa. H. H. Hunt succeeds Mr. Thompson.

W. L. Donaldson, agent of the Lake Shore-Lehigh Valley Route and the Michigan Central-Lehigh Valley Route; and John E. Rogerson, westbound agent of the Michigan Central-Lehigh Valley Route, incident to the closing of the offices of those fast freight lines, have become connected with the freight traffic department of the Lehigh Valley, with office at Chicago. William McMurtie, commercial agent of the fast freight lines at Kansas City, Mo., has been appointed traveling freight agent of the Lehigh Valley, with office at Kansas City.

The jurisdiction of the following officers of the International & Great Northern has been extended over the Texas & Pacific: George D. Hunter, general eastern traffic agent; W. G. Trufant, commercial agent, and D. C. Lorentz, soliciting freight agent, with office at New York; H. H. Taylor, commercial agent at St. Louis, Mo.; G. W. Doll, commercial agent at Cincinnati, Ohio; T. B. Moss, commercial agent at Kansas City, Mo., and James Stuart, recently promoted from traveling freight agent at St. Louis to commercial agent at Denver, Colo., succeeding F. J. Burke, promoted. P. B. Doddridge has been appointed traveling freight agent in charge of St. Louis-Chicago territory, with jurisdiction over both roads, succeeding Mr. Stuart. The jurisdiction of J. B. Payne, commercial agent, and O. E. Duggan, traveling freight agent, of the Texas & Pacific at Louisville, Ky., has been extended over the International & Great Northern. I. M. Griffin, whose appointment as assistant general freight agent of the Texas & Pacific at Dallas, Tex., has been announced in these columns, will continue to act as general cotton agent of the I. & G. N. N. M. Leach, whose appointment as traffic manager of both roads has been announced in these columns, will have temporary headquarters at San Antonio, Tex.

Subsequent to the recent reorganization of the freight traffic department of the western lines of the Canadian Pacific (see *Railway Age Gazette*, April 21, 1911, page 968) changes have been made, effective June 15, by which that department has been divided into the following divisions: Manitoba, Saskatchewan, Alberta, Kootenay and Boundary, and British Columbia. W. C. Bowles, division freight agent at Vancouver, B. C., has been appointed general freight agent of the western lines, with headquarters at Winnipeg, Man., a new office. R. E. Larmour, division freight agent at Winnipeg, has been appointed division freight agent of the British Columbia division, with office at Vancouver; and reporting to him are: F. H. Clendenning, district freight agent at Vancouver; W. H. Gardiner, district freight agent at Victoria, B. C., and A. J. Cambie, who has just been appointed district freight agent at Vancouver, in charge of Vancouver and Westminster terminals and Okanagan lake traffic. George H. Smith, district freight agent at Winnipeg, has been appointed division freight agent of the Manitoba division, with office at Winnipeg. D. C. MacDonald has been appointed division freight agent of the Saskatchewan division, with office at Regina, Sask., and W. H. Allison has been appointed a district freight agent of that division, with office at Saskatoon, Sask., succeeding R. W. Drew, who has been promoted to division freight agent of the Kootenay and Boundary division, with office at Nelson, B. C. John Halstead, formerly division freight agent of the Western division at Calgary, Alta., has been appointed division freight agent of the Alberta division, with office at Calgary. The offices of district freight agent at Regina and at Winnipeg have been abolished.

Engineering and Rolling Stock Officers.

C. C. Fralich has been appointed assistant master mechanic of the Ann Arbor Railroad, with office at Owosso, Mich.

A. W. Munster has been appointed engineer of tests of the New York, New Haven & Hartford, with office at Boston, Mass., succeeding B. S. Hinckley, transferred.

F. S. Rodger, general car and locomotive foreman of the Chicago, Milwaukee & St. Paul at Marion, Iowa, has been appointed assistant district master mechanic of the Superior division, with office at Green Bay, Wis., succeeding E. Z. Hermansader, promoted. G. F. Hennessey succeeds Mr. Rodger.

John J. Pelley, roadmaster of the Illinois Central at New Orleans, La., has been transferred to Fulton, Ky., succeeding J. M. Egan, appointed superintendent. C. E. Weaver, resident engineer at New Orleans, succeeds Mr. Pelley. Shelby S. Roberts has been appointed a division engineer, with office at Chicago, succeeding E. I. Rogers, transferred to New Orleans.

C. H. Rae, general master mechanic of the Louisville & Nashville, at Louisville, Ky., has been appointed assistant superintendent of machinery, succeeding Charles F. Giles, promoted. C. H. Hedgcock, chief clerk in the mechanical department, also becomes assistant superintendent of machinery. W. A. Stearns, mechanical engineer, at Louisville, has resigned, to become assistant to the chief mechanical engineer of the American Steel Foundries, at St. Louis, Mo.

Charles F. Giles, assistant superintendent of machinery of the Louisville & Nashville, at Louisville, Ky., has been appointed superintendent of machinery, succeeding T. H. Curtis, resigned. Mr. Giles was born at Rowlesburg, W. Va., November 2, 1856, and entered railway service as an apprentice in the shops of the Baltimore & Ohio at Wheeling in 1873, and in the shops of that road, the Texas & Pacific, the Pennsylvania and the Louisville & Nashville he remained until 1882, in which year he was made foreman on the L. & N. In 1887 he was promoted to the position of master mechanic, at Birmingham; the next year to a similar position at Pensacola, and on October 1, 1902, became master mechanic at the main shops of the company at Louisville. He was appointed assistant superintendent of machinery on February 1, 1904.

John D. Maupin, whose appointment as superintendent of motive power of the Trinity & Brazos Valley, with office at Teague, Tex., has been announced in these columns, was born at St. Catherine, Mo., January 16, 1869. He began railway work in 1889 as a machinist apprentice with the Missouri Pacific-Iron

Mountain system at De Soto, Mo., and on completing his apprenticeship in 1892 was for a year connected with George J. Fritz's contract shop at St. Louis, Mo. He then returned to the Iron Mountain at De Soto, where he was employed in the shops as a machinist for ten years. In 1903 he was appointed gang foreman, and a year later was promoted to general roundhouse foreman, which latter office he held continuously until January, 1909, except for a part of 1907, when he was general foreman of the Texas Central at Walnut Springs, Tex. His next position was general foreman of the Trinity & Brazos Valley at Teague, and in May, 1910, he was promoted to master mechanic of the same company, from which office he has just been advanced to superintendent of motive power as above.

Theodore H. Curtis, superintendent of machinery of the Louisville & Nashville for the last eight years, has resigned and will leave railway work to engage in private business. Mr. Curtis was born at Terre Haute, Ind., August 12, 1866, and entered railway service at the age of 20 as a draftsman on the Cincinnati, Indianapolis, St. Louis & Chicago, now a part of the Big Four. In the drafting rooms of that road and the Brooks Locomotive Works, the Pittsburg Locomotive Works and the New York, Chicago & St. Louis Railroad he remained until 1897, being chief draftsman on the Nickel Plate eight years. In 1897 he was made mechanical engineer of that road, which place he held for two years. Then he went to the Erie in the same capacity. On January 1, 1901, he was appointed mechanical engineer of the Louisville & Nashville, and in August, 1903, was promoted to the position from which he now retires.



T. H. Curtis.

Purchasing Officers.

B. S. Hinckley, engineer of tests of the New York, New Haven & Hartford, has been appointed purchasing agent, with office at Boston, Mass., succeeding C. N. Chevalier, retired.

Frank D. Reed, whose appointment as purchasing agent of the Chicago, Rock Island & Pacific, in addition to his duties as assistant to the vice-president, has been announced in these columns, was born April 22, 1868, near Fort Dodge, Iowa. He was educated in the Chicago public schools, and began railway work with the Pennsylvania Lines at Chicago in September, 1884, as a wheel inspector. In six months he was made clerk and timekeeper, and for five years from 1890 was chief clerk in the car department. He was then promoted to assistant chief of the motive power clerk of the Lines West of Pittsburgh at Fort Wayne, Ind., and in February, 1900, was made chief motive power clerk at the same place. He went to the Rock Island Lines in April, 1904, as chief motive power clerk at Chicago, and two years later was promoted to general storekeeper at Silvis, Ill. He was advanced to assistant to the vice-president, with headquarters at Chicago, in May, 1910, which office he continues to hold.

Special Officers.

H. H. Harrington has been appointed agricultural director of the south Texas lines of the St. Louis & San Francisco.

OBITUARY.

Maurice Brosnihan, formerly traveling freight agent of the Illinois Central, with office at Chicago, died in Chicago on June 5.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Wisconsin & Michigan is in the market for 2 locomotives.

The Mexico Northwestern is in the market for 2 Mallet locomotives and 6 Prairie type locomotives.

The American Smelters Securities Company, New York City, has ordered 1 mikado locomotive from the Baldwin Locomotive Works.

The Jacksonville Terminal Co. has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works. The cylinders will be 19 in. x 28 in.; diameter of the driving wheels will be 50 in., and the total weight on drivers will be 118,000 lbs.

CAR BUILDING.

The Mexico North Western is in the market for 500 logging cars.

The Cuba Railroad has ordered 19 coaches from the American Car & Foundry Company.

The Queen & Crescent is in the market for 1,067 miscellaneous freight cars. This item has not been confirmed.

The Louisville & Nashville will re-enforce 1,000 freight cars, and is in the market for the steel underframes. This item has not been confirmed.

IRON AND STEEL.

The Grand Trunk has ordered 2,000 tons of bridge material.

The Baltimore & Ohio has ordered 500 tons of structural steel, and is inquiring for 3,500 tons.

The Pennsylvania Railroad has ordered 150 tons of bridge material.

The Delaware & Hudson has ordered 2,000 tons of rails from the Cambria Steel Company.

The Boston & Maine has ordered 150 tons of bridge material from the American Bridge Company.

The United Railways of Hayti have ordered 8,000 tons of rails from the Lackawanna Steel Company.

The Atlantic Coast Line has ordered 250 tons of bridge steel from the Pennsylvania Steel Company.

The Kansas City Southern, mentioned in the *Railway Age Gazette* of May 19 as being in the market for 14,000 tons of rails, has divided an order for this material between the Illinois Steel Company and the Pennsylvania Steel Company.

The Missouri Pacific has divided an order for 50,000 tons of rails as follows: 22,800 from the Tennessee Coal, Iron & Railroad Company; 5,000 tons from the Illinois Steel Company, and 22,000 tons from the Colorado Fuel & Iron Company.

SIGNALING.

The contract for installing automatic block signals on the Chicago, Indianapolis & Louisville, between Hammond and Indianapolis (single track), 163 miles, has been let to the General Railway Signal Company. Signals of type 2A will be used, upper quadrant.

The Chicago, Burlington & Quincy will shortly begin installation of automatic block signals between Cameron Junction, Mo., and Harlem, 44.7 miles of single track and 7.3 miles of double track. The single track is used jointly with the Rock Island, and the double track jointly with the Rock Island and the Wabash. All material will be furnished by the General Railway Signal Company. Signals of type 2A, lower quadrant, will be used.

Supply Trade News.

The National Railway Equipment Company is in the market for 100 second-hand 50-ton hopper-bottom gondola cars.

The McKeen Motor Car Company has received an order from the Sand Springs Interurban Railway of Tulsa, Okla., for a second 70-ft. motor car. The Oregon-Washington Railroad & Navigation Company also has placed an order for a 70-ft. motor car. There are now 111 of these cars in service in the United States.

Cornell S. Hawley, hitherto vice-president, general manager and treasurer of the Consolidated Car Heating Company, with office at New York City, was on Monday last elected president and treasurer of the company. Claude C. Nuckols, hitherto superintendent and purchasing agent, was at the same time chosen general manager.

E. G. Schmeisser, formerly assistant engineer in the department of electric traction of the Pennsylvania Railroad, has been elected second vice-president of the Wiener Machinery Company, New York. The capital of this company, which handles machinery, tools and railway appliances, has been recently increased to $25,000. Branch offices have been opened in Pittsburgh, Pa., and Boston, Mass.

Harvey H. Brown has been elected president of the Brown Hoisting Machinery Company, Cleveland, Ohio, succeeding his brother, the late Alexander E. Brown, founder of the company, who died April 26. Other officers were elected as follows: Alexander C. Brown, director and vice-president; George C. Wing, secretary; Charles T. Pratt, treasurer, and Richard B. Sheridan, general manager.

The gross sales of the Western Electric Company, for the month of May, exceeded the sales of the same month in 1910 by 12 per cent.; and at the end of the month the company was employing 26,000 persons, as compared with 25,000 two months ago. The amount of work turned out this year is about 5 per cent. more than it was in the busiest season of 1907, when the company employed 10 per cent. more persons than at present.

A special meeting of the shareholders of the Canadian Locomotive Company, Ltd., Kingston, Ont., was held on May 26 to consider an offer for the sale of the works to a Canadian and English syndicate. Before any definite action is taken, a valuation and a general audit will be made of the company's business. When this report has been handed in the future policy of the company will be determined upon. The capital which the syndicate proposes to put into the business of the company would be derived from the sale of the following securities: $2,000,000 first mortgage sterling bonds; $1,500,000 preferred stock; and $2,000,000 common stock.

TRADE PUBLICATIONS.

Brake Beams.—The American Steel Foundries, Chicago, has issued a 40-page catalogue describing the Simplex brake beams for passenger, freight and tender service.

Chicago & Northwestern.—The passenger department of this line has published an illustrated folder giving a description, with diagrams, of its new passenger terminal at Madison and Canal streets, Chicago.

Cranes.—The Industrial Works, Bay City, Mich., has issued a new general catalogue covering wrecking, locomotive, construction, pillar and hand cranes, pile drivers, transfer tables, portable rail sawing machines and clam shell buckets. The book is handsomely printed and bound, and contains 107 illustrations.

Asphalt Products.—The Standard Asphalt & Rubber Company, Chicago, has published a small booklet on Sarco asphalt products and their uses. Among others, Sarco asphalt paving cement, Sarco waterproofing, Sarco asphalt mastic flooring and Sarco mineral rubber pipe coating are illustrated and briefly described.

Cranes.—The Industrial Works, Bay City, Mich., has published catalogue 104 of its railway and commercial cranes, embracing wrecking, locomotive, construction, pillar and hand power cranes; also pile drivers, transfer tables, portable rail sawing machines and clam shell buckets. These machines are fully illustrated and minutely described.

Lubricators.—The Collins Metallic Packing Company, Philadelphia, Pa., has published a small booklet on the Collins improved wheel-flange lubricators, in which it illustrates this device and points out its characteristic features and advantages. For description of this lubricator, see issue of *Railway Age Gazette* for October 7, 1910, page 675.

Lupton Specialties.—The David Lupton's Sons Company, Philadelphia, Pa., has devoted a 36-page illustrated booklet to the Lupton specialties. Among these are included Lupton steel sash for side walls, Pond continuous sash for monitors and saw-tooths, Pond operating device for all types of windows, and Lupton rolled steel skylights for all buildings. Full descriptions and diagrams are given.

Geared Locomotives.—The Lima Locomotive & Machine Company, Lima, Ohio, has published a full catalogue of its locomotives. Special attention is devoted to the Shay gear and rod locomotives. Illustrations of the various types are included and some photographs of the shops are given. Tables giving various dimensions and corresponding code words for ordering by wire are also included.

Roach Rail Joint.—The Reinforced Rail Joint Company, St. Louis, Mo., has issued an illustrated booklet describing its Roach rail joint, which is now in service on several roads. This joint is made in one piece and is heavily reinforced, making its strength equal to or greater than that of the rail. It grips the rail tightly in the center, but allows it to deflect at the end, reducing the danger of breakages. This method of supporting is claimed to prevent any rolling movement in the joint.

Michigan Central.—The passenger department of the Michigan Central has issued a booklet entitled Mackinac Island, describing the summer resorts in northern Michigan; it is fully illustrated and contains detailed maps and a list of special tourist fares to these places. Summer Tours is a booklet by the same company giving useful information regarding tours to Niagara Falls and the Adirondacks. Resorts of the fruit belt of Michigan are described in a pamphlet entitled Near-by Resorts.

Selective Signaling.—The United States Electric Company, New York, maker of the Gill selector and other apparatus used on telephone lines, has issued bulletin No. 702, calling attention to its train order semaphore—a standard semaphore with an electric slot. With this semaphore, used in connection with a selective calling apparatus, a despatcher is put in control of the signal at each one of any number of train-order offices. With this electric slot the semaphore is locked in the stop position so that it cannot be cleared until the despatcher releases it; and he, therefore, has full control over the movement of trains at any station, regardless of the absence of the station operator. The clearing of the signal is effected by reversing the battery used in calling.

In consideration of the surrender of the Northern Territory by South Australia, the Commonwealth Government undertake to construct a railway from Port Darwin southwards to a point on the northern boundary of South Australia proper, thus linking the north and the south of the continent, and adding greatly to the defensive strength of the country. The Commonwealth Government are to acquire the Port Augusta Railway, and are to construct a line from a point on the Port Augusta Railway to connect with the other part of the Transcontinental Railway at a point on the northern boundary of South Australia proper. The Commonwealth Government are also authorized to construct a railway westerly from a point on the Port Augusta Railway to a point on the western boundary of South Australia proper. These schemes will facilitate the construction of the other great transcontinental system to connect the east of Australia with the west, in anticipation of which Western Australia joined the Federation in 1900. The undertaking has become more feasible of late through the discovery of artesian water along the proposed route in Western Australia.

Railway Construction.

New Incorporations, Surveys, Etc.

Arizona & Swansea.—Construction work has been started on an extension, it is said, from Swansea, Ariz., to the Clara consolidated copper district, six miles.

Atlantic Coast Line.—A contract is said to have been let to W. Z. Williams & Co., Macon, Ga., for constructing new yards east of the Augusta city limits. The improvements will cost between $85,000 and $90,000. There is also to be some revision work carried out on the Charleston & Western Carolina.

Camp Creek Railway.—Incorporated in Montana with $100,000 capital, to build from Manhattan, Mont., in the Camp Creek country, through an agricultural district for about 20 miles. Preliminary survey has been made and most of the right-of-way secured. A. M. Harvey, Livingston; Clancey Salesville, A. J. Walrath, H. S. Buell and F. L. Benepe, all of Bozeman, are directors.

Charleston & Western Carolina.—See Atlantic Coast Line

Grays Harbor Electric.—This company will build a line, it is said, from Raymond, Wash., to South Bend.

Great Northern.—A new branch, called the Cherry Valley branch, has been opened for business on the Cascade division, from Monroe, Wash., west to Tolt, 17.9 miles.

Intercolonial Railway.—An officer writes that the Canadian government will build branch lines as follows: Dartmouth, N. S., northeast to Deans, 73 miles; Sunny Brae, east to Guysborough and Country Harbor, 80.5 miles, and from Alba, northeast to Baddeck, in Cape Breton, 22 miles. The lines have already been located and bids will probably be asked in the near future, and construction work started within three months. The improvements call for putting up stations, freight houses, engine houses and water tanks The branches are being built to carry coal, farming commodities, fish and lumber.

Kamas Valley.—Preliminary surveys have been made for the first section of a line to be built from Wanship, Utah, on the Union Pacific, to Woodland, 18 miles. It is proposed to eventually extend the line to Park City and up Provo canyon to the Uintah reservation. R. W. Barnes, Kamas, is the principal promoter, and H. S. Joseph is chief engineer. S. W. Stewart, Salt Lake City, is interested in the project.

Lewisburg & Northern.—See Louisville & Nashville.

Louisville & Nashville.—An officer writes that contracts have been let for double-tracking and improvement work between Covington, Ky., and Paris, to the following contractors: Boxley Brothers Company, Quincy; Patterson & Griffin, Pittsburgh, Pa.; Hough & Spradlin; C. J. McKinney and Callahan Construction Company, Knoxville, Tenn.; J. H. Flick Construction Company, Chicago; Robert Grace Contracting Company, Cleveland, Ohio, and Price Construction Company, Middleboro, Ky.

According to press reports, surveys have been made for the Lewisburg & Northern, from a connection with the Louisville & Nashville, at Maplewood, Tenn., just north of Nashville, through the counties of Davidson, Williamson, Rutherford, Marshall, Giles and Lincoln. Right-of-way has been secured for most of the line. At the Tennessee-Alabama state line connection is to be made with the new double-track line to be built to Athens, Ala., under the name of the Nashville & Decatur. In addition to building a bridge at Nashville, Tenn., bridges are to be put up across Elk river in Tennesese, near the Alabama state line; at Mulberry and at Locust forks, on the Warrior river in northern Alabama. The plans of the L. & N., it is said, include piercing five or six tunnels in Tennessee. From Athens, Ala., south to the freight yards at Boyles, the grades and curvature will be reduced and a second track is to be added. Nearly all the right-of-way for the second-track work in Alabama has been secured.

Oregon Roads (Electric).—The Lane County Asset Co., Eugene, Ore., has given a grading contract to George Perry & Co., it is said, for building an electric line from Eugene to Elmira.

Oregon Short Line.—Work has been started, it is said, on the Salt Lake & Idaho, from Lucin, Utah, north to Burley, Idaho, via the Raft river valley, about 100 miles.

Porterville Northeastern.—This company, which expects to begin operating trains from Porterville, Cal. to Springville, 16 miles, on July 1, it is said will extend the line to the entrance of Sequoia National Park, eight miles. Surveys have been made.

Richwood & Gauley.—Incorporated in West Virginia with $75,000 capital, to build a line along Cherry river in Nicholas county, W. Va., to open up coal and timber lands. Connection is to be made with a line already built at the junction of Cherry and Gauley rivers. The incorporators include: C. S. Weston, W. Briggs, J. M. Oakford and F. L. Space, Scranton, Pa., and H. W. Armstrong, Richwood, W. Va.

Salt Lake & Idaho.—See Oregon Short Line.

Savannah, Augusta & Northern.—This road has been extended from Garfield, Ga., to Stevens crossing, 14 miles.

Southern Pacific.—Announcement has been made that work on the double-track line from Rocklin, Cal., west to Colfax, which has been under way for some time, has been finished.

This company will double-track its line, it is said, between Pasadena, Cal. and Huntington drive, South Pasadena, and electrify the same.

Work is soon to be started, it is said, on a line from Fernley, Cal., and Lassen county.

According to press reports, this company will electrify the line between Riverside, Cal. and Colton.

Southern & Tidewater.—Incorporated in California with $800,000 capital, to build from Santa Monica, Cal., near Los Angeles, via the Maribu ranch to Oxnard, 67 miles. The incorporators include: M. K. Rindge, F. H. Rindge and N. D. Darlington.

Spokane International.—The Bayview branch has been opened for business from Corbin Junction, Idaho, south to Bayview, 12 miles, and the Coeur d'Alene branch has been opened for business from Coeur d'Alene Junction, south to Coeur d'Alene, 10 miles.

St. Louis, Arcadia & Jefferson City.—Incorporated in Missouri with $250,000 capital, and headquarters at St. Louis, Mo. The plans call for building an interurban line from St. Louis to Fenton, 15 miles. The incorporators include: T. G. Portis, C. F. Vogel, E. R. Kinney and R. M. Hamlin, St. Louis, and H. D. Mackey, Springfield.

Taos, Sierra Nevada & San Francisco.—This company has been incorporated in New Mexico with $800,000 capital, and office at Taos. The plans call for building 750 miles of railway through the counties of Taos, Rio Arriba, Santa Fe, San Juan, Colfax and Union, in New Mexico, and the southern counties of Utah. One terminus is to be at Fort Sumner, N. Mex., on the Santa Fe cut-off, and the other on the Colorado & Southern in Union county, near Amistad, passing through Santa Fe and Taos. H. S. Annamaker, president, Amistad; F. Hamm, vice-president, Dallas, Tex.; J. S. Holland, second vice-president; J. Gill, secretary, Clayton, N. Mex.; A. C. Probert, treasurer, Taos, and W. P. Halliday, chief engineer, Fort Worth, Tex.

Western Pacific.—According to press reports, work will soon be started on a branch from near Marysville, Cal., to Susanville.

RAILWAY STRUCTURES.

Albion, Pa.—According to press reports, the Bessemer & Lake Erie has plans made for improvements, to include enlarging the yards at Albion, building new sidings and putting up several new bridges.

Kalamazoo, Mich.—The Lake Shore & Michigan Southern will build a brick freight house on concrete foundation, 40 ft. x 110 ft.; second floor 40 ft. x 74 ft. In connection with the freight house this company will build 1,000 ft. of team track, served by brick driveways.

Morgantown, W. Va.—The Morgantown & Kingwood has given a contract, it is said, for building shops at Morgantown, to cost $40,000.

Nashville, Tenn.—See Louisville & Nashville under Railway Construction.

New Castle, Pa.—According to press reports, the Pittsburgh & Lake Erie will put up a new passenger station at New Castle, also shop buildings.

Railway Financial News.

Algoma Central & Hudson Bay.—The Manitoulin & North Shore, extending from Sudbury, Ont., to Crean Hill, 23 miles, and controlled by the A. C. & H. B., is now called the Algoma Eastern Railway.

Atlanta, Birmingham & Atlantic.—S. S. Palmer of New York, and Francis R. Hart of Boston, Mass., have been made members of the general protective committee representing the securities of the railway company and of the Atlanta & Birmingham Construction Company; the Georgia Terminal Company; the Alabama Terminal Company and allied companies. The committee now consists of: E. S. Marston, chairman; Frederick Ayer, Samuel Carr, John I. Waterbury, S. S. Palmer and F. R. Hart.

Boston & Maine.—At an adjourned meeting of the stockholders at Boston, June 13, the consolidation of the Worcester, Nashua & Rochester with the Boston & Maine was approved.

Bruce Mines & Algoma Railway.—A press despatch says that this property has been bought by business men of Sault Ste. Marie, Mich. The road runs from Bruce Mines, Ont., to Rock Lake. See also item in Construction News.

Central of Georgia.—The company has deposited with the trustees of the first and second preference income bonds, money to pay the interest which the Superior Court of Chatham county, Ga., found was due for the year 1907.

Chicago & Eastern Illinois.—O. S. Lyford, vice-president, with office at Chicago, has been elected a director for one year, succeeding Frank Trumbull of New York, resigned.

Chicago, Rock Island & Pacific.—The Des Moines, Iowa Falls & Northern first mortgage 5 per cent. bonds, dated 1901, have been called for redemption on July 1, 1911, at 105.

Denison, Bonham & New Orleans.—The Missouri, Kansas & Texas has bought all of the outstanding securities of the Denison, Bonham & New Orleans, consisting of $50,000 stock and $325,000 bonds. The D. B. & N. O. runs from Bonham Junction, Tex., to Bonham, 24 miles.

Denver & Rio Grande.—At the meeting of the board of directors on June 8, action in regard to the dividend on the preferred stock was postponed until June 13 in order to allow Blair & Co., and Speyer & Co., both of New York, to consult with George Gould.

Des Moines, Iowa Falls & Northern.—See Chicago, Rock Island & Pacific.

Great Northern.—The outstanding $500,000 Minneapolis Western first mortgage 5 per cent. bonds are to be paid at maturity on July 1.

Illinois Central.—Bankers in New York say that this company has concluded negotiations for the sale of refunding 4 per cent. bonds to the amount of $10,000,000 to Kuhn, Loeb & Co. The price paid to the railway company is believed to be above 96; but it does not appear that the Executive Committee of the road has yet taken formal action.

Intercolonial.—This Canadian government railway has acquired thirteen railways in the maritime provinces which become branch lines of the I. C. R., and a part of the government system. The railways it is about leasing are the Valery property of the Arcadian Coal Company; the Oriental railway; the Hampton & St. Martin's; the Albert railway; the Moncton & Buctouche; the Caraquet railway; the Gulf shore railway; the York and Coulton; the International; the Temiscouata the New Brunswick & Prince Edward Island; the Elgin & Havelock, and the Kent Northern. The railways are to be leased on terms and conditions approved by the Government Railways Managing Board, the value of the railways to be fixed by the judge of the exchequer court; based on the report of the chief engineer of the government railways. The amount of the rental to be paid will not exceed, for the first five years of the lease, 3 per cent. of the fixed value; for the second five years, 3½ per cent., and thereafter 4 per cent. These railways was mostly short roads with poor service and old rolling stock, and with their acquisition by the I. C. R. will be brought up to the standard of that road.

International & Great Northern.—The property and franchises of this company were sold at auction by the receivers at Palestine, Tex., June 13, for $12,645,000; the purchaser being a committee headed by Lawrence Greer, understood to represent the Gould interests. This property went into the hands of a receiver on February 26, 1908. The plan of reorganization proposed by a committee of the third mortgage bond holders, was outlined in the *Railway Age Gazette* May 19 last, page 1188; and the general acceptance of this plan was indicated by an item published in this column last week.

Lakes Champlain & Moriah.—This company has asked the New York State Public Service Commission, Second district, for authority to increase its capital stock from $200,000 to $400,000, the additional $200,000 to be used to reimburse the treasury for expenditures which have been made to the property during the past five years. The petition shows how the expenditures made have produced an increase in business. The amount of freight carried has increased from 458,000 tons in 1904 to 971,000 tons in 1910. No dividends have been paid since 1893, except one of 3 per cent. in 1899. Since 1899 the net earnings have all been expended in improvements. This road, eight miles long, extends from Port Henry, N. Y., to Mineville, N. Y., and is owned by the iron ore interests which furnish most of its business.

Louisiana Southern.—It is said that the stockholders are to vote in the near future on the question of increasing the capital stock from $300,000 to $1,000,000, and on issuing $1,000,000 first mortgage refunding bonds.

Maine Central.—The stockholders are to vote on July 1 on the question of authorizing the merging of the Somerset Railroad and the Sebasticook & Moosehead with the Maine Central, under the provisions of an act recently passed by the Maine legislature. The stockholders are also to vote on the question of leasing the Portland terminal. See this company below.

Missouri, Kansas & Texas.—See Denison, Bonham & New Orleans.

Missouri Pacific.—The Nebraska railway commission has granted the company's application for authority to issue $20,000,000 in notes for permanent improvements.

National Railways of Mexico.—The company will pay on July 1 the $3,661,000 consolidated mortgage 4 per cent. bonds of the Mexican Central and the assenting 4 per cent. bonds and registered income bonds aggregating $49,547. The money for this refunding was raised through the recent sale of $10,000,000 two year 4½ per cent. notes.

Pere Marquette.—Through the Bankers' Trust Company the Guaranty Trust Company and White, Weld & Co., New York, this company has sold equipment trust gold notes to the amount of $870,000, bearing 5 per cent. interest. The notes are dated June 1, and mature in instalments half yearly up to June 1, 1921. The equipment bought cost $1,023,913; the balance having been paid already by the company. The purchase included 50 locomotives, 12 passenger cars and two combination mail and baggage cars.

Portland Terminal Company.—This is the new name of the Portland (Maine) Union Railway Station Company. The old company issued $300,000 first mortgage 4 per cent. bonds due 1927-1929, guaranteed jointly by the Boston & Maine and the Maine Central. See also item under Railway Structures.

St. Louis & San Francisco.—Frank Trumbull, chairman of the board of the Chesapeake & Ohio, has resigned from the board of directors of the St. Louis & San Francisco; the Chicago & Eastern Illinois; the Evansville & Terre Haute; the Kansas City, Ft. Scott & Memphis, and the Kansas City, Memphis and Birmingham. The resignation is due to the press of other business.

Wabash-Pittsburg Terminal.—The taking of testimony of George J. Gould and Joseph Ramsey, Jr., in the suit of the Central Trust Company, New York, to foreclose the Wheeling & Lake Erie general mortgage, has been postponed until fall; and all of the other litigation brought by the Wabash-Pittsburg Terminal Reorganization committee against the Wabash Railroad has been put off until fall.

Wabash Railroad.—See Wabash-Pittsburg Terminal.

Wheeling & Lake Erie.—See Wabash-Pittsburg Terminal.

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THE committee on Repair Equipment for Engine Houses has adopted the term "engine house," instead of round house, and suggests that that term be regarded as recommended practice. The locomotive dictionary is in a measure an official publication which defines various locomotive details and it might be extended so as to include those describing locomotive shops and the buildings used for locomotive running repairs. The British term "running shed" is a definite term which causes no confusion. Engine house may mean the building for the stationary engines, but a better term for this is the "power house," and this, too, could be made the recommended word, by official action of the association. The report is one of unusual merit, and it should do much to raise the grade of machine tools and equipment used in engine houses. It contains a sentence which should become the slogan of the master mechanic, when the annual tool appropriations are under consideration. It is this, "*If a tool is not efficient enough for repair shop work it will generally pay to scrap it.*" The report recommends a tool room, a store room with a more complete stock than is generally carried at such points, and it emphasizes the importance of making the engine house attractive, convenient and well ventilated so as to render it possible to hold in employ a desirable class of workmen.

A NUMBER of members disagreed quite emphatically with the report of the committee on the diameter of piston rods and the size of crossheads, which was presented yesterday. The title of the report required only formulæ and tables giving proportions for such parts and those presented were found acceptable, but the design for the piston rod fit in the crosshead was generally discredited. The breakage of piston rods is often due to the severe stress produced by driving in the key, and for this reason a nut fastening for the piston to the crosshead found considerable favor. But the chief objection to the design presented is the combination of end butting fit and taper fit which experience has shown is not good practice. If the rod has an end butting fit into the crosshead, the taper fit will soon become loose. There is a loss in the area of the bearing of the taper fit when the butting fit is used. It is best, therefore, to use such a taper that the rod can have a full bearing in the crosshead and to place no dependence upon the butting fit at the end of the piston rod or a shoulder fillet at the front end of the crosshead.

THE quality of the steel used for main and side rods has more to do with frequent breakage than design, and the large sections for rods used on American locomotives seem to be due to an allowance for material which is not uniform in quality rather than national design based on working stresses which good steel should permit. In the discussion of the report on main and side rods it was pointed out that in the manufacture of fluted rods by milling from the solid, the best part of the steel, which has been compressed by hammering, is cut away and the poorer steel is left to form the web of the I section. Two remedies were suggested which appeared to find general favor, first, that adopted by the New York Central in using rectangular sections for the rods of freight engines; second, the forging of fluted rods instead of milling. The fluted rod should be adopted for passenger engines where it is desirable to use polished details for the machinery parts. Such rods could be forged nearly to size and finished by milling and there would then not be a loss of the best material, but the web would receive as much working in forging as the other portions of the rod. The forging press, which is coming into use in railway shops, is admirably adapted to this kind of work, as it produces a better forging than the hammer. The rectangular side rod has the advantage of lateral flexibility and is therefore well adapted for use on long engines like the consolidation and decapod. There is still room for considerable improvement in locomotive rod practice, not only in design, but in the selection of the proper grade of steel and in the heat treatment during the forging process.

CURIOUSLY, the use of the brick arch was not referred to in the discussion of the report on mechanical stokers Wednesday, although in the present state of the art it seems to be inadvisable to operate a mechanical stoker without it. The principal reason is that the arch assists in the proper distribution of the coal. Without it the tendency is for the light coal and slack to be carried too far forward in the box, a considerable amount being drawn unconsumed into the flues and front end, stopping them up and in some cases seriously interfering with the capacity and efficiency of the

boiler. With the arch a proper distribution of the coal can be made and there is very little opportunity for the fine particles to pass back and over it without being perfectly consumed. The discussion of the brick-arch question at the Master Boiler Makers' convention indicated that an arch to be properly applied must rest snugly against the flue sheet with an open space between the fire bricks and the side sheets, and at the corners where the flue sheet joins the side sheets. An interesting experiment is being made on one road—that of testing superheater locomotives both with and without the arch. While the tests have not been completed and the data worked up, the indications are that it will be found that efficiency will be considerably greater with than without the arch, the degree of superheat being increased owing to the greater volume of gases passing through the top tubes. One road is cutting out a number of the lower tubes where the brick arch is being used without any perceptible effect on the efficiency of the locomotives and with a reduction in the cost of maintenance.

THE report on the lubrication of locomotive cylinders was a unique contribution to technical literature. In commenting upon the report and discussion on smoke prevention in the issue of yesterday, attention was called to the seeming helplessness of the association to suggest a means of accomplishing what is demanded of it. But there was no suggestion that the final word was considered to have been said, or that some means of smoke prevention would not ultimately be found. The report on cylinder lubrication seems to say between the lines that the limits have about been reached, and that there is practically nothing in sight that offers any great improvement on present practice; not but that improvements in details might be made, but, simply that the right feed hydrostatic lubricator is so far superior to anything else that it seems likely to continue to hold the field. Certainly, it is difficult to imagine anything more thoroughly condemnatory than the statements made regarding the mechanical lubricators. The only thing that prevented the report from being final and of closing the whole subject against further consideration was the statement, in the discussion, that one road had been experimenting with a mechanical lubricator that injected a mixture of oil and graphite into the steam chest, and was so well satisfied with the results obtained that a further investigation on a more elaborate scale is to be made during the coming year, and it was hoped that full data as to the results would be available by the time of the next convention. This chance statement seems to have been all that saved the subject from being closed, and thus becoming a unique feature among the topics that the association has considered. As it is, it is still open for discussion.

THERE is often a satisfaction in obtaining an explanation of a fact and the reason for its existence, even though the fact itself may have been very familiar for a long time. So, the paper on the use of superheated steam fills a long-felt want. For several years Schmidt has been advocating the use of a high degree of superheat in locomotive work, but without the accompaniment of any very definite data as to why he advocated it, or any very good reason why a lower degree would not do as well, or at least almost as well. In the discussions of the past Mr. Vaughan, of the Canadian Pacific, has told of the increased economy obtained as the temperature of the superheat was increased, and beyond this we have had practically no authoritative data on the subject. The paper presented yesterday morning fills in the gap and supplies just the sort of information that is needed, based upon carefully conducted laboratory investigations that seem to afford a full explanation of the suggestions that have heretofore come from the practical side. The Purdue investigations show that the moderate degrees of superheat give such slight savings in fuel that they are not worth making, thus exactly checking with the practical results of the Canadian Pacific, and that the percentage of saving increases with the rise of superheat temperature to a point not yet determined but certainly somewhat beyond the 240 deg., which was the upper limit reached in the Purdue experiments, and probably extending beyond the region of practical operations.

This will come somewhat as a surprise to many who have regarded superheating merely as a means of overcoming cylinder condensation, and to whom it seemed that a proportional reduction of condensation ought to show a proportional reduction of coal and water consumption. The paper is, of course, a climax resulting from what has gone before, and of what has been presented and, while it confessedly falls short of a complete and final statement of the case, and must be regarded, like its predecessors, as a report of progress, it is doubtful if any further statements can equal in importance those set forth therein. It is certainly the most important contribution on the subject of superheated steam on locomotives yet made, and will go far toward setting the whole matter in its proper light. While it comes as a whole and stands forth by itself, its author would be the first to acknowledge their indebtedness to and dependence on the work that has preceded their own, for it really embodies the results of a long period of investigation, and cannot be credited wholly to the work of the past year. Strong and valuable as the paper is, there is promise in it of more to come, and it is to be hoped that the painstaking work that has been done on locomotive Schenectady No. 3 may be continued without interruption to the further elucidation of this most important subject.

WATER PURIFICATION.

ABOUT ten or twelve years ago a proposition was made to the superintendent of motive power of a prominent railway to purify some particularly hard water on his line. He declined to consider the proposition, on the ground that it would not pay to bother with water treatment, and that the locomotives could be kept in service as matters were. Since then a change has taken place throughout the country and water purification is now taken as a matter of course. That it pays, and is recognized as profitable, was brought out very forcibly, by inference, in the report and discussion on water purification yesterday morning. To begin with, the report was limited to a consideration of those localities where density of traffic does not warrant the establishment of water treating plants. In substance, then, the association, in assigning the topic, says: "Of course water treating is the proper thing, but there are some places where the consumption is so light that the economic value of a treating plant is doubtful; so what shall we do in such cases?" The report made various suggestions, gave some figures of costs of materials, and indicated in a general way the course to be followed in handling these small stations. But it said nothing as to the economic value of the saving of tubes, of fire-boxes, of coal and labor.

While this did not quite hold in the discussion, it obtained to a great extent. Members were anxious for detailed experiences. There were, to be sure, allusions to advantages that had been obtained from water purification, such as an increase of fire-box life, in one instance, from 12 months to 7 years; but as a whole these savings were ignored, and the main interest seemed centered about practice. This was especially true regarding foaming. The means of its prevention when concentrations reach high points were talked over pretty thoroughly; and, while the use of anti-foaming compounds was advocated for the lower concentrations and is, apparently efficacious; it appears that, for the higher concentrations the blow-off is the only resort.

Water treatment, then, may be regarded as an accomplished economic fact, and as so accepted. It now remains to work out a means of riddance of some of the annoyances which accompany its use. This is a chemical problem that will involve a deal of labor and take much time before

it will be even partially solved. As for a final solution, there is no prospect of that, for the problems already existing are innumerable, and as fast as one is solved another springs up. So, even though the incrusting solids and foaming salts were to be cared for and eliminated, there would still remain the common salts, which it is sometimes desirable to remove, but which have not yet been touched. The essential point to be noted, then, in this report and discussion, is the unanimous acceptance of water purification as an economic proportion, and the tacit recognition of the desirability of its practice, coupled with the intense interest shown in the improvement and perfection of that practice.

OIL FUEL FOR LOCOMOTIVES.

THE cost of equipping a locomotive for burning oil, including the burner and regulating valves, the firebrick furnace and the tank with its pipes and valves on tenders is about $800, and the cost of steel storage tanks for roadway supply is approximately 25 cents per barrel. The oil stations cost only about 50 per cent. of the cost of coaling stations, but the latter are in place and already provided, while the oil stations are clearly an extra expense.

One of the principal advantages of oil fuel for locomotives is the increased steaming capacity obtained from the boiler and the possibility of maintaining this at a maximum throughout the run. It is this which has made possible the successful operation of very large Mallet locomotives which develop a maximum tractive effort of 100,000 lbs. and nearly 2,000 h. p. at ordinary freight speeds. The fireman does not become fatigued, and even in hot weather the maximum output from the boiler can be depended on whenever needed for any part of the run. While the physical exertion of the fireman with oil fuel is not great, it requires more careful and close attention than in coal burning to secure economical combustion. The fireman and engineer must work in harmony, and with each change in the throttle or reverse lever a corresponding regulation must be given to the oil supply and atomizer. If the fireman is not careful and skillful in this way it is possible for him to waste large quantities of oil and a greater value in fuel than is wasted by a careless fireman on a coal-burning locomotive.

The capacity of the boiler is soon reached as speed increases in coal-burning locomotives, and the engineer reduces the cut-off to accommodate steam consumption to steam production; but with oil fuel the boiler can be so easily forced with increased oil consumption that there is a tendency on the part of enginemen to use a longer cut-off than is economical, and complete the trip in a shorter time than careful economy in oil consumption would require. This important feature in the operation of locomotives when fired with oil is referred to in a comprehensive paper on "Petroleum as Locomotive Fuel," by Eugene McAuliffe, general fuel agent of the Frisco Lines, presented at the recent meeting of the International Railway Fuel Association. The author gives carefully prepared rules for the guidance of engineers, firemen and others in handling oil-burning engines, including instructions for starting the fire, using the heater, preventing black smoke, and handling the atomizers, blowers and dampers. He exposes the careless habits of enginemen, and says it is easy to make schedule time or make up lost time with oil fuel, but it requires an excessive consumption of oil and results in a lack of discipline, and mechanical facilities are allowed to deteriorate on account of the comparative freedom from failure actually to deliver the train on time. It is possible to measure oil very accurately, and the consumption under proper regulation of speed and combustion could be easily established for each class of trains, so that it ought not be a difficult thing to determine which enginemen are careless in the use of oil fuel.

There is an economy in oil fuel as compared with coal which is seldom referred to, and that is the comparative loss when engines stand idle under steam at terminals or are delayed on side tracks. It is then possible so to regulate the oil jet that there is a small consumption of fuel, while with coal the large mass of incandescent fuel must be maintained over the grate to insure prompt movement when orders for departure are given. The saving in oil in this respect averages 50 per cent. of the coal equivalent, and in freight traffic in winter it is an important item. It is fortunate that large deposits of petroleum are found in districts where there is a poor coal supply, and where coal for locomotives is expensive. This is particularly true of California and Mexico.

TO-DAY'S PROGRAM.

M. M. ASSOCIATION.

Discussion of Reports on:	
Safety Appliances	9.00 A. M. to 10.30 A. M.
Design, Construction and Inspection of Locomotive Boilers	10.30 A. M. to 11.00 A. M.
Contour of Tires	11.00 A. M. to 11.15 A. M.
Steel Tires	11.15 A. M. to 11.30 A. M.
Flange Lubrication	11.30 A. M. to 12.00 A. M.
Minimum Requirements for Headlights	12.00 P. M. to 12.30 P. M.
Resolutions, Correspondence, etc.	12.30 P. M. to 12.40 P. M.
Unfinished Business	12.40 P. M. to 12.45 P. M.
Election of Officers—Closing Exercises	12.45 P. M. to 1.30 P. M.

ENTERTAINMENT.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Six Kirksmith Sisters, 3.00 P. M.—Brighton Casino, in grand concert of vocal and instrumental music.

Band Concert, 3.30 P. M.—Entrance Hall, Million Dollar Pier.

Euchre and Bridge, 9.00 P. M.—For both ladies and gentlemen and their guests attending the conventions. Solarium Marlborough-Blenheim Hotel.

ENTERTAINMENT BY THE KIRKSMITH SISTERS.

One of the pleasing features of to-day's entertainment will be the vocal and instrumental musical program which will be given at 3 P. M. by the Six Kirksmith Sisters at the Brighton Casino. The sextette are sisters actually as well as in their advertising literature, and each of them both sings and plays on various instruments. It is said—this can be verified by those who attend—that they are not only good to listen to, but also good to look upon.

The Brighton Casino is between the Marlborough-Blenheim and the Traymore, and the entrance is on the Boardwalk. Admission will be by badge.

SUPPLYMEN'S EXECUTIVE COMMITTEE MEETINGS.

The executive committee of the Railway Supply Manufacturers' Association meets daily, Sunday excepted, in its office, adjoining the enrollment booth, on the pier.

CORNELL DINNER.

The annual dinner of Cornell men attending the convention will be held this year at the Hotel Windsor at 8 o'clock P. M., Saturday, June 17. It is expected that Jack Moakley will be present and explain his secret for winning intercollegiate track meets. Special music and entertainment has

been arranged for, and it is planned to make this the most enjoyable dinner of the kind ever held.

All Cornell men attending the conventions are requested to register at the booth of the *American Engineer and Railroad Journal* (opposite north stairway main building) as soon as possible after arrival.

TO-NIGHT'S CARD PARTY.

The card party to-night will be one of the most interesting features of the entertainment program in connection with this year's conventions. It will be given in the ball room of the Marlborough-Blenheim, which is just off the Exchange, and will begin at 9 o'clock. Both progressive bridge and progressive euchre will be played, half of the tables being set aside for each game. Fifty prizes will be awarded, 25 to ladies and 25 to gentlemen. The lady who wins the highest number of games of bridge will draw with the one winning the largest number of games of euchre for first choice of the ladies' prizes, and the gentlemen will similarly draw, until all the prizes have been awarded.

The sub-committee in charge desires to have it particularly understood that no woman will be allowed to play without a man for a partner. Last year was the first when prizes for both men and women were given. This rule was enforced then, with the result that about 300 men and 300 women played.

The sub-committee in charge will be: J. C. Younglove, chairman; H. S. Hammond, P. J. Mitchell, Ross F. Hayes, R. C. Coburn, W. J. Walsh, George R. Carr, H. A. Nealley, C. P. Williams, C. A. Knill, J. M. Brown and Thomas Farmer, Jr., and all having any questions to ask about the games, either before or during the party, are invited to refer them to the committee members.

In order to prevent confusion two bells, having entirely different sounds, will be used to announce the ending of the games. A large gong will be used for bridge and a small bell for euchre.

The following are the rules to be observed in playing bridge:

No. 1. Play four hands; 20 minutes will be allowed for each four hands. Change partners when bell rings.
No. 2. Progress on points not including honors, but put down total score. Do not add anything to scores for progression.
No. 3. Cut for deal at every table—low deals.
No. 4. Change partners at beginning of each four hands at every table.
No. 5. Double and redouble once only.
No. 6. Count easy aces.
No. 7. Misdeal does not forfeit deal.
No. 8. Play spades whether doubled or not, but no royal spades.
No. 9. Prizes awarded on total points and honors.
No. 10. Do not finish hand if playing when bell rings.

Note:—Guests of railway men or supply men may play, but will not be contestants for prizes. To be a contestant for prizes one must be: A railway man or a member of his immediate family, a railway supply man or member of his family.

The following are the rules for euchre:

1. Commence playing when bell rings.
2. Eight hands at head table constitute a game.
3. Other tables, game ends when bell rings, unless the trump has been turned.
4. For progressing the bell will be rung twice.
5. Lone hands count four. No taking of partner's best.
6. Misdeal, dealer loses deal.
7. Visiting lady deals first hand.
8. Remain seated until score is taken.
9. In case of tie, couple scoring first moves.

The prizes will be placed on exhibition in the ball room, where the party will be held, at 11 o'clock this morning. The following is a list of them:

LADIES' PRIZES.

Library electrolier.
Boudoir electric lamp, copper coffee percolater.
Bronze figure.
Tiplitz flower basket.
Brass fruit basket.
Cut-glass jewel box.
Sandwich tray.
Mahogany tray.
Thermos carafe.
Velvet band with buckle and slide.
Bracelet.
Cavilier hand bag.
Cluny luncheon set, center piece and thirty-six doilies.
Cut-glass vase.
Venetian flower holder.
Rockwood tray.
Mahogany candle sticks with shades.
Cut-glass relish dish.
Rockwood vase.
Sheffield platter.
Parasol.
Dresden compote.
Dessert set.
Salad bowl.

GENTLEMEN'S PRIZES.

Russian leather traveling bag.
Eight-day desk clock.
Necktie case (leather).
Brush set.
Adjustable shaving glass.
Cut jet ink stand.
Set of hangers in case.
Thermos bottle.
Umbrella.
Cane.
Cordial set.
Doutton pitcher.
Cigar jar.
Terra cotta bag.
Venetian cordial set.
Brass smoking set.
Beer moat.
Brass ash tray.
Desk electrolier.
Electric standing lamp.
Ice tub.
Copper champagne cooler.
Cocktail mixer.
Serving tray.
Brass book rack.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION ANNUAL MEETING.

The annual meeting of the association will be held in the Greek Temple, Million Dollar Pier, Saturday, June 17, at 11 o'clock A. M.

If the two candidates named by the nominating committee are elected (and, if universal popularity counts, they will be elected), it will be necessary to amend the new by-laws adopted last year. Both the president and the vice-president of the association should be members of the executive committee. This is fully covered by the present by-laws, provided those officers are chosen from among the 12 regularly elected members of the committee; but Stafford is scheduled to retire at the close of this convention, and the complement for the second district.

from which Mr. Allen hails, is already full. Again, Section 4, Article 2, of the by-laws says: "A member of the executive committee who shall have served three years continuously, shall be ineligible for further service until an interim of three years shall have elapsed." As Mr. Stafford will have just finished his term, he could not be re-elected to the committee without special action, although he would not be barred from the presidency. However, as Article 4 of the constitution permits amendments "at any meeting of the association by a two-thirds vote of the members present and voting," the way is clear and simple.

CALL FOR YOUR MAIL.

There is a large amount of mail at the office of the secretary of the Railway Supply Manufacturers' Association for persons attending the conventions. Some of it may be for you. Anyway, it won't do any harm for you to call and find out.

THE M. M. SCHOLARSHIP AT PURDUE.

Secretary Taylor announced at the session yesterday that a letter had just been received from H. A. Houston, the young man who has the M. M. scholarship at Purdue University, who has just completed his fourth year. Mr. Houston stated that he had written to the donors of the scholarship thanking them for it, and indicating that he had endeavored to reflect credit on the association by keeping his grades up to a high standard.

THE AMIABLE WEATHER MAN.

The Atlantic City weather man has been, thus far, almost as amiable as could be desired. He made it storm Tuesday night, which was distinctly disagreeable in him, but perhaps he was under the impression that convention visitors would not arrive until Wednesday, the day of the opening session of the M. M. Association. Certainly he was a dear, as the ladies would say, Wednesday and yesterday, although he did let it get a bit too warm yesterday afternoon. If he does as well until after the M. C. B. Convention he will deserve a handsomely trimmed chromo.

FOREIGN RAILWAY NOTES.

The progress which is being made in the development at the Port of Bahia, Guatamala, gives every indication of this point becoming a formidable rival of the other ports in the republic. The railway from that town to Quito is being pushed forward vigorously, and already there has been opened to traffic a section extending to a point near Calceta, a distance of 33 miles. The preliminary survey on the Chone branch, via Caimito, has been completed, as has also the survey on the line from Guayaquil to Balzar. Plans for the installation of an electric light plant are now being prepared, and every effort is being exerted to render the port of Bahia de Caraquez an important commercial center.

The Quillacollo to the valley of Cliza electric railway in Argentina, with terminal stations at Vinto and Arani, has a total length of 56 miles. The construction of the first section of this important electric line has been completed and work on the second section, which will extend to the fertile and beautiful Cliza valley, will soon be begun. The survey of this railway extends in an easterly direction to Las Cuadras, and from there runs southward to the Cliza valley, crossing the public highway at Angostura. The completion of this much needed electric railway will greatly accelerate the development of the rich country through which it passes and will exert a beneficial influence on the agricultural and mining industries of the neighboring regions.

Proceedings.

President Fuller called the second session of the Master Mechanics' Association to order at 9.30 Thursday morning.

The President:—The oldest living ex-president of the association is here—Reuben Wells. The next two oldest ex-presidents are also here—Mr. Garstang and Mr. Mackenzie, and I would ask the youngest ex-president, Mr. Wildin, to escort them to the platform.

MAIN AND SIDE RODS.

The committee submitted a progress report, coupled with the request that every member of the association send the committee criticisms or suggestions for modifications before February 1, 1912. The first part of the subject assigned to the committee relates to the kind of material in rods. There is very little difference in the steel for rods, and open-hearth steel having an ultimate tensile strength of 80,000 lbs. per sq. in., is used by all railways. There is some variation in the chemistry. Special alloy and heat-treated steels have been considered and put in service, but, to date, information relating to such steels in rods is too meager to justify recommending their use. The second part of the subject relates to specifying formulæ for checking up sizes and designs of main and side rods.

Main Rods.—The rod bodies are subject to the following strains:

1. Tension and compression, due to piston pressure and inertia of the reciprocating weights.
2. Bending, caused by centrifugal force acting vertically.

Stresses from compression are always more than from tension. Reciprocating parts are made as light as possible, and stresses due to inertia of reciprocating weights are usually less than those created by cylinder pressure. Furthermore, when drifting, the amount of retardation, due to vacuum and compression in the cylinder, will, to some extent, balance the inertia strains. If for passenger and high-speed freight locomotives the maximum piston pressure is less than the product of the reciprocating weights by four times the crank length in inches ($P < 4rW$) the latter value ($4rW$) should be used in place of maximum piston pressure. For slow freight and shifting engines, such substitution is not necessary. From the above it will be noted that the calculations may be confined to a consideration of the rod body as a strut, with the load equal to the piston pressure, or its substitute, and as a beam subject to bending on account of whip action at high speeds.

Side Rods.—The rod bodies are subject, first, to tension or compression arising either from a part of the piston pressure transferred through the main crank pin, or from a requirement for the rod to slide one or more of the driving wheels, and, second, to bending caused by centrifugal force acting vertically. When all drivers are not of exactly the same diameter, and when the locomotive is passing over curves, the side rods must slide drivers. The limit of the force to slide drivers is governed by the coefficient of friction between wheels and rails. The commonly accepted coefficient of friction, when calculating tractive power, is .25, or less. For our purpose it should be somewhat higher, to be on the safe side. A number of builders and roads use the coefficient .3, which fully meets the requirements.

For starting, we assume that each rod must be capable of sliding the pairs of drivers to which it imparts rotation, but when running at speed it must slide the drivers on one side only. Therefore, the value P in Professor Lanza's formula would be:

$$P = \frac{WR}{r} \text{ for starting}$$

$$P = \frac{WR}{2r} \text{ for running at speed, in which}$$

W = Weight on pairs of drivers receiving rotation from the rod
R = Radius of wheel
r = Radius of crank.

Most roads base calculations of rods on a speed of 336 r. p. m. This is high for some engines, such as Mallet compounds, and low for fast passenger engines, some of which now reach a greater speed, and the tendency is to achieve still greater speed. The use of 375 r. p. m. for fast freight engines and passenger engines, and 420 r. p. m. for fast passenger engines, would be sufficiently high for ordinary locomotives. For Mallet compounds, and other very slow locomotives, a special figure may be taken.

Rods as Struts.—Main rods are almost invariably made tapered, and the section, if fluted, may vary in thickness of flange, height of web, thickness of web, or a combination of two, or all three. The taper is never of such amount that the results are appreciably affected if calculations are based on the section at the center, the same as for rods having a uniform cross-section. Good practice indicates that this center area for all rods should not be less than maximum assumed end load divided by 10,000 lbs. Merriman's Rational Formula for columns (see Kent's Pocket Book) is:

$$C = \frac{B}{1 + \frac{nB}{n^2E}\frac{L^2}{r^2}} \text{ in which}$$

B = Unit load
C = Maximum compression unit stress
L = Length of column
r = Least radius of gyration.
E = Coefficient of elasticity
n = 1 for both ends, round
n = ¼ for both ends, fixed or flat.

If we have a unit stress of 10,000 lbs. per sq. in., the value of length divided by least radius of gyration (L÷r) must not exceed eighty (80) for neutral axis vertical or parallel with side of rod, and not more than one hundred and sixty (160) for neutral axis horizontal. For these values the maximum compression unit stress is 12,710 lbs. per sq. in., or slightly within the assumed figure for maximum allowable stress of one-sixth of the ultimate tensile strength.

With neutral axis vertical for rods having rectangular section $r = b \div \sqrt{12}$ ("b" being the depth of section). Substituting this in L÷r=80, we get L=23b. Therefore, if the length from center to center of pin is less than twenty-three (23) times the depth of a rectangular rod, the value L÷r is less than 80. Similarly with neutral axis horizontal $r = a \div \sqrt{12}$ ("a" being width of rod) and the value L÷r is less than one hundred and sixty (160) when L is less than forty-six (46) times the width of section.

Offset Rods.—A number of the rods are offset, that is, the vertical center line of the bearings at the end do not lie in the same plane, or in the plane of the center line of rod body. This creates a bending strain and increases the stress in the rod body. The added stress from this source is equal to the product of the maximum end load and the offset, divided by the section modulus with axis vertical, and requires a correspondingly large section modulus.

Side Rods with Knuckle Joints.—Rods for three and four coupled locomotives must be provided with knuckle joints. The knuckle joints are all necessarily flexible vertically, and some are flexible horizontally also. When the drivers on one side are not in perfect horizontal alignment, slight bending strains occur, in addition to the compression strains. To take these bending strains into consideration would complicate the formulæ.

The end pressures on the rods being based on driver weight and a coefficient of friction greater than that expected, the margin in this assumption is sufficient to compensate for the bending strains arising from the non-alignment of the drivers on the one hand, and the deflection of the rod due to centrifugal force, when running at high speed, on the other hand; therefore, both bending strains may be ignored for the purpose of simplifying the final checking formulæ. When running at speed the centrifugal force from the short rod connected to the extension of the long rod reduces the bending strains due to centrifugal force in the long rod. As the extension to the long rod is short, this effect may also be ignored as the possible reduction in weight of long rod would not be appreciable.

When the drivers, due to wear between hubs and boxes, etc., are not in vertical alignment, bending strains are induced. Knuckle joints are at times made flexible transversely, in addition to the vertical flexibility, for the purpose of eliminating the bending strains. For locomotives on which a large amount of side play is allowed to accumulate, this transverse flexibility is of great value to avoid rod failures. When the knuckle joints are flexible in both directions, the value of L÷r, for the short rods, should be one hundred and ten (110), instead of one hundred and sixty (160), as given in *rods as struts.*

Bending Strains Due to Whipping at High Speed.—For main rods the point of maximum bending strain is always very close to six-tenths of the length from crosshead end. This statement is based on the examination of a large number of rod designs. The section at this point may, therefore, be taken as the governing section. For side rods the point of maximum strain is at the center.

Simplification of Formulæ.—As accurate calculations are rather lengthy, and must necessarily be based on conditions representing extremes, simple formulæ giving values within a very small per cent. of those obtained by the more accurate method are better adapted for the purpose and especially useful for checking. The basis for bending strains at speed is the centrifugal force F.

If G represents the weight, considered in pounds and r represents the crank radius, in inches, then

Centrifugal force	= 2Gr	3Gr	4Gr	5Gr	for
Number of revolutions per minute	265	325	375	420	

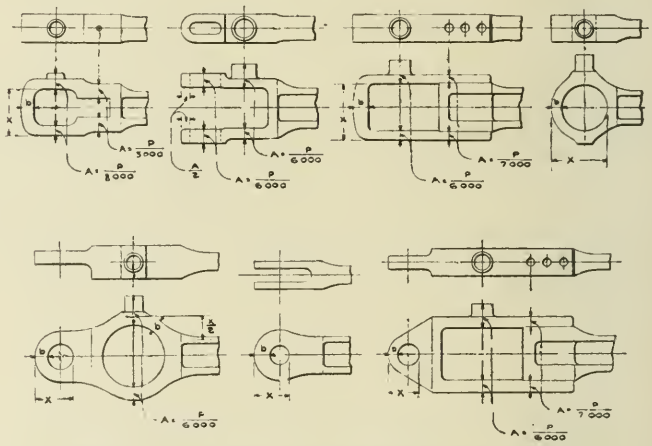
A cubic inch of steel weighs closely .2833 lbs. Both main and side rods may be considered as having a uniform section, equivalent to the governing section and extending from pin to pin. This assumption is accurate for side rods, but for main rods gives stresses at high speeds possibly one per cent. higher than those found by the accurate method.

If A = Governing area of rod, in square inches
and L = Rod length, center to center of pins, in inches,
then G = .2833 AL
and Gr = .2833 ALr
For side rods the bending moment M = .125FL.
For main rods the bending moment M = .064FL.

The formulæ for bending moment (M) for main rods and side rods, at the assumed speeds, are noted in the following tabulation:

Revolutions per minute	265	325	375	420
"M" for main rods...	.036AL²r	.055AL²r	.073AL²r	.091AL²r
"M" for side rods....	.071AL²r	.106AL²r	.142AL²r	.177AL²r

From the above, the stress due to whipping action may be found by means of the well-known formula, $M \div SM =$



Sections to be Checked in Strap and Stub End Design.

Stress, to which the stress due to end strains assumed as maxima, must be added. The sum of these stresses should not exceed one-sixth of the ultimate tensile strength of the steel.

Knuckle Pins.—Data in regard to knuckle pins have not been included, as the rules governing pins for wheels and crosshead should also govern knuckle pins, and if the bearing surface of the knuckle pin is sufficiently large to avoid trouble, the shearing area will be excessive.

CHECKING FORMULAE.

All measurements are given in inches and pounds.
A = Area of section considered.
a = Width of section considered.
b = Depth of section considered.
C_1 = Max. compression unit stress for transverse bending.
C_2 = Max. compression unit stress for vertical bending.
c = c_1 — c_2 = Coefficients.
d = Cylinder diameter.
L = Length of rod from center to center of pins.
M = Bending moment.
P = Max. compression strain acting at end of rod.
p = Max. boiler pressure.
Q = Cylinder pressure = 0.7854 d^2 p.
R = Radius of driving wheels.
r = Radius of crank.
RG = Radius of gyration of section—axis horizontal.
rg = Radius of gyration of section—axis vertical.
S = Stress—and where used in formulæ must not exceed one-sixth of ultimate strength of the steel.
s = Amount of horizontal offset in rod.
SM = Section modulus of section considered—axis horizontal.
sm = Section modulus of section considered—axis vertical.
W = Weight on pairs of drivers actuated through rod considered.
Main rod area must not be less than P ÷ 10,000 lbs.

For main rods $P = \frac{Q}{0.3}$

For side rods $P = \frac{WR}{r}$

To determine C_1 and C_2, calculation should be based on a section half way between rod pins.

For transverse bending in rods having knuckle pins flexible transversely

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{675{,}000{,}000\ A\ rg^2}}$$

For all other rods

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{1{,}200{,}000{,}000\ A\ rg^2}}$$

For vertical bending in all rods

$$C_2 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{300{,}000{,}000\ A\ RG^2}}$$

Values for C_1 and C_2 can also be taken from tables in "Kent's Pocket Book" under heading "Merriman's Rational Formula for Columns."

First—

For rods without offset the larger value of C_1 and C_2 should be taken equal to S.

For rods with offset the larger value of $C_1 + \frac{P_s}{sm}$ and C_2 should be taken equal to S.

Second—

$$S = c\frac{AL^2r}{SM} + c_1 P \left(\frac{1}{A} + \frac{5}{sm}\right)$$

The calculations should be based on a section located at a distance 0.6 L from crosshead pin for main rods, and half way between pins for side rods.

		VALUES OF C AND C_1.			
Rev. per min.		265	325	375	420
Main rod	C =	0.036	0.055	0.073	0.091
	C_1 =	0.500	0.500	0.400	0.300
Side rod	C =	0.071	0.106	0.142	0.177
	C_1 =	0.500	0.500	0.500	0.500

The coefficients selected should correspond with the highest number of revolutions per minute which the locomotive can make.

If this can not be determined, use

420 R. P. M. for high speed passenger locomotives.
375 R. P. M. for passenger and high speed freight locomotives.
325 R. P. M. for all other locomotives.

Very simple rules for rods, without offset, and having bodies with rectangular section, based on the above theory, follow.

First—

Stress is less than one-sixth of ultimate strength of the steel if L is less than $46a$ or $23b$ and if A is more than P divided by one-eighth of ultimate strength of the steel.

Second—

$$S = C_2 \frac{L^2r}{b} + C_1 \frac{D}{A}$$

		VALUES OF C_2 AND C_1.			
Rev. per min.		265	325	375	420
Main rod	C_2 =	0.22	0.33	0.44	0.55
	C_1 =	0.50	0.50	0.40	0.30
Side rod	C_2 =	0.43	0.54	.085	1.06
	C_1 =	0.50	0.50	0.50	0.50

The allowable stresses for the various sections of rod ends are given in connection with the diagrams following, except where thickness of section is indicated by the letter b. The figures denote maximum stress allowed under end load P. If the minimum areas of the two members differ, take double the lesser area for A.

The minimum area at points indicated by letter "b" should be

For main rods—$A = \frac{PX}{30{,}000\ b}$

For side rods—$A = \frac{PX}{60{,}000\ b}$

In which X is the average diameter of eye or average spread of jaw members.

There is an appendix containing specifications, formulæ and data received from various members of the Association—also one giving the calculation of stresses in the body of the main rod by Professor Gaetano Lanza.

The report is signed by:—W. F. Kiesel, Jr. (Penn.), chairman; H. Bartlett (B. & M.), G. Lanza (M. I. T.), H. B. Hunt (Am. Loco. Co.) and W. E. Dunham (C. & N. W.).

DISCUSSION.

C. A. Seley (C. R. I. & P.): I think this report is a very valuable addition to the records of the association, and it will assist us in calculating and checking rods, particularly the shortened form, and I feel it will be of great assistance to us for that purpose.

F. F. Gaines (Cent. of Ga.): I think it is extremely valuable to have formulae of this kind worked out by a responsible committee and on record in the proceedings of this association. I have not had time to go over the paper, but one item appeals to me, and that is where the rods are offset and the additional allowance that must be made. That is a very important item. Years ago, on some engines, we were continually breaking rods that had been considerably offset to keep the cylinder spread down, and yet their sections were as large, or even larger in proportion, to engines of equivalent power that had straight rods that were giving us no trouble. It took considerable figuring and feeling around before we finally decided that the offset was at the bottom of the thing. In the next lot of engines we ordered of that type we spread the cylinders wider and got the rods straightened out and with the same section of rod we finally got rid of all trouble of that kind. That has taught us it is an exceedingly important thing, if you have got to offset rods on consolidation locomotives, where it is principally done, that you want to have considerable strength in the rod to compensate for the offset.

George W. Rink (Cent. of N. J.):—We have experienced a little trouble with certain side rods due to the fact that we were using too high a working stress in designing them. I believe that formulae of this kind, as given in the report of the committee, are very essential so that we can arrive at standard practices. I found that these rods to which I refer had stresses exceeding 15,000 and 16,000 lbs. per sq. in. and when brought down to 12,000 lbs. they gave excellent service. We have experienced considerable trouble in the breakage of fork end rods, principally on 10-wheel engines, and we do not seem to have been able to get over this difficulty as yet. We have got around the repair part of it, by simply welding another portion of the fork, that is, one of the half portions of the fork, by means of thermit welding, and it makes an excellent job.

One of the important features in connecting rods of that type is to look after the knuckle pins and see that they are always kept up properly. We have found it necessary to apply single nuts and allow the pin to project beyond the nut about ⅛-in. and then rivet the pin there. We also have a washer about ⅛-in. thick between the side of the rod and the under side of the nut, and we find that also helps to keep that particular connection up in good shape.

M. C. Hayes (Erie):—As a usual practice the web section, the web portion of the I-section rod, is made of the same thickness throughout the length. A number of rods broke just about at the end of the web, where the fluted portion begins. I was told some time ago of an improvement being made by tapering the web portion near the end rather than making the web the same thickness throughout. I would like to ask if any one here has actually put that in practice, and if they have found that section overcomes that breaking to which I referred.

Mr. Gaines:—I know that is in practice, especially on main rods, where the front end trouble is caused by a harrowing of the metal, and this is overcome by a long tapering rod. I have known of several designs of engines where they started out with ½-in. web at the back end and run the web up as heavy as 1-in. at the front end of the main rod, and it has overcome that trouble.

Mr. Rink:—In designing these side rods we increase the weight of metal in the corner of the web, making the rods about 12 to 15 in., so that the web would increase from ⅝ in. to almost 2 in. up close to the butt. We find that that saves the rod considerably.

Wm. Forsyth (*Railway Age Gazette*):—I think it can be safely said that the main rods and side rods on American locomotives are the largest and heaviest, proportioned to cylinder thrust, that are used by any country in the world, and I have wondered what the reason is. Is it due to the use of low fibre stress in the steel, or is it due to a large factor of safety, to allow for defective material? I should think we have reached the point in steel manufacture where, in buying billets for rods, we could depend on uniform quality, and it would not be necessary to allow for defects in material as part of the factor of safety. Then we have high strength steel, from 80,000 lbs., which should allow an elastic limit of over 40,000 lbs. and taking that, for the working stress of 20,000 lbs., I should think that we could get steel which ought to have a practical working stress sufficient to meet the requirements. A gentleman near me says that he finds that 15,000 lbs. is too high. If you cannot use a stress of 15,000 lbs. in high carbon steel for locomotive rods, it must be because there is either an allowance for defective material or very rough work on the part of the engineer.

W. F. Kiesel, Jr. (Penna.): In connection with what Mr. Forsyth has said I think he possibly lost sight of the fact that the stress in rods reverses. For instance, taking a steel of 80,000 lbs. ultimate tensile strength and 40,000 lbs. elastic limit, it would not be proper to use a stress higher than the one specified here, amounting to about 13,000 lbs. per sq. in. I think that is the reason why engineers keep the stresses low. Furthermore, it would be dangerous to life if a side rod should break. There would be apt to be a bad wreck involving the whole train. Hence the stresses ought to be kept rather low, I think. There is one thing that the committee would like to emphasize, namely, the request made that members shall send in criticisms before February 1st, 1912.

J. A. McRae (M. C.): It is the practice on some roads to put a fillet on the cranks. I think that is a good scheme, and I do not know that it was mentioned.

H. T. Bentley (C. & N. W.): My own road is similarly situated to many other roads in that we are having a whole lot of breakage with main rods and side rods. In making some etchings of some side rods that broke immediately after being delivered to us by the builders, we found that the material was very poor and our engineer of tests said: "You go to work and get a billet and hammer it up and close the grain, and then you mill out the best part of it and therefore you reduce the strength of your rod." He has advocated that we go back to the rectangular rod. It seems to me that even with the large factor of safety that is allowed it is not enough when you get poor material. However, we have had steel rods come with engines that have broken and we have had to replace them with iron of our own manufacture of a very much lower tensile strength, and they have given us good service where the I-section steel rods furnished by the manufacturer did not stand up. I would like to ask if any of the members here have gone from the I-section rod to the rectangular rod for the purpose of getting away from the difficulty that I mentioned?

Mr. Gaines: In answer to Mr. Bentley's inquiry, I am developing a scheme to remedy that difficulty. We have a forging press using a very slow action hydraulic machine, and we are going to endeavor to make it work so that we can run the metal right through and avoid the trouble that Mr. Bentley refers to, if it is a fact that the best part of the metal is now being removed by milling it out. With regard to what Mr. Forsyth had to say relative to low stresses, I would ask if he has considered two stresses: First, take a beam that is a long column. There you have got to consider the stress in connection with that long column. Then, second, that same long column in addition to the loading at the end of the beam on the side rods, calculated at the center, and on the main rod about .6 of the crossed end. Those should be taken into consideration, and you will find that the unit stress is not very light, because if you add up the long stress of the long column action and the the inertia action, you get stress very much higher.

Wm. Forsyth: In reply to Mr. Gaines, I would say that the forces he mentions must act in other countries as they do here, and foreign engineers must use a higher unit stress to arrive at the small sections that are used almost all over the world in contrast with the heavy sections used in America.

Mr. McRae: In reference to Mr. Bentley's remarks about I-section rods, we have discarded those for all low speed engines, like engines engaged in freight service. We smooth-forge them. We do that, too, for another purpose than getting a dense metal. It accomplishes the purpose of not cutting out the good metal that Mr. Bentley referred to. We have got very good results from rectangular forged rods, as compared with I-sections.

The President: The question of forged fluted rods, I might say, is an old one. It was done with the light engines when I went to the Central Vermont, in 1892. A large number of their engines were equipped with fluted rods, forged without any machining other than the bush centers and, if I remember right, they had excellent results with those rods; but whether that would carry out with the heavier type is a question, as the rod is so much heavier and larger that it would make quite heavy forging. Putting rods as near in line as possible is absolutely necessary. We have a lot of engines that the offset is very great, and we find that the offset rods will break.

D. R. MacBain (L. S. & M. S.): We had considerable experience on the New York Central Lines with the various types of rods, fluted and otherwise, and we almost came to the conclusion that for all slow-speed engines the rectangular section is by far the best proposition. In the first place, we were trying to smooth-forge them and leave the outer shell, excepting on the ends where machining must be done, just as it came from under the hammer. The results were very satisfactory.

We used to have a great deal of breakage, especially on the consolidation engine, with the rectangular section, and we started in five or six years ago on the Michigan Central and substituted a rectangular section. That has given no trouble whatever. While I was on the New York Central Lines they were changing from the I-section to the rectangular section, and the results at that time were first-class. We have found that it is better, where possible, to have the rod straight, and cut out all the offsets that we can. Many breaks have occurred at the offset which we believe would not have occurred if the rod had been straight.

R. Patterson (G. T.): We have had a great deal of experience in forged fluted rods for low power locomotives. We did that altogether in our Stratford shops, but since we adopted the heavy power we went back to fluting the rod by machinery. We had a great deal of trouble with fluted rods breaking and we substituted the rectangular rod. Rods will break no matter whether rectangular or fluted if they are not kept up, but not nearly to the same extent as the fluted rod will.

O. C. Cromwell (B. & O.): We have used rectangular rods on consolidated freight engines and the I-section rods on the passenger engines. This practice has developed in recent years since we have increased the wheel base of the locomotive. The larger in-play that we get in the drivers on a consolidated locomotive, I think, contributes toward the failure of the rod. We not only have failure through the eye of the rod where we use the bushing, but we have it in the jaws, and we have trouble in keeping the wrist pins tight. What we want is a rod that will spring laterally as well as vertically—a kind of universal joint. That would keep the in-play between the drivers and the driving box down and would help in increased mileage. Another method would be to give plenty of lateral play in the crank pin. We tried that to some extent and had trouble in keeping the collars on the crank pin. We have in service one locomotive with a universal connected tie rod, and we are looking forward to some result in that direction, but I cannot tell you anything about it at present.

Mr. Wildin: A great deal of the trouble with side rods is due to the slipshod manner in which they are designed. Just prior to my connection with the New Haven they ordered 12 engines from the builders and they were delivered soon after I came. Three of those engines stripped themselves on our limited trains inside of three months. These had the I-sections rods. We took those engines out of service and substituted an I-section rod of a proper design, and they have been running now for four years without any trouble whatever. I think it is safe to say that at least nine-tenths of this trouble is due to poor designing and not so much to the material.

C. E. Chambers (C. of N. J.): We commenced annealing all our main rods and side rods that had been in service 5 years or more, and we found that it very much reduced the crystallization effect. I would like to know whether any of the other members here have followed a similar practice?

The President: We anneal all our rods, not only for the purpose of reducing crystallization, but to detect cracks. We think it has helped some and know that we have found cracked rods that we should not have found otherwise.

Mr. Chambers: How often do you do it?

The President: Every time an engine comes into the shop for general repairs, regardless of the age of the engine. Especially a rod that has been painted or has ever been repaired. With a new engine we would not do it.

O. C. Cromwell (B. & O.): We found considerable trouble in keeping the bushing tight on main rods and side rods. Recently we have tapered the middle section of the rod toward the main pin and think it has overcome the trouble. We had nothing to say as to the method of preventing the distortion of the I by buckling at the end of the rod. If you have loose bushings and knuckle pins, it sets up stresses in the rod which you cannot calculate.

Mr. Chambers: My solution for that difficulty is a split brass. Our troubles are much less with the split brass than with the solid bushings.

H. T. Bentley (C. & N. W.): Instead of putting a rod in the fire to find out if there are any cracks in it, we whitewash it. We put on a very heavy coat of whitewash and then let the rod stand for a day or so; if there are any cracks they soon show up.

Angus Sinclair: In European shops when the rods are taken off they are thoroughly wiped, so that any oil starting can be seen readily. The rods are put on trestles, each end of the rod resting on a trestle; it is then struck heavily in

of the rod resting on a trestle; it is then struck heavily in the middle with a wooden mallet which starts the oil out of the cracks.

Mr. Kiesel: I do not think there is anything more to say except again to ask the various members of the association to let us hear from them before February 12, after they have had a chance to look the report over more thoroughly and compare it with their own practice, and to advise us especially whether they consider the stresses we allow here as checking stresses are too high.

PISTON RODS AND CROSSHEADS.

The committee appointed to present formulæ for the proper diameter of piston rods and sizes of crossheads has obtained data from a number of the largest railways and from locomotive builders. Several different formulæ and designs are in use which give satisfactory results, therefore



J. A. McRae.

Chairman, Committee on Piston Rods and Cross Heads.

representative groups of the data obtained are presented instead of recommending only one set of formulæ for each part.

GROUP I.

Piston Rods.

Let

P=area of piston × boiler pressure.
S=fiber stress.
A=least area of piston rod through key-way.
Allowable working fiber stress in tension, 9,500 lbs. per sq. in. for steel.

Then

$$(1)\quad A=\frac{P}{S}$$

Piston rods to have enlarged fit in piston and in crosshead; ends to be approximately ¼ in. greater in diameter than body of rod.

Crosshead Key.

Allowable working fiber stress, 17,000 lbs. per sq. in. for spring steel. The diameter of body of piston rods, based on 9,500 lbs. fiber stress in tension at least area through key-way, with nominal diameter of cylinder and full boiler pressure for simple engines, are shown in the following table. The sizes vary by even ¼ in.

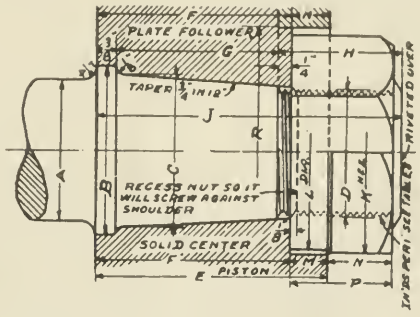
DIAMETER OF BODY FOR PISTON RODS, IN INCHES.

Cylinder Diameter (Inches).	Boiler Pressure (Pounds). 180	190	200	210	220
16	2¾	2¾	3		
16½—17	2¾	3	3		
17½—18	3¼	3¼	3¼	3¼	
18½—19	3¼	3¼	3½	3½	
19½—20	3½	3½	3½	3½	
20½—21	3¾	3¾	3¾	3¾	3¾
21½—22	3¾	3¾	4	4	4
22½ ..	4	4	4	4	4
—23	4	4	4	4	4¼
23½—24	4¼	4¼	4¼	4½	4½
24½—25	4¼	4¼	4½	4½	4½
25½	4¼	4½	4½	4½	...

The dimensions of piston-rod end for piston rods with body diameter as shown in the above table are given in Fig. 1. The dimensions of the crosshead end are given in Fig. 2.

Crossheads.

The formulæ for figuring crossheads to be used with the above designs of piston rods were not obtained, but drawings of the crossheads were furnished. A standard formula



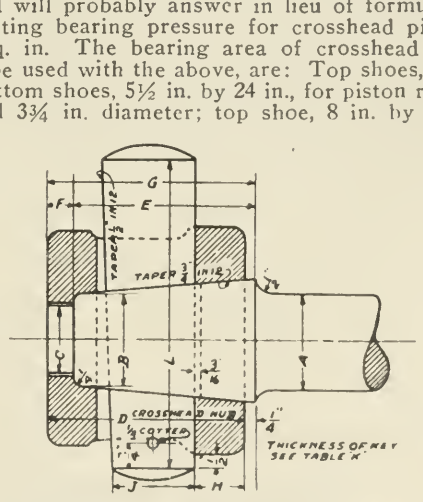
DIMENSIONS FOR PISTON END OF PISTON ROD.

A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S
2¾	3¼	3	2½	4½	3¼	3⅜	2⅜	5⅞	3⅞	3¾	¾	1¼	2	4¾	8
3	3½	3¼	2¾	4½	3¾	3⅜	2⅜	5⅞	4¼	4⅜	¾	1¼	2	5¼	8
3¼	3¾	3½	3	5⅛	4¼	4⅜	2⅜	6⅛	4⅜	4½	¾	1¼	2	5¾	8
3½	4	3¾	3¼	5½	4½	3⅜	2⅜	7⅛	5	4⅞	1	1½	2½	6	6
3⅝	4	3¾	3¼	6½	5½	4⅜	2⅜	8⅛	5	4⅞	1	1½	2½	6	6
3¾	4¼	4	3½	6½	5½	4⅜	2⅜	8⅛	5⅛	5¼	1	1½	2½	6½	6
4	4½	4¼	3¾	6½	5½	4⅜	2⅜	8⅛	5¾	5⅝	1	1½	2½	6⅞	6
4	4½	4¼	3¾	7	6	5⅜	2⅜	8⅝	5¾	5⅝	1	1½	2½	6⅞	6
4¼	4¾	4½	4	7	6	5⅜	3⅜	9⅛	6⅛	6	1	2	3	7¼	6
4½	5	4¾	4¼	7	6	5⅜	3⅜	9⅛	6½	6⅜	1	2	3	7¾	6

Fig. 1—Dimensions of Piston End of Piston Rods.

in terms of the diameter of the rod could not be derived to cover all the sizes. The dimensions of the crosshead hubs for cast-steel crossheads of the alligator type are given in Fig. 3, and will probably answer in lieu of formula.

The limiting bearing pressure for crosshead pins is 4,800 lbs. per sq. in. The bearing area of crosshead shoes, designed to be used with the above, are: Top shoes, 7 in. by 24 in., and bottom shoes, 5½ in. by 24 in., for piston rods 3¼ in., 3½ in. and 3¾ in. diameter; top shoe, 8 in. by 24 in., and



DIMENSIONS FOR CROSSHEAD END OF PISTON ROD

A	B	C	D	E	F	G	H	J	K	L
2¾	2⅝	1 15/16	5¾	5¼	¾	6	1½	2⅜	⅝	9
3	2⅞	1 15/16	5¾	5¼	¾	6	1½	2⅜	⅝	9
3¼	3⅛	2 7/16	6½	6	¾	6¾	1¾	2⅝	¾	9
3½	3⅜	2 7/16	6½	6	¾	6¾	1¾	2⅝	¾	9
3¾	3⅝	2 15/16	7	6½	¾	7¼	1¾	3	¼	10½
4	3⅞	2 15/16	7	6½	¾	7¼	1¾	3	⅞	10½
4¼	4⅛	3 7/16	7½	7	¾	7¾	2	3¼	1	11½
4½	4⅜	3 7/16	7½	7	¾	7¾	2	3¼	1	11½

Fig. 2—Dimensions of Crosshead End of Piston Rods.

bottom shoe, 6 in. by 24 in., for piston rods 4¼ in. and 4½ in. diameter.

GROUP II.

Piston Rods.

Let

P = pressure per square inch on piston.
D = diameter of cylinder in inches.
d = diameter of piston rod.
l = length of rod between piston-rod center and the center of the crosshead pin.
f = allowable working compressive stress.
r = least radius of gyration of rod.

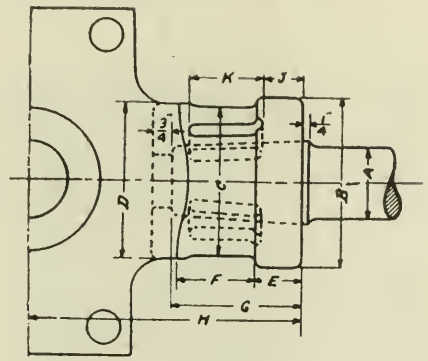
Then

(1) $f = P\dfrac{D^2}{d^2}$

(2) $d = D\sqrt{\dfrac{P}{f}}$

(3) $P = \dfrac{d^2 f}{D^2}$

Under repeated alternate strains allow the compressive



DIA OF ROD A	B	C	D	E	F	G	H	J	K
2¾" 3"	6½"	5¾"	6"	1¾"	3"	5"	10½"	1½"	2 13/16"
3¼" 3½"	7¼"	6½"	7"	2"	3¼"	5¾"	12"	1¾"	3⅛"
3¾" 4"	8"	7"	7½"	2"	3¾"	6¼"	13"	1¾"	3½"
4¼" 4½"	9"	8"	8½"	2¼"	3¾"	6¾"	14"	2"	3¾"

Fig. 3—Dimensions of Steel Alligator Crosshead Hubs.

stresses given in the following table. (From Pencoyd experiments.)

$\frac{l}{r} = \frac{4}{d}$	(70,000 lbs.) Steel		
20	13,360	70	6,520
30	9,540	80	5,940
40	8,380	90	5,300
50	7,760	100	4,680
60	7,120	110	4,220

Crossheads.

The formulæ for cast-steel crosshead hubs used in connection with the above piston rods are shown in Fig. 4.

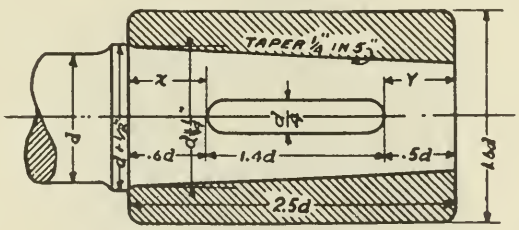


Fig. 4—Crosshead Hub.

The allowable working fiber stresses are as follows:

Rod at key-way..... 12,500 lbs. per sq. in.
Key = $\frac{d}{4}$ bearing value..... 40,000 lbs. per sq. in.
Key — 1.4d shear..... 13,400 lbs. per sq. in.
Hub diameter — 1.6d..... 28,000 lbs. per sq. in.
X = .6d shear hub..... 12,000 lbs. per sq. in.
Y = .5d shear rod..... 9,400 lbs. per sq. in.

GROUP III.

Piston Rods.

The following formulæ for piston rods are expressed in terms of the diameter of rod at root of thread on the piston end.

Let

P = area of piston × boiler pressure.
A = area of piston rod at root of thread.
d = minimum diameter of piston rod at root of thread.
S = working fiber stress equals 10,000 lbs. per sq. in.

Then

(1) $A = \dfrac{P}{S} - \dfrac{P}{10{,}000}$

(2) $d = \sqrt{\dfrac{A}{.7854}}$

The dimension for the piston rod in terms of diameter at root of thread on piston end is shown in Fig. 5.

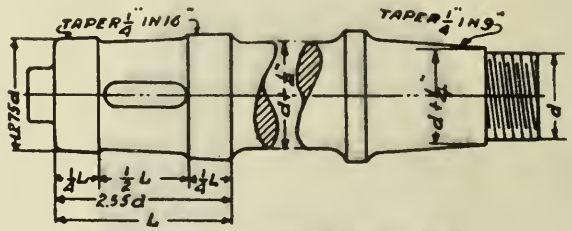


Fig. 5—Piston End of Piston Rod.

The center part of crosshead fit is reduced 1/32-in. diameter so as to insure having bearing at ends of fit only.

Crossheads.

The crossheads used with the above piston rods have following dimensions of hubs:

$\frac{d}{2}$ = distance from end of hub to key-way.

Piston pressure × .00003 = thickness of metal in outer end of crosshead hub for cast steel.

Bearing area in crosshead for crosshead pin = piston pressure divided by 12,000.

The three groups of formulas are presented as representative of the data obtained.

The report is signed by:—J. A. McRae (M. C.), chairman; H. C. May (L. & N.), R. L. Ettenger (Southern) and B. P. Flory (N. Y. O. & W.).

DISCUSSION ON PISTON RODS AND CROSSHEADS.

W. F. Kiesel (Penna.): We allow a stress of 10,000 lbs. per sq. in. for the maximum piston pressure in the small section of the rod which is at the root of the thread in front of the facing. In order to keep the piston on tight we put it on a taper, and the smallest diameter of that taper is ¼ in. larger than the smallest diameter of the thread, so we have ½ in. for wear, although we never turn down a rod more than ¼ in. We find in most cases that the keys are too small, and we have, therefore, adopted a rather large key and the formula is given for the size of the key. Then the stresses in the crosshead body end are not allowed to be lower than the stresses in the body of the rod. If the rod is fitted up well we do not have any trouble. We have had breakages through the crosshead end fit, but these breakages are generally traced to a poor fit or to too much lost motion in the crosshead itself.

F. F. Gaines (Cent. of Ga.): I want to thoroughly endorse the end design shown on page 3, in which the fit is made ¼ in. uniformly larger than the diameter of the road I think it is one of the most important things in the design of piston rods. I know from my own experience that most of the trouble with broken piston rods has been due largely to breaking through the key-way. I attribute that to two things, one the use of insufficient metal where the key-way exists, and the keying-up itself, especially where a rod has to fit a shoulder, and the keys are driven home by a sledge. An additional load is thus applied, and nobody knows what it amounts to. The greatest trouble, in my experience, has been with rods breaking just at that point, and where on our older engines we had the rods without the enlarged end, this end has been substituted when it was necessary to renew the rods, and we have entirely eliminated the trouble in this way.

I have a formula which I have been using for a number of years in designing piston rods and will present it for what

it is worth. It is an empirical formula in the first place, with a constant derived from checking over a very great number of designs and getting a value for that constant. A piston rod must be treated, more or less, as a long column, and Euler's formula reduces it to the form.

$$d = S\ C\ \sqrt{}\ D\ L$$

where d = required rod diameter.
S = steam pressure.
C = A constant depending on nature of material.
D = Diam. of cylinder.
L = unsupported length (From crosshead pin to center of piston head.)

From a large number of analyses of rods that have given long and favorable service without any trouble, the value *C* has been worked to give .0006, and I find, in rechecking this after I received this paper and before coming to the convention, that on some of our most recent engines it checks out very closely, and these engines have given no trouble.

M. D. Franey (L. S. & M. S.): I notice on Fig. 2 that the committee recommends a shoulder at the end of the rod, which butts against the shoulder on the crosshead. I note this same form of design is shown in Fig. 3. It is my experience, in examining the rods that come to the shop after they are in service, that we find a very small percentage of the rods that bear against the shoulder. When the rod is disconnected in the engine house, and the engine is then put in service, there is a certain abrasion that takes place between the two metals. Assuming that the end of the rod is a proper fit on the crosshead, when it is originally fitted, it is fair to assume that the rod is too small when it is returned to the crosshead. I find, where the end of the rod is in contact with the shoulder in the crosshead, there is a working of the rod in the crosshead fit, and the man making repairs in the engine house will remove sufficient metal to insure a space between the end of the rod and the crosshead. Usually there is 1/16 in. It is my experience that we get better results by removing the shoulder from the crosshead and using the additional bearing space to prevent the working of the end of the rod in the crosshead.

H. T. Bentley (C. & N. W.): I was very glad to hear from Mr. Gaines that he overcame his trouble by putting larger ends on the piston rods and still use the key. We have used the large ended piston rod, but I am sorry to say we have not overcome our difficulty with the piston rod ends breaking, due to the driving in the key. On our last engines we have gone to the nut on the crosshead end, and I would like to ask the gentlemen present which they think is the better proposition. It seems to me you do not know what you are doing when you drive a key in, but when you tighten up a nut you have some idea what is going on.

The point brought up by Mr. Franey about the shoulder on the piston rod, where it butts up against the crosshead, is a good one. I do not believe you can get the fit in both places all the time. You have either got to have a fit in the crosshead, and it will not fit up against the shoulder, or it will fit against the shoulder, and not fit properly in the crosshead. I would like to know whether it is a practical thing to try to have the two fits and maintain these conditions. The fitting of the piston in the crosshead is a very important thing, but unfortunately a good many people do not seem to realize that, and we have had very considerable trouble at both ends, the piston end and the crosshead end, due to improper workmanship, and I believe if more care was given to that work it would probably result in less failures. In the old days they used to grind them in, especially in the crosshead, to be sure they got an absolute fit, but there is much grinding-in done in these days.

Mr. Gaines: I want to reply to Mr. Bentley's remarks relative to the use of the nuts. I do not think there is any argument on the proposition that the nut is infinitely better. I presume most of you recall the design worked out by Mr. Thomas, of the Southern, several years ago of a crosshead with the use of nuts for securing the piston rod. It is in very general use down through all our part of the country, and I must say, that the causes of any trouble from that kind of piston rod are greatly eliminated by the use of the nut—it is away ahead of the practice which uses the key.

With relation to the remarks regarding the shoulder, I agree that you cannot have two different kinds of fit and make them both fit I think you must remove the shoulder and depend on the drawing up of the taper fit.

Mr. Franey: Relative to the fit, we have tried the method of grinding and other methods. The most satisfactory method that I have found in any piston rods is to turn the rod to a proper fit to the crosshead, forming the taper in the crosshead, with the taper attachment in the lathe. After obtaining a perfect bearing to remove the tool marks with a file. We have tried the grinding, but find even with the most careful workmen we are apt to remove more surface on the larger diameters of the piston rod than we would in the other portion. It would depend entirely on the care given by the individual. I seldom find that a ground piston rod, where it is ground by the use of emery, will give as perfect a bearing or contact between the piston rod and crosshead as the turning and filing method. Relative to keying the piston rod into the crosshead we find that we are obtaining better service by confining this work to one individual, the man in charge of fitting up the pistons; it is his duty to draw the piston home in the crosshead on repaired engines by the aid of a special key, after which he uses the finished key or the key that is to go into service after the piston rod is brought home in the crosshead.

C. A. Seley (C. R. I. & P.): I desire to endorse Mr. Gaines' statement about the use of the Thomas crosshead. I think the use of the key is a barbarism in a way, because you can not tell how much pressure the weight of the sledge will wield, or the weight of the man who will use the sledge will wield, in driving the key in; whereas you can limit the length of the wrench, and to a certain extent the length of the pipe on the wrench, that is used to put on the nut. I think it is a very desirable practice, and I would suggest in the printing of this paper in the proceedings, if it would be agreeable to the committee, that some reference to that should be included in the report.

R. L. Ettinger (Southern): We have on our lines in the South a great many of what is known as the Thomas crossheads, that is, the crossheads with the piston rods held with two nuts, and as far as I know we have comparatively few failures from broken piston rods, but we do have considerable trouble with the piston rods getting loose from the crossheads, probably due to the short length of the piston rod in the crosshead. The broken rods are practically eliminated by the use of the nuts.

D. R. MacBain (L. S. & M. S.): I would like to ask the convention whether any one has ever made an investigation into the cause of trouble with the fits. We have used all the fits known to the craft at various times, and we started in at the beginning of 1909 on a pretty big railway to keep a record of every cylinder head broken, and rods broken through the key-way, and at the end of the year we made an analysis of the whole thing and found 90 per cent. of the breakages occurred on the left hand side of the engines. We then started in to stiffen up the cylinders, put in a cylinder cock tumbling shaft across the front end, so that the left hand cocks were opened if the right hand cocks were open, and we found it largely cut out the trouble.

George W. Rink (C. of N. J.): Our practice regarding the piston fit referred to on page 3 is to make the diameter C the same as the diameter A. We never have any trouble with that style of a fit. Regarding the crosshead end, we establish that same rule, and followed the practice for about 10 years, making the diameter of the enlarged end on the crosshead end the same as the diameter of the rod. In looking into the matter recently we found that we removed hundreds of rods on account of the cracking between the key-way and the large end of the taper fit. The cracks did not extend all the way through, they simply extending in about 1/16 or 1/4 in., so that our practice now, and has been for the last three months, is to make the enlarged end of the rod 1/4 in. larger in diameter than the rod proper.

Another thing, I note, referring to the Fig. 2, that the committee calls for a taper of 3/4 in. in 12. Our practice is a taper of 1/2 in. in 12. We use nearly that same method of fit, but we have now cut off the extension marked C, as we find there is not much value to it. The only cause to which I can ascribe the crack of the large end of the fit is simply that the rod fit is perfect from the small end up to about two-thirds of the way, and then there is a slight motion which causes these cracks to generate. The average life of a large number of our rods is only two years and a half. The rod proper is all right, but they have to be removed on account of these small check cracks. I might also mention that we have provided clearances between the end rod fit and the crosshead. We simply insist on the one fit, and that is only the taper portion.

John A. Pilcher (N. & W.): I will simply state in connection with the rod, that it has been our practice to follow the methods described by Mr. Rink, as to the large ends, where it comes in contact with the crosshead lug. We have the same diameter of rod that he described. We do not have any epidemic of broken rods. Of course, there is an occasional rod broken, but no great number. We use almost exclusively the key on account of the reduction in length.

O. C. Cromwell (B. & O.): We use the practice pretty largely as outlined in the paper. Formerly on our older

locomotives we did not enlarge the crosshead fit, but since we entered upon the practice of doing that it has helped matters very considerably. We find that a little matter of detail is a further step toward improvement, and that is to round the top edge of the keyway and immediately remove the sharp saw tooth edge, which is the beginning of the crack, file it off with a file to about ⅛ in. or 3/16 in. radius, and it prevents the beginning of a crack.

I do not believe we will ever prevent the breakage of piston rods, when we use a key, if we use the rod long enough. The point should be that we should avoid disconnecting the piston rod from the crosshead, making the rod sufficiently long, so that when you want to renew the packing rings you can disconnect the front end of the main rod and shove the crosshead up against the stuffing box and expose the piston rod and renew the ring. My point is to take away the necessity for removing the key and replacing them. We can keep on with sufficient keying to break the rod. That is the direction in which we are working.

Mr. Gaines: I found in many of the older and lighter type engines the guides were so light there was undoubtedly a great deal of broken piston rod trouble caused by the springing of the guide allowing flexure. Where the rods were made heavier, in engines which had previously given trouble from that source, we found that the difficulty was entirely overcome.

Mr. McRae: In regard to the cracks in the piston rods, between the face of the crosshead hub and the key-way on the rods, I have seen that thing in piston rods with ends enlarged ¼ in.; therefore it would not seem to be due to the size of the rod.

REPAIR EQUIPMENT FOR ENGINE HOUSES.

The committee realized that no one solution would fit all conditions in the equipment of engine houses and that each house would require a special study, but at the same time there are a few general principles which should be kept in mind. It recommends that the word "roundhouse," which was undoubtedly descriptive a number of years ago, should be replaced, for the sake of accuracy, by the word "engine house."

The capital invested in a locomotive represents a certain total of earning capacity, and the sooner this total earning capacity is realized the greater will be the yearly returns on the capital invested. If it is a sound business proposition to wear out locomotives in service in as short a time as this can be done legitimately and to keep them as near one hundred per cent efficiency as possible, these principles should be kept in mind in determining the extent to which repairs should be made at engine houses, and this policy, once settled, in turn largely determines the repair equipment needed.

In order to obtain an approximate estimate of the net daily earnings of a freight locomotive, the gross freight earnings of a trunk line for the year 1910 were divided by 365 and again by the total number of freight engines owned, plus nine-tenths of the switch engines owned. The operating ratio for freight service was assumed to be 60 per cent, leaving 40 per cent net operating income. The result was that $45 was found to be the approximate daily net operating income from each locomotive engaged in freight service. This computation assumes each freight locomotive was in service every day. This means that $900 capital at 5 per cent could afford to be invested in engine-house repair equipment for each extra day in service that could be obtained for each freight engine, by making the repairs at the engine house instead of the main shop. Expressed more concretely, it means that, if the engine-house repair equipment kept each of 100 freight engines in service two extra days a year, the extra net operating income would be 5 per cent on a capital of $180,000. This does not necessarily mean an increased net operating income, as it may and in the end probably would mean a smaller capital invested in freight locomotives.

While the fixed charges at main repair shops do not appear in reports showing the cost of locomotive repairs, it is evident they enter into costs and should therefore not be ignored. With a view to determining approximately the importance of this item, the figures for a shop at which no car repairs are made, repairing about 600 engines during 1910, have been taken. The average cost of repairs per engine, including labor and material, was found to be about $1,200, so there must have been a considerable proportion of the engines which received only medium and light repairs. This plant, including land, buildings, machinery and tracks, has a book value of about $1,000 000. Assuming that 10 per cent of this value represents the fixed charges, these amount to $100,000 a year, or slightly less than $170 per year per engine receiving repairs at that point. It is interesting to note that the fixed charges amount to between 15 and 20 per cent of the total amount charged at this shop to engine repairs for 1910. The cost of fixed charges for another shop, at which, with the exception of some miscellaneous work, only locomotives are repaired, amount to $234.94 per year for each engine repaired, and are 13.2 per cent of the total value of the plant.

In all probability it will be conceded it would be a waste of time and money to run a locomotive to the main shop to have a driving-box cellar repacked or the flues cleaned. Why? Because it would involve time lost from revenue service getting the engine to, through and from the shop, reducing the yearly earnings of the engine; necessitate the use of main shop space, increasing the capital invested in shops, or reducing the main shop output; congest the shop-track movements and disarrange the shop routine, thus delaying other more important shop work. At the main shop, though the item does not appear in the statistics showing the cost of repairs, there are the shop fixed charges, including interest on the investment, repairs, taxes and insurance, a no inconsiderable item. At the engine house the fixed charges would be very much less, as they would not include those of the engine house proper, the tracks, turntables, ash pits, coal chutes and other facilities necessarily provided, and would cover only the comparatively small investment in the shop building and machinery provided for repair work.

With tools and men under their immediate control and being responsible for results, engine-house men will, in all probability, keep the motive power in better condition, more efficient and less liable to breakdown, and take a greater pride in making repairs quickly than when repairs must be made by the independent organization of the repair shop. It is common experience that the qualifications of engine-house employees should be quite different from those of repair-shop men. The work of the repair-shop man is steady and should be accurate, thorough and first-class in every respect, with the aim that a locomotive shall remain out of the repair shop as long as possible, and there is no pressing necessity that his job be finished by a certain minute. In contrast to this, the work of the engine-house man is spasmodic; at certain hours he is extremely busy, working under high pressure, and again has little to do. His chief care is to have the engines ready for their next run and in such condition that they will make at least a round trip successfully.

When repairs, other than general, are made at the main shop, more work is usually done than is necessary. The shop man's experience is not such as to educate his judgment as to what work he can with safety let go. Whatever the cause, there can be little doubt as to the fact. To those lacking the experience, it no doubt seems that this practice could be stopped by the issue of proper instructions and supervision, but proper instructions do not change human nature or life-long habits, nor does a reasonable amount of supervision seem to work the miracle.

It is commonly the case at engine houses that tools are frequently missing or inefficient for lack of repair, resulting in considerable useless expense not only for tools, but in time lost in hunting them and exasperating delays in making repairs. The committee believes the remedy for this is a toolroom, with some one in charge whose duties should include not only the issuing of tools on checks, but keeping the tools in good condition and a proper supply on hand. If a locomotive must lay in the engine house a day for lack of the material necessary to repair it, there follows a loss of earning power which, if expressed in dollars, would pay a good interest on a considerable investment in storeroom stock. There should be kept at all important engine houses an ample supply of material and spare parts, such as air pumps, lubricators, injectors and bell ringers, which should be used to replace defective apparatus whenever it will take less time to exchange than to repair. As a general proposition important repairs to such accessories can be made to the best advantage at the main shops, where special tools and specialists are available. It seems evident that the interest on the investment in spare parts must be less than the loss in earnings resulting from not having them.

To get and keep a desirable class of men, engine-house conditions should be made as attractive and convenient for them as possible, including good ventilation and heat, lockers, toilet and washroom accommodations kept in first-class condition. It seems particularly important to have a system of ventilation which will quickly and thoroughly carry off the steam and smoke, which are necessary in an engine house, that work may be done more rapidly and efficiently than would otherwise be the case. It is not an unusual policy in equipping important engine houses to use worn-out and obso-

lete tools. This is short-sighted, not only because a big shop is better able to find profitable use for such tools and better able to keep them in repair, but engine-house conditions warrant the best of tools. If a tool is not efficient enough to meet the requirements of repair-shop work it will generally pay to scrap it.

When studying the requirements of roundhouses, determining the kind of work to prepare for and the repair equipment needed, the following points should be kept in mind: Locomotives should be held out of service for repairs as short a time as possible; they should be kept as near 100 per cent efficiency as possible; the effect of earnings of time saved by repairs made at engine houses; the effect on engine efficiency of repairs made at engine houses; the smaller fixed charges for repairs made at the engine houses, as compared with those at the main shop; the effect of storeroom stocks on engine earnings; engine-house men should have ideals and methods quite different from those of shop men; and it is important that engine-house conditions and facilities should be attractive and convenient to get and keep good men and increase their efficiency.

These conclusions can be generalized in the statement that locomotive repairs and repair facilities at engine houses are warranted when they will result in increased earnings either because of more or better engine service obtained from a given number of locomotives.

Engine houses may conveniently be classified under three heads: Those at minor division terminals, or the outlying ends of branch lines, where only very light repairs are made; those at important division terminals, and not in connection with important repair shops, and those in connection with repair shops. At outlying engine houses we assume there would be no power-driven machines and suggest the following list of tools, the number and sizes to be determined by local requirements:

Twist drills.
Drill sockets.
Taps—including machinists', steam-chest, pipe, wash-out, straight and taper, stay bolt.
Dies to correspond.
Pipe stock and dies.
Hacksaws.
Straight edge.
Flue tools—caulking, rolls, expanders, beading.
Pipe cutters.
Jacks, sledges, drifts, crowbars, saws, brace and bits.
Twist drills, extra long.
Drill chucks.
Ratchets and braces.
Surfacer plates.
Tinners' bench shears.
Reamers, rod and taper.
Wrenches, socket, crowfoot, hexagon.

As local conditions vary and as conditions should largely determine facilities, it follows that the committee's recommendations can be only general. With this understanding, the following suggestions are submitted. In general, an engine house should be equipped with driving and truck wheel drop pits and tools to take care of all necessary rod work, driving-boxes, ordinary valve-gear work and the replacing of flues needed between general overhaulings. The list of tools suggested for outlying engine houses, to be expanded to meet the requirements of a larger terminal by the following:

Ample storeroom stock.
Drop pit for driving-wheels.
Double blacksmith forge, face plate and tools.
72-inch boring mill.
Driving-wheel lathe.
38-inch tire turning-lathe.
Planer.
Slotter.
Sensitive drill.
Bolt cutter.
50-ton hydraulic press.
Power-driven valve-setting machine.
Air hammers.
Hot-water washout facilities.
Drop pit for engine truck and tender wheels.
Portable blacksmith forges.
36-inch boring mill.
24-inch lathe.
16-inch lathe.
Shaper.
36-inch vertical drill.
Emery grinder.
Pipe-bending machine.
Punch and shear.
Air compressor.
Air motors.

For engine houses in connection with repair shops, the committee has not been able to agree. Several of the members feel that it is economical to depend on the main shop for considerable machine work. On the other hand, the other members believe that, except for tire turning, the equipment should be practically the same as for an independent engine house, because of the saving of time and cost of repairs and the different training of engine-house and shop men.

The report is signed by:—C. H. Quereau (N. Y. C. & H. R.), chairman; W. H. Fetner (Cent of Ga.), H. P. Meredith (Penn.), A. G. Trumbull (Erie) and J. A. Carney (C. B. & Q.).

DISCUSSION.

G. W. Wildin (N. Y. N. H. & H.): I ask the committee if they really mean that: "It seems axiomatic that locomotives should be worn out in legitimate service as soon as possible." It has always been my idea that you should make them last as long as possible in legitimate service. I do not believe the committee means what it says. It is our aim to make them last as long as possible. You can always wear them out.

H. S. Hayward (Penna.): I think the committee is perfectly justified in that statement. In my opinion, too many engines are kept in service after they become obsolete for the demands of a modern railway. They should be worn out during the period of usefulness of that type of engine. The demands of our service are constantly increasing—we are getting larger engines—and I expect that nearly all of us find that we have a number of engines on hand that are not of a character suitable to our roads. Many roads have had engines in use for 15 or 20 years, and they are still using them at a disadvantage, compared with engines of modern type, suited for the service in which these old engines are employed.

H. T. Bentley (C. & N. W.): I think the New Haven is in the same box as many of the other roads. We had a mania for scraping engines some time ago, but now we put new boilers on the engines that we thought we ought to have scrapped several years ago, and we keep them in service. Many roads have gone too far in scrapping their small engines. In some cases they are running a 10 car engine on a 2 car train, and that is not economy.

F. F. Gaines (C. of Ga.): I thoroughly believe in the necessity of having such facilities at roundhouses and terminals that you can do all the necessary running repairs thoroughly and quickly. I believe in having such conditions at your roundhouses that men can work under them—that is, in the winter time you should have your rooms sufficiently heated and ventilated, and there should be other sanitary facilities provided for the comfort of the men. These are things ordinarily overlooked in a roundhouse. I have found from experience if you provide a good modern roundhouse, well heated and ventilated, that the improvement in your output and the class of work performed is marvelous. I do not think any roundhouse of any size can exist and perform its proper functions without a tool room, and a man in charge of the room both day and night. In most of the roundhouses the men do not have access to the storeroom of the company for small supplies, and it is necessary to keep small supplies in this tool room, where they are available day and night.

The roundhouse in a large terminal should be separated entirely from the back shop, with all the necessary equipment in the roundhouse required to take care of the ordinary running repairs, without having to depend on the back shop. I differ with the report in one respect, that at outlying points they do not recommend any tool equipment. I think, of course, this is a matter which depends on the surrounding circumstances, but nowadays when electric power is available in many of our smaller outlying points, through the city lighting system, I think wherever it is possible we ought by all means have a drill press and lathe and a few other tools, a dry grinder if it is possible to obtain the necessary power; and if it is not possible to do this, it is advisable to install a small gasoline engine to give temporary power for emergency uses in making repairs.

C. E. Chambers (C. of N. J.): I thoroughly agree with the committee on points of equipment of engine houses and I wish to say that I have found it one of the best aids for proper back shop work. I think that when an engine is turned out in the back shop proper attention must be given to the possibility of very heavy repairs in the engine house. There are many things while an engine is stripped down in the back shop that can be done for about one-quarter of the expense that they could be done for three or four or five months afterwards. It is true that you must have the necessary lathes and good drop pit facilities. I have found different places throughout the country where engine houses were trying to be operated without drop pits where they had trouble. It simply encourages an engineer to run an engine with a box pounding here or there, when if they had a good drop pit the trouble would have been discovered and remedied at once.

J. F. Devoy (C. M. & St. P.): I agree with the committee that a roundhouse man should be a specialist. In my opinion, the back shop is the proper place to manufacture. The men in the roundhouse should be equipped with tools which will permit them to get an engine in shape quicker than in any other place. If the proper thought be given we will get back, say 25 per cent. of our engines to the old eight wheel type, for the reason that the average eight wheel type or American type of locomotive, pulling, say up to a six car train, will cost on an average from 2 to 4 cents per mile for its maintenance. If one of a larger type, say three times as large, is put on that service it is an absolute impossibility to maintain it for less than 7 or 8 cents a mile. The fact that an engine 10 years old is no good is the furthest away from helping the treasurer to be on the right side of the fence of anything that I can imagine. There is not any question

but what the money of the mechanical department on a railway is spent about two-thirds of it in round house work and the other third in back shop work. So that I can see no more important paper that could take our attention than this. In the past three months it has been a problem in order to make both ends meet as to how quickly we could get an engine laying on a side track waiting for repairs into service, and I think that everybody should discuss this paper; especially along the line of the 10 car and the 2 car proposition.

A. E. Manchester (C. M. & S. P.): I agree with that portion of the committee's report that speaks of engines being kept in service. One of the things that I discovered in connection with engine house service is that there is too great an amount of dead time between the time the engine is cut loose from the train or leaves the round house and is attached to the train and the time it is in the round house undergoing repairs or in position to have attention given to it. The best equipment that can be applied in the average round house is that of coaling facilities, water facilities, clinker pits. Clinker pits generally I think is the keynote of the whole situation and when you do get your engine into the round house there should be a great many devices for quick and ready repairs. Drop pits are absolutely essential and I believe they are generally the practice in modern round houses. In many sections of the country boiler washing is a most important feature in a round house, and everything that goes to the quick handling of boiler washing and speedily getting a boiler back in shape and ready to return to service adds greatly to the time saved and the advantages gained by the engine being in the round house. I do not believe there is any economy that will ever come by restricting a round house in such tools and facilities as are necessary for the quick handling of parts. The great trouble in many round houses is that they try to make them repair shops as well as round houses, which I think should be stopped. The building up work should all be done at the shops. A round house should have to do with the putting together of things that can be readily dismantled and the getting of them back into service.

J. F. Enright (D. & R.): I agree heartily with the committee in the statement that a round house should be provided with certain tools to expedite the handling of running repairs. My idea is that all renewing of parts should be done in the main shop, and I think that the running repairs can be taken care of in the round house very easily as the committee has recommended.

M. J. McCarthy (C. C. C. & St. L.): I agree with the last speaker that sufficient tools should be kept in the round house to handle engines with as little delay as possible. In fact, I quite agree that the system of doing such work as dropping a wheel, and the handling of rods, work that will cost perhaps $150 or $200 or even as high as $300, might be done in the round house.

H. C. Oviatt (N. Y. N. H. & H.): There has been such a marked contrast on the division with which I have been connected for several years that I cannot refrain from endorsing what I consider the most able paper that I have ever heard on the floor of this convention. I was connected with a division on the New Haven road that had no means of maintaining power at round houses up to a year and a half ago. Then one of the most modern round houses was erected and equipped with sufficient tools to properly care for the engines that had been in service say 10 or 12 months. I heartily agree with the committee that when engines are turned out of the back shop they should be put in a first-class condition. I also believe that at the end of 8 or 10 months, with a round house properly equipped, the engine should be held for a time not to exceed the time it would have to wait to get into the back shop for repairs, and the proper repairs made that will extend the life of that engine from 6 to 8 months. I think this is what the committee had reference to when they said an engine should be worn out as quickly as possible—meaning to keep away from the back shop as long as possible and to keep in service as much as possible, thereby tending as nearly as possible to 100 per cent. efficiency.

I am especially anxious not to be misunderstood in regard to the cost of the power. I did not mean to be understood as stating that power could be maintained in the round house. It was my idea that we would avoid a great many repairs that were necessary to do by keeping the engine out of the back shop, as well as taking the place of an engine that needed general repairs. By doing this work in the round house it would help out the big repairs and keep the engine in better condition than by allowing everything to go to the round house.

R. D. Smith (B. & A.): I believe that 60 per cent. of the maintenance of the locomotive should be expended in the engine house to insure the best road service, and 40 per cent. in the shop. We have arranged our coaling plant in such a way that an engine may get coal outbound as well as inbound, which facilitates cleaning flues and making repairs. The clinker pits are so arranged that the ash pan can be cleaned and the grates examined, and such work may be done outbound as well as inbound. We have found that in handling many engines a good drop pit section is necessary at some of our terminals. We have our drop pit sections made from 100 to 112 feet long. I think that is perhaps a little out of the ordinary, but the reason for doing it was so that we could move an engine with the shop doors closed, drop out any wheel under the engine that was required, and get at any part of it easily. We have hoists in connection with these drop pits. At each of our engine houses three pits are connected together in what we call the drop pit section. Upon these we may keep one engine, because we think that it is good practice to keep an engine in the round house on which the force may be employed when not engaged on other work.

We believe it is those little things to be done in a round house that go to make up good service. If an engine needs a driving wheel, why, most anybody can see that, but if it needs a cotter pin in some particular place some fellow is likely to overlook it; but where you have an adequate drop pit all these things can be observed easily. I desire to emphasize that it is important that engine house conditions and facilities should be made attractive and convenient and thus increase the work and the efficiency of the men. We have in our new terminals everything that goes to make for the comfort of the men and their convenience in the way of light, heat, toilet facilities, etc. We believe that by doing this, and keeping the place clean and tidy we can get better service.

Mr. Devoy: I would like to ask Mr. Smith, of the Boston & Albany, if his road would recommend the extension of drop pits in round houses, especially in cities where space is cramped, to 150 ft. in order to permit the movement of an engine after you had dropped a wheel?

Mr. Smith: Yes, sir; decidedly.

Mr. Devoy: I should much rather put a motor on my turntable, with a wire rope, to drop the wheel in that way than to build an extension of the drop pit. Even if you leave the engine outside, why, nine times out of ten she is dead and the little exposure will not hurt her at that time. Besides, it would be very expensive to get the necessary land in some of our cities for such a purpose, especially in cities where you have got to pay $500 a foot for it.

E. W. Pratt (C. & N. W): The drop pit extension, which Mr. Smith mentioned, is in line with the practice that we are following in our later work. The fact that the modern freight car appears to have the consolidated engine in the majority, there are four pair of tank wheels and one pair of engine truck wheels to be dropped in the drop pit. If these truck wheel pits have an extension permitting the movement of the engine, why, you can take out any pair of tank wheels or a truck wheel and still keep the engine inside the roundhouse walls in bad weather.

The committee capitalizes the net freight earnings per locomotive. I have had a little experience myself in capitalizing various things, and I can assure you that it depends on which side of the fence you are which way you will check the figures. I notice that $900 a day for the 365 days in the year represents a total capitalization of $328,500, and that that would buy at the rate of $20,000 per locomotive 16 engines. Now, it seems to me that there is some fallacy in the statement there in that paragraph. They say that is equivalent to freight earnings of $45. Of course, you cannot controvert that. But you will have to show us in the West why you cannot get that same result by adding another locomotive. I believe that there are many places where we can make that saving by assigning engines regularly. We have got the pool on our brain so much that we oftentimes pool engines where their mileage is not up to the average of the engines on the system. Wherever regular locomotives can be assigned and good average mileage attained, I believe it will show something that is much more interesting than is shown in this statement of the paper.

A. Lorell: I think an overhead traveling crane is a very essential feature in the modern round house. A few years ago while on a western road I had occasion to install an electric traveling crane in a new round house that was being built, and the results were so satisfactory and the economy in its use was so great, both in the time saved and in the labor required in handling heavy parts of the locomotive, that a considerable number of such traveling cranes have since been installed on the same line.

Mr. Quereau: I will only say in closing that it was not the intention of the committee to go into details, but simply to discuss the subject on its broad general grounds. The list of tools to be kept at a terminal round house was not intended as

one that should be applied to all terminal roundhouses everywhere. The list of tools given is for use in roundhouses where there is no power. It was specifically stated that each roundhouse must be considered by itself. The opinion has been expressed that an engine cannot be maintained at the roundhouse as cheaply as at the back shop. Now I cannot speak authoritatively on behalf of the committee, but for myself personally I am very much inclined to doubt that. On the contrary, I am of the opinion that a road which does 60 per cent. of its repairs at the roundhouse and 40 per cent. of its repairs at the back shop will have its engines in better condition and at a less expense. There are several factors entering into that. We must not forget that we are only one branch of a railway. If an engine breaks down on the road it simply means in our statement engine failure. It means to the superintendent's department freight delay, overtime, and other excuses that we cannot figure on. For that reason ample facilities for repairs at roundhouses I am personally persuaded will pay. Then, too, we should not lose sight of the fact that while we do not show in our cost of repairs the fixed charges, yet it is there just the same, and the fixed charges saved by repairs made at the roundhouse will probably mean a saving of from $150 to $200 per engine each year. This is an item that it strikes me is well worth bearing in mind.

TREATING WATER WITHOUT TREATING PLANTS.

Until within a few years, only two methods for the prevention of incrustation in steam boilers have been prominent, namely, boiler compounds and water-softening plants. The former, which include the familiar soda ash, aims to keep the incrusting substances in a soft, pulverulent condition until they can be blown or washed out of the boiler. In locomotive service one of the difficulties connected with the use of boiler compounds is in applying them proportionally and regularly to all of the water. The plan of putting the matter in the hands of the engine crew was early found to be a fai'ure. The next step was to put the dose for a whole trip into the tender tank at the beginning of the



H. E. Smith.

Chairman, Committee on Water Treatment.

run. This method involves a considerable and possibly harmful excess of compound at the beginning, and a corresponding deficiency near the end of the run. The obvious remedy is to transfer the base of operations from the locomotive to the wayside tank. To secure this, as well as some other advantages, separate softening plants have been adopted and have easily proved their usefulness.

The small station must be able to respond to occasional heavy consumption for short periods and a softening plant having sufficient capacity for this purpose becomes expensive during normal times. A very useful compromise between the two systems of treatment is an apparatus of simple construction which will mix the water uniform'y with the proper proportion of some chemical solution which, although it will not actually remove incrusting solids, will act as a boiler compound in keeping them in a soft condition in the boiler. If a fair storage capacity is provided, partial removal of incrusting matter may also be effected. The work of the committee indicates that few railway officers realize the importance of this idea or the benefits to be derived from its systematic and intelligent application. At track-trough stations soda ash (or other material) may be thrown directly into the trough, in regulated quantity,

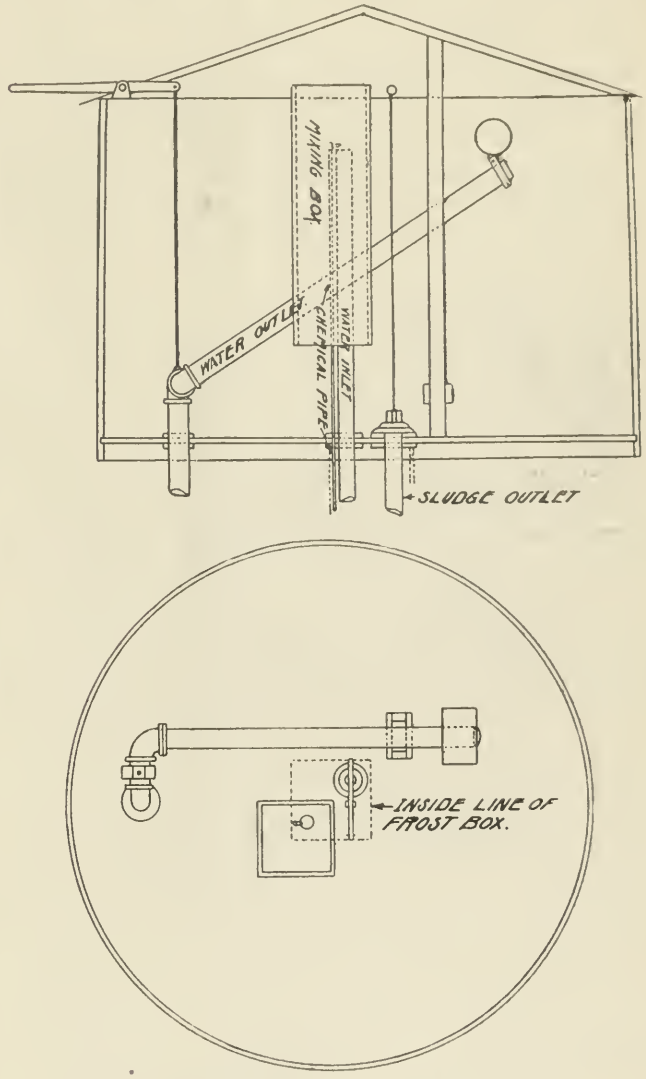


Fig. 1—Wooden Tank for Water-Softening.

after each train passes. This crude but fairly effective method is used on one road at four stations, pending the installation of automatic devices.

Much more systematic is the plan of pumping the solution with the water. This plan is used by seven roads. A small branch may be run from the water-pump suction to a tank of solution and the flow of the latter be regulated by a valve. This method has the advantage of producing a thorough mixture during the passage through the pump, but also sometimes causes deposits on the valves of the pump which interfere with their action. It is found preferable to pump the soda with a small power pump actuated by direct conection with some moving part of the water pump, thus insuring a correct proportional feed of solution. The discharge of the chemical pump should be carried to the large water tank independently of the water. In the water tank the chemical pipe should discharge close to the main water inlet in order to produce satisfactory mixture. As it is not practicable to run the small chemical delivery pipe for long distances, this system is not desirable when the tank is more than 100 ft. from the pump house. When distances are greater the chemical apparatus should be separated from the pump house and transferred to a point close to the water-storage tank or to the top of the tank itse'f. In such cases, the chemical pump may be actuated by a positive displacement motor or water wheel through which passes all, or a definite aliquot, of the water to be treated. While such a device has long been used in full

softening plants, it is not used for the simpler treatment, so far as the committee has learned, except on one road (the L. S. & M. S.). The same arrangement is suitable when water is taken from city supplies where the railway company has no water pumps. For pumping chemical solutions, simple single-acting, outside packed plunger pumps with outside check valves are much to be preferred. Plungers one to two inches in diameter and of six to ten inches stroke are sufficient. Their attachment to any convenient moving part of a water pump is very simple.

The essentials of the arrangement recommended for the usual wooden tub, when it is located near the pumping station, are shown in Fig. 1. The water and chemicals mix in the central compartment, which may be merely a wooden box, and pass down and out at its bottom, rising gradually in the main part of the tank. The water is drawn off through the floating pipe and a sludge valve is also provided. Fig.

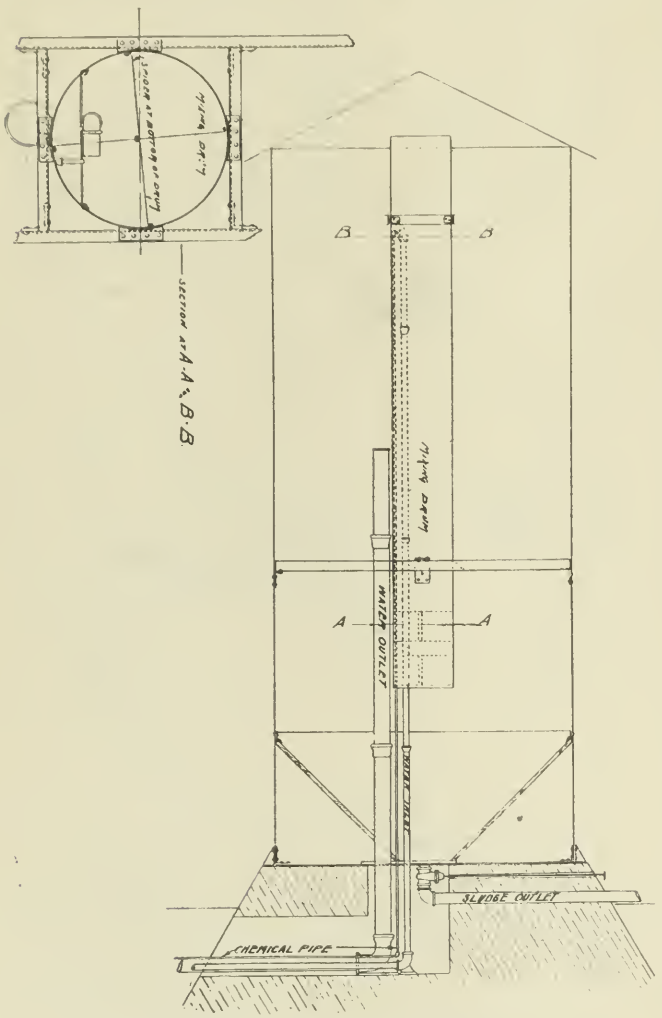


Fig. 2—Steel Tank for Water-Softening.

2 shows a similar arrangement for a steel tower. Owing to the larger settling space in the tower, a floating outlet is not necessary. The choice of suitable chemicals for the treatment of water under the conditions covered by this report is limited. It is very important to avoid the production of any sediment whatever, or else to provide both time and space in which to separate the sediment entirely. The separation of sediment in the pipes must obviously be avoided. When sediment must be avoided, as in ordinary wooden tanks when the water is used within two to four hours, soda ash, or possibly bicarbonate of soda is the only reagent available. The latter is least apt to produce sediment. Neither reduces the total amount of incrusting matter, but both change it all to carbonate, or bicarbonates, so that hard scale is largely avoided. This treatment has been found very beneficial on a number of roads. It is applicable to waters of moderate hardness. With very, very hard waters, the amount of soda required to decompose the incrusting matter is liable to cause deposits. In this use of soda ash, as well as with soda ash placed directly in the tender tank, blowing and washing out must be done thoroughly at regular and sufficiently frequent intervals.

In the opinion of the committee the case well merits the small further elaboration of process and apparatus, sufficient to separate a considerable amount of sediment. For this purpose a steel tower, as shown, and the use of caustic soda are recommended. With correctly proportioned apparatus and proper adjustment of the soda, a water of twenty or more grains of incrusting solids, of which 25 to 50 per cent is permanent hardness, may be reduced to ten grains, of which all is carbonate. In this manner a very troublesome water is reduced to one which will give very successful service, with reasonable care of boilers. So far as the committee is aware, this process is in use only on the Lake Shore & Michigan Southern, although after this report was practically complete it was learned that the Philadelphia & Reading used it some years ago.

One other reagent deserves mention and that is barium hydrate. It has the great advantage of treating sulphates without introducing foam-producing alkali. It should be borne in mind that barium hydrate is poisonous. The principal objection to its use is its cost. Not only is its price per pound higher than that of soda ash, but more pounds are required. It has, however, been used by a few roads on very high sulphate waters which could not be treated satisfactorily with soda. In actual work, one road reports that five engines were treated one month with 4,290 pounds of soda ash costing $42.90, but, although this was all that could be used on account of foaming, the boilers were not clean. It was estimated that about twice as much, costing about $85, would have kept the boilers clean if it could have been used. For the same engines 13,000 lbs. of barium hydrate, costing $390, was sufficient to keep the boilers clean. It must be borne in mind that these waters are very much worse than the average boiler water of the country. Finally, it is urged that water purification of any kind should always be supervised by a competent chemist. The raw water should be analyzed occasionally and the chemical solutions, as well as the water that has been treated, should be tested frequently.

The report is signed by:—H. E. Smith, (L. S. & M. S.), chairman; F. O. Bunnell (C. R. I. & P.), L. H. Turner (P. & L. E.), J. E. Mechling (Vandalia), and J. J. Connors (C. M. & St. P.).

DISCUSSION ON BEST METHOD OF TREATING WATER FOR LOCOMOTIVE USE.

Angus Sinclair: I have had considerable experience in my time in trying to eliminate impurities from feed water. There are certain waters that contain elements that cause encrustation, and they are not the same in all waters. Yet you take the same dose and apply it to them all, and, if the dose you give doesn't remedy the evil, you think the case isn't worth curing. All bad feed waters should be under the supervision of a chemist who is able to tell by analysis what should be done and what elements will put the bad encrusting matter out of solution. That is something that is not understood by every man connected with a feed-water station, and it ought to be systematically attended to if any remedy is attempted at all. I think the greatest disappointments in connection with water purification, or the preventing of the bad effects of hard water, have been ignorance in the treatment.

J. F. Dunn (O. S. L.): We have used both systems. That is, we have treated the feed water in the tank by soda ash and lime, and we have also used a compound introduced into the tank on the tender. Our experience has been that we have got much better results with the use of the compound. It has been put up under the direction of a chemist after analyses of the different waters, and it has reduced our flue failures considerably and also has decreased the trouble we had with the cracking of fire-box plates. It is handled entirely by the hostler in the engine house. The engine men like it so much now that they won't go out on the road without a certain quantity of this compound in their engines.

A. Trumbull (Erie): We believe the proper thing to do is to treat the water before it is introduced into the boiler. I believe a little study on the part of any one of the results of the solids found in boilers will convince them that that is the most desirable practice. We have one recognized standard of treatment which has been highly successful, and we have reduced our water washing period very considerably after its introduction and have obtained very good results in the way of boiler maintenance generally. We have had some experience also with the soda ash treatment. While that may be a temporary expedient to employ where

great difficulty is found with bad water, nevertheless it is only a temporary remedy and ought to be replaced with some more modern scientific method.

J. Christopher (T. H. & B.): I have had a great deal of experience with bad water on our road. In dry seasons of the year the water analyzes as high as 70 per cent. sulphur, and we have found that we were creating sulphuric acid in our boilers. I had difficulty in convincing the management of the road of the necessity of treating this water. We used a compound. This compound was dumped in the tank, and it was good for all the water in the tanks over a stretch of 180 miles or more. The only proper way to treat bad feed water is to treat it and then discharge it in the tank. We find that we have to vary our treatment of this water as close as 48 hours. Therefore, it is quite necessary that the operator shall have full knowledge of the variations that are taking place in the water that is flowing into these stations. In some of the creeks I have found as high as 20 streams of sulphur water. Through the wet season with soda and hydrates of lime we reduced that as much as 80 per cent., and then we have to run it up again, in the dry season. We have had cracked flues on our consolidation engines every trip, but since the treatment of this water in this way, we only touch up the flues at every wash out, which is about once in two weeks. The life of the fire-box is prolonged to the extent that the fire-box work alone will pay for the tank in a year. The operation of the tank is conducted at very little expense. We have a wheel connected with the discharge pipe and a current of water flowing through this discharge pipe operates a wheel which provides power for the agitator, and also at the same time drives a pump for throwing the chemicals into the top of the high tank.

S. L. Bean (A. T. & S. F.): Our experience has been similar to that of the last speaker. Our system of treatment is managed by our chief chemist, and I cannot go into the details of it, but I know since we introduced the system it has worked very well and has increased the mileage of a set of flues from 15,000 to 40,000. We are equipping a feed water plant now at quite an expense for use where we have a great deal of very bad water. We have found where we have the system installed that it has increased the life of the fire-boxes from 12 months, oil burning, to 7 years.

D. J. Redding (P. & L. E.): We have the same system of treating water in use that I believe the last two speakers have. We precipitate practically all of the solids in our wayside tanks. A difficulty arises then when the water is so very bad that it becomes light and foamy after the treatment, and then we use what is called an anti-foaming compound. I hoped to hear some one outline a scheme for getting rid of the foaming without the necessity of using another compound for that purpose. I understood that there was a system by which the foam passed off as steam without getting down into the water in the boiler.

E. W. Pratt (C. & N. W.): I should be glad to answer Mr. Redding as to what to do to prevent the foaming on what we call over-treated water. We have some water that in order to remove the considerable amount of encrusting caused by over-treating, and which causes more or less foaming, where we apply blow-off cocks liberally to the boiler near the mud ring, and use it very frequently at short intervals. Our former practice was to blow out locomotives at the terminals or when standing at outlying places, but we have had much better success in avoiding foaming and preventing leakage of flues by blowing out practically between every station. Those are detailed instructions to the men, and they are quite generally carried out. We ask the men in charge of the engines if there is any trouble for an explanation of it, and if they do not blow out once at every station. I may say that our stations average perhaps 6 miles apart. Now, we have not had a failure from foaming engines that I recall in six or eight months, whereas there used to be a great many each day.

With regard to installing feeding plants at wayside stations, it has been our custom to ascertain the number of pounds of encrusting solids in the water per 1,000 gallons and the number of gallons used at any feed water tank in 24 hours. In that way we would install a feeding plant wherever the greatest number of pounds of encrusting solids developed in 24 hours. That did not always mean where the poorest water was. It was sometimes found in good water. The plants have been extended, and the poorer waters are treated in this way. We always use soda ash quite extensively where we have none of these treating plants.

Mr. Redding: I would like to know whether Mr. Pratt has any data to show whether it costs more to treat water at each station or to put in the anti-foaming compound. I would also like to know whether they have had any trouble in the blow-off cocks between stations. I wanted particularly to find out whether or not there was any system of injecting water into the boiler which would give an opportunity for the foaming to pass off in steam.

A. E. Manchester (C. M. & St. P): The question raised as to barium hydrates: We have had a little experience on a branch in South Dakota, where the water was of such a character that in order to soften it so that it could be used in the locomotive it became over-treated and was too light, and we used the barium hydrate there for nearly a year with very satisfactory results. As to the anti-foaming compound: Instead of blowing out, there is a large territory in South Dakota in which alkali water is the only reliable source of supply; the hard waters are too scarce to be relied upon, and we are using an anti-foaming compound in connection with that water. It does very nicely until the concentration of alkali gets up between 600 and 800 grains to the gallon, and then we begin to have trouble even with the anti-foaming compound. Then we have to commence this blowing out process to keep it below 600 grains.

Mr. Wells: I did not understand what Mr. Redding meant about treating water so that it would not foam. I think it is pretty well understood that the foaming principle in water is carbonate of soda, and the only way that it can be taken out is by evaporation. It cannot be treated out. You always get carbonate of soda when you treat sulphate of calcium. Barium hydrate treats the sulphates of calcium and does not leave any foaming. It is the best thing that I have seen that has been suggested. I do not know of any way to prevent the foaming with the possible exception of the introduction of some anti-foaming compound, but that would be only temporary and would only last a short time.

I was interested in Mr. Manchester's statement that they are able to carry the degree of separation up to 600 grains to the gallon. We found on the Burlington that a boiler would begin to foam ordinarily at about 200 grains to the gallon. We hope some day that some one will suggest a method to help us out on the foaming.

Mr. Christopher: After we began to treat our water we had great difficulty with the foaming. We got our chemist after the difficulty and he analyzed the water, but could not seem to understand why it foamed. Many of the engine crews supplied castor oil themselves to save them annoyance and trouble in getting up heavy grades.

C. E. Gosset (M. & S. L.): I am closing my 24th year in the northwest in continuous railway service on 8 different lines. During that time I have had to deal with some bad water. The road I am connected with now operates an 800 mile tract where we have only from 2 to 4 trains daily, and therefore our side tank feeding proposition is prohibitive. Without the use of soda ash we could only get along a few days without blowing out. I selected four consolidation type of locomotives, two of them being used in freight service locally and two in through freight service. For the two local freight engines I selected a mechanical draughtsman from my office and one from the road engineer's office, and on the through freight engines I put two road foremen and had them make every trip and watch results. The result was that we reduced our boiler repairs 62 per cent. by the use of the compound over what we did with the soda ash. The miles, per boiler washing, was doubled. Our cost per thousand freight ton mile was about two pounds less.

Mr. Smith: The committee realizes that there is no one method of treating water that is apt to be good for every road. The subject given to the committee, however, limited it to one particular line, which we have tried to adhere to. On any one road it will very often happen that all of these methods may be necessary at one time or another. Furthermore, the same thing applies to chemicals—no one chemical is equally efficient for all cases, and we do not wish to put ourselves on record as advocating soda ash for every purpose. So far as boiler compounds are concerned, of course, a discussion of those would bring us into the line of proprietary articles.

With reference to the method of injecting water to evaporate foam-producing substances, it does not appear to me personally how such methods could be carried out. As has already been stated, the foam producers are nearly always alkaline, especially in treated water. There may be some cases in which some volatile substances were present, and it could be removed by injecting the water into the steam space with suitable baffle plates or fans or something of that kind. A surface cock has sometimes been found much more efficient in reducing foam than the bottom blower. Also, it is quite frequently the experience the foam is much more prevalent when a system of water treatment is first entered upon, but after the boilers are cleaned and the old scale or mud removed, the foam disappears very largely. The discussion has also brought out one other point, that almost any system, with thorough supervision, produces much better results than some other system which has not been watched

closely, for the reason possibly that it has been standard for a number of years.

LUBRICATION OF LOCOMOTIVE CYLINDERS.

The committee compiled the following questions, which were submitted to members:

1. Have you experienced difficulty in lubricating modern passenger and freight locomotives, with steam pressures from 180 lbs. to 230 lbs., with the up-to-date lubricators which operate by condensation of steam, adjustable feed, etc., and, if so, state experience and causes for same?

2. What recent improvements have been made in the hydrostatic-feed lubricators, to add to their efficiency and economical operation? Give explanation, experience and results.

3. If familiar with any device, independent of the hydrostatic-feed lubricators as furnished by the manufacturers, which increases their efficiency or economical use, give description, principle of operation, etc.

4. For the lubrication of valves and cylinders on modern locomotives, state your objections, if any, to the up-to-date hydrostatic-feed lubricator

5. What types of mechanically operated lubricators have you used? State method of application, principle of operation, control and regulation of feed, location of device on the locomotive, with experience and results.



C. H. Rae.

Chairman, Committee on Lubrication of Locomotive Cylinders.

6. For the lubrication of modern locomotives, valves and cylinders, state your objections, if any, to the mechanically operated lubricator.

7. Are you familiar with any method, or device, for admitting the oil into the steam before it reaches the saddle casting? If so, state details, experience and results.

8. Have you had any experience with the oil-delivery pipe attached to deliver the oil into the steam-way in the saddle casting, instead of at the steam chest or valve chamber? State results.

9. What has been your experience in the lubrication of locomotive cylinders where superheated steam has been used? In this connection state the degrees of temperature acquired, if hydrostatic or mechanically operated lubricators were used, and the results from both, where both have been used.

10. Do you consider it necessary to lubricate cylinders of locomotives using superheated steam, independently of the valves, using any type of lubricator?

11. What is your experience with the lubrication of cylinders on Mallet compound locomotives, using superheated steam with the hydrostatic-feed lubricator? With the mechanically operated lubricator?

12. Do you consider it necessary to lubricate the valves and cylinders on the high and low pressure cylinders of Mallet compound locomotive (by lubricators of whatever type) piped independently to each valve chamber and cylinder?

The replies to question No. 1 were universal in expression, that there is no serious difficulty now experienced in lubricating modern passenger and freight locomotives with the up-to-date lubricators of the hydrostatic-feed type. Several of the members, in reply to question No. 2, have referred to a recent improvement in the hydrostatic lubricator, whereby it is made possible to close or shut off feeds without interference with the feed-valve adjustments. This is an economical feature, but of such recent date that no comparative data have been submitted as to the results obtained. The replies to question No. 3 were limited. One member replies as follows: "The automatic steam-chest choke plugs, which feed against a constant boiler pressure in the oil pipe, and not against a pressure that fluctuates with pressure in steam chest, will result in a high degree of efficiency in the lubricator."

All replies to question No. 4 indicated there were no objections. The replies to questions Nos. 5 and 6 embody the same general information, but were limited in number. Some are given herewith:

a. "Have used several types of mechanically operated forced-feed lubricators. Three of those experimented with were driven from a moving part of the engine. This was unsatisfactory, since the feed is required that does not vary with the speed of the engine. More oil is required per minute while the engine is worked hard at low speeds than when running fast with a light throttle. To overcome this we used some forced-feed lubricators with independent air motor. None of them, however, have been satisfactory. It is difficult to apply to the filling holes screens that are fine enough to keep out dirt, without restricting the speed at which the oil can be put in, and the enginemen pull them out. The consequence is that the plungers wear rapidly, and after a time the feed becomes irregular. They are troublesome to maintain, and under conditions specified, in answer to question No. 1, gave no better results than the hydrostatic lubricator."

b. "We have experimented with two or three makes of mechanical-feed lubricators, but have been unsuccessful in getting as good results as we do with the hydrostatic-feed lubricators. The trouble with the mechanical-feed lubricator seems to be due to the difference in temperature; in warm weather, or during the warm part of the day, they would feed sufficient oil, but in cold weather, or at night when the weather is colder, they do not feed as well as when it is warmer."

c. "We have used two mechanical lubricating devices, which received their motion from a connection made to the valve stem and oil chamber, and the regulating devices were located in the cab. Our test record shows that after considerable experimenting the device operated fairly well, but after a time it gave considerable trouble and was finally removed on account of not giving satisfactory results. Mechanical means are objectionable, in that the device is so complex, and consists of so many parts, it is difficult to keep joints from leaking. To be properly installed, all pipes must be kept constantly filled and under pressure, with return valves at distributing points. On account of mechanical movements, parts will wear, and it will be more expensive to maintain, and in making repairs more oil is lost than with hydrostatic lubricators. Devices of this sort do not appear to have as yet been perfected to such an extent as to make them thoroughly reliable."

d. "Have used a force-feed lubricator with pipe connections to all the driving boxes and to the steam chest. Operated by a mechanism deriving its motion from a connection to the Walschaert link. Lubricator was located in the cab. While reducing friction on the journal bearings; and delivering oil to the steam chest, I do not consider it entirely satisfactory, for the reason that there is nothing to indicate that the pumps are working properly and delivering the oil until the valves become dry."

e. "Our objection to mechanically operated lubricators is that they are necessarily more complicated than the hydrostatic lubricator, without showing any beneficial results."

f. "Have tried some, but have not obtained satisfactory results."

g. "We have in the past used on some of our two-cylinder compound engines mechanically operated lubricators. Our objection to it was the rapid wear of the parts, leakages and annoyances."

h. "Using displacement plunger force feed. Secured in suitable location in cab, and operated by a series of rods and bell cranks, which are connected, either to eccentric blades and independent eccentric on rear or other convenient axle, or by reducing-arm on back crank pin. Device subject to varying control, and fed by increasing or decreasing

stroke of plungers by means of adjustment thumb-nut. Results as to economy and distribution very satisfactory. Slight trouble experienced in experimental stage, due to method of operating lubricator."

There was but one reply to question No. 7, citing experience which is herewith submitted:

"Present method in use with mechanically operated lubricator is to tap direct through dome into steam pipe, or throttle box. This method has proven to be superior to the old method of admitting to steam chest direct."

In this connection, and pertinent to the question, a member refers to a test:

"Delivering the oil from the right side of the lubricator into the left cylinder, passing it through the smoke box, and from the left side of lubricator into the right cylinder in the same manner. The gases in the front end superheating the oil, and evaporating the water of condensation, putting the oil into the cylinders superheated."

The substance of the replies to question No. 8 from those who have had experience was in accord with the report from a member who has tried this method extensively:

"On slide-valve engines consider results distinctly superior; on piston-valve engines reports vary, but general experience is that better results are obtained by putting oil into the steam passage."

Questions Nos. 9 and 10 have been considered jointly by the members. In the information submitted, the important features of this phase of the subject are well expressed in the quotations, as follows:

a. "Superheat varies from 550 to 580 deg. F. Our regular practice is to use one feed pipe to valve chest, applying it to go to each end of valve in center of the valve bushing. This lubricates the valve very well, but it is questionable whether delivering oil to the steam passage is not preferable. We also use one feed to each side of the cylinder, at the top and in the center. This is not used unless required. When working with full throttle and long cut-offs, over considerable distances, the cylinder feed was found necessary. There is no difficulty whatever in obtaining satisfactory lubrication in superheater engines with hydrostatic lubricators, on account of difference of pressure between steam chest and boiler, previously mentioned. In fact, there is considerably less difficulty than on engines using saturated steam. In spite of this the piston-ring wear is far more rapid."

b. "On our superheaters we carry 170 lbs. boiler pressure; the maximum degree of superheat is 225. On a number of superheater engines we introduced an oil both at the steam cavity and into the cylinder direct; the latter connection was found unnecessary. The only trouble which we had with superheater engines was to get our men to use the drifting valve when the engine was shut off. If this is not done, trouble was experienced with the bushings cutting out, but on districts where the drifting valve is put on we are having very good success."

All replies to question No. 11 pertain to the satisfactory use of the hydrostatic lubricator. No information was furnished concerning the use of mechanically operated lubricators on Mallet compound locomotives using superheated steam.

Replies to question No. 12 were at variance as to the location of the oil pipes, but it was the consensus of opinion that piping to the high-pressure valves and cylinders only was insufficient for satisfactory lubrication.

The experience of the committee, supplemented by the information received from the members of the association, warrants the assertion that there is no serious difficulty now experienced with the use of the hydrostatic-feed lubricator. The recent addition of a stop-feed feature is an improvement, rather tending to economical operation than to efficiency, and it behooves the manufacturers of this device to keep pace with, or in advance of, the constantly increasing demands.

The information obtained from the members, and cited in the foregoing, confirms the experience and opinion of the committee, that a properly constructed hydrostatic lubricator meets the locomotive requirements better than a mechanically operated lubricator, for the several reasons:

1. Familiarity with care and operation by the different classes of labor whose duties are in connection with its use.

2. Simplicity of design and substantial in construction; the operating parts being better protected from disarrangement or breakage.

3. A more accurate regulation of the amount of oil applied to the valves and cylinders under the varying conditions of service performed by the locomotive at different speeds and points of cut-off.

4. Because of less complication in construction and attachments, a corresponding less expense of maintenance.

The more general custom of delivering the oil to the steam chest or valve chamber is open to question, and there has been some very conclusive evidence submitted favoring the delivery of the oil into the steam at a point where it may become highly attenuated and intermingled with the steam. The presumed effect of extreme temperatures, due to high pressure and superheat upon the oil, has been an objection to delivering the oil in the steam before it reaches the cylinder saddle. Information has been furnished and confirmed by the experience of some of the members, that the efficiency of a properly compounded mineral cylinder oil is not seriously impaired when protected by the steam.

As the reports on this particular feature of the subject are indefinite, the committee recommends further consideration and experimentation. The information obtained from the members who have had the most general and extended experience with locomotives using superheated steam confirms the experience and opinion of the committee, i. e., that the same reasons advanced for the endorsement of the hydrostatic-feed lubricator on locomotives using saturated steam apply to locomotives using superheated steam. The information submitted and quoted in the replies, pertaining to the proper location and number of oil pipes on superheated locomotives, is of much value. The experience thus far is not sufficiently conclusive to justify a decisive recommendation at this time.

However, it is recommended that liberal openings be given to drifting valves, and attention to their proper manipulation, that the temperature of the cylinders may be promptly reduced within the lubricating possibilities of the oil when exposed to the atmosphere.

The problem of satisfactorily lubricating the Mallet compound locomotive is still in process of solution. At present it seems essential to pipe independently to the high and low pressure cylinders. However, the committee has been advised that there has been some experience, with satisfactory results, by eliminating the pipes to the low-pressure valves and cylinder, substituting an auxiliary oil pipe to the receiver with the high-pressure steam connection. This carries sufficient oil over to the low-pressure cylinders to insure good service. Increased efficiency and reduced expense of operation confront the mechanical departments of our railways to a greater extent than ever before. The final and most important recommendation of the committee is a continued live interest in the lubrication of locomotive cylinders.

The report is signed by:—C. H. Rae (L. & N.), chairman; Jos. Chidley (L. S. & M. S.), T. R. Cook (Penn.), J. F. DeVoy (C. M. & St. P.), J. F. Walsh (C. & O.), S. T. Park (C. & E. I.) and P. M. Hammett (M. C.).

DISCUSSION ON LUBRICATION FOR LOCOMOTIVE CYLINDERS.

George L. Fowler (*Railway Age Gazette*): I will simply repeat some information that I obtained the other day from Mr. Muzzey, who is mechanical engineer for the Long Island. They have been experimenting for the last six or eight months with a mechanical lubricator for cylinders, in which a mixture of oil and graphite is pumped into the cylinder, operated mechanically, and after a run of about two hundred miles the faces of the steam chests, valve seats and cylinders become coated with this film of graphite, and as far as that one engine is concerned, the operation has been very successful and very satisfactory, and they are inclined to think that it will reduce the internal friction of the engine to such an extent as to produce some saving in fuel.

There has been no data published, but it has been so successful that they are about to make an extensive trial, I understand, of some eight or ten engines, in which very exhaustive tests will be made to determine exactly what can be done from both a mechanical and economical standpoint in developing this method of feeding.

As the lubricator is so constructed that the old trouble of the graphite settling and becoming a sediment in the bottom of the oil is done away with by the mixture, which keeps it stirred up until it is actually deposited in the steam chest. Hence the operation is wholly satisfactory.

E. A. Miller (N. Y. C. & St. L.): We have found that very good results can be obtained by applying the graphite at the commencement of each trip to a cup, separate from the lubricator, and applying this graphite cup to our steam chests in addition to the regular lubricator.

George A. Hancock (St. L. & S. F.): We have fifty engines, with the steam temperature about 535 to 565 deg. We tried the mechanically operated lubricator and found it unsatisfactory. We had trouble on our connections with the

ordinary lubricator. Instead of admitting the oil directly through the cylinder and valve, we connected the oil pipes direct to the steam passage. This in connection with a small amount of graphite gave satisfactory service. We are allowing for our freight engines one pint of valve oil for every forty miles, and one pint of valve oil for every sixty miles in passenger service.

CONSOLIDATION.

At the last meeting of the association the committee was instructed to ascertain if there would be any objection to the consolidation of the two associations. An attorney has been consulted, and the committee reports that the consolidation can be carried through legally. That really carries out the instructions that the committee received at the last convention. In view of the president's remarks, in his address yesterday, it would seem desirable to have a committee continued on this subject.

DIFFERENT DEGREES OF SUPERHEATED STEAM.

The locomotive Schenectady No. 3, at Purdue University, has been equipped with a Schmidt superheater, giving substantially more superheating surface than the ones formerly used. This has rendered possible the use of still higher temperatures, so that, whereas in previous experiments a maximum of about 200 deg. of superheat was obtained, from 200 to 275 deg. were used in the experiments described in this report.

Two conditions were to have been expected in these experiments: first, practical difficulty with the lubrication of the slide valve; second, less rapid improvement in economy at the

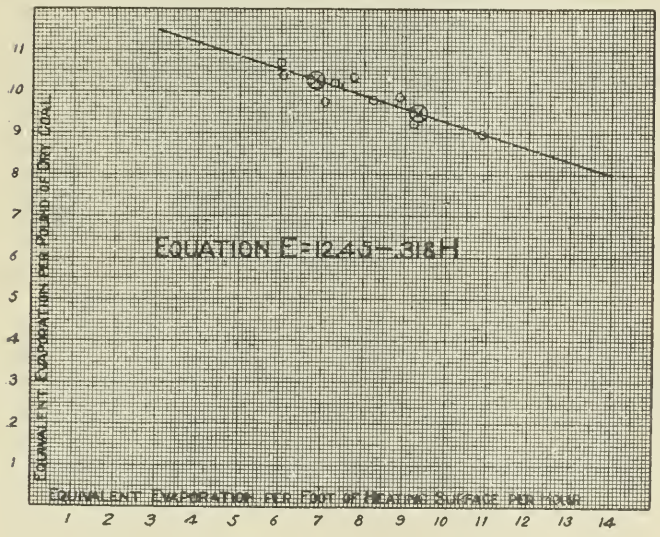


Fig. 1—Coal Per Square Foot Heating Surface; Schmidt Superheater.

higher temperatures. Neither of these conditions has been realized. Little difficulty was experienced with the lubrication of the valve and no maximum of economy has been reached. As far as the figures and tables in the present report are evidence, the coal consumption decreases more and more rapidly as the superheat becomes higher. There seems to be no practical limit to the gain to be obtained in this way, except the usual troubles incident to the use of superheated steam. Although these experiments are not yet completed, it has seemed advisable to call to the attention of the Association the results so far obtained.

Equipment.—The same locomotive, now known as Schenectady No. 3, was used in all the tests. When used with saturated steam the locomotive was in normal condition. After the tests on saturated steam had been completed it was first equipped with a Cole superheater, and the results from tests of superheated steam, as reported to the Master Mechanics convention in 1909, were obtained with the original superheating surface of 193 sq. ft. (neglecting header). The work as reported last year was from results obtained after reducing the superheating surface by two successive decrements of 42 sq. ft. each, or approximately 21 per cent. at each reduction.

Prior to the experiments described in this report, the locomotive had been overhauled and a Schmidt superheater installed in place of the Cole superheater. In order to distinguish between the different superheaters as used on Schenectady No. 3, in last year's report, the first superheater was known as Cole A, the second as Cole B and the third as Cole C. The superheater in this year's report is referred to as the Schmidt. The heating surface of the tubes of the four superheaters are:

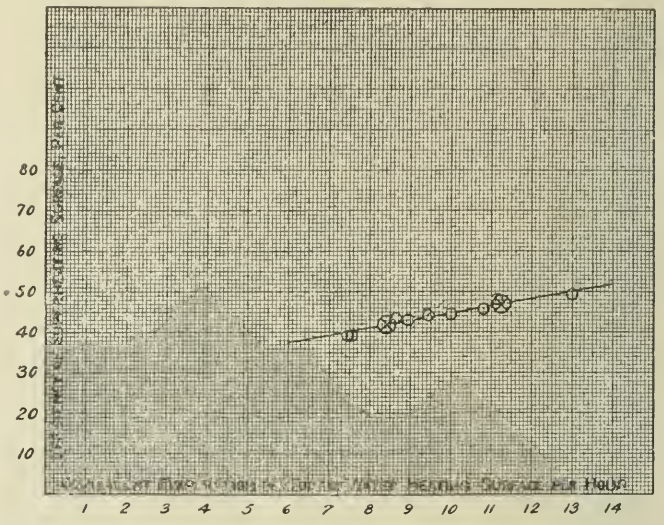


Fig. 2—Efficiency of Superheating Surface; Schmidt Superheater.

Cole A	193 sq. ft.
Cole B	151 sq. ft.
Cole C	109 sq. ft.
Schmidt	324 sq. ft.

The boiler dimensions were the same for all the Cole superheater tests, but in order to install a Schmidt superheater, with a larger amount of superheating surface, the number of small 2-in. flues was reduced from 111 to 107, and the large 5-in. flues were increased in number from 16 to 21. This change in the number of flues increased the water-heating surface from 897 sq. ft. to 956.5 sq. ft. With the above exceptions, the boiler and engine were the same for all the testing upon the four different superheaters.

The nominal dimensions of Schenectady No. 3, as used in the tests with the Schmidt superheater, are as follows:

Type	4-4-0
Total weight (pounds) about	109,000
Weight on four drivers (pounds) about	61,000
Driving-axle journals:	
Diameter (inches)	7½
Length (inches)	8½
Drivers, diameter (inches)	68.99
Valves—Type, Richardson balanced:	
Maximum travel (inches)	6
Outside lap (inches)	1⅛
Inside lap (inches)	0
Ports:	
Lengths (inches)	12
Width of steam port (inches)	1.5
Width of exhaust port (inches)	3
Total wheel base (feet)	23
Rigid wheel base (feet)	8.5
Cylinders:	
Diameter (inches)	16
Stroke (inches)	24
Boiler—Style, extended wagon top:	
Diameter of front end (inches)	52
Number of 2-in. flues	107
Number of 5-inch flues	21
Length of flues (feet)	11.5
Heating surface in flues (square feet)	956.5
Heating surface in fire-box (square feet)	123.5
Total water-heating surface (square feet)	1080.0

Length of fire-box (inches)	72.06
Width of fire-box (inches)	34.25
Depth of fire-box (inches)	79
Grate area (square feet)	17
Thickness of crown sheet (inches)	7/16
Thickness of tube sheet (inches)	9/16
Thickness of side and back sheet (inches)	3/8
Diameter of stay bolts (inches)	1
Diameter of radial stays (inches)	1⅛

The Schmidt superheater, as used in these experiments, has the following dimensions:

Outside diameter of superheater tube (inches)	1¾
Number of double return loops	21
Average length of the pipes in the double return loops (feet)	42.8
Total superheating surface based on the outside surface of the tubes in square feet	324

The total water and superheating surface of the locomotive equipped with the Schmidt superheater is 1,404 sq. ft.

TESTS WITH SCHMIDT SUPERHEATER.

Following the method primarily adopted, the tests on the Schmidt superheater were run at 200, 160 and 120 lbs. pressure. The tests at 200 lbs. were omitted because it was felt that there was no further need of tests at this high steam pressure. The speeds and cut-offs adopted for the tests were the same as those used last year. These tests were all run during the months of April and May of this year.

Lubrication of the Valves and Cylinders.—After a few tests, however, it was found that no more oil was required with the Schmidt superheater than was used with the Cole superheater. The oil used in all of the superheater tests was 600 W. The amount of oil used was approximately one drop (through a sight-feed lubricator) to each valve box for each 12 to 30 revolutions of the locomotive, and one drop to each cylinder for each 30 to 60 revolutions of the locomotive, depending upon the length of valve travel. That is, a short cut-off and high steam pressure required more oil than a long cut-off and lower steam pressure. The amount of oil used in a 75-mile run (this being the length of each test) varied from 1½ pints to 3 pints. This amount of oil may seem rather high to a railway man, but to insure against the cutting of the valve, more oil was used than was really necessary, as was shown by the fact that during none of the tests was there any evidence of dry valves. An inspection of the valves and cylinder wall after all the tests had been completed showed a high polish and no cutting.

Evaporative Efficiency of the Combined Boiler and Superheater.—The fuel used in all tests was Youghiogheny lump. The equivalent evaporation (pounds of water evaporated from and at 212° F.) per pound of dry coal, plotted against rate of evaporation, equivalent evaporation per foot of water-heating and superheating surface per hour), is shown for the Schmidt superheater in Fig. 1. The equation for the line most nearly approximating all the points is

$$E = 12.45 - .318\ H$$

where E is the equivalent evaporation per pound of dry coal and H is the equivalent evaporation per square foot of water-heating and superheating surface per hour. The area of the heating surface is based upon the interior surface of the fire box, and the exterior surface of the boiler and superheater tubes. This equation is derived from all tests at all pressures, and, therefore, fairly represents the average performance of the boiler at any pressure. It is to be noted that a majority of the points which represent individual tests fall very near the average line, which was obtained by finding the center of gravity of two groups of points and drawing a line through the two points thus found. These points are shown by a cross inscribed in a circle.

The Degree of Superheating.—The temperature of superheat was obtained by high-grade mercurial thermometers placed in thermometer wells in the branch pipe at a point directly adjoining the superheater header.

DESIGNATION OF TESTS.		CORRECTED LOCOMOTIVE PERFORMANCE											
NUMBER	LABORATORY SYMBOL.	EQUIVALENT STEAM TO ENGINE PER HOUR FEED-WATER AT 60 DEGREES F.	EQUIVALENT EVAPORATION PER POUND OF DRY COAL BY EQUATIONS	DRY COAL FIRED PER HOUR. CORRECTED BY EQUATIONS.	DRY COAL PER INDICATED HORSE-POWER PER HOUR	EQUIVALENT STEAM PER INDICATED HORSE-POWER PER HOUR.	MACHINE FRICTION			DYNAMOMETER HORSE-POWER	DRAW-BAR PULL	COAL PER DYNAMOMETER HORSE-POWER PER HOUR	STEAM PER DYNAMOMETER HORSE-POWER PER HOUR.
							M.E.P.	HORSE-POWER	PER CENT INDICATED HORSE-POWER				
I	II	XVI	XVII	XVIII	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII
1	30 2 200	8397	10.55	796	2.74	28.94	6.5	46.5	16.00	243.7	3017	3.27	34.45
2	30 4 200	10737	10.02	1072	2.44	24.50	8.5	60.2	13.70	377.9	4706	2.85	28.42
3	30 6 200	12817	9.52	1346	2.55	24.25	9.3	65.2	12.30	463.3	5840	2.90	27.67
4	30 4 160	8349	10.56	791	2.50	26.32	6.5	45.7	14.40	271.5	3415	2.92	30.75
5	30 6 160	10060	10.05	1002	2.55	26.91	8.5	60.2	15.30	333.8	4162	3.01	30.14
6	30 8 160	12372	9.64	1284	2.61	25.22	9.3	65.7	13.40	425.0	5320	3.02	29.12
7	30 8 120	9932	10.20	973	2.86	28.94	8.4	59.5	17.30	283.6	3533	3.43	35.02
8	30 10 120	11456	9.86	1162	2.77	27.30	6.9	48.5	11.70	371.2	4666	3.13	30.80
9	30 14 120	15183	9.02	1684	3.29	29.69	3.0	21.2	4.20	490.2	6112	3.43	30.98

Fig. 3—Comparative Performance of Locomotive; Assuming Irregularities in the Results of Individual Tests Eliminated.

The following table gives equations for finding the degree of superheat at different boiler pressures:

Boiler Pressure	Equation
120	T = 107 + 16.5 H
160	T = 101 + 16.5 H
200	T = 90 + 16.5 H

In the above table T equals the superheating degrees F., and H equals the equivalent evaporation per square foot of water and superheating surface per hour. Assuming a rate of evaporation which will give approximately 440 indicated horse-power, which is 8.5 lbs., the corresponding values of T for the various pressures can be obtained. The value of superheaters is expressed for the Schmidt superheater by the equation.

$$T = 133.8 - .216\ P + 16.5\ H$$

where T equals the superheat in degrees Fahrenheit, P equals the boiler pressure in pounds gage and H equals the equivalent evaporation per square foot of heating surface per hour. The above equation is applicable for any pressure and any rate of evaporation.

The ratio of Heat Absorbed per Square Foot of Superheating Surface to that Absorbed per Square Foot of Water-Heating Surface.—If the efficiency of the superheating surface be expressed as a ratio of heat transmitted through it to the heat transmitted through the water-heating surface of the boiler, or as the ratio of the equivalent evaporation per square foot, and

this ratio be plotted for each test against the corresponding equivalent evaporation per square foot of water-heating surface per hour, the diagram shown in Fig. 2 will be obtained. Since this line represents tests at all pressures, it is seen that the efficiency of the superheating surface is increased with increase in the rate of evaporation. It is worthy of note that

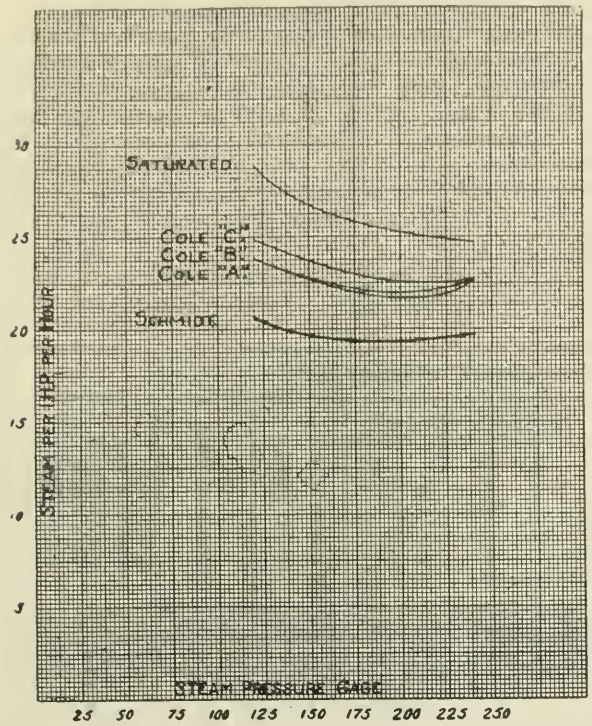


Fig. 4—Steam Per I. H. P. for Different Types of Superheaters.

the efficiency of the superheating surface is equal to fifty per cent. of that of the water-heating surface when the equivalent evaporation per square foot of water-heating surface per hour is 13 pounds or more.

Boiler Pressure Pounds Gage	Pounds of Coal per Indicated Horse Power per Hour				
	Saturated Steam	Superheater Cole "A"	Superheater Cole "B"	Superheater Cole "C"	Superheater Schmidt "A"
I	II	III	IV	V	VI
240	3.31	3.12	3.24	3.20	2.63
220	3.37	3.00	3.16	3.16	2.57
200	3.43	2.97	3.11	3.18	2.55
180	3.50	3.01	3.16	3.22	2.51
160	3.59	3.08	3.24	3.35	2.55
140	3.77	3.17	3.33	3.45	2.63
120	4.00	3.31	3.48	3.60	2.89

Fig. 5—Coal Consumption Under Different Pressures and Superheaters.

Smoke-box Temperatures.—The temperature of the gases in the smoke box was obtained by the use of a mercurial thermometer placed midway between the diaphragm and the front tube sheet. The equation of the line represening these temperatures is

$$T = 500 + 13.08\ H$$

where T equals the smoke-box temperature in degrees Fahrenheit, and H equals the rate of evaporation.

Corrected Results of Individual Tests.—The results of individual tests have been corrected to eliminate individual irregularities, the corrected results being shown in Fig. 3.

Column 16, which gives equivalent steam supplied to engine per hour, equals pounds of steam supplied to engine per hour from original log, multiplied by [b. t. u. taken up by each pound of steam in boiler and superheater minus (60 minus feed-water temperature), divided by 970.4 latent-heat of evaporation].

Column 17, which gives the equivalent evaporation per pound of dry coal, was obtained by substituting for H in the equation

$$E = 12.45 - .318\ H,$$

the values in column 16 divided by 1,404 sq. ft.

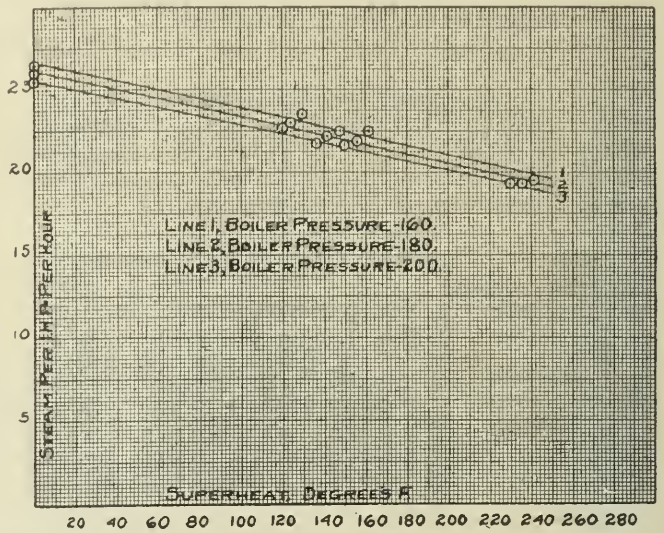


Fig. 6—Steam Per I. H. P. for Different Boiler Pressures; Schmidt Superheater.

Column 18, which gives dry coal per hour, is obtained by dividing column 16 by column 17.

Column 21, which gives the machine friction in pounds of mean effective pressure, was taken from the 1909 report by Dean Goss, Vol. 43, page 158.

Column 22, which gives the machine friction in horse-power, was obtained by using valves of m. e. p. of column 21 and the speed in revolutions per minute of the individual tests, together with the indicated horse-power constant of the locomotive.

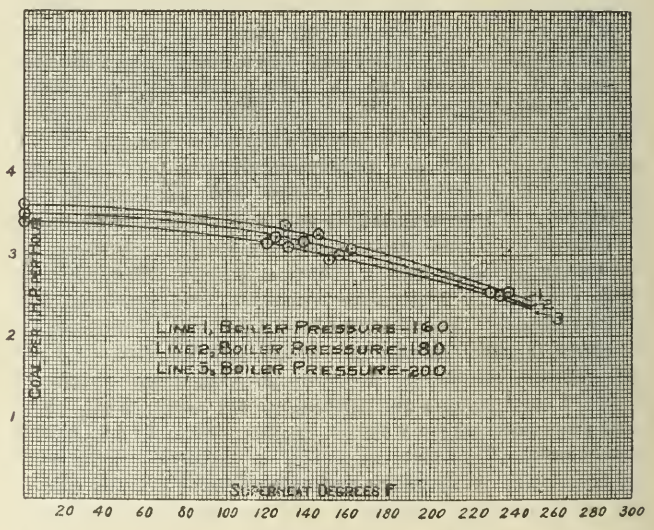


Fig. 7—Coal Per I. H. P. for Different Boiler Pressures; Schmidt Superheater.

Column 25, which gives the draw-bar pull, was obtained by dividing column 22 by (.000547 multiplied by the revolutions

per minute), in which .000547 is the tractive horse-power constant of the locomotive.

Column 26, which gives the coal per dynamometer horse-power per hour, equals column 18 divided by column 24.

Column 27, which gives steam per dynamometer horse-power per hour, is obtained by dividing column 16 by column 24.

A COMPARISON OF RESULTS OBTAINED WITH SATURATED AND WITH FOUR DIFFERENT DEGREES OF SUPERHEATED STEAM.

Basis of Comparison.—As the area of the water-heating surface of the boiler with the Schmidt superheater is approximately only 47 sq. ft. greater than with the Cole superheater, it would seem that this difference would not be enough to affect the relative efficiency of the boiler. In the comparisons which follow, therefore, no allowance is made for differences resulting from different water-heating surfaces. In the tables and diagrams which follow, all material included under Saturated Steam and superheater Cole A, has been taken directly without change from the 1909 report, and that under superheaters Cole B and Cole C from the 1910 report.

Comparison of Engine Performance.—The steam consumption of the locomotive operated under saturated steam and the four different degrees of superheated steam represented by Cole A, Cole B, Cole C and Schmidt are shown graphically in Fig. 4. From an inspection of these curves, it is seen that the tests with the Schmidt superheater, that is, the one giving highest degree of superheat, gave the lowest water consumption. The relation in coal consumption per hour for the four different superheaters and for the saturated steam is shown numerically in Fig. 5. Here again the Schmidt superheater results are the smallest, going as low as 2.5 pounds per indicated horse-power per hour.

The consumption of water per indicated horse-power, as affected by the degree of superheat, is well shown in Fig 6, in which the pounds of steam per indicated horse-power per hour are plotted against the degrees of superheat. It will be seen that the comparisons are made at 160, 180 and 200 lbs. steam pressure, these being the pressures that fall in the center of the field of experiment, and for that reason would be more likely to represent correct results. As indicated last year, it would seem that this relation could be approximately represented by a straight line as shown. It is also seen that the water consumption for all pressures between 160 and 200 lbs. for the Schmidt superheater is practically the same.

Coal Consumption.—The pounds of coal per indicated horse-power per hour plotted against degrees of superheat are shown in Fig. 7.

The same pressure of 160, 180 and 200 lbs., were used in this comparison as in the comparison for steam consumption. This relation between the coal per indicated horse-power per hour and the degree of superheat for pressures of 160, 180 and 200 lbs., would seem to indicate, as brought out last year, that it could be represented by a curve as shown. In other words, the first 80 or 100 deg. of superheat does not make the same proportionate decrease in coal consumption as does the second 80 or 100 deg., and, in like manner, the third 80 deg. increase makes a still greater reduction in the coal consumption. For instance, the coal consumption per indicated horse-power per hour at 180 lbs. steam pressure for the locomotive using saturated steam was 3.50 lbs., and for 80 deg. of superheat it was 3.4 lbs., a gain in efficiency of 2.8 per cent.; while the consumption at 160 deg. superheat is 3.05 lbs., a gain of 12.8 per cent., and the coal consumption at 240 deg. superheat is only 2.47 lbs., a saving of 29.4 per cent. over that of the locomotive using saturated steam. Thus, if we take the locomotive using saturated steam as consuming 100 per cent. of coal, it might be said that the first 80 deg. superheat will reduce this 2.8 per cent., the second 80 deg., 10.0 per cent., and the third 80 deg., 16.6 per cent., making the total reduction for 240 degrees superheat, at 180 lbs. pressure, 29.4 per cent. Practically the same results would be obtained for the curves representing 160 and 200 lbs. steam pressure.

A locomotive equipped with a superheater giving from 200 to 240 deg. of superheat will, during the time of running, effect a saving in coal consumption of from twenty to thirty per cent. over that of the same locomotive using saturated steam. It would seem that the total gain in efficiency which could be obtained from superheat in a locomotive would not be reached until the temperature became too high for practical purposes.

DISCUSSION ON LOCOMOTIVE PERFORMANCE UNDER DIFFERENT DEGREES OF SUPERHEATED STEAM.

Prof. Arthur Wood (Penn. State College), non-member, was given the privilege of the floor.

Prof. Wood: I thank you very much, Mr. Chairman, for the privilege extended to say just a word or two in the discussion of this subject.

There are one or two points in the paper that are of particular interest to me. The first is the one that was expressed last year to the effect that the second eighty degrees of superheat gave a much better economy test on evaporation than the first eighty degrees. I take it that there is a decided reason for that, and that it is partly due to the cylinder concentration. When you get near the saturation point, you may have superheated steam and saturated steam in the cylinder at the same time. We do not know how much saturated steam you have, of course. So I am going to raise a question, for an answer here, as to whether or not it is fair to compare the economy of the first eighty degrees with the second eighty degrees or with the third eighty degrees of superheat.

The second point of interest in the paper that I have noted is that the net economy obtained, taking into account the three factors, is not given. The first of these factors, of course, is the gain due to the superheat on the basis of the increased heat that is given the superheat. The other two factors are negative. The first one of those is, of course, the loss due to the actual heat required to superheat. The second one of these factors is the loss due to depreciation, or rather the interest on the initial cost and to depreciation. If we take the curve representing that increased economy, and then the decrease from these two factors mentioned in the case of a stationary plant, a steam turbine, we will find that there is a minimum point to the net economy curve, and that shows that the maximum economy on the basis of cost, comes out about 100 deg. superheat. Now, if these results could be put upon such a basis as that, where we could get the net economy by combining these three elements, I think we would have a very interesting result.

On the surface, of course, it proves that we have upwards of 16 per cent. on the basis of the third eighty degree range in superheat. That, however, does not take into account these other elements I have spoken of. It seems as if we would not really expect a maximum point before we reached upwards of 270 deg. superheat.

H. H. Vaughan (C. P.): Those of you who have patiently listened to what I have said about superheating in the last few years must realize that this paper is quite a gratification to me. It explains very clearly several points that are experienced with superheated locomotives induced us to bring forward, but which we were unable to substantiate without any actual scientific experiments. For instance, one or two years ago I ventured to state that in my opinion it was a waste of money and time to worry about equipping locomotives with superheaters that only gave a superheat of forty to eighty degrees. At that ime such cost was advocated with the hope that trying the system in that way would avoid some condensation, and that results would be very nearly as good as they would be with high superheat.

Professor Benjamin's paper shows us very distinctly how our experience was obtained, in practical service along these lines. The saving from low superheat is so small as not

to make it worth while to maintain the apparatus. You will remember that I stated that our feeling was that until we got up to a hundred and fifty to 160 deg., we hardly began to realize the benefits of superheating. From what I have heard in the last few months of the successful results obtained with locomotives equipped with still higher degrees of superheat, I think we would have gained very much more if we had followed the practice of the Schmidt people and got a really high superheat.

A very interesting thing that strikes me in a cursory examination of this paper is a comparison of the diagrams. Fig. 7 shows how we obtain more and more economy as the superheat goes up. There, gentlemen, is the explanation of the increased capacity that we get in actual surface upon superheater engines. We have always found that the harder you work them the more superheat you get, and the greater the saving, so that, while perhaps your coal figures will only show a 15 to 20 per cent. saving, yet, taking all the coal used, when you are working the engine hardest you are getting the most saving per horse power. That is an increased advantage that we have always found in superheaters, and, while it has been frequently referred to, it has never been so clearly shown as in this paper.

Another thing; the last paper presented covering the results at Purdue University two years ago tried to make an explanation as to where we shall find greater economy in service than the results at Purdue indicated. The amount of superheat we were using was about 180 to 190 deg. There is quite a considerable drop in coal consumption between the amount of superheat obtained on the Cole locomotive at Schenectady and the one we were using, and it fairly well accounts for the results which we told you about.

I do not think that superheating needs any more advocacy on the part of the Canadian Pacific. We think it is doing very well, and we have not changed our policy, except that we are going to follow the example set in the United States and equip our engines so that we will obtain a higher degree of superheat than has been obtained in the past.

H. T. Bentley (C. & N. W.): It may be of interest to the members to know that we have just conducted a series of tests with superheaters and saturated steam engines, and that the results obtained compare very favorably with the test results obtained on the testing plant. On our Chicago-to-Elroy run we had two superheated steam engines and two saturated steam engines, and we put them on that test, and it was found that there was an average economy of 35 per cent. in fuel consumed in favor of the superheated engine. This was not while the engine was standing still, or while being fired, but while the engine was in actual service.

As explained by Mr. Vaughan, the harder you work an engine equipped with superheaters the greater the economy. We found that very true. We made some tests on other engines out in Iowa, and we obtained practically the same results there. Our men feel that they have got the best engines that they ever had in the superheated engines. The superintendent and everybody concerned cannot say too much for them. We put two lubricators on those engines at first, but we had trouble with one, with the left valve cutting out, and we took that lubricator off and put a larger lubricator on in front of the engineer, on the right side, and then that trouble was nearly eliminated. I think any railway man who has not had a superheater, and once gets it, will be astonished at the results to be derived from it.

C. D. Young (Penna.): There are two questions that have come up in my mind, concerning which I would like to have information. It is my understanding, from the results of the test at Purdue, the conclusion was reached that it was preferable from the standpoint of economy to have steam pressure at from 160 to 170 lbs., that conclusion being based on the eighty and 160 deg. superheat.

Now, referring to Fig. 7, giving the superheat in degrees per horse power per hour. I notice that with the 240 deg. the lines 1, 2 and 3 are coming very close together, and I would judge that if there was sufficient data for all of the intermediate points that probably line 3 and line 1 would intersect at about 280 deg.; in other words, as you increase the superheat effect, it looks as though you could run your boiler pressure up. That would seem to indicate that we could use the superheat to greater advantage than formerly, as was brought out by Professor Goss's paper, for the reason that it is very difficult to get larger cylinders on some of these engines. On the passenger engines it is very difficult to get much larger than a 27-inch cylinder. If we can hold down the size of the cylinder I think we can get the larger economy that Professor Goss says was obtainable with only 160 deg. of superheat.

I would like to ask Mr. Endsley, then, if, in his opinion, any change should be made in the original position taken, whether it is preferable to use this 160 or 170 deg. steam pressure for the boiler when using superheat.

J. F. DeVoy (C. M. & S. P.): We were asked to take one of our engines equipped with a Schmidt superheater, and make a very extensive test with it. While the test agrees very closely with this paper, still I want to give you what we obtained. We obtained about 200 deg. of superheat as an average for the entire test. The boiler pressure averaged about 117 lbs. The water rate was 21.54 lbs. per indicated horse power. Now, I am giving you something that I do not believe is perhaps advisable, still I am going to tell you just exactly what we did obtain. Over the division the average of our coal performance of the simple engine—the non-superheater engine—burned 18.4 lbs. per hundred ton mile. The consumption in case of the superheater engine showed that the average was 13.34 lbs., or a saving of 35 per cent. in favor of the superheater. I want you to understand, though, that the engine equipped with the superheater was just out of the shop and in good condition, and the average was the division average of approximately 100 engines. So I would not say that that 35 per cent. would bear out on the whole proposition. It is my opinion without any re-equipping or rebuilding of a simple engine of that type, especially one in which the boiler capacity is somewhat limited, that you can reasonably expect to get a saving in fuel of at least 25 per cent.

Another very interesting feature which was shown by the dynamometer car, which accompanied the test at all times, was that we were able to haul from 150 to 300 tons more freight, more or less, with the superheater engine than we were with the non-superheater engine, so I think the results obtained bear out the statements expressed in the Purdue University paper. If you have an old engine in which the boiler is somewhat small, you can reasonably expect to get a little higher efficiency, due to the fact that the action of the steam in the cylinder is somewhat different from that in the non-superheating engine. It appears that the engine holds her feet better, as we say—that is, she does not slip—and she hauls a load a little bit easier over the hills than the non-superheater engine.

Professor Endsley: I can answer Mr. Young's question by saying that other things were taken into consideration besides efficiency. It was injector trouble and boiler maintenance. As the actual figures show a greater efficiency at 220 deg. pressure, that was greater than with saturated steam. It also follows down with 160 deg. and 200 deg. exactly to the point of all those tests. So I do not think it makes any difference whether you run 160 deg. or 200 deg. I might say that we have never yet taken up the question of increasing power by adding superheat. We are going to do that next year. What we have attempted to do so far is to run along on all the different degrees of superheat with the same power as nearly as we could get it.

The saving shown in this paper is a saving for the same power and a saving in coal, doing the same work exactly. Next year I may say that we hope to increase the power about 25 per cent. This year we are only depending on our small fire-box engine, having about 87 lbs. per sq. ft. of grate area, which is very low for that kind of an engine, and we can get up easily to 125 lbs. per sq. ft. of grate area. As to Professor Wood's comment, I will say that we have not in any way taken up the maintenance of the boiler or the other things which are necessary when figuring the exact efficiency. We have simply compared the coal used per indicated horsepower; that is all. The work which could be done will no doubt be carried on by some of the railways, when they can figure out the difference in cost for maintaining the superheater; but that is a question which the laboratory is not able to take care of, because we only have one engine and our repairs are not very numerous, and we have no method of keeping track of the cost of repairs in our shop.

SAFETY VALVES.

The president announced that as the committee on safety valves only rendered the report since arriving at Atlantic City, it was referred to the incoming executive committee.

A decree has been issued by the government of Uruguay authorizing the provisional opening to public service of a section of 31 miles of the Midland Railway branch from Algorta, Uruguay, to Fray Bentos, now in course of construction. The new section completed is between kilometers 34 and 87.

M. M. REGISTRATION.

Atkinson, R., Baldwin Locomotive Works.
Baker, Geo. H., Railway Educational Ass'n, Dennis.
Best, W. N., W. N. Best International Calorific Co., East Bouvier.
Brewer, J. W., M. M., B. & O. Ry., Strand.
Bussing, G. H., S. M. P. & R. S., Buffalo & Susquehanna Ry., Haddon Hall.
Chambers, J. S., S. M. P., Atl. Coast Line, Marlborough-Blenheim.
Clark, F. H., G. S. M. P., C., B. & Quincy Ry., Marlborough-Blenheim.
Cleaver, F. C., S. M. P., Rutland R. R., Marlborough-Blenheim.
Cooper, F. R., Strand.
Dickerson, S. K., Asst. S. M. P., L. S. & M. S., Marlborough-Blenheim.
Diehr, C. P., M. M., N. Y. C. & H. R. R. R.
Edmonds, Geo. S., M. M., Delaware & Hudson, Chalfonte.
Gardner, Henry, Asst. Supt. Appren., N. Y. C. Lines, Traymore.
Grieves, E. W., Mech. Expert, Galena Signal Oil Co., Marlborough-Blenheim.
Hawkins, B. H., D. M. M., D. L. & W. Ry., Traymore.
Herr, E. E., M. M., Penna. R. R.
Jackson, H. D., M. M., C. H. & N. Ry., Watkins.
Johnson, L. R., Can. Pac. Ry., Marlborough-Blenheim.
Keiser, C. B., M. M., Penna. R. R. (Penna. Term. & Tunnel Div.), Marlborough-Blenheim.
Kellogg, W. L., S. M. P., C. H. & D. R. R., Haddon Hall.
Kendig, R. B., M. E., N. Y. C. Lines, Marlborough-Blenheim.
Langton, Geo. H., M. M., K. C. S., So. Div., Dennis.
Macbeth, H. A., M. M., N. Y. C. & St. L. R. R., Traymore.
Manning, Jas. H., S. M. P., Delaware & Hudson Co., Marlborough-Blenheim.
Mean, E. G.
Miller, E. A., S. M. P., N. Y. C. & St. L. R. R. Co., Traymore.
Moler, A. L., M. M., Frisco Lines, Windsor.
Monkhause, H., Rome Loco. & L. Mach. Wks., Chalfonte.
Montgomery, Wm., M. M., Central R. R. of New Jersey.
Moriarity, G. A., M. M., N. Y., N. H. & H. R. R., Elberon.
O'Hearne, John E., M. M., W. & L. E. R. R. Co., Marlborough-Blenheim.
Oviatt, H. C., M. M., N. Y., N. H. & H. R. R., Strand.
Painter, J. H., Supt. Shops, Atlantic Coast Line, Chalfonte.
Patterson, Robt., M. M., Grand Trunk Ry., Haddon Hall.
Paxton, Thos., S. M. P., E. P. & S. W. Ry., De Villa.
Potts, C. H., M. M., Penna. R. R., Chalfonte.
Rhodes, L. B., S. M. P., Virginian Ry., Chalfonte.
Riegel, S. S., M. E., Dela., Lack. & Western R. R., Runnymede.
Robb, J. M., M. M., C. G. W. Ry., Marlborough-Blenheim.
Ryan, J. J., S. M. P., So. Pac. Co.
Sharp, Wm. E., Supt., Armour Car Line, U. S. Yards, Chicago, Marlborough-Blenheim.
Shea, R. T., Insp. Tools & Machy., N. Y. Central Lines, Marlborough-Blenheim.
Shelby, C. K., M. M., Northern Central Ry.
Smith, Carl B., Boston & Maine R. R., Bellevue-Stratford, Philadelphia.



Some Workers on the Enrollment Committee.

Top row, left to right: H. L. Leach, A. E. Hooven, C. L. Woodruff, B. Palmer Claiborne, J. G. Mowry, C. S. Parker. First row; C. B. Yardly, M. S. Simpson, O. F. Ostby, chairman; H. F. Jefferson, C. W. Beaver.

Smith, Daniel A, Div. M. M., Boston & Maine R. R.
Smith, H. E., Chemist, L. S. & M. S. Ry.
Stewart, Thos. R., M. M., B. & O., Chetwood.
Sumner, Eben T., M. M., Boston & Maine R. R. Co.
Thomson, Samuel G., A. E. M. P., Philadelphia & Reading R. R., The Lenox.
Van Valin, H. D., D. M. M., Balt. & Ohio R. R.
Warnock, Harry R., G. F. L. D., Monongahela R. R., Francis.
Williams, W. H., M. M., Buffa., Roch. & Pittsburgh R. R., Rudolph.
Wirt, G., M. M., C. C. C. & St. L. Ry., Dunlop.
Wyman, R. L., M. M., Lehigh & New England R. R., Pennhurst.

M. C. B. REGISTRATION.

Averill, E. A., Managing Editor, Am. Engr. & R. R. Jl., Traymore.
Cade, J. R., M. C. B., G. H. & H. Ry. Co.
Chambers, J. S., S. M. P., Atlantic Coast Line R. R. Co., Marlborough-Blenheim.
Clark, F. H., G. S. M. P., B. & O. R. R., B. & O. S. W. R. R., Marlborough-Blenheim.
Cleaver, F. C., S. M. P., Rutland R. R., Marlborough-Blenheim.
Cooper, F. R., Strand.
Coulter, H., G. C. I., Phila., Balt. & Wash. R. R., Dorset Ave. and 58th St, care Dr. Kelly.
Dickerson, S. K., Asst. S. M. P., L. S. & M. S. Ry., Marlborough-Blenheim.
Dunham, W. E., Supvr. M. P. & M., Chicago & N. W. Ry., Haddon Hall.
Forsyth, Wm., Railroad Age Gazette, Traymore.
Goodnow, T. H., M. C. B., L. S. & M. S. Ry., Marlborough-Blenheim.
Gossett, C. E., M. M., Minneapolis & St. Louis R. R., Dennis.
Keiser, C. B., M. M., Penna. R. R. (Penna. Tunnel & Term. Div.), Penna. Sta., New York, N. Y., Marlborough-Blenheim.
Kendig, R. B., G. M. E., N. Y. C. Lines, Marlborough-Blenheim.
Klein, R. L., Gen. Car Insp., Penna. R. R. Co., Dennis.
Lovell, Alfred, M. C. B., Traymore.
Lungren, W. H., Phila., Balto. & Wash. Ry., Pennhurst.
Manning, J. S., S. M. P., D. & H. Co., Marlborough-Blenheim.
Miller, E A., S. M. P., N. Y. C. & St. L. R. R., Traymore.
Onderdonk, J. R., Engr. of Tests, B. & O. R. R., Dunlop.
Paxton, Thos., S. M. P., El Paso & Southwestern R. R., De Ville.
Roberts, L. D., Chief Joint Inspector, A. T. & S. F. Ry., C. R. I. & P. Ry., D. & R. G. R. R., M. P. Ry., Colorado & Wyoming Ry.
Ryan, J. J., S. M. P., Southern Pacific Co.
Searles, E. J., Asst. to G. S. M. P., B. & O. R. R., Marlborough-Blenheim.
Sharp, Wm. E., Supt. Armour Car Lines, Marlborough-Blenheim.
Shea, R. T., Insp. Tools & Machy., N. Y. Central Lines, Marlborough-Blenheim.
Smith, Benjamin T., Genl. Foreman, W. J. & S. S. R. R., Young's.
Taylor, G. W., S. M. P., San A. P., Shelburne.
Thomson, S. G., A. E. M. P., Phila. & Reading Ry., The Lenox.
Van Brimer, George, Supt., Colorado & Wyoming Ry.
Wirt, G., M. M., C. C. C. & St. L. Ry., Dunlop.

GUESTS.

Adams, C. S., Asst. Gen. For., N. Y. C., Young's.
Adams, J. W., Gen. Insp., B. & O., Strand.
Amole, John E., Insp. Engineer, P. & R., Ramsey.
Armstrong, L. N., P. R. R., W. J. S. S.
Bankard, E. H., Pur. Agt., B. & O., Brighton.
Beck, H. J., Gen. Loco Insp., P. & R., Sneidle.
Beck, Irving H., Foreman Air Brake Dept., C. R. R. of N. J.
Beny, Robert, Asst. Foreman, P. R. R.
Best, J. I., Chief Clerk to S. M. P., P. & R. R. R.
Bickley, W. H., Round House For., P. R. R., Effling.
Bradshaw, J. H., M. C. B., American Cot. Oil Co., Traymore.
Burns, J. W., P. R. R., New England.
Butts, G. W., Asst. Div. Operator, Penna. R. R., Jackson.
Cady, Paul C., C. C., Gen. Mech. Eng., N. Y. C., Young's.
Campbell, R. F., Commercial Agt., Phila. & Reading, Marlborough-Blenheim.
Carsey, J. T., P. R. R., New England
Cooper, W. H., Div. Stk., P. & R.
Cooper, W. J., Insp. M. P. Dept., P. R. R., Muncaster.
Crawford, M. R., Genl. Foreman, C. R. R. of N. J., Irvan.
Detroe, A. E., Gen. For., Cent. R. R. of N. J.
Deyo, L. B., Clerk Pur. Dept., N. Y. Cen. & H. R. R. R., Dennis.
Dobson, J. O., Asst. Secy. to Genl. Supt. M. P., B. & O., Bouvier.
Donellan, Jos., Rd. House Foreman, B. & O.
Douglass, A. E., Asst. Pur. Agt., Big Four, Dennis.
Dupell, R. E., R. F. E., P. R. R.
Emory, J. B., M. M., Kansas City Southern, Chalfonte.
Fisher, C. D., For. Wheel Dept., P. R. R., Rafters.
Fuhrer, M., Pur. Agt., Interboro Rapid Transit Co., Shelburne.
Gouty, H. E., Inspector, P. R. R., Young's.
Hall, Mrs. R. T., U. S. N., Haddon Hall.
Hall, Mrs., Sr., Haddon Hall.
Hickey, J. E., Mech. Supt., Mexico North-Western Ry., Traymore.
Himmleright, R. J., Spec. Apprentice, L. S. & M. S. Ry., Marlborough-Blenheim.
Hoover, Geo. F., Asst Foreman, Penna. R. R.
Jeffery, C. A., Supt., G. S. M. P., B. & O., Bouvier.
Johnson, Ben, Mech. Engr., M. & O. R. R., Rudolph.
Kennedy, L. A., Mech. For., B. & O., Arlington.
Kincaid, B. M., Inspector, Penna. R. R., Malatesta.
Lea, E. V., Supt. of Apprentices, Erie R. R., Schlitz.
Lester, W. J., Sr., Ch. Clk., Boiler Insp., Interstate Commerce, Haddon Hall.
Lewis, T. E., N. P. W., R. R., Chalfonte.
Lovell, D. H., Supt. N. J. & Seashore R. R, Haddon Hall.
McCormick, F. R., Clk., P. & R. R., Windsor.
McManamy, Frank, Asst. Chief Insp., Interstate Commerce, Haddon Hall.
McMaster, H. W., Receiver & Genl. Mgr., Wabash Pitts. Terminal Ry., Marlborough-Blenheim.
Mallory, C. E., Kingan Refrig. Line, Indianapolis, Traymore.
Mansfield, J. J., Chief Boiler Insp., C. R. R. of N. J., Pinehurst.
Martin, Chas. W., Gen. Air Brk. Insp., Penna. R. R., Haddon Hall.
Nelson, E. D., Engr. Tests, Penna. R. R.
Neff, S S., Pres. Phil. & Sub. Elev., Manheim Apts.
Neal, R. H. F., C. R. R. N. J., Pinehurst.
Ogilvie, Jas., Canadian Ry. Commission, Young's.
Pace, R. T., Pur. Agt., A. & W. R. R., St. Charles.
Reese, I., Round House For., P. R. R., Harrisburg, Effingham.
Reeve, W. K., Traveling Frt. Agt., N. Y. C. & H. R. Ry., Schlitz.
Reynolds, Chas. W., Asst. to Secy. Ry. Supt., Mfg. Assn., Penhurst.
Rhoads, G. E., Asst. Foreman Loco. Test Plant, Penn. Ry., Muncaster.
Rice, W. L., Genl. Foreman, Phila. & Reading, Monticello.
Riley, A., Paymaster, N. Y. O. & W., Shelburne.
Seiders, Irwin A., Road Fman. Engines, Reading, Worthington.
Shanks, H. T., C. C. to Pur. Agt., L. & M., Haddon Hall.
Shelby, Joseph L., Chelsea.
Skilling, J. K., Shop Clerk, B. & O.
Smith, Admiral J. A. B., U. S. N.
Snyder, J. C., Ch. Clerk Pur. Dept., N. Y. Cen. & H. R. R. R., Shelburne.
Thomas, W. H. M., Lumber Agt., Pur. Dept., Penna. R. R., Chalfonte.
Toomey, T. H., P. R. R., New England.
Warrington, J. B., Supt. P. & R. R. R., Shelburne.
Watson, J. S., Ch. Clk. M. M. Camden Shop, P. R. R., Spidle.
Westley, I. S., Div. Shop Foreman, P. & R., Spidel
Whaley, A. R., Gen. Supt., N. Y. N. H. & H. R. R., Dunlop.
Wolcott, C. S., Foreman Car Shops, Penna R. R., Dunlop.
Woodworth, Wm. C., For. Eng., P. &. R., Windsor.

The report of the Sao Paulo Railway Co. for the half-year ending December 31, 1910, fixes the receipts at $6,091,-785, and operating expenses at $3.055,300, leaving a net revenue of $3,036,485, as against $3,715,385 in 1909. The directors declared a dividend of 2½ per cent. on the preferred stock (at the rate of 5 per cent. per annum) and on the common stock a dividend of 5 per cent. (at the rate of 10 per cent. per annum), together with a bonus of 1 per cent. Durng the last ten years the dividend of this company has never been less than 12 per cent. per annum.

THE MASTER MECHANICS' ANNUAL BALL.

Probably no more successful ball has been given in the history of the Master Mechanics' Association than that which took place on the Million Dollar Pier last night. It is estimated that 400 couples were in the grand march and that almost 1,000 couples danced. There was also a large and interested crowd in the balcony; and those in it witnessed a beautiful and brilliant spectacle on the floor below. The dancing lasted until about 2 o'clock this morning.

The members of the marshal's committee escorted the officers and their wives down to the pier in roller chairs; members of the social squad met them at the entrance and took them to the Galena-Signal Oil Company booth, at the east end of the ball room, which was headquarters for the officers of the association during the evening. As President and Mrs. Fuller crossed the floor the band played "Hail to the Chief."

The procession for the grand march began forming at 9.30 in front of the headquarters booth. The march was conducted by J. Will Johnson, chairman of the entertainment committee, and led by President and Mrs. Fuller, and proceeded along the uptown side of the pier to the boardwalk end, where the dancing programs were given out to those in line. It then turned to the left, proceeded along the boardwalk end, and then eastward to the ocean end.

It continued around the ballroom again, and then, at the Boardwalk end, turned eastward down the middle of the room. At the ocean end it divided, one couple turning to the right and the next to the left. At this point the favors were presented to the ladies by the members of the ushers' committee. They were very pretty vanity bags made of creton, lined with pink and carried by a long pink cord.

As the favors were given out the two lines turned and marched toward the Boardwalk in zigzag formation, the members of the entertainment committee being placed at points along the floor to maintain the formation. When the heads of the two columns approached the Boardwalk end this time they stopped, the music ceased, and, after all on the floor had faced toward the Boardwalk end, a photograph was taken. As the crowd confronted the camera, the beautiful gowns of the hundreds of women on the floor illuminated by brilliant and variegated lights, and sharply differentiated from the evening clothes of their escorts, it presented a delightful and dazzling picture; but this picture was speedily exceeded in attractiveness by the one presented when, as soon as the photograph was taken, the whole floor was suddenly made alive with the graceful motion of the dancers.

The dancing program was begun with a two-step. There were 19 dances on the regular program; and a number of encores were given.

Twelve stations, indicated by signs bearing the names of twelve leading cities, were established about the room, and the dancing cards had a space opposite each musical selection on which to enter the name of the station at which the dancer would find his partner for each dance. The plan worked very satisfactorily, preventing the confusion and annoyance often caused at large balls by partners for a dance being unable to locate each other.

Music was furnished by Vollmer's orchestra of 30 pieces, which was situated about the middle of the uptown side of the pier. Punch, lomonade and ice water were served from tables in the southeast and the northwest corners of the ball room.

All the members of the entertainment committee were on duty throughout the evening. The special committee in charge of the ball was composed of W. J. Walsh, chairman; Thomas Farmer, Jr., E. H. Janes, J. Soule Smith, Harry S. Hammond, J. C. Younglove, William Miller, Philip J. Mitchell, F. M. Nellis, C. N. Wardell, L. B. Sherman, F. B. Ernst and Leonard J. Hibbard.

The ushers' committee was composed of Philip J. Mitchell, chairman; H. A. Nealley, Charles P. Williams, Charles A. Knill, J. P. Landreth, Herbert Green and C. N. Wardell.

The marshal's committee was composed as follows: Ralph G. Coburn, chairman; E. H. Janes; J. P. Landreph and H. A. Nealley.

The social squad was composed of Leonard J. Hibbard, chairman; Edward S. Toothe, C. A. Dunkelberg, Frank Martin, George R. Carr and Herbert Green.

The following are brief descriptions of the way in which the ladies of some of the officers were gowned:

Mrs. C. E. Fuller, blue satin, draped with gold cloth. Carried American beauties.

Mrs. T. H. Curtis, light blue satin, veiled in blue chiffon.

Mrs. H. T. Bentley, white satin with Brussels over-satin; carried pale pink sweet peas and orchids.

Mrs. T. Rumney,

Mrs. A. Sinclair, pale blue satin, with point lace trimmings; carried pink carnations.

Miss Helen MacBain, pink and white chiffon.

Miss Grace MacBain, pink and white chiffon.

Mrs. D. F. Crawford, pink gauze with silver trimmings.

Mrs. G. W. Wildin, pink satin with lace over-dress.

Miss Mary Walsh, white embroidered lingerie.

Mrs. A. F. Stewart, mauve colored chiffon with rose trimmings.

Mrs. C. A. Schroyer, light gray marquisette over yellow silk; carried lilies of the valley.

Miss Harriet Brown, lavender silk; carried sweet peas.

Mrs. H. E. Passmore, white lingerie over pink.

Mrs. C. B. Young, white voille with blue trimmings; carried lilies of the valley.

Mrs. C. W. Seddon, gold messaline with gold chiffon over.

Mrs. W. C. Arp,

Mrs. F. W. Brazier, black and white striped silk, with black velvet trimmings; carried pink roses.

Mrs. E. W. Pratt, imported gown of solidly-embroidered net over white satin.

Miss Verona Pratt, decollette gown of corn-colored brocade draped with Japanese gold-embroidered scarf; bird of paradise in her hair.

Mrs. W. L. Kellogg, pale blue silk with steel trimmings; carried American beauty roses.

Mrs. L. L. Dawson, steel gray marquisette over silk messaline; carried pink carnations.

Mrs. William Garstang, black lace over satin.

Miss Mabel Garstang, pink satin covered with white messaline lace.

Miss Virginia Garstang, crepe de chine.

Mrs. T. O. Sechrist, white marquisette trimmed with pink.

Mrs. George T. Anderson, gray beaded net over lavender.

Mrs. J. F. Dunn, white lace; carried lilies of the valley.

Miss Edna Dunn, yellow satin with white chiffon over; carried American beauties.

Mrs. T. Rumney, lavender chaeursse with lace and beaded trimming; carried lilies of the valley and orchids.

Mrs. W. C. Art, white chiffon with point lace; carried lilies of the valley and orchids.

Mrs. H. D. Gordon, white messaline with lace yoke.

Miss Louise Snow, pink satin; carried pink carnations.

Miss Edith Snow, lavender silk.

Mrs. D. J. Redding, white satin, trimmed with pink coral; carried sweet peas.

Mrs. John Carroll, chiffon over blue messaline; carried orchids.

Mrs. J. S. Chambers, chiffon over blue messaline; carried sweet peas and lilies of the valley.

Mrs. G. W. Rink, rose messaline under pink marquisette.

Miss Clara Winters, pink silk.

Miss Nellie Eberenz, marquisette trimmed with violet.

Mrs. B. P. Flory, pale blue chiffon; carried orchids and lilies

of the valley.

Mrs. C. A. Paquette, white marquisette with lace trimmings; carried pink peas.

Mrs. R. D. Smith, net gown embroidered in pink and white and trimmed with fillet lace over pink satin.

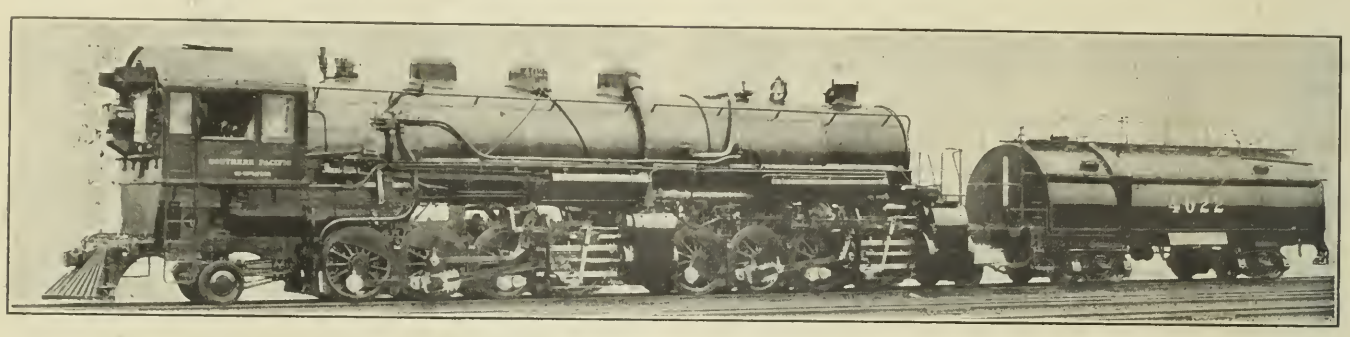
Mrs. R. B. Kendig, gray voile over pink, touches of green with fillet lace; carried orchids and lilies of the valley.

Mrs. G. N. Dow, black chantilly lace over white satin.

OIL BURNING MALLETS; SOUTHERN PACIFIC.

The Southern Pacific introduced Mallet locomotives for handling heavy freight traffic on its Sacramento division in 1909. This division has grades of 116 ft. per mile. The first two locomotives were of the 2-8-8-2 wheel arrangement and were operated in the usual manner with the smoke box end leading. After several months' experience 15 more of these locomotives were built to run cab end first in order that the engineman might have a better view of the track ahead, especially in passing through tunnels and snow-sheds. The general dimensions of these locomotives are as follows:

General Data	
Fuel	Oil
Tractive Effort	85,500 lbs.
Weight in working order	432,600 lbs.
Weight on drivers	398,500 lbs.
Weight of engine and tender in working order	612,000 lbs.
Wheel base, driving	39 ft. 4 in.
Wheel base, rigid	15 ft. 0 in.
Wheel base, total	56 ft. 7 in.
Wheel base, engine and tender	90 ft. 4 in.
Cylinders	
Diameter	26 in. and 40 in.
Stroke	30 in.
Valves	
Kind	Bal. Piston.
Wheels	
Driving, diameter over tire	57 in.
Driving, journals, main, diam.	11 in. x 12 in.
Driving, journals, others, diameter	10 in. x 12 in.
Engine truck, diam.	30½ in.
Engine truck journals	6 in. x 10 in.
Trailing truck, diameter	30½ in.
Trailing truck journals	6 in. x 10 in.
Boiler	
Style	Straight
Working Pressure	200 lbs.
Outside diameter of first ring	84 in.
Firebox, width and length	78¼ in. x 126 in.
Firebox, water space	5 in.
Tubes, number and diam.	401—2¼ in.
Tubes, number and diam., feed-water heater	401—2¼ in.
Tubes, length	21 ft. and 5 ft. 3 in.
Heating surface, tubes	4,941 sq. ft.
Heating surface, fire-box	232 sq. ft.
Heating surface, total	5,173 sq. ft.
Heating surface, reheater	625 sq. ft.
Heating surface, feed-water heater	1,220 sq. ft.
Grate area	68.4 sq. ft.



Mallet Locomotive With Cab at Front End; Southern Pacific.

EXPRESS CARS FOR THE LACKAWANNA.

The Delaware, Lackawanna & Western recently received 10 steel express cars designed by the American Car & Foundry Company, New York, and built at their Berwick works. The length of these cars is 60 ft. 9 in. over end sills and the width is 9 ft. 11 in. over side sills. The weight of body is 64,000 lbs.; of trucks, 30,000 lbs., giving a total weight of 94,000 lbs. The trucks are of the four-wheel type, with Commonwealth cast steel frames and bolsters. The wheels are Boies No. 2, 36 in. diameter, with Latrobe steel tires. The axles are M. C. B. standard, with 5½ in. x 10 in. journals. The underframe is steel, built up of structural shapes with center sills of 10-in. I-beams and side sills of 6 in. x 6 in. x ⅜ in. angles. Four cross-bearers built up of 3/16 in. pressed steel plate diaphragms, extend from the side sills to the center sills. A built-up double type of body bolster is used, made up of ¼ in. pressed steel plate diaphragms with 1 in. top and ⅞ in. bottom cover plates. The end sills are made up of 10-in. channels. The side frame is built in the form of a truss designed to carry the vertical load and has diagonal braces of 3 in. x 2½ in. angles, with 5-in. channels at the side doors. The side posts are 3 in. x 3 in. angles, extending from the side sill to the side plate, the latter being a 5 in. x 3 in. angle. The carlines are 1¾ in. x 1¼ in. angles. The outside and end sheathing of these cars consist of a ⅛-in. steel plate, for the roof and hood sheets, steel plates



Steel Express Car; Delaware, Lackawanna, & Western.

of 1/16 in. thickness are used. Wood is used for the headlining for both the upper and lower decks and also for the interior finish of the cars. The floor is of wood, laid on No. 18 steel plates, with 3 in. x 2 in. angles for the floor beam supports. These cars are insulated with Resisto for the sides, ends, roof and headlining. Asbestos mill board is used for insulation between the lower floor and the steel floor plates, and Neponset waterproof Dyke felt is used between the upper and lower wood floors. The specialties on these cars include the Westinghouse air brake with air signal and the American slack adjustor. The Gold combination pressure and vapor system is used for heating. Gould couplers, Miner tandem draft gear and Standard Coupler Company's buffing mechanism are also applied. Pintsch gas is used for lighting.

SUPERHEATED STEAM ON MALLET LOCOMOTIVES.

The growth in favor of the Mallet locomotives in this country has been phenomenal. The realization of what could be accomplished by obtaining such an increase of capacity in a single unit caused them to soon be widely adopted. It was quickly found that the steam and water economies when using saturated steam were not in proportion to the great capacity. As a result designers quickly took advantage of the possibilities afforded by superheating. Two distinct methods of using superheat on Mallet engines have thus far been tried. First, by means of the initial or high pressure superheater; and second, by means of the receiver or intermediate superheater.

In the high pressure superheater steam is raised in temperature about 200 deg. or 250 deg. F. before entering the high pressure cylinders. This amount of superheat is sufficient to carry the steam through both the high and low pressure cylinders in an efficient manner. It also has the advantage over the receiver superheater of requiring a smaller amount of apparatus, and it can be arranged in a location and manner which results in a minimum amount of labor for maintenance. The apparatus is less bulky, and its mechanical features are more attractive from all standpoints than the receiver or low pressure superheater. It is possible, with this system, to obtain economies in the high pressure cylinders by the elimination of cylinder condensation which cannot be secured when saturated steam is used. With this design, no abnormal boiler construction is required such as might be the case when the larger intermediate superheater is applied.

During 1910 the New York Central, the Pennsylvania Railroad and the American Locomotive Company working together, conducted a very thorough and accurate series of tests of Mallet engines. The results are believed to be the most conclusive and reliable that have been obtained. They indicate in a striking manner the saving in coal and water and also the increase in draw-bar pull secured with this type of engine. An average economy of 28.3 per cent. in dry coal per dynamometer horse-power, which can be credited only to the superheater, was shown by tests made under speeds ranging from 12½ to 18 miles per hour. These figures were increased to 33.3 per cent. by the addition of a brick arch. It was also shown that the draw-bar pull was increased 12.4 per cent. covering the same range of speeds. The economy in fuel and increase in tractive power which were thus shown and which must be credited to the superheater, prove better than argument the desirability of its application to this most useful type of engine.

Another andvantage of the fire-tube type of superheater when used for Mallet engines, which is entirely apart from fuel economy, is the protection which this device affords against damage to the high pressure steam pipes, steam chests and cylinders, due to foaming, and the consequent large percentage of moisture which is carried past the throttle. That this percentage of priming is greater in the Mallet type of engine than in the older types, as a result of the greater length of the boiler together with the fact that high water adds to this percentage, makes the application of the fire-tube superheaters a means of preventing breakages and damage. It is practically impossible for water as a liquid to pass through a fire-tube superheater and reach the steam chests.

The operating limit of a Mallet engine is, in the last analysis, established by the capacity of the fireman, and by means of the application of an efficient superheater the capacity of the fireman, as measured by the draw-bar pull of the engine, is increased to even a greater percentage than the rduction in coal consumption. On many Mallet engines not provided with superheaters, the capacity of the fireman has been reached, with the result that the engines are operating continuously at a point far below their maximum efficiency. The superheater has been one of the useful means for eliminating this wasteful condition of operation. It is therefore safe to look for the steady growth in the number of Mallet engines equipped with this device during the next few years.





Two Views of the Master Mechanics' Grand March to the Pier on Wednesday Morning.

Those in the left-hand picture are Mr. and Mrs. Fuller, Mr. and Mrs. Bentley, Mr. and Mrs. Curtis, Mr. and Mrs. Wilden.

Conventionalities.

So they've gone and nominated Staff for president! What d'ye think of that!

George A. Post came down from New York Tuesday. Mrs. Post arrived yesterday.

Mr. and Mrs. Mark A. Ross, Chicago, are, as usual, at the Marlborough-Blenheim.

There has been much talk about the electric sign on top of the hippodrome on the Million Dollar Pier. It was made in England.

F. J. Bingham, who has made a study of car refrigeration for many years, is attending the conventions. He is staying at the Chalfonte.

J. F. Walsh, general superintendent motive power of the Chesapeake & Ohio, is said to have developed a strong liking for orange juice.

C. J. Olmstead, of the Westinghouse Air Brake Company, is here incognito. He is spending his time looking over the whole show, quietly but earnestly.

Mr. and Mrs. R. C. Vilas and Mr. and Mrs. W. A. Vilas are at the Marlborough-Blenheim. The former have been attending the conventions for a good many years.

A. W. Horsey, master mechanic of the Canadian Pacific at Farnham, Que., arrived Wednesday with his eleven-year-old son. This is the boy's second convention.

It is reported that First Boss B. M. Osbun and Second Boss John A. MacLean, who are attending these conventions for the first time, are nutty on one and the same subject.

Harry Finnell seems to have diminished neither in superficial area nor in that cheery good nature which makes him so thoroughly welcome at these conventions.

J. G. Bower knows a heap about fixing blown out automobile tires. In fact, one hot day recently he had an experience that was almost weird. Ask him to tell you all about it.

One of the stay-at-homes is Happy Steve McPartlin, who attended the conventions last year. He is a busy man both at his office and at his home, McPartlin, third, having arrived only a few weeks ago.

H. D. Taylor, superintendent motive power and rolling equipment of the Philadelphia & Reading, is the inventor of a new plan to evade the irrepressible supplymen. He is wearing badge 3182.

Conventions come and go, but Doc Bateman, like the tubes he sells, began well finished inside and out, is practically indestructible in service and is not attacked by either treated or untreated water.

Mr. and Mrs. George T. Anderson are, as usual, quartered at the Chalfonte. Mr. Anderson is the mechanical superintendent of the Chicago, New York and Boston Refrigerator Company and of the Whipple Car Company.

Henry Gardner, assistant superintendent of apprentices of the New York Central Lines, is stopping at the Traymore. Mrs. Gardner spent yesterday with him, but has hurried back home to look after the numerous children.

C. W. Beaver, who has just returned from a four months' trip to Europe, says that he preferred to miss the coronation of King George rather than miss the convention. He will return to England soon, to remain for a year or more.

Henry A. Hoke, assistant engineer of the Pennsylvania at Altoona, has been prevented from attending the conventions by a visit from the stork. The youngster is about a week old, and is in fine shape. Weight not mentioned.

James E. Forsyth, who has attended these conventions regularly for some years, is here in a new capacity, having been made president of the recently organized Mid-Western Car Supply Company. Mr. Forsyth is staying at the Chalfonte.

W. B. Hall, general storekeeper of the Denver & Rio Grande, is with us. Mr. Hall told Tom Purves that he had had any number of men offer to lend him a dress suit for the social functions—at which Tom at once joined the volunteer corps.

H. H. Vaughan, assistant to the vice-president of the Canadian Pacific, arrived Wednesday noon. He headed for the Million Dollar Pier after lunch, but was captured before he got very far and was carried off to the golf grounds. He will remain until Tuesday.

C. A. Dunkelberg, one of the most earnest workers on the entertainment committee, keeps up his habit this year of looking out for the interests of all. He is accompanied by Mrs. Dunkelberg, who is also a great help among those who dabble in society at these annual gatherings.

Treasurer Herbert I. Lord, of the executive committee of the Railway Supply Manufacturers' Association, has made a good record during the past year. He has established efficiency and scientific management in the treasurer's office of the association, although possibly he has not effected a saving of $1,000,000 a day.

H. C. Edson and Mrs. Edson are staying at the Traymore. Their children, F. H. Edson and Miss Eleanor E. Edson, are also in attendance; and while it is not their first visit at these meetings, it has been several years since the family has been able to attend as a unit, owing to college duties of the younger members.

E. W. Pratt, assistant superintendent of motive power and machinery of the Chicago & North Western, was accompanied to the conventions by Mrs. Pratt and Miss Pratt. They are at the Marlborough-Blenheim. Miss Pratt was not at the conventions last year and her many friends are glad to see her here again.

One of the most welcome visitors to the office of the *Daily* was E. W. Grieves. This is his twenty-sixth convention. Mr. Grieves was vice-president of the Master Car Builders' Association for seven years, and president for two, 1893-94. He lives in Baltimore and retired from railway service in 1897.

If you want to get something done, and done well, apply to the Bear Committee, Messrs. Phillips and Walker. We don't know which is chairman. Guess they're both chairmen; but Lou Phillips' name appears first because he is somewhat more weighty than Ed. Walker. At any rate, they got those d—— bears away from our front porch.

Cass Kennicott, "The Sun Never Sets on Kennicott," has 13 letters in his name, arrived in Atlantic City on June 13, on the M. M. and M. C. B. Pennsylvania special train consisting of 13 cars; was at once assigned to room 313 in the Traymore hotel; and made 13 new acquaintances before the sun had set on every one but him.

A. J. Farley, of the Chicago Railway Equipment Company, "Farmer" Farley, as he does not seriously object to being called, remains at his beautiful country home at Wheaton, Ill., this year. They do say that he is closely watching the mysterious and marvelous ways of a new calf, a thoroughbred named "Creco."

The presence of Mayor Stoy in the M. M. parade Wednesday morning was pleasing to all. Mr. Stoy, however, nearly missed his place in the line of march on account of a series of trifling

accidents and incidents which delayed his journey from home to the pier. But Mayor Stoy was there and in time; if it had been necessary he would have chartered a special aeroplane to keep his promise to the committee.

William Garstang, superintendent motive power of the Big Four, who is here with his wife and two daughters, has cultivated his goatee since the last convention, and his old friends will have no trouble in recognizing him again. By the way, have you noticed that Harry Vissering is trying to follow suit? However, the result is only a poor imitaton, and he refuses to be held for a royalty.

Mrs. Lee Parish is managing her husband on the bonus system. Their room at the hotel is equipped with a street car register. The bell is rung up once for every half hour he turns in before midnight, and is turned back two points for every half hour afterward. Just now he is ahead of the game. Whether he will be able to keep up the pace is a question. It is said that Harrington Emerson has been retained to figure up the bonus.

Jack Turner got up at six, intending to board an early train for Philadelphia. Some of the necessary articles of attire lay reposing comfortably in one of the drawers of his dresser. There had been a thunderstorm during the night, and it is thought that some of the storm crawled in through an open window. At any rate, it required the combined efforts of Jack and the hotel carpenter to release the imprisoned where-with-all.

R. D. Smith, superintendent motive power of the Boston & Albany, suggests that the stoker question should be considered on the basis of hand fired tractive effort. For instance, a fireman can maintain a fire to furnish 25,000 lbs. tractive effort for a period of five hours. For a shorter period, say two hours, he might be able to maintain it at the rate of, say, 60,000 lbs. The stoker can maintain the maximum tractive effort over the entire division. The suggestion is a good one, and well worth consideration.

Tim O'Brian, the auburn-haired shortstop of the Eastern base ball team, declares that he is out for the $50 Durham bull prize in Saturday's game. In yesterday's practice he lacked but a few yards of batting the ball against the bull sign on center field fence, and he feels confident that the prize is even now fairly well within his grasp. "Tim" is expected to give complete detailed advice to the umpires in next Saturday's game. The phonograph has nothing on "Tim." It has to be wound up. "Tim," never! He was born that way.

R. B. Kendig, general mechanical engineer of the New York Central Lines, is some pumpkins. At least that is what the supply fraternity thinks. Shaw, who deals in electric light when he isn't taking gas, happened to drift into Kendig's office at the tail end of a day when the string of visiting dignitaries had been impressively long. He sent in his card and waited. After Kendig had decided that Shaw's heels were real cool, he sent for him. And this was his greeting: "You will p-p-please p-p-pardon me for having d-d-detained you, Shaw, but I have b-b-been so b-b-busy today receiving vice-p-p-presidents that I just had to k-k-keep you waiting."

Captain Nellis, like lots of others, believes his eastern team will win Saturday's game. His confidence is based on the performance of one of his colts, George W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, in yesterday afternoon's practice game at Inlet Park. With two strikes and no balls called on him, Wildin laced the ball to deep center for a three bagger. But for the collapse of his belt buckle between second and third base, he really believes the hit would have been a home run. After a nine minutes' delay to take a full tank of water and to pump up his air, Wildin publicly announced he could repeat his achievement as many times, and at any old time, that he pleased.

The Symington contingent is well represented at this year's convention by five of the Symington brothers and several other representatives not answering to the name of Symington. The extremes of weight of the Symington aggregation are represented by the genial "Bill" Rosser at 350 lbs. and "Lil" Arthur Weston at 120 lbs. It is rumored about the corridors of the Brighton Hotel that a "catch as catch can" wrestling match is scheduled between Rosser and Weston in one of the Brighton bed rooms (time and place announced later). The prevailing odds are 10 to 1 on Rosser; but some of Mr. Weston's friends are taking the short end of the bet on tne assumption that Weston will slip under Rosser's belt and in some way "turn the trick." B. S. Johnson and M. K. Kimberly, who have recently transferred their headquarters and affections from the East to the West, will act as seconds for Mr. Rosser, while T. C. deRossert will be found in Mr. Weston's corner.

G. J. Hatz, master mechanic of the Union Pacific at Omaha, has a story on his friend, J. H. Nash, superintendent of shops of the Illinois Central at Chicago, that is too good to keep. It goes to show that even railway men are sometimes deceived by numbers. Mr. and Mrs. Nash were en route to the convention via the Pennsylvania. Mrs. Nash was suffering from a headache. Attentive Mr. Nash went quietly to the buffet to get a dose of bromo for her. On returning to the dimly lighted car he drew the curtain and said to the recumbent form in the berth:

"Here, Lill; take this."

Female voice: "What!"

Mr. Nash: "Take this, it will do you good."

Female voice: "I don't want anything!"

Mr. Nash: "Why, my dear, of course you do."

Female voice: "I tell you, if you don't go away and stop annoying me I shall call the conductor."

And Mr. Nash silently stole away. He had the right berth (as numbers go), but the wrong car.

This is the first year that either of the mechanical associations ever had as its president a railway officer bearing the title of "assistant general manager." This is now the title on the Union Pacific of C. E. Fuller, president of the Master Mechanics' Association. Mr. Fuller was given this title since his election as president of the Master Mechanics' Association as a result of the extension to the Union Pacific general offices within the last year of the Hine system of organization. Under this scheme of organization, which was devised by Major Charles Hine, of the staff of J. Kruttschnitt, director of maintenance and operation of the Harriman lines, radical changes are made in the titles of both division and general officers. On the division, for example, the engineer, master mechanic, division engineer and trainmaster become assistant superintendents; and in the general offices the superintendent of motive power, chief engineer and general superintendent become assistant general managers. The change is not merely one of title. The former superintendent of motive power, now assistant general manager, for instance, remains specially charged with the duties and responsibilities of the mechanical department, but his jurisdiction is also extended over other departments; so that if there is a wreck and he happens to be on the ground before the assistant general managers specially charged with operating matters he can take charge and give orders to men in any branch of the operating department. In brief, each assistant general manager, whatever his special duties, is the superior of every officer of lower rank and of every employee in the operating department, regardless of what special branch of the operating department he may be in.

The Exhibit.

At the exhibit of the Chicago Railway Equipment Company the fame of the Creco brake beam in foreign lands is indicated by the display of a diploma of merit recently awarded the company at the Buenos Aires Exposition.

One of the most attractive spaces on the pier is that of the Dearborn Drug & Chemical Works, Chicago. The man directly responsible for the pleasing result, is H. G. McConnaughy, manager of the New Jersey district of the company.

The Buffalo Brake Beam Company, New York, exhibit consists of truss and solid type of brake beams for freight equipment, truss type of brake beams with adjustable heads for high speed passenger equipment, and a full line of brake beam forgings.

Some ingenious models are being exhibited at space 236, by the Union Fibre Company, Winona, Minn. The model of the Brown collapsible tank is complete, showing the ice tank, bulkhead and non-splash drip pan as installed in refrigerator cars.

The Ewald Iron Company, Louisville, Ky., is represented at this convention by Baylor Hickman, president, St. Louis, Mo.; Stephen F. Sullivan, general sales agent, in St. Louis, Mo.; and R. F. Kilpatrick, sales agent, Louisville, Ky. This is Mr. Hickman's first visit to these conventions.

Besides the mechanical features of their exhibit, the Locomotive Superheater Company, of New York, has placed at the disposal of visitors a file of 300 of the representative daily papers of motive power centers. This file will be changed daily for 10 days, thus covering the entire convention period. Evidently the pleasure of obtaining news from home is amplified for those having other than purely literary tastes by the contents of numerous open cigar boxes, which are also displayed in the booth.

A new machine for driving staybolts with compressed air is shown at the Thor exhibit of the Independent Pneumatic Tool Company, Chicago. The Thor staybolt drivers are the result of several years of experimental work in the company's plant at Aurora, Ill., and in the various railway shops where they were tested out in practice. They are now in use in a large number of shops throughout the country. Many tests have been made with these drivers by the railways, and it is claimed that the saving is about 60 per cent. over hand work.

The ruby globes made of mica and exhibited by the Storrs Mica Company, Owego, N. Y., at space 601, are not the only globes made by that company of this same material. It also furnishes globes of a similar pattern in white, blue and green, and in fact can furnish any required color. The form of its new-style globe is claimed to give much better results than heretofore. The mica portion of the globe, flaring outward, prevents the deposit of smoke from the lantern flame from striking against the side of the globe and minimizes the amount of cleaning required. This shape of globe is also claimed to give an ideal shape to the flame of the lamp.

The representatives of the Standard Steel Works Company, Philadelphia, Pa., are making a lot of fuss over the small word "casting" that appeared yesterday in a statement giving the weight and dimensions of the large crusher ring that forms part of the company's exhibit, in space 9. They even went so far as to have "Not cast, but forged and rolled from solid ingot-weldless" painted on the rim of the ring, "that he who runs may read." The fact is, a ring the size of the one shown, 10 ft. in diameter, is not uncommon as a casting; but to roll one is unusual, and the Standard Steel Works Company included the piece in its exhibit as evidence of remarkable ability.

The Kewanee union testing machine at space 212, National Tube Company, Pittsburgh, Pa., is attracting much favorable attention. Many people who were satisfied users of the well-known Kewanee unions have been inclined to smile a little when the claim was made by the salesman that every Kewanee union was tested with 125 lbs. air pressure under water, and patronizingly say: "Now, that's all right. I know the Kewanee is a good union. I use it, and shall continue to use it; but don't expect me to believe you test *every* union before shipment. That's mere piffle." After viewing the Kewanee union testing machine in action, they invariably offer abject apologies and insist on reversing the usual order by offering the salesman a cigar.

The T. H. Symington Company, Baltimore, Md., is exhibiting a few designs of its journal boxes. For freight or passenger service the M. C. B. type lid with a heavy coiled spring is shown; and exclusively for passenger or locomotive tender service, the pivot type lid is shown. The principal features of the M. C. B. type lid used in freight service are that the spring exerts over double the pressure of the ordinary M. C. B. flat spring, and the lid hood makes a close fit all the way round the M. C. B. hinge lug on the journal box. The features of the pivot lid are the central spring pressure on the lid, a machine seat both on the journal box and the lid, and the interlocking fit of the lid to the hinge lug on the journal box. The lid joints on all Symington journal boxes are machined to exactly true surfaces.

Safety News, issued monthly by the Safety Car Heating & Lighting Company, New York, makes a strong bid for popularity with its Convention number. Aside from the usual descriptions and illustrations of Safety equipments, there have been injected into it some convention breezes. Ellis Parker Butler, the author of Pigs is Pigs, contributes an exaggerated view of railway standardization. He has used his well-known humorous style, illustrated by some clever pen and ink sketches. A wierd story, entitled Semelinsaniv musomnesitis, has been inspired by Mr. Brandeis' recent statements regarding railway management, and describes an extreme case of efficiency. The Safety company has emulated the *Railway Age Gazette* by placing copies of this periodical in a number of the hotels for free distribution.

The oyx-acetylene process of welding has been substantially advanced since the convention of last year. In space 660, Linde Air Products Company, Buffalo, N. Y., may be found the latest methods in every form of application to railway service. The welded locomotive firebox shown is a remarkable example of the economy and facility with which patches may be applied and cracks welded. Accurate data of the costs of the several operations illustrated in the structure of this boiler is furnished in pamphlet form. To those who have oxy-acetylene apparatus installed, or are contemplating such installation, the exhibit of the Linde company will be interesting as illustrating the development of the art, and by concrete example show the saving in time and labor effected in locomotives and car repairs by the use of the cutting and welding blow pipe.

The U. S. Light & Heating Company, New York, has adopted the widely used electric flash sign to demonstrate the regulating efficiency of its car lighting apparatus. At spaces 374-377 it has a sign abbreviating the name of the company thus: U. S. L. & H. Co., outlined with lamps which are comparable in numbers and voltage with the lamps in a standard railway car. The current is supplied by a standard U. S. axle generator which is run at varying speeds. The letters U. S. L., etc., are flashed in sequence until the sign is finished. Then the lights are extinguished; and after an interval the entire sign is flashed. A flashing timer automatically repeats the cycle over and over. The regulating duty imposed by this sign is fully

as exacting as that which can be obtained in an actual car installation. A full set of meters and a speed indicator calibrated in miles per hour show to visitors how the regulating apparatus copes with all the conditions imposed by varying speed and varying lamp load.

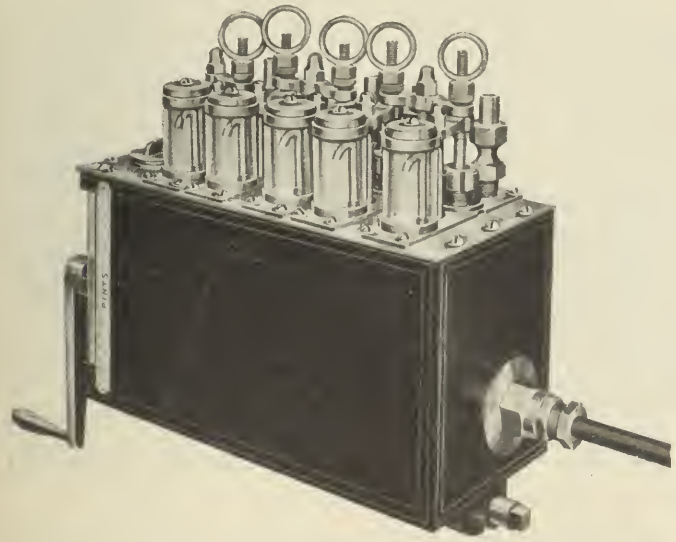
TITAN STEEL CASTING COMPANY.

The Titan Steel Casting Company, Newark, N. J. was organized last year to take over and continue the business of the Atha Steel Casting Company, makers of cast steel bolsters and other car and locomotive castings. Last November, Robert E. Jennings bought a considerable interest in the company, and undertook to reorganize it and add a department for the manufacture of manganese steel and special alloy steels. Charles W. Guttzeit was appointed general manager on January 1; Maunsel White, engineer, formerly of the Bethlehem Steel Company, is actively engaged in the production end at the plant; and Ebenezer Francis, formerly of the Pennsylvania Steel Company, is superintendent. Mr. Francis was the first man to make Manard manganese steel at the Pennsylvania Steel Company's plant at Steelton.

The plant will not be devoted to special steel castings only. It is understood that, besides the Titan cast steel bolsters, a Titan cast steel side frame will be made; also other specialties for the railway trade in the regular open-hearth and manganese steels. The company will build extensive additions to its plant.

McCORD LUBRICATORS FOR VALVES AND CYLINDERS.

A lubricating device, depending for its operation on the excess of boiler pressure over that in the steam chest, is seriously handicapped, if not rendered inoperative, when the latter pressure approaches or exceeds that of the boiler. Such conditions occur when a wide open throttle is maintained for any



Force Feed Lubricator for Cylinders and Valves.

length of time, and when cylinder compression takes place, at short cut off and high speeds. Wet steam locomotives may be run under such conditions 50 miles without any lubrication in the valves and cylinders, but with superheated steam very serious cutting will take place before 15 miles have been run. Consequently the increased use of superheated steam and the increasing size and weight of locomotives will make desirable the use of a positive lubricating device.

By the use of the McCord lubricator, made by McCord & Company, Chicago, locomotive mileage per pint of valve oil has, it is claimed, always been increased, in some cases as much as 60 per cent. It is recognized that the actual cost of lubrication is one of the smallest in the total cost of locomotive operation; but even here enough saving can be made to pay for the increased cost of the lubricator within a short time, while a much greater saving is accomplished in reduced fuel and repair costs by having locomotives perfectly lubricated at all times.

BOYER RIVET BUSTER.

The No. 2 Boyer rivet buster is exhibited by the Chicago Pneumatic Tool Company, Chicago. This tool is built along the lines of the Boyer riveting hammer, but is large enough to be used for cutting off rivets, breaking stay bolts, driving out frame bolts, etc. It resembles a cannon in size, yet it it claimed for it that it can be handled almost as easily as the riveting hammer, accomplishing the work at less than one-half the expense of former methods.

LAME LOCOMOTIVES.

A prominent railway man once made the statement that he didn't care if his engines didn't square up within 6 or 7 per cent. in full gear. Six per cent. on an engine with a stroke of 30 in. is 1.8 in., and 7 per cent. is 2.1 in. With this variation in cut-off one will find a greater variation in power exerted on the piston. If indicator cards were taken they would be found that the mean effective pressure would vary possibly 20 per cent. If the engine is on a hard pull, this variation in the cylinder power might cause the engine to stall; whereas if this weak side would do its part of the work the engine would pull over the hill without any trouble. On the other hand, if it is a fast passenger engine and she is out considerably in short cut-off, the high speed that the engine reaches causes an unbalanced condition in the machinery. An engine that is square within about 1 per cent. is better on a pull and will save in the wear and tear of the machinery at high speeds.

The Baker locomotive gear can be squared up within 1 or 2 per cent. The manufacturers have a full sized model on exhibition, which shows how nicely the gear squares up in both motions and why it squares up. It also demonstrates why it is that the angularity of the main rod does not materially effect this gear. The Baker gear is made by the Pilliod Company, New York, spaces 563 and 564.

TATE FLEXIBLE STAYBOLTS.

The round head bolt design of the Tate flexible staybolt, made by the Flannery Bolt Company, Pittsburgh, Pa., has strong sections of bolt area, capped over with sufficient clearance between the cap and the bolt head to allow for suitable adjustment to compensate for the difference in the amount of sheet expansion, affording a ready means of inspection. It has several sizes of sleeves to suit the various angles and sheet contours of boiler designs, adapted to take several diameters of bolt and affording interchangeability of parts. The difference between a two-piece flexible stay and one constructed in three parts is that the three-piece bolt affords easy inspection by the removal of the cap, thus exposing the staybolt proper, from outside of boiler to inside of fire-box, for the purpose of holding on for hammer test; and when fracture or breakage is discovered the bolt itself is simply removed and a new one installed at less expense than the rigid stay.

Tate flexible staybolts are claimed to reduce the resultant expense of staybolt renewals and the number of stoppings of engines for the purpose of renewing broken staybolts and repairing cracked fire sheets. The true sense of security depends not so much on the fact of knowing that a boiler is strongly stayed, as in the knowledge that all stays can be readily inspected at cer-

tain periods in fire-box service, and that bolts can be adjusted to compensate for inequalities of sheet expansion, thus relieving the rigid connections by rendering such less liable to excess stress in localities of rigid construction where constant staybolt breakage occurs. Five million Tate flexible staybolts are now used on over 200 railways. The results obtained are in proportion to the amount of care used in applying such and adjusting same to suit the conditions of sheet expansion. A new pamphlet dealing with the breakage of staybolts has just been issued by the Flannery Bolt Company, owner and manufacturer of the Tate flexible staybolt.

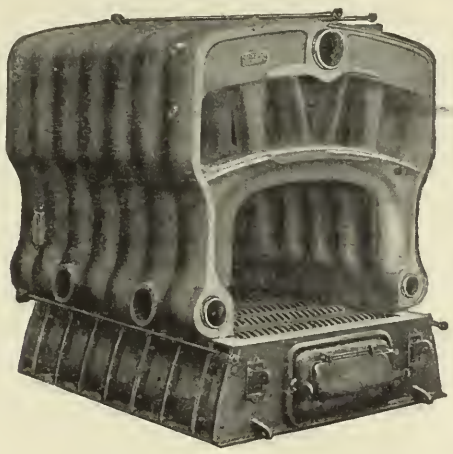
HIGH PRESSURE HOSE.

In booth 386 the Sprague Electric Works, New York, is exhibiting a new design of 1¾-in. air brake hose under conditions approximating those found in practice. The stands upon which the hose is mounted are equipped with the standard car couplers, and movable platforms are used in order to show the hose under the different working conditions. The 1¾-in. air brake hose with fittings as mentioned above is a new design, but the armor itself is about the same as that used in former designs, except that greater flexibility is provided. The main difference, however, lies in the method of clamping and the use of fittings that conform with standard M. C. B. practice. The clamping is done in the same manner as with the M. C. B. hose, but the M. C. B. clamp secures the hose and armor in such a manner as to obtain not only the customary anchorage, but an additional anchorage which will eliminate blow-outs, according to the claims made for it. This is accomplished by the M. C. B. clamp bearing upon a pressed steel clamp which secures the armor and engages with the head of the standard Westinghouse coupling and with a collar on the car end nipple.

This pressed steel armor clamp is part of the armor, and nothing is discarded when the armored hose is replaced with the M. C. B. hose. The many advantages of a properly armored hose are generally recognized, but until recently fittings for armored hose were not designed so as to be used with M. C. B. hose.

FURMAN BOILERS.

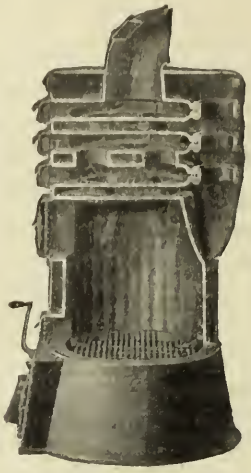
The Furman sectional boiler and round boiler, as made by the United States Radiator Corporation, Dunkirk, N. Y., are here illustrated. In addition to the Furman boiler, this company also makes the Capitol sectional boiler, the Capitol solar round boiler, the Sunray sectional boiler and the Winchester round boiler. All of these were originally produced by independent companies, and the advantages of consolidation have brought up their quality to an even higher level.



Furman Sectional Boiler.

Each has some distinctive points that make it particularly adaptable under certain conditions.

Different styles of United States boilers have been adopted by many railways for station heating. It is claimed that they are suited for this because of their ease of operation, their durability and their ability to maintain a water line in the steam boiler even under adverse conditions.



Furman Round Boiler.

ONE PIECE CAST STEEL TRUCK SIDE FRAMES.

Basic open hearth, thoroughly annealed cast steel having a high elastic limit is the only composition permitted to enter into the manufacture of the Bettendorf truck side frames. The Bettendorf truck side frame is in one piece, all its members corresponding to the arch-bars, columns, spring seat, journal boxes and brake-beam hanger brackets of the arch-bar truck frames, being cast in one integral casting.

An advantage of the one-piece truck frame is that of reducing the cost of maintenance. Where several men may devote all their time to these minor truck repairs in connection with the ordinary trucks, none are required with the Bettendorf. Where repairs are needed on the one-piece truck frame, they are caused by wreck or derailment, and not through the loss or failure to replace minor parts.



Bettendorf One-piece Cast Steel Truck Frame.

The truck frames are made to interchange with any standard design of truck. Any length of wheel-base, height of bolster, clearance above rail, or other requirement is possible without in any way interfering with the general features of the design.

The lower part of the frame is so designed that in case of derailment, it will skid over the road-bed and not tear up the track. The general design and distribution of metal is such as to resist all stresses and provide a high factor of safety.

The bolster opening is designed to accommodate any standard bolster, either the rigid or lateral motion type. A hole is provided in the spring seat of the frame, which is engaged by a round boss or projection from the spring plank. Flexibility in connection with the side frames of a truck in this manner overcomes rigidity to an extent that the truck is adjustable to track irregularities, reducing flange wear on the wheels and end wear on the brasses.

The journal boxes which are cast integral with the frame meet the M. C. B. requirements, taking M. C. B. standard bearings, wedges, and lids unless otherwise desired. In its early development, to overcome the fear that a slight injury, while in service, to one of the journal boxes, would render the entire side frame useless, they were furnished under the broad guarantee to replace the entire side frame at the price of a malleable iron journal box, if the journal boxes failed in normal service. This guarantee has been in effect seven years and it still stands. The Bettendorf Axle Company, Davenport, Iowa, is still awaiting an opportunity to redeem this guarantee.

COMMONWEALTH STEEL UNDERFRAME.

The steel underframe here illustrated has Commonwealth standard construction at each end, consisting of combined steel double body bolster and platform cast integral. These are connected by steel beams, which, with the Commonwealth cast steel needle beams and cross ties, form a strong and rigid underframe.

Each end of the underframe is one large steel casting, so the car is prevented from being knocked out of square when struck on the corners. This does not increase the height of the car. It is light and very simple. These steel underframes have been through many bad wrecks and have in every case done all that was expected of them in saving life and property.

It is not necessary to alter the wooden construction of old cars in order to apply this steel underframe. The old car is merely set down upon the new steel underframe and the sills bolted to it. It is therefore particularly well adapted for re-enforced old cars now in service, and as no special shop equipment is required to prepare it for use, it can be readily applied in any railway shop. The I-beam end posts are also easily applied. It is made by the Commonwealth Steel Company, St. Louis, Mo.



Commonwealth Steel Underframe.

NEWSPAPER ENTERPRISE.

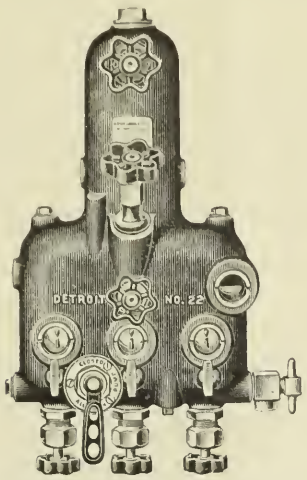
While full credit is due to the manufacture of the Creco brake beam, it has been due in large part to the energy of the staff of the *Railway Age Gazette* that the Creco aeroplane reached Atlantic City on time and without a mishap. Five A. M. is evidently too early an hour for those attending the Atlantic City conventions, as no one but Mr. Williams, of the Chicago Railway Equipment Company, and the staff photographer of the *Railway Age Gazette* were up at that hour, when the Creco aeroplane swung around over the Million Dollar Pier, under perfect control of the operator. That it was on hand at the time mentioned will not be questioned, as an excellent photograph of the machine in flight is reproduced on the outside back cover of the weekly issue of the *Railway Age Gazette*. The short time taken to develop the negative, print the photograph, make the necessary cut and get it into our June 16 issue establishes a new record for speed in journalistic work.

LOCOMOTIVE LUBRICATOR.

The Detroit Lubricator Company, Detroit, Mich., shows in its space 22, a bullseye lubricator with three feeds. This lubricator includes an oil control valve, which is placed in the oil passage between the reservoir and the sight feed regulating valves. This places in the hands of the operator an instantaneous means of starting, stopping or throttling the rate of speed, does away with the necessity of shutting off the feed regulating valves at a terminal, or in refilling on the road, and consequently the necessity of opening and readjusting these valves after refilling or at the commencement of a service movement. Under the method of closing, opening and adjusting the regulating valves, the frequency with which this occurred not only shortened the life of the device, but the length of time consumed in this operation made it impractical to require the operator to shut off his cylinder feeds during temporary stops, with the result that much oil was wasted and the oil mileage decreased. This oil valve has a lever handle and index plate, and is so designed that from the closed position, a half turn will open all feeds, or a quarter turn the feed to air pump only, and vice versa.

A small ball check has been put in the oil feed nozzle which will prevent, through the improper closing of the steam valve before the oil valve, the loss of oil from the reservoir due to

equalization of pressure. This check valve will also permit, in case of stoppage or an obstruction in the oil nozzle, blowing out of such obstruction by closing the oil valve and removing the center piece of the feed effected. The ball check can then be raised by a small wire. It has also been demonstrated that the placing of a check at this point prevents the passage of water from the sight feed chamber into the lubricator and that the water in the sight feed chamber remains much clearer than was otherwise the case. The oil valve positively controls the passage between the sight feed regulating valves and the oil

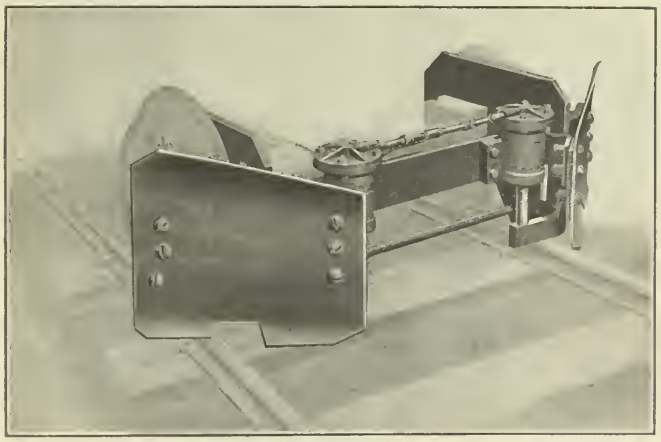


Bullseye Locomotive Lubricator.

reservoir. Consequently, if it becomes necessary, while the lubricator is under pressure, to make any repairs to the regulating valves, the closing of the oil valve will avoid the necessity for draining the reservoir, an operation always attended with more or less of oil and inconvenience.

SNOW FLANGERS.

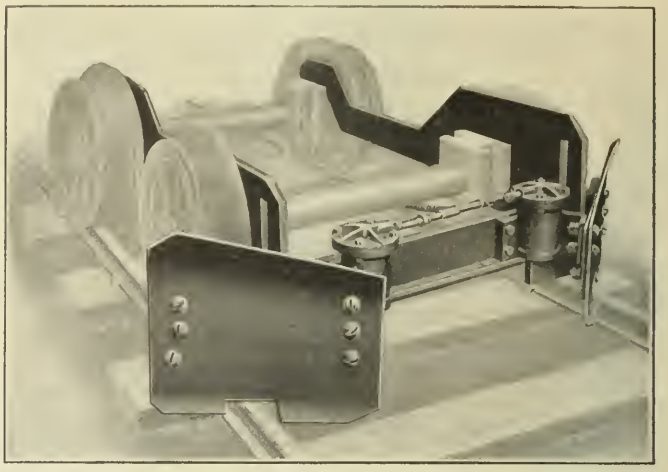
The Railway Appliance Company, Chicago, is exhibiting, at booth 312, a new development in snow flangers. The flanger exhibited is mounted on a truck which is equipped with means for raising and lowering the flanger blades by air, so as to illustrate the operation of the device. This



Snow Flanger Applied to a Pony Truck; Flanger Raised.

company has, for a number of years, made and sold the Priest snow flanger, but the type of flanger exhibited this year is the Ray self-contained flanger. The air cylinders for lifting the flanger blades are attached to the cross bars, and all parts of the flanger are hung upon and become a part of the truck. By reason of this arrangement all attachments or connections with the body of the engine are dispensed with and the entire mechanism is contained on the truck. Hence it may be applied either to engine trucks, tender trucks, freight car trucks, interurban electric cars or geared engines.

This device is simplified and the number of wearing parts is reduced. The accompanying illustrations show this flanger



Snow Flanger Applied to a Four-Wheel Truck; Flanger Lowered.

in the lowered position and in the raised position. The working sample on exhibition demonstrates that there is no shock or pound in the raising or lowering of the flanger, consequently no jar or wear on the truck. It can be located either as a forward or as a trailing flanger. A number of flanges of this new design were put in service last winter and an order for a lot is now in course of manufacture for application to new locomotives.

CAST STEEL BRAKE BEAMS.

The advent of the Westinghouse P. C. & L. N. schedules of air brake equipment created the demand for a stronger and better brake beam, the use of which would insure the full benefits and advantages to be derived by the adoption of this improved air-brake apparatus. To meet this demand the American Steel Foundries, Chicago, has, after many experiments and tests, brought out the Vulcan solid cast steel brake beam. Several of these beams are being exhibited by this concern. On account of the difficult conditions imposed on the designer by the small space available in most six-wheeled trucks, it becomes almost impossible to make a beam built up of several parts that will keep within the required minimum deflection under exceedingly heavy strains.

Besides being very stiff, the Vulcan beam is tough, and will bend rather than break under excessive strains. The truss being in a single piece, there are no joints to open or parts to work loose. If the beam will support a center load of 40,000 or 50,000 lbs. with not more than 1/16 in. deflection when it is put in service it will do just as well at the end of years of service. In addition to the Vulcan cast steel one-piece beam, the American Steel Foundries is showing various types of Hercules and Ajax trussed brake beams, suitable for passenger and freight equipment. While every effort is made to keep weights as low as possible, it has always been the policy of the company to put in enough metal to keep the stresses within safe limits, taking into account not only the direct loads which the beams are intended to carry, but also the various shocks and strains to which they are subject in actual service.

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IT was something of a disappointment that the committee on headlights was not prepared to make a report. Aside from the general interest in the subject the matter is of importance because of the legislation that has been passed fixing certain minimum headlight powers and of the variations in the requirements of different states by which the operation of a road and some lines is variously affected. At least a full statement of the pros and cons of high and low power headlights should be made at the earliest opportunity in order that there may be on record a clear and clean-cut authoritative statement of the value of the various headlights for their intended purposes. Regardless of what that statement may be, it will be authoritative if it receives the sanction of the Master Mechanics' Association and could hardly fail to have an influence on state and federal enactments, and weight with the courts. On this basis it is to be desired that there should be a report of such a character that the whole headlight situation would be made clear, and that as soon as possible.

IF a daily paper is to be the echo of public sentiment, it is appropriate that the *Daily Railway Age Gazette* should be the echo of sentiment of the golden opinions won by Mr. Fuller, as the presiding officer of the Master Mechanics' Association. Comments on the admirable way he handled the convention have been widespread, and there has been a full appreciation of the skill with which he kept matters moving, and moving rapidly, from start to finish. Yet there was never the slightest appearance or suggestion of hurry. No one felt that his desire or ability to talk was curtailed, nor was the debate cut off until all had had full opportunity to be heard. On the other hand no time was wasted. The moment it was apparent that the last word had been said, a subject was closed and the next was speedily in course of presentation. Whether the presiding officer could foresee what was coming, information is wanting, but there seemed to be a balancing of subjects, either through skillful adjustment or manipulation, by which any encroachment on the time allotted to one subject by another was made up later, with the result that each day's work was finished on time and each committee had the satisfaction of having its report fully discussed. The beauty of it is that the presiding officer did not seem to have anything to do with it, and that matters appeared to flow on smoothly without any interference or even guidance on his part. But to those who watched it was evident that there was a steady, though almost unseen, hand at the helm. Mr. Fuller won laurels and touched a high point as a presiding officer.

WE often hear of locomotive repair plants being remodeled or extended to take care of increased business. Usually the machine, erecting or boiler shops are the ones which are most greatly in need of this. Very seldom is it true of the blacksmith shop. The reason for this must be credited largely to the introduction of forging machines in recent years. The home-made bulldozer was first introduced by some of the more progressive foremen. It was followed by the forging machine, but for quite a period very few foremen seemed to comprehend how it could be used to the best advantage. The secret of the success of these machines finally proved to rest almost entirely in the amount of ingenuity possessed by the man who had charge of designing and making the dies; and at the present time really wonderful results are being obtained, the most intricate pieces often being formed at one heat and in a single operation. In some cases the manufacturer has been agreeably surprised to find a railway doing work of the machine. A good forging machine supplied with a proper furnace will, on the average, do the work formerly requiring 12 fires, with a smith and helper at each. It is little wonder, then, that in most cases the smith shop has remained undisturbed while the other departments have had to be extended.

THE three reports on contour of tires, on specifications for tires, and on flange lubrication, were properly grouped together on the programme, as they are in a measure interrelated. All have to do with tire wear, and particularly with the expense for tire maintenance and renewal. As to the form of contour for locomotive driving tires, it is not at all certain that this should be the same as the M.C.B. 1909 standard, which the report recommends. The discussion developed some very sound objections to it, particularly on the matter of expense for turning off so much steel for the tapered tread which might be better utilized in rendering further service. The short flange, 1-in. deep, with rounded end, should assist the manufacturer in the rolling of tires which do not develop

cracks at the point, as the sharper and deeper flange does frequently. A flange only ⅞-in. deep, has been used successfully by some lines while others cannot use it on account of derailment. This indicates that tire practice in this and several other respects depends on local conditions, and it may not be wise or profitable for all lines to adopt the one standard contour as recommended by the committee. It is claimed for the taper of tread of one in twenty that it causes the wheels to run with flanges away from the rail and thus prevents excessive flange wear, and this may generally be true; but it is not necessarily the most economical practice for some roads. The excessive taper of the tire rim does not seem to be always desirable in returning tires, as a flatter section would give longer service, and good practice with driver brake shoes should prevent the formation of double flanges. The tire rim, instead of being turned off by the lathe, should be utilized in furnishing metal for the wear due to brake shoes. The preliminary specification for steel tires presented is a very good one and properly includes a destructive drop test, a feature which has been in use for many years by foreign railways, but for some reason has never come into use here. This destructive test need not be generally used, but by making it one of the requirements in an occasional large order would doubtless result in valuable information for the manufacturer and assist him in improving the quality of tires. The report on flange lubrication is an admirable one, which will advance a practice sure to accomplish large economies in tire maintenance. It does not refer to the liability of lubricating the top of the rail and thus reducing adhesion of drivers, a matter which is quite possible with the careless use of flange lubricators and one which should be prevented by proper rules and careful practice.

THE discussion yesterday regarding locomotive boiler inspection and safety appliances manifested clearly the strong desire that railway officers have to co-operate with the officers of the state and national governments in carrying out the laws that have been enacted for the regulation of these matters. There were almost no expressions of discontent because the policy of regulating railway mechanical affairs has been adopted. A feeling was shown, however, that the new legislation has put railway officers in a trying position. There is always difficulty in adjusting any industry to a new form of governmental control; and the difficulty in the case in question has been enhanced by the fact that neither the requirements of the states nor of the nation are thoroughly understood, and that in not a few instances they are inharmonious or conflicting. In these circumstances it is to be hoped that the government officials will deal with the situation in the same spirit in which the railway officers are disposed to meet it. All the rough places can be measurably smoothed over if all the interested parties will approach the subject with a disposition to secure nothing more, less nor other than the result that the laws are designed to accomplish, viz., the increase of safety in transportation. If we may judge from all that is being said and done by railway men, there is absolutely no disposition on their part now either to resist or to the slightest degree to evade these statutes. And if there shall be shortcomings in their compliance with them they will probably be chargeable to defects in the laws themselves or to misunderstanding of them; and these things furnish reasons for further conference between them and the officers of the government, not for setting in motion the machinery of the courts.

FOR the second time within three years an English-born president has been selected to head the Master Mechanics' Association. H. T. Bentley, assistant superintendent motive power of the Chicago & North Western, who was elected to fill that position yesterday was born in London, England, in 1863, and was educated at Dulwich College, near London. In 1877 he entered the service of the London & North Western at Crewe, England, as an apprentice under F. W. Webb, who at that time was chief mechanical superintendent. H. H. Vaughan, who was president of the association in 1908-9, was also born in England, at Forest Hill; he was educated at King's College, and was employed by both the Manchester, Sheffield & Lincolnshire and the London & South Western before coming to this country. Mr. Bentley remained at Crewe as an apprentice and journeyman for ten years and was then promoted to shop foreman of the locomotive department at the Chester shops of the same road. In the fall of 1892 he came to this country and entered the employ of the Chicago & North Western. He worked in the Chicago shops for ten days and was then sent to take charge of the enginehouse at Boone, Iowa. In 1895 he was promoted to general foreman, in charge of the shops and enginehouse at Belle Plaine, Iowa, and in 1898 he was made general foreman of the Clinton, Iowa, shops. His next promotion was to the position of master mechanic, in charge of the Madison division, with headquarters at Baraboo, Wis. His splendid work on this division resulted in his being placed in charge of the largest division on the road—the Iowa division—with headquarters at Clinton, Iowa, on January 1, 1900. Two years later, in 1902, he was made assistant superintendent motive power, with office at Chicago, which position he now fills. That he has remained so long with the Chicago & North Western is not because he has not received the most flattering offers from other roads, but because that road has made an extra effort to make him stay. Mr. Bentley has a kind and genial disposition and at the same time is a man of force. This, combined with a goodly supply of tact, is responsible for his success in getting along with men and of having them measure up to their responsibilities and requirements. His success is also due in a large measure to the fact that he enjoys detail and goes into things thoroughly before making a decision. This does not prevent him from dispatching his work quickly. His ideals are extremely high, and, as Mr. Quayle says, "he would rather be right than president." The association is fortunate in securing just at this time, which, in many respects promises to be a most critical period in the life of the association, a man so well equipped, both by experience and personality to take the leadership. The *Railway Age Gazette* joins heartily in wishing him a most successful and fruitful administration.

THE RAILWAY AS A MANUFACTURER.

AT the recent meeting of the Railway Storekeepers' Association at Milwaukee, in addition to other papers of more especial interest to the stores department, five papers on the general topic of "The Railway as a Manufacturer" were read. It is instructive to find that not one of the authors favored the railway being a manufacturer. The storekeepers themselves have been responsible for the manufacture by railways of numerous small articles which they could get promptly when needed, but the writers of these papers all said that it is bad practice and not often economical. Others in the stores department and in the mechanical department may not agree with this, and may favor the manufacture in the railway shops of many articles which are specialties in the trade.

On most railways the number of these shop-made articles could be reduced, and the list should be gone over systematically by the store and mechanical departments with the object of determining accurately what items can be made to advantage by the railway and what should be purchased from the regular manufacturer. This would result in a more careful scrutiny of the cost of manufactured articles, and a standing committee of the Railway Storekeepers' Association should report from time to time on articles which should be dropped from the list.

Conditions are constantly changing and always in the direction of the production of more specialties by intensified and economical methods of manufacture with which the railways are not familiar and which, for obvious reasons, they do not and cannot use. At one time it was necessary for railways to make some fixtures because they were not made of proper grade in

the industrial factories, but today most of them are made better and cheaper than they can be produced by the railway repair shop. The railway wheel foundry and iron foundry are almost things of the past, and the brass foundry is becoming a less important adjunct than it formerly was. Brass goods, valve checks, cocks, injector parts, air brake parts and the brass trimmings for passenger cars can all be produced by the ordinary factory much cheaper than by the railway shop, and if the railway can buy them even at the same cost as they can make them themselves it is good policy to do so.

The prevailing opinion among the storekeepers is that, almost without exception, any article made in railway shops today can be bought for the same cost elsewhere. Only such material as is required in small quantities and can be handled satisfactorily with ordinary shop facilities should be made in the repair shop, and when any commodity can be obtained from the manufacturer at a reasonable cost it is more economical to purchase it.

In the making of tinware, piston packing, locomotive and car springs, crank pins, etc., the railway cannot compete with concerns which make a specialty of manufacturing such articles, and there are few things used by railways in the economical production of which the manufacturer does not have the advantage. Two things have contributed to bringing about this condition: First, the growth and development of factories and factory methods; second, the increase in the number of cars and locomotives on every line to such an extent that under normal conditions of traffic the shops are fully occupied in maintaining the equipment. The managers are urging the master mechanics and shop superintendents to bend their energy toward a greater output of repaired cars and locomotives, and they do not find spare time to properly attend to the manufacture of miscellaneous materials for store stock. They do not, therefore, have the same interest in manufacturing and would prefer that such supplies be purchased, so that the shop is relieved of that amount of work and the time and attention is given to equipment repairs.

Unless the manufacture of miscellaneous supplies is placed on a factory basis and kept separate from repair work, it cannot be done so cheaply as to compete with the manufactory, and it interferes in many ways with the course of repairs through the shop. The manufacture of complete locomotives or cars is a larger question, which has been already decided by most lines, which have abandoned such work; but it still can be carried on to a limited extent by larger shops where it is desirable to retain a supply of well-trained skilled mechanics, who would always be available when there is a rush for repair work. At the smaller shops labor conditions are often such that it is found best to employ as few men as is actually necessary for repairs, and this precludes the possibility of any new construction work.

Taking the question in general, as applied to the average railway repair shops, the tendency is more and more toward the purchase of most supplies, and it is fortunate that when these shops are so fully occupied with their proper and legitimate work that it is now possible to purchase many miscellaneous supplies, formerly made in the shop, with prompt delivery and at satisfactory prices.

TODAY'S AND SUNDAY'S PROGRAMS.

SATURDAY.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Base Ball Parade, 2.00 P. M.—Million Dollar Pier to special trolley cars.

Base Ball Game, 3.00 P. M.—East v. West, Pennsylvania Railroad Company's Inlet Park Base Ball Grounds. Free trolley cars for those wearing the official badge. Music by Railway Supplymen's Band.

All Star Vaudeville Show, 9.00 P. M.—At Apollo Theatre. Direct from Keith & Proctor's Fifth Avenue Theatre, Percy G. Williams' Colonial Theatre, Hammerstein's Victoria Theatre, New York City.

SUNDAY.

Concert by Marlborough-Blenheim Orchestra in Blenheim Exchange, 11.00 A. M.

Prelude and Intermezzo from "Cavalleria Rusticana" *Mascagni*
The Last Hope *Gottschalk*
Grand Fantasie, "Carmen" *Bizet*

CELLO SOLO

Nocturne *Chopin*

MR. LEO SACHS

a Humoreske *Dvorak*
b The Lost Chord *Sullivan*

VIOLIN SOLO

Paraphrase, "Die Meistersinger" *Wagner*

MR. J. KINSBERGER

Fantasie, "Rigoletto" *Verdi*
Ave Maria *Gounod*

Concert by Marlborough-Blenheim Orchestra, in Blenheim Exchange, 8.00 P. M.

Overture, "William Tell" *Rossini*

PIANO SOLO

Fantasie, "Faust" *Gounod-Liszt*

MR. HENRY GRUHLER

Fantasie, "Tannhauser" *Wagner*

CELLO SOLO

Hungarian Rhapsody *Popper*

MR. LEO SACHS

Meditation from "Thais" *Massanet*

VIOLIN SOLO

Gypsy Airs *Sarasate*

MR. J. KINSBERGER

American Fantasie *Herbert*

THE RECLAIMING SCRAP MATERIAL COMPETITION.

The success of the competition on Reclaiming Scrap Material, which has been announced in the Shop Section of the *Railway Age Gazette* to close July 15, promises be one of the most successful competitions yet held judging from the number of those who have dropped in to say that they expected to send in contributions.

ENROLLMENT COMMITTEE ANNOUNCEMENT.

Chairman Ostby has arranged to open the enrollment booth on Sunday, between 11 A. M. and 1 P. M., and from 4 to 7 P. M. This will give those who arrive on that day an opportunity to register.

On Saturday the hard workers on the committee will take a half day off to see the ball game. The booth will be open only from 9 A. M. to 1 P. M.

MAIL DISTRIBUTION.

Secretary Conway has arranged to deliver all mail addressed to the pier, so that hereafter it will be unnecessary for members of the Railway Supply Manufacturers' Association to call at his office.

RAILWAY CLUB SECRETARIES.

Members of the Society of Railway Club Secretaries are again reminded of the annual meeting which will be held at the Hotel Brighton, Saturday morning at 10 o'clock. The annual dinner will be held in the garden of the Hotel Windsor at 7.30 in the evening. If the weather is unfavorable it will be held inside.

VAUDEVILLE ENTERTAINMENT: SPECIAL NOTICE.

The entertainment committee wishes to remind members and guests that admission to the Vaudeville at the Apollo Theatre to-night will be by *official badge only*, and it is urgently requested that badges be worn in *plain sight*.

Don't forget your badge; it is your ticket.

TO-DAY'S BALL GAME.

The annual ball game in connection with the conventions will be played at the Pennsylvania Railroad's Inlet Park grounds this afternoon at 2 o'clock.

The parade will be formed at the entrance to the million Dollar Pier at 2 P. M., and will proceed from there to New York avenue, where trolley cars will be provided to take the entire crowd to the grounds. The parade will be led by Mayor Stoy and the chief of police, and will be composed in addition as follows:

Eight police officers.

Base ball band.

Base ball teams.

Girl rooters for east and west, with their cheer leaders.

Members of the conventions' associations, ladies and guests in roller chairs and on foot.

The teams will be composed as follows; they will bat in the order in which their names are given:

EASTERN TEAM.

Third base, Clifford Beaumont (B. & O.), Baltimore, Md.

Short stop, Leonard J. Hibbard, Leonard J. Hibbard Co., New York City.

Second base, T. P. O'Brian, O. M. Edwards Co., New York City.

Center field, B. K. Stephenson, Griffin Wheel Co., Boston, Mass.

First base, George Wildin, Mech. Supt., N. Y. N. H. & H., New Haven, Conn.

Right field, Frank Martin, Jenkins Brothers, New York City.

Catcher, Harvey C. Oviatt, Gen. Insp., N. Y. N. H. & H., New Haven.

Left field, F. M. Nellis (captain), Westinghouse Air Brake Co., Boston, Mass.

Pitcher, C. A. Jeffrey, Baltimore & Ohio, Baltimore, Md.

Substitutes—George H. Nichol, Johns-Manville Co., Baltimore, Md.; Charles Gilman, Q. & C. Co., New York City; Henry B. Bradford, Westinghouse Air Brake Co., Boston, Mass.

WESTERN TEAM.

Short stop, Jas. E. Tarleton, Union Draft Gear Co., Chicago.

Third base, Sheldon C. Potter, Reliance Electric and Eng. Co., Cleveland.

Second base, Stanley W. Midgley, Curtain Supply Co., Chicago.

Center field, Neil W. Snow, Detroit Twist Drill Co., Detroit.

First base, Harry S. Hammond (captain), Pressed Steel Car Co., Pittsburgh.

Left field, T. O. Sechrist, M. M., C. N. O. & T. P., Somerset, Ky.

Pitcher, C. S. Schwartz, St. Louis Refrigerator Car Co., St. Louis.

Catcher, Geo. Gallinger, Independent Pneumatic Tool Co., Pittsburgh.

Right field, Adam La Mar, Penn., Fort Wayne, Ind.

First base, J. F. Strieb, Pressed Steel Car Co., Pittsburgh.

Right field, Wm. H. Allen, C. H. Besley & Co., Chicago.

Third base, J. H. Nash, Illinois Central, Burnside, Ill.

Second base, I. S. Downing, M. C. B., L. S. & M. S., Cleveland.

Right field, B. H. Forsyth, Ford and Johnston, Michigan City, Ind.

Left field, Wm. Wilson, Flannery Stay Bolt Co., Chicago.

Harold E. Oviatt, mascot eastern team.

Charles E. Fuller, Jr., mascot western team.

——— Steele, mascot eastern team.

Harry Fuller, cheer leader, western team.

H. E. Passmore, T. & O. C., umpire, west.

W. E. Cade, Franka Barbey Co., umpire, east.

The official score card keepers will be Louis Pelletier, *Machinery*, and Harry O. Fettinger, Clement Restein Company.

The make-up of the mysterious base ball band—mysterious now no longer—will be as follows:

J. Will Johnson (leader), Pyle National Electric Headlight Co., cornet.

Charles J. Pilliod, Pilliod Brothers Co., Bb clarionet.

Mark A. Ross, Pyle National Electric Headlight Co., cornet.

George W. Bryant, Thos. Prosser & Son, alto.

W. E. Sharp, Armour Lines, alto.

W. W. Rosser, T. H. Symington Co., bass.

Jos. W. Taylor, secretary M. C. B. and M. M. Associations, baritone.

Fred M. Nellis, Westinghouse Air Brake Co., slide trombone.

C. W. Bird, Jenkins Bros., snare drum.

F. L. Gault, Nathan Mfg. Co., slide trombone.

Joseph Violande, Crane Co., bass drum.

Philip Sreda, American Arch Company, E clarionet.

There will be two teams of rooters, composed of 20 ladies, 10 representing the west and 10 the east, and each team will be inspired to greater efforts by the cheers of these rooters, who will be led by cheer leaders. The rooter team for the east will be seated on the right of the grand stand, facing the grounds, the rooters from the west on the left of the grand stand, and the band in the center.

The committee in charge of the game is composed of Charles M. Knill, Chas. H. Besly & Co., chairman; Fred M. Nellis, Westinghouse Air Brake Co.; Harry S. Hammond, Pressed Steel Car Co.; Thomas Farmer, Jr., Consolidated Car Heating Co.; Herbert Green, Burton W. Mudge & Co.; W. S. Furry, Ohio Injector Co., and Frank Martin, Jenkins Bros.

VAUDEVILLE AT THE APOLLO THEATRE TO-NIGHT.

An all-star vaudeville show will be given to-night at the Apollo Theatre, on the Boardwalk, between New York avenue and Kentucky avenue, for persons attending the Conventions. The players will be direct from Keith & Procter's Fifth Avenue Theatre in New York, and are said to constitute the strongest group of vaudeville players ever got together for entertainment of this kind. Admission will be by badge. The show will begin at 9 P. M. The program will be as follows:

1. Overture—Orchestra, direction of Henry Conrad.

2. Rice, Sully and Scott, Original Eccentric Comedians.

3. The Courtney Sisters, introducing a somewhat different Singing Act.

4. Howard, the Scotch Ventriloquist, in a Comedy Sketch entitled "A Visit to the Doctor's Office." Cast: McGregor, by himself; Jimmy, by himself; The Doctor, Howard.

5. E. Frederick Hawley, Frances Haight and Company, in the dramatic playlet, "The Bandit." Cast: Cochiso Ramando, the Bandit King, E. Fred. Hawley; Jose Travenia, his Body Servant, A. McKaskill; Marie, the Captive, Miss Frances Haight; period, 1870; season, fall; time, morning.

6. Jack Wilson, the Inimitable Comedian, assisted by Miss Ada Lane and Franklyn Beattie in "An Upheaval in Darktown."

7. "Top o' the World" Dancers and the Original Famous Collie Ballet in A Dancing Novelty. Cast: The Doll Princess, Vivian Ford; Peppermint Kid, Harry Ali; Jack in the Box, Bobby Nolan; The Polar Bear, Harry Hewitt; Kris Kringle, Dixie Kirkland; Dancing Boys, Bobby Nolan, Harry Ali, Dixie Kirkland, Walter Burke; Dolls, Jean Barnett, Goldie Stover, Marie Savage, Olga Fayette, Mable Burke, May Lane, Gertrude Rutledge, Grace Townsend; Collie Ballet, Goldie Stover and Sunny Jim, Jean Barnett and Snow Boy, May Lane and Bebe, Marie Savage and Tip, Olga Fayette and Collo, Gertrude Rutledge and Frost King.

Proceedings.

President Fuller called the third and final session of the Master Mechanics' Association to order at 9.30 Friday morning. The Auditing Committee reported that the books and vouchers of the Secretary-Treasurer were correct.

SAFETY APPLIANCES.

The committee on safety appliances has carefully considered this important subject in the limited amount of time that it has had since the issuance of the order of the Interstate Commerce Commission in the matter of United States Safety Appliance Standards, dated March 13, 1911, which is a modification of the original order issued October 13, 1910. The United States Safety Appliance Standards prescribed in the Interstate Commerce Commission's order of March 13, 1911, must be applied to all equipment built on or after July 1, 1911. As to applying the United States Safety Appliance Standards prescribed in the Interstate Commerce Commission's order of March 13, 1911, to equipment built prior to July 1, 1911, the order of the commission prescribes the following:

"Carriers are granted an extension of one year from July 1, 1911, to change switching locomotives to comply with the standards prescribed in said order.

"Carriers are granted an extension of two years from July 1, 1911, to change all locomotives of other classes to comply with the standards prescribed in said order."

The committee then inclosed the standards prescribed by the commission, with which railway men are already familiar.

The matter of appending to this report drawings or cuts showing the manner of application of these safety appliances was considered by the committee, but owing to the various local conditions and practices to be met by the various railways of the country in applying these standards, and also to the limited amount of time in which to gather the requisite information since the issuance of the final order of the Interstate Commerce Commission, the committee has not prepared drawings or cuts.

The report is signed by:—Theo. H. Curtis (L. & N.), chairman; M. K. Barnum (I. C.) and C. B. Young (C. B. & Q.).

Mr. Curtis (Chairman of committee): Referring to the Interstate Commerce Commission standards for steam locomotives in road service and the location of the sill steps, there have been a great many questions asked as to where the roads are going to place this sill step. The order is very plain that it must be outside of the rail, and not over 16 in. above it. It may be placed on the face of the bumper beam, or it may be placed on the rear of the bumper beam, or it may be placed on the pilot; so long as it is outside of the rail and not over 16 in. above the rail, it complies with the law. There are some railways that use this step entirely, where the clearance will permit it, on the rear of the bumper beam. Other railways use it and have the same attached to the pilot. Some are applying it on the face of the bumper beam. I wish to call your attention to the fact that this sill-step is to have a metal tread 8 in. by 10 in. It says it also may have a wooden tread. My interpretation of this is that sill step must have a metal tread. If you wish to put a wooden tread on top of it you can.

The pilot beam handholds and rear-end handholds for steam locomotives in road service are to be ⅝ in. in diameter with a minimum clear length of 14 in., preferably 16 in., and minimum clearance of 2½ in. The end handhold for steam locomotives used in switching service must be 1 in. in diameter, with 4 in. clearance, except at coupler casting or braces, when minimum clearances shall be 2 in. Under the location we learn that this handhold shall extend across the front end of the locomotive, in the rear of the tender. You will note that the road engine has a different handhold from the switch engine. There is nothing said in the order as to when the road engine becomes a switch engine, but it is reasonable to understand that a road engine could not switch too long and not become a switch engine; therefore it becomes almost necessary to equip your road engine as a switch engine in order that you may transfer a road engine to switch engine service. The handholds on a switch engine would be permissible on a road engine, but the handholds on a road engine would not be permissible on a switch engine.

The important feature of the end clearance is the 14 in. from the vertical plane passing through the inside face of knuckle when closed with the horn of coupler against buffer block or end sill. There are exemptions made for air hose, steam hose and different appliances, but there are no exemptions made for bolt heads, rivets or push pole pockets. Therefore the matter stands about like this: There are 14 in. required by law; about half an inch will have to be added for contingencies, 3 in. will need to be added for push pole pockets and other parts of the tender that are not exempt, and 2 to 3 in. clearance must be added for compression of the spring, making a total distance of about 20½ in. from the end sill to the inside of the knuckle. Now, this is a very long overhang to maintain on a switch engine. Especially is this so when it is required on a switch engine, and a road engine may be made a switch engine almost momentarily. So it becomes practically necessary to equip a road engine with a very long distance between the knuckle and the end sill. With this long overhang, or distance, we begin to have some more trouble. The uncoupling lever arm will be very long, it may be 15 to 18 in. long. In fact, it is so long that it is very hard to lift the knuckle. This uncoupling apparatus must extend near the full width of the tender; there is very little allowance left. There is nothing said in the law as to the length of the arm on the outer end of the uncoupling lever as it applies to locomotives, but there is as applied to cars. It is open to reasonable interpretation that this lever must not be too long. If it is too long, when the trainman on one side of the tender or pilot raises the uncoupling lever the long handle will stick out on the other side and perhaps injure a fellow-trainman.

These difficulties must needs be obviated after a very careful study of this safety appliance question and after, I might say, a conference of your best men in an endeavor to ascertain how it can be applied to your locomotives. I have held several of these conferences with the officials of the road with which I am connected, and we feel that we have learned a great deal about the application of safety appliances, but we believe there is still much more to learn.

DISCUSSION ON SAFETY APPLIANCES.

The President:—A serious question in connection with this subject is the length of the draw bar head to obtain the 14 in. clearance, especially on the rear of the tender where you have been using the M. C. B. standard coupler. You have either got to lengthen out the head, or you have got to move the draw bar and draft rigging out, and I think we ought to arrive at an understanding of the best method of taking care of this clearance, with as few couplers as possible. In interchange work, this question does not enter into that, but there is no necessity of perpetuating a dozen couplers if two or three will answer the purpose.

W. E. Dunham (M. P. & M.):—The Committee on Standards of the M. C. B. Association had this matter under consideration, and the committee was informed that a Special Coupler Committee of the M. C. B. Association was figuring on a longer head to take care of this clearance.

G. W. Wildin (N. Y. N. H. & H.):—That is what the Coupler Committee will report at the Association meeting next week, and I think that whatever action is taken by that association will apply so far as the length of the coupler is concerned to the switching locomotive as well as the cars. The only thing that is troubling the committee is to get some idea as to how many standards will be necessary. We have not been able to get the information from the various roads as to their clearances. Until we do have that information we shall be unable to sum up and say how many standards there will necessarily be.

C. A. Seley (C. R. I. & P.):—In regard to fitting up of our equipments to meet these requirements, my thought is that the switch engines should be considered first, for the reason we must have them equipped within a year, to comply with the law; and then comes about the idea that road engines are used in switching service very extensively, and while we have two years on them, we ought not to neglect the thought that possibly switch engines and road engines should have the same equipment. I am referring to the end handholds particularly. Probably what we shall do will be to put stands on the ends of the buffer beams 6 in. apart, to receive a piped handhold pinned to these stands, with an opening in the center for the uncoupling frame, and have the uncoupling lever inside the pipe. It makes a very neat arrangement. So far as I can construe the law it will fulfill the law. It is applicable both to switch and road engines, and so far as we had the thing figured out when I came away, that is about where it will land if we do not change our mind. That is my thought up to the present time. The fitting up of road engines so as not to make a violation under the heading which is used in these rules, not "switching engines," but engines used in switching service, is pretty

broad, and I do not know whether we could plead temporarily as a bar to that, so I think it is very important, indeed, that the road engines be fitted up on the switch engine lines in so far as handholds and clearances are concerned. We have found considerable advantage in our design of front ends of switchers on account of having a tapered buffer beam, that is a bowed front, which gives us better clearance out where the man stands in relation to the coupler lengths than where you have a straight design.

J. H. Manning (D. & H.): I think it would be a serious mistake on the part of this association to introduce another M. C. B. coupler to take care of the end clearance on locomotives as well as cars. I think there is no doubt but that the yoke can be lengthened out and the filler put in to meet all requirements. We do it now. Where the springs are used or friction gear, the yoke can be lengthened, and where the nigger head is fastened onto the back of the end sill, a liner can be put behind it. I do not think that what we do with that matter will have much practical effect, as far as the locomotive ends are concerned. The chances are that each road will adopt its own ideas in complying with the law. I presume the Committee on Standards of the M. C. B. Association will have something to say as to how to meet the conditions on the cars.

Mr. Seley: I might have added it is our intention in a number of designs to put in a filler and lengthen out in that way.

Oliver C. Cromwell (B. & O.): I believe it is advisable to keep down the number of couplers which are used on our wooden tender frames. I do not see how it is going to be possible to use our M. C. B. type coupler without cutting away the end sills entirely. You will have to fill it out to give the end ladder clearances. You might take care of that on a steel underframe, but when you come to a wooden one, you will not be able to solve it, as I can see, in that way. I am afraid we will have to look towards making a longer shank, but the draw bars will not have sufficient support to hold up the coupler, if we carry our carrier out towards the coupler. I did not realize it would require quite so much over hand as the Chairman has shown us. We can take care of that part on the new locomotive, but the older ones are those which will give us trouble. I would like to add to the remarks of Mr. Seley that it would be of great importance to fit out both the freight and the switcher locomotive tenders in the same way because they do get into the same service. I believe we are all here willing to listen to suggestions on this matter, because we have not had much time to solve the problem as yet. I believe it would be well if this subject was thoroughly threshed out on the floor.

Mr. Curtis: In regard to the coupler, whether the head shall be made longer or the shanks shall be made longer, I have had considerable experience so far in this matter. We have endeavored to keep the switch engine with the M. C. B. coupler, with the 9 in. head; that is 9 in. from the coupler horn to the inside face of the knuckle. It required 8½ in. in the buffer block to hold the coupler up. We had to cut the end sill nearly in two to get the yoke of the coupler to come up far enough to allow any action of the spring; and when we looked upon our work we were not satisfied with it, it did not look well. Then we purchased a coupler that had a head 13½ in. from the coupler horn to the inside face of the knuckle. It is the cheapest way to handle the subject. This head was placed in the tender without any change whatever except removing the old M. C. B. coupler and applying a new coupler without a name. This coupler looks bad; the overhang is immense to a man that is accustomed to a close coupled engine, but of the two I think the change of the coupler is by far the better. I take this view from the experience I have had in having equipped engines both ways.

F. C. Chambers (C. of N. J.): With reference to the push pole pocket, I would say that there is a way of getting around that, namely, the pocket may be depressed so that it will be flush with the sill. On wooden end sills we have fitted up a few that were depressed, and have put in simply a steel plate forming a pocket in it, which was only ⅝ in outside of the face of the sill. We took up the matter directly with the Interstate Commerce Commission about the curve line of the uncoupling handle, which stuck out say 4 in. They passed upon that as not being a matter considered in the Act, but that it was taken in the exception that was made with respect to the coupling lever arm. We had a cast iron push pole pocket on the same end sill that did not stick out as far as this coupler handle did, but I did not bring that before the Commission; I thought I would wait a little while as I did not care to take it up with them, although I could not see what difference it made when it was outside of the handle, and both were outside of the step on the rear. My idea was that they would not accept that exception. By countersinking a push pole pocket in the end sill 3½ to 4 in. of that overhand can be eliminated, and it is the overhang, as mentioned by Mr. Seley, that would be decidedly objectionable.

Mr. Seley:—The Special Committee which has had to do with the handling of these matters to a considerable extent, and also the Conference Committee, composed of members of this Association, have been discharged in so far as any connection with the legislation end of the matter is concerned. It is now up to this Association, as you probably noticed in the President's address, to take care of the details, the technical matters. I do not know how the Executive Committee can handle that matter, but I can see how members can make it pretty hard for the fellows who are on that committee to try and interpret the law. Try to interpret the law for yourselves; do not ask somebody else to do it. I hope our membership will realize the burden that has been put, and possibly may be put, on any one who has to do with handling matters of this kind, and lighten it as much as possible by not asking such general questions.

W. E. Dunham (M. P. & M.): In connection with this 8 in. x 10 in. length of step, I would inquire whether that refers to the shape of the step crosswise of the truck or lengthwise of the truck?

Mr. Curtis: The step can be put on either way so long as it is 8 in. x 10 in. The ladder may be placed anywhere on the rear of the tender. At the conference with the inspectors at Washington that matter was discussed, and it was thought preferable to have it at the side of the tender, so that it would not interfere with a man going up the ladder when the tender was coupled to a car that had a vestibule. A tender does not require a hand brake when coupled to a locomotive, but if you ship that tender in a train then it will be necessary to put a hand brake on it, as it then becomes a car. You will notice that a variation of 5 per cent. is allowed for manufacture and wear. This must not be taken as a permission to reduce the size of the material when applied to the minimum. That is, when it calls for a ⅝-in handhold bar, iron nominally ⅝ in. diameter could be used. You should not use a bar, however, that is 5 per cent. under ⅝ in. If you do so, as soon as there is any wear upon it you are subject to the fine for operating a locomotive with a safety appliance under the size prescribed by-law.

DESIGN, CONSTRUCTION AND INSPECTION OF LOCOMOTIVE BOILERS.

C. A. Seley (chairman of committee): The committee is unable to present a written report on account of the late date of the promulgation by the commission of the boiler inspection rules.

Last year, due to legislation in Congress, it was thought wise for the association to put itself on record, so far as it could out of convention, in regard to getting out a set of rules covering minimum requirements of boiler inspection. The committee met and got out such a set of rules, and sent them out in a circular dated September 8, 1910.

These rules were submitted to the membership. They concluded with a request for an informal ballot to get the mind of the Association, and they were carried practically unanimously, the negative votes being insignificant in number. These rules were brought to the notice of those handling the legislation, and, after the law had been passed the railways were invited by the chief boiler inspector to send representatives to a conference at Washington to discuss the matter of the rules, and a Conference Committee of mechanical officers—appointed as a sub-committee of the Special Committee on Relations of Railway Operation to Legislation—discussed the matter with the inspectors and the representatives of the employees, arriving at a set of rules with which you are probably familiar through Bulletin No. 17 of the Special Committee, which has also been published in the *Railway Age Gazette*, May 12, page 1105. Those rules were revised and finally acted upon at a hearing before the Interstate Commerce Commission on May 29 and were issued, with the ruling of the Commission, under date of June 2, 1911, and they have been distributed to the railways.

This ruling of the Commission and the rules which have been materially changed from those in the above-mentioned Bulletin No. 17, are given as follows:

Whereas the fifth section of the act of Congress approved February 17, 1911, entitled "An act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto," provides, among other things, "that each carrier subject

to this act shall file its rules and instructions for the inspection of locomotive boilers with the chief inspector within three months after the approval of this act, and after hearing and approval by the Interstate Commerce Commission, such rules and instructions, with such modifications as the commission requires, shall become obligatory upon such carrier: *Provided, however,* That if any carrier subj ct to this act shall fail to file its rules and instructions the chief inspector shall prepare rules and instructions not inconsistent herewith for the inspection of locomotive boilers, to be observed by such carrier; which rules and instructions being approved by the Interstate Commerce Commission, and a copy thereof being served on the president, general manager, or general superintendent of such carrier, shall be obligatory and a violation thereof punished as hereinafter provided;" and

Whereas at the expiration of the period of three months after the approval of said act many of the common carriers subject to the provisions thereof had failed to file their rules and instructions for the inspection of locomotive boilers with the chief inspector; and

Whereas the chief inspector thereupon proceeded to prepare for submission to the Interstate Commerce Commission for its approval rules and instructions for the inspection and testing of locomotive boilers and their appurtenances for such carriers so failing to file the same; and

Whereas upon due notice there came on a hearing before the Interstate Commerce Commission in the matter of the approval and establishment of the rules and instructions prepared by the said chief inspector, on the 29th day of May, 1911; and

Whereas such carriers as had filed their rules and instructions for the inspection and testing of locomotive boilers and their appurtenances with the chief inspector within three months after the passage of said act asked, through their representatives at said hearing, that such of said rules and instructions which did not fulfill the requirements of the proposed rules and instructions prepared by the chief inspector be modified to the extent necessary to conform thereto, and that such of said rules and instructions as prescribed a higher standard than that required by the rules and instructions prepared by the chief inspector be regarded as withdrawn from consideration, and joined in a request that such rules and regulations as had been prepared by the chief inspector and approved by the Interstate Commerce Commission be established with uniformity for them and all other carriers subject to the act; and

Whereas at the hearing aforesaid the rules and instructions prepared by the chief inspector were submitted to the Commission for its approval and all parties appearing at said hearing were fully heard in respect to the matters involved, and said proposed rules and instructions having been fully considered by the Commission:

It is ordered, That said rules and instructions for the inspection and testing of locomotive boilers and their appurtenances, as follows, be, and the same are hereby, approved, and from and after the 1st day of July, 1911, shall be observed by each and every common carrier subject to the provisions of the act of Congress aforesaid as the minimum requirements: *Provided,* That nothing herein contained shall be construed as prohibiting any carrier from enforcing additional rules and instructions not inconsistent with the foregoing, tending to a greater degree of precaution against accidents:

Flues to be removed.—All flues of boilers in service, except as otherwise provided, shall be removed at least once every three years, and a thorough examination shall be made of the entire interior of the boiler. After flues are taken out the inside of the boiler must have the scale removed and be thoroughly cleaned. This period for the removal of flues may be extended upon application if an investigation shows that conditions warrant it.

Method of testing rigid bolts.—The inspector must tap each bolt and determine the broken bolts from the sound or the vibration of the sheet. If stay-bolt tests are made when the boiler is filled with water, there must be not less than 50 pounds' pressure on the boiler. Should the boiler not be under pressure, the test may be made after draining all water from the boiler, in which case the vibration of the sheet will indicate any unsoundness. The latter test is preferable.

Flue plugs.—Flue plugs must be provided with a hole through the center not less than three-fourths inch in diameter. When one or more tubes are plugged at both ends the plugs must be tied together by means of a rod not less than five-eighths inch in diameter. Flue plugs must be removed and flues repaired at the first point where such repairs can properly be made.

Leaks under lagging.—If a serious leak develops under the lagging, an examination must be made and the leak located. If the leak is found to be due to a crack in the shell or to any other defect which may reduce safety, the boiler must be taken out of service at once, thoroughly repaired, and reported to be in satisfactory condition before it is returned to service.

The order is pretty clear. Without having had any legal advice in the matter I will say that as I understand it the railways that have filed rules have withdrawn them, and all the railways in the country will work under the set of rules which are attached to the order. In our own case we will make these rules supplement the rules of the railways for a reason which will appear later. The changes in the rules which are issued with the order, as compared with those which were handed to the Commission at the hearing, are in the arrangement of the rules in regard to the numbering of them; there are two minor changes in the wording, and one change in the arrangement, the Accident Report Rule being moved from its location in the former set of rules. None of these are, I believe, objectionable.

The order of the Commission includes copies of the report forms. It is desired that the railways print their copies of the monthly and annual reports of the identical size and the same arrangement as in the samples in order to have a similarity of reports for convenience of filing. There is no size given for the Quarterly Inspection Report or Cab Card. A number of us, however, are of the opinion that it is desirable to print it half the size of the other standard reports, which are 6 in. x 9 in., and half of that would be 4½ in. x 6 in. Some of our Chicago roads are working towards a standard card holder, so as to get it a matter of commercial manufacture in large quantities and at cheaper prices. The report also includes a Specification Card for locomotives, which will keep our mechanical engineers busy figuring out the dimensions and the strengths of present locomotives. The order concludes with a copy of the law.

Rule 12 reads as follows: "Any boiler developing cracks in the barrel shall be taken out of service at once, thoroughly repaired, and reported to be in satisfactory condition before it is returned to service."

As I would interpret that rule: These reports are our own, and we are not required to report repairs to the inspectors.

Testing Boilers: Rules 17 to 20. These rules cover the annual test, and there are a great many items in the report which have to be filled in.

The monthly and the annual forms of reports have diagrams on their backs for filling in as to defective stay-bolts, but these are only the bolts which are allowed to run; therefore, any railway which desires to have a complete record of its stay-bolts will have to maintain its present boiler inspection forms, provided such forms carry with them diagrams of the broken stay-bolts. In our own case we will retain our Rock Island form and do our work just the same as we have heretofore, supplementing it with the Government requirements.

DISCUSSION ON DESIGN, CONSTRUCTION AND INSPECTION OF LOCOMOTIVE BOILERS.

Chas. Young (P. L. W. of P.): In connection with the cab card, Mr. Seley has suggested that it be one-half the size of the monthly and annual statements. I had thought that if we made that the size of a library card, 3 in. x 5 in., it would be a convenient size for the locomotive cab, reduce the amount of stationery, and still have room for all the information required and the blanks could be filled in easily. I think the suggestion to get up a standard form of holder is a good one, too. I think that ought to be embodied as a recommendation to the Association. I would suggest that the holder, when designed, made as near dust-proof and damp-proof as possible, because the steam and the dirt in the cab of a locomotive quickly soils the sheet so that you cannot read it unless it is pretty tight at the joints. One other point, in connection with the monthly form. As I understand it the government requirement gives an option between the card form and the larger sized blanks. I believe we should have a practice recommended as to which of those the railways will place in the cab, because if the order could be made uniform it would be very desirable, I think.

J. F. Enright (D. & R. G.): It is my understanding that the quarterly card that is posted in the cab is not a sworn statement, simply a monthly report, so that if the quarterly card is adopted, and which I think by all means should be adopted for the cabs, they would be used simply with the signature of the party who took care of the gage cocks and water glasses and the inspector who looked after the boiler, so that there should be no delay to power on account of this card for the cab. The quarterly card should be used, in my opinion, but it is not a sworn statement.

F. C. Cleaver (Rutland): I ask if it is necessary to have a second card pocket in the cab for the Federal card? Does the Federal Law specifically state that this card must be exposed? It has been suggested that we could carrry two cards in one pocket. I would like some information on that subject. In New York State we have to carry a card. Now, can we have the Federal card in the pocket we already have—the pocket which has been provided for the New York State card?

D. R. MacBain (L. S. & M. S.): It is our intention in New York and Pennsylvania to put both cards in the same holder. We have it arranged now so that all these cards referring to the states of New York, Ohio and Pennsylvania shall go into one holder, and we intend to put them and the Federal card in the same holder.

J. H. Manning (D. & H.): How is Mr. MacBain going to keep the cards exposed, if he puts them all in one pocket? The law of the state of NewYork and the federal law requires them to be under glass, exposed——

Mr. MacBain. The inspector can pull the cards out and inspect them.

Mr. Manning: Will that comply with the law?

Mr. MacBain: I think so.

Mr. Manning: I would like to hear Mr. Robinson on that matter. My understanding is that the New York state law called for one pocket and the federal law called for another, and both cards should be exposed, so you can stand on the deck and read them. If I am wrong I want to find it out.

Mr. Cleaver: I looked that up carefully, and I think the federal law does not state that the card shall be read through the glass; it simply states that the card shall be under glass. Apparently, you can turn it wrong side out, as far as I understand the federal law.

E. A. Miller (N. Y. C. & St. L.): I would like to ask Mr. Seley if the stay-bolt chart shown on the back of the federal report is to be filled out in case the broken stay-bolts are replaced before the chart is made out for the government. That will make quite a difference, as to whether we should show these broken stay-bolts on this chart, or whether the showing of these stay-bolts is eliminated from the chart, except in cases where they are allowed to run in a broken condition.

The time is also getting very short within which we can put this in operation, between now and July 1, getting our blanks prepared and ready to meet that work. As I understand, the law goes into effect the first of this coming month.

M. E. Wells (W. & L. E.): I have had considerable anxiety about the same point that Mr. Miller speaks of, that is the monthly report, and I was under the impression at first that the report had to be filed in the cab every month, and I am very happy to learn that it is only the quarterly report that has to be filed in the cab—the monthly report is simply made out and forwarded to the District Inspector.

J. F. Enright (D. & R. Q.): Would it not be well for Mr. Seley to give a definition of flue plug for the benefit of the gentlemen who meet with bad water? I understand a definition was obtained from the chief inspector and others at a meeting the sub-committee had with them May 27th last.

M. H. Haig (A. T. & S. F.): I may have misunderstood something. In that first list that Mr. Seley sent out for securing information I noted a reference for cleaning out water glass cocks and gage cocks every time the boilers were washed. In some districts it is necessary to wash boilers every round trip, but I do not think it would be necessary to clean out the cocks so frequently. I would appreciate some information on that before the subject is closed.

Mr. Wells: I will say for the benefit of the gentleman, all that means is to know that they are open, which you want to know anyhow. It does not mean they shall be cleaned if they do not need cleaning. It means that you shall know that they are open and free.

R. D. Smith (B. & A.): I'm going to correct Mr. Wells. That means, and the law specifically states, that the gage cocks and water glass cocks must be cleaned, and the law goes on to state how they shall be cleaned and reported. We have not had any trouble whatever in carrying out this law, which is practically the same as the one in New York State under which we are operating. As I read this law, we will be obliged to have the certificates in the cab under glass, the same way that we now carry the certificate of the New York State inspection. It would seem to me, and I hope that some time action will be taken by this Association to that end, that it would be a good thing in some way to have the federal laws supersede the state laws.

Our round house clerks are notaries public and the inspectors go before them and make out their inspection reports, and they are sworn to and forwarded in the regular way. This is not done at one time but it is a continuous performance. It goes on daily, and it goes on at night as well as in the day time. In engine houses where we have a large number of engines the night clerks are notaries as well as the day clerks. The copy of the law did not reach my desk until just as I was leaving the office, and I am not familiar with the time which we are to be given to fill out the specification cards for boilers. Of course, those of us who have had engines running in the State of New York can get copies of those specification cards, which will make very much less work than stated by Mr. Seley is necessary, but I do not know how much time we have in which to file these cards.

D. F. Crawford (Penna.): I think we should do everything possible and in good faith, co-operating and assisting the federal inspectors and the state inspectors as far as we can. I should say for the present, put all the cards necessary in the cab, exposing them, they are put there to assist the inspector. Let him go on and see that the engine has been inspected within the proper time. I feel all here can do a great deal with the gentlemen on the various State Commissions to get them to adopt and use, or permit the use of, a Federal quarterly inspection card as covering the whole situation, the reports to be sent to the Commission as may be decided by our various Legal Departments. We have had a little experience along that line, in that the form promulgated by the Pennsylvania Commission differed slightly from the form put out by the Ohio Commission, and the Pennsylvania and Ohio reports also differed slightly from that of the New York Commission. Representatives of the three Commissions have met at some place, and have agreed that the form that we use shall be used by the Commission. The form in question reads: "This boiler has been inspected in accordance with the requirements of the States of New York, Pennsylvania and Ohio." That one form answers the purpose. I believe we could present this matter to the various State Commissions in such a form that would assist us in simplifying the work as much as possible, and I think it is distinctly up to us to co-operate with both the State and Federal Commissions to carry out this work.

Mr. Seley: As regards the size of the cab card, would say there has been nothing done definitely in this matter by us in Chicago except to consider a size one-half the size of the monthly and annual reports, which would give us a card 4½ in. x 6 in. I am advised that 4½ in. x 6 in. is not a standard paper size; 3½ in. x 5½ in. is postal size, and 3 in. x 5 in. is library size. Inasmuch as the amount of printing to be done on the card could readily be shown on one of these smaller sizes, further consideration may lead us to adopt one or the other of them. As regards the design of the car holder, would say that we have considered a pressed steel affair, that is fastened up in the cab, has guides on each side and stops at the bottom, and is open at the top. Into that is dropped another case, which holds the card, also of pressed steel, with a glass front and a couple of clips at the back, to press the card tightly against the glass, and keep the dirt and moisture out of the case.

That being dropped down into the holder makes a very neat arrangement, and if you should run in territory where you might be afraid of malicious interference and trouble with the maintenance of the card it is an easy matter to secure a piece of molding over the top of the case, so that the card could not be removed without the removal of the molding. That is a matter of detail which almost anybody can take care of. As regards the oath by the officers, I doubt very much if we can get away from the notarial requirements, as the law requires these reports to be under oath. That is really a matter for our Legal Departments rather than for us to handle.

I would strongly urge the use of the quarterly card for the cab card. It is true the rules will permit the filing of a monthly inspection report as a permissive card for operating the locomotive, but that involves a case 6 in. x 9 in. I think you will agree with me that is too large a case to put in a cab. Regarding the stay-bolt chart, would say for Mr Miller's information that the reports state very plainly that the location of broken stay and crown bolts which were not renewed must be indicated on the diagram, so that any bolts which are renewed are not shown on the diagram. The report is to indicate the condition of the engine when it goes into service after inspection, but not what its condition was before that inspection. The condition of your stay-bolts will have to be mapped out on your own forms if you wish a complete history regarding them.

Regarding the flue plug matter, would say that I wrote to the Chief Inspector for an interpretation and I received the following reply: "Inasmuch as the rules do not prohibit the use of thimbles, I think it is a matter in which the railways must use their own discretion in regard to their use. However, I think the indiscriminate use of thimbles should be discouraged, and they should only be used when the bearing is in good condition and the thimbles are properly applied." As I understand the matter, the flue plug as stated in the rule is a plug having a hole through the center not less than ¾ in. in diameter; solid plugs are not allowed. If that hole is larger than ¾ in., reasonably larger, say 1 in. or 1¼ in., it would be construed as a thimble, but they wish to discourage the use of them to the greatest possible extent, and I think that is desirable.

The cleaning of water glasses and gage cocks is a little mixed. Rule 39 reads as follows: "The spindles of all gage cocks and water glass cocks shall be removed and cocks thoroughly cleaned of scale and sediment at least once each month." Now, if you will turn to Rule 48, which is the office record, it reads as follows: "An accurate record of all locomotive boiler washouts shall be kept in the office of the

railway company. The following information must be entered on the day the boiler is washed: (a) Number of locomotive; (b) Date of washout; (c) Signature of boiler washer or inspector; (d) Statement that spindle gage cocks and water glass cocks were removed and cocks cleaned; (e) Signature of the boiler inspector or the employee who removed the spindles and cleaned the cocks."

Inasmuch as much weight is given to getting these statements and signatures, I should be inclined to construe that every time you wash a boiler out you ought to do the other, although it says in Rule 39 "once a month," which might be answered in this way: In many sections of the country, where the water conditions are so very good, you would not wash out more than once a month. To fulfill the requirements the rule would secure the cleaning of these cocks at that same time.

As regards the filing of specification cards, I will say that we have a two-year period in which to file cards, although, if we have definite information in the office available, the rule says file them at once or as soon as you can prepare them, but there is little information, and the specification card has to be made up from an actual inspection of the boilers, and to cover a large number of old engines, we have two years from July 1. All boilers built after January 1 next must have a factor of safety of at least 4. That time was given so as to enable pending contracts to be filled and deliveries of locomotives to be made, and will give us ample time to check over and change our standard specifications and drawings so that in our new equipment after January 1 next we will have a factor of not less than 4.

The President suggests that we take up a little more time in regard to this washing-out matter. On the monthly locomotive boiler inspection and repair report question 3 reads: "Was the boiler washed and gage cock and water glass cock spindles removed and cocks cleaned?" That, of course, will be answered "Yes," or you would be violating the requirement to do it in every 30 days.

Now, as regards your office record, it should be accessible to the Government inspector and for the information of your own office force. I think the right way to do it is to clean these things and have the signatures for every washing, and then, in case anything happens, you have a clear record. You do not have to swear to that: you do not have to get any signatures other than for the purposes of your own office records.

Mr. Crawford: Inasmuch as the Federal Inspection Rules become effective July 1, and we will, therefore, not have time to refer the question of the size of this card to the Committee on Standards, I would move that the Association adopt as recommended practice, at least, the size 3 in. x 5 in., the library card size, which will enable a copy to be kept, if so desired, in your regular card catalogue file. (The motion was put and carried.)

H. T. Bentley (C. & N. W.): It seems to me a vote of thanks is in order to Mr. Seley and the Committee who had the Federal Boiler Bill in hand. They have done a tremendous amount of work. They have made trips to Washington and interviewed the Chief Inspector and his assistants; they have done very painstaking and careful work in connection with this bill, and they have also given valuable information to us individually and to the organization collectively, and I move a vote of thanks be returned to Mr. Seley and the other members of the Federal Boiler Bill Committee. (The motion was seconded and carried unanimously.)

Mr. Seley: In order that you may know to whom you have voted the thanks of the Association, I would say that my associates were the Presidents of the two Associations, also Mr. Crawford and Mr. MacBain, all of whom should share most liberally in any credit given to the Committee.

CONTOUR OF TIRES.

The committee has been instructed to give consideration to the following and make recommendations: The desirability of adopting the M. C. B. standard contour for engine-truck wheels, tender-truck wheels, driving and trailing wheels, also limit of wear of tread, shop and road limit of last turning, maximum height of flange, thickness of flange and gages. As the present standard contour for cast-iron wheels of this association is identical with the 1909 standard of the Master Car Builders' Association, it assumes that the instructions as to contour refer to steel and steel-tired wheels only.

Replies to a circular of inquiry indicate that the M. C. B. 1909 contour is being very generally used for engine-truck and tender-truck wheels. Some roads have already adopted this contour for flanged driving-wheel tires as well. The committee feels that this contour is desirable for all flanged wheels under locomotives and tenders for the same reason that it is desirable for car wheels, in addition to which is the feature of uniformity. The present A. R. M. M. A. standards call for six widths of flanged tires, and five widths of plain tires, as follows:

Flanged tires	5 in.	5¼ in.	5½ in.	5¾ in.	6 in. 6¼ in.
Plain tires	6 in.	6¼ in.	6½ in.	6¾ in.	7 in.

Replies from the manufacturers of steel tires indicate that of the flanged tires manufactured by them, there are practically but two widths, namely, 5½ in. and 5¾ in., the large



W. C. A. Henry.

Chairman, Committee on Contour of Tires.

majority being the former. In the case of plain tires the prevailing widths manufactured are 6 in., 6½ in. and 7 in., there being little demand for the 6¼ in. and 6¾ in. widths. It is the opinion of the committee that one standard for cast-iron and one for steel and steel-tired flanged wheels, namely, the M. C. B. 1909 standards, and three widths of the present A. R. M. M. A. contour for plain tires will meet all requirements and be to the advantage of all concerned, due to the fewer number of standards.

The prevailing limit of wear of tread or channeling for all

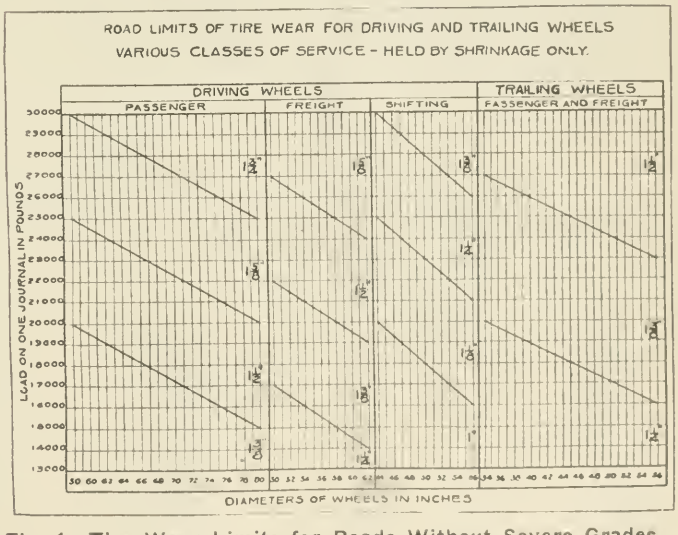


Fig. 1—Tire Wear Limits for Roads Without Severe Grades.

wheels under locomotives and tenders is ¼ in. for locomotives in road service and 5/16 in. for locomotives in shifting service, which we feel is good practice. In investigating the subject of limits of wear of driving-wheel tires the committee has found the greatest variation. After full consideration, it does not seem possible, or advisable, to establish a minimum road limit to be followed by all roads. Where long, steep grades necessitate heavy braking, or severe weather conditions result in frozen roadbed for long periods of time, tires can not be worn to the same degree of thinness

as where these conditions do not prevail. Also, the use of retaining rings, which practice, however, is not universal, has a bearing on tire thickness. After consideration of all the data available, the committee feels that the limits prescribed in Fig. 1 submitted as a portion of its recommendations will be suitable for roads not having severe grades, or extremely cold weather, and not using retaining rings. Where these conditions prevail, or retaining devices are used, such deviations will have to be made as experience indicates are desirable.

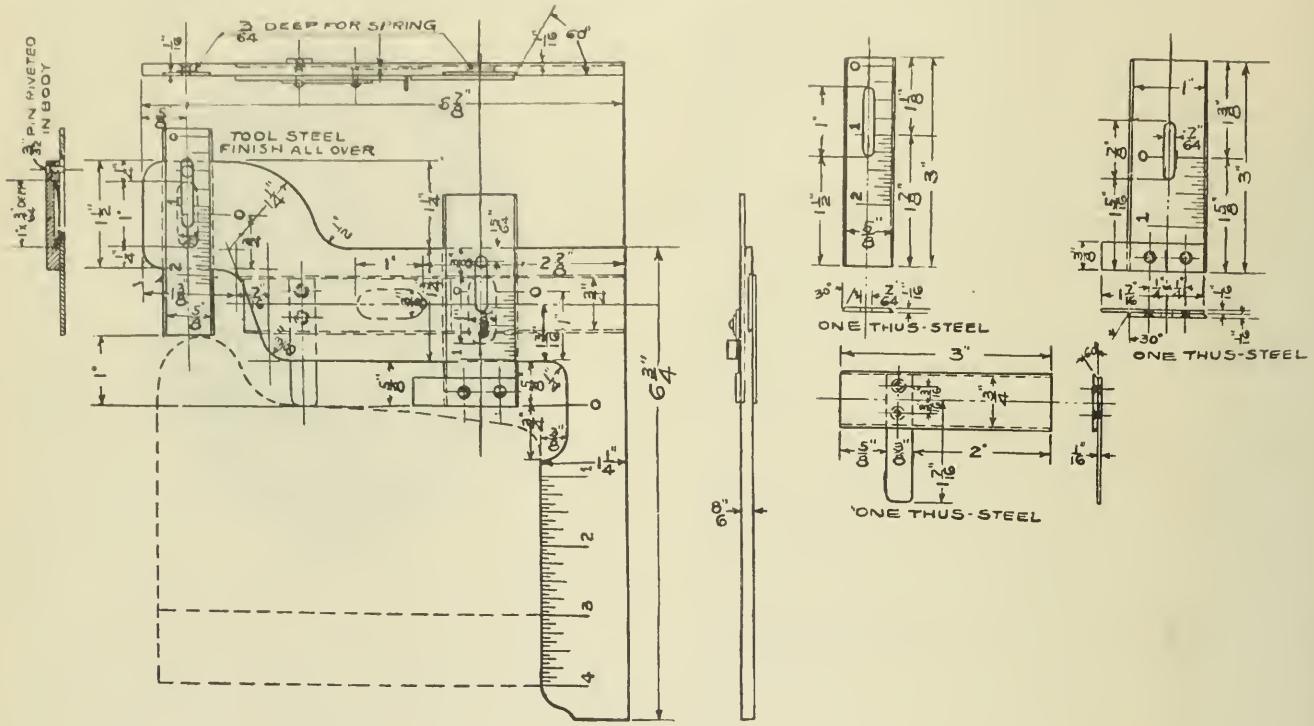


Fig. 2—Tire Gage.

The prevailing practice is to establish the shop limit of thickness of tires ¼ in. above the road limit. This limit is strictly one of economy and not safety, and will vary with the facilities for doing the work. The M. C. B. limit for thickness of tire or rim for steel and steel-tired wheels is being generally followed in the case of engine-truck and tender-truck wheels with satisfactory results, and the committee recommends the same limits be adopted. The M. C. B. Association has already adopted a maximum height for flanges, of 1½ in. This was considered the maximum height flange that would not, in service, damage track bolts, filler blocks, etc. There is no reason why this maximum height should be deviated from. The question of gages is one in which there is practically no uniformity, each road apparently having gotten up a gage to suit its individual views. Recommendations for a shop or engine house gage on which can be read direct the important dimensions, namely, channeling of tire, height of flange and thickness of tire, are herewith submitted.

It has been suggested that the number of brackets on standard wheel circumference measure be increased from three to four and the length of the brackets increased so as to project ⅛ in. beyond the rim when the brackets are in

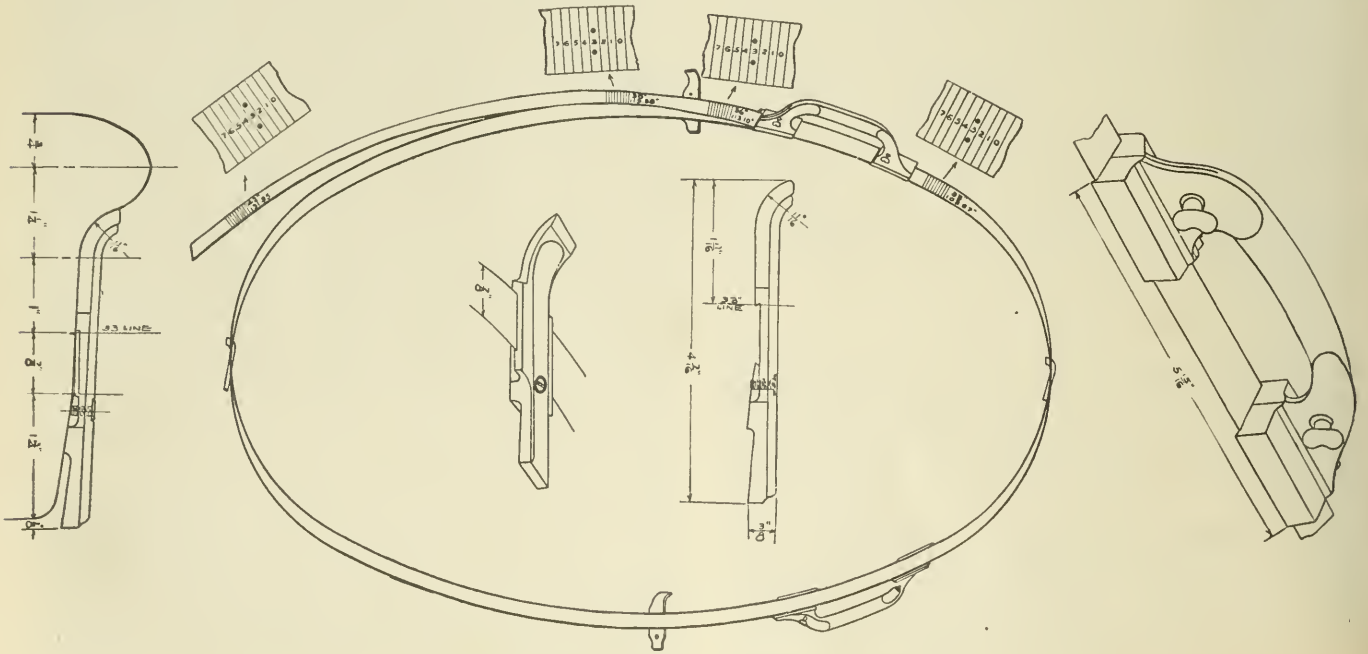


Fig. 3—Wheel Circumference Measuring Gage.

proper position. The present method of graduating the circumference measure does not provide a definite boundary for each tape size, as the tape sizes are indicated by lines.

It is, therefore, recommended that instead of defining tape sizes by lines they be defined by spaces. The committee is of the opinion that these changes in the size and number of brackets, as well as the markings of the circumference measure, all of which are shown in Fig. 3, are desirable. These same changes are among the recommendations of the standing committee on car wheels to be made to the M. C. B. Association at the 1911 meeting.

RECOMMENDATIONS.

1. The committee recommends the M. C. B. 1909 contour for all flanged steel or steel-tired wheels, as follows:
   a. Engine truck.
   b. Tender truck.
   c. Driving wheels.
   d. Trailing wheels.
2. Plain tires to be of three widths, namely, 6 in., 6½ in. and 7 in., the contour to be the same as the present standards; the widths of 6¼ in. and 6¾ in. to be eliminated.
3. Limit of wear of tread or channeling to be as follows: ¼ in. for all locomotive and tender wheels in road service; 5/16 in. for all locomotive and tender wheels in shifting service.
4. Road limit for driving and trailing wheels to be as specified in chart.
5. Road limit for steel and steel-tired wheels for engine and tender trucks to be as per the 1909 recommended practice of the M. C. B. Association.
6. Maximum flange height to be 1½ in.
7. Gage to be as per Fig. 2.
8. Wheel circumference measure to be modified as per Fig. 3.

The report is signed by:—W. C. A. Henry (Penn.), chairman; O. C. Cromwell (B. & O.), J. A. Pilcher (N. & W.), O. M. Foster (L. S. & M. S.) and A. C. Adams (N. Y. N. H. & H.).

DISCUSSION ON CONTOUR OF TIRES.

W. E. Dunham (M. P. & N.): I would like to ask if any one has had any experience particularly with the 1-in. height of driving tire flange, as indicated in this contour. This is the size adopted by the M. C. B. Association for car wheels. It is quite a different proposition when you come to the driving wheel contour to take the same height of the flange.

R. W. Bell (I. C.): We are a little at sea. We have been using 1⅛-in. on our driving wheel and engine truck wheel on high-speed engines, and in fact on all engines. We would like to hear some discussion on that matter, and have some of the members who use 1-in. flange on driving wheel and engine truck wheel, particularly in high speed service, relate their experience and what success they have had in operating flanges of that height.

H. T. Bentley (C. & N. W.): I ask the members of the Association if any of them have tried ⅞-in. height of flange for switching service only. It had been recommended to us that we use ⅞-in. flange, so as to decrease the amount of wear on the trucks and increase the life of the tires, and I would ask the members of the Association if any of them have used the ⅞-in. flange for switching locomotives only.

F. F. Gaines (C. of Ga.): In reply to Mr. Bentley, will say that I have used that ⅞-in. flange for a long time on several roads, and I have never had any trouble. It gives a good flange, and it gives you a chance to wear the tires down and get more wear before it is necessary to shift them for a high flange.

R. L. Ettenger (Southern): A number of years ago, when I was with the Big 4, we tried some switch engines with ⅞-in. flanges, and they did not stay on the track very well—we had to change them. They were leaving the track a great deal of the time.

Mr. Bell: I might add that that has been our experience. With the ⅞-in. flange we could not keep the switch engines on the track, and we had to discontinue using them.

C. A. Seley (C. R. I. & P.): I really cannot make up my mind to the wisdom of adopting the same contour on these tires as is used in cast iron wheels. I am not quite sure but what the taper of cast iron wheels is excessive. With wide track it certainly contributes to derailment by reason of the different circumference. On some types of locomotives, if the tire is brought to this taper, it is going to give us some trouble. When we recently received some new Pacific type engines, there was some complaint that the engines were nosing quite a little. I abided my time and the complaints died out. I believe it was because the tires flattened by wear, shortly after they were on the road, down to their natural contour, and stopped a great deal of that nosing. The main drivers of a Pacific type engine are a pivot, to a certain extent, and I do not like to turn off all of this steel unless there is some good reason for it, and I am rather convinced that for a steel tire the taper is not desirable. Of course, it is necessary in a cast iron wheel, perhaps, to a certain extent for foundry purposes, but I am not quite sure but that we have gone too far in the M. C. B. Association.

E. W. Pratt (C. & N. W.): I was in hopes, when Mr. Seley started, that he was going a little further and would suggest that the contour of flange for steel-tired wheel might not be right when it is practically the same as a cast iron wheel. There are several flanges 15-16 in. thick after they are worn which do not break, and we do not have much experience, any of us, with broken driving wheel flanges. I believe there are a good many roads that have a minimum thickness of flange for returned tires, and it seems to me now that, if we are after that million dollars a day, we might come out publicly and state what our practice is and adopt a safe course.

Mr. Seley: I think that is a very good view of the subject, and I think that this association, as well as the M. C. B. Association, has got to adopt a different tack. I think it is generally believed that had the safety appliances as required by the M. C. B. standards been applied to the cars, that we would not have had nearly as much legislation as we have had. A good many of us talked a great deal on the floor here, but many of us went back home and did not to do what we talked about. I think the standards of this association, as well as the M. C. B Association, should be carried out, and if we cannot do these things on our railways that we are doing in the proceedings of the association we are not at all consistent. I believe that the shop practice, the road practice and the M. C. B. standards should all agree.

T. H. Curtis (L. & N.): I am glad to hear this discussion on the height of flange, but I am not ready to adopt the 1 in. height of flange for driving wheel, but I might for the tender wheels and engine truck wheels. I will adopt the 1 in. height for switch service, which we have tried and which has given good satisfaction. A word in regard to economy has been mentioned here. I will make a citation that 1⅛ in. is the condemning limit for steel tired wheels for tenders. Switch engine tenders use up a large number of wheels. In a steel tired tender wheel 1⅛ in. is not the condemning limit. For switch engine service this limit can be reduced in some cases to ⅝ in., and by running these wheels under switch engines and making special axles for them it is not necessary to buy any wheels for switch engine service on your line. A great many switch engine tenders will use the M. C. B. 4¼ in. axles, and you might buy the axles with fits as high as 7 in. and mount the wheel on these same journal axles that have a large fit. In this way you can use the tender wheels or car wheels from all your service for your switch engine tenders, and thereby make it unnecessary to purchase any wheels for that service. This has been the practice of the L. & N. for a long time and it works out well.

Robert Patterson (Grand Trunk): I am rather surprised that after the years of experience which we have had in turning the tread of tires straight that a recommendation like this should come in now. Before my time that design of turning tires was abandoned. The report does not say what benefit we are to get, from tapering, over our present practice. The only thing I can see is that it is going to make it more difficult to turn the tires; it will take longer to turn them, and they will not be turned as accurately. It will only be a short time after the engine is running on the road when the tires will come to the natural flat tread, the same as we turn them now. This practice was abandoned many years ago, and was abandoned because there was no good purpose served by having the tires turned in that manner, and I would like to know why we should go back to this practice now.

C. E. Chambers (Cent. of N. J.): I do not know where the last speaker is located—the road with which he is connected—or how many interlocking plants he has on his system, but I will say if he has as many as there are on the system with which I am connected he will see the benefit of getting the tire tapered. With the tire turned straight, without the taper, we find that there is a great deal of damage done in breaking detector points and other appliances in connection with our interlocking signal systems; and our road adopted four years ago the tapered turn on the tire to avoid interference with the wires connected with our signaling system.

O. C. Cromwell (B. & O.): I can say the railway with which I am connected turns the tire taper considerably, to what would amount to ¼ in. in the width of the tread. We have

been carrying that practice out for about eleven years. We formerly used that practice and went to the Master Mechanics' contour later. A very rapid wearing on the thread at the throat of the flange produced a rapidly reducing thin flange, and a reduction in the mileage between turnings, and after about a year's service they went back to the previous practice of turning the tread a uniform taper, which eliminated the trouble with the grooved tires accumulating so rapidly.

When you turn the full taper in the tread it starts to wear the groove in the tread well away from the throat of the flange and thereby increases the mileage between turnings. Prior to the practice of eleven or twelve years ago, at which period the Master Mechanics' contour was used, for about a year, there was a decrease in mileage. This decrease of mileage developed and was brought to our attention very noticeably by the fact that when we got after the division people for not obtaining mileage out of the locomotives they said it was due to running the tire with partially cylindrical Master Mechanics' tread, and when we went back to the full taper we got the fuller mileage as formerly. As to the height of flange, I am not much concerned about the 1 in. height of flange giving much trouble. On the road with which I am connected we had 1½ in. at one time, and concluded we would cut it down to 1-5/16 in. and then 1¼ in., and finally down to 1⅛ in., and we have not had any more trouble with it than when it was 1½ in.

H. T. Bentley (C. & N. W.): It seems to me that the tire is going to make a good deal of extra work in the shops. I am glad the subject has come up, because it has brought out a number of points the committee will want to look over a little further. To dispose of the matter I suggest that the committee be continued, and that we suggest to them that they consider some of the points which have been brought up to-day, and see if they cannot make a report which will more nearly conform to the requirements. I make that as a motion.

Mr. Pratt: Does that include further consideration of the minimum flange for return tires?

Mr. Bentley: I will embody that.

Mr. Gaines: I would also venture to suggest that the committee try to get some reports on the actual contour during the year.

Mr. Bentley: I shall be glad to embody the suggestion in my motion.

The motion was carried.

Mr. Henry: I would like to say in regard to the height of the flange that for many years 1 in. has been our standard for engine truck and tender truck, and we never had reason to believe that was in any way objectionable. It has the advantage that if you start with a short flange you can get more mileage from the wheel before it reaches the point that necessitates renewal. The height of our flanges on driving wheels of switching locomotives is 1 in., that being our standard now for a number of years, having been changed from 1⅛ in. We find that it has the same advantage as the 1 in. flange on a truck wheel. In regard to the question of the taper 1 in 20: Our experience has been that the taper gives a longer life to the flange, the tendency being for the flange to run away from the rail. We believe that that has given us more mileage. The advantage that we felt would result from tapering off the outside of the rim was to delay the time when you have an objectionable amount of generating of heat. It is true that it means a little more shop work, but I think if you actually get the cost of your extra shop work you will find that it won't be worth bothering about. We have not had any experience with 1 in. flange driving wheels on road locomotives. I understand that some roads have recently adopted them, and I am also told that they are quite general in European practice.

The President: The next subject is Steel Tires. We have not received a report on this subject, but Mr. Johnson will make a verbal report. Mr. Johnson has only been Chairman of this Committee a short time, and he has not had a full opportunity to work up on the subject.

STEEL TIRES.

The committee has been without a chairman until very lately, and consequently will give simply a report of progress. Collections of specifications already in use, and information as to the practice on the different railways in the United States, Canada and Great Britain, on the question of handling the purchase of steel tires for locomotives and cars have been collected.

Tabulated statements in conection with this material are given therewith for the information of members. It will be noticed that so far as this continent is concerned, purchasing tires by specification is the exception, whereas, in Great Britain it is the rule. Where specifications are used in America, they are used principally as guides, giving limits in analysis within which the tires should be accepted, and guarding railway companies against accepting tires with facial and contour defects, and a specification has been drawn up for your consideration which, if not entirely satisfactory to the association in its present form, will at any rate serve the purpose of bringing out a discussion and criticism of its different details, and should the committee be continued for another year, it may be possible by next convention, to place before you a specification acceptable to the members.

It is considered advisable by the committee that tires for locomotive service should be purchased in three grades, for passenger, freight and switching purposes. A physical drop test is necessary in the opinion of the committee that it is the only true way of knowing exactly what kind of material you have in your tire as it will show up the result of the working and heat treatment in the manufacture of your tires, which the chemical analysis by itself will not do. The test piece for both pulling and analysis should be taken from the tires which have undergone the drop test.

Copies of the specifications received from the different railways, at home and abroad, together with synopses of replies to our correspondence are included in the report.

The report is signed by:—Lacey R. Johnson (C. P.), chairman; J. R. Onderdonck (B. & O.); R. L. Ettinger (Southern) and M. Hogan (N. Y. C. & H. R.)

SPECIFICATIONS FOR STEEL TIRES.

1. *Material.* Steel for tires shall be made by the open-hearth or crucible process.

2. *Classes.* There will be three classes of tires for the different classes of service as follows:

Class 1. Driving tires for passenger engines.

Class 2. Driving tires for freight engines.

Class 3. Driving tires for switching engines and tires for engine-truck, tender-truck, trailer and car wheels.

3. *Chemical composition.*

Class No. 1.

Carbon, not less than		0.50 per cent.
Phosphorus, not over		0.05 per cent.
Manganese, between	0.50 and	0.80 per cent.
Sulphur, not over		0.05 per cent.

Class No. 2.

Carbon, not less than		0.65 per cent.
Phosphorus, not over		0.05 per cent.
Manganese, between	0.50 and	0.80 per cent.
Sulphur, not over		0.05 per cent.

Class No. 3.

Carbon, not less than		0.70 per cent.
Phosphorus, not over		0.05 per cent.
Manganese, between	0.50 and	0.80 per cent.
Sulphur, not over		0.05 per cent.

4. **Finish.** The tires must be free from defects of any kind and finished tires must be accurately machined to the prescribed dimensions of the Master Mechanics' Standard, and rough tires must not be outside the limits of the attached print.

5. *Branding.* The tires shall be distinctly stamped when hot with such brands as the purchaser may require, and in such a manner that these marks shall be legible when the tires are worn out.

6. *Samples for Chemical Analysis.* Drillings from a small test ingot cast with the heat or turnings from a tensile specimen or turnings from a tire (where tires are machined at the works of the manufacturer) shall be used to determine whether the chemical composition of the heat is within the limits specified in Paragraph 3.

When required, the purchaser or his representative shall be furnished an analysis of each heat from which tires are made.

7. *Physical Properties.* The steel for the different classes of service shall meet the following minimum physical requirements:

Class.	Tensile strength lbs. per sq. inch.	Elongation per cent. in 4 ins.
(a)	105,000 quotient of	1,550,000 *+ Tensile strength.
(b)	115,000 quotient of	1,300,000 + Tensile strength.
(c)	125,000 quotient of	1,150,000 + Tensile strength.

8. *Falling Weight Test.* A test tire from each heat represented shall be selected by the purchaser or his representatives, and furnished at his expense, provided it meets the requirements.

8a. The test tire shall be placed vertically under the drop in a running position on a spun foundation with an anvil of at least ten tons weight and shall be subjected to successive blows from a tup weighing 2,000 lbs., falling from heights of 10 ft., 15 ft. and 20 ft. and upwards, until the required deflection is obtained as specified in Paragraph 8b.

8b. The test tire shall stand the drop test described in Para-

graph 8a, without breaking or cracking, and shall show a minimum deflection, and it is hoped to present a formula covering this point at the next meeting.

8c. A specimen for the tensile test is to be taken from a tire that has been subjected to a falling-weight test, and it shall be cut cold from the tested tire at the point least affected by the falling-weight test. The tensile test specimen, when cut from a tire that has been subjected to a falling-weight test, shall be cut normal to the radius and parallel to the face.

8d. Should the test fire fail to meet the requirements in any particular, two more test tires shall be selected from the same heat if the manufacturer so desires, and at his expense. Should these two tires fulfill the requirements, the heat shall be accepted.

9. *Inspection.* The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times while his contract is being executed. All reasonable facilities shall be afforded to the inspector by the manufacturer to satisfy him that the tires are being furnished in accordance with the specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, and shall be so conducted as not to interfere unnecessarily with the operation of the mill.

DISCUSSION ON STEEL TIRES.

The President: I want to take this opportunity to personally thank Mr. Johnson for what he has accomplished in the exceedingly short time during which he has had this work in hand.

C. A. Seley (C. R. I. & P.): I am personally opposed to the destructive test if it can be avoided. It seems to me that in the matter of tires we ought to hesitate a long time before adopting, or even considering, destructive tests. While with a large order of locomotives one might be able to justify the cost of such tests, I do not believe that is true of a majority of tire purchases. A great many roads buy a limited number of sets of tires at a time; and I rather think, without going into any calculation, that it would require a pretty good sized order to justify the cost of the waste of material in a destructive test. I do not wish, however, to discourage the committee. Nevertheless, I think they ought to have this thought in mind.

G. F. Fowler (*Railway Age Gazette*): I think it well to suggest to the committee that it would be interesting to the members of the Association for the present year if they would give the reasons why they recommend three kinds of tires for three services, running it up from 50 to 70 in the three types of tires involved.

H. T. Bentley (C. & N. W.): I think if the committee can work up a specification that will enable a manufacturer to produce a tire that will not shell out under engine, tender and car service, they will confer a lasting benefit upon the members of this Association. The way in which steel tired wheels fall down in service is getting to be a serious matter. At one time we were in the habit of taking up the situation with the manufacturers and telling them, "We have some steel tires that are very badly shelled and we would like to have you look at them and make arrangements to replace them," and they were quite willing to do it; but apparently they have gotten over that disposition and gotten together now, and none of them will replace a shelly tire, and they take the position that it is the service that we give it and not the material in it that caused the tire to shell. Now, it seems to me it is up to the manufacturers to make a tire that will stand the service that we require of it. Some of the manufacturers contend that it is due to sliding. I have personally shown them tires where on one side there was a shelly condition extending for 14 to 16 in. around the tread, and where on the other side there was no indication whatever of sliding. Hence, I do not think that point is well taken, especially when the defects will penetrate a tire a depth of from ¼ in. to ⅝ in. I would like to know whether other members here have had a similar difficulty, and, if so, if they can recommend anything to overcome it.

T. H. Curtis (L. & N.): I certainly hope Mr. Johnson will answer the inquiry why the Committee recommend three kinds of tires for three services. I agree with Mr. Seley in what he has said respecting the destructive test. The Louisville & Nashville have over 900 locomotives in use and they average about 7 wheels per locomotive, and the tire breakage is practically nil. I do not think we have a tire to break once in a year. I think that is due to the climate, perhaps, because roads in colder climates have more breakage. We have purchased tires from all of the leading manufacturers, and our experience has been pretty much the same with them all.

Mr. Fowler: In answer to the suggestion of Mr. Bentley, I would say that a few years ago I had the opportunity of making some elaborate investigations in respect to steel tires. I was about two years collecting samples of tires from various parts of the country that had shelled out. I had the assistance of the New York Central, the Erie and the Pennsylvania lines in picking out tires with the idea of determining, if possible, what was the cause of the shelling. I had a large number of tires that were shelled out, and I made a very careful examination and investigation to ascertain the cause of the defect. I cut down through the shelled-out portion of the tire where the defect was very apparent, and then on the other side of the tire, and took out the best parts or pieces of the metal that I could find, and I came to the determination in all the tires that I examined that the cause of the shelling out was simply slag. These tires were picked out haphazard by the three roads that I have mentioned. I think it is a matter of clean metal which will prevent that particular shelling. There may be other causes for it, but, as I say, that was the only thing that I succeeded in finding.

F. F. Gaines (Cent. of Ga.): Lately I have run into a little difficulty, especially on the rolled solid wheel, with the flange cracking down towards the hub of the wheel. I would like to suggest to the committee that they endeavor to find some remedy for that defect. The makers claim that it is due to brake burn because of the character of the brake shoes.

The President: Have you used flange brake shoes?

Mr. Gaines: Yes; but lately we have gone to a semi-flange shoe.

The President: We had considerable trouble of that kind, and the wheel makers claimed it was due to the flange shoe. We changed to a semi-flange shoe, leaving about 1½ in. at each end, but we have had almost the same trouble. I think with a built-up wheel we have not had very much trouble with the flange cracking. We have taken the position that it is the fault of the wheel maker, not the fault of the railway. We have also taken the position in regard to showing in accord with the experience with Mr. Bentley. I think it is a question of manufacturers making a steel wheel that will stand the service regardless of what the service is, except, of coure, abuse.

Mr. Fowler: They had identically that same trouble in Brooklyn in the rapid transit service on the elevated road, using a flange shoe. There were vertical cracks down through the flange of the wheel. They came to the conclusion there that it was a manufacturer's defect, and upon carefully cutting out those wheels and looking them over critically under the microscope we discovered evidences that the trouble was caused by a heat crack due to some process in the rolling of the wheel. And that is the position that is assumed and maintained by the railway company.

Mr. Johnson: As to the destructive test, I would say that this specification was laid before the convention more for the purpose of eliciting suggestions. It was thought that it would bring forth a whole lot of discussion, and that the various details might be worked out hereafter. We felt very strongly that it was necessary to have such a test for the reason that we give in the report, namely, that it is the only true way of noting exactly what kind of material is in the tire when delivered, because it will show up the result of the working and the heat treatment in the manufacture of the tire, which a chemical analysis by itself will not do. For instance, you can take an ingot which will pass a good chemical analysis, and yet that same ingot can be destroyed by its after-treatment in the process of manufacture.

Then there was a question brought up in regard to the three different grades of tires. The reason for making that specification was not that we should have a good class of tire for one particular service and an inferior class of tire for another so much as that we could use a very much harder steel for freight service than we could for fast passenger service, and consequently get a correspondingly longer life to it. It was not that there should be any difference in the actual quality of the metal. In regard to the shelling out of tires: I suppose there is hardly a railway that has not had more or less experience of that kind, but the chemical analyses which have ben used by the Baltimore & Ohio for some years now has practically eliminated that trouble and shelled-out tires are now unknown there.

The committee was ordered to continue.

FLANGE LUBRICATION.

It has been the purpose of the committee to obtain sufficient information to determine to what extent trouble from flange wear is experienced, the lubricants and means of applying them which are in use and the effectiveness of lubrication in overcoming flange wear and its attendant evils. A circular of inquiry was issued and the committee's report is based upon the replies received from motive-power offi-

cials of about 30 railways representing widely different grade, curvature and weather conditions of operation. Among the detailed replies to the committee's circular, two only indicate that the officials represented are not having trouble in their territory from flange wear. In addition, five replies state that lubricators are being used or experimented with, which indicates trouble from this source. Eight answers, on the other hand, state that the railways represented have no lubricators in use, and, unfortunately, no statements are made as to flange-wear conditions.

The Lake Shore & Michigan Southern reports having no trouble with road engines, but in some yards the wear on



M. H. Haig.

Chairman, Committee on Flange Lubrication.

driving-wheel flanges of six and ten wheel switch engines becomes a very serious matter. The Santa Fe has had the same experience with six-wheel switch engines where a large percentage of the total mileage is made on curved track. The railways reporting flange wear have curvatures reaching a maximum of six degrees or more. It would seem, however, that the mileage of curved track relative to total mileage would produce more effect on flanges than the degree of curvature alone. There are a number of other conditions affecting flange wear; among them are length of rigid wheel base, speed, lateral movement and tire spacing, and the degree of stiffness of engine truck. Pacific in passenger service and consolidation in freight service are the types on which flange wear is most prevalent. However, where types are employed with longer wheel base than the

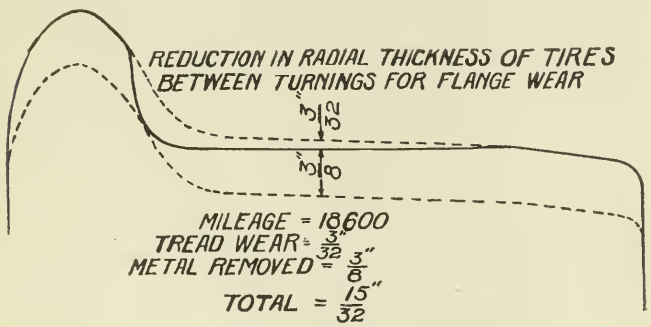


Fig. 1—Tire Wear without Flange Lubrication.

consolidation, these are reported as being subject to greatest flange wear. In general, if other conditions are equal, it is the type with longest rigid wheel base on which flange wear is greatest. There are some notable exceptions to this rule in passenger service. One division of the Pennsylvania with engines of the Pacific type in service reports greatest flange wear on those of the Atlantic type. This is also the case on the Eastern Lines of the Santa Fe System. While there is no statement to this effect, this condition may be due to the Atlantic type operating on a section of the road more severe on flanges because of excessive curvature.

There are two classes of expense due to excessive flange wear. One results from the metal lost in producing standard flanges after they have been badly worn and the other is due to the loss of revenue and the cost of repairs when necessary to turn or remove tires for flange wear between regular

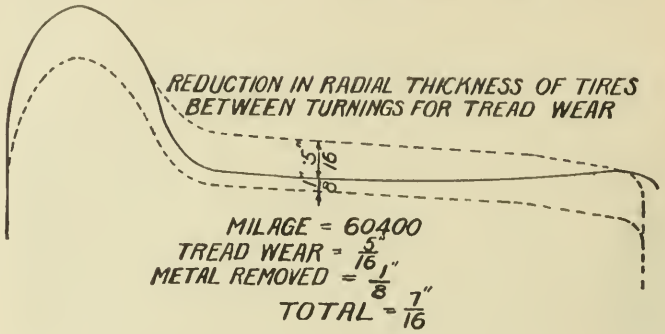


Fig. 2—Tire Wear with Flange Lubrication

shoppings of the engine. The figures covering metal loss have been presented according to different standards and it is, therefore, difficult to compare them. In some instances the loss has been measured in radial thickness of tires, in others by weight per turning, and in still other cases by the value of metal turned off. Where stated in radial thickness, the amount varies between ¼-in. and ¾-in. Loss in weight is stated as varying between 55 lbs. and 1,150 lbs. per engine per running, depending upon the number of wheels, and the extent of flange wear. The loss of metal expressed in terms of money value for engines of various types is given as follows: Four-wheel switch, $45; six-wheel switch, $50; standard, $50; ten-wheel, $50; consolidation, $60. Mallet, $90.

The total mileage obtained during the life of a set of tires appears to be the most satisfactory measure of tire service. On this measure as a basis, the estimate presented in Table I has been prepared to show the loss due to turning tires on account of flange wear compared with the total mileage during the life of tires when turned for tread wear. It represents the service obtained from Atlantic type locomotives operating on the Missouri Division of the Santa Fe. The mileage between tire turnings is computed from the average mileage per locomotive per month and the time between

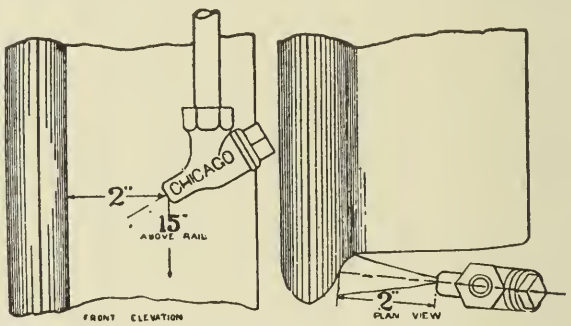


Fig. 3—Flange Nozzles for Hydrostatic Oiler.

turnings; the average mileage per locomotive per month was obtained from records of 20 locomotives over a period of eight months. Before lubricators were applied, these locomotives averaged 18,600 miles between tire turnings before reaching the limit of 1-in. vertical flange wear. Since the adoption of flange lubrication, the same locomotives average 60,400 miles between tire turnings for tread wear. Figs. 1 and 2 graphically illustrate the method of arriving at the aggregate loss given in Table I. In Fig. 2 is shown the condition of tires with 5/16-in. tread wear after making 60,400 miles. To facilitate proper turning, ⅛-in. is usually removed in the lathe. The total reduction in radial thickness between successive tire turnings will, therefore, amount to 7/16-in. Fig. 1 illustrates the condition of tires when the locomotive is shopped because of sharp flanges after making only 18,600 miles.

TABLE I.

Loss of Tire Mileage Due to Excessive Flange Wear.

4-4-2 Type, operating on Missouri Division, A. T. & S. F. Ry.:	
Mileage between turnings—Flange Wear (7/16 in. to 1 inch vertical)	18,600
Mileage between turnings—Tread Wear (5/16 in. maximum)	60,400

Flange Worn	Metal removed to build up standard flange	3/8 in.
	Tread Wear (Rate 5/16 in. per 60,400 miles)	3/32 in.
	Total reduction in radial thickness between turnings	15/32 in.
Tread Worn	Metal removed (To facilitate turning)	1/8 in.
	Tread Wear	1/16 in.
	Total reduction in radial thickness between turnings	3/16 in.

Flange Worn Tires. Thickness of Tire.	Average Mileage.	Tread Worn Tires. Thickness of Tire.	Average Mileage.
New, 3½ in.	.....	New, 3½ in.	.....
After first turning, 3½ in.	18,600	After first turning, 3 1/8 in.	60,400
After second turning, 2 5/16 in.	18,600	After second turning, 2 5/16 in.	60,400
After third turning, 2 3/32 in.	18,600	After third turning, 2 1/16 in.	60,400
Scrap	18,600	Scrap	60,400
Estimated total	74,400	Estimated total	241,600

Total loss of mileage during life of tires..... 167,200
Loss, per cent..... 69

That this estimate may be conservative, a very liberal curve has been assumed at the throat of the worn flange. In order to reproduce the standard tire contour it is necessary to turn off 3/8-in. of metal from the tread. The total reduction in radial thickness between tire turnings is 15/32-in., which is 1/32-in. greater than the total shown in Fig. 2. Assuming a minimum thickness at the last turning of 2 in., the difference in total mileage during the life of tires under

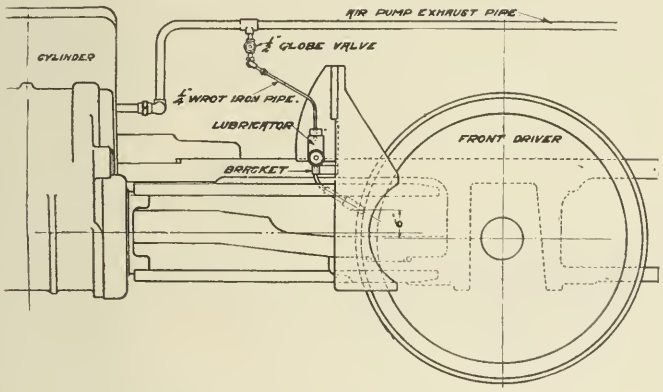


Fig. 4—Flange Lubricator; Southern Pacific.

the two sets of conditions is 167,200, a loss in tire service of 69 per cent. due to flange wear.

TABLE II.

Estimated Saving by Use of Driver Flange Lubricators on Forward Drivers of Mountain Engines, Southern Pacific.

69 Consolidation Engines.	Average Mileage per engine per month.	Total Mileage per Year.	Cost per Mile Run.	Total Cost of tire attention One Year's Service.
Before application	2491	2,062,548	$ .0097	$20,006.72
After application	2635	2,181,780	.002041	4,453.01
Estimated saving effected on mileage obtained with flange lubricators based on cost per mile before use of same	.....	2,181,780	$ .007659	$16,710.25

In some instances, where flange wear is excessive, when the front pair of tires becomes badly flange worn, it is removed and exchanged with another pair from the same locomotive. On locomotives with four pairs of drivers, two shifts may be made. But under severe conditions, it is impossible by this means alone to keep locomotives in service until the tires become tread worn. In Table II, showing the estimated saving due to the use of flange lubricators on the Southern Pacific, the average mileage per change of tires necessitated by flange wear was 8,869. The practice was to make two shifts of tires before turning. Computed on this basis, the mileage between successive turnings for flange wear is only 26,607, while tread-wear mileage obtained since the application of lubricators is 42,151.

Fourteen different forms of lubricators are now in use or have been tried by the railways reporting to the committee. These may be grouped according to the kind of lubricant used into the following classes: Crude oil, engine and car oil, solid lubricant, water and exhaust steam. There are four types of lubricators designed to use asphaltum base crude oil. These are the Chicago, the Southern Pacific, the Canadian Pacific and the Rock Island. Where no other name is known that of the railway upon which the lubricator has been developed is used. The Chicago flange oiler is designed to meet the requirements of the Elliott system of lubrication, which embodies a sight-feed oiler located on the back boiler head and a delivery pipe on each side of the engine leading to the flange nozzles. The oiler is similar in general appearance and principle of operation to the sight-feed valve-chamber lubricators in general use in America. The manufacturers recommend that the nozzles be located 15 in. above the rail, 2 in. from the flange toward the outside of the tire and close in toward the tread, as shown in Fig. 3. Where two pairs of nozzles are used, each delivery pipe is branched through a "T" pipe connection. Where more than two pairs are used either two two-feed

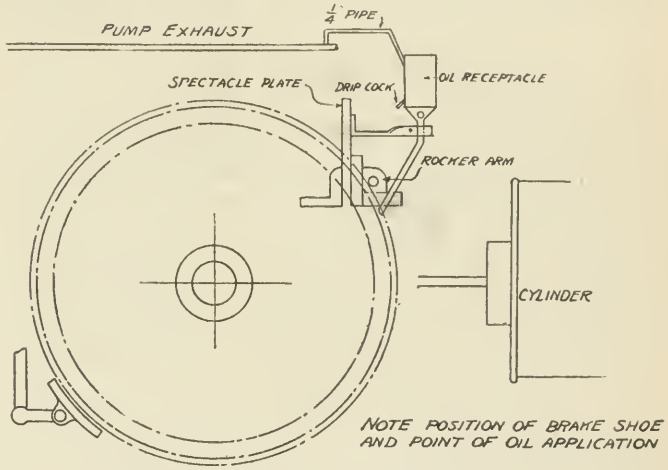


Fig. 5.—Flange Oiler; Canadian Pacific.

oilers or one four-feed oiler should be provided. The manufacturer's practice is to apply one pair of nozzles in front of forward driving wheels on road engines; one pair in front of forward drivers and one pair back of rear drivers on switch engines; on Mallet engines in road service, one pair in front of forward drivers on both engines, and in pusher service one pair in front of forward drivers of both engines and a third pair back of rear drivers on high-pressure engine.

The Wabash Pittsburgh Terminal applies nozzles to all drivers on standard type; to the front and main drivers on ten-wheel type; to the front and back drivers on the consolidation; to main and back drivers on six-wheel switch engines, and to the front and back drivers of both engines on the Mallet type. A few consolidation engine trucks are also equipped. The Lake Shore & Michigan Southern applies lubricator nozzles to all drivers on switch engines. The practice adopted by the Santa Fe System is to apply nozzles to the rear of forward drivers where trouble is experienced from frozen sand pipes with nozzles placed in front of the drivers.

The lubricator illustrated in Fig. 4 has been developed by the Southern Pacific after experiments covering the use of a number of other methods of delivering oil to the flanges. This device consists of a steam-jacketed receptacle holding about one and one-half pints of crude oil, which is fed by gravity through a needle valve into the one-half-inch delivery pipe. A clamp bracket gripping the pipe just below the oil cup secures the oiler to the engine frame in front of the forward drivers. Loosely sliding upon the delivery pipe is a piece of one-inch pipe over the lower end of which is slipped a short section of one-inch rubber hose. The projecting end of the hose is shaped to fit the throat of the flange and acts as a shoe to distribute the oil. A weight rigidly attached to the upper end of the one-inch pipe holds the shoe against the flange at all times. The oil-cup jacket is supplied with steam from the air-pump exhaust pipe, which serves to keep the oil in a fluid state during cold weather. The drip from the jacket runs along the delivery tube, tending to prevent congealing of the oil before reaching the flange.

The Canadian Pacific, having tried hard grease and engine oil without success, is about to try crude oil in the lubricator shown in Fig. 5. This is similar to the Southern Pacific type in principle. Oil is fed through a regulating valve from the cup to the feed pipe and flange shoe, which consists of a

piece of rubber hose. Steam from the air-pump exhaust pipe passing through a coil placed within the oil cup maintains the oil in a fluid state. The Chicago, Rock Island & Pacific is using a lubricator shown in Fig. 6 on two Pacific type locomotives. The oil receptacle stands upon the running board over the right cylinder. Exhaust steam passes through a pipe leading from the exhaust cavity in the cylinder casting to the oil cup. The accumulation of condensation in the oil cup lifts the lubricant into the delivery pipe, exhaust steam carrying it to the flange. The flow of oil is controlled by the engineer through a globe valve operated by a rod extending back to the cab. A check valve placed in the pipe leading from the cylinder exhaust cavity prevents a back flow of oil through this pipe.

There are two lubricators in use employing lubricant in the solid form: the Collins and the Turnbull. The Collins is illustrated in Fig. 7. A bracket attached to the frame

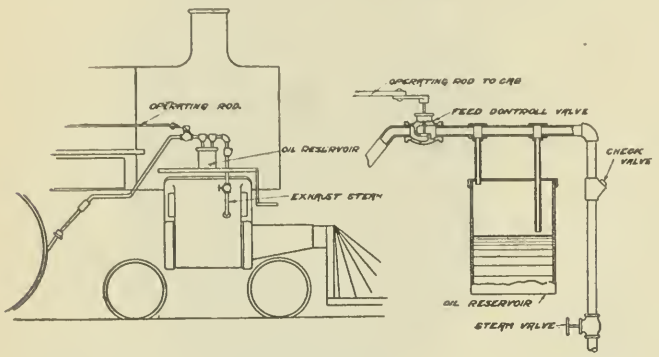


Fig. 6—Flange Oiler; Chicago, Rock Island & Pacific.

supports the lubricator in position before the driver. The angle of the lubricator is adjustable to suit conditions imposed by the location of the bracket, on which it is laterally adjustable. The angle should be as nearly as possible 25 deg. from a line parallel to the axle and it should be placed on the horizontal center line of the wheel. The location recommended by the manufacturers is shown in Fig. 7. The lubricator itself is a tube of rectangular cross-section through which slides the lubricator block of hard grease. Below this tube is a spring-feeding device designed to keep the lubricator block pressed against the flange. Pressure from a coil spring acts through a dog engaged in one of a series of notches on the under side of the lubricator block. As the lubricant becomes worn, the spring is recompressed by means of a downward projecting trigger. At the same time the dog is moved back into engagement with the next notch in the lubricator block. This periodical readjustment is the only attention required to operate the lubricator.

The Turnbull lubricator embodies the same principle, spring pressure holding a cake of hard grease against the flange. The committee is informed by the manufacturer that this device is no longer marketed and a more detailed description will, therefore, be unnecessary.. The feed is automatically regulated to suit the varying needs of the flanges. On the Colorado & Southern, however, it has been found that the grease used in the Turnbull lubricator absolutely loses its merit in either wet or cold weather and its use has been abandoned. On the Canadian Pacific, Lines West, hard-greese lubrication has been found unsatisfactory. The committee is unable to state what type of lubricator was used.

Several methods of delivering engine and car oil to the flanges have been tried. The simplest is a piece of pipe or hose secured to the frame in front of the driver in such a manner as to cause the lower end to bear against the flange. The pipe or hose is filled with oil-saturated waste, which acts as a swab, more oil being supplied from time to time. Where the waste comes in contact with the tire, if packed hard, it will glaze and cease to be effective. If loosely packed, it will be drawn out and lost. Crude oil is being used in this manner on the Illinois Central to a limited extent on Pacific type engines with very little apparent benefit. It is not reliable in cold weather.

The Canadian Pacific has experimented with a siphon lubricator using engine oil, but this has proved inefficient and has been abandoned for the fuel-oil lubricator shown in Fig. 5.

Another simple device has been applied to six-wheel switch engines in the Chicago yard of the Santa Fe, and is shown in detail in Fig. 8. It is simply a block of wood resting upon the tire and grooved to fit the flange. A waste-filled cavity contains engine oil which feeds through a ⅜-in. hole to the flange. The block is loosely anchored and is usually applied to forward and back drivers. This method, however, greases the whole tire, which sometimes causes the wheel to slip.

The Chicago, Rock Island & Pacific has 10 Pacific type and 3 consolidation locomotives arranged with piping to carry water from the tank to nozzles spraying against the leading drivers. This means of lubrication is of very limited service. The pipes run horizontally along the engine frames and cause trouble by freezing during winter weather. The Pennsylvania has made use of exhaust steam from the air pump, with what success it is not known. Of the lubricators described, all are in very limited use except those using crude oil.

Flange lubrication on the Santa Fe has been developed to its present state after experiments covering the use of most of the simple devices, such as swabs of oil-saturated waste, water jets operated from the injectors and the block type shown in Fig. 8. These have all proved to be in some manner unsatisfactory. Water and engine oil have both proved too light to satisfactorily resist the action of centrifugal force, being thrown away from the throat of the flange before reaching the rail. Crude oil is now in general use for flange lubrication on the Santa Fe System

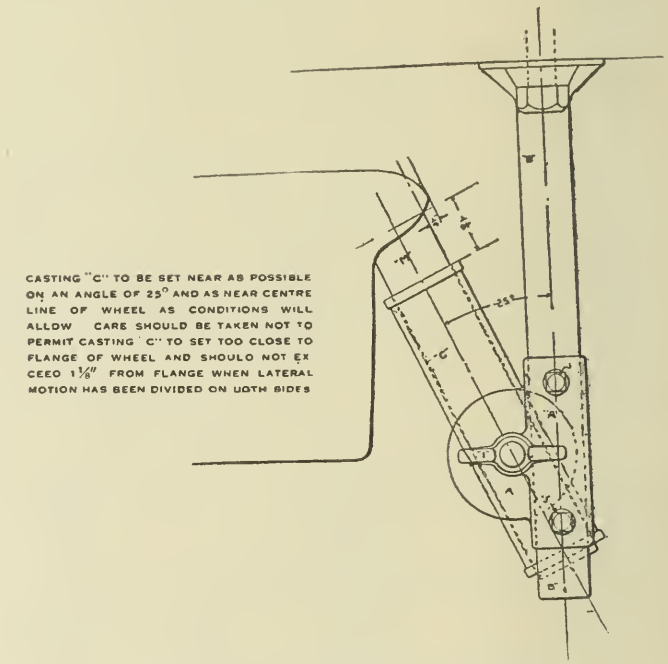


Fig. 7—Hard Grease Flange Lubricator.

Experience indicates that the delivery of a proper lubricant to the flange will reduce the wear of both flange and rail. The committee's information is confined largely to the results obtained by lubrication with crude oil. California crude oil contains a high percentage of petroleum asphalt. When delivered to the rail by the driving-wheel flange, it forms a thin coating of paste on the inside of the ball of the rail which does not run or spread over the top. When all engines on a division are equipped with lubricators, the rails on the outside of curves will become thus coated, and friction will be reduced on all wheels passing over the track. The resulting reduction in flange wear is noticeable on both passenger and freight car wheels, but data are available for locomotive driving wheels and tender truck wheels only. It necessarily follows that train resistance is much reduced on curves.

The block lubricator previously described (Fig. 8), applied to six-wheel switch engines, has extended the period between turning for flange wear in some cases from two months to one year.

On the New Mexico Division, a 65-mile section of which has 288 curves of 6, 8 and 19 deg., it was found impossible to keep engines of the Santa Fe type in service for more than 18,000 to 20,000 miles, but at the present time with lubricators applied they are making as high as 35,000 to 40,000 miles between shoppings with no evidence of flange cutting

On Pacific type locomotives the mileage was increased from between 25,000 and 30,000 to between 75,000 and 100,000. The performance of lubricators has been closely watched in this territory. There are instances where lubrication has not entirely stopped flange wear because of the difficulty experienced in getting engineers to give the lubricators proper attention. On the New Mexico Division, with 100 per cent. of the locomotives equipped, it has been estimated that there has been an increase of about two months in the life of rails, that previously required changing about every thirteen months. This is an increased life of 15 per cent. In territories where no figures are available, it is, however, the opinion of all officials that the flange oilers have materially decreased rail wear. The effect on wear of rails on curves has been no less marked. Where rails on 8-deg. and 10-deg. curves would last only about eight or ten months, conservative figures place the life since general application of flange oilers at about three years.

Flange lubricators on the Southern Pacific have become a necessary part of the locomotive equipment in mountain territory. When not working properly the engineers complain seriously until they are repaired. Locomotives ride easier and smoother around curves without the tendency to climb the rail which is evident when the flanges are run without lubrication.

On the Wabash Pittsburgh Terminal before the application of lubricators the average time between shopping for sharp flanges was eight months. A ten-wheel freight engine, working on a section having maximum curvature of 11 deg. 28 min., would not run three months before developing flange wear to such an extent that tires had to be turned. Since applying the lubricator this engine, working on the same section of the road, was out twenty months before shopping, when tires were turned for tread wear. Since the

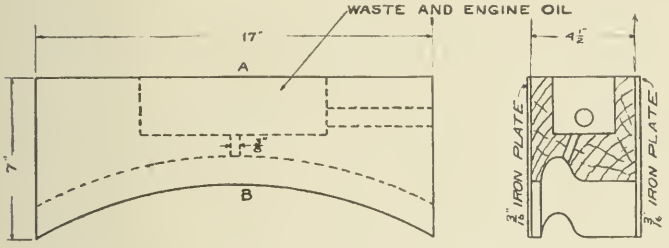


Fig. 8—Flange Lubricator; Atchison, Topeka & Santa Fe.

application to all locomotives there has been no occasion to turn tires for flange wear. It has stopped almost entirely on wheels to which the oil is delivered, and oiling the drivers materially decreases the wear on engine-truck wheel flanges. In some cases, oil has been applied to the trucks where wear was unusually excessive. Mallet locomotives showed some signs of cutting the front flanges on the low-pressure engine. By plugging the nozzles leading to the back drivers on this engine and delivering the same amount of oil that was previously used on both pairs to the front wheels, the cutting has been reduced and it has been found that the other wheels are sufficiently oiled. In addition to the direct benefit to the locomotive, there has been a decrease in the wear of switch points and rails on curves, as well as a decrease in the number of derailments. Flange wear has also been reduced on tender truck wheels.

The Atlanta, Birmingham & Atlantic has gotten as high as 50,000 miles out of locomotives that ran only 13,000 to 15,000 miles before lubrication was adopted. The average length of service for switch engines without lubricators was three or four months at twelve hours per day. Another individual case on this road shows forcibly the effect of lubrication. A ten-wheel locomotive, weighing 130,000 lbs. on drivers, in making 18,958 miles, had cut the front flanges very badly. Owing to the rush of work it was necessary to keep the engine in service if possible. A lubricator was applied and the engine again placed in service. After making 34,495 additional miles, the flanges showed no further wear. The tires were shifted and the engine again put into service. The Elliott system is in use on this railway. The cost of oil has been about 3 cents per 100 engine miles.

A service test of a yard engine was made on the Kansas City Terminal. The yard where this engine worked is so located that the front and back flanges on the left side of the engine became worn to such an extent that the engine began to climb the rail after being in service about three months. It was then necessary to change tires. The engine equipped with a flange oiler was put in service with a new set of tires and remained in service under these conditions over a period of thirteen months, when it was shopped for other repairs. The flanges were still in good condition. The results obtained were made possible by the careful attention the lubricator is reported to have received from the engineer. The foregoing instances indicate the service of flange lubrication under some of the worst conditions affecting flange wear reported to the committee.

The report is signed by:—M. H. Haig (A. T. & S. F.), chairman; T. W. Heintzelman (So. Pac.) and D. J. Redding (P. & L. E.)

After presenting this report Mr. Haig spoke as follows: The locomotives in passenger service upon which flange wear is most prevalent are the Pacific type and the consolidation. However, where types are employed with a longer wheel base than the consolidation these are reported as being subject to the greatest flange wear. In general, if other conditions are equal, it is the type with the longest rigid wheel base on which flange wear is the greatest. There are some notable exceptions to this rule, however, in passenger service. There are two classes of expense due to excessive flange wear. One results from the metal lost in producing standard flanges after they have been badly worn. The other is due to the loss of revenue and the cost of repairs when necessary to turn or remove tires between regular shoppings of the engine. There are four types of lubricators designed to use asphaltum base crude oil. These are the Chicago, the Southern Pacific, the Canadian Pacific and the Rock Island. Where no other name is known, that of the railway upon which the lubricator has been developed is used. Crude oil is now in general use for flange lubrication on the Santa Fe system. There are no data on the Santa Fe to show the exact increase in the life of rails on curves effected by the flange oilers.

DISCUSSION ON FLANGE LUBRICATORS.

T. O. Sechrist (C. N. O. & T.): Before introducing this flange lubricator on our road we would not average over 12,000 miles before we had to change tires, and after the application of the flange lubricator we got as high as 80,000 miles. We have used the Turnbull lubricator. It is made up of two solid cakes, and we could not make a trip, say, of 137 miles before the cakes would be used up. This was caused, of course, by the friction and heat that was developed. Since we have used the Chicago lubricator and asphaltum crude oil as a base, in connection with the lubricator we have gotten over that trouble. I believe that this committee has given us the information that is necessary, for all of the railways that have adopted the flange lubricator will verify the statements made.

F. F. Gaines (Cent. of Ga.): In the past we have been very much troubled with the repeated cutting of flange. It was not due so much to curvature of the line, either. About a year and a half ago we started in experimenting by putting on a few engines the Southern Pacific type of lubricator, and we got good results so long as we followed up the engineer, but the trouble was that he did not use it always. It was a little out of the way and not handy for him to use it. With some engineers we got excellent results. We then tried the Ohio lubricator. It seems with the use of that lubricator the engineer can watch the feeding of the oil, and it is conveniently handy for him, and he is more apt to use it. Our results with it have been very good, indeed. If you take the Pacific type of engines, where we turned flanges about three times on an average we now have every reason to believe that we are going to run them right through from engine repairs to engine repairs without having to turn tires. On the consolidation engines the results are equally favorable. We have also tried the stick lubricators, but my experience with them is the same as that of Mr. Sechrist. They wear out too fast. Taking it all in all, it seems to me that some lubricator of the form of the Ohio, with crude asphaltum as a base, is the best for the purpose.

E. W. Pratt (C. & N. W.): I would like to ask Mr. Haig if his road has used any flange lubricators on trailer wheels, and with what results? Also if they have had a large enough number of their engines equipped with flange lubricators to indicate whether lubrication on the flange of the rail would decrease the flange wear on other wheels of the engine or train? Also whether there has been any slipping of the engine on curves resulting from this flange lubrication?

G. A. Hancock (St. L. & S. F.): On the Frisco system we have at present about 50 lubricators. We use crude oil asphaltum as a base. What the saving is on the flange of the tender wheels I am unable to say, but we are getting very good results from it on the engines.

Angus Sinclair: A long time ago I was running a locomotive on a very crooked road. I was responsible for the condition

of the engine and had to keep it going. It quickly developed a great deal of trouble from cutting out flanges. I never had any experience to guide me as to what was to be done, but I tried swabs—a very crude way of oiling the flanges, and then I had trouble from the wheels slipping and consequently I had to give that up. It did prevent the cutting of the flanges, however. Then I used tallow. I first tried blocks of tallow and it worked fairly well. Then I mixed it with Dixon graphite and made blocks just as hard as I could get the tallow and the graphite to hold together, and I had very good results from that. With the crude oil I should imagine there should be more or less trouble with slipping.

O. M. Foster (L. S. & M. S.): I can say that we have had very limited experience with lubricators on switch engines, but it was entirely satisfactory. Indeed, it has given more satisfaction than I have seen in the case of almost any new device.

Mr. Haig: I understood Mr. Pratt to ask if the flange oiler had been applied directly to trailer wheels. I will say that on the road where I am employed, flange oilers have not been applied direct to trailer wheels. There is every indication that the flange lubricator lengthens the life of the trailer wheels because of spreading oil on the ball of the rail. That effect is also observed under the tender, and to some extent on the wheels of the cars. The effect of slipping is not serious.

MINIMUM REQUIREMENTS FOR HEADLIGHTS.

The committee has gotten together considerable information on this subject from railways and also a great deal of data concerning tests on various headlights made at Purdue University, and some tests of a number of headlights which were made at the United States Bureau of Standards. This data is rather conflicting, and the committee would ask to be continued for another year, hoping at that time to submit a full report to the convention.

The request was granted.

CLOSING EXERCISES.

The Association passed a resolution of appreciation to all those who have contributed to the success of this Convention, as follows: To the President for his able address and the ability with which he has presided over the meetings. To the officers of the Association for the duties they have so thoroughly performed in handling the details in connection with the necessary preparations for this convention. To the Committees for the splendid reports submitted. To Prof. C. H. Benjamin, of Purdue University, for his valuable paper on Locomotive Performance under Different Degrees of Superheated Steam. To the Committee on Arrangements for its effective service in preparing plans for the meetings. To the railways for the many courtesies extended. To the American Railway Supply Men's Association for its magnificent exhibition of railway supplies that have become so important and essential a part of these conventions. To the Railway Press generally, and to the *Railway Age Gazette* especially, for the daily record of our meetings.

ELECTION OF OFFICERS.

The following officers were elected:

President, H. T. Bentley, Chicago & Northwestern.

First vice-president, D. F. Crawford, Pennsylvania Lines.

Second vice-president, T. Rumney, Erie.

Third vice-president, D. R. MacBain, Lake Shore & Michigan Southern.

Treasurer, Dr. Angus Sinclair.

Executive Committee members, C. A. Seley (C. R. I. & P.), E. W. Pratt (C. & N. W.) and J. F. Walsh (C. & O.).

D. F. Crawford: The members and the officers of this association, as well as the railways represented, owe a debt of gratitude to Mr. Fuller, our retiring president. His interest in the work of the association is probably best evidenced by the many long journeys taken by him to Washington to attend the frequent meetings of the safety appliance and boiler inspection committees, where his work and assistance have been particularly valuable. I am sure that you will all agree with me that Mr. Fuller during his term as president has rendered splendid service to the Master Mechanics' Association, and in the advancement of the mechanical science and arts. It is, therefore, with great pleasure that I move that we all rise to indicate to him our esteem and hearty thanks.

The motion was unanimously carried.

Scott H. Blewett presented Mr. Fuller the gold badge voted him.

Conventionalities.

Ask Harry Frost what grows on the trees at the entrance to the pier.

J. H. Mitchell is here, as usual. He is staying at the Brighton.

S. L. Smith arrived yesterday. It is well, for his genial smile was missed.

Among the new faces are G. W. Ristine, Jr., and J. C. Anderson, two able P. S. C. men.

J. Snowden Bell, Mrs. Bell and their daughter, Miss Marie J. Bell, are staying at the St. Charles.

D. O. Ward is here again, and Mrs. Ward and Miss Ward are with him. They are staying at the Ostend.

O. C. Gayley arrived yesterday and will remain until the close of the M. C. B. Convention. He is staying at the Marlborough-Blenheim.

Walter S. Carr, a brother of Robert F. and George R., arrived Friday. Mr. Carr is president of the Sheffield Car & Equipment Company.

J. J. Ross, who was recently appointed western railroad department manager of the U. S. Metal & Manufacturing Company, arrived on Tuesday.

Ed. Moan, master mechanic of the Southern Cotton Oil Company, formerly a red hot railway master mechanic, is here. Good luck to Ed. in the oil business.

Look out for Posty. His camera arrived yesterday and he has on a pair of sneakers. His first victim, Frank Moore, pretty nearly put Posty and his camera out of business.

Among the Pittsburghers present, we note the familiar face of J. J. Kennedy, general manager of sales of the National Tube Company. Mr. Kennedy is staying at the Chelsea.

George E. Molleson got here early. Mrs. Molleson is not with him this year. Same old trouble—difficulty in keeping servants when one leaves home, even for a few days.

H. W. McMaster, receiver and general manager of the Wabash-Pittsburgh Terminal, arrived Wednesday. Mrs. McMaster is with him and they are staying at the Marlborough-Blenheim.

W. F. Kiesel, assistant mechanical engineer of the Pennsylvania at Altoona, is stopping at the Chelsea. His son was graduated from the mechanical engineering department of Lehigh University last week.

If you want to see the long and short of it, just walk down the pier behind G. W. Seidel, superintendent of the Rock Island shops at Silvis, Ill., and Big Bill Steele of the American Locomotive Company.

H. C. Oviatt, general inspector of the New Haven, who is to play with the Eastern base ball team today, took his two boys out for practice on Thursday. He may be some player, but they have him beaten to a frazzle.

F. R. McFeatters, general manager of the Union Railway and president of the Pittsburgh Railway Club, is stopping at the St. Charles. Mr. McFeatters bids fair to make a record for efficiency as the head of the Pittsburgh Club.

W. V. S. Thorne, director of purchases of the Harriman Lines, accompanied by his assistant, Sidney Williams, arrived Thursday evening. Yesterday they made a thorough inspection of the exhibits on the pier. They will remain only a day or two.

There has been much speculation among his many friends as to why John Smythe has disfigured himself by appearing at the convention with a shining bald pate. The six feet six of genial John help to make the loss of the former 16 much cherished hairs more conspicuous.

A vigilance committee has been formed to lynch Billy Wilkinson for praying for rain. Just because one man happens to have one of London's latest creations in raincoats is no reason why the two or three thousand people who are attending these conventions should be made miserable.

Charles D. Young, assistant engineer motive power of the Pennsylvania Lines, Southwest System, one of the younger members of the association, is displaying a keen interest in the convention proceedings, and by his questions and remarks shows a thorough study of the subjects under consideration.

The rumor that the New York Stock Exchange has held trading in abeyance, pending the outcome of today's ball game, is not without foundation. Indeed, such intense interest is being manifested that the unfortunate broker who timidly inquired what would happen if it should rain was promptly expelled from the board.

Charles Maier, engine house foreman of the West Jersey & Seashore at Atlantic City, and Mr. Rettinger, the car foreman, managed to get away from their work long enough Friday afternoon to make a flying visit to the exhibits. Mr. Maier, it will be recalled, is a frequent contributor to the Shop Section of the *Railway Age Gazette.*

J. H. Painter, superintendent of the Atlantic Coast Line at Rocky Mount, N. C., has his wife with him this year. Plans are being made practically to double the capacity of his shops. He reports prospects for a large delegation of foremen from the Atlantic Coast Line for the General Foremen's convention in Chicago the latter part of July.

Captain Nellis, of the Eastern team, was overheard humming something that sounded like:

Jeffrey's record oft reminds us,
How to swat the pill intense;
And departing, leave behind us,
Splinters in the outfield fence.

Among those here who have deserted railway service for a more questionable life is Frank H. Greene. Last year at this time Mr. Greene was general purchasing agent of the New York Central Lines. Now he is king bee for Hale & Kilburn; but, as the hives of New York are more to his liking, he has decided to make his headquarters just one block, not 90 miles, from Broadway.

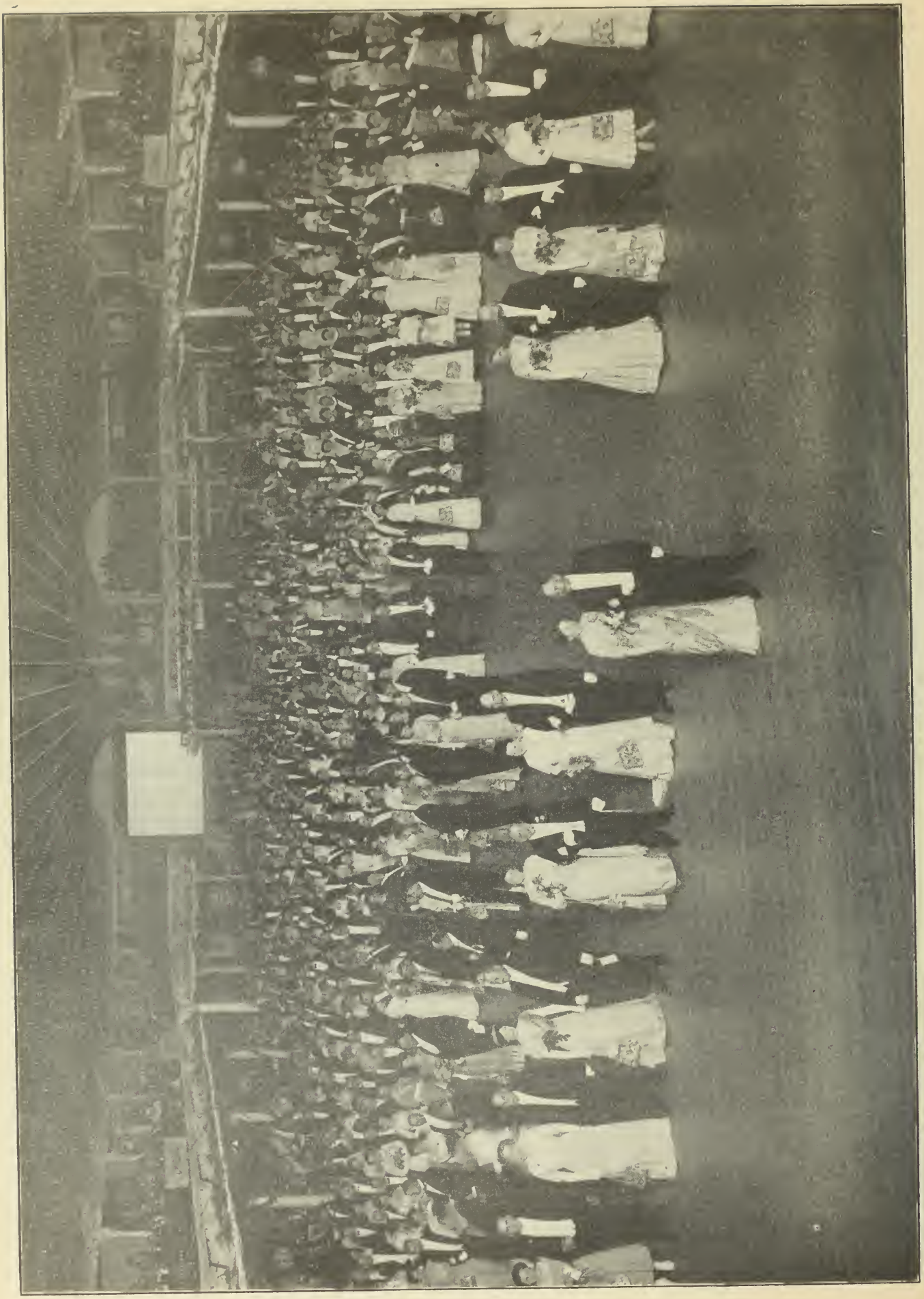
Prof. A. J. Wood, of Pennsylvania State College, is stopping at the Edison. Eight students are expected to enter a new course in railway mechanical engineering in this school, which is to be started next fall, and its Motive Power Club, devoted entirely to the consideration of railway mechanical subjects, had a good year. The club meets once a month and has 30 members. The college has a locomotive equipped for testing purposes and also a complete air-brake equipment. It is the only college in the east that is displaying any considerable amount of activity along railway mechanical lines.

Dave Pye is very fond of children. This fondness, coupled with Mr. Pye's enthusiastic way of expressing his admiration, put him in a peculiar light the other day. Mr. Pye was talking with some friends when a fine specimen of wholesome babyhood was being wheeled by. When Mr. Pye spied the child he broke the current of his remarks with the exclamation, "By Jove! fellows: I do like to look at a nice kid." And then a well groomed young lady who was passing in the general direction in which Mr. Pye's words had drifted turned and swept Dave with a look which meant volumes.

Consternation, admirably concealed, has reigned in the camp of the Eastern base ball team since Tuesday last. Bart Stephenson, he of "swatting" fame in last year's game at Inlet Park, wired that he would not come to Atlantic City this year, owing to the loss of his pet bat which drove out two triples and two two-baggers last year. Said pet bat, it was further explained, had been purloined during a game on the back lots of Chelsea, whither Bart had journeyed last Saturday in quest of a little needed practice for today's game. A 90-word telegram, with 90 lbs. of appeal per word, was immediately dispatched by Captain Nellis to Bart. The rumor is, that the entire police departments of Chelsea and San Saugus were turned loose in search for the missing bat; however, Bart wired yesterday a summary of a fierce back-lot battle, in which two hoodlums were prepared for the emergency hospital and the pet bat recaptured. The joyous news was received by the Eastern team during practice, Mascot Harold Oviatt accentuating it by standing on his head four minutes. Bart's bat and he have arrived and will be on exhibition at Inlet Park today at 3 P. M.

A good many people who have visited the *Railway Age Gazette* office on the pier have inquired about Miss Jennie Boyd, who for years was a member of the staff of the *Daily Railway Age* and the *Daily Railway Age Gazette* at these conventions. She is not here, and for a good reason. The reason is that she no longer is Miss Jennie Boyd; she is now Mrs. George Tebo. She left the service of this paper, was married last September and now, instead of being a business woman, is a happy and industrious little home-maker in Chicago. Mrs. Tebo in point of service—although not in age—was one of the oldest employes of the *Railway Age Gazette.* She became connected with the *Railway Age* when she was a little girl in short dresses, and stayed with it and its successor, the *Railway Age Gazette,* until she was married, almost 20 years afterward. And never did any concern have a more faithful, loyal, competent employee than she was during all those years. It was never too early in the morning for her to get down to the office, never too late at night for her to stay, if there was anything to do; and it was all done, not merely without reluctance, but gladly and enthusiastically. Miss Boyd attended these conventions for years and made numerous friends, and all of them who had not before heard of her marriage will join with those who had in wishing Mrs. Tebo many years of richly-merited happiness.

Intense interest is being shown in the progress of the two Jays, Gardner and Keegan, in their daring race to the convention. The wireless operator reports frequent calls from both voyagers, but static, due to the recent thunder showers, has interfered somewhat with the transmission. Items such as, "Sorry to have missed the reception," and, "Wish I could have made it for the dance," have been received at intervals. However, two distinct messages have reached us from Gardner's aeroplane since it left Chicago. The first gives a thrilling account of an encounter with an eagle. The second says, "Owing to fouled spark plug, broken propeller and split elevating plane, will be delayed. Expect to arrive 9 o'clock Sunday morning." Keegan's dispatches lack the detail of Gardner's, probably due to the tremendous exertion he puts in his swimming. For awhile rapid progress was reported, but when off Coney Island he ran into a shoal of mermaids. Later messages tell us that he was sighted off Long Branch with a shark and sea-serpent in hot pursuit, but that his strong crawl stroke was rapidly leaving them astern. At his present rate he may be expected at 4 a. m. tomorrow. As a mark of honor to the victor in this hair-raising race, the committee has under consideration a special net hawl at that time in order that Keegan may rise from the waves with due ceremony.



THE MASTER MECHANICS' BALL.

Photograph by George A. McKeague Co., Atlantic City, Official Photographer, Railway Age Gazette.

ELECTION OF EXECUTIVE MEMBERS, SUPPLY MANUFACTURERS' ASSOCIATION.

The election of members of the Executive Committee of the Railway Supply Manufacturers' Association resulted in the selection of members from the different districts as follows:

Third district, George N. Riley, National Tube Company, Pittsburgh, Pa.. Frank J. Lanahan, Ft. Pitt Malleable Iron Company, Pittsburgh, Pa.

Fifth district, J. Will Johnson, Pyle-National Electric Headlight Co., Chicago.

Sixth district, George L. Morton, Galena Signal Oil Company, Atlanta, Ga.

M. M. REGISTRATION.

Allan, Arthur, M. M., Temiskaming & No. Ontario Ry., North Bay Ont., Can., Traymore.
Combs, W. B., M. M., Macon, Ga., Macon, Dublin & Sav., Young's.
Emory, J. B., M. M., Kansas City Southern, Chalfonte.
Gillis, H. A., Seaside.
Harrington, H. H., M. M., Erie R. R., Penhurst.
Hedley, F. G. M., Interborough R. T. Ry. Co., Shelburne.
Jacobs Henry W., Asst. S. M. P., A., T. & S. F. Ry., Traymore.
James, E. T., Supt. Shops Lehigh Coal & Nav. Co., Dunlop.
Langton, Geo. H., M. M., Kansas City South. Ry., Dennis.
Milliken, Jas., S. M. P., Phila., Balto. & Wash. Ry., Marlborough-Blenheim.
McGill A. M., M. M., Lehigh Valley R. R., Traymore.
Noble, L. C., Dennis.
Poole, A. J., S. M. P., Seaboard Air Line Ry.
Reagan, Frank H., Supt. Scranton Shops, D., L. & W., Belville.
Robertson, D. D., M. M., Lehigh Valley R. R., Traymore.
Smock, F. A., M. M. Pennsylvania R. R.
Stewart, A. F., M. M., C. & O. Traymore.
Wardwell, H. F., Supt. Power & E., Belt Ry. Co., C. & W. I. R R. Traymore.

M. C. B. REGISTRATION.

Boutete, H., Chief Joint Inspector, Chalfonte.
Burgman, C. P., M. M., Ann Arbor R. R.
Bussing, S. H., S. M. P., Buffalo & Susquehanna R. R. and New Orleans Gt. Northern, Haddon Hall.
Carroll, J. T., Supt. M. P., B. & O. R. R., Traymore.
Cory. C. H , Dennis.
Downing. I., S. M. C. B., L. S. & M. S. Ry., Traymore.
Gaskill, C. S , Asst. Engr., M. P., P. B. & W. R. R., Chalfont.
Gentry, T. W.. Amer. Loco. Co., Wiltshire.
Gill, Wm, M. M., Iowa Central Ry., Rudolf.
Hogarth, Wm., Cudahy Refr. & Tank Lines, Brighton.
James, Edwin T., Supt. Shops, Lehigh Coal & Nav. Co., Dunlop.
Knox, W. J., M. E., Buff., Roch. & Pitts. Ry., Rudolf.
McGill, A. M., M. M., Lehigh Valley R. R., Traymore.
Martin, P. A., Supt. Equipment, National Car Lines, Traymore.
Milliken, James, S. M. P., Phila., Balto. & Wash. Ry., Marlborough-Blenheim.
Osman, H. L., S. C. D., Morris & Co. Refr. Lines, Traymore.
Peterson, A. F., M. C. B., Cold Blast Trans. Co., Haddon Hall.
Poole, A. J., S. M. P., Seaboard Air Line Ry.
Thomas, W. H., Dennis.
Reagan, F. H., Supt. of Shops, Del., L. & W., Belville.
Rommel, Geo., M. M., P. & R. Ry.
Wardwell, H. F., Supt. Power & E., Balt. Ry. Co., Traymore.

GUESTS.

Allcroft, G. E., Pur. Dept., Penna. Lines, Russell House.
Andrus, C. H., Genl. Loco. Inspector, Penna. R. R.
Barr, W. N., Ch. Clk., Gen. Mgr., P. & R. Ry., Chalfont.
Barton, E. O., Foreman Mach. Shops, P. R. R. St. Ives.
Beatty, J. B., Ch. Clk., G M. Car Dept., P. R. R., Dunlop.
Beaumont, C., M. C. B. B. C., B. & O., Young's.
Bingaman, Chas. A., Eng. of Tests, P. & R. Ry., Monticello.
Benkhart, A., Asst. Gen. Foreman, N. Y. Central, Penhurst.
Conn, J. J., Asst. Gen. Pur. Agt., Santa Fe System, Chelsea.
Casper, D. B., Gen. Storekeeper, P. R. Ry.
Davies, H. W., Pur. Agt., Norfolk & Southern Ry., Traymore
Deeter, Harry H., Genl. Foreman, P. & R. Ry., Mullica.
Deamarest, Geo. A., C. C. to Supt. of Shops, C.R.R. of N.J., Jackson
Douglas, F. R., Inspector Test. Dept., P. R. R.
Frazier, George H., Secy., N. E. Railroad Club, Dennis
Gearhart, J. F., Foreman Painter, P. R. R., Dunlop.
Gehret, S. S., Gen. Fman., Penna. R. R., Hawley.
Garity, J., Foreman Machine Shop, P. R. R, Traymore
Gosline, E. W., Foreman Pipe Dept., P. R. R.
Grant, H. H., Foreman, P. R. R., Princess.
Hall, C. B., Inspector, Pur. Dept., P. R. R.
Hines, J. P., Genl. Foreman, B. & O., Monticello.
Hubbell, C. C., Pur. Agt., D., L. & W., Marlborough-Blenheim.
Justice, H. B., Asst. Storekeeper, P. R. R.
Kidd, C. M., Genl. Air Brake Insp., N. & W. Ry
Kline, A. J., Foreman, P. R. R.
Lewis, Thos. E., Genl. Foreman, N. & W. Ry.
Little, D. A., For., P. R. R., Rudolph.
Maddy. J. H., Special Rep.. Erie R. R., Marlborough-Blenheim.
O'Malley, G. W., Asst. Rd. For. Engines, Phila. Ter. Div.
McConnell, W. T., Frman. Erecting Shop. P. R. R., Stanley
Marshall, T. B., Foreman, P. R. R., Chelsea Hall.
Minnett Harry, Foreman Car Insp. P. R. R.
Myers, J. E., Overseer Loco. Testing, P. R. R.
O'Brien, Jno. J., Supt. O. Dept., Terminal Ry., Watkins
Pangborn, R. G., Mech. Engh., B. & O. R. R.
Packer, E. M., Lumber Inspector, P. R. R.
Philpot, John, Foreman Mech. Shop, N. Y. C. & H. R., Monticello.
Powell, James, Chief Draftsman, Grand Trunk Ry., Young's
Robinson, Garland P., Asst. Chief Inspector, Interstate Commerce Committee, Haddon Hall.
Robinson, W. L , Supt. M. & W. Shop, B. & O.. Haddon Hall.
Roby, E. O., Genl. Pie. Wrk Insp., N. Y. C. & H. R., Monticello.
Scheile, John, Asst. Rd. For. of Eng., P. & R., Ariel.
Scott, J. M., Pres., Cliffside R. R., Chalfonte.
Scott, Z. D., Agt. Penn. Lines at Milwaukee, Penn. R. R., Phillips
Sheldon, R. D., Round House Foreman P.. B. & W. Ry. Chalfonte.
Skinner. L. H., Secy. to V. P. Southern, Dennis.
Steen, W. J., Traveling Eng., P. R. R.
Stout, H. D., Storekeeper, P. R. R.
Thompson, J. G., Gen. Foreman, N. Y., O. & W., Koenig.
Wight, S. B., Pur. Agt., N. Y. C. Lines, Marlborough-Blenheim.
Wilkes. W., Elect., P. R. Ry.
Zelly, Walter, Chief Clk., P. R. R.

THE SIX KIRKSMITH SISTERS.

The entertainment planned for yesterday afternoon at the Brighton Casino proved to be one of the very best afternoon concerts ever given in connection with the conventions. The attendance was about 200 and comfortably filled the theatre.

The six Kirksmith sisters are, indeed, a very versatile group, rendering with pleasing technique and harmony both vocal and instrumental music. Every selection was thoroughly appreciated, and the continuous encoring following the rendition of each selection brought forth as many additional pieces as were provided on the original program.

The entertainment committee, in providing such a concert, has set a standard that will be hard to live up to. Every selection was just of the right length to at all times hold the audience, and the variety of combinations was likewise pleasing.

The "Six" was composed of Miss Gertrude Kirksmith, soprano and viola; Miss Maud Kirksmith, violin; Miss Lillian Kirksmith, flute; Miss Marguerite Kirksmith, cornet; Miss Pauline Kirksmith, saxophone; Miss Agnes Kirksmith, piano. The program given follows:

1. Dance of the Serpents.....*Boccalari*

INSTRUMENTAL

2. Cavatina .....*Raff*

VIOLIN SOLO

3. My Lady Chlo.....*Clough-Leiter*
VOCAL QUARTETTE
4. Traviata .....*Verdi*
FLUTE SOLO
5. Hear Me Norma.....*Bellini*
DUET FOR FLUTE AND VOICE
6. Siamese Patrol .....*Lincke*
INSTRUMENTAL
7. Hero Song from "Chocolate Soldier" .....*Strauss*
SOPRANO SOLO
8. Dixieland .....*Haines*
INSTRUMENTAL

In addition to this program, Miss Gertrude Kirksmith, by special request, repeated the "The Hero Song" from "The Chocolate Soldier." She also rendered a vocal solo, playing the violin accompaniment herself, and sang an extra solo to the flute accompaniment of her sister, Miss Lillian.

MORE GLIMPSES OF PAST CONVENTIONS.

In a way, the 1904 convention, the last held at Saratoga, was uneventful. Of course, there were the usual carriage drives, band



Broadway, Saratoga, 1904.

concerts (sacred and otherwise), dancing and other forms of harmless entertainment. Yes, we do recall that there was another base ball game; that the East won, and that the score stood 12 to 10. But aside from all these things (enough to make time pass pleasantly and all too quickly) some did say, "It was too slow." However, it is an even chance that the 1905 convention would have been held at the same place had the hotel owners shown the proper spirit, and had the village provided a suitable place for the exhibits, which had outgrown their old quarters. Instead, the committee selected Manhattan Beach.



Frank H. Greene and Two Pals, Saratoga, 1904.



W. T. Hippey, G. R. Henderson, G. M. Basford and W. C. Arp, Saratoga, 1904.

Now, Manhattan Beach was no place for a convention. It was too near Broadway. At least that is what "they" all said. And "they" were right in their prediction, but wrong in their reasoning. According to the *Daily Railway Age*, "It is as difficult to get to New York from the Oriental as from Saratoga."



Cashing in Bets on the Ball Game, Saratoga, 1904.

And will you ever forget the time "they" had in getting *from* Manhattan borough *to* Manhattan Beach! Those who used the one steam line found that a new signal system was being installed. We do not recall whether it was manual, or automatic, but we do remember that the number of blocks was most unusual. To those who used the Brooklyn trolley lines, one has only to mention "Sheepshead" if he would hear a tale of real woe;; and the same applies to those who chose the elevated lines to Coney Island. Perhaps it was all for the best, however; because those who finally reached the Oriental, or its companion a little further



H. F. Ball, J. F. Walsh and W. T. Simth, with C. A. Seley on the Side, Saratoga, 1904.



J. F. Walsh, S. N. Rushmore, R. S. Chisolm, E. A. Simmons and W. F. La Bonta, Manhattan Beach, 1905.



H. C. Macklin, E. H. Bankard and W. F. La Bonta, Manhattan Beach, 1905.



H. C. Macklin, W. H. Lewis, N. L. Friese and W. K. Carr, Manhattan Beach, 1905.



Rooters and Rubbernecks, Manhattan Beach, 1905.



Japanese Girl Rooters, Manhattan Beach, 1905.

to the south, made no attempt to go back to the Great White Way.

The year 1906 saw the convention's first visit to Atlantic City. The predictions of dire disaster were many; but really, things went pretty smoothly, on the whole.



O. C. Gayley and L. O. Cameron, Atlantic City, 1906.

Even as sometimes before the weather man was a little backward and for a day or two the only cheerful thing on the Steel Pier was the chirp of the radiator; but after awhile his disposition was much more kindly. The report of the bureau of vital and other statistics for that year shows one important birth—the McBarmma Golf Club, named after the two mechanical associations. Clementine F. Street mothered the infant, which has since grown to healthy proportions; but the name of the father is not given. Among the suspects, however, are H. H. Vaughan, R. P. C. Sanderson, Otis H. Cutler and T. H. Symington.



On the Green, near the Oriental, Manhattan Beach, 1905.



ENTERTAINMENT COMMITTEE.

Top row (left to right)—Wardell, Furry, Miller, Martin, Coburn, Nellis, Farmer, Smith, Mitchell, Corr, Green, Toothe, Ernst, Landreth.
Bottom row (left to right)—Williams, Dunkelberg, Silk, Walsh, Hibbard, Nealley, Johnson (chairman), Hayes, Sherman, Younglove, Janes.

THE CARD PARTY.

The card party in the ballroom of the Marlborough-Blenheim last night was a very interesting and much enjoyed affair. A large number played, the games being progressive euchre and progressive bridge. Fifty prizes were awarded, 25 to ladies and 25 to gentlemen. The prizes were on exhibition in the ballroom all day yesterday, and were seen by a large number of intending players.

The committee in charge of the party was composed of J. C. Younglove, chairman; H. S. Hammond, P. J. Mitchell, Ross F. Hayes, R. C. Coburn, W. J. Walsh, George R. Carr, H. A. Nealley, C. P. Williams, C. A. Knill, J. M. Brown and Thomas Farmer, Jr.

The number of couples playing bridge was 56, and 76 couples played euchre, making a total of 264 people playing.

The following is a list of the prizes and the prize winners:

LADIES' PRIZES.

1. Mrs. G. L. Fowler (Bridge), bronze figure.
2. Mrs. Henry Boutet (Euchre), cut-glass relish dish.
3. Miss Verona Pratt (Bridge), tapestry serving tray (mahogany rim).
4. Mrs. L. J. Bordo (Euchre), copper coffee percolater.
5. Mrs. B. H. Forsyth (Bridge), cluny luncheon set, center piece and thirty-six doilies.
6. Miss M. Campion (Euchre), cavilier hand bag.
7. Mrs. Robert Tawse (Euchre), library electrolier.
8. Mrs. A. F. Stewart (Bridge), thermos carafe.
9. Mrs. W. F. Miller (Euchre), boudoir electric lamp.
10. Miss Edith Tewkesbury (Bridge), velvet band with buckle and slide.
11. Mrs. J. F. Dunn (Bridge), bracelet.
12. Mrs. C. A. Paquette (Euchre), Sheffield platter.
13. Mrs. George A. Post (Euchre), cut-glass jewel box.
14. Mrs. F. H. Scheffer (Bridge), venetian flower holder.
15. Mrs. F. A. Purdy (Euchre), mahogany candle sticks with shades.
16. Mrs. T. M. Ramsdell (Bridge), Austrian vase.
17. Mrs. A. C. Langston (Euchre), Rockwood vase.
18. Mrs. E. H. Gold (Bridge), tiplitz flower basket.
19. Mrs. W. C. DeArmond (Euchre), Dresden compote.
20. Mrs. W. S. Furry (Bridge), dessert set.
21. Mrs. F. O. Brazier (Euchre), brass fruit basket.
22. Mrs. L. R. Phillips (Bridge), parasol.
23. Mrs. G. H. Prussing (Euchre), sandwich tray (china).
24. Mrs. A. O. Chase (Bridge), rockwood vase.
25. Mrs. W. H. Hill (Euchre), sandwich tray (metal trimmed).

GENTLEMEN'S PRIZES.

1. Henry H. Kerr (Bridge), Russian leather traveling bag
2. S. Anderson (Euchre), desk electrolier.
3. H. B. Payne (Bridge), umbrella.
4. F. O. Brazier (Euchre), electric reading lamp.
5. L. A. Williams (Bridge), cane.
6. A. G. Sandman (Euchre), terra-cotta figure.
7. H. W. McGraw (Bridge), brass smoking set
8. A. C. Langston (Euchre), cut jet inkstand.
9. Frank Slocum (Bridge), eight-day clock.
10. H. Boutet (Euchre), Venetian cordial set.
11. F. V. Springer (Bridge), set of hangers in case
12. B. S. Johnson (Euchre), cocktail mixer.
13. Barney W. Frauenthal (Euchre), Thermos bottle.
14. H. Morley Hitchcock (Bridge), beer moat.
15. T. B. Arnold (Bridge), Bohemian cordial set.
16. George W. Rink (Euchre), adjustable shaving glass.
17. H. F. Deverell (Bridge), brass book rack.
18. E. W. Pratt (Euchre), ice tub.
19. P. J. Meade (Euchre), brass serving tray.
20. A. F. Stewart (Bridge), Doulton pitcher.
21. C. H. Rae (Euchre), brass ash tray.
22. George L. Fowler (Bridge), copper champagne cooler.
23. W. H. Wood (Bridge), necktie case (leather).
24. N. E. Sproul (Euchre), brush set.

FOREIGN RAILWAY NOTES.

Workmen in the shops of the Prussian State Railways have for some time complained of the contracts for piecework under which many of them work. Now the Minister of Railways purposes to have this matter thoroughly investigated by a commission composed of officers and employees of all grades, including representative workmen, the head of which is one of the highest officers in Berlin, and in which are four journeymen chosen by the workmen of some of the great shops, and several officials who formerly served as workmen, and so know by experience what the effects of the system are.

Three years have now elapsed since the government of the Dominican Republic assumed the full control of the Central Railroad, and each succeeding year has shown a greater profit than the preceding one. This is a most gratifying indication of the progress and sound fiscal management of the republic. According to the accounts submitted by the company for the year 1910, the total gross receipts amounted to $284,421.72; of this total, $281,517.06 were received from freight and passenger traffic. The net earning of the line for the year aggregated $73,419,40, which represents a 5½ per cent. income on the estimated value of the road, including the Santiago-Moca branch. The number of miles covered by passenger trains during the year totaled over 37,000.

The contract for the construction of the strategical railway which is to assure Turkish supremacy in the Yemen has been given to a French company. The line was designed to reach from Hodeidah to the important post of Sana by way of Hujjeilla and Menacha. By folowing this route, however, very great difficulties would have to be overcome, as a high and rugged mountain range intervenes, necessitating the use of a rack railway. Permission has been given for the line to be diverted southwards, and it will now reach Sana by a détour via Beit-el-Fakih, with a branch line to Taiz. Another important work has been allotted to the French contractors—namely, the improvement of the port of Ras-el-Ketib, 10 miles north of Hodeidah, and the construction of railways in connection therewith.

A bill was introduced in the congress of the republic of Chile during the January session for the establishment of a special savings bank and pension system for employees of the state railways. This measure, which has been approved by the senate, provides for the raising of funds for the savings bank in the following manner: 5 per cent. of the earnings of employees; fines levied on employees for the improper performance of their duties; receipts from advertisements in railway stations; unclaimed wages of employees; and 0.0015 per cent. of the receipts of the state railways. The bank is to be managed by an administrator and board of directors composed of five members, two of whom shall be the director general of railways and the administrator of the second section of the central railway system. Pensions will be granted to persons who have served the state railways 10 years or over, and who have become incapacitated for service. Employees completely disabled because of injuries sustained during the performance of duties in the employ of the state railways are entitled to a pension for life at full salary, and employees temporarily incapacitated are entitled to full salary during convalescence for a period not exceeding six months.

HIGH DEGREE SUPERHEAT.

The rapid increase in economy with a less rapid increase in the amount of superheat has been a feature in connection with the application of superheated steam which has been discussed from many angles for a long time. It is a point which is not at first apparent and which has often been discussed only from the theoretical side, and with the aid of complicated equations and mathematical calculations, which have served only to confuse the average person who has tried to study the problem. It has been shown by a large number of experimenters, including Dr. W. F. M. Goss, whose work has been of an intensely practical and reliable character, that the matter can be made clear without cumbersome mathematical demonstrations. This was forcibly shown in Dr. Goss' report of the experiments on an engine equipped with a fire-tube superheater. The experiments were conducted through a range of pressures and with varying degrees of superheat intended to cover all conditions of actual service. Taking, for example, a boiler pressure of 180 lbs., it was found that the coal per indicated horse-power when using saturated steam was 3.4 lbs. With 120 deg. of superheat the coal consumption was reduced to 3.25 lbs., showing an economy of 7.2 per cent. At 160 deg. of superheat, the coal consumption was 3 lbs., showing an economy of 14.4 per cent. It is thus seen that the increase in superheat of 40 deg. from 120 to 160 deg., gives the same increase in percentage as the first 120 deg. from saturated steam. No clearer nor more convincing fact can be shown, in proof of the claim that the economies increase more rapidly than the superheat. This shows plainly the reason for the increasing number of engines equipped with high degree superheaters.

With the fire-tube type of superheater, which has been so extensively used in this country, it is interesting to note that with the demand for increased power placed upon the engine the degree of superheat increases, and this, producing increased efficiency, results in the demand upon the boiler being increased less rapidly than the power developed by the engine. In other words, a certain increase in the horse-power, or tractive effort results in a smaller increase in the amount of fuel required. This feature is of great advantage for the reason that the capacity of the engine is increased without increasing the maximum of fuel consumption, or the labor of the fireman. On the contrary, where saturated steam is used, the efficiency of the boiler and locomotive decreases when the boiler is forced. With saturated steam the quality of the steam delivered to the cylinder is lowered as a result of the larger percentage of moisture, so that in this case when the demand for power is increased the demand for fuel is increased at a more rapid rate. Consequently the capacity of the fireman is reached before the capacity of the engine. For this reason, if no other, the superheated steam engine has a decided advantage.

FOREIGN RAILWAY NOTES.

The railway recently constructed from Corrientes, Argentina, to Dodero and General Paz has been opened to traffic, thereby affording direct freight and passenger service between Buenos Aires and General Paz.

The proposed Great Western Railway, Queensland, will consist of four sections, measuring 245 miles, 348 miles, 361 miles, and 328 miles respectively. Construction will be begun, as nearly as may be, simultaneously on all four sections. The second railway system is to run along the coast and connect up the existing railways. This line, which will be about 454 miles in length, will be constructed in five sections. In the state of Western Australia a railway with a length of about 22 miles is to be constructed to give access to the new goldfield.

The Exhibit.

George E. Molleson has been appointed general sales agent to railways for the Thomas Steel Company, Niles, Ohio.

A new line of truss brake beams for freight equipment and high speed passenger service, manufactured by the Buffalo Brake Beam Company, New York, are shown in its space on the pier.

The attractiveness of the booth of the U. S. Metal & Manufacturing Company, New York City, is due largely to E. D. Hillman, mechanical engineer of the company. Mr. Hillman has been here since Sunday.

The Independent Pneumatic Tool Company, Chicago, is showing 48 air tools and appliances of various sizes and types, and has 16 representatives to demonstrate and explain the different features. In addition to the standard line of drills and hammers, the exhibit includes several special drills of the compound type, and hammers and drills with sections removed to show the inside working parts.

While the new lantern globes are emphasized in the exhibit of the Storrs Mica Company, Owego, N. Y., the principal part of its product in the railway supply field is headlight chimneys, which have been used for the last ten years. The makers claim that these headlight chimneys help to keep the headlights in good condition by protecting the reflectors from the smoke and heat of the burner, to which they are sometimes exposed when a glass chimney becomes broken.

The Parkesburg Iron Company, Parkesburg, Pa., which occupies the same space on the pier as for the last four years, is represented at the convention by George Thomas, 3d, treasurer; L. P. Mercer, sales agent, Chicago; J. A. Kinkead, sales agent, New York; W. H. S. Bateman, sales agent, Philadelphia; Charles L. Humpton, traveling sales agent, Philadelphia; H. C. Hunter, tube expert; and J. H. Smythe, boiler expert, Parkesburg, Pa. H. A. Beale, president, was called away, but will return next week.

The representatives of the Kennicott Company, Chicago Heights, Ill., who are here are C. L. Kennicott, vice-president and general manager; C. B. Blair, assistant treasurer; T. J. Windes, salesman and chemist, water softener department; and G. E. Pratt, railway repair car department.

The following representatives of the Pressed Steel Car Company, Pittsburgh, Pa., are in attendance at this convention: O. C. Gayley, vice-president, New York; C. E. Postlethwaite, manager of sales, Pittsburgh; J. H. Mitchell, manager of sales, Chicago; J. G. Bower, assistant manager of sales, Chicago; G. T. Merwin, assistant manager of sales, St. Louis; L. O. Cameron, manager of sales, Washington, D. C.; J. S. Turner, New York; W. H. Wilkinson, New York; J. C. Anderson, New York; H. S. Hammond, Pittsburgh; M. S. Simpson, Pittsburgh; G. W. Ristine, Jr., Chicago; C. A. Lindstrom, chief engineer, Pittsburgh; B. D. Lockwood, assistant chief engineer, Pittsburgh.

The general offices of the Indian Refining Company have recently been moved from Cincinnati, Ohio, to 133 William street, New York city. Although this Company is not making an exhibit this year, it sends a cordial invitation to all its railway friends going to New York to drop in and see them at their new headquarters. Their "Indian Head" brand of lubricating oil is being furnished to railways on a mileage guarantee basis. It also manufactures valve oils made from pure Pennsylvania stock, compounded with a high grade of material. Coach and car oils are also a product in which the company deals extensively, as are also headlight oil for railway purposes, and the refining of gasolene of various gravities.

The railway department, of the International Correspondence Schools, Scranton, Pa., has brought to this convention several students from different shops where instruction is being given under its method. Of these: Letcher Vandergriff, Knoxville,

Tenn., W. H. Baldock, Knoxville, Tenn., Will T. Curlee, Spencer, N. C., Edward J. McCormick, Spencer, N. C., Garland Duckett, Atlanta, Ga., Wiley Blackwell, Atlanta, Ga., Malcolm Hankins, Birmingham, Ala., and King Holton, Birmingham, Ala., are from shops of the Southern Railway; Daniel Neal, Birmingham, Ala., and Henry Davidson, Birmingham, Ala., are from Queen & Crescent shops; S. D. Sprouse, Mobile, Ala., and J. D. Lang, Mobile, Ala., are from Mobile & Ohio shops; S. E. Purdun Yoakum, Tex., and W. L. Dornberger, Yoakum, Tex., are from S. A. & A. P. Ry. shops; and Murray Dixon, Toronto, Can., and Allen Norman, Toronto, Can., are from the shops of the Canadian Pacific.

The T. H. Symington Company, Baltimore, Md., is exhibiting an M. C. B. slotted butt coupler as adopted in 1910 by the M. C. B. Association and subsequently made standard by Letter Ballot. A portion of the top wall of the coupler shank is cut away to show the M. C. B. reinforcement of the standard key slot and the proper length of bearing for the key at the front and back ends of the slot. The slotted butt couplers are suitable either for the riveted yoke or a key connected draft gear attachment. The shank of the slotted butt coupler is stronger through the slot in tension, compression and flexure than it is between the slot and the coupler head. Slotted 8½-in. and 9⅛-in. butt couplers may also be used with the riveted yoke, thus reducing the number of couplers and stock on hand necessary to carry out outlying car repair points.

METAL CAR SPECIALTIES.

Forsyth Brothers Company, Chicago, has built an extensive and modern plant at Harvey, Ill. This company is constantly adding to the number of pressed metal specialties, many of which it has already gotten into extensive service. Among others of these metal formations might be mentioned the pressed unit side sections, doyle posts, carlines, pressed steel roof sections, one-piece metal doors, self-adjusting dust-proof window sash and sash weather-stripping. This company also manufactures, in its other departments, draft gears and buffing devices.

IMPROVED NATIONAL LOCK WASHER.

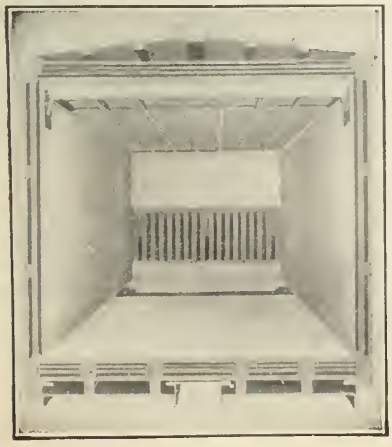
At space 4 in the main building, the National Lock Washer Company, Newark, N. J., is exhibiting a full line of its lock washers, from 3/16 in. to 4 in. in size. This company has been making nut locks for 25 years. All the steels used are special in every sense of the word, and must pass exacting analytical and physical tests before acceptance. The machines used in tempering and hardening the nut locks are of special design, fully protected by patents owned by the company. There is no part of the treatment left to the judgment of the employee. The whole operation is automatic from the original winding of the nut lock until the final testing. The fact that over 500,000,000 National lock washers have been used to advantage in track has convinced railways that they can be used to equal advantage on car work; and many roads have made this practice standard. The principal claim made for the National lock washer is that it is the only nut lock which, by reason of its rib, causes a lock between nut and bolt independent of spring power, and at the same time acts as an elastic bond between nut and backing, retaining a tight joint even if the bolt stretches or the bearing surfaces be rough or uneven.

LOW WATER ALARM.

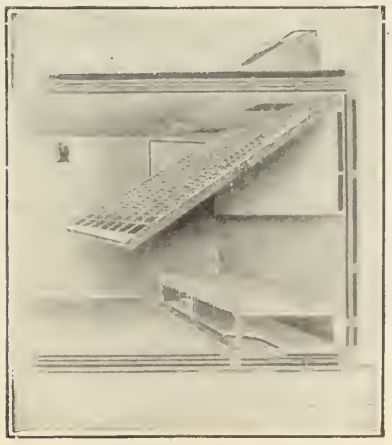
The Kellogg low water alarm automaticaly signals to the engineman in case the water level in the boiler sinks below the desired and permissible safety limit. It consists of a tube filled with mercury and placed in a metallic casing, which connects with the water space of the boiler at a point below which the water level should not sink. As long as the casing is submerged in water, the mercury in the tube will exercise no function; but when the water level sinks below the safety limit and steam enters the casing, the mercury will be heated and the force of the expansion will automatically open a valve, admitting steam to a whistle which sounds the alarm. The connection with the water space of the boiler may be so made that the level of the water above the crown sheet can be predetermined at any height desired. The Kellogg alarm is made by the Nathan Manufacturing Company, New York.

GALVANIZED PRESSED STEEL BULKHEAD.

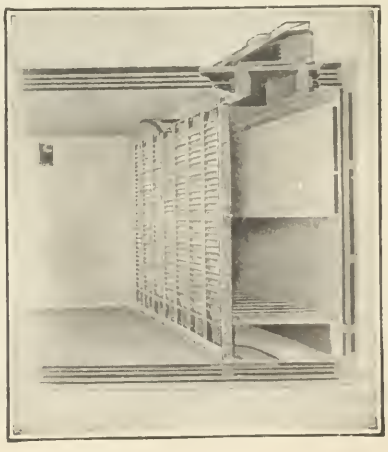
The White Enamel Refrigerator Company, St. Paul, Minn., has made an improvement in its bulkhead material for refrigerator cars that reduces the weight of the car by 600 lbs. Instead of the wooden construction usually applied to this class of equipment, it has perfected a galvanized pressed steel bulkhead that does away with wooden posts, wooden protection strips, and screens. The Bohn system of refrigeration is doubtless used to a greater extent for both car and stationary purposes than any other one arrangement. It has been in use for years upon such roads as the Harriman Lines, the Atchison, Topeka & Santa Fe, the Chicago, Burlington & Quincy, the Chicago Great Western, and the Canadian Pacific. A contract recently awarded this company calls for Bohn refrigerators for the Grand Trunk Railway hotel, the Chauteau Laurier, and Central Union Station, Ottawa, Canada. A feature of the bulkhead is that when the car is not in use it folds up under the roof and out of the way. The accompanying illustrations show the bulkhead in its positions.



Bulkhead Out of the Way.



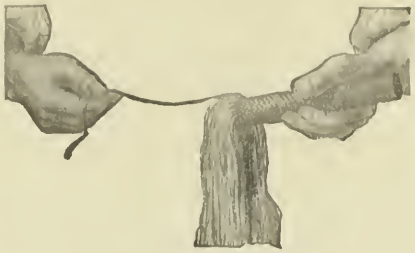
Bulkhead Partly Raised.



Bulkhead In Position for Icing.

PALMETTO PACKING.

Greene, Tweed & Company, New York, are showing, in booth 606, the Palmetto packing. The accompanying illustration shows this packing, as made up of many strands braided together. The strands are asbestos and are well

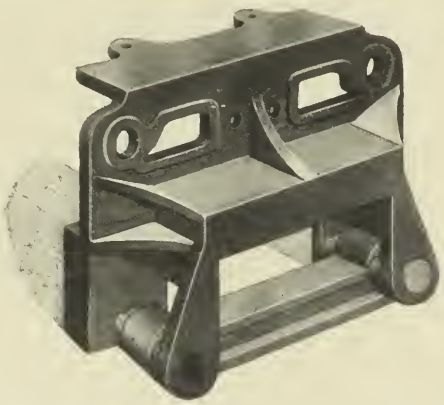


Palmetto Packing.

saturated with lubricant before braiding. This keeps the packing soft and pliable in service, which prevents it from scoring or binding the rod. This packing is furnished in forms suited to air pumps, throttle valves, Walschaert's valve gears, shop engines and compressors, as well as small hand valves, etc.

COMMONWEALTH-FLORY STRIKING PLATE AND CARRY IRON.

The Commonwealth-Flory striking plate and carry iron is made by the Commonwealth Steel Company, St. Louis, Mo. Attention is called to the fact that it meets a new emergency



Commonwealth-Flory Striking Plate and Carry Iron.

in its ability to secure any required end clearance. The carry iron is reversible, and turning it over raises a drooping coupler ¾ in., thereby obviating the necessity of altering the height of the car. In this, as well as in the time saved in changing couplers and attachments, a large item of expense is eliminated.

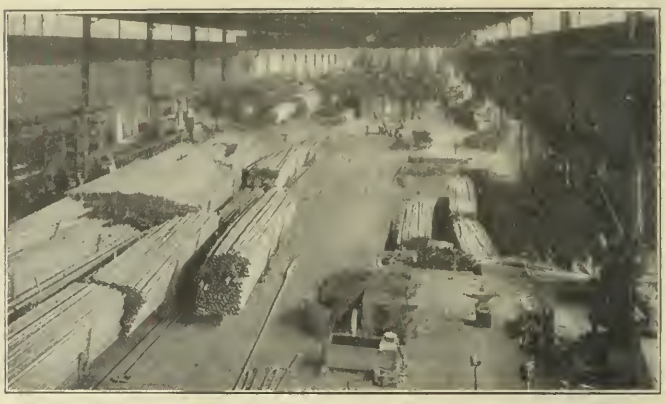
RADIATORS FOR STATION HEATING.

Radiators of different designs and construction, which give a wide range of choice to the architect or engineer, are made by the United States Radiator Corporation, Dunkirk, N. Y. They are designed with the purpose of giving a high heating value for every square inch of surface, the outer barrels of the sections being made to give as large a surface as possible to the outside air. The Triton radiator has been adopted by the government for heating many public buildings.

Among the different types made by this company are the Triton Plain, the Triton Ornamental, the Puritan Plain, the Florentine Ornamental, the Grecian Plain and the Sun Ornamental.

CHARCOAL IRON FOR TUBES.

The Parkesburg Iron Company, Parkesburg, Pa., formerly H. A. Beale & Co., has been in continuous operation for about 50 years, its output of blooms being converted into charcoal iron boiler tubes. For a number of years, in addition to skelp from charcoal iron blooms, puddled iron skelp was also produced at this mill. This latter material made a very durable tube, but as it is not as ductile as charcoal



Tube Mill; Parkesburg Iron Company.

iron, it gradually fell into disfavor, and to-day the output is exclusively charcoal iron skelp, which since 1908 has been manufactured into tubes at Parkesburg, in an electrically driven tube mill, an interior view of which is shown herewith. This company's output has increased from less than 1,000 tons of blooms per year, at the beginning, to 18,000 tons of tubes annually. The accompanying illustration represents one of the 26 forge fires at Parkesburg, where each fire produces a loup of iron of about 240 lbs. in the neighbor-



Forge for Making Charcoal Iron.

hood of 45 minutes. The raw material is either run-out metal, of charcoal pig iron from which the graphitic carbon and silicon have been eliminated, or clean steel or iron scrap, the refining process in both cases being the same, namely; to melt the charge in a charcoal fire under blast. By this operation, all particles of the charge under the reducing flame are melted and purified, making a homogeneous loup of nearly pure iron in the bottom of the hearth. It is claimed that the resulting cinder, as in the basic open hearth furnace, reduces the sulphur and phosphorus and eliminates

the carbon and manganese from the charged material, the total iron being 99.7 per cent., or higher, in the bloom. This process produces a ductile material, which is converted into boiler tubes.

LITTLE GIANT DRILLS.

The Chicago Pneumatic Tool Company, Chicago, has on exhibition one of its No. 10 Little Giant drills fitted with pistol grip handle. This is the smallest piston air drill ever placed on the market; the complete machine weighing but 6¾ lbs. It was especially designed for drilling telltale holes in stays. The pistol grip handle is patterned after the handle on Boyer hammers. The throttle lever is operated by the thumb which renders speed control perfect.

BETTENDORF TANK CAR.

The accompanying illustration shows a tank car made and designed by the Bettendorf Axle Company, Davenport, Iowa, to eliminate as far as possible the damage done to tank cars by the liquid surging when the cars are being coupled.



Underframe for Bettendorf Tank Car.

The underframe consists of a center sill or buffing column, to which is riveted the body transom and draft sills, made in one piece. Above the side bearings are located horizontal rollers arranged in roller seats with inclined surfaces, and on which corresponding seats, secured to the tank, may travel. A special designed buffing device is provided above the center plate to assist in eliminating the horizontal travel of the tank over the underframe. A special locking device is also provided at this point to anchor the tank to the underframe. Thus it will be observed that in coupling cars the underframe will be the first to stop, and the tank, with its load, in which is stored a great amount of energy, due to its load and the speed at which the car is traveling at the instant of impact, is free to travel further, but in an inclined direction, bringing the tank to rest with its own weight, and dissipating the force of the blow in an upward direction.

An interesting test report is given herewith, in which the tank car was run at various speeds, hitting a loaded high capacity gondola car with brakes set, showing the movement of the tank over the underframe.

TANK EMPTY

Weight of Car 48,000 *lbs.*

M.P.H.	Velocity Feet per Second	Momentum Foot Pounds	Horizontal Travel Inches	Vertical Travel Inches	Recoil Inches
4	5.37	281,760	1 5-16	½	¼
6	8.8	442,400	3⅜	1 5-16	⅝
8	11.73	565,040	4	1½	15-16
10	14.66	703,630	4 5-16	1¾	1⅛

TANK FULL

Weight of Car and Load 154,250 *lbs.*

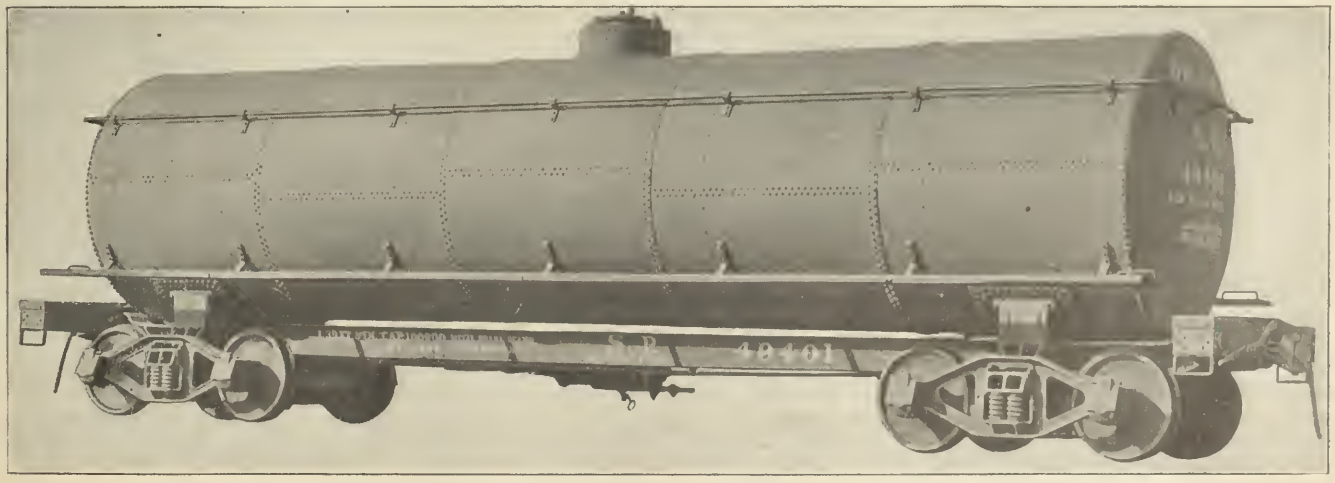
4	5.37	905,447	1 3-16	7-16	⅛
6	8.8	357,400	3⅛	1¼	¼
8	11.73	1,809,352	3¾	1½	⅝
10	14.66	2,261,305	4 5-16	1¾	½

AUTOMATIC TONGUE LIFT AND BRAKE FOR BAGGAGE TRUCKS.

The Railway Appliances Company, Chicago, is showing a model of an automatic tongue lift and truck brake. It is an arrangement which, as soon as the handle of the truck is dropped, instead of falling to the ground it is raised upward and at the same time applies brakes to the truck wheels. This stops the movement of the truck, eliminates the danger of persons stumbling over the truck handle and prevents the trucks from being driven off the platforms by gravity or wind. This last feature is imporant, as railway and express companies have suffered considerable loss by such accidents.

VALVE GEAR STOCK.

Anything that can be done on a railway to reduce unnecessary stock is a benefit to the road; it not only reduces the amount of money tied up, but also reduces the possibility of running out of any one material. It is quiet a problem in the motive power department to tell just what forgings and castings are necessary in order to maintain the engines.



Bettendorf Tank Car.

The different engines vary quite a good deal in construction and it is impractical to carry some of all the different parts in stock.

Locomotive valve gear has been standardized by the Pilliod Company, New York, makers of the Baker valve gear, so that the same gear parts are used on the different types and classes of engines. These gear parts, barring wrecks, would last indefinitely, they being designed so that the bearings can be renewed without the renewal of the piece itself. Even the matter of rights and lefts has been reduced to the minimum. These parts can be applied to any of the engines.

GALCO FOR INTERIOR FINISH.

The United States Metal & Manufacturing Company, New York, is showing in booth 337 material and samples of Galco for interior finish. This material can be used generally for interior finish throughout a car body; it will take a high finish and can be made to imitate various kinds of wood, especially mahogany and oak. It can be smoothed with a

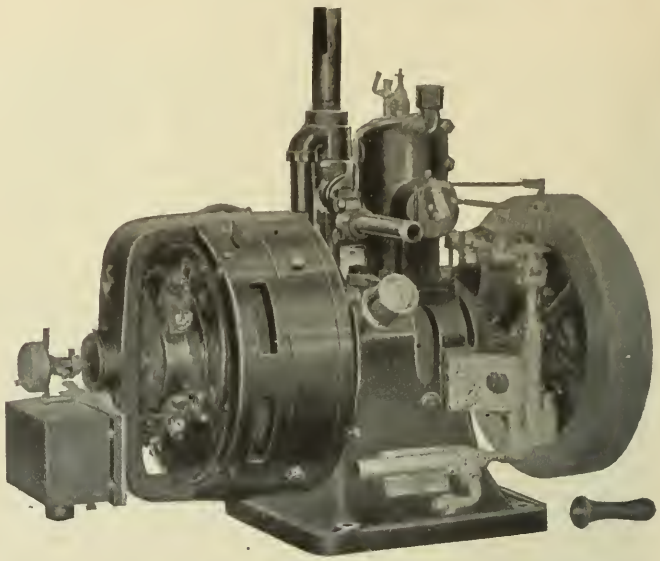


Galco for Interior Finish.

steel scraper or knife and is treated the same as natural wood. It is claimed by the makers that Galco overcomes the many troubles encountered with veneered head-linings, peeling and cracking, and being destroyed from leaky car roofs; that when painted, it becomes waterproof and can be soaked for a week with no disintegration and gets harder, like whalebone, with age; that it is a good non-conductor of heat and, to a great extent, electricity; and that, when subjected to 200 deg. of dry heat for a period of four to six minutes, it may be warped into any desired shape while in the heated condition without any fracture to the surface of the material.

GAS ELECTRIC GENERATING SET.

The General Electric Company, Schenectady, N. Y., which manufactures gasolene electric generating sets of capacities 3, 5, 10 and 25 kw., has added to this line a 1-kw. set which is designed for furnishing electricity for power and lighting in private residences, small hotels, rural railway stations, etc., not now served by central stations. This set comprises a single cylinder, vertical, 2-cycle water cooled gasolene engine direct connected to a 1-kw. d. c. generator. The regulation and steadiness of the voltage of this set is such that current may be taken direct from the generator, thus avoiding the expense of installing and maintaining a large battery and the losses and troubles incidental to the operation of the latter. The engine is provided with a suction gasolene pump for lifting fuel from a tank placed under ground and located at some distance from the engine, thus fulfilling the requirements of the National Board of Fire Underwriters. The cooling is done by a thermo siphon which does away with the necessity of a pump to provide forced circulation of the cooling water. The governor is located in the engine fly wheel and operates a throttle valve, giving close regulation and satisfactory operation at all loads. The dimensions of this 1-kw. set are: Length, 2 ft. 6⅝ in.; height, 2 ft. 2 in.; and width, 17⅝ in.; and the total weight is 350 lbs.

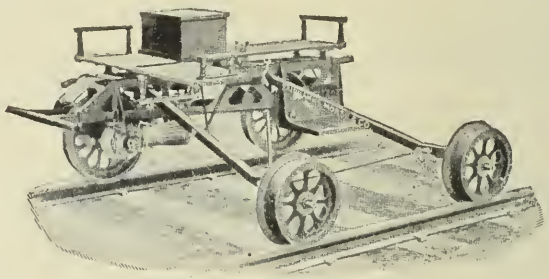


One K. W. Gas Electric Generating Set.

These sets can be furnished with either 35, 75 or 125 volt flat compound wound generators. Switchboard panels are furnished for controlling these sets.

GASOLENE INSPECTION CAR.

Gasolene cars are rapidly coming into extended use on railways. We now have the gasolene passenger car, gasolene inspection car, gasolene section car, and the velocipede type of gasolene car for roadmasters, signal and telegraph service. Following the general trend of improvements made from time to time, the builders of gasolene cars are now using steel very extensively and produce cars entirely of steel. The latest pro-



Gasolene Inspection Car.

duction is one made by Fairbanks-Morse & Company, Chicago, and known as their No. 28 car, which has been in use on a number of the leading railways for enough time to show that it is up-to-date in both design and construction.

Some of the principal features of this car are: Frame, framed from one piece of pressed sheet steel; guide arms, square steel tubing; and power, two cylinder, two-cycle, air-cooled engine, direct connected to the front wheel. The engine has no valves, cams, pawls, springs, in fact, scarcely anything to get out of order. The crank-cases are enclosed and absolutely dust-proof. For lubrication, oil is mixed with gasolene and hard grease cups are used on main bearings. Speed of from six to 30 m. p. h. is attained under perfect control of the operator. The car runs backwards as well as forwards. It has a capacity of three people and yet the weight is so distributed that one man can easily handle it on and off the track.

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NATURALLY, after the developments of the past few months in which scientific management has been so much in the forefront, it is to be expected that the subject would be more or less thoroughly discussed at the conventions—not in the meetings, for no special provision has been made for it on the programs of either of the associations, but among the members as they gather in little groups on the pier or in the hotels. Much good has undoubtedly been accomplished by the "tempest in the tea pot" which was stirred up by Mr. Brandeis. It is not due, however, to any general acceptance of the methods advocated by the efficiency men, but rather to the fact that mechanical department officers have been spurred to focus their attention on finding methods for improving the efficiency of their departments. One motive power officer suggests that after all there is more or less question as to whether F. W. Taylor's investigations may really be regarded as a discovery of any new science of management. Would not Taylor's work more logically be regarded as a discovery or development in making steel, just as Gilbreth's work is a discovery of a better way of laying bricks? The methods used by Taylor, for instance, must be greatly modified or changed to be applied successfully to any business differing from the steel industry. Repairing locomotives and cars differs greatly from either of the two industries above mentioned and must receive an entirely different treatment. Unlike managers of manufacturing industries, mechanical department officers have taken their fellows into their confidence as to the methods they have tried out and the results gained therefrom, and, therefore, improvement in efficiency on the railways in general has been more steady and more marked than in most manufacturing industries. The problem will have to be solved by each road to meet the special conditions with which it has to contend. The general principles which must be followed to bring about successful results may be the same for all roads, but the detail methods will, in most cases, not be at all alike.

THE twenty-fifth annual convention of the Master Car Builders' Association was held 20 years ago at Cape May. In his address the president, John Kirby, said, "The diversity of design of the Master Car Builders' type of coupler is already the cause of a great deal of trouble, and we now have 20 to 25 different paterns all considered as standard couplers, yet the knuckle, that part which requires most frequent renewal, is not interchangeable with any of the other designs. Then there are the coupling devices differing from each other and as diverse as the couplers themselves. This multiplicity of design is tending in the wrong direction, and in view of the past experience, I venture to recommend that a committee be appointed to consider the best course to pursue in restricting the use of M. C. B. couplers to not more than five different kinds and that the uncoupling devices be as nearly uniform as possible." It would have been a fortunate thing if such a committee had been appointed and had been made a standing committee, for the difficulties which Mr. Kirby referred to have been increasing ever since and they have been the cause of an enormous amount of trouble and expense in car interchange. The secretary, John W. Cloud, had at that time so improved on the ancient custom that he placed each member in possession of all the committee reports two weeks in advance of the convention. He reported a total membership of 264 and the number of cars represented was 982,970. A report on metal for brake shoes, made by G. W. Rhodes, contained the results of measurements of the friction of brake shoes on a small machine designed for the Burlington laboratory by F. W. Sargent, and this was the commencement of the important research work on brake shoes which has been carried on by Mr. Sargent ever since that time. A report on the use of pressed steel in car construction indicated that there were about 15,000 tons of that material on cars in the United States. The principal report related to the maintenance of standards for couplers and contained an investigation of the executive committee to ascertain how nearly the various coupler manufacturers were conforming to the standard lines for the shape of the coupler head and anchor; it was decided to be important for the association to establish standard gages for the inspection of couplers in the maintenance of standard lines.

IT is nearly 25 years since the M. C. B. coupler was adopted as a standard for all railwaly cars in the United States, Canada and Mexico, and while the universal adoption of an automatic coupler for the railways of Europe has been under consideration for several years and some progress has been made in improving the coupler designs, yet we believe no system of railways in Europe has decided to equip all its freight cars with automatic couplers. In Great Britain there is little pros-

pect of such an act for years to come as the average capacity of freight cars is small and is not increasing to any great extent, and it is still claimed that a man with a stick of wood can couple freight and passenger cars and connect air hose as rapidly as can be done when automatic car couplers are used. In India, however, conditions are much more favorable, as the cars and locomotives are larger and the breakage of the screw coupler is causing such wholesale renewals that something better is demanded. When the screw coupler is made more than 1½ in. in diameter it becomes so heavy that it is not easily handled by one man, and if it is not made stronger for large capacity cars it breaks so frequently that the Indian railways, ever slow to adopt anything new, are beginning to look more favorably on the adoption of an automatic coupler. In Argentine a state law passed in 1909 makes it compulsory for all cars to be fitted with automatic couplers within 9 years from that date. Three years are allowed for investigation and tests by a commission appointed by the state, and after a standard coupler has been approved and adopted by this commission all the cars must be equipped with it within 6 years. From the various types presented a few of the best will be selected and 50 cars will be equipped with each type selected for the tests. These coupler tests will be the most extensive and important which have been made since those conducted by a committee of the M. C. B. Association in 1887. One of the prominent couplers which will be entered in the Argentine tests is the Jepson, which is in use in various parts of Europe and is largely used in India. This coupler has a large buffet face solid with the drawbar, and stresses due to shock are transmitted through this, but the coupler gear is protected. Each head is provided with a large hook and a link or shackle which is hinged so as to have a vertical motion. The coupler is flexible and on curves it sets itself so as to enter fair. It does not allow for as much variation in the height of cars as the M. C. B. and some slack, about ⅜ in., is necessary to allow for a vertical range of 4 in. It has an advantage over the M. C. B. for the transition period, as its link can be used to couple with an ordinary link and pin coupler, and a hinged nut can be inserted in it to make it articulate with the standard screw coupling. It can also be easily made to couple with the M. C. B. couplers or the Norwegian hook types. Probably the best arrangement for the transition period is the Laycock modification of the M. C. B. type, which is already in use on some of the large joint stock equipments in England and on the Continent. In this coupler the automatic coupler head swings out of the way when it is desired to bring the ordinary draw hook into use. It is likely that it will be extensively used in England where the transition phase will be long continued, and principally on passenger equipment as there is no probability of the introduction of automatic couplers on the small freight cars of that country. In France, Germany and Russia, where the freight cars are larger, automatic couplers are being used experimentally, but there is no strong movement toward their adoption as there is in India and the Argentine.

CAR LIGHTING.

DURING the past year very satisfactory improvement has been made in car lighting, and while much of this is due to metal filament electric lamps, gas lighting has also contributed its share. The Illuminating Engineering Society is rapidly educating the railway electrical engineer, as well as the railway public. It is teaching the former how to provide efficient and economical illumination for passenger cars, and the latter to be more rational in its demands. Bright lights in spots are no longer regarded as satisfactory, moderate illumination well diffused being more desirable.

Much of the fatigue and nerve stress caused by railway travel is due to the glare of bare lamps, which cause a constant stream of light to strike the eye. The attempt to correct this by covering the center lamps with reflectors which direct the light to the ceiling and allow it to be reflected to the seats, while correct in principle, has not been worked out in practice so as to be generally applicable to car lighting, though some special cars with white headlinings have been successfully lighted in that way, and this method will doubtless extend to the more exclusive and first-class equipment. Some improvement in comfort is obtained by the use of ground glass lamps, and a large gain in efficiency is due to the use of small metallic reflectors or glass prism reflectors.

A larger distribution of the lamps and their location on the sides of the car and on the lower deck has also resulted in a considerable gain in satisfactory car illumination. The attempt to light dining cars with the lower lights only, leaving out the center lamps in the upper deck, has not proved satisfactory, as it leaves all the upper portion of the car in comparative darkness, producing a gloomy effect which is distasteful to the passengers. Here is an opportunity to make the center lights a decorative feature by providing a slight illumination in colored flower effects similiar to those employed for table decorations, as it would help to illuminate the upper portion of the car and at the same time furnish something more pleasing to the eye than the usual metal lamp fixture. The berth lamps in sleeping cars have been improved so that they furnish satisfactory light for reading in an economical manner, and it is no longer necessary to furnish deck lights of great brilliancy, as they can be so well shielded as not to be oppressive to the eye. The 60-volt metal filament lamp of 12 candle power has been found admirably adapted to car lighting, and is now being used on a number of roads. By a proper distribution and the use of reflectors a much better illumination is obtained, the number of lamps is considerably reduced and a large economy is effected in the electric current supply. The lighting of postal cars has received special attention in this reform, and the aim has been to have a greater distribution of light in smaller units at the places where most needed.

The head end system of lighting, with the generator on the locomotive or in the front car, is found to be an economical method and so reliable that it is no longer found necessary to provide an auxiliary lighting supply. Improvements in gas lighting have kept pace with electric lighting, especially with respect to the burners, mantles, and lamp fixtures adapted to side and lower deck locations.

The present state of the art of car lighting by electricity was recently described, with illustrations of the improved fixtures and tables giving the results of tests, in a paper on Recent Developments in Train and Car Lighting, by C. R. Gilman, chief electrician of the Chicago, Milwaukee & St. Paul, read at a meeting of the Chicago section of the Illuminating Engineering Society on April 20. In measuring the degree of illumination, Mr. Gilman has referred to a horizontal plane 33 in. from the car floor, and he regards 2 candle feet measured in that way as satisfactory car illumination. While there has been considerable controversy as to the proper angle to be used in measuring car illumination, there is now a general agreement that the horizontal plane is the simplest, and with proper factors to be used when desirable it is sufficiently accurate. It is probable, therefore, that this will be made a standard by the Illuminating Engineering Society.

PROGRAM FOR THE WEEK.

MONDAY, JUNE 19.

Address by the President.....	10.00 A. M. to 11.00 A. M.
Reading of the minutes of the last meeting	11.00 A. M. to 11.05 A. M.

Report of Secretary and Treasurer	11.05 A. M. to 11.20 A. M.
Assessment and announcement of annual dues; appointment of Committees on Correspondence, Resolutions, Obituaries, etc.....	11.20 A. M. to 11.30 A. M.
Election of Auditing Committee...	11.30 A. M. to 11.35 A. M.
Unfinished Business.....	11.35 A. M. to 11.40 A. M.
New Business.....	11.40 A. M. to 11.50 A. M.
Discussion of Reports on:	
Nominations	11.50 A. M. to 12.00 M.
Revision of Standards and Recmended Practice.....	12.00 M. to 12.30 P. M.
Train Brake and Signal Equipment	12.30 P. M. to 1.00 P. M.
Brake Shoe Equipment.....	1.00 P. M. to 1.30 P. M.

TUESDAY, JUNE 20.

Discussion of Reports on:	
Rules for Loading Materials....	9.30 A. M. to 10.00 A. M.
Rules of Interchange.....	10.00 A. M. to 10.30 A. M.
Prices for Labor and Materials for Steel Cars.....	10.30 A. M. to 10.45 A. M.
Coupler and Draft Equipment...	10.45 A. M. to 11.15 A. M.
Car Wheels.....	11.15 A. M. to 12.00 M.
Safety Appliances.....	12.00 M. to 12.15 P. M.
Revision of Code of Air Brake Tests	12.15 P. M. to 12.30 P. M.
Freight Car Trucks.....	12.30 P. M. to 1.00 P. M.
Refrigerator Cars	1.00 P. M. to 1.30 P. M.

WEDNESDAY, JUNE 21.

Discussion of Reports on:	
Consolidation of Master Car Builders' and Master Mechanics' Associations	10.00 A. M. to 10.30 A. M.
Springs for Freight Car Trucks.	10.30 A. M. to 11.00 A. M.
Lumber Specifications	11.00 A. M. to 11.15 A. M.
Train Lighting and Equipment..	11.15 A. M. to 11.45 A. M.
Train Pipe Connections for Steam Heat	11.45 A. M. to 12.00 M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention	12.00 M. to 12.15 P. M.
Election of Officers.....	12.15 P. M. to 1.30 P. M.

ENTERTAINMENT.

MONDAY, JUNE 19.

Grand March, 9.30 A. M. Sharp.
From Marlborough-Blenheim Hotel to Convention Hall, Million Dollar Pier.

Band Concert, 10.30 A. M.
Entrance Hall, Million Dollar Pier.

Band Concert, 3.30 P. M.
Entrance Hall, Million Dollar Pier.

Reception, 9.00 P. M.
By the President and Officers of the Master Car Builders' Association in the Blenheim Exchange, Marlborough-Blenheim Hotel.
Cadets de Gascogne.

TUESDAY, JUNE 20.

Band Concert, 10.30 A. M.
Entrance Hall, Million Dollar Pier.

Miss Beatrice Herford, 3.00 P. M.
Entertainer in Original Monologues, Brighton Casino.

Band Concert, 4.00 P. M.
Entrance Hall, Million Dollar Pier.

45th Annual Ball, 9.30 P. M.
Of the Master Car Builders' Association (Vollmer's Orchestra).

The Galena-Signal Oil Company's booth will be used as a rest room for the Officers and their guests.

M. C. B. ASSOCIATION OFFICERS, 1910-1911.

President, T. H. Curtis, S. M., Louisville and Nashville; First Vice-President, A. Stewart, G. S. M. P., Southern; Second Vice-President, C. E. Fuller, A. G. M., Union Pacific; Third Vice-President, D. F. Crawford, G. S. M. P., Penna. Lines; Treasurer, J. S. Lentz, M. C. B., Lehigh Valley; Secretary, Joseph W. Taylor. Executive Members, J. D. Harris, C. E. Fuller, A. G. M., Union Pacific; C. A. Seley, M. E., C. R. I. & P.; D. F. Crawford, G. S. M. P., Penna. Lines; F. W. Brazier, S. R. S., N. Y. C. & H. R.; C. A. Schroyer, S. C. D., C. & N. W.

STANDING COMMITTEES.

Arbitration—J. J. Hennessey (Chairman), M. C. B., C. M. & St. P.; T. W. Demarest, S. M. P., Penna. Lines; J. S. Lentz, M. C. B., Lehigh Valley; W. A. Nettleton, G. S. M. P., C. R. I. & P.; E. D. Bronner, S. M. P., M. C.

Revision of Standards and Recommended Practice—R. L. Kleine (Chairman), G. C. I., Penna. R. R.; W. E. Dunham, Supervisor M. P., C. & N. W.; T. H. Goodnow, M. C. B., L. S. & M. S.; W. H. V. Rosing, M. E., M. P.; C. E. Fuller, A. G. M., U. P.; T. M. Ramsdell, M, C. B., C. & O.; O. C. Cromwell, M. E., B. & O.

Train Brake and Signal Equipment—R. B. Kendig (Chairman), G. M. E., N. Y. C. Lines; T. L. Burton, Gen. Inspr., C. R. R. of N. J.; B. P. Flory, S. M, P., N. Y. O. & W.; E. W. Pratt, A. S. M. P., C. & N. W.; R. K. Reading, S. M. P., Penna. R. R.

Brake Shoe Equipment—W. F. M. Goss (Chairman), University of Illinois; C. D. Young, A. E. M. P., Penna. Lines; R. B. Kendig, G. M. E., N. Y. C. Lines.

Coupler and Draft Equipment—R. N. Durborow (Chairman), S. M. P., Penna. R. R.; G. W. Wildin, M. S., N. Y. N. H. & H.; F. W. Brazier, S. R. S., N. Y. C. & H. R.; F. F. Gaines, S. M. P., C. of G.; F. H Stark, Supt., Pittsburgh Coal Co.; H. La Rue, M. C. B., C. R. I. & P.; H. L. Trimyer, M. C. B., S. A. L.

Rules for Loading Materials—A. Kearney (Chairman), A. S. M. P., N. & W.; R. E. Smith, G. S. M. P., A. C. L.; William Moir, M. S., Minn. & Int.; L. H, Turner, S. M. P., P. & L. E.; W. F. Kiesel, Asst. Engr., Penna. R. R.

Car Wheels—William Garstang (Chairman), S M. P., C. C. C. & St. L.; W. C. A. Henry, S. M. P., Penna. Lines; A. E. Manchester, S. M. P., C. M. & St. P.; R. W. Burnett, G M. C. B., C. P.; R. L. Ettenger, C. M. E., Southern; J. A. Pilcher, M. E., N. & W.; O. C. Cromwell.

Safety Appliances—T. H. Curtis (Chairman), S. M., L. & N.; A. La Mar, G. C. I., Penna. Lines; C. B. Young, M. E., C. B. & Q.; H. Bartlett, G. S. M. P., B. & M.; T. M. Ramsdell, M. C. B., C. & O.; M. K. Barnum, G. S. M P., C.; W. O. Thompson, M. C. B., N. Y. C. & H. R.

SPECIAL COMMITTEES.

Revision of Code Tests—A. J. Cota (Chairman), M. M., C. B & Q.; F. H. Scheffer, S. M., N. C. & St. L.; J. R. Alexander, Gen. Road Foreman, Penna. R. R.

Freight Car Trucks—A. S. Vogt (Chairman), M. E., Penna. R. R.; C. A. Seley, M. E., C. R. I. & P.; J. J. Tatum, S. F. C. D., B. & O.; J. F. De Voy, M. E., C. M. & St. P.; G. A. Hancock, S. M., St. L. & S. F.

Prices for Labor and Material for Steel Cars—F. H. Clark (Chairman), G. S. M. P., C. B. & Q.; G. E. Carson, D. M. C. B., N. Y. C. & H. R.; C. F. Thiele, G. C. I., P. C. C. & St. L.; Ira Everett, G. F. C. R., Lehigh Valley; B. Julien, G. C. F., U. P.; S. T. Park, S. M. P., C. & E. I.; T. M. Ramsdell, M. C. B., C. & O.

Refrigerator Cars—M. K. Barnum (Chairman), G. S. M. P., L. C.; J. S. Chambers, S. M. P., A. C. L.; G. W. Lillie, S. C. D., St. L. & S. F.; W. E. Sharp, M C. B., Armour Car Lines; E.

Posson, Engr. Car Cons., A. T. & S. F.; W. C. Arp, S. M. P., Vandalia; R. S. Miller, G. F. C. D., N. Y. C. & St. L.

Springs for Freight Car Trucks—F. M. Gilbert (Chairman), M. E., N. Y. C. & H. R.; W. F. Kiesel, Asst. Engr., Penna, R. R.; M. H. Wickhorst, Engr. Tests., C. B. & Q.; T. A. Lawes, S. M. P., Southern Indiana; J. R. Onderdonk, Engr. Tests, B. & O.

Lumber Specifications—G. N. Dow (Chairman), G. M. I., L. S. & M. S.; G. H. Gilman, M. C. B., N. P.; R. W. Burnett, G. M. C. B., C. P.

Consolidation—F. H. Clark (Chairman), G. S. M. P., B. & O.; W. A. Nettleton, G. S. M. P., C. R. I. & P.; C. A. Schroyer, S. C. D., C. & N. W.

Train Lighting and Equipment—T R. Cook (Chairman), M. M., Penna Lines; C. A. Brandt, A. E. M. C., L. S. & M.; Ward Barnum, Elec. Engr., L. & N.; J. H. Davis, Elec. Engr., B. & O.; E. A. Benson, M. S., Pullman Co.

Train Pipe and Connections for Steam Heat—I. S. Downing (Chairman), M. C. B., L. S. & M. S.; C. A. Schroyer, S. C. D., C. & N. W.; H. E. Passmore, M. M., T. & O. C.; T. H. Russum, S. P. C. D., B. & O.; J J. Ewing, M. E., C. & O.

Nominations—J. F. Deems (Chairman), G. S. M. P., N. Y. C.; A. W. Gibbs, G. S. M. P., Penna. R. R.; C. A Seley, M E., C. R. I. & P.; W. H. Lewis, S. M. P., N. & W.; J. F. Walsh, S. M. P., Ches. & Ohio.

Arrangements—T H. Curtis, S. M., L. & N. R. R.

LOST BADGES.

Losers of badges are requested to immediately report the badge number at the office of the enrollment committee on the pier. Finders of badges will also please report to the same committee.

THE CORNELL DINNER.

The annual Cornell dinner was held at the Hotel Windsor Saturday evening. About 30 men were present. J. F. DeVoy was elected president for next year and E. A. Averill was again elected secretary. Among those present were: A. M. Darlow, M. E., B. & S.; E. A. Averill, *American Engineer and Railroad Journal;* L. H. Snyder, Joseph Dixon Crucible Company; M. H. Hague, M. E., A. T. & S. F.; W. E. Dunham, Sup'v'r. M. P. & M., C. & N. W.; George F. Johnson, Buckeye Steel Castings Company; George W. Ristine, Jr., Pressed Steel Car Company; E. A. Stillman, Watson Stillman Company; P. B. Harrison, Chicago Railway Equipment Company; Chas. P. Storrs, Storrs Mica Company; Huntly H. Gilbert, George E. Molleson Company; John D. Ristine, Mamolith Carbon Paint Company; H. G. McDonald, Standard Steel Car Company; B. F. Cory, S. M. P., N. Y. O. & W.; W. W. Gephart, Acme Supply Company; W. W. Storm, William Sellers & Company; John H. Thomas, Standard Paint Company; R. S. Cooper, Independent Pneumatic Tool Company; R. L. Gordon, Standard Steel Car Company; J. F. DeVoy, A. S. M. P., C. M. & St. P.; F. F. Gaines, S. M. P., Cent. of Ga.; C. B. Young, M. E., C. B. & Q.; C. B. Goodspeed, Buckeye Steel Casting Company; John H. Wynne, American Locomotive Company.

LOST.

George E. Cooper lost an alligator leather pocket case Saturday afternoon on the way to Inlet Park. While it contained no money, it did contain some memoranda of value to Mr. Cooper. The finder will be properly rewarded upon return of the lost article to Mr. Cooper at the Marlborough-Blenheim.

"Whip." has lost his umbrella, a new one of the folding type, and mourns it greatly. He lost it on the pier. "Whip." is A. L. Whipple and is staying at room 470, Marlborough-Blenheim.

SUPPLY MEN'S ANNUAL MEETING

The annual meeting of the Railway Supply Manufacturers' Association was held in Greek Temple, Million Dollar Pier, Saturday morning at 11 o'clock.

President Adrian opened the meeting by speaking of the healthy condition of the finances of the association and gave some interesting statistics. He stated that last year the exhibits aggregated 71,453 sq. ft., whereas this year they cover 76,110 sq. ft. The number of exhibitors in 1910 was 238, and this year the number is 250.

Chairman Storrs, of the By-Laws Committee of the Executive Committee, reported the necessity for making certain changes in the by-laws of the association; and on his motion, Section 2, Article 2, of the by-laws was amended as follows: Canada was added to district 1, which has heretofore consisted of the New England states only. Maryland, Delaware, District of Columbia and West Virginia, heretofore in the third district, and Kentucky and Tennessee, heretofore in the fourth district, were added to the sixth district. With this amendment, the third district will consist of the state of Pennsylvania only; district four will include Ohio, Indiana and Michigan only, and district six will be composed of the states of Maryland, Delaware, District of Columbia, Virginia, West Virginia, North Carolina, Kentucky, Tennessee, Alabama and Mississippi. The districts named were readjusted because a tabulation of the members showed that while one was from Canada, that country had not been included in any of the districts; and that in the case of district six, there were but three members, although it had equal representation in the Executive Committee with the first and seventh districts. The change in district six will swell the representation from three to 14, assuming that the same number of members enroll in 1912 as this year.

The by-laws were further amended so that officers elected from without the Executive Committee become ex-officio members of that committee.

The report of the executive committee covering the district elections of the day before showed the election of George N. Riley and Frank J. Lanahan (third district), succeeding B. E. D. Stafford and E. M. Grove; J. Will Johnson (fifth district), succeeding L. R. Phillips; and George L. Morton (sixth district), succeeding A. C. Langston.

The report of the nominating committee, which had named B. E. D. Stafford, Flannery Bolt Company, Pittsburgh, Pa., for president, and Samuel G. Allen, Franklin Railway Supply Company, New York City, for vice-president, showed that the association had not exercised its prerogative by naming other candidates.

Messrs. Stafford and Allen were elected unanimously. Both candidates made short speeches of acceptance, saying how unexpected was the honor, and thanking the association for the confidence shown. The latter was quite in order; but everybody present knew that the first statement was a mere formality, since the election of both deserving men had already been predicted in *The Daily.*

A vote of thanks was tendered to the retiring officers.

The Benguella Railway, which is to extend from the Atlantic at the harbor of Lobito eastward across the Portuguese colony of Angola to the copper mines of Katanga, near the ninth parallel of south latitude, has been completed for 200 miles, and surveys have been completed for some 400 miles further. Three lines are headed for these mines, of which the Benguella is the shortest; but the route down the Congo is mostly a navigable river, while the nearest port by the Rhodesian railway is on the other side of the continent, in Portuguese East Africa. The Benguella Railway has a short section with a grade of 330 ft. per mile, worked by the Riggenback cog-wheel system.

REMAINING GLIMPSES OF PAST CONVENTIONS.

The 1907 convention got a bad start. To begin with, the executive committee decided to smash some antiquated precedents. For instance, it decreed that permanent booths of uniform design should be used for all exhibits. The Stick



A. Kearney and J. Milliken, Atlantic City, 1907.

To It Paint Company (and some others) failed to see why it should not be permitted to put up the same striped tent that it had occupied every June for so many years back; and insult was added to injury when the concern was forced to pay a most outrageous charge for exhibit space to boot! And after Mark Ross and his bodyguard had explained matters, and after everything had been put in ship-shape order, it was discovered that the weather man was grouchy because he had not been visited by a delegation and presented with a badge. Surely he was justified; for even the chambermaids in the numerous hotels had not been overlooked. In any



C. E. Postlethwaite, A. Kearney and J. H. Mitchell, Atlantic City, 1907.



F. P. Huntley, Atlantic City, 1907.

event, the records show that for several days a steady stream of men in flannel clothes, straw hats and overcoats passed in review before the office of the *Daily Railway Age* casting envious glances at the little oil stove running full blast. The leading editorial note in *The Daily* of June 12, 1907, said: "The *Daily Railway Age* has attended twenty of these conventions and never until yesterday did we find it necessary to install a heating plant in our temporary local office." And scattered through later issues we find remarks of this tenor: "Weather for today: Falling snow, with rising temper." "If the temperature yesterday was two degrees warmer than the day previous, and the same increase is made with each



J. G. Bower, Atlantic City, 1908.



A Pressed Steel Car Crowd—Messrs. Bowen, Lindstrom, Gayley, Mitchell, von Schlegel and Postlethwaite, Atlantic City, 1908.



T. H. Symington, R. P. C. Sanderson and H. A. Gillis at the Country Club, Atlantic City, 1910.



The Durisett-Storrs-Symington Troupe, Atlantic City, 1909.



Frank T. Reese, William Latshaw, William Gibson and Bob Fisher, Atlantic City, 1910.



Prof. Paul Anderson and A. Telford, Atlantic City, 1909.



Country Club, Atlantic City, 1910.

successive day, it will be 80 in the shade some time." "Weather indications for today:—Partly cloudy, with light, variable winds, becoming northwest. WARMER!!!" Old Sol smiled a bit before the end of the convention, but for some days the only comfortable place on the Steel Pier was the lee side of the wind break.

Aside from the weather, there was little to gossip about in 1907. The Railway Supply Men's Association changed its name to Railway Supply Manufacturers' Association and adopted a new constitution and bylaws; but as that proceeding had been all cut and dried, it was only incidental.

The Million Dollar Pier was used for the first time by the M. M. and M. C. B. associations in June, 1908; and the convention was a great success from start to finish—all except the ball game. But that was awful! The railway men, under the leadership of one George W. Wildin, (with emphasis on the din) thought that for once in their lives they would get ahead of the supply men; so the challenge was put and promptly accepted. The final line-up showed 14 men to a side; and of the 14 railway men, the combined weight of 12 was 2,272 lbs., and the chest measurement, 490 in. As the square inches of heating surface are not known, one is unable to figure the total waist area; but a rough approximation is a matter of simple arithmetic. At any rate, the final score was 25 to 19. As the betting had been 100 to 1 on the supply men, under the condition that the umpires were not subsidized, it is needless to say which side won.

And of the 1909 convention, what shall be said? Oh, yes! We now recall that the supply men had a lot of fun electing officers for their little association. It all started over the chance remark of a lost brother, who said that somebody or other wasn't fit to drive the car, or even to act as footman. It certainly was some dusty around these sandy parts for a few days; but if it were not for our irrepressible anxiety to take advantage of this opportunity to deliver one or two gentle digs in the intercostal spaces it is doubtful if anyone here would have thought of the incident.

It would be unjust to all concerned to pass 1909 without recalling the fact that it was in that year that the wholesale distribution of badges and the practice of giving souvenirs were stopped. Those two acts have contributed much to the combined efforts of railwaymen and supplymen to place these conventions on the highest possible plane.

Last year is still so fresh in the minds of most of us who are here today that little need be said. In fact, there is not much, outside of the regular routine, to relate. So successful was the convention that most everyone was happy when it became known that Atlantic City had been selected for 1911.

M. C. B. REGISTRATION.

Ayers, A. R., M. E., L. S. & M. S. Ry., Shelburne.
Beaumont, H. A., G. F. Car Shops, B. & O. R. R., Young's.
Bloxham, C. M., M. C. B., Union Tank Line Co., Young's.
Boughton, Wm., G. M. M., Pere Marquette R. R., Traymore.
Brandt, C. A., Mech. Eng., C. C. C. & St. L. R. R.
Carson, G. E., Div. M. C. B., N. Y. C. & H. R. R. R., Traymore.
Case, S. T., M. C. B., N. Y. C. & H. R. R. R., Pennhurst.
Crone, S. A., Past President, M. C. B., Dennis.
Deems, J. F., S. M. P., N. Y. C. & H. R. R. R., Marlborough-Blenheim.
Demarest, H. N., G. C. I., Penna. R. R., Pennhurst.
Dooley, Wm. H., S. M. P., C. N. O. & T. P., Dennis.
Durborow, R. N., S. M. P., Penna. R. R. Co. (Eastern Div.), Chalfonte.
Everett, Ira, Gen. For. Car Rep., L. V. R. R. Co., Dennis.
Fogg, J. W., M. M., B. & O. Chgo. Term. R. R., Chalfonte.
Gorrell, W. F., M. C. B., Phila. & Reading Ry., Monticello.
Graburn, A. L., M. E., Canadian Northern Ry., Young's.
Graham, H. E., V. P. & Mang., P. A. & McKees. R. R. Co., Marlborough-Blenheim.
Hayward, H. S., S. M. P., P. R. R., Chalfonte.
Hendry, John, M. C. B., Grand Trunk Ry. Sys., Traymore.
Hennessey, J. J., M. C. B., C. M. & P. S. Ry., Tacoma Eastern R. R., Chalfonte.
Hitt, Rodney, Asso. Editor Electric Ry. Journal, Chalfonte.
Hodgson, John L., M. C. B., Grand Trunk Ry., Traymore.
Jackson, O. S., S. M. P., Chgo. Terra Haute & South East Dunlop.
Kalbaugh, I. N., S. M. P., Coal & Coke Ry., Traymore.
Keegan, J. E., S. M. P., Grand Rapids & Indiana Ry., Young's.
Kent, F. S., Penna. R. R., Marlborough-Blenheim.
Krause, Julius, Gen. Car Inspr., Penna. R. R. Co., Chalfonte.
Lake, J. J., Gen. Car For., Gt. Nor. Ry.
LaMar, A., Gen. Car Insp., N. W. Sys., Dennis
Lentz, John S., M. C. B., L. Valley, Dennis.
Lynn, Samuel, M. C. B., P. & L. E. R. R., Pennhurst.
McCuen, J. P., Gen. Inspr., Queen & Crescent Route, Dennis.
McCuen, R. E., Lexington & Eastern Ry. Co., Dennis.
McWood, Wm., Past Pres., M. C. B., Traymore.
May, H. C., S. M. P., Chgo. Ind. & Louis. R. R., Chalfonte.
Miller, R. S., G. F. D., N. Y. C. & St. L. R. R., Dennis.
Mowery, I. N., M. M., N. Y. N. H. & H. R. R., Chalfonte.
Mussey, Wm. H., A. E. M. P., Long Island R. R. Co.
Ord, L. C., Gen. Inspector, B. & O. R. R., Young's.
Payne, H. R., V. P., Union Tank Line Co., Young's.
Rasbridge, R. B., V. V. I., P. & R. Ry., Dennis.
Rollings, R. O., Asst. M. M., L. & N. R. R., Westminster.
Russum, T. H., Supt. Pass. Car Dept, B. & O. R. R., Shelburne.
Sage, R. V., Cambria Steel Co., Chelsea.
Scheffer, F. H., Supt. Machry., M. C. & St. L., Runnymede.
Schnepel, J. H., Chief Draftsman, N. Y. C. & H. R. R. R., New England.
Schwartz, C. L., A. G. M., St. Louis Rfr. Car Co., Young's.
Tatum, John J., S. F. C. D., Baltimore & Ohio R R. Co., Chelsea.
Tewkesbury, E. M., G. S., South Buffalo Ry., Haddon Hall.
Thomas, F. H., V. P. & Gen. Mgr., Bellefonte Central R. R., Craig Hall.
Treleaven, Thos. A., M. C. B., Grand Trunk Ry., Traymore.
Wilson, R. D., Asst. Ch. Car Insp., P. & R. R. R., Monticello.

M. M. REGISTRATION.

Bingaman, Charles A., Engr. Tests, Philadelphia & Reading Ry., Monticello.
Boughton, Wm., G. M. M., Pere Marquette R. R., Traymore.
Brangs, P. H., Dennis.
Deems, J. F., G. S. M. P., N. Y. C. & H. R. R. R., Marlborough-Blenheim.
Durborow, R. N., S. M. P., Penna. R. R. Co., Chalfonte.
Ferguson, L. B., M. M., Vicksburg, Shreveport & Pacific, Monticello.
Greenwood, H. F., Gen. For., Norfolk & Western Ry., Wilson.
Grimshaw, F. G., M. M., W. J. & S. S. Div., Penna. R. R.
Keegan, Jas. E., S. M. P., G. R. & I. R. R., Young's.
Kells, Willard. M. M., Lehigh Valley R. R., Revere.
Kneass, Strickland L., Wm. Sellers Co., Ltd., Marlborough-Blenheim.
Mowery, J. N., M. M., N. Y. N. H. & H. R. R., Chalfonte.
Robb, J. M., Marlborough-Blenheim.
Sheahan, J. F., M. M., International G. N., Tracy.

GUESTS.

Albers L. H., Ch. Supervision of Air Brakes, N. Y. C. Lines, Marlborough-Blenheim.
Allen, W. P., Spt. Eng., M. of W., Penna. R. R., Shelburne.
Anderson, H. A., Foreman Metal Yard, New England.
Anderson, John, Ch. Clk. to S. M. P., P. R. R., Runnymede.
Andrews, D., Mach. Shop Foreman, B. & O. R. R., Whittle.
Andrews, S. B., Mech. Eng., Seaboard Air Line, Monticello.
Atkinson, C. R., Secy. C. S. M. P., P. R. R.
Baker, Horace, Gen. Mngr., C. N. O. & T. P., Private Car, P. R. R. Tracks.
Baldwin, R. S., Elec. Eng., Mexico & No. Western Rwy., Chalfonte.
Beaghen, Thos., Jr., Asst. to M. C. B., Union Tank Line Co., Young's.
Bender, E. N., Genl. Pur. Agt., Can. Pac Ry. Shelburne.
Bender, H. C., For. Erect. Shop, Penna. R. R., Maryland.
Bertin, M. J. A., Spec. App., Penn. R. R., Continental.
Besler, W. G., V. P. & Gen. Mgr., Central R. R. of N. J., Dennis.
Best, J. I., Ch Clerk S. M. P., P. & R. Rwy., Dennis.
Bloxham, C. L., Travelling Inspector, Union Tank Line Co., Young's.
Bonhof, H. J., Inspector, Union Tank Line Co., Young's.
Bowers, W. C., Pur. Agt., N. Y. Cen. & H. R. R. R., Shelburne.
Boyer, C. W., For. Erect. Shop, Penna. R. R., Continental.

Broncher, Peter S., For. Iron & B. Found., P. & R., Strand.
Brown, Thos., Erecting Foreman, P. & R. Ry., Rudolph.
Bunnell, F. O., Eng. Tests, Rock Island, Dennis.
Carpenter, C. L., Genl. Mngr., Guantanamo & Western R. R., Penhurst.
Carter, F. C., Stock Clerk, P. R. R., Chalfonte.
Chamberlin, F. H., For. Mach. Shops, P. R. R., Whittle.
Church, H. M., Asst. Eng., Oper. Dept., B. & O.
Collier, P. M., M. M., P. A. & McK. R. R. R., Marlborough-Blenheim.
Collins, Geo., Manager, Central Ontario R. R., Pennhurst.
Connecly, E. K., Pur. Agt., Pgh. & E. R. R., Young's.
Conniff, P., M. M., B. & O., Wyoming.
Cooke, D. E., Genl. Foreman, N. Y. N. H. & Hartford, Dunlop.
Cooper, R. W., Asst. Foreman, Standard Oil Co., Young's.
Copperstone, D. C., Aud. Disbursements, Penna. Co., Chalfonte.
Coulter, A. F., Genl. Car Foreman, Union R. R., Channel.
Covert, M. F., Asst. M. C. B., Swift Car Line, Arlington.
Cross, W. L., Asst. Rd. Foreman Engines, P. R. R.
Crow, C., Insp., P. R. R., Dennis.
Davidson, W. W., Gen. For., P. R. R., Whittle.
Dawson, E. A., Mgr. Union Line, Penna. R. R., Dennis.
Deeter, Harry E., Ins. Shops, P. & R., 21 S. Arkansas Ave.
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Deyo, L., Clerk Pur. Dept., N. Y. Cen. & H. R. R. R., Young's.
Driscoll, F. E., Clerk, Purchasing Dept., Erie R. R., Strand.
Esterley, E. C., Clerk, Mech. Dept., A. R. Co., Young's.
Farrady, W. H., Ch. Cl. to V. P., P. R. R., Brighton.
Farrell, J. F., Pur. Agt., Michigan Central R. R., Shelburne.
Farrington, A. S., Special Oppr., Reading, Monticello.
Farrington, R. J., Genl. Foreman, Reading R. R., Monticello.
Frauenthal, B. W., Sec. St. Louis Ry. Club, Sewickley.
Faust, L. P. B., Fman. Shop, Penna. R. R., Biscayne.
Fishe, Warren, H., Chief Engineer, Mexico Tramways Co., Chalfonte.
Fuller, Harry C., Marlborough-Blenheim.
Garland, Edward R., Clerk, Pur. Dept., Penna. R. R., Mullica.
Gossler, Geo. S., Erect. Foreman, P. & R., Wellsboro.
Garaghty, W. C., Air Brake Inspector, B. & O., Ryder.
Gardner, G. C., Genl. For. M. P., Penna. R. R., Dennis.
Henry, W W., Ch. Cl., Store Dept., P. R. R., Chalfonte.
High, O. K., Foreman Machine Shops, N. Y. P. & N.
Hodges, H. B., Pur. Agt., L. I. R. R., Shelburne.
Hogen, C. C., Supt., Standard Oil Co., Young's.
Holmes, Harry, Pas. & Frt. Agt, Atlantic City Ry.
Holst, W. A., Chief Clerk, Union Tank Line Co., Young's.
Hornig, E. O., Secy. to Gen. Pur. Agt., N. Y. Cen. Lines, Young's.
Howe, W. C., Supt., P. A. & McK. R. R. R., Marlborough-Blenheim
Hudson, W. R., Gen. Supt., Nov. Southern, Marlborough-Blenheim.
Hughes, J. E., Genl. Yardmaster, P. & L. E. R. R., Francis.
Hugus, Geo., Foreman Car Shop, Atlantic Ref. Co., Young's.
Jackson, L., Secy., S. M. P., Penna. R. R., Jackson.
James, C. H., Supt. Car Shop, S. O. Co., Young's.
Jones, W. F., Genl. Stkp., N. Y. Central, Young's.
Josias, H., Purchasing Agent, Cuba R. R. Co., Brighton.
Keegan, Geo., Asst. to V. P. & G. M., Interborough Rapid Transit Co., Ostend.
Keim, G. W., Supt. Car Shop, Atlas Ref. Co., Young's.
Keim, A. W., Foreman Car Shops, Atlas Ref. Co., Young's.
Kelly, R. J., Foreman, Long Island R. R., Shelburne.
Koch, George B., Foreman Test Dept., P. R. R., Windsor.
Lambert, W. H., Chief Inspector, Union Tank Line Co., Young's.
Long, M. A., Architect, B. & O. R. R., Traymore.
Luke, W. T., Gen. Storekeeper, Norfolk Southern, Iroquois.
Lewis, E. E., Foreman, P. R. R., New England.
McCarthy, J. H., Mat. Agt., Penn. R. R., Young's.
McCracken, J. T., Supt. Printing Dept., Interboro R. T. Co.
McElroy, F., Asst. to Chief Clerk, Union Tank Line Co., Young's.
McGary, A., Chief Electrician, N. Y. C. & H. R. R. R., Young's.
McHenrey, W. E., Auditor, Cambri Terminal R. R., Seaside.
McIntosh, F. G., Supt., A. R. Co., St. Dennis.
McMunn, W. R., C. C. Supt. R. S., N. Y. C., Young's.
Maurer, W. R., M. E., N. Y. N. H. & H., Haddon Hall.
Macklin, H. C., P. Agt., Seaboard Air Line, Haddon Hall.
Mackrow, H. A., Asst. Chief Clerk, Union Tank Line Co., Young's.
Merkel, A. L., Foreman, P. & R. Ry.
Miller, B. E., Master Painter, D. L. & W. R. R., Traymore.
Moran, E. L., Foreman, B. & O., Windall.
Morgan, D. C., Vice-Pres., P. & Shawmont, Muncester.
Neubauer, J. G., General Manager, Solar Refining Co., Young's.
Nichols, L., Foreman Car Shop, Solar Ref. Co., Young's.
Nichols, Howard M., Asst. Supt., Standard Oil Co., Young's.
Orcutt, R., Spec. Representative, Erie, Marlborough-Blenheim.
Paden, Charles, Foreman Car Shop, Vacuum Oil Co., Young's.
Parker, E. W., For. Erect. Shop, Penna., Continental.
Phillippe, B. Pemberton, Coal Agt., Pur. Dept., P. R. R., Shelburne.
Plummer, W. P., Pur. Agt., Mexico Northwestern Ry., Chalfonte.
Rankin, Robt., Sec'y., C. N. O. & T. P., Private Car, Penna. R. R. Tracks.
Reed, P. L., Inspector Pur. Dept., P. R. R.
Reese, D. W., Foreman, P. & R., Monticello.
Renker, C. H., Gen. For., D. & H.
Reifsteck, A. W., Secy., G. S. M. P., Illinois Central Ry., Young's.
Roberts, G. S., Test Dept., Penna. R. R., Penhurst.
Roach, J. J., Smith Shop Foreman, B. & O. Ry., Young's.
Root, J. J., Jr., Draftsman, Union Tank Line Co., Young's.
Ross, W. H., Chief C. to Genl. Stk., N. Y. Cent., Buckingham.
Salt, H. S., M. M., Brazil Rwy., Chalfonte.
Scatchard, H., North & West Roanoke, Young's.
Schwag, M., M. M., Armour Car Lines, Marlborough-Blenheim.
Scott, Harry C., Machine Foreman, P. & R. Ry., Young's.
Smith, A. E., Mechanical Engineer, Union Tank Line Co., Young's.
Smith, Adam F., Stkpr., P. & R., Hamilton House.
Small, J. F., Ch. Clk. Pur. Agt., Norfolk Southern Ry., Iroquois.
Spratt, Thos., Asst. Pur. Agt., Norfolk & Western, Traymore.
Sorve, K. B., Special Appr., Reading, Monticello.
Spangler, J. W., Foreman Car Shop, P. R. R., Dennis.
Stull, H. W., For. Machine Shop, Reading, Monticello.
Stone, H. L., Asst. Supt. Car Shop, S. O. Co., Young's.
Stenger, A., Foreman, P. R. R., Largemont.
Thompson, D., Loco. Inspector, B. & O. R. R., Schlitz.
Thorpe, C. N., Foreman Car Shop, Standard Oil Co., Young's.
Warner, F. R., Shop Foreman, B. & O. R. R., Whittley House.

FOREIGN RAILWAY NOTES.

The proposed company for the North Eastern Railway has been favorably considered by the Russian Council of Ministers. The object of the company is to construct and exploit two railway lines intersecting each other near the station of Egorschin; the first line going from Ekaterinburg to Santkoff in the Tobolsk government, the length being about 200 miles. The second line begins at Alapaieffsk to finish at the station of Bogdanovitch on the Perm Railway: length about 85 miles. The capital it is proposed shall be issued in shares, $1,400,000, and government guaranteed 4 per cent. debentures, $15,000,000. The specific object of this system is to serve the mining interests of the Ural mountains, and it will also serve to bring the famous Irbit market town into closer communication with the business world.

The Argentine government, through its Minister of Public Works, has authorized the folowing lines to be opened to public service: Buenos Aires to Pacific Railway—branches from Ramales de Maza to Tres Lomas, and westward for 22 miles; Mendoza to La Cumbre, in the part between Las Cuevas and the tunnel; Rawson to Arribenos, 37 miles, from July 1, 1911. Central Argentine Railway—from Las Rosas to Monte Grande, 20 miles; Canada de Gomez southwestward, 18 miles; Carmen northwestwardly, 17 miles. Southern Railway—from Alvear to Olavarria, 63 miles, and branch from same between kilometer 5, the south shore of the Riachuelo and the central produce market; from Mar del Plata to the Atlantic coast, 2 miles, and Florencio Varela to Ezpeletea, 4 miles. On July 31, from Pringles to Corhue, 92 miles; Cooper to Cristiano Muerto, 40 miles; from September 20, Alvear to Pigue, 65 miles, and between Alvear and Recargo, 42 miles; from December 31, between Constitucion and kilometer 5, and on April 30, 1912, the Mar del Plata station. For immediate service, Buenos Aires to Rosario, 235 miles; from Salliquelo, 85 miles; to Asturias of the line to La Plata, 55 miles; branch to Ludeña, 8 miles; branch to Mataderos, 13 miles; branch from Pergamino to Vedia, 75 miles. Central Cordoba—from July 31, the branch to Rio Ceballos. Northern Argentine Railway—from Santo Tome to Posadas, 55 miles.

THE ANNUAL BASEBALL GAME.

The proud and haughty baseball banner of the effete East was captured and dragged through the dust by those redoubtable Westerners at the Inlet Park grounds last Saturday afternoon, and the score of East, 15, West, 1, made last year, was joyfully revenged. At the end of the fourth inning, which settled it that the game could not be called off, and in which Wildin broke his bat, the score was 7 to 5 in favor of the East, and the eastern rooters sent up to the gods of the weather loud cries for rain.

But, like the gods of the priests of Baal in the scriptures, those whom the East petitioned were, perhaps, deaf, or gone on a long journey, or, mayhaps, indisposed to heed the appeals of the wicked. At any rate, the rain didn't come; the game went on; the score went up to East, 9, West, 5; and then those terrible Westerners—Snow, Midgley, et al—fell on those effete Easterners; at the end of the sixth it was East, 11, West, 12; at the end of the first half of the seventh it was East, 12, West, 22; and darkness closed over the field of carnage.



The Parade on the Boardwalk.

Because, owing to darkness, the game was stopped at the end of the first half of the seventh, the 10 runs made in it were not included in the official score, which was announced as 11 to 12. But the loud explosion made by the eastern team when it blew up in the seventh will continue, just the same, to cast down the spirits of the East and to gladden the hearts of the West. The baseball band persistently played "O, Lord, How Dry I Am." The East regarded it as referring to the weather. If it had only rained at the end of the fourth or fifth—but it didn't until some time afterward!

It was a fine parade, a bully band—of its kind—a big crowd, and a corking game—also of its kind. The official score, likewise, looks quite respectable; but, considering the way things were going toward the last, the Lord only knows what it would have been like if nine innings had been played.

The parade began forming at the Million Dollar Pier at 2 o'clock in the afternoon. It was the longest and finest looking procession that ever marched to one of the annual ball games in connection with these conventions. Mayor Stoy, of Atlantic City, led the van, followed by a squadron of the city police. Then came the baseball band, 14 in number and especially organized for the occasion, arrayed in white sacque coats, cut low, with wide lapels, white serge trousers with cuffs—both coats and trousers being decorated with white pearl buttons—and white felt hats, white canvas shoes and blue neckties. They looked mighty fetching, did those band boys.

The ball teams followed, looking distinctly professional in their nice new uniforms. The western players had white flannel shirts, with blue collars, blue bands down the front, and short sleeves with blue edges, and had the letter W on the left breast. Their knickerbockers were of white flannel, with a blue cord down the outer seams; their stockings white, with blue stripes; their caps white, with blue seams, blue buttons on top and blue visors.

The eastern players wore white flannel shirts, with red collars and red bands down the front; short sleeves, with red edges, and had the letter E in red in a red circle on the left breast; white flannel knickers, with red cords down the outer seams; white stockings, with red stripes, and white caps, with red seams, red button on top and red visor.

The ball clubs were followed by teams of girl rooters, led by masculine cheer leaders. The costumes of the ten western rooters were white serge coats, skirt length, with blue collars, blue cuffs and large pearl buttons on the front of the coats and on the sleeves, and those of the eastern rooters were white serge coats, skirt length, with red collars, red cuffs, large pearl buttons on front of coat and sleeves.

The shade of blue used in the trimmings of the western ball team's uniforms and in the costumes of both teams of rooters was identical with that officially adopted by the National Baseball League.

After the teams of rooters, came hundreds of conventionites marching double file, and hundreds more being wheeled in roller chairs. It was a glorious summer afternoon when the parade started. The sun shone brilliantly on the white of the uniforms; and yet it was not too hot to



The Rooters' Teams.

Standing, left to right—Harry Fuller (western cheer leader), Mrs. L. R. Phillips, Miss Edith Tewkesbury, Mrs. S. W. Midgley, Miss Verona Pratt, Mrs. A. L. Whipple, Mrs. R. H. Weatherly, Miss Lydia Brannon, Miss Virginia Garstang, R. B. Steel (eastern cheer leader).
Seated, left to right—Miss Helen Grove, Miss Elizabeth Magraw, Mrs. W. S. Furry, Miss Mabel Garstang, Miss Clara Furry, Mrs. B. H. Forsyth, C. E. Fuller, Jr. (western mascot), Harold E. Oviatt (eastern mascot), Mrs. A. C. Langston, Miss Helen Little, Mrs. R. W. Barnett, Miss Mary Walsh, Miss Hazel Cumback.



The Base Ball Band.

Front row, left to right—Rosser, Violand, Bryant, Sharp, Taylor, Bird.
Bottom row, left to right—Wilson, Gault, Sreda, Johnson, Ross, Pilliod, Segrey.

make walking unpleasantly warm. Never, perhaps, during convention time did the Boardwalk present a more gala appearance, or did a merrier crowd march along on it. And the convention baseball parades have sometimes been led by bands which, viewed from a purely æsthetic standpoint, could make more tuneful music, but never was one led by a band whose music was more enjoyed—at least by those have been ample in past years, were provided, but the crowd was so unprecedentedly large that they were filled to overflowing. Those new musicians were certainly stuck on their jobs. They tooted and thumped their bloomin' instruments all the way to the grounds. Homer—or whoever it was—wasn't more assiduous—and hardly less musical—in thumming his bloomin' lyre.



The Eastern Ball Team.

Top row, left to right—Pellitier (score keeper), Oviatt, Gilman, Jones, Martin, Wildin, Fettinger (score keeper), Passmore (umpire), Molleson.
Middle row, left to right—Knill, Stephenson, Jeffrey, Hibbard, Nellis, Bradford, Beaumont, Nicol, O'Brian, Cade (umpire).
Bottom—Oviatt, Jr. (mascot).

who made it. Home-made cake, made by a brand-new wife, often is not as digestible as baker's cake; but it often is liked a lot better by the fool man who eats it. It is the same with home-baked music. Really, the music wasn't bad at all; but if it had been worse the crowd would have enjoyed it almost as much, just because it was home-grown.

The procession marched to New York avenue, and there special cars were taken to Inlet Park. Cars, which would

The crowd that poured into the grand stand, on arrival at the grounds, pretty comfortably filled it. On the left of the grand stand there was also a large number of automobile parties. The eastern team of rooters, which was led by Cheer Leader R. B. Steele, of the American Vanadium Company, was seated on the right of the grand stand, and the western team of rooters, led by Cheer Leader Harry Fuller, a son of President Fuller of the Master Mechanics'



The Western Ball Team.

Top row, left to right—Passmore (umpire), Molleson, Sechrist, Bowles, Allen, Fettinger (score keeper), Cade.
Middle row, left to right—Knill (chairman), Snow, Midgley, Hammond (captain), Tarleton, Forsyth, Downing, Potter, Schwartz.
Bottom Row—Gallinger, Fuller, Jr. (mascot).

Association, was seated on the left hand side of the grand stand.

The band was stationed between them. It speedily grew reckless about the present state and future prospects of its soul and began to play "What the H—— Do We Care!" There was no place handy at which to wet its collective whistle after this exertion; and Leader J. Will Johnson struck up "O Lord, How Dry We Are," in which the other musicians joined with hearty alacrity and which they made the favorite ditty of their repertoire.

The West went first to bat, with Jeffrey pitching and Oviatt catching for the East. When the East came to bat Bowles, pitcher, and Gallinger, catcher, composed the West's battery. Jeffrey was wild at first, but he rapidly warmed up, and before the second inning was over was pitching good ball. At the beginning of the sixth inning, when the score was West, 5, East, 9, Captain Nellis took him out and put in Bradford. The westerners soon got onto his curves, and began to wallop the ball all over the field. The easterners never did get so familiar with Bowle's throwing. In consequence at the end of the sixth, while the westerners had raised their score to 12, the East had increased its runs only to 11. Martin was substituted for Bradford, but those westerners also speedily landed on him. Bowles pitched throughout for the West and, like Jeffrey for the East, did a thoroughly workmanlike job after he got well warmed up.



Oviatt Ready to Swat for His Boss.

An incident of the game which will go thundering down baseball history to the remotest ages happened when George Wildin broke his bat. It was in the second half of the third inning. O'Brian and Stephenson were on bases. Then up stepped the mighty Wildin. A hush fell over the field. The great Wildin looked defiance at Pitcher Bowles, and Pitcher Bowles looked some considerable defiance at him. Then Bowles let 'er drive. The sphere bizzed through the air. There was a terrific crash. And then the fragments of the mighty stick of the Mighty Wildin went sailing through the circumambient atmosphere, one piece chasing the ball over Bowles's head out toward center field. The crowd jumped up and yelled its head off; the band played "Hail to the Chief," the cheer girls set up loud cries for pieces of the historic stick for souvenirs; and the Great Wildin circulated around the bases like a son-of-a-gun. If Wildin's bat hadn't broken the ball would be going yet.

As the game progressed the members of the band grew drier and drier, and, at last, between the halves of the fourth, W. W. Rosser, Joe Taylor and Charles J. Pilliod marched out into the diamond playing their favorite air.

There were very few disputes that amounted to anything. One was in the first half of the sixth inning, when Umpire Cade called Gallinger out for turning to the left on rounding first base. Midgley and other western players objected vigorously to this ruling, and it was incorrect, as Umpire Cade subsequently conceded. However, as the West won, anyway it did no harm.

The following is a somewhat detailed account of the game by innings:

FIRST INNING.

The hostilities began with the West at bat and Tarleton up. Pitcher Jeffrey almost beaned him with the first thrown ball, but he ducked it shiftily. When Jeffrey thoughtfully hesitated about shooting again, some fan yelled, "Throw the ball, and play to-morrow." Jeffrey evidently had a slight case of stage fright and was wild, and Tarleton walked.



The Band in Action.

Potter was next to bat, and made a one-base hit. O'Brian tried to stop Tarleton at second, but was unsuccessful in his effort to catch the ball with his shin, and Tarleton finally scored. Midgley made a one-bagger to center, and Snow poled a long drive between second and third. Bowles walked. Gallinger distinguished himself by being the first batter to fan, and he vainly beat the air on a third strike several times afterward, just as a pneumatic tool man consistently should. Jeffrey continued wild throughout the inning; but, as later developments showed, he was just warming up to his work.

Beaumont was the first batter for the East, and Bowles, who was pitching for the West, promptly pickled him on



Heckling the Umpire.

the patella, which gave him first. Hibbard fouled, and was caught out. When O'Brian failed to hit it, somebody yelled: "Get a tennis racquet," and when he tried to get to first on the ground that he had been hit with a pitched ball, the Western crowd bawled, "Baby, baby!" This made him mad, and he hit 'er hard to left. He got caught off second, but by a pretty slide got back safely. Stephenson struck out. When Wildin came to bat the crowd cheered wildly, and a bunch of eastern rooters sang: "Every little railway has a movement all its own." He was nicked on the wrist and

given first, which caused him to throw away his bat in mighty disgust. Martin made a hit into left and brought in O'Brian. Wildin, in trying to steal third, ran like a Mallet with a down hill pull, but got caught 30 feet from the base.

SECOND INNING.

Tarleton started the second inning with a foul into the grandstand. Oviatt covered yards of ground to get Tarleton's foul, but missed it, and the crowd advised him to acquire a basket. Stephenson in center was waiting for Tarleton's high fly and coppered it. Potter almost knocked a hole in the fence, got safely to first, and finally scored. Midgley patiently waited for a good one and swatted it past the short stop for a single. He made a beautiful slide to second, but missed his connection with the bag and O'Brian touched him out, incidentally yanking his left leg to right angles with his right one. Snow found the sphere, as usual, as did Bowles also, but Bowles got caught at second, putting the western team out, with one score for the inning.



Tarleton was First at Bat.

Oviatt come first to bat for the East, and hit a slow one to short stop. Tarleton threw him out at first. Jones repeated the play made by Oviatt and also was thrown out at first. Schwartz, playing first, made a beautiful recovery of a high throw in time to get his man, and Bowles, now using great speed, struck out Jeffrey on three pitched balls, and retired the side.

THIRD INNING.

Sechrist, Schwartz and Gallinger were mowed down in rapid succession, no scores being made.

The pitchers had now warmed up to their work and both teams were playing good ball. Beaumont fanned the air for the second time and Passmore said "Strike 2." The next looked like a bad one, but Passmore called the batter out on three strikes. Hibbard lined a beauty to deep center that would have been good for a home run had it not been for the fence. He got two bases. O'Brian pasted the first ball pitched to deep left, on which Hibbard raced home, O'Brian reaching second on the throw in. Stephenson hit for a single in short left and reached second when a play was made for O'Brian at third, both batters being safe. Then came the historic incident when Wildin hit 'er with such might that he broke his bat. He lined the ball out to center and reached third base when the sphere was thrown past the catcher. Stephenson and O'Brian scoring ahead of him. Wildin followed over the plate on the next ball, which was a wild pitch. Martin sent a high fly that was taken in left field. Oviatt hit a high bounder to third base on which he reached first safely. Jones struck out under protest, retiring the side.



Schwartz Expectant.

FOURTH INNING.

Downing walked to first on four balls. Downing had second base stolen, but in his anxiety, overran the bag and was touched out by O'Brian, who straddled him to keep him from escaping. Tarleton fanned on trying to dodge a fierce inshoot. Powers hit a swift grounder to short stop, but was thrown out at first.

Jeffrey tried twice to bunt his way to first, but failed. He then went out on third strike, but had to be thrown out, as the catcher dropped the throw. Beaumont was hit with the ball and walked. He got all the way around to third on passed balls and wild throws. He scored when Hibbard was thrown out at first by Midgley. O'Brian hit an easy grounder to short stop and was thrown out at first.

FIFTH INNING.

Pitcher Jeffrey objected to a used ball and was given a new one. Midgley hit to deep center, but the ball was gathered in by Stephenson. In his eagerness to get to first, Midgley fell and got the laugh. Snow hit one so fast through short that the short stop couldn't see the ball, and got two bases by a beautiful slide to second. He stole third without even drawing a throw from the catcher. Bowles struck out, and the side was retired when Sechrist hit a fast grounder to short and was thrown out at first.

Stephenson hit a fast ball through the pitcher. Midgley made a fine throw, but the runner beat it out and was called safe at first. Immediately afterward Stephenson's snoring at first attracted the pitcher's attention, and when the base runner awakened he was out. Somebody yelled, "Get an alarm clock." Wildin hit an easy roller to the second baseman, who had plenty of time, but who made a wild toss past first base, on which Wildin, running like a New Haven electric engine, reached second. Martin hit a fast one down to second and was safe at first, Wildin advancing to third. Martin stole second without drawing a throw. Oviatt, used to the every day job of assisting his boss, Wildin, now hit a swift one down to short stop; Tarleton lost his balance and threw the ball home too late to catch the



Sechrist, the Ex-Giant.

runner; and Wildin arrived home. Oviatt went to third and Martin scored on two wild heaves. Flemming, batter in place of Jones, hit a weak grounder to the pitcher and was thrown out at first. Jeffrey hit a slow one to short stop and was thrown out at first on a close play.

SIXTH INNING.

Southpaw Bradford was now put in the box for the East. Schwartz hit a liner to left field. Flemming allowed it to go through his legs, and it went for a three base hit. Gallinger dropped an easy roller to Bradford, the pitcher, who held his man at third and then threw wild to first, Schwartz scoring and Gallinger going to second. Gallinger was called out by Umpire Cade for turning to the left on rounding first base. Midgley and other Western players violently protested that that rule is now obsolete, but Cade stood pat, and Gallinger had to walk to the bench. Captain Hammond, who was now in the game, hit a single to right field and was safe at first. Downing followed with a single and all hands were safe, Downing running to second on the throw in. Tarleton hit safely. Potter tried to hit the Durham bull sign, and almost did so. Midgley hit safely, as did Snow and Bowles. Sechrist and Schwartz singled. Gallinger struck out, retiring the side, and seven juicy runs were checked up for the West.



If Nellis HAD Played.



Bowles Ogling a Bee-Liner.



He's a Warm Snow.

George A. Nicol took Beaumont's place at the bat. He hit a slow grounder to short and beat it to first, stole second, and went to third on a passed ball. Hibbard hit a sharp grounder and raced to first, scoring Nicol. O'Brian hit past short stop for a single, sending Hibbard to second. Stephenson singled, advancing the runners. Wildin walked, filling the bases. Martin spoiled two good ones after having three balls and two strikes and drew a pass to first, forcing in O'Brian. Bradford struck out with the bases full, making the second out. Flemming hit a smooth bounder straight to First Baseman Schwartz and was out at first, retiring the side with the bases full.

SEVENTH INNING.

Hammond made 6 fouls in rapid succession, his fondness for poultry suggesting that at some time he had been a Methodist parson. He finally hit a short fly ball that was gathered in by the catcher. Tarleton hit an easy roller to second base, but was safe on an error by First Baseman Wildin. Tarleton stole second on a wild throw to catch him napping at first. Jones took Wildin's place at first, Wildin's finger having been split by a thrown ball. Potter hit for a double to left and reached first on a bad throw. Tarleton scoring. Midgley walked to first on four wide ones, and went to second on the first ball pitched without drawing a throw. Snow nailed it, and Flemming muffed it, Potter scoring and Midgley going to third. Bradford went to second on the throw in. Bowles bunted safely and the bases were full. Sechrist hit a slow little sneaking safe ball to third and everybody advanced a base. Schwartz struck out. Gallinger hit to Second Baseman O'Brian, who waited too long before throwing, and everybody was safe, the bases being still full. Hammond walked on four balls, Bowles being forced in for another run. Tarleton batted for the second time during the inning. Tarleton hit for a single and sent two men over the plate ahead of him. He reached second on the throw in and Hammond perched on third. Potter was beaned by a pitched ball and walked to first, filling the bases again. Midgley hit to left for two bases, Hammond and Tarleton racing over the plate. Snow knocked an easy grounder to third and the third baseman touched the bag, thinking that he could force Midgley who had been resting on second, but Midgley rushed back to second and all hands were safe, the bases still being full.



After Gallinger Had Thrown One.



O'Brian Beaming on the Pitcher.



Hammond Alert for a Fly.



Midgley on the Slide.



O'Brian on Top at Second.



Passmore Bossing the Job.



Bowles struck out, retiring the side with the bases full, and 10 runs were chalked up for this inning. However, they were not included in the official score.



Snow Winging it to First.

The following is the score by innings:

	1	2	3	4	5	6
West	4	1	0	0	0	7—12*
East	2	0	4	1	2	2—11

DETAILED SCORE CARD.

EAST.

	AB.	R.	1B.	PO.	A.	E.	SB.	SH.
Beaumont, 3b	1	2	0	0	1	0	2	0
Nicol, 3b	1	1	1	0	0	0	1	0
Hibbard, ss	3	1	1	0	3	1	0	1
O'Brian, 2b	4	3	3	3	0	1	0	0
Stephenson, cf, c	4	1	3	7	0	0	0	0
Wildin, 1b	2	2	2	5	0	2	1	0
Martin, rf, 1b, p	3	1	2	1	1	1	0	0
Oviatt, 1b	3	0	2	5	2	0	0	0
Jones, rf	2	0	0	0	0	2	1	0
Flemming, lf	1	0	0	0	0	0	0	0
Jeffrey, p. cf	3	0	0	0	0	0	0	0
Bradford, p, 1b	1	0	0	0	1	0	0	0
Total	28	11	14	21	8	7	5	1

WEST.

	AB.	R.	1B.	PO.	A.	E.	SB.	SH.
Tarleton, ss	5	4	2	1	3	0	1	0
Potter, 3b	4	4	2	0	0	0	0	1
Midgley, 2b	5	3	4	0	2	0	2	0
Snow, cf	6	3	3	0	0	0	3	0
Bowles, p	5	3	2	0	3	0	1	0
Sechrist, lf, rf	4	1	1	1	0	0	1	0
Schwartz, 1b	5	1	2	8	0	0	1	0
Gallinger, c	5	1	0	8	1	0	0	0
Hammond, rf	2	2	1	0	0	0	0	0
Downing, lf	1	0	0	0	0	0	0	0
Total	42	22*	17	18	9	0	9	1

Earned runs—East, 11; West, 9.
Two-base hits—Hibbard, 1; Midgley, 2.
Three-base hit—Schwartz.
Bases on balls—By Jeffrey, 4; by Bradford, 0; by Martin, 1; by Bowles, 2.
Hit by pitcher—Beaumont, 2; Potter, 1.
Wild pitches—Jeffrey, 2.
Passed balls—Oviatt, 1; Gallinger, 2.
Struck out—By Jeffrey, 7; by Bradford, 3; by Bowles, 7.
Left on bases—East, 5; West, 6.
Hits off pitchers—Jeffrey, 4 in 5 innings; Bradford, 9 in 1 inning; Martin, 4 in 1 inning.
*The difference here shown is because the first half of the seventh inning was played, although not counted in the official score.



Just Before Wildin Broke His Bat.

The umpires were, West, H. E. Passmore, T. & Co.; East, W. E. Cade, Frank A. Barbey Co. The mascots were, West, Charles E. Fuller, Jr.; East, Harold E. Oviatt. The official score card keepers were, East, Harry O. Fettinger, Clement Restein Co.; West, Louis Pelletier, *Machinery.*

The base ball band was composed of the following: J. Will Johnson (leader), Pyle National Electric Headlight Co., cornet; Charles J. Pilliod, Pilliod Brothers Co., B flat clarionet; Mark A. Ross, Pyle National Electric Headlight Co., cornet; George W. Bryant, Thos. Prosser & Son, alto; W. E. Sharp, Armour Lines, alto; W. W. Rosser, T. H. Symington Co., bass; Jos. W. Taylor, secretary, M. C. B. and M. M. Associations, baritone; Fred M. Nellis, Westinghouse Air Brake Co., slide trombone; C. W. Bird, Jenkins Bros., snare drum; F. L. Gault, Nathan Mfg. Co., slide trombone; Joseph Violand, Crane Co., bass drum; Philip Sreda, American Arch Company, E clarionet; L. F. Wilson, *Railway List.*

The rooters team for the West was led by Harry Fuller, and that for the East by R. B. Steele. The rooters were Mrs. L. R. Phillips, Miss Edith Tewkesbury, Mrs. S. W. Midgley, Miss Verona Pratt, Mrs. A. L. Whipple, Mrs. R. H. Weatherly, Miss Lydia Brannon, Miss Virginia Garstang, Miss Helen Grove, Miss Elizabeth Magraw, Mrs. W. S. Furry, Miss Mabel Garstang, Miss Clara Furry, Mrs. B. H. Forsyth, Mrs. A. C. Langston, Miss Little, Mrs. Burnett, Miss Mary Walsh, and Miss Hazel Cumback.



Wildin and the Fragments.

The committee in charge of the game was composed of Charles M. Knill, chairman; Fred M. Nellis, Harry S. Hammond, Thomas Farmer, Jr., Herbert Green, W. S. Furry, and Frank Martin.

THE WINNING TEAM.

To the gallant winners of the struggle belong rightly the honors of victory. It will be of interest to recount the previous base ball history of its members and their early training to reach the pinnacle of fame which they achieved on Saturday.

Hammond (captain) thought more of base ball all through his school days than any other game. He was on every team on which he could get a place and preferred first base. His last playing was in a county league embracing the city of Pittsburgh, in which he lived.

Midgley had four years on a team in the Cook County (Illinois) league, being its captain the last two years; was three years on the Lewis Institute of Technology (Chicago)



The Batter Beat Stephenson to It.



Downing Telling How it Happened.



Midgley on His Way.

team, of which he was captain; and has played the past nine consecutive years as a member of the Western team at the M. M. and M. C. B. conventions.

Bowles pitched four years on the Cornell University team, and was its captain in his senior year.

Tarleton played second base in the Weatherly, Pa., team in the Lehigh Valley league. The team was the champion and flew the pennant during the two years in which he was on it.

Snow was one of the greatest all-around athletes of the University of Michigan. He was a leading foot ball and base ball player in his four years there; captained both teams, and was picked by Walter Camp for the 1901 All-American foot ball team.

Potter was a member of the Nassau team of Princeton College for three years.

Allen was third baseman three years in the Beloit, Wisconsin, college team in the Western league.

Forsyth was captain of the Bankers' Athletic Club (Chicago) team in the Bankers' Base Ball league for two years.

Downing played ball "just for fun," as he says, in and around Toledo, Ohio.

Schwartz was with the Davenport (Iowa) team in the Three-I League for three years.

Gallinger was with the Watertown (Wisconsin) team for two years.

Sechrist was with the Cincinnati (professional) team in



Forsyth Rooting on the Side Lines.



Few Escaped Potter.



Jeffrey a Little Wild.



Forsyth Meant Well.



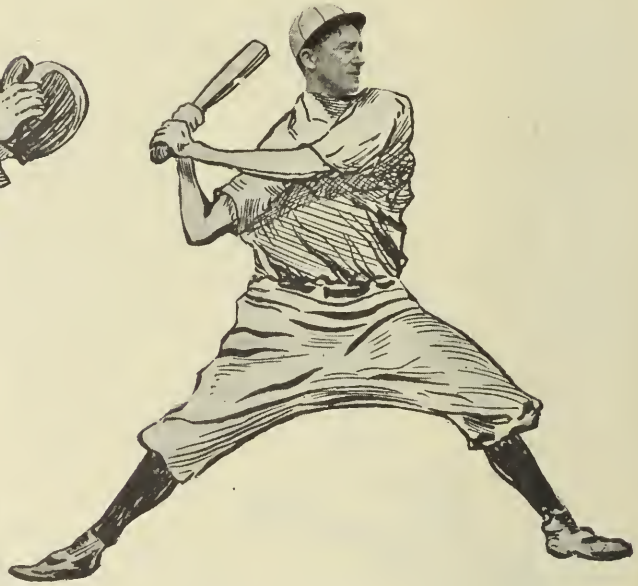
"O Lord, How Dry We Are!"
(Rosser, Taylor and Pilliod on Parade.)



Cade Watching It.



Gallinger Expecting It.



Beaumont Swatting It.



Midgley Putting It on Martin at Second.



Bradford Wondering if It's Foul or Fair.

1894; was with the New Orleans (Southern League) team in 1894-95 as pitcher; with the Norfolk, Va., team in 1896, when it won the pennant; was on the New Bedford, Mass., team in 1897; on the Hartford, Conn., team in 1897, and was drafted by the New York Giants in 1899.

NOTES OF THE GAME.

The base ball band did all its practicing in Chicago up to the time it arrived in Atlantic City. It began its practice work—and it was work, believe us—in a Masonic lodge room on the south side in Chicago. The neighbors finally raised such a rumpus that it had to move to the office of W. E. Sharp, of the Armour Car Lines, in the Union Stock Yards; and there most of its repertoire was learned. Joe Taylor says the neighbors at the stock yards did not protest, mainly because the noises it made harmonized so well with those to which they were accustomed.

Beaumont is certainly an enthusiastic worker. He keeps on practicing, not only up to the game, but even during the game. Along about the fourth inning he practiced a slide to third, the ball not having yet left the center fielder's hands.



A Few of the Fans.

Did you ever have more than one ball when you met up in the vacant lot over by the grocer's? Where would our race be if we did not revere the memories of our youth? So we applaud the committee for upholding tradition of democratic simplicity in providing only two base balls for the game.

George Wildin took off 35 lbs. in the five weeks he practiced for the game, but he kept enough weight to insure a high factor of adhesion. There was no wheel slipping when he wanted to get under way.



Nichol Defying the Pitcher.



Oviatt After a Bounder.



Sorrowful Wildin and His Broken Bat.



Anyway, the Mascots Remained Friendly.



The Scene of the Hostilities.

Bert Waycott did his best to have the banjo playing seals included in the band, but on second thought he decided that there were enough of that kind of players in it without them.

Oviatt, junior, warmed up Oviatt, senior, on the sidelines; and it looked as if he might be able to whip the old man in a game of burn out.

The public little knows what a catastrophe the breaking of that bat was. We found Mr. Wildin clasping to his bosom such splinters as he had saved from the souvenir hunters. We dried his tears and begged him to tell us all. "It was one among a thousand," he said, at last. "I knew it when it was young; only big enough to play one-o-cat with. With loving care I trained it up and taught it all I knew. There will never be such another."

The two ball teams and the western and eastern teams of rooters went to and returned from Inlet Park in a handsome new Electric Car furnished through the courtesy of A. A. Thresher, Chief Engineer of the Federal Storage Battery Company. The car, of double truck design, was sent under its own power from Jersey City to Atlantic City especially for the occasion.

SOME "IFS" BY THE EASTERN TEAM.

Were the players on the Eastern team to give voice to their feelings after Saturday's game, they might individually be quoted as follows:

Pitcher Jeffreys: If Nellis had let me finish the game I would have given them goose eggs to the end.

Pitcher Bradford: If those Westerners aren't the hardest hitting bunch I ever saw, I'm no judge.

Harry Oviatt: If there's any more ball playing for the Oviatt family the kids'll have to do it.

George Wildin: If my bat hadn't broke they would have had to field the ball from the Inlet in a row boat.

Tom O'Brian: If we had only half the luck the westerners had we would have won hands down.

Leonard Hibbard: If that wasn't the roughest diamond in the neighborhood, I'd like to see the worst.

Cliff Beaumont: If I hadn't been hit on the knee with a pitched ball, I'd been able to play my game.

"Bart" Stephenson. If those Chelsea hoodlums hadn't hoodooed my bat I would have had a home run each time up.

Fred Jones: If I'd known the game was to have class, I'd have trained harder.

Frank Martin: If I'd done all the pitching those westerners would have had a string of goose eggs.

Capt. Fred Nellis: If I'd had a second fly I suppose I'd have muffed it like I did the first.

George Nichol: If I'd only reduced ten pounds more in weight, I'd have played my old game.

Charlie Gilman: If that fly had been a little closer I think I could have caught it.

The team in chorus: If we could only play the game over again we would surely win.

Retrospect is generally interesting, especially when applied to an important event like Saturday's base ball game and given by the head of the defeated team. We quote an opinion expressed by Captain Nellis of the Eastern team substantially as follows: "We lost because the Western team played better ball in general. They went up into the air early in the game, but came down in reasonable time. We delayed our ascension, but when once up nothing could bring us down except the calling of the game. Jeffrey was a trifle wild in the opening inning, but soon steadied down and pitched gilt-edge ball. He had found the curves the Westerners could not hit and was successfully feeding them up when he gave way in the sixth to Bradford, according to an agreement between the two when they "signed up" that each should pitch his half of the game. Jeffrey's disappointment was keen, I know, but as the game was one of good fellowship and not solely to win, the agreement between the two pitchers compelled Jeffrey's retirement at a time when he was going strongly at his best. Under other circumstances it would have been inexcusable to take out a winning pitcher. In the sixth inning a break of luck in the Westerner's favor and weakened support by the Eastern team wrongly reflected against Bradford's work. Many of the batted balls were either fumbled, poorly fielded or actually muffed, as an analysis of the game will show; further, I believe the three retired batters in the sixth inning were put out on strikes. Beaumont, one of our best players, was struck by a pitched ball on the knee in the first inning and was obliged to retire in the fifth because of the injury. Wildin also retired in the fifth because of a split finger. Martin, who relieved Bradford, received a little better support and finally succeeded in stopping the Westerner's fierce batting rally."

SOCIETY AT THE GAME.

Society was out in full force for the great occasion. Gaily decorated automobiles and roller chairs, with flying flags attached, carried many of the "400" from the pier and the Boardwalk hotels. At the Inlet Park the automobiles were stationed along the west side of the park adjoining the grand stand.

Among the many parties in automobiles noticed by the society editor of the *Railway Age Gazette* and his corps of assistants were the following:

Mr. C. L. Mellor, Mr. and Mrs. C. E. Fuller, Miss Mary Fuller, Mr. C. E. Fuller, Jr., Mr. Harry Fuller.

Mr. and Mrs. J. F. Walsh, Mr. and Mrs. R. T. Walbank, Mr. Frank J. Walsh.

Mr. J. E. Meek, Mr. and Mrs. C. C. Hubbel, Mr. and Mrs. J. C. Younglove.

Mr. and Mrs. Hugh Montgomery, Dr. C. W. Gould, Miss Ruth Gould, Mr. Clarence Rood.

Mr. and Mrs. Walter B. Leach, Mr. and Mrs. C. B. Young, Mr. and Mrs. R. D. Smith.

Mr. and Mrs. O. M. Edwards, Mr. and Mrs. E. F. Chaffee, Mr. and Mrs. C. M. Walsh, Mr. C. W. Edwards, second, Mr. W. A. Le Brun.

Mr. and Mrs. B. P. Flory, Mrs. F. O. Brazier, Mr. Charles H. Scarritt.

Mr. Edward E. Gold, Mrs. T. H. Russum, Mrs. W. S. Chamberlain, Mrs. Lloyd A. Sheatz, Mr. F. H. Smith.

Senator and Mrs Clarence Wolf.

H. S. Hayward, Jr., A. V. Lyle.

C. Fred Elliott, Frank Sherritt.

Mr. and Mrs. W. A. Blanchard, Mr. and Mrs. Arthur S. Blanchard.

Mr. C. S. Hawley, Mr. W. S. Hammond, Mr. and Mrs. H. L. Hawley.

Mr. and Mrs. Clarke P. Pond.

Mr. Edwin H. Baker, Mr. C. C. Steinbrenner, Mr. Daniel M. Brady, Mr. Harry D. Vought, Mr. Frederick A. Guild.

Mr. W. O. Duntley, Mr. Thomas Aldcorn, night mayor of Atlantic City, Mr. George E. Molleson, Mr. Huntley Gilbert.

Mr. J. W. Dalman, Mr. Frank Moore, Mr. William Gibson, Mr. Robert A. Bole, Mr. Edward Kneeland.

Mr. J. R. Ellicott, Mr. and Mrs. Fred F. Small, Miss Sweet, Mr. A. L. Humphrey, Mr. T. L. Burton, Mr. S. J. Kidder.

Mrs. J. F. Deems, Mrs. J. E. Meek, Miss Carrie Emery, Mr. and Mrs. C. H. Boaz.

Mr. T. L. Dodd, Mrs. L. F. Wilson, Miss Alice Mooney, Mr. and Mrs. B. E. Clements, Mr. and Mrs. S. D. Gloss, Mr. Frank Cheesman.

Mr. C. R. Cummings, Mrs. Rebecca McKinley, Mr. F. D. Lyman.

Mr. and Mrs. D. F. Crawford, Mr. and Mrs. G. T. Ladd, Mr. and Mrs. C. D. Young.

Conventionalities.

Ask Bert Waycott if quality really *is* appreciated.

Both Staff and Allen had the nerve to say that the honors were wholly unexpected!

Conventions were invented to show a man what a really decent lot of fellows his competitors are.

F. W. Hodges, of lubricator fame, is one of the latest arrivals. He is staying at the Marlborough-Blenheim.

Dan Brady came down Thursday night, to borrow a pencil. Now that he's here, he'll probably stick around for a while and see the place.

Fred and Robert Shults, sons of Charles Shults, are making their first visit to these meetings. Mrs. Shults and Miss Marjorie are with them.

A. A. Burkhardt, assistant general foreman of the car department of the New York Central at West Albany, N. Y., came in on Friday to spend a few days.

George N. Sweringen, the famous and successful expert on convention balls, expresses unqualified appreciation and approval of the M. M. ball. George says, "It was chawming."

H. S. Demarest, who has been traveling through Germany, Italy and France for several months, leaves England for New York, June 24.

It will interest the friends of Robert J. Gross, formerly executive vice-president of the American Locomotive Company, to know that he is now president of the United States Radiator Company.

C. W. Cross, superintendent of apprentices of the New York Central Lines, returned to New York for one day to attend the graduation exercises at Pratt Institute, his son being one of the graduates.

W. G. Gove, superintendent of equipment of the Brooklyn Rapid Transit, made a hurried visit of twenty-four hours, for the sole purpose of seeing the exhibit at the pier. He was accompanied by his son, Kenneth.

Isaac T. Johnson is visiting the conventions for the first time this year, accompanied by Joseph M. Brown. Mr. Johnson is president of the Johnson Manufacturing Company.

W. P. Plummer, purchasing agent of the Mexico North-Western, spent Saturday here, presumably in order to get an idea as to what sort of base ball equipment to buy for peons to keep them amused when no revolution is going on.

J. W. Fogg, master mechanic of the Baltimore & Ohio Chicago Terminal, has a little girl about six weeks old, which has a fine head of hair and eyes to match those of its father.

James E. Forsyth, president of the recently organized Mid-Western Car Supply Company, who has been a regular attendant at the conventions for many years, was an early arrival. He is registered at the Chalfonte.

J. A. McRae, mechanical engineer of the Michigan Central, was not quoted just right in the discussion on main and side rods on Thursday, when he was reported as saying: "It is the practice on some roads to put a fillet on cranks." The words "side rods" should be substituted for the word "cranks."

D. O. Ward, Chicago, an old-timer at the conventions, who takes pride in the fact that he is a man of his word, yesterday claimed to have almost instantly recognized in the person of D. D. Mallory, of the Galena-Signal Oil Company, a boy-friend and school mate whom he had not seen in 40 years.

G. W. Rink, mechanical engineer of the Central of New Jersey, is another one of the small group of the younger men who are showing an active interest in the work of the association by taking part in the discussions on the floor of the convention.

This is Stanley W. Midgley's ninth consecutive year as a member of the Western base ball team. "Midge" has done fine work (tho' it's all play) for the West, having captained several winning teams; but he says that he will play only one year more, and then quit on account of old age.

Mr. and Mrs. W. E. Fowler and family will not visit the conventions this year and their absence will be noticed. This is on account of Mr. Fowler's health, which has not been good of late. He resided in Southern California all the past winter.

If you want to see an Irishman in action, just get Mike Franey, assistant master mechanic of the Lake Shore, to tell you about the forgings they make at the Collinwood shops. Poor Joe Chidley, in spite of his talking ability, cannot find a chance to get in a word and simply has to stand by and try to look pleasant.

Tiffany's window at Christmas never showed to brighter or better advantage than the imposing, scintillating, collection of badges on the manly breast of W. H. Bliss. This sparkling display is set off by a background consisting of a soft, but not too subdued, checked suit, and topped by one of the whitest felt hats at the convention.

Charles P. Williams, eastern agent of the Chicago Railway Equipment Company, and his near namesake, Charles H. Williams, Jr., of the same company, are again with us. Their abundant supply of cheerfulness and earnestness of purpose in the interests of their organization seems each year to be inexhaustable.

Prof. Edwin C. Schmidt, professor of railway engineering at the University of Illinois, is attending the conventions. He is registered at Haddon Hall. Prof. Schmidt is one of the university men who seldom miss the conventions; and the very practical and effective work he does is no doubt in large part due to this.

Among the government officers who have visited the exhibits was Admiral Schley. He and Mrs. Schley spent most of Saturday morning on the pier. After making a round of the exhibits under the escort of C. E. Postlethwaite, the Admiral and Mrs. Schley held a reception in the booth of the Pressed Steel Car Company, where they met a number of prominent railway and railway supplymen.

The *Daily* has been served with papers in a suit for libel It seems that our statement about Alex. Brown's year-old Parisian importation was O. K.; but he declares most emphatically that he was not in Maxim's that night. His defense is merely a technicality. The truth is, it was the morning of June 18, to be accurate. Our expression, "the night of June 17," was a euphemism.

H. J. Bentley was reported as saying that tests on the superheater engines on the Chicago & North Western showed a saving of 35 per cent., when the paper on superheat was under discussion on Thursday. He really said 25 per cent.; but apparently the stenographer, or linotype operator, wanted to make it sound better, so increased it by 10 per cent.

H. J. Small, superintendent of motive power of the Southern Pacific, went earnestly to work immediately on his arrival, as has been his custom for many years. His counsel in the discussions of papers, and his informative views on mechanical matters are always listened to with interest. This year Mr. Small is accompanied by his sons, Charles and Albert, and his daughter, Miss Barbara Small.

On account of important business matters, J. E. Muhlfeld will not be able to respond to the roll-call at Atlantic City this year. His non-attendance at the deliberations of both conventions will be felt by the members. Since the conventions of last year, Mr. Muhlfeld has been appointed vice-president and general manager of the Kansas City Southern, a fitting tribute to his ability. He is now chiefly engaged in important improvement work on his road.

Jack Fogg, master mechanic of the Baltimore & Ohio at South Chicago, Ill., is lonesome. Anyone can notice his condition the moment he sees him; but in case your mental capacity is greatly overtaxed with other matters, Jack will tell you he is lonesome. If you are still in doubt, he will prove it to you. And the proof is his statement, that this year Mrs. Fogg is not with him—and then Jack will show you a fine photograph of a little Fogg who arrived only three weeks ago.

It is to be regretted that Mr. and Mrs. J. F. Graham will not come to Atlantic City this year. Mr. Graham's important duties as assistant general manager of the first district of Oregon-Washington Railroad and Navigation Company compel him to remain. It will be noted that Mr. Graham, like Mr. Fuller, of the Union Pacific, no longer fears the title superintendent motive power, his road, like the Union Pacific, having recently been reorganized under the Hine system. However, he remains charged with the duties of the mechanical department.

Mayor Franklin P. Stoy of Atlantic City, an honorary member of the X Club, composed of ex-officers of the Railway Supply Manufacturers' Association, is more and more in evidence each year as a willing worker in making the conventions successful. Just before the arrival of the M. M. convention hosts this year, he wrote to a Chicago member of the X Club as follows: "The coming to Atlantic City each year of the M. M.'s and M. C. B.'s is like meeting your family relations; and I am counting the days when I can welcome you all and wear my X pin, of which I am very proud."

Walter E. Coffin, who pursues the coy coupler contract to the farthermost ends of the earth, is not here this year. The first hint that he had flitted again come on a post card marked "Lisboa," and having on it other suggestions of Portugal. The word it conveyed was, "Left Cleveland in April for South America via England, France and Spain. Will be back some time in August." After a reasonable time came another card from Buenos Aires, Argentine. This gave a brief itinerary covering Chili, Uruguay, Brazil and a few places like that, and, after expressing regret that he could not meet his old friends now at Atlantic City, he wound up thus: "I have Mrs. Coffin along. Yes. W. E. C." Now what kind of a way is that to break real news? Coffin has long had the reputation of being what the English call a "sly old top," when there were any coupler orders in the offing. He has been known to walk out of a purchasing agent's office with the order for couplers in his pocket and not tip off the bunch of waiting salesmen; but to break the news of his marriage when he is too far away to be reached, is the quintessence of sly old topness.

The absence from the staff of The Daily this year of Mrs. George Tebo, (nee Miss Jennie Boyd,) was referred to in the issue of June 17. Another who was on its staff for many years, but who is not here this year, is Francis W. Lane, whose facile, nimble pen was wont to write "conventionalities" and turn limericks which were a joy to our readers. Mr. Lane no longer is a railway journalist. He is editing a land and irrigation paper in Chicago; and incidentally, on the day the Chicago contingent of The Daily was starting to Atlantic City he was attending the wedding of his oldest son, Harold F., who has followed paternal footsteps into newspaper work, and is railway editor of the *Chicago Tribune*. Some question may be raised as to how Mr. Lane, after so many years in railway journalism, can adopt himself to land and irrigation writing. Well, in the first place, Frank Lane can do anything that he pleases, and do it well; and in the second place, he made a long special study recently of irrigation in this country for the *London Times*, during which he acquired a very substantial special knowledge of the subject. Here is a true story, illustrating his versatility, which will amuse his friends at the conventions: A short time after he took his present job, a letter written in German came into the office of the president of his company. It was passed from hand to hand for translation, and finally came to Mr. Lane, who readily turned it into English. Later, when a letter in French was received he was asked if he could translate it, and he did so as readily as he had translated the German one. His office mates then decided to try to stall him, and began to bring him articles in Spanish, Italian and other modern European languages, all of which he easily disposed of. At last, determined to stick him, they brought him a sentence in Gaelic. When he translated this with as much facility as anything that had gone before, they all stood around, paralyzed with astonishment. Lane chuckled and let them stay paralyzed for a few days, when he confided to them that the Gaelic they had brought him was a Gaelic motto, and was absolutely the only thing in that language that he could read.

SUPERHEATERS APPLIED TO OLD ENGINES.

The possibilities of increasing the capacity of some of the older types of locomotives has only within the past year or so been taken up by the railways. The locomotives built 15 or 20 years ago were, in many instances, equipped with a boiler too small to supply sufficient steam when the cylinders and pressure were proportioned for an efficient use of the tractive weight. Hundreds of these engines are going through the shops in all parts of the country for repairs, which make it an easy and inexpensive proposition to apply superheaters. That this can be done with exceptionally good results has been proved in a number of cases, and applications are being made in this way at the present time to a large number of locomotives.

In a number of instances where new cylinders were to be applied, and where, by reason of the age of the boiler, it had been deemed advisable to reduce the boiler pressure, it has been found advantageous to apply fire-tube superheaters, and by increasing the diameter of the cylinder to maintain, and in some cases to increase the tractive effort of the engine, at the same time effecting a marked economy in coal and water. This combination has produced a greatly increased locomotive mileage before a new boiler was required, and has saved the cost of the superheater many times. It is often found possible to bore cylinders or take out cylinder bushings, thereby obtaining enough cylinder diameter to permit lowering the tractive effort without a material decrease in boiler pressure and without the necessity of applying new cylinders. In such cases economies of coal and water have been obtained which in a short time far more than make good the cost of the application of the superheater.

Several railways have ordered all engines of certain classes going through the shops for new tube-sheets to be supplied with fire-tube superheaters. This has been done only after experiments with one or two engines which have shown that such changes are an excellent investment from an operating and financial point of view. Engines thus equipped have been given a higher rating than the same engines using saturated steam. That the application of superheaters in this way will permit of a reduction in the boiler pressure is of special advantage for locomotives operating in bad water districts, where the records have shown a continual increase in boiler maintenance and repairs and a decreased life of the tubes.

stay-bolts and fire-box sheets as the boiler pressure has been increased.

REGISTRATION OF PURDUE.

Purdue men attending the conventions are requested to register at the booth of the *Railway Age Gazette.*

THE SUNDAY CONCERTS.

The two concerts yesterday in the Blenheim Exchange were thoroughly appreciated by large audiences. The Marlborough-Blenheim orchestra is an excellent one, and the soloists in particular won generous applause.

UNIVERSITY OF ILLINOIS DINNER.

The following were at the University of Illinois Dinner given at the Shelburne Saturday evening:

A. S. Goble, Standard Steel Works; A. A. Hale, Griffin Wheel Company; George R. Carr, Dearborn Drug & Chemical Works; F. H. Clark, Gen. S. M. P., B. & O.; Grant W. Spear, Dearborn Drug & Chemical Works; A. A. Stevenson, Standard Steel Works; Prof. E. C. Schmidt, University of Illinois; C. B. Young, M. E., C. B. & Q.; Walter S. Carr, Sheffield Car & Equipment Company; J. A. Kinkead, Parkesburg Iron Company; L. F. Hamilton, National Tube Company; J. A. McRae, M. E., Mich. Cent.; and P. G. Stevens, *Railway and Engineering Review.*

THE VAUDEVILLE.

The all-star vaudeville performance given Saturday night at the Apollo Theatre was a complete success. The house was filled to the last seat in the peanut gallery and even some stood or sat in the aisles. How many came late and could not get in is a matter for speculation, but there must have been over a hundred of them. Every act was well sprinkled with comedy and fun and such jokes as were perpetrated at the expense of the car builders settled well.

Judging from the opinions expressed by various persons who were in the audience, some of whom have attended many conventions, this performance was an exceptionally good one. Again the Entertainment Committee is to be congratulated.

The conventions are half over now and so far every entertainment which has been provided has been up to even the "last man's" standard. We should have a continuation of this splendid work.

REGISTRATION FIGURES.

Some comparative registration statistics are rather interesting, although it should be borne in mind that last year the M. C. B. convention was held the first week. Book No. 1, the official list of members and guests, issued last year, contained 66 pages of names; this year book No. 1 contained 134 pages. Book No. 2 last year had 125 pages and this year 162 pages. Book No. 3 last year totaled 189 pages and this year 179 pages. These figures indicate clearly the large number of early arrivals this year. Book No. 3, of this year, which recorded every registration of a member of the Master Mechanics' Association up to 6 o'clock Friday evening, showed a total of 347 names. Book No. 3, of last year, containing the M. C. B. members arriving up to 6 o'clock Friday evening, showed 376 names. No registration of Master Mechanics was attempted the first convention week last year, but this year the Master Car Builders registered during the first week and book No. 3, issued Saturday morning last and containing registrations up to 6 o'clock the previous evening, contained the names of 164 Car Builders.

The Exhibit.

The T. H. Symington Company, Baltimore, Md., is exhibiting a draft gear model with plate and angle draft sills attached to wood center sills, of Symington design, which, in addition to carrying the draft gear, serves as a reinforcement of the center sills. Both of these draft gear models have the three-key Farlow arrangement.

E. P. Bullard, Jr., president of The Bullard Machine Tool Company, Bridgeport, Conn., and his brother, Stanley, are kept busy explaining why their new vertical turret lathe is called the Maxi-Mill. It is because it represents their development of the maximum possibilities of the vertical boring and turning mill. The exhibit machine has been sold to the Treadwell Engineering Company, Easton, Pa.

During the past year the United States Metal & Manufacturing Company, New York, has perfected the Empire pressed steel truck bolster, and a test made by R. W. Hunt & Company at Columbia University, New York, on the 30-ton capacity type gave satisfactory results. At 145.000 lbs. the deflection was 0.33 in. with a permanent set of 0.102 in. The final load was 222.300 lbs., which caused the bolster to buckle at the center.

The Thor exhibit of the Independent Pneumatic Tool Company, Chicago, includes reversible wood-boring machines, which are made in three sizes, viz., Nos. 5, 6 and 14, for boring in wood up to 4 in. in diameter. The No. 6 has a capacity up to one inch in diameter; the No. 5 drill is suitable for boring up to 2 in. in diameter, and the No. 14 for wood boring up to 4 in. All Thor wood-boring drills are made in the reversible type, have the Corliss valve motion, and are equipped with a cylinder plate for giving easy access to the inside working parts.

Among other exhibits of the Farlow draft gear, the T. H. Symington Company, Baltimore, Md., is demonstrating the action of Farlow draft gear attachments. An air cylinder is attached to the end sill of a full size working model and operates a piston and rod whose inner end is connected to a casting representing the butt end of an M. C. B. standard coupler. The Farlow parts and their arrangement are the same as used with the Farlow twin spring draft gear. At the end of the exreme outward and inward travel of the gear the distribution of the shocks to the sills at six points is clearly shown.

The introduction of the L. N. and P. C. brake equipment called for a brake beam of a strength and efficiency not before contemplated, and by many thought impossible. The Chicago Railway Equipment Company, Chicago, has solved the problem in the development of its P. C. Creco brake beam, which has most successfully met all the conditions imposed. The first application of the P. C. Creco beam was in 1909, on Pullman cars; and recently some of these beams were removed, after very large mileages had been covered, for the purpose of making a minute and careful study of this service test. A rigid and critical inspection of the beams confirms the accuracy of the maker's original conception of design, construction and selection of materials, as no changes other than a few minor modifications have been found desirable. The beam can be seen at the exhibit of the Chicago Railway Equipment Company.

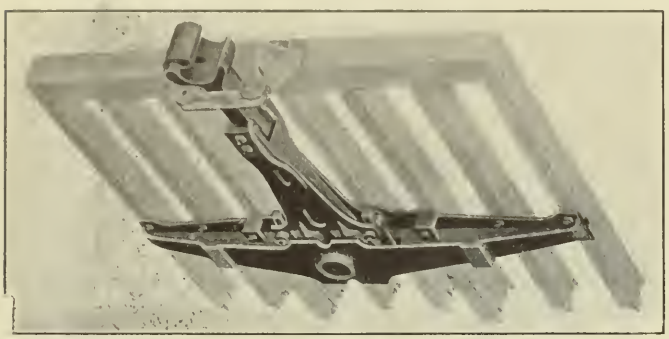
NATIONAL SASH BALANCES.

The National Lock Washer Company, Newark, N. J., is exhibiting at space 4 its latest designs in sash balances, with both belt and chain attachments. The former has brass straps at either end of the webbing, which is chemically treated to make it weatherproof and fireproof. It is a noiseless working fixture. The newly patented chain at-

tachment can be adjusted to any position along the roller, and thus does away with all soldering.

COMMONWEALTH TRANSOM DRAFT GEAR.

The draft gear shown in the accompanying illustration is made by the Commonwealth Steel Company, St. Louis, Mo. It is made up of a cast steel body bolster, which receives the buffing and pulling shocks and distributes them to the sills, thereby avoiding concentrating shocks on the center sills. It pulls radially from the pivoting point of the car body on

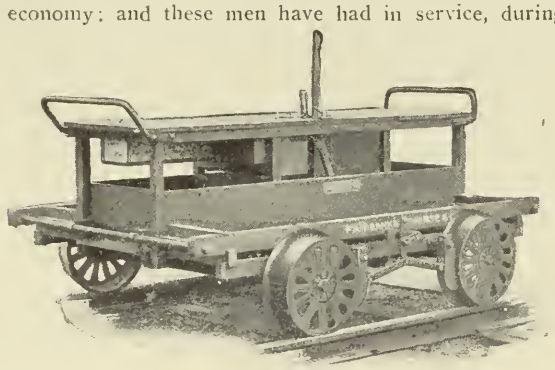


Commonwealth Transom Draft Gear.

the truck, and consequently shortens the pulling length of the car, reduces side strains, wheel flange shocks and wear on flange and rail at curves. It provides a simple method of securing draw bar end clearance, as the draw bar extension is made to suit any end clearance required, the standard M. C. B. coupler being maintained, and the lengthening of the coupler shank is not necessary. It consists of only three strong and simple cast steel pieces that eliminate draft timbers, tail straps and followers, and reinforce wooden cars for service in heavy trains with and between steel cars.

MOTOR INSPECTION CARS.

There has been an undoubted change of sentiment regarding motor cars for section service in the past twelve months. Experiments have been going on quietly here and there, under intelligent supervision, and under the watchful eyes of railway operating men who are keenly on the look-out for every possible economy; and these men have had in service, during the

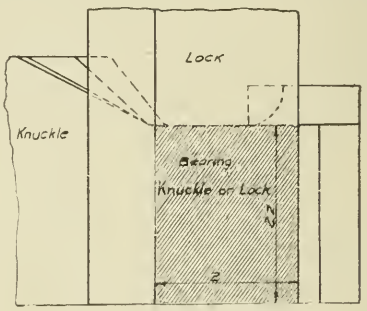


Section Track Inspection Car.

past year or two, installations of motor section cars under the control of the regular section forces, and have been keeping close and accurate data of their performances. On May 19 the *Railway Age Gazette* published a pretty complete analysis of these tests, with the data connected therewith, some of which extended back six or eight years, and in some cases was very much in detail. The reports we gather of these tests not only show that there is an absolute economy in the use of motor cars on sections, but that there is crystallizing a feeling that they are going to contribute to the safety not only of the employees but also of the public; for it has been definitely found that fewer accidents happen to section men with motor cars than with hand cars. The condition under which the men get to work, besides being a real economy, puts into service men who go into their work without having wasted the energy used up in going to and from work on a hand car. There is in addition the advantage which may come from closer inspection, not only by the section gangs, but also by the roadmasters, who may be among their gangs every day, instead of handling them more or less at long range, dropping off written instructions to them from the back end of a train, as must necessarily be more or less the practice where hand-propelled cars are used. This latter advantage, if there were no other, stands as a recommendation for the use of motor cars; in fact, in addition to the regular section motor car, some railways are adopting the plan of having a special car for the exclusive use of the roadmaster, so that he may go about from one section to the other, inspecting his track and the work of his forces closely and intimately each day, and be able to move along over his division without disturbing the operations of the gangs. A roadmaster recently said that the advantage just mentioned was considerable, as he could get over his entire division, and see each section gang at least every other day; whereas, when doing his inspection on regular trains it was impossible for him to make a similar inspection oftener than once every thirty days. The type shown in the accompanying illustration is especially fitted to do inspection work; it was built by Fairbanks-Morse & Company, Chicago.

FREIGHT COUPLERS.

The McConway & Torley Company, Pittsburgh, Pa., is showing in connection with its exhibit at booths 617, 619, 621, a new design of freight coupler which it calls the Penn. This coupler, shown in the accompanying illustration, is a combination of the features of the Pitt and Janney X couplers made by this company, and provides an increased bearing surface between the locking pin and knuckle, this surface being increased to 5 sq. in. It is different from the Janney type in that it has a vertical locking pin which does not extend through



Penn Freight Coupler.

the bottom of the coupler. Another feature is the accessibility of the parts, the locking pin and the knuckle opener can be removed and replaced without removing the knuckle. The coupler also has a heavy section of metal in its contour face. It has the features of a lock-to-the-lock, which prevents the locking pin from climbing or creeping by the oscillation of the cars in bumping over rough frogs or switches; a lock-set, which retains the locking pin in the open position without the necessity of locking up the uncoupling lever on the side of the car; and a positive knuckle-opener, which pushes the knuckle open to its fullest range of movement by the operation of the uncoupling lever at the side of the car, thus preparing for automatic coupling without any further adjustment or attention from the trainmen. The coupler on exhibition

has a long head designed to meet the latest requirements of the Interstate Commerce Commission, covering the distance between cars when coupled up in train.

TRUCK BOLSTERS.

The American Steel Foundries, Chicago, this year is exhibiting a new type of Simplex truck bolster which is sold under the trade name of Samson. This bolster is made at the Simplex plant and is intended for use under heavy tenders. On account of the short wheel base, a constantly varying load and the difficulty of providing suitable springs; the conditions of service under locomotive tenders, even of



Samson Tender Truck Bolster.

comparatively light capacity, have always been severe. With the newer type of tenders having a large capacity for fuel and water, the weights carried demand a heavy and strong bolster. It is for service of this description that the Samson bolster has been made. The compression member is made of a heavy 15 in. rolled steel I beam, a rolled steel tension plate and a heavy cast steel center plate and king post. They are designed with the idea of giving strength vertically as well as transversely to withstand the blows and shocks, due to the inertia of the trucks, as well as the strain



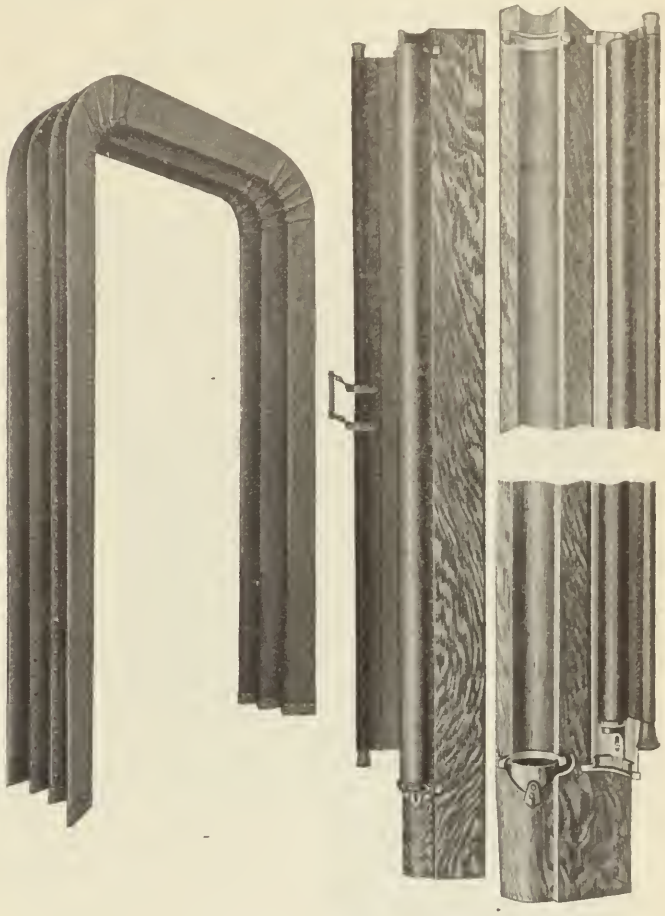
Box Shape Cast Steel Truck Bolster.

and stresses resulting from imperfections in the track, and from the heavy brake applications which are common in modern railway practice. The cast steel box section bolster is also being exhibited in connection with the American Steel Foundries' 75-ton truck. This bolster is designed for use with any high capacity truck where the axles are provided with 6 in. x 11 in. journals. Bolsters of this type are designed to provide strength both vertically and transversely, making them well suited for the heaviest class of equipment.

VESTIBULE DIAPHRAGMS AND CURTAIN FIXTURES.

Improved forms in the construction of vestibule diaphragms and vestibule curtain fixtures are included in the exhibits of the Railway Appliances Company, Chicago. Diaphragms are shown mounted on face plates which are constructed without any corner joints and are of a solid type of construction. One of the features tending to increase the life of the diaphragm is an unusual amount of expansion provided to prevent tearing of diaphragms near the toot.

A vestibule curtain casing, with brackets and handles, is also included in the exhibit, and is shown herewith. The brackets are a part of the casing, and by simply pushing aside a button at the top the casing is removed from the vestibule post with the curtain. A sliding bracket, with a set screw, enables the curtain to be quickly removed from the brackets. This saves time and trouble in making repairs in the shops, and avoids the necessity of removing any screws or fittings from the car in order to set up or take down curtains. Another feature is the fact that the curtain rolls out of its housing in a straight line without chafing or binding over the edge of the post and produces a free operating roller which saves much of the damage that usually occurs to vestibule curtains in service. A special feature also is the release handle for vestibule curtains which is automatic and positive and does not rely upon spring tension to uncouple it when the cars have been parted without



Vestibule Diaphragm and Curtain Fixture.

uncoupling the curtains. This is accomplished by a trigger or tripping device that loosens the pivoted handle bar as soon as the curtain has been unrolled a fixed distance and before it can be torn from the roller.

HUTCHINS ALL STEEL-STEEL CARLINE ROOF.

The roofing sheets, carline caps and ridge caps of the Hutchins all-steel carline roof, are made from 1/16-in. steel plate galvanized, and the carlines are 7/32-in. rolled steel, having side plate brackets riveted to the carlines. The brackets have a dowel pin that fits into the side plates and also receives the bolt that passes through the side plate. At the ridge, malleable running board saddle castings are used, and over the running board saddle castings, galvanized steel running board covers. The roofing sheets are secured to the car with two bolts, together with malleable thimble castings which allow for the air-spacing of the down turned roofing sheet flanges between the fascia of the car.

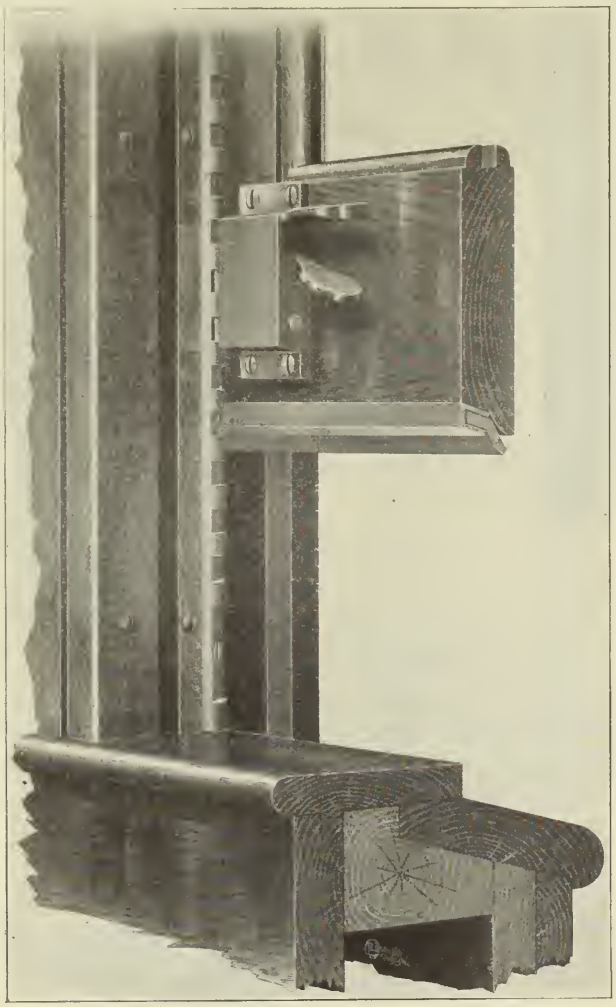
The carlines are bolted to the side plate, and the fascia are also bolted to the side plate, and the roofing sheet bolts only extend through the fascia, but not through the siding of the car; thus, any bolts used to secure the roof that pass through the siding of the car, are covered by the down turn flange of the roofing sheet. This does not allow water to follow the bolts and get on the sheathing of the car. Two purlines, one on either

side of the ridge of the car, are placed below the carlines, and the ridge pole is placed above the carlines. The side plates, purlines and ridge pole support the roofing sheets, carline caps and ridge caps.

The Hutchins Car Roofing Company, Detroit, Mich., manufactures this roof as well as outside and inside metal car roofs and plastic car roofs. This company is represented in Chicago by the Spencer Otis Company, and in New York by the U. S. Metal & Manufacturing Company.

UNIVERSAL WEATHER STRIPPING

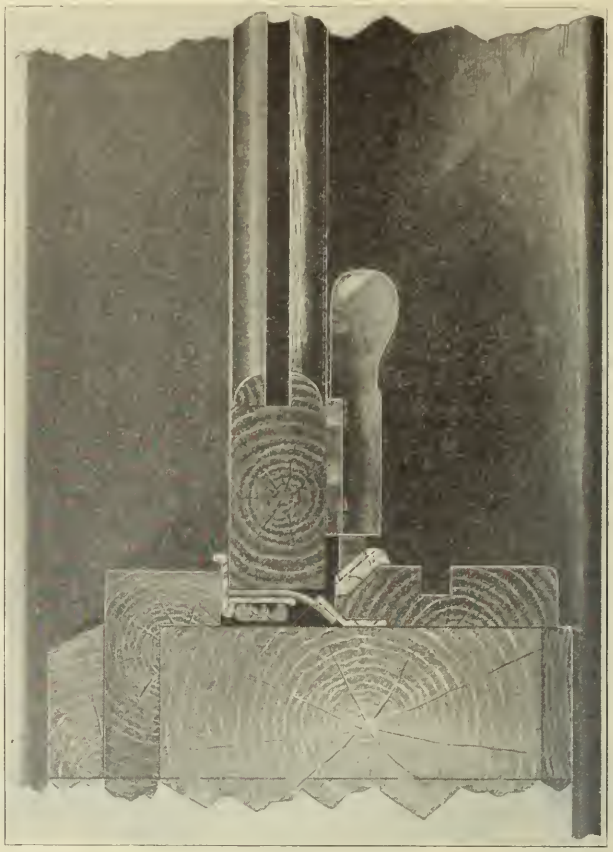
Universal weather stripping manufactured by the McCord Manufacturing Company, Chicago, here illustrated, when used in combination with either metal or wooden sash, is claimed to make the windows positively wind and weather proof. On wooden sash, it takes care of the conditions caused by the swelling and shrinking of the wood.



Universal Weather Stripping and Wedge Sash Lock.

The special grade of weather stripping furnished by the McCord Company should be serviceable for from 10 to 12 years. It is claimed that its superior value as compared with metal weather strip has been definitely determined. The class of weather stripping furnished by this company has been found, after years of service, to form a positive contact, insuring a tight yet flexible joint the entire height of the two sides of the sash.

A special grade of rubber 1/16 in. thick, covered on one side by first grade of linen duck, applied with the duck side forming the bearing, has been found to retain its flexibility with apparently no deterioration for a period of five years, and the manufacturers are confident that it will remain flexible for more than double that period. However, it is not possible for the weather strip to become unseated from the bearing and it will always retain a positive contact, being held to its seat on account of its peculiar construction. The surface of the weather strip, after a time, takes on a sort of metal coating, and after several



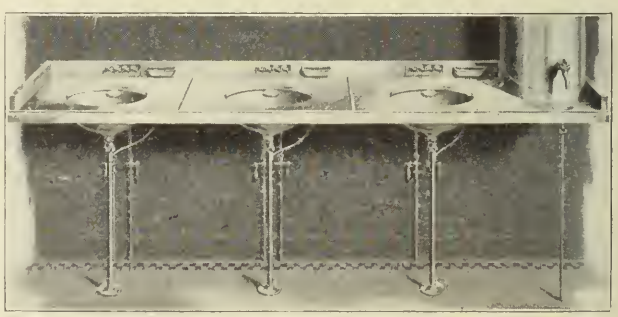
Application of Universal Weather Strips to Coach Sash.

years of service it is found that there is no perceptible wearing of the surface of the strip. Ten full sized windows showing the most improved methods of window construction are exhibited in booths Nos. 655 and 657 in the annex.

ADLAKE WASHSTAND.

The Adams & Westlake Company, Chicago, has been making washstands for 25 years and the one here illustrated is its latest product in this line.

The washstand is made of white Ajax metal, is solid and the same all the way through. The washstand has some decided advantages in, that the drain valves and faucets are



Adlake Washstand for Pullman Cars.

removed from the surface, which gives a neat and clean appearance. The valves operate to furnish either hot or cold water and also for opening or closing the drain valve. Every-

thing about the washstand is easily detachable, and if for any reason anything gets out of order, repairs can easily be made. The Adlake washstand is made with either one, two or three bowls, and with open or closed plumbing.

BETTENDORF CONTINUOUS UNDERFRAME.

The simple freight car underframe with minimum weight and number of parts, together with maximum strength which permits easy inspection and ready access for repairs as found in Bettendorf construction is made possible by the careful distribution of metal so that all members are designed as to effectually carry their proportions of the load with nearly equal maximum fibre stresses.

The Bettendorf underframes, made by the Bettendorf Axle Company, Davenport, Iowa, are furnished in two types, single center sill and double center sill designs, and are built to suit the conditions for any type of car.

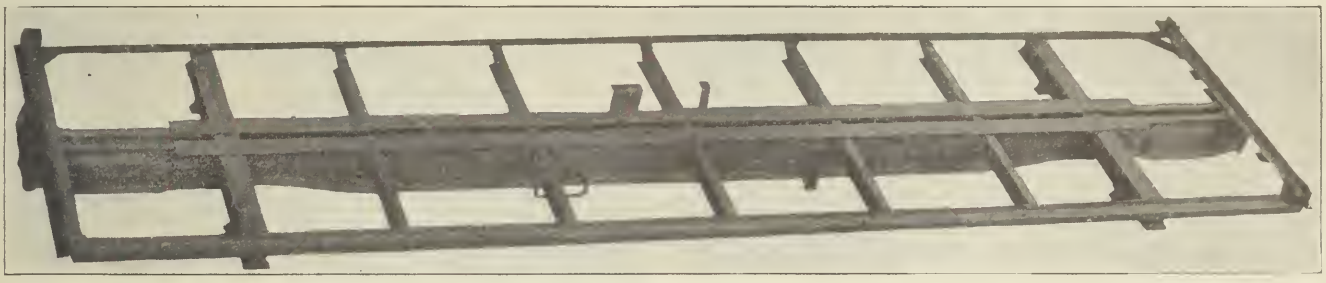
In designing such underframes, it is necessary to select a center sill, or center sills of sufficient strength to carry all the load and absorb all the shocks. It is also necessary to design the cross members (needle beams and body bolsters) to transmit their load from the side sills and floor directly to the center sill through which they pass; thus making the members continuous from one side of the car to the other as well as from end to end of car, which dispenses with the possibilities of poor workmanship on rivets and joints and makes a design which does not depend on rivets to carry the load.

The center sills are made from commercial rolled shapes of I-beam cross section of sufficient depth to carry the entire load. These are shaped and punched cold in special hydraulic machinery in such a manner that one-half of the sill is punched and shaped in one stroke of the press, making all sills interchangeable with no variation in the spacing of holes, and preventing the possibility of internal forging stresses. This method also eliminates the necessity of using drift pins and reamers in order to match rivet holes and consequently insures good riveting and eliminates the fracture of metal due to the drawing up method of drift pins. All the riveting is done by hydraulic compression riveters as far as possible.

To the ends of center sills are secured the Bettendorf cast steel draft sills, or center sill ends, which are made of thoroughly annealed open hearth cast steel designed to give ample strength, in which are combined the functions of draft sills as well as draft gear stops. These center sill ends are cast in one piece together with the necessary connections to secure them to the end sills and having the draft lugs cast integral with same. These center sill ends are designed to accommodate any desired type of draft gear the application of which is greatly facilitated due to the alinement of all parts of these castings.

A connection is provided between the body bolsters and center sill, and needle beams and center sill, of malleable iron castings which serve to hold them in position, but upon which the load carrying member is not dependent, as the load is transmitted directly from member to member and not through gussets or rivets. The needle beams are located at intervals which depend upon the size and strength of the wooden sills or nailing stringers, so as not to depend too much on the wooden sills to transmit the floor load.

The side and end sills are designed to accommodate the superstructure of the car and are made from either channels, Z-bars or angles; they are not designed to carry the load in the car but merely to transmit the load to the needle beams, body bolsters and end sills which in turn transmit the load to the center sill.



Bettendorf Continuous Car Underframe.

ATHENIAN WALL RADIATION.

Athenian wall radiation occupies little space in the room. It is well adapted for station heating, switch tower heating, and also for shop heating. It is very nearly as efficient as pipe coils, costs less to install and presents a better appearance. The cross bars in its construction prevent any air binding and also insure positive circulation of steam or water. It is made by the United States Radiator Corporation, Dunkirk, N. Y.



Athenian Wall Radiator.

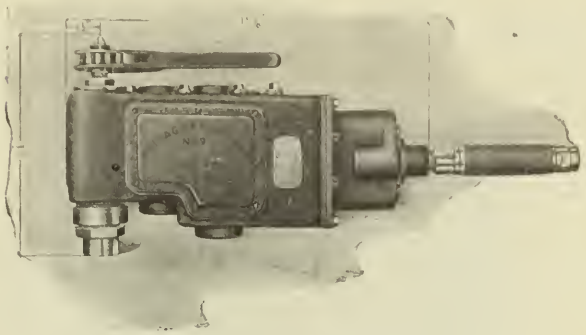
ELECTRIC HEATERS.

As some of the railways are electrifying part of their lines, and others contemplate doing so, and in consequence the necessity of electric heaters is increasing, the Gold Car Heating & Lighting Company, New York, spaces 301-311, has brought forward and is exhibiting an entirely new line of electric heaters. These are of the ventilated porcelain type, with heating elements which are interchangeable and quickly detachable in case repairs are necessary.

LITTLE GIANT CLOSE QUARTER DRILLS.

The close quarter drill shown herewith is included in the exhibit of the Chicago Pneumatic Tool Company, Chicago. These machines are designed for use in corners and close places where the regular shaped drills cannot be used. They are compact in design, powerful and capable of drilling and reaming to the full capacity of their sockets. That is, the No. 8 has a No. 3 Morse taper socket which will do drilling and reaming up to 1¼ in., while the No. 9 has a No. 4 Morse socket and which can be used up to 2-in. diameter. The dimensions

of both machines are 7⅞ in. long overall. They are 3½ in. wide and 15⅛ in. long, exclusive of throttle handle. The distance from center of drill to outside of case is 1½ in., the feed is 2¼ in. long, and the weight 36 lbs. The motor consists of two double-acting cylinders placed at the end of the case. Geared to the crank of his motor is a second crank on which are mounted two bearings which slide in the end of the ratchet arms, communicating a backward and forward motion, equal to the throw of the crank, thereby moving the spindle forward in a rotary direction one or more teeth, depending on



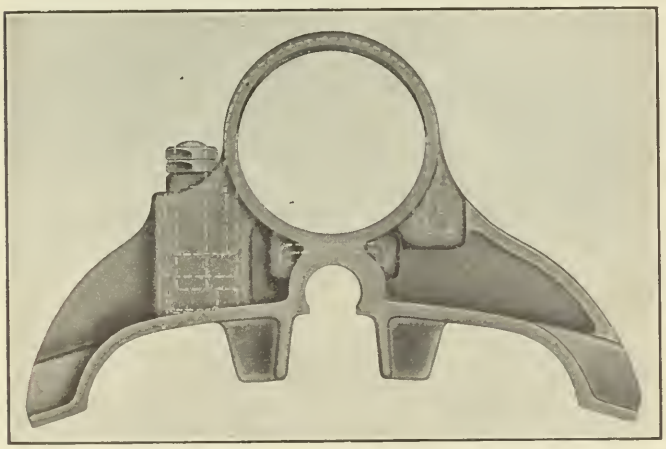
Little Giant Close Quarter Drill.

the number of teeth cut in ratchet, which determines the gear ratio of the machine.

These ratchets are mounted in the spindle, two on each side, which insures the torque on the spindle being properly distributed at all times, and prevents wear on one side of the spindle. The speed of the spindle in the No. 8 is 220 r. p. m.; in the No. 9 it is 170 r. p. m. These drills are being shown in sections with the working parts exposed. An inspection of the exhibit will show many features which are entirely new in drills of this character. The cross-heads or guides are cast solid in the housing. Cylinders are provided with stuffing box or gland, so as to prevent the cylinders leaking, thereby insuring the machine working to its full capacity.

ADJUSTABLE BRAKE HEAD FOR HIGH SPEED TRAINS.

The accompanying illustration shows the new design of adjustable brake head used on the high speed passenger brake beams, made by the Buffalo Brake Beam Company,



Adjustable Brake Head.

New York. The head is made of high grade malleable iron, with steel inserts at points of greatest strain. The adjusting arrangement is of few parts, simple and effective. The brake head can be seen at the company's space, 418.

BODY AND TRUCK BOLSTERS.

The cast steel I-beam section body and truck bolsters made by the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., are claimed to give substantial aid in cutting down the maintenance charges on railway equipment by sav-

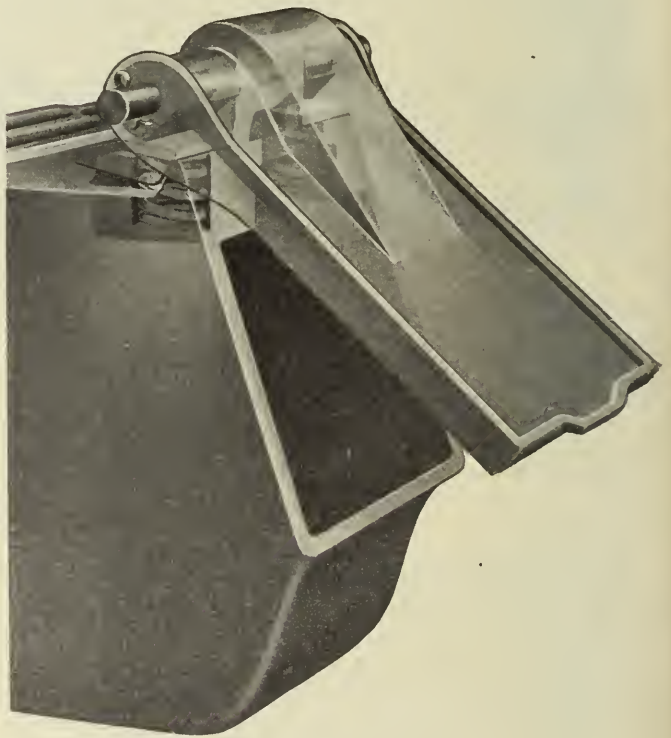


Cast Steel Bolster.

ing in the cost of up-keep of the equipment by decreasing the dead weight to be hauled over the road, but at the same time giving a simple one-piece device with strength to meet all requirements; and by the increase in revenue which comes from more constant availability of the equipment for service. The bolsters made by this company are of basic open hearth steel, meeting stringent specifications, chemically and physically; so designed as to give strength with minimum weight, and every bolster is thoroughly and carefully annealed before shipment.

BUFFALO JOURNAL BOX.

The Pratt & Letchworth Company, Buffalo, N. Y., is placing on the market a malleable iron journal box, one of the features of which is the cylindrical cam, with a flat surface, on the cover



Buffalo Journal Box.

through which the hinge pin passes. If the lid of the Buffalo box is left open it will close and lock automatically, because of the weight of the lid, the flat surface of the cam acting as a lock. The only resistance offered to the closing of the lid is the friction between the revolving cylindrical surface of the cam and the cover over the two spiral springs, shown in the illustration, which is pressed up against the cam. This friction,

of course, is inconsiderable and offers no appreciable resistance to the closing of the cover.

The Buffalo box has M. C. B. face and hinge, making it perfectly interchangeable with the M. C. B. lid.

DAHLSTROM STEEL INTERIOR CAR WORK.

The Dahlstrom Metallic Door Company, Jamestown, N. Y., believes that it originated the idea of making buildings fireproof by using all-steel interior finish. In order to obtain the same effect as that of the most costly woods, these all-metal products undergo from 20 to 25 distinct operations. The finish is obtained by a process of enameling and baking. Many modern office buildings are finished with Dahlstrom products.

Dahlstrom steel interior car trimmings, such as sash rests, car posts, car moldings, doors, berths, seat ends, partitions, window battens, etc., are being supplied to the largest car building companies. The first all-steel car was built by the Pullman Company and was exhibited at the Jamestown exposition. The interior trimmings of this car were furnished by the Dahlstrom company.

The use of all metal interior trimmings is claimed to add considerably to the strength of the car, decrease the liability of accidents during a wreck, and eliminate almost entirely the creaking noises so common to wooden equipment. Further advantages are durability, absolute safeguard against fire, and uniformity of design and color. The best passenger cars of some of the leading railways are equipped with the Dahlstrom interior work. This idea is in line with the evolution of railway equipment towards better service and the elimination of risks for the traveling public.

Samples of the Dahlstrom products are on exhibition in space 384.

RECORDING METER FOR MEASURING STEAM FLOW.

The General Electric Company, Schenectady, N. Y., has installed, with its exhibit, a recording and indicating meter which measures the total steam used by all exhibitors, from the boilers on the pier.

These instruments are comparatively new and have been only recently placed on the market. The meter is adapted to recording total steam generated by a battery of boilers; the amount delivered to any department of a manufacturing plant and the amount sold for power or heating. It discovers losses due to leaks from defective traps, gaskets, or valves. It may also be usefully employed in determining the loss due to the formation of scale, and as a means of determining efficiency in the method of stoking.

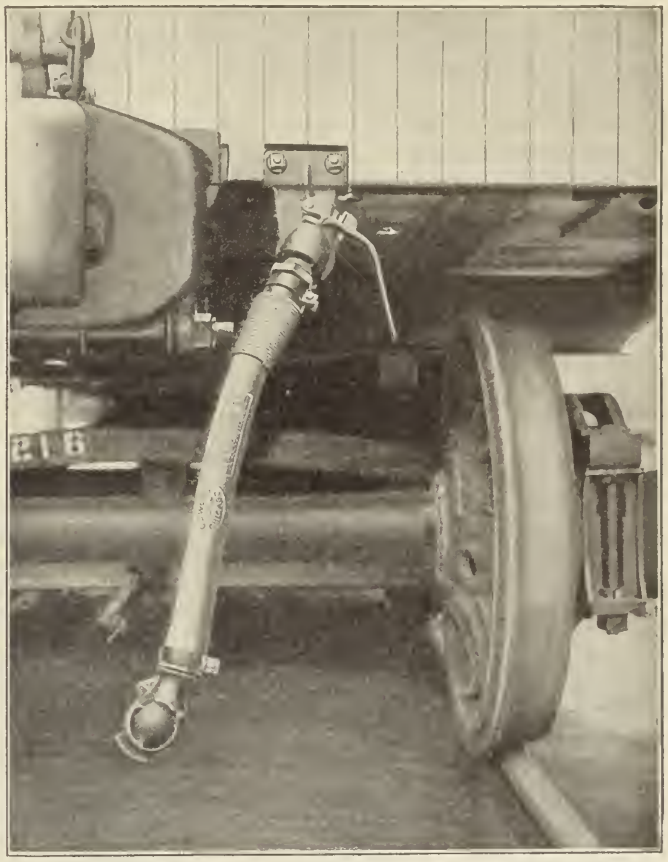
It is difficult to describe the instrument without drawings, and those interested in such meters should see the one in operation at the General Electric exhibit.

THE DEARBORN EXHIBIT.

Probably the most artistic booth for convention purposes that has ever been seen in Atlantic City is that of the Dearborn Drug & Chemical Works, Chicago, adjoining the ballroom on the pier. It is known as "Dearborn Lodge and Gardens," and it took weeks of time and labor to complete it for the opening of the M. M. Convention on Wednesday morning. The feature of the gardens is the electric fountain in front of the lodge, from which flows pure water of vari-colored rays. Flowers in full bloom, green lawns and an electric lighted pergola, surrounding the fountain, all add to the beauty of the scene. Simple receptions are held on the lawn and on the front porch of the lodge afternoons and evenings. H. G. McConnaughy, of the Dearborn company, is receiving many congratulations for the artistic results he has achieved in planning and building the lodge and gardens.

WOOD'S HOSE PROTECTOR AND PRESERVATIVE.

The damage to air brake hose by abrasion at the nipple end so reduces the life of the hose that it will not average more than twelve months from date of application, an inspection of the scrap pile showing that about 50 per cent. are damaged by abrasion or chafing. If the hose is protected at the nipple end, this loss by chafing and abrasion will be reduced so that a saving of from 40 to 50 per cent. in the cost of air hose maintenance will be obtained. Wood's flexible nipple end hose protector, made by Guilford S. Wood, Chicago, produces the required protection at the most vulnerable point. The wire coil makes the protector



Wood's Nipple End Hose Protector.

flexible and can be used on any standard make of air brake hose, and is claimed to be practically indestructible.

The nipple end hose protector is shown in the accompanying illustration. In addition to its extensive use on American railways, it has recently been ordered in large numbers for English railways, as well as for the Western Australia Railway.

The hose preservative, also made by Mr. Wood, has been ordered by the Tasmanian Government Railway and by the India Rubber Gutta Percha & Telegraph Works, of England, indicating the increasing demand for these goods in foreign countries as well as the United States.

J-M AIR BRAKE CYLINDER PACKING EXPANDER RING.

There has been some discussion during the past few years regarding brake cylinder leakage and packing leather wear and different means have been adopted to overcome these defects. The H. W. Johns-Manville Company, New York, is exhibiting a brake cylinder expander ring which, it is hoped, will relieve some of the troubles that have been encountered. This device is of a peculiar section, being so built as to give a

much greater bearing surface, which, of course, will reduce the wear of the packing leathers; in fact, it is predicted that with the use of this device it will be possible to increase the life of the packing leather considerably.

The cost of renewing brake cylinder packing leathers is often a large item, owing to the frequency of such renewals. By increasing the life of the leather, this expense will be reduced and the efficiency of the brake materially increased at the same time.

Pressure retaining valves may be in perfect condition, but their function absolutely destroyed by reason of defective packing leather. Anyone familiar with the troubles due to defective and leaky brake cylinder packing, will recognize the relation of this device to the proper and economical operation of equipment.

In examining removed defective packing leathers, it will be noted that the principal reason for this removal is on account of the leather being worn through at one point. This, it is claimed, is almost entirely overcome with the J-M expander, which covers the entire flange of the packing leather.

This expander ring is not in the experimental stage, as it has been tested out thoroughly by many of the leading railways. In some tests, it has been found that the life of the packing leather is materially increased and also the brake cylinder leakage has been reduced to a minimum. This expander ring can be applied easily to any brake cylinder without any change of the piston follower or any of the other contained parts in the brake cylinder.

A NEW TEST FOR STEEL BOILER TUBES.

For some time the National Tube Company, Pittsburgh, Pa., has been experimenting to find a rigid test for its steel boiler tubes that will show positively the character of material in every tube made. After many methods were tried and rejected, a test was devised which is a real eliminating



Spellerized Boiler Tube Test.

test—an eliminating test because it eliminates the tubes which have defects in material or manufacture.

The accompanying illustration shows this test; the first piece represents one of the two pieces which are cut from both ends of every spellerized boiler tube, one piece being cut from each end.

The second illustration shows the same piece laterally compressed, and the third view shows the same tube compressed from the side and flanged at the top.

It is to be remembered that, (1) this test is made on two pieces from every spellerized steel tube that is made by the National Tube Company; (2) this test is made while the spellerized steel boiler tube is stone cold; (3) this test is in addition to other tests lately made, such as the hydraulic test, expanding test, etc.; and (4) this test is the first test made, and should the tube show up in any way defective it is summarily rejected.

Inasmuch as the requirements of locomotive boiler tubes are becoming increasingly severe, this test is being received with much favor by mechanical officials who desire to know that their boiler tubes will give maximum results in actual service.

SUMMERS BALANCED SIDE BEARING TRUCK.

The Summers balanced side bearing truck, made by the Summers Steel Car Company, Pittsburgh, Pa., is on exhibition in space 149, in Machinery Hall. The side bearing element in truck construction is not new, but the Summers truck and the Summers all-steel box cars with trucks of a similar design are well worth a careful study by all interested in rolling stock and railway economics. It embodies new elements which promise well for the successful general

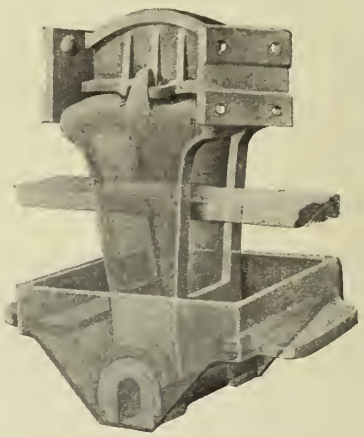


Fig. 1. Side Bearing Rocker Construction; Summers Truck.

application of the side bearing principle, long considered fundamentally ideal in truck construction.

The side bearings consist of cast steel rockers pivoted in a spring saddle and made to straddle the truck side frames, which may be of the standard arch bar type. Fig. 1 shows this feature of construction. The pivot bearing surface of the rocker is 4½ in. in diameter by 11½ in. long, the pivot being covered by a sheet of high carbon steel pressed and locked in place. These proportions are calculated to retain lubricant which is carried in the hollow of the rocker castings. The segmental rockers are 19½ in. in radius, which means in effect that the entire load is carried upon four roller-wheels 39 in. in diameter. One of the most novel elements, however, is the balanced feature, through the method employed in suspending the car body to the trucks. Upon the side bearing rockers is placed a cradle member, made up of two structural channels, tied together at the ends and the middle by steel castings. To this cradle the outwardly inclined wrought steel hanger bars, two on each side, are suspended, their solid forged T-heads engaging between steel plates riveted to outer end of cradle. The lower ends of these hanger bars are connected by a heavy steel bar of rectangular shape, and suitable hanger castings on the car body engage and rest on the top surface of this bar. In this scheme of suspension there are no sliding surfaces, the hanger both at the top and the bottom rocking in its respective supports; the

necessity for lubrication is thus eliminated. Summing up the features of this suspension, it is clear that:—

First—An evenly loaded car body on a pair of these trucks on a level track will maintain a level position.

Second—With one truck on the level and the other on twisted or super-elevated track, as when going from straight track to a curve or vice versa (the severest service condition encountered), the end out of level will adjust itself, the car body moving downward and inward with relation to the curve; the other truck on the level track will in a similar manner effect the equalization of its share of the load. When considering the mechanical points of this inclined hanger arrangement, it should be borne in mind that the lower ends of the hangers on each truck are virtually connected together through the car body, and hangers will move one way or the other in unison, responding to whatever gravity or centrifugal forces may exist until the horizontal components for each opposite pair of hangers are equal and thus balanced.

Third—When rounding curves the segmental rollers come into play in conjunction with the balancing feature, and the car body will assume an inclination commensurate with the speed and super-elevation, if any, on the curve; and similarly for a stop or a lower than calculated speed about a given curve, the top of car body will swing outward and the bottom inward, thus equalizing whatever centrifugal or gravity forces there may be. This effect is due to the fact that the center of gravity is always a considerable distance below the virtual center of motion formed by the junction of radial components through the center of the inclined hangers.

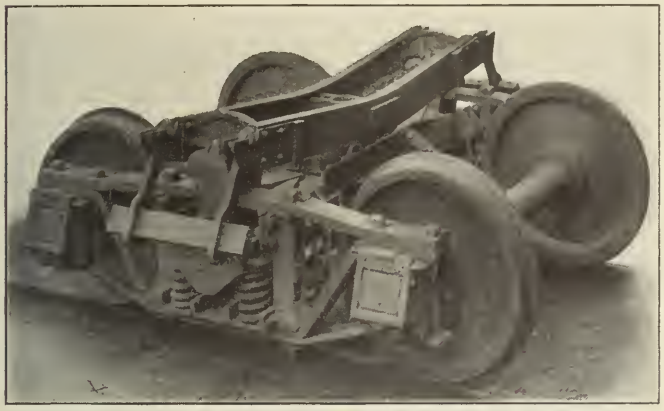


Fig. 2. Summers Balanced Side Bearing Truck.

Fourth—The trucks equalize in unison, each taking its proper share of the abnormal conditions that may exist. If designed to take care of 4 in. of vertical motion, a pair of these trucks will absorb a maximum of 8 in. of twist in a car length of track without transmitting such stresses into the car body.

Fifth—For any car body of rigid construction, such as all-steel passenger, hopper, gondola or box cars, this truck will effect an equalization of the load on the axles and wheels under the most abnormal track conditions.

Sixth—For any car body, stresses due to rigid center-bearing trucks going over uneven tracks are reduced to the minimum; thus for refrigerator or tank cars, where air or water-tight construction is imperative, this feature is invaluable, in that the car body is relieved of twists and distortions imposed by the alternate contact of the side bearings on the opposite corners of car. The junction of the side frames presents a construction of extreme rigidity. A 12-in. I-beam is split to 20 in. where it connects to the top of the column posts, and a 7-in. channel spring plank forms the tie at the bottom, an effective cross-tying insuring permanency in squareness of the truck structure. On the I-beam transom on each side of the king pin, transversely and connected with it, is placed a helical spring, incased. These springs come into play upon curves, relieving the leading wheel of the concentrated effect of a swerving load, and thus distributing it over a much greater rail length and area.

As may be noted from the illustration, chafing plates on the cradle are set low purposely to bring them down into line with the pull. Similar plates on each side of the cradle are provided on the car body. The brake-beam hangers are made of forged steel and the hanger brackets are placed directly on the flange of the I-beam transom and are riveted to it. The trucking of cars with these trucks is as easily accomplished as with the center-bearing truck, it being necessary only to hold the hangers in their inclined position while letting the car body into position.

The side-bearing rockers of such large diameter-equivalent are, of course, very effective in reducing flange and rail friction about curves. With all four side bearings on a car body always in contact, the pounding and grinding due to the intermitent contact of friction or anti-friction side bearings is eliminated. Carrying the load on rockers revolving in machined surfaces, thoroughly oiled, on a rolling contact where they engage with the load, should reduce the friction to the minimum as compared with the non-lubricated center plate support. Equipped with a pair of these trucks, the Summers all-steel box car, now on the track exhibit near the Pier, has been in continuous service for nearly a year. Recently it returned from San Francisco under a load of wine in the short time of 16 days. Going west it carried 105,353 lbs. of tin plate, which was received in excellent condition. It was 23 days en route. No repairs have been made on this equipment since it left the builders.

MOUNTAIN TYPE LOCOMOTIVE

An interesting addition to the American Locomotive Company's exhibit, space 422-24, is a photograph of a new type of heavy passenger locomotive, one of a number it has just finished for the Chesapeake & Ohio. It has been named the Mountain type, because the engines will be used in fast passenger service on the 80-ft. grade between Charlottesville and Clifton Forge.

The type was developed for the purpose of eliminating double-heading on the C. & O. limited trains. The road's present Pacific type engine can handle only six cars on this division on the schedule now in force, while the new engines are designed to haul 10 cars on the same schedule.

The wheel arrangement is something new in this country, being of the 4-8-2 type.

They are the heaviest passenger engines that the American Locomotive Company has ever turned out, weighing 330,000 lbs., of which 248,000 lbs. are on the driving-wheels. The cylinders measure 29 in. x 28 in., while the driving wheels are 63 in. in diam., so that at the boiler pressure of 180 lbs. the maximum tractive effort is 58,000 lbs.

The engines are equipped with Schmidt superheater.

DOYLE METAL POSTS.

The Doyle metal post was designed to reduce the number of parts of a car to a minimum. The guides for the sash, and the curtain fixtures, are formed in the post itself, thus doing away with the necessity of providing extra strips and stops for this purpose. These formations and corrugations in the post also add to the rigidity. Between the sash and the post there is an outward spring thrust shoe carried by the sash and having a wedge or other suitable engagement

with the corrugation or sash guide formed in the post. These shoes automatically adjust the sash to any variations there may be in the distance that the posts may be set from each other, and to any variation in their vertical alinement. They also permit the sash, along its lower edge, to adjust itself automatically to the camber of the car.

This shoe engagement also renders the sash dust-proof. The guides or frames on the posts, upon which the sash shoes operate, are covered with a brass capping, which becomes oxidized from the action of the atmosphere and thus prevents the shoes from coming in contact with the paint or finish of the post.

Another advantage afforded by the sash shoes is that they permit almost instantaneous withdrawal of the sash from the opening, and without the necessity of removing any of the customary sash guides. This is accomplished by forcing the shoes inwardly to the sash, which permits the whole to be swung free of the opening.

The Doyle posts are formed out of one piece of metal, like many of the other products of Forsyth Brothers Company, Chicago, and afford the maximum strength and rigidity with minimum weight.

They are adapted to any construction of car, and are suitable for use in either wooden or steel construction. They are joined along the floor and at the top of the car construction in such a manner as to be removed readily at any time.

In addition to the above specialties, the company manufactures pressed metal carlines, roof sections, and other exterior and interior steel finish generally.

THE WESTINGHOUSE ELECTRICAL EXHIBIT.

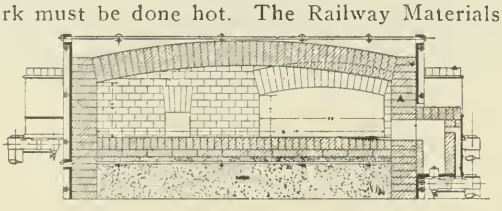
The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is exhibiting a large line of motors and controllers especially adapted for shop and machine tool drive. The motors include direct-current machines for general power and adjustable speed machine tool service, squirrel cage alternating-current motors, slip ring alternating-current motors, and single-phase motors. The type MW slip ring motor for elevator, crane and hoist service is proving especially interesting to visitors.

Another exhibit is an automatic magnetic-switch controller for wheel lathe service. The controller operates automatically, and the motor can be started, slowed down, and stopped from any point by means of push buttons. This arrangement is of special advantage in turning down wheels with hard spots on the tires.

A number of domestic appliances, such as sewing machine motors, buffing and jewelry motors, and the general utility motors, are also on exhibition.

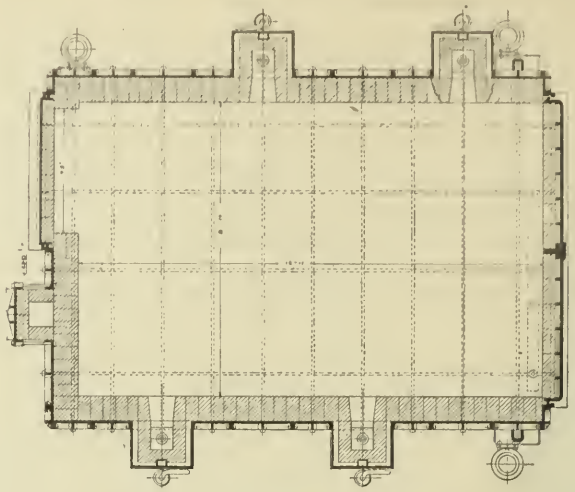
FERGUSON FURNACES FOR STEEL CAR REPAIRS.

A large percentage of repair work on steel cars consists of straightening and replacing damaged plates or sills, and such work must be done hot. The Railway Materials Company, Chicago, has equipped several shops with Ferguson furnaces, designed especially for this work. The furnace in the accompanying illustrations has an inside dimension of 9 ft. x 14 ft., and is capable of heating the largest car plates.

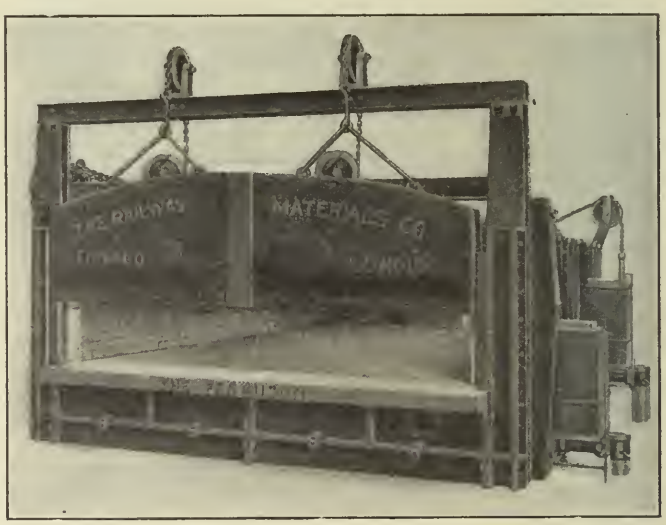


Cross Section of Ferguson Furnace.

A full-width door on the front end is designed to operate in two sections. Opposite one of these sections in the rear wall is a single door and on this side of the furnace one of the combustion chambers is lowered to the floor level. This arrangement is very convenient for running through the furnace long sills or similar material requiring local or center heats, necessitating the operation of the low combustion chamber only and saving the expense of heating up the entire furnace. For plate straightening, the remaining three burners are sufficient to bring the entire furnace area up to a uniform temperature of any required degree.



Plan of Ferguson Furnace.



Steel Car Repair Furnace.

In Queensland, the northeastern colony of Australia, where for some years there has been very little railway building, while the country was recovering from the three-years' drought, the government now purposes to construct a line along the coast from Rockhampton northwestward, 634 miles through Mackay and Townsville to Cairns—all coast towns; and another nearly parallel with it, but about 350 to 400 miles further west from Charleville, the terminus of a railway from Brisbane, northwestward through Longreach and Winton and Cloncurry to the western border of the province at Camooweel, 1,282 miles. This latter would serve as part of a great transcontinental line to the northwest coast of Australia, and would make an enormous grazing country accessible.

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PRESIDENT CURTIS showed great forbearance yesterady morning when he urged compliance with the M. C. B. standards without emphatically calling attention to the fact that if this had been done in the past, the upheaval resulting in the safety appliance legislation last year would not have taken place and the M. C. B. Association, instead of Congress and the Interstate Commerce Commission would have got the credit with the public for the promotion of safety in transportation by the adoption of satisfactory safety appliance standards. What Mr. Curtis urged has been urged time and again in and out of session, but the railways have been slow to learn the lessons of experience and have sacrificed a standard for the gratification of a personal whim or prejudice. In view of the past, this latest recommendation from the chair should receive consideration and be acted on. The standards should be faithfully observed, while the recommended practices which are candidates for promotion to standards should be given a fair trial and an intelligent vote on their promotion thus be made possible. In this connection, the suggestion offered that the height of the running board be referred to the committee on standards deserves especial consideration, for certainly as far as bridge and tunnel clearances and safety of trainmen are concerned, this is quite as important as that of the height of eaves, which has already been standardized.

THE figures presented yesterday by President Curtis regarding the defects in equipment found by the inspectors of the Interstate Commerce reflects no credit on railway management. As he pointed out, most of these defects could have been prevented by proper inspection and supervision on the part of railway managements. Because defects such as these are not prevented property and lives are constantly endangered and destroyed and the railways are subjected to odium because of the numerous prosecutions started against them in all parts of the country. Of course, it is not practicable to repair all defects in safety appliances on equipment in service; but it is possible, and practicable, to make a much better record than has been made in the past both in the way of keeping defective equipment out of service and of promptly taking it out of service after it becomes defective. No doubt a good many prosecutions are instituted for merely technical shortcomings of cars and engines. But if the commission and its inspectors are sometimes too zealous and stringent in applying the law, the railways often have construed it too loosely and obeyed it too laxly. The necessity of paying a fine following a successful prosecution is not the only, or perhaps the most, evil result of it. Every proceeding, successful or otherwise, is mentioned broadcast in the press, and the impression that railway managements are remiss in adopting safety measures and obeying the laws for promoting safety is deepened. A large part of the irksome regulation which has been adopted in recent years has resulted from just such causes.

THE manner of making up the printed proceedings of the M. C. B. Association is this year, for the first time, considered by the committee on Revision of Standards and Recommended Practice. The report favors the elimination of various rules and drawings which change little from year to year, but which, by their inclusion, have made the volume of the proceedings so bulky and cumbersome that it is unwieldy and inconvenient for handling or reading. It is also so thick and heavy that the ordinary binding is hardly sufficient to hold it together, and that it will not bear much service without wear or damage. The idea of the committee is that the annual volume should be confined to the proceedings of the convention, and that the other matter which has caused the volume to become so thick should be printed as separate pamphlets. These are the code of interchange rules; the decisions of the arbitration committee; the rules for loading long materials; and the text and sheets relating to standards and recommended practice. All these are now printed separately, and it is not only an additional expense, but an inconvenience, to include them all in the annual volume of the proceedings. As the subject may be submitted to letter ballot, it is important that it be presented in shape which will permit of some improvement as regards the objectionable features we have mentioned. The slight discussion on this part of the report disclosed a desire of one member to make no changes but continue printing the bulky volume, which grows larger each year. Another member desired that at least the rules of interchange be included. One alternative would be to print the proceedings proper in one volume, and the rules and standards above mentioned in another volume for the same year. The aim should be to make the volume of proceedings a record of perma-

nent matters, and to eliminate the code of interchange rules and decisions of the arbitration committee, which are of transient interest. The standards and recommended practice should form a separate volume.

THE cast iron wheel certainly came pretty near getting a hard rub yesterday morning from President Curtis. It might almost sympathize with the fellow who said: "You've knocked me down and spit in my face, and if you do it again I'll begin to think that you are trying to insult me." The very moderate statement that many railway officials were beginning to think that a steel wheel was the only one to put under a high capacity car was but half expressing the growing sentiment in favor of that type of wheel. For naturally the question is asked, If it is so good for 50-ton cars why not put it under those of 30 tons? On the other hand, there is a large number of railway men who believe in the cast iron wheel and think that it can be so improved as to be fit and safe for any class of service; but, aside from the articles that have been printed in these columns regarding the practices of wheel foundries owned by railway companies, it has been impossible to get any information as to what is being done to improve the cast iron wheel beyond the oft-repeated assurances of the wheel makers that if they are paid more they can make a better wheel. In one case, at least, a railway has accepted the challenge and bought a lot of wheels with an increased guarantee at an increased price. But as to just what was done to better the wheel in formation is lacking. So we do not know whether it was done by selected scrap or pig, by the use of titanium or vanadium, or improved foundry practice, though it is known that experiments with titanium have been in progress for some time. It is certain, however, that even among those who have been most skeptical as to the safety of the cast iron wheel under cars of high capacity there is a firm belief in the possibilities of improving it. But unless this improvement is made without much more delay, it seems probable that the steel wheel will unseat its cast iron rival in the tournament of trade and that it will be thenceforth listed among the vanquished. It has rendered such yeoman service and still has the confidence of so many men that it deserves the best and most scientific attention for its immediate improvement; or, if it has reached the summit of its metallurgical development, it is but right that the railway world should be informed of the fact, that it may act accordingly.

INCREASED BRAKE POWERS FOR FREIGHT TRAINS

AIR brake equipment has been improved to such an extent in the past five years that it is now possible to consider seriously a considerable increase in the brake power in proportion to the weight of the cars. The old and well established rule which provides brake power equal to 70 per cent. of the light weight of the cars is hardly sufficient to control loaded trains on grades, and for some time a number of railways in the mountain districts have increased this to 80 per cent. At the last meeting of the Air Brake Association it was proposed in one of the papers to make the brake power for freight cars equal to 35 per cent. of the total weight of the car and its loaded capacity.

For a 100,000-lb car, weighing empty 40,000 lbs., this rule would make the brake power 49,000 lbs., or about 22 per cent. more than the light weight of the car. As it has been considered necessary to proportion brake power in freight service so that it will be less than the weight of the empty car in order to prevent the sliding of the wheels, it would seem that the proposed new rule involves a radical change in existing practice and presupposes that the cars have modern air brake equipment in uniformly good order.

As this is not the general condition of the equipment in car interchange, where the old and new fixtures may be found in mixed trains, it was properly and naturally objected that such a rule could not at present have general application. There should be, however, a constant effort toward improvements which would make such a rule applicable, and there are places where it could be applied. On many lines with heavy grade the bulk of the traffic in coal and ore is handled in cars owned by the home road, and solid trains of such cars are continually in service on the mountain grades. It is here possible and profitable to apply the modern air brake equipment and increase the proportion of brake power to that sugested by the rule above referred to.

In passenger service very fast trains are now equipped with brake apparatus which permits of the use of a brake power equal to 150 per cent. of the weight of the cars and their load without injury to the wheels by sliding, and it is only by the use of such heavy braking that it is possible to stop heavy steel cars and large locomotives in a distance which good practice regards as a safe one.

The experience gained by the use of such equipment in passenger service will in time be usefully applied to improvements in freight braking, but for the present the impression is that on account of conditions in mixed train service there is more prospect in the development of a special valve or fixture which will make it possible to materially increase the brake power on loaded cars—and reduce it when the load is discharged.

Whatever direction this movement which demands greater brake power for freight cars may take, it is necessary that more tests be made with freight trains to determine the extent to which the percentage may be safely increased. The recent interest in brake improvements and brake tests has related principally to passenger equipment, and while the elaborate tests made a few years ago with freight brakes on the Southern Pacific gave remarkable results, the brake equipment has since been improved and it would seem desirable to conduct further tests with the object of establishing and recommending new rules for freight brake power percentages.

HOTEL AND EXHIBIT ACCOMMODATIONS IN ATLANTIC CITY

THERE has been considerable complaint to the effect that the facilities of Atlantic City for caring for the mechanical conventions are growing inadequate. There is some apparent ground for such complaint. Many had difficulty in getting the hotel accommodations they wished, in spite of the fact that the hotel men estimate that they reserved 20 per cent. more rooms for railway and supplymen this year than ever before. No doubt enough rooms of some sort for all could have been secured in the hotels where those attending the conventions usually go, but practically all of them want rooms with baths, and there were not enough of such rooms available in the hotels referred to. Furthermore, the space available for exhibits on the pier was insufficient. The secretary of the Railway Supply Manufacturers' Association advises that there were received about 70 applications for booths that could not be filled; this, in spite of the fact that the track exhibit is much larger than those of previous years, and that one large exhibitor has taken space opposite the pier at the end of Arkansas avenue.

However, the situation is not nearly so bad as the foregoing facts seem to indicate. In the first place, the hotel accommodations now available might be much better utilized. Almost everybody tries to get into about a half dozen large hotels on the Boardwalk. There are others on or near it having good accommodations which for no sufficient reason do not get much of the convention business. Chalfonte always does a good business. The Chelsea, in the opposite direction from the Million Dollar Pier, is only as far from it by actual measurement, as Chalfonte, and yet there is comparatively little demand by convention visitors for rooms in it. Furthermore, plans have been made for the construction, within the next year, by the management of the Ritz-

Carlton Hotel in New York, of a large, fine hotel on the Boardwalk on the present site of the Windsor. It is expected that it will be open before next June; and if it is, it will afford large additional accommodations which, it is said, will be as good as any to be found on the Boardwalk. On the whole, therefore, it would seem that there should be no substantial ground for complaint about the hotel facilities next year, should the conventions come here and the hotel men reserve enough rooms for the convention trade.

As to space on the pier for exhibits, it can be enlarged enough to take care of them for some time to come. The Marine Hall has been used for them in the past and could be in the future. Being on the second floor of the pier, some exhibitors object to being assigned to it; but some prefer it. The latter say that while the crowds that visit it are not large, those very numerous railway men who come here with the serious purpose of learning all they can about old devices that have been improved and new ones that have been introduced, will visit all parts of the exhibit, and that simply because the crowd in the Marine Hall is apt to be small, it is a good place to show and explain to them the exhibits in a way that will get the most valuable results for both the railway men and the supplymen. Again, a new convention hall could be built farther out on the pier and the hotel men's annex extended to iclude the Greek Temple, thereby providing additional exhibit space the Greek Temple has become inadequate. Members of the staff of The *Daily* last week and yesterday, made careful observations of the size of the crowds, as compared with the capacity of the hall at the beginning, at about the middle and at the end of each day's session; and these were convincing that the Greek Temple is now not over 70 per cent. large enough. Every morning at the opening many people have to stand. Later in the day there is apt to be a number of empty seats, but the hall should be adapted to the maximum crowd of each day. By extending the hotel men's annex beyond the Greek Temple, and building a larger hall farther out on the pier, both the conventions and the exhibits can be satisfactorily accommodated.

It has been suggested that perhaps many of the individual exhibits should be reduced in size. It is pointed out that some manufacturers show, year after year, the same devices, until they are old and are familiar to the regular attendants at the convention, and it is said that many of these old devices might well be eliminated. It is replied to this, however, that every year a large number of young men come here for the first time, and that while many of the devices shown may be old to the older generation, they are new to the younger. Furthermore, owing to improvements, many devices that seem old are really very different from what they used to be.

The conclusion of the whole matter seems to be that Atlantic City is still capable of satisfactorily taking care of the conventions. There has been ground for some of the complaints that have been made this year; but the hotel men of Atlantic City are not solely at fault. The supply men had a chance to get increased space, and did not take advantage of it. The crowds and the exhibits both increased more in size, as compared with last year, than any one foresaw; and the shortage of accommodations was more due to this than to anything else. The Master Mechanics and Master Car Builders' Associations will continue from year to year to receive propositions to hold their meetings at other points; but nothing has yet developed which indicates that they cannot be well provided for here, or that any other place can provide for them equally well.

The Brazilian government has extended by 18 months the time specified for the completion of the Itu-Cratheus section of the Sobral Railway .

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.

Discussion of Reports on:	
Rules for Loading Materials..	9.30 A. M. to 10.00 A.M.
Prices for Labor and Materials for Steel Cars	10.30 A. M. to 10.45 A. M.
Coupler and Draft Equipment.	10.45 A. M. to 11.15 A. M.
Car Wheels	11.15 A. M. to 12.00 M.
Safety Appliances	12.00 M. to 12.15 P. M.
Revision of Code of Air Brake Tests	12.15 P. M. to 12.30 P. M.
Freight Car Trucks.....	12.30 P. M. to 1.00 P.M.
Refrigerator Cars	1.00 P. M. to 1.30 P. M.

ENTERTAINMENT.

Band Concert, 10.30 A. M.—Entrance Hall, Million Dollar Pier.

Miss Beatrice Herford, 3.00 P. M.—Entertainer in Original Monologues, Brighton Casino.

Band Concert, 4.00 P. M.—Entrance Hall, Million Dollar Pier.

45th Annual Ball, 9.30 P. M.—Of the Master Car Builders' Association (Vollmer's Orchestra).

The Galena Signal Oil Company's booth will be used as a rest room for the officers and their guests.

TRAVELING ENGINEERS' SUPPLYMEN'S MEETING.

The officers and members of the Traveling Engineers' Supplymen's Association who are here will meet at 10.30 this morning in the office of the executive committee of the Railway Supply Manufacturers' Association, adjoining the enrollment booth.

The annual convention of the Traveling Engineers' Association will be held in Chicago from August 29 to September 1, inclusive. Judging from the present outlook, it will be the largest convention of any branch of the railway mechanical department ever held in the west. Aside from the expected increase in attendance of members of the Association, the Supplymen have engaged the whole second floor of the New Hotel Sherman for exhibits of locomotive appliances. Already 30 applications for space have been received, and there is no doubt but what the entire 8,000 ft. available will be occupied.

The officers and members of the executive committee of the Traveling Engineers' Supplymen's Association are: President, Charles B. Moore, American Arch Company; secretary, J. Will Johnson, Pyle-National Electric Headlight Company; treasurer, F. W. Edwards, Ohio Injector Company; F. D. Fenn, Crane Company; W. L. Allison, Franklin Railway Supply Company; Charles Shults, Worth Brothers Company; F. A. Morrison, Mason Regulator Company; B. J. Neely, Jenkins Brothers, and W. O. Thompson, secretary, Traveling Engineers' Association.

M. C. B. BALL TO-NIGHT.

The forty-fifth annual ball of the Master Car Builders' Association will be given on the Million Dollar Pier to-night at 9.30 o'clock. Headquarters for the officers of the Association will be at the booth of the Galena Signal Oil Company, at the east (ocean) end of the ball room. The grand march will be led by President and Mrs. Curtis, and the other officers of the Association and their ladies, and will be personally conducted by J. Will Johnson, chairman of the entertainment committee. Vollmer's orchestra will furnish the music, and punch and refreshments will be served at both ends of the ball room.

Proceedings.

The first session of the forty-fifth annual meeting of the Master Car Builders' Association was held in the Greek Temple, on Young's Million Dollar Pier, Atlantic City, N. J., on Monday, June 19, 1911.

The president, T. H. Curtis (L. & N.), called the meeting to order at 9.30 o'clock and invited the past presidents and members of the executive committee of the Master Car Builders' and Master Mechanics' Associations to take seats on the platform. The Rev. Dr. Newton W. Cadwell invoked the Divine blessing. Mayor Stoy, of Atlantic City, for some reason was prevented from welcoming the Association this morning.

The President: We have with us this morning the oldest ex-prseident of the Association, Mr. Wm. McWood, and I will ask him to say a few words to us.



T. H. Curtis,
President, M. C. B. Association.



A. Stewart.
First Vice-President, M. C. B. Association.

Wm. McWood: I thank you for your very kind remarks, but I must candidly confess that I am a much better car builder than speaker. I thank you all for your kind greeting. (Applause.)

ADDRESS OF PRESIDENT CURTIS.

We are here assembled for the forty-fifth annual convention of the Master Car Builders' Association and, as its president, I take great pleasure in welcoming you. It is very gratifying to observe that the ladies have favored us with so large an attendance. Your presence is always beneficial and your smiling countenances are encouraging and inspiring. Surely no place affords more pleasure or diversion than Atlantic City, and we trust that your short stay here may be enjoyed to the fullest and that you will leave with the desire to meet with us another year. It is very pleasing to observe that so many of the members of the Association are present. Some have attended these meetings at various places for many years and have watched the growth and progress of the Association, while others are here on their initial visit. Be it far from any member to feel that his mission here is limited to what may be heard or said within these four walls. The time has passed when the progressive railroad officer may live entirely to himself—he must associate himself with his fellow-men and they, through their combined knowledge and strength, devise effective ways and means for the proper conduct of various departments. The Association's printed and bound record of proceedings contain a complete record of the reports of the various committees and the discussions that follow, and in them is recorded the progress that we make from year to year, and they may be considered annual markers indicating our progress in time as a milepost indicates the distance traveled.

The supplymen, who are truly captains of industry, are to be congratulated upon their fine display and their ever-pleasing manner in exhibiting the appliances which they represent. On this great pier and for some distance in one of the streets in this vicinitv are to be found on exhibition, railway equipment, appliances and supplies so extensive that if only a few moments' time were given to each important subject, it would require over a day to investigate. The opportunity to inspect these extensive exhibits should be considered a great privilege, as much knowledge for the betterment of railroad service may be gained therefrom.

Safety Appliances.—The past year has been a very eventful one in the history of this Association and we have before us for immediate consideration several very important subjects. The twenty-fourth annual report of the Interstate Commerce Commission contains a report of the chief inspector, J. W. Watson, in the summary of which it is shown that in the year ended June 30, 1910, nearly a half-million freight cars were inspected and a little over 5 per cent. were found to be defective. When comparing these figures with those for the year ended June 30, 1905, in which about one-fourth of a million freight cars were inspected and over 22 per cent. were found to be defective, we have the comfort of knowing

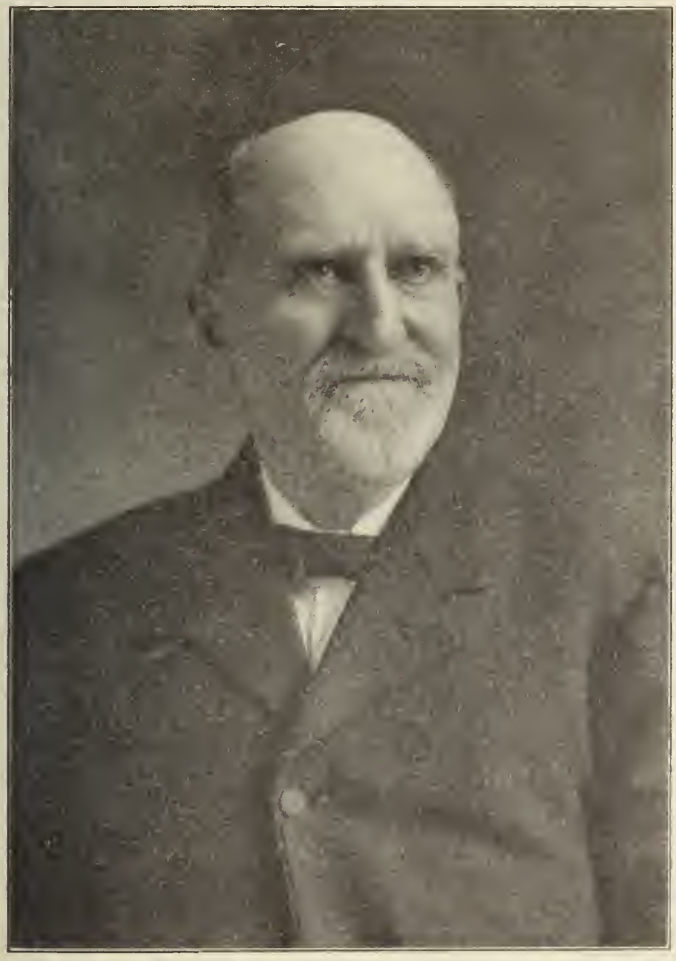
that an improvement was made, but there is still room for further effort. The comparative classified table of defective safety appliances on freight cars, for the year ended June 30, 1910, as to couplers and uncoupling devices, shows over 5,000 defective appliances. Over 1,500 of these defects were in the uncoupling chains. These could have been practically obviated by the use of a first-class chain that would not have cost over 15 cents. Over 2,000 more of the defects reported could have been righted within an average of one-half hour's time for each defect, and at a cost of not over 50 cents each. Over 6,000 cases of defects were reported in hand-holds, ladders and sill-steps. Of this number, over 600 were for missing sill-steps and nearly 4,000 for missing hand-holds. These omissions are to be deeply regretted. As to air brakes, over 16,000 cases were reported, of which over 6,000 were for brakes cut-out and over 2,000 for cylinder and triple valves not having been cleaned within the prescribed time. There were over 2,000 cases of release rods missing. These rods do not cost over 10 cents each.

Of the 16,000 defects cited, 10,000 of them could have been repaired by detaining the car from service only a half-day at the most, and these repairs would have required only labor and they would not have required the services of large shops and machinery. The greater portion of the defects mentioned could have been obviated by greater care and supervision, and this supervision should have come from the higher officers. They should have known that the car men were properly instructed and drilled in regard to the importance of properly applying and maintaining safety appliances.

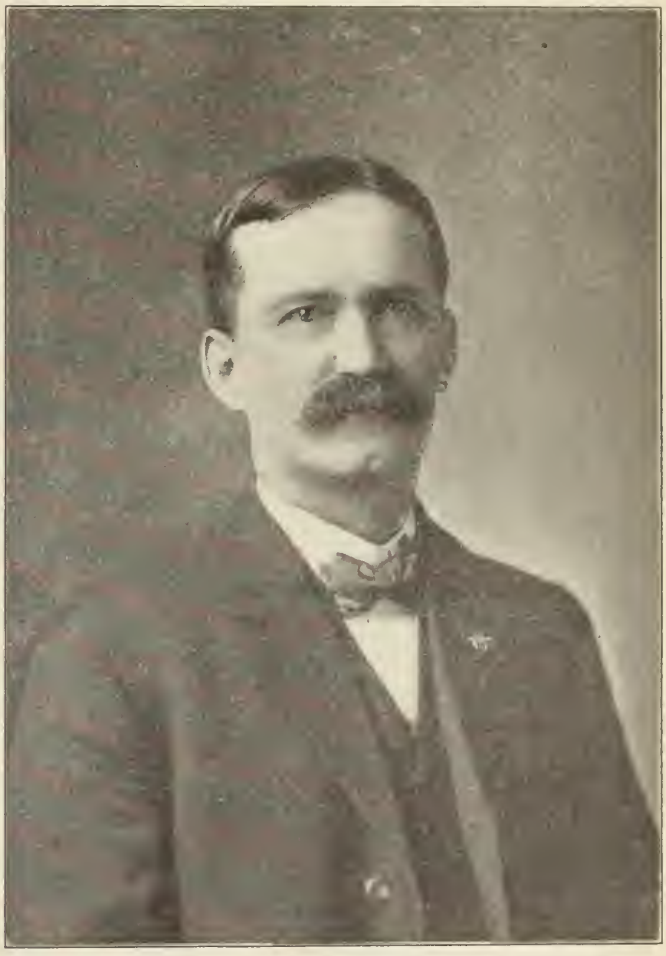
The matter of proper application and maintenance of safety appliances is of great importance. On July 1, 1911, the United States safety appliance standards as set forth in the order of the Interstate Commerce Commission of March, 1911, will become effective. While these standards may not be looked upon favorably by some, they are the result of many conferences and hard work by a committee of inspectors for the Interstate Commerce Commission and the general committee of railways on safety appliance standards, composed of members of our Association, the American Railway Association and others, and it is to be hoped that every effort will be put forth on the part of the members of this Association to familiarize themselves with these standards with a view to properly applying and maintaining them. And, furthermore, I urge you to co-operate with the Interstate Commerce Commission representatives, and by this co-operation the object of the law will be attained and uniformity will be the result, as well as good feeling between all concerned. One result of the enforcement of the safety appliance law will be the bringing into use of common standards for safety appliances for all classes of rolling stock equipment, regardless of the ownership of the equipment, whether it be a railway company or a private car line.

M. C. B. Standard Coupler.—A common standard in railway equipment, which is being interchanged, is a necessity—it is the need of to-day. To further profit by a common standard for equipment it is earnestly recommended that the Master Car Builders' Association speedily adopt a standard M. C. B. car coupler, and that this coupler must be standard in all of its parts, and every railway to use it only. The day of experimenting with car couplers is past, the state of the art has reached its maturity. A common standard for a car coupler will reduce the great number of repair parts that are now required to be kept in stock all over these United States for repairs to the great number of different styles of the M. C. B. car coupler, which is now a standard only in its contour lines. In brief, the M. C. B. coupler of to-day is standard in service, but interchangeable only as a whole, as the various makes are widely different in details of construction. To facilitate the prompt movement of traffic and also raise the standard of efficiency and reduce the cost of operation, a standard M. C. B. coupler is a very present need. This subject of a standard car coupler was earnestly recommended by one of my worthy predecessors in his address to our Association.

Car Wheels.—The day for small or light capacity freight train cars, as well as passenger equipment cars, is about past.



J. S. Lentz.
Treasurer, M. C. B. Association.



J. W. Taylor.
Secretary, M. C. B. Association.

So called heavy or large capacity cars are now being built extensively, and some have been in operation for a long time. In some cases the strains and stresses are possibly exceeding the limits of safety for certain kinds of material that have been heretofore commonly used. As a citation I will mention car wheels. The steel car wheel is now considered by some large railway companies to be a necessity. I will not comment on the steel car wheel or on the different kinds or makes and their mission in railway equipment of to-day, but will say that the time is at hand when something should be done by this Association in prescribing and requiring that under all heavy capacity cars an efficient and suitable car wheel must be used. The common cast-iron car wheel of a grade used under light cars with good results needs to be materially increased in its strength and stability if it is to be used in service under heavy capacity cars of to-day.

Brake Shoes.—The increase in capacity of cars has necessarily increased the light weight of the car, and therefore made necessary the increase of the pressure on the brake shoe. For safety alone all brake shoes should have some kind of a wrought-iron or steel binding member constructed in the brake shoe to prevent the dropping of a piece of the brake shoe on the track should the shoe crack or break and a portion of the shoe fall to the roadbed. The all cast-iron brake shoe does break in pieces in service. It should be replaced by a modern up-to-date brake shoe, thereby increasing the safety of train operation, and I know it will not increase the cost of operation. This change to a modern brake shoe will effect economy and increased efficiency.

Brake Beam Safety Hangers.—For safety all brake beams should have efficient safety hangers, and these safety hangers or their equivalent should be required on all cars offered in interchange. The best design of brake hangers will break once in a while, and there should be a close second hanger or safety device to prevent the brake bream from falling on the track. When a brake beam falls on the track while the car is in motion the results are more or less disastrous.

Air Brake Hose.—Some contentions have arisen during the past two years or so regarding M. C. B. standard air brake hose, incident to the enforcement of the rule requiring the use of standard 1⅜ in. air brake hose properly labeled. After the adoption of the specification and label, the date for complying with the standard was set forward on three different occasions and it was not until Sept. 1, 1910, that it became obligatory to have the standard hose on cars offered in interchange.

As it was not until about three years after the adoption of the specification and label as a standard that it was obligatory to equip cars with this hose, or, in other words, as three years' time had been allowed in which to properly equip cars with suitable hose, the officers of our Association did not feel that it would impose any sudden hardship upon the railways. However, it was a great surprise to many to learn, after having become better acquainted with the situation, that many of the roads had paid little or no attention to the purchase of hose as required by the Master Car Builders' Association. Some of the roads were placed to a large expense to apply the proper hose, which could have been obviated by buying the standard M. C. B. hose. Since Sept. 1, 1910, practically all cars have been equipped with the standard hose, and this subject may now be considered as closed, but it is hoped that all will learn the lesson of the necessity for complying with the Master Car Builders' standards and avoid a recurrence of unnecessary expense due to deviating from the standards, even though the deviation may be slight.

Consolidation.—For several years the subject of the consolidation of the M. M. and M. C. B. Associations has been under consideration. Consolidation is a subject for each member to give sincere consideration, for it may materially affect him. In detail of subjects the two associations widely differ, and yet both locomotives and cars are used in the same train, and under the same management. One would not consider a detail knowledge of the car department as fitting him for detail service in the locomotive department, or vice versa. We now have two associations to deal with two departments, which are different in detail. In the American Railway Association the railways have the consolidation of these two departments; that is, the locomotive and the car department, and this association includes many other departments. The American Railway Association is the executive head of all associations like the Master Mechanics' Association, Master Car Builders' Association and others, and therefore, it may not be wise or necessary to effect a consolidation of the M. M. and M. C. B Association, especially as one of the associations that would form a part of the consolidation is not executive, and the other is not executive except in a limited degree.

If these two associations are consolidated and possibly called American Railway Mechanical Association, as suggested, it will be composed largely of the men that are now members of these two associations. This would possibly be very satisfactory to the men occupying the higher position in railway service, but there would probably soon be formed two other associations, one of the subordinate heads of the locomotive department, and the other the subordinate heads of the car department, and these two associations would take up separately in detail those subjects that are close to the trade in which they are earning their livelihood, the same as the master boiler makers and master blacksmiths now consider subjects in detail that are close to their trade. This subject of consolidation needs much careful thought and consideration on your part, and all matters should be fully weighed before any definite action is taken.

In my remarks I have mentioned a few of the important subjects before us for consideration, each of which requires close application, study and care in order to derive any benefit therefrom, but, aside from the great benefit to be derived in this manner, there is also much to be gained by encouraging the social side of this occasion. There are many points of interest in this vicinity, with enough diversion that all may find a source of pleasure and recreation. Also, the entertainment committee has provided for us a most extensive and delightful program. This committee has spared no care or effort in looking after every detail. We are also indebted to the hotel men and to the city officials for having extended to us so many favors looking toward our comfort. It is said that "All work and no play makes Jack a dull boy." Therefore, do not let us work all the time. May we get into closer touch with our fellow-men by attending the social events, and, when the convention is adjourned, go home recuperated both in mind and in body and be better fitted for our daily duties.

ASSOCIATION BUSINESS.

Secretary Taylor then presented his report which showed that the active membership in June, 1910 was 377. Since that time there have been transferred to representative membership 9, droppd out of railway service 3, resigned 2, deaths 3, transferred to life membership 1, 18 in all, leaving a balance of 359. There have also been transferred from representative membership to active membership 4, new membership 59, total 63, making the active membership June, 1911, 422. The representative membership in June, 1910, was 332, dropped on account of absorption of roads 3, dropped on account of successor appointed 25, dropped on account of being out of railway service 3, dead 4, 35 in all, leaving a balance of 297. There have also been transferred from active membership 9, new representatives, new roads 19, new representatives from old roads 36, total 64, making the representative membership June, 1911, 361. The associate membership remains at 13. The life membership in June, 1910, was 22. During the year four life members have died and one has been elected, making the present membership 19. The total membership in June, 1911, is 815.

The number of cars represented in the association compared with 1910 is as follows: June, 1910, 2,298,633; June, 1911, 2,464,530, an increase of 165,899. During the year 23 roads and private car lines have signified their desire to become subscribers to the rules of interchange governing freight cars, and one road has advised of its acceptance of the code of rules governing the interchange of passenger equipment.

The report of the Treasurer showed that the receipts during the year had been $17,220.76, and the expenses had been $17,213.37, leaving a balance of $7.39. The amount of unpaid dues is $992, and a list of the delinquent members is attached to the report of the Secretary. The association has a surplus fund of $1,126.20.

The report of the Secretary and Treasurer was referred to an auditing committee made up of T. H. Goodnow (L. S & M. S.), J. W. Fogg (B. & O. C. T.) and C. D. Young (Penn.).

The president named as members of the obituary committee the following: For J. E. Cowan (D. & H.), J. H. Manning; for G. P. Sweeley (Penna.), W. C. Arp; for J. J. Connelly, Wm. Garstang; for F. O. Bray (L. S. & M. S.), D. R. MacBain; for A. C. Robson (Ill. Cent.), F. W. Brazier; for J. E. Dorn (B. & A.), R. D. Smith; and for Jas. Denver (N. Y. N. H. & H.). G. W. Wildin.

The annual dues were fixed at $4 per vote, the same as heretofore.

The president named as the committee on correspondence and resolutions Messrs. T. H. Goodnow, J. F. Walsh and J. F. Enright.

Prof. Edward C. Schmidt, of the University of Illinois, has

made application for associate membership, which under the Constitution will lay over until the next annual convention.

J. W. Marden (B. & M.) and J. W. Flemming (C. & O.) have been proposed for life membership.

F. W. Brazier (N. Y. C.): It is a well-known fact that many members decline to serve on committees, stating as the fact that they cannot devote the time to the work; and I regret to say that there are many officials of railways that do not seem to be willing to let members devote time or any little expense to committee work. At the same time, these same officials and railway companies derive benefit from the work that is done by others. The past year has been one of the busiest years for the officers of this association in its history. You are all aware of the safety appliance law which went into effect this year, and most of you know that there was a general committee appointed, who visited Washington and worked with the Government representatives. Finally, at a hearing before the Interstate Commerce Commission, they very wisely referred the matter back to a conference committee, consisting of five railway members, five of the Government inspectors and representatives of the labor organizations. This conference committee spent almost a month's time in going over the safety appliance law with the other representatives, and were able to arrange modifications mutually satisfactory to all the parties in interest, which will save the railways of this country a few million dollars without impairing, even in the slightest way, the efficiency of the safety device. The meetings were conducted so harmoniously that when the final hearing came before the Interstate Commerce Commission every point that was raised was agreed to, an extension of time was given on the old equipment, and concessions that were made on the present equipment were such that all the railways of this country and private lines as well will reap the benefit of their labors.

This association is indebted to its president, Theodore Curtis; Mr. Gibbs, of the Penna. R. R.; Mr. Fuller, of the Union Pacific; Mr. Seley, of the Rock Island Lines, and Mr. Beems, of the N. Y. Central Lines, for the faithful manner in which they attended to their duties and for the good feelings which they brought about with the Government inspectors. It should bring the blush of shame to any railroad official or any member of this association who dares say that they do not have time to attend to the duties of committee work that has been done by the committe I have mentioned and others that were on the general committee.

This association has been more or less criticised for having standards and recommended practices which have not been followed. No doubt the individual members of the association have not been to blame for this; some officials have purposely ignored them and, gentlemen, we are paying dearly for it at the present time, because had the M. C. B. Rules and Recommended Practices been followed out more closely the presnt drastic laws would never have been passed; consequently to show the feeling that this association has towards this committee, that has done this hard work, I move that we extend to them our sincere thanks for their laborious duties and the very pleasant way in which they represented this association and brought about the good feeling between the Government officials and the railways.

The motion was unanimously carried by a rising vote.

H. H. Vaughan (C. P.): I wish to make a request that this association establish a standard or limiting the height for the running board of a standard dimension box car. I will put it in the form of a motion and move that the matter be referred to the committee on standards for its consideration. The standards of this association prescribe a height for the eaves of a box car with standard inside dimensions, but do not prescribe any standard height for the running board. The matter has been brought before the Canadian Railway Commission in connection with bridge and tunnel clearance, and, at the meeting at which it was presented to them, the question arose that this association had never established any standard height for the running board of box cars. I understand that the matter is to a certain extent already in the hands of the American Railway Association, but at the same time I see no objection to the committee on standards corresponding with that association and ascertaining if it would be satisfactory to them for us to take this matter up.

R. L. Kleine (Penna.): We now have a specified height for brake shaft—that is, 14 ft. 2 in., if I am not mistaken—and the safety appliance law requires 14-in. clearance underneath the brake wheel, and that would practically make the maximum height of the running board 13 ft. 10 in. according to present standards.

Mr. Vaughan: There is practically no difficulty, and I think I am correct in saying that almost no cars today exceed a height of 13 ft. 6 in., and the difference between that and 13 ft. 10 in. is worth having, as a matter of saving, if we can get it.

C. A. Schroyer (C. & N. W.): I think it is unnecessary that a committee should be appointed on that subject, because we are limited in the height of our cars by the brake wheel. We must have a clearance between the brake wheel and top of the running board, and we can go to within these limits, so that a committee appointed on that subject would not be able to accomplish anything more than is now accomplished by the limits prescribed.

C. A. Seley (C. R. I. & P.): I think what Mr. Vaughan seeks is merely a statement in the standards of the height, no matter how derived. I think that is within the province of the committee on standards to take that up and include it in their report.

Mr. Kleine: Do I understand, Mr. Vaughan, that it is the maximum height of running board that you want fixed, or is it a uniform height?

Mr. Vaughan: I think we should fix a maximum height in the standards. The height of the brake wheel does not affect this. It is the height of a man standing on the running board that we are after. In Canada there is a movement to fix the height of bridges at 22 ft. and we think they should be 20 ft., as we assume that we are not going to have brakemen who will be over 6 ft. 6 in. tall, standing on a running board 13 ft. 6 in. in height, so that everything we can get out of that is in value in grade crossing work if they are going to insist on clearances enough for a man to stand on top of an ordinary car.

G. W. Wildin (N. Y. N. H. & H.): I believe there should be some limit in the matter of cleaning the triple valves of air brakes. I do not believe, if a road properly cleans the triple valves, that they should be required to pay for another cleaning done within 15 days of the original cleaning. As it stands now, you have got to pay the bills if the arbitration committee says so. I think there should be some reasonable time set as a limit in this matter, and that an owner shall not be required to pay for a second cleaning of the triple valves until after the expiration of a stated period.

Mr. Seley: I do not know whether it is the proper time to bring this matter up, but I will give notice that it is my intention, if it is proper to do it at that time, to introduce in the discussion of the coupler committee report the question of the abrogation of the standard of the association as regard the top lock. I have always considered that this association made a mistake in standardizing the top lock coupler. That has been emphasized this morning in the president's address, quoting from the action of the Interstate Commerce Commission; and whether it is proper to take it up now or in connection with the report of the committee, I cannot say, but I would like to give notice of my intention to make a motion at the proper time to reconsider that matter as a standard.

The President: Mr. Wildin, did you make a motion about the triple valves?

Mr. Wildin: My motion is that the matter of cleaning the triple valve be referred to the Committee on Interchange, so that there will be a minimum limited time in which the owner will be required to pay for cleaning the triple valve.

Mr. Schroyer: I think that is unnecessary, unless we want to change the present limit. If a triple valve has not been cleaned inside of a year, a foreign line can clean it and charge the owners. Unless you want to reduce that time I think the motion is unnecessary.

Mr. Wildin: Mr. Schroyer does not understand what I am getting at. For instance:—You clean a triple valve today, and we pay you for it. In 30 days the car goes over to the C. M. & St. P. and they clean it, and we will have to pay for it. I have had something like 50 cases in the last year, and when I have referred the matter to the arbitration committee, to see where the matter stood, they have said, "You will have to pay the bill." There seems to be no limit now.

T. L. Burton (C. of N. J.): I think this question that Mr. Wildin brings up probably originates from an improper cleaning rather than to a too frequent cleaning of the triple valve. The rule states specifically that the work can be done and charged to the car owner once a year or when the brake is inoperative. I have found, as I have no doubt Mr. Wildin has found, that this work is sometimes done improperly, and then when the car reaches the Milwaukee Road to which he refers, the brake is inoperative and it is up to the road to put it in order. It is also true, unfortunately, that when that work is done the cars are not always stenciled when the valve is opened up and cleaned. I think it is a question of improper cleaning, rather than too frequent cleaning.

Mr. Wildin: I think the road which makes the improper

repairs or cleaning should not be paid for the work, and if it is necessary to clean the valve again within 30 days, the road which cleans the valve the last time should be paid, and the road which cleaned it the first time should not be paid. I know it is a matter of improper cleaning and that is where the whole trouble arises; for if the triple valves were properly cleaned they would not require cleaning again so soon.

W. F. Bentley (B. & O.): I want to endorse largely what Mr. Burton says. I think a very great deal of the work is done improperly, not by reason of improper cleaning, but by reason of the people cleaning the triple valves out in the yard at the cars, without putting the valves on the testing rack to know whether they are properly cleaned or not. By a careful checking of a large number of triple valves on the test rack—the improved test rack of the Westinghouse Company—it will be found that about 35 per cent. of the valves, after cleaning, will not stand the test, and yet if these valves are not properly tested they are put on the cars just the same. If you put the triple valves on the cars out in the yard, the inspectors and others who might do the cleaning will not be able to detect whether the valves are properly cleaned or not by any tests which they will be able to make in the yard. If the triples were tested on the test rack very different results would follow. This is a matter which should be given careful consideration.

T. H. Goodnow (L. S. & M. S.): I believe, in line with Mr. Wildin's remarks, that if the committee which handles this subject will embody in its report a requirement that the name of the road making the repairs to the triple valve, as well as the date, shall be stenciled on the hose, it will go a long way to checking this matter, without complicating the work, and then those who do the work the second time will have the information to give the car owner when a question of this kind comes up. At the present time it is almost impossible to locate the road which did the improper work. By having the additional stencil, showing the initials of the road which did the work the first time, it will protect the car owner from the effects of this improper work. I would like to have that included in the consideration of the question.

Wm Garstang (C. C. C. & St. L.): We have a committee on train brake and signal equipment, and I would move that the question of the cleaning of triple valves, as brought out in this discussion, be referred to this committee for consideration and recommendation.

The President: Mr. Wildin, do you accept that?

Mr. Wildin: I will accept anything to get the matter before the convention.

The President: Gentlemen, you have heard the motion made by Mr. Wildin to refer this subject to the committee on train brake and signal equipment. (The motion was carried.)

C. A. Seley: Do I understand what I had to say will be taken up when the report of the committee on coupler and draft equipment is considered?

The President: Yes.

The committee on nominations made the following nominations: For president, A. Stewart, G. S. M. P., Southern; C. E. Fuller, Asst. Gen. Mgr., Union Pacific, and D. F. Crawford, G. S. M. P., Penna. Lines West, Pittsburgh. For vice-president, A Stewart, G. S. M. P., Southern; C. E. Fuller, Asst. Gen. Mgr. Union Pacific; D. F. Crawford, G. S. M. P., Penna. Lines West, Pittsburgh; M. K. Barnum, G. S. M. P., Illinois Central; R. E. Smith, G. S. M. P., Atlantic Coast Line, and D. R. MacBain, S. M. P., L. S. & M. S.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE.

1. After due consideration of present standards and recommended practice of the Association, together with replies from members to the circular of inquiry and requests involving standards presented by the Secretary, the committee reports as follows:

STANDARDS.

Journal Boxes and Details

Pages 694 to 696, Sheets M. C. B. 1 to 13.

2. A member suggests that the sections for journal bearings, Sheets M. C. B. 1, 3 4, 6, 7, 9, 10, 12 and 13, should show the section of the side guide at the center for journal bearings, arranged similar to each other instead of being lighted from above on some and from below on others. The committee while appreciating that this would make all the journal bearings uniform, at the present time the 3¾-in. by 7-in. and 4½-in. by 8-in. journal bearings are lightened from below and the 5-in. by 9-in. and 5½-in. by 10-in. journal bearings are lightened from above, and as this in no way affects the journal bearing it is thought that the expense incurred in changing patterns, drawings and standards is not warranted.

Journal Boxes and Details. For Journals 5 by 9 by 5½ by 10 Inches.

Sheets M. C. B. 8 and 11.

3. A member suggests that the opening in the rear wall of 5-in. by 9-in. and 5½-in. by 10-in. journal boxes be reduced so as to give some protection for the dust guard, and submits sketch showing the openings recommended.

The committee does not approve of this suggestion, as these walls have but recently been enlarged by a vote of the Association in order to prevent the walls of the boxes being broken out.

Journal Box and Details. For Journals 5½ in. by 10 in.

Page 696, Sheet M. C. B. 11.

4. A member suggests the following: Journal boxes for the heavier capacity equipment are being made of pressed and cast steel, and in order that the standards may be up to date, the following changes in the notes on Sheet 11 are recommended:

Section of box may be made either circular or square below the center line and material may be cast iron, malleable iron, pressed steel or cast steel; provided all the essential dimensions are adhered to. When journal box is made of material other than cast iron, reduction in thickness of metal and coring to lighten weight is permissible, provided all the essential dimensions, which affect interchaneability and the proper fitting of contained parts are adhered to. If the method of manufacture does not permit of placing the letters "M. C. B." on the side



R. L. Kleine.

Chairman, Committee on Revision of Standards and Recommended Practice.

of the journal box they may be placed on the top between the hinge lug and seat of truck sides.

The committee suggests that they be referred to letter ballot.

Axles.

Sheet M. C. B. 15.

7. A member writes as follows: "We have under consideration, at the present time, the question of marking some cars 115,000 lbs. capacity, and using under them 5½-in. by 10 in. axles. We know that under Markings for Tank Cars it is allowable to mark the maximum weight of the car, including the car and lading, 161,000 lbs., and will use an axle with a minimum journal 5 in. in diameter. We are already marking some cars 115,000 lbs. capacity having 5½ in. by 100-in. journals, which car will weigh, when light about 44,000 lbs., making total weight of car and lading about 159,000 lbs., but these car bodies, which are used in coal service, can hardly be loaded in excess, while the coke cars we now have under consideration could very readily be loaded in excess with coal.

"We would like to know if we would be safe in marking these new coke cars 115,000 lbs. capacity, or whether we should mark on them the maximum weight of the car and lading, and if we presume upon taking these axles out when the diameter reached about 5¼ in., what would be the maximum weight that we could mark them and still have them pass the interchange points without any trouble?"

Your committee would call attention to Rule 86 of the

Code of Rules Governing the Interchange of Cars, which provides two methods of marking cars to indicate the load limit on axles. In both of these tables the limits for the 5½ in. by 10 in. axle under the heading of Capacity Car and Maximum Weight are precisely the same, but these limits are varied for the smaller axles. The various railways, as far as can be learned, have not followed the marking of maximum weight, excepting for tank cars, but adhered to capacity marking, usually allowing ten per cent. overload. The published tariff rates which cover minimum carload weights refer to cars of various capacities, and if the cars were to be marked maximum weight some objections might be raised by the traffic people, furthermore, the present prevalent method of marking capacities has been in use a great many years and is thoroughly comprehended and understood by the various departments of all railways throughout the country, and any change at this time would have a tendency to lead to confusion, auditing systems would have to be revised and changed and likewise the stenciling on the majority of the cars in the country. Notwithstanding this, cars should be permitted to be loaded to the carrying capacity of the axles, and it is a question as to how this can be accomplished without seriously affecting both the traffic and motive-power departments.

The committee is not in favor of having more than one limit for the minimum diameter to which the journal and wheel seat may be worn, as this would lead to too much confusion in the shops. It is thought that without increasing the present number of axles and without changing the minimum diameters of journal and wheel seat, the present table of capacity markings for cars could be so amended as to permit variations in the capacity markings of the cars (minimum variations 5,000 or 10,000 lbs.) by adding to the table the maximum load for which the representative axles were designed, and by deducting from this maximum load the light weight of the car and the overload of ten per cent., which would give the correct capacity to be stenciled on the cars. For the consideration of the members before any definite action is taken.

Limit Gages for Inspecting Secondhand Wheels for Remounting.

Page 702, Sheet M. C. B. 16-A.

8. A member suggests the following: "Referring to discussion at M. C. B. meeting relative to advancing from Recommended Practice to Standard, gage for accepting secondhand wheels, would advise that on referring to page 637, M. C. B. Proceedings 1909, it will be noted these gages were proposed in 1907 and since then have not been changed in contour, the condemning height of both gages being 1 5-16 in. With the old 1⅛-in. flange, this represents a wear of only 3-16 in. in the original chill, but with the present 1-in flange this represents a 5-16-in. wear into chill. Specifications for M. C. B. wheels state that the chill at the throat shall be in no case more than 1 in., nor less than ⅜, 7-16 and ½ in., respectively, on the 625, 675 and 725-lb. wheels. Taking the minimum chill, therefore, as ⅜ in. on light wheels with an encroachment of 5-16-in. wear before condemning would leave only 1-16-in. chill on this wheel when the wheel is remounted secondhand. In the same way the 675-lb. wheel would have ⅛-in. chill remaining and the 725-lb. wheel would have 3-16-in. remaining.

"It would seem to us that the committee had overlooked the point that the flange had been reduced ⅛ in. in height."

The chairman of the wheel committee advises that the change should be made as suggested.

The committee, therefore, recommends:

A. That the note under limit gage shown on Sheet M. C. B. 16-A be changed to read: "For remounting cast-iron wheels cast prior to the M. C. B. standard tread and flange adopted prior to 1909."

B. That drawings be added showing the limit gage for cast-iron wheels with M. C. B. tread and flange adopted in 1909, reducing the limit for height of flange from 1 5-16 in. to 1 3-16 in., and a note added under these gages reading as follows: "For remounting cast-iron wheels with M. C. B. standard tread and flange adopted in 1909."

Air Brakes—General Arrangement and Details.

Pages 706 to 708, Sheet M. C. B. 18.

11. A member suggests that to conform to U. S. Safety Appliance Standards the paragraph referring to hand-brake chain should be changed.

The committee approves this recommendation.

12. A member suggests that the double hand-brake arrangements shown on Sheet M. C. B. 18 do not conform to requirements of the Interstate Commerce Commission, and should be made to work with the air.

The committee referred this matter to the committee on train brake and signal equipment for the necessary attention.

Air Brakes—General Arrangements and Details.

Pages 706 to 708, Sheet M. C. B. 18.

14. A member suggests that the distance from the inside face of M. C. B. coupler knuckle to the center of air-brake angle cock shown on Sheet M. C. B. 18 should be changed from 13 in. to 11 in. to agree with the Air Brake Association recommendation.

The committee does not approve.

Air Brakes—General Arrangements and Details.

Pages 706 to 708, Sheet M. C. B. 18.

15. A member calls attention to the following: Relative to brake-lever connection, Sheet M. C. B. 18, this cut shows the connection to be round iron or steel not less than 1⅝-in. diameter. This is the only reference I know of in regard to the material and construction, and I feel sure that it is but little understood by railway men in general. Some railways are making this connection of cast steel in the star section in the center the same as is used in malleable iron. If this connection is to be seriously considered as an M. C. B. Standard it should be plainly brought out.

Committee would call attention to text on page 708, reading as follows: "In 1900 the use of malleable iron construction was discontinued providing that the truck connection be made of round iron or steel not less than 1⅝-in. in diameter." This would indicate that the rods were to be made of 1⅝-in. wrought material, although cast steel is not prohibited.

The committee believes that cast steel of proper section is suitable for truck-lever connection and would suggest that a note be added to Sheet M. C. B. 18 reading as follows: "Cast steel may be used for truck-lever connection if of equal strength to the section of wrought iron or steel specified."

Label for Air-brake Hose.

Paegs 712 and 713, Sheet M. C. B. 18.

16. A member suggests the following: Page 709, seventh paragraph, the size of hose and the letters A and R as well as numerals indicating month hose was applied or removed are not covered in the specifications. To cover the size of hose and after the word "purchaser" in third line the words, "and the size of the hose 1⅜ in."; and to cover the date applied and removed add after "standard" in fifth line the words, "also in the center field the letters A and R to the left and the numerals as shown to the right."

This information should also be shown in paragraph referring to badge plate under specifications and test for woven and combination woven and wrapped air-brake hose.

Show size of hose on label as per sketch submitted instead of as shown on pages 709 and 712, Sheet M. C. B. 18.

The text under heading "Label for Air-brake Hose," page 712, should also include the size 1⅜ in. and M. C. B. Standard as shown on Sheet M. C. B. 18.

The committee recommends that the label and text (paragraph 7, page 709) referring to same be omitted from the specifications for air-brake hose and placed under the label for air-brake hose, paragraph 7, to be changed to read as follows: "Each length of hose must have vulcanized to it the label for air-brake hose of white or red rubber as shown under the specifications, Label for Air-brake Hose. Each lot of 200 or less must bear the manufacturer's serial number commencing at one on the first of the year, and continuing consecutively until the end of the year. For each lot of 200, one extra hose must be furnished free of cost.

17. Change second paragraph on page 711 under the heading of "Specifications and Tests for Woven and Combination Woven and Wrapped Air Brake Hose" to read: "Each length of hose must have vulcanized to it the label for air-brake hose of white or red rubber as shown under the specifications 'Label for Air Brake Hose.'"

18. Change second paragraph under the heading "Label for Air-brake Hose," page 712, to read: "Each length of hose must have vulcanized to it a standard air-brake hose label of white or red rubber as shown. The following information must be branded on the label: On the top of the badge the initials or name of road or purchaser and the size 1⅜ in.; on the bottom the name of manufacturer; on the left-hand end the month and year of manufacture; on the right-hand end the serial number and the letters M. C. B. Standard; and in the center field the years, letters A and R, and the numerals for the month to show the date of application and removal. These letters and figures must be clear and distinct, not less than ¼ in. in height, excepting

name of manufacturer, which must not be less than 1/8 in. in height, and stand in relief not less than 1-32 in. Letters and figures covering the application and removal of the hose must be so applied that they can be removed by cutting without endangering the cover."

Dimensions of label to be 4 in. by 2½ in. Extensions may be made on right-hand end.

No change has been made in the air-brake hose label aside from increasing the size of letters and numerals from 3-16 in. to ¼ in. in height, and name of manufacturer, which has been specified to be not less than ⅛ in. in height. The text has been revised to correspond with label.

20. A member suggests that we should add a paragraph to the specifications, Label for Air-Brake Hose, page 713, to cover fitting up hose to the couplings and nipples so that the label on the hose will show toward the side of the car in such a position that the car inspectors can readily read the label from the side of the car.

The committee concurs in this suggestion and refers it to letter ballot for adoption as Recommended Practice.

Safety Appliances.

Pages 715 to 722, Sheets M. C. B. 19 to 19-B.

24. A member suggests to adopt Recommended Practice for brake details shown on Interstate Commerce Commission Plate "A" as follows: "Brake wheels both flat and dished 15 in. and 16 in. diameter, brake ratchet wheel, brake ratchet-wheel pawl and brake ratchet-wheel pawl plates."

25. A number of members suggest that the text and sheets be revised to conform to Interstate Commerce Commission requirements.

The committee approves these recommendations and suggests that the U. S. Safety Appliance Standards adopted March 13, 1911, by order of the Interstate Commerce Commission be substituted for the present Standards.

Arch Bars for 100,000-lb. Capacity Cars.

Page 723, Sheet M. C. B. 20.

26. The 1½ in. by 5 in. arch bar for 100,000-lb. capacity truck, which was adopted as a Standard in 1909, is giving trouble, due to failing through the bottom column bolt hole. The 1¼ in. by 6 in. arch bar used by some roads for the 100,000-lb. capacity truck is reported as giving good service.

As it would appear that the present standard is unsatisfactory, the committee would recommend that this question be referred to the Committee on Freight Car Trucks, with instructions to investigate what practical results have been obtained with both the 1½ in. by 5 in. and 1¼ in. by 6 in. arch bars, and make recommendations for any necessary revision of the present standard.

Automatic Couplers.

Pages 724 and 725, Sheet M. C. B. 23.

27. Several members recommend the following:

During the 1910 convention it was recommended to the committee on standards and recommended practice the addition of 8½-in. coupler butt, for the reason that the 6½-in. coupler butt was designed to use with the 6¼-in. by 28-in. draft springs, allowing ¼-in. clearance. Again the 9⅛-in. butt was designed to accommodate certain friction draft gears, requiring that width within the yoke. This recommendation was submitted to letter ballot and rejected, the vote being 1,191 yes and 614 no, total vote 1,805, necessary votes for adoption 1,203, or within 12 votes of carrying same. Inasmuch as there are thousands of cars equipped with the M. C. B. Class "G" springs, the 6½-in. butt is not sufficient in depth, and not being good practice to use liners between the butt and yoke ends (the diameter of Class "G" spring being 8 in.), and, furthermore, this spring can not be used with the 9⅛-in. butt as the clearance is too great, also the spring would not be central. Believe the matter should again be submitted to the M. C. B. Committee with a view of urging the adoption of the 8½-in. butt as standard.

The committee does not approve of this recommendation.

Height of Couplers.

Page 737.

31. A member suggests the following: We would recommend that the paragraph reading, "The standard height of couplers for passenger equipment cars is 35 in. from top of rail when car is loaded," be modified to conform to the Safety Appliance Act of March 2, 1893, No. 113, amended April 1, 1896, which reads as follows: "Note—Prescribed Standard Height of Draw Bars; standard gage roads 34½ in.; narrow-gage roads 26 in.; maximum variation between loaded and empty cars 3 in.," in other words, the standard height of 35 in. specified for passenger cars should be changed to 34½ in.

Also, in the second paragraph we should add a clause to cover the standard height for narrow-gage cars to be 26 in., minimum 23 in., and on two-feet gage railways maximum height 17½ in., minimum height 14½ in.

The committee suggests that the text be modified to conform to the order of the Interstate Commerce Commission dated October 10, 1910, reading as follows: "The maximum height of drawbars for freight cars measured perpendicularly from the level of top of rails to the centers of drawbars for standard-gage railroads shall be 34½ in., and the minimum height of drawbars for freight cars on such standard-gage railways measured in the same manner shall be 31½ in., and on narrow-gage railway the maximum height of drawbars for freight cars measured from the level of tops of rails to the centers of drawbars shall be 26 in., and the minimum height of drawbars for freight cars on such narrow-gage railways measured in the same manner shall be 23 in., and on 2-foot gage railways the maximum height of drawbars for freight cars measured from the level of the tops of rails to the centers of drawbars shall be 17½ in., and the minimum height of drawbars for freight cars on such 2-foot gage railways measured in the same manner shall be 14½ in.

Siding, Flooring, Roofing and Lining.

Page 738, Sheet M. C. B. 26.

33. A member calls attention to the details of siding, roofing, lining and flooring, Sheet M. C. B. 26, which shows the corners of the tongue of sheathing, roofing, lining and flooring as being square. With the tongue square, it is difficult to have the same enter the grooves, and, therefore, recommends that the drawings be changed to show the corners taken off of the tongue.

The committee approves of this suggestion.

RECOMMENDED PRACTICE.

Journal Box and Pedestal for Passenger Cars for Journals 5-in. by 9-in.

Page 755, Sheets M. C. B.—A and B.

The committee recommends the following:

(a) Sheet A, 5-in. by 9-in. passenger journal box, change mouth of box and dust-guard opening to conform to freight box and advance to Standard.

(b) Pedestal for 5-in. by 9-in. journal box shown on Sheet B advance to Standard.

Pedestals for Passenger Cars for 5-in. by 9-in. Journals.

Page 755, Sheet M. C. B.—B.

38. A member suggests that the passenger car pedestal for 5-in. by 9-in. journal boxes be dropped from the Recommended Practice for the reason that the flanges and other portions outside of the journal box are such that the fit would not be suitable for all the designs of truck wheel pieces.

The committee does not approve of this recommendation.

Journal Box and Pedestal for Passenger Cars with 5 1-2-in. by 10-in. Journals.

39. A member suggests that the Association again take up and consider the question of the preparation of drawings for journal box for passenger cars with 5½-in. by 10-in. journals.

The committee recommends that this question be referred to the committee on freight car trucks, with instructions to prepare the necessary drawings of pedestal and journal box, showing only the essential dimensions.

Axle "E."

Page 760, Sheet M. C. B.—B.

42. A member suggests that the axle shown on Sheet M. C. B.—B should have the radius for fillet between the dust guard and wheel seat ¾ in. instead of ¼ in., so that it may be turned with the same tool as the journal and wheel seat fillets and to conform to standard axles shown on Sheet M. C. B. 15.

Cast-Iron Wheels.

Page 760, Sheet M. C. B.—N, O and P.

43. A member suggests that the recommended practice for cast-iron wheels for 60,000, 80,000 and 100,000 lbs. cars be advanced to Standard.

The committee believes that the specifications for cast-iron wheels should be advanced to Standard, but before doing so should be referred to the wheel committee for any changes or corrections that may be necessary.

High-Speed Foundation Brake Gear for Passenger Service.

Sheets M. C. B.—J, K and L.

48. A member suggests that the brake-gear arrangement shown on Sheets M. C. B.—J, K and L be revised to show

the hand-brakes independent of the air and conform to Interstate Commerce Commission requirements.

49. A member suggests that the high-speed foundation brake shown on these three sheets be dropped, as it does not conform to the Interstate Commerce Commission requirements, nor is it suitable where high-speed brakes are used, therefore this brake is not suitable for the heavy cars which are being built for passenger service, and the sheets contain no reference to such cars.

The committee recommends that these three sheets be referred to the committee on train brake and signal equipment for revision.

STEAM AND AIR LINE CONNECTIONS.

Pages 775 and 776, Sheet M. C. B.—Q.

50. A member calls attention to air-brake hose, Sheet M. C. B.—Q, being shown as 1 in. by 22 in. while specifications for standard hose, Proceedings 1910, page 708, paragraph 6, show that the inside diameter must not be less than 1⅜ in.

51. A member suggest that the last paragraph on page 776 be changed to read as follows: "That the air-brake hose must be 1⅜ in. inside diameter and 22 in. long, and air-signal hose must be 1⅛ in. inside diameter and 22 in. long." The recommendation to change air-brake hose from 1 in. to 1⅜ in. is made to conform to Rule 21 of the Appendix Code of Rules Governing the Interchange of Passenger Equipment Cars. The recommendation to change signal hose from 1 in. to 1⅛ in. is for the reason that, when signal hose is made on a 1⅛-in. mandrel, the inside diameter is at least 1⅛ in. and hose should, therefore, be branded 1⅛ in."

The committee concurs in the recommendation that air-brake hose must be 1⅜ in. inside diameter, but does not approve the 1⅛-in. diameter for air-signal hose. The committee also recommends that the heading on page 775 be changed to read: "Steam and Air Connections for Passenger Cars."

52. A member calls attention to the angle at which angle cock under car ends it set on Sheet M. C. B. 18, being 30 deg. from the vertical, while on Sheet O it is shown vertical, and recommends that 15 deg. from the vertical be made standard for freight and passenger cars.

The committee recommends that the angle cock shown on Sheet Q be changed to show 30 deg. from the vertical.

Uncoupling Arrangements for M. C. B. Couplers.

Sheet M. C. B.—C.

53. A member suggests that the uncoupling attachments should be changed to conform to Interstate Commerce Commission requirements.

54. A member suggests that Sheet C be revised to meet requirements of the Interstate Commerce Commission.

55. A member suggests that this be advanced to Standard in so far as all clevises and links are concerned, but not the uncoupling lever and attachments, on account of them not being applicable to all of the present equipment.

The committee recommends to advance to Standard the clevises, links and pin now shown on Sheet C, and to include Plate B and text governing the uncoupling levers of the U. S. Safety Appliance Standards, adopted by order of the Commission dated March 13, 1911, in the Standards of the Association.

Coupler Yokes.

Pages 776 and 777, Sheet M. C. B.—C.

56. A member suggests that the yoke for the twin spring gear, yoke for tandem spring gear and yoke for friction gear be advanced to Standard.

The committee concurs in this recommendation and suggests that they be shown on a new Sheet No. 23-A.

Drop-Test Machine.

Page 777, Sheet M. C. B.—I.

57. A member suggests that the drop-test machine for M. C. B. couplers and knuckle pins be advanced to Standard.

The committee concurs in this recommendation.

Box-Car Outside—Hung Side-Door Fixtures.

Page 779, Sheet M. C. B.—F.

62. A member suggests that door-hasp staple, shown on Sheet M. C. B.—F, be increased in length from 5¾ in. to 16 in., to provide for four bolts for fastening staple to door. The present hasp staple is causing trouble, due to pulling through the wood on account of insecure fastening.

The committee approves this suggestion.

Standard Location for Car-Door Seals.

65. At a special session of the General Managers' Association of the Southeast, held on September 9, 1910, the following resolution was unanimously passed:

"*Resolved,* That it be the sense of this meeting that car-door fastenings should be located 5 ft. above top of rail and 1 ft. above the floors of the cars, and it is recommended to all lines that they include these specifications for all new equipment, and that it be made a rule to alter the location of door fastenings for all cars going through the shops for general overhauling to conform to this standard."

It was further stated that this action will be communicated to the Master Car Builders' Association, the various General Managers' Associations and to the American Railway Association, the cause for this action being the present difficulty in procuring proper seal records, by reason of the seals on most cars being so high from the ground that those entrusted with the duty of procuring the sealing records can not read them.

This subject was considered at the meeting of the Executive Committee of the Master Car Builders' Association, on September 21, 1910, and referred to this committee. Subsequently the American Railway Association issued Circular 1069 to all railway members of that association, reading as follows:

"1. Are you in favor of adopting a standard height for car-door fastenings?

"2. Do you favor 5 ft. or 6 ft., or what other height above the rail as the height for car-door fastenings?

"3. If a standard height is adopted, shall it apply to equipment going through shops for general repairs as well as to new equipment?

"4. In your opinion, would an additional fastening be required on the door in the event of the present fastening being lowered to a point near the bottom edge of the door as proposed?"

The committee has given this matter very careful consideration, and would call the attention of the members to Sheet M. C. B.—F, Box Car Outside Hung Side Door, on which the hasp to which the seal is attached is located about 5 ft. 6 in. from the top of rail," and to sheet M. C. B.:—F-1, Box Car Flush Side Door, on which the hasp to which the seal is attached is located "5 ft. 6 in. from top of rail." Flush doors of the description shown on Sheet F-1 are sealed both at door-rod handle and at the hasp, therefore, the sealing dimension should be shown at the door-rod handle as well as at the hasp. On some refrigerator cars, on account of the double-door bar-lock construction, it is difficult to bring the sealing eye lower than 5 ft. 8 in. above the top of rail, and on box cars equipped with vertical door rods sufficient clearance must be allowed between the top of station platform and the handle of the door rod for proper manipulation of the door-rod handle.

It is unquestionable that the seal should be located on the doors within reasonable reading distance from the ground in order to facilitate application and inspection of the seals, and the committee would recommend the following: Center of hasp or sealing eye should be located not less than 5 ft. above top of rail nor more than 5 ft. 9 in. above top of rail. These dimensions to be shown on Sheets F and F-1 and proper reference made in text.

Stenciling Cars.

Page 780, Sheet M. C. B.—M.

71. A member suggests that the lettering for freight cars be advanced to Standard, as it refers only to the form and size of letters and figures.

Your committee concurs in this recommendation.

Limit Gages for Round Iron.

Pages 781 and 782.

72. The executive committee referred to the committee on revision of standards and recommended practice, the following: To investigate and report on whether any changes are necessary in the present recommended practice covering the diameters of round iron.

At the present time the recommended practice does not show any limits for sizes of round iron more than 1⅝ in. in diameter; furthermore, a manufacturer has asked that the limits be increased for bars 1⅜ in. and over in diameter, claiming that the present limits are rather close for rolling-mill practice, and can only be met under special conditions and with special care, which means a special price.

The committee, after carefully considering this question, believes it will be entirely proper to adopt the standards of the Master Mechanics' Association for the allowable variations, both below and above the nominal size for round iron

1½ in. and more in diameter. Revised table is given below.

Nominal Diameter of Iron, Inches.	Large Size End. Inches.	Small Size End. Inches.	Total Variation. Inches.
1½	1.5115	1.4885	.023
1⅝	1.6370	1.6130	.024
1¾	1.7625	1.7375	.025
1⅞	1.8880	1.8620	.026

Round iron 2 in. in diameter and over should be rolled to nominal diameter.

PROCEEDINGS.

78. The committee would suggest that in making up the Proceedings for the succeeding years we eliminate the result of meetings of the arbitration committee, which are published separately and the Code of Interchange Rules, also published separately, and make reference in the Proceedings similar to the reference now made for the Rules for Loading Materials, which latter have, in the past, been eliminated from the Proceedings.

The committee would further recommend that the text and sheets relating to standards and recommended practice of the association be published separately from, and not included in, the proceedings.

NEW SUBJECTS.

81. A member recommends the following: (a) As there is shown among the recommended practice of the Association an axle suitable for carrying 50,000 lbs., or one having 6-in. by 11-in. journals, believe that a committee should make recommendations giving information in regard to all other truck details for a truck suitable for this type of axle.

(b) As the steel truck sides for freight cars are becoming quite numerous and of various designs, suggest that specifications be prepared indicating the kind of tests such structures should stand to make them suitable for cars of 80,000, 100,000 and 150 000 lbs. capacity.

(c) Similar specifications should be prepared for truck bolsters to make them suitable for cars of 80,000, 100,000 and 150,000 lbs. capacity.

The committee concurs in the above recommendations, and suggests that the committee on freight car trucks be instructed to prepare and submit truck details to go with the 6-in. by 11-in. 50,000-lb. axle, and report upon questions B and C.

82. A member recommends that the matter of proper specifications for cast-steel, rolled-steel and forged steel wheels should be referred to the wheel committee, or some special committee, with instructions to prepare the necessary specifications and physical tests.

The committee recommends that this subject be referred to the wheel committee for consideration.

The report is signed by:—R. L. Kleine, (Penn.), chairman; W. E. Dunham, (C. & N. W.); T. H. Goodnow, (L. S. & M. S.); W. H. V. Rosing, (Mo. Pac.); C. E. Fuller, (U. P.); O. C. Cromwell, (B. & O.), and T. M. Ramsdell, (C. & O.).

R. L. Kleine (chairman of committee): Inasmuch as questions 11, 12, 24, 25, 48, 49, 53, 54, 55 and 60 refer to safety appliance standards or have some connection therewith, the committee would suggest that argument upon them be deferred until we hear from the safety appliance committee.

DISCUSSION ON REVISION OF STANDARDS AND RECOMMENDED PRACTICE.

F. W. Brazier (N. Y. C.): Under the head of "Proceedings," I think we will make a great mistake if we leave out of our proceedings the code of interchange rules. Those are our laws and they should go in along with the proceedings. Otherwise I am agreeable to having the result of the meetings of the arbitration committee published separately.

C. A. Seley (C. R. I. & P.): On the basis of Mr. Brazier's remarks, I would recommend the inclusion in the proceedings of all matters which are standard. When we go to our bookcase and get down the proceedings of the last year or the proceedings of five years ago or ten years ago we do not want to find that it is short of the standard that existed at that time, whether they are rules of loading material or interchange rules, or drawing; and I think if this association cannot afford to put them all up in one volume that we ought to increase the dues.

The Secretary: The rules for loading material have been kept out of the proceedings for quite a number of years. They are now a part of the interchange rules and are referred to separately in a preface.

E. W. Pratt (C. & N. W.): I would like to ask Mr. Kleine, in regard to paragraph 72, if the manufacturers' point is well taken it does not seem to me that the last paragraph covers any changes in limiting diameters on sizes below 1½ in. Was that the intention of the committee? To reduce both below and above the nominal size of the round iron 1½ in. and larger in diameter would not apparently cover the 1¾ in. that the manufacturer in this instance suggests changing.

Mr. Kleine: The manufacturer objects to the limit of 1⅝ in. round iron—not the 1⅜ in.

H. LaRue (C. R. I. & P.): In paragraph 65, in regard to the location of door handles, I hope the recommendation of the committee will prevail there.

The President: This is a very important subject, gentlemen, and we have plenty of time, and I hope there will be full discussion.

C. A. Schroyer (C. P. N. W.): In regard to the sealing point on side doors, we are doing on this precisely what we have done for years on our safety appliances. We have made it one place and then another, with the result that none of us has ever gotten it the same; we have never gotten together on it. Now, if there is any reason why it cannot be put at 5 ft., why, we ought to say so. If there is a certain construction of door that would permit of the 5 ft. location of the seal pin, cannot those doors be arranged when new cars are constructed so they will permit of 5 ft. or 5 ft. 6 in., whatever it may be?

Mr. Garstang (C. C. C. & St. L.): I understood Mr. Kleine to say that the American Railway Association had adopted a limit for the height of hasp on side doors. Now, if there is no objection to that limit by members of this association, why not adopt it as the standard of this association?

Mr. Kleine: I will read the communication from the American Railway Association, which is dated May 22, 1911:

"At a session of the association held on May 17, the following resolutions respecting a standard height for car door fastenings were adopted on the recommendation of the committee of maintenance:

"*Resolved*, That car door fastenings should be located normally 5 ft. above the top of the rail, but not less than 1 ft. above the floor of the car;

"*Resolved*,. That these specification for the location of car door fastenings shall apply for all new equipment and wherever it is necessary to rplace fastenings on old equipment."

The latter part of that is rather serious, when it comes to repairing cars. You keep to the standard door and you have the hasp in one location and the staple in another location. That is, if you are making extensive repairs. For new cars I do not doubt that a height of 5 ft. would be conformed to, with the possible exception of some refrigerator cars. I think Mr. Fuller has some refrigerator cars where he has a sort of double door lock, and I think 5 ft. 8 in. is as close as he would come. Take the Wagner door rods. We operate them from the freight house platform, and if the seal is located 5 ft. above the rail it is rather close to the platform, although probably some arrangement could be made there in new cars to locate it 5 ft., but with the existing cars it would be a very serious matter to change some of them.

C. E. Fuller (U. P.): It is a fact that 5 ft. is not feasible for present equipment, especially on refrigerator cars, without you change your door-opening and door-locking device entirely. It seems to me that the committee has done all that they could very well do. With the ordinary box car 5 ft. will do all right. To confine it to exactly 5 ft. is an expense that I do not believe we want to incur, especially with our present equipment. The variation of 9 in. is not sufficient to be objectionable or to warrant the additional expense that would be necessary in order to bring the old equipment up to it. I think the committee's recommendation of 5 ft. to 5 ft. 9 in. is about as close as we can ask.

J. J. Hennessey (C. M. & St. P.): It seems to me that the recommendation of the committee is about correct. We should have a variation there. With old cars it would be very expensive to attempt to get them all 5 ft. In fact, if you did that you would have no fastening for your door hasp. Really, what is the object of having this to an inch? It is simply a sealing proposition, and the seal can be seen as readily at 5 ft. 6 in. as at 5 ft. Consequently I do not think that we ought to tie the railways up to a proposition that will cost them a great deal of money in changing their old cars.

J. J. Tatum (B. & O.): I would like to ask the committee if they have made any test as to the effect in changing the lock on a door in respect to the condition of the door. That is, as to what the effect of the changing of the lock is on the condition of the door.

Mr. Kleine: A test was made by the representative of one of the Texas roads and submitted to the American Railway Association. That test showed that it did not materially affect the pull on the hasp by locating it 5 ft. above the rail. He compared it with 7 ft. above the rail, I think, and he made tests and took measurements with a spring balance. Of course, that depended largely upon the type of door that was under consideration.

W. E. Sharp (Armour Car Lines): It seems to me that the variation allowed by the committee in its report would

only be sufficient to compensate for the various heights of doors from the rail, and it will develop in another report that there is a variation. Consequently, I think if we assume a location of 5 ft. you will find that you will have quite a variation.

F. H. Clark (B. & O.): If I recall correctly the action of the American Railway Association, it was to the effect that a variation of not less than 12 in. above the floor of the car should be allowed. That would cover some variation. Have a minimum of 5 ft. and a maximum of 5 ft. 5 in. The floor of many of these cars is 50 to 53 in. So if the recommendation of the American Railway Association was followed absolutely we would have a variation there. Perhaps, however, it is not enough.

Mr. Garstang: This was brought before the American Railway Association for the convenience of conductors and trainmen. A great many of these seals are located at such a height that it was almost impossible to see them, especially at night-time, and it was the desire of the association to get the seal as near the bottom of the door as would be practicable.

C. A. Seley (C. R. I. & P.): Inasmuch as we have a practical instruction from the American Railway Association, it seems to me that we could cover both sides of the question by a slight change in the verbiage of the committee's recommendation, namely, making the height preferably 5 ft. from the rail, with allowance variation, instead of making it 5 ft. to 5 ft. and 9 in.

Mr. Kleine: The committee would accept that. I think it would be better to indicate to car builders the preferable location, and I believe it would overcome the objection that has been made. You can get all sorts of variables depending on just how the roadbed is located. While 5 ft. 9 in. is a little high, it is still within the range of vision in ordinary railway yards.

The President: Would it be agreeable to the committee to incorporate in its report Mr. Seley's suggestion?

Mr. Kleine: Yes, sir.

Mr. Schroyer: I move that the report of the committee as presented, with the modification just mentioned, be accepted and referred to letter ballot in so far as the recommendations are concerned, excepting those pertaining to safety appliances.

Mr. Kleine: That is agreeable to the committee. The recommendations referring to safety appliances are to be left open for further consideration. Also the questions that were submitted to the committee on steel train lines.

The President: Does the mover of the motion accept that amendment?

C. A. Schroyer: Yes, sir.

The motion was carried.

Mr. Seley: I would like to have an explanation as to the three items referred to the convention for disposition. They are items 7, 78 and 80.

Mr. Fuller, referring to item 7: This question is raised for the purpose of obtaining the full benefit of the load. In other words, if we have a 100,000 lbs. capacity car the weight of the car is based on the carrying capacity of the axle. We have as an illustration a 100,000 lbs. capacity car which weighs 47,000 lbs. With 10 per cent. overload that brings the load up to 157,000 lbs. Now we have another class of car of 100,000 lbs. capacity that weighs 37,000 lbs. These figures you understand I am simply giving as illustrative. This car really weighs 37,800 lbs., an all-steel box car. Now, with 100,000 lbs. capacity and the 10 per cent. overload that makes it 147,000 lbs. Under the present markings, the cars carry their capacity plus 10 per cent., and the result is that we are hauling a 100,000 lbs. capacity car with 110,000 lbs. in it and are not obtaining the full benefit of the work of light design. It is a question of marking the car so that it will not interfere with the accounting system to bring it up to the full load. There is no reason why if we can save an approximate amount of money on hauling light weights and increasing our tonnage by hauling these light weight cars that we should not receive the same benefit in hauling. In place of having 110,000 lbs. we ought to be entitled to 120,000 or 125,000 lbs. Raise the capacity of the car from 100,000 to 110,000 or 115,000 lbs., or whatever will bring it up to the carrying capacity of the axle. I think that is emphasized quite plainly by those of us who have worked on the light weights, cutting off all unnecessary weight of cars in order to avoid hauling dead weight. We want to increase the revenue if we can by hauling more tons in that car. I think this association should take some action that will be clearly understood, and not force us to go to a larger axle. The gross weight of the load and the weight of the car should govern, in place of the capacity.

The President: I would suggest that Mr. Kleine read this paragraph again and let us have it discussed more fully. We have plenty of time and we can do it now.

[Mr. Kleine read item 7 of the report.]

Geo. Gibbs (Penn.): I would ask the committee whether it gave any attention to other factors which have limiting conditions or dimensions, affecting the capacity of the cars; for instance, the kind of wheel that is used certainly has a very important bearing. We know this from our experience with coal cars. As I understand the report, the committee justify the use of the maximum weight, based on the capacity of axles alone; whereas the fact is that the wheels, especially the cast iron wheels, have proved to be a very active factor in limiting the total weight capacity of the car, to say nothing of the column bolts and springs and other parts. I suggest that it be not stated, as the sentiment of the convention, that it be good practice to mark the carrying capacity of the cars, dependent on the axles, regardless of other parts of the cars.

Mr. Fuller: In answer to Mr. Gibbs I would like to say, as an illustration, taking our 100,000 lbs. capacity cars, we are not increasing the load at all. What we want to do is to bring the capacity of the cars up to where they ought to be. We were running 100,000 lbs. capacity cars weighing 47,000 lbs., and we built a car of similar capacity weighing 37,000 lbs., with the same truck, wheels, axles and springs as under the other car, and what we would like to do is to haul 10,000 lbs. more of freight in that car. We are not putting any more labor on the trucks or wheels, and not subjecting the car to any harder service. We simply want to reap the benefit of cutting down the dead weight and in place of the dead weight to haul that much more freight in that car.

Mr. Gibbs: That is, the committee, if I understand them correctly, say that you mark the car 161,000 lbs. maximum weight, and apparently they have not given any attention to the other limiting factors. In my remarks I had no special reference to Union Pacific cars, but my comments were addressed to the committee in regard to the principle involved, in stamping a car 161,000 lbs. capacity, without taking into consideration other factors which should be considered in equipping cars for that additional weight. The time was when we could change the capacity of cars from 40,000 to 60,000 lbs. with a paint pressure load, simply changing the marking, but that time has now passed.

M. K. Barnum (Ill. Cent.): It seems to me this matter is of a good deal of importance in view of the criticism the railways have been under during the past year as to their uneconomical methods; and this is a matter which has been found to be considerably complicated, but I believe it is worthy of the careful consideration of the special committee, and if I am in order I move that it be referred to a special committee for reporting to the next meeting.

J. J. Hennessey (C. M. & St. P.): I would like to have the report cover everything about the car, from the rail to the top of the roof in a box car or stock car. The committee should check the car throughout to see that everything which they may recommend will be consistent and would overcome the objections presented by Mr. Gibbs.

Mr. Kleine: In explanation, Mr. President, of the committee's recommendation, we referred this to the convention for the very reason that Mr. Gibbs gives. It is all right as far as the axle goes, but it does not take in the other truck details. Of course, the present interchange rules do not do that on the maximum weight, which allows now 161,000 lbs. I think it is very well to refer that to a special committee.

Mr. Hennessey: In seconding Mr. Barnum's motion I want to say that I would like to see everything connected with the car, the trucks and column bolts, the whole construction as well as the car body considered—the whole construction must be taken into consideration if you increase the capacity of the cars above their present marked capacity.

Mr. Barnum's motion was carried.

Mr. Seley: In regard to paragraph 78, I move that the proceedings include the code of interchange rules, rules for loading long material, and also the standards and recommended practice, leaving out the decisions of the arbitration committee.

Mr. Fuller: I have no objections to having all of these matters included in the book—personally I think it is a very nice thing to have all of these subjects included in the book—but I want to say to you gentlemen the book is getting so large that I do not believe you will be able to use it with convenience if you keep on increasing its size. We must reduce the size of our volume. It is too large, and personally I do not see why the rules for loading long material and a few other rules should not be incorporated in a separate volume. The book is going to be very unhandy if we keep

on including these various items in it. I have no objection to it personally, but I think the matter should be very carefully considered before Mr. Seley's motion is adopted.

O. C. Cromwell (B. & O.): The book is becoming very unwieldy and very bulky to handle. We now omit certain portions of the proceedings of the convention from the Annual Report, and publish them in a separate volume. Why cannot we take more out of it? Split it up into two volumes. It is unwieldy and it takes considerable time to locate the information you desire. I think the subject ought to be pretty thoroughly discussed before you take action on it.

J. J. Tatum (B. & O.): I think our book of proceedings is becoming too unwieldy. The more we add to it the more difficult it becomes to handle the book. The car inspectors must refer to the book continually. It is too unwieldy in its present form. It takes some time to train the car inspectors to get acquainted with the book, so that they will understand how to locate the information they desire. When adding in these rules for loading long material and some of the other things which we put in the book, they will not know where they are at, and you must remember that the class of employees that we get to do this work are not the best men in the country, with the best brains, and for that reason we must use judgment as to what is put into the book.

Mr. Seley: I did not know that the Baltimore & Ohio furnished the car inspectors with our proceedings. I will admit that the last volume is rather large, but the discussions might have been condensed considerably without affecting its value. Then the report of the committee on air brakes, which is a very valuable contribution to the literature on the subject, increased the size of the report last year, but it is not paralleled in our reports of this year so far as I know, and I do not believe our volume for this year with what is included in my motion will be as large a book as the one for 1910.

T. H. Goodnow (L. S. & M. S.): I think that it would reduce the size of the book if the part relating to the standards and recommended practice be published separately, simply retaining in the proceedings the standards which are required the most, not the standards which are required by the inspectors, but by the officers; the inspectors would not have to carry a book of that size, but still the cuts would be in it, and for further information reference could be made to a separate volume.

The President: Mr. Seley's motion is that the code of interchange rules and the rules for loading long materials be incorporated, and that the text and sheets of the standards of recommended practice be retained in the report of the proceedings, while the arbitration committee's decisions be eliminated.

The motion was carried.

The Secretary: In regard to paragraph 80, if agreeable to the convention the secretary will see that the committee on the revision of standards and recommended practice will get the result of the letter ballot, so that whatever changes they think necessary in the standards can be made.

TRAIN BRAKE AND SIGNAL EQUIPMENT.

A number of subjects relative to train-brake and signal equipment were assigned to the committee for investigation and report. These subjects will be taken up and reported on in the order presented.

EFFICIENT TRUCK BRAKE FOR CARS EQUIPPED WITH ALL-STEEL OR STEEL-TIRED WHEELS.

"To investigate the question of brake efficiency on cars equipped with all-steel or steel-tired wheels."

The committee on standards, in its report to the convention last year, paragraph 31, page 70, reported as follows:

"A member suggests the following: While text or sheet does not specify that steel or steel-tired wheels, for freight cars, must be 33 in. in diameter when new, it is assumed that the diameter new is to be in accordance with the recommended practice for cast-iron wheels. That this question be referred to the committee on car wheels, with instructions to look into the question of proper diameter for such wheels, in so far as maintaining the proper height of couplers for steel freight cars, also in maintaining effective brakes when wheels are worn to the limit, as trouble is experienced in holding cars within the limits, also as the brake details are now such that an effective brake can not be maintained. This question is referred jointly to the committee on train brake and signal equipment and to the committee on car wheels."

A communication was received by the chairman of this committee from the chairman of the standing committee on car wheels, which indicated that the wheel committee would recommend 33-in. maximum diameter of wheels for all-steel and steel-tired wheels, but would make no recommendations concerning the minimum diameter, or when worn to limit. From a compilation of the data received in answer to circular inquiry of the wheel committee the committee has assumed, for the purpose of consideration of this subject, a diameter of 30 in. when wheel is worn to limit. By making several truck-brake layout drawings it was found that the additional brake travel due to decreased diameter of wheels can be readily taken up by means of additional holes in the bottom of connection rod jaws.

The committee recommends that sketch of bottom rod, detail Fig. 1, be shown on Plate 18 to cover bottom-rod details for cars having inside-hung brakes and equipped with all-steel or steel-tired wheels; the inside pin holes to be used with new wheels.

ANGULARITY OF BRAKE-BEAM HANGERS.

"To investigate the question of angularity of brake-beam hangers."

The committee on standards reported last year, see paragraph 32, page 70, of 1910 Proceedings, as follows:

"A member suggests to advance to standard the following recommended practice, under the head of 'Brake Beams;'



R. B. Kendig.

Chairman, Committee on Train Brake and Signal Equipment.

'The brake hangers shall have an angle as nearly as possible to ninety degrees from a line drawn from the center of the brake shoe to the center of the axle when shoes are half-worn. This matter is referred to the committee on train brake and signal equipment, with the request that they investigate the question of angularity of brake hangers before any action is taken to advance to standard."

This subject is somewhat involved by the increasing use of all-steel and steel-tired wheels on freight cars, with the consequent difference in diameter of wheels when new and worn to limit. The wheel committee has made recommendations as to maximum diameter for all-steel and steel-tired wheels, but has left open the question of diameter when wheel is worn to limit. It is obvious that an angle of brake beam hanging suitable for a new 33-in. wheel would be objectionable when wheel is worn to limit, and some compromise angle would have to be selected. The committee recommends, therefore, that the question of advancing to standard the before-mentioned recommended practice be deferred until the committee has more data and time for consideration of the subject.

TRIPLE VALVE TEST RACK AND CLEANING AIR BRAKES.

"To consider whether the recommended practice covering cleaning of air brakes and diagrams of triple valve test rack should be advanced to standard."

This subject was referred by the committee to J. L. Burton and B. P. Flory, as a subcommittee, whose report is as follows:

"A member of the association suggests advancing to standard the association's recommended practice on Clean-

ing Air Brakes. The recommended practice, as adopted in 1902, having become in part obsolete through the almost general adoption of a more modern brake equipment than was in use when the present recommended practice was adopted, the committee does not concur in the suggestion, and submits herewith a proposed revised code of instructions on the maintenance of freight brakes, which, if adopted, will be applicable to all types of brake equipment now in general use on freight equipment cars.

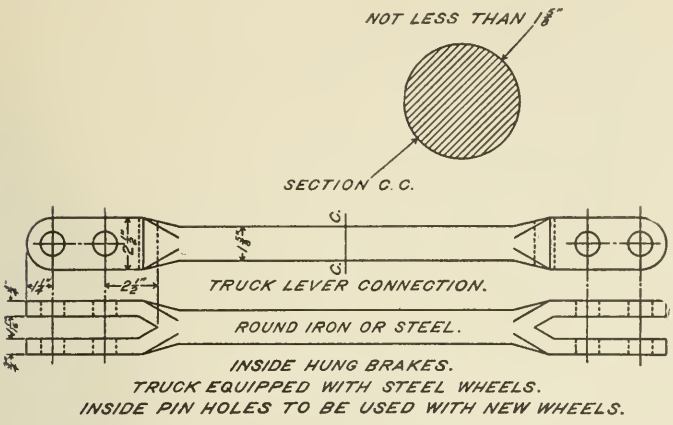


Fig. 1—Bottom Rod for Truck Brakes.

"The topical discussion at the 1909 convention on Cleaning of Triple Valves and Brake Cylinders on Freight Cars to meet the requirements of the Interstate Commerce Commission (see pages 348-367 of the 1909 Proceedings), with which the members have had an opportunity to become familiar, has been used by the committee as a basis on which to construct its report. The committee acknowledges its indebtness to Mr. A. L. Humphrey, vice-president and general manager of the Westinghouse Air Brake Company, and to Mr. F. M. Whyte, general manager of the New York Air Brake Company, for the interest taken in this work.

"In the discussion at the 1909 convention, referred to above, reference was made to the experiments which had been conducted on the Pennsylvania with the operation of triple valves in passenger service without lubricant, and it was suggested that members of the association make similar experiments with triple valves in freight service. In pursuance to the suggestion outlined at the 1909 convention, a member of the association's committee on train brake and signal equipment had placed in freight and coal service on the Philadelphia & Reading and the Central of New Jersey, during the latter part of 1909 and the early part of 1910, 1,500 Westinghouse K-2 triple valves containing no lubricant; also, for comparative test, 1,000 additional triple valves which had been lubricated with a suitable composition of oil and graphite. A large number of the lubricated and non-lubricated valves were removed from the cars after they had been in service for twelve to fourteen months, and were carefully inspected and tested before and after clearing. Briefly stated, the investigation thus far shows the following results:

"Lubricated Valves: After being in service twelve to fourteen months, 65.66 per cent. of the valves tested passed all test before they were cleaned; 21 per cent. failed on charging the auxiliary reservoir in the prescribed time because of the valves being dirty. After cleaning, 86.36 of the lubricated valves tested passed all test.

"Non-lubricated Valves: After being in service twelve to fourteen months, 37.2 per cent. of the valves passed all test before cleaning; 36 per cent. failed on charging the auxiliary reservoir in the specified time. After cleaning, 90.69 per cent. of the non-lubricated valves tested passed all test. All of the slide valves, slide-valve seats, bushing and packing rings were highly polished and showed no ill effects from lack of lubricant. Eliminating the defects that caused the lubricated and non-lubricated valves to pass, the prescribed test which would not be influenced by the application of lubricant, there was no appreciable difference in the performance of the lubricated and non-lubricated valves.

"While the committee does not feel that the scope of its investigation has been sufficiently broad to justify any definite recommendations on discontinuing the application of lubricant to triple valves, it does feel that the subject is of sufficient importance to justify a more thorough investigation than the committee has been able to make. As a conclusion to its report, the committee presents the following

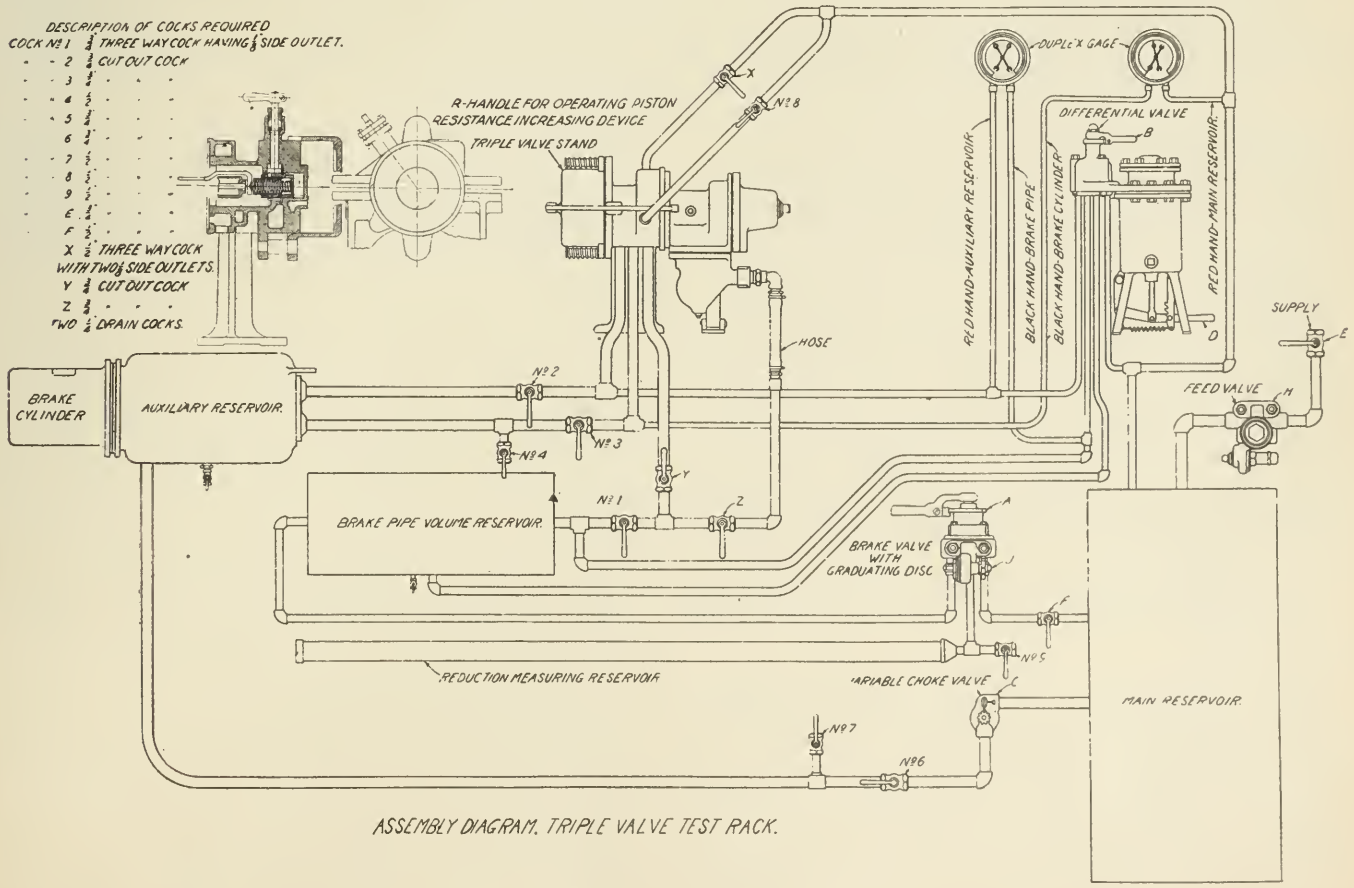


Fig. 2—Test Rack for Triple Valves.

proposed instructions on the inspection, repairs and test of freight brakes, and suggests its adoption as recommended practice."

ANNUAL REPAIRS TO FREIGHT-CAR AIR BRAKES.

Inspection: Cleaning and Lubricating Triple Valves.

The triple valves should be removed from the car for cleaning in the shop, and should be replaced by a triple in good condition. It should be dismantled and all the internal parts, except those with rubber seats and gaskets, cleaned with gasolene, then blown off with compressed air and wiped dry with a cloth.

The slide valve and graduating valve must be removed from the triple piston and retarded release parts from the body in order that the service ports in the slide valve and other parts may be properly cleaned.

No hard metals should be used to remove gum or dirt or to loosen the piston packing ring in its groove.

The feed groove should be cleaned with a pice of wood, pointed similar to a lead pencil. Rags or cloth should be used for cleaning purposes rather than waste, as waste invariably leaves lint on the parts on which it is used.

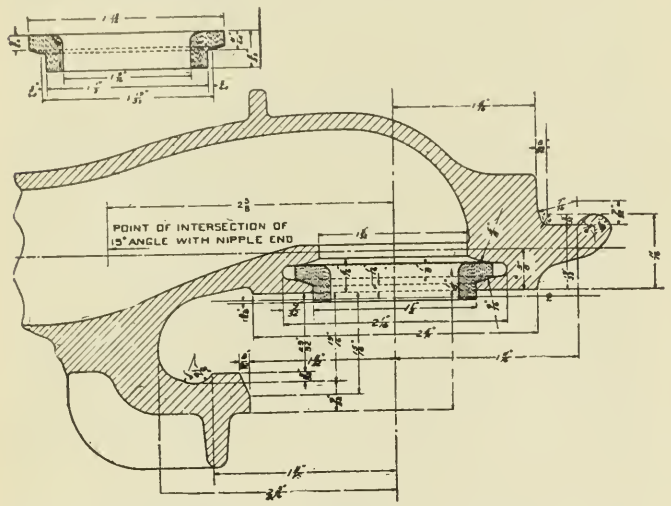


Fig. 3—Proposed Standard Coupling and Packing Ring for Air Brake Hose.

In removing the emergency valve seat, care must be exercised not to bruise or distort it.

Particular attention should be given the triple-piston packing ring. It should have a neat fit in its groove in the piston, and also in the triple-piston bushing; once removed from the piston, or distorted in any manner, it should be scrapped. The fit of the packing ring in its groove and bushing and the condition of the bushing should be such as to pass the prescribed tests.

The graduating stem should work freely in the guide nut. The graduating spring and the retarded release spring in retarded release triple valves must conform to standard dimensions and be free from corrosion. The thead portion of the graduating stem guide should be coated with oil and graphite before reapplying it to the triple cap.

The triple valve piston and the emergency valve must be tested on centers provided for the purpose to insure same being straight. The emergency-valve rubber seat should invariably be renewed unless it can plainly be seen to be in first-class condition, which is seldom the case. A check-valve case having cast-iron seat should be replaced with a case having a brass seat.

The cylinder-cap gasket and check-valve case gasket to be carefully examined and cleaned with a cloth; but should not be scraped. All hard or cracked gaskets to be replaced with new ones.

Standard gaskets as furnished by the air-brake manufacturers should be used. The use of home-made gaskets should be avoided, as the irregular thickness results in leakage and causes triple-piston stem to bend or break.

The tension of the slide-valve spring should be regulated so that the contour of same be such as will bring the outer end ⅛-in. higher than the bore of the bushing when the outside end of the spring touches bushing when entering.

Before assembling the parts after cleaning, the castings and ports in the body of the triple valve should be thoroughly blown out with compressed air, and all parts of the triple not elsewhere provided for known to be in good condition.

Lubricate the seat and face of the slide valve and slide valve graduating valve with high-grade very fine dry graphite, rubbing it onto the surface and the upper portion of the bushing where the slide-valve spring bears, so as to make as much as possible adhere to and fill up the pores of the brass, leaving a very thin coating of free graphite. The parts to be lubricated with graphite must be free from oil or grease.

Rub the graphite in with a flat pointed stick over the end of which a piece of chamois skin has been glued. At completion of the rubbing operation a few light blows on the slide valve will leave the desired light coating of loose graphite.

The triple-valve piston packing ring and its cylinder should be lubricated with either a light anti-friction oil or a suitable graphite grease as follows:

Apply a light coating to the packing ring and insert the piston and its valves in the body leaving them in release position, then lubricate the piston cylinder and move the piston back and forth several times, after which remove the surplus from the outer edge of the cylinder to avoid leaving sufficient lubricant to run on the slide valve or seat while the valve is being handled or stored ready for use.

No lubrication to be applied to the emergency piston, emergency valve or check valve.

All triple valves after being cleaned or repaired must be tested, preferably on a rack conforming to the attached print, and pass the test prescribed under the subject of "Triple Valve Tests" before being placed in service.

Should any of the triple-valve bushing require renewing, such work should be done by air-brake manufacturers.

Triples in which packing rings are to be renewed, slide valve or graduating valves renewed or faced, if the latter is of slide type, should be sent to a central point or general repair station for repairs.

When applying the triple valve to the auxiliary reservoir, the gasket should be placed on the triple valve, not the reservoir.

Cleaning: Lubricating and Inspection of the Brake Cylinders.

First, secure the piston rod firmly to the cylinder head, then, after removing the non-pressure head, piston rod, piston head and release spring, scrape off all deposits of gum and dirt with a putty knife or its equivalent, and thoroughly clean the removed parts and the interior of the cylinder with waste saturated with kerosene.

Packing leather must not be soaked in kerosene oil, as same destroys the oil filler placed in the leather by the manufacturers, opening the pores of the leather and causing the same to become hard.

Particular attention to be paid to cleaning the leakage groove and the auxiliary tube. Triple valve must be removed when the auxiliary tube is being cleaned.

The expanding ring when applied in the packing leather should be a true circle and fit the entire circumference, and have an opening of from 3/16 in. to ¼ in; when removed from the cylinder the ring opening should be 1½ in. to 1 9/16 in., and with this opening, of course, will not be a true circle.

A packing leather which is worn more on one side than the other should be replaced with a new one of uniform thickness, or turned so as to bring the thin side away from the bottom of the cylinder. The piston should be turned each time the cylinder is cleaned. In putting a packing leather on piston, it should be so placed as to bring the flesh side of the leather next to the cylinder walls.

Follower studs to be firmly screwed into the piston heads, and nuts on same to be drawn up tight before replacing the piston.

The inside of the cylinder and packing leather to be lightly coated with a suitable lubricant, using not more than 4 ounces nor less than 3 ounces per cylinder.

Part of the lubricant should be placed on the expander ring, and the adjacent side of the packing leather, thus permitting the air pressure to force the lubricant into the leather at each application of the brake.

No sharp tools should be used in placing the packing leather into the cylinder.

After the piston is entered and before the cylinder head is replaced the piston rod should be slightly rotated in all directions, about three inches from the center line of the cylinder, in order to be certain that the expanding ring is not out of place.

In forcing the piston to its proper position in the cylinder, the packing leather will skim from the inner walls of the cylinder any surplus lubricant that may have been applied.

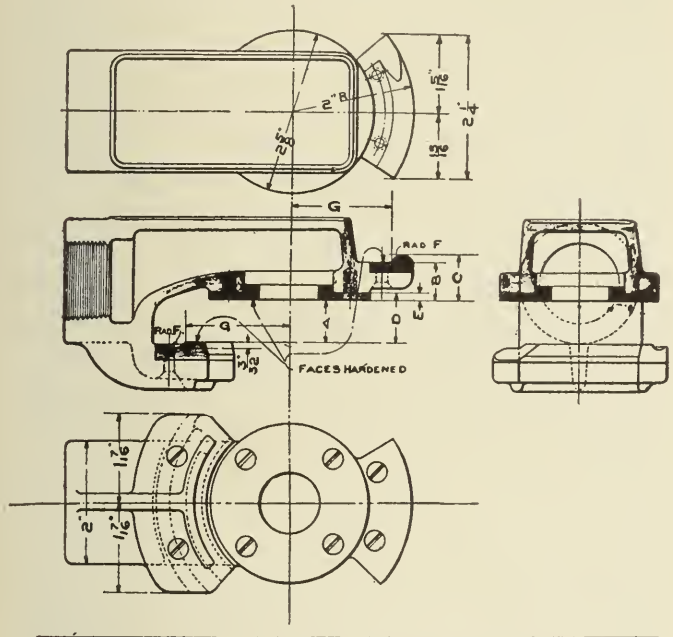
It has been found good practice to again extract the piston and remove the surplus lubricant.

All stencil marks to be scraped off or painted over with black paint. The place of cleaning, day, month and year to be stenciled with white paint, preferably on both sides of the cylinder or auxiliary reservoir, or if same is not readily visible, in a convenient location near the handle of the release rod.

The bolts and nuts holding the cylinder and reservoir to their respective plates and the latter to the car, to be securely tightened.

The brake cylinder to be tested for leakage after cleaning, preferably with an air gage, which can be done by attaching the gage to the exhaust port of the triple valve before connecting the retainer pipe, or where the latest type retainers are used the gage can be connected to the exhaust port of the retaining valve. In either case, the gage will indicate cylinder leakage on releasing the triple valve after making an application, and when attached to the retainer valve it will also test the retainer and retaining-valve pipe.

Brake-cylinder leakage should not exceed 5 lbs. per minute, from an initial pressure of 50 lbs.



GAUGE No		FOR USE ON	A	B	C	D	E	F	G
No 1	MAXIMUM	WESTINGHOUSE 1 3/8" COUPLING	77/128	47/64	53/64	55/128	9/64	3/16	1 11/16
No 2	MINIMUM	1 3/8"	77/128	89/128	101/128	45/64	13/128	3/16	1 11/16
No 3	MAXIMUM	NEW YORK 1 3/8"	83/128	47/64	51/64	101/128	5/64	5/32	1 43/64
No 4	MINIMUM	1 3/8"	83/128	45/64	49/64	87/128	7/64	5/32	1 45/64

Fig. 4—Maximum and Minimum Gages for Air Brake Hose Coupling.

Each time the triple valve and the brake cylinder are cleaned, the brake pipe, brake-pipe strainer and branch pipe should be thoroughly blown out and the triple valve strainer cleaned before recoupling the branch pipe to the triple valve. If a dirt collector is used, the plug should be removed, the accumulation blown out and the threaded portion of the plug coated with oil and graphite before replacing.

All union gaskets should be made of oil-tanned leather. The use of rubber in unions should not be permitted.

Piston travel should be adjusted to not less than 5½ in., nor more than 7 in.

Additional Inspection and Repairs to Cars.

When the brake cylinder and triple valve is cleaned, the following additional work should be done to the car:

Retaining valve cleaned by removing the cap, wiping or blowing out all dirt and seeing that the valve and its seat are in good condition, the retaining position exhaust port open and the valve proper is well secured to the car in a vertical position, pipe clamps applied where missing and tightened where loose, hose and angle cocks turned to their proper position. Pipe joints, air hose, release valves, angle and stop cocks should be tested by painting the parts with soapsuds while under an air pressure of not less than 70 lbs., preferably 80 lbs., and defective parts repaired or removed.

See that there are no broken or missing brake shoes, brake beams or foundation brake gear, and if the car belongs to a foreign road, a repair card should be made out covering all work that has been done and attached to the car, as per M. C. B. rules.

The inspection and repairs which have been mentioned should be made to all cars at least once in twelve months.

TRIPLE-VALVE TESTS AND INSTRUCTIONS FOR OPERATING TRIPLE-VALVE TEST RACK.

Mounting Triple Valves for Testing.

With the triple-valve gasket applied to the face of the triple-valve flange, place the latter against the face of the stand in a vertical position and open cock *X* as shown on attached piping diagram, Fig. 2. Connect the brake pipe to the triple, then open cock *Z*.

Before attaching triple valves suitable for use with 8-in. brake cylinders insert in the auxiliary reservoir end of the valve the friction-increaser extension piece, suitable for the valve under test.

Two triple-valve stand face plates are required for each test rack to permit the testing of all types of freight triple valves.

Plate No. 1 is for use when testing triple valves for 8-in. cylinders.

Plate No. 2 is for triple valves used on 10-in. cylinders.

If it is found necessary to repeat any test which has necessitated a reduction of auxiliary reservior pressure, valve "B" may be moved to position No. 2, which provides a by-pass around the triple valve from the brake pipe to the auxiliary reservoir, thereby permitting a quick recharge.

Test No. 1.—Charging Test for Triple Valves.

Commencing the tests with cocks 2, 3, 7 and 9 open, all other numbered cocks closed, valve "B" in position No. 3 (lap), valve *A* in position No. 1, auxiliary reservoir empty and main reservoir pressure 80 lbs. pressure, proceed as follows:

Close cock No. 7 and open No. 1, and with 80 lbs. pressure in the brake pipe note the time required to charge the auxiliary reservoir to specified pressure, as given in the following table:

(NOTE—If, during this test or Test No. 2 (Leakage Test), any considerable leakage is discovered, the charging test must be repeated.)

With brake-pipe pressure maintained at 80 lbs., the triple valves should charge the auxiliary reservoir as follows:

CHARGING AUXILIARY RESERVOIR.

Westinghouse Triple Valve.	From 0 to 30 Lbs. Seconds.		From 0 to 70 Lbs. Seconds.	
	Min.	Max.	Min.	Max.
8-in. non-quick service	21	28	58	78
10-in. non-quick service	13	17	34	44
8-in. quick service	32	42	100	120
10-in. quick service	49	24	60	72
New York Triple Valve.	**From 0 to 30 Lbs. Seconds.**		**From 0 to 70 Lbs. Seconds.**	
	Min.	Max.	Min.	Max.
8-in. non-quick service	..	..	61	82
10-in. non-quick service	..	..	46	61
8-in. quick service	..	..	100	120
10-in. quick service	..	..	65	80

These tests give practically the same results, and the time of charging from zero to 30 lbs. is given simply to save time in making the test.

Test No. 2.—Leakage Test.

Commencing each of the sections of Test No. 2, with cocks 1, 2, 3 and 9 open, all other numbered cocks closed, valve *B* in position No. 3 (lap), valve *A* in position No. 1 and auxiliary reservoir charged to 80 lbs., proceed as follows:

Sec. "A," Test No. 2.—Westinghouse Triple Valves and New York Quick-service Triple Valves, Leakage at Exhaust in Emergency. Check-valve and Cylinder-cap Gasket Leakage.

Operate the triple valve two or three times in quick action by closing and opening cock No. 1; finally leaving it closed.

Coat the exhaust port of triple valve with soapsuds to ascertain if leakage exists past the slide valve or bushing to the exhaust with the piston and slide valve in emergency position.

Close cocks 2 and 3 and note the rate of fall of pressure indicated by the brake-cylinder gage hand, which is now connected only with the small volumes between cocks 2 and 3 and the triple valve. A leakage greater than 5 lbs. in 10 seconds indicates either excessive check-valve leakage or that the piston does not seal against the cylinder cap gasket.

At the completion of this test, open cocks 2 and 3 in the order given.

Sec. "B," Test No. 2.—Leakage at Exhaust in Release Slide Valve of Emergency-valve Leaking.

Open cock 1, and after the brake-cylinder pressure is exhausted close cock 3 and again coat the exhaust port with soapsuds to determine if there is any leakage from the auxiliary reservoir to the brake cylinder past the slide valve when the triple valve is in release position, or from the brake pipe to the brake cylinder past the emergency valve or its seat, when the differential on the emergency valve is high. Open cock 3, then paint the body of the triple valve with soapsuds to determine if leakage exists direct to the atmosphere through castings or gaskets.

If leakage is discovered at the triple exhaust in release position, determine if it is from the auxiliary reservoir or brake pipe in the following manner:

Move valve *A* to position No. 8 and open cock 7 until the brake pipe and auxiliary reservoir are empty; then with the valve *J* in position No. 3, place a soap bubble on the exhaust port and valve *A* in position No. 2. If no leakage is found at the exhaust, advance valve *J* by stages from position to position until a brake-pipe pressure of 10 lbs. is obtained. Any leakage from the exhaust while the auxiliary reservoir is without pressure must be from brake pipe, past the emergency valve. Therefore, if no exhaust leakage is found and leakage did exist while the auxiliary reservoir was charged, it indicates defective slide valve. At the completion of this test, close cock No. 7 and move valve *A* to position No. 1, recharging auxiliary reservoir.

Sec. C, Test No. 2.—Graduating-valve Leakage.

Move valve *A* to position No. 7 until a brake-cylinder pressure of from 20 to 30 lbs. is obtained. Then return valve *A* to position No. 3 and close cock 3. If the brake-cylinder pressure then increases without leakage at the exhaust port, it is proper to assume that the graduating valve is leaking, providing it has been determined by the preceding tests that the emergency valve is tight. If leakage at the exhaust occurs during this test, which will be determined by placing a soap bubble on the exhaust, the leakage may be either from slide valve or graduating valve. The rate of rise of pressure on the brake-cylinder gage, resulting from graduating-valve leakage must no exceed 5 lbs. in 20 seconds. This comparatively rapid rate of rise is permissible owing to the extremely small volume of the section of brake-cylinder pipe into which the leakage is occurring.

At the completion of test, open cock 3 and move valve *A* to position No. 1.

Sec. A. Test No. 2.—Non-quick Service. New York Triple Valve. Leakage at Exhaust in Emergency. Check-Valve, Quick-action Valve and Cylinder-cap Gasket Leakage.

Operate the triple valve two or three times in quick action by closing and opening cock 1, finally leaving it closed.

Coat the exhaust port of triple valve with soapsuds to ascertain if leakage exists past the exhaust valve or bushing with the piston and valve in emergency position. Close cocks 2 and 3. If the brake-cylinder gage now indicates leakage greater than 5 lbs. in 10 seconds the leakage is excessive, and is usually due to imperfect seating of the check valve or quick-action valve, or to the main piston not making a tight joint on the main-cylinder gasket. To locate the defect place soap bubbles on the vent ports. No leakage at these points indicates that the leakage is past the main-cylinder gasket. If leakage is found at the vent ports, open cocks 1, 2 and 3 and recharge the auxiliary reservoir to 80 lbs., then move valve *A* to position No. 7 until the brake-pipe pressure is reduced to 10 lbs. and return valve *A* to position No. 3. Close cock 2, and if the quick-action valve is leaking the brake will immediately release. If it does not, the leakage is past the check valve.

At the completion of this test, if no leakage were found, open cocks 1, 2 and 3, and if leakage were discovered open cock 2 and move valve *A* to position No. 1.

Sec. B. Test No. 2.—Exhaust-valve Leakage in Release; also Vent-valve and Quick-action Valve Leakage.

Close cock 3 and coat the exhaust port with soapsuds to determine if there is any leakage from the auxiliary reservoir past the exhaust valve, or graduating valve or triples having this valve tandem with the exhaust valve, when the triple is in release position. If exhaust leakage is found, the triple under test has tandem exhaust and graduating valves, determine which valve is leaking by making graduating-valve leakage test.

Sec. C, Test No. 2.—Graduating-valve Leakage.

Move valve *A* in position No. 7 until a brake-cylinder pressure of from 20 to 30 lbs. is obtained. Then return valve *A* to position No. 3 and close cock 3. If the brake-cylinder pressure then increase without leakage at the exhaust port, it is proper to assume that the graduating valve is leaking. The rate of rise of pressure on the brake-cylinder gage, resulting from graduating-valve leakage, must not exceed 5 lbs. in 20 seconds. This comparatively rapid rise is permissible owing to the extremely small volume of the section of brake-cylinder pipe into which the leakage is occurring.

If leakage at the exhaust occurs during this test, which will be determined by placing a soap bubble on the exhaust, the leakage is by the exhaust valve instead of the graduating valve.

At the completion of the test open cock 3 and move valve *A* to position No. 1.

Test No. 3.—Test of Type K Triple Valves for Retarded-release Feature; for Both Westinghouse and New York Triple Valves.

Commencing the test with cocks 1, 2, 3 and 9 open, all other numbered cocks closed, auxiliary reservoir changed to 80 lbs., valve *B* in position No. 3 (lap), lever *D* in position No. 2 and valve *A* in position No. 3 (lap), proceed as follows:

Move valve *A* to position No. 7 until brake-pipe pressure is reduced 20 lbs., then return it to position No. 3; place valve *J* in position No. 4; valve *B* in position No. 1 and valve *A* in position No. 2. This should move the triple-valve parts to normal (full release) position.

If the triple valve moves to retarded-release position, which is indicated by a contracted exhaust and slow release of brake-cylinder pressure, it indicates a weak or broken retarded release spring, or undue friction in the retarding device.

Following this test, recharge the system to 80 lbs. by moving valve *A* to position No. 1 and valve *B* to position No. 2.

When the brake pipe and auxiliary reservoir are charged to 80 lbs. move valve *A* to position No. 7 until brake-pipe pressure is reduced 20 lbs., then return it to position No. 3. Place valve *J* in notch No. 8, lever *D* in notch No. 4, valve *B* in position No. 1 and valve *A* in position No. 2.

Under these conditions the triple-valve piston and slide valve should be forced to retarded-release position. If this does not occur it indicates that the retarded-release spring is not standard, or the retarding devices have excessive friction. Completing test, place valve *B* in position 3 and valve *A* in position 1.

Sec. A, Test No. 4.—Application Test for Both Westinghouse and New York Triple Valves.

If for any reason it is desired to make this test following an application and release produced by closing and opening cock 1, or the auxiliary reservoir has just been charged by opening cock 1, this test should be preceded by an application and release with valve *A*, for the purpose of insuring the slide valve being in its normal position.

Commencing the test with cocks 1, 2, 3 and 9 open, all other numbered cocks closed, valve *A* in position No. 1, valve *B* in position No. 2 and lever *D* in notch 3, then with the auxiliary reservoir charged to 80 lbs., proceed as follows:

To test triple valves for 8-in. cylinders, place valve *B* in position No. 4 and valve *A* in position No. 5.

To test triple valves for 10-in. cylinder, place valve *B* in position No. 4 and valve *A* in position No. 6.

In all of these tests the triple valve should move to application position without causing a discharge of air from the vent port of valve *B*.

A failure to apply under the conditions specified indicates either excessive friction, which will be shown by an exhaust from the vent port or valve *B;* a leaky packing ring, which will be discovered later by the packing-ring leakage test; too large a feed groove in the cylinder, or a combination of two or more of these defects. Should the triple valve fail to apply and no exhaust occur from valve *B*, the indications are that the back flow of air from the auxiliary reservoir to the brake pipe is too rapid to permit the required differential.

At the completion of this test move valve *B* to position No. 3 and valve *A* to position No. 1.

Sec. B.—Quick-service Test (for Quick-service Triple Valves Only) for Both Westinghouse and New York Triple Valves.

Commencing the test with cocks 1, 2, 3 and 9 open, all other numbered cocks closed, valve *A* in position No. 1, valve *B* in position No. 3 and auxiliary reservoir charged to 80 lbs., proceed as follows:

Close cock 9 and move valve *A* to position No. 7 for all 8-in. and 10-in. triple valves. The brake-cylinder pressure obtained should not be less than 5 lbs. greater than that which will be obtained by subjecting to the same test triple valves which do not contain the quick-service features.

At the completion of this test move valve *A* to position No. 1 and open cock 9.

Test No. 5.—Packing-ring Leakage Test for Both Westinghouse and New York Triples.

Release Test, Sec. 1.—Commencing with cocks 1, 2, 3 and 9 open, all other numbered cocks closed, valve *A* in position No. 1, valve *B* in position No. 3 and the auxiliary reservoir charged to 80 lbs., proceed as follows:

Place the valve *A* in position No. 7 until the brake-pipe pressure is reduced 15 lbs., then return to position No. 3 (lap). Place valve *J* in position No. 2, lever *D* in notch No. 1 and valve *B* in position No. 1; close cocks 2 and 3 and move valve *A* to position No. 2. If the discharge does not occur promptly from the vent port of valve *B*, advance valve *J* from position to position until the discharge begins, then note the rate of increase of pressure on the auxiliary reservoir gage, which must not exceed 5 lbs. in 30 seconds.

During this test there must be a steady exhaust of air from the vent port of valve *B* to insure the proper differential being maintained on the triple-valve piston. If, in making this test, the triple valve for the 8-in. cylinder releases or indicates excessive ring leakage, make another test, beginning with moving handle *R* to the right after making the proper brake-pipe reduction and before starting to increase the brake-pipe pressure. Immediately after the test is completed, handle *R* should return to its normal left position.

Should it occur that the friction of the triple valves for the 10-in. brake cylinder is so low as to continue to permit the triple to release, the reduction for the application may be changed from 15 to 10 lbs. When this is done, special attention should be given to determining if the graduating valve is right, as it must be, to permit an accurate test.

At the completion of this test place valve *B* in position No. 3, open cocks 2 and 3 and place valve *A* in position No. 1.

Test No. 6, Sec. 2.—Friction Test. Release Test for Both Westinghouse and New York Valves.

Commencing the test with cocks 1, 2, 3 and 9 open and all other numbered cocks closed, valve *A* in position No. 1, valve *B* in position No. 3, auxiliary reservoir charged to 80 lbs.

Place lever *D* in notch 3 for all triple valves undergoing the test; proceed as follows:

Place valve *A* in position No. 7 until the brake-pipe pressure is reduced 10 lbs., then return it to position No. 3. Place valve *J* in position No. 1, valve *B* in position No. 1, and move valve *A* to position No. 2. Under these circumstances the triple valve should release. A failure to release should be accompanied by a discharge at the vent port of valve *B*, which indicates that the frictional resistance to the movement of the packing ring and slide valve is excessive.

If the triple valve does not release and valve *B* fails to open its exhaust, leakage is occurring from the brake pipe, which will necessitate advancing valve *J* from position to position, remaining in each position 30 seconds, until the triple valve releases or the exhaust in valve *B* opens.

At the completion of the test place valve *B* in position No. 3 and valve *A* in position No. 1.

Test No. 7, Sec. A.—Service-port Capacity Test for Westinghouse Triple Valves and Quick-service New York Triple Valves.

Commencing with cocks 1, 2, 3, 4 and 9 open, valve *A* in position No. 1, valve *B* in position No. 3, place valve *C* in position required for the triple valve under test, as indicated:

Notch No. 1.—For 8-in. triple valves.

Notch No. 2.—For 10-in. triple valves.

During this test the brake-pipe pressure should not drop, except that in the case of the quick-service triple valves there will, of necessity, be a slight drop, which must not exceed 2 lbs.

Place valve *B* in position No. 2 and move valve *A* to position No. 3, open cock 7 until brake-pipe and auxiliary-reservoir pressures are reduced to 50 lbs., then close cock 7. Move valve *B* to position No. 3 and open combination cock 6 and quick-opening valve, leaving it open 3 seconds. This test should not produce quick action. If it does, it indicates a restriction in the service port, or a weak or graduating spring.

SEC. B.—Duplicate the tests specified under Sec. A, placing the wheel of valve *C* in the position as indicated.

Notch No. 3.—For 8-in. triple valves.

Notch No. 5.—For 10-inch triple valves, excepting Westinghouse non-quick service, with which use notch 7.

This should result in the triple valve moving to emergency position. Failure to do so indicates too close a fit of the emergency piston.

At the completion of the test close cock 4 and combination cock 6 and quick-opening valve, move valve *A* to position No. 1.

Test No. 7, Sec. A.—Service-port Capacity Test for New York Non-quick Service Triple Valves.

Commencing with cocks 1, 2, 3, 4, and 9 open, valve *A* in position No. 1, valve *B* in position No. 3, place valve *C* in position required for the triple valve under test, as indicated.

Notch No. 1.—For 8-in. triple valves.

Notch No. 2.—For 10-in. triple valves.

Place valve *B* in position No. 2 and move valve *A* to position No. 3. Open cock 7 until brake pipe and auxiliary reservoir pressure are reduced to 50 lbs., then move valve *B* to position No. 3 and open cock 6 quickly.

NOTE.—During this test the triple valve should move to service position, the brake-pipe pressure must not drop and there must be no discharge of air from the vent ports.

Should the triple valve move to emergency position, it indicates a restriction in the service ports or a weak vent-valve spring.

SEC. B.—Duplicate the test specified under Sec. A, placing the wheel of valve C in the position as indicated for the triple valve under test.

Notch No. 3.—For 8-in. triple valves.

Notch No. 5.—For 10-in. triple valves.

This should result in the triple valve moving to emergency position, causing a strong blast of air from the vent posts and a brake-pipe reduction of at least 3 lbs. Failure to do so indicates a too loose fit of the vent-valve piston packing.

AIR-BRAKE HOSE COUPLINGS.

"To investigate and report on the question of standard dimension for air-brake hose couplings, gaskets and gages for new and worn hose couplings, and possibly signal-hose couplings."

This subject is referred to in paragraph 37, page 71, of the 1910 Proceedings:

"The report of committee on air-brake hose to the 1909 convention, with particular reference to 'standard dimensions of air-brake hose couplings and gaskets,' was received and referred to the committee on standards for further investigation and report. Inasmuch as this involved the design of the air-brake hose coupling, gasket and gages for both new and worn air-brake hose couplings, and should possibly be extended to signal-hose couplings, the committee felt that this matter should have been referred to the standing committee on train-brake and signal equipment, who have direct jurisdiction over the designing and interchangeability of these parts, and accordingly referred this subject to the committee on train-brake and signal equipment by letter, dated August 10, 1909, through the secretary of the association, who advised, under date of August 13, 1909, that the matter had been so referred."

The committee delegated this section of its work to a subcommittee, and its report, concurred in by all the members of your committee, follows:

Air-brake Hose Couplings and Packing Rings.

In its investigations the committee assumed that all air-brake hose couplings and packing rings now in use were supplied by the Westinghouse Air Brake Company and the New York Air Brake Company, or in accordance with their standard dimensions; and therefore the question of the best possible interchange of proposed standard and existing couplings and rings has received due consideration.

For the purpose of determining whether there are sufficient variations in the dimensions of various makes of couplings to justify the association in adopting a standard with a view of securing a more satisfactory interchange, more than 5,000 new and used couplings have been gaged and tested. This investigation revealed the fact that the dimensions of couplings which should be common to all makes vary appreciably in couplings supplied by different manufacturers.

Enlarged drawings have also been made showing the variations in the principal dimensions employed by the Westinghouse Air Brake Company and the New York Air Brake Company in the design of their respective coupling and packing ring. Outlines of the former and details of the latter show that there is a difference of 1/64 in. in the nominal height of a Westinghouse and a New York packing ring. Also, there is 3/64 in. difference in one of the principal dimensions of the couplings affecting the compression of the rings.

When two Westinghouse couplings, with Westinghouse packing ring in each, are coupled together, the nominal compression of each packing ring is 3/128 in. When the couplings are pulled apart (as is the case when cars are uncoupled without first parting the hose) the faces of the hose couplings are 1/32 in. apart.

With two New York couplings, having a New York packing ring in each, coupled together, the compression of each ring is nominally 1/32 in.; and when the couplings are pulled apart, the space between the faces of the couplings is only 1/64 in.

If Westinghouse packing rings are used in New York couplings, the compression of each ring will be 3/64 in., or 1/64 in. greater than when New York packing rings are used in New York couplings. A combination of New York packing rings and Westinghouse couplings will reduce the nominal compression of the latter to 1/128 in.

The permissible variation in the nominal compression of the rings, with the existing standards of the air-brake manufacturers, is therefore in the ration of 6 to1, or 600 per cent., which, in the judgment of the committee, justifies the association in considering the adoption as standard, or recommended practice, such dimensions relating to air-brake hose couplings and packing rings as will insure greater protection against leakage and lessen the damage to hose when "pulled apart" than is now possible.

The New York Air Brake Company recommends adding 1/16 in. radius at the back or larger diameter of ring groove, to insure more satisfactorily machining the groove to specified dimensions without burning off the corners of the tool with which the groove is cut. Adding this radius to the groove will not affect the fit of the proposed or existing packing rings. The committee therefore concurs in the suggestion.

A member of the train-brake and signal committee recommends revising the proposed standard as recommended in 1909 to provide for the reinforced guard arm which is now an important feature of both the Westinghouse and New York couplings. The guard arm in no way affects the interchange of couplings, and the committee believes it should be provided for in the proposed standard.

New Proposed Standard Coupling.

Fig. 3 shows the detail drawing, as submitted by the air-hose committee in 1909, revised to provide for a better interchange with the New York couplings. The revision consists of an outline of the reinforced guard arm, a 1/16-in. radius at the back of the groove for the packing ring, and of a second, 3/16-in. and 5/32-in., radius in the groove of the guard arm and at the outer lug.

For convenient reference, the packing ring as recommended in 1909 is also shown in detail in Fig 3.

Leakage at the packing ring and damage to hose when "pulled apart" will depend largely upon the permissible variation in nominal dimensions to meet manufacturers' requirements. The question of maximum variation in nominal dimensions affecting the compression of the ring and the clearance between faces of coupling has therefore been thoroughly investigated by (as previously stated) "gaging and testing over 5,000 couplings" and a number of packing rings. Couplings which were found to slightly vary from the manufacturer's standard were tested under air pressure on a pulling machine, with which could be approximated the strains to which the hose is subjected in service through the slack action and curving of cars. Notwithstanding the fact that no tests were made with frozen hose (which is, perhaps, the severest service test for ring leakage that can be made), the investigation leads to the conclusion that the air-brake manufacturers can be depended upon to supply their hose couplings and rings with a degree of accuracy that will insure satisfactory service.

This conclusion does not apply, however, to packing rings secured in the open market. In gaging and testing a large number of sample packing rings which were supplied by various rubber companies, less than 10 per cent. of them were found to be fit for service. A number of these sample rings were represented by the rubber manufacturers to be "M. C. B. Standard," "Perfect samples," etc.

If the members of the association care to consider securing packing rings in the open market, then suitable minimum and maximum gages for them should first be adopted (consideration of which does not come within the scope of the committee's investigation on couplings and rings).

It has been suggested that the association should adopt minimum and maximum dimensions for the couplings as a whole. This would affect further developments in the device, such as are now being made by the two leading air-brake companies in what may be termed a "hose-protector coupling," with which it is intended to minimize the tension in the hose when pulled apart. The committee has therefore confined its recommendations to nominal dimensions affecting the interchange of couplings and rings.

Summary.

Summarizing, it can be said that two couplings and packing rings conforming to the dimensions shown in Fig. 3 will couple together as satisfactorily and with equal assurance against leakage at the packing ring, and with as little damage to hose when pulled apart, as is now had with couplings and rings conforming to the standards of the Westinghouse Air Brake Company.

One of the proposed M. C. B. couplings and rings, as shown in Fig. 3, will interchange with couplings and rings conforming to the standard of the New York Air Brake Company more satisfactorily and with greater assurance against leakage and damage to hose when pulled apart than is now possible with a Westinghouse and New York coupling coupled together.

A proposed M. C. B. coupling and packing ring (as shown in Fig. 3) and a Westinghouse coupling and packing ring will interchange as satisfactorily and with equal assurance against leakage and damage to hose when pulled apart as will two couplings conforming to the standard of the Westinghouse Air Brake Company.

Gages for Air-brake Hose Couplings.

The question of gages for used air-brake hose couplings has been investigated with the view of determining proper contour lines of the gages. A number of used couplings have been gaged (and subsequently tested) with gages of such proportions and dimensions as to provide for condemning couplings with guard arms and lugs distorted or worn from 1-128 in. to 1-32 in.

Fig. 4 shows the dimensions which, in the judgment of the committee, are best suited for minimum and maximum gages for Westinghouse and New York couplings; but these dimensions were decided upon too late to permit of securing gages constructed in accordance therewith, and, realizing the importance of the subject, the committee does not feel justified in suggesting the adoption of these dimensions without first gaging (with the proposed gages) a sufficient number of couplings to confirm the committee's judgment in the premises. The committee therefore desires to report progress on the question of gages for air-house couplings, and respectfully asks for further time in which to complete its investigation.

In concurring with the report of the subcommittee, the committee recommends the substitution of the dimensions and contour for air-brake hose coupling shown by Fig. 3 for the dimensions and contour shown with the Air Brake Hose Committee's report, page 180, of the 1909 proceedings. The committee also recommends, for reasons contained in the subcommittee's report, that the question of gages for air-hose couplings be deferred for a future report by the committee in which report will also be taken up the question of signal-hose coupling.

The report is signed by:—R. B. Kendig (N. Y. C.), chairman; T. L. Burton (C. of N. J.), B. P. Flory (N. Y. O. & W.), E. W. Pratt (C. & N. W.) and R. K. Reading (Penn.).

Mr. Burton presented the report and in connection therewith said: Mr. Goodnow brought up the point in the discussion this morning about stenciling the date when the triple valves were cleaned. The committee provides under *Cleaning* of the report the following: "All stencil marks to be scraped off or painted over with black paint. The place of cleaning, day, month and year to be stenciled with white paint, preferably on both sides of the cylinder or auxiliary reservoir; or, if it is not readily visible, in a convenient location near the handle of the release rod." The stenciling of the place, day, month and year is provided for, but we do not specify the road, as suggested by Mr. Goodnow. We believe that the method which we recommend will enable the road to locate the time the work was done. The idea is to put the car owner in a position where he can locate improper repairs before the bills are received. In many cases the bills for repairs do not come in for several months after repairs have been made, and we believe the recommendation we make will cover the matter.

DISCUSSION ON TRAIN BRAKE AND SIGNAL EQUIPMENT.

I. S. Downing (L. S. & M. S.): As I understand it, if the car can be placed between other air-brake cars, the card is to be tied near the triple valve. If it cannot be placed between these cars, it must be tied onto the train line near the angle cock. As this card is important to the switchmen, it seems to me it ought to be on the side of the car, where they can see it, and they should not be compelled to look under the car to find the card.

F. W. Brazier (N. Y. C. & H. R.): I want to call attention to the inferior gaskets which some roads buy—they are

not standard and do not fit properly, and we should frown on the purchasing agent who buys anything except what is absolutely correct. It is too paltry a thing, to get something by which you can save a few pennies, and then delay the trains. All gaskets which are not standard should be thrown in the scrap heap.

C. E. Fuller (U. P.): I would like to refer to the recommendation of the committee the matter of applying this defect card: "If car can be placed between air-brake cars, wire this card near triple valve where it can be readily seen. If car must not be placed between air-brake cars, wire card to brake pipe near angle cock at each end of car."

I do not believe the wiring of a card on a car is good practice. It is apt to be blown away. This is especially true out in the western country. The card should be fastened on the car so as to stay there. I do not think you can hold the card by tying it.

O. C. Cromwell (B. & O.), referring to Fig. 1: I think the dimension in the inner holes at the bottom of the jaw, 2½ in., is too short. I believe it should be 2¾ in.—the beginning of the angle in the corner. I think that should be corrected.

Mr. Burton: A question was raised on the substitution of one card for two, and I will state in that connection that that one little point resulted in more labor on the part of the committee than all the rest of the report put together, and it was the experience of a number, who made it a point to investigate the question, to find that where two cards were provided the train crews applied whichever card they happened to have in their pocket regardless of the nature of the defect. As to attaching the card by wiring rather than nailing, I think the ability to keep the wired card on the car, to get the car to the repair station, depends on how soon you get it to the repair station. The committee did not feel that it was justified in asking train crews to carry tacks and a hammer in their pockets, when they could apply the tag with a wire. The question of the brake rod, 2½ in. from the center of the inner hole to the bottom of the jaw —it was intended to have it conform to the present recommendation—which the committee believes it does.

T. H. Goodnow (L. S. & M. S.): I would like to ask Mr. Burton if they are satisfied with a two-hole connection in the adjuster—whether they have made investigations and have been able to overcome the necessity of the three-hole connection.

Mr. Burton: I am sure that the two-hole connection will be satisfactory, if you have a proper adjustment. It will also depend largely on the spacing of the holes. The spacing of the two holes is not shown here from the fact that any given spacing would not be suitable for all proportion of truck levers. That proportion must be worked out. The points on which the committee suggested that action should be taken and adopted for recommended practice are the defect card, the bottom rod, the annual repairs to freight car brakes and the adoption of the hose coupling and packing ring. I would move that the foregoing be received and submitted to letter ballot for adoption as recommended practice.

Mr. Goodnow: Not having had an opportunity to read over the report of the arbitration committee, I would like to know if the features included in this report which we are considering have been taken care of in the report of the arbitration committee, or whether we must wait for a year before it will go into the rules of interchange. I refer to the provision regarding the marking of the place, day, month and year when the triple valve was cleaned.

Mr. Hennessey: No, I will say that has not been taken care of by the arbitration committee in the report which it will present at this meeting.

Adam LaMar (P. L. W. of P.): I believe that is taken care of in rule 9 of the interchange rules, which reads as follows: "Knuckles removed and applied, whether open or closed."

Mr. Downing: I think it is an important point that the distance between the pin holes in Fig. 1 be specified, if you have to add four holes to the bottom connection. We have more repairs with wrong bottom connections on the cars today than any other thing we get, and if the association can get something we can put on, even if it is a hole or two too many, it will help us out. We have cars coming in with 10-in. piston valves, and we find that some road has put on the wrong connection, and that applies to the inside hung brakes as well as the outside.

Mr. Burton: In reply to Mr. Downing, regarding the four holes, I would say that I can see no objection to adding more than two holes if they are necessary to take care of the variation in the proportioning of truck levers, which the committee had in mind, but I do not believe it will take care of the wrong radius of cars on foreign lines, because the spacing of the inside hole will govern largely there, and the proportioning of truck levers also comes into play.

Mr. Downing: We had an interesting experience—we had four different lengths of levers—I cannot recall the lengths—but we cut them down to one or two levers by adding additional holes on the inside hung brakes.

Mr. Burton: I think the committee would be very glad to revise that cut, if it has the approval of the association, to show two holes at one end and three at the other, or three at each end, if desired, but still omit the dimensions. I think the dimensions would have to be omitted.

Mr. Garstang: I think the adding of a few more holes at each end, in view of the introduction of steel and steel-tired wheels in freight-car service, would be a good thing, and I move that the drawing show three holes in each end, in place of what is shown in the cut, two holes.

The motion was carried.

W. F. Bentley (B. & O.): There is one point under *Cleaning* which I think could be corrected by changing the reading a little, and might overcome some of the troubles which have been complained of here today, where the triple valves had to be cleaned too often. The part I refer to says that the triple valves, after being cleaned or repaired, must be tested, preferably on a rack conforming to the attached print. I think the word "preferable" should be cut out, because there is where most of the trouble comes from now. They are being tested from the yard-line pressure and from other different kinds of apparatus. They are unable to get the proper test; then the triple valve will show up defective in service, and other roads think that it needs cleaning again. Probably they in turn have no good way of testing them, and they are again put back on the car, and again give the same trouble. I think the word "preferable" should be cut out, and make it positive that they shall be tested on an approved testing rack.

Mr. Burton: In reply to Mr. Bentley's point, I think the cutting out of the word "preferable" would not make it binding that they should be tested on a rack, because it is simply recommended practice. The committee thought the word "preferable" would draw sufficient attention to the fact that it should be tested on a rack of that kind, and that if this rack test be made binding it would practically block any further developments in the rack as they come up from time to time, as has been done in the testing of triple valves. As far as the effect is concerned I think it would be as forcible if it remains as printed.

Mr. Burton's previous motion was then carried.

TEST OF BRAKE SHOES.

In addition to its usual duty of investigating the properties of brake shoes, the committee has, for two years past, given consideration to the standards applying to brake beams. This report accordingly deals with two rather distinct subjects, and it is presented in two distinct parts, brake shoes and brake beams.

BRAKE SHOES.

Outline of Tests as Agreed Upon in December.—Mr. Young, of the committee, was requested to act as a subcommittee to select and deliver to the laboratory samples of shoes used on heavy passenger cars in high-speed passenger service by the New York Central Lines, the Pennsylvania Lines and such other lines as might have shoes to submit.

It was agreed that the frictional qualities and the wear of the shoes submitted should be determined by applications to the 33-in. steel wheel of the Master Car Builders' brake-shoe testing machine in effecting stops at a speed of 80 m. p. h. All tests were to be at this speed, and brake-shoe pressures of 12,000, 14,000, 16,000, 18,000 and 20,000 lbs. respectively were to be employed. Each kind of shoe submitted was to be tested in triplicate; that is, three shoes nominally alike were to be subjected to tests for the determination of frictional qualities and wear.

It was agreed that in determining the wear under the foregoing conditions it would be sufficient to weigh the shoes after three applications. It was understood that between applications the shoe would be cooled to its initial temperature. It was agreed that no further investigations of wheel wear need be undertaken.

Mr. Kendig, of the committee, was requested to submit a summary of the results of the brake-shoe tests made under his direction in the fall of 1909 on the Lake Shore & Michigan Southern. Professor Schmidt was requested to submit the results of tests then in progress at the University of Illinois, which were designed to ascertain whether there is any material difference in the coefficient of friction as developed by the

use of the testing machine when the shoe is applied by weights, as in the Master Car Builders' testing machine, and when applied by means of an air-brake cylinder, as in service.

Axle Loads.—In any study of the possibilities of train braking, the facts concerning axle loads are of importance. From collected data it was found that an eight-wheel passenger coach of the Pennsylvania, weighing 119,000 lbs., gives the heaviest load per wheel, namely, a load of 14,875 lbs. Under the usual service applications the brake-shoe pressure would, of course, be less than this amount and could not, in the light of our present experiments, be regarded as excessive; but with modern equipment, in emergency applications, the brake-shoe pressure upon such a car may readily exceed 20,000 lbs.

Performance of Shoes Under Test as Set Forth in the Accompanying Report by Dean Benjamin.—The detailed report of tests which follows shows the precise results obtained as to coefficient of friction and wear from a considerable number of shoes when tested under the several different pressures up to and including 20,000 lbs. It is formally reported to the committee also that tests made at the laboratory of the University of Illinois have involved, without serious difficulty, brake-shoe pressures as great as 24,000 lbs. If it be assumed that a shoe in such service will rarely be called upon to withstand the conditions of an emergency stop from a speed as high as 80 m. p. h., it may also be assumed that shoes such as those tested may be regarded as reliable for such service. It is of the highest importance, however, to know that the value of the coefficient of friction decreases as



W. F. M. Goss.

Chairman, Committee on Brake Shoe Equipment.

the pressure upon the shoe is increased. So great is this change in the coefficient of friction for some shoes that the length of stop is reduced but slightly by increasing the pressure from 18,000 to 20,000 lbs. On the other hand, the wear of all shoes increases rapidly with increase of pressure.

The tests herein reported were made at a speed of 80 m. p. h., and since the previous work of the committee does not involve such speeds, it has been impossible to tie up the results of the present series with those which have already been made of record by the committee. For this reason, it is impossible to judge from them the sufficiency of the present specifications for use in selecting shoes for very high-speed service. It has been suggested that in all probability a shoe which gives the best results under the present specifications will at least give good results under the higher speeds and pressures, such as are now being considered. Under the circumstances, it was thought best to present the results as obtained for the information of members, in the hope that later a series of tests may be made under heavy pressures at different speeds, which will permit such results to be connected with those underlying the present specifications.

Coefficient of Friction as Determined Upon a Brake-Shoe Testing Machine When the Shoe is Applied by Weights and by Air.—By the courtesy of Professor Schmidt, the University of Illinois undertook to determine the effect upon the coefficient of friction as found by experiment when the shoe was quickly applied, as by weight, and when more slowly applied, as by air. The purpose of this inquiry was to settle the question as to whether results obtained on the testing machine were the same as those which would be expected under service conditions on the road, conditions of speed and pressure, of course, being the same. The following brief report from Mr. A. S. Williamson, giving the results of such tests, may be accepted as conclusive evidence that the results are substantially the same in both cases: "Responding to the request of the brake-shoe committee, tests have been made upon the brake-shoe testing machine of the University of Illinois, in the course of which the shoe has been dropped upon the

INITIAL SPEED 80 MILES PER HOUR. BRAKE SHOE PRESSURE 16000 POUNDS.

NO. OF SHOE	DESIGNATION OF SHOE	STANDARD OF	COEFFICIENT OF FRICTION		LOSS per 100000000 Ft. POUNDS OF WORK DONE- IN POUNDS	
			EACH SHOE	AVERAGE FOR EACH KIND	EACH SHOE	AVERAGE FOR EACH KIND
I	II	III	IV	V	VI	VII
333	CONGDON	B & O.	8.80	8.68	2.92	2.36
336	CONGDON	B. & O	8.56		1.80	
339	PLAIN CAST IRON	PENN.	9.34	9.19	5.06	4.58
340	PLAIN CAST IRON	PENN.	9.04		4.10	
345	SPEAR MILLER	C.B & Q	8.15	8.42	5.06	5.03
346	SPEAR-MILLER	C.B & Q.	8.70		5.01	
351	NATIONAL	C.M & St P.	8.60	8.67	5.02	4.00
352	NATIONAL	C.M & St.P	8.75		2.99	
357	DIAMOND-S	SOU. PACIFIC	8.46	8.73	4.20	3.44
358	DIAMOND-S	SOU. PACIFIC	9.01		2.68	
367	U-SHOE	NYC. LINES	8.96	8.72	4.98	4.94
368	U-SHOE	NYC. LINES	8.47		4.98	
376	PITTSBURG		17.20	1775	2.94	2.54 *
377	PITTSBURG		18.30		2.14	

* ACTUAL LOSS IN WEIGHT HAS BEEN MULTIPLIED BY 2.20 WHICH IS THE RATIO OF CAST IRON TO THE ABRADED PARTS OF THIS SHOE.

Fig. 1—Brake Shoe Pressure Tests: 16,000 Lbs.

wheel through the action of weights, and also by use of an arrangement of air equipment giving substantially the conditions of service. These tests were made with a great variety of shoes and under many different conditions of speed and pressure. Within the limits involved by these experiments, the mean coefficient of friction is practically independent of the manner in which the shoe is applied. The following results are typical:

DIAMOND S SHOE, Speed, 60 M. P. H.

Shoe Pressure.	Coefficient of Friction.
6,840 lbs.	13.95 (weights)
6,840 lbs.	14.15 (air)
12,000 lbs.	12.25 (weights)
12,000 lbs.	12.50 (air)

INITIAL SPEED 80 MILES PER HOUR BRAKE SHOE PRESSURE 20000 POUNDS

NO. OF SHOE	DESIGNATION OF SHOE	STANDARD OF	COEFFICIENT OF FRICTION		LOSS per 100000000 Ft POUNDS OF WORK DONE- IN POUNDS	
			EACH SHOE	AVERAGE FOR EACH KIND	EACH SHOE	AVERAGE FOR EACH KIND
I	II	III	IV	V	VI	VII
333	CONGDON	B. & O.	7.25	7.25	3.64	3.30
336	CONGDON	B. & O.	7.25		2.97	
339	PLAIN CAST IRON	PENN.	7.04	7.21	6.34	6.50
340	PLAIN CAST IRON	PENN.	7.39		6.66	
345	SPEAR-MILLER	C.B. & Q.		8.30		12.20
346	SPEAR-MILLER	C.B. & Q.	8.30		12.20	
351	NATIONAL	C.M. & St.P.	6.87	6.87	10.93	10.93
352	NATIONAL	C.M. & St.P.				
357	DIAMOND-S	SOU. PACIFIC	6.77	7.02	5.80	5.94
358	DIAMOND-S	SOU. PACIFIC	7.27		6.08	
367	U-SHOE	NYC. LINES	7.34	7.34	5.71	5.71
368	U-SHOE	NYC. LINES				
376	PITTSBURG		15.35	15.27	4.97	4.54 *
377	PITTSBURG		15.20		4.11	

* ACTUAL LOSS IN WEIGHT HAS BEEN MULTPLIED BY 2.20 WHICH IS THE RATIO OF CAST IRON TO THE ABRADED PARTS OF THIS SHOE.

Fig. 2—Brake Shoe Pressure Tests: 20,000 Lbs.

"The similarity of the coefficient of friction in the two cases is shown."

Recommendations.—In concluding the summary of the work of the past year, the committee recommends:

1. That some further work be undertaken by the association for the purpose of connecting the results obtained under high brake-shoe pressures with those upon which the Associations specifications are based.

2. That in the specifications of the committee, as presented in the report of 1910 paragraphs *c* and *f* be changed to read "steel or steel-tired wheel," instead of "steel-tired wheel."

The formal report of the tests made by Professor Louis E. Endsley under the direction of the committee during the current year is, in part, as follows:

"The tests were conducted upon the Master Car Builders' brake-shoe testing machine, a description of which will be found in the Proceedings of the Association for 1894 and 1906. The shoes tested were of seven different kinds. Six shoes of each kind were received at the university, and of this number two of each type, making fourteen shoes in all, were tested. None of the shoes had been in service prior to their receipt at the laboratory. All of the shoes were given a laboratory number. The numbers of the shoes tested are as follows: 333, 336, 339, 340, 345, 346, 351, 352, 357, 358, 367, 368, 376 and 377. A full description of each shoe tested follows:

INITIAL SPEED 80 MILES PER HOUR.

NO. OF SHOE	DESIGNATION OF SHOE	STANDARD OF	APPROXIMATE DISTANCE PER STOP IN FEET UNDER THE FOLLOWING BRAKE SHOE PRESSURES				
			12000	14000	16000	18000	20000
I	II	III	IV	V	VI	VII	VIII
333	CONGDON	B.&O.	2205	2070	1791	1600	1548
336							
339	PLAIN CAST IRON	PENN.	2472	1995	1755	1595	1656
340							
345	SPEAR-MILLER	C. B. & Q.	2495	2010	1910	1805	1424
346							
351	NATIONAL	C.M. & St.P	2403	2050	1835	1730	1698
352							
357	DIAMONDS	SOU. PACIFIC	2261	1925	1801	1551	1633
358							
367	U- SHOE	N.Y.C. LINES	2167	1964	1771	1660	1598
368							
376	PITTSBURG		1037	932	852	755	735
377							

Fig. 3—Distance of Stop Under Varying Pressures.

Shoe No. 333 was designated by the committee as a Congdon shoe, and was received from the Baltimore & Ohio. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 13¼ in.; width, 3⅜ in.; thickness, 1½ in. This shoe has five inserts, 1 in. wide by 2 in. long, running crosswise. Shoe No. 336 is similar to Shoe No. 333 and bears the same marking.

Shoe No. 339 was designated by the committee as a plain cast-iron shoe, and was received from the Pennsylvania. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 14 in.; width, 3⅜ in.; thickness, 1½ in. This shoe has no insert. It is reinforced with a steel back. Shoe No. 340 is similar to Shoe No. 339 and bears the same marking.

Shoe No. 345 was designated by the committee as a Spear-Miller shoe, and was received from the Chicago, Burlington & Quincy. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 13½ in.; width, 3⅜ in.; thickness, 1¾ in. The shoe has two V-shaped inserts. It is reinforced with a steel back. Shoe No. 346 is similar to Shoe No. 345 and bears the same marking.

Shoe No. 351 was designated by the committee as a National type, and was received from the Chicago, Milwaukee & St. Paul. The dimensions of the shoe when it was received at the laboratory were: Length, on arc, 14 in.; width, 3⅜ in.; thickness, 1⅝ in. This shoe has chilled ends and is reinforced with a steel back. Shoe No. 352 is similar to Shoe No. 351.

Shoe No. 357 was designated by the committee as a Diamond S. Christie type. It is also known as the half-flange type, having a flange of 2½ in. at each end of the shoe. It was received from the Southern Pacific. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 14 in.; width, 4 in.; thickness, 1½ in. The insert of this shoe is composed of a bundle of expanded metal, covering the entire face of the shoe. The shoe is reinforced with a steel back. Shoe No. 358 is similar to Shoe No. 357 and bears the same marking.

Shoe No. 367 was designated by the committee as a U shoe. It was received from the New York Central Lines. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 15¾ in.; width, 3⅜ in. and thickness, 1⅝ in. The ends of the shoe are tapered and chilled. The shoe is reinforced with a steel back. Shoe No. 368 is similar to Shoe No. 367 and bears the same marking.

Shoe No. 376 was designated by the committee as a Pittsburgh shoe. It was received from the Pennsylvania. The dimensions of the shoe when it was received at the laboratory were: Length on arc, 14 in.; width, 3⅜ in.; thickness, 1⅜ in. This shoe is made up of a pressed back, ⅛ of an in. thick, completely filled with a composition filler. Shoe No. 377 is the same as Shoe No. 376.

Schedule of Test.—So far as practicable, each shoe was tested upon a steel-tired wheel under the following brake-shoe pressures: 12,000, 14,000, 16,000, 18,000 and 20,000 lbs., the initial speed of the machine being in each case 80 m. p. h. At each of the above pressures nine stops were made.

Method of Testing.—In anticipation of a test, the shoe was given a number of applications until a full bearing surface was obtained, after which it was accurately weighed upon a pair of scales. The shoes were first tested at a pressure of 12,000 lbs., after which the pressure was increased by increments of 2,000 lbs. until a pressure of 20,000 lbs. was reached, or until the shoe broke or became unserviceable.

The loss in weight of the shoe was obtained by weighing the shoe after each three applications, thus giving a check upon the loss for each pressure. During the nine applications at each pressure, three cards were taken from which the coefficient of friction was obtained. It will be seen that some of the shoes failed before the pressure of 18,000 and 20,000 lbs. had been reached.

Between each application the shoe was cooled by a blast of air until the temperature was reduced to such an extent that the observer could bear his hand upon the shoe. This required from twenty-two to twenty-eight minutes between each application.

Results Obtained.—Fig. 1 gives the results obtained at a brake-shoe pressure of 16,000 lbs. Col. I of this table gives the number of the brake shoe; Col. II, the designation of the shoe; Col. III, the road on which it is standard; Col. IV, the coefficient of friction of shoe; Col. V, the average coefficient of friction of the two shoes of the same kind; Col. VI, the loss for each

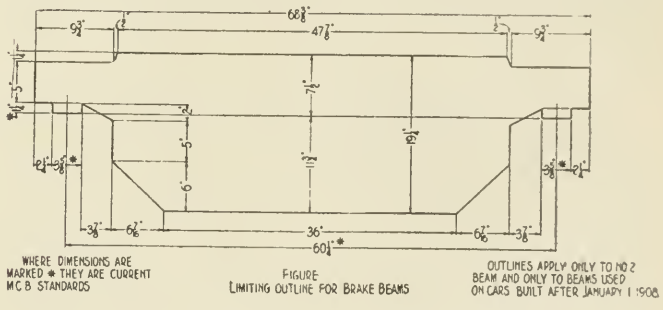


Fig. 4—Limiting Outline for Brake Beams.

100,000,000 ft.-lbs. of work done for each shoe; Col. VII, the average loss per 100,000,000 ft.-lbs. of work done for the two shoes of each kind.

Fig. 2 gives results obtained at 20,000 lbs. pressure.

Fig. 3 gives the approximate distance per stop in feet as obtained from the three cards taken at each pressure for the two shoes of each kind. Col. I of this table gives the number of the brake shoe; Col. II, the designation of the shoe; Col. III, the road on which it is standard; Col. IV, the approximate distance in feet during the stop at a pressure of 12,000 lbs.; Col. V, the approximate distance in feet during the stop at a pressure of 14,000 lbs.; Col. VI, the approximate distance in feet during the stop at a pressure of 16,000 lbs.; Col. VII, the approximate distance in feet during the stop at a pressure of 18,000 lbs.; Col. VIII, the approximate distance in feet during the stop at a pressure of 20,000 lbs.

Notes Concerning Tests.—Shoe No. 334 was selected as the second Congdon shoe for test. This shoe broke in two at the second stop at 12,000 lbs. pressure and no record was made. Shoe 335 of this same type also broke in two at the same pressure during the first stop.

All of the shoes, with the exception of the two mentioned above, stood nine stops at each of the pressures, 12,000, 14,000 and 16,000 lbs. All of these shoes, also, with the exceptions of Nos. 352 and 368, withstood nine stops at 18,000 lbs. pressure, but these two broke at the first stop at 18,000 lbs. pressure. No record, therefore, was obtained for these shoes at this pressure.

Shoe No. 345 broke at the ninth stop at 18,000 lbs. pressure. Shoe No. 336 broke after the third stop at 20,000 lbs. pressure, and the results from this shoes are based on the three stops. Shoe No. 333 and Shoe No. 351 stood only seven stops at 20,000 lbs., and the results from these shoes at this pressure are based on these stops. All of the other shoes tested and not

mentioned above, namely, Nos. 339, 340, 346, 357, 358, 367, 376 and 377, stood nine stops at 20,000 lbs. pressure.

The coefficient of friction of all but two kinds of shoes tested decreased as the pressure increased, the two exceptions being the plain cast-iron shoe and the National shoe. This is no doubt due to the fact that the composition of the outside layer of the shoe is not of the same texture as the inner layer, or that the heating and cooling of the shoe changed the material in such a way as to affect the frictional qualities. Also, the loss due to wear is increased as the pressure is increased in all but three kinds of shoes. These are the plain cast-iron, the National and the U shoe. Two of these kinds of shoes are the ones which showed the inconsistency in the coefficient of friction.

In order to check these seeming inconsistencies, either in the wear or frictional qualities, three shoes, one of each kind mentioned above, were again tested at 12,000 lbs. pressure after the tests at 18,000 lbs pressure had been conducted. In each case the seeming inconsistency practically disappeared, showing that tests of the outside layer of a shoe will not in all cases give similar results to tests of the inner material.

The coefficient of friction for all shoes, except one, are similar, there being less than two per cent. variation in any two sets of shoes. The one exception is the "Pittsburgh" shoe, which is a composition shoe, and gave practically twice the coefficient of friction obtained from any of the other shoes.

The wear is not uniform for the different makes of shoes, it varying from about 1.5 to over 5 lbs. per 100,000,000 ft.-lbs. of work done at 12,000 lbs. pressure and from about 3.5 to over 12 lbs. at 20,000 lbs. pressure. The loss is not much increased until a pressure of 18,000 or 20,000 lbs. is reached.

The distance per stop is about the same for all shoes but one, this shoe being the "Pittsburgh" shoe, which gave the highest coefficient of friction. Three of the shoes tested stopped the wheel in a less distance at 18,000 lbs. than at 20,000 lbs., and three of the other four shoes gave almost the same results at 18,000 as at 20,000 lbs. The only shoe that showed much advantage at 20,000 lbs. over that at 18,000 lbs. was the "Spear-Miller." This shoe became very hot and gave off a flame three or four feet long resembling a gas flame during the stop at 20,000 lbs. pressure.

BRAKE BEAMS.

Changes in Drawing of Brake Head.—The committee desires to recommend certain changes in the drawing of the standard brake head as shown on Sheet M. C. B. 17.

1. The dimensions of the upper-hanger hole have been made the same as the dimensions of the lower-hanger hole, to permit the use of the 1-in. hanger. This change was omitted from the drawing last year through error.

2. The inclination of 15/16 in. in 6⅛ in., as shown on the side elevation of the head on Sheet M. C. B. 17, is correct for the brake beam hung 14 in. above the rail, but is not correct for the standard 13-in. hanging for inside-hung beams. The drawing has been corrected to show an inclination of 19/32 in. in 6 in., to correspond to the 13-in. hanging, and all the vertical dimensions have been made to read from a line drawn through the center of the bottom-hanger hole and the center of the wheel. The contour of the head has not been changed in doing this.

3. The ribs bracing the under side of the lower shoe-bearing lug have been removed from the drawing, as these ribs are not actually being used on the heads to-day.

4. Sheet M. C. B. 17 shows a 5/8-in. radii at the ends of the shoe-bearing lugs, and the committee believes this only results in less bearing area and is of no value, and accordingly the drawing has been changed to show a ⅛-in. radius at this point and the side of the lug has been slightly tapered.

The committee recommends the adoption of these changes, which we believe to be improvements in the design of the head, without affecting its interchangeability with heads and shoes now in service.

Review of Recommendations 4 and 5 of the 1910 Report.—Among the several recommendations made by your committee at last year's convention there were two, numbers 4 and 5, which were rejected on the letter ballot. They are as follows:

"That all No. 2 beams used on cars built after January 1, 1908, shall be of such dimensions that all parts of the beam will lie within the outline shown in Fig. 10 of this report, and that this outline be shown among the standard drawings.

"That on page 591 of the Proceedings for 1909, the seventh paragraph, relating to beam No. 2, be changed to read: 'Beam No. 2 must be used on cars of more than 35,000 pounds light weight, and it may be used on cars of 35,000 light weight or less.'"

For the purpose of ascertaining the reason for the objection to these two recommendations, the committee early issued to the membership of the Association a circular of inquiry, asking the roads which voted against these propositions to state their reasons to the committee. The purpose of this procedure was to secure for the committee such information as would permit it to modify the recommendations so as to make them acceptable to the objecting roads. A meager response, only, was returned.

Some of the suggestions received in reply to this circular are conflicting, but they have all been combined, as far as possible, to form a new diagram as is shown in Fig. 4.

The principal points raised related:

1. To the distance from the face of the brake head to the back of the beam, which has been changed from 5½ in. to 5 in.

2. With steel or steel-tired wheels, which may be reduced to 30 in. in diameter, there is danger with a deep beam of having the fulcrum strike the axle.

3. The location of the diagonal lines limiting the tension members of the beam has been changed to avoid confliction with some beams which are now in service.

The diagram shown in Fig. 4 is submitted for the consideration of the members with the same recommendation with which the diagram was submitted last year.

Having presented the discussion so far as it could be developed, your committee would resubmit for discussion recommendations 4 and 5 as above given, with the request that they be so modified at the convention as to make them acceptable to the members.

The report is signed by:—W. F. M. Goss (Uni. of Ill.), chairman; C. D. Young (Penn.), and R. B. Kendig (N. Y. C.)

The report was presented by C. B. Young in absence of Prof. Goss.

DISCUSSION ON BRAKE SHOE EQUIPMENT.

The President: The recommendations of the committee in the first part of this report, which is the part that we will consider first, are, in substance, that some further work be undertaken by the association for the purpose of connecting the results obtained under high brake shoe pressures with those upon which the association's specifications are based. Also, that in the specifications as presented in the report of 1910, paragraphs "c" and "f," be changed to read "steel or steel-tired wheel" instead of "steel-tired wheel."

C. E. Fuller (U. P.): Mr. President, I move that the recommendation of the committee, reading: "That some further work be undertaken by the Association for the purpose of connecting the results obtained under high brake-shoe pressures with those upon which the Association's specifications are based," be referred to the in-coming executive committee.

I also move that the secretary be instructed to change the reading as presented in the report of 1910, paragraphs "c" and "f," to "steel or steel-tired wheel" instead of "steel-tired wheel."

The motion was seconded.

T. L. Burton (C. of N. J.): Before the motion is put, Mr. President, I would like to inquire as to the operation of this testing machine. The committee states that the shoes were tested under varying pressures, the initial speed of the machine being, in each case, 80 m. p. h., and that at each of these pressures nine stops were made. The resulting coefficient is tabulated later on in the report. Were any provisions made in those tests for varying the axle weight or the wheel weight of the testing machine so that the preferred breaking power remained practically constant?

My reason for making this inquiry is that in raising the brake-shoe pressure from 12,000 to 20,000 lbs., if the wheel weight remains constant it will increase the percentage of the braking power about twenty-three per cent. Naturally, all other things being the same, the stop would be materially shortened and the coefficient friction would naturally run higher than if the wheel weight were increased. So that 20,000 lbs. pressure would represent the same braking power that 12,000 lbs. would. In other words, in putting the pressure up you introduce the very important factor of the time element on the coefficient of friction. It is my understanding that the M. C. B. testing machine did not provide for varying the wheel weight, unless it has been done recently.

Mr. Young: I can only say that the machine is so constructed that it has a falling weight which gives the shoe pressure. It gives the wear of the shoe with any pressure upon the wheel at a corresponding speed. The inertia of the machine is the same throughout any of the varying pressures, whether 12,000, 16,000, 18,000 or 20,000 lbs.

Mr. Burton: Then is it not true that the coefficient of friction shown by the high pressures is materially higher than one would expect in service with the lower percentage

of braking power? The point I am endeavoring to get at is that I want to emphasize the ill-effect that we get from these tremendously high shoe pressures due to the loss of the coefficient friction.

Mr. Young: I believe that the question raised by Mr. Burton ought to be referred to the committee, because I do not feel that I am fully qualified to answer. My judgment would be that the coefficient would be about the same for each of these pressures, regardless of the percentage of braking power. There may be some increase in the coefficient with the testing machine as it stands now, but if so it is very slight.

Mr. Fuller: I will incorporate the suggestion made by Mr. Young in my motion that this be referred back to the committee. It is a very important point, and one that I think should have full and deliberate consideration.

The motion was carried. The second part of the report was then considered.

C. D. Young: The recommendations for brake beams are the same as for last year as regards paragraphs 4 and 5, with the substitution of the diagram shown in Fig. 4 for old diagram 10.

R. L. Kleine (Penn.): Paragraph 4 under *Brake Beams* states that the drawing has been changed to show a ¼-in. radius at this point and the side of the lug has been slightly tapered. The illustration shows that connection to be 1/16 of an in.

C. D. Young: That is a mistake.

The President: Mr. Burton, Professor Endsley has just come in the room, and perhaps he can answer the question that you put to Mr. Young a moment ago.

Mr. Burton: The question that I raised, Professor Endsley, was in relation to increasing the brake shoe pressure without increasing the wheel load of the brake shoe machine so as to maintain a constant percentage of coefficient friction, and I raised the point whether or not we would have the right to assume that the coefficients shown under different pressures are due solely to the variations in the pressures, or whether they are due in part to a variation in the braking power. That is, if we put on the pressure from 12,000 to 20,000 lbs., why it is increased 23 per cent., about, and the stops naturally will have to be shortened and the time element is shortened.

T. E. Endsley (Purdue Univ.): Well, the only thing we can do is to use the one weight of wheel. That is equivalent to a car weighing 145,000 lbs. with 12 wheels under it. There was no difference made in choosing the different per cents. All that was done was choosing different brake shoe pressures upon a given car, like you would take a Pullman car and decide whether you were going to use 12,000 lbs. or 20,000 lbs. brake-shoe pressure. Of course, there would be some difference if you increased the rotary energy of your wheel. If you increased the rotary energy of your wheel it would decrease the coefficient friction—that is, on some brake shoes, and on other brake shoes it would increase it, because some are a little larger hot and cold, and others smaller hot and cold. But here in the test referred to in this report all that was done was to use what was equivalent to a Pullman twelve-wheel car.

The President: Referring again to part 2 of the report, the paragraphs under review of recommendations 4 and 5 contain the statement of the committee that these recommendation were defeated last year by letter ballot, and they would like to have it discussed, if possible, this year. Mr. Seley, can you give us any light on the matter?

C. A. Seley (C. R. I. & P.): I only recall that I did object to the diagrams as presented last year for some minor change, but I cannot see that I object to it at all now, and therefore I move that the recommendation of the committee be adopted and reported to the membership for letter ballot.

The motion was carried.

A railway which was constructed years ago, connecting Llanymynech-Westbury, England, with Shrewsbury, with a total length of 28 miles, has been reopened after having been closed, by order of the Board of Trade, for 31 years. Twenty years of almost continuous running at a loss had put the road in a bad state of repair. Now it is run more economically and is working in connection with the main line railways with which it connects. Its chief advantage will be in carrying stone from Wales to Shrewsbury and the Midland.

M. C. B. RECEPTION.

The annual reception by the officers of the M. C. B. Association was given in the Blenheim Exchange, of the Marlborough-Blenheim hotel, at 9.00 o'clock last night. Before the receiving line formed, the Cadets de Gascogne, in costume, gave a musical entertainment from the balcony. They are three men and one woman, and sang selections in both Italian and French. After the reception there was informal dancing. Refreshments were served in the ball room.

The committee in charge of the reception consisted of F. B. Ernst, Chairman; F. M. Nellis, L. B. Sherman, Ross F. Hayes, Charles A. Knill, George R. Carr, Harry S. Hammond, W. J. Walsh and E. E. Silk.

THIS AFTERNOON'S ENTERTAINMENT AT THE CASINO.

Miss Beatrice Herford, whose monologues are in a class by themselves, will give one of her entertainments at the Brighton Casino at 3 o'clock this afternoon. No one who has heard or read one of her delightful "take-offs" needs urging to go again. Admission will be by badge. The Casino is on the Boardwalk between the Traymore and the Marlborough-Blenheim.

OPERATION OF SUPERHEATER LOCOMOTIVES.

One of the characteristic results of the operation of superheater engines is the sense of security on the part of the engineer. This is manifested by the request to be assigned to these engines rather than to saturated engines. The superheated steam engine has enough reserve power to make up considerable lost time in an emergency; and under ordinary conditions it always has full steam pressure.

In starting out of the engine house, care should be taken, as on the saturated steam engine, to have the cylinder cocks open and to drain away all water resulting from condensation owing to the engine having stood still for a long period. In general it is not at all necessary to open the cylinder cocks on the roads, as is often the case with the saturated steam engine. With full boiler pressure, and as a result of the larger cylinder diameter gained with superheated steam engines, a little greater care is required in starting not to slip the drivers; an extremely light throttle is all that is necessary to start. On the road, however, a full throttle and a short cut-off cannot be to strongly advocated, as the beneficial results obtained in nearly every case where they have been used have proved. In starting, however, for a short time a full cut-off should be used, which will give full valve travel and thoroughly lubricate all surfaces in a manner to guard against trouble.

Arrangement of the superheater damper and its cylinder is such that the engineer can easily ascertain at any time whether the damper is working properly. The counterweight on the damper shaft is located on the right hand side of the smoke box and its movement is upward when the throttle is open, and downward when the throttle is closed plainly shows the way in which it is working. The firing of the superheater engine calls for the same general practice as the firing of the saturate engine, but the advantages of light and regular firing are greater because good firing means a higher fire-box temperature, an increase in the degree of superheat, or a higher temperature to the steam, and, therefore, a maximum coal economy, and the best all-around results.

A new speed recorder is being tried on the Prussian State Railway which records at the stations the speed of the train for every half-second, and, moreover, shows the intervals between trains which follow one another.

Conventionalities.

Mrs. M. H. Coates, mother of Frank R. Coates, spent Saturday and Sunday at Atlantic City.

H. L. Ingersoll, assistant to the general manager of the New York Central, is expected to be in attendance at the convention today.

F. H. Greene, president of the Hale & Kilburn Company, was suddenly called away yesterday because of the death of his father at Toledo, Ohio.

W. C. Bower, the new purchasing agent of the New York Central and formerly assistant to President Brown, spent Sunday and Monday in Atlantic City.

Blake C. Howard, son of George C. Howard, is attending the convention with his father. Mr. Howard is a student of architecture at Washington University.

A. T. Hardin, assistant general manager of the New York Central, arrived yesterday afternoon, and is staying at the Marlborough-Blenheim. Mrs. Hardin is with him.

P. A. Martin, superintendent of equipment of the National Car Line Company, arrived Friday and registered at the Traymore. Mr. Martin is one of the M. C. B. workers.

George Barden is earning a reputation as a faithful attendant at the conventions, for, in truth, he has been with us for many years. Mrs. Barden is with him this year; they are at Young's Hotel.

G. W. Wildin, who busted the bat in the game on Saturday and had one of his fingers badly bruised near the close of the game, spent a quiet Sunday getting rested up. The finger is still badly swollen.

W. P. Richardson, mechanical engineer of the Pittsburgh & Lake Erie, came in Sunday afternoon and spent most of the night on the boardwalk. Business is so lively he had to return home last night.

Norman C. Naylor, of the Railway Steel-Spring Company, is attending the convention this year for the first time, notwithstanding the fact that Mr. Naylor has been in the service of the company for many years.

C. E. Mead arrived yesterday morning from Niagara Falls, and expects to remain until the close of the convention. Mr. Mead is making his headquarters at the Marlborough-Blenheim, where the family tepee is pitched.

James S. Stevenson, general manager of Berry Brothers, is attending his first M. M. and M. C. B. convention. His bodyguard consists of D. W. H. Moreland, Walter F. Warriner and H. P. Stephenson.

W. W. Melchet is attending this meeting for the Massachusetts Mohair Plush Company. Mr. Melchet succeeds Mr. Seabury, who will be remembered as one of the active committeemen at past conventions.

I. S. Downing, master car builder of the Lake Shore, is still walking with a heavy cane and limping slightly, owing to an injury in Saturday's ball game, when O'Brian landed on top of him in putting him out at second.

J. J. Hennessey, master car builder of the Chicago, Milwaukee & St. Paul, arrived yesterday and is stopping at the Chalfonte. With Hennessey, Schroyer and Brazier on the job we need have no fear of dull or commonplace meetings.

C. A. Schoyer, superintendent car department of the Chicago & North Western, is one of those who are using their good efforts to get the younger men interested in the work of the association. When he was nominated for treasurer yesterday he courteously withdrew in their favor, at the same time remarking that the job offered no temptation to him since the association in its life of 45 years had only succeeded in accumulating $1,100.

The white flannel suit, white shoes and white socks (oh, everybody's seen 'em) worn by the exquisite C. J. Donahue, of the American Locomotive Company, have certainly contributed their share toward the brightness of the assembly at the Marlborough-Blenheim.

R. L. Doolittle, of the Atlanta, Birmingham & Atlantic, whose title was recently changed from master mechanic to superintendent motive power, is stopping at Young's. He is probably the tallest railway man in attendance at the conventions.

Frank Reagan, recently appointed shop superintendent of the Delaware, Lackawanna & Western, is one of the younger men who were brought up and developed in the Lake Shore. He is in attendance at the convention and is stopping at the Belleville.

I. B. Thomas, formerly master mechanic of the Pennsylvania at Altoona and recently appointed superintendent motive power of the Erie division of the Pennsylvania and the Northern Central, arrived yesterday, and is busy receiving congratulations on his promotion.

Mr. and Mrs. C. W. Sherman and Mr. and Mrs. G. P. Warner, all Buffalonians, are now entrenched in the convention festivities, and will stay until the close. Mr. and Mrs. Sherman are at Haddon Hall, and Mr. and Mrs. Warner are at the Chalfonte.

C. H. Cory, an honorary member of the M. C. B. Association and formerly superintendent motive power of the Cincinnati, Hamilton & Dayton, is at the Dennis. Mr. Cory is one of the older members and his friends are glad to see him looking so well.

William McWood, president of the association during 1888, 1889 and 1890, was greeted enthusiastically when introduced yesterday as the oldest living president. The conventions at which he presided were held at Alexandria Bay, Saratoga and Old Point Comfort.

H. C. Martin, freight traffic manager of the Grand Trunk, accompanied by their guest, Miss Shallmiller, of New York, are in Atlantic City attending the conventions and are stopping at the Chalfonte. The trip to Atlantic City is in celebration of Mr. and Mrs. Martin's wedding anniversary.

President Curtis was delighted with the attendance at the meeting yesterday and at the interest which the members showed in the subjects under discussion. He has been watching the meeting from the platform for the past two or three years and says that the improvement in interest is very marked from year to year, and especially so this year.

Last week the M. M. Association had some difficulty in finding a representative of the Traveling Engineers' Association. The M. C. B. Association is more fortunate, for W. O. Thompson, master car builder of the New York Central at Buffalo, who is secretary of the Traveling Engineers' Association and was one of its founders, arrived yesterday.

What happened to Mayor Stoy? He didn't show up yesterday morning to open the M. C. B. meeting. Further, following the notice in *The Daily*, the badge given to the Mayor by the executive committee was handed to Chairman Ostby, of the enrollment committee, bright and early yesterday morning by someone who had found the decoration. The question is, "Did the Mayor have his police card with him Sunday night?"

Many will welcome the attendance of J. J. Ryan, superintendent of motive power of the Harriman Lines of Texas,

a member of both associations, who is stopping at the Marlborough-Blenheim. Mr. Ryan has seen 34 years of continuous service in the motive power and car departments. H. J. Small, general superintendent of motive power of the Southern Pacific has seen upwards of 30 years of continuous service, and J. R. Cade, master car builder of the Galveston, Harrisburg & San Antonio, has served continuously 37 years.

C. S. Rea, of the Ralston Steel Car Company, met an old friend here yesterday in Doctor Irvin J. Morgan, organist and choirmaster of Trinity Episcopal Church, of Pittsburgh. Dr. Morgan is here to give a concert at St. James' Church, North Carolina and Pacific avenues, this evening at 8 o'clock. Dr. Morgan is a famous musician, having been organist at Westminster Abbey before coming to this country. Admission to the concert will be free, and perhaps some attending the conventions may choose to make it a prelude to tonight's ball.

J. Will Johnson and S. T. Fulton met on the pier yesterday for the first time in some years. They used to ride on the same train every once in a while down on the Frisco Lines; but they didn't see much of each other en route, for they were at different ends of the train. Johnson, on those trips, was at the throttle of the engine pulling the train on which was Vice-President B. L. Winchell's car, while Fulton was back in the car with Mr. Winchell, who was his chief. Both are now taking money away from the railways by selling them supplies instead of by drawing salaries.

S. T. Fulton, who is attending the convention, formerly was assistant to the president of the Rock Island Lines when B. L. Winchell was their president. He went with the Railway Steel-Spring Company a little over a year ago. Being new to the supply business, he did not attend last year's conventions. This is therefore his first visit. Mr. Fulton was associated with Mr. Winchell back in the days when the latter was president of the Kansas City, Fort Scott & Memphis. He then left railway work and engaged in the coal business. So this is not the first time he has broken from transportation to commercial business. It was Mr. Winchell who later tempted him back into railway service.

Secretary Taylor read the following letter in the convention yesterday:

"June 7, 1911.

"For the first time in many years I shall not be at the convention. Continued bad health has compelled me to make my residence in California, where I hope to partially regain my health, at least. This is a beautiful section of the country. There is everything here to please the eye, but I wish I could be at Atlantic City with you. Wishing the association at its convention all possible success, I am,

"Yours sincerely,

(Signed) "W. E. Fowler,

"Past President of the Association."

Warren J. Lynch, fourth vice-president of the American Steel Foundries, is attending the conventions for the first time. He took his present position only a short time ago, having previously been passenger traffic manager of the New York Central Lines West of Buffalo. It is not an uncommon thing for a man to go from the operative department of a railway into the supply business. It is a very uncommon thing for one to go as Mr. Lynch has from the traffic department into the supply business. But Mr. Lynch was a passenger man who did not confine his study and observation to the traffic department. There was nothing about a railway that did not interest him, so the change from selling passenger transportation to selling supplies is not proving violent.

Charles A. Knill, who was Chairman of the base ball committee, is gradually recovering from the effects of the exertions necessary to pull off last Saturday's game. Mr. Knill deserves a lot of credit for the game's success. It took a great deal of work, both before and since the beginning of the conventions, to make and carry out the plans for it; and the job was mighty well done.

In conclusion, The Daily apologizes to the base ball Chairman for calling him "Charles M. Knill" in its account of the game. It takes a jolly good fellow not to be irritated by recognition of a good job in the form of a wrong statement of his name, and "Charley" Knill is a good fellow—as every one attending these conventions knows.

One of the familiar faces in the eastern base ball team which did not appear among the pictures in *The Daily* on Monday was that of Leonard J. Hibbard. Hibbard has played in every game at these conventions for years, was chairman of the base ball committee last year and was one of the star performers on the eastern team this year, making the only two-base hit for his side. Because several of his friends have called attention to his absence from the pictorial array, the base ball editor of *The Daily* has been laid off until next June. Certain other players were not included, some from lack of space, and others, like Flemming and Jones, because they got into the game after our photographer had exhausted his films and legs. If we ever try a thing like that again, we shall have to get our photographer more films and better legs.

H. F. Wardwell, superintendent power and equipment of the Chicago & Western Indiana, is attending the convention for the first time. He is accompanied by Mrs. Wardwell, and they are at the Traymore. Mr. Wardwell was formerly with the Hicks Locomotive & Car Works. Prior to that he was for some years chief clerk to President F. A. Delano, of the Wabash, and in that capacity he set a good example to numerous other chief clerks to executive officers in his ever considerate and tactful treatment of visitors to his chief's office, in consequence of which he made numerous friends for himself and helped enhance the great popularity of his chief. Mr. Wardwell began his railway career as a machinist's apprentice on the Burlington, and while he was out of the mechanical department some time, his main interest has always been in it.

The name of J. W. Marden (B. & M.) has been proposed for life membership in the M. C. B. Association. The proposal has been approved by the executive committee, and his name will be posted for voting on Wednesday.

J. W. Fleming, who has been a member of the association since 1881, has also been proposed for life membership. He was chairman of the passenger car department of the Chesapeake & Ohio for many years; he was injured and has been unable to do any work since. This proposal also has been approved by the executive committee, and his name will also be posted for voting on Wednesday.

Prof. C. E. Schmidt, of the University of Illinois, has been proposed for associate membership. As required by the constitution, action on this proposal will be taken at next year's meeting. Prof. Schmidt was graduated from Stevens Institute of Technology in 1895, and for three years thereafter was engaged in practical work. This was followed by five years as an instructor in the University of Illinois, and in 1903 he resigned to enter into practical work again. For three years he was engaged with various phases of steam engine design and construction. In September, 1910, he was appointed professor of railway engineering in the University of Illinois.

The Hungarian State Railways are under the direction of the Minister of Commerce, who is overwhelmed with other duties. The recent death of this Minister, Karl vonHieronymi, has been the occasion of a movement to divide the duties between a Commerce Minister and a Transportation Minister, which latter will have not only the railways, but navigation, telegraphs, post-offices, telephones, highways and river and harbor improvements in his charge.

STEEL POSTAL CARS FOR THE PENNSYLVANIA.

The Pennsylvania System has recently received from the American Car and Foundry Company, New York, seven 70-ft. steel postal cars. These cars were built at the Berwick Shops from the railway company's designs. The cars are equipped with six-wheel steel trucks and weigh 124,700 lbs. The center sills consist of two 18-in. channels weighing 44.2 lbs. per foot, with ½-in. top and bottom cover plates. The side sills are 5-in. x 3½-in. x 9/16-in. angles. The end castings are cast steel. Cantilevers of ⅜-in. pressed steel plates extending from center sill channel to side sill angle and are secured to the center sills by ⅜-in. steel tie plates. The side posts are ⅛-in. pressed steel plates extending from side sill angle to deck sill. The corner posts are built up of Z-bars and cover plates. The end door posts are 12-in. channels weighing 31.5 lbs. per foot, with ⅛-in. cover plates. The deck plates are ⅛-in. pressed steel. The cars are sheathed with ⅛-in. steel plates and lined with 1-16-in. plate secured to light angles which are riveted to the side frame. The roof sheets consist of .080-in. steel plates with Nos. 14 and 16 gage sheets at ends. The headlining is made up of aluminum plates 1-16-in. in thickness. The floor sheets are corrugated iron .060 in. thick, having corrugations ¾-in. deep, with 2½-in. pitch and are covered with monolith cement 1½-in. deep.



70-Ft. Postal Car; Pennsylvania Railroad.

The sides and roof of car are insulated by means of 3-16-in. ceilinite glued to the inside lining and headlining sheets.

The paper cases, drop tables, etc., are built up from 1-16-in. steel plates reinforced with light steel angles. Westinghouse air brake schedule P.M. 1612 is used with an automatic slack adjuster and air signals. The heating equipment is the Chicago Car Heating Company's vapor system. The cars are lighted by



All Steel Postal Car; Pennsylvania Railroad.

electricity generated by the Gould axle system, and are equipped with sixteen Tungsten lamps of forty candle power. The Pitt coupler with centering device is used on these cars in connection with Westinghouse friction draft gear.

THE OIL FURNACE IN SMITH SHOP AND FORGE.

In the development of railway shops, the blacksmith department frequently is not fully considered. In the days of hand forging from open fires this was possibly excusable, as the best heating arrangements were crude and did not then, as now, control the output of the shop. However, as the forging machines, bolt headers and bulldozers were developed, the heating facilities became the governing factor and called for consideration more careful. The coke furnace was the first advance made in this development, and in so far as the quality of the heat was concerned, it was very satisfactory, a clean and quick heat being the most important requisite. As the machine possibilities became better understood this method was found too slow, simply because it required too much time to start the day's work and too much attention for cleaning and rebuilding during the day, all of which resulted in high priced machines standing idle much of the time. These conditions, coupled with a desire to rid the shop of the objectionable gases from coke fires and to put to better use the valuable floor space occupied by coke bins, were the direct causes resulting in the development of gas furnaces for those located in or near gas fields and oil furnaces for the less fortunate majority.

It was a very simple matter to burn oil if compressed air was available; the university adopted theory of oil combustion was then based upon a purely mechanical operation of atomizing the fluid. This, in practice, consisted of simply breaking up the oil with the air pressure into very minute particles or globules, so that the maximum surface of the oil would be presented to the air supplied for combustion. The apparent simplicity of the operation resulted in a very general use of oil as a fuel and the development of a great variety of so-called atomizing burners, shooting the oil directly into the furnace. Unfortunately practice did not sustain the theory. Perfect atomization was impossible and unburned oil reached the material being heated, considerable of it even leaving the furnace with the products of combustion. Furthermore, the heat absorbed in the early stages of breaking down the oil to the gases was not in the natural process of combustion returned, but was carried from the furnace with the products of incomplete combustion and wasted. The unburned oil in the furnace was injurious both to material and dies and the slowness of combustion, coupled with the high velocity of the operation, caused a serious loss of heat through the stacks. Fire boxes or combustion chambers were not satisfactory on account of the destructive cutting effect of the high pressure upon the furnace linings, and furnaces large enough to complete a combustion cycle, enabling the iron or steel to absorb heat before it left the furnace, were too large for convenience.

Steam was frequently used instead of compressed air and it is interesting to note that the claim was often made that the use of steam enriched the fuel on account of the hydrogen it contained; in fact, the same argument is occasionally heard to-day. This system, while producing a furnace far superior to the old type, was not equal to the demand of the machines, was expensive on account of the high cost of compressed air and was a nerve-racker on account of the noise produced.

Finally the use of low pressure burners was inaugurated by the invention of a system using a double blast and requiring but a few ounces of fan pressure. This process first gassified the fuel by partial combustion and with a secondary air supply completed the operation. On account of the low pressure, the combustion chamber was found practical and the resultant heat of combustion was made available immediately upon entering the furnace proper. This, coupled with the low velocity and softness of the flame, reduced the loss in products of combustion to a minimum and made small furnaces possible. After years of development we now have oil furnaces specially designed for certain classes of work and the heating facilities of our railway smith shops have reached a high state of efficiency, many of them having installed small, clean furnaces which have brought up the capacity of the forging department to equal or exceed the machine shop requirements.

This condition put the output directly up to the forging machine operator and has developed some exceptionally good work. For instance, daily outputs of 3,600 1-in., 6,000 ¾-in., 7,000 ⅝-in. or 8,000 ½-in. square head car bolts are obtained in regular practice from one machine and a small furnace of this type. Forty thousand button head 3-in. by ¾-in. rivets, or a corresponding output of square head car bolts, is the day's output from one automatic machine where this equipment is in use. In heavy hammer work, heating in a 5 ft. by 8 ft. two-door furnace, 4,700 lbs. of finished shape work, such as main and side rods, transmission bars, eccentric rods, etc., or 64 finished slabs of 300 lbs. each piled from scrap in 10 hours, is a day's work in one of the larger shops. Another shop is turning out 135 engine truck cradle hangers weighing 23 lbs. each, as a day's work, with one machine and furnace. Petroleum is the natural fuel for the general line of furnaces required in railway shops. It has a high calorific value and intensity, is easily handled and is abundant in nature. Properly burned, it makes a clean, soft and quick heat.

ARBITRATION COMMITTEE.

There will be a meeting of the committee on arbitration this afternoon at 4 o'clock in the Greek temple. Any members of the association who have suggestions to make are asked to come to this meeting and make them, so that the matter may be threshed out there rather than on the floor of the convention.

The presentation of the committee's report has been postponed from Tuesday to Wednesday.

FOREIGN RAILWAY NOTES.

An Imperial Chinese decree orders a survey for the purpose of devising a system of railways to connect all parts of the Empire.

The Russian Council of Ministers has considered the general question of Siberian railways and favors the construction of the Semipalatinsk-Barnaul-Novo-Nikolaieffsk Railway at the expense of the treasury. At the present time in view of the applications made from the interested towns the council approves the construction of the Altaisk railways on a concessionary basis with the object of having them completed as soon as possible. This line is likewise of great economic importance to the region it will traverse.

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Alter, William, G. F. C. D., Central R. R. of N. J., Elberon.
Barnum, Morgan K., G. S. M. P., Ill. Cent. R. R., Dennis.
Barry, J. J., M. M., Norfolk & Western R. R., Iroquois.
Bartlett, Henry, Gen. Mech. Supt., Boston & Maine R. R.
Benson, E. A., M. S., Pullman Co., Traymore.
Bentley, W. F., M. C. B., B. & O. R. R., Pennhurst.
Borrowdale, J. M., S. C. D., Ill. Cent. R. R., Brighton.
Bossinger, H. C., G. F., Ches. & Ohio Ry., Pennhurst.

Butts, H. W., Master Car & Loc. Painter, N. Y. C. & H. R. R., Windsor.
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Boyden, N. N., M. M., Southern Ry., Pennhurst.
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Carr, W. K., G. C. L., Norfolk & Western Ry., Traymore.
Caton, S. W., Gen. Car Insp., Western Md. R. R., Monticello.
Chaffie, F. W., Gen. Car Insp., N. Y. C. & H. R. R., Dennis.
Corinth, A. B., Asst. S. M. P., A. C. L. R. R. Co., Dennis.
Cox, W. N., Supt. Transp. & Mach., Wellborn.
Craig, Andrew, Gen. Foreman, B. & N., Young's.
Craig, James, Chief Draftsman, B. & N., Young's.
Contant, M. R., M. M., Ulster & Delaware R. R. Co., Shelburne.
Cullinan, John, M. M., Central Indiana Ry., Arlington.
Davis, G. G., Gen. For. C. Dept., C. C. C. & St. L., Dunlop.
Davis, J. H., Elec. Engr., Balt. & Ohio R. R., Chalfonte.
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Dunlap, W. H., M. M., Louisville & Nashville R. R., Seaside.
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Eckhart, Jno., Jr., F. C. R., Erie R. R., Renova.
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Fryer, C. U., G. F. C. D., N. Y. O. & W. R. R., Chalfonte.
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Gray, G. M., S. M. P., Bessemer & Lake Erie R. R., Traymore.
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Hartman, F. B., Genl. Equip. Inspr., Southern Ry., Pennhurst.
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Johnson, J. O., Foreman Car Rep., Southern Ry., Sterling.
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Keagy, Chas. O., Gen. For., Penna. R. R. Co., Chalfonte.
Kearney, A., A. S. M. P., N. & W. Ry., Traymore.
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Lewis, Harvey L., For. Car Shop, Delaware & Hudson Co., Miller.
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Miller, E. T., Gen. Car Insp., B. & O. R. R., Young's.
Miller, Wm., G. F. C., E. & W. Div., Erie R. R., Monticello.
Mills, Wm., M. C. B., Algoma Central & Hudson Bay Ry. Co., Bothwell.
Minick, Eli, G. F. C. R., Lehigh Valley R. R., Monticello.
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Murrian, W. S., S. M. P., Southern Ry., Shelburne.
O'Donnell, T. J., Arbitrator, care of N. Y. C. Car Shops, Pennhurst.
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Brown, W. G., B. & O., Whitta.
Brown, Wm., Pa. R. R., 1504 Pacific.
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Clark, J. C., For., P. & R.
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Davis, W. H., M. E., N. Y., O. & W., Chalfonte.
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Dill, H. W., B. & O., Whittle.
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Donahue, C. M., M. P. Clerk, Penna. R. R., Chalfonte.
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Dow, T. W., Gen. Air Brake Co., Erie, Deville.
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Hauses, Percy, Draftsman, P. R. R., Dunlop.
Haynes, Bradley S., Jackson.
Haynes, J. W., Supt. Car Equip., C. & L. R. R., Jackson.
Hayward, J. R., N. & W. R. R., Haddon Hall.
Heckman, A. V., C. C. to Asst. S. M. P., N. & W., Iroquois.
Henderson, P. J., Armour & Co., Rudolf.
Hewett, E. F., Gen. For. Meadow Shop., P. R. R., Dennis.
Hepburn, M. J., Clerk M. P., Penna. R. R., Chalfonte.
Hipple, E. R., Clerk to Acc. Dept., K. & M. Ry. Co., Traymore.
Hitch, C. M., Gen. Car Foreman, C. H. & O., Chalfonte.
Holmes, Geo., Gen. Storekeeper, Mich. Cent., Marlborough-Blenheim.
Hornblower, J. H., C. C. to M. M., Penna. R. R.
Hukill, H. O., P. A., Penna. Lines West Pitts., Traymore.
Hukill, J. L., Penna. R. R., Brighton.
Hukill, W. S., Chf. Draftsman, P., Balto. & Wash.
Huntington, C. C., Gen. Storekeeper, L. V. R. R., Brighton.
Huntley, W. P., Gen. Foreman, C. & O., Elwood.
Ingersoll, G. R., Pur. Agt., L. S. & M. S. Ry., Marlborough-Blenheim.
Jansen, E. W., E. E., Ill. Cent., Brighton.
Jellison, B. T., Pur. Agt., Ches. & Ohio, Marlborough-Blenheim.
Johnson, J. C., For., P. R. R.
Justus, I. J., Special Inspector H. S. Dept., N. Y. Central, Pennhurst.
Karrigan, W. H., Chief Clerk, P. R. R., Chalfonte.
Karrigan, F. J., Chief Clerk, P. R. R., Chalfonte.
Kelly O. J., M. M., B. & O., New Berkeley.
Kelly, Geo. W., For. Blksmith, C. R. R. of N. J., Chalfonte.
Kern, Wm., For., B. & O.
Knapp, C. S., M. L., Pullman Co., Shelburne.
Lacey, A. B., P. A. Virginian, Dennis.
Lamberton, Admiral B., Retired, U. S. Navy, Marlborough-Blenheim.
Lane, R. H., Inspector Test Dept., Southern Ry., Chelsea.
Langley C. E.
Lehrsch, G. H., Strkpr., Bellwood Div. P. R. R., Iroquois.
Leet, W. B., M. P., Insp., P. R. R.
Lewis, A. E., D. & H., Miller House.
Lewis, C. E., Gen. For., Jersey City Pa. R. R., Young's.
Lillis, De F., Secy., G. S. M. P., R. St. M., N. Y. C. Lines, Marlborough-Blenheim.
Lotz, H. B., Genl. Foreman, P. R. R., Elwood.
Lucore, F. M., Asst. to Genl. Agt., Amer. Ry. Assn., Dennis.
Lukens, H. A., Purch. Dept., Penna. R. R.
Lutz, W. W., Supt., Rds., Lexington.
Lynch, Geo., Ch. Jr. Insp., All Lines Cleveland, Barton.
Lyons, T. F., A. B. Inst., L. S. & M. S.
McCormack, Ira A., Asst. Genl. Supt., N. Y. Central, Marlborough-Blenheim.
McDevitt, W. H., G. L., P. R. R.
McLean, E. Gen. For., South Altoona, P. R. R., Chalfonte.
Major, Thos., Motive Power Insp., P. R. R.
Marden, Leslie O., Guest, N. Y. C., Haddon Hall.
Markley, C. C., Pur. Dept., N. Y. P. & N. R. R.
Marshall, Geo., For. Jersey City, Pa. R. R., Young's.
Martin, M. J. W., Traymore.
Mayo, Frank, Foreman Sunnyside, P. R. R.
Mason, E. F., Asst. Eng., P. R. R., Chalfonte.
Mendenhall, D. H., Genl. Fman, P. R. R., Norwood.

Meriman, M., C. Clerk Motive Power, West. Md., Brighton.
Mervine, I. B., M. P. Clerk, W. J. & S. R. R., Traymore.
Mahar, F., M. M., N. Y. Central & H. R. R., Abbott.
Mahar, Wm., Asst. M. M., N. Y. C. & H. R. R., Abbott.
Minor, H. C., Inspector, Penn. R. R., Shelburne.
Montague, W. T., Office G. S. M. P., P. R. R.
Moore, Edw., C. M., Genl. For. Offi., W. J. & S.
Morris, W. W., Pur. Dept., P. R. R.
Morrison, C. A., Stm. Convention, Runnymede.
Mosley, W. S., Jr., Mech. Dftsman, C. C. & O. R., Traymore.
Mudd, Frank X., Gen. Mgr. Live Poultry Trans. Co., Marlborough-Blenheim.
Murhlelsen, J. A.
McMullern, John, Gen. For. Car., Erie, Chester Inn.
Mulholland, W. J., Pur. Agt., American Rwys. Co., Brighton.
Murray, J. S., President's Office, B. & O. R. R., Chalfonte.
Myers, J. H., Fman Car Shop, Penna. R. R., Elwood.
Nation, J. D., Trav. Eng., P. R. R.
Nelson, Wm J., Jr., Clerk Pur. Dept., Penn. R. R.
Nicholas, R. D., Gen. For., Cent. of N. J.
Norris, J. C., For. Con. Shop, Cumb. Valley, Strand.
Oakley, R. H., Gen. Car. Insp., Erie, De Villa.
O'Brien, E., Eng. For., Penn. R. R.
O'Dea, P. J., Asst. Supt. Car Dept., Erie R. R., Chester Inn.
Oren, J. W., Eng. House Foreman, N. Y. P. & N., Raymond.
Parker, Fred, N. Y. Central, Marlborough-Blenheim.
Parks, Geo. E., C. D., N. Y. Central Lines, New England.
Patterson, Geo. W., Ch. Clk. to Gen. Supt., Penna. Lines S. W., Sewickley.
Patterson, P. F., P. R. R., Columbia.
Pearsall, R. H., Mechanical Engineer, England, States Villa.
Peddle, C. R., P. A., Vandalia R. R., Young's.
Pierce, Harry, Sec., P. R. R., Maryland.
Price, Jas. H., M. P. Clerk, P. B. & W. R. R., Morton.
Pierce, Robt., For., P. R. R., Maryland.
Pletscher, H. B., Accountant, P. R. R.
Porter, W. M., Gen. For. Trenton, P. R. R., Young's.
Portner, W. H., Genl. Car Inspector, Alabama Great So., Clifton.
Powell, N. C., Yardmaster, Penna. R. R., Westminster.
Rafter, E. L., Special Apprentice M. P. Dept., P. R. R., Chalfonte.
Reilly, Thos. E., Spc. Agt. Supt. Ft. Trans., P. R. R., Chelsea.
Renner, C. W., Asst. G. F., P. R. R., Chalfonte.
Reyno, Elmer, Stkpr., P. R. R.
Rhodes, R. S., Elec. Dept., N. Y. Central, Iroquois.
Robbins, F. S., Asst. R. F. E., P. R. R., Haddon Hall.
Robertson, A. W., Pass. Dept., D., L. & W., Edison.
Robins, J. B., For. Pattern Makers, C. R. R. of N. J., Edison.
Roem, Otto, Ch. Clk., M. C. B., Mott Haven Shops, N. Y. C., Camblos.
Rourke, B., Engineer, Penna. R. R., Maryland.
Runk, W. H., Pipe Fitter, P. R. R.
Rupert, J. W., M. P. Insp., B. & O., Penhurst.
Russell, G. W., Genl. Equip. Inspector, N. Y., P. & N.
Russell, T. N., Genl. Insp. Car Dept., C. H. & D., Haddon Hall.
Rusling, W. J., Genl. Foreman, P. R. R., Chalfonte.
Salisbury, R. W., Insp., B. & O., Kenderton.
Schenck, E., Jr., Asst. M. M., Penna. R. R., Young's.
Schley, Winfield Scott, Admiral Retired, U. S. N., Runnymede.
Schuyler, A. J., Mech. Inspector, Virginia River.
Shapley, R. R., P. R. R.
Singleton, C. W., Shop For., P. R. R., Radnor.
Skelly, John J., P. R. R., Chelsea.
Sloan, J. R., E. E. C. L., M. P. Dept., Penna. R. R.
Small, Alfred, Chalfonte.
Small, Chas, Chalfonte.
Smith, E. J., Storekeeper, Harrisburg, P. R. R.
Spoor, Miss Lillian M., Haddon Hall.
Stanton, E., C. J. Car Insp., West Jersey & S. R. R., Westminster.
Starritt, W. A., Pur. Agt., C. C. & O., Strand.
Stewart, G. M., Master Blacksmith, P. R. R., Westminster.
Stewart, W. B., Clerk to S. M. P., B. & O., Colwyn.
Stoll, W. J., Chief Int. Insp., Dunlop.
Stone, H. H., Retired For., P. R. R., Chalfonte.
Sweetman, Edwd., South. Ry., Traymore.
Streib, J. F., Mech. Eng., Pitts. Al. & McKees, Marlborough-Blenheim.
Taylor, F. C., M. P. Inspector, P. R. R., Elmont
Taylor, J. C., For. Boiler Shop, N. Y. P. & N., Raymond.
Taylor, F. C., Inspector, Chalfonte.
Tebley, Rev. R. B., Penna. Y. M. C. A.
Thompson, W. T., Supt. Car Dept., Windsor.
Thompson, W. S., Div. Eng., Penn. R. R.
Tonge, J. H., Supt., Cumb. Valley R. R., Strand.
Torback, F. S., Shop Foreman, B. & O. R. R., Wittle.
Tozzer, Geo., Pur. Agt., C. C. C. & St. L., Marlborough-Blenheim.
Tracy, Thos., Asst. Supt. Car Dept., Erie R. R., Chester Inn.
Trego, J. G., Asst. R. F. E, West Jersey.
Turner, J. A., Ch. Clk. Pur. Dept., Southern Ry., Dennis.
Utley, E. H., V. P. & G. M., Bess. & L. E., Chelsea.
Vanderloo, Theo., Mch., P. R. R.
Wyne, A. G., Asst. Eng. House Foreman, P. R. R., Islesworth.
Waitt, G. L., Inspector of Materials, N. Y. Cent. & H. R. R. R., Stanton.
Watson, D. H., Genl. Foreman, B. & O., Strand.
Wayward, J. R., Div. Car Insp., N. & W., Haddon Hall.
Weaver, C. N., Supr. A. B., L. S. & M. S.
Weightman, Jos. J., Clerk, P. & R., Monticello.
Weigle, John, Gen. For. Car Inspectors, P. R. R., Edward.
Wenzel, C. F., Fman. Frt. Car Inspectors, Penna. R. R., Elwood.
Westcott, E. A., Supt. Car Dept., Erie, Denny.
Wilson, F. G., For., P. & R., Monticello.
Wilson, W. H., For. Car Dept., N. & West., Strand.
Wilson, O., Mech., Penna. R. R., Flender.
Wilkins, O. R., Foreman Painter, N. & W., Windsor.
Witherspoon, W. H., Foreman, C. R. R. of N. J., Dennis.
Wray, R. W., Motive Power Insp., P. R. R.
Young, W. D., Asst. Comm. Inspr., Balt. Div., P. R. R., Iroquois.

SOME ANTIQUE RAILWAY RULES AND REGULATIONS.

Walter B. Wood has been showing to his railway friends at the conventions an interesting antiquity. It is a copy of the Rules and Regulations of the Pittsburgh, Fort Wayne & Chicago Railway for 1858 and 1859. George W. Cass was then president of the road and J. Edgar Thomson, subsequently president of the Pennsylvania Railroad, was its chief engineer.

Some of the rules seem curious to railway men now.

One provides that "the maximum speed for passenger trains will be a mile in a minute and a half (and in 4 minutes over large bridges) and for freight trains a mile in 4 minutes." Passenger trains are required to "wait at stations where meeting is designated twenty-five minutes for each other, when, if either is delayed beyond that time, the other will wait five minutes more, making thirty minutes in all, then proceed, keeping precisely thirty minutes behind its own time card, until it has met and passed the delayed train. The five minutes are allowable for any possible difference in watches, and must not be used by the delayed train approaching the meeting point or any station where it expects to meet the opposing train. Should any trains be delayed at the same time, and fail to reach the meeting point within the twenty-five minutes, they will each arrive at station where the other is due according to the foregoing rule, twenty minutes, making in all fifty minutes, behind the time card of the expected train, then proceed with the greatest caution, where curves occur, each sending forward a man with proper signals, so as to see at least a half mile ahead; and the engineer keeping his train fully within control until the expected train is passed. Take no risk—always, in case of doubt or uncertainty, adopt the safe rule." No wonder transportation in those days was slow and tedious!

Another rule provides that the "whistle must always be sounded twice before any engine or train is started (except in Allegheny City, east of the outer depot, where it must not be sounded except to prevent accidents." The indications are that there already were some active regulating authorities in Allegheny City, as this also was the only point on the line where trains were specifically prohibited to be run over eight miles an hour. Its people objected to either speed or noise.

It was further provided that "a signal swung across the track will stop the engine; raised and lowered perpendicularly, the engine will move back slowly; and swung broad off to the right or left the engine will move forward." "Passenger trains having the right to pass any station on the line without stopping, must be seasonably checked so

as not to pass the station faster than fifteen miles the hour."

Another rule which was evidently not calculated to increase speed, and which would hardly do today for the Pennsylvania Special, provided that "every engine with or without a train must be brought to a dead standstill at each of the several railway crossings on the line; and the conductor of the train or the fireman employed on the engine, must pass on to the crossing and give a signal that the way is clear, before the train or engine is allowed to pass over it."

It would seem that the trainmen in those days were suspected of "soldiering" or going fishing at stations, for rule 15 said that "trains, passenger or freight, must not be run between stations so as to gain time to be wasted at the stations. Ordinarily one-half minute for a passenger train at any station where wood and water is not taken is ample time for the conductor to discharge and take up his passengers."

A very decent regard was shown for the rights of live stock. Rule 27 required that "When live stock is seen ahead on the track, the engine must be stopped, if possible, and the live stock driven off to prevent accident to the engine and injury to the stock. Delays caused by a careful observance of this rule will be a good excuse for being behind time and losing connections with trains on other roads. The conductor will, without fail, report the number of times in each trip the engine was checked to avoid such stock."

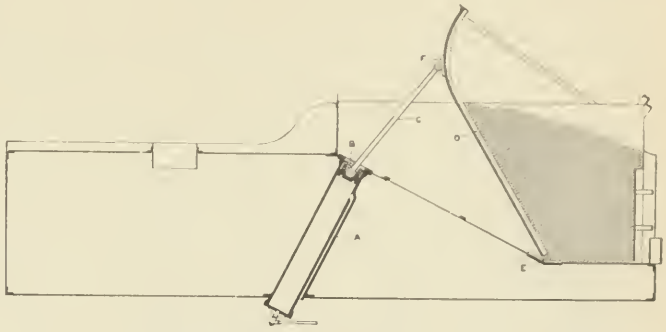
The developments that have taken place in car heating since those primitive days are indicated by a requirement that "wood shall not be piled up about the stove and elsewhere in the cars to the annoyance and inconvenience of passengers."

The modern passenger brakeman will feel that his job is a snap when he reads the following: "Passenger train brakeman will generally ride upon the platforms of the cars while the train is in motion, but during inclement weather they may stand at the door inside of the cars ready to apply the brakes in case of alarm, and to stop the train at the stations; they will supply the cars with fuel for the stops in winter, from the wood boxes on the line; and keep the cars comfortably warm and clean at all times while the cars are upon the road, and the lamps burning during the night." The passenger brakemen of those days would have thought that the passenger brakeman of to-day, heated as he is by the numerous appliances now used on passenger trains, has very little to do but fleck the dust from his uniform and look pleasant.

The conductors probably thought that the rule saying that "conductors have no discretion to allow passengers to pass free" was very arbitrary. However, they probably did not pay much attention to it.

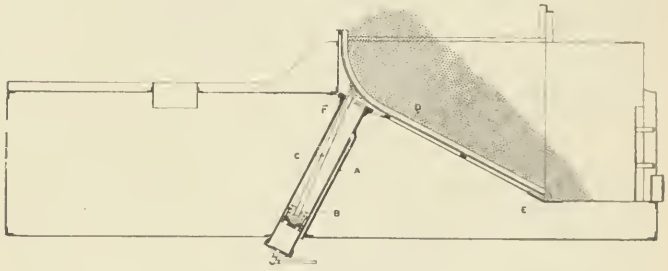
COAL PASSERS ON LOCOMOTIVE TENDERS.

The new Mikado locomotives built for the Burlington by the Baldwin Locomotive Works, Philadelphia, have their tenders fitted with a device which is intended to deliver the coal from the back part of the tender to the front space so



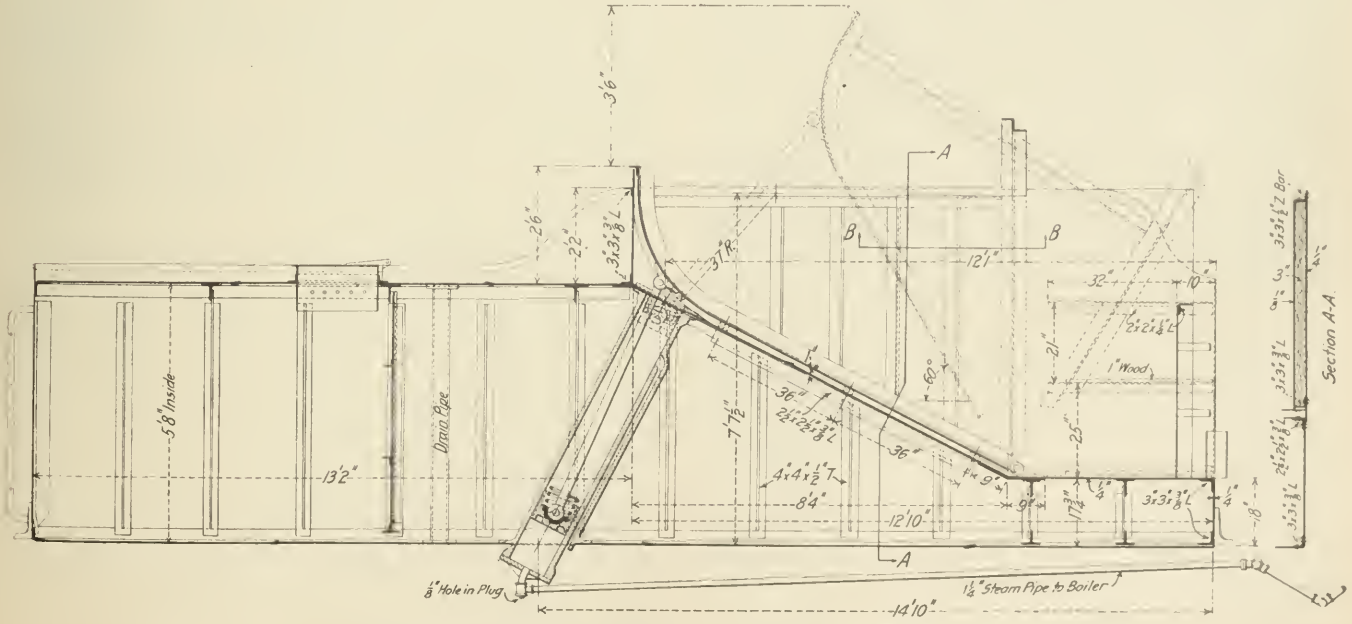
Ryan-Johnson Coal Passer Lifted.

the fireman may handle it more conveniently. It is the invention of Ryan & Johnson, Clinton, Iowa, and is illustrated herewith. The inclined floor of the coal space is covered with an extra sheet bottom which is stiffened by three



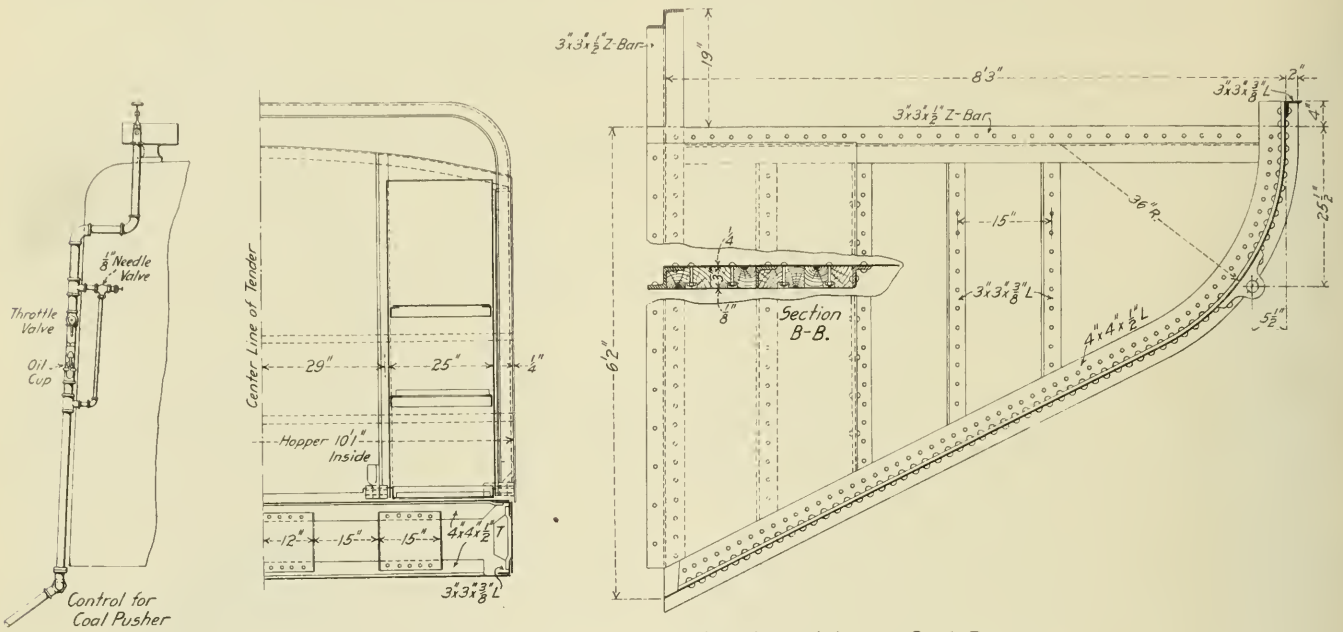
Ryan-Johnson Coal Passer Ready for Lifting.

longitudinal angles 4 in. by 4 in. by ½ in. This plate is hinged at the bottom and the top is pin-connected to a rod working in a vertical trunk steam cylinder. When the coal



Ryan-Johnson Coal Passer for Locomotive Tenders.

in the front of coal space has been used, steam is admitted to the cylinder and the false bottom is raised to a steep incline so that the coal flows forward. The maximum travel of the piston is regulated by a vent opening in the cylinder wall and when the piston passes this opening steam escapes through the vent and the movement is automatically stopped. The steam pipe is 1¼ in. in diameter and is covered with magnesia lagging. Admission of steam to the cylinder is controlled by a three-way cock placed in the cab. It is thus possible to raise the pusher to any desired height and lower



Steam Operating Connections and Details; Ryan-Johnson Coal Passer.

it after the coal has rolled forward by allowing steam to escape through the three-way cock to the atmosphere. A flexible pipe with ball and slip joints conveys steam from the boiler to the vertical cylinder.

THE BAND MYSTERIOUS; HOW IT WAS DONE.

Our special correspondent detailed to delve out the past performances of the members of the "Band Mysterious," now officially adopted as the convention band, has discovered some valuable information which we now make public for the first time.

Leader J. Will Johnson was a born musical prodigy. His nurse first saw his talent when she, one day, found him blowing into his baby milk bottle, making funny noises and faintly and indistinctly murmuring, "Do, Re, Me, etc." As an engineer Will carried a cornet in his seat-box, and while lying on sidetracks he tooted from the top of a box car to the sage brush scenery of the wild and wooly West. Jaybill was the instigator and drill master of the convention band.

Mark Ross' first play-toy was a tin whistle. At the age of four he learned to play "Old Grimes is Dead," and at ten he could knock the stuffin' out of a concertina. It was a simple and quick route for one of Mark's ability to develop into a cornetist without a peer in the convention band, except Johnson.

Charlie Pilliod was an apprentice in his father's clock shop in Switzerland many years ago when he began to develop his musical talent and prepare for the convention band. After stopping the clocks, so as to lose no time, he would hie himself to an adjacent mountain nook, and there, with his clarionet, would melt the glaciers to tears.

Billy Rosser was a kid when Cap. Anson was raising colts in Chicago. Bill had a private knothole in left field fence, and between innings, when the hole was out of commission, he would blow through it and found he could make funny noises. Here at this knot hole was Bill's beginning as a bass horn player.

Charlie Bird and Joe Violand, the drummers, will probably accept positions with Pryor's band before the season is over, providing Jaybill Johnson will accept waiver.

Joe Taylor was a boy in knickerbockers around his father's plumbing shop in Kankankee when he discovered he could make sounds by blowing into a piece of pipe. So pleasing was this to Joe and so annoying to others that Joe's father was obliged to double-lock the shop doors and neighbors took in their tubes at night to prevent Joe from continually hitting the pipe. By easy stages Joe developed into the solo baritone player of the convention band.

Fred Nellis learned to play the slide trombone while a conscript in the German Army. He afterwards saw considerable service in the Salvation Army band at Alliance, Ohio.

Len Wilson says he can't remember when he learned to play the trombone, and Jaybill Johnson says he doesn't care so long as Len can toot so well.

Will Sharp, one night, had a dream that he could play an alto horn, so he bought one and set to practicing. After starring a brief season with a moving picture show he convinced Jaybill Johnson that he was the right man in the right place in the convention band.

Frank Gault always was a star trombone player. Arthur Pryor has nothing on him.

Back on the old home farm in Vermont, George Bryant often left the churn to the difficult task of making its own butter, and hid himself in the hay mow to tickle the Jew's harp between his lips. With such genius and opportunity is it any wonder that George developed into the brilliant alto player of the convention band?

Twenty years ago Phil Sreda tickled the reed of a clarionet while herding sheep on the sunny slope of a mountain in Italy. One day he took a notion that he would like to learn to wear shoes, so he came to America. The shoes hurt Phil's classic feet like fury for a while, but finally persistence conquered, and he now wears shoes every day. Did you notice those natty white canvas shoes in Saturday's parade?

The Exhibit.

To take care of its business with Canadian railways, the Buffalo Brake Beam Company, New York, is now operating a new factory at Brantford, Ont.

The Kennicott Company, Chicago, is represented at the convention by Chauncey Blair, son of the president, Cass L. Kennicott, George E. Pratt and T. G. Windes.

The Buffalo Brake Beam Company, New York, has recently installed at its Buffalo factory a complete and up-to-date testing laboratory, equipped with special apparatus for testing brake beams.

M. L. Evans, who possesses a height of six feet four, has no trouble at all in reaching to the top of his car door (the Williams) or even to the car roof, and pointing out the merits claimed for the device.

The Standard Coupler Company, New York, has on exhibition this year types A, D and F of its standard steel platforms and buffing mechanisms, and types C and K of the Sessions standard friction draft gear.

The T. H. Symington Company, Baltimore, Md., is exhibiting a full size draft gear model with malleable iron draft sills attached to wood center sills, the sills being of a special design controlled and made by the Haskell & Barker Car Company.

The United States Metal & Manufacturing Company, New York, reports that some of the cars furnished with the Dunham hopper door device have been running since 1903, and that this mechanism is still giving satisfaction on the other cars equipped with it.

Greene, Tweed & Company, New York, have installed in space 606 a large pyramid of Palmetto and Manhattan packings and other specialties made by the company. They are also distributing for the first time at any convention a complete catalogue of their products, containing also a telegraph code and other necessary data.

The Bartley self locking nut and bolt fastener and a joint fitted up with the Bartley combined nut bolt and bond wire fastener, made by the American Nut & Bolt Fastener Company, Pittsburgh, Pa., are on exhibition at booth 320. The self locking fastener was patented January 17, 1911, and the combined nut bolt and bond wire fastener, on April 18, 1911.

The General Electric Company, Schenectady, N. Y., is distributing a pamphlet dealing with the use of electricity by steam railways. It is profusely illustrated with interior and exterior views of some of the most notable power houses in this country; views of electric locomotives and motor cars; and the application of electricity to signal service and train and building lighting.

The United States Radiator Corporation, Detroit, Mich., is exhibiting at the convention for the first time this year. The following representatives are here: Frederick W. Herendeen, general manager sales; George W. Barr, manager of the Philadelphia branch; G. C. Blackmore manufacturer and member of the executive board; and Joshua Naylor, manager of the Baltimore, Md., branch.

H. S. Waterman, formerly chief engineer of the Detroit & MacKinac, is attending his first convention as sales manager for the Hutchins Car Roofing Company, Detroit, Mich. D. W. Hawksworth, who attended last year's convention as mechanical engineer of the Hutchins Car Roofing Company, is here as vice-president. Both Mr. Waterman and Mr. Hawksworth make their headquarters at Detroit.

The Gold Car Heating & Lighting Company, New York, exhibits its No. 800 steam hose coupler, which possesses the essential quality that it will not leak. When coupled in the ordinary way it is partially locked, and by a simple device, embodied in the coupler, this lock is made positive. The other good features are that it will couple with all makes of medium size and small couplers as well as lock them, making an interchangeable coupling.

All who are interested in car seats and seat coverings are invited to visit space 20 in the Main Building. The Massachusetts Mohair Plush Company has there a number of seats from well-known makers covered with Bay State brand plushes and freizettes. Go in and sit on the freizette seats and see how cool they are in this hot weather. This is one of the booths on the pier in which you can sit on the exhibit all you wish; and the harder you sit the more the exhibitor will be pleased.

S. F. Bowser & Company, Fort Wayne, Ind., are showing a line of storage system in their pumping and registering apparatus for handling lubricating and paint oils, varnish and similar fluids. There was considerable delay in the arrival of the apparatus, and one of their newest features, a filtering and oiling system, was lost. The non-arrival of this device is a considrable disappointment, as the makers believe it would have aroused much interest, particularly among railway men who want economy-promoting installations.

The Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., is a large maker of miscellaneous steel castings for railway and industrial purposes. The basic open hearth process is used, and the steel produced has been proved to be adapted to the requirements of railway service, meeting stringent specifications, both chemically and physically. Its miscellaneous plant contains three 20-ton furnaces, with improved appliances to produce castings of a superior quality; and a new feature is the large pattern shop, recently finished, which enables the company promptly to make any necessary repairs to customers' pattterns, or, when desired, furnish new patterns.

The Commercial Acetylene Company, New York, has a more than usually attractive space, in which are shown various types of headlights, including a complete set with which 1,000 engines on the Boston & Maine were equipped during the past year. The collection contains other engine lamps, such as classification, steam gage and water glass lamps, all connected with their standard asbestos-packed acetylene cylinders by drawn steel tubing. Center lamps and side brackets of attractive design for car lighting are also shown. The booth is fitted up with a complete installation for lighting a signal lamp. New compression fittings and a new form of wire-bound asbestos-covered flexible tubing are to be found there. Another unusual feature of the exhibit is a marine flashlight with the cylinder cut open to show the interior and cylinders for storing acetylene for oxy-acetylene welding.

Heretofore the name of the McConway & Torley Company, Pittsburgh, Pa., has been usua'ly associated with the production of the Janney and other M. C. B. couplers. This year the company is showing, in spaces 617, 619, 621, the following new departures in other lines of manufacture: The McConway wheel; a built up wheel with a cast steel center and rolled steel tire without bolts or rivets. The Buhoup flexible truck; a cast steel truck having vertical flexibility to prevent derailment on rough or uneven track, a large area for distribution of load, and large spring capacity. The Penn freight coupler; a late development of the Janney type of coupler similar to the Pitt and Janney X couplers so far as mechanical operation of parts is concerned, but with a largely increased bearing surface between the knuckle and the locking pin, this contact being 5 sq. in. Steel Castings for railway work. In addition it is showing full size samples of the Buhoup 3-Stem and Pitt couplers for passenger equipment and of the Janney X freight coupler.

The United States Light & Heating Company, New York, is exhibiting at Spaces 374-7 a real live axle light equipment. A full-sized model of a standard truck is shown, on which is mounted a full-size generator and suspension. The axle is driven by a variable speed motor, taking power from the electric supply wires on the pier. This driving motor is controlled by an automatic controller, which causes the motor and the axle light generator to go through a speed cycle which accurately represents the speed conditions on a local train running from station to station. The apparatus starts from rest, comes gradually to a speed of 80 m. p. h., runs at this speed a little while, then drops off to 40 miles, again goes up to 80, and finally gradually comes to rest, making a stop of about a minute. The entire cycle occupies about 10 minutes, and is continued all day long. The car lamps are also automatically turned off and on in various combinations by means of a little sign flasher. There is no connection whatever between the operation of the speed controller and the sign flasher; and thus a hit and miss condition is secured which faithfully represents what goes on in an axle-light system. There is no throwing on of lamps at the "psycological moment" to favor some peculiar condition. This is the first time such an automatic arrangement has ever been exhibited.

LIST OF EXHIBITS.

The following include the names of those exhibitors whose exhibits were not included in the list printed in *The Daily* of June 14, together with some few corrections to that list:

American Locomotive Company, New York, N. Y.—Reception booth with photographs of locomotives. Represented by James McNaughton, H. F. Ball, G. M. Basford, J. D. Sawyer, J. E. Dixon, W. P. Steele, H. B. Hunt, C. J. Donahue and Wm. Dalton. Spaces 422, 424.

American Rolled Gold Leaf Company, Providence, R. I.—Gold leaf for car striping. Represented by E. A. Smith, T. J. Lawler and Chas. H. Bower. Space 23.

Atlas Car & Manufacturing Company, Cleveland, Ohio.—Two cars. Represented by L. W. Harston. Space, on track.

Boss Nut Company, Chicago, Ill.—Demonstration of the application and service of the Boss nut; literature, etc. Represented by B. M. Osbun and John A. MacLean. This company is exhibiting in space 330.

Blackall, R. H., Pittsburgh, Pa.—Ratchet brake levers. Hose protector ferule. Represented by R. H. Blackall. Space 652.

Chicago Pneumatic Tool Company, Chicago, Ill.—Pneumatic tools, hammers and appliances, compressors and electric drills. Represented by Thomas Aldcorn, W. P. Pressinger, J. T. Duntley, C. E. Walker, James McCabe, G. A. Barden, Geo. A. Rees, L. Summers and H. Kinman. Space 648.

Coale Muffler & Safety Valve Company, Baltimore, Md.—Safety valves for locomotives. Represented by H. C. McCarty. Space 589-590.

Eagle Glass & Manufacturing Company, Wellsburg, W. Va.—Welded steel and one-piece oil cans, torches, buckets and supply cans. Represented by J. L. Fusner. Space 656.

Fort Pitt Malleable Iron Company, Pittsburgh, Pa.—Brown journal boxes. Represented by F. J. Lanahan, P. Brown and A. M. Fulton. Space 650.

Gold Car Heating & Lighting Company, New York, N. Y.—Heating, lighting and ventilating apparatus for passenger and refrigerator cars. Represented by E. E. Gold, E. B. Wilson, A. B. Strange, W. E. Banks, W. H. Stocks, J. M. Stayman, G. F. Ivers, F. H Smith, E. J. Ronan, J. O. Brumbaugh, F. O. Bailey, A. D. Stuver and F. A. Purdy. Spaces 301 to 311, inclusive.

Jessop & Sons, Inc., New York, N. Y.—Tool steel, sheet steel and steel for circular saws. Represented by John E. Sandmeyer, O. H. Reynolds and W. F. Wagner. Space 416.

Johnson Manufacturing Company, The, Urbana, Ohio.—Railway standard galvanized iron and tinware. Represented by Isaac T. Johnson and Joseph M. Brown. Space 330.

Kennicott Company, The, Chicago, Ill.—Photographs of all Kennicott products to date. Represented by Chauncey B. Blair, Cass L. Kennicott, Thos. G. Windes, Jr., and G. E. Pratt. Space 650.

King Fifth Wheel Company, Philadelphia, Pa.—Roller-bearing pivot plate. Represented by A. O. Chase. Space 622.

Remy Electric Company, Anderson, Ind.—American electric headlight. Represented by T. B. Arnold.

Rockwell Furnace Company, New York, N. Y.—Furnaces for railway shops. Represented by W. S. Quigley, S. L. Barnes and F. S. Garrett. Space 2.

Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.—Steel castings. Represented by F. L. Norton, Geo. L. L. Davis, S. R. Fuller, Jr., and H. H. Waldron. Space 25.

Sipe & Company, James B., Pittsburgh, Pa.—Drying oils. Represented by R. E. Rogers and W. F. Robinson. Space 636.

STANDARD STEEL WORKS' EXHIBIT.

Among the interesting exhibits at this convention is that of the Standard Steel Works Company, Philadelphia, Pa. Among other things, it is showing a ring 120 in. in diam., 9 in. face and 4 in. thick, and weighing 3850 lbs. While the ring is not applicable to railway service as a driving tire, it affords an opportunity to see the possibilities of such rings being rolled, instead of cast. The ring was made in identically the same manner as in the manufacture of driving tires. Considerable difficulty is experienced in securing solid steel castings, and it has proven very expensive to discover defects after they have been partially machined. With a solid ring, there cannot be any such defects.

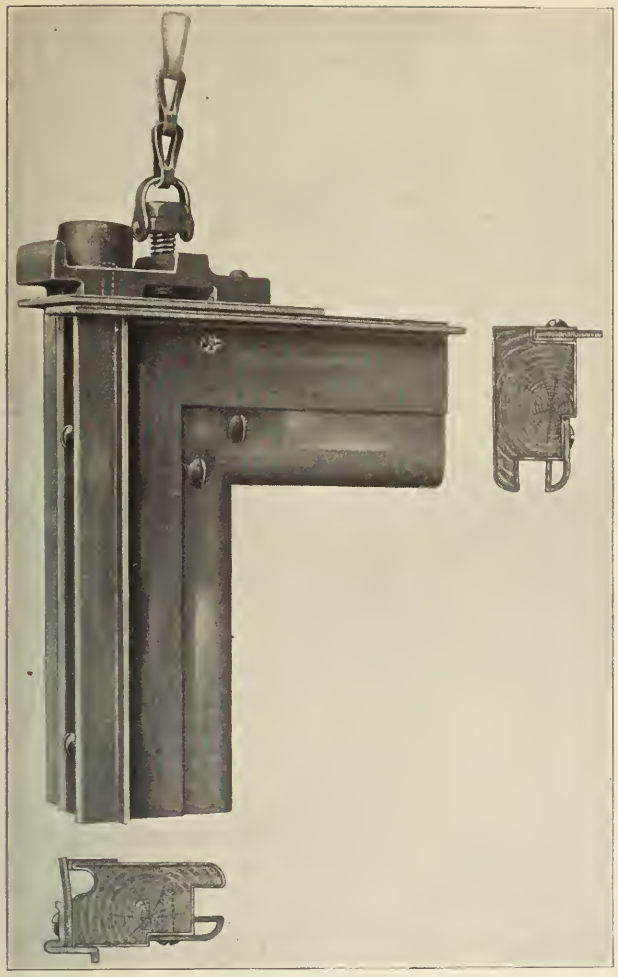
A steel-tired wheel, called the Standard No. 3 wheel, also is exhibited. It is fitted with a rolled steel center, which provides a wheel that can be used indefinitely. The center never wears out; and it is only necessary to apply a new tire when required. It is the best type of wheel that has ever been evolved. The tire is shrunk on the center, and is held securely in place by bolts, which pass through the tire, as well as the wheel center. With this method there is never any danger of loose tires, regardless of how thin they may be worn. The wheel can be re-tired at any railway shop without the use of skilled labor or special machinery. The price received from the sale of the worn-out tires as scrap is very much in excess of the shop cost of the re-tiring.

A solid rolled steel wheel, from which a section had been cut so that the quality of the steel might be seen, is shown. These wheels are manufactured by a method whereby the center of the ingot blank is punched therefrom for the bore of the wheel, and the outside of the ingot becomes the periphery of the wheel. This leaves for the wearing surface the best part of the steel as it is a demonstrated fact that the outside of the ingot is such.

The company also displays castings, forgings and springs of the usual Standard quality, together with a heat-treated driving axle. At the present time the matter of axle failures is a very live subject to those who are welcoming any improved method of manufacture which will assist in eliminating this very serious trouble. It is believed that heat-treating the axle improves it so that failures are eliminated. The Standard Company is expert in heat-treating, having given it most careful thought and conducted many experiments.

UNIVERSAL INSULATED ADJUSTABLE COPPER CAR WINDOW SASH.

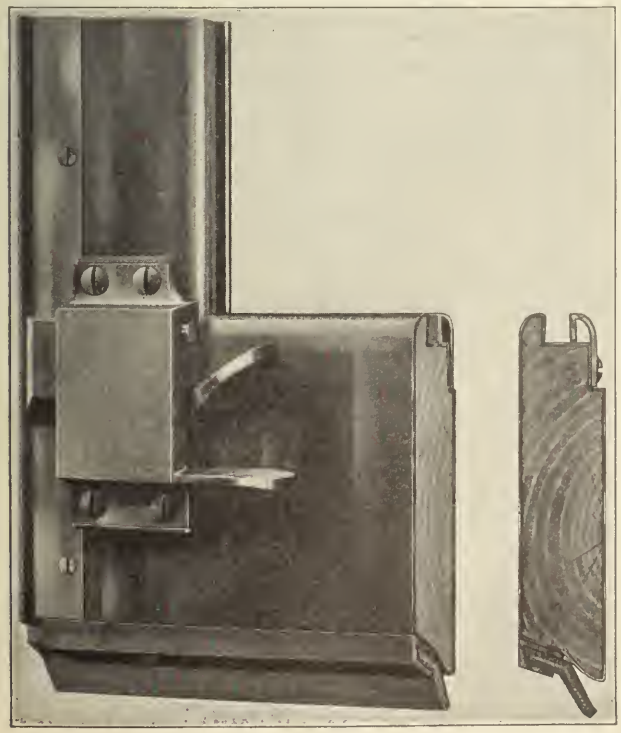
Universal insulated adjustable copper sash, made by the McCord Manufacturing Company, Chicago, is being applied to a great many metal cars. This sash is claimed to be proof against rust and corrosion of all kinds and is therefore practically indestructible, and as the surface of the sash does not come in contact with the window frame and is constructed so it has no bearing or wearing surface it cannot wear out from friction. The Universal sash construction forms an insulation which prevents all radiation of cold and heat through the structure. It is adjustable and provides for the usual inaccuracies of construction of metal car window openings. It is necessary to have means of adjustment to take care of the necessary loose joints around the sash. These are provided for by Universal weather stripping, and the adjustable chain connections attaching the sash balance. The means for adjusting Universal metal sash provides for the inaccuracies of



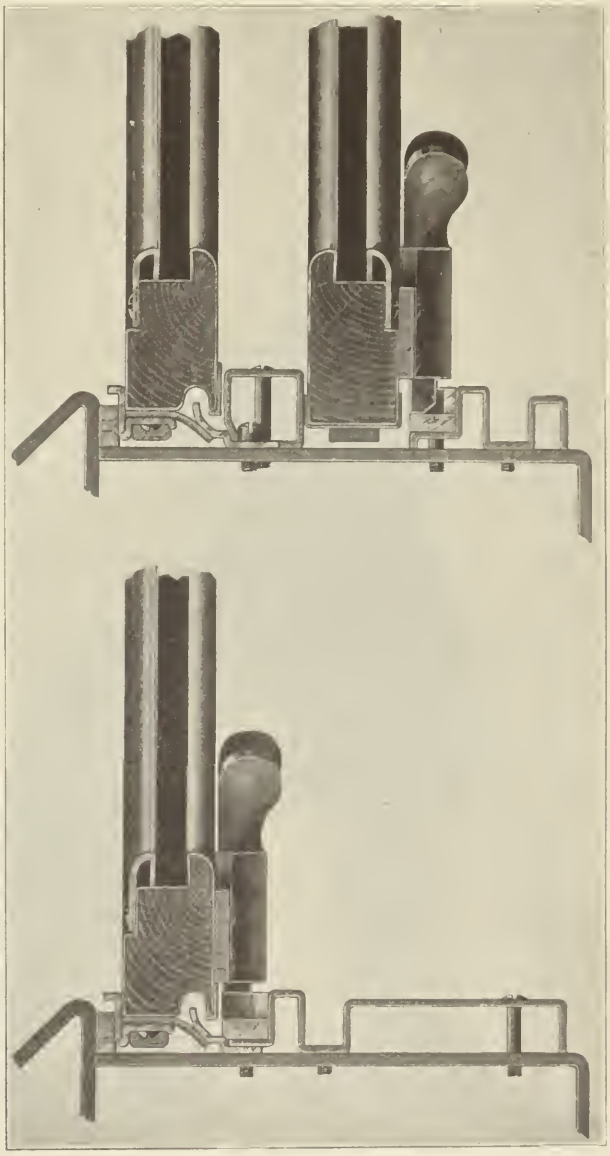
Universal Copper Insulated Sash and Balance Chain.

windows as much as ¼ in. out of square, at the same time sealing the openings around the sash, thus providing a wind and weather proof window, the sash of which will raise easily at all times, regardless of weather conditions, and are rendered noiseless. By the use of Universal weather stripping, double sash is not a necessity.

Universal sash is made of copper, on which it is not necessary to maintain paint. The simple method of attaching the sash bead with wood screws provides a superior holding and is claimed to eliminate from 15 to 20 per cent. breakage of glass. It does away with all machine screws used in the ordinary metal sash construction, which are very often driven in by the workmen with a hammer instead of with a screw-driver. The natural tendency of machine screws in such light construction is to become loose and work out.



Universal Copper Insulated Sash, Lock and Weather Strip



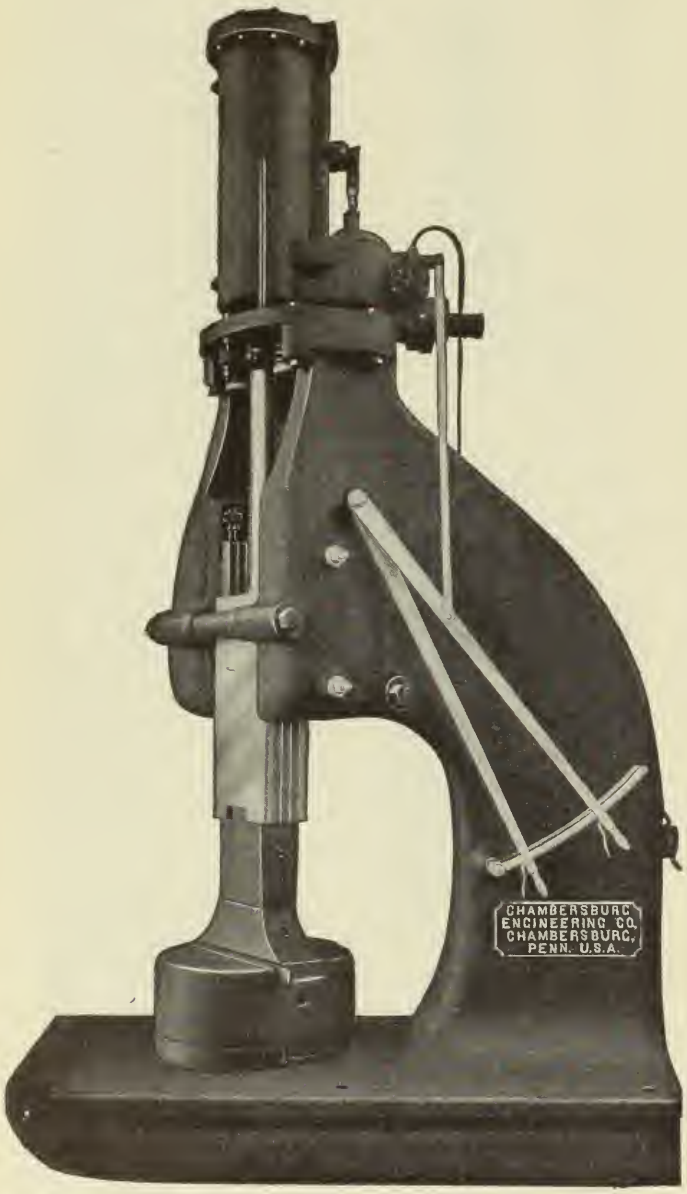
Section of Universal Copper Insulated Metal Sash.

One of the illustrations shows a cross section of Universal copper insulated adjustable metal sash, showing the application of Universal weather stripping. Another shows a lower corner of Universal copper insulated adjustable metal sash, equipped with No. 10 Gravity wedging sash locks. It also includes a section showing the application of Universal weather stripping to the sides and bottom of sash and the application of sash bead. The third is a section of a top corner of Universal copper insulated adjustable metal sash, showing adjustable sash balance chain connection.

Complete full sized models, with 51-in. window openings, are being exhibited at booths 655 and 657 in the annex.

CHAMBERSBURG STEAM HAMMER.

The illustration shows a 3,300-lb. Chambersburg single frame guided ram steam hammer, as designed and built especially for railway work. The distances from center of die to frame and from the underside of frame to the top of anvil die are extra large in order to provide clearance for locomotive frames; and it is for frame work that this type and size of hammer have proved most efficient. The frame is of massive section, made of air furnace cast iron, and is reinforced heavily around the guides. It is provided with steel tie bars, with distance pieces in front of and in back of the ram to strengthen the frame. The ram is long, to give increased bearing in the guides, and the guides are adjustable for wear of ram, being of the Chambersburg pattern. The valve gear is of simple and durable construction, and



Chambersburg Single Frame Guided Steam Hammer.

affords the operator accurate and easy control of his hammer at all times. It is double acting, taking both top and bottom steam.

The Chambersburg Engineering Company, Chambersburg, Pa., describes these hammers in its bullein No. 44. The hammers may be seen in a number of shops of the leading railways.

WRONG CONCLUSION.

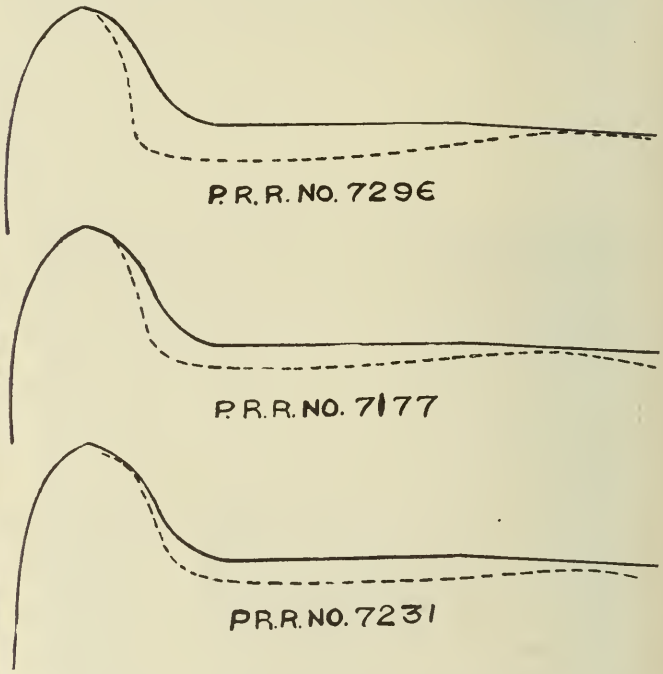
A. C. Moore was explaining some details of the Safety Car Heating & Lighting Company's exhibit to a party of railway officials Monday, when a thick cloud of smoke, caused by a flash-light photographer, rolled into the Safety Company's booth. The circumstance afforded one of the party an opportunity to remark, in a jocular spirit, that probably a Pintsch gas tank had exploded. Mr. Moore at once granted the remark was opportune, when made as a joke; but not otherwise.

This circumstance is the result of exaggerated accounts concerning train wrecks, which are often reported by poorly informed writers for the press.

Out of a total of 1,478 accidents reported in 26 years by the British Board of Trade, 14 were involved in fire. Of those 14 cases, only four could be assigned as due to gas—a percentage of .027 of the total number of accidents. Electric lighting is responsible every year for greater damage to buildings than can be attributed to gas; and the flame temperature of Pintsch gas is the lowest of all combustible gases. Pintsch gas is non-explosive when unmixed with air, and cannot be ignited when there is a mixture of less than 5 per cent. or more than 12 per cent. of gas. It is important that every effort be made to eliminate even the .027 per cent. of train accidents due to gas lighting; but when the total of 210,000 cars that have used Pintsch gas are taken into consideration, there remains very little reason for complaint against gas as a car illuminant.

NICKELIZED CHILLED CAR WHEELS.

A severe test of wheels made by the Nickel-Chrome Chilled Car Wheel Company, Pittsburgh, Pa., has just been finished by the Berwind-White Coal Company, and the cut shows the maximum and minimum wear after 2 1-6 years.



Service Test of Nickelized Chilled Wheels.

Maximum and Minimum Wear on Tread and Flanges After More Than 60,000 Mileage.

One hundred and fifty-six 33-in. nickelized chilled iron car wheels were placed, with steel wheels, under 50-ton Berwind-White coal cars, the heaviest mountain traffic in the country. The trains make 100 miles a day regularly, or 30,000 miles annually, as against 9,600 annually made by the ordinary freight. The service on this train had proved

too severe for the best standard chilled wheels, made from the approved car wheel mixtures, under the supervision of the most intelligent car wheel foundry practice, and the use of such chilled wheels was abandoned. After two years and two months 20 per cent. of the nickelized wheels have been withdrawn only on account of wearing out. No flanges gave way, and the service performed was in every respect equal to that of the steel wheel. There was no chrome in these wheels. Chrome adds greatly to mileage.

CAR VENTILATION.

BY THOMAS H. GARLAND.

It is only within the last decade that car builders and railway car men have turned their attention to the importance of having passenger cars properly ventilated. The necessity of having all classes of railway equipment properly ventilated is now fully recognized, particularly in closed moving vehicles where the space is limited. The public demand for proper ventilation is now so strong that public conveyances cannot be constructed with the ventilation feature omitted. Formerly the only ventilation to be obtained in passenger cars was through the deck windows, or the opening of doors and windows. This means of ventilation was sufficient during the warm season, but in cold weather could not be used without producing strong drafts and discomfort to the passengers.

While there has been many devices patented for the purpose of producing ventilation in railway cars there seems to have been but little progress made towards a practical plan until the Pullman Company took up the subject in a systematic manner, with a view of finding a satisfactory means for properly ventilating their cars. As evidence of the thoroughness with which that company has gone into the subject, Dr. Thos. R. Crowder, superintendent of sanitation, has devoted several years to the collection of data and making exhaustive tests on Pullman cars and those of the various railway lines. The information obtained during this extensive investigation of the subject was presented by Dr. Crowder before the American Public Health Association at the annual meeting in September, 1910. This report has been reprinted under the title of A Study of the Ventilation of Sleeping Cars, and is the most complete treatise on car ventilation that has been produced.

At different times the M. C. B. Association has appointed committees to take up the subject of car ventilation; in each case valuable data was obtained, and each report has brought out many of the requirements necessary for good ventilation. The practical ventilation of cars, however, is yet to be taken up by many of the lines. The change from wood to steel car construction makes it more necessary to give the subject of ventilation careful consideration; particularly is this true with cars of the elliptical type, where deck windows cannot be used.

With the advent of the steel car and the tendency to make the doors and windows as nearly air tight as possible, the necessity for a practical ventilating system is becoming imperative. While numerous reports on car ventilation have been made at different times, and the subject is one that is frequently discussed, there seems to be an absence of practical tests with the different ventilating devices and systems, except for those made by the Pullman Company.

There can be only one way to determine the merit or demerit of ventilating systems, and that is by putting them into service on a number of cars and having extensive tests made by men familiar with this class of work. The committee on ventilation appointed by the Association of Railway Electrical Engineers is now giving this subject careful study, and the conclusions reached by this committee will be of practical benefit to the roads who desire to take up the matter of car ventilation. There is probably no one feature of car construction on which there is such a variety of opinions as to the manner in which cars should be ventilated. Not only do officials, car men and trainmen hold different opinions, but the traveling public is always ready with suggestions how to properly ventilate the cars. Even among the medical fraternity there is a wide difference of opinion as to the part of the room or car at which the vitiated air should escape or be withdrawn and the fresh air admitted.

That passenger equipment must be provided with better means of ventilation than the standard deck sash, is now conceded by all of the railways. It becomes a matter of determining what is the most practical and efficient method to be used. Not only the first cost, but the cost of maintainance should be taken into account in investigating the various plans. It is usually thought that the ordinary deck sash is the least expensive means of ventilation; but a careful investigation may show that during the life of a passenger car so equipped, the expense for maintainance of deck lights, ratchets and screens is no small item. There are so many essential factors in the application of a practical system of ventilation, such as the relation to the heating system, the passing through tunnels, over deserts and through storms, avoiding drafts, excluding smoke, cinders, rain, etc., and the proper admission of fresh air, that the subject can only be dealt with by those who have given it long and careful study, or who are willing to do so.

METALLIC SASH.

Forsyth Brothers' Company, Chicago, makes a number of designs of steel and brass metal sash. In designing the sash it aimed to produce one which, like the wood sash, would be more readily adjustable to variations in the window openings, would be dust proof, and provide a glazing adapted to glass of varying thicknesses and in which reglazing of the glass could be done without special instruction.

Among the company's other designs of metal sash is one in which the rails are quite narrow, affording a maximum area of glass and increasing the light in the car. The sash is sufficiently strong to stand all service.

Metal, and particularly brass, sash is coming into favor; not merely because of the finish which it gives to the car, but as a matter of economy in maintenance. The brass sash, by the action of the atmosphere, takes on a gun-metal finish which is permanent and which is not only pleasing to the eye but does away with the necessity, as in the case with the wooden sash, of removing the sash at intervals for re-varnishing. The work of removing wooden sash from a car, of handling, of re-varnishing, and re-adjusting it in the sash openings in the cars, involves a very considerable expense when the cars go through the shops. This is eliminated in the case of the brass sash. It is estimated that the cost of maintenance of the wooden sash alone will, in a comparatively few years, pay the cost of the brass sash. Along with other metal sash, Forsyth Brothers' Company furnish sash attachments, including weather stripping.

MAXI-MILL VERTICAL TURRET LATHE.

Remarkable work in cutting cast iron is being done by the Bullard 42-in. Maxi-Mill, made by the Bullard Machine Tool Company, Bridgeport, Conn., and on exhibition at the Boardwalk end of Machinery Hall. It is removing about 1,700 lbs. of iron an hour from a casting 36 in. in diam. The cutter on the side head has been taking a cut 1⅛-in. wide with a 1-16-in. feed, while the two cutters on the turret head are each taking a cut ⅜ in. wide with a feed of 1-12 in. at a cutting speed of 71 ft. a minute. Another feature is that the machine may be started or stopped under the heavy load while taking the cuts by simply operating a clutch.

MOTOR CARS.

The Chicago Pneumatic Tool Company, Chicago, is showing, at its Atlantic City store, Boardwalk and Kentucky avenue, several types of its Little Giant commercial car. The latest, a bus, is shown herewith. It is being operated here in Atlantic City for the benefit of members and guests of the convention.

The Little Giant car is gasolene driven, with 5-in. x 4-in. 5 two cylinder, horizontal, four cycle, 20 h. p. engine, and is being operated over all kinds of roads.

The carrying capacity is 1,500 to 2,000 lbs., and it is furnished with an open box body, a canvas top body and a full panel top.

In the manufacture of this car, the Chicago Pneumatic Tool Company is following its custom of using only the best materials and workmanship, and has adopted those features which are essential to the successful commercial car—the water cooled engine, solid rubber tires and double side chain drive; and has designed this car to meet the requirements of general delivery service in all classes of business, from that of farmer to that of merchant.

The frame is of 2-in. x 2-in. x ¼-in. angle steel, hot riveted together, and built to withstand the twisting strains of uneven roads and varying loads.

The power plant is on the sub-frame; and special attention



Little Giant Bus.

has been given to the general construction, so that all moving parts and wearing surfaces are readily accessible for adjustment or removal.

The motor is of rugged design, the right and left cylinders being cast from one pattern, with large water jacket, making it possible effectually to cool this powerful little motor by the thermo-syphon system of water circulation, and with force feed oiler, insuring complete lubrication.

Weight is an important factor in the construction of a commercial truck, and the Little Giant is designed to stand hard usage without carrying superfluous weight, which causes undue consumption of gasolene and lubricating oil. The Chicago Pneumatic Tool Company is adopting improvements as use and experience may suggest. The new Model C car embodies many of these.

The bus on the streets here is the first of that style and it is well adapted to such service, carrying eight to ten passengers, with plenty of space beside the driver for hand baggage, making it particularly desirable for station and hotel use.

The open body car or the canvas top car are suitable for baggage carrying as well as for other classes of delivery work. In fact, these cars are right for any load within their capacity of one ton.

INCANDESCENT GAS LIGHTING IN TRAINS.

The following is from the *Journal of Gas Lighting and Water Supply:* Figures are given in the April issue of the *Revue Technique et Industrielle* showing the number of railway locomotives and cars in different countries of the world lighted by incandescent gas, and showing the large increase in this respect between April, 1908, and December, 1910. In view of recent railway (and other) accidents, these figures are eloquent as indicating the safety, popularity, and convenience of incandescent gas lighting on railways. Without attempting to give all the figures, we select the following:—

	No. of Locomotives and Carriages.	
	1908.	1910.
England	20,459	47,174
Germany	60,804	68,862
France	11,914	15,889
Holland	3,983	4,077
Austria	6,465	7,115
Russia	4,757	5,386
United States	31,392	33,286
Canada	1,626	1,885
Argentina	1,675	1,798
India	12,831	14,473
Australia	2,945	3,127

The statistics given indicate that, whereas in April, 1908, there were 164,432 railway vehicles lighted by gas, less than two years later there were 210,184 gas-lighted cars—being an increase of 45,752.

It is stated that the universal experience of railway companies is that incandescent gas gives a better and more constant light than electricity, at half cost, and with less expense in first cost and upkeep. This is shown by the following comparison:

Carriage equipment for	electricity	4,200 to	4,500	francs.
" "	" gas	700 to	2,000	"
Annual maintenance for	electricity	400 to	450	"
" "	" gas	500 to	100	"

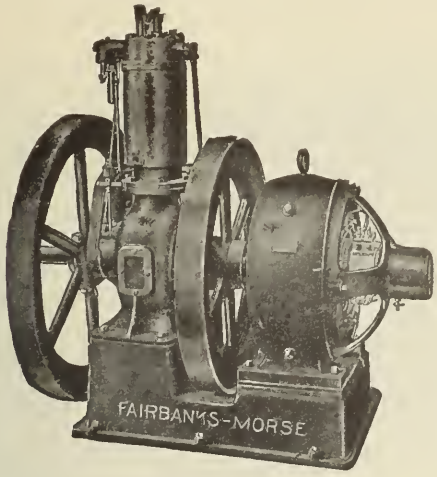
NATIONAL CURTAIN FIXTURES.

The National Lock Washer Company, Newark, N. J., is exhibiting its latest designs in curtain fixtures and curtains for both protected and non-protected grooves. The National cam (non-creeping) fixture is made of heavy steel tubing, with bronze heads and finger pieces finished in standard colors. The unique feature of this fixture is that the heads are stationary on the tube and all the holding is accomplished by moving cams at either end. This reduces to a minimum the possibility of the fixture coming out of the grooves and permits the use of light springs. The cams prevent the fixture from creeping, but permit the fixture to be operated without manipulating the finger pieces. The National C fixture for protected grooves has short solid brass heads of such design that they cannot be jammed in the grooves, and are practically self righting, making an ideal fixture for rough usage.

GENERATORS FOR BATTERY CHARGING.

Just as the storage battery has developed as an important factor in railway signal operation, so has the means of properly and most economically charging these batteries been a matter to which signal engineers have given serious consideration. So important is this branch of railway operation that the Railway Signal Association has published specifications with which engines and generators used for this work must comply. Fairbanks-Morse & Company, Chicago, have had engineers at both their engine works and their electrical works make battery-charging outfits a matter of special investigation. This investigation was accompanied by work with the railways and with the signal association, and as a result they have developed special charging equipments. It is understood that they have installed these equipments to meet all conditions of service, including both stationary and portable apparatus, and covering a large

range in capacity. Some railways use their 600-volt equipments, while others use 160-volt equipments. In building battery-charging apparatus, economical operation has, of course, been as important a feature as perfect mechanical operation. The special electric engines for this work are now designed to operate, if desired, on the lower and less expensive crude oil dis-



Generating Set for Signal Batteries.

tillates. The cost of battery charging has, therefore, been wonderfully diminished. One of the light colored distillates can now be purchased at about one-fourth the cost of gasolene, and the cost of fuel consumption is about 75 per cent. less than when gasolene is used.

RELIABLE SHOP HOSE.

Such accidents as steam hose bursting or fittings blowing out usually happen, strange to say, when the power must be put in service immediately. Especially is this true in the case of the steam hose for blowing up engines in the roundhouse. This trouble is not quite so vital when it happens with the hose used in blowing off the engines, boiler washing, boiler testing or in pneumatic service, but the trouble is there just the same, and each delay means extra expense.

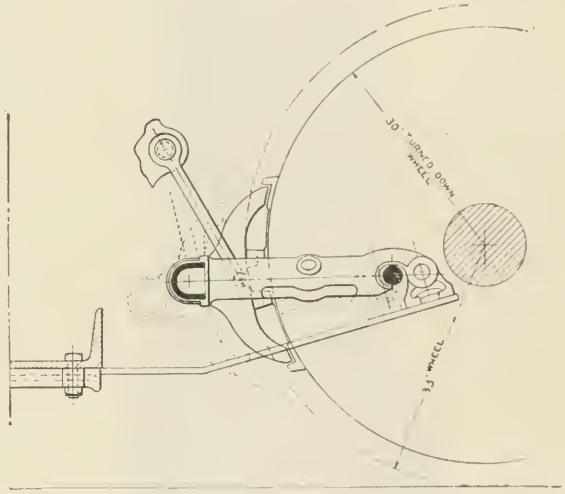
The armored hose manufactured by Sprague Electric Works, New York, and on exhibition in booth 386, is claimed to overcome the troubles of hose bursting or fittings blowing out. The armor is of the interlocking single strip type and is of sufficient strength to reinforce the hose so that it will stand a hydraulic pressure of 1,000 lbs. to 2,000 lbs., depending on the size of the hose. The fittings are constructed to withstand the same pressure. The hose cannot burst, due to the fact that there is no strain on the duck, and even when the rubber does deteriorate the result is only a small puncture of not sufficient size to cause trouble.

In addition to this feature, the armor affords protection from kinking and chafing, eliminates deterioration due to the expansion or stretching of the rubber hose—all lengthening the life—and is constructed so that the flexibility is equal to that of unarmored hose.

BRAKE BEAM SUPPORTS.

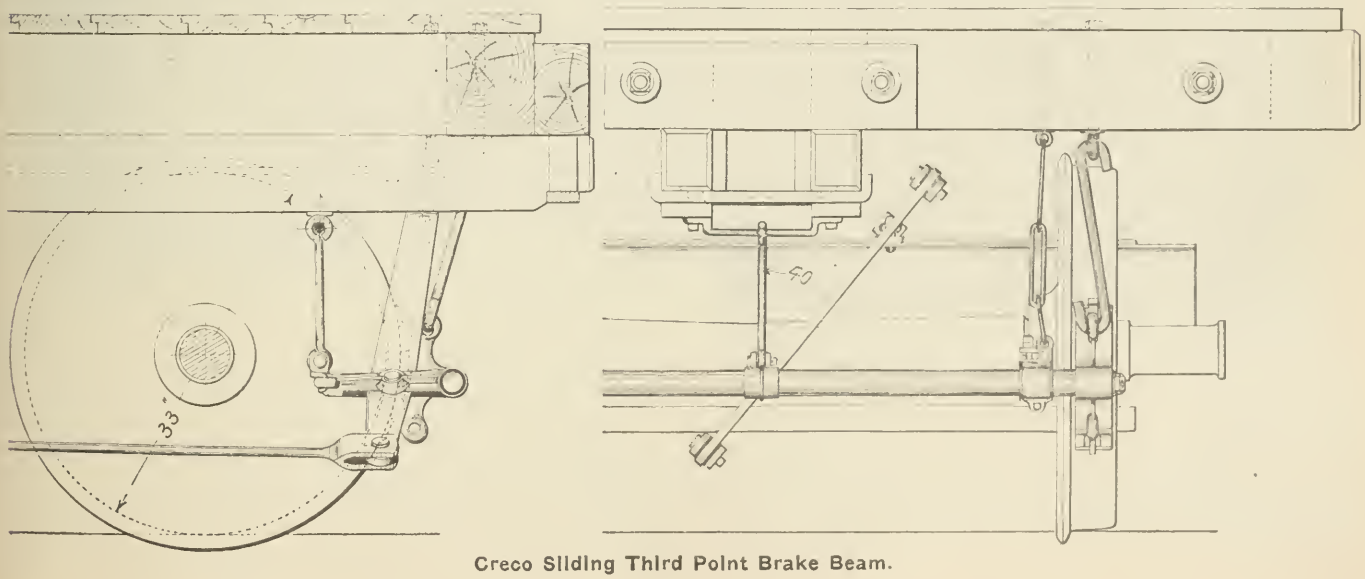
The Creco sliding third point brake beam support, made by the Chicago Railway Equipment Company, Chicago, is shown in the accompanying illustrations.

The makers of this device claim that it prevents the beam from tilting downward, does not pull against the forward



Creco Brake Beam, Showing Adjustments for Wheel Wear.

movement of the beam when brakes are applied with badly worn shoes, and protects the outer end of the beam in just the manner desired. It maintains a proper relation to the beam hangers at all times; is operative for beams of different strut depths on the same truck; does not prevent the beam from having such lateral movement as the brake hang-

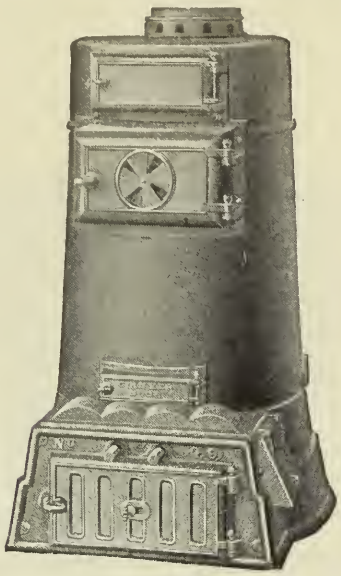


Creco Sliding Third Point Brake Beam.

ers allow; cannot throw the beam downward in case the underhung spring is bent, and cannot get twisted out of place. It does not get damaged so as to interfere with the application of the brake. It has the desired flexibility, broad bearing areas, economical features and can be more quickly applied or removed than any other design. It does away with the use of the second pin and cotter, heretofore used, and allows the use of the cheapest and simplest spring construction possible. It also allows for the reduction of rolled steel wheels from a larger to a much smaller diameter.

TANK HEATERS.

Hot water is being installed by some roads for heating switch towers. Sunray tank heaters, made by the United States Radiator Corporation, Detroit, Mich., are well adapted for that purpose and also for heating water tanks to prevent freezing in winter. These tank heaters are made in various sizes to meet any requirement. They have a deep firepot,



Sunray Tank Heater.

and are heavily built to stand heavy duty work. They can be installed quickly and at little expense and, it is claimed, will operate with a minimum of fuel and attention. They are equipped with all the conveniences of a boiler, such as clinker door, draft door, check door, etc. The deep firepot saves labor, as the heater will run 12 hours without attention.

ADAMS & WESTLAKE BASKET RACK.

Some basket racks for passenger cars as made in the past have projected only 11 or 12 in. from the side wall of the car. This is hardly enough for the large packages often carried

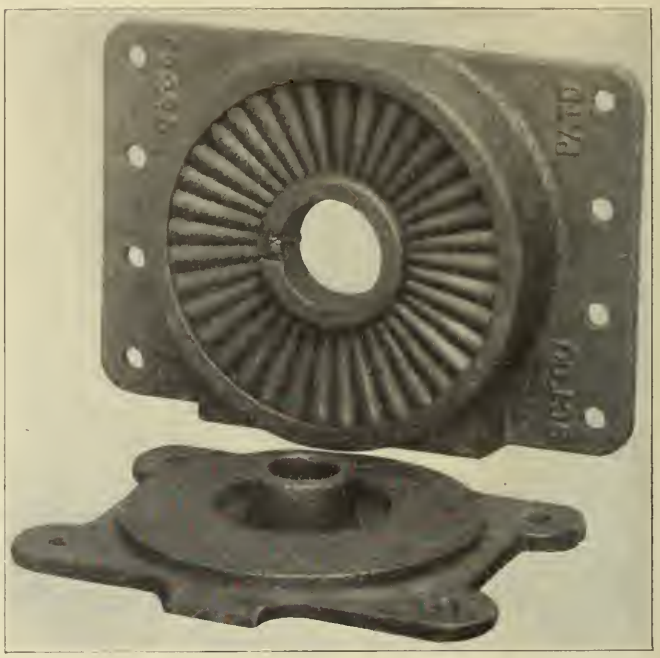


Adams & Westlake Wide Basket Rack.

by passengers, and for suit cases they are not safe, as the rolling of the car frequently causes them to fall out and hurt people. To improve the rack and prevent such accidents, the Adams & Westlake Company, Chicago, has designed the rack here illustrated. It is 14 in. wide, sufficient to hold large suitcases securely.

BARBER ROLLER BEARING CENTER PLATE.

The friction of center plates with flat bearings is usually sufficient to prevent car trucks from returning to normal position after passing curves, and the resulting flange friction adds materially to train resistance. One device for preventing friction under heavy pressure employs roller bearings, and the center plate here illustrated is made in that way. The plates



Barber Roller Bearing Center Plate.

are made of special hardened cast steel, and the rollers are drop forgings case-hardened. The Barber roller bearing center plate is made for all classes of cars and for locomotive tenders by the Standard Car Truck Company, Chicago, and is now in service in large numbers on several western roads.

STEEL PLATFORMS AND BUFFING MECHANISM.

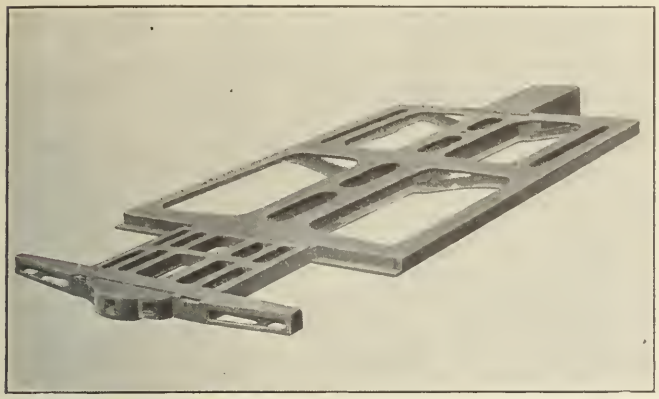
There are three types of standard steel platforms and buffing mechanisms exhibited by the Standard Coupler Company, New York. Type F is a combined friction and spring buffing mechanism, especially designed for use on the new, heavy, steel passenger cars. It has a resilient or protective capacity of 400,000 lbs., and a movement of 5½ in. The buffer is designed so that when cars are coupled the resistance shall be just enough to keep the buffer face plates together, and the act of coupling the cars requires no excessive bumping. Behind the coupling point other springs engage as the travel is increased, until, to absorb the final shocks, all the springs and friction elements come into service. The friction elements, while increasing the protection or blow-absorbing capacity of buffing shocks, reduce the recoil or surging so as to make an easy riding train.

The type D buffer is designed for roads not demanding the high capacity friction buffer, but desiring a spring buffer of sufficient capacity and travel to absorb the less severe shocks of the extremely heavy cars. This spring buffer is so arranged as to couple with the least resistance, the heavier springs coming into play after the coupling is made. Both types F and D are designed for application to I-beams, to built-up structural underframes or to cast steel platforms. The type A buffer is the usual Standard Steel platform and buffer railways. Its resistance is less than either F or D,

but for the average passenger train service it is considered sufficient.

COMBINED PLATFORMS AND DOUBLE BODY BOLSTER.

The accompanying illustration shows the Commonwealth cast steel combination platform and double body bolster as made by the Commonwealth Steel Company, St. Louis, Mo.



Commonwealth Cast Steel Combination Platforms and Double Body Bolsters.

These castings bear the weight of the car body and form its foundation, providing a substantial resistance at the ends of the cars. Car construction is somewhat simplified by their use, and the many parts that must be kept on hand for repairing the built-up platforms are eliminated.

BETTENDORF ALL STEEL BOX CAR.

The Bettendorf all steel box car, made by the Bettendorf Axle Company, Davenport, Iowa, has an underframe of the regular Bettendorf type, is designed to carry the entire load and is similar to the underframe described in a previous issue.

The sides and ends, as well will be seen from the accompanying illustration, are made of panels flanged inwardly and riveted together on the inside of the car, which prevents corrosion at the rivets and facilitates the removal of the panels in case of damage by wreck.

The eaves are made of special rolled shape, designed to form a column along the upper edge of the sides and permitting of inside riveting. The roof sheets run longitudinally and are lapped over the eaves and each other. The running-board and ridge, which are in one piece, are made from checkered plate pressed in a U shape and flanged to rivet to the roof sheets. This construction gives transverse and longitudinal strength and still allows for the torsion required of the car in rounding curves and for irregular track.

At each top corner of the ends is a specially designed ventilator, to prevent condensation upon the roof and side sheets, thereby keeping moisture off the lading and also preventing corrosion.

Steel end doors, side doors, grain doors and hatches are designed to meet the requirements of any service.

HIGH CAPACITY FREIGHT TRUCK.

The truck exhibited by the American Steel Foundries, Chicago, for freight equipment of 70 or 75 tons capacity is of the company's usual construction and is used on a number of railways. The parts of the truck manufactured by this company are: Andrews cast steel side frames, Davis cast steel wheels, cast steel bolster, Ajax brake beams and simplex bolster springs. The total weight of the truck is only 8,600 lbs., making what is claimed to be a lighter and stronger truck than would be possible with any other type of construction, for the following reasons: On account of the strength of the metal used in the manufacture of the Davis cast steel wheels it has been possible to reduce their weight to about 600 lbs. each. If it were possible to make a cast-iron wheel which would be suitable for a truck of this capacity such wheels would weigh not less than 850 or 900 lbs. each, and rolled steel or steel tired wheels would weigh even more. In the use of the Davis wheels, therefore, a reduction in weight of 1,000 lbs. per truck or 2,000 lbs. per car is obtained. The Andrews side frames weigh 500 lbs. each, or 1,000 lbs. per truck, making a saving of at least 250 lbs. per truck, or 500 lbs. per car, over any type of arch bar construction which could be considered. The cast steel bolster weighs about 1,000 lbs., the axles about 980 lbs. each and the journal boxes about 125 lbs. each.

In this truck the two side frames are held rigidly at right angles with the axles by a heavy channel spring plank which is riveted to each frame with 10 rivets, making a total of 20 rivets per truck. The truck tests recently made at the Granite City plant of the American Steel Foundries, the results of which have been published in the *Railway Age Gazette* of March 24, page 691, and also in pamphlet form, show the necessity for a rigid fastening between the two side frames, to hold the truck square and prevent one side frame from getting ahead of the other when the truck is passing around curves. A loose truck or one with a spring plank connection which permits the wheels on one side to



Bettendorf All Steel Box Car.

get ahead of the others, allows the truck to become skewed in passing around curves, and it runs in this condition for a considerable length of time after the truck gets on a tangent. This causes the wheels on the outer side of the curve to grind against the rail, increasing the resistance of the truck and decreasing by a corresponding amount the hauling capacity of the motive power. Reduced to pounds



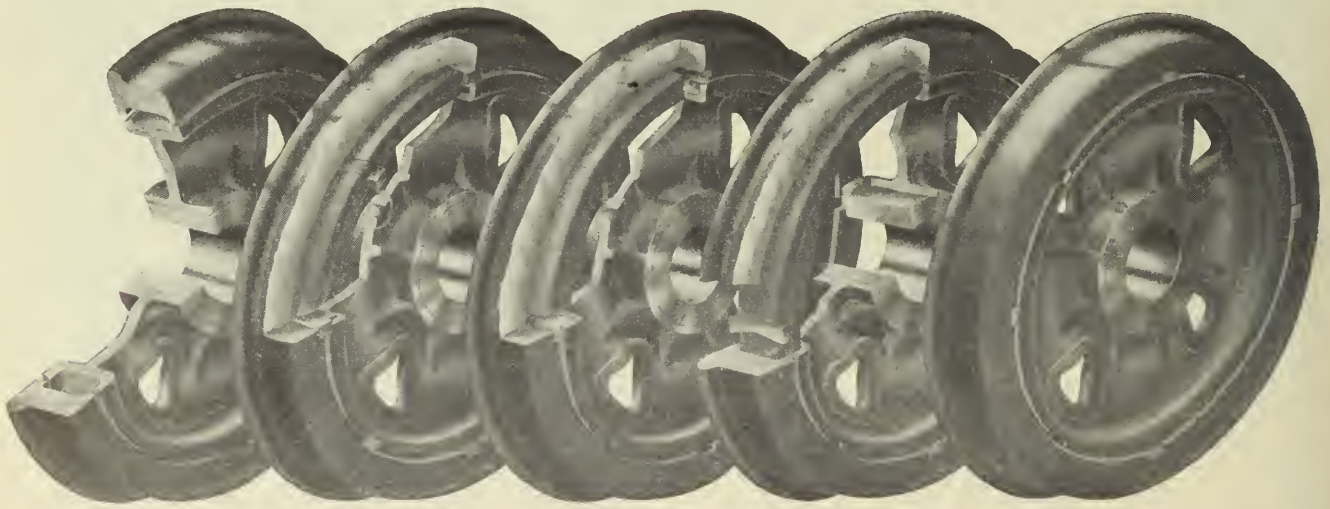
Gages for Measuring Loose Truck Variation on Curves.

per ton, the Granite City tests showed a resistance of 38.33 lbs. on a 22 deg. curve for a loose truck, while for a square truck it was only 24.68 lbs., a difference in favor of the square truck of 13.65 lbs., or 35.6 per cent.

To push a loose truck around a 22 deg. curve required the combined efforts of from 5 to 7 men, while to push a square truck around the same curve only two men were required. A loose truck when it gets into a skewed condition disarranges the position of the wedges and brasses, causing frequent breaking of the lugs of the brass. In order to determine quickly and accurately just how far any given truck will get out of square, a gage for measuring the distance has been designed, similar to the one shown in the accompanying illustration. The part of the gage with the long arm shown lying across the rails has a clamp with set screws at the far end which is securely fastened to the under side of the truck frame or tie bar as near the center as possible. The other end of the arm carries a lead pencil which is held in place by rubber bands. On the opposite side frame or tie bar of the truck, the part of the gage lying alongside of the first rail is securely clamped by set screws, and, as will be noted, two points of attachment are provided, holding the part absolutely rigid. This part consists only of a smooth piece of pine board on the top of which is tacked a piece of drawing paper or tracing cloth. After the parts of the gage are in position and the truck put into motion, any movement of one side frame ahead of the other is indicated by the line which is made on the drawing paper by the pencil carried by the long arm of the gage, the length of the line indicating the amount the truck went out of square. In practice one gage is attached to each truck under a car so that a record of the movements of the frames on each truck is obtained at the same time. The American Steel Foundries has one of these gages in its exhibit booth.

McCONWAY STEEL TIRED WHEEL.

The McConway wheel is on exhibition by the McConway & Torley Company, Pittsburgh, Pa., in spaces 617, 619 and 621. This wheel is of the built-up type, having a cast steel center, a cast iron hub and a rolled steel tire. The illustration shows the wheel in various stages of manufacture from the centering of the tire to the completed wheel. The only machine work necessary in making the wheel is such rough turning as may be necessary to true up the tire and a small amount of rough turning and grinding on the wheel centers. There are no bolts or rivets and the tire is neither fused nor shrunk on. The claims for this tire are that it cannot come off by reason of any amount of expansion, will not turn on the wheel center, and when the original tire is worn out it can be removed and a new one applied, the salvage in the scrap value of the old tire being enough to pay for the cost of removal of the wheel, the application of the new tire and the replacing of the wheel on the axle.



1. *Tire Center and hub assembled; the next operation is the casting of locking wedges into the space shown between the tire and rim of the wheel center. To perform this operation, the wheel is laid flat and the moulten iron is poured through annular opening on the side.*
2. *Locking wedges shown in the first position, the temporary spacing wedges not being removed.*
3. *Temporary spacing wedges removed and the locking wedges driven home, the points of wedges being about—but not quite—in contact, and the final spaces left between large ends of the wedges.*
4. *Sprags in place and the final closers cast, showing the projecting ends of the sprags which engage in the inner flange of the tire to prevent the tire revolving on the wheel center.*
5. *Completed wheel.*

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PROBABLY the most important act of the M. C. B. convention this year was the vote instructing the committee on couplers and draft equipment to design a single standard M. C. B. coupler. The discussion on the report of this committee, which led up to this vote, was also of far-reaching importance, and disclosed a condition in coupler practice which is not creditable to the railways that are buying couplers not in accord with the M. C. B. specifications. It was also made clearly evident that the present conditions, which provide only standard coupler lines and permit a variety of knucklers and locks, have become so burdensome as to be intolerable. The present standard dimensions for couplers are not adequate for the severe service of hump yards and Mallet locomotives, and it is necessary to make radical changes in order to increase the strength of the coupler. It is also necessary to increase the length of the coupler head or the shank in order to comply with the United States safety appliance standards for end ladder clearance. The discussion showed that a majority of the speakers awere in favor of making the increase in the head, as this offered opportunity for improving the locking device and strengthening the head, though it does produce a heavy overhang on the carry-iron. The severe conditions of modern freight service, as well as the federal regulations, have thus brought about this important action of the association, which will lead to the adoption of its own standard coupler, and it is not too soon to begin work on the new design which will be required by law five years hence. The weakness in the present coupler head in not meeting severe freight requirements is one which will be difficult to overcome if the coupler is not protected by buffers, and the more economical design must have some reference to this protection. The use of buffers in connection with couplers should, therefore, be one of the requirements for cars in the ore and coal traffic. This convention must be regarded as truly an eventful one, when the importance of the action on couplers is fully realized.

HERE is an interesting exemplification in the supplementary report on refrigerator cars of the difference between ordering a thing done and doing it. The committee was directed to produce a non-freezing drip that would be applicable to refrigerator cars. After a year's effort it came before the convention and announced its belief that a compliance with the order is a mechanical impossibility. The frankness of the admission should carry due weight and turn attention in other directions. Meanwhile, it forms a precedent for dealing with other snarls that the railways would like to have untangled.

THE report on safety appliances was merely a statement of conditions that have developed during the past year. The discussion hinged on the details of the application of the announcement on the car, as to whether it complies fully or in part with the standards prescribed by the Interstate Commerce Commission. It is gratifying to note that the Master Car Builders' Association acted along the same lines as to safety appliance regulations as did the Master Mechanics' Association last week as to the boiler inspection law. It accepted without qualification the agreement made by the railway committee with the Commission's inspectors, that the lettering, or badge plate, should state that the car was equipped in accordance with the "U. S. Safety Appliances." It was pointed out that if the whole were to be abbreviated to "U. S. S. A" it would occupy less space and be just as intelligible to an inspector. But that was not what was agreed upon, and until the proposed or any other modification of the wording has been accepted at Washington the association felt that it would not be justified in indorsing any modification whatever. The regulation as it stands is a gentlemen's agreement. No penalty attaches to disregarding it. But if it should be disregarded, it is quite possible that the government might tighten the screws on the railways. It remains for the individual roads to act in harmony with the stand the association has taken. For the good of the railways it is necessary, not only that the law should be obeyed, but that agreements like that regarding the badge plate should be carried out to the letter.

TWO important details connected with air brake equipment the hose coupling and its gasket, are treated in considerable detail in the report of the committee on train brake and signal equipment. It fortunately reaches the point where it is able to recommend a standard air brake hose coupling which was fist proposed in 1909, and a standard

gasket for these couplings, which will insure greater protection against leaking and lessen the damage to hose when pulled apart than is now possible. The coupler gaskets supplied by the two air brake companies are not alike, and those bought in the open market have such a variation in their dimensions that when a large number were inspected by gages less than 10 per cent. of them were found to be fit for service. This is a condition which is responsible for a large amount of train line leakage; it has continued too long and should be speedily corrected by the adoption of the standard hose coupler and gasket, which are now recommended. We have used the term "gasket" in preference to "packing ring," as printed in the report, as that seems to more correctly define the "rubber ring in question." Packing rings are usually associated with a moving piston or plunger, while the rings of copper, rubber or other plastic material which serve to make a tight joint in two abutting surfaces are usually termed "gaskets." It is suggested, therefore, in the further consideration of this new standard, that "gasket" be used in preference to "packing ring."

THE committee on car wheels came very close to giving the cast iron wheel a rub equalling that of President Curtis in his address to which allusion was made yesterday. It calmly assumed that the steel wheel was the wheel to be considered. Of course, in strict literalness, this is perhaps straining a point. There was a communication from the wheel makers urging modifications, principally in the direction of greater weight for the cast iron wheel, and in the report there are recommendations that belong to the manufacture of the wheel but the interest seems to center about the steel wheel. The paragraphs at the end of the report were brief, but the discussion hinged on them, and the committee was called upon to explain why it favored a 33-in. steel wheel instead of one of a larger diameter whose mean size should be 33 in. The discussion on the strength of the wheel that has been so notable for the past few years was entirely lacking, and there seemed to be a tacit though unexpressed agreement that the steel wheel is to be used on high capacity cars. It is a revolution in sentiment that has taken but a short time to accomplish, and is probably due to causes already indicated in these columns coupled with the drop in the price of the new product.

THE way in which the story of Saturday's baseball game was handled in *The Daily* of June 19 having elicited many compliments and also numerous expressions of surprise that a technical paper could cover such an event in such a way, has moved us to tell our readers that the entire job, except the making of detailed memoranda of the moves of the players—for which our thanks are due to the official score card keepers—the taking of part of the photographs and the purely mechanical work of engraving and printing—and even a portion of the latter—was done by members of our own staff. The story and the captions on the cuts were written, all the photographs excepting the six largest, were taken, the drawing on the cartoon pictures was done, and the engraving of the cuts and making up of the matter in the pages was directly supervised by men regularly connected with this paper; and even the type and cuts were put into the forms by the make-up man who does this work on the weekly edition of the *Railway Age Gazette* in New York, and who was brought down to the Philadelphia printing plant where *The Daily* is being turned out for the purpose of making it up. However surprising it may seem, there really is nothing surprising at all in the fact that our staff can turn so easily from getting out a technical paper to getting out a baseball edition. Its flexibility is due to the varied experience of its members. For example, two of them had years of experience in the editorial departments of metropolitan newspapers in Kansas City and Chicago; the artist who did the sketching for the baseball story and who is now connected with the *Railway Age Gazette's* advertising copy service, also was formerly connected with daily newspapers, and a fourth staff man is an expert amateur photographer. Past experience has led us to the conclusion that there isn't anything journalistic under the sun that our boys will not merely tackle, but achieve, from dissecting a Mallet or covering a prize fight to describing a lady's gown or giving the railway managers all the details of how to run their business!

LEAKAGE OF AIR BRAKE EQUIPMENT.

AT the last convention of the Air Brake Association the most of one day's session was occupied with a paper and discussion on the leakage of air brake cylinders and various methods for preventing it, and while it was suggested that the subject should be further investigated by a committee which would consider the various improvements which had been suggested by manufacturers and bring the subject before the M. C. B. Association, no definite action was taken, and an opportunity was lost for the performance of an important work.

Exact measurement is always helpful in showing the extent of any defect and in developing improvements. Air brake cylinder leakage has been regarded as a defect inherent in the brake system, but it was not until the use of an air gage was made a part of brake inspection equipment that the full extent of it was realized and more serious measures taken to correct it. Now it is found necessary to obtain better material for the leather packing of the brake cylinder, to improve the design of the expander ring, to give more attention to uniform lubrication of the whole circumference of the cylinder and to be careful to use a lubricant which does not contain corrosive acids which destroy the leather.

In the light of present knowledge it is pardonable to criticise and doubt the results of air brake tests which were made without knowing the condition of the brake cylinder packing or the extent of the leakage, for this must have had an important effect on the brake power developed and its gradual reduction throughout the stop. The brake cylinders on locomotives are located in a warm place where the packing is liable to dry out rapidly and when the engine is over a clinker pit the radiation from red hot coal must so heat the cylinder as to make it dry out both the leather and lubricant. It is a question whether brake cylinders so located should not be provided with metallic packing rings which would not be so seriously effected by intense heat.

Other causes of leakage which have been too long neglected are the various forms and qualities of the hose coupling gaskets. The shapes of these rubber gaskets as used by the two principal brake companies are not alike and they are used indiscriminately; as that of one company does not exactly fit the coupler of the other company there is some leakage due to this lack of a perfect joint. The gaskets are sometimes made of cheap material which hardens or easily becomes distorted, and again the joint is defective. Some canting of the hose coupler is due to the freezing of porous hose which become soaked with water and which, when frozen, is so stiff that the couplers are slightly drawn apart. This causes leaks at the gaskets.

The inspection of air brake hose under pressure by covering it with soapy water is a ready means for detecting spongy hose and should be more generally used. The M. C. B. committee on air brake equipment in its report this year has made some recommendations looking toward the adoption of a standard form and dimensions for air brake hose gaskets, with specifications and tests for the material.

In the design of the new Westinghouse control valve it was found necessary to make special provisions against leakage, as slight vents in this delicate mechanism interfere with its proper functions. The air pump itself is required to supply such a large volume of air that any leakage in its packing or valves renders

it less efficient, and when it is required to keep reservoirs on a 10-car train having total contents of 150,000 cu. in. charged to standard pressure, any leakage in the pump will increase the time of charging and cause unnecessary wear in maintaining the pressure. The late improvements in the air-brake equipment have fortunately been such that a smaller volume of air is required for the application of a given brake power, but the increased demand for more brake power, due to the increased weight and speed of trains, makes it necessary to guard carefully against leakage in every part of the equipment. This is a feature which is now receiving unusual attention and it will repay the most careful investigation.

TO-DAY'S PROGRAM.

M. C. B. ASSOCIATION.

Discussion of Reports on:	
Rules of Interchange.....	10:00 A. M.
Prices for Labor and Materials for Steel Cars.	
Consolidation of Master Car Builders' and Master Mechanics' Associations.	
Springs for Freight Car Trucks.	10:30 A. M. to 11:00 A. M.
Lumber Specifications	11:00 A. M. to 11:15 A. M.
Train Lighting and Equipment..	11:15 A. M. to 11:45 A. M.
Train Pipe Connections for Steam Heat	11:45 A. M. to 12:00 M.
Unfinished business; Reports of Committees on Correspondence, Resolutions, and such other committees as may be named during the convention....	12:00 M. to 12:15 P. M.
Election of Officers	12:15 P. M. to 1:30 P. M.

Adjournment.

FOUND.

Masonic pin, Shriner. Prove ownership at the office of Secretary Conway

NEW PURCHASING AGENT ON THE TEXAS & PACIFIC.

The appointment of C. Ludolph as purchasing agent of the Texas & Pacific is announced in a circular issued by T. J. Freeman, first vice-president.

SUPPLY MANUFACTURERS' COMMITTEES.

President Stafford, of the Railway Supply Manufacturers' Association, has announced the following appointments of officers and committees for the conventions of 1912:

Treasurer—Herbert I. Lord (re-elected).

Secretary—John D. Conway (re-elected).

Finance committee—Charles P. Storrs (chairman), A. C. Ashton and George N. Riley.

Exhibits committee—J. Will Johnson (chairman), E. H. Walker, John R. Blakeslee and Frank J. Lanahan.

Badge committee—E. H. Walker (chairman), Samuel Allen and Lucien C. Brown.

Entertainment committee—Philip J. Mitchell, chairman. (Mr. Mitchell will name the members of the committee at some future time.)

Enrollment committee—Oscar F. Ostby, chairman. (Mr. Ostby will name his committee later.)

Transportation committee—George S. Stuart, chairman. (The makeup of the committee will be prepared later by Mr. Stuart.)

Proceedings.

President Curtis called the second session of the Master Car Builders' Association to order at 9.40 Tuesday morning.

RULES FOR LOADING MATERIAL.

The committee has no recommendations for changes in the present rules for loading material, except to correct some errors, for the most part typographical, that were made in the last issue of the rules. This conclusion has been reached as the result of the few changes that have been suggested during the current year, and more especially in order to give every one handling the rules more time and better opportunity to make up their minds what changes are really necessary.

It was a mistake allowing Rule 26 to go into the 1910 issue of the rules in its modified form. The rule should read:

"The cars must be jacked apart by placing one jack on each side of the coupler, separating the cars until the couplers are pulled out to the fullest extent, inserting hardwood or metal blocks (latter preferred) to completely fill the space between the horns of coupler and end of sill, and coupler



A. Kearney.

Chairman, Committee on Rules for Loading Materials.

release-rod chain disconnected, as shown in Figs. 2 and 3."

We have been asked to consider the rules governing the loading of rolled material of small sectional area, Rules 98 to 103, inclusive. The suggestion has been made that there seems to be the necessity for distinction in the use of center binders on loads of flexible material, pointing out those loads requiring center binders and those which do not. In fact, it has been intimated that it might be more advisable to confine the use of center binders only to the loading of small angles, channels and I-beams, and possibly setting a limit for sizes of this material which would require center binders. It is the opinion of the committee that, for the coming year, definitely specifying the application of center binders to flexible loads is a question on which its experience is too limited to distinguish, and for that reason the rules governing the handling of this material remain unchanged in this respect. The members of this association are earnestly requested to advise the committee during the coming year what, based upon their experience, they would recommend for limits of size and shape of parts for twin or triple loads of flexible material which would require center binders.

It has been suggested that possibly Rule 121, governing the loading of cylindrical boiler shells and tanks, be studied with a view of reducing the height of side blocking to a minimum consistent with safety. To do this would require more information than the committee's experience and advice from the various roads at the present time afford; therefore, the rule will remain unchanged for the present, and any modification will depend upon such advice and experience in handling that the various roads may submit.

Attention is called to the correction of several typograph-

ical errors in the last issue of the rules. They appeared principally in the rules for handling pipe, chiefly with respect to the illustrations showing a greater number of strands of wire binders than is called for by the last revision.

The changes are as follows:

1. The first three lines of Rule 112, page 97, should read: "There should be not less than three pairs of stakes to each pile when the material is 20 ft. or less in length."

2. The next to last paragraph in Rule 112, page 97, beginning, "Intermediate wiring need not be used—." Change 2 ft. to 3 ft., making the paragraph read: "Intermediate wiring need not be used when load is less than 3 ft. above car sides."

3. The title above Fig. 59, in plan, page 101, should read: "Loading one length of all pipe or tubing 12 in. or less in diameter in gondola cars—Rule 112 shows whether three or four pairs of stakes should be used."

4. The clause between the plan and elevation views of Fig. 59, page 101, should read: "Six strands or three wrappings of wire, good ⅛ in. in diameter."

5. The clause between the plan and elevation views of Fig. 60, page 103, should read: "Six strands or three wrappings of wire good ⅛ in. in diameter."

6. The clause above end view, Fig. 61, page 105, should read: "Six strands or three wrappings of wire, good ⅛ in. in diameter."

7. Change ten strands wire to six strands wire, Figs. 57 and 58.

8. Cut out reference to Fig. 20 in note at bottom of Fig. 21, page 52. The note would then read: "10 by 12 in. minimum for double loads when bearing-piece must be bolted through floor and cleat, as shown in Fig. 22."

9. Last line of Rule 109, reading, "paragraph 99," should read, "paragraph 104."

It is reasonable to suppose that physical conditions and requirements bring up problems locally which are met by excellent suggestions for changes in the rules. Some may be of minor importance, while again others are of considerable moment. These oftentimes valuable remedies seldom reach us, hence we are at a disadvantage, because the committee less posted perhaps, in some local situations, is endeavoring to make general and specific rules for the guidance of all. It is not reaping the benefit of the many good ideas arising in handling commodities under the local conditions, which knowledge would greatly tend to increase the efficiency of the committee. The committee is endeavoring to bring about a plan by which it can derive the benefit of the broader experience, so that the rules will be still further increased in their efficiency and integrity.

The report is signed by:—A. Kearney (N. & W.), chairman; R. E. Smith (A. C. L.), Wm. Moir (M. & I.), W. F. Kiesel (Penn.) and L. H. Turner (P. & L. E.).

DISCUSSION ON RULES FOR LOADING MATERIAL.

A. Kearney (chairman of committee): Outside of the few errors or additions the committee have asked to be added to the rules, there would not have been very much to report this year. It is asked, therefore, that the committee be allowed to make the changes in the rules—I refer to the errors—and that the rule 121 be submitted to letter ballot. During the year we have had correspondence with Mr. Arthur Hale of the American Railway Association in reference to the apparent conflict between our rule No. 6 and A. R. A. Rule 15. The committee has not felt that it could consistently change the rule with the information it has had, but after talking the matter over with Mr. Lucore it is believed that the rule can be made harmonious, without giving up or altering any principle in either case. That matter will come up this afternoon at the meeting of the arbitration committee and it can very readily be corrected.

J. J. Tatum (B. & O.): You will remember that last year considerable discussion occurred in connection with the metal spacing blocks—under Rule 26, as it formerly read, it was optional whether we used metal or wood spacing blocks. This year the report reads "inserting hardwood or metal blocks (latter preferred)," etc. Why should the word "preferred" be added there, considering the action of the convention last year. I think that word is superfluous. I will further say in connection with the matter that if we allow that to remain we will be obliged at interchange points to give defect cards for metal spacing blocks. If we allow this matter to remain as presented by the committee, a road receiving a car with metal spacing blocks may remove them and put wooden spacing blocks in their place. I think the matter should be definite and not left optional. In order to dispose of such condition as that, I move that we have the rule as it formerly was, that it be optional whether we use metal or wooden spacing blocks. I think it is important that it should be left in that form, without a statement being made that metal is preferable.

Mr. Kearney: I understand this simply erases the word "preferable?"

The President: Yes.

Mr. Kearney: We had considerable trouble with that rule. Some three years ago I thought a metal block would prevail, but we found later on that it was not satisfactory and that we would have to allow the wooden block. However, it was thought by the committee that the metal block was preferable, hence it was put in that shape. It is entirely satisfactory to the committee if the convention wishes to erase the word "preferable" and allow either; but the majority of the roads prefer metal blocks.

F. F. Gaines (Cent. of Ga.): I think, gentlemen, that the question whether you are going to use metal blocks or wooden blocks is entirely one of locality and a question of loading and one that each road has got to thresh out for itself. Roads that are running in a territory where iron and steel is abundant, prefer to use metal blocks, but if you have a branch line in a sawmill territory, where metal splicing block could not be obtained, why, it would be necessary to use wood. I think there has been some misunderstanding about the use of the word "preferable." In some cases it has been taken to imply that a defect card should be put on whenever you use a metal block or a wooden block. I think we better just simply say "wood or iron."

(Members called for the previous question.)

Mr. Tatum's motion was carried.

C. A. Seley: I move that Rule 121 go to letter ballot.

The motion was carried.

COUPLER AND DRAFT EQUIPMENT.

The standing committee on coupler and draft equipment submits the following report for the year 1911:

End-ladder Clearance:—Numerous inquiries were received from the members relative to the question of redesigning the M. C. B. Standard coupler to provide the necessary end-



R. N. Durborow.

Chairman, Committee on Coupler and Draft Equipment.

ladder clearance on existing freight-equipment cars to comply with the United States safety appliance standards. The committee has considered this question in its different phases and calls attention to the fact that the association is confronted with a serious problem in the resultant effects, both to the railway companies and the manufacturers, unless a proper solution of the matter is made at this convention. It is believed that the most satisfactory way of meeting the conditions imposed is to adopt one, or not more than two, temporary standard automatic couplers, so as to provide for the necessary end clearance as affecting present freight-equipment cars.

This proposed new coupler could be designed by lengthening the shank or by increasing the length of the head between the coupler horn and pulling face of knuckle; either of which would probably introduce conditions contributory to bending of shanks and breaking or buckling of center and end sills, due to the increased length of lever arm. The idea of gaining the required space by lengthening the shank should be dis-

couraged, as it involves changes in the end construction of the car and a greater liability of bent coupler shanks, and the committee believes that the clearance required should be gained by changing the present standard distance between inside face of knuckle and striking horn of coupler.

It is desired that in thus providing for what may be termed an emergency condition that the coupler and draft committee by no means intends to deviate from any fruitful results obtained by the association in the past years, but rather to permit the introduction of this proposed coupler to meet what is nothing more than a temporary need. It should be kept clearly in mind that this emergency coupler is not to be placed an any new equipment, but is merely an expedient to meet a required condition. This change in coupler head would increase the number of M. C. B. standard couplers. In order that the number of standards may be kept to a minimum, the members should advise the committee promptly the amount of increase in length of coupler necessary and the number of cars requiring this increase. When these replies are received it will enable the committee to decide whether it will be necessary to care for more than one additional temporary coupler. It should be borne in mind that it will be necessary to carry these emergency couplers in stock at all repair points, so as to maintain the proper end clearance when making repairs.

Reinforcement of Key Slot:—By referring to Sheet 23, M. C. B. proceedings of 1910, it will be seen that the dimension for the thickness of the reinforcement of the key slot on the 5-in. by 7-in. coupler is 1¾-in., and on the 5-in. by 5-in. it is 1½-in. Various manufacturers have brought this question to the attention of the committee, also the fact that there is a tendency for shrinkage cracks, which weaken the wall of the coupler shank at the point of the present V-shaped reinforcement. This has been investigated, and the committee recommends that the thickness of the reinforcement on the 5-in. by 5-in. coupler shank be made 1¾-in., and that the reinforcement on both the 5-in. by 5-in. and 5-in. by 7-in. couplers be changed in design to conform with these recommendations. Attention has been directed to the comparatively short life of the contained parts within the coupler head, because of early failure under service conditions. The M. C. B. specifications for automatic couplers state: "The couplers furnished under this specification must be made of steel, etc." The breakage failures above mentioned were found to be due, apparently, to material other than steel having been used for the parts within the head.

The evident intent at the time of formulating the above specifications was clearly to consider the contained parts within the head as included in the word "Coupler." Results from present practice leads the committee to think that the use of any other material than steel for these parts is undesirable, and it is suggested that the first paragraph under specifications for M. C. B. automatic couplers, as given on page 728, 1910 proceedings, have this sentence added, viz.: "The word 'Couplers,' as here used, includes the bar itself and the contained parts within the head, such as locks, knuckle throws, etc."

Drop-test Machine:—Difficulty has been experienced when making face tests of couplers, due to the bending and breaking of the set-screws used for holding the coupler in place. The set-screws also become so tightly wedged in the base block that it becomes necessary to drill them out. In view of the above conditions, it is suggested that the use of set-screws be abolished and the filter blocks and wedges to used for holding the coupler in place when making such tests. This will necessitate recessing the base block. The committee has tried out this arrangement and finds it to be an improvement over the set-screws.

Purchase of Couplers:—At various times the attention of the committee has been called to the fact that the M. C. B. specifications have only been complied with in varying degrees on the part of the manufacturer, and likewise there has been considerable latitude allowed by some of the railways in the matter of their insistence that couplers purchased should meet the prescribed M. C. B. specifications. Accordingly a circular letter was sent to the members of the association, embodying the questions given below:

1. Do you purchase couplers in accordance with the M. C. B. specifications?
2. Do you have your own specifications, and if so, what are they?
3. Do you purchase couplers without specifications?
4. If you are not using the M. C. B. specifications, will you kindly give your reasons?
5. Have you any changes to suggest in the M. C. B. specifications for automatic couplers?

Replies to the above questions were received from 43 railways, and of this number 36 replied affirmatively to question No. 1. From the replies of the other seven railways it was noted that some purchasers do not require the face test, others rely entirely upon the manufacturer's integrity and some purchase in such small quantities that apparently the M. C. B. specifications are not insisted upon.

In replying to question No. 2, 32 railways advised that they adhere to the M. C. B. requirements, while 8 railways stated that they purchased couplers according to their own specifications, which in most cases were practically the same as the M. C. B. requirements.

Question No. 3. Forty railways answered negatively, and three stated that they purchased couplers without specifications.

Question No. 4 was replied to by five railways, stating that they did not use the M. C. B. specifications, claiming that their own were better.

Question No. 5 brought out the following suggestions:

1. That all manufacturers provide themselves with proper testing apparatus.

The committee would advise that this is covered by the present coupler specifications.

2. That the key slot be made 1⅜-in. wide so as to permit the use of a 1¼-in. key.

The committee does not approve this suggestion.

3. That an 8½-in. butt end be made standard.

That an 8¾-in. butt end be made standard.

This was rejected by letter ballot in 1910, and in the opinion of the committee it is undesirable to increase the number of standards.

4. That the face test either be properly enforced or that it be replaced by the guard-arm test previously used.

The committee is satisfied that the introduction of the face test has largely reduced the face breakage which was experienced in the past. Some criticism has been made relative to the severity of the present face test, and it is the intention to conduct another series of tests during the coming year to ascertain whether any modifications are necessary. The committee does not approve of the replacement of the face test by the guard-arm test.

5. That paragraph 7 be changed so as not to require serial numbers of manufacturer on draw bar.

The committee does not approve this suggestion.

6. That knuckle pins must bear a manufacturer's mark.

The committee approves this suggestion, and recommends that its identification mark be placed on head of pins.

7. That dimension at bottom of coupler shank (Sheet 23) reading "12-in. no projection here," be increased ½-in. forward toward head of coupler so as to increase shank clearance at carrier iron.

The committee approves this suggestion.

8. That a paragraph covering the bottom operating coupler be incorporated into the specifications.

The committee does not approve this suggestion, as it is inadvisable to increase the number of standards.

9. That the knuckle pin be increased from 1⅝-in. to 1¾-in. in diameter.

The committee does not approve this suggestion, as this can not be done without weakening the knuckle lugs of the head.

10. That the 8¾-in. dimension from inside face of knuckle to striking horn of coupler, as shown on Sheet 23, be changed to 9¼ in. as indicated by note.

The committee does not approve of this suggestion, as the 9¼-in. dimension is for new types of couplers introduced after January 1, 1909.

11. That the severity of the pulling test be increased.

The committee believes that this test can be safely increased, and will conduct tests to determine to what extent the present requirements should be increased.

12. That it is desirable to purchase knuckle pins according to chemical specifications.

The committee does not approve this suggestion. The present physical test largely determines the chemical composition of the knuckle pins.

13. That a lug at coupler-yoke gib be made standard.

The committee does not approve this suggestion.

14. That a minimum weight be established for couplers.

The committee does not approve this suggestion, as they are not in a position to set any definite figures.

15. That a dstance be given from center line of coupler to center of knuckle-pivot pin

The committee will take this recommendation under advisement. At present this is taken care of, to a certain extent, by the contour lines of the coupler

16. That the line shown for the minimum distance knuckle should open should be properly located

The committee would refer the member to Sheet M. C. B. 23, which now takes care of the point raised

As outlined in the report of the previous year, it was the intention of the committee to conduct the draft-gear tests

and make report to the 1911 convention. It is regretted, however, that the building of a test machine, as proposed, was prohibited by the large expense involved, and the committee can, at this time, do no more than reiterate its previous position in the matter, with the idea of carrying on the proposed tests as soon as the proper testing apparatus can be procured.

SUMMARY.

A summary of the recommendations which the committee offers to be submitted to letter ballot, to be adopted either as standards or recommended practice, is as follows:

Standards:—1. That the key-slot reinforcement for the 5-in. by 5-in. coupler be made 1¾ in. in thickness, as shown on Sheet *A*, and that the V-shaped reinforcement on both the 5-in. by 5-in. and 5-in by 7-in. coupler be changed in design, as shown on Sheet *A*.

2. That the specification for M. C. B. automatic couplers, as given on page 728, 1910 Proceedings, have the following sentence added after the words "Must not be painted," in the fourth sentence from top of page, "The word couplers as here used includes the bar itself and the contained parts within the head, such as locks, knuckle throws, etc."

3. That knuckle pins must bear a manufacturer's mark on head of pin.

4. That dimension at bottom of coupler shank, Sheet 23, reading "12 in., no projection here," be increased ½ in. forward toward head of coupler.

Recommended Practice:—That the use of set-screws, shown on Sheet J, 1909 Coupler Report, for holding the coupler in place when making drop test, be abolished; that filler blocks and wedges, shown on Sheets *B* and *E*, be used instead of the set-screws, and that the base block, shown on Sheet *I*, 1909 coupler report, be changed to conform to that shown on Sheet *C*.

The report is signed by:—R. N. Durborow (Penn.), chairman; G. W. Wildin (N. Y. N. H. & H.), F. W. Brazier (N. Y. N. H. & H.), F. F. Gaines (C. of Ga.), F. H. Stark (Pitts. Coal Co.), H. La Rue (C. R. I. & P.) and H. L. Trimyer (S. A. L.).

The report was read by Mr. Stark.

DISCUSSION ON COUPLER AND DRAFT EQUIPMENT.

Mr. Stark: I presume the question of the emergency coupler will be of more interest than any other feature of the committee's report. The question as to whether the necessary increase is to be accomplished by increasing the length of head or by an increase in the length of shank is a question which should provoke a free discussion. The overhang will be practically the same no matter whether it is accomplished in one way or another, and also the effect on the center sills and longitudinal sills. The tendency to shank failures would not be increased by increasing the length of coupler shank except where cars are equipped with very substantial buffer blocks, in which case the car frame, of course, would absorb more or less of the shocks and relieve the shank, but the buffer block is a rather indefinite quantity. In the near future it will be necessary to consider the whole proposition of coupler design and capacity. It is a question whether we ought not at this time to take into consideration the length of the coupler shank, as it is now the coupler yoke in some cases comes in contact with the end sill construction. To increase the shank and reinforce it in proportion would give you more longitudinal travel. This would enable the friction draft gear to dissipate the shocks to a great degree in proportion to the increased travel. To make a radical increase would, of course, increase the overhang which would be detrimental.

There is one feature about increasing the shank, which is important, and that is to make it possible to increase the connection between the coupler yoke and the shank—whether that is necessary or not, is a question for this body to determine. As it is now the coupler shank is short and oftentimes you have to cut away the end construction of the car to provide for the longitudinal travel, and I believe that the question of length of coupler should be considered not only in connection with the emergency coupler but in connection with the coupler of the future. This is a matter of vast importance, and I believe the coupler committee would court suggestions and the only way in which to work this out will be by making tests of couplers of various designs, so far as reinforcing the head or the shank is concerned.

F. F. Gaines (Cent. of Ga.): As a member of the coupler committee, I have affixed my signature to the report, but there are one or two items in the report concerning which I am not altogether in harmony with. In the first place, the committee turns down the recommendation that the 8½ in. butt be made standard. Last year that failed to carry by only 12 votes, and it looks to me as if it was too close a vote on which to turn down such a recommendation, and that it should be again submitted to letter ballot. The 8½ in. butt is used all over the country. Everybody must have them in order to make repairs, and it should be made standard. In regard to the temporary coupler, I have been looking at a coupler recently on exhibition here having 11¼ in. between the face of the knuckle and the striking point, and it is not a bad looking coupler. The overhang does not look anywhere near what you might think it is. It gives more room for the lock, for increasing the strength of the walls, and backs up the guard arm in better shape than the 9½ in. head. I would like to suggest, for the earnest consideration of this association, not making a temporary coupler with say a 2 in. increase of the head, but making a permanent coupler, so that there will be only one coupler. I do not believe that we are going to make any mistake in increasing that head.

F. W. Brazier (N. Y. C. & H. R.): As a member of the coupler committee I signed the report in order to bring it before the association. But referring back to this report I would say: It is to be regretted that conditions have arisen so that there is any question relative to the necessity of having a different length coupler. For one I would be opposed to having more than two lengths of couplers. In the report you will note it is to be called a temporary standard coupler, and is not to be used in any new equipment. In other words, new equipment will be built so as to conform to the United States Safety Appliance Standards, using our present standard coupler. I feel that unless this association takes a decided stand the different roads will write the coupler committee and there will be a large number of recommendations as to different lengths of couplers. We might as well decide at once that there should not be but one additional length of temporary coupling.

In the convention of 1904 I suggested that a committee be formed to report the desirability of having a coupler designed standard so that the knuckle locks and other parts of the coupler would all be interchangeable. The coupler committee of 1905 recommended that a special committee be appointed to work in connection with the coupler committee. In the convention of 1906, the committee on the composite design of coupler, of which I was a member, made its report and great stress was then laid on the fact that none of the manufacturers were willing to give up their patent rights and surrender them to the association; also it was the opinion of the railway representatives of the committee that it was not in accordance with business ethics to ask the manufacturers to surrender their rights without compensation and the Master Car Builders' Association is not a body which can properly acquire rights of this character and sell them or give them to manufacturers, without rendering itself liable to charges of unfair discrimination.

It was also agreed by the committee that if we only had three or four kinds of couplers there would be less cause for complaint than at the present time. This committee concluded its report by commending that no couplers be purchased by railway companies unless they meet with the requirements of the M. C. B. Association and recommendations of the standard committee on tests of M. C. B. couplers and in this way the elimination of all couplers which do not fulfill the requirements would soon be affected. I am quoting the above to show the feeling at that time. I feel the time is come, and the experience that we have had with couplers is sufficient, so that we should get down to one standard design of couplers. My reasons are as follows:

We have to carry so many different parts of couplers in stock to maintain the different kinds that it is great expense to the companies, a serious delay to freight and on a loaded car marked out for broken knuckle or knuckle lock of a coupler not standard to the line on which the failure occurs it is necessary, in order to make repairs, to remove the entire coupler and apply a new one complete. This means the application of a coupler not standard to the car. I find that the road I represent has in the past few months been compelled to order a little over 10,000 knuckles of 39 different makes; about 7,000 knuckle locks of 21 different makes; 246 knuckle lifters of different makes, and so on with other minor parts of couplers.

In these days of economy when we are trying to keep our stock low, you can readily see what it means to have so many different kinds of couplers to maintain. Recently we had a statement made showing the number of second-hand freight couplers on hand that we were holding for repair to be a total of 2,015; 1,547 we were holding for knuckles; 1,435 of the 2,015 for locks, and the balance for other minor parts. This represented 26 different makes of couplers. From my viewpoint this is all uncalled for—the railway companies represented in the association could have a special committee, or the coupler committee meet with the coupler manufacturers, and, without doubt, a design of coupler could be agreed upon that would meet all the requirements. I feel positive about this point, as I have taken it up with several of the prominent coupler manufacturers, and I am assured that they would be willing to get together and settle this point.

The second plan would be to have the coupler committee given power to design a coupler that meets the requirements and that the association pay the necessary expense; then we would have a coupler with a knuckle that would be interchangeable for all couplers, and reduce the cost of our stock many thousand dollars a year, and also would save the delay of trains. A coupler arrangement should be provided at the same time, that would be operative either at the side or bottom and stop the trouble we are having with the top uncoupling arrangement. After 15 years of experience we know that either bottom or side uncoupling arrangement can be made absolutely satisfactory.

At the present time, when one of these numerous couplers, which are not standard to our own lines breaks, we either have to set the car off, or possibly in some cases use an emergency knuckle, and under the Safety Appliance Law no two cars could be coupled together with them; neither could we interchange this car with a foreign line with an emergency knuckle in, simply because we have not a knuckle that would fit the coupler. Now, what is the result? This car goes to the repair track. The coupler is taken out. A coupler is put in that we have in stock. Then, rather than to throw away the foreign coupler, which was removed, we order a knuckle and hold the coupler body until we get the knuckle, which may be any time from 1 to 4 months. These are facts, and occurrences of this kind are happening every day on our roads. It is time that this association should wake up and take some action. I could give a great deal more data on this subject. I have the facts and figures with me showing the expense this means to the railways throughout the country as well as those I am representing.

I wish to repeat what I have said before, that there is no reason why this one design of coupler cannot be brought about and be interchangeable the same as journal bearings, oil boxes and other parts of cars. I am told that it will stop competition. It may be very interesting to the members of this association to know that to-day there is no competition in couplers. The coupler manufacturers have apparently devised means whereby the couplers are all one price, so the argument of competition is the same in either event. I believe that we should give this subject more attention and more discussion than ever before in view of the alleged inefficiency of railway methods to which so much publicity has been given. I believe that a duty rests directly on this association now, and I certainly believe that this can be brought about at the present time better than at any time in the past.

J. F. Deems (N. Y. C. & H. R.): I want to say just a few words on this subject. First I desire to emphasize what Mr. Gaines has said in regard to making this coupler with new dimensions standard instead of making it merely a temporary coupler. I cannot see any reason why we should be jealous of retaining the old standard dimension for the coupler. I fear the association has gotten into the habit of considering a dimension once established a sort of fetish and that it is well nigh sacrilege to depart from it. We seemed to have thought that for a great many years in regard to safety appliances, but we have departed from it now. Of course, we know that it would add something to the weight of the head, making it a little more difficult to carry on the carry-iron, but as I understand it, the gain that we will obtain in regard to strengthening the walls and giving a better opportunity for the locking device will much more than compensate for that, and I do not see why we are starting out now with this coupler and calling it a temporary coupler, and thus introducing two kinds of couplers and perpetuating them for years and years. It does seem to me, as Mr. Gaines has stated, that we should go to work at this coupler with the utmost care and then it should be made the standard coupler.

I also want to emphasize what Mr. Brazier has said. It does seem to me that the time has come when we should have a Master Car Builders' coupler, not a Master Car Builders' type of coupler. I have talked that at conventions and otherwise for the last five or six years, and I firmly believe that if we do not do that, if we do not make a standard coupler, we will be invited and compelled to make it. I know there is a great deal of discussion going on now in regard to insisting upon roads using one kind of coupler; and, as Mr. Brazier has said, in the face of the severe criticism that the roads have been subjected to on account of their lack of proper management and so forth we cannot very easily defend such a ridiculous situation as he cited if we admit that the Master Car Builders' Association is unable to design a coupler. If we can do that, why, let us do it, and if we do it, let us use it.

I believe that this subject of couplers is one that should be taken in hand at once, and I cannot see any reason why it should be doled along through three or four years before we come to any lasting conclusion about it. We have all used the M. C. B. coupler in its various forms long enough to know pretty nearly what is required, and I firmly believe we should take some action to-day looking to an early solution of the question. It may be that there are some members here who can advance some good reason why this coupler should be made temporary; I think Mr. Seley is one of those who thinks it should be made temporary, but I cannot see it that way; I cannot agree with him. Then instead of a standard contour line, I think if this association does not take some action about that at an early date it will probably be required to do so.

J. J. Hennessey (C. M. & St. P.): I fully agree with the gentleman who has last spoken on this subject. I believe we have arrived at the time when we should have a standard coupler. At the same time I believe we ought to raise a committee to meet with the coupler manufacturers, and say to the coupler manufacturers that regardless of their so-called patents —and there are very few of their patents to-day that are valid on couplers—and say that one coupler must be designed, and the different manufacturers should waive all questions of patents and get down to a fair manufacturing profit. That is practically where it is to-day.

J. F. Walsh (C. & O.): It seems to me this discussion this morning, with respect to couplers, is strongly opportune. As I remember the matter, the present M. C. B. type of coupler, the contour, the knuckle, the general design of that coupler was adopted a number of years ago when the bulk of our cars were very much lighter in capacity than they are to-day. About the time that type of coupler was adopted it became fashionable to take off the buffer block, and we have been buffing with that unfortunately weak coupler, until I know of one case where one car had 8 couplers in a year. In connection with this matter of couplers, would it not be well to arrange to adopt some form of coupler that would constitute not only a coupler, but a substantial buffing device in connection with the coupler. I think it would be a good plan, as Mr. Deems said a moment ago, if we do not go into this matter some one will go into it for us. The M. C. B. Association ought to endeavor to bring out something in the way of an M. C. B. type of draft rigging. The draft rigging we have to-day provides the same strength for pulling as it does for buffing, and we know that is wrong.

C. E. Fuller (U. P.): If I understand the committee's report correctly they disapprove of cutting out the 8¾-in. coupler, and I would ask the chairman of the committee or some other member of the committee, what their objection is to cutting out the 8¾-in. and going to the 9¼-in. coupler?

C. A. Schroyer (C. & N. W.): There are 39 couplers to-day, and by putting in these different standards, you make 39 times 39 couplers.

Mr. Fuller: We are getting away from the 8¾-in. coupler, and yet the committee objects to cutting out that coupler and going to the 9¼-in. coupler, if I understand the report correctly. I think we ought to get away from the 8¾-in. and go to the 9¼-in. and thus reduce the number of standards.

S. M. Hindman (Penn.): The reason the 8¾-in. coupler was left there, is, that the 9¼-in. dimension simply takes care of the couplers designed after January 1, 1909. You have these two standard couplers in existence, and the 8¾-in. coupler will be in existence until it is worn out and scrapped. You must take care of them until that time.

Mr. Fuller: You do not have to manufacture any more of them?

Mr. Hindman: No; that specification says that all couplers manufactured after January 1, 1909, must have 9¼ in. dimension.

Mr. Fuller: In reference to this discussion, it seems to me that the question with this association taking action on matters pertaining to standards is not only a question of getting down to a standard, but it is important from a commercial point of view. I am afraid we have all been disposed to try to keep too many things in existence. We have had the M. C. B. coupler for a great many years, and it is now further from a standard coupler than it ever was before, and five years from now it will be still further from being a standard coupler. I think Mr. Brazier's remarks are to the point, and this is a question that this association should take very careful note of. We cannot longer continue to defend our position in regard to the M. C. B. coupler. If we are worthy of being called the mechanical representatives of the railways, we certainly should have sufficient ability to get down to a standard. There does not seem to be any more reason for having to carry 8, 10 or 20 different kinds of knuckles for our couplers than there is for carrying 8, 10 or 20 different kinds of brasses. We have a standard brass which will interchange and go into any car, and we

should have the same thing for the coupler; and the sooner we take action the stronger will our association be, and I for one feel that this association has got to get down to rock bottom, and the members must forget a lot of their personal opinions and adopt a standard M. C. B. coupler after giving the matter full consideration—to consider the matter fully and know we are right and then adopt something that will be a credit to the association. I think we should use whatever is the standard, 9¼ in. coupler on all new cars, but the old cars are going to be in operation for a good many years to come, and we will probably have to use the 8¾ in. coupler on those cars. You must remember that even if we take action on this coupler question at this time it will be five or six years before we reap the benefits of it, and the sooner we begin on the matter the better.

Mr. Schroyer: The thought that comes to my mind in connection with this coupler question is this—that it is very much more important to this association and to the railways of this country that we should have a coupler in which the same knuckle would be operative. Now, the difference between couplers is in the difference in the shape of the knuckle and the knuckle arm, and the difference in the locking and unlocking apparatus in the side of the head. All the patents which exist to-day on couplers are in connection with these details. If we could require that a coupler be constructed in which the same knuckle could be used, regardless of what the uncoupling attachments may be, or the uncoupling or locking apparatus may be, we could under our rules, as they exist to-day, buy one style of coupler for our own use, and under our rules we could put that style of coupler into any car that came into our possession in which we had a broken coupler. Our greatest difficulty to-day in the maintenance of couplers is in the knuckle, not in the coupler heads themselves, because we can soon work out a coupler head, but the knuckle question is the difficult one, and we are required to carry in stock all the different kinds of knuckles that Mr. Brazier referred to. We do not want to stand in the way of progress in the way of a coupler, but I think we should say to the inventor—you must invent a coupling in which a certain kind of knuckle will be operative, and your locking attachments in the head must be operative from an upper or lower connecting rod, and if we could secure these things I think the difficulty would be reduced to a minimum, and we would not be standing in the way of progress in the development of coupler construction.

H. L. Trimyer (S. A. L.): As a member of the coupler committee I wish to say that I telegraphed authority for my signature to be appended to the report, but as Mr. Gaines has said, in regard to himself, I will say for myself, there are many things in the report which do not exactly meet my views. In the first place, I am in favor of one standard coupler. While I cannot agree with Mr. Schroyer that all the troubles are in the knuckles, I will say that the troubles we have developed are in the knuckle pins, coupler locks, faces and guard arms. We have some conditions existing in our territory that have led me to believe that the coupler should be entirely redesigned. The coupler, as stated by Mr. Walsh, was designed years ago for comparatively light capacity cars, and tests I have actually made lead me to believe that the present contour lines are not just right. We have a large number of failures of knuckles, locks, and knuckle pins are also failing in a great many of our cars, and we have a few failures of the guard arms. We have some conditions existing on two of our connections, practically new roads, running up into mountainous territory, operating 75 to 100 car trains, and experience with the couplers on those trains has led me to believe that the present coupler is wholly inadequate for the service.

I have discussed this matter with a great many coupler manufacturers and they have agreed that the present coupler is not of sufficient capacity for that service. As Mr. Gaines stated, I believe that we require additional space in the head of the coupler to enable us to strengthen up those parts that are failing, and I am in favor of increasing that distance so as to give us an opportunity to strengthen the locks knuckles and knuckle pin, and there is no reason why we should not design a coupler that shall meet all of the requirements both in regard to the large humo yards; the difficulties experienced around the coal tipples and bad track conditions which are responsible for a great many coupler failures at the present time, and I for one am in favor of the committee making some effort to adopt a standard coupler.

G. W. Wildin (N. Y. N. H. & H.): I move that the committee be instructed to design an M. C. B. coupler and present it to the next convention.

Wm. Garstang (C. C. C. & St. L.): I offer this amendment to Mr. Wildin's motion: That the committee on coupler and draft equipment be authorized to take up with the coupler manufacturing companies the matter of redesigning the coupler, and invite them to join the M. C. B. committee in the designing and adopting of one standard freight car coupler.

Geo. Gibbs (Penn.): In fairness to the coupler committee I think they should be given some sort of guide as to what is required. I think in the case referred to by Mr. Trimyer, they are hauling trains with two or more Mallet engines ahead, which stretch the couplers out of shape. If two Mallets will not do it, three or four will, and if they keep putting on these Mallet engines on their trains in these numbers, they will pull all their couplers out of shape and have no end of coupler failures. I think the committee should have instructions as to whether they should design couplers to be used in trains hauled by 2 Mallets or 10 Mallets—unless they have instructions of this sort it will be difficult for them to perform the work assigned to them.

The President: Mr. Wildin, will you accept Mr. Garstang's amendment?

C. A. Seley (C. R. I. & P.): Do I understand this authority conferred on the coupler committee will permit them to depart in all respects from the present standards of the association if in their judgment it is desirable to do so? I think the committee should be authorized to proceed regardless of present standards.

Mr. Garstang: My motion will allow the committee to use their own judgment in that matter.

Mr. Seley: I do not mean the present standard—of course, retain the contour line until that has been changed.

H. L. Trimyer: In answer to what Mr. Gibbs has said, I would like to say that actual tests made with one Mallet engine and fifty 50-ton steel cars, clearly demonstrated that the present coupler will not meet the service required.

I want to say this was not an investigation made by the coupler committee; it was an investigation made by us on account of some conditions we experienced up there. In gaging 596 cars with a 5⅛ in. gage between the guard arm and the knuckle there were only 132 cars that would pass, and I believe every one of us here will be greatly surprised if we take a gage and start through our yards, if we follow the rules, to see how many cars we will have to send to the tracks or take the coupler knuckles and locks out to make them come to a 5⅛ in. gage as required.

I. S. Downing (Ill. Cent.): It would be interesting to know from Mr. Trimyer's remarks whether these couplers were old, worn couplers that had been in service that did not meet the test, or new couplers that were pulled out of shape.

Mr. Trimyer: The test was made on cars which had been on the road from four months to four years. We have actual figures—while I have not them with me, they can be shown to the coupler committee—which show that couplers which had been in service 41 days were out of gage according to the M. C. B. requirements.

W. F. Bentley (B. & O.): I would inquire whether the couplers referred to were all gaged to know whether or not they conformed to the M. C. B. requirements or came up to the gage before the test was made.

Mr. Trimyer: The cars were assembled together and gone over and gaged before test was made.

Mr. Schroyer: Regarding this getting out of gage, let me say that I am very sorry that anything of that kind should have gotten into our record. It is a condition which, if it does exist, is certainly very alarming, and we sometimes get wrong ideas as to why certain things are being done by this association. At the time a gage was established to be used for knuckles and draw bars we used the short guard arm, and much trouble was occasioned in cars becoming uncoupled because of the gage passing the guard arms, but it was due to the bending of the light 1½ in. knuckle pin and the wearing of the wearing face of the knuckle. Those were the causes that prompted the use of a gage. The extension of the guard arm 1¼ in. has been almost entirely done away with that difficulty of cars becoming uncoupled on the road. On our road we are using that gage all the time, and I believe the majority of the principal roads of the country are using it. Where we find cars that are out of gage we have them corrected. If the bars in such cases fail to the extent that is mentioned, it is questionable in my mind as to how we can get bars that will stand. We certainly cannot do it with the present contour lines.

Mr. Trimyer: I very carefully considered this before saying anything about couplers getting out of gage, and I came to the conclusion that possibly we had gone a little too far in keeping these things quiet. I was greatly surprised to find how many couplers would not pass gage requirements.

Mr. Bentley: I would say that the most of the difficulty that we find is with the knuckle pin. We have established a rule on the B. & O., where we gage all couplers, and the most of our trouble seems to be with the knuckle pin being

bent, or possibly sometimes the knuckle pin hole is worn, thus permitting the coupling to get out of gage. As Mr. Trimyer says, I think there is quite a number of them that we find out of gage, and frequently we are able to bring them up to the standard by applying a new knuckle pin.

Mr. Walsh: I think we have simply outgrown the conditions that the present type of coupler seems to have been gotten up for. Nine years ago we had one thousand 50,000 lbs. capacity cars, and to-day we have twenty-five thousand such cars. Nine years ago the tractive power of our freight locomotives was about 30,000 lbs. To-day it is 90,000 lbs. We have taken off our buffers and we are doing our buffing now with the couplers, and the knuckle pins of course have got to stand it. So you see we have outgrown the conditions that those couplers were made for, and I think it is high time for us to design something that will meet the conditions that we have got to deal with now.

The President: Mr Wildin's motion is before the house. Are you ready to vote upon it?

Mr. Garstang: Before the vote is taken, Mr. President, I desire to say a word. On account of having been connected with car building for many years I think I appreciate the work that this committee has got laid out before it. Now, I think if we can get a committee of this association and a committee of the manufacturers to meet and let them get up one standard coupler it will solve the problem, and I think they should have assistance—indeed, it may be necessary to employ a mechanical engineer to work out the problem for them—and I would, therefore, suggest that this association appropriate to the committee a sufficient amount of money to carry on that work.

Mr. Deems: I heartily endorse that suggestion. I think we are approaching a very critical period in this coupler matter. What Mr. Trimyer has mentioned is going on all over the country, and this committee with the many duties that its members have to perform cannot, as individuals, take this work up and handle it as it should be handled, and it seems to me that they ought to have the money, and arrangements ought to be made so that they can employ a mechanical engineer to assist them in the detail of the work.

Mr. Stark: I desire to say on behalf of the committee that we have no objection whatever to working at a standard coupler. The demand has arisen from the membership of the association for a temporary coupler, and we are by no means wedded to the present standard; but there is a large expense involved and the committee has no appropriation or authority to spend a large amount of money in the working out of a satisfactory coupler and I think this association ought to provide for the committee in that respect. It has been expressed here to-day that these couplers are failing. I think possibly one reason of that may be that so many of them are purchased without specifications. To bring about a standard coupler is going to be a pretty hard proposition. It is a question, too, whether we want just one single standard. You will have no means of comparing one design with another. It is a large subject. As Mr. Schroyer has said, if it can be worked out so that one knuckle will apply to all couplers that will be a great step in advance; but we will have to provide also for a top lift and a bottom lift no doubt, because there are certain conditions that require it.

Mr. Wilden's motion was then carried.

M. K. Barnum (Ill. Cent.): I would like to offer a motion —perhaps it could have been put as an amendment of the other motion—that the committee be authorized to incur such expense for the employment of a mechanical engineer or other assistance as seems to them justifiable and that the Master Car Builders' Association stand the expense.

The motion was carried.

Mr. Gaines: While we have talked generally, there has not been anything definite done about one point. If we get an increased head of the coupler that will give us 2 in. additional end clearance, it will save a lot of money, and I think it will be satisfactory to the majority of the roads. Therefore, I move that couplers with 11¼-in. dimensions be submitted to letter ballot.

The motion was seconded.

Mr. Seley: I think it is highly important that we decide now as to the amount of that extension. It was the argument on the safety appliance hearings that any extension would add to the overhang and produce a weakening of the structure, and I doubt very much the possibility of going any further in regard to extensions than is absolutely necessary. I am of the opinion that it will take more than 2 in. to save the troubles of some people in short clearances. It would be very handy to them, no doubt, to have a coupler 5 in. or 6 in. longer than the present coupler, but at the same time I am persuaded that we would have no argument at all on the safety question, from an engineering standpoint, by this increase. I believe that what Mr. Gaines has suggested is moderate and consistent, and that further than that we should hesitate to go.

C. P. Cleaver (Rutland): I would like to say that I am opposed to that motion. We have expressed our confidence in this committee and in its ability to design a satisfactory coupler. Now, this is commencing to tie their hands at once, and I say that we should not do it. There might be half a dozen motions of this kind and the committee would find themselves in a position where they couldn't do anything.

Mr. Brazier: I do not think the member understands Mr. Gaines' suggestion. We are talking now about a temporary appliance, not a standard one.

Mr. Wildin: Why are we so anxious about this temporary coupler? If we can get a standard coupler inside of a year, why not wait?

Mr. Gaines: There is just this one point to be considered. In the first place, I think the coupler committee ought to have some designating dimensions, and my motion was to submit this proposition to letter ballot as a new standard, and thus give the coupler committee an increased space within which to work out the strength of the coupler and the various details. Another thing. We can gradually have all our cars come under the law without any extra expense and get our equipment standard where the 2 in. dimensions will do it without any additional expense. I think probably it will be necessary to have special couplers probably on some few roads with a larger end clearance, but not as a standard.

T. H. Goodnow (L. S. & M. S.): In seconding Mr. Gaines' motion it was with the understanding that it was not to tie up the coupler committee at all to the 11¼ in. standard head. In answer to Mr. Wildin, I would say that I think it is necessary to get a temporary coupler with that length of head at the present time so that we can stencil our cars as they come off the tracks. The United States Safety Appliance standard is required, and it will be necessary before four or five years roll around to have a great many of these couplers. I do not think the action taken by the association this morning will provide within the next two years, anyway, a standard coupler. I think the 11¼ in. dimension should be considered as a temporary expedient, and as not tying up the coupler committee at all.

Mr. Deems: I very much hope that Mr. Gaines' motion will not prevail as it applies to the work of this committee in designing a coupler. I can realize that it might be very well to have it prevail for the period intervening between now and the time we get the standard coupler. Indeed, it is quite probable that the committee will use that dimension, but I do not think we should tie their hands. If this is offered as an instruction to the committee in their designing of a new coupler I certainly hope it will not prevail.

Mr. Wildin: I want to emphasize what Mr. Deems has said. I do not understand where they got their dimension or why it is said to be satisfactory. If this committee is going to design a coupler we ought to keep our hands off and let them alone. When they put in their report, why, then is the time to jump on them if you think it necessary; but do not tell them in advance what they must not do or what they should do.

Mr. Gaines: It was not my idea to tie up the hands of the committee at all. I think Mr. Deems brought out the essential point when he stated that it is going to be some time before the committee will be ready to submit a standard. Meanwhile the 11¼ in length I think ought to go to letter ballot and be used if carried. Besides, it will be an indication to the committee, if it should be adopted as the present temporary standard, without tying up the committee to it at all.

Mr. Wildin: I have no objection to the motion, as Mr. Gaines now explains it.

C. E. Chambers (C. of N. J.): I do not understand why the figure 11¼ in. is arbitrarily taken. We have draw bars and rigging ranging up to 5 in. in length, and I fail to see the necessity of making any standard coupler which might apply to some individual road to help it out of a difficulty and put it on us.

Mr. Fuller: I agree with Mr. Chambers that it is going to get a lot of couplers on our hands unnecessarily, and half of the roads won't have an interchange. If you have got to move your draft rigging out you might as well move it out 5 in. or 6 in., and I, for one, dislike to see a change of couplers all the time. While it may be necessary for old cars to have an emergency or temporary coupler, I think it ought to be temporary and not standard in any particular. I might say that there is probably more earnest work on the part of the committee on the expense incidental to bringing this clearance to meet the requirements than any other one subject. The subject was very carefully considered relative to the effect of the overhang. It looks

nice, and I want to say to you that if you put 85 or 100 cars on, the longer you bring out the head of your coupler the weaker your structure is. I think this addition ought to be very carefully considered.

Mr. Chambers: As to a new standard coupler, I think anybody who has walked through the repair yard will realize that the present coupler has outlived its usefulneses. We do want a new coupler, but let us have it a permanent one.

Mr. Trimyer. I want to second what Mr. Chambers has said. I have made a lot of measurements of what the average distance required is to meet the new Safety Appliances Law. The figures show that we require 4¼ in. on wooden cars and 2⅜ in. on steel cars. Therefore, the 11¼ in. proposed by Mr. Gaines would do very little good on either class of cars.

Mr. Gaines: I would like to ask Mr. Seley whether the summing up of the figures that he tabulated last year would not show that a very substantial majority of the cars that have to be changed for end clearance would be covered by an increase of 2 in.

Mr. Seley: As I recall the figures, the tabulations of all the cars reported to the committee shows that 2 in. would cover over 50 per cent. of the cars.

D. F. Crawford (Penna.): I am quite in accord with the idea of designing a standard coupler by this association, and also a number of other standard parts that are not perhaps quite as annoying, but I would like to ask just one question. Several times this morning the present coupler has been referred to as inadequate, and Mr. Chambers just spoke of walking through yards and looking at the discarded couplers. What do you know about the present coupler? We have got to use it for some time in many cars. Is the coupler complained of the coupler that is required to pull a 150,000-lbs. car? That is our present coupler. Or is it the coupler that we purchased five or six years ago with no specification? Or the one that is purchased now without specification? We will have to use this present coupler for a year or perhaps two years.

Mr. Stark: I agree with Mr. Wildin that we ought to go slow on this matter of a temporary coupler. The wooden cars that are now short of end clearance could be changed within the next five years by moving the draft attachments out, and they will fail many times before that time comes, when repairs and the corrections can be made at the time of the making of repairs. Steel cars will be with us for years to come, and it is possible for the new proposed standard coupler to be applicable to our lighter design cars. It is possible that we may avoid substituting three or four temporary couplers and that the standard coupler will apply to the cars that we intend to perpetuate.

Mr. Gaines' motion was put, and lost.

The President: What is the pleasure of the convention with respect to the committee's recommendations?

Mr. Crawford: Was the committee unanimous in those recommendations?

The President: I so understand.

Mr. Stark: I move that they be submitted to letter ballot.

The motion was carried.

Mr. Seley: As I understand it the coupler committee is charged with the duty of getting up a new standard coupler. I do not understand that anybody or any committee has been charged with doing anything in regard to a temporary coupler. Am I right or wrong about that?

The President: You are right about it.

H. E. Passmore (T. & O. C.): Has not the Interstate Commerce Commission got that matter in hand now? Haven't they made some order about it?

The President: I have not heard of any order that has been issued in that respect. I would ask Mr. Seley if he has anything to propose in this regard.

Mr. Seley: I believe the coupler committee should undertake that work, possibly by a sub-committee; but I would presume to dictate to them how they shall handle the matter. I believe the coupler committee ought to handle all coupler questions, whether those of a temporary coupler or of a permanent coupler. I would move, Mr. President, that the coupler committee be instructed to prepare a design regarding a temporary coupler and submit it to the executive committee; this report to be expedited as much as possible through circulation of information regarding the additional length, which information shall be gained by the most expeditious means. In other words, I mean that the report to the executive committee should be made as quickly as possible.

The motion was seconded.

E. W. Pratt (C. & N. W.): I would like to ask when this has reached the executive committee, what action can they take that will bring it to a close as soon as possible? Have they the authority to submit it to letter ballot before the next convention?

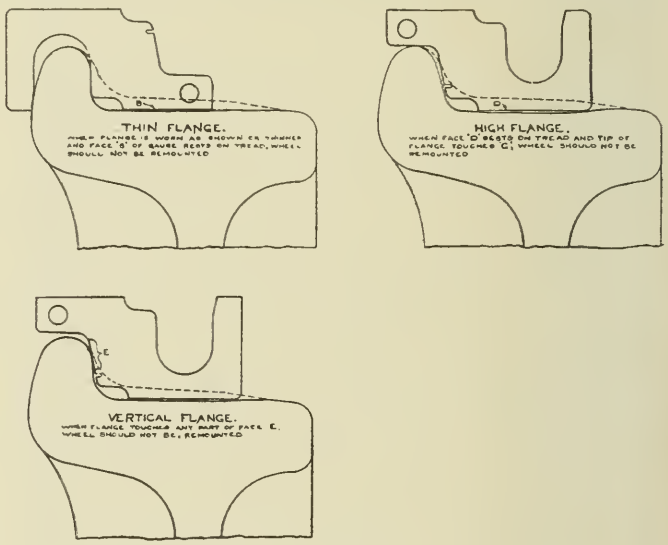
Mr. Seley: Indeed they have. They can do anything they like with it.

S. M. Hindman (Penn.): In order that the coupler committee may work intelligently to provide this temporary coupler as suggested by Mr. Fuller, there is certain information that they will have to get from the various roads. Now, they have asked in their report, in order that the number of standards may be kept to the minimum, that the members advise them of the number of cars requiring this increase. They will have to get that information before they can go ahead.

Mr. Seley's motion was put and carried.

CAR WHEELS.

The attitude of the committee during the past year has been of a receptive nature, that is to say, awaiting developments and criticisms in regard to existing standards and recommendations made heretofore. Several modifications have been suggested in connection with the standard reference gages for mounting inspecting and checking wheels, the circumference gage; and also, some changes in the design and use of the standard cast-iron wheels, which are herewith presented for your consideration. The committee, as heretofore, has worked jointly with the committee representing the Association of Manufacturers of Chilled Car Wheels, on subjects relating to or affecting the efficiency of the cast-iron wheels, and has added, as an appendix to this report, a communication received from the Manufacturers' Association, which, however, is not published herewith. The point brought out by this association is, that under present conditions with high-braking pressures the limiting factor for each weight of wheel is the temperature stresses set up on account of the rapidity with which heat is generated on the surface of tread of the wheel under heavy and continuous braking.



Instructions for Using Wheel Limit Gages.

As the present tendency is toward increased braking pressure, it is thought possible that the present weights should be raised, particularly for wheels used under cars of high tare weight, such as refrigerator cars of 60,000 lbs. marked capacity, for which at present the standard 625-lb. wheel is used. As this question was found to be quite far-reaching in its effect upon the present standards, and sufficient time was not available to give it the thorough investigation that it demands, the committee does not feel justified in making a recommendation at this time. It is considered of such importance however, that your attention is called to same here in order that a study be made of the subject.

The following is a copy of a circular of questions sent out by the secretary to the members of this association bearing on the diameters of steel and steel-tired wheels in connection with coupler heights, efficiency of brakes, etc.:

"1. What is the maximum diameter, steel or steel-tired wheels, that can be applied to freight cars of the class to which you might consider the application of such wheels and still keep the draw-bar height not to exceed 34½ in.?

"2. What is the maximum diameter of steel or steel-tired wheel that can be applied to cars as above, and in connection with existing brake beams and heads?

"3. What is the minimum diameter of steel or steel-tired wheels that can be used in cars as above and keep the draw-bar height at all times not less than 31½in. above the rail, and also keep all parts of the truck at least 2½ in. above the top of rail, as specified in the M. C. B. rules of interchange, bearing in mind the compression of springs, wear of brasses, journals, etc.?

"4. What is the minimum diameter of steel and steel-tired wheel that can be used in connection with your existing brakes and not reduce their efficiency on account of the angularity of brake hangers and levers?

"(a) With the brakes applied, what will be the angle of the brake-beam hanger with a line drawn from the center of the wheel to the center of the brake shoe, with wheel worn to minimum diameter and brake shoe worn to limit?

"(b) What will this angle be with maximum diameter of wheel and new brake shoe?

"5. With the maximum and minimum diameter of wheels as quoted by you, how do you propose to keep within the prescribed draw-bar height and maintain proper clearance of not less than 2½ in. for all parts of truck above the rail? Please explain in detail for each of the various types of truck."

To the above circular twenty-nine replies were received. After a careful analysis of them, it was found that the maximum diameter of steel or steel-tired wheels that can be used by most of the railroads and keep a draw-bar height not to exceed 34½ in. and be used in connection with the existing brake beams and head was 33 in., several of the roads reported that they could use 33½ in., and in a few instances 34 in. and 34½ in. In deciding upon the minimum diameter to which all-steel or steel-tired wheels should be worn, the question of maintaining a draw-bar height of not less than 31½ in.—making allowances for compression of springs, wear of journal and brasses, and also to compensate for the wear of the wheels—was duly considered. Three methods were suggested that can be used, depending upon the construction of the trucks, as follows:

1. Lining under center plate and side bearings
2. Blocking under spring seat.
3. Lining on top of journal box.

The first-mentioned method can only be used to a limited extent where detachable center plates and side bearings are used. The second method can be adopted in cases where the clearance between the top of the bolster and truck frame is sufficient to allow for wear of journals and bearings and for necessary reduction in the diameter of the wheels. On trucks with steel side frames, this can not be done in many instances, and attention is called to this in order that greater clearance between the top of bolster and the truck frame be allowed in new construction. The third method can be used on most trucks except such as have the boxes cast solid with the frames, and consists in using two or three thicknesses of metal liners applied between the tie bars and the bottom of the journal box, when using maximum diameter of wheel. These liners to be transferred one by one to the top of the box as the diameter of the wheel decreases. With either of these methods it is possible in many cases to use a minimum wheel diameter of 30 in. The majority of the roads, however, advise that the minimum diameter that can be used under present equipment is 32 in.

From the replies that were received to the circular of inquiry, the following table was compiled, showing the number of railroads, the number of 40 and 50 ton cars operated by same, and the minimum diameter to which all-steel or steel-tired wheels could be worn on these roads:

9 roads	representing	115,611,	40 & 50 ton cars, recommend	32 -in. wheels
3 roads	representing	42,582,	40 & 50 ton cars, recommend	31½-in. wheels
1 road	representing	12,186,	40 & 50 ton cars, recommends	31¼-in. wheels
2 roads	representing	49,117,	40 & 50 ton cars, recommend	31 -in. wheels
1 road	representing	101,	40 & 50 ton cars, recommends	30½-in. wheels
2 roads	representing	120.619,	40 & 50 ton cars, recommend	30 -in. wheels
1 road	representing	1,492,	40 & 50 ton cars, recommends	29¾-in. wheels
1 road	representing	24,531,	40 & 50 ton cars, recommends	29½-in. wheels

From these results the committee does not feel disposed to recommend a specific dimension as a minimum diameter at which all-steel or steel-tired wheels should be worn before replacement. On account of the great variation in diameters due to wear that might be possible with the use of all-steel and steel-tired wheels, and the effect that this wear will have on the efficiency of the brakes due to the increased angularity of the brake hangers and levers, the committee has forwarded to the committee on train brakes all data bearing on this subject for its consideration

RECOMMENDATIONS.

1. At present, three standard gages are shown on Sheet 16, standard practice, M. C. B. Proceedings, 1910, one for mounting, one for inspecting and one for checking wheels. As these gages are all slightly different, they are confusing to the shopmen, and it has been proposed that one gage be used in place of the three gages now shown. This method has been found to be entirely practical, and is, in fact, followed by many roads. The present wheel-check gage, shown on Sheet 16, M. C. B. standard, fulfills the requirements of such a gage, and it is recommended that an illustration of same be substituted for the three gages now shown on Sheet 16, of the M. C. B. standard practice. In order to better protect the gage from wear, the gaging point at the throat of the wheel has been increased from ⅛ in. to ¼ in. This has the further advantage of more nearly approximating the original location in remounting secondhand wheels.

It is also recommended that the first sentence, paragraph 3, under Mounting Wheels in Recommended Practice, be changed as follows:

"Third.—That in mounting wheels, new or secondhand, the 'standard wheel-mounting and check gage' be used in the following manner:"

2. In 1909 the Railway Club of Pittsburgh made the following suggestion:

"The dimension 4 ft. 5 3/32 in. on Fig. 6-A be changed to 4 ft. 5 5/32 in., due to not mounting more than one wheel with maximum flange thickness on the same axle. In accordance with rule 66."

This was approved by the arbitration committee in 1909 and changes made in the code of rules. The gages shown on sheet 16, however, were not changed. The dimension referred to is the distance between backs of flanges at the base line. After careful consideration, the committee does not feel that this dimension should have been increased to 4 ft. 5 5/32 in., as it will not accomplish the purpose for which this change was intended, or to prohibit the mounting of two maximum flanges on the same axle. It is, therefore, recommended that this dimension should be 4 ft. 5 3/32 in., as recommended in 1907 report. This will necessitate changing the dimension 4 ft. 5 5/32 in. on Fig 9, page 37, code of rules, and Fig. 9, page 599 of the Proceedings of 1910, back to 4 ft. 5 3/32 in.

3. The second paragraph of rule 24 in code of rules reads:

"In no case may two new wheels having maximum thick flanges be mounted on the same axle."

It is recommended that the wording of this rule be changed to the following:

"In no case should two new wheels be mounted on the same axle when the thickness of the two flanges together will exceed the thickness of one normal and one maximum flange or 2 17/32 in.

4. The committee recommends that the standard wheel circumference gage be changed as shown in the Master Mechanics committee report on contour of tires.

5. The present method of graduating the circumference measure does not provide a definite boundary for each tape size as the tape sizes are indicated with lines. It is, therefore, recommended that instead of defining a tape size with a line, it be defined by the spaces.

6. The committee recommends that the limit gage for remounting secondhand cast-iron wheels, which is shown on Sheet 16-A of the proceedings of 1910, of the M. C. B. Association, be shown in the different positions in which it is to be used with explanatory notes as shown in Fig. 1 herewith.

7. It is recommended that the minimum flange thickness gage for new wheels, shown on Sheet 16, of the 1910 Proceedings of the M. C. B. Association, have the figure 1 5/32 in. changed to 1 11/64 in., in order that the minimum thickness of flange be as much below, as the maximum thickness of flange is above, a normal flange.

8. The Association of Manufacturers of Chilled Car Wheels suggested a few unimportant changes be made in the design of the present standard wheels, in order to improve foundry practice and reduce losses, which are recommended by the committee.

9. Manufacturers' Association also suggests some additional changes in the 675-lb. wheel, consisting in the reduction of the thickness of bracket and thickness of tread and making the contour of the plate same as 725-lb. pattern. The committee feels that it can not approve this suggestion until a more thorough investigation has been made.

10. It is also recommended that the part of the paragraph No. 8, page 763, of the Proceedings of 1910, which reads as follows:

"And the day, month and year when made, plainly formed on the inside plate in casting"

Be changed to read

And the month, day and year when made, plainly formed on the inside plate in casting.

11. It is recommended that the diameter for all new steel and steel-tired wheels for freight cars be made 33 in.

12. For high-capacity freight cars built in the future and likely to be equipped with steel wheels, it is recommended that provisions be made in the construction of car and trucks to permit the use of wheels varying in diameter from 33 in. to 30 in.

This report is signed by:—Wm. Garstang, (C. C. C. & St. L.), chairman; A. E. Manchester (C. M. & St. P.), O. C. Cromwell (B. & O.), W. C. A. Henry (Penn.) R. W. Burnett (C. P.), J. A. Pilcher (N. & W.) and R. L. Ettenger (Southern).

DISCUSSION ON CAR WHEELS.

F. H. Stark (Pitts. Coal Co.): I move that the report be accepted and submitted to letter ballot.

E. W. Pratt (C. & N. W.): I would like Mr. Garstang to give us a little information relative to the eleventh recommendation. It occurs to me that many roads have been using a wheel somewhat larger when they buy a steel or steel-tired wheel, feeling that they will compromise between the new and old life of the wheel by having dimensions above and below 33 in. I would like to know why the committee have set 33 in. as the maximum instead of splitting the difference.

Mr. Garstang: One of the principal reasons for the 33 in. diameter was due to the fact that all wheels under freight cars at the present time are 33 in. in diameter and that the 33 in. wheel fits into the trucks and the brakes and the connections better than any other dimension.

M. K. Barnum (Ill. Cent.): As a matter of fact, quite a number of manufacturers of all steel wheels are making a standard wheel 33½ in., and the company with which I am connected has been ordering that sized wheel for locomotive tenders and also for some of its passenger cars. So long as that only raises the center of the wheel ¼ in., it seems to me that a maximum of 33 in. should be very carefully considered.

C. A. Schroyer (C. N. & W.): While we recommend that on a steel tired wheel, I think it would be a mistake to have a steel tired wheel that had to receive several turnings before it was worn out with 33 in. as its original diameter. We calculate on turning at least 1½ in. out of that metal, and then we have got 30 in. as the outside diameter of the wheel when worn out, which, as this report indicates affects the truck leverages and the angularity of the hanger, and the speed at which the wheel revolves. I think it would be a mistake to limit the wheel to 33 in., 33½-in. or 34 in., it should be for us, because we would take them as large as we could get them, so long as the wheel did not interfere with the construction of the truck and the angularity of the brake hanger.

C. E. Chambers (C. of N. J.): I think an allowance in many different sizes of wheels should be made. In a few years it will be like it is with the coupler proposition now, and then what are you going to do if you have a 33½-in. wheel and another road's car comes along that won't take anything over a 33-in. wheel. I have heard more complaints about getting clearances down at 33½ in. and 34 in. for new cars than anything else, and I think if you use a larger wheel you are going to run up against trouble.

Mr. Garstang: I was just talking to our mechanical engineer who worked up the details of this report, and he tells me that 90 per cent. of the wheel reports received recommended a 33-in wheel. I am heartily in accord with the gentleman who has just spoken that we do not want to get two or three sizes of wheels, and if 33 in. is not right let us make it 34 in., but get some dimension and stick to it.

Mr. Barnum: I fully agree with that, but the steel tired wheel is a different proposition than a cast steel wheel and a steel wheel with a hardened surface. As a matter of fact, I do not think there are any wheels made now that would turn down to 30 in., and my idea would be to make 33 in. the nominal diameter; start with 33½ in. and turn it down to 33 in. I believe also that the rolled steel wheels are only expected to stand about two turnings. So you will never get 30 in.

W. E. Dunham (C. & N. W.): I believe that what Mr. Pratt and Mr. Barnum have stated are right in line with our best locomotive practice. I do not think anybody has had any trouble in maintaining the proper height of the draw bar on the tender with a steel tired wheel.

Mr. Pratt: Inasmuch as we have steel-tired wheels that are worn, if there should be a car that was too high we could probably make arrangements to put in a wheel that had been turned down.

Mr. Garstang: The first question that was raised in the circular sent to our committee concerned the maximum temperature of steel-tired wheels that could be applied to freight locomotives and still keep the drawbar head not to exceed 34½ in. The answer to that question was that 90 per cent. of the replies received by the committee were in favor of the 33 in. wheel, and it was largely upon those replies that the committe made its report.

The President: The question before the house is on the adoption of the report of the committee and referring to letter ballot the recommendation made in it.

The motion was carried.

Mr. Fuller: I move that a committee be appointed, or else that the wheel committee be instructed to consider the fastenings for built-up wheels. We all know that we have wheels running the fastenings of which are not suitable for mountain service, and I think we ought to adopt a standard fastening for built-up wheels.

The President: This is a matter that must be taken up by the executive committee, and I will suggest that when they make up their programme for next year's convention they allot space to it.

Mr. Garstang: In connection with Mr. Fuller's suggestion, I think the committee ought to get up a drawing showing the principal dimensions of steel and steel-tired freight wheels.

The President: That suggestion will also be referred to the executive committee, Mr. Garstang.

SAFETY APPLIANCES.

The committee on safety appliances has carefully considered this important subject in the limited amount of time that it has had since the issuance of the order of the Interstate Commerce Commission in the matter of United States Safety Appliance Standards, dated March 13, 1911, which is a modification of the original order issued October 13, 1910. The United States Safety Appliance Standards prescribed in the Interstate Commerce Commission's order of March 13, 1911, must be applied to all equipment built on or after July 1, 1911. As to applying the United States Safety Appliance Standards prescribed in the Interstate Commerce Commission's order of March 13, 1911, to equipment built prior to July 1, 1911, the order of the Commission prescribed the following:

"(a) Carriers are not required to change the brakes from right to left side of steel or steel-underframe cars with platform end sills, or to change the end ladders on such cars except when such appliances are renewed, at which time they must be made to comply with the standards prescribed in said order of March 13, 1911.

"(b) Carriers are granted an extension of five years from July 1, 1911, to change the location of brakes on all cars other than those designated in paragraph (a) to comply with the standards prescribed in said order.

"(c) Carriers are granted an extension of five years from July 1, 1911, to comply with the standards prescribed in said order in respect of all brake specifications contained therein, other than those designated in paragraphs (a) and (b), on cars of all classes.

"(d) Carriers are not required to make changes to secure additional end-ladder clearance on cars that have 10 or more inches end-ladder clearance, within 30 in. of side of car, until car is shopped for work amounting to practically rebuilding body of car, at which time they must be made to comply with the standards prescribed in said order.

"(e) Carriers are granted an extension of five years from July 1, 1911, to change cars having less than 10 in. end-ladder clearance, within 30 in. of side of car, to comply with the standards prescribed in said order.

"(f) Carriers are granted an extension of five years from July 1, 1911, to change and apply all other appliances on freight-train cars to comply with the standards prescribed in said order, except that when a car is shopped for work amounting to practically rebuilding body of car, it must then be equipped according to the standards prescribed in said order in respect to handholds, running boards, ladders, sill steps and brake staffs: Provided, That the extension of time herein granted is not to be construed as relieving carriers from complying with the provisions of Section 4 of the Act of March 2, 1893, as amended April 1, 1896, and March 2, 1903.

"(g) Carriers are not required to change the location of handholds (except end handholds under end sills), ladders, sill steps, brake wheels and brake staffs on freight-train cars where the appliances are within 3 in. of the location, except that when

cars undergo regular repairs they must be made to comply with the standards prescribed in said order.

"(h) Carriers are granted an extension of three years from July 1, 1911, to enable passenger-train cars to comply with the standards prescribed in said order."

The committee appended the standards prescribed by the commission.

The matter of appending to this report, drawings or cuts showing the manner of application of the United States Safety Appliance Standards to passenger-train cars was considered by the committee, but owing to the various local conditions and practices to be met by the various roads of the country in applying these standards and also to the limited amount of time in which to gather the requisite information since the issuance of the final order of the Interstate Commerce Commission the committee has not prepared drawings or cuts.

The committee recommends that the Association's standards for safety appliances, Plates 19 to 19-P, be withdrawn and that the United States Safety Appliance Standards be substituted. Plates 19-A to 19-P contain cuts showing the matter of application of safety appliances to the various types of cars and these plates also contain texts pertaining specifically to the car illustrated by the respective plate. These texts were a great help to car inspectors and others desiring to gain information quickly, and it is recommended by the committee that plates with texts of the United States Safety Appliance Standards to cover the various types of cars be submitted at the next convention.

The committee recommends that designating marks for cars equipped with the United States Safety Appliance Standards be adopted. The Interstate Commerce Commission's order prescribes that all cars built on or after July 1, 1911, shall be equipped with the United States Safety Appliance Standards, whereas there are various exceptions in the case of equipment built prior to July 1, 1911, it will be necessary to have two designating marks, that a car may readily show whether it comes under the rules for equipment built on or after July 1 1911, or under the rules for equipment built prior to July 1, 1911.

The committee recommends the following designating mark for cars built on or after July 1, 1911:

UNITED STATES
SAFETY-APPLIANCE
STANDARDS, BUILT

and for cars built prior to July 1, 1911—

UNITED STATES
SAFETY-APPLIANCE

(Date built not to be included in the marking.)

These markings to be used on each side of the car; letters if stenciled to be not less than 1 in. in height and as per the M. C. B. Recommended Practice for lettering for freight cars, sheet M; letters if on a metal badge plate to be not less than ½ in. in height and raised not less than 1/16 in. and have not less than ⅛ in. bar or staff. The arrangement of the words should be as near as possible as shown above.

A metal badge plate 4 in. x 12 in., with the proper margin, is preferred; one plate to be secured on each side of the car by four bolts or rivets if on metal cars, and by four bolts or screws if on wooden cars; the bolts, rivets or screws to be not less than ¼ in. diameter. The badge plate to be made of malleable iron.

The marking for cars built after July 1, 1911, shows the word "standard," and this word "standard" designates that the safety appliances on the car comply with the law in every respect, and furthermore, this same marking should be applied to any car that is equipped with safety appliances that complies with the law in every detail, regardless of the date the car was built.

The word "standard" is omitted in the marking of the cars built prior to July 1, 1911, and having safety appliances which are permissible (not standard) for service by complying with the order of the Interstate Commerce Commission, which permits a variation on cars built prior to July 1, 1911, that is not permitted on cars built after that date.

The report is signed by:—Theo. H. Curtis (L. & N.), chairman; C. B. Young (C. B. & Q.), Henry Bartlett (B. & M.), T. M. Ramsdell (C. & O.), M. K. Barnum (L. C.), W. O. Thompson (N. Y. C. & H. R.) and A. LaMar (Penna.).

DISCUSSION ON SAFETY APPLIANCES.

E. W. Pratt (C. & N. W.): I do not quite understand this lettering. It seems to me that the only difference in stenciling is in relation to the word "standard." We are very likely to have our painters stencil that word on the cars which should not have it on, as well as those which should. I do not see what the idea is of putting any such stenciling as that at all on cars not standard. Perhaps the committee had some reason in mind.

C. A. Seley (C. R. I. & P.): The stenciling on the vast majority of present cars changed over will have the stenciling as indicated by the committee, without the word "standard." That word "standard" will only be applied to new cars, which you will buy in the near future, and I should doubt the advisability of giving the painter a stencil with the word "standard" on it until the road had arranged to have complete standard cars. It is going to be some little time, I think, before that can be arranged by any road. Of course, any new car which is to be repaired will have the stencil in accordance with the new standard. It will require a little effort and care, as Mr. Pratt suggests, but I do not think we will have quite the amount of trouble which he has in mind.

J. F. De Voy (C. M. & St. P.): I did not get your meaning with relation to the metal badge plate. Do you mean that will do away with the stenciling of the date on the side of the car? We do not understand why it should be that way. Is that a ruling?

Mr. Curtis: Yes.

Mr. De Voy: Would it be optional to do it as we are doing it now?

Mr. Curtis: It will be optional; you may use whichever method you choose. You will find it hard to find room enough on some of the flat cars to put the stenciling on the cars, and the badge plate can be used with much greater ease and comfort to the man putting it on.

Mr. De Voy: And, of course, with a great deal more comfort from the commercial end of it. Some one will do some business we might do in our own shops.

C. A. Schroyer (C. & N. W.): What is the object of putting this badge plate on, or even stenciling it? Does not the condition of the car imply whether it is standard or not?

Mr. Seley: I might answer Mr. Schroyer, while I am on my feet, and say that it was understood with the inspectors who attended the conference committee that we would mark our cars so that they could be designated as United States standard. It is not required by law, but we had that practical understanding that we would do it. I did not know the malleable plate had been so named until hearing the remarks of Mr. Curtis in presenting the report of the committee. I think that should be changed to cast plate, and you could use either a gray iron casting or a malleable iron casting as you saw fit.

F. H. Clark (B. & O.): Inasmuch as the committee recognize the fact that on a good many of our cars we have not much room for additional lettering or stenciling, and as the committee has already abbreviated United States to U. S., why not abbreviate Safety Appliances also in the same way, making it read U. S. S. A.?

Mr. Curtis: I was a member of the conference committee, and as a matter of good faith with the inspectors I feel that they expect we should use the words "Safety Appliances."

Mr. Schroyer: If there is a badge plate that goes on that car with the initials indicating what it means, it is just as good as spelling out the whole word. We are doing that on many of our cars, putting the initials of the road on the car, instead of spelling out the whole word, and I am in favor of using the initials.

C. D. Young (C., B. & Q.): I believe there will be a good deal of confusion between the two types of stencils for the cars which have been built prior to and those which were built after the passage of the law, and it has occurred to me that it might be desirable for future cars, those coming up to the requirements of the law, to have a seal of some form in a small stencil or casting, and leave the other abbreviations or spelling out of the words, for the old cars brought up to the requirements so far as it is necessary. I think it is very desirable to reduce the amount of lettering all we possibly can. As everybody knows, it costs us more now to letter our cars than it does to paint them, and we are putting more lettering on, and it simply increases the expense every time you put more letters on your car, but if a seal could be worked out for the future cars that would designate the thing that we require, that this car has been built in accordance with the standard prescribed by law, it would soon become known to anyone whenever that seal appeared on the car that the car was in accordance with the requirements, and it would also give you the difference between the old cars which had been brought up to the standard and the new cars which had been built in accordance with the requirements.

G. W. Wildin (N. Y., N. H. & H.): I do not like this designation—the old car that is brought up to the standard is just as standard as a new car built to standard.

Mr. Crawford: If it is brought up to standard, yes.

Mr. Wildin: You have two standards, one for old cars and one for new cars, which fill the laws as a new one does. If

you get the 10-in. clearance, you have the standard for old equipment. It looks to me as if there should be a plainer designation.

Mr. Schroyer: I think Mr. Wildin is correct in that respect. The old car, when equipped in compliance with the law as modified, has everything that is required under the law, and there should not be anything on the car to indicate a difference between an old car and a new one.

C. E. Fuller (O. P.): I ask Mr. Schroyer how his inspector is going to determine between a car built after July first and the car that has left your shop with these modifications. In one case he is justified in accepting the car without a penalty, while in the other case he is not justified in accepting it, and he cannot take the time to measure the cars to see if they conform to the requirements. He has to know something definite about it. He has five years to bring these cars up. It is the inspector I am looking out for.

Mr. Schroyer: I regret to have the inspector brought in it at all. If we are to expect to educate the inspectors to know all about the safety appliances, starting from the sides and ends of the cars, we must get a different class of inspectors. If we instruct our inspectors that on and after a certain date cars must not be accepted unless they comply with the law, there will be a good deal of confusion. This should not be done for our own inspectors, but for the accommodation of the inspectors of the Interstate Commerce Commission. I think that is the object that we ought to keep in mind.

Mr. Wildin: I think our own inspectors will have to know something about it until all cars are completed. It seems to me the committee did wrong in leaving out the date. It seems to me that the date when the car was built should be applied on all cars. If you say "U. S. Safety Appliances" and put the date on the car, the car people will know in each case which car complies with the law, and nobody can go would have all the information. He would not have all the information desired.

B. F. Crawford (Penn.): Mr. Wildin stated the inspector would have all the information. He would not have all the information unless he made measurements. He would not know whether the car must maintain to the standard or the standard as modified by the order of the commission. There are many cars running their lives out with grab irons and appliances not fully in accordance with the standards, but they will be accepted under the order. They will vary as much as 3 in. from the standard, which is perfectly permissible. It was the intention of the committee, as I understand it, to mark these cars which will run for many years with variations from the standard U. S. Safety Appliances. Those which conform strictly to the standards, and which we expect other roads to maintain for us and which we expect to maintain for other roads at the standard, will be marked "U. S. Safety Appliances, Standard." There is a clear line of demarkation between the two, which I think can be supported legally.

J. F. Deems (N. Y. C.): I confess I don't grasp the necessity for these two markings. The instructions which have gone out on the New York Central lines are to the effect that no car shall be marked "U. S. Safety Appliances" unless it is absolutely standard in every way. I think that is the correct interpretation. As to these cars that are changed the 3 in., to which Mr. Crawford referred, we know that car will be allowed to be passed in interchange, and will not be penalized, but it is not marked, and if one of the inspectors of the government singles that car out and objects to it, we can defend ourselves under the law, and I do not believe the car should be marked. I believe it is misleading. I do not think any car should be marked except a car that conforms absolutely to the rules laid down for a new car. Many of our old cars that are made to conform to the modifications will pass in interchange without difficulty. If we take advantage of the latitude given us under the modifications that are secured, that car is not marked, but goes through all right. I think it is a mistake to mark it and it will result in a great deal of confusion. Perhaps I am wrong about it but we discussed it fully and decided, while many of the cars would run and pass and we would not be penalized for them, they would not be marked because they did not conform absolutely to the standards. If a car is made to conform absolutely, it does not make any difference whether it is old or new.

M. K. Barnum (Ill. Cent.): Our road had a conference of everyone interested in the safety appliance question, and we took exactly the position Mr. Deems has outlined, and have only marked cars, whether new or old, that are standard in every detail.

R. L. Kleine (Penn.): The marking of the cars, not strictly in accordance with the United States Standard Safety Appliance Laws, which do not conform to the requirements of the government, is for the purpose of helping out the car repairmen and inspectors. When that car goes to the shop and the safety appliances, after the five year period are within 3 in. of certain dimensions, that car can go out of the shop, otherwise the car would have to be changed to the U. S. Safety Appliances. For that reason the markings should prevail on the cars.

Mr. Seley: I think the position of the committee is entirely consistent for the very reason Mr. Kleine states, that at the expiration of the five year period, what are you going to do, how are you going to know—are you going over each car and measure it to find if you can safely accept it? If the car is stenciled by some method or other, then when the inspector sees the car after the expiration of a five year period he will know whether the car complies with the law or not, without going into the measurement of these safety appliances as to whether it is acceptable or not. It is the easiest way out of the trouble, I believe, in order to comply with the legal requirements, that we should follow the recommendation of the committee, and that all cars fully and completely equipped in accordance with the standard shall show the word "standard," and those which comply with the modifications shall show "United States Safety Appliances" I think I can say safely that it will be a breach of faith with the inspectors unless we do this very thing.

Mr. Schroyer: I want to make a motion, that instead of using the words "United States," that the initials "U. S." be used.

Mr. Curtis: That is optional in the report. As chairman of the committee I will take it upon myself to change the words "malleable iron" to "metal"—the badge plate shall be made of metal, so that you can make it of brass, malleable iron or cast iron.

Mr. Clark: I move that the words "Safety Appliances" be abbreviated to "S. A."

Mr. Crawford: I would like to ask if the wording of this is in agreement with the U. S. Safety Appliance inspectors or merely the result of our own conference committee?

Mr. Schroyer: I believe there would be no objection whatever on the part of the safety appliance men to having that abbreviation.

Mr. Curtis: These words "United States Safety Appliance, Standard," are taken from the law. It is not required by the law. It was in a nice way requested by the inspectors of the Interstate Commerce Commission that we would use this designation. In good faith the conference committee took the matter under consideration, and I feel it safe in saying it was implied by us and understood by the inspectors that a marking of this order would be placed on the cars.

Mr. Clark: If it is understood that "U. S. S. A." means United States Safety Appliances, is not that a practical compliance with the request of the inspectors, and could not we go even further while we are at it, and put the letter "S" on the cars, and have it understood that the letter "S" means these things? Why should we put a lot of white paint on our cars where it is not necessary?

Mr. Curtis: We have the privilege of doing what we please in this matter.

C. D. Young (C. B. & Q.): I would like to amend the motion to have the committee submit a drawing showing the metal plate, or a stencil plate, which would give the marking for the cars built strictly in accordance with the standard, and preferably to have some designating character such as the combining of the four letters, or one single letter in a circle of some character, so that anyone looking at that seal or stamp will understand exactly what is meant by it.

Mr. Schroyer: I second the amendment.

The President: Do you accept the amendment, Mr. Clark?

Mr. Clark: I do not understand the purpose of the amendment.

Mr. Schroyer: It means the adoption of a uniform branding.

Mr. Clark: I am in favor of that, want to see it simple. We want to cut out a lot of the lettering. We have too much now. We can make some abbreviations so that it will help out in that respect. My suggestion was simply to make it U. S. S. A.—that means just as much as to spell it out. We can go even further than that, as Mr. Young suggested, and put the letter "S" in a circle, or something of that sort. That, I think, will cover the ideas of the inspectors, although I have not talked with them about it. This is simply an agreement, and the agreement is to have some sort of marking added on the cars, to show that the car complies with the standards. We do not need a lot of lettering in order to make that clear.

T. L. Trimyer (S. A. L.): I would say that we have received a drawing from the association showing this stencil,

and are actually receiving cars now with the stencil on them. I notice a good many roads are repairing cars, making them conform to the requirements, and a good many of them are in service and are stenciled. It occurs to me it is quite late now to make a change. It has been specified on a large lot of new equipment, and is actually being applied in service.

S. M. Hindman (Penn.): At the meeting of the committee yesterday, I believe the question of making a drawing, as suggested by Mr. Young, was brought up.

Mr. Curtis: The time was not sufficient. Mr. Lamar tried to make a drawing, but he had no tools.

Mr. Hindman: It seems to me very important that this association should officially take up the work done by the conference committee and support any agreement or understanding that that committee had with the Interstate Commerce inspectors, and I think it would be very inconsistent for the association to adopt anything that did not follow these lines; but, of course, it would be left to the roads to adopt them if they saw fit. It seems to me that we ought to carry out the letter and the spirit of the agreement in that conference as far as possible, and then, if it is thought best to reduce the lettering, have another conference with that object in view.

Mr. Crawford: I move that the report of the committee be adopted.

The President: There are two pending motions before the house—a motion made by Mr. Clark and an amendment by Mr. Young. The amendment by Mr. Young will be put first, and that was the committee submit a drawing showing the metal plate or a stencil plate which would give the markings for the cars, and that it was preferable to have some designating character, such as the combining of the four letters or one single letter in a circle. (The amendment was defeated.)

The President: We will now put to vote the motion made by Mr. Clark, that the words "U. S. Safety Appliances" be abbreviated to "U. S. S. A."

(This motion was defeated.)

Mr. Crawford's motion was put to vote and adopted.

REVISION OF CODE OF TESTS.

The committee appointed to revise the M. C. B. specifications for testing apparatus and code of test for freight triple valves in connection with 100-car trains begs to submit the following proposed revision and respectfully requests its discharge:

CONDITION OF TESTS.

Triple valves will be tested on a rack representing the piping of a one-hundred (100) car train. All cocks, angles and connections will be as nearly as possible identical with those in train service. The rack shall conform to blue-print C-11379 (Rev. 3-9-09) in the hands of the committee, which gives the proper fittings, piping, cylinders, auxiliary reservoirs, main reservoirs, automatic brake valves, etc.

The main reservoir capacity shall be approximately 57,000 cu. in. The capacity of each auxiliary reservoir shall be such as will, with a pressure of 70 lbs., produce 50 lbs. pressure in its brake cylinder when fully equalized in service application with 8 in. piston travel.

The air supply for the test rack shall be obtained from a locomotive type of air compressor having a capacity of from 80 to 120 cu. ft. of free air per minute. The compressor to be controlled by a single top-pump governor adjusted to maintain 110 lbs. main reservoir pressure.

Tests will be made with a brake-pipe pressure of 70 lbs., except when otherwise specified.

With brake-pipe and auxiliary reservoirs charged to 70 lbs., the section of branch pipe between the cut-out cocks and triple valves, also the triple valves, should be tested with soap suds and leakage eliminated. Branch pipe cut-out cocks should then be closed and brake valve placed in lap position; break-pipe leakage should then not exceed 2 lbs. per minute.

Brake-cylinder packing leathers must be maintained in good condition and free from leakage.

All tests shall be made with 8 in. piston travel, except when otherwise specified.

Triples must be so constructed that they can be secured and operated on apparatus conforming to Diagram D-15611 (which shows triple valve end of auxiliary reservoir, branch-pipe union and location of bosses for retaining valve pipe, with detail dimensions of each as well as detail dimensions between these parts when in the relative position they would occupy if triple valve were in place).

The auxiliary reservoirs, brake pipe and brake cylinder of the first, twenty-fifth, fiftieth, seventy-fifth and one hundredth brakes shall be fitted with test gages. All gages must be calibrated and maintained in good condition. Brake No. 1 shall be fitted with two recording pressure gages, one to be connected to the brake-pipe branch pipe, the other to the brake cylinder, and brake No. 100 shall be fitted with a test gage connected to the brake cylinder. The attachment of electric circuit closers, also the general arrangement of the electric circuit wiring, shall be as shown in Fig. 1.

Tests shall be repeated three times under the same general condition, a record being taken of each test, also the average result of each three tests. The room temperature at the time of the tests shall be recorded, also humidity.

The essentials of a quick-action triple valve are, charging, service application, graduation, release and quick action.

INDIVIDUAL TRIPLE-VALVE TESTS.

Charging Tests.

Not less than three triples, selected at random, shall be tested, as follows:

With the triple valve cut out at the branch pipe cut-out cock; the auxiliary reservoir empty; and 90-lb. brake-pipe pressure maintained, the triple valve should be cut in.

A. Under these conditions the auxiliary reservoir should be charged from zero to 70 lbs. in not more than 90 seconds nor less than 70 seconds.



A. J. Cota.

Chairman, Committee on Revision of Code of Tests.

B. When triple is in normal release position, the auxiliary reservoir should be charged from zero to 70 lbs. in not more than 60 seconds and not less than 40 seconds.

Service Application Tests.

A.—(To determine sensitiveness to service application.)

1. Three valves, selected at random, shall be taken for this test and each tried separately. They will be tested on the first brake of the rack using the brake pipe only of the first car and locomotive, having the engine and tender brakes cut out.

2. These triple valves should apply in service when the brake-pipe pressure is reduced by direct discharge to the atmosphere through an orifice which will reduce brake-pipe pressure from 70 to 60 lbs., in 16 to 18 seconds, with brake valve and triple valves on locomotive and first brake cut out.

3. In preparing for this test, insert the required disk in union shown in Fig. 2 with all cocks closed, after which open cock C and start test by opening cock B.

B.—(Graduating Test.)

1. Three valves, selected at random, shall be taken for this test and each tried separately. They will be tested on the first brake of the rack, using the brake pipe only of the first car and locomotive having the engine and tender brakes cut out.

2. The first admission to the cylinder should be made with a reduction of brake-pipe pressure not exceeding 5 lbs.; each succeeding reduction should reduce the pressure in the auxiliary reservoir not to exceed 3 lbs., until equalization takes place. The pressure in the brake pipe should not be

more than 3 lbs. lower than the equalized pressure in the brake cylinder and reservoir at equalization.

C.—(Holding Test.)

Three valves selected at random will be taken for this test and each tried separately on the first brake on the rack, using the brake pipe only of the locomotive and the first car, having the triple valves cut out on engine and tender. The one brake will be applied admitting as nearly as may be 15 lbs. into the brake cylinder following a service application. Record of pressures in the auxiliary reservoir cylinder and brake pipe will be taken as follows:

First. At completion of application.
Second. In five minutes.
Third. In ten minutes.
Fourth. In fifteen minutes.

In this test, when a constant brake-pipe pressure is maintained, the brake-cylinder pressure must not be increased more than 5 lbs. in 5 minutes.

D.—(Release Test.)

Three triples valves, selected at random shall be taken for this test and each tried separately. They will be tried on the first brake of the rack, using the brake pipe only of the first car and locomotive having the engine and tender brakes cut out. When the triple goes to normal release position it must exhaust the air from the brake cylinder from 50 to zero pounds in not more than 15 seconds.

When the triple goes to retarded release position it must exhaust the air from the brake cylinder from 50 to zero pounds in not more than 40 seconds.

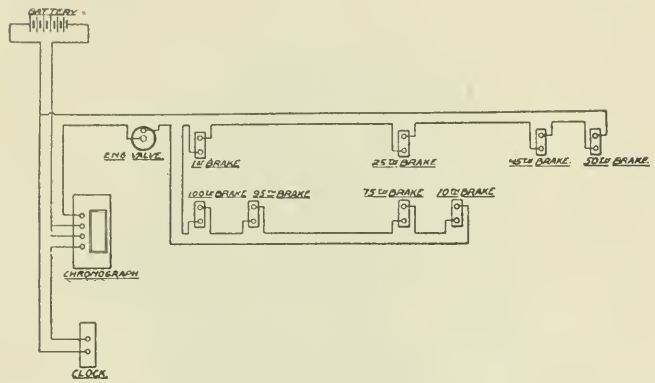


Fig. 1—Wiring Plan M. C. B. Brake Rack; Purdue University.

Emergency Application Tests.

(To determine sensitiveness to quick action.)

Three triple valves, selected at random, shall be taken for this test and tried separately on the first brake of the rack. During this test the locomotive and tender triples are to be cut out.

A.—These triple valves must give a quick-action application when the brake-pipe pressure is reduced by direct discharge to the atmosphere through disk with a $\frac{1}{64}$ in. orifice.

B.—These triple valves must not give a quick-action application when the brake-pipe pressure is reduced by direct discharge to the atmosphere through a disk with a $\frac{10}{64}$ in. orifice.

C.—(Holding test.) Three triple valves, selected at random, shall be taken for this test and tried separately on the first brake on the rack. The brake will be applied in quick action by moving the brake-valve handle to emergency position, where it must remain until completion of test for the purpose of insuring the discharge of all brake-pipe pressure. Record of pressure in auxiliary reservoir and brake cylinder will be taken as follows:

First. At completion of application.
Second. In five minutes.
Third. In ten minutes.
Fourth. In fifteen minutes.

In this test the auxiliary reservoir and brake-cylinder pressure must not show a reduction of more than 5 lbs. in 5 minutes.

RACK TESTS.

Service Application Tests.

A.—(Service Equalization.)

With a service reduction of 25 lbs. from brake-pipe pressure, a brake-cylinder pressure of not less than 48 lbs., nor more than 52 lbs., must be obtained.

B.—(Graduating Test.)

1. A reduction of 5 lbs. in brake-pipe pressure should apply lightly the 100 brakes. However, the brake-cylinder pressure may not be sufficient to show on all test gages.

2. A further reduction of 4 lbs. to 6 lbs. should increase the cylinder pressure of all brakes.

3. A further reduction, making a total of 25 lbs., should equalize the pressure between the auxiliary reservoirs and brake cylinders.

C.—(Service application time.)

Brakes will be applied by reducing brake-pipe pressure 10 lbs. There shall not be more than 25 seconds difference in the time of obtaining 10 lbs. pressure in the cylinders of the first and one hundredth brakes.

Emergency Application Tests.

A.—(Quick action, time and pressure.)

The one hundredth brake must be applied with at least 45 lbs. pressure in 6¼ seconds from the movement of the brake-valve handle to emergency position and at least 55 lbs. in 7 seconds. The final maximum pressure in this test must not be less than 15 per cent. nor more than 20 per cent. above the pressure given by the same brake in full service application. This test will also be made to determine that quick action is obtained with:

First.—Four inches piston travel.
Second.—Twelve inches piston travel.

(Note.—The object of this test is to secure, as nearly as possible, uniformity of pressures in brake cylinders in an emergency application and uniformity of time required to obtain the pressures; to secure a minimum length of stop and a minimum of shock, and of trains parting.)

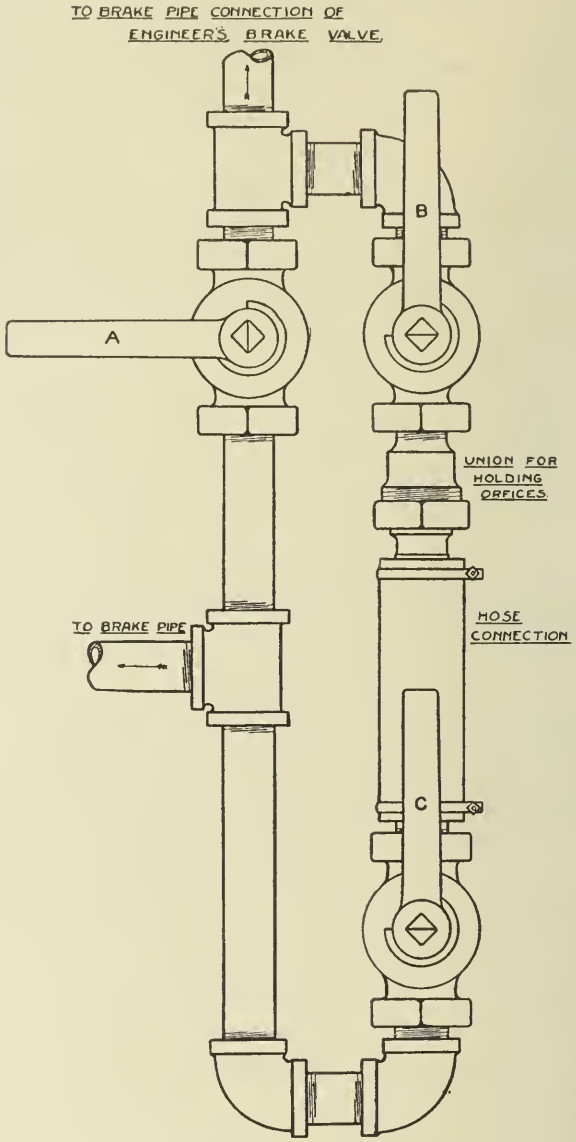


Fig. 2—Piping Arrangement for Brake Test.

B.—(To determine whether quick action will follow a service application.)

Using the 100 brakes, make a service reduction such as will give 20 lbs. cylinder pressure on the first brake. Then place the brake-valve handle in emergency position, which should cause quick action operation of all triple valves. The pressure in the first cylinder will be increased or decreased by steps of about 5 lbs. until the point at which quick action commences or ceases is determined.

C.—(Quick-action jumping test.)

With brakes Nos. 1, 2 and 3 cut out, quick action should be obtained with the remainder of the brakes by an emergency reduction, and the time, from the movement of the brake-valve handle to emergency position to obtain 45 and 55 lbs. cylinder pressure on the one hundredth brake, should not be increased more than one second over that required to obtain the same pressures with all brakes cut in. This test should be repeated with groups of three brakes cut out, consisting of Nos. 2-3-4, 4-5-6 and 5-6-7, and the time from the movement of the brake-valve handle to emergency position to obtain 45 and 55 lbs. cylinder pressure in the one hundredth brake should be the same as with all brakes cut in. These tests will also be made with piston travel of 4 in.

Holding Tests.

A.—(Following a service application.)

The one hundred brakes will be applied, admitting, as nearly as may be, 15 lbs. into the cylinder of the first brake. Record of pressures in the auxiliary reservoirs and cylinders will be taken at all record points as follows:

First. At completion of application.
Second. In five minutes.
Third. In ten minutes.
Fourth. In fifteen minutes.

In this test any increase of brake-cylinder pressure should be in proportion to the reduction in brake-pipe pressure due to leakage.

B—(Following a quick-action application.)

The 100 brakes will be applied in quick action by placing the brake-valve handle in emergency position, where it will be left until completion of test, for the purpose of insuring the discharge of all brake-pipe pressure. Record of pressures in auxiliary reservoirs and cylinders will be taken at all record points as follows:

First. At completion of application.
Second. In five minutes.
Third. In ten minutes.
Fourth. In fifteen minutes.

The results of this test must not indicate an excessive amount of back leakage into brake pipe.

Release Tests.

A.—(Release Time.)

The 100 brakes shall be applied with an 18 lb. service reduction of brake-pipe pressure and brake valve then placed in release position. Time will be taken from the movement of the brake valve into release position until pressure is reduced to 5 lbs. in the cylinder of the first brake. The pressure in the cylinder of the first brake should not reduce to 5 lbs. in less than 18 seconds nor more than 25 seconds.

(Note.—Main reservoir pressure must be 110 lbs. at time of release.)

The report is signed by:—A. J. Cota (C. B. & Q.), chairman; J. R. Alexander (Penn.), and F. H. Scheffer (N. C. & St. L.).

The report was presented by J. R. Alexander in the absence of A. J. Cota, Chairman.

C. E. Fuller (U. P.): Before going on to the discussion of this subject, I would like to go back to the report on safety appliances. We have a standard safety appliance code in the M. C. B. Association, and, to be consistent with the work that we have done this morning, I would move that the report of the committee on safety appliances be referred to letter ballot, including the requirements of the U. S. Safety Appliances which are to be adopted as the standard of this association, the same to be referred to letter ballot.

R. L. Kleine (Penn.): That brings up the other question that was left over to the committee on standards with regard to the safety appliances. That would eliminate questions Nos. 11, 24, 25, 53 and 55, and still leaves open the following to be acted on: 12, hand brake for freight cars to work with air. The suggestion on that was to refer the matter to the committee on hand brake and signal equipment. Nos. 48 and 49, hand brakes on passenger cars to be worked with air, and that also was to be referred to the committee on train brake and signal equipment. And 60, to advance the 7/16-in. brake chain to be standard, to be referred to letter ballot.

D. F. Crawford (Penn.): I move that the two points referred to by Mr. Kleine which should be referred to the committee on train brake and signal equipment be so referred, and that the third question be referred to the Association for letter ballot.

The motion was carried.

DISCUSSION OF CODE OF TESTS FOR AIR BRAKES.

E. W. Pratt (C. & N. W.): I know the amount of work that was required of this committee in getting up this report as I was fortunately a member of the committee for several years; hence, I wish to criticise the report very reluctantly. But I notice under *Service Application Tests*, section A, numeral 2, the reduction in the brake pipe travel is shown by the number of pounds reduced in a given time. This, to my mind, is a very great improvement over what has been the practice heretofore, namely, giving the size of orifice through which the air must escape. But in other parts of this report, under *Emergency Application Tests*, it gives the size of the orifice that we should use in order to produce quick action. It seems to me it would be well for the committee to make that a given reduction in a given time, the same as the one I have just referred to. To be sure, it states here that there is nothing but the locomotive pipe and the car pipe cut in. However, the size of locomotives have been changed within the past year or two from 50 ft. to 150 ft., and it does make a great deal of difference as to the length of the engine whether the size of the orifice will give the same time reduction in one case as in another. There is another thing that the committee should explain to us, and that is the style of brake valve, if a brake valve is to be used in making these tests, that is, to be standard for this testing apparatus; and also it would be more than interesting for us to know what triple valves are best employed for the purposes of this test.

J. W. Alexander (Penn.): In reply to Mr. Pratt, I wish to say that the opening is given for the emergency test. It would be extremely difficult to determine that by time limit, for the reason that the movement of air is almost instantaneous through an opening of that character, and it is a question of getting the orifice down to a size in which a quick, sudden movement of the air will affect the triple valve at a certain distance from it, and these tests were made on. In regard to the type of brake valve, the Figs. 1 and 2 show the attachment, but you can put any type of brake valve—Westinghouse or New York or any other type—on the test, and this also shows the kind of triple valves that have been subjected to these tests and possibly these tests may be said to be practically all of those in general use on the different roads of the country.

The report was accepted and recommendations submitted to letter ballot.

REFRIGERATOR CARS.

The committee was instructed to investigate and report on three separate questions, as follows:

The uniform height of refrigerator cars from the rail to the floor.

Adoption of standard drip cup for refrigerators.

Relatively small ice tanks.

THE UNIFORM HEIGHT OF REFRIGERATOR CARS FROM THE RAIL TO THE FLOOR.

The investigation of this subject shows that a large majority of the refrigerators built within the last ten years or more have the height of floor varying between 48 in. and 50 in. above the rail, but the Santa Fe Refrigerator Dispatch has some 6,000 cars with floors approximately 46½ in. above the rail. We have not been able to learn of any cars which have the floor at 42 in. above the rail, as stated in the Railroad Refrigerator Service Association Circular 84 dated June 26, 1909.

It is also found that all freight-house platforms of the largest roads and packing-houses vary in height from 42 in. to 46 in. above the rail, and understand that the American Railway Engineering Association has not yet adopted any standard height for freight-house platforms; we therefore suggest that the Master Car Builders' Association adopt a minimum of 48 in. as the recommended practice for refrigerator-car floors, and that the matter be taken up with the American Railway Engineering Association with the view of having them adopt 46 in. as the maximum height of freight-house platforms, as we believe that this will make ample allowance between the bottom of refrigerator doors

and top of platforms, so as to avoid trouble about opening the doors at freight houses.

STANDARD DRIP CUP FOR REFRIGERATORS.

In Circular 73 the Railroad Refrigerator Service Association specifies the following requirements for an ideal drip cup:

It must keep the lower end of drain pipe submerged in water when tanks contain ice during summer or winter.

It must prevent water in drip cup from freezing in winter when cars are iced without salt.

It must prevent cold air from entering car in winter when cars are not iced.

The committee has not yet been able to find any drip cup which will meet all of these requirements, which now seem impossible to meet in full, but the committee will continue to investigate the subject and make supplementary report.

RELATIVELY SMALL ICE TANKS.

Refrigerator cars may be divided into two general classes:—Fresh-meat cars; and fruit and dairy cars.

The best and most modern refrigerators are used for shipping fresh meats, and these are provided with ice tanks which experience has proven to be amply large. Fresh-meat cars use crushed ice and salt, and a total capacity of



M. K. Barnum.

Chairman, Committee on Refrigerator Cars.

5,000 lbs. per car has been found ample for all ordinary service conditions; the committee, therefore, recommends that tanks of 5,000 lbs. ice capacity be adopted as the minimum for such cars.

For fruit and dairy refrigerators a minimum of 3,000 lbs. per tank, or 6,000 lbs. per car, is recommended. Our investigation leads us to believe that the complaints mentioned by the Railroad Refrigerator Service Association have been caused by old cars that had ice tanks much smaller than the present practice, which are rapidly disappearing from service, and we believe tanks of the size above recommended are amply large to protect shipments under all ordinary conditions.

The traffic department will be the first to object to encroaching any further than necessary on the loading space of the car, and there seems to be no present necessity for increasing the outside length of the car beyond about 40 ft., the present size of the largest refrigerator.

The report is signed by:—M. K. Barnum (I. C.), chairman; J. S. Chambers (A. C. L.), G. W. Lillie (St. L. & S. F.), W. E. Sharp (Armour Car Lines), E. Posson (A. T. & S. F.), W. C. Arp (Vandalia) and R. S. Miller (N. Y. C. & St. L.).

DISCUSSION ON REFRIGERATOR CARS.

Mr. Barnum (chairman of committee): In regard to the freight house platforms, it is stated that the committee intended to take up with the American Railway and Maintenance of Way Association the matter of having them adopt 46 in. as the maximum height of freight house platforms. Since the report was written we believe that should be made 44 in., and we wish to correct the report to read 44 in.

I have the supplemental report here, reading as follows:

The committee has continued its investigation of a standard drip cup for refrigerator cars, and has obtained from a number of the roads which are the largest owners of refrigerators and also from the packing companies drawings of their standard drain cups, together with reports on their performance. All of these drain cups are alike in their essential features, consisting in:

1. A depression or cup below the level of the drip pan into which the water drains; and

2. A drain pipe, the top of which project above the bottom of the cup to a varying height, thereby retaining some water in the cup round about the pipe, which, with the inverted cap fitted over the top of the drain pipe, forms a water seal. This arrangement permits the melted ice to overflow into the drain pipe and at the same time prevents the admission of warm air in summer; but it will not obviate freezing in winter, and the drain pipe must be plugged to exclude cold air in freezing weather. All of the replies received to our inquiries indicate that there are no serious complaints about the last two features. Our investigation leads us to believe that the combination of requirements specified by the Railroad Refrigerator Service Association are mechanically impossible.

I might give a little further explanation of our reason for changing the maximum height of platform from 46 in. to 44 in. We found that the average refrigerator car door has a bevel of about 2 in., which would make the outside edge of the door about 2 in. below the floor of the car; and there are quite a good many refrigerator doors that have locks which project a little below the outside edge of the door, and we thought that it was advisable to increase the minimum distance between the car floor and the top of the platform to 4 in., which we believe will be ample for all practical purposes.

J. J. Hennessey (C. M. & P. S.): It does not seem to me that the report of the committee has covered the point that a great many roads are much interested in, and that is the matter of salt water drippings.

Mr. Barnum: We disposed of that last year.

Mr. Hennessey: The committee disposed of it in a certain sense last year but at the same time I do not see that the private lines are making much of an effort to get any device that will carry the salt water drippings clear of the tracks. I think it is well understood that especially the Maintenance of Way people are very much exercised at so much salt water drippings on metal bridges, tie plates, etc., and I believe this is a question which should be gone into very thoroughly and a greater effort made than has already been made to ascertain if some device cannot be worked up which can be adopted as a standard to prevent salt water drippings from refrigerator cars.

Mr. Barnum: I will recall to the mind of Mr. Hennessey and that of the other members of the association the fact of last year the committee on refrigerator cars recommended that certain principles be followed for the purpose of retaining within the iceing tanks the salt water drippings and discharging them at the iceing stations. We considered that that covered the subject, and the committee was discharged as having completed its work in that particular. It then remained to take up with the companies owning refrigerator cars and using salted ice the matter of carrying out the instructions. I have made some inquiries as to how the work is progressing and I find that the packing houses, particularly the owners of refrigerator cars using salted ice, have tried several devices in the form of valves for the purpose of retaining the salted water and discharging it at iceing stations, and I find that they have been successful in retaining the water, but have had some trouble with the valves freezing, thus making it difficult to open them at the iceing stations. I was informed by the representatives of several packing houses in Chicago that they were fitting up all cars as they passed through their shops with such valves, and I think so far as the committee of this association is concerned we have done all that we can in that direction, and if anything further is to be done it will have to be taken up by the American Railway Association with the private car owners who handle the refrigerator cars. Perhaps Mr. Sharp can give some additional information on this matter which will be of interest.

W. E. Sharp (Armour Car Lines): The supplemental report of Mr. Barnum covers that point. We have tested several valves, and much to our surprise we have had difficulty in operating them; not in holding the brine, but the valve must be placed at the lowest point on the tank in order to drain the entire tank, and, as that is the coldest place in the tank, the valve freezes. A remark was made that not much effort was

apparently being made by the owners of refrigerator cars to overcome the annoyance from the dripping of salt water. We have not said anything about it, but we have been busy and there is no intention on our part to go to sleep on the subject. We have a number of cars equipped with valves of different types. We are not operating them, because it would be a serious matter to undertake to operate a valve until you know it is reliable and that you can draw the water off at the iceing stations.

We invite the committee and the individual members of the association to coöperate with us on this matter and to come to our shops and see what we are doing. I feel free to say that the other packers, as well as the company that I represent, are going to continue their efforts and accomplish just what you want us to accomplish, and that by another year there will be a decided improvement in that direction.

A. Stewart (Southern): I move that the recommendations of the committee be referred to letter ballot.

The motion was carried.

THE ANNUAL MASTER CAR BUILDERS' BALL.

The forty-fifth annual ball of the Master Car Builders' Association was given on the Million Dollar Pier last night at 9.30 o'clock. The officers of the association and their ladies were personally conducted from the hotels to the pier in roller chairs by members of the Marshals' Committee. At the entrance to the pier, they were met by members of the Social Squad, and escorted to the booth of the Galena-Signal Oil Company at the ocean end of the ball room, which was headquarters for them during the evening. As President and Mrs. Curtis crossed the floor the band played "Hail to the Chief."

There were 376 couples in the grand march. It formed at the ocean end of the pier and was conducted by Chairman J. Will Johnson of the Entertainment Committee and led by President and Mrs. Curtis. It performed numerous graceful evolutions, during which the Ushers' Committee presented the ladies with favors. They were fancy gauze fans.

There were 19 numbers on the regular dancing program; and in addition, the Vollmer's Orchestra, which furnished the music, responded to a number of encores. Refreshments were served at both the ocean and Boardwalk ends of the ball room throughout the evening.

All the members of the Entertainment Committee were on duty. The committee especially in charge of the ball was composed of Thomas Farmer, Jr., Chairman; W. J. Walsh, F. B. Ernst, C. A. Dunkelberg, Ralph C. Coburn, H. A. Nealley, J. P. Landreth, Edward S. Toothe, J. C. Younglove, Leonard J. Hibbard, William Miller, Harry S. Hammond and E. E. Silk.

The following briefly describes the way in which the ladies of some of the railway officers were gowned:

Mrs. T. H. Curtis, shell pink satin, veiled in Chantilly lace and white chiffon, with rhinestone trimmings; carried orchids.

Mrs. C. E. Fuller, white Chantilly robe over pale yellow satin.

Mrs. J. F. Deems, Paris gown of King's blue, with jet overdress; pearls and diamonds.

Mrs. G. W. Wildin, lingerie over pink satin.

Mrs. F. W. Brazier, lavender and silk chiffon, with inside lining of green silk and black jet trimmings; carried pink roses.

Miss Verona Pratt, blue flowered net over blue satin, trimmed with marabout.

Mrs. Wm. Garstang, white lace over satin.

Miss Mabel Garstang, yellow lace heavily embroidered over yellow satin; carried orchids.

Miss Virginia Garstang, American beauty colored chiffon over white satin; carried lilies of the valley.

Mrs. R. D. Smith, net gown embroidered in pink and white and trimmed with fillet lace over white satin; carried sweet peas and orchids.

Mrs. J. S. Chambers, violet crepe meteor embroidered; carried orchids.

Miss Hazel Cumback, pink marquisette; carried pink roses.

Mrs. B. P. Flory, black marquisette over yellow satin; carried American Beauty roses.

Mrs. H. E. Passmore, white batiste with lace trimming.

Mrs. George T. Anderson, black satin with lace trimmings; carried American Beauty roses.

Mrs. J. F. Dunn, white lace dress over white satin; carried orchids.

Miss Edna Dunn, white crystal over pink satin; carried orchids.

Miss Helen MacBain, blue chiffon; carried roses.

Miss Grace MacBain, white chiffon; carried lilies of the valley.

Miss Mary D. Walsh, pink mulle with pink ribbon; carried orchids.

Mrs. E. W. Pratt, pale green crepe de chine with raised velvet flowers, rice bead trimmings and point lace.

Mrs. Jas. A. Beamer, white Swiss with white embroidered trimmings.

Miss Blanche Beamer, pink Swiss with point lace.

Mrs. R. B. Kendig, gray voile over pink, touches of green with fillet lace; carried orchids and lilies of the valley.

Mrs. W. E. Sharp, white voile with hand-embroidered lace; carried orchids and lilies of the valley.

Mrs. C. B. Young, white voile.

Mrs. H. F. Wardwell, soft yellow silk, trimmed with pearls.

Mrs. R. L. Klein, black lace gown over apricot satin.

Miss Margaret Hennessey, pink and bordered chiffon; American Beauty roses.

Mrs. Thomas T. Thompson, white satin, veiled in violet chiffon and lace; carried orchids.

Mrs. T. M. Ramsdell, embroidered net over cream messaline.

Mrs. I. A. McCormick, white lace with heavy French embroidery.

Miss Louise Ramsdell, white chiffon over yellow satin.

Mrs. F. S. Kent, apricot radium silk, coral chiffon, Venetian lace trimmed with marabout.

Miss Barbara Small, fancy lingerie dress over pink; carried orchids.

Mrs. H. Telford, white lace over white silk; carried pink roses.

Mrs. J. A. McRae, black lace dress with spangled trimmings; carried orchids and roses.

THE HERFORD MONOLOGUES.

The entertainment given yesterday afternoon at the Brighton Casino was enjoyed by everybody. Miss Beatrice Herford, society entertainer in original monologues, was at intervals handicapped by a competing thunder storm, but the shower soon passed. Miss Herford has a pose and delivery that is unique, and her ability in adapting herself to suit the various sketches was thoroughly entertaining. The program consisted of the following:

I. In a Restaurant.
II. An Elderly English Lady Packing Her Trunk; Her Niece Helping Her.
III. A Girl in a Telephone Pay Station.
IV. Choosing the Wall Papers.
V. The Shampoo Woman.

The entertainment committee very thoughtfully provided enclosed chairs for the audience to return to their hotels so that no inconvenience was due to the impromptu shower.

The railway from Volcan, Chili, to Maipu, which starts from Puerto Alto, the terminal point of the Pirque Railway, has been opened to traffic.

Conventionalities.

If you see one, you see the other—the Davis Brothers.

It was the intention of J. C. Barber to attend this convention, but he was unavoidably detained.

Frank W. Noxon, secretary of the Railway Business Association, was a visitor on the Million Dollar Pier yesterday.

Hugh M. Wilson came down from New York to renew acquaintances for a few days with his host of friends at the conventions.

Ronald G. Coolbaugh, who is attending the convention for the first time as a railway supply man, is the son of F. W. Coolbaugh. Mr. Coolbaugh is a Cornell man.

M. K. Barnum, general superintendent motive power of the Illinois Central, did not get here for the M. M. convention, but is here for the M. C. B. convention.

Arthur P. Bowen, director of purchases, Pullman Company, Chicago, passed Monday and Tuesday on the pier attending the conventions and seeing the exhibits.

George E. Carson, master car builder of the New York Central at West Albany, N. Y., is at the Traymore. He is said to have made a remarkably fine record during the past year.

One of the most effective workers at the convention is Mrs. I. H. Case. It is an interesting sight to see her take visitors in hand and show them over the model house of Dearborn.

Staff says he didn't say that the presidency of the Railway Supply Manufacturers' Association was unexpected. What he did say was, that he had not sought the office—which is absolutely true.

J. H. Manning, superintendent motive power of the Delaware & Hudson, is extremely enthusiastic over the service results which are being obtained from the big Mallets which are being used on that road.

R. B. Kendig, general mechanical engineer of the New York Central Lines, had quite a severe illness during the spring. He is in attendance at the conventions, however, and seems to have fully regained his health.

H. C. Manchester, formerly superintendent motive power of the Maine Central, is missed by his friends this year. Since the last convention he has been appointed superintendent of transportation, and is busy now getting out the summer schedules.

W. L. Jacoby, whose energy resulted in building a large steel plant in which the first tire was rolled within 14 months after ground was broken, is staying at the Brighton. Mr. Jacoby started to make tires 20 years ago, when he was but 17 years old.

Hugh Montgomery, superintendent motive power of the Bangor & Aroostook, is stopping at the Dennis. He has been very busy during the past year. About 150 miles of new road were opened recently and 200 miles more will probably be built in the near future.

A. M. Darlow, who was appointed mechanical engineer of the Buffalo & Susquehanna a few weeks ago, is at the Marlborough-Blenheim. He came down early last week and has been working hard to put in his time to the best advantage, both in the meetings and in studying the exhibits.

John H. Jaschka, of the National Malleable Castings Company, who recently changed his headquarters from Salt Lake City to San Francisco, is again on the job. Mr. Jaschka says it is a long way to come, but he feels that it is a great pleasure to meet his many friends here.

Henry Bartlett, general superintendent mechanical department of the Boston & Maine, is at the Brighton. The new Pacific type locomotives, the first to be introduced on that road, are handling the heavy Portland passenger trains, and trains on the White Mountain division, with splendid results.

As the Cadets de Gascogne, who furnished the music for the M. C. B. reception, speak only French and Italian, and Chairman Johnson, of the entertainment committee, speaks only the rest of the languages, the conversations between them had the soul of wit: they were plenty brief.

G. W. Kelly, master blacksmith at the Elizabethport shops of the Central Railroad of New Jersey, who presided over the last convention of the Master Blacksmiths' Association, arrived Monday afternoon and returned home last night. He worked hard all the time he was here in studying the exhibits.

George Carr, of the Dearborn Drug & Chemical Works, saved the Million Dollar Pier yesterday morning by heroically extinguishing a bad fire in a waste basket. It will be recalled that his brother Bob was a candidate for a Carnegie medal a couple of years ago when he rescued a young lady in the surf.

F. H. Stark, superintendent of the Montour Railroad and of the Pittsburgh & Moon Run and superintendent rolling stock of the Pittsburgh Coal Company, arrived early Monday morning and is stopping at Chalfonte. Business has been a little light, but he is looking forward to a big rush during the midsummer months.

Yea, verily, advertising in *The Daily* pays. After A. L. Whipple's new folding umbrella had been lost for four days, *The Daily* was informed of the fact and at once printed a notice that "Whip" was mourning the loss. The same day that the notice appeared the lost umbrella was returned to the owner—and "Whip" is happy once again.

We have not as yet been able to decide which is the biggest exhibit here, but we do know the littlest exhibit; and the aforesaid littlest exhibit is attracting great attention. Little Miss Lillian Brazier is attending the conventions. She was born to Mr. and Mrs. F. O. Brazier seven months ago, on the birthday of her grandfather, F. W. Brazier.

J. F. Walsh, general superintendent motive power of the Chesapeake & Ohio, is looking forward with a great deal of interest to the testing out in service of the two 4-8-2, or Mountain, type locomotives which are about to be placed in operation on his road. These engines are intended for use in fast passenger service on the mountain grades.

Lou Yates, master car builder of the Pacific Fruit Express, lives in Los Angeles and goes bathing in the Pacific. He comes to Atlantic City to the conventions and goes bathing in the Atlantic. He likes the Atlantic and says it is a bit warmer than that of the Pacific. As for the climate, he says that of the Pacific coast has a decided "shade" on that of the Atlantic.

A pleasant automobile trip from Buffalo to Atlantic City was enjoyed last week by Mr. and Mrs. George N. Dow, Mr. and Mrs. Harry Schroyer and Mr. and Mrs. Harry U. Morton, in Mr. Schroyer's Pierce-Arrow. The trip was made in four days, the party arriving on Tuesday. Mr. and Mrs. Schroyer will motor from Atlantic City to Chicago, their home city, leaving Wednesday.

The members of the Enrollment Committee have presented to Oscar F. Ostby, chairman of that committee, a handsome silver mounted snake-wood cane, engraved with Mr. Ostby's initials. With the gift was sent a letter expressing the esteem and good-will which Mr. Ostby's able and diplomatic management has inspired in all who have come in contact with him at the conventions.

It was rumored among the convention crowds yesterday that J. E. O'Brien, superintendent motive power of the Western Pacific, had been appointed general superintendent motive power of the Missouri Pacific. A telegram from President B. F. Bush of the latter road to *The Daily* says: "There is nothing in the report of O'Brien coming to the Missouri Pacific as general superintendent motive power."

The following ha been received from dear old David Holtz, who still feels as young as he did 20 years ago: "Just a line to let you know w ere my thoughts are this week. I had engaged a room, but on account of being on the grand jury and not able to get excused, I gave it up and forfeited the pleasure I had had in mind of meeting you again and my other friends in the Master Mechanics and Master Car Builders' associations. I hope for better results next year. I am receiving the daily edition of the *Railway Age Gazette*, and my daughters and I have enjoyed reading the names of those attending the convention, and the reports.

The last meeting of the Entertainment Committee was held yesterday noon. At the conclusion of the meeting, C. A. Dunkelberg, in behalf of the members of the committee, expressed to J. Will Johnson, the retiring chairman, the feeling of gratification and good will held by every member toward their leader, and presented him with a handsome open-face gold watch. Mr. Johnson responded feelingly. Everybody who has attended the conventions the two years of Mr. Johnson's chairmanship will concur in the statement that this mark of recognition for the work he has done is heartily merited.

C. A. Schroyer, superintendent car department of the Chicago & North Western, loves to put one over in the shape of a real good joke that does no harm. His many friends know this only too well; they can testify to having been stung, but not hurt, on occasions too numerous to mention. But the "worm will turn," as we all know; and it is therefore with great glee that Charlie Schroyer's friends are repeating the story of a sail on the ocean indulged in last Sunday by a party of which Mr. Schroyer was a member. When at some distance from the Inlet the wind failed and in a short time the calm became complete. It was then that Mr. Schroyer addressed the commander of the yacht, and in this fashion: "I say, captain, while there is nothing doing in the way of wind, would you loan us a line I'll show you how to land a few fish for dinner." The captain said he was very sorry but that there were no lines aboard. Then he winked to the members of the party and handed this to the Chicagoan: "However, Mr. Schroyer, rather than disappoint you, I have this suggestion to make. I will give you a pencil and paper and you can drop a line to the fish." Just then the breeze sprang up; but in the general merriment, in which Mr. Schroyer heartily joined, its arrival was not noticed.

M. C. B. REGISTRATION.

Alexander, J. R., Gen. Rd. Fore., Penna. R. R., Haddon Hall.
Bundy, C. L., G. F., D. L. & W. R. R., Haddon Hall.
Deibert, John H., F. C. R., Lehigh Valley R. R., Boswell.
Dow, Geo., Gen. Mech. Ins., N. Y. Cen. Lines. Chalfonte.
Grove, P. L., A. E. M. P., Penna. R. R. Co., Chalfonte.
Halverson, H., M. C. B., Soo Lines, Seaside.
Harris, Wells, G. F. C. R., N. Y. N. H. & H. R. R., Chester Inn.
Henderson, Geo. R.
Jaynes, R. T., M. M., Lehigh & Hudson, Traymore.
Kells, Willard, Asst. to G. S. M. P., A. C. Line, Revere.
Kipp, A., G. C. I., N. Y. O. & W. Ry., Chalfonte.
Lindstrom, C. A., Chief Engr., Pitts., Allegheny & McKees Rocks Ry., Chalfonte.
McBain, D. R., S. M. P., L. S. & M. S., Marlborough-Blenheim.
McGraw, Wm. P., Supt. of Cars, Jamison Coal & Coke Co., Dennis.
Morris, W. S., Special Agt., C. & O., Marlborough-Blenheim.
Ott, Wm. B., Asst. Engr. M. P., Penna. R. R., Chalfonte.
Sheahan, J. F., M. M., International & Grt. Northern, Arlington.
Turner, Amos, M. M., Lehigh Valley R. R. Co., Dennis.
White, E. T., S. M. P., Mt. Clare Shops, B. & O. R. R., Haddon Hall.
Wyman, R. L., M. M., Lehigh & New England R. R., Pennhurst.

M. M. REGISTRATION.

Brooks, H. S., Asst. M. M., B. & O., Colwin.
Newhouse, John F., M. M., Kentucky & Indiana Ter. Rwy.
Shepard, L. A., The Steel Castings Co., Dennis.

GUESTS.

Baird, A. N., Insp. Boiler & Plate, Santa Fe.
Bedell, Thos., Chalfonte.
Billan, L. S., Ch. Draftsman, B. & O. R. R., Arlington.
Beach, C. A., Supt. N. Y. Div., Phila. & R., Dennis.
Beswick, J. H., Foreman, P. R. R.
Bracken, J. W., Clk. to Supt., P. R. R, Haddon Hall
Bradley, E. J., Foreman Car Inspect., P. B. & W. Ry.
Brown, J. D., Ch. Electrician, B. & O. R. R.
Carmichael, E., Gen. Foreman, P. R. R., Traymore.
Clarke, Arthur B., For. Car Rep., P. & R.
Cook, J. J., Road For. Eng., P. R. R.
Cook, C. A., Master Painter, P. B. & W., Devonshire.
Cooke, George T., Mechanical Inspector, The Pullman Co., Traymore.
Culver, W. R., M. M., Union Tank Line, Young's.
Dixon, A., Gen. Fman., C. P. R., Haddon Hall.
Dykeman, William, C. C. to Pur. Agt., N. Y. C., Marlborough-Blenheim.
Elcholm, E. L., D. & H. Co., Monticello.
Endy, W. N., Stkpr., P. & R.
Enslow, Frank, Attorney, C. & O., St. Charles.
Entrikin, T. C., Mach., P. & R..
Erb, C. W., Stkpr., P. R. R., 605 Pacific Ave.
Finney, Harold R., Asst. Road Foreman, Penna. R. R., Marlborough-Blenheim.
Fox, P., G. F. C. R., Erie R. R., Shelburne.
Garabrand, W. P., R. F. of E., Penn. R. R., Haddon Hall.
Gibson, Edward, Foreman Wheel Shop, P. B. & W. Ry.
Gearhart, H. F., Pur. Agt., Pressed Steel Car Co., Chalfonte.
Gilliard, W. J., Shop Clk., P. R. R., Haddon Hall.
Grim, Chas. B., For. Car Insp., P. & R. R. R., Dennis.
Hankins, L. G., Ch. Clerk.
Hardy, C. R., M. P. Insp., P. R. R., Newton.
Heald, W. E., Supt. Const. Elec. Dept., B. & O., Traymore.
Herr, E. D., P. R. R.
Hinkle, H. M., Asst. Road For. Eng., Penna. R. R., Elwood.
Hughes, S. W., G. C. For., Wash. Term. Co., Ardmore.
Hynes, J. M., Gen. For. M. P. Dept., B. & O.
Illig, L. J., Ch. Draftsman, Penna. R. R., Haddon Hall.
Jackson, C. H., For. Car Insp., P. R. R.
Keith, J. T., Vineland, N. J.
Kerigan, W. R., Ch. Clk. Rd. For. of Eng., P. R. R., Haddon Hall.
Kerigan, F. J., Ch. Clk. to M. W., P. R. R., Haddon Hall.
Kiefer, C. J., Insp. Test. Dept., P. R. R., Iroquois.
Lowther, H. F., Asst. Pur. Agt., D. L. & W., Frontenac.
Lane, S. F., Gen. Supt., L. C. & Moriah, Shelburne.
Lewis, Chas. W., Asst. M. S. At. Ref. Co., Union Tank Line, Young's.
Louderback, A. L., M. C. B. Clerk, Penna. R. R., Pennhurst.
McConnell, Saml., Marlborough-Blenheim.
McCool, Chas., Reg. Clerk, Pur. Dept., P. R. R.
McCormick, W. H., Assnt. Gen. Pass. Agt., P. & R., Chalfonte.
McHarg, J. J., Chief Clerk, Penna. R. R., Haddon Hall.
McIntosh, J. B., Supt. L. H. & P., Wash. Term. Co.
Mackey, W. C., Foreman, B. & O. R. R., Pennhurst.
Mathrs, S. R., Master Mechanic, Norfolk & Southern, Dennis.
Miller, E. W., Car Foreman, B. & O., Tryon.
Morgan, C. H., Dfa. Fr. Agent, P. & R., Dennis.
Munger, E. T., Gen'l Supt., H. & M. Ry., Shelburne.
Nestopp, R., For. Car Shops, Penna. R. R., Camden.
O'Donnell, J. C., Inspector, P. R. R.
Oliver, R. G., M. M., P. R. Transit, Dunlop.
Pastorius, O. B., Genl. Electrician, W. J. & Seashore, Marlborough-Blenheim.
Pryor, C. L., S. Buffalo Ry., Marlborough-Blenheim.
Rankin, W. E., For. Wayne Test Shop, P. & R.

Runkle, D. F., For. Car Shop, P. & R., Somerset.
Riffert, Harry V., P. W. Ins., P. & R.
Ringland, J. A., Fore. Eng. House, P. R. R., American.
Rue, W. M., Loco. Engineer, P. R. R.
Roberts, G. H., Mach. Foreman M. P., L. I. R. R., Windsor.
Russell, H. H., Genl. Foreman, N. Y. P. & N. R. R., Chalfonte.
Schanze, H. C., Fman., P. R. R.
Searing, J. J., 3d., Asst. Shop Clerk, Penna. R. R., Pennhurst.
Sickles, E. C., Supt. Pow. House, B. & O.
Shay, J. M., Gen. Car For., B. & O. S. W., Pembroke.
Simon, Louis S., Schlitz.
Shannon, Wm. P., Asst. Fman. Car Shops, Penna. R. R., Elwood.
Staples, Oscar, Eng. House Foreman, P. R. R., Haddon Hall.
Stewart, H. A., Shop Superintendent, Armour Car Line, Marlborough-Blenheim.
Stratton, G. E., Gen. Foreman, P. R. R., Haddon Hall.
Stroble, Harry H., Gas Fitter, P. & R.
Travella, W. H., Foreman, P. R. R.
Turk, J. E., Supt., P. & R., Dennis.
Van Buskirk, J. H., M. E., N. Y. Central, Chalfonte.
Walsh, Charles E., Asst. Ch. Clerk P. Agt., Penna. Lines R. R., Brighton.
Walton, E. A., Chalfonte.
Wells, W. W., Chief Clerk 4th V. P., P. R. R., Dennis.
White, Geo., Storekeeper Meadows, P. R. R., Marlborough-Blenheim.
Wilbur, Rollin H., Vice-Prest. & Genl. Manager, Lehigh & New England.
Wright, J. D., Genl. Foreman M. P. Dept., B. & O., Rudolf.
Wolf, G. M., Gen. Foreman M. P. Dept., B. & O.
Yoder, J. H., Foreman, P. & R.
Zimmerman, Geo., For. Car Shop, P. & R., Somerset.

THE TRACK EXHIBIT.

The track exhibit this year includes a motor passenger car, some special dump cars, box cars, a portable forging plant and an industrial car. The motor passenger car is the one built by the General Electric Company, and has a seating capacity for 95 passengers. The passenger section of the car is divided into two compartments, one for smokers. The engine is of the gasolene internal combustion type driving an 80-kilowatt generator with an overload capacity running up to 120 kilowatts. The motors are of the ordinary type, so that there is really nothing experimental about the design. The engine and motor are carried above the springs and form an ordinary stationary plant, while the motors are on the trucks, as in regular street car service. An auxiliary engine is provided for driving the generator for the electric lights and also for providing compressed air for the brakes when the main engine is standing.

A novelty at the exhibition is the forging car, exhibited by the United Engineering Forging Company. It is a portable forge set on a steel underframe car and fitted with an oil furnace for heating material, a steam hammer for doing the work, with a boiler for supplying the steam. Both the boiler and the furnace use oil burners, which are supplied with fuel from a tank car serving as a tender. It is possible to execute work of considerable magnitude with this plant, as demonstrated by the daily operations.

The Railway Equipment Company shows three hopper bottom cars. Two have the hopper doors swinging on a line parallel with the length of the car, and in the other the doors are hinged on the transverse line. They are closed by a chain with block links winding over a rectangular block, and drawn up by means of a long handled wrench. The locking is effected by a ratchet and pawl, the latter being held down by a gravity lock, so that there is no danger of the pawl slipping or the dog letting go under the motion of the car.

Another hopper bottom car is that equipped with the Johnson hopper door and shown by the Industrial Supply & Equipment Company. The door resembles in its action the ash-pan door used on the New York, Ontario & Western which is carried by two parallel hangers, and is so arranged as to have its first opening motion a drop away from the bottom of the hopper, after which it slides out towards the end of the car, leaving the whole of the opening clear and unobstructed.

There is a refrigerator car shown by the Whipple Car Company in which some simple novelties are incorporated. The insulation is a four-ply felt. The ice-boxes are collapsible and can be moved in and out with ease. The outer insulated partition when pulled out is held in place by knee-joint hinges like a buggy top, as well as by the ice racks that drop down from the end of the car. Access to the interior is obtained through a door in the front. On the roof there are four waterproof ventilators that are self-draining, and are set to face the ends of the car. Their action is to force the air in at one end of the car and down into the ice box, thence out at the floor and through the car to an escape at the ventilators at the other end. The interior ventilation is provided for by a double roof extending to the line of the side door. This roof is perforated with a number of 3-in holes through which the warm air rising from the lading passes to the air space above and thence to the ice box at the ends. This avoids the necessity of the air moving from the ends to the center of the car in order to escape. It is stated that, with this construction, a temperature of 45 deg. Fahr. has been maintained throughout the whole length of the car with fruit lading from Colorado to Chicago.

Next to this is a box car fitted with the Franklin flexible roof and exhibited by the Franklin Railway Supply Company. This roof is an all-steel structure. The carlines and purlines are of pressed steel, and the roof sheets are held by clamps at the edges and an inverted T-clamp that lies in the groove of the carline. The running board saddle is carried by bolts, passing through the legs of the carlines and held clear above its edges, so that there is no possibility of the sheets of the roof being caught and consequently buckled by any warping of the body of the car. The leakage of water due to driving storms is provided for by carrying the sheets over the edge of the ridge, which is a U-shape, with the opening up. Water may be driven into this, but it drains into each carline, which, in turn, forms a trough to carry the water to the eaves, where it is discharged. The use of pressed steel straps insures strength in the roof, while the method of holding the sheets provides an equal insurance against the buckling of the roof sheets.

A drop-bottom gondola, from the Cincinnati, Hamilton & Dayton, is also shown. This has a method of rolling up the doors by means of a crankshaft, fitted with rollers, and having a ratchet and dog at one end near the bolster, by which it is operated and held in place. This car is built with deep center sills and no side sills.

The Summers all-steel box car has a truck of a peculiar construction, which has been already described in these columns.

Loaded on a flat car are two examples of the Jacobs Shupert firebox, with which the readers of this paper are already familiar. One of these fireboxes is set in proper position so that it can be seen from the outside, while the other is laid on its side so that the interior or fire-side can be seen through the opening in the mud ring. Finally, there is a small industrial motor car shown by the Atlas Car & Manufacturing Company.

The progress which is being made in the developments at the Port of Bahia, Guatamala, gives every indication of this point becoming a formidable rival of the other ports in the republic. The railway from that town to Quito is being pushed forward vigorously, and already there has been opened to traffic a section extending to a point near Calceta, a distance of 33 miles. The preliminary survey on the Chone branch, via Caimito, has been completed, as has also the survey on the line from Guayaquil to Balzar. Plans for the installation of an electric light plant are now being prepared, and every effort is being exerted to render the port of Bahia de Caraquez an important commercial center.

MAINTENANCE OF SUPERHEATER LOCOMOTIVES.

The superheater locomotive does not require any more attention to obtain satisfactory service than an ordinary locomotive. It is essential with a fire-tube superheater that the flues be kept open, and free from accumulaions of cinders and dust, which would prevent the attainment of the desired degree of superheat. A double loss occurs when the flow of gases through the flue is restricted, for the reason that the flue itself and the superheater surface of the tubes are reduced in efficiency. To keep the large flues clean it has been found that the first requisite is regularly in blowing them out. If they are blown out at regular and frequent intervals, less time is required to prepare the engine for the road, as the cinders have not had time to become baked hard. If the flues are blown out on every round trip, this operation is not much of a task. An air pressure of about 100 lbs. per sq. in. is generally used for this purpose. A ⅜ in. pipe long enough to reach all the way through the flue is inserted from the fire-box and below the superheater tubes, and is gradually worked forward, blowing the cinders and dust out of the flue into the smoke box. It frequently has been found that carelessness in cleaning the flues results in the cinders being blown part way, where they are not visible from the fire-box, and the engine is reported as having clean flues. This condition merely invites a more rapid accumulation of cinders, followed by an immediate reduction in the efficiency of the superheater.

Frequent inspection of the front end should be made; this is easily accomplished by means of hand holes on each side of the boiler, a short distance ahead of the front tube sheet, from which any leakages of the superheater tube joints or of the tubes in the front tube sheet can be readily ascertained. Any leakages of air into the front end are, of course, just as detrimental to a superheater engine as any other.

On a large number of lines it is customary to give a thorough inspection and test of the superheater at regular periods. The test is made with water pressure. To make it the steam chest valve ports are blocked and the dome cap removed; the steam pipe headers and superheater tubes are then filled with water, which is introduced through a special water test fitting, generally located on the left hand steam pipe, to which a hose may be connected by taking down the netting manhole. After the water level reaches the throttle, this is securely blocked up and the pressure is raised to the desired amount. In this way the joints of all parts carrying steam between the throttle and steam chest are tested for leakages with a minimum amount of labor.

The troubles which in some cases have been experienced in keeping the large flues tight in the fire-box tube-sheet have been eliminated by the improved methods of setting and working, with the result that flue troubles are practically a thing of the past. When it is found necessary to repair the flues in the fire-box tube-sheet a prosser is now generally used in preference to a roller. This prosser tool should be made with not less than 12 sections to give satisfactory results, and except in very bad water districts a very light prossering is all that is necessary. When a roller is used it should have not less than five rolls, as the use of tools with a smaller number of rolls has proved injurious for this size of work. Plugs driven into the tubes and flues surrounding the one which is being worked has in many instances proved good practice.

The superheater damper and its cylinder should be maintained in operating condition. The object of the damper is to prevent the flow of gases through the flues at a time when live steam is not passing through the superheater tubes. If the damper is not in operative condition it causes damage to the part of the superheater tubes closest to the fire-box; while this condition does not produce any immediate bad effects it does cause a deterioration of the superheater tubes and return bends in the course of time, which the damper is designed to prevent. It is not possible to tell just how fast this deterioration is, but when the means are provided for preventing it, it is important that it should be kept in operating condition and not be rendered useless by the lack of a little attention.

When the engine is being fired up this damper is in a closed position. When the flues are being blown out, however, it should be open, so that all cinders and dirt removed from the flues may drop out of the damper into the smoke box, where they can easily be taken out.

When extended piston rods and guides are provided for engines using highly superheated steam, they should be given careful attention and inspection. The tendency has been, when extended piston rods were used, not to give them the proper adjustment or attention. A number of greatly improved designs have been brought out in which the early troubles have been eliminated, and several of these are in very satisfactory service at the present time. A carefully maintained piston rod guide of good design will prove an invaluable aid in the satisfactory operation of superheater engines. Experience has shown that the cost of maintenance has not increased over the saturated steam engine, nor is the time which they are out of service for attention greater than it is for the non-superheater engine.

FOREIGN RAILWAY NOTES.

The Russian Council of Ministers has considered the general question of Siberian railways and favors the construction of the Semipalatinsk-Barnaul-Novo-Nikolaieffsk Railway at the expense of the treasury. At the present time in view of the applications made from the interested towns the council approves the construction of the Altaisk railways on a concessionary basis with the object of having them completed as soon as possible. This line is likewise of great economic importance to the region it will traverse.

In Queensland, the northeastern colony of Australia, where for some years there has been very little railway building, while the country was recovering from the three-years' drought, the government now purposes to construct a line along the coast from Rockhamton northwestward, 634 miles, through Mackay and Townsville to Cairns—all coast towns; and another nearly parallel with it, but about 350 to 400 miles further west from Charleville, the terminus of a railway from Brisbane, northwestward through Longreach and Winton and Cloncurry to the western border of the province at Camooweel, 1,282 miles. This latter would serve as part of a great transcontinental line to the northwest coast of Australia, and would make an enormous grazing country accessible.

A bill was introduced in the congress of the republic of Chile during the January session for the establishment of a special savings bank and pension system for employees of the state railways. This measure, which has been approved by the senate, provides for the raising of funds for the savings bank in the following manner: 5 per cent. of the earnings of employees; fines levied on employees for the improper performance of their duties; receipts from advertisements in railway stations; unclaimed wages of employees, and 0.0015 per cent. of the receipts of the state railways. The bank is to be managed by an administrator and board of directors composed of five members, two of whom shall be the director general of railways and the administrator of the second section of the central railway system. Pensions will be granted to persons who have served the state railways 10 years or over, and who have become incapacitated for service. Employees completely disabled because of injuries sustained during the performance of duties in the employ of the state railways are entitled to a pension for life at full salary, and employees temporarily incapacitated are entitled to full salary during their convalescence for a period not exceeding six months.

The Exhibit.

A passenger brake beam with the adjustable head feature for four or six-wheel equipment is one of the many interesting things to be seen in the Buffalo Brake Beam Company's exhibit.

The tea rooms on the boardwalk do not compare with the artistically arranged reception booth of the Galena-Signal Oil Company, Franklin, Pa., where luncheons are served to the ladies.

The Heywood Bros. & Wakefield Company, Wakefield, Mass., was unable to get a suitable space this year, and for that reason it is not making an exhibition of car seats. Bertram Berry is here in the company's interest, as usual.

Charles W. Guttzeit, general manager of the Titan Steel Castings Company, Newark, N. J., arrived Sunday night. Mr. Guttzeit was appointed general manager of this company January 1. He was formerly with the Taylor Iron & Steel Company.

The full-size working model of thermo-jet heating system, exhibited at the Safety Car Heating & Lighting booth, is an interesting demonstration of the positive temperature regulation that can be obtained. The recent orders from roads that have tried one or more thermo-jet equipments is the best indication of this heating system's merits.

All the railway representatives of S. F. Bowser & Co. are staying at the Marlborough-Blenheim. These include: C. A. Dunkelberg, treasurer; F. T. Hyndman, eastern manager, and E. H. Barnes, southern manager. W. T. Simpson, western manager, expected to attend the gatherings this year, but was called to the Northwest, and could not arrange his return in time to leave for Atlantic City.

Included in the exhibit of the Standard Coupler Company, New York, is the type C malleable iron friction draft gear of 125,000 lbs. capacity and the type K all-steel friction draft gear of 180,000 lbs. capacity. Both of these gears have had many years of service. The Sessions standard friction draft gears are made with a combined spring yielding and frictional resistance, with a small reactive force or recoil and allow a positive release at any point in the stroke.

The Garlock Packing Company, Palmyra, N. Y., has in its space, 510, samples of its number 950 gasket for triple and brake valves, pump heads, steam, air and ammonia pipe lines. This is one of the new products of this factory and is claimed to be most economical and efficient in every way. Garlock style number 2200 air pump packing and style number 3200 throttle packing are shown. These packings are known to railroad men the world over. Style 333-549 steam hammer packing is a product that is said to withstand from 12 to 15 months' service with ordinary care. In addition to the above are shown Garlock high pressure packings number 200 and number 1906, a hot water packing, as well as its locomotive metal packings, numbers 870 and 826. As a whole, the collection presents a most comprehensive assortment of packings for railway use.

HALE & KILBURN COMPANY.

This new organization is the successor of the well-known Hale & Kilburn Manufacturing Company, Philadelphia, Pa. Francis H. Greene, formerly director of purchases for the New York Central lines, is president. Attractive convention exhibits have been the invariable rule of this company in the past, but the present display surpasses, both in size and character, any hitherto made. This company was one of the first to develop the finer grades of steel passenger car construction, being in advance of conditions in the new art and anticipating its needs in pressed steel work, such as steel car interior finish, steel doors, steel sash and many other parts.

An entire steel compartment forms a part of the exhibit. It is full size and complete in every detail, being fitted with steel chiffonier, metal open bed, metal sofa, folding upper berth, steel lavatory and other articles. The interior and exterior are beautifully finished in hard white enamel, and indicate the possibilities of elegant finish to be secured on steel surfaces. The Walkover car seat is shown in numerous patterns and varied colors of upholstery. The all steel types of the Pennsylvania, the Lehigh Valley, the Harriman lines and the Long Island are there, with the new Baltimore & Ohio seat and many others.

The exhibit includes also parlor car and reclining chairs.

BETWEEN THE AQUARIUM AND THE HIPPODROME.

C. B. Adams says he can sell anything, but wants to work along the line of least resistance—and the kind regard he has for safety equipment speaks volumes.

Strange how a man gets confused. J. G. Van Winkle is usually right there with convincing talk; but when the system is as simple as Thermo-Jet, he doesn't unwind fast enough.

A. C. Moore, resplendent with smiles and white flannel, satisfied with the past, making the present show results and optimistic for the future, has absorbed so much Pintsch light enthusiasm while at Atlantic City that he is often mistaken for Julius.

George E. Hulse makes one wonder how he can be so agreeable all the time. "Well," says he, "they all go away so enthusiastic about our axle lighting equipment, it kinder keeps me cheered up."

"I'll be back later, Garland; my wife isn't familiar with heating equipments." The wife resented the inference and stayed. When Billy had explained Thermo-Jet, she said something about not freezing or roasting in a car hereafter if she had any influence. They carried away a Thermo-Jet circular.

J. S. Henry is somewhat despondent. He worked up an elaborate campaign of education in car heating for Harvey in Canada. Then the Safety company produced that Thermo-Jet hot water regulation, which needs very little demonstrating. Now he has to sell Pintsch plants to use up his energy.

William St. John, the dean of the Safety company's sales department, has been compelled to forego the pleasures of meeting his many railway friends. He is recuperating at Mt. Clemens, Mich. The boys missed that expansive smile and hearty handshake on his seventy-second anniversary of his birth.

George H. Chadwell, the real sport of the Safety company, has a swelled head; and all because he recently sold 200 Thermo-Jet installations for heating cars in a foreign country.

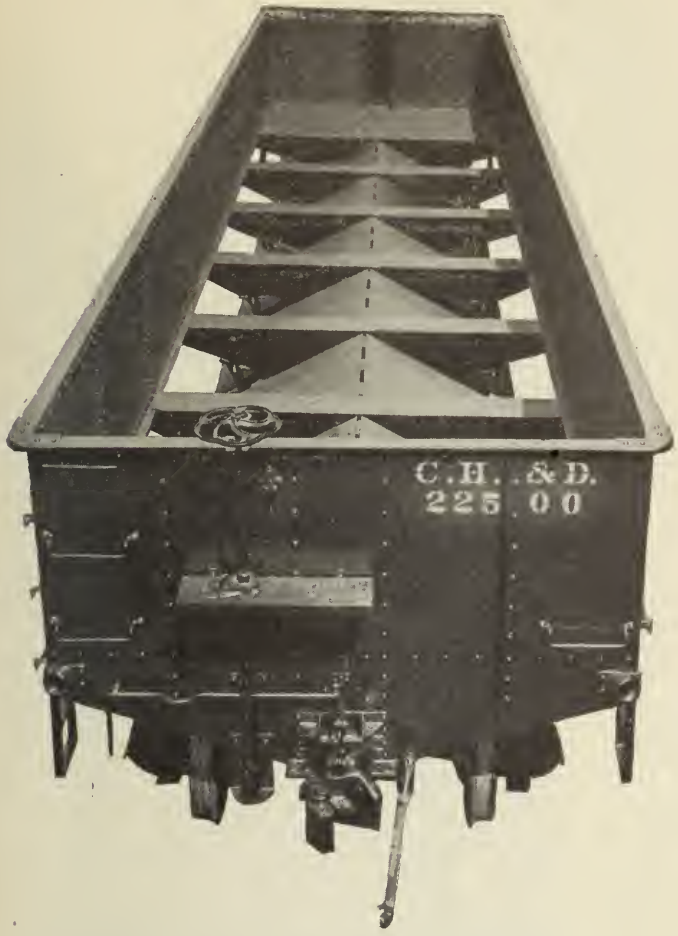
RALSTON DROP BOTTOM GONDOLA.

The Ralston Steel Car Company, Columbus, Ohio, has built to date, 7,000 gondola cars with its drop bottom device. It is exhibiting a car built for the Cincinnati, Hamilton & Dayton, which embodies the latest design for this class of car. It has a capacity of 50 tons and weighs 38,500 lbs. It has 12 drop doors, which are operated by a crank arm shaft moved by hand lever with ratchet, as in the company's previous practice; but the principal change is in the location of the ratchet and lever on the side of the body bolster instead of on the end sill.

The car is 41 ft. long, 9 ft. 3 in. wide and 8 ft. high from

rail to the top of car side. The sheets used throughout the car are ¼ in. thick and the stakes are ¼ in. thick in the usual pressed form. The center sills are in an A-shaped section, 23 in. deep, consisting of two webs ¼ in. thick, which are reinforced at bottoms with 4-in. x 3-in x ⅜-in. angles, and the webs are joined into a single member at the top, the angular shape allowing clearance for the drop doors and the section providing for an equivalent of two center sills.

The body bolster has a deep web ⅜ in. thick, with angles on both sides. The principal equipment consists of Cardwell friction draft gear and Simplex truck bolsters, brake beams and couplers. The brakes are Westinghouse, with the K2 triple.



50-Ton Ralston Gondola, Showing Crossbearers and Drop Doors.

AMERICAN INGOT IRON.

There is an interrelationship between all things mechanically by which they are held together in a way that cannot be broken. So, though American ingot iron is used mainly for culverts, where its anti-corrosive properties are especially valuable, it will also find a place wherever there are corrosive elements at work, as in smokestacks and overhead structures where the fumes from locomotives have a chance to work. With the new mills that are in course of construction opened and the product upon the market in larger quantities than are now available, there will be found places where its qualities can be used to advantage. As an example of this, it would seem that it would be especially valuable for boiler tubes for which its strength, ductility and ability to resist corrosion should make it especially suitable. As it stands, it has made a reputation for itself for culvert construction, and is used all over the United States, from Maine to California in that class of work.

OXY-ACETYLENE WELDING AND CUTTING.

Several railways are using oxy-acetylene apparatus for welding and cutting metals. The hardest steels can be cut as easily as the softest, and, with the aid of hydrogen, plates up to 24 in. thick have been cut. The International Oxygen Company, New York, owns the American rights for gas producing appliances of two French concerns, one of which, L'Electrolyse Francaise, has the largest plant in France devoted exclusively to the production gases, as well as auto-welding and oxy-cutting appliances. The system has been in use in Europe for over 10 years with very satisfactory results.

In order to produce the best results in welding, cutting, or other operations, it is essential that the gases used should

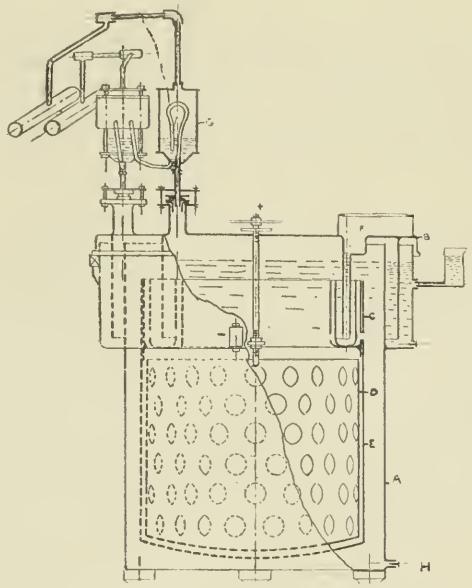


50-Ton Ralston Drop Bottom Gondola Car. View Showing Doors Open.

be of the purest character. Oxygen which contains the least impurities is the most economical in the end, as it is the most efficient. If it should contain any portion of inert gas, like nitrogen or chlorine, for every per cent. of such impurity, the percentage of efficiency will be reduced many times.

The oxygen and hydrogen produced by the International Oxygen Company system are said to be free from impurities; the gases are made electrolytically and can never contain either chlorine or nitrogen. Hence, such oxygen when combined with pure acetylene or hydrogen will give a flame of maximum efficiency, and less of it will be consumed for a given amount of work than of oxygen obtained from any other source.

The aim of this company is to enable a manufacturer to produce pure oxygen and hydrogen on his own premises, and it is now placing on the market equipments of various capacities, suitable to the individual needs of manufacturers. These plants are simple and reliable in operation, require no expert attention and cost very little for maintenance. The cost of producing the gases is practically that of the cost of electrical current. This system for producing oxygen and hydrogen consists of a group of oxy-hydrogen generators. Each generator is an electrolytic cell, which by the aid of electric current decomposes water into its constituent parts—oxygen and hydrogen.



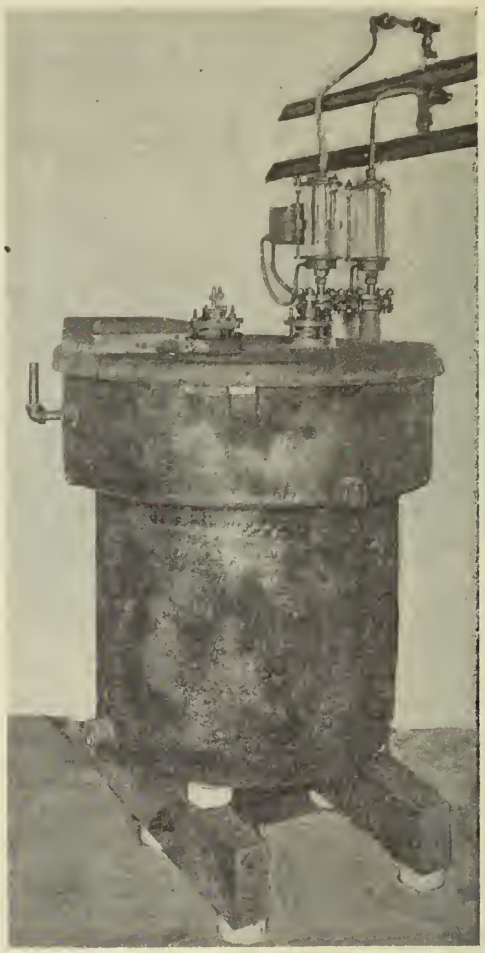
Sectional View of I. O. C. Generator.

A—Outer Electrode. B—Cover. C—Hyd-Joint. D—Inner Electrode. E—Hole in Cover. G—Lantern. H—Porcelain Supports.

It works as simply as an electroplating apparatus. Instead of separating copper, silver or some other metal from a solution, the generator separates oxygen from water, which contains some alkali to make it a better conductor. As water is made up of one part of oxygen and two parts of hydrogen, the hydrogen is set free simultaneously with the oxygen and both gases become immediately available.

The construction of the generator is as simple as the principle by which the gases are produced. An iron tank serves as the negative pole. From the cover of this tank are suspended an hydraulic joint and a perforated tank which serves as the positive pole. By means of an asbestos sack suspended from the hydraulic joint, two separate compartments are formed. Through an opening in the cover, a solution of water with alkali is poured into the hydraulic joint and distributed in the two compartments. When current is sent in the generator oxygen immediately forms on the walls of the inner tank, and hydrogen on the walls of the outer. The two gases are thus produced in separate compartments and are therefore absolutely pure. As a further check against any possible mixing of the gases the asbestos sack when impregnated with the alkali solution, forms an effective wall between the two gases.

The hydraulic joint automatically adjusts the inner working of the generator. The oxygen and hydrogen do not pass directly from their respective compartments to the offtake pipes, but first bubble through the water placed in the lanterns affixed to the cover of the generator. By means of these, one can see at a glance how the generator is working. All that is needed is to add distilled water daily to make up for the quantity decomposed into the oxygen and hydrogen. The gases can be produced whenever needed and for whatever length of time required.



I. O. C. Generator for Producing Oxygen and Hydrogen.

A plant for producing these gases being made up of a group of units is very flexible. The units can be arranged in single file and double file; also in many rows and tiers. A group of generators may contain just enough units for only one torch, or it may be great enough to generate thousands of feet of gas. In addition to manufacturing these generators at its Waverly Park (Newark, N. J.) factory, the International Oxygen Company will also produce oxygen and hydrogen in cylinders.

In determining costs by this system, the following data will be of value: One k. w. h. of current will produce about 3 cu. ft. of oxygen and 6 cu. ft. of hydrogen. Each unit requires about 2 volts and from 300 to 400 amps. The quantity of gas obtained is proportionate to the amperes used. With about 350 amps., about 65 cu. ft. oxygen and 130 cu. ft.

hydrogen are obtained daily. The expense outside of current consumption is very small, the only other material required being distilled water. It takes only 1/100 of a gallon of water to produce 1 cu. ft. of oxygen and 2 cu. ft. of hydrogen.

EXTENSION SHANK FOR SHARON COUPLER.

A new development in coupler design, on exhibition in the exhibit of The National Malleable Castings Company, Cleveland, Ohio, is a special shank extension for applying Sharon freight couplers to all classes of passenger equipment. This shank extension, which takes the place of the wrought iron straps ordinarily used, is entirely separate from the coupler and can be made in lengths to suit all conditions. The coupler is attached to the shank extension by regular yoke rivets, bolts and wrought iron or steel keys.

Adjustable pocket or attachment castings are provided for maintaining the center line of draft of locomotive couplers. This is accomplished by elongating the bolt holes in the base plate of the casting and by using washers. These washers can be inverted, as the tires wear and the locomotive and tender settles, thus bringing the center line of the draft gear up to the standard height.

The Sharon coupler for which this extension is designed operates from either the top or the bottom, with a central vertical lift in both cases. It is designed to suit every class of equipment, without any change whatever in the operating parts. The Sharon bottom as well as top operating coupler can be operated from either or both sides of freight and passenger cars and locomotives, as desired. In case of failure of the rear draft attachments of either the top or bottom operating Sharon coupler, it will automatically release and uncouple in pulling out.

REFRIGERATOR CAR SEALS.

BY CHARLES V. EADES.

The reliability and efficiency of sealing compound used in insulating refrigerator cars is one of the most important items in the car's construction. To maintain the required protection and be of greatest benefit, it must have a number of known qualities, the following being the most important.

It must be tasteless and odorless, so that no taint or odor will be given to the most delicate of the commodities carried; as many, like dairy, meat, fruit and poultry products, are very susceptible to these odors, which reduce their selling value as articles of food.

It must be elastic under all variations of temperature and adhere to flashings and not crack or run.

It must resist the liquids, gases and chemicals that seep from the multitudinous burdens that are in daily transit, or the alkalies used in refrigeration. Under no condition (vibration, age or chemical) shall it become a dry, hard, dead, inert mass of carbon that will crack or crumble, which if done, proves the material worthless and renders the whole work a waste of time and money, impairs all the insulation and increases the cost of icing and transportation charges.

The cost of re-icing a car once will pay the difference between a good seal and a poor one.

All systems of insulation have some special merit, but none are complete in themselves; they must be properly sealed.

Revenue being the one principal object of transportation companies, and known security of the products transported, the principal factor in basing rates, the showing of the traffic department is greatest when a unit of force will produce the greatest revenue from the tonnage carried, and when the commodities are of regular, steady, daily movement, at highest standard tariff rates, and when the element of loss is reduced to a minimum.

Perishable food products which are susceptible to and absorb any odors or are destroyed by extremes of temperature offer an immense tonnage but require special service and intelligent care.

Perfect security is needed, and the vehicle must be so constructed that an accurate, uniform condition can be maintained over long distances and resist any climatic change no matter how severe, from torrid to intense cold. A failure, even for but a short time, is sufficient to cause an entire loss.

All are agreed on dead air as the theory of insulation; but the opinions vary as to the best means of obtaining it. Hair felt, fibre, quilt, cork, paper and many others have merit, but none are sufficient in themselves. The construction of the car is such that the insulation is interwoven with the car's construction, and broken in many places by bolts, screws, nails and timbers, or careless workmen, which break the air cells and renders the insulation of little value. Any perforation, no matter how minute, has its effect and increases the operating expense.

The writer was in the shops of one of the largest car builders some days ago. They were at work on a big order of refrigerator cars for one of the standard lines. The specifications as to material were being carried out to the letter; but when the inspectors had passed on the material as to brands they were careless or ignorant as to the principal factor or the object of its design and construction—the confinement of the air as the real insulation of the car.

The ignorance of an inspector as to the fundamental principles of insulation is an acknowledgment on his part of his unfitness for his position, as much so as carelessness in carrying out the engineer's instructions.

Over the sills of the car in question (there were several others nearly as bad) had been laid a good quality of three-ply rubber roofing. This has been carefully secured. The workmen, in nailing cleats holding part of the floor insulation, were using the insulation of the sills as a chopping block; and in a distance of about 23 ft. there were 51 holes cut with a hand axe and 12 triangular pieces entirely cut out. This was wilful waste, carelessness, inefficiency and lack of knowledge or interest on the part of the inspector in charge.

There was no repair or seal used in securing their breaks, which should have been done. (This is intended as no reflection on the engineer, but on general factory conditions).

Some time the claim department will have to handle claims aggregating great amounts, and will bring in figures to show that rates should be advanced, while the real reason was entirely construction. Had there been a good seal used, and that seal ever ready, any defects could be easily remedied and efficiency maintained.

An intelligent knowledge of the results must be based on facts—not theory—and all work must be directed to that end. Faulty construction and bad or cheap insulation is not economy.

All manufacturers of insulation advocate and use a refrigerator seal, but price and not quality seems to be the one consideration. Nearly all of these manufacturers have claimed to the writer that "competition compels the cheapest material possible for a seal; it's all covered up anyhow, and by the time it is put into service and gets back for repairs, no one will know what was the cause;" and for the saving of a very little money—often but a few cents per car in the first cost of construction—both the claim and operating departments carry an added burden.

Few construction engineers have given this subject very much thought, leaving the question of sealing compound largely to chance or the fact that it can be secured with

the other items of insulation, or taking the word of the salesman offering it. When the car comes back for repairs and is stripped, the sealing compound is a dry powder, and many of them are valueless even after a few weeks of service. They become hard and brittle, and then the vibration of the car soon reduces them to impalpable dust.

The Standard Asphalt & Rubber Company, Chicago, has perfected the only seal, Sarco Refrigerator Compound, that fills the requirements. It is tasteless and odorless, elastic under all variations of temperature, will resist acids, alkalies or gases, and stand service and remain alive and elastic during the entire life and service of the car. It is in use by several of the standard refrigerator car lines, and is endorsed by some of the best car builders and engineers. When greatest efficiency and economy is desired, Sarco Refrigerator Compound is offered.

HOBART-ALLFREE CYLINDERS AND VALVE GEARS.

The Pittsburgh & Lake Erie has had in service during the past year 20 engines equipped with the Hobart-Allfree cylinders and valve gears, made by the Hobart-Allfree Company, Chicago, and its management is so well satisfied with the results that the same equipment was ordered for the five passenger engines recently built for the road by the American Locomotive Company.

This improved locomotive cylinder and valve gear is also applied to 20 Mallet locomotives and 50 old locomotives on the Mexican National. It has been somewhat simplified by having the compression valve connected to the combination lever in the Walschaert's or similar valve gears. In the exhibit the combination valve is shown full size; and the general arrangement of cylinder valve and gear is well illustrated by a model which is an exact reproduction, one-quarter size, of the equipment on the Pittsburgh & Lake Erie passenger engines. The principal advantages claimed for the Hobart-Allfree cylinders and valves are as follows: The cylinders are designed with short ports and the exhaust passages are separated and insulated from the live steam passages; consequently the heat losses from radiation and condensation are greatly reduced.

The waste spaces in the cylinders are reduced to the minimum. In common practice this amounts to at least 10 per cent. of the piston displacement, while these cylinders have not more than 2.5 per cent. Having an increased area of about 50 per cent., this system produces a quick and large opening of exhaust, discharging the exhaust steam freely. This greatly reduces back pressure in the cylinders, and owing to the sudden release, a better fire is maintained even with an enlarged exhaust nozzle.

In the return or exhaust stroke of the piston the exhaust is not closed until very late in the stroke; but when the proper point is reached, enough exhaust steam is entrapped in the cylinders and small clearance spaces to produce sufficient compression to answer the mechanical needs of cushioning.

In the Allfree system a single valve correctly controls admission, cut-off and release the same as in the standard engine, except that a sufficient amount of exhaust lap is used to carry the steam to a point that will give a greater expansion. To avoid an early closure, a small piston valve, called the compression valve, is introduced through a section of the ports beneath and to one side of the main valve, and this has only the function of controlling the compression and providing greater freedom for the escape of exhaust steam. While the two valves release at the same instant, the compression valve in closing falls about 1¼ in. behind the main valve. The clearance having been reduced to 2¼ per cent. of the piston displacement, a sufficient amount of compression takes place to cushion perfectly the reciprocating parts.

NEW McCORD JOURNAL BOX LID.

The part of a journal box most likely to give trouble is the hinge pin, as it is in constant duty; and, while this duty is light, the fact that it is unremmitting will develop defects, if any exist. The results of such defects are box lids missing, inoperative, or, by reason of wear of the bolt, ineffective. The accompanying cuts show the construction and operation of the new McCord



Fig. 1. McCord Journal Box Lid.

Pinless box, designed to eliminate the troubles due to hinge pins, made by McCord & Company, Chicago.

For the different types of hinge pins are substituted two bosses (Fig. 1) about ½-in. long, cast integral with the lid and projecting ½-in. inwardly from the side of the lid, in the same location as the hinge pin would be. These bosses are not round, but have a segment of the circle cut away so that the diameter in one direction is less than in the others. A slot (Fig. 2) is cut through the top of the lug slot the same width as the small diameter of the bosses and at an angle to the lug slot. The lid is applied to the box by rotating it until the small diameter of the bosses and the slot coincide (Fig. 3), when the lid drops down into the proper place. The position



Fig. 2. McCord Journal Box Lid.

in which the lid is applied is one it cannot assume under any service condition, and is such that it cannot be removed without a special tool. When the lid is rotated to open it, it rises to the top of the slot, the large diameter of the bosses is across the small slot and they therefore cannot get out (Fig. 4). There is no wear on these bosses, because when the lid is closed the

center bearing action of the McCord spring forces the lid against the face of the box; and when it is in the closed position the bosses (exactly as the pin in the ordinary McCord box) are not in contact with either the front or the back wall of the lug slot.

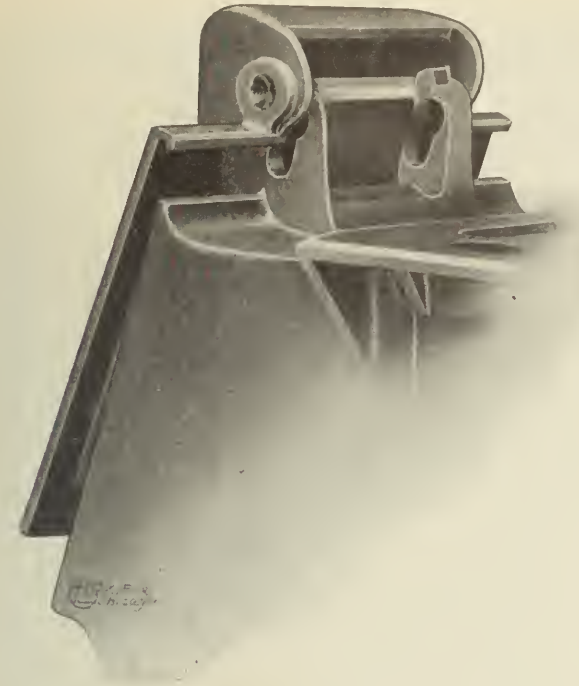


Fig. 3. McCord Journal Box Lid.

The principle of interchangeability of parts has been carried out, so that for repairs the M. C. B. lid, the old flat spring McCord or the more recent improved coil spring McCord lid can be applied for repairs if necessary. As lid repairs to boxes are almost entirely due to pin failures, and as there is no pin

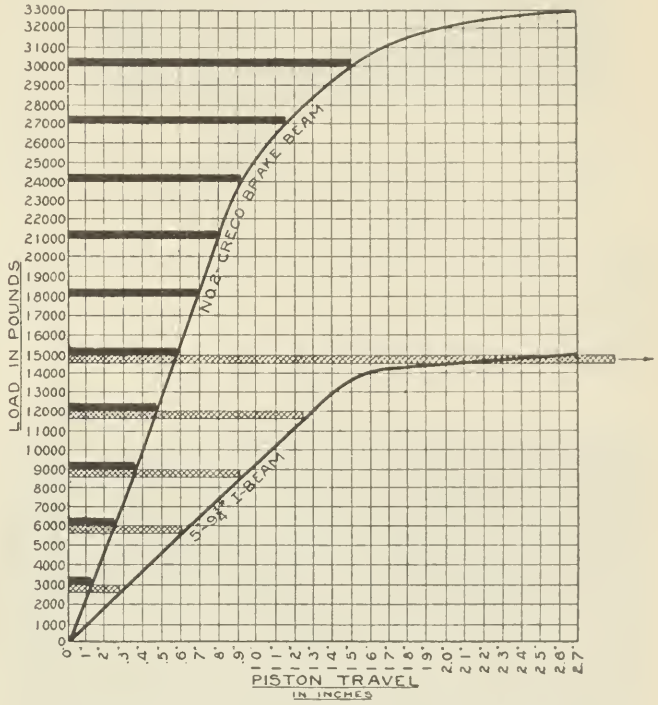


Fig. 4. McCord Journal Box Lid.

in this lid, it is not expected that any repairs will be necessary. A number of these boxes have been in service for the past two years, and one box, which has run over 180,000 miles in the hardest kind of passenger service for the past 18 months, can be seen at McCord & Company's space.

DEFLECTION OF BRAKE BEAMS.

The test of brake beams usually concerns the deflections of the beams under various loads up to the elastic limit. A slight motion of the beam due to deflection is multiplied by the total brake beam leverage, and its effect on piston travel is important, the stiff beams having an advantage over those with a greater deflection. The diagram illustrates this difference in effect upon piston travel of the M. C. B. No. 2 Creco brake beam, made by the Chicago Railway Equipment Company, Chicago, and the ordinary 5 in. 9¼ lbs. I section brake beam. It will be noticed that while the deflection of the I-beam at 6,000 lbs. load results in a piston travel of over ½ in., the deflection of the No. 2 Creco only causes ¼ in. At 12,000 lbs. the I-beam deflection causes a piston travel of 1¼ in. on an 8 to 1 brake leverage, while the Creco deflection gives a piston travel of about ½ in. The I-beam collapses at 15,000 lbs. load



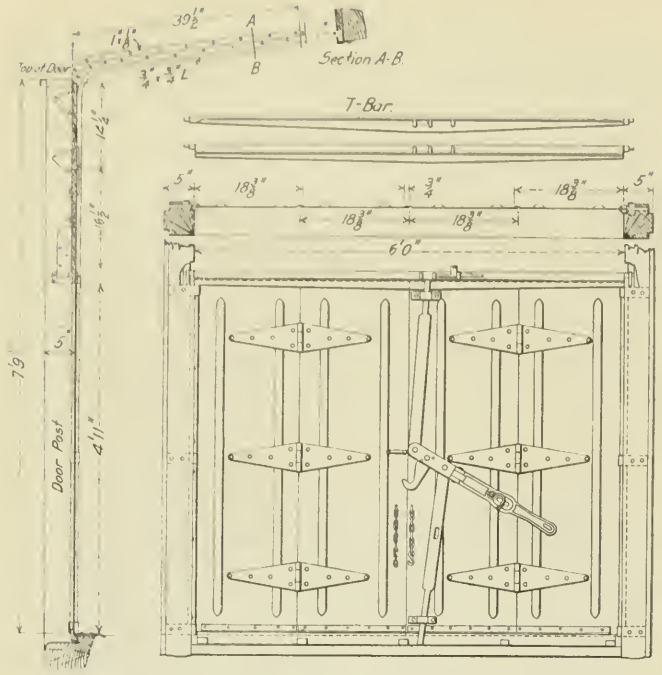
Deflections of Creco and I-Section Brake Beams.

and would allow the piston to bottom itself against the brake cylinder head, while the No. 2 Creco beam would allow piston travel of only a little over ½ in. at the same load. The importance of controlling piston travel and of not allowing it substantially to exceed the normal movement is fully appreciated and the effect of brake beams in this respect is clearly shown by this diagram.

WILLIAMS ALL-SERVICE CAR DOOR.

The Williams door, illustrated herewith, was designed by W. S. Williams, superintendent of the Illinois Central at Clinton, Ill. It has been in service for three years. It is a steel-hinged folding door, each side having two parts, and the attachment to the wooden door posts is partially recessed and arranged so that the door can swing in either direction.

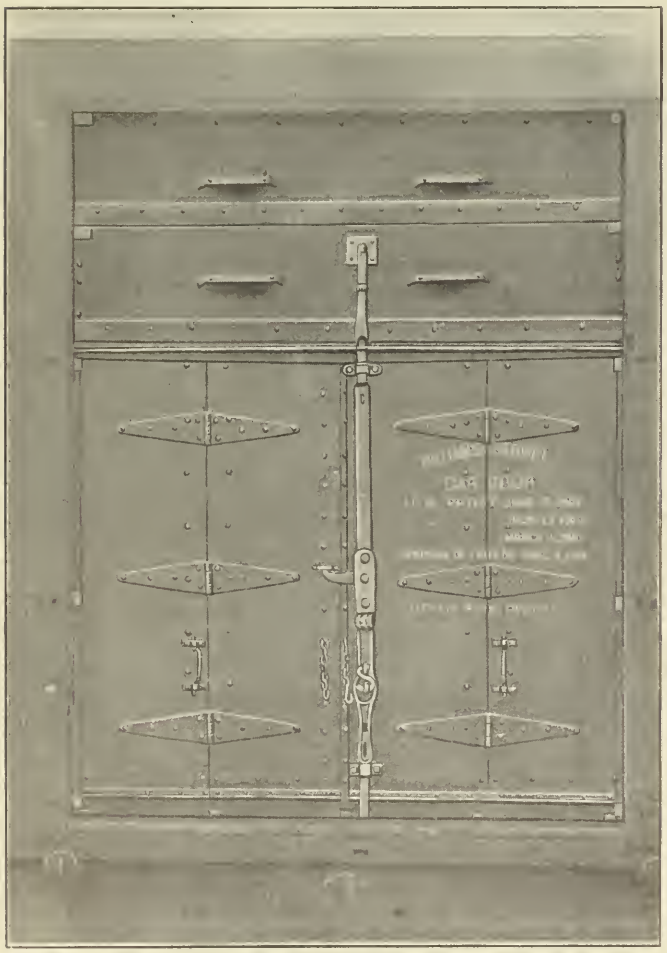
The swing doors are fastened by a latch somewhat similar to that used on refrigerator cars, and the door sill is arranged with a flanged portion so as to make it waterproof. The main hinged doors are about 5 ft. high and are made of sheet steel ⅛ in. thick. Above these there is a metal T-bar, which serves to stiffen the attachment of the upper part of the hinged doors and to make a bass support for



Details of Williams All-Service Car Door.

the rolling shutters, which are folded up into the roof. These upper folding doors are made of wood and bound with iron straps. The construction is clearly shown in the drawing and two photographic views.

One of the principal advantages claimed for this door is that it can be released in five seconds; a car of grain can be completely unloaded in 25 to 30 minutes, and the door replaced and closed in five seconds. The ordinary car door when closed to the elevator requires 15 to 20 minutes to be released so that the grain will run out. An important advantage connected with the use of this door is the saving in the cost of wooden doors. The steel portion of the door weighs 600 to 700 lbs., or about 1,300 lbs. per car. The Williams All-Service Car Door Company, Clinton, Ill., is prepared to put on these doors for trial for any road desiring them.



Outside of Williams All-Service Car Door.



Interior of Williams All-Service Car Door.

AIR COMPRESSOR USED FOR CONVENTION EXHIBITS.

The compressor used for power purposes at the exhibit of this convention was built by the Chicago Pneumatic Tool Company, Chicago, and is known as its class GCB. It is of two-stage type, low pressure cylinder being 16 in. in diameter, the high pressure cylinder 10 in. in diameter, and the stroke 12 in. The compressor has a capacity of 419 cu. ft. of air when operating at a speed of 150 r.p.m. to a final pressure of 100 lbs., and is driven by a 75 h.p. Western Electric Company's motor with an automatic starter, the receiver being of the vertical type 42 in. in diameter and 8 ft. high. The compressor is entirely self-contained, and has a heavy single piece cast iron sub-base. The main bearings and cross head guides on each side are a single casting, the air cylinders being bolted to this and overhanging, thus making the operating parts accessible, and permitting uniform expansion of the cylinders.

The frames are heavy, box-shaped castings with double bearings, set on an angle so that the thrust is taken on the solid

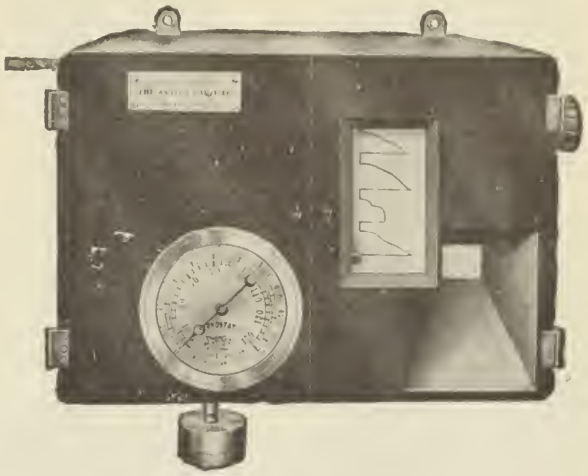
metal of the bearings. The cross head guides are bored concentric with the cylinder. The shaft is especially heavy single-piece steel forging, with cranks at 90 deg. The belt wheel is 84 in. in diameter with a 16-in. base, and made heavy enough to insure smooth running at a moderate speed. The connecting rod is a solid, single-piece forging with heavy marine type crank pin bearing. The cross head is a single casting with adjustable taper shoes turned to fit in the cylindrical guides. The piston is of the solid type with cast iron spring rings. The air cylinders are cast of special mixture iron; they are simple in design and free from complicated passages and are cast heavy enough to stand re-boring. They are water-jacketed throughout and have water-jacketed heads. The air inlet valves are of Corliss type, mechanically operated by eccentrics on the main shaft, the design being such that the port area is large and the clearance is reduced. The valves open rapidly and shut quickly without hammering or causing excessive wear due to unnecessary movement. Owing to the valves being operated by independent eccentrics, it is possible to obtain close adjustment. The parts of the valve motion and the valves themselves are readily accesible for examination or repair; the wearing parts are of generous proportion and the bearings provided with phosphor bronze bushings and improved adjustments. The discharge valves are of the Chicago pneumatic poppet type with removable guides and are automatic in operation. The valves, being of the cup type, with external guide, move freely and without the use of excessively heavy springs.

The air intercooler between the two cylinders is of the unit type, consisting of a nest of tubes, secured to suitable head plate, which slip into a containing chamber in the base and directly under the air cylinders. The construction is such that the tubes are free to expand under the influence of varying temperatures without causing leakage. The connection between the intercooler chamber and the cylinders is made by pedestals connecting with the under side of the cylinders, these pedestals in addition to forming the passage or connection between the cylinders and the intercooler give a more rigid construction than where the cylinders are supported by the frame alone. The regulation is effected by an automatic throttling unloader of simple and substantial construction, and is connected with the receiver, and privided with weight adjustment so that the working pressure is maintained in the receiver at a constant and predetermined amount. In principle, this unloader consists of a throttling valve on the inlet side of the low pressure cylinder, the amount of opening being automatically proportioned to the service demands so that the air taken in by the compressor is only that required to maintain the constant predetermined pressure in the receiver.

WHEEL PRESS RECORDING GAGE.

The Ashton hydraulic wheel press recording gage, illustrated herewith, is made by the Ashton Valve Company, Boston, Mass. It is the result of a recent invention that has been developed as a machine that will assure the accurate mounting of wheels on axles. The recording gage, by its own record, shows the fit throughout the length of the wheel hub from the entrance of the axle to its full travel, being a record of the operation from the start to the finish. The importance of this information is essential, for the application of too much pressure will strain wheels, making them liable to burst, while easy fits with too low a pressure applied results in wheels working loose. The Ashton wheel press recording gage can be readily attached to any hydraulic wheel press. It is so constructed that the operator cannot get at the record to change or alter it in any way. There is an opening provided in the front of the outside casing so that there can be written, or stamped, on the chart, directly opposite the record of the wheel fit, the pressman's name or number, wheel fitter's name or number, the size of axle and the number of wheel.

The machine has a capacity for 300 records, or 150 pairs of wheels. These records are made on a single continuous paper roll, or chart, 5 in in width, and as each roll becomes filled it can be quickly removed and filed for future reference and a new record roll inserted in a short time. The

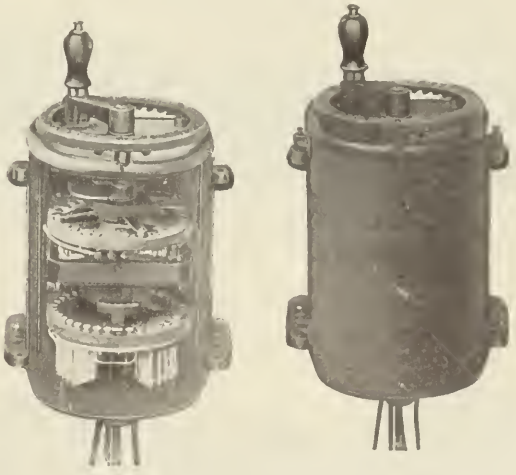


Wheel Press Recording Gage.

chart works vertically from a lower to an upper reel, and operates only on the forward stroke of the ram, moving 1/16 of an inch to every one inch movement of the arm. On the back motion of the ram the chart remains stationary. The use of plain paper charts is an advantage over expensive ruled paper, and by eliminating clock movements there is nothing that requires winding or adjusting.

WESTINGHOUSE CONTROLLERS FOR SHOP USE.

The accompanying illustrations show types of machine tool controllers made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. They have been designed with special reference to ease and accuracy of operation and facility of repair. The operation of the motor is controlled by a single handle which remains securely locked at the proper notch until

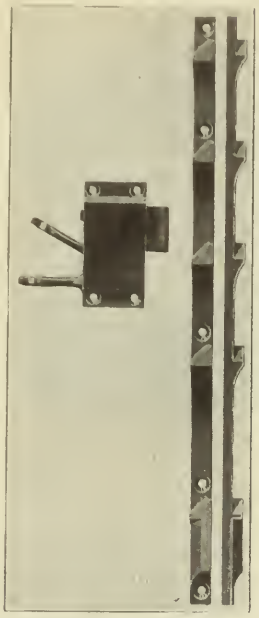


Westinghouse Electric Controllers.

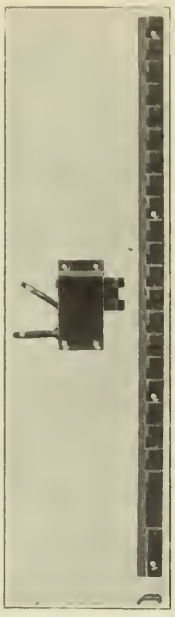
released by the operator. The controller can be mounted in any convenient position, or the handle can be removed and mounted on the carriage so that it will travel with the work. Automatic machine tool controllers give great assistance to the operator. The motor is started, accelerated, and brought to the desired speed automatically, and it can be controlled by master notches placed wherever desired.

CAR WINDOW SASH LOCKS.

The Universal No. 10 sash locks, manufactured by the McCord Manufacturing Company, Chicago, wedge by gravity, using the weight of the sash. The beveled surface of the lock bolt in contact with the rack, giving downward and outward



Universal Gravity Sash Lock.



Universal Wedge Sash and Lock Rack.

bearing surface along which the bolt slides by force of gravity, wedges the sash against the outside strip and tends to prevent all rattle.

The illustrations show the Universal No. 20 wedge sash and lock rack, and the No. 10 lock.

BOSS NUT LOCK.

The lock nut shown in the accompanying illustrations, made by the Boss Nut Company, Chicago, is a natural thread lock



Boss Nut Applied and Locked.

nut for use on cars, track, frogs, crossings; in fact, for use anywhere that a simple, positive, vibration proof, locking device is required. It is made of special mild steel and is double



Boss Nut Applied; Not Locked.

concave in shape, being applied either way and run on a bolt with the fingers like any ordinary nut. When brought square with the home nut, the Boss nut bears on the two outer edges only; and as the nut is wrenched tight, the inner arch of the Boss nut is flattened, causing the outer surface to draw downward and inward until the threads of the nut are sunk deeply and tightly to the root of the threads of the bolt. It automatically takes up variation in bolts due to defective manufacture, wear, etc., and may be used repeatedly, as it does not destroy threads of the bolts, is labor saving and does not require the service of an expert mechanic to apply it, for the tighter you wrench the Boss nut, the tighter you lock it.

ADLAKE CASTING.

A small frame which hangs at the entrance of the general offices of the Adams & Westlake Company, Chicago, contains a casting which was made in the new shop of the Adams & Westlake Company nine days after the Chicago fire of 1871. The fact that any casting could have been made so soon after so great a disaster speaks much for the energy and resourcefulness of the company that made it. The Adams & Westlake Company has now been serving the railroads for 50 years.

NATIONAL SASH LOCK.

The improved National sash lock, made by the National Lock Washer Company, Newark, N. J., is designed to lock and absolutely hold the window at any desired height. It is made of special alloy, and, it is claimed, can be subjected to the most severe treatment without showing any signs of wear. The fact that it can be applied without mortising is of special importance as regards application and maintenance. But one sash lock is recommended for each window.

NEW CONSOLIDATED COUPLER WITH POSITIVE LOCK.

The Consolidated Car-Heating Company, New York, recently placed on the market a new type of coupler, No. 33TDX, for use between engine and tender and where high pressure steam is carried in the train line for operating electric lighting generators



Consolidated Hose Coupler, Connected and Locked.

in baggage cars. This coupler consists of their standard two-piece coupler head of the slide-gasket type, equipped with a positive lock. One of the accompanying illustrations shows a



Consolidated Hose Coupler, Uncoupled.

pair of these couplers connected and locked together. The other shows the small amount of lift to the heads necessary for coupling and uncoupling, a feature which has much to do with

the life of the steam hose. This point of advantage is produced by the correct angle of the nipples, which allows the couplers to hang naturally when in service.

These couplers give a steam tight joint and when furnished with the Consolidated two-piece hose clamps and high pressure steam hose they make a steam connection that is cheap and easy to operate. They are on exhibition at booths 579, 580.

GASOLENE ELECTRIC MOTOR CAR.

The General Electric Company, Schenectady, N. Y., is exhibiting a gas-electric car of the standard type. Its length is 66 ft. 1 in. over the bumpers; its width is 10 ft. over the sills and 10 ft. 4¾ in. over the belt rail, and the overall height is 14 ft. 1 in. The car is divided into four compartments, the forward one being the cab, 11 ft. 5 in. long, in which all the motive equipment is placed. Immediately to the rear of this is a 6 ft. baggage room, and lying between the baggage room and center entrance is a smoking compartment 12 ft. 5 in. long. Directly back of the center entrance is the main passenger compartment 32 ft. 5 in. in length, with a circular observation rear end. The seats are somewhat longer than the standard car seat, namely, 47½ in., and will accommodate three persons. The circular observation end accommodates seven persons. On the basis of three in each of the longer seats, the smoker will accommodate 28 and the passenger compartment 69, making a total of 97 in all.

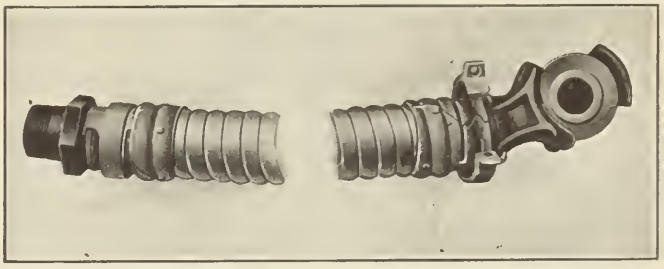
The trucks are standard M. C. B. design throughout. The forward truck, upon which are mounted the two driving railway motors, one on each axle, has a wheel base of 6 ft. 10 in. The rear or trailer truck has a wheel base of 6 ft. The wheels are 33 in. in diameter with M.C.B. standard treads and flanges. The distance between the bolsters is 50 ft. 7 in., making a total overall wheel base of 57 ft. The equipment under the car has been so arranged that the trucks have a clearance for a minimum radius of 150 ft. The car in operating condition weighs 45½ tons, 66 per cent. of the weight being on the driving wheels and therefore available for traction. The car has a maximum speed of 50 m.p.h. The interior finish of the car is a high grade mahogany. The ceiling is of composite board painted dark green with gold stencil decoration. The upholstery of the seats in the passenger compartment is green friezette plush and that in the smoking compartment green Spanish leather.

The car is provided at each end with ¾ type automatic couplers of M. C. B. contour. The equipment of the car consists of the main gasolene engine set comprising an 8-cylinder, 4-cycle, engine direct connected to which is an 8-pole commutating field self-excited generator. The generator outboard bearing is housed in a three-arm bracket, ring oiled. An auxiliary gasolene engine set comprising a 2-cylinder, 4-cycle, 10-h.p. engine direct connected to a single cylinder air pump and lighting generator, furnishes an initial charge for the air tanks and supplies current for illumination and ceiling fans. A field voltage controller transmits the power from the generator to the railway motors mounted upon the front truck. The car is heated by a coal-fired Baker hot water heater, and so arranged that the water from the heater may be admitted to the engine radiators to prevent freezing during lay-overs in cold weather. The radiators, which are of the fin-tube type, are mounted upon the roof of the cab, circulation being maintained by thermo-siphon system. A standard equipment for straight and automatic air brakes and air signals, together with pneumatic gong and air sanders, are included.

The main gasolene engine is started by air admitted through an air-starting valve mounted upon the cap plate of the electrical controller to rotating valves driven from the cam shafts. An air pump is direct driven from the main engine shaft. This has a capacity of 22½ cu. ft. of free air at 550 r.p.m., the normal speed of the engine; gasolene and air pumps are similarly driven. Gasolene is pumped from the tank beneath the car to chambers in the carbureter. For initially charging these tanks a hand pump is provided. The engine is lubricated by system of forced feed with ducts in the crank shaft. The ignition consists of two low-tension magnetos and make-and-break spark plugs. The magnetos are provided with automatic centrifugal switches to prevent the engine exceeding a safe speed. The motors are of standard railway commutating pole type, each rated at 100 h.p. on the standard basis.

ARMORED AIR BRAKE HOSE.

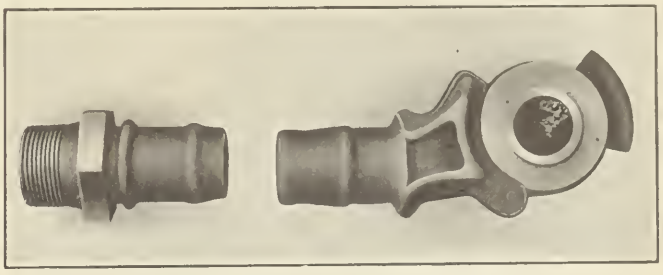
The Sprague Electric Works, New York, are exhibiting, in space 386, a new design of 1⅜ in. air brake hose. It is designed to allow the use of fittings that conform to the standard use with M. C. B. hose. The illustrations show the



Armored Air Brake Hose.

hose mounted, also the coupling and nipple before applying. It will be noted that the coupling and nipple are suitable for use with either M. C. B. standard hose or flexible steel armored hose. The M. C. B. clamps secure the armor and hose, and in such a manner as to eliminate the blowing out of fittings. This is accomplished by the M. C. B. clamp bearing upon the pressed steel armor clamp, the latter being securely riveted to the armor on one end, and engaging the fitting on the other end.

The armor clamp is secured by four rivets through the high part of the armor convolutions, thus preventing the



Hose Nipple and Coupling.

heads of the rivets from chafing the rubber hose. This armor clamp does not compress the armor, and it is stated that the fittings are applied without any more trouble than with the M. C. B. hose.

The maker claims that the rubber hose within the steel armor cannot rupture, even though the puncture or defect exists; it is also claimed that when this hose deteriorates in time, only a small puncture can occur, and not of sufficient extent to necessitate replacing before arriving at the terminal. The armor protects the hose against kinking and chafing, and eliminates the expensive practice of removing such damaged hose, in order to avoid delay to trains. Furthermore, the enclosed rubber hose, not being subject to the deteriorating effect of stretching, will result in increased life.

FORSYTH ONE PIECE METAL DOORS.

Forsyth Brothers Company, Chicago, has for some time made a one piece metal door, in which the framing and panels are formed out of a single sheet of metal. Formerly, metal doors were built up in sections the frames being made up of separate parts riveted or welded at the corners; and, likewise, the panels and finish of the door were composed of separate parts, similarly attached to the frame of the door. It was found that, under the constant racking action on the part of the door when the cars were in motion, the joints and seams made of separate parts would tend to open, permitting the entrance of moisture in the interior of the door, causing rust. Where light metal sheets are overlapped and riveted together, it must be evident that either the rivets themselves, or the rivet holes in the light metal, become elongated, in either case giving rise to a gradual motion in the similar parts. Where there is a marginal overlapping of sheets of steel, moisture enters, and rust commences at these points. The Forsyth one-piece metal door was designed to overcome these defects in the built-up type of metal door, and in the Forsyth metal door there are no joints.

It is composed of single sheets of metal in which the frame, panel, and other finish, are formed up in the metal itself. These formations in the sheet of metal have, in themselves, the effect of stiffening the door and making it rigid. There is no overlapping of sheets.

Within the interior of the door, and along its edge, is a one-piece reinforcing frame, which further assists it to withstand abusive treatment and prevents distortion of the door in service.

These doors can be made in any design, or to any dimensions desired, and with such glass or panel design as may be preferred. Formed up from accurate dies, there can be no variation in the dimensions of the door; therefore there is an interchangeability of the doors for similar openings which cannot be obtained to the same degree in a built-up door.

The door is rendered rust proof, within and without, by a special steel preservative baked on the interior and exterior. The hardware is securely united to the interior reinforcements, which are, in turn, welded to the interior framework of the door itself; consequently, any strains which may be imparted to the hardware are not transmitted to the shell of the door and do not cause bulging or distorting of the finished surface of the latter. Among other cars upon which these doors are in service might be mentioned a considerable number of electric cars of the Southern Pacific Company and of the Interborough Rapid Transit, New York.

BETTENDORF FLAT CAR WITH REMOVABLE SIDES AND ENDS.

The car here illustrated is one of a large order recently delivered by the Bettendorf Axle Company, Davenport, Iowa. The car is a 40-ft. flat car of 100,000 lbs. capacity, having Bettendorf underframe and trucks, to which have been applied wooden slides and ends which are removable from the car, so that the car may be converted back and forth from flat car to gondola as required.

This car is equipped with the regular Bettendorf underframe having a single center sill made from a 24-in. 120 lbs. per ft. Bethlehem girder beam, having flanges 12 in. wide,



Bettendorf Flat Car with Steel Underframe.

to the ends of which are secured the Bettendorf cast steel draft sills, arranged with the necessary stops, which are cast integral with the draft sills, to accommodate the Miner tandem draft gear. The needle beams are five in number and are from rolled I-beams 10 in. deep and weighing 25 lbs. per foot. These needle beams pass through the center sill at the openings provided for them, and in which they rest, bearing directly on the center sill and held in position by means of malleable iron gussets attached to either side of the web of the center sill.

The body bolsters are of cast steel, of special design, to accommodate this type of car, and are continuous, passing through an opening in the ends of the draft sills. The brake mast is so arranged that it can be located either at the end



Bettendorf Gondola Car with Steel Underframe.

or at the side of the car in case the lading would otherwise interfere with it. The sides and ends of the car are Oregon fir 2¼ in. thick, with white oak stakes, and the flooring is yellow pine 2⅜ in. thick. The weight of the car as a gondola is only 32,200 lbs., and as a flat car it is but 26,800.

FAIRBANKS-MORSE STANDPIPE.

For many years Fairbanks-Morse & Company, Chicago, have been building water cranes and it is of interest to look back at the old "two-man" models and compare them to the modern crane with its improvements and perfections. Their No. 10 telescopic spout standpipe is their latest type, although it has been on the market three or four years. Large locomotives with high tenders, used on the same divisions with older type low-tender engines, call for a water crane with a vertical range. The No. 10 Fairbanks-Morse standpipe has a vertical range of five feet, enough to water the highest and lowest engine tanks without flooding the tracks. It is a one-man pipe which can



Fairbanks-Morse Standpipe No. 10.

be operated alone by the fireman on the engine. The main valve is the same as that used on other types of Fairbanks-Morse standpipes and has thoroughly demonstrated its merits under all conditions of service. This valve is water balanced, giving the same pressure on both sides of it when closed, so that there is little chance for leakage. An automatic relief valve is furnished which prevents water hammer, which is so destructive to pipe lines and tanks. The standpipe is securely locked parallel with the track, and can be unlocked and turned by the fireman on the tender. When an engine is watered, the pipe locks automatically when swung back from the tender.

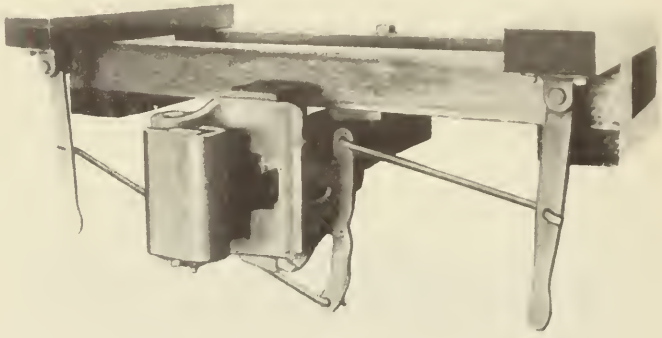
CAR RADIATORS.

The United States Radiator Corporation, Detroit, Mich., makes a special type of radiator designed for heating new styles of passenger coach. This radiator is installed at the side of the car close to the floor, and is so built that expansion is well cared for and there is no strain from the movement of the car on the tracks or around curves. Large orders for these special radiators have been received from the Pennsylvania Railroad for installation in cars that were built by the American Car & Foundry Company, New York. Samples of these radiators are on exhibition at the company's booth.

SIMPLEX COUPLERS.

The Simplex passenger coupler exhibited at the booth of the American Steel Foundries, Chicago, is made so it can be uncoupled from either side of the train, thus meeting the requirements of the new safety appliance law. The same arrangement can be applied to the ordinary type of Simplex passenger couplers which are already in service, with but slight alteration, making the device equally desirable for new work or repair purposes.

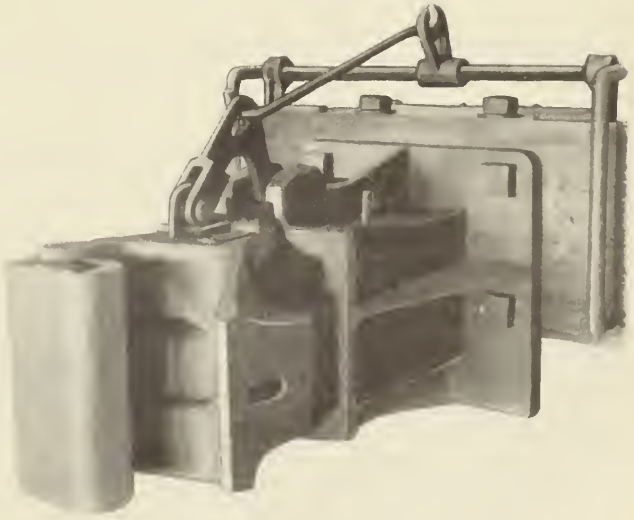
In addition to the passenger coupler, engine couplers of various types are shown with uncoupling arrangements as



Simplex Passenger Car Coupler, Arranged to Operate from Either Side.

recommended in the safety appliance law, and arranged for maintaining standard coupler heights, with the least amount of attention and expense. The usual types of top lift and side opening Simplex freight couplers are also exhibited. These couplers are made with a great variety of different sized shanks and ends to meet the needs of various kinds of service.

There are now about half a million Simplex couplers in use and to meet the constantly increasing demands for the coupler the American Steel Foundries is devoting the entire



Simplex Engine Coupler.

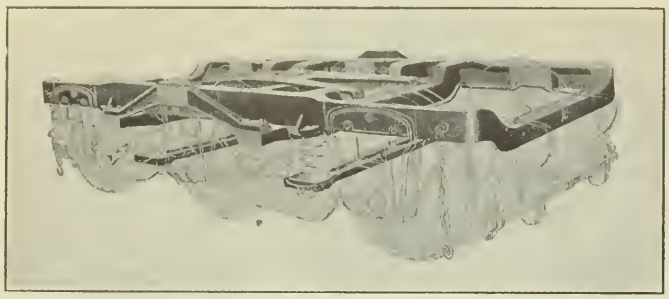
tonnage of its Alliance foundry to coupler work. Apparatus for conducting all of the tests provided for by the Master Car Builders' rules is maintained for the use and convenience of the representatives of the railways who have in charge the work of conducting tests. Simplex couplers are made of high grade open hearth cast steel, accurate physical and chemical analyses being taken of each heat.

The Simplex couplers embody the suggestions and recom-

mendations which have been made from time to time by the Master Car Builders' Association. Special attention is given to the interchangeability of parts, the locks and knuckles being ground accurately to gages, resulting in a smoothness of operation in the completed coupler. Special attention is given to the contour of the coupler head and knuckle tail in order to make them coincide accurately, and thus permit two engaging couplers to mate readily at slow speed. This feature with the wide opening provided by the knuckle makes a coupling positive regardless of the relative position of the couplers to each other, or the speed at which they come together. Simplex couplers contain as few parts as possible, and have no small parts, making the coupler easily handled and maintained.

COMMONWEALTH PASSENGER TRUCK.

The six-wheel truck shown herewith is the product of the Commonwealth Steel Company, St. Louis, Mo. This truck

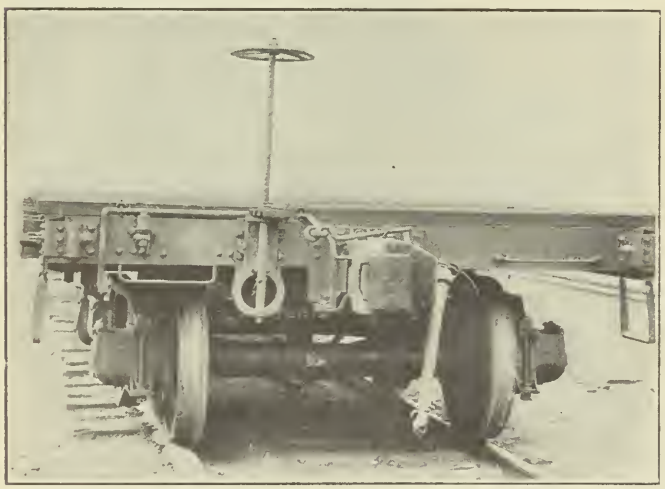


Commonwealth Six-Wheel Passenger Truck.

has been used in passenger service for many years, and the makers claim for it an efficiency due to the elimination of repairs, simplicity of construction and maintenance of alinement.

FEASIBLE DROP BRAKE STAFF.

The new design of the Feasible brake staff, as made by the United States Metal & Manufacturing Company, New York, is shown in the accompanying illustrations. This



Feasible Drop Brake Staff in Vertical Position.

brake staff meets the rulings of the Interstate Commerce Commission. The necessary change on the cars to have them agree with these new requirements is to build out the coupler striking plate the proper distance to give the necessary clearance between the edge of the brake wheel and the line through the face of the locked knuckle. During the past year about a thousand cars have been equipped

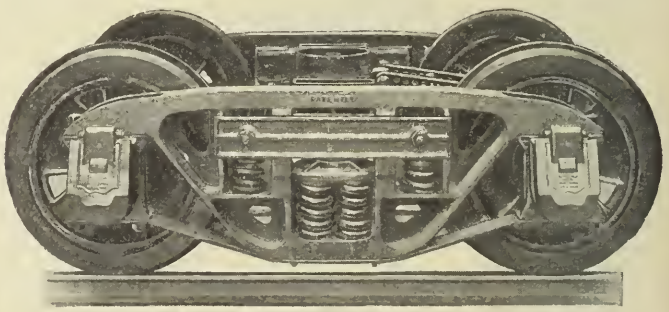


Feasible Drop Brake Staff in Horizontal Position.

with this brake staff; a sample of it is on exhibition at booth 337.

BUHOUP FLEXIBLE TRUCK.

The Buhoup flexible truck is exhibited by the McConway & Torley Company, Pittsburgh, Pa., in spaces 617, 619, 621. This truck embodies the desirable features of the cast steel side frame, which has passed the experimental stage, and has other distinctive features peculiarly its own. The truck consists of two cast steel side frames in combination with a cast steel bolster and will take any style or make of standard oil box as is used with the arch bar type of truck, with forged bottom tie bars. The brake hanger brackets are attached to the inside of the side frame. The truck is so constructed that the usual spring plank is not necessary. It is flexible to vertical movement, but rigid to any twisting or angular horizontal movement. This vertical flexibility allows



Flexible Truck.

the truck to adapt itself to the uneven conditions of track, high or low joints, with the wheels firmly on the rails, without any undue strains to any part of the truck.

The load is distributed over a large area instead of being concentrated in the middle of the side frames. The distribution of springs is such that an increased spring capacity may be secured, and this feature, with the large area of distribution of load, should insure an easy riding and long-lived truck. Several of these trucks have been in successful operation for some months past under tenders of locomotives in switching service. The side frame and bolster and other parts of the truck are made from acid open hearth steel, thoroughly annealed, and conforming to standard cast steel specifications.

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THE EXHIBIT: 1639

THE legal department is now pope of the railway business, and when the M. M. and M. C. B. Associations began to feel a fondness for each other that they thought might lead to matrimony, they naturally applied to it for a dispensation. Now that the legal department has said that they may marry their affections seem to be cooling. The committees on Consolidation of both associations were continued, but perhaps Mr. Schroyer expressed the view of most of their members when he said, as a member of the M. C. B. committee, that it probably would do nothing. The contemplation of matrimony is somewhat different from entering into it. The two associations have worked along similar lines and in close co-operation for years, and have secured good and enduring results. A consolidated body might do better; but it is far from certain that it would do equally well. At any rate, the prospects of consolidation in the near future look very slim.

IN the *Daily* of June 14 we commented on the failure to get some of the committee reports of the two associations to the members early enough to allow them to study and digest them before coming to the conventions. Investigation leads us to believe that this delay was largely due to the fact that many of the committee chairmen and members were compelled to give so much time to the question of safety appliances and federal boiler inspection during the year that they could not very well give much time to the committee work of the associations without seriously interfering with their other duties. It seems only fair that this explanation should be made; but it is greatly to be hoped that it will be possible to make a far better showing next year.

STEPS must be taken to provide a steady supply of recruits for carrying on the work of the car department. It is true that in the days of the light capacity wooden car this department did not offer the same attractions to the young man as the locomotive department, but to-day the building and repairing of high capacity freight and passenger cars to withstand the severe service in heavy and high speed trains requires a very different type of training and ability. To-day the car department offers an attractive field to the young man about to select his life work. Mr. Downing's motion that a committee be appointed to investigate the question of the development and training of car department apprentices is therefore a most important one. The committee will at least have some good sources to draw on for information as to how not to do it, and as to methods that are already giving good results. Mr. Downing at Collinwood, George Carson at West Albany and W. O. Thompson at East Buffalo have all been studying and working along the line of training young men in the work of the car department.

DONALD R. MACBAIN, the newly elected third vice-president of the Master Mechanics' Association, was born October 23, 1861, at Queenston Heights, Ont., Can. He was educated in the common schools and entered the service of the Canadian Southern, now a part of the Michigan Central, as a machinist apprentice October 9, 1876. Two years later he was made a locomotive fireman, remaining in that position until November, 1882, when he was promoted to engineer. In May, 1890, he was appointed a traveling engineer, and ten years later was promoted to the position of master mechanic, with headquarters at Michigan City, Indiana. A year later he was transferred to St. Thomas, Ont., and later to Jackson, Mich. He was appointed assistant superintendent motive power in July, 1906, and in April, 1908, was transferred to the same position on the New York Central & Hudson River, with headquarters at Albany, N. Y. In the spring of 1910 he was appointed superintendent motive power of the Lake Shore & Michigan, the Chicago, Indiana & Southern, and the Indiana Harbor Belt, which position he now holds. No greater tribute could be paid to Mr. MacBain than to quote the expression of one of his intimate friends, that "he is one of the most evenly balanced men I know." This rare combination of qualities marks him as big and broad gage, and, together with his extensive experience, fits him admirably for the important executive position he now holds on the Lake Shore. Like his predecessors on that road, he is greatly respected and liked by both his subordinates and those to whom he reports.

THE action taken by the Master Car Builders' Association yesterday morning to start an apprenticeship movement in the car shops, though a trifle belated, is one in the right direction and cannot fail to bear fruit. The ostensible reason for it was the rapid increase in the number of steel cars, and the necessity of having men skilled in the art of car building to make repairs and do other work in connection

with them. For years the car repairer has "just growed;" he has had little instruction as to the reasons for practices that have existed time out of mind, and his sole dependence has been upon his own observation and experience. A veteran car builder tells the story of his own experience, that, as an apprentice, he was set to work in the "bone" yard and kept there for months. Tiring of the dirty, unsatisfactory work, he asked to be transferred to the building shop. The master car builder of the day told him to go back to the bone yard and keep his eyes open, because that was the way to learn. He was advised to observe how and where cars failed; where they were strong and where they were weak. He says he followed the advice and there learned more of car building than he had thought possible before. It was the old-time way. The boy could learn what he could pick up, and he developed into a master car builder or a wood butcher according to his ability. But the new wine of present day vintage needs new bottles, and the old system of hit-and-miss car shop apprenticeship must be regarded as a thing of the past, and modern ways take its place. Certainly it will be a profitable field to cultivate.

THE strong point of M. K. Barnum, who was yesterday elected third vice-president of the Master Car Builders' Association, is diplomacy—diplomacy not of the wishy-washy sort, but of the very highest type. For instance, when he was appointed general inspector of machinery and equipment of the Chicago, Burlington & Quincy, reporting directly to the vice-president, he accomplished remarkable results, and yet at no time was there the slightest friction with any member of the mechanical department. Cases are not uncommon of men who have occupied similar positions who have stirred up a lot of trouble and have accomplished very little as far as net results are concerned. When W. L. Park, vice-president and general manager of the Illinois Central, was looking for a strong and capable man to head the mechanical department of that road he selected Mr. Barnum because he understood him thoroughly and knew exactly what his capabilties were. Mr. Barnum had been closely associated with him on the Union Pacific in both a business and a personal way. Mr. Barnum was born April 6, 1861. He was graduated from Syracuse University in 1884 with the degree of bachelor of arts, and later had the degree of master of arts conferred upon him. He entered the service of the New York, Lake Erie & Western, now the Erie, at Susquehanna, Pa., as a special apprentice. He was a machinist, mechanical inspector and general foreman of the same road at Salamanca, N. Y.; also general foreman of the Louisville & Nashville shops at New Decatur, Ala.; assistant master mechanic of the Atchison, Topeka & Santa Fe at Argentine Kan.; superintendent of the Union Pacific shops at Cheyenne, Wyo., and later district foreman of the same road at North Platte, Neb., and division master mechanic at Omaha. He was then appointed assistant mechanical superintendent of the Southern Railway, and in February, 1903, was appointed superintendent of motive power of the Chicago, Rock Island & Pacific. In April, 1904, he was made mechanical expert of the Chicago, Burlington & Quincy, and in 1907 was made general inspector of machinery and equipment of that road, reporting directly to the vice-president. In the spring of 1910 he was appointed general superintendent motive power of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley.

TWO of the most successful railway mechanical department conventions ever held have drawn to a close, and the members are hurrying back home to take up their duties with renewed energy and inspiration. It would be interesting if we could accurately gage the after results upon the attendants of each of three important factors—the discussions in the convention hall, the inspection value of the exhibits, and the information gained in the informal conferences of the members at the hotels and on the pier. Many railway mechanical men are so busy with details on their own roads that they can not travel much and see what those on other roads are doing. In other words, there is a possibility of getting into a rut. Taking part in the discussions at the conventions and following them closely is a splendid way of making a member realize that he has much to learn; the effect is very broadening. The educational value of the exhibits is far-reaching. Here may be seen the very latest new devices, or improvements on old devices. In many cases the apparatus is shown exactly as it is applied or is in actual operation. Not the least important good which may be derived from the convention comes from the informal chats among the members. Each one has some problems or difficulties which have been solved or overcome by his fellows, and often a few minutes' talk may be the means of solving a problem which it would have taken months to solve otherwise. The number of roads whose higher officers are insisting that the mechanical department officers, including the foreman, should avail themselves of these opportunities in Atlantic City, is growing, and all records are being broken in the number of railway men in attendance.

PRESIDENT STEWART

NO mention is made in the constitution of the Master Car Builders' Association of any requirements concerning the birthplaces of candidates for the presidency of that association. Nevertheless, Illinois seems to be the favored district. Alexander Stewart, the newly-elected president, was born in Springfield, Ill., in 1868 and spent his early school days there. Theodore Curtis, the retiring president, was born in Terre Haute, Ind., in 1866, and that city is just on the line between Indiana and Illinois. Frank H. Clark, who preceded Mr. Curtis as president, was born at Pecatonica, Ill., in 1865.

Mr. Stewart entered the service of the Union Pacific as a machinist apprentice. After serving his apprenticeship, he worked as a machinist, machine foreman, general foreman, general division foreman and master mechanic, leaving the service of the Union Pacific in 1903 to accept a position as division master mechanic with the Southern Railway at Knoxville, Tenn. Four months later he was promoted to general master mechanic of the Western district of that road. On the resignation of Samuel Higgins, April 1, 1904, Mr. Stewart was appointed mechanical superintendent, and two years later, April, 1906, he was made general superintendent motive power and equipment.

Mr. Stewart is noted for his executive ability, and his success as an organizer has enabled him to handle the mechanical department of the Southern Railway, which is scattered over an exceptionally large territory, with practically no friction and on an economical basis. His delightful personality has made him a host of friends. He is always ready to grant an audience to those who may wish to see him on business matters, and is uniformly considerate of the feelings of others. He will make a strong running mate with Mr. Bentley, the newly elected president of the Master Mechanics' Association. The *Railway Age Gazette* congratulates the association on making such a good selection, and Mr. Stewart on the honor which has been conferred upon him.

The report of the Sao Paulo Railway Co. for the half-year ending December 31, 1910, fixes the receipts at $6,091,785, and operating expenses at $3,055,300, leaving a net revenue of $3,036,485, as against $3,715,385 in 1909. The directors declared a dividend of 2½ per cent. on the preferred stock (at the rate of 5 per cent. per annum) and on the common stock a dividend of 5 per cent. (at the rate of 10 per cent. per annum), together with a bonus of 1 per cent. During the last ten years the dividend of this company has never been less than 12 per cent. per annum.

Proceedings.

President Curtis called the third and final session of the Master Car Builders' Association to order at 9:35 Wednesday morning.

Ballots were distributed for the election of officers. D. F. Crawford and C. E. Fuller withdrew their names from the ballot for the election of president.

CONSOLIDATION.

F. H. Clark (chairman of committee):—At the meeting last year the committee on consolidation presented rather a long report, and about the only thing that they did not cover in that report was the question of the legality of the proposed consolidation. The committee was continued at that time and instructed by the executive committee to look into the question of the legality of the proposal and to report at this meeting. We have not prepared a written report, but we simply report that we are advised that there is no legal objection to the consolidation of the two associations.

C. A. Seley (C. R. I. & P.):—I move that the report of the committee be received and the committee continued.

(The motion was seconded.)

G. W. Wildin (N. Y. N. H. & H.):—I think it is about time that we got down to something definite in this matter. I think every member here ought to express himself one way or the other on this question. Now, as the representative of the New Haven road I want to cast the vote of that road for consolidation, and I would like to hear from other members of the association here along that same line. I think we have dilly dallied on this matter long enough. Now, so long as there is no legal objection to the consolidation, let us vote on it one way or the other. If we do not want consolidation, let us say so. If we do want consolidation, why then let us say that we do.

(The question was called for and the motion carried.)

Mr. Wildin:—I rise for information, Mr. President. Now that this committee has been continued I would like to ask what it is going to do?

C. A. Schroyer (C. & N. W.):—As a member of the committee I would advise the gentleman that we are not going to do anything (laughter).

Mr. Wildin:—I move that the committee be instructed to present a plan for consolidation at the next convention.

(The motion was lost.)

(Vice-president Stewart took the chair.)

REVISION OF RULES OF INTERCHANGE.

The railway clubs and members have submitted their proposed changes in the rules and these have been considered, and the recommendations of your committee are submitted herewith:



Donald R. MacBain.

New Third Vice-President, M. M. Association.

Rule 2.—The committee suggests the following modification of the first paragraph of this rule: "No car having defects constituting a violation of the law should be offered in interchange. Cars, if defective, under M. C. B. Rules, must be properly carded when offered in interchange. Empty cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 32 to 38, inclusive.

"Loaded cars offered in interchange must be accepted, except that receiving line may reject cars not loaded in accordance with the Rules for Loading Materials, A. R. A. Car Service Rule 15 to apply (see page —) when transfer or rearrangement of load is necessary.

"When it becomes necessary to transfer a load, such car, when empty, may be returned to the delivering line, in which case all defects objected to must be designated on a return card of form shown on page 77, filled in with ink or black

indelible pencil and placed on car adjacent to the destination card.

"Balance of rule to remain as at present."

Rule 3.—The committee recommends that the rule be changed to read:

"If a car has defects for which the owners are not responsible, the receiving line shall require that a defect card be securely attached to the car, as per Rule 14."

Rule 4.—The Vandalia R. R. Co., the St. Louis Railway Club, and the Railway Club of Pittsburgh suggest in Rule 4, add new paragraph, viz.:

"Defect cards shall not be required for any damage that is so slight that no repairs are necessary."

The suggestion is approved, but the committee would recommend that it be made a new paragraph under Rule 3.

Rule 5.—It is suggested that the word "cardboard" be added after the word "be" in the first line.

The above suggestion meets with the approval of the committee.

Rule 9.—The committee approves the following revision of this rule to show necessary information in tabulated form:

"M. C. B. couplers or parts thereof applied and removed.	New or secondhand.
	Make or name of coupler.
	Steel or malleable.
	Size of shank.
	Size of butt.
	Complete, or name of part or parts.
	Open or closed knuckle.
	Yoke or stem attachment
	Part or parts scrapped.
	Cast or solid steel.
"Wheels and axles R. & R.	New or secondhand.
	Box numbers (see Rule 14)
	Cause of removal and reference to M. C. B. rule under which all defective wheels are removed.
"Journal bearings R. & R.	Solid, filled or other kind.
	Length of bearings.
	Box number (see Rule 14)
"Metal brake beams or parts thereof R. & R.	Make, or name of beam.
	New or secondhand.
	Complete, or part or parts.
	Cause of removal.
	Part or parts scrapped.
"Brake shoes R. & R.	Cast or reinforced

"Kind of triple valve removed and applied."

Last paragraph of Rule 9 relative to removal of load in order to make repairs, to remain as at present.

The committee approves the following suggestions: Fourth paragraph, change word "open" to "slotted" and word "closed" to "solid." Add the following: "When triple valve or cylinder is cleaned, the initial of road and date of last cleaning must be shown."

Rule 12.—The committee would recommend that the rule be changed to read:

"The evidence of a joint inspector or the joint evidence of two inspectors, one representing the owner of the car and the other representing a railroad company, that the repairs are not proper, shall be final: the evidence to be signed only after an actual inspection has been made." Remainder of rule to remain as at present.

Rule 17.—The committee approves the suggestion to add to end of last paragraph: "Fir or oak may be substituted for pine when splicing longitudinal sills."

Rule 18.—The committee suggests eliminating "Except on cars offered in interchange" from third paragraph and refers the suggestion regarding the standardization of coupler with 8½-in. butt end to the committee on couplers and draft attachments.

Rule 20.—The committee approves the suggestion of adding the words "measuring 31½ in. or less" after "loaded car" in the tenth line. Also the suggestion that a period be placed after the word "thereof" in the ninth line, beginning therefrom a new sentence reading: "A loaded car measuring 31½ in. or less should be adjusted to 33½ in., or within a ¼ in. thereof . . . " following with the balance of the rule after eliminating the phrase "and when it is necessary to alter a loaded car it should be adjusted to 33½ in., or within a ¼ in. thereof."

Rule 21.—The committee does not approve the suggestion that the following should be embodied in this rule: "Charging car owners for any temporary repairs made to get cars home when necessary on account of owner's responsibility."

Rule 22.—The committee recommends that the rule be changed as follows:

"Draft timbers must not be spliced. Longitudinal sills may be spliced at both ends, except that not more than two adjacent sills may be spliced at same end of car. The splicing of any sill between cross-tie timbers will not be allowed.

"The splice may be located either side of body bolster, but the nearest point of any splice must not be within 12 in. of same, excepting center sills, which must be spliced between body bolster and cross-tie timber, but not within 24 in. of body bolster.

"In splicing longitudinal sills other than center sills, if same are less than 12 in. in depth, the plan shown in either Fig. 8 or 9-B shall be followed. If the sills are 12 in. or more in depth, the plan shown in either Fig. 9 or 9-B shall be followed. In splicing center sills the plan shown in Fig 9-B shall be followed.

"Sills of foreign cars shall be spliced as above provided.

"Cars delivered in interchange with center sills spliced in accordance with Fig. 9-A will be accepted.

"(Last paragraph to remain as at present.)

"(Figs. 8, 9, 9-A and 9-B should be relocated and shown together. Figs. A, B and C to remain as at present.)"



J. J. Hennessey.

Chairman, Committee on Arbitration.

Rule 24.—The committee recommends that the second paragraph of this rule be changed to read:

"In no case should two new wheels be mounted on the same axle when the thickness of the two flanges together will exceed the thickness of one normal and one maximum flange, or $2\frac{17}{32}$ in."

Rule 30.—The committee proposes the following:

That the first paragraph of this rule, covering the weighing and restenciling of cars, be eliminated, and that Rule 11, of the code of car-service rules adopted by the American Railway Association, be substituted therefor, as follows:

(a) The date (month and year), also weight and capacity, should be stenciled on each new car as it comes from the car works, under the supervision of the owner's inspector. The scales used for this purpose should be tested by the railroad company's inspector, provision to this effect to be incorporated in the contract covering purchase of the equipment.

(b) Wooden cars one year old should be reweighed and restenciled, the weight to be followed by one star; cars two years old should be again weighed and stenciled, the weight to be followed by two stars; cars three or more years old should be again weighed and stenciled, the weight to be followed by three stars, which will indicate final weight.

(c) Steel cars should be reweighed and restenciled after they have been in service twelve months, the weight to be followed by three stars, indicating final weight.

(d) If cars are materially changed by reason of new appliances or otherwise, they should be reweighed and restenciled without change in the number of stars.

(e) Unless the owner instructs otherwise, any car without stenciling, or with a variation of 500 lbs., should be imme-

diately reweighed and restenciled and car owner notified of old and new weights. The Official Railway Equipment Register will designate the proper officer to whom these special reports should be made.

(f) The date (month and year) of each reweighing should be stenciled the same as provided for new cars in paragraph (a).

Cars must be cleaned before reweighing.

Rule 32.—The committee approves adding new paragraph as follows:

"Defect cards shall not be required for any damage so slight that no repairs are necessary, the receiving line to be the judge."

Rule 33.—The committee would recommend that the rule be changed to read:

"Material missing from bodies of cars offered in interchange, except grain doors, water troughs and attachments, nuts, body truss-rod saddles on bolsters, roof boards, ventilated side and end doors unless car is so stenciled, wooden door caps, side and end fascia and all inside or concealed parts of cars."



Morgan K. Barnum.

New Third Vice-President, M. C. B. Association.

Rule 37.—The committee approves of the suggestion regarding the change in the heading of the rule which should read:

"Combination of damages to cars with wood underframe or composite wood and metal underframes which denote unfair usage, if existing at same end of car." Also the change of word 'or' in the third line to 'and.'

Rule 40.—The committee would recommend a new rule as follows:

"Damaged end sill, accompanied by damage to draft timber (or its substitute) or longitudinal sill, and damage to either coupler body or pocket."

Rule 43.—The committee approves the suggestion that the rule be changed to read: "Damaged corner and end posts, if necessitating the renewal of more than two posts."

Also suggests a new paragraph, reading: "This will include damage to upper structure of cars with metal underframes."

A new heading to cover steel cars should be added as follows:

"ALL STEEL OR ALL STEEL UNDERFRAME CARS."

A new rule relating to steel cars is recommended as follows: "Damage to bodies of all steel cars, or damage to underframe of all-steel underframe cars, when necessary to repair, if caused by unfair usage (delivering company responsible). When repairs exceed the combinations as covered by Rules 37 to 43, inclusive, owners' authority must be obtained before repairs are made. Longitudinal sills, end sills and other steel parts of cars which become defective due to corrosion and which were not damaged in accident or by unfair usage (owners responsible),"

Rule 44.—The committee would recommend the following addition:

"The transfer or readjustment of lading as prescribed in A. R. A. Rule 15, see page — (delivering company responsible)."

Rule 53.—The addition of two new paragraphs is suggested as follows: "After September 1, 1912, all freight cars offered in interchange not equipped with pressure-retaining valve (delivering company responsible)."

"After September 1, 1912, no cars will be accepted in interchange unless equipped with M. C. B. quick, action triple."

The committee approves of the suggestion regarding pressure-retaining valves and would approve the suggestion relating to quick-action triple valves with the modification that the words 'standard 1¼-in. train line, angle cocks and' be omitted.

Rule 57.—The committee approves adding after the words "triple valves" the words, "brake pipe air strainer or dirt collector."

Rule 58.—The committee suggests that the cut illustrating the label be changed so as to show the name of the road or purchaser.

Rule 59.—The committee would approve of the suggestion that the words "rust or" be added after the words "account of" in second line.

Rule 60.—The committee approves the suggestions that the word "marked" in the fourth line be changed to read "stenciled." The additions after the word "the" in third line. "Initial of road together with:" and at end of rule, "Triple valves cleaned should be tested on an M. C. B. test rack."

Rule 64.—The committee would suggest that rule be changed to read:

"Material missing from trucks of cars offered in interchange except journal-box lids and nuts.

Rule 66.—The committee approves the addition to this rule reading:

"After September 1, 1915, cars equipped with wooden or trussed wooden brake beams will not be accepted in interchange."

WHEELS.

Rule 70.—The committee approves change of rule to read:

"Cars equipped with forged steel or steel tired wheels and so stenciled, if found with cast-iron or cast steel wheels."

"Forged steel or steel tired wheels may be substituted for cast-steel wheels."

And the following addition: "Cars equipped with cast-steel wheels and so stenciled, if found with cast-iron wheels."

Rule 75.—The committee approves the omission of the following words:

"Flange over 1 1/16 in. thick for cast-iron wheels, standards of 1903, 1904, 1905 and 1906 (see Fig. 6), or."

Rule 76.—The Central Railway Club recommends that the matter of devising a gauge and determining the depth that a wheel tread can be worn before necessary to remove be referred to the Wheel Committee for the adoption of a gage and limit.

The committee suggests that this matter be referred to the car wheel committee.

Rule 83.—Mr. W. A. Nettleton suggests an M. C. B. standard gage or method for measuring the thickness of service metal of rolled-steel or steel-tired wheels.

The committee approves the suggestion changing the rule, omitting Fig. 6 and changing Fig. 9 from 4 ft. 5 5/32 in. to 4 ft. 5 3/32 in. The suggestion of Mr. Nettleton is referred to the wheel committee.

Rule 85.—Add after the words "worn out" in second line, "the length of journal increased ½ in. over standard length."

This suggestion meets with the approval of your committee.

Rule 86.—The wheel-seat 5-inch journal, Table I, given as 6¼ in., should be 6¾ inches. This is a typographical error and should be corrected.

IMPROPER REPAIRS.

Rule 91.—The suggestion of elimination of this rule meets with the approval of the committee.

Rule 92.—The suggestion of the elimination of this rule is approved by the committee.

Rule 96.—The committee approves that this rule be eliminated.

Rule 101.—The committee would recommend to the executive committee the appointment of a committee on uniform secondhand and scrap pieces for wheels or the reference to the car wheel committee of such suggested changes in this rule as relate to prices for wheels. The price for new 33-in. cast-iron wheel, new, $9.50, is wrong; it should be $9.00. This is a typographical error and will be corrected.

Rule 103.—The second paragraph of this rule should be omitted, as it is covered by Rule 10.

Rule 104.—It is suggested for this rule—Air-brake Material: Prices for release valve handle for 8-in. equipment should be changed to 10 cents, instead of 8 cents, or the same as for 10-in. equipment, as they are identical.

Second item, page 51, reading ¾ in., should read pipe, ⅜ in., per foot.

Add the following items:

	8-inch.	10-inch.
Release valve rubber seat	$0.02	$0.02
Release valve vent valve complete	.10	.10
Air-hose coupling-guard pin	.10	.10

Omit item:

Triple cylinder bushing renewed	$1.12	$1.12

This item was recommended to the arbitration committee last year as "Triple cylinder bushing reground or refitted" and should be properly placed under Rule No. 115, as Rule 104 covers only material charges.

Change price of "triple check-valve case" to 1.00 1.00.

Material: Prices for coupler parts should be adjusted so that the same compare more closely with the cost, also that the details will correspond with the prices for complete couplers which will simplify the billing transactions. At the present time the detail credits for secondhand parts of couplers removed exceed the total value of complete secondhand coupler applied. Proposed change as follows:

Coupler body, one, new steel, 5 by 5 in. shank	$5.75	instead of $6.50
Coupler body, one, new steel, 5 by 7 in. shank	6.50	instead of 7.75
Coupler knuckle, one, new, solid	2.25	instead of 2.00
Coupler lock, one, new	.50	instead of .40

No changes in scrap credits.

The committee approves of the suggestions covering prices for air-brake materials and coupler parts.

The recommendation increasing the price of mineral paint, is approved, but your committee would suggest 6 cents per pound instead of 8 cents. The second item, page 51, viz.; pipe, should read ⅜-inch per foot instead of ¾-inch. This is a typographical error and should be corrected.

The committee would recommend that the price for applying handhold, one, applied, net, be increased from 25 cents to 40 cents.

Rule 108.—The committee recommends that a new paragraph be added as follows:

"In the case of defective couplers, when another make is applied, credits shall be confined to the body, lock, knuckle and knuckle pin."

Rule 111.—The committee would suggest that the charges for weighing and restenciling cars be increased as follows:

Stock cars, net	$1.00
Other cars, net	.75

On page 57, the thirteenth line from the bottom, should read $14.64, instead of $16.64. This is a typographical error and should be corrected.

Rule 113.—The committee suggests changing length of carrier iron from four to six inches is approved by your committee.

Rule 114.—It is suggested adding paragraph as follows: "Applying brake hangers when brake beam is applied," and to second paragraph: "Also side siding when side sill or side plate is removed or replaced," and new paragraph to be added:

"Applying side sheathing where side sill or side plate under sheathing is renewed or replaced."

Your committee approves the above suggestions.

Rule 115.—The committee approves the following changes:

Cut-out cock, grinding in, R. & R	$0.30
Triple cylinder bushing reground or refitted	1.12
Triple-piston packing ring, fitted	.22
Dirt collectors in branch pipe, cleaned, drained and stenciled	.05

The item reading "Retaining valve repaired, 35 cents, is wrong; it should be:

Retaining valve repaired	$0.25

DETAILS.

Retaining-valve handle, R. & R	$0.02
Retaining-valve case, R. & R	.01
Retaining-valve, ground in	.05
Retaining-valve cock key, ground in	.15
Retaining-valve cock key and spring, R. & R	.02
	$0.25

Rule 119.—Exceptions have been offered as follows: "Except in case of trucks of 50,000-pound capacity or less, when railroad destroying the car may elect to retain trucks and settle for them (with the exception of the wheels) at scrap or secondhand value, in accordance with M. C. B. Rules, except those belonging to cars of individual ownership."

This suggestion is approved by the committee.

Rule 120.—The committee approves of the following changes and additions:

TRUCKS.

First Item:	
50,000 lbs. capacity and less, with metal transoms and wooden bolsters, per pair	$215.00
Second Item:	
70,000 lbs. capacity, but under 80,000 lbs., with wooden bolster, per pair	215.00
New Item:	
50,000 lbs. capacity, all metal trucks, per pair	225.00

BODIES.

New Item:	
Gondola, all-metal, twin-drop bottom, 40 tons capacity, but less than 50 tons capacity, 36 feet but under 40 feet	790.00

First item under steel cars (bodies) third line, add the word "over" between the words "over" and "end sills." Add the word "body" before the words "metal bolsters" in eighth line top of page 70.

The committee suggests changing the recommendation of the Western Ry. Club from $60 to $40.

Rule 124.—The adoption of some plan or provision is recommended to compel furnishing of shortest route home for movement of cars under this rule, that such cars may be delivered at the nearest home point on owning line, rather than furnish the original routing of the car and allow it to be billed accordingly.

The committee can not at this time approve these sugges-

tions, but would suggest that the executive committee communicate with the American Railway Association to ascertain whether such a provision in the rules of interchange is desirable.

FURNISHING MATERIAL.

Rule 126.—Regarding the question of furnishing materials on requisition for repairs to cars while on foreign lines, the committee would suggest that the matter be referred to the Executive Committee with the view obtaining an opinion from the Interstate Commerce Commission as to the responsibility for freight charges on such shipments.

APPENDIX.

Rule 1.—In the third line omit the word "and" and after the word "inspection" and add "and adjusting brakes."

Rule 3 (a), 3 (b), 3 (c).—Rule to read:

"Line expenses shall consist of the expense of terminal cleaning, icing, lubrication (oil, waste, tallow and labor).

"Oil lighting (oil, chimneys, wicks, burners, shades).

"Gas lighting (gas, mantles, tips, domes, globes, bulbs, bowls).

"Electric lighting (fuses, incandescent bulbs, charging currents).

"Heating (terminal heating and coal furnished for individual car heaters en route) candles and broken glass." These suggestions meet with the approval of the committee.

Rule 12 (a), 12 (b).—The following changes are suggested and approved: "On electrically lighted cars, furnished to foreign roads, where no agreement is made, the following charge shall be made per day for use of batteries:

	Depreciation	Current	Total
32 cells	46 cents	29 cents	75 cents
16 cells	23 cents	14 cents	37 cents"

Change last paragraph to read:

"On electrically lighted cars a charge of $3 per 1,000 miles, with a maximum charge per car per month of $30 shall be made to cover rental of the electric lighting apparatus and depreciation of batteries."

Referred to the committee on train lighting.

WHEELS—CAST-IRON.

Rule 14 (a), 14 (b), 14 (c), 14 (d), 14 (e), 14 (f).—This rule be changed to read:

"Worn flanges: flanges having flat vertical surfaces extending more than 7/8-in. from tread, or, flanges 1 in. thick or less, gauged at a point 3/8 in. above tread," and that Rule 14-c to read:

"On flange 1 in. thick or less, flange having flat vertical surface 7/8-in. or more." Fig. 4-a—reference to this figure should be omitted.

These suggestions are approved by the committee.

WHEELS—STEEL-TIRED.

Rule 15 (a), 15 (b), 15 (c).—Rule 15-b should be changed to read:

"Worn flange or tire; with flange 15/16 in. thick or less, or having flat vertical spot extending more than 1 in. from tread, or with tire thinner than shown in Figs. 1, 2, 3 and 4."

This is approved by the committee.

Rule 21.—The committee would suggest that rule be changed to read:

Air hose applied must be made in accordance with specifications for M. C. B. standard 1 3/8-in. hose and so labeled.

PRICES FOR MAINTENANCE OF PASSENGER CARS.

The committee recommends the following:

Item 14. Change to $1.75. Item 15. Change to $1.00. Item 16. Change to $0.70. Item 17. Omit reference to mail cars and add it to Item No 15.

New Items:

Bowls, gas, at cost. Globes, gas, at cost. Bulbs, gas, at cost.

Item 22. Change to read: Electric lighting material incandescent bulbs, fuses, etc., at cost.

Gas-lighting materials, mantles, tips, bulbs, globes, domes, bowls, etc., at cost. Electric current, illuminating oil and Pintsch gas to remain separate items. Rearrangement of price-list in alphabetical order and separate columns for new secondhand and scrap prices.

Item 19. Change note to read: (No additional charge for cleaning trucks.) Item 21. Change to read: Brake shoes, Diamond S or steel back, applied, each, no credit for scrap, $0.50.

New Item:

Hose, 1 5/8-in., steam, new, complete with fittings.....$6.50

Item 58. Change to read: Wheels, solid steel or steel-tired, new or re-tired, cost.

Add footnote to list of prices as follows:

Cost price to be charged for material not in list above.

JOS. W. TAYLOR,
Secretary.

The Arbitration Committe as a result of a meeting Tuesday afternoon modified one or two of its recommendations, as follows:

Rule 2. Change the second suggestion in the rule to read: "Cars having defects for which delivering company is responsible must be properly carded when offered in interchange."

Add paragraph as follows: "Owners must receive their own cars when offered home, subject to the provisions of these rules."

Change paragraph concerning loaded cars in interchange to read: "Loaded cars offered in interchange must be accepted except that the receiving line may reject leaking tank cars and cars not loaded in accordance with the rules for loading materials, A. R. A. Car Service Rule 15 to apply when transfer or rearrangement of load is necessary.

Change the last paragraph to read; "When it becomes necessary to transfer load, such car, when empty, may be returned to the delivering line. In case cars are rejected by the receiving road and returned to the delivering company, all of the defects objected to must be designatad on a return card of the form shown on page 77, filled in with ink or black indelible pencil and placed on the car adjacent to the designation card." (Under M. C. B. couplers for parts thereof, etc.)

Rule 104. The committee would change the first paragraph of its decision to read as follows: The committee approves of the suggestion covering prices for air brake materials and coupler parts as outlined in the first recommendation, except the item for air hose coupling guard pin."

Rule 52. The committee would recommend the following additional paragraph. "Lag screws must not be used on cars stenciled United States Safety Appliances, Standard, or on cars stenciled United States Safety Appliances."

The report of the arbitration committee, as amended, was accepted and adopted.

SPRINGS FOR FREIGHT CAR TRUCKS.

The Secretary: I have the following report of the committee on springs for freight car trucks: The committee has not succeeded in getting together sufficient information to covr the subject properly, and respectfully asks for more time. (Signed) F. M. Gilbert, chairman.

The report of the committee was accepted and the committee was given further time.

LUMBER SPECIFICATIONS.

The Secretary: The Secretary has not received a report from this committee. Talking with Mr. Dow, the chairman, yesterday he said, as he understood it, the specifications prepared last year were satisfactory and are being adopted all over the country by the various lumber concerns and others interested in the work of the committee.

The committee on lumber specifications was afterwards discharged.

PRICES FOR LABOR AND MATERIAL FOR STEEL CARS.

The committee does not think it advisable to make any radical changes in prices for repairs to individual parts at this time, as it is impracticable to designate the extent of damage to the individual part on the various classes of cars, and establish a stipulated amount to make necessary repairs, for the reason that there are various parts of cars slightly damaged, which do not interfere with the safety for service or impair the strength of the car. Where it is found necessary to make extensive repairs, the rules as now recommended should be changed to the rivet basis; hourly labor charges and material prices will cover all requirements in making necessary repairs to this class of equipment for the present. In considering this subject, it was found that the parts of steel cars not included on the rivet basis are already covered by the present rules established for repairs to wooden-car equipment and which will govern.

The recommendations of the committee are as follows:

Eliminate all present rules on page 58 of the 1910 Code of Rules, with reference to repairs to steel cars, and substitute the following: All rivets ½-in diameter or over, 12 cents net per rivet, which covers removal and replacing of rivets, including removing, fitting, punching or drilling holes when applying patches or splicing and replacing damaged parts, not to include straightening. All rivets ¼-in. diameter and less than ½-in. diameter, 7 cents net per rivet, which covers removal and replacing of rivets, including removing, fitting, punching or drilling holes when applying patches or splices and replacing damaged parts, not to include straightening

Straightening or repairing parts removed from damaged car, 60 cents per 100 lbs. Straightening or repairing parts in place on damaged car; also any part that requires straightening, repairing or renewing, not included on rivet basis, 24 cents per hour.



F. H. Clark.

Chairman, Committee on Prices for Labor and Material for Steel Cars.

Paragraph showing steel-scrap credits to be eliminated from Rule 111, on page 58; also Rule 107, on page 51 to be eliminated, and charges and scrap credits shown in Rule 104, on page 51, change to read as follows:

	Charge.	Credit.
Steel, plate and structural, per pound....	.03	.00½
Steel, pressed and flanged, per pound.....	.04½	.00½

In making repairs to cars on a rivet basis, the cost of removing and replacing fixtures not secured by rivets, but necessarily removed in order to repair or renew adjacent defective parts, should be in addition to the rivet basis; rules covering wood-car repairs to govern. Paint applied, one-quarter-hour labor to be allowed per pound of paint applied and on the basis of Rule 105.

The report is signed by F. H. Clark (C. B. & Q.), chairman; G. E. Carson (N. Y. C. & H. R.), C. F. Thiele (P. C. C. & St. L.), Ira Everett (L. V.), B. Julien (U. P.), S. T. Park (C. & E. I.) and T. M. Ramsdell (C. & O.).

The report was approved and the recommendations of the committee were referred to letter ballot.

TRAIN LIGHTING.

The committee sent out a circular of inquiry asking for recommendations as to any changes, additions or corrections in the recommended practice on train lighting and any other points which the members desired the committee to take action on. It received quite a number of replies to this inquiry and changed its suggestions as to recommended practices given in the report of 1910 to read as follows:

1. That each electrically lighted car be provided with a notice giving the following information that this notice shall be posted in the electric locker.

Type of Generator.
Type of Regulator.
Type of Lamps.
Voltage of System.
Voltage of Lamps.
Number of cells of storage battery.
Normal charging rate (at charging receptacle).
Size of train wires, No. —— B. & S. Gauge.
Number of train wires (2 or 3).
Capacity in amperes of generator
Setting of axle generator.
Current output—amp.
Automatic switch—volts.
Zero charge relay—volts.
Lamp regulator—volts.
Amperes—full light.
Diameter of axle pulley. (Outside.)
Diameter of axle bushing. (Outside.)
Diameter of axle bushing. (Inside.)
Diameter of generator pulley. (Outside.)
Diagram of connections showing location, type and ampere capacity of fuses.

2. That where train line connectors are used, Gibbs' No. 3-G train line connector be used, with connections to the battery, dynamo and jumper as shown on Fig. 1. If only

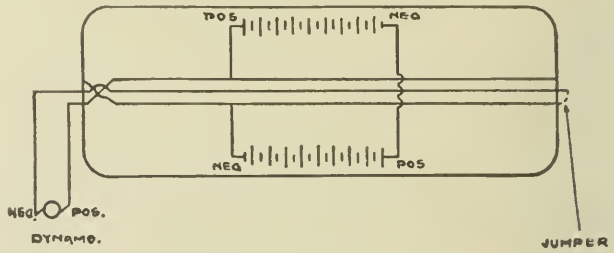


Fig. 1—Connection of Battery to Train Line.

two wires are used they shall be connected to the two outside terminals and the female connector on each end of car shall be stenciled "Not for use on head-end system."

3. That batteries shall be connected up with the positive to the right, facing the car, as shown on Fig. 1.

4. That where double compartment tanks are used, the connections and arrangement of battery terminals are to be shown on Fig. 2.

5. That each electrically lighted car shall be provided with two charging receptacles with swivel supports installed one on each side of the car, the outside angular ring to be the positive.

6. That each electrically lighted car be provided with two

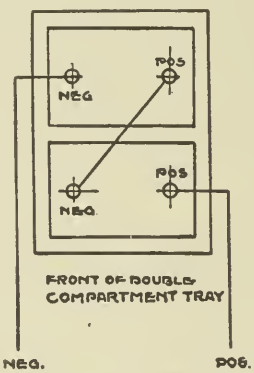


Fig. 2—Arrangement of Terminals.

150-ampere fuses, close-connected to each battery terminal, the fuses to be arranged and placed in a cast-iron box.

7. That each electrically lighted car shall be provided, on the switchboard in the car, with a switch, a fused switch, fuses or terminals. The switches, fuses or terminals to protect and completely disconnect the following parts: Train line (where train line is used), battery, axle dynamo (where axle dynamo is used. The axle dynamo switch or fuses to control the positive, negative and field of the dynamo). Each of the above switches, fuses or terminals is to be plainly stenciled, designating the part controlled, the positive terminal to be on the right side facing board.

8. Where a main lamp switch is used or where fuses controlling all lamps are used, they shall be so stenciled in plain letters.

9. That all fuses on cars shall be National Electric Code fuses.

10. That where axle dynamos are used, negative, positive and dynamo field shall be fused as close as possible to the

dynamo and prior to the leads either entering the conduits or being secured to the bottom of the car. The above fuses to be used for emergency service only and are to be at least one hundred per cent. above the capacity of the fuses on the switchboards protecting the same leads.

11. The following voltages should be used:
    60 volts (nominal) for straight storage, head end and axle dynamo systems.
    30 volts (nominal) for straight storage and axle dynamo system.

12. That the batteries shall be preferably installed in double compartment tanks.

13. That battery boxes shall have a vent provided in each door.

14. That when facing the end of the truck on which axle generator is mounted, the pulley or sprocket shall be on the right-hand side.

15. That the rules of fire underwriters shall cover all car wiring.

16. That all wiring under car to the switchboard shall be run in conduits.

17. That a straight pulley seat be provided for the axle pulley. That if a bushing or sleeve be used it must be secured to the axle independent of the pulley. Bushing to have an external diameter of 7½ in. and to be 8½ in. long, turned straight. That the pulley hub have a uniform internal diameter of 7½ in., the length of the hub to be 6½ in., the face of the pulley to be 9 in. or wider if flangeless, and 8 in. if flanged. That the generator pulley be flanged, crowned and perforated, and have an 8-in. face.

The following changes have been made in the 1910 exhibits to conform to the recommendations of 1911:

Exhibits *E* and *F* have been changed so that the fuse box will accommodate an N. E. C. fuse On the floor plan in Exhibit *E* the fuse box has been changed to a location along the end of the battery box.

Exhibit *H* has been changed to show the Gold positive plate the same dimensions as the Willard positive plate.

Exhibit *H* has been changed in that the length of the negative bridge has been changed from 10 3/16 in. to 9¾ in., also added on Exhibit *H* recommended dimensions for the National battery.

On Exhibit *I*, the detail of chest handle, a lip has been added at the top and projects into the wood tank.

Exhibit *H* has been changed in that the crown of the lead line is specified as three to four per cent. antimony lead instead of pure lead.

On Exhibit *G* the method of applying lead lining has been changed to read as follows: "Size lead tank with one coat of chrysolite, then with pretrolite and then insert in wooden tank which has been filled to a depth of 2 in. with a mixture of paraffin and pretrolite, having the melting point 150 deg F.

On Exhibit *G* the abbreviation S. B., indicating Single Braid wire for cross section, omitted; unbraided wire to be used

Item 31 on Exhibit *G* covering No. 6 flexible rubber-covered wire changed to show solid wire.

Exhibit *K* has been changed to show recommended design of vent for battery door

In connection with Master Car Builders' Rules covering interchange of equipment, your committee suggests that the paragraph at the bottom of page 103 reading:

"On electrically lighted cars a battery depreciation charge of 75 cents per day shall be made," be changed to read as follows:

"On electrically lighted cars, furnished to foreign roads, where no agreement is made, the following charge shall be made per day for use of batteries:

	Depreciation.	Current.	Total.
32 cells	46 cents	29 cents	75 cents
16 cells	23 cents	14 cents	37 cents

The report is signed by:—T. R. Cook (Penn.), chairman; E. A. Benson (Pullman), Carl Brandt (L. S. & M. S.), Ward Barnum (L. & N.), and J. H. Davis (B. & O.).

DISCUSSION ON TRAIN LIGHTING AND EQUIPMENT.

G. W. Wildin (N. Y., N. H. & H.): There are a number of recommendations made in that report as to certain special devices, and I would like to inquire if they are patented.

D. F. Crawford (Penna.): It is my understanding that none of the patents are still in existence on those devices.

C. A. Schroyer (C. & N. W.): We have with us this morning J. D. Cartwright, of the Lehigh Valley. He is an electrical engineer and he is also the chairman of the committee on standards of the Association of Electrical Engineers, and I move that he be extended the privileges of the floor for five minutes.

(Mr Cartwright was given the floor).

Mr. Cartwright: Before making any remarks on the subject under consideration I wish to state the interests I represent and the reason for my appearing before you to-day. As an individual I represent the Lehigh Valley; I also represent the Association of Railway Electrical Engineers. At a recent meeting of our Association the present report of your committee was thoroughly discussed and I am here to present for your consideration the wishes of the Association of Railway Electrical Engineers, primarily formed for the purpose of standardizing as far as possible the electrical equipment on cars. Fully realizing the importance of the subject, I hope you will bear with me for a few moments in the presentation of the subject which will be submitted to you for your consideration. I take this opportunity to thank your committee on train lighting for their hearty co-operation in embodying in their report several recommendations which have been made by our Association. We do, however, take certain exceptions to a few of these recommendations, as follows:

Sec. 1 Should be changed to include additional information not shown.

Sec. 2. The first line, after the word "used" it was suggested that there should be inserted the words "they shall be interchangeable with."

Sec. 5. After the word "car" in the first line insert the words "equip with battery boxes."

There is no necessity of putting a charging plug on an electrically lighted car that has no battery boxes in it.

Sec. 6. Should read: That each electrically lighted car be provided with two 150-ampere fuses close connected to positive and negative terminals of batteries, at battery box, before wires enter conduit leading to distributing board in car. The fuses to be arranged and placed in a strong metal box, substantially as shown on Exhibit F, and installed on car as shown on Exhibit E.

Sec. 7. Omit the word "completely" in the fourth line Also omit the second item. We have found several instances where porters on the cars have pulled the battery switch instead of the light switch. The result is that all the lamps in the car have been burned out, due to the excessive voltage generated.

The sixth line should read as follows: The axle dynamo switch or fuses to control the positive armature and positive field of the dynamo.

We had considerable discussion on *Sec. 10.* We wish to eliminate all fuses that we can from a car, consistent with safety. It might be practicable to put a few in your armature but do not put any in your field or both sides of your armature circle.

Sec. 11 should read as follows: The following voltages should be used:

For head end or straight storage, 64 volts (nominal).

For axle dynamo systems, 32 volts (nominal).

You will notice that we have omitted the recommendation for 30 volts for the straight storage system. On the second part we have omitted straight storage. It was not considered practicable to operate straight storage on 30 volts.

There is one typographical error which has crept into Sec 17. In the seventh line the figure "7" should be inserted instead of the figure "8," as the dimensions for the face of the generator pulley.

At a meeting of the members of the Association of Railway Electrical Engineers, held in Washington on June 16, 1911, it was voted that the recommendations of your committee regarding interchange of electric lighted cars should read as follows On electrically lighted cars, furnished to foreign roads, where no agreement is made, a charge of 75 cents per car per day shall be made for the use of the electric lighting equipment.

If any of the suggestions or recommendations that I have made are out of order, I would ask you to excuse my presumption, but accept the recommendations of the Association of Railway Electrical Engineers just the same.

(The President resumed the chair).

Mr. Wildin: I would like to know whether the committee in formulating this report took into consideration the fact that some roads are being electrified, and that the charging of the batteries on the car will be taken care of while the cars are on the electric zone? I notice that the gentleman who has just spoken, Mr. Cartwright, recommends a 30 volt system where axle light is used I would say that you must use axle light for the time being, but it is presumed that in the future the dynamo will be removed and the batteries will be charged while the cars are on the electric zone, and in that case 30 volts is very low.

Mr. Cartwright: If the axle light equipment is removed from the car, then you are not confined to 30 volts.

Mr. Wildin: But I understand you to assume that you were going to have 30 volts.

Mr. Cartwright: Not necessarily.

Mr. Wildin: Then you will have to put in something else.

Mr. Cartwright: We will go to 60 volts.

Mr. Wildin: Then what is the use of throwing a battery away?

Mr. Cartwright: When you go to 60 volts you add a battery.

Mr. Wildin: We are going to put a motor generator set in the electric locomotive and charge the cars while on the electric zone. We are going to have 60 volts, and I do not like the recommendation of a 30 volt system where axle light is used.

(The report was accepted and referred to letter ballot.)

M. K. Barnum (I. C.): It seems to me that in referring this report to letter ballot the members would have to vote on it as a whole and not in detail.

The Secretary: That will be arranged.

C. A. Seley (C., R. I. & P.): In referring the report to the members for letter ballot I would suggest that the recommendations of the Association of Railway Electrical Engineers, which have been voiced here by Mr. Cartwright, be put in form so that our members may consider them in casting their ballots.

Mr. Schroyer: If that is a motion, I second it.

(The motion was carried.)

TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

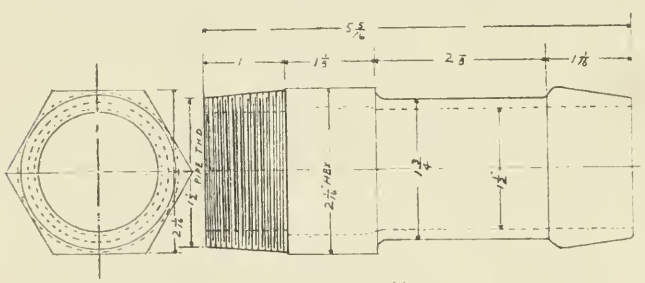
The committee recommended that the following Recommended Practice be adopted as Standards: Two-inch train pipe; end valves with not less than 1½-in. openings, and



I. S. Downing,

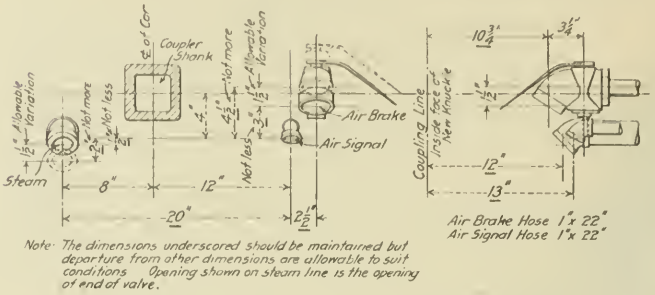
Chairman, Committee on Train Pipe and Connections for Steam Heat.

location of steam, air and signal pipe as shown in the accompanying illustration. The location of pipes is changed to show the dimensions taken from the center line of the car instead of the center line of the coupler shank. The committee finding but few railways using a hose larger than



Nipple for Steam Hose.

1½ in., recommends that the present Recommended Practice of 1⅝ in. hose be changed to 1½ in. It also recommended for adoption as Recommended Practice the following: Hose nipples of dimensions shown in the accompanying illustration; steam hose to be 5-ply, 1½ in. inside diameter and 25 in. long; hose clamps to the dimensions as shown in the accompanying illustration; each end of hose to be fitted with a nipple, and the coupler to have not less than 1½-in. opening. The horizontal elevations of nipple to opening through this

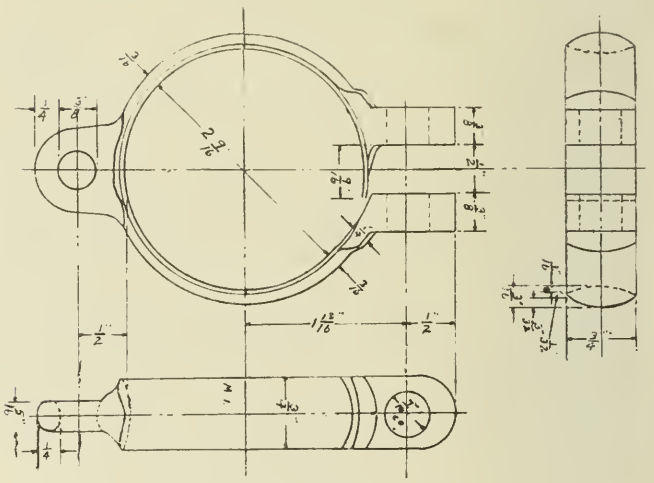


Note: The dimensions underscored should be maintained but departure from other dimensions are allowable to suit conditions. Opening shown on steam line is the opening of end of valve.

Location of Steam, Air and Signal Pipes.

coupler to be, minimum, 15 deg.; maximum, 20 deg. The coupler to be tapped with 1½-in. pipe thread.

It is further recommended that manufacturers of steam hose couplers be asked to appoint a committee to act jointly with a committee of this association and to report at the



Recommended Hose Clamp.

next convention on the contour lines of a coupler that will be interchangeable.

The report is signed by:—I. S. Downing (L. S. & M. S.), chairman; H. E. Passmore (T. & O. C.), T. H. Russum (B. & O.), J. J. Ewing (C. & O.) and C. A. Schroyer (C. & N. W.).

Mr. Downing presented the report and in connection therewith said:

The recommendations concerning the train line, end valves and pipe locations have been recommended practice since 1903, and we are inclined to feel that they should be advanced to standard. In connection with the steam hose couplers, there is but very little difference in the large couplings—about 3/16 in. on the locking arm—and we feel that the coupler manufacturers, if they work with the committee—we would get a coupler that would be interchangeable.

In regard to Fig. 1, that has always shown the dimensions taken from the center line of the coupler shank. The committee has changed that, showing the dimensions taken from the center of the car. The figures are just the same. It does not change the location of the end valves or pipe. The straight shank couplers are coming in now, and the old coupler shank is offset an inch and a half from the center of the head and as the coupler is not always in the center of the car, it is a hard proposition to measure, and we have found that most of the roads have measured from the center of the car.

DISCUSSION OF TRAIN PIPE AND CONNECTIONS FOR STEAM HEAT.

C. E. Fuller (U. P.): In regard to the length of steam hose, I think 25 in. is too long—in fact, 24 in. is pretty long—it is bringing the hose too close to the track. I think it would be a mistake to increase the length of hose over 24 in.

I would like to ask whether or not the committee in working up this report gave any consideration to changing the angle of the neck of the coupler to change the kink in the hose when coupled together. I think it is safe to say that the majority of hose connections, when they are coupled together are kinked, which cannot help but destroy, to a certain extent, the life of the hose. We have been using it in that manner, and I have observed on a great many other roads that it seems to be the common practice. We have got now to a point where we cannot get an angularity of the coupler that will prevent that kinking entirely, and I would like to see this committee continued with a view to making a further report on this subject. I will make that motion.

Mr. Downing: I overlooked something I should have referred to. The committee on standards in their report yesterday referred to certain matters which in turn were referred to our committee. One was the size of the hose on passenger trains. Our committee did not feel they should take any action on this matter, as we were appointed to consider the matter of steam heat connections. In regard to showing the angle cock at 30 deg., we agree with the committee on standards. As to Mr. Fuller's remarks concerning the kinking of the hose, until you adopt a standard end valve, a standard coupling, you cannot get away from it. The angle at which the hose leaves the end valve and goes into the coupling governs. I have no objection to the committee being continued, but I do feel that what we have recommended as a standard for this association should be made standard and that the members of the association should adopt the standard in practice. It has been on the books since 1903, and should either be made standard or taken off the books.

Mr. Fuller: That is the reason why I made the motion to continue the committee. I do not believe that this association desires to adopt the present practice. I did not know until about one month ago that we could accomplish what I would like to ask this committee to present to us, and I wish to take exception to the remarks of the chairman of the committee that we have to use one angle valve for the end of the car or one coupling. Any pipe fitting can be brought to the required angle, whether it is a globe valve or angle valve or simply a T on the end of the pipe. The angularity of the coupler has more to do with it than the connection of the train pipe line.

I should like to see this committee charged with recommending the adoption of a standard size of hose. If you want it one ⅝-in. adopt that, not 1½-in. I also think the committee should be charged with something in the way of a nipple besides the old style nipple, with which we find it is almost impossible to hold the hose on, especially with head-on system, where we use anywhere up to 200 lbs. steam pressure. There is a nipple which I submitted to the committee which is not patented, at least the patent is not valid, and everybody is making it, and every steam heat hose company and a great many of the roads have their own patents and are using it. If there is any question about patents then I would suggest that question be considered. I do not want to recommend a patented device, but do want to recommend a positive nipple and clamp for a hose connection.

C. H. Osborn (C. & N. W.): In designing a standard coupler I think that consideration ought to be given to the question of designing some kind of a positive lock that will hold the couplers together. We have a number of different kinds of couplers to-day that can be coupled together, but cannot all be locked together, and that is the greatest objection I have to the different kinds of couplers. Another thing, I do not quite agree with the recommendation concerning Fig. 2; that the hose should be fitted up with a nipple on each end and screwed into the head. We found where that is done, that the heads are kept at outside points, unscrewed from the hose, and new hose are attached and screwed into the heads, and the heads kept in continual service without having to go into the shops and be looked over and fixed up, and that is the cause of a great deal of trouble with the joints on the head. I think the head that is clasped to the nipple, so that when the hose gives out the head has to go into the shop with the hose, where is an opportunity for testing it and grinding in the joint for the gasket, etc., it is a much better plan and it gives us an opportunity to shop them and fix them up.

Mr. Downing: In regard to Mr. Fuller's remark about the nipple, when Mr. Fuller submitted to us the print to which he has referred, we took the matter up and we were advised that it was a patented device, and I think the clamp referred to by Mr. Fuller is a good deal better than this clamp, but we understood it was patented and did not consider it. In regard to the two-piece coupling, we felt that it would be a long time before this committee would be able to get a coupling that would be adopted, so we thought if we could get a two-piece coupling, we would not have to change the hose and coupling at interchange points as we are doing now all over the country. The committee should be instructed to act with the manufacturers of hose couplings. The committee would not attempt to design a coupling in two pieces, if we are going to have a standard. We simply wanted to have that as a makeshift.

F. W. Brazier (N. Y. C. & H. R. R.): As long as we have plenty of time, we might make an experience meeting of this. Regarding the length of steam hose, we find on our long 70 and 75 ft. cars with our short and sharp curves, we must have a hose at least 25 in., and if we did not have it that length we would have considerable trouble. After a hose is in service for a while it congeals so that it becomes sometimes 1½ in. shorter than it was when applied. On our system we have some pretty severe weather, and do not find any necessity of having any locked couplings. I think our records will show that during the severe weather we have trouble sometimes, in going over our water tanks, where a piece of ice will uncouple everything, but for steam hose to be uncoupled in ordinary service is something unknown to us. We have a heavy head and it practically locks itself. As to the end train pipe valves, as referred to by the chairman of the committee, I thoroughly agree with his statements. As to blowing off, I find the trouble which causes the blowing off is generally that the inside lining on the head end system, Mr. Fuller speaks of, it softens up and peels off. That happens on our lines occasionally, but hardly enough to notice it.

Mr. Fuller: I ask Mr. Brazier if it is not usually kinking that makes the hose shorten—if they did not kink, do you think they would shorten up as much?

Mr. Brazier: That contributes to it, but take some of the hose put in yard service, and confined in service, where we have from 75 to 125 lbs. pressure, the hose congeals and contracts after it is in service and shortens up.

R. L. Keene (Penn.): When the report of the committee of standards and recommended practice was considered there were several items left over until the presentation and discussion of the report of the committee on train pipe and connections to steam heat, and I would make a motion that paragraphs 50, 51 and 52 of the committee of standards be referred to letter ballot.

The motion was put and carried.

Mr. Downing: In case this committee is continued, I believe it should be instructed whether you want it to design the hose coupler complete, or give you the contour lines so the manufacturers can work to that, the same as we do in the case of the automatic coupler.

Mr. Fuller: It is not my thought to tie this committee down at all. I would like to turn them loose to cover the whole subject. If they can recommend a standard steam heat coupling and connection, hose and everything incidental to the system of steam heat, to this association, I think we should let them do it, and under my motion they are free to take up the whole subject without any strings to it.

T. H. Curtis (L. & N.): As Mr. Brazier says this is an experience meeting and I will say that the Louisville & Nashville R. R. equipped its passenger equipment with 26 in. hose, but it was so long we had to shorten it, and we now use 24 in. hose with good results. That is an inch shorter than Mr. Brazier is using and I feel safe in saying that a 26 in. hose is quite too long.

O. C. Cromwell (B. & O.): I think we should give consideration to some method of locking the couplings together. I have had considerable experience with the coupling opening after the hose has become set and hardened. In connection with the opening up of the steam-heat hose, it sometimes causes signals to be given to the engineer, through interferring with the hose. The whole subject is one which appears to need considerable revision at this time. I am not sure that the location of the train pipe at the end is correct particularly as we are going into greater length of car. We have to have a greater lateral motion of the coupler, and to my mind that must spread the ends of the pipe, and I think the proper thing is to leave this matter wide open and leave it in the hands of the committee to make a thorough revision of the whole matter.

Mr. Fuller: I move that the committee be continued to take up the entire subject of steam-heat hose and connections, including a locking device, location of the train line pipe, angularity of the head and its connection, length of hose, and in fact the entire subject of steam-heat hose and connection for passenger car equipment.

(The motion was seconded and carried.)

Mr. Fuller: I move that the report be accepted and referred

back to the committee. (The motion was seconded and carried.)

CONCLUDING EXERCISES.

The Secretary stated that the auditing committee had examined the accounts of the secretary and treasurer of the association, including the vouchers, and had found them correct.

The following report of the committee on correspondence and resolutions was presented:

The committee wishes to acknowledge the appreciation of the association to the President, for his very able address and ability with which he presided; to the other officers for their good work in handling the details; to the committees that have considered and reported on the subjects assigned to them and for the thorough manner in which their work has been performed; to the committee on arrangements for effective service in attending to the comfort and pleasure of those attending; to the railways and the Pullman Company for courtesies extended. To the American Railway Supply Men's Association for its magnificent exhibition of railway supplies that have become so important a feature of these conventions and the entertainment provided by that Association. To the press in general for their co-operation and interest. To the *Railway Age Gazette* for the daily record of our meetings.

On motion, the report of the committee was adopted.

D. F. Crawford (Penn.): We have tried the present method of elections for two years and it seems to me it is unnecessarily cumbersome. I therefore move that the executive committee be authorized to appoint a committee, with a view of simplifying them, and to transmit a circular report to the members by December 1, which covers the six months' period required, and report their recommendations at the next meeting. (The motion was seconded and carried.)

I. S. Downing (Ill. Cent.): We have a lot of apprentices in our car shops, and we are getting a lot of steel passenger cars and pretty complicated things around the cars now, and I do not know but what we ought to have subject of that kind in this association as they do in others. We have about 40 apprentices in our shops, and I believe other shops are doing the same thing, and it might be a good thing to consider this matter.

D. R. MacBain (M. S. & L. S.): I think Mr. Downing's suggestion is a good one. There is very little attention paid to the development of the young men for the car department on a good many of the roads, and it would seem in view of the fact that the work is becoming more complicated and the material for advancement is becoming scarcer every day that something should be done to encourage young men to take up car department work.

C. H. Osborn (C. & N. W.): I agree with the idea Mr. Downing has advanced. We are having a great deal of trouble in getting young fellows to take up car department work, and are having a good deal of trouble in filling the position of foreman for the various shops and yards and I think some move should be taken by this association toward securing a good grade of apprentices in the shops. I believe it will assist us very much.

Mr. Downing: I would move that a special committee be appointed to make a report at the next convention on this subject of apprentices in car shops. (Motion seconded and carried.)

The president: I suppose some of you have noticed that you did not receive reports. I would say that the executive committee has been for years urging the chairmen of various committees from time to time to be prompt in presenting their reports so that the matters might receive careful consideration by all concerned. It seems that this year the reports were more delayed than ever before. Indeed, some reports were not here until a day or so before the opening of the convention. I think this is a matter to be regretted.

D. F. Crawford (Penn.): Mr. President I would suggest that you call the attention of the members to the provision of the By-Laws in respect to reports.

C. A. Seley (C. R. I. & P.): It occurs to be that it would be advisable for this association to invite railway officials to visit our conventions and see the magnificent exposition of railway appliances. There is no question but that we have on this pier a most complete exposition of railway appliances, and it is an exhibit that would be of very great value to every railway official from the president down. It is true that the exhibit is seen by quite a number of purchasing agents, but I do not think it is viewed generally by the executive officers. The value of this association to the railways is undoubted in many quarters, but there are some railways I understand that do not extend to their men the opportunity of attending these conventions. Now I believe we should make an effort in this respect and therefore I make a motion that the executive committee of this association extend to the executive committee of the American Railway Association a cordial invitation for them to individually visit our next convention, wherever it may be held, and suggest the advisability of their appointing a committee to visit the convention and report back to their association.

(The motion was carried.)

O. C. Cromwell (B. & O.): Referring to the delay in getting out reports, I would say that the committees would be greatly assisted if the membership of the association would reply promptly to the circulars. I think a great deal of the delay in getting out the reports is due to that fact. I am sorry to say that a great many reports are meagre that are sent in to the executive committee. Hence, it leaves the committee a great deal of work to do in comparatively short period of time. If the members will bear this in mind it will facilitate the getting out of reports very much.

J. J. Tatum (B. & O.): Mr. Cromwell criticizes the railways. Now I think I will take the other side and criticize the committees. If a committee waits until the eleventh hour to get out circulars seeking the information that it wants, why, naturally there is going to be delay. I happened to be on one of the committees that did not have a meeting this past year; I don't know why, but I know that a typewritten report from the committee was here. I don't know how it happened to be made. I think if committees would get busy right away after they leave the convention and decide on what they want and promptly send out circulars to the railways asking for the information that they need it will greatly facilitate the getting out of these reports.

C. D. Young (Penn.): I would suggest that the executive committee can help the committees quite considerably. The executive committee usually does not meet until August or September, and then it appoints the committees for the next year, and by the time those committees have gotten together the information and printed the same it is December or perhaps January of the next year. The replies to the circular sent out are hard to get at best, and the members of the committees have hardly much over 30 days or 60 days at the outside, and a great many of the replies require investigation, and when you get the replies in they have to be boiled down and condensed, all of which takes time. I think it would materially assist the association if the committees could be appointed earlier, and then when they are appointed instructions issued to the chairman of the various committees to call the members together promptly.

E. W. Pratt (C. & N. W.): I would suggest that it would be helpful to all members if, in addition to notifying each committee independently, there was a list made of all the committees, with their various chairmen, and this list sent out to the members as early as possible, stating the subjects to be considered, and also if there are any detailed instructions to be given to the committees as to getting up their reports a brief outline of them should be given. The thought in my mind is that in that way many of us would look out for information early in the year, and it might be that somebody would offer information without waiting to be requested for it by a committee.

C. A. Seley (C. R. I. & P.): I move that the appointment of the committees be issued by the secretary in circular form to all members.

(The motion was carried.)

R. L. Kleine (Penn.) In connection with the work of the committee on standards, I desire to say that when a circular is sent out we get a great many replies upon the subject matter that refers directly to the work of other committees, and I would suggest that members bear in mind that we have other committees on those particular subjects. That I think will obviate some of the delay. If members would refer those subjects, where there is either a standing committee or a special committee on the particular subject, directly to those committees or empower the committee on standards to do so, it will expedite the work of the association a great deal.

The following officers were elected: President, A. Stewart, Southern; first vice-president, D. F. Crawford, Pennsylvania; second vice-president, C. E. Fuller, Union Pacific; third vice-president, M. K. Barnum, Illinois Central; treasurer, J. S. Lentz, Lehigh Valley. Executive Committee—F. W. Brazier (N. Y. C. & H. R.), C. A. Schroyer (C. & N. W.) and A. Kearney (N. & W.).

President Curtis was presented with the ex-president's badge and the meeting adjourned.

SAFETY APPLIANCES.

The recommendation of the committee on safety appliances, presented at the meeting on Tuesday, June 20 (*Daily Railway Age Gazette,* June 21, 1911, page 1602), was not reported correctly as to the designating mark for cars equipped with the safety appliance standards. It should have read as follows:

The committee recommends the following designating mark for cars built on or after July 1, 1911:

UNITED STATES
SAFETY-APPLIANCES
STANDARD.

and for cars built prior to July 1, 1911—

UNITED STATES
SAFETY-APPLIANCES

(The letters U. S. may be used in lieu of United States.)

The first part of the paragraph referring to the metal badge should have read: "A metal badge plate 4 in. x 12 in., with the proper marking, is preferred." The badge plate is also to be made of metal and not of malleable iron, as reported.

A decree has been issued by the government of Uruguay authorizing the provisional opening to public service of a section of 31 miles of the Midland Railway branch from Algorta to Fray Bentos, now in course of construction. The new section completed is between kilometers 34 and 87.

The Exhibit.

McCORD LOCOMOTIVE LUBRICATOR.

The system of force feed lubrication, as supplied by McCord & Company, Chicago, is designed to provide an efficient method of lubricating a locomotive automatically, positively, and in proportion to the work the locomotive is performing. The system is applicable to the valves, cylinders and air pumps, as well as to the driving boxes. In valve and cylinder lubrication the valve oil is introduced at a point where it will mix with the steam just before the latter enters the steam chest on both piston and slide valve engines. In driving box lubrication the engine oil is introduced into the longitudinal cavity in the crown of the driving box brass.

The lubricator proper consists of individual vertical plunger pumps for each feed set in an oil cup or reservoir, located usually in the cab. Eccentrics on a horizontal shaft through the reservoir operate the plunger pumps. The circular motion of the shaft is obtained from the rectilinear motion of the valve stem by means of a flexible shaft and a set of bevel gears with a ratchet attachment on one gear which is connected direct to the valve stem or rocker. This bevel gear or transformer may be located on the running board or on a bracket on the boiler where convenient attachments can be made to the lubricator proper and to the valve gear of the engine.



Some Workers on the Transportation Committee.

Top row, left to right: Underhill, Hawley, Toomey, Elliott, Taylor, Stuart, Berger.
Bottom row, left to right: McNaughton, Nicol, Kuhns (chairman), Porter, Peabody.

PRESSED UNIT CAR SIDE SECTION.

The pressed unit car side section as made by Forsyth Brothers Company, Chicago, represents advanced development of the built-up steel truss side construction. The latter, while utilizing the full height of the side of the car for a lattice girder or truss (having the diagonals so disposed as to permit of windows being formed in the structure), has resulted in a car body of maximum strength and rigidity, with minimum weight. As the life of a steel car depends so much on the security of the joints of its members, it is obvious that the fewer the joints the better will be the car. This latter consideration led to the invention of the pressed unit section, wherein the side posts, diagonal braces and side brace of the car are formed of one piece of metal.

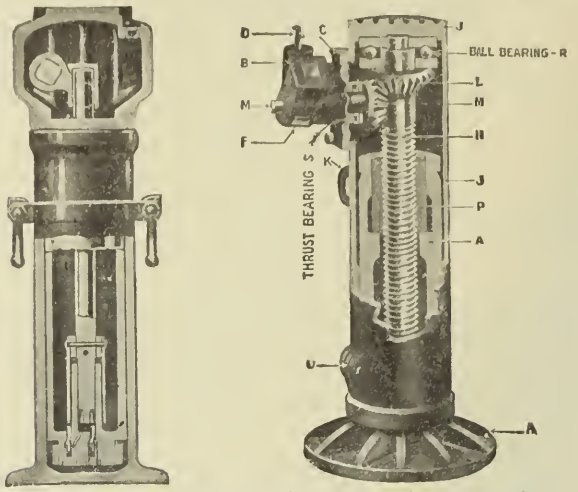
As to the safety of passengers in a truss side frame car, the distribution of shock resisting members in the truss frame results in practically surrounding the passenger space with a metal shield. The buffing shocks can be taken by a comparatively light center sill construction, as this sill can be supported and secured from deflection at each side post by the rigid frame.

Weight for weight, a car built with the pressed unit side truss will be more rigid and provide greater security to passengers than a car having all its shock resisting members in the underframe, or relying on a plate girder side construction having its top member below the sash rest. As an illustration, in a mixed freight train of flat cars and box cars, a severe collision results in more wrecked flat cars than box cars.

This form of construction may be adapted to any design of car or underframe.

HYDRAULIC JACKS.

The new forged steel Duff-Bethlehem hydraulic jacks were shown by Fairbanks, Morse & Co., Chicago. Several new features are to be found in these jacks. There is no packing at the base, as this is forged integrally with the cylinder, making it one solid piece with no joints whatever. On account of their steel construction, these jacks combine large capacity with light weight. The latest development of the geared ratchet jack is the No. 400 Barrett jack, which is designed particularly for the rapid, safe and convenient handling of the heaviest loaded freight cars, passenger or Pullman coaches, locomotives in roundhouses, etc. It is claimed to be capable of taking care of any kind of railway equipment under all conditions. The jack is made of malleable iron and steel, except all bearings, which are of hard bronze. The automatic lowering device is simple and is arranged so that when the load is being raised there is no part of the lowering



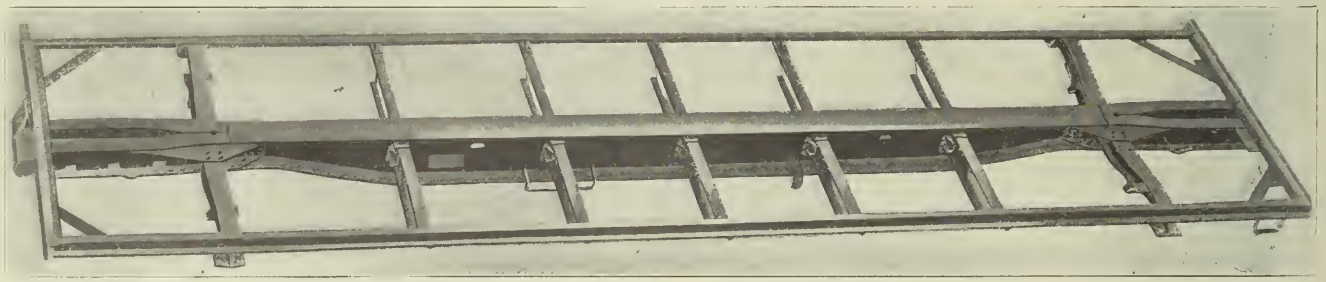
Duff Bethlehem Forged Steel Hydraulic Jack.

device in service, it being dropped out of the way. A full line of these jacks were exhibited at the booths of Fairbanks, Morse & Co. and the Duff Manufacturing Co., spaces 550-630-548 and 628 in the Annex.

BETTENDORF UNDERFRAMES FOR BOX CARS.

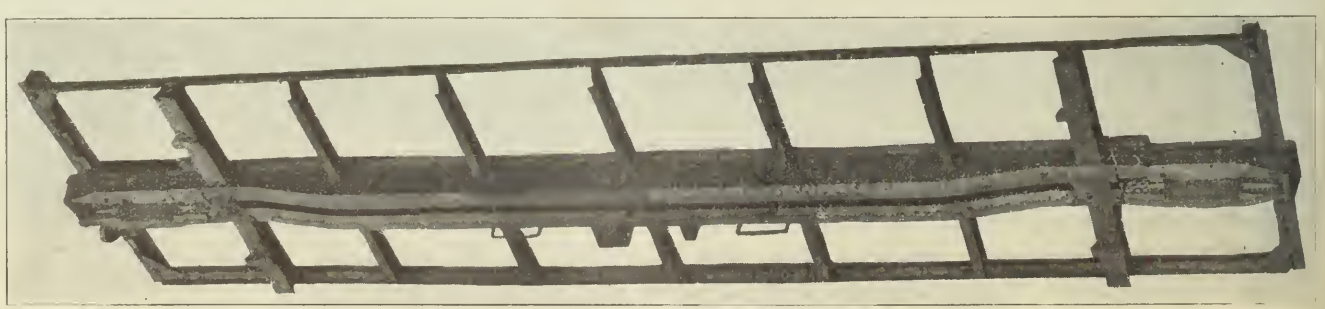
Herewith are illustrated two types of underframes of the Bettendorf construction, single center sill and double center sill, both of which were exhibited by the Bettendorf Axle Company, Davenport, Iowa, at space 200.

The single center sill underframe shown is designed for use under 40 ft. box cars of 100,000 lbs. capacity, of which there are now over 8,000 in service. These underframes, like all other Bettendorf underframes, were designed to carry the required load with the least possible dead weight and having the fewest possible number of pieces.



Bettendorf Single Sill Underframe for Box Cars.

The double center sill underframe, designed for 36 ft. box cars of 80,000 lbs. capacity, possesses the usual light weight, maximum strength and few parts, as well as accessi-



Bettendorf Underframe with Double Center Sills for Box Cars.

bility to inspection, repairs and painting, which qualities are found in all the product of Bettendorf Axle Company, Davenport, Iowa.

In both these designs the center sill carries the entire load, which is transmitted to it by means of the continuous bolsters, needle beams and end sills. These needle beams and body bolsters are continuous from side to side of the car and pass through the center sill, which is continuous from end sill to end sill.

The center sills in these underframes are shaped and punched cold in powerful hydraulic presses in such a manner that one-half of the beam is punched in one stroke of the press, thus making all sills interchangeable, with no variation in the spacing of holes and preventing the possibility of internal forging stresses. Consequently no drift pins or reamers are required to match rivet holes and no metal is fractured by drawing up with drift pins.

To the ends of the center sill I-beams, which are rolled shapes, are riveted thoroughly annealed open hearth cast steel draft sills, or center sill ends. Cast integral with these draft sills are the draft gear stops, connections to the end sills, etc., making a solid casting—one-piece—which eliminates the shearing of rivets and insures alinement of all parts, thereby greatly facilitating the application of the draft gear in the proper manner.

The needle beams are made from rolled I-beams and are continuous from side to side of car, passing through the center sill and resting directly on the opening in the center sill through which they pass. These needle beams are spaced at such intervals as necessitated by the size of the wooden sills or nailing stringers, from which the load of the floor is transmitted through these beams directly to the center sill.

PORTABLE AIR COMPRESSOR.

The portable air compressor made by the General Electric Company, Schenectady, N. Y., and shown in the accompanying illustration, is used for furnishing compressed air for blowing out apparatus, driving small tools, etc., in small plants where it is not advisable to install a permanent system of piping. To facilitate handling, the compressor is mounted on a three-wheel truck, the single wheel in front carrying a handle, which permits of easy transfer and of turning sharp corners. A sheet iron plate, carrying four posts, occupies the rear of the truck, and forms a convenient support on which to coil the hose, when not in use. The compressors furnished with these sets are single acting, single stage, with horizontal cylinders. The motor drive is accomplished by means of a gear and pinion having herringbone teeth. The frame casting encloses the working parts of the compressor, and contains both the motor and crank shaft bearings. The motor frame is bolted to the compressor frame. This makes a compact arrangement and eliminates the necessity of a separate gear case. With this construction the dimensions of the motor are not limited by the distance between gear centers, and it has been designed with electrical characteristics best suited to its service. All bearings and working parts are automatically lubricated from a well formed in the compressor frame immediately below the gear. The driving gear picks up oil from the well, and throws it in a steady stream into an oil pan on the underside of the crank chamber cover, from which the oil flows through channels to the various bearings.

The armature and the interior of the motor are protected from oil by deflectors on the armature shaft, which divert any oil that may pass the motor bearing into a pocket from which the oil returns to the crank case through a hole entering it below the oil level. The oil therefore acts as a seal, preventing oil vapor from entering the interior of the motor. A dust-proof door, closed by a cam locking device, is provided in the cover where it is immediately accessible from the side of the car. This door permits convenient inspection of the brushes or commutator when required. The armature can be quickly removed when occasion requires, by taking off the motor frame head, turning the brush holders back and loosening the pinion nut without having to touch the crankshaft gear. In order to maintain an air pressure within specified limits, standard governors are used to close the motor circuit when the pressure falls below a predetermined value and to open the circuit when the pressure rises to another predetermined value.



Portable Air Compressor.

Adjustment for pressure range can easily be made by means of two screws located in the upper part of the governor frame.

The storage reservoir is 18 in. in diameter, 60 in. long and is located below the truck frame, thus keeping the center of gravity of the set low and insuring stability to the equipment. The capacity of the reservoir is approximately 8½ cu. ft. and is sufficient to maintain a steady supply of air through the outlet nozzle for ordinary service, such as operating pneumatic tools or for cleaning purposes. A drain cock is placed in the bottom of the reservoir to drain off any water or sediment that may collect. The over-all dimensions of this portable set are: Length (not including the handle), 6 ft. 8½ in.; width, 2 ft. 8 in.; height, 3 ft. 9 in.; clearance between end of drain cock and floor 2½ in. The net weight is about 1,600 lbs.

CRECO JOURNAL BOX.

The Creco journal box and lid exhibited by the Chicago Railway Equipment Company, Chicago, form a dust proof box, the lids having no projections beyond the edges of the mouth of the box. An additional safeguard against the working of dirt into the box is provided by the oil table on the inside of the lid, so arranged that all oil thrown against the inside of the lid, instead of working to and oozing out between the lid

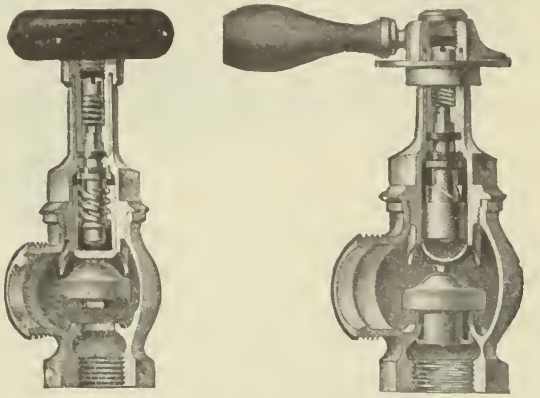


Creco Journal Box and Lid.

and the box, is thrown back into the box. Again, there are no openings in the lid to allow dirt to sift through. The Creco box has an antomatic and permanent locking device which is simple and effective. The lid is easily opened and no special twist or pull is necessary, all of which tend to increase the life and reduce the cost of maintenance. The arrangement of the springs places equal pressure on all parts of the lid, thus insurging a close contact between the lid and box at all times. These lids and boxes are so designed that the Creco lid will fit and lock as readily on any standard M. C. B. cast steel or malleable box as on the Creco box, and furthermore Creco boxes will take any standard M. C. B. lid.

PACKLESS STEAM AND WATER VALVES.

The packless water valve, as made by the United States Radiator Corporation, Detroit, Mich., is something unique. It permits a full opening with less than one turn of the handle



Packless Steam and Water Valve

and has double protection against leakage by the packless washer. It has a graduated device by which the desired valve opening may be quickly adjusted. The accompanying illustrations give sectional views of these valves.

UNIVERSAL CAR SEAT.

The new pressed steel Universal car seat made by the Heywood Brothers & Wakefield Company, Wakefield, Mass., is in use on both steam and electric railways. These seats are made entirely of wrought or malleable iron, pressed and dropped forged steel, no cast iron being employed in their construction; this tends to decrease injury from rough handling. They may be adapted to almost every service.

SARCO FOR REFRIGERATOR CARS.

Sarco, made by the Standard Asphalt & Rubber Company, Chicago, for refrigerator cars, is claimed to fill the following requirements for such a product, which are: It must be tasteless and odorless so that it may impart no taint or odor to the most delicate of the commodities carried; it must remain elastic under all variations of temperature, and adhere to the flashings and not crack or run; it must not be dissolved by liquids, gases or chemicals that are liable to be given off by the material carried; and it must not become dry and hard so that it will crack from vibration or age. With a poor grade of sealing, the transportation cost increases on account of the additional ice required and the deterioration of the products carried. The cost of re-icing a car once is claimed to pay the difference between a good seal and a poor one.

NEW STEEL FOUNDRY.

A foundry recently built at the Indiana Harbor plant of the American Steel Foundries, Chicago, is devoted entirely to making steel castings for freight cars. At the present time many designers of railway equipment specify steel castings for purposes where strength is required and at the same time light construction desired. Just as steel castings are being used more and more in locomotive and tender underground construction, in the same way their use is increasing in freight car construction, they being used for striking plates, corner plates, filler castings, draft sills and other parts requiring rigidity and ability to withstand shocks and strains incident to the present-day train service. As castings for this purpose are comparatively light in weight and are usually made in large quantities, they call for somewhat different foundry methods than is the case with the ordinary run of steel castings. This new foundry has modern molding machines and apparatus for the rapid and economical handling of castings. It contains an open-hearth furnace and a one-ton electric furnace for making very small or intricate castings which cannot always be made of satisfactory quality by the open-hearth process.



Foundry for the American Steel Foundries at Indiana Harbor, Ind.

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THE New Jersey Public Utilities Commission finds that the derailment at Martin's Creek, April 29, was due to insecure track, but its report, printed in another column, does not cite the evidence on which the finding is based, or even name the witnesses who gave the evidence. The Pennsylvania Railroad appointed two committees, and the view of one of these committees is adopted by the commission; Mr. McKelvey, inspector for the commission holds this same opinion, and his opinion is endorsed, but nothing is said as to how soon he reached the scene of the accident; and an "outside expert," not named, also thinks the trouble was with the track, though he did not reach the spot until three days afterward. Thus we have a report which, very likely, is a fine example of Dutch justice, but which lacks a main element of simple fairness. As the rails, ties and ballast were seriously disturbed by the derailed cars, and as, apparently, the persons whose opinions are relied on by the commission, did not see the track until hours or days after the accident—and after there had been time to do any amount of tamping—the main facts in which the public is interested are conspicuous by their absence. Trains running at moderate speed had passed over the track in safety. The difference between a track safe for only 30 miles an hour and one safe for 50 miles an hour is too delicate a question to be settled by any but careful and detailed testimony. On the question of the fire the commission finds that the acetylene tank (car 100) had been punctured, and that the Pintsch gas also contributed to the fire by reason of the pipes of the Pintsch tanks having been broken. The track having been insecure, a flagman should have been sent out. As the report says nothing to the contrary, we assume that the foreman thought the track secure, which explains his neglect to flag. The statement that an officer of the Pennsylvania holds flagging unnecessary must be a piece of carelessness on the part of either the officer or the commission, for no officer in his senses thus stultifies himself. Trains must be warned in the case of any work on the roadway that makes the track unsafe for regular speed. This is the universal rule. Nothing is said in this case about excessive speed, so that no blame attaches to the engineman.

THE state of New York proposes to establish a farm and industrial colony for tramps, a bill for that purpose being now before the legislature. The state already owns large tracts of land, and it is proposed to pick out a place where a farm of 500 acres can be established. One of the promoters of the bill says that a reformatory institution of this kind would result in a saving of money for the state, about $2,000,000 being expended yearly for the maintenance of institutions for the confinement of tramps. The proposition is favored by Dr. Bailey, director of the state agricultural college. Why should not every state take action in this direction? State action, as distinguished from town and city action is a crying need. The efforts of the railways toward suppressing the tramp evil, which have been noticed frequently in these columns, make very slow progress. The action of railway officers almost always meets apathy if not opposition among local magistrates. From the *Utica* (N. Y.) *Observer* of a recent date we take the following:

"These two men were chased off a passenger train in Albany by an officer last night. They ran around the train, climbed aboard on the opposite side and came through to Utica without paying any fare."

Judge O'Connor's eyes brightened with happy recollections. "They showed pluck and perseverance," said the judge. "I like that kind of spirit. I remember that I was kicked off a train six times by railroad detectives in Chicago when I was broke in that city one time." One of the men was a plumber.

"Well, a plumber ought not to be broke so he will have to steal rides," said Judge O'Connor. "A plumber is like a burglar—if he can get three or four good jobs a year he doesn't have to work the rest of the time."

"I'm looking for those jobs now," said the man.

"You deserve a show, then," said the judge. Both men received suspended sentences.

From another town on the same railway a similar report recently came, the judge frankly avowing the old feeling, that any measure is justifiable which will evade expense and throw the burden on another town or county. That railways and telephones have obliterated local boundaries, making the whole world a small place, is an idea which, in orations and philosophical essays, is now generally accepted; but in actual practice, as in this matter of jurisdiction over petty crimes, we are still following the theories of a century ago. When it is plain that a tramp can commit an offense against society in a dozen different towns within a period of two hours, it is clear that something more effective than our minutely subdivided municipal machinery is needed to deal with the problem.

MUCH credit is due those in charge of the development of the freight station of the Missouri, Kansas & Texas at St. Louis (described in another column) for the very progressive step taken. While this country has been a leader in the installation of labor saving devices generally, such installations have been conspicuously wanting in railway freight stations.

The handling of the l. c. l. freight has undergone very little change during many years, although the cost has been increasing. Instead of following the beaten path in freight house layout, this station was designed in an entirely new way and the details were worked out with practically no precedent to follow. The design and construction show the results of a very careful study and mark an epoch in railway freight house building. The operation of the station will be very closely watched by railway men, and it is gratifying to learn that the results so far have far exceeded the expectation of the designers. Not enough freight has yet been offered to enable the plant to be run to its capacity, which is necessary to enable the greatest economy to be secured. The conditions existing at freight stations in general are far from satisfactory. They are almost uniformly congested and worked beyond their economical capacity, and the construction of additions is put off as long as possible because it means a heavily increased expense both in first cost, for additional land and buildings, and in operation, the cost of trucking increasing very fast with increase in floor area. The present expense of handling package freight is out of all proportion to the cost of handling other kinds, and it is in the handling of it that the greatest proportionate saving in the expense of freight transportation can be effected. The cost of terminal handling may be divided between the fixed charges, or the investment in land and plant, and the operating expenses, consisting principally of labor. Both these classes can be materially reduced by a mechanical handling system. With such equipment, the ground area required can be reduced in several ways as is illustrated by the case of the St. Louis station. Here the unloading platforms and driveways are on the upper floor, while the cars are on the lower, whereas in a one floor house they must, of course, be on one level. Again, the entire platform area on the upper floor, except the hatchway area, can be used for the storage of freight, as it is not necessary to keep open any runways for the truckers. All packages are elevated and carried over the freight on the floor without interference. The storage capacity is also greatly increased, for packages can be stacked higher and much more readily by machinery than by hand. The second, or labor expense will be greatly reduced because of the greater loads carried and because of the greater speeds possible. One telpher load averages as much as about four truck loads, and not only are the telpher loads so much larger, but many more may be handled in a given time.

IF the state railway commission of Mississippi has done anything to enhance the safety of railway travel, or of the work of railway employees in that state; or has in any respect improved the quality of the service rendered to the people by the railways, somebody ought to lay the fact before the public; for the commission itself (or whoever is working for it) seems to be able to think of nothing creditable to the board except its rate reductions and other blood-letting operations. This we gather from an account which appears in the *New Orleans Picayune*, wherein it is said that:

> The Mississippi Railroad Commission, during three and a half years last past, with the late Frank M. Lee as its president, has accomplished among other things, the following:
>
> Thirty-five per cent. reduction on crossties; 50 per cent. reduction on alfalfa and feed products grown at home; 60 per cent. reduction on peanut rate to the mills; rate on drain tiles reduced 25 per cent., which was most important to farmers; joint rates on long distance telephone messages reduced 25 per cent.; rates on petroleum reduced from third to sixth class; rates on grain and hay and milling in transit reduced; rate on cotton to Gulfport placed on parity with that to New Orleans, estimated to be worth millions to Mississippi; assessments on railway property materially increased, aggregating over $5,000,000. * * * Under the circumstances it is not unnatural that each member of the commission should seek re-election. * * *

Were the rates on alfalfa, tiles, grain, petroleum, etc., so exorbitant as to justify the imposition on other commodities of the burdens which would be transferred to them by these great reductions on the commodities named? Since Thomas M. Cooley, in 1887, reached the conclusion that the function of the Interstate Commerce Commission was to *get justice from* the railways rather than to dispense justice without regard to what interests might be affected, evidences of the spirit of "the square deal" in state commission decisions have been faint and scattering. The glittering generalities that have been so profusely scattered about by our great apostle of the square deal seem thus far to have had an effect, in railway regulation, quite similar to that of Mrs. Partington's broom with which she swept back the ocean. Assuming that the Mississippi Commission has been thoroughly independent and just in all things, it would greatly enhance the force of its statement to its masters, the voters (who are assumed, apparently, to desire nothing but to "beat" the railways) if the other side of the question were at least mentioned. Did the railways make any of those reductions willingly? If not, did they fail, after being allowed a fair chance, to justify the higher rates? Had their tax assessments been lower, proportionately, than those on property owned by others? A judicial body should be judicial even when it condemns a robber; and a judicial spirit is appropriate and praiseworthy not only on the bench, but in the issuance of press notices.

COLLEGE MEN AND RAILWAY WORK.

IN the class of 1911 just graduated at Yale College out of 308 men in the class 3, or less than 1 per cent., have chosen transportation as their life work. This is the "culture" department at Yale where it would perhaps be reasoned that a particular branch of business would not draw the new-fledged graduate. But Yale has her large scientific school, too, with its several branches of engineering. The returns for the living graduates of that branch show that less than 2 per cent., or 76 out of 4,019, are in the transportation business. Taking again the whole number of living Yale graduates of all departments numbering 14,806 and 200, or about 1.3 per cent., are all that are engaged in transportation. The returns for Yale are doubtless in a general way typical of those of most of the other American universities, certainly those of the Eastern States; and of the "transportation" group of graduates only a part are in the railway business. The generalization, therefore, seems to hold that the railway as a vocation does not attract the college man. Qualifying facts should, of course, be allowed for in the returns. Thus a civil or mechanical engineer, though working habitually on a railway line, returns himself probably as an engineer, and the same holds in a minor sense of other vocations allied with the railway. But the statement that the railway is in its vocational attractions non-academic still rings true.

The fact seems the more singular in view of some conditions that, on their face, ought to make the railway service and the college graduate congruous. Railway operation is closely joined to business in a broad sense—certainly is not in a technical sense professional. On its financial side it approaches the business idea still closer; and even the railway shops have a certain analogy to the factory. Now recent returns of vocations of young college men show a very different trend toward business. In one or two of our New England colleges which have only "culture" departments nearly 50 per cent. of recent graduating classes have chosen business as an occupation. The drift toward business has been variously accounted for, with the overstocking of some professions and a certain material and get-rich-quick tendency of the times cited as the leading forces. But whatever the cause one would infer that in the drift to concrete things of the college men the railway would have had a larger share. So, too, with the picturesque attractions of the railway service, its breadth, its variety, its large magnitudes, the fascination of such features as great locomotives and fast train service. These one would suppose to be alluring to the more or less imaginative average college man. So, too, in the social contacts of the railway service both internal and with the traveling public. The college is supposed to teach good manners; and certainly they are in these days no disqualification in the railway office.

Why, in the face of such natural magnetisms, so few college men choose the railway service is not easy to find out. But one can note some, at least, of the superficial causes. In a large number of the branches of the service there are certain fiscal

limitations. The various trainmen, with the conductor at the head, and the groups represented by engineers and firemen are highly paid at the top measured by the mechanical standard, but ill paid when measured by the standard of academic ambition. Business is apt to hold out higher ultimates, if not greater immediate rewards. Again, the theory of the railway service, more than perhaps any other, rests upon the idea of beginning at the bottom and the survival for promotion of the fittest after a struggle apt to be pretty long and stressful. Favoritism, on the whole, prevails in the service less than in almost any other calling, and even favoritism must face usually its responsibilities. It is a great vocation for trying out good men, but the tryout is protracted and arduous, save in some few lucky cases, and makes its beginnings low down. It begets the natural fear of the college neophyte that in the service, unless backed by some power higher up, he will become "rutted." Finally, there is presumptively in the eye of the college man, who otherwise would be willing to begin low down, the influence of the unions with their enforced equations of pay and resistance to the principle of individual efficiency. It affects other concrete vocations as well as the railways.

It will be interesting to watch, as time goes on, to see how far these resistances which, on the face of the statistics seem to be excluding college men from the railway service weaken or wax. The change, if it comes, however, is much more likely to be receptive to the college man than resistive. The railway, like other vocations of a "business" quality analogous to it, has a distinct call for his energies diverted from the athletic field, for his enthusiasms and for his high average standard of integrity and honor—without which the best academic mental training goes for nothing. It is just possible, too, that in the comparatively recent trend of the young college graduate toward business and affairs, and away from the professions, his first glance has been toward the foremost of them—mercantile life. In his secondary vision hereafter the attractions of the railway may fill a larger angle.

NEW BOOKS.

Engineering Education. Proceedings of the eighteenth annual meeting of the Society for the Promotion of Engineering Education. Edited by Arthur N. Talbot, Henry S. Munroe, and Henry H. Norris. Published by The New Era Printing Co., Lancaster, Pa. 450 pages, 5¾ in. x 8¾ in. Cloth. H. H. Norris, Secretary, Ithaca, N. Y.

This book is the secretary's report of the minutes, papers and discussions of the meeting held at the University of Wisconsin, Madison, Wis., June 23, 24 and 25, 1910. There were numerous papers presented, including the following: Efficiency in Engineering Education by Prof. Henry. S. Munroe, Columbia University; Engineering Education in Germany, by Frank Koester, consulting engineer, New York; Inspection Trips, by Prof. Wm. T. Magruder, Ohio State University; Co-operative Work for the Wisconsin Railroad and Tax Commissions, by Prof. W. D. Pence, Prof. John G. D. Mack, and Prof. C. F. Burgess, University of Wisconsin; and Notes on the Co-operative System, by Herman Schneider, Dean of the Engineering College, University of Cincinnati.

The paper on Efficiency in Engineering Education is followed by a symposium of 100 pages on the same subject, in which many of the leading educators took an active part. George F. Swain, professor of civil engineering, Harvard University, criticized the college lecture system as a serious evil, maintaining that a text-book in the hands of the student with instructions as to how to study it was far more valuable. He strongly advocated a course in logic for the engineering student, and considers that Union College, by adding this course to its curriculum, has placed itself in the lead among our engineering schools.

Professor Schneider said that the list of applicants to the co-operative engineering courses at Cincinnati had grown and improved in quality so that even though the requirements for admission have constantly increased, the loss of students during the summer trial period has decreased from 40 per cent. in the first year to 8.1 in the last.

Letters to the Editor.

THE SUPERINTENDENT WHO IS ON TO HIS JOB.

Montana, Wyoming & Southern Railroad Company.
Belfry, Montana, June 12, 1911.

To the Editor of the Railway Age Gazette:

Referring to the communication from Mr. Fritch in your issue of May 26, page 1193, under the caption "Inventory of Labor on Railways," I cannot agree with Mr. Fritch as to his proposed new department—a general "Smelling Committee," as such committees are commonly termed.

The communication states that little attention is paid to the matter of taking an inventory of labor. This is probably a fact in some remote instance; but I know from past experience on very heavy divisions, that the labor question was one of my most ardent and continuous duties, and it is a fact with every division superintendent, who is on to his job. The fluctuating traffic of all through lines absolutely requires constant activity on the part of the division superintendent, if the system is not departmental. The superintendent is, or should be, competent to economically operate his division and keep up with the various changes that constantly occur. The fact of a committee investigating him from time to time is at the least distasteful and not conducive to good organization. Every time the committee would make a trip, the "stove committee," which is permanent on all railways, would infer that there was something lacking in the old man's management. My experience also indicates that a wide-awake general superintendent or general manager is a successful taker of "labor inventories." He is competent, or should be, to make any necessary corrections and report to the president.

Mr. Fritch might think a minute, and I believe he will agree with me that the present executive head of his road *can* and *does* digest a "labor inventory" (payroll) as quickly and thoroughly as anyone he has come in contact with.

The communication further states, "The formation of such a department need not necessarily infringe upon any other department. . . . Departments of railways are so busy with their own affairs that there is not sufficient time to properly go into the merits of every expenditure to determine whether it is proper or extravagant." Such a committee would certainly infringe, and in fact, I believe would cause discord in the entire organization from the general manager down. I cannot imagine anything else, when to justify the new department, or in other words, have some people *think* they are earning their salary, they must do something. They must ignore the judgment of the general manager or general superintendent and his division people by disagreeing or condemning their judgment on something or other. I believe this would be infringement; yes, more than infringement; it would be conflict.

Proper organization holds the division superintendent responsible to his superior officers for all expenditures; hence he must not be too busy to supervise all important matters as well as minor details. He has his staff of trainmasters, master mechanics, division engineers and others always on the alert. When it comes to large expenditures, new work and the like, it is frequently necessary to provide him with additional assistance; and he dispenses with this assistance, as soon as the work is complete, without the advice of a committee. This would also apply to employees in train, station or other service.

M. W. Maguire,
General Manager.

The German Government Railway management is experimenting with the electrical operation of freight and passenger trains in the Bitterfeld district of the Prussian province of Saxony. About 16 miles are now in operation. When completed the line will be 96 miles long and will form part of a through route between Magdeburg and Halle.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

V.

Tucson, Arizona, May 6, 1911.

My Dear Boy:—I have had a good deal to say to you at one time and another about chief clerks and the chief clerk system. From actual experience as a chief clerk I know that it is a trying position. It is because the railway chief clerks of the country are as a class such a splendid body of men that I am trying to do what I can to help them. Too many times a chief clerk misses promotion because he is such a valuable man that he has to stand still to break in all the new bosses who come along and leave him in the side track.

The chief clerk system as we know it today cannot long survive because it is too feudal in conception to reflect the spirit of a progressive age. We need a chief clerk to be a head clerk, a senior clerk, a foreman of the office forces, as it were. Much of the time on American railways the chief clerk is in effect an acting official, acting trainmaster, acting superintendent, acting general manager, acting vice-president, and even acting president. As such he signs the name of his boss, the theory being that the latter, like a feudal baron or a king, is omnipresent within his own dominions. Not only does this outgrown conception violate the fundamental laws of matter; it often borders upon a breach of honor, integrity and good faith. Legal fictions are fast giving place to the law of common sense. Railway officials should not risk arraignment before the bar of public opinion for such indefensible practices.

When the chief clerk does business in the name of some one else the effect is dwarfing to all concerned. We do not get the effect of either one or two men, but that of a fraction of both. Again, the chief clerk is handling important correspondence with officials below of higher rank than himself, of greater compensation, and presumably of wider experience. Human nature is such that sooner or later the chief clerk, a junior, is telling an official, a senior, where to head in. Among the hundreds of railway officials with whom it is my proud privilege to claim acquaintance, I have found nearly every one flattering himself, "My chief clerk never makes such breaks." To avoid awkward and embarrassing silences, I am learning to discontinue the acid test, "How about your boss's chief clerk?" So widespread a belief indicates a generic trait of human nature rather than a sporadic condition. Organization as a science seeks by proper checks and balances to minimize such amiable failings of human nature. Organized society preserves the effectiveness and dignity of its courts by allowing only a duly qualified judge to administer justice. The old clerk of the court may really know more law than the young judge, but only the latter can sit on the bench and decide causes. The lay reader must be duly ordained before exercising the full functions of a minister. The man who uses another's autograph signature in the banking business becomes a malefactor. Are we so different in the large corporations that we can with impunity ignore such safeguards?

The chief clerk system had its origin when railways were small and officials were few. On a division, for example, the superintendent was perhaps the only official and by common acceptance his clerk was really the next in rank. When a small tradesman or a small farmer goes away for a day his wife and boy may do the work without any one knowing the difference. In a larger enterprise there has to be an understudy in charge when the head is away.

You may have noticed that I use the word "rank" considerably. Rank is a practical necessity for the proper enforcement of authority. Rank makes its appearance as soon as society organizes for its own protection. Rank may be local, limited, changing and temporary as contra-distinguished from general, extensive, hereditary, or permanent, but it is rank just the same. The purest democracies clothe their chosen leaders with temporary rank. Before misconstruing the poetic aphorism of Robert Burns, "rank is but the guinea's stamp," remember that the guinea is only fluctuating bullion until the stamp or authority of government can be invoked.

Let me now enunciate a principle, which is this: "In modern organization the chief clerk as we now know him has no place. When the stage is reached that such a chief clerk seems to be needed, there should be another assistant this or that." Mind you I do not say assistant *to*, because that little word "to" may give a sent-for-and-couldn't-come appearance. Nearly every week you notice the announcement of the appointment of an old chief clerk to the position of assistant *to* somebody. This is encouraging, since it permits him to do business in his own name. It also shows that railway officials are waking up to the distinct limitations of the chief clerk system. The discouraging feature is the failure to profit by centuries of experience of such well-handled activities as the navy and the merchant marine. At sea the executive officer ranks next below the captain, and is in effect, though not in name, the latter's chief of staff. The captain's clerk or the purser cannot hope to become executive officer and then captain without getting outside and working up through the deck. When railway executives and directors become better students of organization, the science of human nature, their stockholders will pay for fewer unnecessary experiments. One railway will profit by the discoveries and mistakes of another, as to bridges and equipment, but rarely as to organization and methods.

The United States Army, copied largely from the English, has the assistant *to* system, calling such officer the adjutant. The rank of the adjutant has been raised to captain, or rather the grade from which the colonel can select his adjutant, has been elevated to that of captain. The adjutant has thus gained and many military men hope that he will eventually be the lieutenant-colonel and as in the navy, be the executive officer, and in effect, chief of staff for the colonel. Since no officer of the army or navy permits another to sign his name the adjutant uses his own autograph signature but preceded by the phrase, "By order of Colonel Blank"; objectionable because it is sometimes a legal fiction. The adjutant system in the army works better than the assistant *to* system on the railways, because the adjutant is relatively better trained for his position. Not only does the adjutant know office work, but he has learned practically to perform every duty required of non-commissioned officers and private soldiers. Very few assistants *to* could run a train, switch cars, handle a locomotive, or pick up a wreck. This is why soldiers and sailors have more faith in the ability of their officers than railway employees have in that of their officials. He who would be called Thor must first wield Thor's battle axe. We should office from the railway rather than railway from the office.

Since these things are so, as runs the old Latin phrase, I would recruit my office assistant from the road, from the head of a so-called department, from an official who has gained a face-to-face experience in handling men. The old chief clerk is the first man I would consider for appointment as one of my junior assistants. I would so assign him that he would get outside experience. Sunburn and redness of blood sometimes go together. For the pink tea contact of the telephone, for the absent treatment of the typewriter, I would ask him for a while to substitute the strong coffee of the caboose and the surprise test of the through freight. Office railroading has its origin in the mistaken theory of overspecialization, that office work is a highly-segregated specialty beyond the ken of the average man. The world advances and as education becomes more general, as tenure is made more permanent, and employment more attractive, we can impose increased requirements. Suppose that it all could be so worked out that a generation hence no man would expect to be a railway clerk until he had served some such outside apprenticeship as trackman, brake-

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man, switchman, or fireman, etc. This would mean that in an organization like the post office department every clerk in the department in Washington would have been graduated from some such outside position as letter carrier, railway mail clerk, country postmaster, rural free delivery carrier, etc. Every clerk in the war department would be a soldier and every clerk in the navy department a sailor. Then the papers that the clerk handled would have a living meaning for him. His action would be more intelligent. Pardon me a moment while I shake hands with the highly-conventional gentleman who is approaching—Mr. Cant B. Dunn. No introduction is necessary. We have met all over the United States, in Canada and in Mexico. We usually differ, but never quarrel, because each is so necessary to the other.

Sure, my boy, all these things can't be done right away quick, or before the Interstate Commerce Commission again asks for increased authority and larger appropriations. I do not expect to live to see the consummation, but hope that you may. I do expect to survive long enough to see a good start made along such rational lines of elasticity. Because we cannot accomplish it all at once is no reason for not making an intelligent beginning. If a compromise with principle is ever advanced its advocates should be prepared to pay the ultimate cost. Those questions on which the Federal constitution compromised required the expensive settlement of civil war. Otherwise the constitution has been elastic enough to cover nearly fifty states as fully as the original thirteen. It is even strong enough to withstand the latest political fallacy, the recall of the judiciary, as solemnly proposed out here in fascinating Arizona.

Remember always, my boy, that although the good old days have completed their runs, there are better days arriving and still on the road; that beyond the terminal of the vanishing point of the perspective, the best days are coming special because no railway time table is big enough to give them running rights.

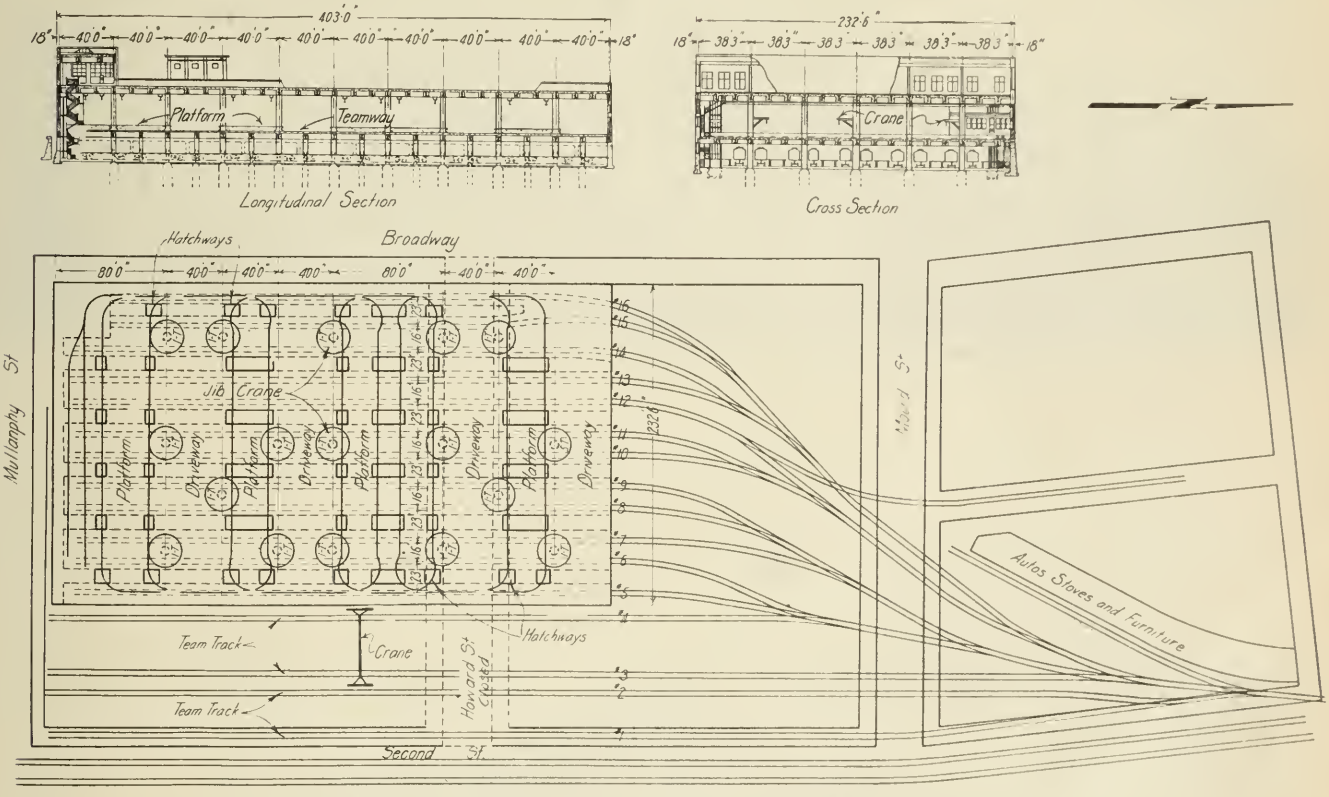
Affectionately your own

D. A. D.

M., K. & T. FREIGHT HOUSE AT ST. LOUIS.

The Missouri, Kansas & Texas has just completed the construction of a large freight terminal at St. Louis, which is attracting much attention, because of the adoption of a comprehensive telpherage system for handling the freight. This is the first installation of the kind in the country for handling this class of freight from the wagon to the car, and with the exception of that at the Baltimore & Ohio pier at Baltimore, Md., it is the first telpherage system to be installed for handling freight at a railway freight terminal.

This freight house is located on the east side of Broadway, between Mullanphey and Mound streets, and is 403 ft. long by 232 ft 6 in. wide. The building consists of the basement, or track level, and the first floor or driveway level, while a third floor has been built across the two south bays the entire width of the building for office purposes. A temporary roof of wood covered with a composition roofing, has been put on until the rest of the third and fourth floors are put up, the building being designed for these additional floors. The framework of the building is of steel, with reinforced concrete floors, brick exterior walls and Fenestra steel window sashes.



Missouri, Kansas & Texas Freight House, General Plan.

The fact that this freight house is situated on a side hill, with tracks (on the east side) on the level of the basement floor, and with Broadway on a level with the second floor level, was of advantage in the design of the terminal; but this is practically the only difference between the natural conditions existing at this and other freight houses. Being near the center of the city, and the value of the ground being high, it was important to restrict the area as much as possible; and it was decided to install modern labor-saving devices. For these reasons the telpherage system for handling freight was decided on.

The basement, or track level floor, is given over entirely to track and intermediate platforms. Twelve tracks are provided, which enter the north end of the building, and are stubbed at the south end. They are arranged in pairs, spaced 16 ft. center

to center of adjacent tracks, and 23 ft. between pairs with a platform between. The two east tracks are planned for inbound freight, while the other 10 are used for outbound. The total car capacity within the building is 117 cars. In addition, there are three tracks east of, and parallel to, the house with a capacity of 60 cars to provide for team track freight. An overhead crane of 12 tons capacity traveling the length of the building, inside where the men and goods are protected from the weather. The driveways are all paved with creosoted wooden blocks to reduce the noise to a minimum. The freight is received and sorted on two platforms 42 ft. by 217 ft. long, and two 82 ft. by 232 ft. long.

Seventeen jib cranes are installed, three of which are of 5-tons capacity, and 14 of one ton capacity, to lift heavy articles



New Freight House of the Missouri, Kansas & Texas at St. Louis; Broadway Side.

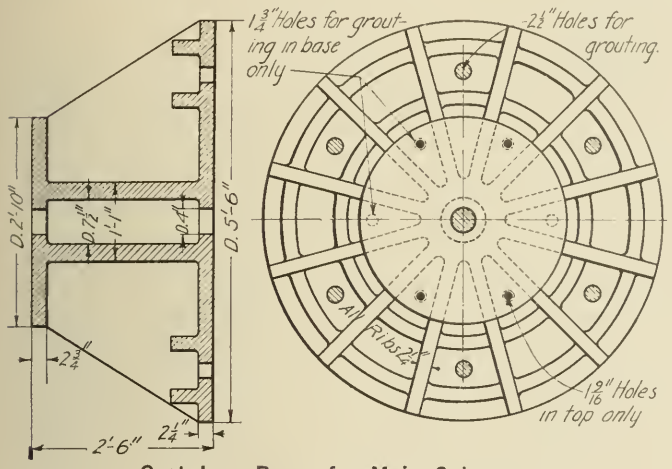
extends over the two tracks next to the house, serving 20 cars. On the second, or Broadway level, four driveways are provided, each 38 ft. in width, which are entered directly from the street on a level grade. Raised platforms are built between these driveways, providing 1,600 ft. of wharfage along which the wagons may stop and unload. No provision is made for unloading or handling freight outside the building, all this work being done from the wagons to the scales and then to the telpher trucks. Twenty Winter-Coleman automatic scales have been installed. Most of the freight from wagons passes over these scales and is weighed before being picked up by the telphers. After the freight is weighed the telpher picks up the truck and lowers it through one of the 57 hatchways to the large platform below. It is possible to drop this truck beside any one of the 117 cars,



Missouri, Kansas & Texas Freight House, St. Louis; Track Side.

when the truck can be pushed into the car and turned within it.

For inbound freight the operation is reversed. The truck is loaded in the car, wheeled out on the platform, lifted up through the hatchway by the telpher and deposited on the upper platform. Eleven of these hatchways extend under two telpher tracks, so that articles too long to be handled through the small hatchways can be lifted jointly by two machines on parallel tracks. Pneumatic tubes are installed at several points within the house to convey bills and slips to the billing office on the third floor. The arrangement of the tracks and platforms on the lower level and of the platforms, hatchways, driveways and monorail crane runways, are illustrated herewith. The machinery for this freight handling system includes 18 electric telphers or monorail cranes,



Cast Iron Bases for Main Columns.

12 runway switches, runway conductor, grapples and flatboards or trucks in addition to the 17 jib cranes mentioned above. Sixteen of the monorail cranes have a rated capacity of two tons, and two a capacity of 6 tons at 60 ft. per minute, the height of lift being about 30 ft. Two drums are mounted on the same shaft, and two hooks are employed, this arrangement being adopted in connection with the grapples described below to prevent excessive swinging or twisting of the load. Each of the two trolleys is of the 4-wheel type and is equipped with a motor geared to give a traversing speed of 500 ft. per minute. The gears are enclosed wherever practicable to reduce the noise. The trolley motors are provided with magnetic brakes and the hoisting motor with magnetic and load brakes. The cranes are operated from a cage hung at one end and below the main body of the machine in which are located the controllers and the control resistances, one controller for the hoist motor and one for the two trolley motors. Two switch control levers on opposite sides of the cage, and equipped at one end with contact shoes, enable the switch control and runway conductors to be energized and the switch thrown to the right or left as desired.

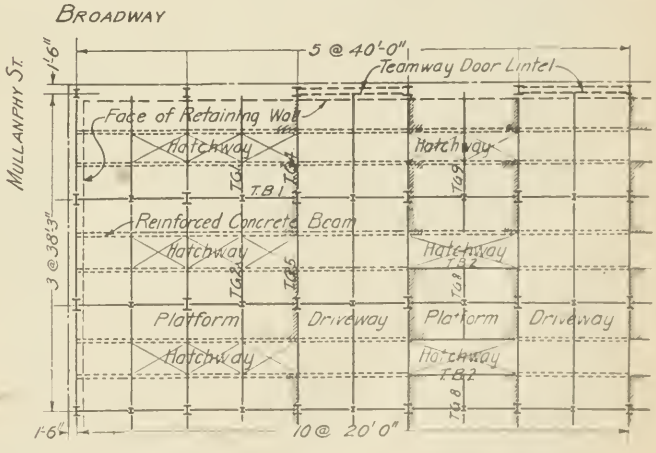
The runway consists of over 2,700 ft. of 18-in. 55-lb. I-beam, exclusive of switches. To the upper surface of each half of the lower flange, but separated from it by a wooden filler tapered so as to give a horizontal seat, a 20-lb. T-rail is bolted, these rails forming the running rail for the cranes. In addition to providing a horizontal seat for the rail, the wooden filler greatly reduces the noise of operation.

The switches are motor operated and controlled from the monorail cranes by means of the levers previously referred to. They are of two types, having two or three tongues or arms, respectively, depending on the number of runway branches to be connected. The tongues consist of 18-in. 55-lb. I-beams angularly located with respect to each other. The upper flanges are rigidly framed together and the whole structure is arranged to move at right angles to the runway. The three-tongue switch thus enables connection to be made from either of two branches on one side of the switch to either of two branches on the other side. The motion of the switch is obtained through the medium of a motor-operated screw passing through a nut secured to the switch framing, the motor being connected through a controller to the switch control runway conductors. The present arrangements provide for all the cranes to be run in the same direction.

The switch control runway conductors and the main positive conductor supplying current for operating the cranes and switches consist of lengths of angle iron spliced together and hung from insulators attached to straps clamped to the upper flange of the runway beam. The negative crane supply is the grounded runway beam itself. The positive conductor is interrupted at the switches and the gap bridged by the two shoes with which each crane is equipped, so that there is no interruption in the current supply. Each of the switch control conductors connected to a switch corresponds to a given position of the switch and the energizing of the conductor causes the switch to take this position. The switch continues to move as long as the control lever shoe is in contact with the conductor, or until the switch reaches the proper position. When this occurs an indication is given by a lamp located at the far end of the conductor. The length of the switch control conductors is such that the switch is enabled to move between its extreme positions before the crane reaches it.

The 17 jib cranes are each equipped with one motor for hoisting, the rotating and trolley motions being made by hand. The height of the runway is such that the monorails, with suspended flatboards, have ample clearance in passing over these cranes. The one-ton cranes have a hoisting speed of 15 ft. per minute, and the five-ton cranes of 21 ft per minute.

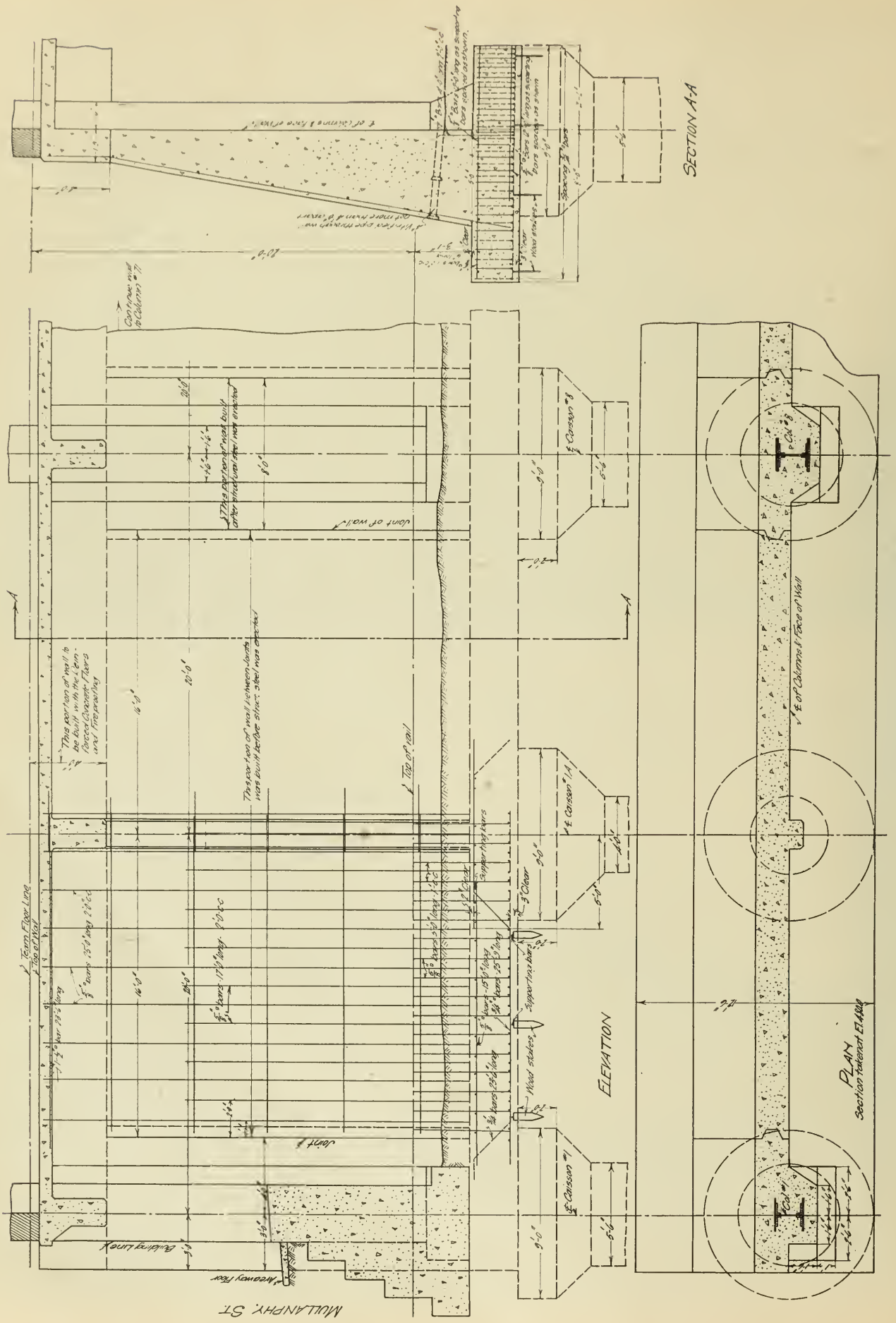
The flatboards, or trucks, into which the freight is loaded to be picked up by the monorail cranes, are made of steel, and are 6 ft. 6 in. long and 4 ft. wide. The truck platform is about 10 in. above the floor level and rests upon two wheels placed underneath at the centers of the two sides. Castors are provided at the end, enabling the truck to be turned readily. Pockets for stakes are placed along the side, giving the truck a capacity of about 110 cu. ft. The trucks are designed to bear a weight corresponding to the capacity of the monorail cranes.



Quarter Plan of First Floor Steel Framing.

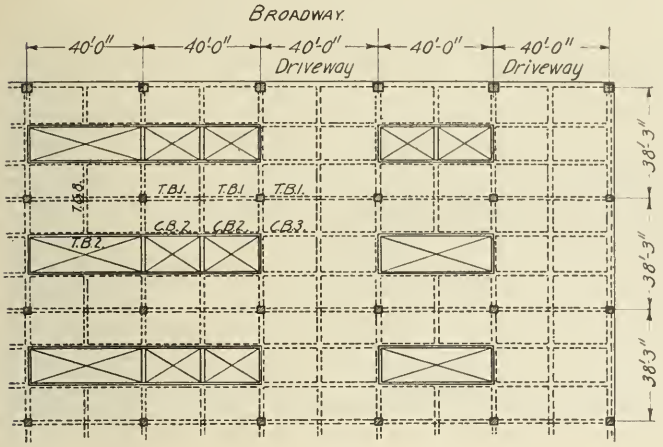
They are picked up by means of grapples, which engage with pins at the sides and near the ends of the truck platforms. These grapples are arranged to disengage automatically when the truck is deposited upon the floor. Under the terms of the contract this machinery is guaranteed to move 1,000,000 lbs. of freight in five hours from where it is dumped by the wagons on the platforms on the upper floor to points directly in front of the car doors on the car level platforms.

Some unusual structural features resulted from the exceptionally large panels required to accommodate freight cars and intermediate loading platforms in the basement, and provide generous spans and headroom in the first story in which to operate the electric telphers. The story heights are: basement (track


SECTION A-A
ELEVATION
PLAN
Retaining Wall, Broadway Side.
McLANAHY ST.
Joint
Wood stakes
Top of wall
Joint of wall
Existing Line
Footway floor
Town Floor Line
Top of Wall
Section taken at El. 45.0
Wall stakes
Joint
Joint
Joint

level) to first floor (driveway level) 20 ft.; driveway level to second floor level 33 ft. 10 in.; second to third floor 21 ft.; and proposed third floor to low point of roof 20 ft. The column spacing across the building was fixed at 38 ft. 3 in. by the width required for two lines of freight cars and an intermediate platform 11 ft. 3 in. wide to each bay. The column spacing longitudinally was made 40 ft. to correspond to an ordinary car length. While the main columns are spaced 40 ft., this spacing is reduced below the first floor to 20 ft. by placing short columns in the basement only, so that the basement panels are 20 ft. x 38 ft. 3 in.

The first floor is carried on steel plate girders having a depth



Quarter Plan of First Floor Fire Proofing.

of 34¼ in. back to back of angles. The total depth of the first floor construction, including the creosoted wood block flooring of the driveways and the concrete fireproofing, is 4 ft. The platforms are 3 ft. 9 in. above the driveways, and also have a flooring of creosoted wood blocks laid on a 1 in. sand cushion on top of the concrete.

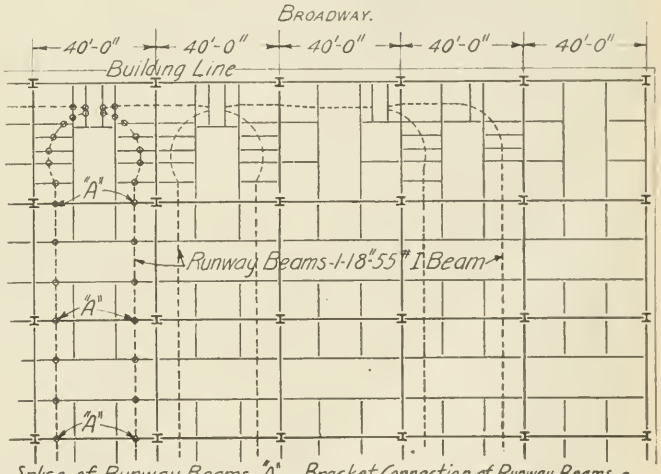
As all of the steel work was to be encased in concrete, it was practicable to substitute in the first floor 3,200 lineal feet of reinforced concrete beams of 20 ft. spans in place of steel plate girders, thereby effecting a large saving. The details of these concrete girders are referred to later.

The columns are supported on concrete piers carried to bed rock, which was found about 20 ft. below the basement level, or approximately 40 ft. below the street level. These piers are 6½ ft. in diameter for the main column and 4 ft. in diameter for the short columns.

The cast iron bases for the main columns are circular, having a height of 2 ft. 6 in., and a bearing surface on the concrete 5 ft. 6 in. in diameter. These castings weigh about 3½ tons each, and special provision was made in their design to insure a uniform bearing when set in place. A large hole was provided in the center of the top plate for grouting through, and a corresponding hole below it on the bottom plate. Twelve additional holes in two concentric rings were also provided in the bottom plate. The method for setting these castings was to support them temporarily on hard wood wedges in correct position and then after putting a clay dam around the bottom edge, pour cement grout through the large hole in the top of the casting, filling the large cylinder in the center and gaining thereby considerable hydraulic head to force the grout under the casting until it rose through the 12 holes provided in the base. In order to strengthen the base two concentric vertical ribs were cast, as shown.

A retaining wall 25 ft. high and over 400 ft. long was required along the Broadway side of the building. This is a reinforced concrete cantilever wall and is supported on concrete piers or caissons 20 ft. apart carried to bed rock, the tops of these piers being enlarged to 9 ft. in diameter. The base or footing of the wall is 12 ft. 6 in. wide, as shown. The main wall columns are embedded in this retaining wall 40 ft. apart and rest on castings directly on the fall footing above the piers. As the wall was started before the steel work was delivered, the plans provided that the wall should be built above its base in sections with joints near the columns, while the base of the wall, with its continuous steel bar reinforcement, was built continuously without joints. As no transverse bracing could be introduced in the building, it was of prime importance to design a retaining wall that would not move forward under earth pressure and bring thrust onto the steel work.

One-quarter plans each of the steel framing plan, of the fireproofing plan of the first floor, and the steel framing plan of the second floor are shown in three of the illustrations herewith. The full lines on the steel framing plan of the first floor indicate the structural steel girders and beams, and the dotted lines on this plan show the reinforced concrete beams. In the first floor, as has been mentioned, the panels are 20 ft. x 38 ft. 3 in., and steel plate girders are used for the 38 ft. 3 in. spans, and also to connect between the columns on the 20 ft. spans, but the intermediate 20 ft. beams are of reinforced concrete. As will be seen from the plan, provision was made for single and double hatchways, and an unusual feature was introduced in the framing plan where the double hatchways occur. The plate girders T. G. 8 are continuous over a supporting column at the center so that the top flanges of these girders are in tension. The girders T. B. 2 are therefore supported at their centers by the girders T. G. 8, thus reducing the spans of the girders T. B. 2 from 40 ft. to 20 ft. for dead load and for at least part of the live load. The design of the reinforced concrete girders is illustrated. Each flange in the structural steel beams T. B. 1 of 20 ft. spans consists of two angles 3½ in. x 3½ in. x 7/16 in., and one cover plate 8 in. x ⅜ in. The web plate is 30 in. x 5/16 in., while the net area of the flange is 6 sq. in. The area of the four reinforcing bars in the concrete girders is 4 sq. in., these girders being calculated for a moment equal to $WL^2 \div 12$, the reinforcing being continuous over the supports.



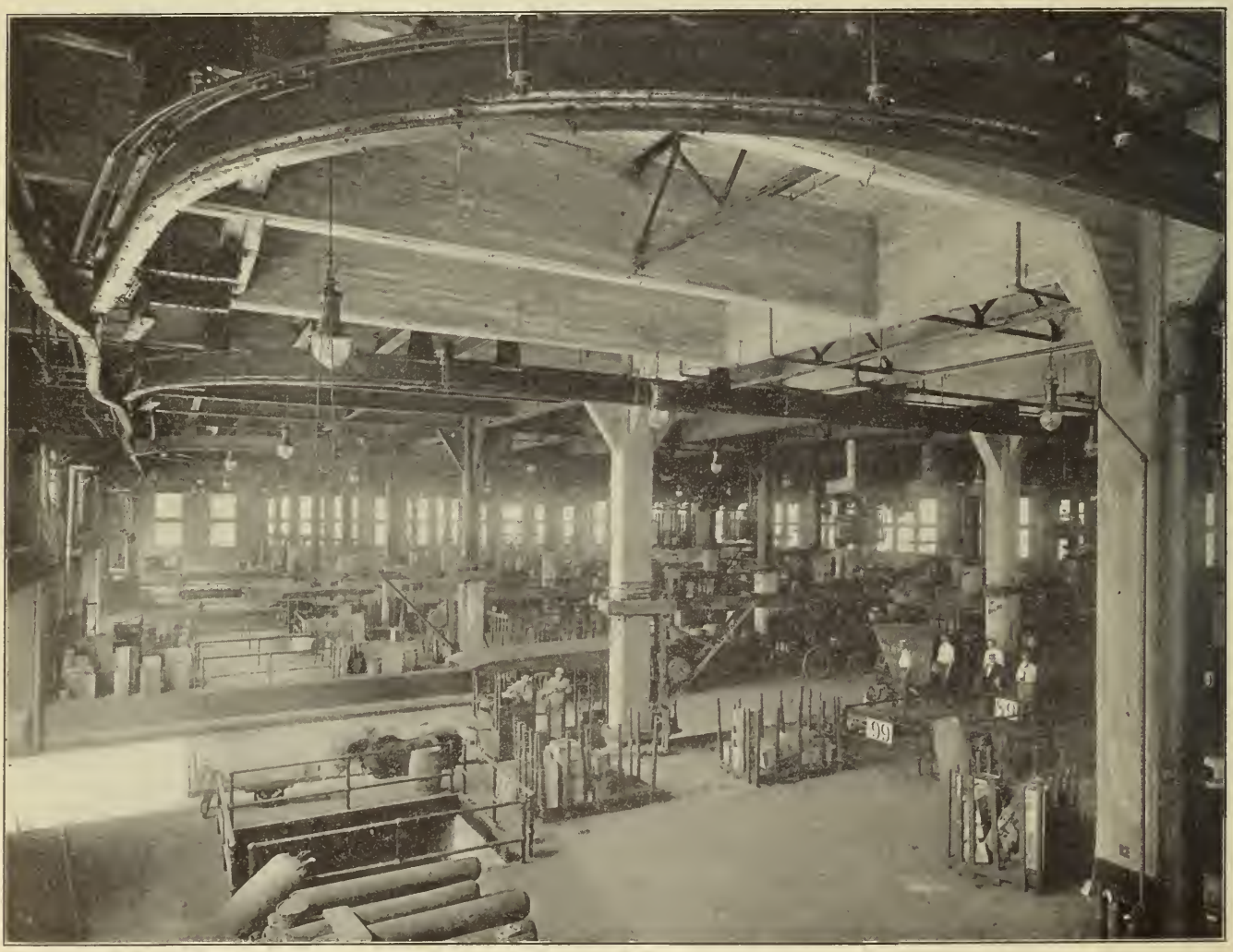
Quarter Plan of Second Floor Steel Framing.

It was originally intended that the first floor should all be on the same level as the driveways, and that the raised platforms should be of temporary construction, so that they could be readily changed in position or size, if experience showed it desirable to change them. After the plans were made and work had progressed, it was decided to raise the level of the concrete floor between driveways to the platform level. As the steel work was well advanced, no changes were made in it, but concrete walls were built on the girders where the floor was to be raised.

The main columns are 54 ft. 10 in. long, extending from the foundations to the level of the second floor, and were designed to be encased in concrete, which was depended upon to add to

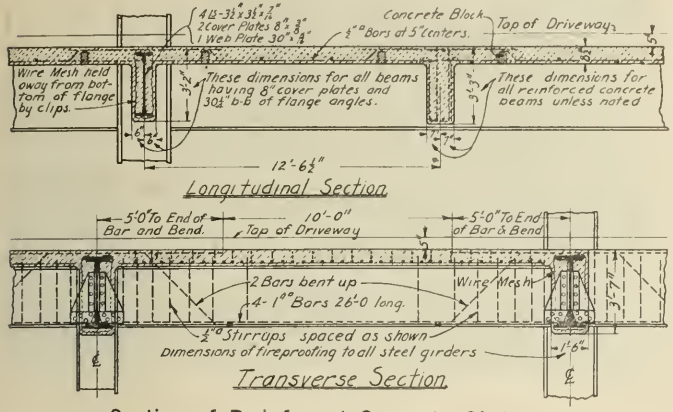


Lower Level.



Interior of Freight House, from Street Side.

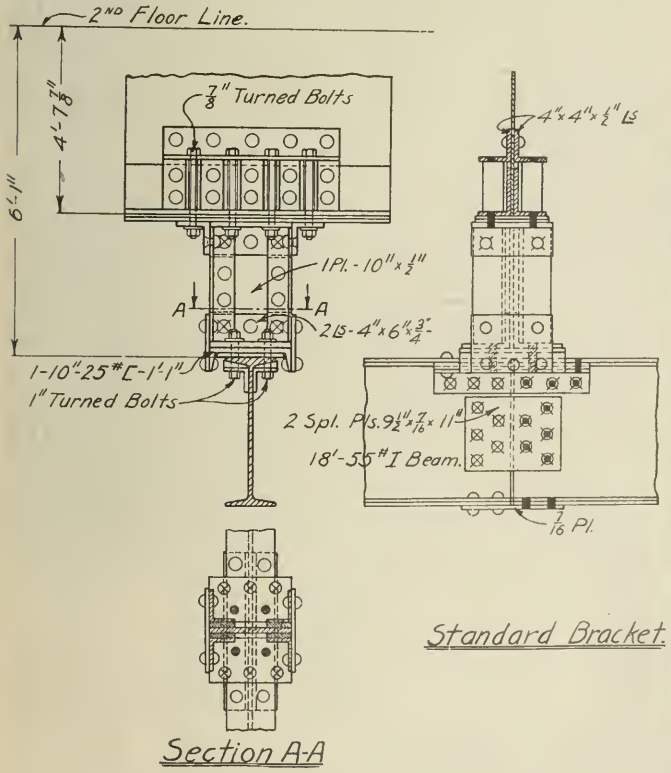
their stiffness. The section consists of four angles 7 in. x 3½ in. x ¾ in., with a 16 in. x ⅝ in. web plate. In the basement they have two plates 9 in. x ¾ in., 2 plates 14 in. x ⅜ in., and 4 plates 21 in. x ⅞ in., the 21-in. plates extending the full length of the columns, and making a total area of section of 137 sq. in. Each column weighs about 12 tons. It was originally intended to splice the columns 1 ft. 6 in. above the second floor line, but



Section of Re-inforced Concrete Girders.

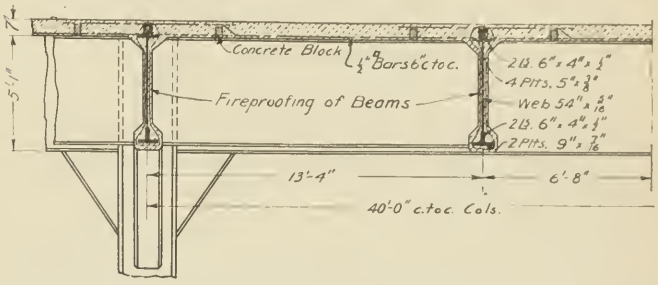
later it was decided to raise the second floor 1 ft. 6 in.; therefore the splice plates for the second story columns were put on the columns and the second floor girders all connected onto the columns 1 ft. 6 in. higher than first planned, so that the change was made in the second floor without involving any material expense.

The dotted lines on the framing plan of the second floor indicate the location of the runways for the electric telpher system.



Details of Hanger for Runway Support.

These runways are 18-in. steel I-beams bent to the required curves and connected to the structural steel girders by special hanger brackets where indicated. Where runways are curved, it was necessary to put in additional beams in the second floor to support the runways, these additional beams being clearly indicated on the plan. Special details were required to accommodate the switches which were a part of the mechanical equipment. In order to support these 18 in. runway beams from the floor girders, a special type of hanger, shown herewith, was designed, this hanger to be of sufficient strength to take care of the load coming on 13 ft. of the runway beam. In addition to the vertical load on the runways, the hangers were designed to be strong enough to take care of the impact and lateral thrust from the telphers. As the floor girders were to be encased in concrete and as the system of overhead sprinkler pipes was to be placed above the telpher runways and below the concrete fireproofing, the hanger brackets for the runways were of greater depth than would ordinarily be required. Great care was taken



Section of Second Floor Longitudinal Slab.

to design these hanger brackets so that they would be even stronger above the line of the fireproofing than below, so that in case any repairs became necessary such repairs could more readily be made. It will be noticed that the upper flanges of the runway beams were strengthened where the beams connect to the hanger brackets, by riveting two pieces of angles to the web of the I-beam just below the top flange and placing between these angles and the flange wedge-shaped plates held in place by the 1 in. turned bolts connecting the hanger brackets to the telpher runway. The telphers run on two steel rails bolted to the upper sides of the lower flanges of the 18 in. I-beam runways. These brackets were designed so that the connections could be made for the curved beams as well as for the straight



Five-Ton Crane.

beams by varying the position of the holes connecting the brackets to the floor girders.

The second floor girders are 4 ft. 6 in. in depth, back to back of angles, the total depth of this floor construction being 5 ft. 1 in. In this floor the top flanges of the steel girders depart from usual practice, the flange angles being riveted to the webs with their outstanding flanges down, forming a better support for the concrete slabs, and reinforcing bars, as shown.

The height of the first story from the level of the driveways on the first floor to the level of the second floor is 33 ft. 10 in., and the clearance between the under side of the telpher runway beams and the driveways is 26 ft. 3 in., and from the underside of the telpher runways to the level of the platform 22 ft. 6 in. This clearance is required for the operation of the telphers above the jib cranes, which were placed at the columns along the edges of the platforms.

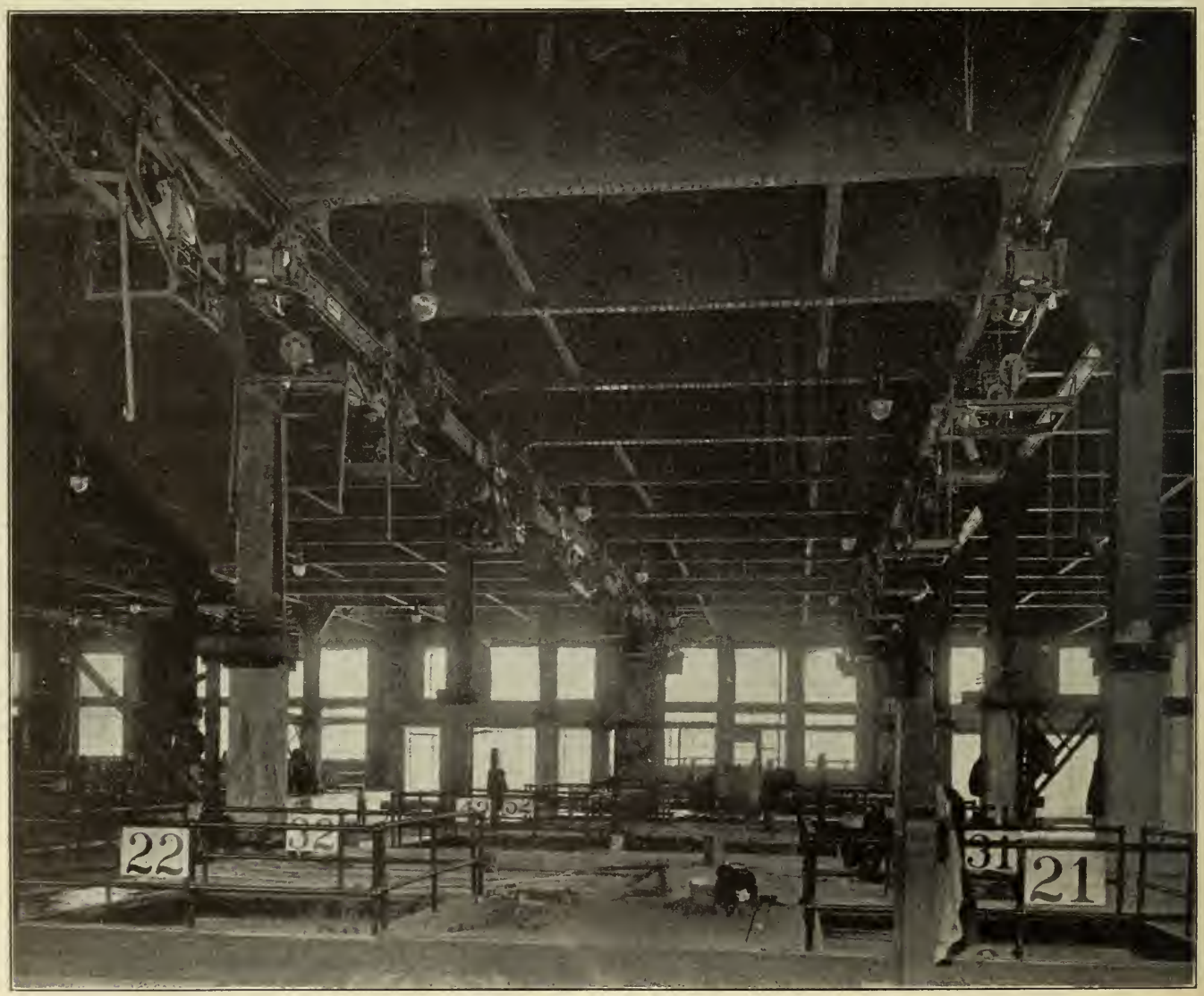
While the design of the structural steel columns was based on a building having two floors and a roof above the first story, the second and third floors and the permanent roof have not been put in, except that part of the steel work for the third floor across the south end of the building has been built, and a temporary roofing has been placed on this steel work, and on the steel work of the second floor over the remaining area of the structure. The total weight of the structural steel and iron castings for the building up to and including the second floor and the portion of the third floor which is erected amounts to approximately 3,500 tons.

The building is lighted by 132 d. c. luminous arc lamps. The 100-kw. motor generator sets, driven by 4,000 volt, three-phase, 60-cycle, synchronous motors, with direct-connected exciters, are installed on the mezzanine floor, using power bought from the Union Electric Light & Power Company, St. Louis. A very complete switchboard controlling both the arc lamp and monorail crane circuits, has been provided, the lights using 125 volts, while 250 volts are provided for the cranes. Directly below the motor generator sets the boilers for heating the building are installed.



Two-Ton Crane.

The amount of freight now being handled amounts to about 800,000 lbs. daily, or about 3,500 average truck loads of 225



Telphers.

lbs. The telphers will average about four times this amount on each trip, and will reduce the movement to about 900 loads. The cost of handling this freight by trucks has been about 45 cents a ton, and it is expected that after the plant has been in use this will be reduced to at least 30 cents.

Just across Mound street from the main building a reinforced concrete furniture and automobile shed, 24 ft. x 225 ft., has also been built. Track room has been provided alongside for seven cars, although with more than five cars on the track it is necessary to foul the lead into the freight house. The location of this building at this point was made necessary on account of the difficulty in securing certain pieces of property.

The total expenditure, including right of way, buildings and track, is approximately $3,000,000. All track work was done by the railway company, while the building and equipment were contracted. The steel work for the building was fabricated by the American Bridge Company, New York, and the structural castings were made by Christopher & Simpson, St. Louis. Reinforcement was furnished by the Corrugated Bar Company, St. Louis. The building was erected by James Stewart & Co., St. Louis. The mechanical freight handling equipment was installed by the Sprague Electric Works, New York, while the General Electric Company, Schenectady, N. Y., installed the electric power plant.

The design and construction of this terminal have been under the direct charge of S. B. Fisher, chief engineer of the Missouri, Kansas & Texas, who personally worked out a large part of the plans. Widmann & Walsh, St. Louis, were the architects, while Condron & Sinks, Chicago, designed the steel and reinforced concrete portions of the building. H. W. Lohman was manager, C. Dunlap, superintendent of erection of structural work, and Capt. Mills, superintendent of the general building work for James Stewart & Co. R. Beeuwkes was superintendent of installation for the Sprague Electric Works. We are specially indebted to Messrs. Fisher, Condron, Beeuwkes and Dunlap for the above information.

REPORT ON MARTIN'S CREEK DERAILMENT.

[Issued by the Board of Public Utility Commissioners of New Jersey, Robert Williams, President, June 13, 1911.]

On April 29, 1911, an accident occurred about eight-tenths of a mile south of Martins Creek Station, on the Belvidere Division of the Pennsylvania Railroad, resulting in the deaths of twelve and injuries to 101 persons.

Formal investigation of this accident was begun by the Board at a meeting held at Phillipsburg, May 10. Following the meeting at Phillipsburg a request was received from the Interstate Commerce Commission to be permitted to join the Board in the further investigation of the accident. This request was granted, and the investigation was resumed at a meeting held at Trenton, May 31, 1911, at which meeting Mr. E. L. Pugh, chief of the division of accidents, represented the Interstate Commerce Commission.

The derailed train was the second section of passenger train No. 573, and consisted of Pennsylvania engine No. 3169, Delaware, Lackawanna & Western combination car No. 706, Delaware, Lackawanna & Western coaches No. 84, 100 and 85, and Delaware, Lackawanna & Western dining car No. 458, in the order named. All of the cars were of wooden construction with vestibules and steel platforms. Coach No. 100 was lighted with acetylene gas, and dining car No. 458 was lighted with acetylene gas and equipped with axle-generator for electric light. The other cars were lighted with Pintsch gas. Train was en route from Utica, New York, to Washington, D. C., with 168 passengers and two tourist agents; it left Manunka Chunk at 2:40 P. M., and was derailed at about 2:56 P. M. The engineman, conductor and baggageman received injuries from which they soon died, and the fireman was seriously injured.

The derailment was immediately followed by fire, caused by the ignition of gas, evidently from a puncture in the gas tank under the third coach (No. 100) as well as from the escaping gas from the gas tanks under the other cars, which had their connections broken, and permitted gas to escape. All cars were totally consumed by fire. The gas tank under the dining car exploded several hours after the wreck, which was caused by heat from the burning cars.

On the morning of April 29, acting under the instructions of the supervisor of the division, the section foreman, with a force of seventeen men, was engaged in throwing, realining and surfacing the curve . . . to the line stakes that had been set some months before.

The track at this point runs almost directly north and south, with about one-half of one per cent grade descending toward the south. The curve is about 2½ deg., and has a superelevation of about 5 in. for the east or outside rail.

The track is laid with 85-lb. standard steel rail, which has been in service nine years, and showed from one-eighth to one-quarter inch wear on curve north of point of derailment. There were from one to two bad ties in the track for each rail length, and tie plates were used on each rail. Track is ballasted with gravel and cinders.

The required work was to throw or shift the track from about two to nine inches, at different points, for a distance of about one thousand feet. The ballast was removed from the ends of the ties on the inside side of the curve, for the distance necessary to permit of the throw or shift of the track to the proper alinement. After throwing this track, by the use of bars and by easy stages of from one to two inches at a time, to the proper alinement, as indicated by the line stakes, the ends of the ties were tamped up with shovels. The section foreman then lined up and surfaced the inside rail, and had partially lined up and surfaced the outside rail.

The track, both north and south of, as well as at the point of derailment, had been thrown from two to nine inches on the day of the accident. Track jacks were used at different places on the curve in raising the track to proper level.

At the time of the accident the men were engaged in filling up the center of the track and tamping up under the ties with shovels at a point just immediately north of the place where the derailment occurred. The track gage was not used at any time in doing this work, but the level board was used for the purpose of arranging proper super-elevation and the necessary run-off leading to the same.

During the forenoon flagmen were used to protect this track in both directions, and after the noon hour a flagman was used to protect against trains from the north, until about 1 P. M., the time of the arrival of first 573, after which time no flagman was used. Three trains passed over this track between 1 P. M. and 2:56 P. M., the time second 573 was wrecked. No one of them, however, was running at the rate of speed of the wrecked train.

Eye witnesses of the accident say that the cars were derailed first. Some testified there was an explosion followed by the crash of derailment; others that the crash of derailment was immediately followed by an explosion; others say that the crash of derailment was all that they heard or saw. All agree as to the almost immediate presence of fire. Testimony as to the condition of the gas tank equipment disproves any theory of gas explosion, on account of the fact that the gas tank under car No. 100, the one supposed to have exploded, had been punctured by some outside agency.

Two committees of experts, selected by the Pennsylvania Railroad Company, made careful inquiry and investigation as to the cause of the accident, and agree as to it being a derailment of the forward truck of the tender, and agree, practically, as to where this truck left the rail. They disagree as to the cause of the derailment. One committee reported the derailment as evidently caused by a combination of uneven and irregular track, the high speed of the wrecked train while

passing over the track, and the probable failure of the section men to have proper superelevation on the curve, together with suitable run-off leading to the same, and sufficient ballast against ends of ties on high side of curve. The other committee reported that track condition was such as would warrant them expressing the opinion that it was not the cause of the derailment.

An outside expert, who was on the ground May 2 gathering data and making measurements as to the condition of the track, both at the point of the accident and at the curve just north of the accident, expresses the opinion that the cause of the derailment was the uneven and irregular condition of the track and the failure to have proper superelevation on the curve, and run-off leading to the same, causing the forward trucks [truck] of the tender to mount the rail, followed by the derailment of the other cars in the train.

The track being in loose condition, each train that passed over, prior to the accident, caused it to settle to such an extent that it became uneven and irregular and, in the opinion of Inspector McKelvey [of the New Jersey Commission], this caused the driving wheels of engine No. 3169 of second 573 to mount the outside rail, throwing the rails across the track, thus letting the entire train, with the exception of rear trucks of the dining car, off almost simultaneously. No one of the cars was telescoped.

The train, running at a speed of about 50 miles an hour, was thrown down an embankment on the east side and outside of the curve, the engine, tender and first car of the train turning over on their side, the remaining cars standing nearly upright.

The evidence shows that no throwing or alining was done after first 573 passed, but work of surfacing, tamping and filling between the ties was being done continuously until the arrival of the second section.

The Board, under these conditions, concurs in the opinion of Inspector McKelvey that the section foreman erred in judgment in not having the track in proper condition for the safe passage of second 573, which was running at high speed. Under the circumstances he should have protected the same by a flag.

CONCLUSIONS.

It is the conclusion of the Board and of the Interstate Commerce Commission, from the evidence in this case, that the derailment was caused by an uneven, irregular and insecure condition of track, which would not permit a train to pass over it in safety, at a speed of from fifty to sixty miles an hour, the rate at which this train was running.

It is also concluded that this piece of track should have been protected by flag, until the work was completed; that is, until the elevation of the high rail had been carried around the curve and properly run off at the same point where the surfacing had been run off on the lower rail, and ballast replaced against the ends of the ties on the high side of the curve.

The rule, as interpreted by an official of the Pennsylvania Railroad Company, does not require flag protection in doing work of this character, and we believe such rule should be so amended as to leave no doubt as to the requirement of flag protection to all trains when the track is being shifted, realined or thrown, or where such similar insecure conditions of track exist.

The facts that the cars in this train were of wooden construction, and that the lighting system used was gas, are evidently responsible for the great loss of life and the total destruction of the train by fire. Had the cars been of steel construction, or had electricity been used as the lighting system, it is certain the loss of life would not have been so great.

57½-TON STEEL HOPPER COAL CAR; NORFOLK & WESTERN.

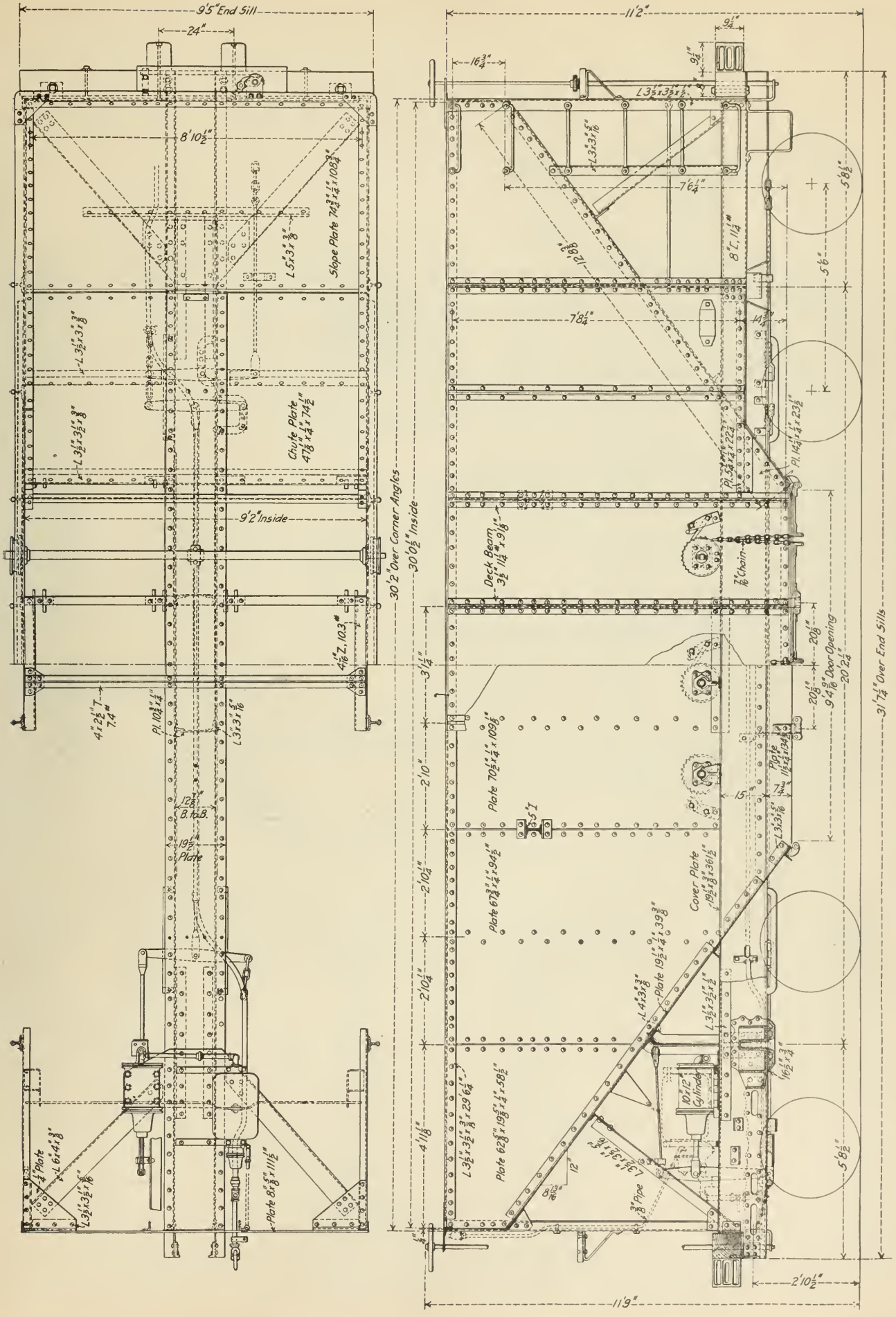
The Norfolk & Western is building 500 steel hopper coal cars with a capacity of 115,000 lbs. each, at its Roanoke shops, which contain some interesting features. The prevailing type of steel hopper car closely resembles that



57½-Ton Steel Hopper Coal Car; Norfolk & Western.

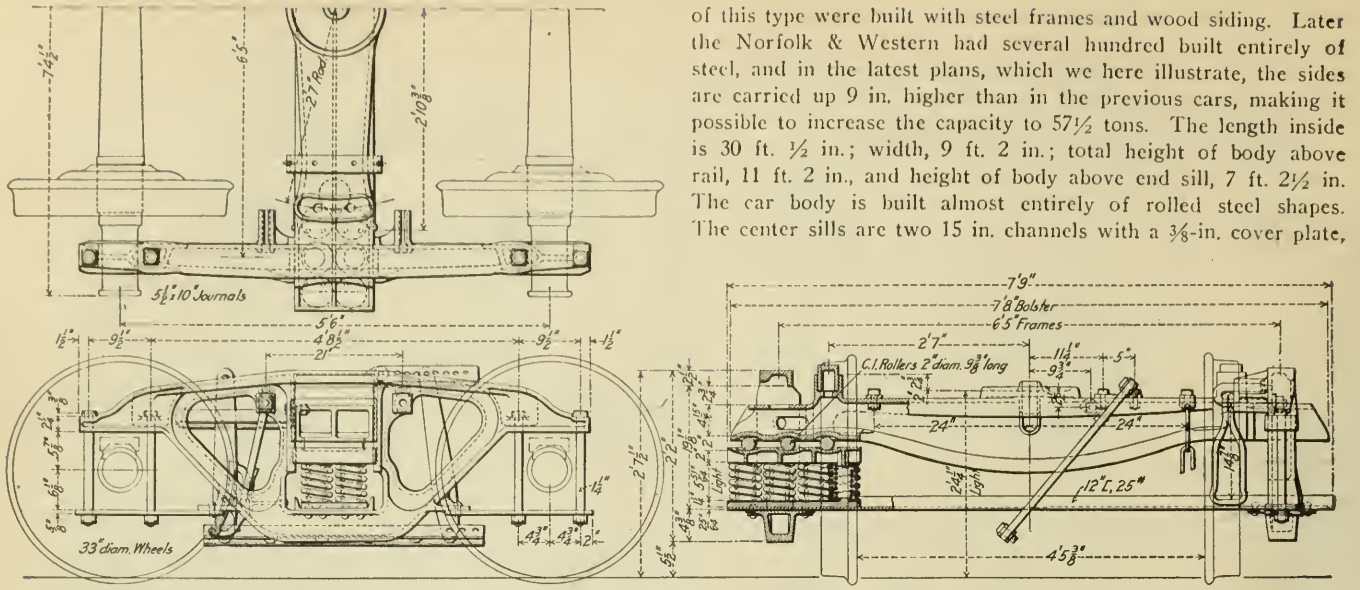
originally designed by Charles T. Schoen of pressed steel shapes, in which the long inclined floor extended down below the sills and terminated in a swinging door, which was nearly at right angles to the inclined floor, when closed. This type required an incline between the hoppers that extended up into the space above the sills, thus taking room which should naturally be occupied with the lading.

The railways in the Virginia coal fields—the Norfolk & Western, the Chesapeake & Ohio, and the Virginian—have developed a type of hopper car with flat narrow doors operated by chains, in which the hopper extends down between the trucks, making that space useful for carrying coal. This makes it possible to obtain a capacity for 50 tons of coal without carrying the sides as high as the usual steel hopper car. The first cars

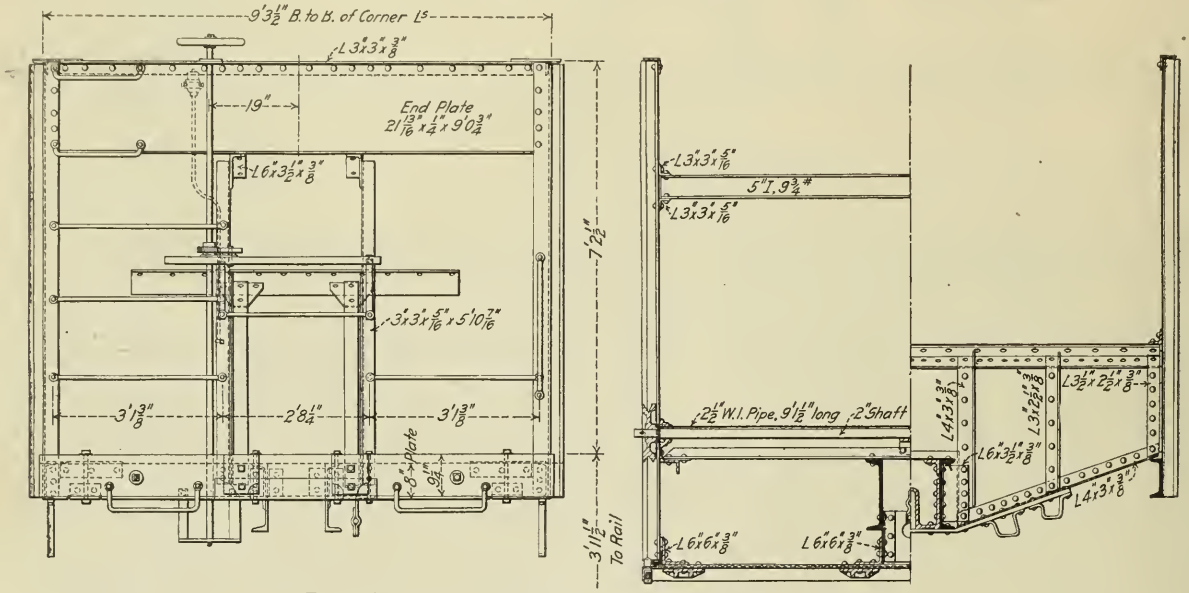


Steel Hopper Coal Car of 57½ Tons Capacity; Norfolk & Western.

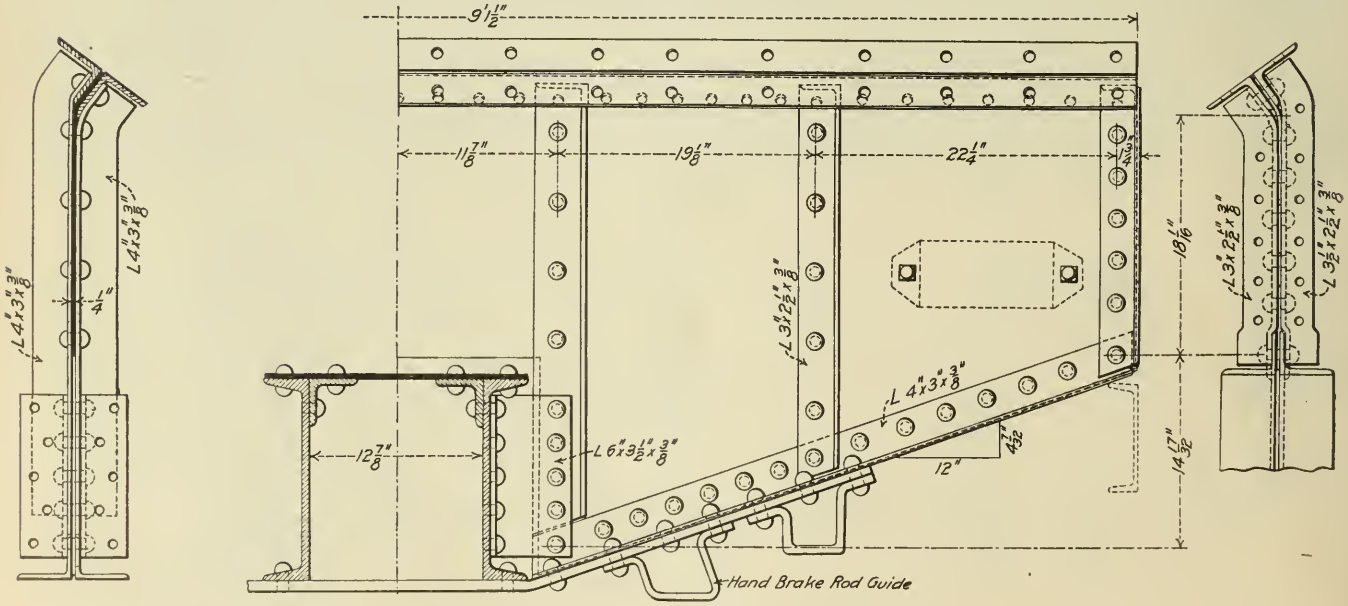
of this type were built with steel frames and wood siding. Later the Norfolk & Western had several hundred built entirely of steel, and in the latest plans, which we here illustrate, the sides are carried up 9 in. higher than in the previous cars, making it possible to increase the capacity to 57½ tons. The length inside is 30 ft. ½ in.; width, 9 ft. 2 in.; total height of body above rail, 11 ft. 2 in., and height of body above end sill, 7 ft. 2½ in. The car body is built almost entirely of rolled steel shapes. The center sills are two 15 in. channels with a ⅜-in. cover plate,



Truck for 57½-Ton Steel Hopper Coal Car.



End View and Cross-section of Steel Hopper Coal Car.



Body Bolster; Steel Hopper Coal Car.

which extends the full length between the end sills. The end sills are 8 in. x 9¼ in. oak, backed by a ⅝-in. steel plate, and the couplers are protected by malleable iron buffer blocks. The steel sides and ends are ¼ in. thick, and extending across the car near the center are two 5-in. I beams, which act as lateral stiffeners to the high sides. On the outside the vertical stiffeners are 3½ in. deck beams spaced 34 in. on centers.

There are three pairs of flat hopper doors which are held in position by chains. The chain sheaves are rotated by shafts, and are held by ratchet pawls. The two chains from adjoining doors are wound on one sheave. The construction of this second lot of cars by the Norfolk and Western, with a capacity 7½ tons greater than the prevailing maximum, undoubtedly marks the beginning of a movement which will lead to the adoption of a 60-ton coal car as the new standard.

TRAIN ACCIDENTS IN MAY[1].

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of May, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
3.	N. Y., N. H. & H.	Scituate	xc.	P. & P.	0	9
6.	Midland Valley	Bokoshee	bc.	P. & F.	1	5
*14.	Central Vt. } Boston & M. }	White R. Jcn.	bc.	F. & F.	4	3
21.	C., C., C. & St. L.	La Fayette	xc.	P. & F.	0	5
23.	M., St. Paul & S. S. M.	Gray's Lake	bc.	F. & F.	2	1
†29.	Chic. & B. Q.	Indianola	bc.	P. & P.	12	20
29.	Southern	Knoxville	xc.	F. & F.	1	11

Derailments.

Date.	Road.	Place.	Cause of Derailment.	Kind of Train.	Kil'd.	Inj'd.
2.	Ches. & Ohio	Hinton.	unx.	P.	2	0
3.	South. Pac.	Tacoma, Nev.	unx.	F.	1	1
5.	San Pedro L. A. & S. L.	Akin, Utah.	washout.	P.	1	0
6.	Stephenville, No. & So. Tex.	Hamilton.	unx.	F.	1	0
8.	Lehigh Valley	Elmira.	unx.	P.	..	20
10.	Lake E. & W.	Erlin.	exc. speed.	F.	7	12
10.	Denver & R. G.	Minturn.	unx.	P.	2	27
11.	C., St. P., M. & O.	Lyons.	unx.	P.	2	4
14.	Balt. & Ohio	Niles Junc.	unx.	P.	0	6
15.	Balt. & O. S. W.	E. Madison.	d. track.	F.	2	0
16.	St. Louis & S. F.	Garfield.	d. track.	P.	1	3
19.	Chas. & W. Car.	Laurens.		F.	1	1
*23.	St. Louis & S. F.	McBride.	unx.	F.	1	2
24.	Boston & M.	Brookside.	unx.	F.	0	3
28.	Seaboard A. L.	Bostic, N. C.	bridge.	F.	4	2
30.	Chi. & N. W.	Chelsea, Ia.	journal.	P.	..	5
30.	Chi., M. & P. S.	Malden.	unx.	P.	2	3

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of Train.	Kil'd.	Inj'd.
14.	Southern Pac.	Bryn Mawr.	boiler.	P.	1	1

The butting collision near White River Junction, Vt., early on the morning of the 14th was between a southbound freight of the Central Vermont and a northbound freight of the Boston & Maine, this part of the road being used joinly by those two companies. There was a "dense" fog at the time, and it is said that neither engineman had time to even apply the brakes before the collision occurred. The wreck took fire, caused it is said by the explosion of a brakeman's lantern, and fire engines were called from several towns around, but the fire was not cooled sufficiently to allow a search for the bodies of the victims until about seven hours after the collision. The bodies of the four men killed were all blackened by the flames. One of them, it is believed, was not killed by the collision, but was burned to death; and the death of one of the firemen was due to scalding. The collision was due to an error on the part of the train despatcher in giving meeting orders to the trains. He discovered his error before the collision occurred, and attempts were made by telegraph and telephone to stop one of the trains, but these efforts failed. It is said that the agent at North Hartland opened his office that morning about two minutes too late; that two minutes earlier he could have received and executed an order to stop the northbound train.

The collision at Indianola, Neb., on the 29th, was between westbound passenger tram No. 9 and eastbound passenger train No. 12, and the list of killed or fatally injured included, 4 enginemen, 1 express messenger, and 7 passengers. The collision is said to have been due to a misunderstanding of despatcher's orders.

The derailment at Aiken, Utah, in which the baggageman of the train was killed, was caused by the breaking of a dyke of an irrigation ditch.

The 7 persons killed at Erlin, Ohio, on the 10th, were members of a construction gang riding in a caboose, and the train consisted only of an engine and the caboose. It is said that the speed at the time of derailment was about 50 miles an hour, and the caboose was tossed about in very violent fashion.

In the derailment at Minturn, Col., on the 10th, a chair car and a sleeping-car fell into the Eagle river.

In the derailment at Bostic, N. C., on the 28th, both enginemen and both firemen of a double-head coal train were killed. The accident occurred in daylight, but it is said that the bridge, which was burning, was not seen by the runner of the leading engine in time to stop the train.

Electric Car Accidents.—Of the 21 accidents to electric cars reported in the newspapers as occurring in the United States in the month of May, four were charged with fatal results; one each at Oklahoma City; at Quincy, Ill.; at Tonawanda, N. Y., and near New Haven, Connecticut. There was one fatal injury in each case.

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc, obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

PRENTICE'S WIRELESS TRAIN CONTROL.

Frank W. Prentice, inventor of an automatic train stop and cab signal in which the apparatus on the engine is actuated from the roadway by Hertzian waves, without metallic contact, has been making extensive experiments on the Canadian Pacific, near Toronto, during the past year, and is about to hand his apparatus over to the railway company. As Mr. Prentice makes use of a number of instrumentalities not before tried in connection with railway signaling, we have procured from him drawings showing the arrangement of his electric circuits, and he has sent us notes descriptive of his apparatus and explaining his experiments, which form the substance of this article. Mr. Prentice began his experiments with his apparatus on an electric railway near Chicago several years ago, and these experiments have already been mentioned in these columns in connection with the annual reports of the Block Signal Board, which body examined the Chicago installation.

The experiments at Toronto have been made with a locomotive (No. 798) used in short distance freight service, and the stations or signaling points on the line equipped are as follows, going west from Toronto:

Queen street subway,
Noble street,
Lansdowne avenue,
Golden avenue,
Wallace avenue,
Royce avenue.

The essential features of the track portion of this system are the track circuit and the generator of the wave. The generators include the transformer T, Fig. 3, the condenser C, and the discharge points PP, commonly known as oscillators. One of

these generators is placed at the end of each block, and a wave wire is extended for a block length in the rear. This wave wire is No. 12 copper, and is laid in conduits on the ties in the center of the track, midway between the rails. The generator is controlled by the track circuit of the block in advance. A closed track circuit keeps the A. C. relays R closed, thus keeping the generator connected with the A. C. feed wires. The 110 volt current is stepped up in the ratio of 200 to 1, causing a static discharge to continuously take place between the oscillators, PP. The wave wire WW is connected to the oscillators, as is the pick up wire, U. All the block sections are provided with the ordinary form of vane type relays and A. C. track circuits. The wires WW and U are charged with the wave producing current only when the block in advance is clear. The wave wire WW is insulated from the track, and its preferred position with reference to the track is along the middle of the ties as shown. The maximum length of the wire which can be charged with one oscillator is measured by miles, so that the length of the blocks is governed by the requirements of traffic and economical operation of track circuits.

The track installation on the Canadian Pacific consists of eight blocks from 2,000 ft. to 4,500 ft. each in length, four blocks on the westbound and four on the eastbound track, beginning at Queen street subway and ending at Royce avenue, a distance of two miles, generators (transformers) being located at Noble street, Lansdowne, Golden, Wallace and Royce avenues. These have been in constant service since March 25, 1910, without interruption. The expense for current for this period has been two cents per days per block. There being no batteries in the track installation, the cost of maintenance is low.

Having a wire which extends throughout a block and being charged with a wave-producing current, which makes the wire the center of a series of outwardly extending impulses, and having a constant radius of influence at any point along the wire, it remains only to run a train-carried antenna, with its coherer, into the block, and at the instant this antenna enters the zone of the wave, the coherer is caused to become a conductor of electricity. Intangible, mysterious though the wave may be, nevertheless it furnishes a positive connection between train and track. More than this, its field of influence can be definitely confined; the radius of the zone can be limited to one, or two, or five feet if desired, as easily as to a mile. This is accomplished in the generating apparatus.

The part of the system which is carried on the engine comprises first, the main antenna, 19 ft. long, suspended from the boiler braces by three hangers, the antenna consisting of aluminum plate four inches wide, and hanging directly over the

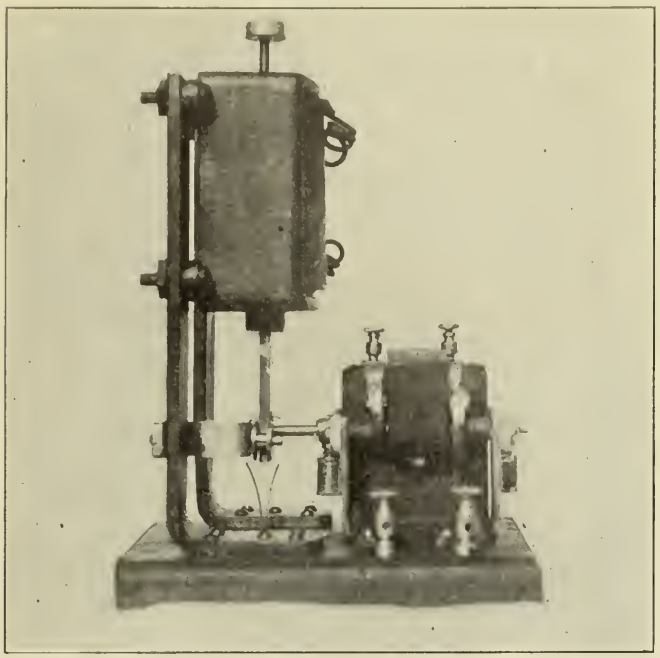


Fig. 1—Coherer and Solenoid; Coherer in Operating Position.

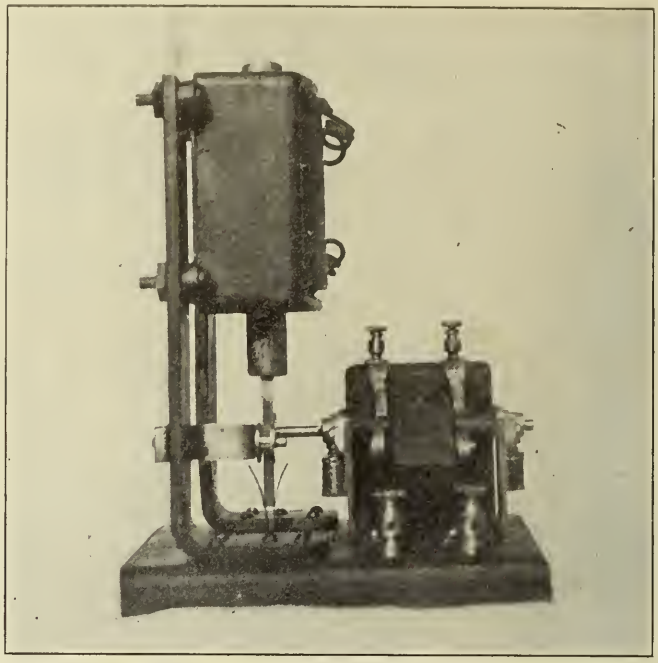


Fig. 2—Coherer and Solenoid; Solenoid De-energized and Rack in Lower Position.

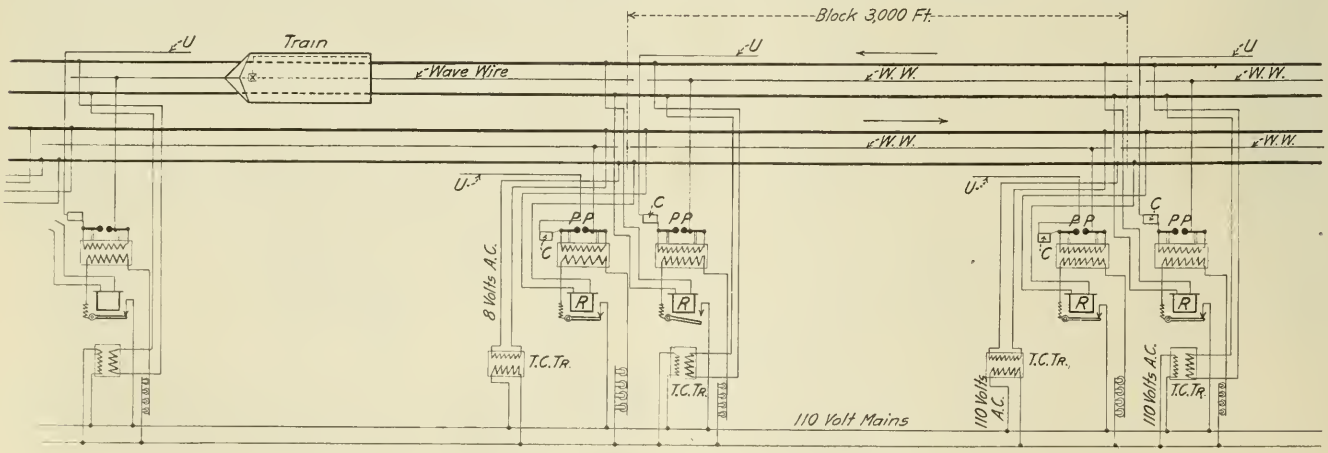


Fig. 3—Electric Circuits on Track and Roadside.

wave wire, 1½ in. above the level of the pilot, or 6½ in. from the conduit. Second, a pick-up antenna suspended in a like manner on the right hand side, beneath the cylinder cocks, 13 in. outside of the rail and directly over the pick-up wave wire which is fixed at the end of each block. Third, a Pyle turbine generator giving 6 volts and 20 amperes of current for supplying the current to the wave responsive apparatus. Fourth, the train-control mechanism, the main feature of which is the coherer, Figs. 1 and 2, consisting of a wood fiber receptacle having a hole in the center and two lugs inserted in its bottom ¼ in. apart

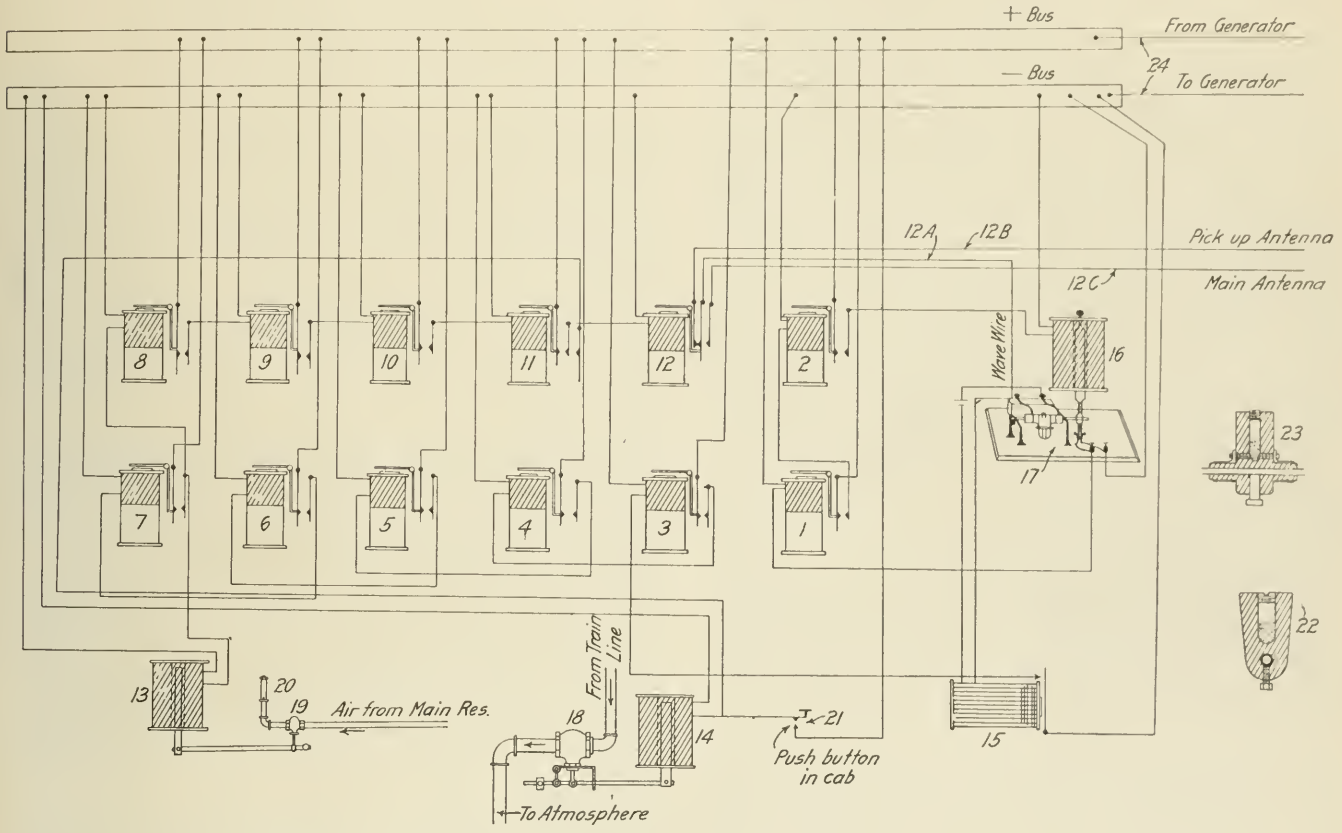


Fig. 4—Electric Circuits on Locomotive.

(22 and 23, Fig. 4). Within the coherer are the wave responsive filings, sufficient to fill in the aperture between the lugs. The coherer is rotated regularly on an axle through 90 deg. of a circle, and back again, by a solenoid working a rack and pinion. This apparatus, energized by a current from the turbine generator, by overturning the coherer destroys it, as a conductor of current, every three seconds. Fig. 1 shows the rack in its upper position. The solenoid having lifted it to this position, the solenoid circuit is automatically opened, but the current continues for two seconds because the relays which open the circuit are slow-releasing, the relays successively holding the circuit

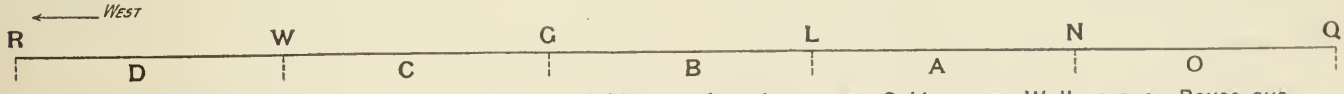


Fig. 5—Sequence of Block Sections; Queen st., Noble ave., Lansdown ave., Golden ave., Wallace ave., Royce ave.

closed one second each. In this position the filings rest between the two lugs. At the end of the two seconds the rack drops to the position shown in Fig 2, allowing the filings to drop out of their position by gravity. This de-coheres them, opening the main circuit. As soon as the rack reaches its extreme lower position it again closes the circuit which energizes the solenoid and the coherer is again revolved into its working position.

Normally the filings are a non-conductor of current, but when a Hertzian wave passes through their zone the resistance on their outer surface is broken down and a current flows through them; that is, they complete the circuit of the master relay, 15. Once these filings have cohered they will retain such cohesion until they are jarred by the rotating apparatus, as described.

The coherer is thus kept in operation constantly while an engine is in service. By this means the relay opens and closes every three seconds during the time the wave is being received.

Connected to the master relay is a series of 10 hold relays, 3 to 12 inclusive. These relays will hold their magnetism one second each after the current is broken, and as they are in parallel series, relay 12 releases its contact 10 seconds after the master relay ceases to be energized by the current flowing through the coherer.

Relay No. 7, through its armature contact points, energizes solenoid 13, whose plunger holds closed, through a fulcrumed lever, valve 19, which prevents the air (from the main air brake reservoir) from blowing the whistle (20).

Relay No. 11, through its contact, energizes solenoid 14, which through its fulcrumed lever holds closed balanced valve 18, preventing the escape of air from the train line through a one-inch port.

Relay No. 12 has a front and a back contact, and a common wire, 12a, connecting wth coherer 17. When relay 12 is closed its common is in connection with the main wave wire antenna under the engine; and when the relay is de-energized this common wire is in connection with the pick-up antenna suspended under the steam chest.

Solenoid 14 also may be energized by pressing a push button, 21, in the cab of the engine within the reach of the engineer.

Engine 798, leaving the roundhouse at Toronto on its trip to West Toronto, has its solenoid, 16, energized and coherer, 17, in operation. There being no wave wire for some distance (to

Parkdale) the master relay 15, the hold relays 3 to 12 and the solenoids 13 and 14, are de-energized; the whistle (20) is blowing and the train line valve 18 is held closed by push button 21 to keep the brakes released. The engine enters the wave zone just west of Queen street subway, and if the first block is unoccupied the pick-up wave wire is energized and the wave jumps from it to the pick-up antenna, the wave reaching the coherer through its contact on relay 12 (wire 12a), closing the master relay 15, which closes relays 3 to 12. By the closing of relay 12 the coherer is connected with the main antenna under the engine; solenoid 13, energized by the closing of relay 7, stops the whistle from blowing; solenoid 14 likewise closes valve 18 and the engineman can then remove his finger from push button 21. The engine is now under control of the wave, and as long as the wave is being received master relay 15 will be opened and closed every three seconds, 2½ seconds closed and ½ second open. That is to say, the wave is constant, but its influence is made intermittent by the regular destruction of the receiving apparatus by the overturning of the receptacle containing the filings. But the destroying process, at its completion at the end of 2½ seconds, becomes a restoring process—closes a circuit to again energize solenoid 16 (through the contact points of relays 1 and 2), which again puts the filings in working position; and relay 15 is thus again energized before the opening of the successive relays (3 to 12) has proceded far enough to disconnect the coherer from the main antenna 12c at relay 12, or even far enough to blow the whistle. Consequently relay 3 and its trailing relays 4 to 12 will remain closed. The wave is being received from the generator at Lansdowne avenue, the generator in turn being controlled by the A. C. track circuits being fed from Golden avenue block station.

If there is a train in the block between Golden avenue and Wallace avenue, the wheels of the train shunt the current of the track circuit, and de-energize the relays at Golden avenue, making dead the wave wire in the block in the rear. The coherer then receives no wave and the master relay remains open; in one second relay 3 opens and relays 4, 5, 6 and 7 open successively, each one second later; so that in five seconds after entering the block at Lansdowne avenue, solenoid 13 drops its valve 19, and the whistle starts blowing; 4 seconds later relay 11 opens, de-energizing solenoid 14, and the train line valve is opened; so that 10 seconds after entering the block at Lansdowne avenue the brakes are being applied.

Relay No. 12 has opened and the coherer is now connected with the pick-up antenna under the steam chest by wire 12b; and the coherer cannot again operate until the engine reaches a pick-up wire. That is to say, the giving of a clear signal on the engine by means of the coherer, can be effected but once in each approach section. The pick-up antenna is 3 ft. 5 in. from the main wave wire, which lies in the center of the track. The engine is brought to a stop unless the engineman, when the whistle starts to blow, closes push button 21, holding solenoid 14 closed, thus preventing the application of the brakes. If the engineman is incapacitated or dead it is obvious that the train will be brought to a stop. Suppose that before the engine reaches G (see Fig. 5) Block C has cleared; then when it comes to the point where it is over the pick-up wire at G, it is again placed under control of the wave. But suppose that Block C is still occupied; the pick-up wire at G is not energized and the engine enters the block with its coherer still connected with the outside antenna, and as the waves from the main wave wire will not jump more than 12 in., the apparatus on the engine is irresponsive, and the train runs into and through Block C under the whistle signal of caution.

The hold relays are immersed in oil in a metal box, and the oil will remain liquid at 50 deg. below zero.

The equipment on the engine has been run continuously for 104 hours. This engine usually is in service from 6 a. m. Monday until 8 p. m. Sunday, hauling from 20 to 60 cars a trip. Stops are made daily by the wireless apparatus with wide open throttle.

The reduction of pressure required to stop a train depends on the speed of the train and number of cars. A reduction of about 25 lbs. in the train line is required to stop a light engine running at 60 miles an hour, and a reduction of from 8 to 10 lbs. is required to stop a train of 40 cars running at 35 miles an hour.

All track devices and all train devices are arranged on the closed circuit principle. The train air brake pipe is kept closed by a balanced valve, and when the wave ceases it drops open by gravity. It is not pulled open, and the only chance of its failure, says Mr. Prentice, is when the apple fails to fall from the tree to the ground; and when that occurs we shall none of us have any occasion for train control.

The coherer, always working, is the watchman of the apparatus. It delivers a report every two seconds to the master relay that all is well; and when all is not well it ceases reporting. The coherer is perpetually being drawn up to keep it in perfect condition for the wave influence, which it received by the engine-carried antenna. The whistle valve and the train line valve are being forcibly held closed by the presence of the wave, and are dropped by gravity and opened in case of its cessation. A failure anywhere means a stop, except the engineman is in possession of his senses and faculties and uses the push button to keep the train line closed; but even then the air whistle keeps blowing and is a constant reminder of the necessity for caution and danger ahead.

A train entering a block when the next block is occupied is brought to a stop unless the engineman intervenes. After this the train may proceed under a caution signal. The caution signal forces attention either until a clear block is reached, or until the mechanism on the engine has renewed operations because of the wave on the unlock wire at the side of the track.

The wave may be confined to a definite zone, and its ability to affect the coherer is in no way affected by the presence of foreign currents of electricity or the presence of masses of metal. On the line between West Toronto and Parkdale the tracks run parallel to and cross the line of the Ontario Development Company's and the Hydro-Electric Company's high tension wires of 110,000 volts; two metal bridges are crossed over and one is passed under.

The device has taken its present form as the result of a process of elimination by its designers of less suitable forms. The present installation of the system has now been working for the last six months experimentally, and Mr. Prentice says that the results on the engine and beside the track with the Hertzian wave are absolutely satisfactory in every respect.

FOREIGN RAILWAY NOTES.

A new railway is projected to fill a gap between Stadskanaal, Holland, in the province of Drente, and the German frontier at Ter Apel, about 10 miles.

To provide an outlet for the products of the Zoutpansberg district in the Transvaal, about 360 miles of new railway construction is proposed by the government. This new line will serve what will probably prove the largest cotton belt in the Transvaal, while the distance by railway to the coast will be reduced by about 200 miles.

Last January a passenger going from Paris to Havre found that there was no heat in his car. He complained of this at a station where the train stopped, but nothing was done, and the train went on as cold as ever. In his rage he pulled the safety signal cord, which passengers are forbidden to touch unless there is imminent danger. When the guard came he had the passenger taken before the court for his outrageous conduct in stopping the train. But the court found that the passenger was justified, since he was in imminent danger of freezing, and it let the passenger go free. This was on a state railway.

General News Section.

The general offices of the Evansville & Terre Haute will be removed from Evansville, Ind., to Chicago on August 1.

The marine repair shops of the New York Central at West New York, N. J., were destroyed by fire on Sunday last.

The roundhouse of the Atchison, Topeka & Santa Fe at Seligman, Ariz., was destroyed by fire on June 11, and nine locomotives in the house were badly damaged.

The southbound limited express of the Southern Pacific was stopped by highwaymen near Drain, Ore., last Saturday night about 11 o'clock, and the mail car was robbed.

Officers of the Pennsylvania say that the strike of shop men on the Pittsburgh division of the road has been subdued. Four hundred strikers returned to work on Tuesday.

A searchlight of great power, and which will be lighted every evening from 8 to 10 o'clock, has been installed on the top of the new passenger terminal of the Chicago & North Western at Chicago.

Official figures given out by the Indiana state board of tax commissioners show the total appraisement of steam railways in the state to be $203.919,419, an increase of $6,978,044 over the figure for last year.

The Southern Pacific, which recently sent a train load of its conductors to the eastern states, has just started its third "educational" trip of that kind, carrying division superintendents and subordinate officers. This trip is to consume four weeks.

In the federal court at Albuquerque, N. M., the government has filed a suit against the Atchison, Topeka & Santa Fe for violation of the hours of labor law, charging thirty-five offenses during the month of December last between Albuquerque and Belen.

The Baldwin Locomotive Works are running; and officers of the company say that there is no trouble. Reporters have difficulty in securing accurate information. Large numbers of strikers held a mass meeting on Monday last, but it does not appear that any action was taken.

The suburban trains of the Southern Pacific which make their terminus at Alameda, Cal., across the bay from San Francisco, are now propelled by electric power, and it is expected that suburban trains running to the adjacent pier at Oakland will also have electric motors next week.

Edgar S. Cooke, who has been on trial at Cincinnati on a charge of embezzling $24,000 from the Cleveland, Cincinnati, Chicago & St. Louis Railway, has been declared not guilty. Cooke was tried in connection with charges under which Charles L. Warriner, convicted last year, was sentenced to six years imprisonment.

The Mississippi Valley, South America & Orient Steamship Company, which has filed its charter at New Orleans, La., with $3,000,000 capital stock, of which $100,000 has been paid in, proposes to operate lines from New Orleans to the west coast of South America and to the Orient on the completion of the Panama canal.

The Great Northern has filed suit in the United States Circuit Court at Seattle, Wash., asking for a restraining order to prevent the enforcement of the state full crew bill, the contention being that two brakemen and a flagman on a full train and a flagman on a light engine are unnecessary and would cause an annual expense of $60,000 without corresponding benefit.

C. W. Wilson, an employee of the International & Great Northern, who entered suit against the road for $30,000 for the loss of his eyesight, alleged to have been caused by a piece of metal which flew loose from a pick with which he was working on the company's roadbed several months ago, has been awarded $20,396.05 damages by a jury in the Thirty-seventh District Court of Texas.

The authorities of the city of New York, on application of the New York Central, have extended to December 31, 1912, the time within which the improvements at the Grand Central Terminal must be completed. The rule adopted has, however, a proviso that certain bridges must be completed by April 1, 1912, namely: the bridges carrying Forty-sixth, Forty-seventh, Forty-eighth, Forty-ninth, Fifty-second and Firty-third streets across the railway yard. Bridges at some of the other streets and across the yard are already passable.

The Transcontinental Passenger Association held its annual meeting at Salt Lake City on June 14, this being the first time it has been held outside of Chicago. Questions concerning making special rates for meetings of various clubs and organizations to be held throughout the country during the summer and fall, stopover privileges, free transportation for clergymen, baggage regulations, etc., were discussed and referred to special committees. On June 15 members of the association and friends were the guests of the Oregon Short Line on a trip to Yellowstone Park.

Postmaster-general Hitchcock, who is investigating the subject of railway mail pay, says that the work has progressed far enough to enable him to say that many railways are making large profits on mail carriage, while others are doing the work at a loss. Of 394 companies which he has investigated, 278 are making a profit and 116 are losing. The rate of profit or loss varies widely with different companies. He proposes to make up a schedule under which each carrier will make a profit of 6 per cent. on carrying the mails; and expects that with such a schedule he will save to the government $9,000,000 a year.

The merging, on July 1, of the Washington County Railway, the Somerset Railway and the Sebasticook & Moosehead with the Maine Central, will enlarge two divisions of the M. C.; the Washington County Railway becomes a part of the Eastern division, and the Somerset and the Sebasticook & Moosehead become parts of the Portland division. At the same time the Rangeley division becomes a part of the Portland division of the Maine Central. The terminal division of the M. C. will hereafter be a part of the Portland Terminal Company, which embraces the Union Station and some territory of the Boston & Maine.

A complaint has been filed by the Southern Pacific Company in the United States Circuit Court at Salt Lake City, Utah, asking that six ticket scalpers named in the complaint be brought to court and made to answer to charges of violations of the Interstate Commerce law forbidding scalping. Since Salt Lake City and other Utah points have become famous as health resorts, thousands of tourists take advantage every year of the reduced rates to that portion of the country, affording scalpers a big business in unused portions of tickets; and the roads are taking steps to make it impossible to secure tickets in any way other than through the regular channels.

At a meeting of the officers of the National Association of Railway Commissioners, held in Chicago on June 17, Chairman C. F. Staples, a member of the Minnesota railway commission, was directed to appoint a sub-committee to study the matter of investigating express companies, their profits and the rates charged by them. This committee will probably make a report at the annual convention of the National Association which will be held at Washington, D. C., next October, with a view to making express rates throughout the different states uniform, fair and reasonable. Representatives of the railway commissions of Minnesota, Illinois, New York, Oklahoma, Ohio, Indiana, Kansas, Kentucky, Missouri, North Dakota, Michigan, Florida and Massachusetts, were present at the Chicago meeting.

The Chicago, Burlington & Quincy, in a letter signed by President Darius Miller, has asked more than 44,000 of its employees to join in an effort toward increasing the efficiency and reducing the expenses of operation of the road, and solicits suggestions for improvements in the service, for greater economy and greater safety. Mr. Miller says of the plan to economize: "It would overcome many of the disadvantages with which the company is now confronted in the way of increased cost of material and increased pay roll and without perceptible effort would also greatly increase the efficiency and value in the company's serv-

ice of every employee on the pay roll. In this way the company would have the assistance and support of every employee in adjusting its affairs to the decreased earnings which are now resulting from the large shrinkage in the volume of business prevailing at the present time."

Under the reorganization of the Missouri Pacific and the St. Louis, Iron Mountain & Southern (see item under Operating Officers in the Elections and Appointments column of this issue), the general manager will have charge of transportation and the maintenance of way and equipment. The general superintendent will have charge of the divisions in his district, and is to be assisted by an engineer of maintenance and an assistant superintendent of machinery, as outlined in the item referred to; and the superintendents will have charge of the transportation and maintenance of their divisions and supervision over the trainmasters, chief despatchers, master mechanics and the division engineer in charge of roadmasters, supervisors and assistant engineers. The chief engineer will have charge of construction and maintenance of way, reporting to the first vice-president on construction and to the general manager on maintenance. He will assume the duties of the engineer of construction, and of the chief engineer maintenance of way, and will handle items of improvement and maintenance exceeding the capacity of the superintendent's forces and equipment. The superintendent of machinery will have charge of the construction and maintenance of equipment and the direct supervision of shops and yards for general repairs of importance requiring a shop superintendent.

The New York, New Haven & Hartford has sent to every member of the Massachusetts legislature a circular protesting against the proposed law to require the electrification of railways in and near Boston. It says: "Except where use of tunnels is rendered less dangerous by use of electricity, there has been no compulsory electrification of railways. All the electrification of the New Haven has been without compulsory legislation. The New Haven has repeatedly stated its desire and willingness to electrify. This year it proposes to electrify from Boston to Readville, 9 miles, and from Boston to Beverly, 19 miles, on the Boston & Maine.

"Electrification of short distances, say 10 miles, has never been found at all economical, and a compulsory electrification within a 10-mile limit will be unusually uneconomical. Money required for electrification must be raised by the issue of new securities. . . . It is proposed to discriminate against every other city and town of the state in favor of the district within 10 miles of Boston. It is estimated that the cost of electrification in this district will amount to approximately $40,000,000. If the railways are called upon to make this expenditure and the proceeds of the securities which the public may be willing to purchase must be expended in this electrification, then other railway improvements must necessarily wait, because there is a limit to the amount of money which the public will invest in railway securities."

Professor Adams on Efficiency.

Henry C. Adams, who resigned his place with the Interstate Commerce Commission, has taken a commission as special investigator for the New York Central, and will advise President Brown on matters of "efficiency." As quoted in the *Wall Street Journal,* Professor Adams says:

"I believe the railway is a public servant. The railways are eager to answer for themselves the questions which Mr. Brandeis raised in the rate cases. There has come up recently a new generation of railway presidents, Willard of the Baltimore & Ohio, Brown of the New York Central, and Ripley of the Atchison. These men have the business idea of railroading. They know perfectly well that the financial stability of the Harriman lines was brought about by the work done in the office of Julius Kruttschnitt.

"Realizing that public control is going to be more and more enforced, the railways want to be in a position, with reference to a knowledge of themselves, from which they can reveal the defects of any proposed regulation based on injustice or unreasonableness. The railways know that they are going to be subjected to an even greater measure of public control than they now experience, and they want to insure the reasonableness of that control.

"The railway is a public servant; but no servant serves whose services are not wanted. To my mind a reasonable rate is one that insures a fair return to the poorest railway that the public needs. The public is a partner in the railway business, and is entitled to just as definite a share in the railway's earnings as a stockholder. When a railway finds itself at the end of the fiscal year in a position to pay interest, declares a dividend, and still has money on its hands, to whom does that money belong? I say it belongs to the public. No definite percentage, such as 6 per cent. or 7 per cent., can be stated at this time as a reasonable return for a railway. For one railway a profit of 6 per cent. would be large; for another, small. There is no typical railway, any more than there is a typical man."

Railway Farming.

Worn out land will yield a profit if it is treated wisely. The Pennsylvania Railroad has been proving it at Bacon, Delaware. The company bought land which had not been farmed for over five years. It had been robbed of its fertility several years earlier and, considering it worthless, its owners let it grow up in sassafras, sweet briar and weeds. It was in this condition when the company's expert took charge. By a small application of stable manure, about 15 tons per acre, and 500 pounds of lime, corn was raised at the rate of 47 bushels an acre the first year.

A large variety of fruits and vegetables was grown and nearly everything planted added something to the farm's income. The best moneymakers were lima beans, yielding a net profit of $147.61 to the acre. Cucumbers yielded $104, watermelons $52, muskmelons $42, radishes $42.70, leeks $41, onions $40.37, and sweet potatoes $40.50 per acre. All this during the first year. Much better results are assured as the land is strengthened.

Besides offering to farmers these practical examples, demonstrations of up-to-date farming methods have been given. One of these, which consisted of draining a swamp and blowing out stumps with dynamite, was attended by over 500 people from the surrounding country. Following is a sample record at Bacon:

LIMA BEANS.

Seed, per acre	$10.00	Lima beans sold, per acre	$250.00
Labor, per acre	36.23		
Fertilizer, per acre	34.00		
Freight and commission	22.16	Total expense, per acre	102.39
Total expense	$102.39	Profit, per acre	$147.61

Society for the Promotion of Engineering Education.

The Society for the Promotion of Engineering Education will meet at Pittsburgh, June 27-28-29. The meetings of Tuesday and Wednesday will be at the School of Applied Sciences of the Carnegie Technical Schools; and the meeting of Thursday at Thaw Hall, University of Pittsburgh. The executive session and election of officers will be held on Wednesday evening at the School of Applied Industries of the Carnegie Technical Schools. On Tuesday afternoon there will be a visit to the Country Club, and in the evening there will be a dinner; and President A. N. Talbot will deliver his annual address. On Wednesday and Thursday afternoons there will be excursions to industrial plants, and on Thursday evening a reception at the Carnegie Music Hall. Excursions to industrial plants will be arranged also for Friday and Saturday. The chairman of the local committee is J. H. Leete.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 26, 1911, Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March. May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

L. D. Rosenheimer has been appointed traffic manager of the International Forwarding Company, with office at Chicago.

The Chicago & North Western has put on, to run from Chicago to Omaha, a new "daylight" train, which will leave Chicago daily at 8:30 a. m., reach Cedar Rapids, Iowa, at 2:26 p. m., and arrive in Omaha at 10:40 p. m.

The latest educational train on the Southern Railway is the "road improvement train," which is making a tour of eastern Tennessee, beginning June 26, and extending to and including July 8. This train is run in conjunction with the United States Office of Public Roads.

Beginning July 1 the New York Central, in connection with the Louisville & Nashville, will have a more direct line from Chicago to the gulf of Mexico, the route being via the Chicago, Indiana & Southern and the Big Four to Mt. Carmel, Ill., and from thence by a branch of the Big Four, which will begin operations on that date, to Evansville, Ind., where connection is made with the Louisville & Nashville.

The Everett line of the Chicago, Milwaukee & Puget Sound has been opened for freight traffic, and shipments can now be handled to and from the following points in Washington: Tanner, North Bend, Snoqualmie, Falls City, Tolt, Stillwater, Duvall, Monroe and Snohomish. Through rates have been established between these points and stations on the C. M. & P. S., and connecting lines.

The industrial department of the Southern Railway announces the appointment of Dr. C. M. Morgan as dairy agent for that company. Dr. Morgan is a graduate of the Ohio State Agricultural College, and has served several years in the United States Department of Agriculture. Since last September he has been special agent of that department in South Carolina and Georgia, devoting his efforts to the development of live stock.

The Chicago Great Western has restored the faster freight train schedules between Chicago and Kansas City, Omaha, Milwaukee, St. Paul, Minneapolis, Duluth and other western cities, which were superseded last March on that and a number of other Chicago roads by slower schedules, providing for delivery on the third instead of the second morning from Chicago. It is believed that the other roads which made the changes will also restore their former schedules.

Tariffs filed by the Oregon-Washington Railroad & Navigation Company and the Southern Pacific Company provide for the absorption by those companies at Portland, Ore., after July 20 of the $5 switching rate, which it has been their practice to charge for transferring cars of freight from the east which arrive over the Harriman lines to the premises of shippers located on the lines of the Oregon Electric and the United Railways.

The Maine Steamship Company announces that, beginning tomorrow, it will run steamers from New York to Boston daily, leaving New York at 4 p. m., and reaching Boston about 8:30 the next morning, with a corresponding service in the opposite direction. The fare is $4, and the price of staterooms ranges from $1 to $8. It will be observed that the time named in this announcement is somewhat slower than that which was made by the Yale and Harvard last year. The vessels of the new line are described as the "luxurious new steel passenger steamships" Massachusetts and Bunker Hill.

The Wabash has made the announcement to shippers that beginning June 18 its freight schedule between Chicago and St. Louis will be lengthened, and it is probable that the Alton, the Illinois Central and the Chicago & Eastern Illinois will follow the lead of the Wabash, it having been concluded that the fast freight service between those points yielded too narrow a margin of profit to the roads. Under the new arrangement shippers at Chicago will have until 6 o'clock in the evening to get their freight to the depots, it having been necessary under the shorter schedule for the freight to be at the depot at 3:30 p. m. Second morning delivery only will be guaranteed instead of first morning delivery, as had been the practice.

Beginning June 28, the Illinois Central will run two additional passenger trains between Chicago and St. Louis, and the "Diamond Special," which now leaves Chicago at 10:15 p. m., and arrives in St. Louis 7:24 a. m., will leave Chicago at 11:45 p. m. and reach St. Louis at 7:49 the following morning; and its counterpart from St. Louis to Chicago will leave at 11:47 p. m. and reach Chicago at 7:59 a. m., instead of leaving St. Louis at 9:12 p. m. and reaching Chicago at 7:15 a. m. as at present. A new "daylight" train will leave Chicago at 10:02 a. m. and arrive in St. Louis at 6:02 p. m., and, returning leave St. Louis at 11:28 a. m. and reach Chicago at 7:28 p. m. Another train, the "Chicago Express," will leave Chicago at 9:10 p. m. and reach St. Louis at 7:24 a. m., and from St. Louis to Chicago will leave at 9:10 p. m. and arrive at 7:15 a. m. The new trains will be all-steel, electric lighted, and each will be equipped with an observation-parlor car, cafe-club car, coach, and combination coach and baggage car.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 97, giving a summary of car shortages and surpluses by groups from February 2, 1910, to June 7, 1911, says:

"There is little change in the car situation since our last report, the total surplus being 169,006, an increase of 773 cars. Box cars increased 1,456, coal and gondola 249. This was partially offset by a decrease of 949 in the flat car surplus. Notwithstanding the increase in surplus box there is an indication of a tightening in the supply of this class, owing to the approach of the grain shipping season. Attention is called to the report of a shortage of 812 box cars in group 11, which also reports a decrease of some 600 in the surplus of this class."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report and the charts show bi-weekly totals from 1907 to 1911 inclusive.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until July 15, certain tariffs on coke, presented by the Norfolk & Western, the Pennsylvania and the Chesapeake & Ohio.

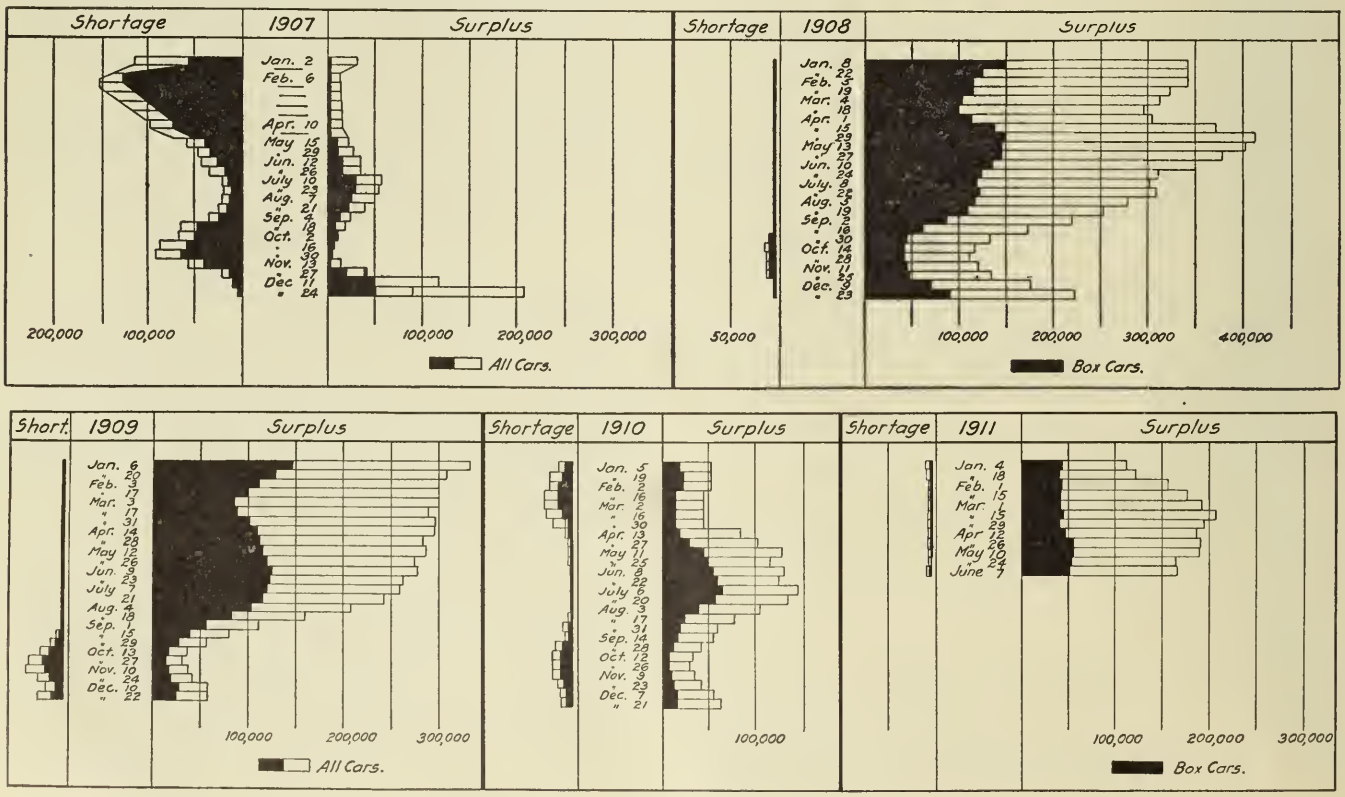
The commission has suspended until October 28, the rule of the new classification of the Trunk Lines and Central Traffic Association Lines, increasing the minimum price on single shipments of freight.

The Illinois Central; the Grand Rapids & Indiana; and the Louisville & Arkansas have been authorized, for limited periods,

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—June 7, 1911	8	501	482	934	261	2,178	260	34	0	17	311
" 2.— " 7, 1911	25	2,193	147	18,362	6,957	27,659	0	0	0	0	0
" 3.— " 7, 1911	25	10,153	1,541	36,915	3,811	52,420	0	0	0	101	101
" 4.— " 7, 1911	10	1,747	105	3,912	1,160	6,924	11	177	0	0	188
" 5.— " 7, 1911	19	4,930	461	4,694	2,044	12,129	11	8	0	1	20
" 6.— " 7, 1911	26	11,165	948	3,538	5,624	21,275	0	0	0	4	4
" 7.— " 7, 1911	5	1,714	80	648	699	3,141	0	0	0	0	0
" 8.— " 7, 1911	16	7,601	171	2,013	4,109	13,894	0	0	0	0	0
" 9.— " 7, 1911	11	2,273	538	295	709	3,815	0	53	0	0	53
" 10.— " 7, 1911	22	8,503	2,183	2,136	9,640	22,462	26	2	0	5	33
" 11.— " 7, 1911	6	1,871	136	15	1,087	3,109	812	182	0	500	1,494
Total	173	52,651	6,792	73,462	36,101	169,006	1,120	456	0	628	2,204

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia, and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1911, Inclusive.

to continue the use of passenger tariffs containing some fares which are higher for shorter distances than for longer.

The commission has refused to approve proposed advances in rates on rice and rice products. Instead it holds that the rates on rice and rice products should be the same from Orange and Beaumont, Tex., via Galveston by rail and ocean to north Atlantic ports. These rates should not exceed the corresponding rates from Houston by more than three cents per 100 lbs. The difference between carload rates and less than carload rates from Beaumont and Orange to said destinations ought not to exceed 10 cents per 100 lbs.

Discrimination Against Fremont.

Fremont Commercial Club v. Chicago, Burlington & Quincy et al. Opinion by the commission:

Defendants charge for the transportation of coal from Missouri, Kansas, Arkansas and Oklahoma points to Fremont, Neb., rates which are from 25 cents to 59½ cents per net ton higher than the rates from the same points of origin to Omaha, Neb., while the rates from the same points of origin to Lincoln, Neb., are uniformly 15 cents higher than the rates to Omaha. Present rates are unduly prejudicial to Fremont to the extent that they exceed the rates to Lincoln by more than 10 cents per net ton. From certain points on the Chicago, Burlington & Quincy Railroad in Colorado and Wyoming the rates on coal other than slack to Fremont are 35 cents per net ton in excess of the rates to Omaha and Lincoln; these rates are unduly prejudicial to Fremont to the extent that they exceed the rates to Lincoln by more than 10 cents per net ton. (21 I. C. C. 74.)

Rates Prescribed for Locomotives and Tenders.

Having suspended advances in rates for the transportation of locomotives and tenders named in a tariff proposed by certain southern railways, the commission investigated the subject and now holds:

1. Locomotives and locomotives and tenders, live or dead, on their own wheels, are somewhat in the nature of an anomalous commodity particularly susceptible to individual treatment and should not be subjected to class rates.
2. Whatever may be the effect of water competition it cannot be extended, theoretically or practically, to articles to which such competition does not apply by merely classing them with other things to which it does apply.
3. The proposed change from a rate per mile regardless of weight to sixth class rates at 50 per cent. actual weight found to result in charges which will be unreasonable.
4. The cost of transportation is likely to vary with some degree of directness with the weight of the article to be transported, and in so far as cost is a factor in rate making, weight must likewise be a factor.
5. The total disregard of weight existing under the mileage basis, as applied to dead locomotives, found to be unfair to the carrier and discriminatory as between shippers.
6. Rate per ton per mile, graduated according to distance, perscribed for the transportation of locomotives and locomotives and tenders, dead, on their own wheels, and rate per mile prescribed for the transportation of locomotives and locomotives and tenders, live, on their own wheels.
7. While every effort conducive to uniformity of classification is to be commended, it does not follow that that result should be attained by accepting as a standard a classification prescribing a rate which when applied to a given commodity or territory becomes unreasonable.

The opinion, by Commissioner Meyer, says that the proceeding had its inception in a complaint filed July 30, 1910, by the Southern Iron & Equipment Company, of Atlanta, Ga., attacking the reasonableness of a change proposed to be made by the southern classification committee in the rating of locomotives. Under southern classification, of October 1, 1897, locomotives, dead, took a rate of 20 cents a mile, and when accompanied by an attendant he was passed free one way. Effective February 1, 1900, the attendant was given free transportation in both directions. On November 1, 1902, the rate was advanced to 30 cents a mile, and on January 5, 1904, to 35 cents a mile, which is the rate now, the only change being the withdrawal on August 26, 1907, of free transportation for the attendant. . . . Obviously the lighter locomotives cannot fairly be taxed with a rate based upon the heavier equipment, for if 35 cents per mile were a reasonable charge for a 200-ton locomotive, manifestly it would be unreasonable for the transportation of a locomotive weighing only 50 tons.

The heaviest movement is in second-hand locomotives which are used by short or industrial lines, new locomotives seldom being used by any but the larger railways. When, on account of obsolescence, locomotives have outlived their usefulness on the lines of the larger companies, they are ordinarily purchased by second-hand locomotive dealers, overhauled and repaired, and sold to lumber mills or other industrial plants. The average price paid by dealers for these locomotives is $1,600, and after being repaired they are sold for about $3,500. The value of new locomotives varies from about $10,000 to $20,000, the average being about $13,000. While no distinction has been made in the rates on new and second-hand locomotives, the dealers in and users of the latter are the ones most directly affected by any change in these rates.

The total disregard of weight under the mileage basis is manifestly unfair to the carrier and discriminatory as between shippers. . . . It was contended by the carriers that locomotives should take sixth class rates because of their analogy to machinery, which takes sixth class rates. But, though there may be some physical analogy between locomotives on their own wheels and some of the articles which now take sixth class, considering all the circumstances connected with their transportation, we believe locomotives on their own wheels to be much in the nature of an anomalous commodity particularly susceptible to individual treatment.

In official classification territory locomotives moved on a mileage rate of 30 cents prior to 1899, since which time fifth class rates, with a weight allowance of 50 per cent., have applied. Through rates from points in this territory to points in southern classification territory are constructed on a combination on the Ohio river, using class rates to the river and mileage rates south.

The fifth class rate from Philadelphia to Norfolk, a distance of 255 miles, is 14 cents, yielding a per-ton-mile revenue of 5.5 mills based on gross weight. From Pittsburgh to Cincinnati, 309 miles, the rate is 15 cents, and the per-ton-mile revenue 4.8 mills. From Cincinnati to Cadillac, Mich., 331 miles, the rate is 20 cents, and the per-ton-mile revenue 6 mills.

In western classification territory locomotives take class E, which from East St. Louis to Topeka, Kan., 339 miles, is 16½ cents, yielding a per-ton-mile revenue of 5 mills.

It is contended that the establishment of class rates on locomotives in southern classification territory will make for simplification of rate construction and uniformity of classification. While every effort conducive to such uniformity is to be commended, it by no means follows that that result should be attained by accepting as a standard a classification prescribing a rating which when applied to a given commodity or territory becomes unreasonable.

Under the mileage rate of 35 cents, and based on gross weights, the per-ton-mile revenue for all distances is 9.75 mills for the transportation of locomotives weighing 36 tons, 5.83 for locomotives weighing 60 tons, and 1.75 for those weighing 200 tons. Under the class rate from Atlanta to Dyersburg the revenue per ton per mile will be 12.4 mills, while to Columbia, S. C., and to Asheville, S. C., the per-ton-mile revenues will be 11.7 and 20.1 mills, respectively. From Albany to Milton, Fla., there is an increase to 30.7 mills, while from Cincinnati to Atlanta the revenue per ton per mile will be 8.6 mills, to Birmingham 7.1 mills, and to New Orleans, La., 4.7 mills.

There are numerous instances of inequalities produced by the application of class rates. From Atlanta to Milton and to Marianna, Fla., the distances being 357 and 385 miles, respectively, and the rates are 42 and 60 cents. While under the present mileage basis Milton has a reasonable advantage, under the class basis it takes a rate, per 60-ton locomotive, $108 less than Marianna. It is well known that class rates in southeastern territory have been very materially shaped by water competition. It is admitted by all parties in this proceeding that locomotives on their own wheels cannot be affected by water competition, but it was argued that that was no reason why they should not be included within class rates, which are partly the result of water competition, for the reason that the same argument might be directed against many other articles in the classification, which

likewise were not influenced by water competition. We do not believe that this line of argument is meritorious. It is hardly conclusive to argue that, simply because there are many other articles in the classification not subject to water competition, it is not objectionable to place locomotives, which are admittedly not subject to water competition, into one of these classes. Courts and commissions have long recognized the validity of water competition. Whatever may be the effect of water competition, it cannot be extended, theoretically or practically, to articles to which such competition does not apply by merely classing them with other things to which it does apply. It appears to us, therefore, that this argument, with respect to the absence of water competition on certain articles in the southern classification, merely points out the necessity of segregating those which are affected by water competition and those which are not so affected. It cannot force locomotives into an unnatural class.

We are therefore of the opinion that at least in the territory here involved locomotives should not be subjected to class rates, but that a rate should be found which will give proper regard to both weight and distance—two universally recognized fundamental factors in rate making.

Both as a matter of equity and expediency it is rare indeed that a flat ton-mile rate can be prescribed. The great diversity in the characteristics of the objects transported, as well as the kaleidoscopic succession of the conditions under which this transportation takes place, combine to make such a rate, when universally applied, both unreasonable and discriminatory. It is not so in the instant case. Locomotives, as suggested above, stand in a class by themselves and present a rate problem in many respects different perhaps from any that has heretofore been brought to our attention.

Under all the circumstances, and accepting as a basis the per-ton-mile revenue of 5.83 mills arrived at by applying the present mileage rate of 35 cents to the average gross weight of 60 tons, or 120,000 lbs.; we are of the opinion and find that a reasonable rate for the transportation of locomotives, and locomotives and tenders, dead, on their own wheels, in southern classification territory, should not exceed the following rate per-ton-mile applied to the gross weight of locomotives, and locomotives and tenders:

Distance.	Rate per ton per mile, gross weight of locomotives. Mills.
Not over 200 miles	6.0
Over 200 and under 300 miles	5.8
Over 300 and under 400 miles	5.6
Over 400 and under 500 miles	5.4
Over 500 and under 600 miles	5.2
Over 600 and under 700 miles	5.1
Over 700 miles	5.0

The application of this basis will give to the shippers approximately the same rates they now enjoy when they ship locomotives whose weight does not exceed 60 tons, while, when that weight is exceeded, the carrier will be fully compensated for the additional tonnage.

The rates prescribed represent no more than an approximation of what the schedule would be were all the data available for a detailed analysis of terminal and line expenses. In calculating the total charge the rate applicable to its respective zone should be applied for the distance in that zone only. The rate applicable to the final zone should not be applied to the entire haul. It is obvious that for distances under 200 miles there is a uniform charge of 6.0 mills per ton per mile. But the charge for 300 miles is not 300×5.8, but $(200 \times 6.0) + (100 \times 5.8)$. The charge for 575 miles is not 575×5.2, but $(200 \times 6.0) + (100 \times 5.8) + (100 \times 5.6) + (100 \times 5.4) + (75 \times 5.2)$.

While it is possible to express the rate for any given distance on a uniform mileage basis, the above distance tariff doubtless can be applied in the manner suggested without difficulty.

While the original complaint also attacked the change proposed to be made in the classification of locomotives, live, or moving by their own power, and while our order also suspends this item, no one was prepared at the hearing to offer any testimony regarding such movements. The complainants stated that it was not interested in the transportation of locomotives, live, and a witness for one of the carriers stated that his records showed only one movement of this kind during a period of more than a year. Another witness for the carriers stated that, in his opinion, dead and live locomotives should take the same rate. However, the conditions presented in the transportation of a live locomotive are materially different from those attendant upon the transportation of a dead locomotive, for the reason that, as the carrier furnishes only trackage and no motive power, weight is almost an immaterial factor. It is true that such a movement is similar to the movement of an entire train so far as train despatching is concerned, but it would seem that a flat rate per mile properly might be charged in such cases.

As no testimony was offered upon this point, we conclude that the proposed change must be withdrawn and a rate not in excess of 30 cents a mile maintained.

The order prescribing rates is to go into effect August 1, and it is addressed to roads in Northern and Western as well as Southern territory, the list of roads filling seven pages. (21 I. C. C. 1,581.)

Milling-in-Transit Privilege Not Sustained.

Douglas & Company v. C. R. I. & P. et al. Opinion by Commissioner McChord.

Upon supplemental complaint alleging that defendants had canceled certain transit privileges which were established in compliance with the commission's decision in the prior case, certain tariffs were suspended and investigation made. It appears that more than two years have elapsed between the time of the first decision and the filing of the supplemental complaint; *Held,* Upon the present record that the withdrawal of the transit rates heretofore accorded does not work undue preference or unjust discrimination. A privilege, savoring as this does of a gratuity, however valuable and beneficial and however difficult of relinquishment, can not, as a matter of law, be continued by this commission, unless the original granting of the privilege rested on some legal obligation which under the law affords ground on which the commission could, as an original proposition, require that it be granted, or, if discontinued, order it restored. Supplemental complaint dismissed and orders suspending tariffs vacated.

The original complaint arose from the withdrawal of certain milling-in-transit rates at Cedar Rapids under which corn was manufactured into starch and the starch was forwarded to destinations at the corn rates. Under the tariffs then in force and the conditions then existent the commission found that the withdrawal of the transit privileges created unjust discrimination against complainant. No order was issued and defendants removed the unjust discrimination by restoring transit privileges at Cedar Rapids to the satisfaction of complainant.

Defendants did not attempt to withdraw all transit rates and privileges on corn manufactured into starch at Cedar Rapids. Under the proposed Illinois Central tariffs transit arrangements are continued to all points in Illinois on the north of a line drawn through Havana, Springfield, Decatur and Champaign. To Illinois points south of that line and to points in southeastern and Carolina territories the proposed tariffs apply the rates on corn to Cedar Rapids and the starch rates from Cedar Rapids to destination, or the rates on corn to the basing points and the starch rates beyond, whichever makes lower. One important consideration in the previous decision was the discrimination then shown against complainant and in favor of a competitor at Pekin, Ill. Pekin was at the time of the former hearing the only point on the Illinois Central road aside from Cedar Rapids which had transit arrangements similar to those in force at Cedar Rapids, and they have since been withdrawn at Pekin. No point on the Rock Island road other than Cedar Rapids has this transit privilege.

An important point in the previous case was the fact that the Chicago, Burlington & Quincy had in effect transit arrangements at Keokuk. It is understood that if the Illinois Central tariff becomes effective the Chicago, Burlington & Quincy transit privilege at Keokuk will be at once limited. The conditions which obtained at the time of the previous hearing have been materially changed. There is now no transit on starch at Pekin and there will be none at Keokuk. There is no transit on starch made from corn from Iowa at Decatur, and the rates applicable there on products of corn from other than Iowa points is the product rate from the point of origin of the corn to the destination of the product. The Decatur plant does not manufacture starch. It produces corn flour which is somewhat similar to, but chemically different from, powdered starch. Starch is manufactured at Chicago, Argo, and Waukegan, Ill., and at Robey and Indianapolis, Ind., at which points it enjoys no transit privilege.

Defendants contend that the arrangement now in force results in rates that are unreasonably low and that the rates under the proposed tariffs will be reasonable. They show that the proposed rates through Cedar Rapids will in no instance be higher than those through other points at which starch is manufactured, and that in some cases they will be lower.

The Supreme Court in Southern Pacific Co. v. I. C. C., 219 U. S., 433, has decided, among other things, that money invested on the faith of the maintenance of a certain rate structure does not require carriers to indefinitely or forever continue that adjustment. The fact that agents of a carrier solicit traffic carries with it no obligation and no liberty to do other than to charge the lawfully established tariff rates.

A full review of the record demonstrates that a situation now obtains, and will result if the contemplated action of the carriers is permitted to become effective, different from that which formed the basis of the former decision. It is seen from complainant's testimony that it is at no disadvantage in the purchase of corn; that is, "In securing their material for milling." Complainant is on an equality with all other purchasers of corn. It is admitted that there is no competition between the products or the by-products of complainant's plant and the cereal plant at Cedar Rapids. Therefore, there is here no "competition between the millers of grain either in marketing their product or in securing their material for milling." No transit privilege on corn manufactured into starch is accorded any other manufacturer on the lines of defendants. Transit to certain territory is still accorded to complainant.

The supplemental petition must be dismissed and such an order will be entered. An order will also be entered vacating the orders suspending the tariffs in question. (21 I. C. C. 1580.)

STATE COMMISSIONS.

The California State Railroad Commission, acting under section 15 of the new railway law of that state, is to make a general investigation of highway grade crossings in Los Angeles county.

The State Railroad Commission of Tennessee has authorized the Tennessee Central to adopt a general rate of 3 cents a mile for passenger fares on that part of its road east of Nashville, raising the rate from 2½ cents. West of Nashville the rates are already on the 3-cent basis.

The governor of New Hampshire has appointed as members of the new Public Service Commission of that state, Edward C. Niles of Concord; John E. Benton of Keene; and Prof. T. W. D. Worthen of Hanover. Messrs. Niles and Benton are young lawyers, classed as progressive republicans. Prof. Worthen is at the head of the department of mathematics in Dartmouth college, and is classed as a progressive democrat. Governor Bass says that he tried, without success, to secure Prof. F. H. Dixon of Dartmouth.

COURT NEWS.

The Supreme Court of California, in a suit against the Southern Pacific, has affirmed the verdict of a lower court for $70,000 damages for personal injuries.

The federal court at Columbus, Ohio, has dissolved the injunction, which has been in effect for nearly a year past, under which the Chesapeake & Ohio was forbidden to vote on its stock in the Hocking Valley.

In the Common Pleas Court at Columbus, Ohio, June 17, a temporary injunction was granted against the enforcement of the recent order of the Ohio State Railroad Commission, promulgating car demurrage rules and applying them to cars used in interstate, as well as intrastate business. The injunction was applied for by fifty railways.

In the United States Circuit Court at New York City this week, Judge Lacombe has decided in favor of the express companies in the suit which was brought in their behalf against the city of New York last autumn, at the time of the strike of wagon drivers. When men were brought from other cities to take the place of strikers on the wagons, the city hampered the efforts of the companies to break the strike by its action in requiring each driver to be licensed. The present decision holds that drivers engaged in interstate commerce cannot be required to submit to a city ordinance requiring them to be licensed.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. W. Vallery, general manager of the Colorado Midland, has been elected president, with office at Denver, Colo., succeeding A. D. Parker.

H. T. Evans has been appointed auditor of the Chicago, Indianapolis & Louisville, with office at Chicago, succeeding Joseph L. Doherty, deceased.

W. B. Rodman has been appointed general solicitor of the Norfolk Southern, with office at Norfolk, Va., succeeding Edward R. Baird, Jr., resigned, effective July 1.

Clark B. Ferry, assistant secretary of the Chicago, Milwaukee & St. Paul, since January, 1883 has become senior assistant secretary of that company by the death of James M. McKinlay, with office at New York

J. E. Votaw, general superintendent of the Marshall & East Texas, has been elected vice-president and general manager, with office at Marshall, Tex., and his former position has been abolished. E. Key, assistant treasurer, has been elected treasurer, and J. I. Hey, auditor and assistant secretary, has been elected secretary, both with offices at Marshall, Tex.

John Millen, vice-president and general manager of the Duluth & Northern Minnesota, at Duluth, Minn., has been elected president, with office at Duluth, succeeding B. W. Arnold of Albany, N. Y., elected vice-president.

Henry Irving Miller, whose election as president of the New Orleans Great Northern was recently announced in these columns, was born at Cleveland, Ohio, and received a public school and collegiate education. In 1880 he entered the service of the Pennsylvania Lines West of Pittsburgh, and after serving for some time in the engineering department, he was consecutively assistant engineer, engineer, and then superintendent of the Richmond division; and later was appointed superintendent of the Louisville division. In April, 1894, Mr. Miller was made superintendent of the Main Line division of the Vandalia Railroad, extending from Indianapolis to St. Louis, and in June, 1901, he was appointed general manager of that road. He left the Vandalia in December, 1903, to become general manager of the Chicago, Rock Island & Pacific, remaining in that position until March 1, 1905, when he was elected second vice-president and general manager of the Chicago & Eastern Illinois, the Evansville & Terre Haute, the Evansville & Indianapolis, and the Evansville Belt Railway; and in November, 1907, he was elected president of these properties. He resigned from these various positions on December 1, 1909. In May, 1910, he was appointed receiver of the Buffalo & Susquehanna, which position he still occupies, and in December of the same year he was elected first vice-president of the New Orleans Great Northern and the Great Southern Lumber Company, and on May 26, 1911, he was elected president of these companies. Since April last Mr. Miller has been a director of the Missouri Pacific, and on May 23, he became vice-president and a member of the executive committee of that road. On the M. P. Mr. Miller will act in an advisory capacity to the chairman of the board of directors. His headquarters are at New York.



H. I. Miller.

Operating Officers.

D. Salle has been appointed trainmaster of the Missouri, Oklahoma & Gulf, with office at Calvin, Okla., succeeding D. Sullivan, resigned.

E. F. Donohue has been appointed car accountant of the Texas & Pacific, with office at Dallas, Tex., succeeding C. Ludolph, promoted.

The office of J. H. Rosenstock, superintendent of the Susquehanna division of the Delaware & Hudson, has been transferred from Albany, N. Y., to Oneonta.

W. E. Roberts, trainmaster of the Canadian Northern at Dauphin, Man., has been appointed superintendent of District No. 6, with office at Brandon, Man.

J. A. McDougal, superintendent of terminals of the Missouri Pacific at Little Rock, Ark., has been appointed superintendent of the Arkansas division, with office at Little Rock, succeeding J. F. Murphy, promoted.

F. W. Green, general superintendent of the Louisiana & Arkansas at Stamps, Ark., has been appointed general manager, with headquarters at Stamps, a new office. He will have general control and direction of the construction, operating and maintenance departments.

J. W. Dodge, chief clerk to the general superintendent of the southern lines of the Illinois Central at New Orleans, La., has been appointed superintendent of the New Orleans division of the Yazoo & Mississippi Valley, with office at Vicksburg, Miss., succeeding B. F. Galvani, resigned.

B. C. Crow, chief clerk in the office of the general manager of the Texas & Pacific at Dallas, Tex., has been appointed general superintendent and general freight and passenger agent of the Weatherford, Mineral Wells & Northern, with office at Weatherford, Tex., succeeding P. E. Bock, resigned to accept service elsewhere.

P. E. Bock, whose appointment as general superintendent of the Gulf, Texas & Western, with office at Jermyn, Tex., has been announced in these columns, began railway work in April, 1881, in the construction department of the Denver, Utah & Pacific, now a part of the Chicago, Burlington & Quincy, at Denver, Colo., and remained with that road in the operating and mechanical departments until 1890, when he took charge of the construction of the Weatherford, Mineral Wells & Northwestern, in Texas. On the completion of that road he was train conductor until February, 1892, when he was appointed superintendent. In October, 1898, he was elected also vice-president, and assumed the duties of general freight and passenger agent, with office at Weatherford, Tex., from which he now resigns to go the the Gulf, Texas & Western, as above noted.

Beginning June 19, the Missouri Pacific System will be operated in three districts as follows: The Eastern district, with headquarters at St. Louis, Mo., comprising the St. Louis Terminal, Illinois, Missouri, Eastern, Joplin and White River divisions; J. F. Murphy, superintendent at Little Rock, Ark., has been appointed general superintendent; R. J. Turnbull, division master mechanic at Osawatomie, Kan., has been appointed assistant superintendent of machinery; and Phil Carroll, division engineer at Poplar Bluff, Mo., has been appointed engineer maintenance of way. The Western district, with headquarters at Kansas City, Mo., comprising the Kansas City Terminal, Omaha, Northern Kansas, Central Kansas, Colorado, Wichita and Southern Kansas divisions; W. J. McKee has been appointed general superintendent; W. L. Tracy, assistant superintendent of machinery; and J. R. Leighty, engineer maintenance of way. The Southern district, with headquarters at Little Rock, comprising the Arkansas, Memphis, Valley, Natchez and Central divisions; M. M. Richey has been appointed general superintendent; D. W. Cunningham, assistant superintendent of machinery; and E. J. Correll, engineer maintenance of way. (See item in General News Section.)

The jurisdiction of the general superintendent, the assistant superintendent of machinery and the engineer maintenance of way of the Southern district of the Missouri Pacific System, and that of the superintendent, the master mechanic and the division engineer of the Valley division, has been extended over the line from Alexandria, La., to Lake Charles, which will hereafter be operated as the Lake Charles district of the Valley division. The jurisdiction of similar officers of the Eastern district and of the Illinois division has been extended over the Coal Belt division, which will hereafter be operated as the Coal Belt district of the Illinois division. The jurisdiction of officers of the Omaha and Northern Kansas divisions having been separated, A. DeBernardi, superintendent at Atchison, Kan., has been appointed superintendent of the Omaha division, with office at Falls City, Neb., and J. F. Russ, trainmaster at Concordia, Kan., has been appointed superintendent of the Northern Kansas division, with office at Atchison, Kan. (See item under Engineering and Rolling Stock Officers.)

Edward Wilson Mason, whose appointment as division superintendent of the Western Pacific, with office at Sacramento, Cal., has been announced in these columns, was born March 23, 1877, at Moberly, Mo. He received a public school education and began railway work in June, 1893, as a night caller in the operating department of the Northern Pacific at Tacoma, Wash. Two years later he was transferred to the South Tacoma shops as night operator, and was then consecutively relay operator, ticket clerk and operator, despatcher, then night chief despatcher and chief despatcher, filling these offices at different times at Tacoma, at Helena, Mont., and at Missoula. His next promotion was to trainmaster, which position he resigned in November, 1909, to go with the Western Pacific, after having been with the Northern Pacific continuously, except for six months in 1902-1903, when he was trainmaster at Kent, Wash., for the Puget Sound Electric Railway. He was then made superintendent of telegraph and car accountant of the Western Pacific, from which office he has been promoted as above.



E. W. Mason.

Traffic Officers.

Russell C. Thompson has been appointed a traveling freight agent of the Georgia Railroad, with office at Tampa, Fla.

G. W. Lee has been appointed traveling immigration agent of the Mobile & Ohio, with headquarters at St. Louis, Mo.

C. R. Alvarez has been appointed a soliciting freight agent of the Seaboard Air Line, with office at Tampa, Fla., succeeding W. H. Drew, resigned.

George W. Vaux has been appointed traveling passenger agent of the Southern Pacific, with office at Toronto, Ont., succeeding J. O. Goodsell, transferred.

Charles Hall, assistant general freight agent of the St. Louis & San Francisco at St. Louis, Mo., has been appointed general western freight agent, with headquarters at San Francisco, Cal., a new office.

Edward S. Giles, chief of the tariff bureau of the Delaware, Lackawanna & Western, has been appointed assistant general freight agent, with office at New York, and his former position has been abolished.

T. E. Brazelton, traveling freight agent of the Gulf, Colorado & Santa Fe at Dallas, Tex., has been appointed industrial agent, with office at Galveston, Tex., succeeding S. A. Kendig, colonization agent, deceased.

W. H. Foust, chief clerk to the assistant general passenger agent of the Baltimore & Ohio at Pittsburgh, Pa., has been ap-

pointed traveling passenger agent, with office at Pittsburgh, succeeding Arthur W. Tiddy, deceased.

Press Nicholls, formerly soliciting freight agent of the Atchison, Topeka & Santa Fe at Beaumont, Tex., has been appointed commercial agent of the Mallory Steamship Company, with office at San Antonio, Tex., succeeding S. C. Timpson, resigned.

J. F. Jutz has been appointed a traveling freight agent of the Union Pacific, with office at St. Louis, Mo., succeeding George Carroll, and M. Meadors has been appointed a contracting freight agent, with office at Los Angeles, Cal., succeeding W. J. Robinson.

J. P. Brandon, district passenger agent of the St. Louis & San Francisco, the Chicago & Eastern Illinois, and the Evansville & Terre Haute, with office at Cleveland, Ohio, has resigned, and for the present M. B. Muxen, district passenger agent at Pittsburgh, Pa., will have jurisdiction over the Cleveland territory.

F. L. Corwin, commercial agent of the Central of Georgia, at Jacksonville, Fla., has been appointed Florida freight agent, and J. R. Randolph, traveling freight agent, at Jacksonville, succeeds Mr. Corwin, both with offices at Jacksonville. H. E. Shepard has been appointed a commercial agent, with office at Tampa.

W. L. McWhirter, commercial agent of the Atchison, Topeka & Santa Fe at Galveston, Tex., has been appointed general agent, with office at New Orleans, La., succeeding W. J. Nolan, appointed soliciting freight agent at Beaumont, Tex. Albert R. Bone has been appointed soliciting freight agent at Galveston, succeeding to the duties of Mr. McWhirter.

Holman D. Waldron, assistant general passenger agent of the Maine Central and its controlled lines, has been promoted to the position of general passenger agent; office at Portland, Me. Mr. Waldron succeeds Frederick E. Boothby, who has been at the head of the passenger department of the Maine Central for 37 years. Col. Boothby has for many years been a prominent member of the American Association of General Passenger and Ticket Agents.

M. C. Broughton, district freight solicitor of the Pennsylvania Railroad at Easton, Pa., has been appointed freight solicitor, with office at Pittsburgh, succeeding E. B. Mitchell, promoted. W. J. Hickey, freight solicitor, at Rochester, N. Y., succeeds Mr. Broughton. Bruce K. Wimer, freight solicitor at Easton, succeeds Mr. Hickey; Edward S. Neilson, freight solicitor at New Haven, Conn., succeeds Mr. Wimer; W. S. Franklin, Jr., freight solicitor, with office at Baltimore, Md., succeeds Mr. Neilson, and S. T. Stackpole succeeds Mr. Franklin.

Iverson Lea Graves, whose appointment as coal freight agent of the Southern Railway, with office at Atlanta, Ga., has been announced in these columns, was born June 21, 1870, at Augusta, Ga. He was educated at Emory College, Oxford, graduating with the degree of A. B. in the class of 1891. The following year he began railway work with the Richmond & Danville, now a part of the Southern Railway, and was for two years in the law department of that road, and then for one year was out of railway work. He was then with the operating department of the Plant System of Railways for one year, then one year with the Southeastern Car Service Association at Atlanta, and since January, 1897, in the executive and traffic department of the Southern Railway. At the time of his recent appointment as coal freight agent he was general freight agent at Memphis, Tenn.

L. L. McCleskey, whose appointment as assistant general freight agent of the Southern Railway, at Atlanta, Ga., has been announced in these columns, was born at Monroe, Walton county, Ga., and was educated at the University of Georgia. He began railway work in 1875 as soliciting agent on the Port Royal & Augusta, now a part of the Charleston & Western Carolina, and the following year went to the Atlantic Coast Line as soliciting freight agent. About two years later he was appointed passenger agent of the Associated Railways of Virginia & Carolina, remaining in this position until April, 1881, when he was appointed commercial agent of the Richmond & Danville, now a part of the Southern Railway, and about three years later was made assistant general freight and passenger agent of the same road. In March, 1898, he was appointed division freight agent of the Southern Railway, and in November, 1909, was appointed assistant to general freight agent, which position he held until his recent appointment as above noted.

James Westmoreland Hunter, whose appointment as assistant general freight agent of the Southern Railway, with office at Mobile, Ala., has been announced in these columns, was born on February 23, 1871, at Atlanta, Ga., and was educated in the public schools of his native town. Mr. Hunter began railway work on December 17, 1890, as stenographer in the office of the assistant general freight agent of the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, and was later chief clerk. In February, 1896, he was appointed chief clerk to the division freight agent of the Southern Railway, at Raleigh, N. C. The following May he went to the passenger department of the Georgia & Alabama, now a part of the Seaboard Air Line, and from April, 1897, to June, 1899, was rate clerk and chief clerk in the division freight office of the Southern Railway, at Birmingham, Ala., and in June, 1899, he was promoted to soliciting agent. He was then made commercial agent, and later division freight agent at Selma, which position he held at the time of his recent appointment as assistant general freight agent.

Joseph H. Brown, whose appointment as general freight and passenger agent of the Gulf & Ship Island, with office at Gulfport, Miss., has been announced in these columns, was born November 16, 1873, at Rochester, N. Y. Mr. Brown began railway work in August, 1886, with the Blue Line (fast freight line), and in 1896 he was appointed a rate clerk on the Michigan Central, at Chicago. The following year he was appointed chief rate and percentage clerk in the general freight department, at Detroit, and in 1898 was appointed general accountant of the North Shore Despatch. In 1899 Mr. Brown was appointed chief clerk to the assistant general freight agent of the Michigan Central, at Chicago, and the following year he was made chief clerk to the freight traffic manager, at Detroit of the same road. He was appointed manager of the North & South Despatch, in 1906, with office at Chicago, and three years later was appointed assistant general freight agent of the Michigan Central, with office at Bay City. Now he becomes general freight and passenger agent of the Gulf & Ship Island, as above noted.



J. H. Brown.

Engineering and Rolling Stock Officers.

David L. Robertson has been appointed assistant engineer of the New York Central & Hudson River, with office at New York, succeeding S. C. Upson.

F. B. Hart has been appointed roadmaster of the Pecos & Northern Texas, with office at Amarillo, Tex., succeeding J. H. Stinson, transferred to Canadian, Tex.

W. H. Sample has been appointed master mechanic of the Ottawa division of the Grand Trunk, with office at Ottawa, Ont., succeeding R. Cowan, assigned to other duties.

P. J. Carter has been appointed assistant engineer of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., succeeding Kenneth B. Duncan, transferred to Topeka, Kan.

B. S. Wathen, chief engineer of the Texas & Pacific at Dallas, Tex., has been appointed consulting engineer, with office at Dallas. C. H. Chamberlin, assistant engineer at Dallas, has been appointed chief engineer.

F. G. Jonah has been appointed chief engineer of the New Orleans, Texas & Mexico, and the St. Louis, Brownsville & Mexico, with office at St. Louis, Mo., succeeding on the former road M. C. Byers, who will devote his entire time to other parts of the system.

The following have been appointed shop superintendents of the Missouri Pacific and the St. Louis, Iron Mountain & Southern; M. J. McGraw at Sedalia, Mo.; W. C. Smith at Kansas City, Mo.; E. F. Stroch at Hoisington, Kan.; B. J. Peasley at De Soto, Mo., and B. E. Stevens at Argenta, Ark.

A. R. Cook, engineer maintenance of way of the Northern Pacific lines west of Paradise, at Tacoma, Wash., has been appointed principal assistant engineer, a new office, with headquarters at Tacoma. L. M. Perkins, engineer maintenance of way of the lines east of Paradise at St. Paul, Minn., succeeds Mr. Cook, and Andrew Gibson, head of the timber department at Missoula, Mont., succeeds Mr. Perkins.

Incident to the re-districting of the Missouri Pacific System (see items under Operating Officers and in the General News Section), R. J. Trumbull, division master mechanic at Osawatomie, Kan., has been appointed assistant superintendent of machinery of the Eastern district; and Phil Carroll, division engineer at Poplar Bluff, Mo., has been appointed engineer maintenance of way, both with offices at St. Louis, Mo. J. T. Robinson has been appointed master mechanic of the Central Kansas division, with office at Osawatomie, succeeding Mr. Trumbull. E. R. Lockhart, assistant master mechanic at Hoisington, Kan., has been appointed master mechanic of the Colorado division, with office at Hoisington, and his former position has been abolished. The jurisdiction of officers of the Omaha and Northern Kansas divisions having been separated. F. W. Schultz, master mechanic, and O. Rickert, division engineer, both at Atchison, Kan., have been transferred to Falls City, Neb., with jurisdiction over the Omaha division. C. E. McAuliffe, assistant master mechanic at Jefferson City, Mo., has been appointed master mechanic of the Northern Kansas division, with office at Atchison; and H. E. Boardman, whose appointment as division engineer at Atchison was recently announced in these columns, will have jurisdiction over the Northern Kansas division.

Purchasing Officers.

C. Ludolph, car accountant of the Texas & Pacific at Dallas, Tex., has been appointed purchasing agent, with office at Dallas, and W. F. Duane has been appointed general storekeeper, with office at Marshall.

Benjamin S. Hinckley, whose appointment as purchasing agent of the Boston & Maine, with office at Boston, Mass., has been announced in these columns, was born November 18, 1875, at Charlestown, and was educated at the Massachusetts Institute of Technology. He began railway work in August, 1899, with the Northern Pacific, and for six years was a special apprentice and dynamometer car operator on that road. In April, 1906, he went to the New York, New Haven & Hartford as chief inspector in the test department, and was appointed engineer of tests in June, 1907, which position he held until his recent appointment as purchasing agent of the Boston & Maine.

Special Officers.

Eden B. Hunt has been appointed superintendent of the voluntary relief department of the Pennsylvania Railroad and subsidiary companies, succeeding Spencer Meade, deceased.

OBITUARY.

E. M. Kenly, vice-president, general superintendent and chief engineer of the Yakima Valley Transportation Company, died suddenly at his home in North Yakima, Wash., on June 10.

Sylvester T. Smith, formerly president of the Chesapeake Beach Railway, died in Chicago on June 18, at the age of 72 years. Mr. Smith was born at Buffalo, N. Y., and began railway work in 1864 with the Union Pacific (Eastern division), afterwards the Kansas Pacific Railway. He was connected with the accounting and auditing department until October, 1878, when he was made receiver. He was transferred to the operating department in the following year, and from October, 1884, to April, 1887, was general superintendent. He was then for a number of years general manager of the Denver & Rio Grande. He was associated with David H. Moffat in the construction of the Denver, Northwestern & Pacific, and amassed a large fortune in the mining industry in Colorado.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The International & Great Northern has ordered nine locomotives from the Baldwin Locomotive Works.

The Erie Railroad is in the market for 35 Mikado locomotives, 5 Pacific type locomotives and 20 switching locomotives.

The Mexico North Western, reported in the *Railway Age Gazette* of June 16 as being in the market for 2 Mallet (2-6-6-2) locomotives and 6 Prairie type locomotives, has ordered these engines from the American Locomotive Company.

The Uintah Railway has ordered 1 Mikado locomotive from the Baldwin Locomotive Works. The diameter of the cylinders will be 19 in., stroke of piston, 22 in., diameter of driving wheels will be 40 in., and the total weight in working order will be 146,000 lbs.

The Escanaba & Lake Superior has ordered one 10-wheel locomotive from the Baldwin Locomotive Works. The cylinders will be 19 in. x 26 in., diameter of driving wheels will be 58 in., weight on drivers will be about 107,450 lbs. The total weight of the engine will be 137,750 lbs., and the weight on tender 110,000 lbs., in working order.

The Southern Railway, as mentioned in the *Railway Age Gazette* of April 28, has ordered 33 mikado locomotives from the Baldwin Locomotive Works, and 15 Pacific type locomotives from the American Locomotive Company. The dimensions and specifications of these locomotives will be as follows:

	Mikado	Pacific
Type	Mikado	Pacific
Simple or compound	Simple	Simple
Weight on drivers	212,300 lbs.	134,000 lbs.
Total weight	269,000 lbs.	224,300 lbs.
Diameter of cylinders	27 in.	22 in.
Stroke of pistons	30 in.	28 in.
Diameter of drivers	63 in.	72½ in.
Type of boiler	Extended wagon top	Straight top
Working steam pressure	175 lbs.	220 lbs.
Heating surfaces, tubes	3,019 sq. ft.	3,700 sq. ft.
Heating surface, firebox	212 sq. ft.	185 sq. ft.
Heating surface, total	3,231 sq. ft.	3,885 sq. ft.
Tubes, number	30 5½ in. superheater 183 ordinary	312
Tubes, outside diameter	2¼ in.	2¼ in.
Tubes, length	20 ft. 0 in.	20 ft. 0 in.
Firebox, type	Wide	Wide
Firebox, length	108 in.	109 in.
Firebox, width	72¼ in.	73 in.
Firebox, material and maker	Carbon acid	Carbon acid
Grate area	54 sq. ft.	54 sq. ft.
Tank capacity for water	8,000 gals.	7,500 gals.
Coal capacity	14 tons	12 tons
Special Equipment.		
Axles	Open hearth steel	Open hearth steel
Bell ringer	Improved Golmar	Improved Golmar
Boiler lagging	85% magnesia	85% magnesia
Brakes	New York	New York
Brake beams	Waycott	Waycott
Brake shoes	Amer. Brake Shoe & Fdy. Co.	Amer. Brake Shoe & Fdy. Co.
Couplers	McConway & Torley	McConway & Torley
Driving boxes	Cast steel	Cast steel
Headlight	Electric Pyle	Electric Pyle
Injector	Hancock	Hancock
Journal bearings	Ajax	Ajax
Piston and valve rod packings	Paxton-Mitchell	Paxton-Mitchell
Safety valve	Consolidated	5 engs. consolidated 10 engs. Crane
Sanding devices	Viloco	Viloco
Sight-feed lubricators	Detroit	13 engs. Michigan 2 engs. Detroit
Springs	Pittsburgh Spring & Steel Co.	Vanadium
Staying	Ewald	United States
Steam gages	Ashton	Ashton
Steam heat equipment	None	Gold
Superheater	Locomotive Superheater Co.	Locomotive Superheater Co.'s superheater on 2 engs. Cyls. on these engs. will be 24 in. x 28 in.
Tires	Midvale	Midvale
Tubes	Charcoal iron	Charcoal iron
Valve gear	Walschaerts	Walschaerts
Wheel centers	Cast steel	Cast steel
Stay bolts	Tate flexible	Tate flexible
Throttle	Chambers	Chambers
Frames	Vanadium steel	Vanadium steel

CAR BUILDING.

The United Traction Co., Albany, N. Y., has ordered 12 street cars from the Pressed Steel Car Co.

The Great Northern has ordered 1,000 40-ft. long, 40-ton capacity box cars from the Haskell & Barker Car Company.

The Mexico North Western, reported in the *Railway Age Gazette* of June 16 as being in the market for 500 logging cars, has ordered this equipment from the Bettendorf Axle Co., with an option for 100 more cars after January 1. The cars are to be all steel, 40 ft. long, and to have a capacity of 40 tons.

The Southern Railway, as mentioned in the *Railway Age Gazette* of April 28, has ordered 35 all-steel passenger cars from the Harlan & Hollingsworth Corporation; 10 all-steel combination passenger and baggage cars from the St. Louis Car Company, and 20 steel underframe postal cars from the American Car & Foundry Company. The inside measurements of the 35 passenger cars will be 66 ft. long, 8 ft. 10¾ in. wide, and the overall measurements will be 74 ft. 8¾ in. long; 9 ft. 10¼ in. wide, and 14 ft. 1⅜ in. high, from rail. The inside measurements of the 10 passenger and baggage cars will be 65 ft. long, 8 ft. 10¾ in. wide, and the overall measurements will be 74 ft. 4¼ in. long; 9 ft. 10¼ in. wide, and 14 ft. 1⅜ in. high, from rail. The 20 postal cars are to have wood bodies and steel underframes. The inside measurements will be 60 ft. long, 9 ft. wide, and the overall measurements will be 63 ft. 4 in. long, 9 ft. 10⅛ in. wide, and 14 ft. 2 in. high, from rail. The special equipment on all three types will be identical, except where indicated.

Axles	Open hearth steel.
Bolsters, body	Built in.
Bolsters, truck	Commonwealth.
Brakes	Westinghouse.
Brake beams	Waycott.
Brake shoes	American Brake Shoe & Foundry Co.
Brasses	Ajax.
Couplers	McConway & Torley.
Curtain Fixtures	Pass., Pass. and Bagg., Curtain Supply Co.
Curtain material	Pass., Pass. and Bagg., Pantasote.
Draft gear	Miner friction.
Dust guards	Harrison.
Heating system	Gold Combination Straight Steam and Vapor.
Journal boxes	Symington.
Lighting system	Electric.
Paint	Lowe Bros.
Platforms	Pass., Pass and Bagg., steel. Postal, short.
Seat covering	Pass., Pass. and Bagg., Plush, Chase's crimson.
Side bearings	Wood's single roller.
Springs	Pittsburgh Spring & Steel Co.
Trucks	Pass., Pass. and Bagg., Commonwealth all steel, 6 wheel, 4¼ in x 8 in. journals. Postal, Commonwealth all steel, 6 wheel, 5 in. x 9 in. journals.
Vestibules	Pass., wide enclosed. Pass. and bagg., wide enclosed on pass. end. Postal, Pullman type.
Vestibule diaphragms	Ajax.
Vestibule trap doors	Pass., Pass. and Bagg., Edwards.
Wheels	Rolled steel.
Window fixtures	Pass., Pass and Bagg., Edwards. Postal, A. C. & F. Co.
Buffer device	Miner friction.

IRON AND STEEL.

The Wabash Railroad has ordered 2,500 tons of rails from the Illinois Steel Company.

The Philadelphia & Reading has ordered 4,000 tons of Bessemer rails from the Maryland Steel Company.

The National Railways of Hayti are said to have ordered 8,000 tons of rails from the Lackawanna Steel Company.

The Canadian Car & Foundry Company has ordered 50,000 tons of structural steel from the United States Steel Corporation.

The Japanese government's plans for railway extension in the future contemplate an outlay of $676,000,000, it is said, of which at least $530,000,000 has to be borrowed—largely from abroad. This scheme represents a program of some 30 years' duration, but the portion of the project to be carried out at once extends over a period of about 13 years and involves an expenditure of $238,000,000. About $63,000,000 of this is to be derived from profits on ordinary railway traffic, but the remaining $175,000,000 will come from abroad. According to the present arrangement the government will spend about $15,000,000 annually on railway extension.—*Consular Report.*

Supply Trade News.

The Korean Railways have ordered 50 tons of staybolt iron from the Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio.

The Philadelphia Locomotive Works, recently incorporated to take over the Baldwin Locomotive Works, has filed notice of an increase of its capital to $40,000,000. This sum is twice the amount of the capital of the old company.

Announcement has been made that George C. Jerome has bought all the rights and interests of A. B. Elliott, in the firm of Jerome & Elliott, and that the business will hereafter be conducted under the name of the Jerome Metallic Packing Company, at 1120 West Monroe street, Chicago.

The Asbestos Protected Metal Company has opened a new plant for making asbestos protected metal and weatherproof non-rusting skylights at Beaver Falls, Penn. The executive offices of the company have been removed and all communications should hereafter be sent to the above address.

In the new Chicago & North Western passenger station recently opened at Chicago, some 25 Sirocco fans of various sizes, made by the American Blower Co., Detroit, Mich., have been installed in connection with the ventilating system, also two of the disc fans made by this company.

Judge Dyer, sitting in the United States Court, at St. Louis, Mo., has rendered a decision in favor of the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., in the case of the American Steel Foundries vs. the Scullin-Gallagher Iron & Steel Company for infringement of patents on the Hardie side frame by the Wolff truck frame. The case was dismissed on the grounds that there was nothing novel or patentable in the Hardie device.

Electrification with 1,500 Volts D. C.

The Westinghouse Electric & Manufacturing Company has taken a contract for the electrification of two sections of road of the Piedmont Traction Company in North Carolina and South Carolina, aggregating 130 miles of line. This is the first railway electrification in America to be equipped with apparatus for 1,500 volts direct-current. A number of lines are now operated on 1,200 volts, but this is the first one to contract for 1,500-volt equipment. One section is 35 miles long, from King's Mountain, N. C., to Charlotte; and the other is 95 miles from Greenwood, S. C., to Spartanburg, S. C., with a 10-mile branch from Belton to Anderson. The power for both lines will be bought from the Southern Power Company and fed to the line through motor-generator sets in sub-stations. There will be sub-stations at Charlotte, Gastonia, and King's Mountain, each equipped with one 500 Kw. motor generator set; and at Dead Falls, Belton, Anderson, Greenville, Greers and Spartanburg, requiring seven 500 Kw. motor-generator sets and two of 300 Kw., together with transformers, etc. Four classes of service will be maintained on both of the roads, namely, express passenger, local passenger, light freight and express, and heavy freight service.

TRADE PUBLICATIONS.

Railway Telephones.—"Our Contribution," is the title of a leaflet which has been issued by the Western Electric Company, New York and Chicago, filled with pictures illustrating the variety of instruments and apparatus which the company has made for railways during the past few years.

Transformer.—The Crocker-Wheeler Company, Ampere, N. J., has issued a small booklet on the Remek transformers, which illustrates and shows the gain in efficiency in these transformers. Among other things is a table showing the comparative efficiency of the leading transformers on the market.

Denver & Rio Grande.—The passenger department of the Denver & Rio Grande has issued an illustrated booklet, written by Edwin L. Sabin, entitled "The Peaks of the Rockies," describing the scenery in these mountains and containing a list of the mountain ranges and peaks, with the altitude of the latter and the names of the nearest railway stations. There is also a map showing the location of the principal peaks in Colorado, Utah and New Mexico.

Railway Construction.

New Incorporations, Surveys, Etc.

Alma Railway.—See Maxton, Alma & Southbound.

Arizona Eastern.—Contract has been given to the Grant Brothers Construction Company, it is said, for building an extension from Mesa, Ariz., to Chandler ranch, 12 miles.

Atchison, Topeka & Santa Fe.—This company has begun operating the section of the Texico-Coleman cut-off between Sweetwater, Tex., and Lamesa, to a connection with the Pecos Valley division from Lamesa to Canyon. The section between Coleman and Sweetwater has been finished for several months, and the link between Lamesa and Texico, N. Mex., is expected to be finished by November. (May 12, p. 1132.)

Beaumont & Great Northern.—This company is planning to build an extension, it is said, from Livingston, Tex., southeast to Beaumont, about 100 miles, and the line is eventually to be extended from the northern terminus at Weldon, northwest to Waco.

Canadian Northern.—Bids are wanted by Mackenzie, Mann & Co., Toronto, Ont., until July 1, for work on sections as follows: Port Arthur, Ont., to a point on the boundary between the districts of Thunder Bay and Algoma; from the end of Section 1 to Kapuskasing lake and Kapuskasing lake to Sellwood Junction.

Canadian Pacific.—An officer writes that a contract has been given to Dutton & Timson, Winnipeg, Man., to build a 32-mile line from Wilkie, Sask., northwest.

Cleveland, Cincinnati, Chicago & St. Louis.—An officer writes that the new extension from Mount Carmel, Ill., to Evansville, Ind., 32.21 miles, is to be opened for operation on July 1. The line is of high-grade permanent construction with maximum curvature of 1 deg., except within the city limits of Evansville. Maximum grade northbound is 0.03 per cent.

Crosbyton-Southplains.—An officer writes that this company, which operates a 38-mile line from Lubbock, Tex., east to Crosbyton, will build an additional 30 miles as soon as surveys are completed. Some of the work will be heavy, there will be a 100-ft. steel bridge and other bridge work. (April 28, p. 1016.)

Elberton & Eastern.—Incorporated in Georgia with $500,000 capital, and office at Elberton, Ga., to build about 50 miles of railway. The projected route is from Elberton, south to Washington, Wilkes county, thence east to Lincolnton. W. O. Jones, L. M. Heard, W. F. Anderson, J. H. Blackwell and Z. B. Rogers, Elberton; W. J. Adams and J. A. Morse, Tignall, and M. A. Pharr, Washington, are incorporators.

Grand Trunk.—An officer is quoted as saying that this company will build in the near future an additional line to Ottawa, Ont., but it has not yet been decided whether the line will be built from Kingston or Brockville.

Greenville, Spartanburg & Anderson.—See Piedmont Traction Company.

Hummelstown & Campbellstown (Electric).—See Lebanon & Campbellstown (Electric).

Illinois Roads.—An officer of the Northern Illinois Industrial Company writes that it is the intention of that company to build a belt line railway encircling the cities of North Chicago, Ill., and Waukegan, to supply switching facilities to industries in that manufacturing district. The necessary right-of-way is being secured, and it is expected that part of the line will be in operation this coming fall. C. E. Sayler, president, Chicago.

Lebanon & Campbellstown (Electric).—Rights-of-way have been secured and construction work will be started soon on a 12-mile line. This is to be an extension of the Hummelstown & Campbellstown, and will provide a through route for electric lines from Harrisburg, Pa., to Lebanon.

Lehigh Valley Transit.—An officer writes that contracts have been let to Joseph Nepoliano, Johnstown, Pa., for building a cut-off at Sellersville, 1.25 miles, and another cut-off at Perkasie, 1.25 miles, on which work is now under way. Maximum grades will be 6 per cent., and maximum curvature 6 deg. There will be about 12,000 cu. yds. of grading per mile. The work calls for four plate girder bridges and a tunnel under the main tracks of the Philadelphia & Reading, at Perkasie. There will be brick and concrete passenger stations at Sellersville and at Perkasie, each one story high, 18 ft. x 46 ft., to cost about $3,000 each, for which bids have not yet been asked. (June 9, p. 1334.)

Maxton, Alma & Southbound.—An officer writes that this company has taken over the rights and property of the Alma Railway, which operates a line from Alma, N. C., to Midway, seven miles. Beyond Midway the line was operated as a logging road. The new company expects to build a 15-mile extension from Alma. At present only freight trains are in operation between Alma and Midway, but when the extension is built the completed line is to be opened for passenger service. Connection is to be made with Maxton over the Seaboard Air Line tracks. C. J. Cottingham, general manager, Alma.

Missouri, Oklahoma & Gulf.—Announcement has been made that construction work will be started about October 1 on an extension of between 200 and 250 miles. The proposed route is from Denison, Tex., southwest to Dallas and Fort Worth, on the south, and from Muskogee, Okla., on the northern end, west to Oklahoma City. The line is eventually to be extended from the present northern terminus at Wagoner, Okla., either to Pittsburg, Kan., or Joplin, Mo. Surveys have been made also from both these places to Kansas City. (December 23, p. 1204.)

Missouri Pacific.—An officer is quoted as saying that improvements are to be made on the Central branch and the line from Topeka, Kan., to Fort Scott. The main line through Kansas is also to be improved. New heavier rail is to be laid on the more important branches, the grades and curvature reduced, and some bridge improvement work is also to be carried out. A large amount of ballasting is included in the improvements, also a new station at Topeka.

New York, Westchester & Boston.—An officer writes that this company, which is a consolidation and merger of the New York, Westchester & Boston Railway Company and the New York & Port Chester, succeeded to all the rights and privileges granted those two corporations, holding a charter to build a high speed electric line from the Harlem river through the borough of the Bronx, New York City, to Port Chester, with a branch from Mount Vernon, north to White Plains. The main line starts at Lincoln avenue, New York City, between 132d street and the tracks of the New York, New Haven & Hartford, continuing through the borough of the Bronx to 180th street and Morris Park avenue, at which place the company intends to establish a transfer station for the interchange and distribution of passengers between its own line and the Interborough, both the subway and the extended third-track elevated service. From 180th street the line passes through the eastern section of the borough of the Bronx, through Morris Park to the Mount Vernon line, with stations at White Plains Road, Morris Park, Pelham Parkway, Allerton avenue, Gun Hill Road, Baychester avenue and Dyre avenue, and at Kingsbridge Road, near Merrit avenue, in Mount Vernon. The line will continue through Mount Vernon, with stations at East Sixth street, East Third street and Columbus avenue to the east line of that city, near Lincoln avenue, where the road divides, one line going easterly to New Rochelle, and a map issued by the company shows this line extended to Port Chester. The other line is being built northerly through Mount Vernon, New Rochelle and Scarsdale to White Plains. Construction of the line is proceeding rapidly under contracts with the O'Brien Construction Company, New York; Lathrop & Shea, Mount Vernon; Merritt & Gilbert, New Rochelle, and Henry Steers, Inc., New York. Stations of concrete are being built under contracts with William Dickinson, Murray Brothers, Snare & Triest and Cauldwell & Wingate. The work in the upper part of the Bronx and in Westchester county is heavy. Maximum grades will be 1 per cent. and maximum curvature 6 degrees. There will be 67 steel bridges and viaducts, ranging from a 20-ft. span to a 2,800 ft. viaduct. There will also be two viaducts each 700 ft. long; four concrete arches, varying in length from 20 ft. to 65 ft., and a subway, 4,000 ft. long. The line is being built entirely on private right-of-way. Work has been finished on all four tracks over a section of about six miles. The electrification will be A. C.

system and it is expected that a considerable portion of the line will be in operation before the end of the present year. L. S. Miller, president; T. D. Rhodes, vice-president; J. L. Crider, chief engineer, and John Roberts, signal engineer, all with offices at New York. The company's charter gives it the right to build a branch from West Farms, southeast, thence east, via Clason Point to Throgg's Neck, but no work is being done on that branch at present, as every effort is being made to finish the main line and the line to White Plains. The road will be a four-track high-speed electric line with frequent trains, and will be equipped with steel cars of the latest type.

Omaha, Sioux City & Northern.—A contract has been given to the Kansas Construction & Irrigation Company, Garden City, Kan., to build from Omaha, Neb., north via Blair, Tekamah and Decatur to Sioux City, Iowa, 90 miles. B. M. McCue, president; B. L. Allen, chief engineer. E. A. Tennis, Garden City, Kan., is interested in the project.

Oregon Short Line.—This company has finished work on the cut-off at Wendell, Idaho. It is said that the construction between that place and Jerome will be finished, and the cut-off between Rupert and Bliss will be open for traffic July 4.

Piedmont Traction Company.—An officer writes that under this name a line is to be built from Charlotte, N. C., west via Mount Holly, Gastonia and Kings Mountain to Grover, thence under the name of the Greenville, Spartanburg & Anderson through South Carolina, from Blacksburg, via Gaffney, Spartanburg, Greenville and Belton to Greenwood. All contracts are let, except for the section from Spartanburg, S. C., to Grover, N. C., to W. J. Oliver & Co., Greenville, S. C., and to Stewart & Jones, Gastonia, N. C. Some of the work will be heavy. Maximum curvature will be 6 deg. There will be a number of bridges, as the line will cross many streams. J. B. Duke, president, New York, and W. S. Lee, vice-president, Charlotte, N. C. The company owns and operates a nine-mile line between Belton, S. C., and Anderson.

St. Louis & San Francisco.—A contract is said to have been entered into by this company with residents of Mason, Tex., to build an extension of the Fort Worth & Rio Grande division, from Brady to Mason, 27 miles. It is understood that the line will be extended eventually from Mason to Waring, which is about 100 miles from Brady.

Southern Pacific.—Bids will soon be asked for building a 16-mile section of the proposed line from Glamis, Cal., to the Palo Verde valley.

Tennessee, Alabama & Georgia.—An officer writes that the Tidewater Development Company will not take over the property and rights of the Tennessee, Alabama & Georgia, as was recently stated in these columns, nor are any negotiations pending with this end in view.

Texas Roads.—A line is to be built through timber lands near the Sabine river in San Augustine and Sabine counties, Tex. The proposed route is from Broaddus, via Hemphill to Sabinetown, about 50 miles. W. H. Knox, Livingston, who owns extensive timber lands along the proposed route, is back of the project.

Twin Mountain & Potomac.—Organized in West Virginia with $100,000 capital, to build from McNeill, Hardy county, W. Va., on the Hampshire Southern, to Twin Mountain, Grant county. It is expected to begin construction work on the line this summer. The incorporators are residents of Fairmont, W. Va.

Wabash-Pittsburgh Terminal.—See Wheeling & Lake Erie.

Wheeling & Lake Erie.—According to press reports, plans are now under way for carrying out extensive improvements on this line and on the Wabash-Pittsburgh terminal. The improvements include double-tracking work on the main line between the Ohio river and Toledo, Ohio, and a number of new passenger stations are to be put up.

Winnipeg, Salina & Gulf.—An officer writes that this company expects to begin actual construction work in August, at Okeene, Okla.; Turon, Kan., and at Salina. It is expected to have at least 10 miles finished and in operation by September, when financial arrangements will be made and contracts let for building the entire line. The plans call for building from Winnipeg, Man., south to the gulf of Mexico, 1,500 miles. The company has just given a contract to the Beaumont Lumber Company, Beaumont, Tex., for 300,000 ties, to be delivered at Oklahoma City, Okla. The ties are to be used on the line from Oklahoma City to Okeene. H. Leone Miller, president. The engineering work is in charge of special engineer, H. E. Wylie, Salina. (February 24, p. 369.)

RAILWAY STRUCTURES.

Baton Rouge, La.—See Memphis, Tenn.

Edmonton, Alb.—See Winnipeg, Man.

Elmira, N. Y.—The Delaware, Lackawanna & Western, it is said, will build a 10-stall roundhouse of brick and steel construction, with a 90-ft. turntable, at Elmira.

Jacksonville, Fla.—An officer of the Seaboard Air Line writes regarding the reports that that company will soon begin work on terminal improvements, including a number of warehouses to be built on the river front at Jacksonville, that nothing definite has yet been decided regarding this work. The improvements as planned will cost $100,000.

Los Angeles, Cal.—The San Pedro, Los Angeles & Salt Lake has taken out a permit for an addition to the freight house at Los Angeles.

Memphis, Tenn.—An officer of the Illinois Central writes that the plans call for building a new brick and stone passenger station at Memphis, on Calhoun street, to be three stories high, 110 ft. x 250 ft. It has not yet been decided when bids will be asked for the work, which will cost about $500,000. It is reported that this company will also build a passenger and freight house at Baton Rouge, La. (March 31, p. 816.)

Pasadena, Cal.—The Southern Pacific and Pacific Electric Railways, it is said, will build a new station on the site of the present station at Pasadena.

Perkasie, Pa.—See Lehigh Valley Transit under Railway Construction.

Portland, Ore.—The Portland Railway, Light & Power Company, it is said, is building a new freight station and office building at Portland, to cost $70,000.

Prince Rupert, B. C.—See Winnipeg, Man.

Rochester, N. Y.—An officer of the New York Central & Hudson River writes that work on the station at Rochester, which was commenced last year, is being continued, and bids are now being opened for partial construction of the station. The work will require about 1,000 tons of fabricated steel. It is expected that the station will be finished some time during 1912.

Seattle, Wash.—The Northern Pacific is having plans made to carry out alterations and additions to the pier at Seattle, at a cost of $100,000..

Sellersville, Pa.—See Lehigh Valley Transit under Railway Construction.

Topeka, Kan.—See Missouri Pacific under Railway Construction.

Upland, Cal.—The Atchison, Topeka & Santa Fe Coast Lines will enlarge the passenger and freight station at Upland.

Vancouver, B. C.—The Great Northern will spend a large amount of money for reinforced concrete docks, piers and warehouses, it is said, on Burrard Inlet. About 2,000 ft. frontage has been secured by the railway.

Weldon Springs Landing, Mo.—A bill has been introduced in the lower house of Congress authorizing the St. Louis, Kansas City Electric Railway to build a bridge over the Missouri river at Weldon Springs Landing.

Winnipeg, Man.—Contracts are to be let at once by the Grand Trunk Pacific for a new hotel at Winnipeg, also for a hotel at Edmonton, Alb., and a new dock is to be built at Prince Rupert, B. C.

Woodland, Cal.—The Southern Pacific is building a new station, it is said, at Woodland.

Railway Financial News.

Athens & Tellico.—See Louisville & Nashville.

Atlantic Coast Line.—J. P. Morgan & Co., New York, are offering $3,000,000 unified mortgage 4 per cent. bonds of 1909-1959 at 93. The total outstanding unified mortgage bonds, including the present issue, is $6,167,000.

Atchison, Topeka & Santa Fe.—On June 2, trading was begun in the $10,000,000 common stock of the Santa Fe, which was recently listed in the official market of the Paris Bourse.

Baltimore & Ohio.—The directors have deferred action on the common stock dividend due September 1.

Boston & Maine.—The company has sold one year 4 per cent. notes to the amount of $5,000,000 to the First National Bank of Boston. The proceeds of the notes are to be used partly for the purchase of stock of the Worcester, Nashua & Rochester (the absorption of which has just been approved) and partly for improvements.

Carolina, Clinchfield & Ohio.—Rumors that this road will be leased to the Chesapeake & Ohio and the Seaboard Air line jointly, for a long term of years, continue to find credence in New York financial circles; and statements to that effect are made with increasing confidence.

Delaware, Lackawanna & Western.—Stephen Palmer and J. S. Talmadge of New York, have been elected directors.

Denver, Northwestern & Pacific.—The holdings of the estate of the late D. H. Moffat in this company have been transferred to the Denver Railway Securities Company. According to a press despatch from Denver, the amount of money thus far expended on the construction of the road is $14,000,000, and of the securities issued for that expenditure the amount acquired by the new company is $10,181,818. The president of the Denver Railway Securities Company is W. G. Evans.

Denver & Rio Grande.—The directors last week decided to declare no dividend at present on the non-cumulative preferred stock amounting to $49,779,800; nor on the common stock. President Jeffery says that the gross receipts for the current fiscal year will be about the same as for the preceding year, and the net revenue, exclusive of taxes, about $7,500,000, as compared with $7,779,467 last year. Operating expenses now include depreciation charges, as required by the Interstate Commerce Commission. These amount to $500,000, so that but for this change in accounting the surplus this year would probably be about the same as last year. The company has no floating debt, but having guaranteed the interest on the first mortgage bonds of the Western Pacific, it was decided that the money which would otherwise go to the holderes of the preferred stock should be used to pay the interest, September 1, on the fifty millions of Western Pacific bonds.

Indianapolis Union.—The Belt Railroad & Stockyards Company, leased to the Indianapolis Union, has filed with the secretary of state of Indiana a certificate providing for the increase of its common stock from $1,000,000 to $2,000,000. Half of the increase is to be issued to the common stockholders as a stock dividend, while the other half is to be sold to provide funds for the enlargement of the stockyards and other improvements to the property.

Louisville & Nashville.—The Athens & Tellico Railway, which for some time has been controlled by Louisville & Nashville interests, will become a part of the Louisville & Nashville on July 1. The road extends from Athens, Tenn., eastward to Tellico Plains, Tenn., 24 miles. It crosses the Atlanta line of the Louisville & Nashville at Englewood.

National Railways of Mexico.—The new minister of finance, at Mexico City, says that the National Railways will pay the usual dividend of 4 per cent. on the preferred stock, in spite of the losses incurred during the revolution. For the month of May the receipts were two million pesos less than in May of last year.

Nezperce & Idaho.—The Farwell Trust Company, Chicago, is offering at par a block of first mortgage 6 per cent. bonds of February 1, 1910, due serially. Of the total authorized issue of $300,000 the amount outstanding is $125,000. The company operates 15 miles of line running from Vollmer on the Grangeville branch of the Northern Pacific to Nezperce, Idaho. The territory served, according to a statement by the president, includes 90,000 acres of grain and agricultural lands heretofore without transportation facilities. The organization and building of the road originated with the residents and the property owners within this territory. Arrangements have been made with the Northern Pacific for exchange of freight.

Oregon Washington Railroad & Navigation Company.—Subscribers to the $12,500,000 stock reserved for New York, of the $25,000,000 first and refunding mortgage guaranteed 4 per cent. bonds recently offered in this country and abroad, received, it is said, allotments averaging about 10 per cent. of their subscriptions.

Pennsylvania Company.—The stockholders of the Cleveland & Pittsburgh have authorized the increase of the capital stock of that company from $22,000,000 to $40,000,000.

Pennsylvania Lines.—The stockholders of the Toledo, Walhonding Valley & Ohio, have approved the proposition to consolidate that company with the Cincinnati & Muskingum Valley; the new company to be called the Toledo, Columbus & Ohio River Railroad. Both of the constituent companies are parts of the Pennsylvania system west of Pittsburgh; the first-named being the Toledo division of the Northwest system, and the other a part of the Southwest system.

Southern Pacific.—The Galveston, Harrisburg & San Antonio has applied to the railway commission of Texas for authority to register $7,504,785 in bonds under the mortgage on the Galveston-Victoria division. Of the bonds named, the sum of $203,000 is to provide for the company's share of the cost of the causeway at Galveston, the money to be paid to Galveston county; and $1,197,300 is to be used for cars and engines for the Galveston-Victoria division.

Toledo, Columbus & Ohio River.—See Pennsylvania.

Western Maryland.—This company has applied to the Public Service Commission of Maryland for authority to issue first mortgage bonds to the amount of $4,114,000. The bonds are a part of the issue of fifty millions which has been underwritten by a syndicate headed by Blair & Co., of New York. Bonds of the West Virginia Central & Pittsburgh to the amount of $3,250,000 due on the first of next month, and bonds of the Piedmont & Cumberland amounting to $650,000, due August 1, are to be retired with a part of the proceeds of the new issue.

FOREIGN RAILWAY NOTES.

The railway from Ligua, Chili, to Papudo has been opened for business, also the line from San Bernardo to Volcan.

A special car for transporting live fish has been built in Saxony for a firm of fish merchants in Zwickau. The water in the tank of the car is kept aërated by means of a motor working a pump. With this the fish are kept alive on long routes, some coming from southern Russia.

Work on the railway from Baro, on the Niger, in Northern Nigeria, has been finished to Kano, 400 miles. This brings Kano within four days of the seacoast, about 900 miles distant, and will do much to develop the rich natural resources of the country through which it runs. It will also facilitate the rapid opening up of the Bauchi tin fields and will greatly increase the export of tin. The government has taken active measures for the immediate construction of a branch from the Baro-Kano railway to the foot of the plateau in the Bauchi district.

The hatpins must go! The management of the Saarbrück division of the Prussian State Railways has notified ladies who come to its stations with long hatpins protruding, manifestly dangerous in crowds, that they must remove these pins or muffle the points thereof. Station employees are directed, without waiting for complaints from other passengers, to enforce this regulation. "She who does not obey the instructions of the employees in this matter, may, according to Section 11 (1 and 2) of the Railway Regulations, be excluded from the trains and required to leave the station. Disobedience of the orders of the railway employees may be punished by fine as per Sections 77-81 of the Railway Regulations."

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GENERAL NEWS SECTION 1701

THE New York, New Haven & Hartford is to adopt a new form of general statement for its annual revenue and outgo. It will treat the system that it owns as a whole, and the operating results will be consolidated in one statement. Thus a large part of what has heretofore been income from other sources will enter as a factor in the general operation, with the result of greatly increasing the figures on both sides, revenue and expenses. Gross earnings of its large street railway system of some 700 miles in Connecticut, for example, thus will become part of the gross earnings of the parent company, and the same is true of outgo, including fixed charges. The plan has at least one advantage in the direction of publicity and information of stockholders. The company has a number of large subsidiary properties operated as separate corporations, at least one of which, the New England Navigation Company, has been more or less of a fiscal mystery. Some of the corporations have declared full dividends, others have earned dividends, but withheld them, others still have had a considerable surplus over dividends. What may be called suspended dividends represented by surplus really earned on the company's investments have been disguised and with them the resources for future net revenue and the real strength of the corporation in its subsidiaries. The plan has also the value of suggesting the real magnitude of a great railway system hitherto obscured by the "income from other sources" schedule. It may, on the other hand have the drawback of preventing comparison with other years, though on this point criticism may wait until the exact form of statement appears next autumn. While the consolidated statement will be illuminating and suggestive there is nothing to prevent additional clarity by giving the separate statements of the subsidiaries also.

WITH the wage increases of the last eighteen months in the foreground, the question of the standard of maintenance of American railways becomes interesting, and not less so because somewhat obscured. During the ten years from 1901 to 1910 inclusive the cost of maintenance of way structures and equipment in ratio to gross earnings rose from 26.52 per cent. to 28.27 per cent. But of the rise of the last year of full record —1910—which was from 27.76 per cent. to 28.27 per cent., the increase is undoubtedly to be accounted for by the increase of wages which, indeed, probably outran any increased standard. This factor of the raised wage in the maintenance standard shows strikingly in the post-panic year 1908. It was then the highest in ratio—28.83 per cent.—during the last 10 years. But this was because gross earnings fell from $2,589,105,578 in 1907 to $2,421,542,005 in 1908, while maintenance expenditures slightly increased. During the present year, 1911, the situation is such that the figures for maintenance, when they come, ought to be moderately significant. There will probably be an increase of gross earnings. On the other hand, the railway year will express the full impact of the raised *rate* of wages, but modified by reductions of the working force. Roads already in pretty good condition are likely to reduce maintenance somewhat for the same reason that in hard times a man wears a serviceable suit of clothes longer. Nor has the governmental policy been such as to stimulate high maintenance charges—rather the other way. The presumption runs, therefore, in favor of a decline of the actual maintenance standard for the year, though, as in 1910, the higher wage scale may continue to raise the ratio to gross earnings. But the dominant fact of the situation is a transition period in which between wage increase on the one hand and governmental restraint on the other, the real maintenance standard is bound to be considerably disguised.

READERS of this paper twenty years ago will remember the extensive discussion of the use of gas for car lighting which was carried on in our columns. The present generation accepts as facts what were then, in part, unproved theories. In view of the New Jersey public utility commissioners' report on the Martin's Creek derailment, it is well to recall the basic reasons for considering Pintsch gas a safe illuminant. No man can say that any combustible gas released in unconfined space *cannot* under some conditions be ignited. But we can say that in the case of this particular gas the chances are overwhelmingly against it. The pressure under which it is stored in the tanks and connecting pipe lines is such that, at a break, it escapes with sufficient velocity to blow out a torch. This has been proved by test. At such a break it is possible to ignite it only by some such means as a piece of incandescent metal. Furthermore, the combustible mixture of air and this gas is within unusually close limits. The small amount of this illuminant necessarily carried in the tanks of cars will, in case of a break, escape and expand in the atmosphere in two or three minutes; and of that time there is but a narrow zone, only a few seconds, in which even a high temperature will ignite it. There is no evidence of the explosion of Pintsch gas tanks in a wreck;

and it is obviously impossible to have conclusive evidence of the behavior of escaping gas in a wreck. It would require an expert standing alongside of the track watching the train continuously from the moment of the derailment or collision. We have investigated, to the best of our ability, many of the alleged cases of Pintsch gas burning in a wreck, and have never found evidence to support the allegations. In the Martin's Creek wreck the piping was broken in many places. The tanks being under the car, and there being breaks in the piping near the tank, it is not possible to conceive of the gas escaping into a confined space; so there is every reason for believing that the gas was dissipated in the atmosphere so quickly that it had no part in the conflagration.

HENCEFORTH all railway accidents which are fatal to any person must be reported promptly by telegraph to the Interstate Commerce Commission. This is required by an order just issued, dated June 21. According to the preamble, the purpose is to aid the commission in informing itself as to the advisability, in particular cases, of making an investigation; and the order is issued under the authority of section 20 of the Interstate Commerce Law, which empowers the commission to require carriers to file special reports concerning any matters into which it is required by law to inquire. The order is very brief and gives no details, but as that part of the accident law which calls for monthly reports of accidents is limited to those "arising from the operation of the railway" and as the regulations under which the monthly reports are made do not call for the details of accidents where no moving vehicle is involved, it might be presumed that these latter, termed in the regulations "industrial accidents," will not be required. But to follow strictly the letter of the order, it will be necessary to telegraph such cases as a painter falling off the roof of a freight house or a drunken tramp falling through a bridge, should the accident result fatally. Even with the industrials omitted, however, the order will be sufficiently burdensome. In the last annual statistical report of the commission (1909, page 88) the number of trespassers reported killed on the railways was nearly 100 a week, four-fifths of them by being struck by trains or in other accidents similarly devoid of interest from the standpoint of Congressional legislation; so that the number of useless telegrams now required will not be small. As to what details to report by wire, those roads which now telegraph to state commissions will have a guide in the requirements of the state authorities; others will have to use their own judgment. The Indiana commission (which requires telegraphic notice of both fatal and non-fatal injuries) has lately issued a new order (Circular No. 76) calling for increased attention to details, including information as to place, date and hour of any coroner's inquest. Much of this detail must be a useless burden, even in a single state, to say nothing of the territory covered by 240,000 miles of railway.

APPLYING the Supreme Court's "rule of reason," the United States Circuit Court has found that the merger of the Union Pacific and the Southern Pacific does not violate the Sherman anti-trust law. The decision surprised many who were not familiar with the relations existing between these roads, both before and after their merger. The popular notion, we think, has been that before the Union Pacific acquired control of the Southern Pacific, both reached San Francisco on their own rails. But then, as now, the Union Pacific extended only from Kansas City and Omaha to Ogden. The Central Pacific, extending from Ogden to San Francisco, then, as now, belonged to the Southern Pacific Company. The Union Pacific could not reach California without either building a new line there or acquiring the Central Pacific. It could not acquire the Central Pacific except by getting control of the entire Southern Pacific system. Beyond question, Mr. Harriman's chief purpose in obtaining control of the Southern Pacific was to secure for the Union Pacific a permanent connection to San Francisco. In other words, it was a merger chiefly of connecting, not of competing roads. Both lines handled through traffic originating in the east and destined to California, and vice versa, but the Union Pacific could not get it to California except in conjunction with the Southern Pacific. Therefore, for the Union Pacific really to compete with the Southern Pacific, the latter had to compete with itself. Anyone who will look at a map of the two roads will readily see why there could be no local competition between them. The attorneys for the government pointed out that the Union Pacific, through its control of the Oregon Short Line and the Oregon Railroad & Navigation Company—now the Oregon-Washington Railroad & Navigation Company—reached Portland, as did the Southern Pacific, on its own rails, and contended that the effect of the combination was to stifle competition to and from Portland, and also to and from San Francisco, between which point and Portland business moved by boat. The testimony showed, however, that the Union Pacific's competition with the Southern Pacific by this indirect route for San Francisco business was largely mythical. The combination did not result in advances in rates or deterioration in service. The physical condition of and the service rendered by the Harriman Lines are vastly superior now to what they were ten years ago. It is difficult to see, therefore, how any court could find that the merger was in "unreasonable" restraint of trade. The decision, even if upheld by the Supreme Court, will not establish a precedent which will certainly protect other railway combinations. The merger of the Harriman lines was perhaps more conclusively defensible than almost any other merger of roads that could be called parallel that has ever been effected. The Rock Island-Frisco combination, for example, would have been much more vulnerable. The decision merely means that the union of the Harriman Lines probably will not be dissolved and not that any other merger of parallel lines is safe from attack.

THE COST OF RAIL AND WATER TRANSPORTATION.

WE give in another column a letter from S. A. Thompson, field secretary of the National Rivers & Harbors Congress, on the subject of the relative costs of transportation by rail and by water. Mr. Thompson's letter is a reply to one by Mr. Moulton, of the University of Chicago, which was published in the *Railway Age Gazette* of June 2.

Mr. Moulton in his communication brought out clearly the point that the fundamental question that ought to be settled before the government of the United States engages in extensive development of inland waterways is whether the *total* cost of transportation on such waterways is, or probably can be made, less than the total cost of transportation by rail is, or can be made. The rate that the shipper pays to the railway, as he indicated, covers the total cost of transportation by rail. The rate that the shipper pays to the owner of a boat covers only a return on the investment in, and the operating expenses of the boat. To arrive at the total cost of water transportation there must be added to this expense what the public pays in taxes for the development and maintenance of the waterway. Therefore, as Mr. Moulton said, comparison between the *rates* paid by rail and by water gives no clue to the relative *costs* of transportation by rail and by water.

We have never known an advocate of the development of inland waterways who would meet the issue squarely and try to show that the total cost of transportation on canals or canalized rivers is, or can be made, less than the total cost of rail transportation. Mr. Thompson is no exception to the rule. Like all the rest, he dodges the real issue. He starts off by making comparisons between rates by rail and by the Great Lakes on coal. He compares the rate on coal per ton per mile on the Chesapeake & Ohio with that on the Great Lakes from Buffalo to Duluth, without giving any consideration to the fact that the haul from Buffalo to Duluth is vastly longer than the haul on the Chesapeake & Ohio, and that the water rate ordinarily is made to secure a back haul for boats which otherwise would move with very small lading. Furthermore, he gives no con-

sideration to the fact that the haul by lake is very circuitous, which makes the distance the coal moves very much greater than the distance would be as the crow flies, and makes the average rate *per ton per mile* very much lower in proportion than is the *absolute* rate from the point of origin to destination. Almost exactly the same criticism may be made of his comparisons between the rates by rail and water on iron ore from Lake Superior to the Pittsburgh district.

Replying to Mr. Moulton's perfectly just statement, that a comparison between rates by rail and via the Great Lakes is unfair, because, "the Great Lakes constitute a highway ready made by nature," Mr. Thompson says that in the development of the Lakes there has been spent about $130,000,000, and that he is "not able to see that a highway which has required the expenditure of $130,000,000 is any more entitled to be called a highway 'ready made by nature,' than a railway on which a similar sum had been expended." Everybody but Mr. Thompson can readily see what he says he cannot see. Before a dollar of this money was spent the lakes were a great highway capable of accommodating, and actually accommodating, a heavy traffic; and by this relatively small expenditure, which would not build more, perhaps, than 1,500 miles of double track railway, without equipment, they have been enabled to handle a traffic one-third as great as that of all the railways of the United States, and rendered capable of handling a very much larger traffic. Men build railways outright; what they have done to make a highway of the lakes is incomparably smaller than what nature has done. Furthermore, it will be noted, Mr. Thompson does not include a return on this $130,000,000 in his figures regarding the cost of transportation on the lakes.

Continuing, Mr. Thompson says that if the cost of developing and maintaining a waterway is to be included in the cost of water transportation, the expenditures which the people have made for the development of railways should be included in the cost of rail transportation. He then refers to the donations of cash and gifts of land that have been made by the public to secure the construction of railways, and toward the end of his article says: "The people of the United States have given outright to the railways property and franchises worth about $2,500,000,000." The *Railway Age Gazette* does not believe that the public has given to the railways property and franchises which approached $2,500,000,000 in value at the time that they were given, or which can be shown to approach it now. It is a common thing for advocates of waterway development and other persons who desire to injure the railways for their own benefit to make sweeping statements of this sort, which they know they cannot prove. We believe this is what Mr. Thompson has done in this case, and we ask him to bring in a bill of particulars listing the property and franchises worth $2,500,000,000, which the railways have been given, with the value of each. The columns of the *Railway Age Gazette* are open to him to prove his assertion.

If in the cost of railway transportation we should include the value of all the property and franchises that have been given by the public to railways, we should include all similar items in the cost of water transportation. In their earlier history the various canals, like the railways at a later date, were the recipients of large donations of land and franchises. Bourne in his "History of the Surplus Revenue of 1837," refers to the fact that four million acres of land even at that early date had been granted to canals or in aid of canal construction. Furthermore, there should be included all that has been spent not only on waterways now in use, but on those that have been abandoned. The expenditures on canals which had been abandoned up to 1906 amounted to $73,168,795; and the total expenditure by the United States government on inland waterways alone, exclusive of the Great Lakes, had been almost $216,000,000.

Mr. Thompson referes to the fact that tolls on the Erie canal, up to the time they were abolished in 1882, covered the cost of construction, maintenance, operation, etc., and yielded a large profit. He conveniently ignores the fact that practically all of this was done before the canal had to meet the competition of the railways, and when it was charging rates that would make the modern railway man turn green with envy. The canal was finished in 1825. At first its rates were very high. A 40 per cent. reduction was made in 1834. In spite of considerable further reductions the canal fund grew so rapidly that in 1845 its managers were buying up their bonds at 20 per cent. premium. Dr. Hadley says in his "Railroad Transportation," page 30; "In 1852-3 the tolls per ton per mile were only about one-third their original figures; the revenue was over $3,000,000 in each year. From that time forward begins the history of the contest between the canal and railway. The use of the canal continued to increase; its receipts at one time also increased largely; but its commercial power slowly diminished. From 1853 to 1859 there was a fight for supremacy between canal and railway. For twelve years there was a contest for profits. Then it became a question whether the canal could pay expenses of maintenance, a question which was finally decided in the negative." "The complete abolition of tolls on the canal," Dr. Hadley adds (page 98), "was almost a matter of necessity, and when it came it did not suffice to protect the canal business in the face of a renewed railway war." In other words, the Erie canal twenty-nine years ago became unable to withstand railway competition. Mr. Thompson commends the action of the people of New York in voting $101,000,000 to construct a new and larger canal, and says: "I may add, in my judgment, they would have been much wiser if they had voted a sufficient sum to build a very much larger canal than the one now under construction." The people of New York chose to employ Col. Thomas W. Symons, of the Corps of Engineers of the United States Army to advise them on this matter, and in a report in 1897 on the proposed deepening of the canal, he estimated that the *cost to the shipper* of transporting wheat in a lake freighter of 7,000 tons capacity on a ship canal would be 38 per cent. greater than with a tow boat and barges on a barge canal. This took no account of the fact that the estimated cost to the public of building the ship canal would be four times as great as that of building the barge canal. Mr. Thompson's judgment on this subject does not weigh heavily in the balances against that of Col. Symons. It was this report of Col. Symons that caused the people of New York to decide to dig a barge canal 9 ft. deep.

Mr. Thompson says several nations of Europe which have had experience in the matter covering forty years or more are continually putting more and more money into the improvement of waterways and turning them over for the free use of the public in competition with state owned and state operated railways which constitute the principal source of national revenue. This is another of his sweeping statements which have but slight foundation in fact. The only country in Europe whose state-owned railways yield a large amount of revenue to the government are those of Germany. While he was on this part of the subject he might have given some figures about the cost of transportation on these European waterways to which he refers; for transportation on the canals and canalized rivers of Europe is much more nearly analogous to what transportation would be on canals and canalized rivers in the United States than is transportation on our Great Lakes. On the Rhone in France, according to the British Royal Commission, the rates vary from 7.8 mills to 15.6 mills per ton per mile; on the Seine from 26 to 56 mills; on the Canals du Centre and du Midi from 6.2 to 7.8 mills; and on the canals in the northeast and east of France from 3.8 to 4.6 mills. The average rate on a wide variety of commodities moving to Paris, where the traffic is very heavy, is 5.78 mills. The figures given by the British Royal Commission indicate that the average rate per ton per mile on all the waterways of France is certainly not less than 6 mills; on the waterways of Germany about 5 mills; and on the Belgium waterways about 6.5 mills. The expenditures of the French government for the maintenance of canals and improved rivers, and for interest on the money laid out in their development, amount to 4 mills per ton per mile for all the water-borne traffic. The similar expenditure in Belgium amounts to 4.6 mills, and in Germany

to eight and one-half tenths of a mill, including the Rhine and the Elbe, on which the traffic is very large, and excluding them, to 2 mills per ton per mile. This makes the *total* average cost of water transportation in France 10 mills per ton per mile; in Germany 6 mills; and in Belgium 11 mills. The average railway rate per ton per mile in the United States is 7.63 mills. The foregoing figures may, perhaps, indicate why Mr. Thompson prefers to compare the freight rates of the Great Lakes with railway rates, rather than the rates on canals and canalized rivers with those of railways.

Mr. Thompson concludes with a reference to the fact that the American public has spent large sums on the improvement of streets and roads. He asks, "Who shall deny them the right to make similar expenditures on waterways?" and says that "the experience of other nations shows that such an expenditure would be one of the wisest and most profitable that the people of the United States could make." Nobody that we have ever heard of denies the right of the American people to tax themselves for any purpose that they may please. The question is not whether they have a right to tax themselves to develop waterways, but whether it is expedient for them to do so. It is not true, as Mr. Thompson asserts, that the experience of other nations shows that expenditures by the people of the United States for the development of rivers and canals would be either wise or profitable. That the rivers and canals of European countries have been able to compete successfully with the railways, while those of the United States have not been able to do so, has been mainly due to the circumstance that railway rates in Europe are much higher than they are in the United States and that the governments have refused to allow the railways to so reduce their rates as to attract traffic from the waterways. As has been repeatedly shown, the rivers and canals of the United States are today in as good shape to handle a large traffic as are those of Europe. If the government of the United States would compel the railways in this country to raise and maintain on a higher basis their rates at points where they meet the competition of rivers and canals, the latter would be enabled effectively to compete. There seems no other way of enabling them to do so. If the people of the country desire water transportation more than they do cheap transportation they may decide to adopt this policy; but so long as they are not so anxious to have their goods moved by water that they will be willing to pay more for the privilege than they have to pay for rail transportation, it is probable that the canals and rivers of the United States will be unable to compete with its railways.

NEW BOOKS.

Formula for Scientific Freight Train Rating. By D. C. Cheney, 1368 Fullerton avenue, Chicago. Cannon Printing Co., Milwaukee, Wis. Cloth, 4 in. x 8 in. Price, $1.50.

Operating men agree that trains either overloaded or under loaded are expensive, and that the nearer the total train resistance is to the available tractive power of the engine the more economically is a train handled. This resistance varies with different trains, depending on the temperature, the direction of the wind, the number of cars and the weight of the train. In making up tonnage ratings arbitrary reductions are made for low temperatures, head or side winds and the number of cars, for it is recognized that the resistance is much higher per ton for an empty car than for a loaded one.

The author of this book has worked out values for the resistance of cars of all weights from 10 to 78 tons on grades varying from level to 1 per cent., in pounds per ton, and in tractive power required per car from data secured in recent dynamometer tests. From this table a tonnage rating chart can be quickly made up for any ruling grade for all weights of cars. In making up tonnage trains the resistance of the various cars taken from this chart is added up until the tractive power of the engine is reached, instead of adding up the weight in this way taking care of accurately instead of by an arbitrary rule the varying resistance of empty and loaded cars.

Letters to the Editor.

SOME RAILWAY ORGANIZATION NEEDS AT THE BOTTOM.

Palestine, Texas, June 20, 1911.

To the Editor of the Railway Age Gazette:

Mr. Acworth's recent remarks on the need for decentralization of authority on American railways were widely copied and commented on in the press throughout the country. I also noticed an interview with Major Charles Hine in the daily newspapers recently in which he said, among other things: "The top and not the bottom is where modern reorganization is needed." Any remarks by such eminent authorities will naturally attract more than passing notice, and I will not take issue with either because I have the greatest respect for the opinion of both and frankly admit I do not know much about the top.

I shall therefore refrain from presuming to offer an opinion as to what is needed up there. But I have had quite a varied experience along the bottom of the organization in the operating departments of several railways, both large and small and both departmental and divisional, and it occurs to me some changes at the bottom are now needed and will soon become more necessary, to meet changed conditions.

I favor the divisional plan of organization, but I do not believe that the superintendent can be the general manager of his division and personally handle the details in connection with operating trains, engine performance, maintenance, etc. It is true, he is provided with assistants, including one or more train masters, a master mechanic, a division engineer, etc., but these assistants are rarely, if ever, given sufficient authority to get the best results. I believe the one thing needed on American railways today is a strong, broad-minded, capable superintendent on each division in full charge of all departments, whose duties shall be to outline the policy of his assistants, keep general supervision over the division and a close check on unit costs, arbitrate and smooth out any friction or differences between the heads of the several departments and see that all work together to the best interests of the railway as a whole. He should also cultivate the acquaintance of the town, city, county and state officers and of the prominent shippers and business men on his division and (with apology for the slang phrase) get the road back "in right" with the people.

Give him a master mechanic in charge of the round houses, a division engineer in charge of maintenance of way and a train master on each freight district in charge of the despatchers, operators, agents, yard, train and enginemen. These division officers should maintain discipline and be responsible to the superintendent for the men on their respective payrolls. These men should report to and receive their instructions from their immediate superiors. Each officer's authority should be clearly defined, so all will understand alike, and no one should be permitted to go over any one else's head, nor should any one be allowed to go under any one else's head. The practice of going over or under the man directly in charge of the men, who ought to be responsible for results; and two, three or four different officers giving the same men different and conflicting instructions, has done more to break down discipline and bring about unsatisfactory operating results than any other one thing, with the single exception of the rule of seniority; and as seniority is here to stay, and as most railway men are fully conversant with the causes that brought it about, I shall not discuss that here. The standard rules practically outline such an organization for the transportation department now; but I do not think it is carried out in actual practice on any railway.

With such an organization as I have outlined, the officer in actual charge would be clothed with authority and could get close to and know the men working under him. He could educate those capable and receptive and if his policy were wise, he would take care of the good men and gradually weed out the unsafe ones. He must be right all the time and the good men

will recognize the justice of his discipline and line up with him—something not to be despised, because when the good men are right with the officer in charge, they will give him valuable information that he can get in no other way. Then the bad men have either got to get in line or move; they usually prefer the former. Moreover, if the several divisions of a railway were so organized and run, the rank and file would know who they were working under and what was expected of them. It would promote harmony and discipline, division matters would be taken care of on the division and the men at the top would then have more time to look after the really big things.

J. O. KELLY,
Trainmaster, International & Great Northern.

THE PURCHASING AGENT WHO KNOWS.

CHICAGO, June 17, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the chapter of Mr. Pearce's able and interesting work on the supply department, which is devoted to Duties of Officers he unintentionally exposes one of the weak points in the present-day railway organization when he touches on the qualifications of the purchasing agent.

He reflects correctly the idea, which is all too frequently accepted, that a man may be a good purchasing agent and yet be a numskull so long as he is "absolutely honest and fair." That this was unintentional is shown by his serious statement: "It is not necessary that the purchasing agent should have a knowledge of the practical application of the material which he buys," and the sentence which follows it is a sad commentary on the state of the art if true. Stated bluntly, the purchasing agent's duties as described by Mr. Pearce consist in unerringly detecting the lowest of several figures when he sees them, and being quick about it; qualifications which should be found in any bright office boy who expected to hold his job.

This prevalent idea is the outgrowth of the period so well described in the opening chapter of Mr. Pearce's book when purchasing agents "were little more than clerks under the direction of the general managers, and simply placed the orders as directed by the heads of the departments."

It is true that an attempt is made to tone down the disparaging estimate by the introduction of such well-worn phrases as "keen, wide-awake business man," etc. But how a man can be keen, and wide-awake, and a good business man, and at the same time be entirely ignorant of the goods he is dealing in is not made clear. One might as well say that a keen, wide-awake superintendent need not know a train order from a way bill. Such a man reminds me of a salesman who once tried to induce me to buy the air brake hose he was selling by enlarging upon its superior qualities, and illustrating his point by describing at some length a break-in-two of a fast express train which was equipped with his air hose, and was running at a speed of 60 miles an hour. The instant the train parted the air brakes were applied with such terrific force that it came to a standstill within 200 yards, and he called upon me to marvel at the enormous pressure which his hose had successfully withstood in producing such unheard of results! I did marvel, but it was at the manager of the sales department who was cruel enough to send such a representative into a cold and heartless world. Probably his conception of a purchasing agent was akin to Mr. Pearce's.

I once knew a purchasing officer of a large railway who was a most conscientious, industrious and honest man and really a fine character, but he was literally ignorant of the difference between a box car and a stock car; and he did not know a piece of beveled house siding from a wooden bridge stringer, when he saw it. He was not a success in the vocation which had been thrust upon him, but he fitted Mr. Pearce's description to a nicety.

The idea that the purchasing agent is "fully protected by the specifications, tests and store inspection" cannot always be depended upon to work out in practice. Some railways have no laboratories and no testing department. There are no laboratory tests that exactly simulate service conditions, and the performance of different materials in service sometimes varies considerably from what the engineer of tests is led to expect. Besides this it must be remembered that any specifications necessarily describe the poorest material that will be accepted—never the best—and that occasionally the manufacturers discover methods of beating the specifications.

A purchasing agent who invariably paid the lowest obtainable price for material of a quality that just barely met the requirements of a specification, when by paying 10 per cent. more he could secure material that would give double the service, would be an expensive attachment to any railway, no matter how honest he was; but unless he knows exactly what he is doing he cannot afford to do otherwise. In other words, he cannot act intelligently even with such assistance as he may get from other departments, because he does not know enough about the material to apply the information he gets to any good purpose.

Real purchasing agents are not born, neither do they just grow. They are trained men, and their proper training is long and arduous. About the time when they should become most valuable they are usually, if successful, removed to some other sphere of activity and their greatest value is lost. If unsuccessful they are usually allowed to remain where they are to the detriment of the service and of themselves in the long run.

The time of a really efficient purchasing agent can most profitably be divided into about four equal parts. Two of these parts may be spent in his office, one on the road and at the shops, studying the practical results obtained from the materials he has bought, and one in the mills and at the factories, learning how the material which he is going to buy is produced.

The unfortunate thing about the matter is that there is no method of determining with exactness how much a purchasing agent who thoroughly understands his business saves for the company he serves. It can by no means be expressed by the prices he pays for what he buys. When you find a road on which the maintenance costs are uniformly low year after year, the superintendent of motive power and the engineer of maintenance of way earn well deserved reputations, but looking behind them you will probably discover a purchasing agent who knows all about "the practical application of the material which he buys," and, further still, knows a good deal about the processes by which it is produced. It is safe to say that a fairly large percentage of the final results reached by the men who use the material is due to the *purchasing agent who knows.*

GEO. G. YEOMANS,
Assistant to the President, Wabash Railroad.

INVENTORY OF LABOR.

WINNIPEG, Man., May 30, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read in your issue of May 26 a letter from Mr. Fritch on an Inventory of Labor. It gives an interesting description of a situation which does not exist, and as a remedy to the imaginary situation, makes a suggestion which only the great reputation of the oringinator will rescue from general ridicule. I am forced to the conclusion that his abilities have heretofore been exercised exclusively in outside engineering work, and that he has no close acquaintance with actual operating conditions.

There is no warrant for the statement that the cost of labor is not carefully weighed and compared, and the amount of help employed, adjusted to the volume of traffic. The first duty of a general manager is to see that, subject to the consideration of safety, the expenses are cut to fit the earnings. The shadow of this burden pursues his daylight hours and often stalks with him through the misty corridors of night.

On this railway, the superintendent makes up on the first of each month, an estimate of the month's payrolls for the upkeep and operation of his district, under the various headings and sub-headings. A copy of this estimate goes to the general superintendent and a copy to the general manager. If the latter is in touch with the traffic being handled, he can judge at once to what extent the estimates correspond and if any curtailments are

necessary he can order it made in anticipation. Each superintendent has an accounting office, which furnishes him, not only with the general results of operations on the district, but also detailed figures in connection with any piece of work in which he is specially interested. The general statistical office gives him the tonnage and expenditure figures, so arranged and analyzed that he can view his operations from many different standpoints and compare them with the performance on other districts. The same figures enable the general manager to arrive at the relative efficiency of different officers and to arrest any tendency towards stagnation, which may manifest itself on a particular district. The same system, modified to suit local conditions, is in existence, I am told, on almost every other American railway. If the results after all are not satisfactory, which I deny, it must be because we do not grow the right kind of general managers, or because their powers are restricted, or their usefulness impaired by outside interference.

The suggestion of your correspondent is that the situation, as he describes it, be saved by the creation of another department. In congress, or parliament, when the politicians are up against making a decision which is bound to meet with disapprobation from one quarter or another, they sidestep by appointing a commission of investigation. In the same way many railway officers when confronted with a problem which requires energy and patience for its solution, try to cut the knot by creating a department. We already have too many departments. Some created to assist and facilitate, only impede; others formed to counsel, only criticize and snarl. On some railways the only time they work in unison is when they desire to stifle the energies of some man of action who trys to get things done.

It is about time we decided to leave to Brandeis and that ilk these jeremiads over the sins of railway managers. The charge that inefficiency and waste are tolerated generally is a slander. The men who guide our operations are loyal to their elementary duties, which are to transport in safety and comfort their passengers, to handle with efficiency their freight tonnage, and to be at all times faithful stewards for the owners of the property.

GEORGE BURY,
General Manager, Western Lines, Canadian Pacific.

THE COST OF RAIL AND WATER TRANSPORTATION.

Richmond, Indiana June 20, 1911.

To the Editor of the Railway Age Gazette:

In your issue of June 2 there appeared a communication from H. G. Moulton, of the University of Chicago, on the "Cost of Rail and Water Transportation." In this he states that there has been a dearth of real argument in support of the contention that water transportation is incomparably cheaper than that by rail, and that conclusions, which seem likely to be of determining force in shaping our future transportation policy, have been deduced from mere assumptions of the inherent cheapness of water transportation, supported by comparisons drawn from dissimilar conditions. Since the particular argument which he chooses for attack is one for which I am responsible, I beg the favor of sufficient space to point out a number of radical errors in Mr. Moulton's premises which destroy the correctness of his conclusions.

Professor Moulton quotes the figures showing that a dollar will carry a ton of freight 127 miles by rail, 333 miles on the present Erie canal, 1,250 miles on the Great Lakes, and nearly 2,000 miles on the Erie barge canal now under construction. He declares that the comparison on which these figures are based is misleading in that the average rate for railways is made up from rates both on high class, expensive freight and bulky commodities traveling at low rates, tonnage hauled both on easy grades and heavy grades, hauled short distances and long distances, and handled in both expensive and inexpensive terminals. He says: "The waterways carry practically only low grade freight, which must travel at low rates if it travel at all. These rates are, however, compared not with the railway rates on similar freight but with the so-called average rate on all freight of whatever kind. It is from such a comparison that the conclusion has been reached that transportation by water is cheaper than by rail. A comparison of water rates with those charged by the railways on bulky traffic would not reveal a similar disparity."

Broad generalizations are of use in developing underlying principles, but it often happens that such generalizations are not accurate when applied to particular cases. I am not prepared to admit, however, that such is the fact in the matter under consideration. The lowest railway rate on any commodity handled in bulk which has come to my attention is a rate of 2.1 mills per ton mile, made by the Chesapeake & Ohio on coal for export. Coal is handled on the Great Lakes in large bulk, more than 13,500,000 tons having passed through the Soo Canal in 1910. The rate from Buffalo to Duluth was .3 of one mill per ton mile —just one-seventh of the export rate by rail.

One of the greatest volumes of traffic of identical nature hauled partly by rail, and partly by water, consists of the shipment of iron ore from the head of Lake Superior to Lake Erie ports, and thence by rail to the Pittsburgh district, and the return movement of coal by rail from the Pittsburgh district to Lake Erie ports, and thence by water to the head of Lake Superior. These two commodities furnished more than 55,000,000 out of the 62,363,218 tons of freight passing through the Soo Canal in 1910. The average rate for the railway portion of the total haul was between 6 and 7 mills per ton mile, while the average rate on the water portion of the haul was between .6 and .7 of a mill per ton mile—or only one-tenth the rail rate. We thus find that when the comparison is confined strictly to low grade traffic handled in bulk and moving over long distances, the relative rates are not essentially different from those to which objection has been made.

Mr. Moulton is mistaken in the belief that only low grade materials are handled on the Great Lakes, although of course the great bulk of traffic is of that class. The reports of the United States Engineers classify the traffic through the Soo Canal under seventeen different headings, the commodities included in which vary in value from $2.75 to $222.34 per ton. The estimated value of the total freight passing the Soo Canal in 1910 was $654,000,000, and $416,000,000 out of this total was made up of general merchandise, manufactures and commodities, the value of which was in excess of $40 per ton.

Mr. Moulton insists, however, that a comparison of rates on the Great Lakes with those on railways is unfair, because "the Great Lakes constitute a highway ready made by nature," hence, "the rates charged there need be merely sufficient to yield a reasonable profit on the investment in the ships, in addition to meeting the expenses of operation. Naturally, the rates under such conditions would be much lower than if they had also to earn a profit on a tremendous investment in the highway itself." A study of the reports of the chief of engineers, the dominion department of public works, the lighthouse boards of both countries and the hydrographic office, shows that there has been expended in the deepening of connecting channels, the improvement of harbors, the construction and maintenance of lighthouses, buoys and other aids to navigation, and in surveys and publication of charts something like $130,000,000. Unquestionably, a large portion of the lakes have water deep enough for any vessel which ever has been built, or which probably ever will be built, but I am not able to see that a highway which has required the expenditure of $130,000,000 (and other large expenditures authorized and under way) is any more entitled to be called a "highway ready made by nature" than a railway on which a similar sum had been expended.

Mr. Moulton further states that conclusions drawn from comparisons of the cost of water and rail transportation are worthless unless the same elements are included under "cost" in each case, and points out that railway rates are made not only

to provide for the cost of maintenance and operation, but to provide for a profit upon the capital invested in construction and equipment, while in the case of the enlarged Erie canal the cost of construction, maintenance, and operation is borne by the state. "Any one who desires," he says, "can build a boat and engage in the carrying trade free of charge on the state's highway. If he can earn in addition to the operating expenses a reasonable profit on the cost of a small boat or barge he is satisfied. . . . Consequently, in comparing the relative cost of two rival modes of transit, to omit the enormous construction and maintenance expenditures in the one case, and to include them in the other, is to totally invalidate the conclusions drawn." There is more in this point than in the others which have been mentioned. In fact, there is a good deal more in it than Mr. Moulton has made manifest.

There is an old saying that what is sauce for the goose ought to be sauce for the gander. If interest on the amount invested by the people in the construction of canals or the improvement of our natural waterways ought to be included in the computation of the total cost of transportation thereon, why should not interest on the amounts given by the people for the construction of railways be included in the total cost of transportation by rail? Enormous quantities of lands were granted to aid the construction of railways in the United States. The total area of the lands so granted by the national and state governments is equal to that of the thirteen original states and greater than the combined area of France, Great Britain and Belgium. Other areas vast in the aggregate, were granted by counties, townships, cities and individuals. The customary arrangement in the Northwest was for the railway to demand of the owner of a town site free right-of-way and station grounds and a deed to each alternate lot. Enormous amounts of financial aid were given by national and state governments, cities, towns and vilages, counties, townships and individuals. The net amount donated by the state of Missouri and towns and cities in the same state was $34,000,000. The six cities of Wheeling, St. Louis, New Orleans, Pittsburgh, Baltimore and Philadelphia had in 1853 a railway debt of $26,584,000. The census of 1870 showed that there were still outstanding $185,000,000 of county bonds issued in aid of railways. One stretch of road in Wisconsin, one hundred miles long, received gifts of an average of $11,000 per mile in farmers' notes secured by mortgages.

One other point must be mentioned. The value of the grounds occupied by railway terminals is enormous. In some cases it is said that the value of the terminals is equal to the value of all the rest of the road. Recent purchases of ground for enlarging terminal facilities have necessarily commanded high prices, but much of the terminal properties were bought many years ago for low prices, and large quantities of such grounds were donated outright. And all such grounds, whether acquired by gift or purchase in former days, have increased tremendously in value, and a large part of this great increase in value has come, not by reason of what the railways have done, but by what the people have done. The value could not have been what it is except for the railways, of course, but when we remember that there were mighty empires, populous cities and a thriving commerce thousands of years before the railway was ever heard of, we are justified in concluding that the fundamental reason for this increase in value is the work of the people. People can build a city without railways, but railways cannot build a city without people. Unfortunately no complete compilation and tabulation of the amount and value of all the gifts made to aid in the construction of railways in this country has ever been made. Possibly the time is past when a complete compilation could be made, and it is certain that there can be no accurate calculation of the share which the people have had in increasing the value of terminals and other property of the railways, including the franchises. If, therefore, all conclusions are worthless when we make a comparison of the costs of transportation unless we include all the elements which have contributed to that cost, such comparisons must henceforth be entirely avoided, because it is utterly impossible to get at the "total cost" of railway transportation.

Mr. Moulton calls attention to the fact that the people of New York state have voted an appropriation of $101,000,000 for the work on the new Erie canal, and says: "This is an expenditure of approximately $300,000 per mile for the mere improvement of a waterway upon which many millions of dollars have already been expended." My understanding is that over much the larger portion of the route between Lake Erie and the Hudson river the barge canal has been located elsewhere than along the line of the original Erie canal. And I find from the reports of the state engineer and surveyor of New York that up to the end of 1882, when the tolls on the Erie canal were abolished, the revenues derived therefrom had paid back to the state the entire cost of construction, enlargement, maintenance, operation, superintendence, and collection of tolls, and a net profit of $42,599,717.25. That would seem to me to be a fairly profitable investment, even if there had been no collateral benefits in the way of a reduction of freight rates on competing railway lines and the up-building of cities at its terminals and along its line.

How great has been its influence on competitive freight rates is indicated by the fact that on at least one occasion on the day the Erie canal froze up the rail rate on grain from Buffalo to New York was increased from 3½ cents to 7½ cents a bushel. Philadelphia was originally the larger city, but within ten years after the completion of the Erie canal, New York took the leading place in population, wealth, commerce and manufactures, and has held it ever since. The people of New York were wise, in my judgment, in voting $101,000,000 to construct a new and much larger canal than the old Erie. I may add that, in my judgment, they would have been very much wiser if they had voted a sufficient sum to build a very much larger canal than the one now under construction.

Mr. Moulton says further: "Transportation must be paid for by someone. If the state builds and keeps in repair a transportation system, donating its use to the public, the cost of construction and maintenance is paid for by the inhabitants of the state in the form of taxes. The remaining cost—of equipment and operation, plus a reasonable profit on this investment—is paid by the shippers of traffic to the carriers thereof. On the other hand, if the means of transportation are privately constructed, the entire cost is paid by the shippers who make use of the transportation agencies." With the first part of this statement I agree, although I must add that Mr. Moulton seems to have overlooked the returns in the way of development which accrue to the state through the economic effect of waterways. Several nations of Europe which have had an experience in the matter of covering forty years or more, are continually putting more and more money into the improvement of waterways and turning them over to the free use of the public, in competition with state-owned and state-operated railways, which constitute the principal source of national revenues. But with the latter part of the statement above quoted I must emphatically disagree. The cost of transportation is not paid by the shippers who make use of the transportation agencies. It is only advanced by them. All transportation charges are ultimately paid by the people who consume the commodities transported. Any shipper who failed to take the cost of transportation into account in fixing the price of his goods would very soon go out of business.

Again he says: "There are waterway schemes before this country involving an initial expenditure of approximately $2,500,000,000. This vast sum, together with the interest which would accrue from a long period of bonded indebtedness, would constitute an enormous taxation burden for the country to bear." I should be gad to receive information as to the location and character of the projects to cost such an enormous sum, and to understand in what way they are before the country. On Feb-

ruary 11, 1910, Chairman Alexander, of the Committee on Rivers and Harbors, stated on the floor of the house that the completion of all projects then under improvement would cost $252,017,400. This sum includes all harbors, rivers and canals upon which any work had been done—that in addition there were projects which had been favorably reported upon by the engineers, but not yet adopted, which up to February 7 amounted to $87,548,600, or a total of $339,566,000.

The two largest projects which have been advocated in recent years are the Lakes-to-the-Gulf waterway and the proposed inland waterway along the Atlantic and Gulf coasts. The army engineers estimated the total cost of a 14 ft. waterway from the Great Lakes to the gulf of Mexico at $158,697,462. But this plan was reported upon adversely by the engineers, and appropriations are not made except upon a favorable report. The reports of the surveys on the Atlantic inland waterway have not yet been made, but as that project consists essentially of a number of comparatively short canals connecting bodies of water naturally navigable, even if the plan in its entirety is recommended by the engineers and adopted by Congress, the cost per mile will be very small as compared to the Erie canal. I am at a loss, therefore, to imagine where and what the projects are to which Professor Moulton refers. Even if there be projects calling for the expenditure indicated, we must consider not only the cost of the improvements, but their benefit, before we can judge whether or not the expenditure will be wise. James J. Hill says that the railways of the United States ought to spend more than twice as much as that in order to put themselves in a position to promptly and efficiently handle the enormous amount of business which the country has already shown it is capable of producing.

Mr. Moulton asks why such men as Daniel Drew, Commodore Vanderbilt and James J. Hill forsook the waterway business, in which they had been engaged, for the railways. Judging by what followed the transfer of their operations from waterways to railways my judgment is that one reason, if not the principal one, was the fact that all the natural waterways classed as navigable, which could of course be improved for a vastly less cost than artificial waterways could be constructed, are under the exclusive control and jurisdiction of the United States government, and so afford no opportunities for the piling up of colossal fortunes through the issuance of bonds to twice the cost of construction and the further issuance of stock in an amount equal to if not greater than the bonds, with construction companies, holding companies and town site speculations on the side.

Professor Moulton says: "Obviously the transportation system which can serve the country efficiently at the least cost is the system which should be established. . . . If a deep waterway from the Great Lakes to the Atlantic ocean or to the gulf of Mexico would drive competing railways from the field, why have not our great business men seized the golden opportunity?" I do not know anybody outside of a lunatic asylum who wants to drive the competing railways from the field. The transportation system which can serve the country most efficiently and at the least cost will be made up of three things: highways, railways and waterways, each co-operating with the other for the service of the public. Mr. Hill did go out of the waterways business and into the railway business many years ago, but he has learned something in the course of his years of experience. Standing before a great convention of the National Rivers and Harbors Congress in Washington, D. C., on the afternoon of December 5, 1907, Mr. Hill delivered a most striking address, in the course of which he said:

"Existing conditions in the transportation business of the country compel attention to its waterways and the assistance they may render. . . . We must prepare to utilize the waterway as a common carrier. . . . The railways are now unequal to the demands upon them. Farmer and merchant and manufacturer are feeling loss from uncertainty and delay in their shipments. Unless commerce can have an adequate channel it must decline. . . . All the terminals are congested. There is no longer certainty of delivery on any large shipment. . . . In seeking ampler ways for traffic, the country turns to its waterways for relief. These are about to emerge into an era of restored usefulness and influence in the development of our resources. The age of pioneering relied upon them alone. The age of settlement sought speedier and more universal means of communication. The age of maturity must press all the available agencies of transportation into service. The enthusiasm that built the Erie Canal must be aroused in this generation for a systematic and scientific improvement of all our waterways."

There has been expended in this country an enormous amount in the construction of streets and roads. This expense and the further expense of interest on the cost and of maintenance is paid by the people—paid for by taxes and not by tolls. I do not think anyone could get a respectful hearing today who would advocate the turning over of the streets and roads of the country to private companies. It is recognized that there are benefits derived from this expenditure which make it both necessary and wise. The same thing is true of the expenditure on waterways. The people of the United States have given outright to the railways property and franchises worth probably two and one-half billions of dollars. Streets and roads have cost at least that much, probably more. Even if they should spend that amount on waterways, who shall deny them the right to do so? And the experience of other nations shows that such an expenditure would certainly be one of the wisest and the most profitable investments that the people of the United States could possibly make.

S. A. THOMPSON,
Field Secretary, National Rivers & Harbors Congress.

THE MADEIRA-MAMORE RAILWAY.

BY P. H. ASHMEAD.*

The Madeira-Mamoré Railway, now being built in the interior of Brazil, is the outgrowth of many years of exploration, surveys and disastrous attempts at construction. As early as 1846 Col. José Augustin Palacios of Bolivia had mapped parts of the rivers, and Lieutenant Lardner Gibbon, U. S. N., described this territory in an official document published by direction of our Congress in 1854. Since that time several expeditions have penetrated this territory and numerous reports and books have been written on it, including exhaustive descriptions of the country by the German engineer, Franz Keller, and by Neville B. Craig, a member of the Collins expedition of 1877-79.

In 1868 Col. George Church secured a concession from Bolivia to organize the National Bolivian Navigation Company, with the view of canalizing the river around the falls. In 1869 he again went to Bolivia and secured a modification in the concession authorizing the construction of a railway, if it were more feasible, and also the right to make a loan, the principal and interest of which were to be guaranteed by the Republic of Bolivia. From the Bolivian capital he went to Rio de Janeiro in 1870, and the Empire of Brazil granted to him personally a concession for the enterprise to be called the Madeira & Mamoré Railway. After many difficulties Col. Church made a contract in 1876 with the American contractors, P. T. Collins, Philadelphia, Pa., a firm that had successfully built many miles of railway in the United States, but none in the tropics; in fact neither of the partners had ever been in the tropics. They worked under distressing conditions, having practically no money, little food and few medicines, until 1879 when Col. Church went to Rio and had the Brazilian concession cancelled.

Brazil will owe the actual accomplishment of the construction of this railway to Percival Farquhar, another American whose interests had been largely in railways in southern Brazil, in various port improvements and in electric railways and power plants in the republic. The present company was organized under the laws of Maine, and May & Jekyll, American contractors, who had been for a number of years in Central America and in

*Consulting Engineer, New York. Mr. Ashmead was chief engineer of the Madeira-Mamoré Railway from 1908 until he was sent out with the beri-beri in 1910.

Cuba were engaged on a percentage basis, the railway company being represented on the work by a chief engineer and an accountant to direct the engineering work and audit the accounts and expenditures in Brazil.

The rivers Mamoré and Guaporé are integral parts of the Madeira. Cartographers, however, designate as the Madeira only that part from the mouth of the river Beni, at Villa Bella in Bolivia, to the mouth of the Madeira at its confluence with the Amazon near the village of Itacoatiara about 100 miles east of the Brazilian city of Manáos. Keller estimated the maximum discharge of this stream below the falls to be approximately 1,400,000 cu. ft. per second. Apart from close to the river banks very little is known of the great Amazonian area comprised in the states of Amazonas and Matto Grosso, and the information that has been published regarding it is limited to the notes of travelers along the rivers, whose explorations ashore have covered but narrow zones parallel to the rivers. The dense forests, in which the trees average considerably over 80 ft. in height,

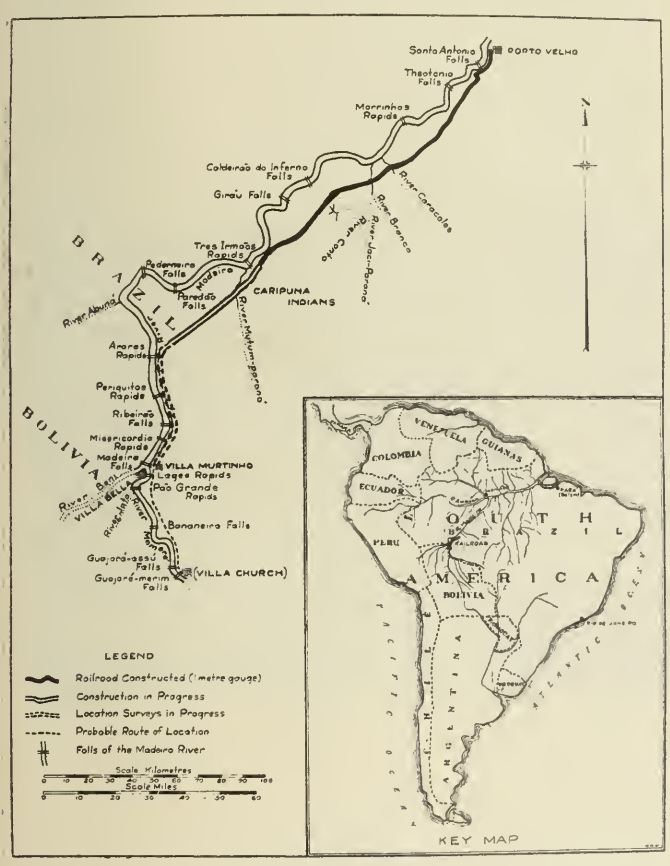

Fig. 1—Madeira-Mamore Railway.

with individual trees upwards of 125 ft., together with a dense jungle of undergrowth, are supposed to extend for 40 leagues south and east of the Madeira and Mamoré rivers, and approximately to parallel them.

From the time the white man entered South America until the present, the route by water, with portages around the falls, has been the only one traveled from that section of eastern Bolivia and western Brazil to the sea. Passengers are carried up and down the river in the cargo boats called "bateloes," of from two to 10 tons capacity. From Riberalta, on the river Beni, to Santo Antonio, on the Madeira, somewhat over 320 miles by the water route, the journey under favorable conditions occupies from 10 to 12 days going down, and from 30 to 40 days going up. Lieut. Gibbons required 12 days to descend from Guajara-merim to Santo Antonio, which he says "is considered by Brazilian navigators fast traveling."

The cargo boats usually have a hood of thatch, made from the palms of the forest, which is placed at the stern as a shelter from the rays of the sun and from rains. They are manned by from 12 to 16 paddlers with a pilot, the Bolivian semi-civilized Indians making the best crews. Sufficient food must be carried for the whole journey, because practically nothing other than a few articles of canned food at two of the falls can be procured until Villa Bella is reached. The whole journey is annoying, uncomfortable and tiresome. One must sit in a cramped position under the cover of the hood, or if outside, on top of the variously



Fig. 2—Engineers' Camp.

shaped parcels of miscellaneous cargo. By day a small fly, locally called a "pium," attacks in swarms all exposed parts of the anatomy, and the bites itch for days afterward. By night mosquitoes attack, and there are other annoying insects, among which are huge beetles with jaws like calipers, which are attracted by the lights and fires when camp is made for the night.

At each of the falls cargo must be unloaded and carried around on the shoulders of the crew, the boat beached and

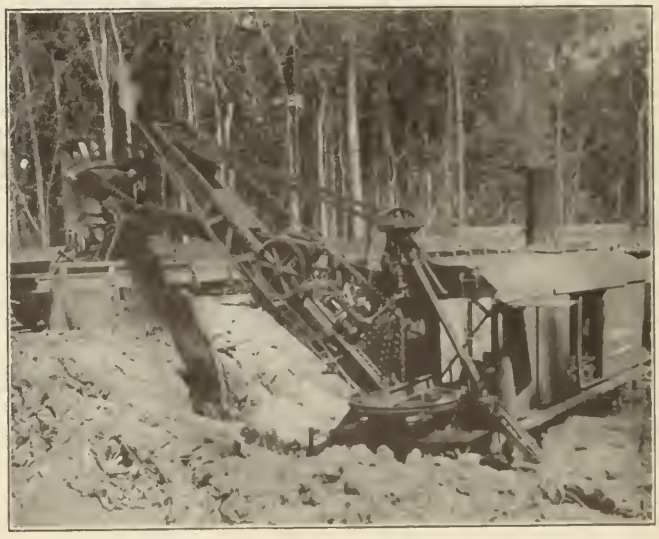

Fig. 3—Steam Shovel at Work.

transported, sometimes on rough rollers hewn in the forest, sometimes by dragging it by main force over the smooth round stones. At Theotonio falls, the greatest of all, one of the largest rubber exporting firms of Bolivia has built a little narrow gage railway over which boats are transported on trucks, those of the firm gratis, while others pay a tariff of 5 milreis, or about $1.50 per boat for the few hundred feet haul.

It has been said that the Madeira-Mamoré will occupy a posi-

tion in this immensely rich section of the world comparable to that of the neck of an hour-glass, and over it must pass the huge traffic that will develop a few years after its completion. It will doubtless be the main stem of hundreds of miles of railway that must be built to develop the section. The country through which the railway will pass lies a few degrees south of the equator. Observations by the engineers of the present expedition locate Porto Velho in latitude 8 deg., 45 min., 25 sec.



Fig. 4—Method of Building Bank Across Swamp.

south, and longitude 64 deg., 21 min., 54 sec. west. To reach it by the regular lines of steamers it is necessary to touch at Pará, some 90 miles from the ocean, having a population of perhaps 180,000, and at Manáos, with a population of about 60,000, and nearly 1,000 miles from the sea, on the Rio Negro. Both of these cities are attractive in appearance on first view, but unfortunately yellow fever is nearly always existent in them. In southern Brazil, the government has exterminated this type of fever. Rio de Janeiro and Santos are now free from it, but in the north little has been done toward its eradication. The feel-



Fig. 5—Track Supported on Brush Foundation.

ing among the citizens in the north with regard to this type of fever seems to be that as it only attacks the foreigners, of whom there are comparatively few, and who are in the country for but a short time, and mainly to make money, that it should not be incumbent upon the authorities to spend the money received from taxation for the eradication of the fever and to protect the foreigner, when the Brazilians themselves are apparently immune. When Porto Velho is reached, it is most difficult, from the appearance of the region, to comprehend the reason for the high percentage of sickness there and along the line of the railway. Away from the immediate vicinity of the river mosquitoes are not as annoying, nor apparently so plentiful as in many parts of the United States, and it is now universally acknowledged that malaria is transmitted solely by the mosquito.

The temperature along the line during about ten months of the year ranges from 72 deg. to 93 deg., seldom, however, exceeding 88 deg. The maximum occurs between 2 and 3 p. m. From the latter part of June, until August, the range is perhaps 5 or 6 deg. lower during the day, and has reached 59 deg. some nights. Along parts of the cleared right of way, in the larger camp clearings and in Porto Velho, a good breeze generally stirs until 11 o'clock in the morning, while from that time until the middle of the afternoon it is hot, sometimes stifling. In the cleared sections the country looks attractive, and yet there is continually enough sickness to require a large hospital of some 12 or 14 buildings, five or six wards, of which each is some 40 by 200 ft. Including those on the line, are some 14 to 16 physicians, 8 to 10 trained nurses, and perhaps 10 to 20 native helpers or Jamaican negroes. During two years' experience in the country, and from information covering nearly two more years' work of the present expedition, the writer knows of but three employees who escaped some form of illness.

The annual rainfall approximates 100 in., and the most severe



Fig. 6—Circular Concrete Culvert.

illness occurs during the dry period of a part of June, in July and August, and a part of September. The actual percentage of sickness from each disease of record has not yet been computed, but doubtless malaria is responsible for 80 or 90 per cent. of the whole. A number of cases of yellow fever have developed among the laborers while on the river en route to the works. Such cases are quarantined on an island in the river near Santo Antonio, and of those that have been so confined, infection has generally been traced to Pará and Manáos. Other diseases that cause trouble are hookworm, blackwater fever, dysentery and beri-beri, while there have been a few cases of typhoid. Of beri-beri, that peculiar disease of the Orient and parts of the tropics, little is actually known of the cause. The army surgeons in the Philippines, and the Japanese surgeons claim it is caused by eating hulled rice, but in Brazil rice is a rare article of diet, and yet there are hundreds of cases. Departure from the environment in which it was contracted has seemed on this particular work to be the only real cure.

In the region of the railway on the Brazilian side of the rivers, there were probably not more than 500 inhabitants, other than the autochthons, before this construction began. From Santo Antonio down the Madeira to its confluence with the Amazon, there are but three settlements that may be properly called towns;

Borba, Manicoré and Humaythá, the last named the largest, with perhaps 500 people. It is probable that from Santo Antonio to the mouth of the river, about 700 miles, there are not more than 2,500 people inclusive of those in the towns mentioned. In these villages are the churches, the lower officers of the state and a few small shops.

The Brazilian in this section is not fond of work. Along the river the men are seen in boats spearing fish or shooting turtles, or they may be swinging in their hammocks in the shade of the trees, while the women seem to be always preparing something to eat. In general they all live a happy-go-lucky life, with no cares and little food other than that readily obtained from the



Fig. 7—Spanish Sub-contractor at Work.

river, their mandioca patches and the fruit trees. Upwards of 50 per cent. of the labor employed on the railway has been Brazilian, and it is quite inefficient. The head surgeon on the staff has been quoted as stating in a report that a great number of the deaths on the works occur from chronic diseases of the liver, and nephritis, which result fatally only after many months or years of insufficient food, intestinal parasites and malaria.

The Collins expedition in 1877-79 had located a line somewhat over 60 miles long between Santo Antonio and Caldeirão do Inferno (boiler of Hell). Their records were not available when the present expedition began its surveys. The Brazilian government informed us that although Dr. Pinkhas of the 1885



Fig. 8—Car Shops at Porto Velho, Under Construction.

Brazilian commission had brought much of the Collins data to the capitol, it had been destroyed by rats and insects while in storage just after the Republic succeeded the Empire. Unfinished cuts and embankments made by the Collins firm extended some seven miles south of Santo Antonio, covered by woods as thick as the virgin forest on each side of the old roadbed. From Mr. Craig's book descriptive of the Collins expedition, a small lithographic map was secured, showing the line they had surveyed, which had been approved and adopted by the Morsing-Pinkhas commission in its report to the government, and which also indicated Dr. Pinkhas' suggested line beyond the terminus of the Collins survey toward Guajara-merim. On this small map, from the end of the location made at the time the writer



Fig. 9. *Fig.* 10.

Fig. 9 and 10—Telegraph Pole Made of Old Rails, Necessary to Withstand Attacks of "Cupim"—Nest of the "Cupim."

reached the work, a distance of 28 miles from Porto Velho—a tangent was laid following the general direction of the Collins survey to the river Jaciparaná—the magnetic course was scaled, and a preliminary party was instructed to run out that tangent, to make topography where a railway could be built near it, and to run spur lines and take topography from them if the tangent ran through country in which construction was not feasible. In

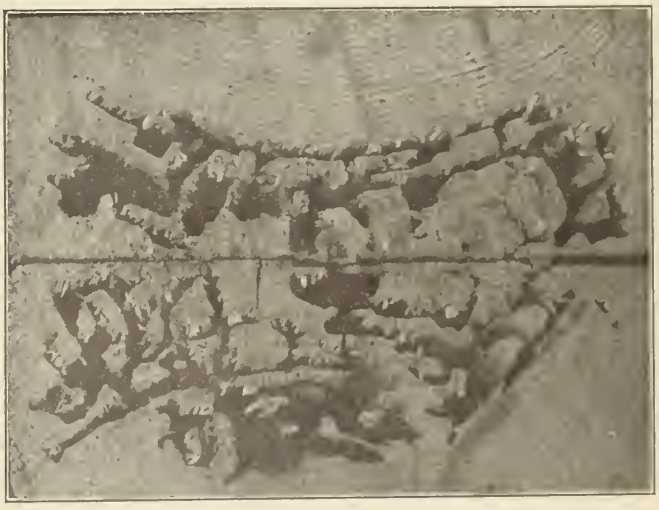

Fig. 11—Result of Action of "Cupim."

running the one tangent through, the objects were mainly to secure a direct line over which supplies might be sent to the engineers at the front and to have a base line from which to make the studies and secure the necessary topography in some rough country through which, from previous reports, we felt certain the railway would have to be constructed. This method proved to be entirely satisfactory in the virgin forest with undergrowth so dense that it was usually impossible to advance even a few feet without constant and laborious cutting with machetes and axes. During the rainy season the light was frequently so dim in the cleared lines, or "picketes," that instrument work could

be done only between nine in the morning and three in the afternoon.

Mainly because of sickness, engineering parties were each practically doubly equipped with men. There were two transitmen, from two to four topographers, two levelmen and from twenty to forty laborers, the majority of the latter, other than the cook, being Brazilians accustomed to the use of the machete. Delays were frequent, even with such large outfits, and at times only five or ten of the laborers were fit for field work, the others being confined to their hammocks with fever or with poisoned and swollen feet caused by contact with thorns on trees and



Fig. 12—Grading at Kilometer 80.

shrubs. Because of the various delays, the maps of the finally located line for the most difficult section, between Porto Velho and the Jaci-parana, somewhat over 55 miles, were presented to the government in April, 1909, nearly a year after it had been decided to follow the Collins line. Some months after that part of the line had been located, through the courtesy of J. C. Patterson, who had been a member of the Collins engineering staff, we received a profile, and the alinement notes of their first 20 miles of line. When platted to the scale of our maps and superimposed on them, it showed that we had practically followed their location, the main difference being that from a point some 12 miles from Porto Velho, we had run in a five mile tangent and cut through a small knoll, around which they had introduced a short curve. Other than by delays caused by the constant cutting of underbrush, sickness and frequent changes of personnel of the engineering staff and its laborers, the surveys were delayed during the rainy season by high water in the Madeira river and its affluents that the line crossed. During the dry season all of these affluents, except the Jaci- and Mutum-paranás, may be waded, or spanned with logs; but in the wet season it was necessary to pass out of the woods to the Madeira, and up it and its branches in canoes. The Brazilian laborers are decidedly averse to packing camp equipage and supplies on their backs, and when ordered to do so many of them quit work, consequently attempts to move camp by such means were in general abandoned—the time necessary to inform headquarters and have more laborers sent to the front to replace the disaffected men, being longer than that required to move the long way round by boats.

The terminal points originally decided upon by the government were to have been Santo Antonio—at the northern end of the series of falls—and Guajara-merim—the most southern of the falls, and just previous to the death of Colonel Church the ministry at Rio de Janeiro gave its consent to name the proposed town there Villa Church in his honor. At the present time there is no village of any sort at the place, and it is merely a name on the map designating the falls. It has been found advisable to have the northern terminus some seven kilometres down the Madeira, because of the restricted area available at Santo Antonio for yards and docks, and the site chosen is now called Porto Velho. From Santo Antonio to the river Mutum-paraná, the land along the Madeira river is rough. A line close to the river would incur a prohibitive cost on account of the small hills of granite divided by deep ravines.

The possibility and probability of annihilation by the Indians had restrained explorers and engineers of former expeditions from venturing great distances from the river's edge. From the beginning of the present work until its engineers reached the Mutum-paraná, they were continually on the "qui vive." There had been many reports of signs made of rudely-cut sticks placed in newly-cut trails, and signs made of feathers had been interpreted as warnings, but none of the parties was attacked. After passing kilometre 45 without attacks, it was decided to run the long tangent mentioned. The surveys of the present expedition have resulted in gaining a general knowledge of the topography of a district from five to seven miles wide parallel to the right bank of the Madeira river and it is known now that there exists a range of small hills between the river and the comparatively flat country back of it, the edge of the flat country being from two to five miles from the river. The line upon which the railway is built after climbing out of the main valley of the river some twelve miles south of Porto Velho, follows the divide between the area draining directly into the Madeira and that draining into its branches. the Jamary and Jaci-paraná, at an elevation of from 90 to 120 ft. above high water, descending again at the Jaci-paraná to an elevation some 36 ft. above the Madeira at Porto Velho. Near Porto Velho there are several cuts through a particularly hard granite, but on the summit, the cuts are in a more recent, softer granite, called "cascalho" in Portuguese, red in color, some of which rapidly disintegrates when exposed to the air, but other sorts harden. This latter constitutes an ideal material for ballast, packs well, forms no dust, and when formed into the roadbed sheds water quickly and perfectly. In some of the cuts this material has been worked readily with a steam shovel, while in others it has been necessary to use some powder.

The length of the main line was estimated by the government to be 340 kilometres, and with the additional 7 kilometres to



Fig. 13—Group of Caripuna Indians.

Porto Velho, this would be somewhat over 215 miles, but it is probable that including the detour made to reach the mouth of the Abuná river, the actual length of the main line will be shown by the surveys when completed, to be somewhat more than 225 miles. With the consent of the governments of Bolivia and Brazil, the company will also build a branch line from some point on the main line, not yet selected, to a point on the Beni river above Esperanza falls, some 25 miles in length, and may later continue this branch to the town of Riberalta, 30 or 40 miles further up the Beni. The road is of one metre gage. The contract provided for maximum grades of 2 per cent. and for

curves of not less than 160 metres radius (10 deg., 45 min. English), but as the Madeira-Mamorè Railway Company desired to avail itself of the right to lease and operate the road, the engineers were instructed not to exceed 1 per cent. grades, and no curves have been staked exceeding 9 deg. English.

It is now estimated that the cost to the Madeira-Mamoré Railway Company will be upwards of $20,000,000 to complete the main line of approximately 215 miles, and to this will be added the cost of a bridge over the Mamoré river into Bolivia, over



Fig. 14—Jaci-Parana Bridge; 271 ft. 9¾ in. Span.

half a mile long, together with the cost of proposed branch lines and extensions in the Republic of Bolivia, which at present are estimated to aggregate some 80 or 90 miles in length.

The difficulty in mapping the country sufficiently well to make a proper economic location in the dense forest may be appreciated when it is known that for each mile of located line, slightly more than five miles of spur and preliminary lines were run. In the estimate of the government, allowance was made for payment for but one mile of preliminary to each mile located, but when its fiscal engineer became cognizant of actual conditions, it was arranged and mutually agreed that payment should be made on the basis of three to one.

Of the equipment now on the works, the locomotives, flat and box cars, will become a part of the operating equipment. There are now in Brazil: 9 Baldwin Mogul locomotives, weight on drivers, 68,000 lbs.; 2 Baldwin Consolidation locomotives, weight on drivers, 92,000 lbs.; 200 flat cars, 20 tons capacity, 33 ft., 4¾ in. long; 36 box cars, 20 tons capacity, 33 ft., 4¾ in. long; 40 Rodger ballast cars, 33 ft., 4¾ in. long; 3 45-ton Bucyrus steam shovels, 1 35-ton Bucyrus steam shovel, 7 Marion ballast unloaders, 100 Decauville cars and 80 miles of light track; 1 25-ton Bay City locomotive crane, 1 7½-ton Bay City locomotive crane.

The Decauville dump cars and track are sent up the river in the large canoes, and after being unloaded at the most convenient point to the part of the line on which they are to be used, are transported on wagons to the line. Boilers for the drills, concrete mixers and pile drivers are transported to the line in the same way when they are needed ahead of track. Temporary trestles are built so as to push the track ahead, and permanent bridges and culverts are built later. The steam shovels can, of course, only be used as track advances, and the grades in some cuts have purposely been left high at times so as to get equipment through, after which the grades were lowered.

It is not anticipated that much passenger equipment will be required, but there are now in Porto Velho two combination first and second-class passenger coaches, each 43 ft. long. The rolling equipment of all the various railways in Brazil in which Mr. Farquhar is interested, which, with the lines now operated, being constructed or surveyed, total about 15,000 kilometres, will be standardized. The shops will be quite completely equipped. It is already possible to make all repairs now needed and



Fig. 16—25-ton Locomotive Crane in Porto Velho Yard.

eventually it will be possible to construct cars by importing only the wheels and some few parts. The complete equipment for the shops will be purchased in the United States.

Usually there are from 150 to 200 mules and 100 work oxen on the work, and the sub-contractors are furnished with animals to use in connection with the dump cars. Mules have been brought from Pará, 1,600 miles away, and from as far as Rio de Janeiro and Buenos Ayres, in steamers that required from 17 to 25 days to make the trip. The oxen have been purchased along the Amazon river, but as soon as the road reaches a convenient point, these animals can be secured from the large herds



Fig. 15—Porto Velho in December, 1910.

in Bolivia at perhaps one-third of the cost of the Amazon cattle.

In general, the ocean freight rates from New York and Europe to Manáos, are from thirty to forty shillings per ton, and until the railway company bought and operated its own marine equipment for use between Manáos and Porto Velho, the lines of river boats operating on the Amazon and Madeira rivers charged as high as $25 gold per ton for the 810 mile trip, and in some cases absolutely refused to transport certain parts of construction plant. The company was therefore obliged to buy its own river craft and now owns and operates for its exclusive use: One swift river steamer for passengers and freight, five powerful tug boats, four steam launches and 11 lighters of from 80 to 200 tons capacity, in addition to a number of the large canoes used

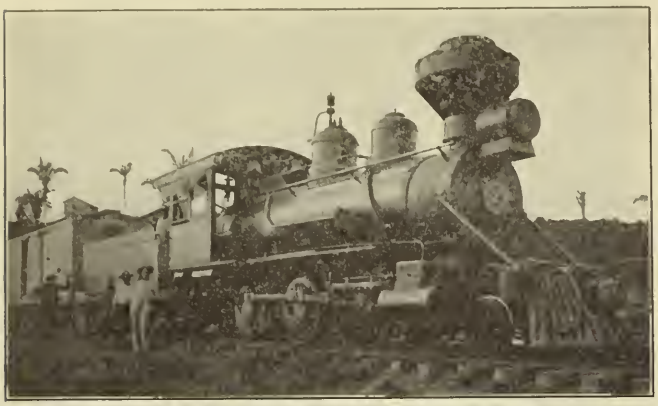

Fig. 17—Baldwin Mogul Locomotive.

in the river between the falls. Ocean steamers drawing 20 ft. can navigate to Porto Velho from early in January until late in May. In 1909, nine steamers reached Porto Velho from New York and ports of Europe, loaded with railway material. In 1910 fourteen steamers cleared from foreign ports for the place. The difference between high and low water at Porto Velho is approximately 46 ft., high water occurring about March 20 and low during the whole month of September.

The force employed on the work has come from many parts of the world. Probably 50 per cent. or more of the laborers have been Brazilians, but nearly all of the South and Central American countries have contributed, as have China, Persia and Turkey. Foremen, clerks and engineers have come mostly from the United States, but England and her colonies, France and Germany have also contributed to the staff. The most experienced and intelligent laborers are the Spaniards, the nucleus of which force came from Cuba, having been employed on railway work there by the same contractors. Other labor, common and skilled, has been recruited by agents of the contractors in Portugal, the West Indies and Germany, but the Spanish Gallegoes have been the bone and sinew, and many of them in gangs of from 3 to 10 men take sub-contracts and save much money.

The physical construction of the railway is not difficult. In the first fifty-five miles some heavy work was necessary, and the contractors divided their men and distributed their forces as well as they could, so that the completion of the larger cuts would not delay the track. Practically all of the work between Porto Velho and the river Jaci-paraná, except a few shovel cuts, was done with men, mules and the Decauville outfit. The Spanish "subs" would move from 3 to 7 cubic metres per day, while the Brazilians, working for wages, seldom moved 2 cubic metres per day. The most economical method for the construction of the road would doubtless have been by the use of light machine equipment, but for certain reasons this was not used, and when completed the road will have been mainly built by hand, notwithstanding the fact that the greatest difficulty encountered has been that of securing laborers, sufficient in number and efficient in action.

Construction may be said to have begun in April, 1908, and from that date until December of the same year, it has been estimated that from twelve to thirteen thousand individuals were sent to the works in order to secure an average monthly force of 1,100—staff and labor forces both included. During the year 1909 the average number per month rose to 2,300, during 1910 the number per month gradually increased, and early in 1911 the contractors reported that they had a total of 3,500 on the whole works. The boats and lighters of the company brought in hundreds of laborers each month, and the regular lines of river steamers carried their hundreds of laborers away from the work. For months at a time, the company sent in as many as 600 men per month, while the river steamers carried out slightly more, depleting the force constantly. It was a constant struggle to secure enough men to keep the track advancing, and there were seldom enough men to keep the work going ahead and the track up at the same time. During the period from June to September, the hospital records indicate a loss in efficiency of from 10 to 25 per cent. and during the rest of the year of from 5 to 10 per cent. from sickness.

Some of the unit costs of this work may be almost unbelievable to engineers and contractors without experience in tropical countries. The approximate costs of some items, for instance, are: Clearing, $225 per acre; earth excavation, $2.25 per cubic yard; rock excavation, $7.00 per cubic yard; concrete masonry, $61.00 per cubic yard; ties, $2.60 each; track laying, $8,400 per mile; telegraph and telephone, $600 per mile; timber, $310; piles, $3.60 per lineal foot. For the necessary buildings, the government contract provides payment to be made per square metre of superficial area. For the shops and warehouses that have been erected the cost to the railway company has been upward of $2.75 per square foot.

The charges for transportation by the barge canoes in the district of the falls has been: For freight of whatever class, down river, $1.52 per ton mile; up river, $2.22 per ton mile. For passengers, down river, $0.57 per mile; up river, $1.14 per mile. The government has already approved the bases of the tariffs that may be charged by the railway under twenty-five freight classifications, for which there are, however, but fifteen different



Fig. 18—Completed Track.

rates, a number of the classes having the same rate. For a long haul the rate per kilometer is from 60 to 70 per cent. of the short haul.

For the first few years of operation, rubber, food stuffs and cattle will doubtless constitute the bulk of the traffic, and for these the long haul rates are: Rubber, $0.80 per ton mile; food, $0.40 per ton mile; cattle, $0.90 per head per mile. For passengers the tariffs for the long haul are, for first class 70 per cent. and for second-class 80 per cent. of the short haul rates. The long haul rates are: First class, $0.14½ per mile; second class 0.10 per mile. The railway is required under its lease to transport free of charge, colonists and immigrants and their baggage, tools and farming implements—seeds and plants sent by the

Federal and State Governments—the mails, and employees of the government mail and telegraph departments. It is required to transport at 50 per cent. of tariff rates officers of the government and their baggage, and all supplies sent by the government to relieve drought, floods and other public calamities—at 30 per cent. of tariff rates—munitions of war, officers, soldiers and their baggage, at 15 per cent. of tariff rates—all other passengers and cargoes of the Federal Government not specified above, and materials destined for the construction of branch lines of the same railway.

All photographs for this article were taken by the official photographer for the railway, D. B. Merrill.

DEMURRAGE OFFICERS.

The twenty-second annual convention of the American Association of Demurrage Officers was held at the International Hotel, Niagara Falls, N. Y., June 22 and 23. John F. Roach, Manager of the Central Demurrage & Storage Bureau, St. Louis, Mo., and president of the association, presided.

The membership of the association was shown to have been reduced to twenty-nine, by the abandonment of eleven associations in New York, New Jersey, Maryland, Pennsylvania and Ohio; but the members have not lost heart, and Manager E. E. Mote, of San Francisco, announced that he had traveled across the continent to attend the meeting, by direction of his executive committee; thus to attest by his presence the desire of the Pacific Coast roads for the continuance of bureau supervision over demurrage rules. The Southern managers, pretty generally, reported the same sentiment prevailing among the railways in the South. But in the general discussion there were radical differences of opinion. The men from the West agree with the Southerners, but the Eastern men, evidently reflecting the views of their superior officers, were divided. East of Chicago a number of bureaus have been abandoned. As on many previous occasions, the idea was prominently brought out that the success of a bureau depends on the personality of its manager.

The principal business of the meeting grew out of the report of Captain Haskell, of Atlanta, who, as chairman of the committee on rules, recommended changes in the reconsignment rule; the rule governing cars containing freight in bond, or subject to the United States customs; the rule relating to the giving of notice of the arrival of freight; and the claim rule. Under the claim rule an extended discussion arose over the provisions for refund or cancellation of demurrage charges caused by weather interferences, or by the bunching of cars in transit, which are delivered to the consignee at destination in accumulated numbers. The conclusions of the association, with respect to the amendments and modifications of the rules, are to be laid before the American Railway Association.

I. R. Van Tuyle, Manager of the Western Demurrage Bureau, Omaha, Neb., was elected president for the ensuing year; E. E. Mote, manager of the Pacific Car Demurrage Bureau, San Francisco, was elected vice-president, and A. G. Thomason, Demurrage Commissioner, Boston, Mass., was re-elected secretary and treasurer. The selection of a time and place for the next meeting was deferred until later in the year, and is to be determined by ballot.

It was the consensus of opinion at this meeting that the Uniform Code of Demurrage Rules had, on the whole, worked very satisfactorily during the first year of its operation. The changes suggested are designed to make clearer the intent of the rules.

An interesting feature of the meeting was the reading of a paper which had been presented to the American Association of Local Freight Agents, at Kansas City, Mo., in which the local freight agents argued for the continuance of bureau supervision over demurrage rules. It was contended that a good demurrage bureau, under a capable manager, prevents most of the difficulties arising from demurrage rules, and provides conditions under which both the railways and the public have confidence in uniform treatment, applied impartially, on all roads.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

VI.

Phoenix, Arizona, May 13, 1911.

My Dear Boy: You ask me to give you my views on the handling and settling of freight claims.

I restrain my impatience and consequent desire to jump on you hard. Allow me, therefore, with expressions of distinguished consideration, to invite your esteemed attention to the fact that your valued request contains no mention of an intelligent desire for possible enlightenment on the most important feature of the problem, namely, the prevention of claims, the eradication of causes.

A railway is a complex proposition. Seldom can we discuss one of its problems independently. So ramified are its activities that the penumbra of one shadow coincide with the outline of the next. Studied from the broadest view of railway administration, freight claims are found too often doing duty as a shadow which hides the real substance, poor operation. It was formerly the almost universal practice on American railways for freight claims to be handled and settled by the freight traffic department. It was felt that the man who secured the business, who dealt with the shippers, was the man to placate the claiming public. No, this did not always lead to rebating. It placed before the man hungry for gross revenue a temptation which he often resisted. Since the passage of the Hepburn act and the consequent inspection of claim disbursements by the Interstate Commerce Commission, the general trend of railway practice has been to place the so-called freight claim department under the accounting department. Railways are waking up to the fact that the new order of things means more than an accounting proposition; that in government regulation and supervision the whole matter of railway administration is involved. What we technically term "operation" is the largest of the component elements of administration.

The tendency of overspecialization has been to leave to the accounting or the legal department the matter of relations with the various branches of government, both state and federal. Since a part can never equal the whole the results have been disappointing. Railways are learning by costly experience that traffic men and operating men must have an active part in these vital relations. Government in the long run reflects the spirit of its people. The American people as a nation are positive and constructive. The training of railway lawyers and railway accountants is often negative and resisting. The general counsel and the general auditor are inclined to tell us what we can not do. The traffic manager and the general manager, on the other hand, tell us what we can do. Out of it all should come a well balanced administrative machine. We need the whole machine, not a specialized part, the positive as well as the negative elements, when we move alongside the reciprocating engine of government.

Again, putting a man in the accounting department does not make him any more honest than the rest of us. There is more logic in taking freight claims away from the traffic department than there is in placing them under the accounting department. The traffic man, the accounting man, or the legal man can settle or refuse a claim. None of these can eradicate its cause. Only the operating man can do this. Many roads cling to the belief that their wonderful interior combustion and hot air harmony give the operating department sufficient information to serve the practical purpose. My observation has been that this information is not sufficiently fresh; that it trails along too far behind the actual transaction. Some roads, like the Southern and the 'Frisco, have organized special bureaus in the operating department to minimize the causes of freight claims and to follow up discrepancies while the case is fresh; in other words, to investi-

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gate before the claim is filed. Sometimes this duplicates the work of the freight claim office and sometimes it does not.

So bad have been freight loss and damage conditions on most American railways that almost any kind of attention has resulted in improvement. Nearly every road can cite figures in defense of its particular treatment of the situation. There are many good ways. In the absence of an absolute unit of comparison the best way must be largely a matter of opinion. To me the logical and practical principle has been discovered by two of the best managed railways in the country, the Chicago & North Western and the Chesapeake & Ohio. These roads, among others, place their freight claims under the operating department, thus reserving the hair of the dog for treatment of its bite. With such a system the general manager controls the disbursements to operating expenses for which he is responsible. Under other systems the general manager accepts charges which he does not directly control. Some roads have endeavored to correct this last defect by requiring claim vouchers to be signed by the general manager and the division superintendent. This beautiful example of circumlocution is expensive. There are only twenty-four hours in a day, and even claim papers can not be handled for nothing. Furthermore, the claimant himself refuses to see the beauty of delaying payment to carry out a theory. In some states he has secured legislation penalizing railways for delay in settling intrastate claims. Can you blame him? The claimant aforesaid may happen to be a country merchant waiting for the way freight to come in. It brings him six boxes of groceries. In his presence, and that of the agent, the way freight brakeman drops and spoils a box. On many roads, not only is the agent not allowed to pay for this spoiled box, but is expected to require the indignant consignee to pay the freight on all six boxes before removing the other five. The consignee is told to file a claim, which then makes its weary round through the circumlocution office where clerks are called investigators. Such companies say in effect to the agent: "Yes, you are a good fellow; you get us a lot of business; you handle thousands of dollars of our money; you represent us in many things; you must understand, however, that a freight claim is a specialty requiring expert advice; a bad precedent might involve us in the future; you know, too, we might be criticised as opening the way to grafting by some other agents if we let you pay out money without authority from the accounting department; yes, we like your work and expect to promote you in the sweet by-and-by," etc., *ad nauseam*. Fortunately, these narrow views are giving place to more enlightened practices. On several railways in Texas most station agents are authorized to settle instanter certain classes of palpably just claims up to $20 or $25.

Among the practical advantages of claim control by the operating department are quicker recognition of lax methods causing claims, better discipline and morals of train and station forces, prompter settlement, and greater attention to seal records. The Chesapeake & Ohio make surprise tests by breaking a seal and resealing the car with a different seal to see if the next man copies the last record, or actually takes his seal record from the car. This road also appeals to the human element. Claims settled are tentatively charged to the conductor or agent apparently at fault, and he is given an opportunity to explain. This is not real money, but a combination of Brown system, Christian Science coin, and 1907 clearing house certificates. The practical effect is very real, however. Each man learns to feel a responsibility which is reflected in a desire for a clean record. The general claim agent, who is under the general manager, sends monthly to each division superintendent a list showing the name of every freight conductor on the division, with number of claims, if any, charged to him on account of pilferage from train, rough handling, etc. The local divisions of the Order of Railway Conductors have been interested and feel some responsibility in keeping the work of their members upon a plane above the imputation of collusion with pilferage. Seek, my boy, to develop the higher natures of your men and you will be astonished at the response. Let them know that you know what they are doing, and it becomes easier for them to withstand temptation.

Freight claims are a fine example of an exaggerated specialty resulting in unnecessary centralization. The whole proposition can be decentralized for the good of the service. Because the division superintendent can not well settle interline claims of other divisions is no reason why his forces should not settle such local claims as concern his division.

A thorough study of freight claims will bring you early to a consideration of personal injury, stock, and fire claims. The fad has been on many railways to take these items of operating expenses away from their former location in the operating department and give them to the legal department. This exaggerated view of the laws of liability is partly responsible for the growth of the damage suit industry. It is another case of considering a part of the railway at the expense of the whole. We need legal advice and expert knowledge. The true function of the expert and the specialist is to see how much working knowledge he can impart to the layman for everyday use and reserve himself for the real complications which, if his tutelage has been sound, the layman will quickly recognize and bring back for expert assistance.

Not long ago I happened near a freight wreck. One of the cars in the ditch contained an emigrant outfit in charge of a man. This man was bruised, but not seriously injured. With the superintendent and the wreck train came a specialist, a claim adjuster for the legal department. He could settle only the personal injury. The damage to property was a freight claim and belonged to another department, the accounting, not formally represented at the impromptu function, and over which the superintendent as master of ceremonies had no jurisdiction. The various items of operating expenses involved on this occasion were in a decidedly diverged condition. What the spiritualist medium calls the control was in this case the office of a busy president some fifteen hundred miles away. Of course, the company spirit and common sense guided the superintendent, and he made the best of circumstances; perhaps risking criticism and censure for crossing sacred departmental lines. What do you think of a system that breaks down in emergencies? Is not an emergency a test of a system, a proof of its elasticity? Can we develop the highest efficiency of superintendents when we, the executive and general officers, place upon them the burden of departing from a system that fails to meet their practical problems? Is it not a species of unconscious administrative cowardice for boards of directors to impose implied and practical responsibility without conferring corresponding authority? Can such questions be ignored as exceptional, trifling, and captious? Do they not reach to the heart of railway organization and efficiency? Will the railways correct such errors themselves, or will they await once more the remedy by legislatures and commissions?

If a study of conditions does not convince you theoretically that one claim bureau should handle freight, stock, fire, and personal injury claims—in short all claims covering injuries to persons and damages to property—go down on the Chesapeake & Ohio and watch them do it practically. Instead of several specialists duplicating each other's itineraries, you will find some all-round claim men doing a variety of practical stunts. When they do strike a really different and highly technical case, they utilize the services of their best specialist in that particular line, not infrequently the general claim agent himself. Overcharge claims are very properly handled under their traffic auditor, being a matter of correction and not of operating disbursement. Were it up to me, I would make the general claim agent an assistant general manager, so that in claim matters he would have rank and authority superior to the division superintendent's. The division claim agent I would make an assistant superintendent, so that in claim matters he would have rank and authority superior to all employees on the division.

On this last division feature I once convinced my old friend, Cant B. Dunn, by a long, practical test.

Affectionately, your own, D. A. D.

NEW SIGNALING AT WASHINGTON; P. B. & W.

One of the most complete and modern signal installations in the country was recently put in service by the Pennsylvania (Philadelphia, Baltimore & Washington), between the south portal of the Capitol Hill tunnel and the Potomac River bridge, Washington, D. C. The installation consists of two electro-pneumatic interlockings and 13 electro-pneumatic automatic signals. The interlocking machine at Second street and Virginia avenue has 18 working levers operating 49 functions; the machine at Fourteenth street has eight working levers operating 35 functions.

Speed signaling, as recommended by the committee on signal practice of the Railway Signal Association, was installed through-

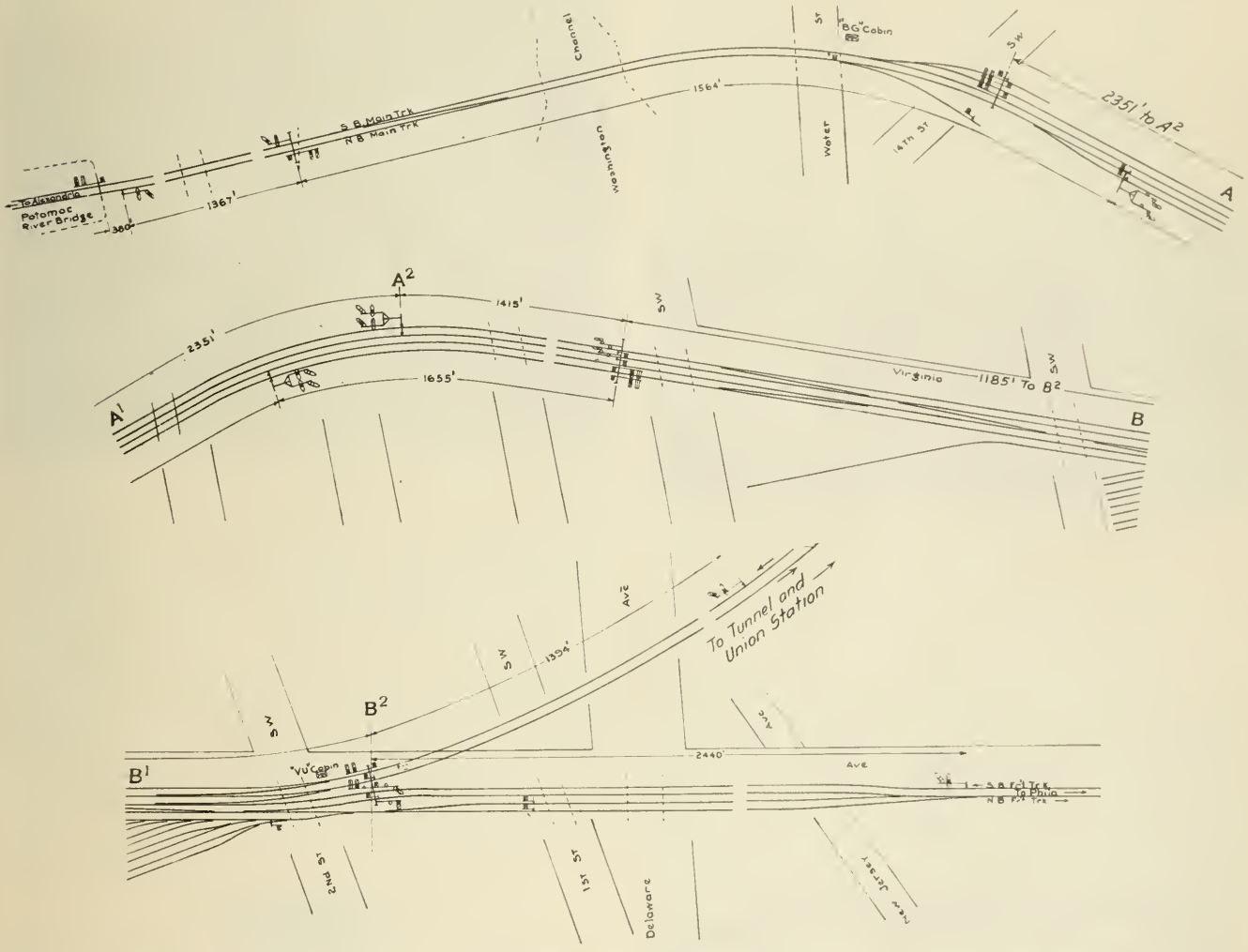

Fig. 1—Arrangement of Tracks and Signals between the Potomac River and Capitol Hill Tunnel, Washington, D. C.; Philadelphia, Washington & Baltimore.

Note.—The upper portion of drawing at A joins the second portion at A^1. The second portion at B joins the third portion at B^1.

signals near it. Electric detector approach and advance locking are provided for all switches, and there are no detector bars. Alternating current is used for operating the track circuits and for controlling the automatic signals.

The electrical energy and the compressed air are obtained from the power house of the Washington Terminal Company, situated about two miles north of the tunnel portal. Emergency electrical energy taps in the local electrical company's lines are provided for use in case of failure of the main supply.

The electrical energy is transmitted at 2,200 volts, 60 cycles, over a No. 6 B & S flexible twin conductor cable. A lead-sheathed cable is used from the power house to the first interlocking, and from this point a cloth covered, jute filled rubber insulated cable is used. The lead cable is run in terra cotta conduits from the power house to the south portal of the tunnel and in galvanized iron pipe from that point to the first interlocking. The cloth covered cable is laid in wood trunking about 2 ft. below surface. The trunking was treated with creosote. About one-half inch of pitch was placed in bottom of the groove of trunking. The cable was then laid in and the groove filled with pitch. A cross section of the trunking and cable is shown in Fig. 5.

The 2,200-volt current is stepped down to 10 and 110 volts at eight different transformer locations. A sectionalizing switchboard panel is placed in the 2,200-volt mains at each transformer location. The switches on these panels are so arranged that with power at both ends of the line any section of the cable

out. The interlocking home signals have three arms with vertical lights, the distant signals two arms with staggered lights, the automatic signals one arm and two staggered lights, the dwarf signals one arm and one light. All signals governing in the direction of traffic indicate the position of the next high signal in advance; and all signals operate in the upper right-hand quadrant.

Fig. 1 is a plan of the tracks embraced in this installation. It is broken into three parts, the west end (Potomac River) being at the upper left hand. The different parts of the engraving are to be connected as indicated by the letters A and A^1, B and B^1. Fig. 2 is a view at the Fourteenth street interlocking, looking west, and Fig. 3 shows signal cabin "VU" and the

between transformer locations may be cut out of service without affecting the operation of any signal. The sectionalizing panels and transformers are placed in cases, made of reinforced

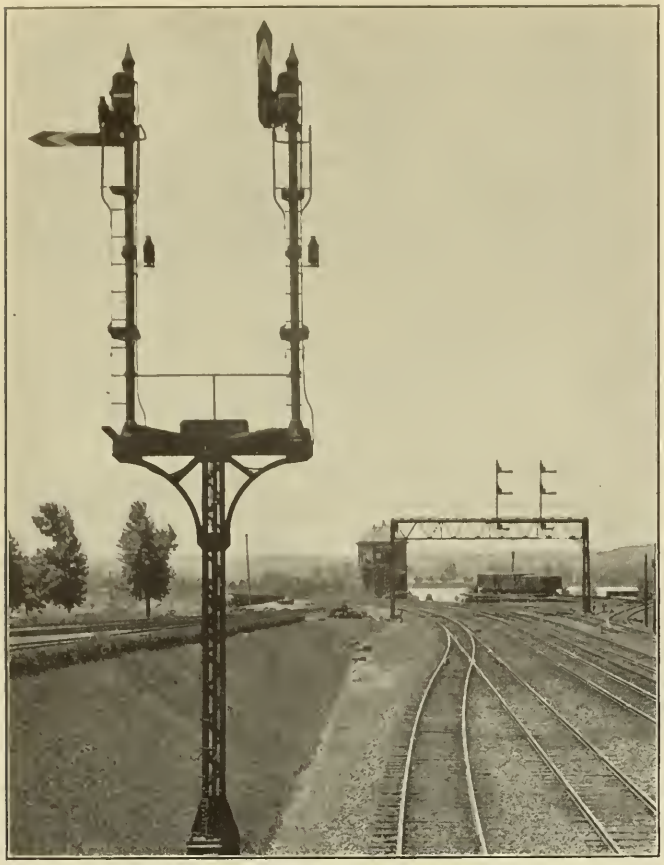

Fig. 2—Signals at B G Interlocking, Fourteenth Street, Washington.

concrete, which are divided into two parts, the upper part being used for panels and the lower for the transformer. There are 44 track circuit sections in the installation, averaging 775 ft. in

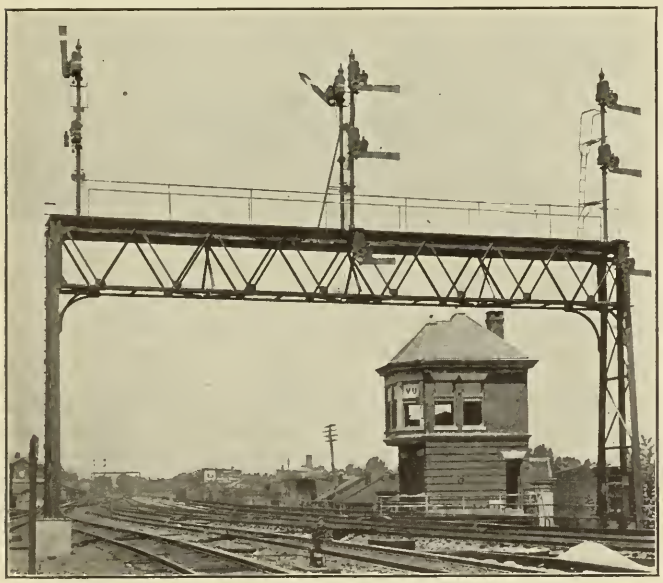

Fig. 3—Signals and Cabin at Second Street and Virginia Avenue.

length. The longest is 2,400 ft. long and the shortest 93 ft. The sections are fed from the 10-volt taps of the transformers. Leads of No. 6 wire are run from the transformers to bus bars in the distributing boxes. The track feeds are tapped to the bus bars through a resistance tube. These tubes have three units of resistance, 0.5 ohms, 0.75 ohms and 1.25 ohms. Fig. 4 shows a view of the distributing boxes and Fig. 6 of a relay box. The track relays are of the galvanometer type. The



Fig. 4—Distributing Box.

fields of these relays are connected to the 110-volt bus bars with a non-conductive resistance of 140 ohms in one of the leads.

The voltage across the rails at the feed end averages 2.4 volts and at the relay end 1.85 volts.

The signals are of the top post mechanism type. The home and dwarf signals are controlled by direct current magnets operating from a 14-volt storage battery. The distant and automatic signals are controlled by alternating current magnets operating on 110 volts. The stick circuit for the semi-automatic signals is controlled by slow-acting relays to prevent the signals

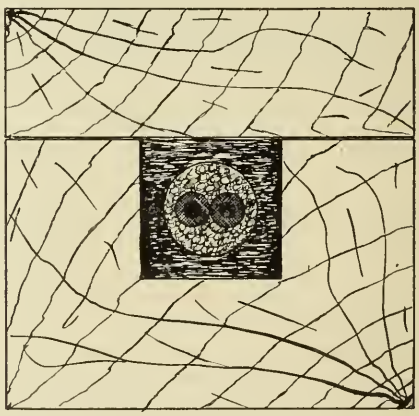

Fig. 5—2200-volt Wires in Trunking.

being thrown to stop by a momentary interruption of the power supply. Each signal is lighted by one lamp of two candle power which burns continuously.

Directly over each lever of the interlocking machines there is a small electric light which indicates to the signalman when the block or the track circuit section over which signal indications are given by means of that lever, is clear.

The interlocking and signal material for the installation was furnished by the Union Switch & Signal Co., and the wire by the Kerite Insulated Wire & Cable Co. The work was installed by the railway company's force under the supervision of W. L. Smith, supervisor of signals of the Maryland division. The cost of the whole was $60,791, including the cabins, which are of brick, costing about $4,731 each. The four-arm bracket posts cost in place about $773 each. The average cost of the four-track signal bridges complete with four two-arm signals in place is $2,111.

In the original plans for this installation signal bridges were provided for in all cases. One of the new bridges was put up

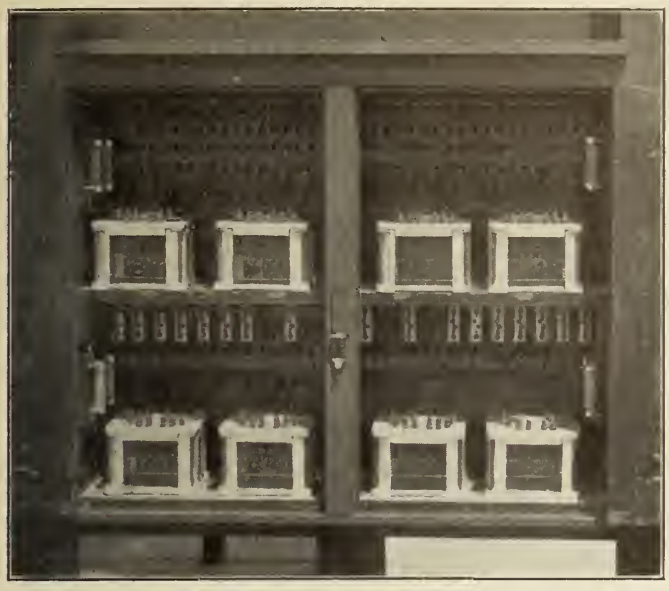

Fig. 6—Relays.

south of Seventh street, at which point there is a parkway alongside of the tracks. People residing in the vicinity objected to this bridge as unsightly and as obstructing their view, and at their request the railway company substituted the bracket post in place of the bridge.

Putting the power line (south of "VU") in trunking was to some extent experimental, with the view of obtaining the cost, life and efficiency of this method of installation. The cost of this line, including the cloth-covered cable with two No. 6 B & S gage copper wires, was about $35 per 1,000 ft., which it is estimated is much cheaper than lead-covered cable in either galvalized iron pipe or any other method of conduit construction.

FOREIGN RAILWAY NOTES.

The English government has provided $900,000 for the construction of the Jinja-Kakindu Railway, Uganda Protectorate, Africa.

A Cologne paper calls attention to the fact that the 12th of May last was the 30th anniversary of the opening of the first electric railway. This was an experimental line about a mile and a half long, from the Lichtenfeld military school to the Anhalt station in Berlin, equipped with a single car with seats for 12 passengers, built by the firm of Siemens & Halske. The speech made by Dr. Siemens on that occasion is remarkable for a modesty not often shown in introducing new inventions. "The child born today," said he, "is a sturdy little fellow, with abundant vitality. I think he will make out to live. But he has the diseases of childhood yet to meet, and as yet has not even cut his teeth. We may be glad, however, that the babe has at least come into the world. As to what will become of him, whether he ever amounts to anything, we must wait to see." We have waited; and we have seen.

TRAIN DESPATCHERS' ASSOCIATION.

The twenty-fourth annual convention of the Train Despatchers' Association of America was held at Baltimore, Md., June 20, 21 and 22. There was an unusually large attendance. From the Atchison, Topeka & Santa Fe sixteen men were present, and the representation otherwise was from a larger number of roads than usual. The business report showed a cash surplus in the treasury of $321 and invested funds amounting to some $1,500. There was a decrease in the membership of six members, leaving a total membership of 932, while 42 new members were elected at the meeting, making a total membership of 974.

An amendment to the constitution was submitted changing the method of amendment which threatened, if adopted, to open the door to radical changes in the association, but it was defeated by the decisive majority of ninety-one to one, and the character of the association as an organization which prohibits discussion of the labor question in any form was emphatically reaffirmed.

The report of the train rules committee was the main feature of the convention and evoked vigorous debate on some of its features, which were referred back to the committee for further consideration.

The convention held two sessions on Tuesday, and one short session on Wednesday morning preceding a steamboat trip to Annapolis, and return. An evening session was held after the return from Annapolis which continued the debate and disposed of the report of the train rules committee. The following six proposals recommended by this committee were approved by the association.

Under train-order form G, example 3, the explanation should be amplified by the addition of the proviso that if the extra be a passenger train, the track must be cleared by the time the extra is due to leave the last station in the rear. This would make the practice under form G conform to the practice under general rule No. 86. The paragraph next to the last in the explanations of form H should be included in the double track rules as well as the single track.

Under form B, example 3, it would be better to provide that the second named train must run with caution and at such speed as to avoid accident to the first named train. It is believed that this would be quite as safe as the provision now in force. In most cases the speed of the leading train must be guessed. The committee believes it would be well to provide under this example that the form should be used only when the superior train is indefinitely late, and that an order of this kind should be replaced as soon as practicable by form E. The committee recommends the omission of the word "until" in example 4, form E, and the word "leave" in example 3, form G, except against the first item in the order. The letters "A. M." and "P. M." might also be omitted, except as they are used in time-table schedules.

In the train despatcher's clearance form, the committee recommends the use of the following formula: "All trains due at G *at or before,*" etc. A clearance form ought to be used in all cases where there is no register, but where trains have to be cleared before starting. The committee recommends the adoption of the "Q" response, said to be in successful use on the Rock Island lines. The requirement is that operators receiving orders, *except the one first repeating,* shall listen to and compare their own copy with the first repetition and preface their own repetition by "Q," thus informing the despatcher that they have made the comparison. The present rule in regard to listening is not very generally observed, but the committee believes that the proposed requirement can be obeyed without difficulty.

Several recommendations failed to receive approval. The committee recommends the introduction of a paragraph allowing different forms of orders to be combined, when practicable, except form K, provided each specified movement directly affects the train first mentioned in the order. This rule is proposed as a restrictive measure, to keep despatchers from making all sorts of combinations; but the association was not ready to take action.

Form K is that one used for annulling trains. This the committee would never allow to be combined with any other form. The committee proposed that rule No. 221 be modified so that after delivering a clearance card the train should be allowed to proceed without the clearing of the signal; also the common practice of allowing a train to pass the train order signal in order to do the station work should be definitely set forth in the rules. But on this also the association refused to commit itself. The same result followed a proposition to change the third example under form G.

On Thursday the convention held two sessions and voted to appoint a train rules committee of four members to act hereafter in conjunction with the proposed train rules committee of the Association of American Railway Superintendents, the president and secretary continuing to be ex-officio members of the committee.

The election of officers resulted in the selection of J. B. Ford, chief train despatcher of the Santa Fe, Clovis, New Mexico, as president. T. W. Kane (N. P.), Livingston, Montana, was elected vice-president. J. F. Mackie was re-elected editor. J. P. Finan (Santa Fe), Needles, Cal.; T. D. Dellmin (L., S. & M. S.), Youngstown, Ohio; W. H. Whitaker (B. & O.), Baltimore, and H. M. Conley (B. & O.), Columbus, Ohio, were elected members of the executive committee, the last named being a re-election. There was some bitter opposition to the election of Mr. Mackie as editor, but it was at long range and ineffective. Communications were read from 35 despatchers, threatening to leave the association in case of his re-election. When the matter came to a vote, however, Mr. Mackie received a unanimous endorsement.

Louisville was selected as the next place of meeting, and the date was fixed for June 18, 1912.

Messrs. Daniel Willard, President of the Baltimore & Ohio, Charles Selden, superintendent of telegraph of the same road, and A. J. Wells, general manager of the Santa Fe Coast lines, were elected honorary members.

The meeting was the best attended and most enthusiastic held by the association since 1893.

CAR CAPACITY AND FREIGHT RATES.*

BY J. F. STROMBECK.

By car capacity is meant the amount of freight, in terms of weight, that can be loaded into a car. The capacity of any given car may depend upon several conditions. In the first place, the strength of the car limits the weight which can be safely hauled in it, usually varying from 30,000 to 80,000 lbs. The character of the freight loaded is another important factor in determining car capacity. It is possible to load commodities of great densities, as iron, grain, etc., even above the marked capacity, while light and bulky articles, as pleasure vehicles, can usually, even in a 50-ft. car, be loaded up to only 18,000 lbs. Other freight, because of extreme size of each piece, or because of perishability, cannot be loaded without leaving much unoccupied space in the car.

Again, less-than-carload freight cannot be loaded as heavily as straight carload lots. Carriers claim that the weight of the former may fall as much below that of the latter as one to two and even as three to eight. This is so because it is impossible to load miscellaneous freight as compactly as a single commodity, because there is often a lack of sufficient freight to fill a car at stated, regular intervals, and because way freight must be so placed in the car as to permit loading and unloading at all stations.

Finally, commercial conditions may prevent heavy loading of cars. Cannel coal, being used almost entirely for grate purposes, is sold in such small quantities that even though its density is almost equal to that of other bituminous coal, it is seldom, if ever, loaded as heavily as is the latter. Other conditions might be mentioned, but these are sufficient to show the varied influences that affect car capacity.

Car capacity, as a factor in determining freight rates, is an element affecting the cost of performing the transportation service, and as such is of great importance. Commissioner Prouty has said that "in determining what are reasonable rates for carriage of various commodities, no one thing has been oftener or more earnestly insisted upon by the carriers as a controlling element than car capacity."

This factor is important, first, because from the point of view of service it becomes the almost controlling element in determining relative rates on articles of great density, on the one hand, and on light and bulky freight, on the other. Too great importance attached to car capacity will result in an undue disparity in the rates on these two classes of traffic. This will be brought out more clearly later. In the second place, the factor is of much importance in determining carload and less than carload differentials. These differentials, with possibly some exceptions, should be based on the difference in the cost of hauling, and as car capacity is one of the most important factors determining this difference in cost, it necessarily becomes of much importance in determining the differentials.

While car capacity has always been an important factor in determining freight rates for rail carriage, it is constantly increasing in importance. About two decades ago most cars had marked capacities of from 20,000 to 24,000 lbs., while today 80,000 is common, and many have 100,000 lbs., capacity.

Car capacity affects the cost of hauling in that the dead weight, that is, the tare weight of the car, carried per 100 lbs. of freight decreases as the load increases. If the weight of the car is 30,000 lbs., and the weight of the load is 20,000, there are 150 lbs. of dead weight carried for each 100 lbs. of freight, but if the load is increased to 40,000 lbs. only 75 lbs., or one-half as much, dead weight is carried for each 100 lbs. of freight.

A superficial consideration of this has led to the error of holding that a rate ought to decrease as the weight loaded is increased; if not in exactly the same ratio, nearly so. Traffic managers have said time and again that each and every carload should pay approximately the same amount of revenue as every other carload as far as it is possible to make them do so; and some hold that the carload should be made the unit of shipment upon which to base charges, rather than 100 lbs. or a ton. A study of those commodities which take more than one classification according to the minimum weight loaded, will give considerable evidence that carriers are attempting to carry out such a policy. That this policy is subject to criticism will be shown shortly.

The following case is a typical one illustrating the method by which reduction in cost by increased car capacity is figured. It is an ideal case because all other elements but car capacity, both from the point of view of cost of service and value of service are eliminated. Commissioner Prouty used it in *The Planters' Compress Company Case*, 11 *I. C. C. Rep.* 382. He said:

"An ordinary box car weighs perhaps 36,000 lbs. The total weight of that car loaded with square bale cotton would be 61,000 lbs. and the carrier would receive, at a rate of 30 cents per 100 lbs., $75 for the service, or about 12.3 cents per 100 lbs. for the gross weight of car and contents. If this same car were loaded with round bale cotton, it would weigh, car and contents, 86,000 lbs. At a rate of 20 cents per 100 lbs. the total revenue would be $100, or about 11.6 cents per 100 lbs. for the gross weight carried. When it is remembered, therefore, that the car in one case earns $100, while in the other it earns $75, it must be evident that cotton compressed to a density which permits loading of 50,000 lbs. to the car is as good business, looking only to the cost of carriage, at 20 cents per 100 lbs., as is cotton which will load 25,000 to the car at 30 cents per hundred."

According to this, as Mr. Prouty also claims later in his argument, loading 50,000 instead of 25,000 lbs of cotton to the car saves one-third of the cost.

Before it is possible to point out the fallacy in the above argument, it will be necessary to briefly consider railway costs. These costs may be said to be of two kinds, direct and indirect, sometimes called variable and constant expenditures, respectively.

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NOTE:—A portion of the matter in this article is taken from a book by the same writer on "Freight Classification and Commodity Tariffs," which is to be published in the near future by Houghton, Mifflin & Company, and is used with the consent of the owners of the copyright.

Direct costs represent such items as expenditures for fuel, water, etc.; wages of engineers and trainmen; wear and tear on rolling stock and interest on money invested therein; payments for repairs of roadbed and track made necessary because of wear from hauling and other similar items. Indirect costs include expendiures for maintenance of way caused by the rusting of rails, rotting of ties and washing out of road bed; repairs and renewals of fences and road crossings; wear and tear on stations because of the action of the elements of nature; expenses to replace cars and locomotives that have become out of date; a large part of station expenses; wages of switchmen, flagmen, watchmen, etc.; the expenses of the general office, and fixed charges, including interest on funded debt, interest on interest bearing current liabilities, rents paid for lease of roads, taxes, etc.

There is a marked difference between these two kinds of costs. Direct costs depend upon the amount of business done and vary directly, though not necessarily in the same ratio, as the volume of traffic carried. The indirect costs, within certain limits, remain about the same irrespective of the amount of business done. They correspond to what in some industries are called overhead costs. It is of the greatest importance that these two kinds of cost be kept clearly in the mind throughout the following discussion, and, in fact, in all considerations of freight rates. A failure to clearly recognize these two kinds of cost has resulted in much severe and unjust criticism of the railways, and many valueless discussions of rate problems.

Judge Noyes, in "American Railroad Rates," has shown that approximately 40 per cent. of the total expenditures of the railways of the United States represent direct costs and 60 per cent., indirect costs. As these total expenditures are exclusive of dividend payments, something less than 40 per cent. of an average rate, under average conditions, goes to cover direct costs. With this explanation of transportation costs in mind, it will be possible to discover the fallacy in the use of the factor car capacity as in the case cited above.

By putting our case in a different form it will be easier to analyze. If 50,000 lbs. are loaded into two box cars, each weighing 36,000 lbs., the gross weight is 122,000 lbs. If the same weight is loaded into one car the gross weight will be 86,000 lbs., and the hauling of 36,000 lbs., or 29.5 per cent. of the weight, is saved. This seems on hasty consideration to be a saving of nearly one-third in the cost of transportation. Such is, however, not the case. The saving does not at all affect that something more than 60 per cent. of the rate which goes toward indirect costs and dividend payments. Furthermore, not even all of the items of direct cost are affected by the saving from hauling one car less. Such expenses as handling less-than-carload freight at freight houses and other terminal expenses, which are included in the 40 per cent. for direct costs, go on the same as before. It might, therefore, be safe to say, after making allowance for dividend payments and items of direct cost which are not affected by car capacity, that prossibly one-third of an average rate, under average conditions, is affected by the element car capacity, and the saving from the loading of 50,000 lbs. of cotton instead of 25,000 lbs. results in a saving of 29.5 per cent. of one-third of the rate, or approximately only 10 per cent. of the rate. It is evident if the doubling of the weight loaded merely cause a saving of approximately 10 per cent., an increase from say 30,000 to 40,000 lbs. in a load would result in a considerably smaller saving, which would possibly amount to one cent were the average rate 25 cents per 100 lbs. This certainly makes car capacity seem less important than it is usually considered.

The point in question might be further elucidated. The total cotton crop of the country ought to bear a certain amount of the indirect costs of all transportation, or in other words, of the aggregate constant expenditures of the railways, each unit shipment bearing its share. This amount that each unit shipment contributes toward indirect costs should clearly remain the same whether 25,000 or 50,000 lbs. are loaded to each car. If it is decreased, the carriers will receive just that much less net revenue for the transportation of the cotton crop than that commodity should pay. This is, of course, true only provided that the rate for the 25,000-lb. minimum is reasonable. Such a deficit must be made up by other traffic or reduce the profits of the carriers. Therefore, in varying the rates with the weight loaded, it should always be remembered that a portion of the rate goes toward paying indirect costs, and should remain constant irrespective of the weight loaded into a single car, and that the only costs that is affected is that of the actual hauling of the freight. This is also true for carload and less-than-carload differentials. The amount that 100 lbs. of any commodity should contribute toward indirect cost should be the same whether those 100 lbs. are carried as a part of a straight carload shipment or as a part of a less-than-carload lot. If an increased car capacity is accompanied by so great reduction in the rate that the amount which each 100 lbs. contributes toward the indirect costs is reduced, the present tendency toward greater car capacities is surely a poor business policy for the carriers. Sometimes one is led to question whether or not traffic managers are aware of this.

The above clearly shows that a car should not pay about the same revenue whether loaded with a heavy load or a light one. If the 30-cent rate on cotton is an average one, about 20 cents of it goes to pay indirect costs and dividends. If 25,000 lbs. are loaded, $50 will be earned for that purpose, but if 50,000 lbs. are loaded $100 must be earned to cover the indirect costs assessable against this particular amount of cotton. With a minimum of 25,000 lbs. about 10 cents per 100 lbs., or $25, are needed to cover the direct costs. If 50,000 lbs. are loaded there is a saving of 29.5 per cent. of this part of the rate, or about 3 cents, leaving 7 cents per 100 lbs., or $35 for the entire load, needed to cover the direct costs. Thus, if a carload of 25,000 lbs. reasonably earns a gross amount of $75 for the carrier, a load of 50,000 lbs. should earn a gross amount of $135. It can hardly be said that these two amounts are approximately the same. This also shows that the claim by some that the carload should be taken as a unite for determining freight charges instead of the 100 lbs., or the ton, cannot be grounded in reason. It would result in an enormous discrimination in favor of the shippers of heavy carload lots.

There is an element that further reduces the supposed saving in direct costs resulting from increased car capacities, which ought to be mentioned. An 80,000-lb. capacity box car with a steel underframe weighs about 44,000 lbs., while a box car having a capacity of 40,000 weighs about 30,000 lbs. Hence, while in the case of the former car a greater number of unit shipments of 100 lbs. each are hauled over which to distribute the dead weight, there is also a considerable greater quantity of dead weight to be distributed. The dead weight per unit shipment does not increase in the same ratio as the weight loaded increases in those cases where the increased capacity necessitates a stronger and therefore heavier car. It is even conceivable that at some point there is an increase in the dead weight per unit shipment instead of a decrease. This fact materially reduces the 10 per cent. saving shown above.

There is another matter to which attention should also be called. In the above case it was assumed that the 30-cent rate on cotton for a 25,000 minimum was an average rate. In the case of low-grade and cheap commodities a much smaller part of the rates goes toward indirect costs, and therefore it is possible that a very large per cent. of a rate is affected by car capacity. On the other hand, if the rate applies on valuable freight it is probably that considerable less than 30 per cent. of it is affected. Thus, car capacity is of much more importance for low rates than for high ones. This is also true of rates for long hauls as compared with those for short hauls, for in the case of the former the part going to indirect costs is often a smaller per cent. of the rate than in the case of the latter.

The evils resulting from a failure to recognize properly the factor of car capacity are significant, to say the least. If given too much importance, it leads to an undue difference between

rates on light and bulky articles and on those which are heavy and compact. A study of classifications indicates that in practice this difference is considerably greater than it ought to be. This is an unjust discrimination against light and bulky freight. Again, as car capacity is one of the most important elements in determining the difference in the cost of hauling carload and less than carload traffic, these differentials may become too great and cause an undue prejudice in favor of the large shipper who makes carload consignments. The small, less-than-carload shipper is made to bear part of the burdens which rightly belong to his stronger competitor.

Thus, a failure to distinguish between the direct and indirect costs of railway transportation has led to error in the application of the element car capacity, and the present tendency to increase car capacities causes a decrease in the carriers' revenues which go to play indirect costs. At the same time, light and bulky articles have been given too high rates as compared with those of great density and less-than-carload shipments as compared with carload lots.

AMERICAN ASSOCIATION OF LOCAL FREIGHT AGENTS.

The annual meeting of the American Association of Local Freight Agents, was held at Kansas City, Mo., on June 20, 21, 22 and 23. The following are abstracts of some of the reports presented by local associations:

VOLUNTARY PAYMENTS OF SWITCHING (KANSAS CITY ASS'N).

A special committee appointed for the purpose investigated the switching schemes in use all over the country and made an elaborate report at the Montreal meeting. Its report treats of six different schemes and covers forty-five pages in the official minutes. All of the different plans which have been suggested from time to time contemplate that the switching line shall depend upon its own resources only to collect the switching revenue due it and none of them provides for any assistance to be furnished by the paying line. If the switching line fails to ask for the money it receives nothing for the service performed. Way-bills may be issued for switch cars and any of the various checks suggested may be applied, but still care will be missed and the switching lines will lose much revenue in consequence. The inherent principle that prompts every man who works out a new scheme is the desire to obtain an accurate check on switching revenue and the primary object of every plan of checking switching is to insure the collection of revenue on all cars switched.

The local offices have forces of men employed to check interchange reports, switching orders, yard checks, cards removed from cars and all other records having any bearing on switching movements of cars. The accounting departments have forces of men in the field to check the stations to enforce proper checks being made by the latter. Bills for missed switching are made up from time to time and the paying line spends much time, energy and money in digging out old records and checking the supplementary bills made by the switching line. All of this is done and the local offices suffer much criticism because they fail to pay their known obligations in the first place. Every railway wants to pay all the switching revenue that is due every other railway, therefore why not carry out the policy of our managers and pay the switching lines for all cars switched, using the most simple and direct method? I believe that we have solved the problem at Kansas City.

At the time of ordering a car to a switching line the road carrying line writes up the way-bill on a statement of billing or other form, making whatever number of copies is needed, using one column to show the amount of switching due the switching line. Outbound business is written up in the same manner, showing the outbound way-bill reference. At the end of the week the statement is footed and a draft is issued to the switching line for the amount due it, which is paid in the weekly settlement. One copy of the statement is delivered with the draft to enable the switching line to properly apply the money. Another copy is sent to the accounting department as authority for the payment and the transaction is closed.

The switching line may continue all of its checks and safeguards to insure the proper charge being made for cars handled and will render bills for all cars missed by the road carrying line, which should be paid in the next weekly settlement. The switching line posts switching items received in the same manner that it applies prepaid and freight received items. Cars switched locally are settled for in the same manner, the originating line assuming the same position as the road carrying line. The voluntary settlement gives the switching line the double check, so much needed. When one line misses a car the other will catch it. The switching desk in each local office is supplied with the switching tariffs of the other lines or a statement of rates compiled from the tariffs which enables it to make its payment at the tariff rate. This plan has been in effect here for nine months and we are well pleased with it. The longer we use it the better we like it, and we commend it to other switching centers.

HANDLING L. C. L. FREIGHT AT JUNCTION POINTS (LOUISVILLE ASS'N).

The practice is indulged in more or less by nearly all present. Have we reached the state of perfection expected by our several managements? How can we overcome the irregularities so prevalent among us? We must assume that particular attention has been given the practice of loading merchandise cars over junction agents' heads whenever practicable and at the same time, emphasize the necessity of remodeling instructions from time to time as conditions change, bearing in mind that every shipment so handled—

(1) Decreases time of freight in transit.
(2) Decreases cost of handling.
(3) Decreases liability of damage, thus preventing claims.
(4) Decreases transfer charges at junction points.
(5) Reduces switching and yard expenses.

Originating points should first arrange to load to break bulk at points as near ultimate destination as their tonnage will justify, regardless of the number of junction points interested.

The same practice can be indulged in by receiving agents when the tonnage warrants, thus enabling us to reduce to a minimum that which gives us the most trouble, namely, "The cross-town movement."

Those of us who are favored with an up-to-date, responsible and well-organized transfer company will at once favor the use of same for the cross-town work, but those less fortunate will be fully as enthusiastic in favor of the use of the car system. Both have their advantages and disadvantages. Which is the preferable?

In using the transfer system, we find in its favor, generally speaking:

(1) The saving of probably twenty-four hours in time consumed in transit.

(2) A greater degree of accuracy in getting the freight to the proper depot, as it becomes the object of two individual checks instead of one.

On the other hand, we find favoring the car system, speaking in a general sense:

(1) Saving of transfer charge expense.
(2) Eliminating of a third party in handling the business.
(3) Saving of office labor in properly presenting transfer bills for settlement.

In order to enable transfer stations to make package cars to stations on foreign roads, and far-removed points on such lines when tonnage is sufficient to justify it, we recommend the adoption of interline billing. By doing so, the waybills will indicate the route freight is to travel and shipments would not be held up by originating line for rebilling, as is now largely the practice on business moving through the Ohio and Mississippi gateway into the South and West and through Chicago for the North and Northwest.

The following officers were elected to the association for the ensuing year: President, Charles E. Cochrane, Baltimore, Md.; first vice-president, George B. Ager, Boston, Mass.; second vice-president, H. J. Griffin, Mobile, Ala.; secretary, R. O. Wells, St. Louis, Mo.; treasurer, C. E. Fish, Cincinnati, Ohio.

PACIFIC COAST LOCAL FREIGHT AGENTS' ASSOCIATION.

The annual convention of the Pacific Coast Local Freight Agents' Association was held at San Diego, Cal., June 20-22. The territory of the association includes California, Oregon, Washington and British Columbia, and members from every important city in these states were present, making it one of the most successful meetings in the history of the organization.

Sessions were held both day and evening on all three days. On the twenty-second the meeting was adjourned at noon, to afford the members an opportunity of visiting Tia Juana, on the border line, and witnessing a battle between the Mexican Federal troops and the rebels which was taking place.

The following officers were elected for the ensuing year: President, W. J. Hardy, San Francisco; vice-president, T. W. Pate, Los Angeles; secretary, F. P. Hanlon, Seattle; treasurer, W. Merriman, Portland. It was voted to hold the next annual convention at San Francisco.

LEGAL ASPECTS OF SYSTEMATIC COMPENSATION FOR INDUSTRIAL ACCIDENTS.*

BY CARMAN F. RANDOLPH.

Dismissing state accident insurance as not, at present, in question, and considering compensation at the employer's charge, I am of the opinion that he cannot be affected with an absolute liability and a fixed indemnity for all industrial accidents. If the courts shall decide otherwise (and I remark in passing that a denial of legislative power in a few states would tend to check its application to competitive industries in neighbor states), they must, I think, enunciate a new principle broad enough to draw contributions from workmen, if this shall be expedient. If the employer may be required to help the workman, the workman may be required to help himself, and so far as the cost is shifted to the public, the workman is as likely to be recouped by higher wages as is the employer by higher prices.

A compulsory rule need not be applied immediately, or ever, to all employments; but it must be, potentially, applicable to all. No employment can plead constitutional exemption because of its relative freedom from danger—the "dangerous trades" are not alone subject to the obligation. No employer can plead exemption because of his pettiness—the obligation is imposable upon rich and poor alike.

The compensation rate must be moderate and not confiscatory, and since all employers may ultimately be gathered in, and since the rate basis must be uniform, the incidence of an initial burden should be estimated in view of its potential imposition upon all sorts and conditions of employers, and not simply by the standing of those at first affected.

In planning the administration of a compensation law we must reject, as unconstitutional, the compulsory association of employers. Instead of the collective responsibility of the German system, we must impose the individual responsibility of the British system, though we should improve upon this by allowing responsibility to be shifted by insuring in an approved company or voluntary association, as is the rule in France.

There is reason to fear that in many, if not most, of our states, the summary procedure so essential to the useful operation of a compensation law will be embarrassed by an indefeasible right to trial by a jury, with its delay, expense and uncertainty.

The simple motive of a compulsory compensation scheme cannot be simply effectuated. Complexity is its dominant note, and it should be observed in passing that the New York and, more markedly, the Montana and the Maryland legislatures have, in straining for simplicity of procedure, but drawn attention to the insistent complexities they would fain ignore.

Even if the legislature may lawfully decree the naked principle of compulsory compensation, the practice is likely to be sufficiently embarrassed by constitutional restraints and directions to preclude the adoption of a thoroughly satisfactory scheme.

VOLUNTARY COMPENSATION.

In the compulsory principle of the European compensation schemes be, as I maintain, repugnant to our institutions we may, nevertheless, accomplish, by voluntary methods, a substantial measure of systematic compensation. Voluntary accident relief has already made fair progress. Besides a widespread proffer of medical and hospital service to injured workmen we mark a number of schemes founded by employers to provide accident indemnity alone or in conjunction with sickness or old age relief. Some involve workmen's contributions. In others the employer bears the whole cost, and among these the most notable of the purely accident schemes are those recently formulated by the Steel Corporation and the International Harvester Company. To the objection that few employers are likely to make a free-will offering to their employees I reply that the voluntary method I have in mind would not be inspired by philanthropy, though by no means lacking the humane spirit. While the legislature cannot, in my opinion, strip the master of all defences to a suit for damages it may so narrow them as to encourage the bringing of suits with their inevitable delays, uncertainties, irritations and waste. The mere holding of this power in leash suggests a special motive for employers to volunteer compensation schemes in the hope of thereby discouraging its exercise.

Voluntary compensation may, I believe, be substantially promoted if the legislature shall discard the idea of threatening employers with more litigation if they reject it and hold out, instead, the promise of less litigation if they embrace it. And we derive the principle of persuasive legislation from a rule embodied in the best of the foreign laws—the master who is bound to systematic compensation is relieved from all liability in suit except when the accident is due to his culpable act or neglect. This is the complement of the general rule that a workman shall not have compensation for an accident due to his wilful act. The absolute fairness of this position is evident to all who are not bemused by the notion that continued subjection to damage suits somehow tends to make the master more careful and somehow maintains the dignity of the workman; but such persons have really no business to advocate systematic compensation at all, for if this is not better than the lottery of litigation it should be rejected. If it is better it should discourage litigation except when public policy commends this for the punishing of culpable masters.

Let the legislature declare that an employer who has, by a proper plan, obligated himself to pay compensation for all accidents shall be liable in damages only when an accident is the result of his culpable act or neglect, and that the mere institution of a suit shall bar all claim to compensation. This declaration should so discourage suits in all except flagrant cases as to offer a strong inducement for the voluntary plan.

Conceding that this plan would in its best showing leave out a fraction of workmen whom compulsion would have covered (if I rightly estimated the inducement the fraction would not be large), the community might well be gratified with a great achievement, and the fraction would be no worse off than the tens of thousands of employees who are not, as a rule, included in current compulsory proposals. Even if a legislature shall be free to compel systematic compensation, it should prefer the voluntary method which, with compulsory power in reserve, might be more widely commended to employers.

It will be objected that compulsion would gather in more employers than would persuasion, even with the threat of force

*Extracts from a monograph prepared for a railway company.

behind it; but there is every reason to believe that a successful initiation of the voluntary method would promote its extension especially among the so-called "dangerous trades," which are the conspicuous objects of systematic compensation.

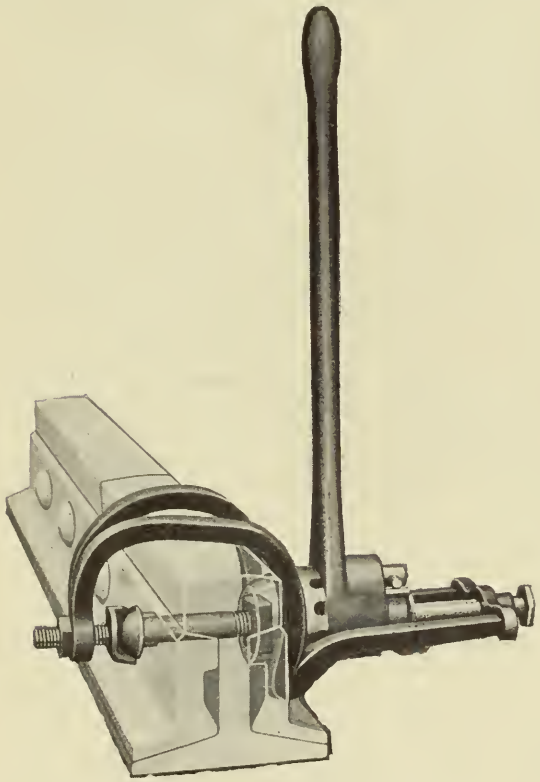
It will be objected that employers would accord a lower compensation than the state would impose; but the voluntary rates must conform to a standard approved by the public authorities. This standard would require reasonable compensation as an invariable but not necessarily the only factor in a scheme.

While uniformity would not be perfectly assured by the voluntary method it would be greatly facilitated. The very simplicity of the basic law I have suggested—the release of the employer from all liability in damages except in the case of his culpable negligence—should commend its enactment in the several states, and, while there would be more room for differences in respect of the standards for a voluntary system, these should be so simple in comparison with the provisions of a compulsory law as to render a wide uniformity attainable.

A compulsory scheme requires an intimate participation by courts, commissions or other public bodies, which means more red tape, delay and expense than under the voluntary method. This needs from the government only recognition and supervision. For the rest it assures the handling of a complicated business matter by a business organization—an assurance quite as valuable from a social, as it is from a business standpoint, for every voluntary arrangement by employer and employee equitable in its nature and executed in good faith improves their relations.

RATCHET TRACK WRENCH.

The National ratchet track wrench, illustrated herewith, is made by the National Surface Guard Company, Chicago, with the idea of overcoming some of the objections found in the older type of wrenches. It is claimed that with this wrench

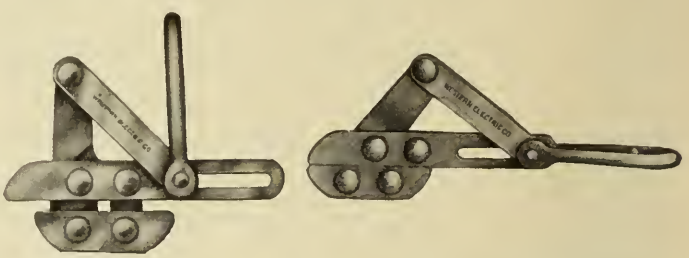


National Ratchet Track Wrench.

three or four times as many nuts may be put on, or removed, in a given time as is possible with the ordinary track wrench. This wrench is made of high-grade steel and weighs from 10 to 13 lbs. according to the rail section and the joint on which it is to operate. The extension frame holds the shoulder of the bolt firmly in position while putting on or removing the nuts. It does not clamp on the rail and can be removed instantly in case of an emergency. The reverse motion ratchet, being an integral part of the socket, gives direct power. The sockets are interchangeable and can be furnished for different nut sizes in both square and hexagon shapes. It is easily adjusted to fit different rail sections, having the regular angle bar type of rail joint. It can be made, however, for any special rail joint desired.

WIRE GRIP WITH NEW LOCKING DEVICE.

The accompanying illustrations show the improved Buffalo grip as made by the Western Electric Company, Chicago. It has a special locking feature which is operated by a turn of the handle. It will lock the jaw in any position, thus enabling the



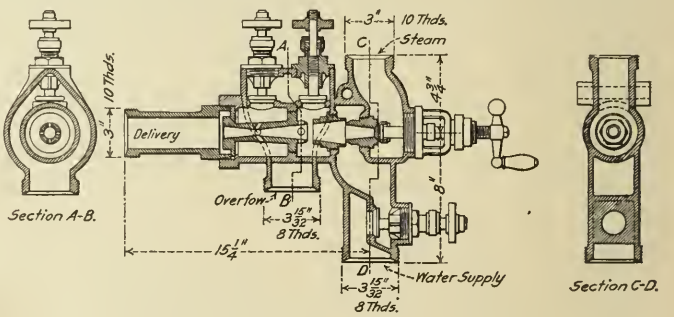
Improved Buffalo Wire Grip in Open and Closed Position.

lineman to insert the wire in the grip easily and quickly. When the handle is pushed down it clamps the wire, and the harder the handle is pulled the tighter the wire is held. This grip is made in various sizes for both bare and insulated wire, and can be supplied with or without pulleys.

LOCOMOTIVE INJECTOR.

An automatic restarting locomotive injector, known as the Twentieth Century injector, is shown in the accompanying illustration. It is the product of the American Railway Supply Company, Conneaut, Ohio. The injector is of simple construction, the parts being so arranged that a ready passage is provided for the overflow at a point close to the water inlet. Independent valves control the cold and hot water overflows. A novel form of forcing tube is provided to permit the passage of hot water to the overflow at the beginning of the operation and to prevent it when the jet has reached boiler pressure.

The injector will work at a boiler pressure of from 20 to 250 lbs., with the same accuracy and without waste of water. It



Twentieth Century Locomotive Injector.

will work as well and with the same velocity from a tank nearly drained as one that is full. A peculiar feature is that it will work promptly in case either the steam or water be turned on first, and will draw water up to 130 deg. F. This injector is interchangeable with others, the standard connection being provided. It is guaranteed for two years, the tubes being made of hardened copper. The injector was invented by L. E. Hogue, of Greenville, Pa., and was later improved by Frank Brosche, of Erie, Pa.

General News Section.

Three masked men stopped an Illinois Central passenger train just outside of Memphis, Tenn., on June 21, and made their escape after forcing the mail clerks to surrender a registered mail pouch.

The Oregon-Washington Railroad & Navigation Company is to use telephones for train despatching between Portland and The Dalles, 90 miles; and has ordered the instruments from the Western Electric Company.

The state prosecuting attorney at Columbus, Ohio, has entered suits in the supreme court of the state, for the purpose of punishing the Pennsylvania and the Baltimore & Ohio railways on a charge of compelling their employees to join voluntary relief associations.

A law of Massachusetts, requiring railways to provide individual drinking cups on trains traveling 30 miles or more, went into effect June 15. Notices are posted in the cars informing the passengers that cups may be had on application to the conductor or baggage master.

The Southern Pacific is now taking eastern freight into San Francisco over the Dumbarton cut-off, and the ferryboats between Oakland and San Francisco will no longer carry overland or interior freight. The Dumbarton cut-off is about 25 miles south of Oakland, and this 50-mile detour is made for the purpose of avoiding the four-mile ferry.

In a recent interview, T. J. Freeman, receiver of the International & Great Northern, indicated that a meeting of the new board of directors, will be called by him before the property is turned over to the new owners, the Third Mortgage Bondholders' Committee, he will be elected president, this being part of the plan outlined at the time of his recent election to the vice-presidency of the Texas & Pacific.

It is reported that Charles L. Ewing, one of the defendants in the recent case of the Illinois Central against certain car repair concerns, has made a settlement with the company of the civil suit to which he was a party, and that negotiations are pending toward similar settlements with the company by F. B. Harriman, former superintendent of the Illinois Central, and J. M. Taylor, former general storekeeper.

Both houses of the Connecticut legislature, after long discussion, have passed a bill to establish a public utilities' commission, to supersede the railway commission. It is said that the bill, which has been passed, has the approval of the governor, and that therefore it will undoubtedly be signed by him. The number of commissioners provided for is three, and they are to be appointed by the legislature on the nomination of the governor.

The commission appointed by President Taft to investigate the cost of transporting and handling second class mail, consisting of supreme court Justice Hughes and Messrs. Lowell and Wheeler, will hold a hearing at New York City, July 18, in the Post Office building. All persons and organizations desiring to appear before the commission are requested to notify the secretary of the commission, C. W. Bell, Colorado building, Washington, by July 10.

At Spokane on the evening of June 7, the Spokane Transportation Club gave a dinner in honor of the railway commission of the state of Washington; about 120 guests being present. Addresses were made by commissioners Fairchild and Lawrence. The Spokane Transportation Club is composed largely of railway officers, but shippers are also strongly represented, and the club is coming to be an important factor in improving the relations between shippers and railways.

The new White Star steamship *Olympic*, 882 ft. long, and the largest vessel in the world, left New York for Plymouth on Wednesday of this week on her first eastbound trip with 725 first class passengers, said to be the largest number of that class ever taken across the ocean on one vessel in regular service. There were more applicants for first class accommodations than the ship could take; and there were about 500 second cabin and 1,000 third cabin passengers. It is estimated that the receipts for tickets for this voyage aggregated $250,000. Sixteen thousand persons visited the Olympic at her dock in New York on Friday and Saturday of last week and (at 50 cents each) paid $8,000 into the seamen's charity fund.

The governor of Pennsylvania has signed the bill which was passed by the legislature of that state establishing a "full crew law," and the law goes into effect within thirty days from the date of signing, which will be about July 22. This law is similar to the full crew laws which have been passed in several states, except that it has an additional provision for the comfort of the hind-end man on trains which have neither passenger car nor caboose. Section 7 of the law says that it shall be unlawful to run any train "consisting of United States mail or express cars without the rear end of the rear car so equipped with exit free from obstruction platform of thirty inches in width, guard rails and steps; also heating appliances to maintain a temperature of sixty-five degrees."

The Illinois Traction System, one of the most ambitious electric railways in the country, announces that, beginning July 1, express trains are to be run between St. Louis and Peoria, 174 miles, with only two stops—at Springfield and Lincoln. Springfield is nearly 100 miles from St. Louis, and Lincoln about 130 miles. It is proposed to run through in 5 hours and 30 minutes, or at the rate of about 32 miles an hour. New parlor cars, so called, have been ordered for these trains, but whether or not the fare will be higher than in ordinary cars is not stated. The company has ordered from the St. Louis Car Company 14 new interurban cars. The company is putting up a new station at Lucas and High streets, St. Louis, 120 ft. x 40 ft., and two stories high. This company has installed automatic block signals on parts of its line and has ordered signals for additional sections, as recently noticed in the *Railway Age Gazette*.

Trains de luxe, special and not special, are now literally too numerous to mention. The Ancient Arabic Order of Nobles of the Mystic Shrine, of Oklahoma City, will leave that place next week, Friday, for Rochester, N. Y., in "the finest train ever sent out from Oklahoma City"; steel sleeping cars, dining car, etc., all electric lighted, and with a conductor and brakeman who are members of the Shrine. Including their wives and a band of music, the company will number 100. The train of steel cars, which is to be furnished by the St. Louis & San Francisco and the New York Central for Texas members of the National Ad Men's Convention, to be held in Boston the last of July, will be the "most modern ever operated in the Southwest." To turn for a moment from outer to inner delights, the latest novelty in the transportation of merchandise is the "Raspberry Special" of the American Express Company, running from New Albany, Ind., to Chicago..

The special commission established last year by Congress to consider the subject of employers' liability and compensation legislation, has held hearings at Washington to discuss the constitional questions involved in legislation of that kind, and has considered a number of arguments presented by lawyers representing the railways. The newspaper accounts of the hearings are not very clear, but from one of the railway counsel who attended we learn that nothing was done except to consider this one phase of the question; namely, the limitations imposed by the constitution. The commission has announced that until it has gathered the statistical information for which it is now asking the railways, it will not be in a position to consider any particular form of legislation. Representative Sabath, of Illinois, has introduced a bill on the subject, to be applicable to employees on lines of interstate carriers and on lines over which United States mails are carried; but this bill is in many respects crude and it does not appear that the commission has as yet discussed it. Legal officers of prominent railways have had this matter under consideration for several months, and an unofficial committee of 21 has been investigating the constitutional questions connected with it. A sub-committee of four was appointed to appear before the Federal commission. The committee appears to be

unanimous in doubting the power of Congress to pass a compulsory compensation act. It is recognized, however, that there is need of reform in the present method of disposing of personal injuries sustained by railway employees, and the committee desires to co-operate with the federal commission in promoting such federal legislation as shall be just to both employer and employee.

Safety Appliances.

In the *Daily Railway Age Gazette* of June 21, p. 1605, some remarks by M. K. Barnum, general superintendent of motive power, Illinois Central, were credited to S. M. Hindman, general car inspector, Eastern Pennsylvania division, Pennsylvania Railroad. They were made during the discussion of the M. C. B. report on safety appliances, and should have been given as follows:

Mr. Barnum: At the meeting of the [safety appliance] committee yesterday [June 20], I believe the question of making a drawing [showing the stencil that should be used for cars equipped with the safety appliances] as suggested by Mr. Young was brought up.

Mr. Curtiss: The time was not sufficient. Mr. La Mar tried to make a drawing but he had no tools.

Mr. Barnum: It seems to me very important that this association should officially take up the work done by the conference committee and support any agreement or understanding that this committee had with the Interstate Commerce Commission inspectors, and I think it would be very inconsistent for this association to adopt anything that did not follow these lines; but of course it will be left to the roads to adopt them as they saw fit. It seems to me we ought to carry out the letter and the spirit of the agreement [made by this committee with the Interstate Commerce Commission inspectors] in that conference as far as possible, and then if it is thought best to reduce the lettering, have another conference [with the above inspectors] with that object in view.

Wreck on the Philadelphia & Reading.

One passenger was killed and about 20 others injured in a wreck which occurred at the entrance of the Philadelphia & Reading tunnel at Twenty-first and Hamilton street, Philadelphia, Pa., on Wednesday night. A Chestnut Hill express, running into the Reading terminal in Philadelphia, fouled the tender of a freight locomotive standing on a switch track at the entrance to the tunnel. Newspaper accounts say that the engineman of the express train overran a danger signal. The passenger locomotive struck the tender of the freight engine and was thrown against the north wall of the approach to the tunnel. The first car of the train apparently got past the obstruction, but the second coach was caught by the locomotive and badly wrecked.

Freight Claim Association.

At the twentieth annual meeting of the Freight Claim Association, held at St. Paul, Minn., on June 21, the following officers were elected for the ensuing year: President, W. L. Stanley (S. A. L.); first vice-president, F. E. Shallenberger (Union Line); second vice-president, George W. Perry; secretary and treasurer, Warren P. Taylor (R. F. & P.), Richmond, Va. The next meeting will be held at Buffalo, N. Y.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago.

American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh, Pa.; 1st and 3d Tuesday. Pittsburgh.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Missouri Pacific and the St. Louis, Iron Mountain & Southern have withdrawn from the joint traffic department of the Gould lines which has been maintained at Chicago.

A committee of business men of Knoxville, Tenn., is raising money to establish a traffic bureau, in connection with the board of trade; and the promoters of the enterprise say that success is already assured.

On application of the Denver & Rio Grande, the Colorado railway commission has authorized and ordered reductions ranging from 20 cents to $1.10 per ton in the rates on coal from Crested Butte and Baldwin, and from the Canon City, Walsenburg and Trinidad districts to points in the San Luis valley.

Railways belonging to the Central Passenger Association are preparing to compile data relating to the results of the operation of the 2-cent fare laws in Illinois, Indiana and Ohio, with a view to testing the validity of those laws. Rate clerks representing each of the roads met in Chicago on June 26 to discuss plans for gathering the desired information.

Country rice millers of Louisiana are protesting before the railway commission of that state against the reductions asked for by the big rice milling interests of New Orleans in the rates on rough and clean rice into New Orleans, on the ground that such reductions would bring all of the rough rice into New Orleans and ruin the business of the outside millers.

Beginning on July 2, the "Denver Limited" of the Chicago, Burlington & Quincy, which leaves Chicago at 5 p. m., will have its running time to Denver reduced by 25 minutes. It will reach Denver at 7:30 p. m. of the second day, instead of at 7:55 p. m., as at present. Eastbound from Denver, train No. 6 will leave at 4:15 p. m. instead of at 3:45 p, m., and reach Chicago at 8:45 p. m. of the second day, as at present, making a 30-minute reduction in its schedule.

To compete with the Pacific Navigation Company, which carries passengers between Los Angeles and San Francisco, and which made a special reduction on the occasion of the recent International Sunday School Convention at San Francisco, the Southern Pacific made a round trip rate between the cities named of $10, good for a single day, June 19, but with the privilege of returning any time within fifteen days. It is said that nine train loads of passengers took advantage of this reduction.

The Chicago Great Western does its agricultural missionary work in part by means of little essays printed in its passenger time-tables, thus securing a forced circulation, so to speak. The time-table folder for June, consisting of 54 pages, has two pages devoted to a chapter on the desirability of "spraying around the home," with instructions how to kill bugs and other bad things on trees, plants and vegetables. This little essay is by Prof. G. R. Bliss, of the Iowa State College; and seven other articles are to appear in successive issues of the time-table.

A special committee representing the various passenger and freight associations in Chicago has been appointed to work out a plan by which the headquarters of all these associations can be located in one building instead of in different buildings, as at present, the object being to facilitate the necessary interchange of business between the associations and to lessen the total expense for rent, etc. The following associations are interested in the plan: Central Freight Association, Central Passenger Association, Chicago and Ohio River Committee, Chicago Freight Committee, Illinois Freight Committee, Mississippi Valley Freight Association, Transcontinental Freight Bureau, Transcontinental Passenger Association, Western Classification Committee, Western Passenger Association, Western Railway Inspection Bureau, Western Railway Weighing Association and the Western Trunk Line Committee.

Traffic Clerks' Association of Pittsburgh.

The chief clerks, rate clerks, tariff clerks, traveling freight agents and solicitors of the railways and industrial concerns of Pittsburgh have formed the Traffic Clerks' Association of Pittsburgh, with the object of getting better acquainted with each other. The following officers have been chosen: President, F. M. Garland, Pressed Steel Car Company; secretary, W. P. Keane, Wabash Railroad; treasurer, G. J. Wadlinger, Pittsburgh & Lake Erie.

A Comparison of Foreign and American Railway Figures.

The accompanying table, compiled by the Bureau of Railway Economics, is a comparison from various points of view of the operation and management of the railways in the three most important European countries with that of American railways as a whole, and in Group II. The inclusion of figures for 1900, 1905 and 1909, give a survey of railway development for nearly a decade. In a general way, the more rapid industrial development of the United States is revealed in a greater increase during the decade in traffic and revenues.

A Comparison of American with English, French, and German Railway Statistics: 1900, 1905, 1908 and 1909.*

Subject for Comparison.	1900.	1905.	1908a.	1909a.
Miles of line operated at end of fiscal year—				
United Kingdom	21,855	22,847	23,205	23,280
France	23,639	24,597	24,931	.....
Prussia-Hesse	19,102	21,629	22,657	23,154
United States, Group II	21,717	23,281	23,697	23,887
United States, All groups	192,556	216,974	230,494	235,402
Percent. of line having two or more tracks—				
United Kingdom	55.6	55.6	55.7	55.8
France	42.3	42.5	43.0	....
Prussia-Hesse	40.5	38.6	41.8	42.3
United States, Group II	27.0	29.4	30.9	31.2
United States, All groups	6.3	7.9	8.8	8.9
Capitalization per mile—				
United Kingdom	$261,863	$271,069	$274,842	$274,766
France b	133,583	138,053	141,301	.....
Prussia-Hesse	98,030	100,062	108,293	110,727
United States, Group II	.....	.....	.....	.....
United States, All groups c	.....	.....	57,201	59,259
Operating revenues per mile d—				
United Kingdom	$22,011	$22,391	$23,184	$23,135
France	12,363	12,364	13,406	.....
Prussia-Hesse	17,440	19,171	20,221	21,056
United States, Group II	16,514	20,752	22,915	22,021
United States, All groups	7,722	9,598	10,491	10,356
Operating expenses per mile d—				
United Kingdom	$13,743	$14,157	$15,159	$14,833
France	6,717	6,455	7,765	.....
Prussia-Hesse	10,373	11,622	14,621	14,527
United States, Group II	10,635	13,671	15,972	14,674
United States, All groups	4,993	6,409	7,320	6,851
Net operating revenue per mile d—				
United Kingdom	$8,268	$8,234	$8,025	$8,302
France	5,646	5,909	5,641	.....
Prussia-Hesse	7,067	7,549	5,600	6,529
United States, Group II	5,879	7,081	6,943	7,347
United States, All groups	2,729	3,189	3,171	3,505
Ratio of passenger to total revenues—				
United Kingdom ....(percent.)	38.5	38.3	38.5	37.9
France e "	34.3	33.0	32.9	....
Prussia-Hesse "	27.6	27.5	28.2	28.6
United States, Group II "	22.0	21.7	22.4	22.2
United States, All groups "	21.8	22.7	23.7	23.3
Locomotives per 1,000 miles of line—				
United Kingdom	970	980	980	980
France	443	452	480	....
Prussia-Hesse	674	711	816f	838f
United States, Group II	449	507	563	561
United States, all groups	195	223	246	243
Cars (all kinds) per 1,000 miles of line—				
United Kingdom	35,740	35,750	36,190	36,060
France	13,347	13,595	14,704	.....
Prussia-Hesse	16,458	16,687	19,332	19,607
United States, Group II	19,077	20,098	23,028	22,388
United States, All groups	7,535	8,494	9,680	9,423
Average capacity of freight car (tons)—				
United Kingdom	....	....	....	....
France	11.2	12.2	13.0	....
Prussia-Hesse	14.1	14.7	15.3	15.5
United States, Group II	....	....	....	....
United States, All groups	....	31.0	35.0	35.0
Average seating capacity of passenger car—				
United Kingdom	....	....	....	....
France	....	....	....	....
Prussia-Hesse	46	48	49	49
United States, Group II g	57	59	62	63
United States, All groups	....	....	....	....
Average train miles per mile of line—				
United Kingdom	18,397	17,548	18,237	18,009
France	9,112	8,612	9,317	.....
Prussia-Hesse	10,166	11,724	12,489	12,164
United States, Group II	.....	.....	10,217	9,715
United States, All groups	4,605	4,786	4,899	4,726
Passenger miles per inhabitant—				
United Kingdom	.....	.....	.....	.....
France	224.6	224.3	253.7	.....
Prussia-Hesse	244.8	299.5	339.5	366.7
United States, Group II	272.7	328.5	368.1	347.5
United States, All groups	211.0	283.4	327.6	322.1
Average trips per inhabitant—				
United Kingdom h	27.8	27.7	28.7	28.1
France	11.7	11.3	12.2	....
Prussia-Hesse	16.3	20.4	23.7	25.4
United States, Group II	13.2	15.2	16.2	15.5
United States, All groups	7.6	8.8	10.0	9.9

Subject for Comparison.	1900.	1905.	1908a.	1909a.
Average passengers per train—				
United Kingdom	....	....	....	....
France	64	62	65	....
Prussia-Hesse	80 i	78 i	79	85
United States, Group II i	47	55	62	60
United States, All groups i	41	48	54	54
Passenger miles per mile of line—				
United Kingdom	.....	.....	.....	.....
France	369,021	357,574	398,984	.....
Prussia-Hesse	.....	.....	627,032	675,023
United States, Group II	202,902	255,718	304,163	290,023
United States, All groups	83,290	109,949	130,073	127,299
Average journey per pass. miles—				
United Kingdom	....	....	....	....
France	19.3	19.8	20.8	....
Prussia-Hesse	15.0	14.6	14.3	14.4
United States, Group II	20.7	21.6	23.0	22.8
United States, All groups	27.8	32.2	32.9	32.8
Ton miles per inhabitant—				
United Kingdom	....	....	....	....
France	292	309	359	....
Prussia-Hesse	486	555	579	606
United States, Group II	2,554	2,826	3,125	2,950
United States, All groups	1,863	2,220	2,460	2,421
Ton miles per mile of line—				
United Kingdom n	.....	739,466	808,857	814,713
France	478,891	491,955	565,158	.....
Prussia-Hesse	889,441	988,157	1,028,503	1,069,743
United States, Group II	1,900,578	2,200,372	2,565,154	2,451,841
United States, All groups	735,352	861,396	974,654	953,986
Average tons per train—				
United Kingdom n	....	107	116	123
France	144	173	177	233
Prussia-Hesse	163 i	159 i	210	....
United States, Group II i	355	412	464	479
United States, All groups i	271	322	352	363
Average haul per ton (miles)—				
United Kingdom n	....	22.7	23.2	23.1
France	81.1	79.0	81.0	....
Prussia-Hesse	73.1	69.6	69.5	69.0
United States, Group II	110.9	114.6	130.6	130.3
United States (average railway)	130.9	130.6	143.8	141.9
United States (as a system)	242.7	237.6	253.9	251.1
Total revenue per revenue train mile—				
United Kingdom	$1.20	$1.28	$1.27	$1.28
France	1.35	1.43	1.43	....
Prussia-Hesse	1.60	1.52	1.50	1.61
United States, Group II	....	....	2.24	2.26
United States, All groups	1.66	1.98	2.11	2.17
Receipts per passenger per mile (cents)—				
United Kingdom	....	....	....	....
France	1.16	1.15	1.11	....
Prussia-Hesse	1.01	.95	.90	.94
United States, Group II	1.79	1.72	1.69	1.70
United States, All groups	2.00	1.96	1.94	1.93
Receipts per ton per mile (cents)—				
United Kingdom n	....	2.36	2.31	2.30
France	1.32	1.27	1.21	....
Prussia-Hesse k	1.24	1.25	1.24	1.24
United States, Group II	.61	.66	.64	.65
United States, All groups	.73	.77	.75	.76

* The 1908 figures in this table differ in some instances from those presented in preceding bulletins. This is due chiefly to adjustments made necessary by the four-year comparison, and partly also to corrections made since the figures were first issued. *a* American figures for 1908 and 1909 do not include returns for switching and terminal companies. *b* "Cost of construction." *c* Net capitalization. *d* The operating revenue, expense, and net revenue items are not strictly comparable as between the different countries, owing to variations in accounting methods. *e* "Grande vitesse" train revenues, which correspond roughly to passenger service train revenue in the United States. *f* Includes an appreciable number of motor wagons (Triebwagen). *g* Pennsylvania Railroad only. *h* Excludes trips on season and periodical tickets. *i* Mixed train miles included in divisor. *k* Excluding receipts from miscellaneous sources (Nebenerträge), for which ton-mileage figures are not given. *n* North Eastern Railway only.

Total Revenues and Expenses.

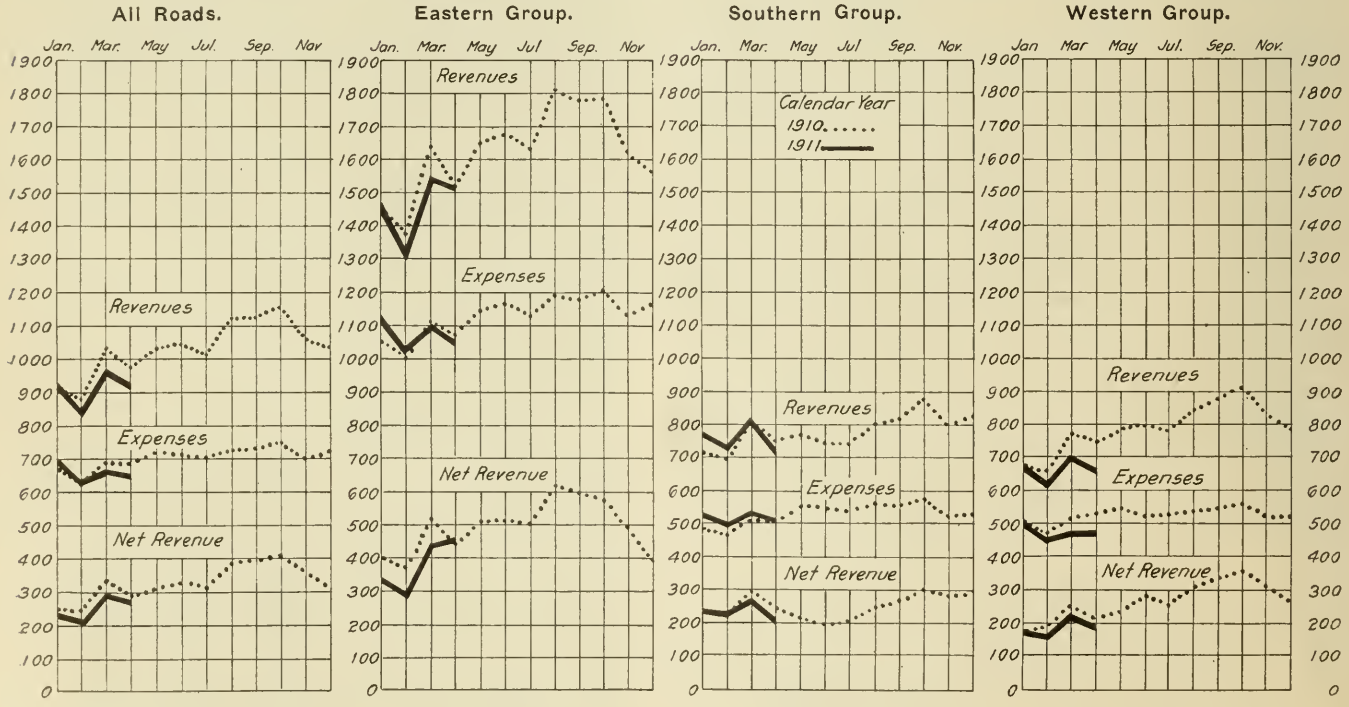
Logan G. McPherson, director of the Bureau of Railway Economics, in presenting the summary of Revenues and Expenses of steam roads in the United States for the month of April, 1911, says:

"For the month of April, 1911, total operating revenues decreased from the same month of 1910 nearly $7,324,000, which was equivalent to $48 per mile or 4.9 per cent. This decrease was practically all in freight revenue.

"Operating expenses also declined as compared with a year ago, the decrease amounting to 4.9 per cent. This is the result of reductions amounting to 15.3 per cent. in maintenance of way, 7.1 per cent. in maintenance of equipment, and 0.4 per cent. in transportation expenses, general expenses increasing 3 per cent. It is significant that this is the first time since this method of reporting monthly revenues and expenses was inaugurated in November, 1910, that there has been any decrease in the transportation account for the United States as a whole. The operating ratio was 70.4 per cent., exactly the same as for April, 1910, as compared with 69.4 per cent. in March, 1911, and 74.7 per cent. in February, 1911. Net operating revenue showed a decrease of $14 per mile or 4.7 per cent. Net revenue per mile per day was $9.16 as compared with $9.55 in March. There was an increase in taxes of 1.4 per cent., and operating income, which is net revenue with outside operations included and taxes deducted, showed a decline of $14 per mile, or 5.6 per cent.

"Every group shows a decline in total operating revenues, the South for the first time since this method of tabulation was begun in November, 1910. The heaviest decline was in the western group, amounting to 10.2 per cent. In the East there was a decline of only 0.1 per cent., and in both East and South passenger revenue increased.

"In operating expenses the East shows a decline of 1.7 per cent., heavy reductions in maintenance expenses being largely offset by increases in the other accounts. In the South the increase in transportation expense of 7.3 per cent. overcame reductions in other accounts and resulted in an increase in total



Total Revenues and Expenses in 1910 and 1911.

operating expense of 1.8 per cent. In the West, there was a decrease in operating expenses of near 10 per cent., the reduction amounting to nearly 23 per cent. in maintenance of way.

"The operating ratio shows a considerable increase in the southern group, rising from 67.3 per cent. in April, 1910, to 70.2 per cent. in April, 1911. The changes in the other groups are slight, the East showing a decrease and the West an increase. For the first time since these tabulations were inaugurated, the East shows a gain in net revenue, amounting to 3.7 per cent. The other two groups show declines of 11 per cent. The same relative results are found in the case of operating income, the increase in the East being 3.8 per cent., and the decreases in the South and West being respectively 14.5 and 12.3 per cent.

"For the ten months of the fiscal year 1911, there is a slight increase of operating revenues for all roads of three-tenths of 1 per cent. over the corresponding period of 1910. However, expenses increased 4.4 per cent., with the result that net revenue shows a decrease of 7.6 per cent. This decrease runs as high as 11.8 per cent. in the eatsern group, and was 4.6 per cent. in the West, and 1.0 per cent. in the South. In operating income corresponding results are found.

"The calendar year to date makes an unfavorable showing as compared with last year, because with a decrease in operating revenues there is not a correspondingly large decrease in operating expenses. Operating revenues for these four months for all roads declined 3.6 per cent., all the decrease being in freight revenue. Expenses decreased 1.1 per cent., with the result that net revenue shows a decrease of 9.6 per cent. and operating income of 11.5 per cent. As has been the case during the ten months of the fiscal year, the heaviest decline in operating income is found in the eastern group, but a decrease appears in every group."

The accompanying chart shows the variation in revenues and expenses in the separate months.

Ratio of Expenses to Total Operating Revenue.

	April, 1911.	April, 1910.	Fiscal year ended June 30, 1910.
Percentage of total operating revenue—			
Maintenance of way and structures..	13.3	14.9	13.4
Maintenance of equipment.....	15.5	15.8	15.0
Traffic	2.2	2.1	2.0
Transportation	36.7	35.1	33.4
General expenses	2.7	2.5	2.5
Total operating expenses	70.4	70.4	66.3

INTERSTATE COMMERCE COMMISSION.

The Interstate Commerce Commission has suspended until December 24, increased freight tariffs filed by the railways between the Mississippi and the Missouri rivers. The proposed new rates apply to all of the first four classes of freight and the increase is estimated to average about 8 per cent. over those of the existing tariffs.

"The Interstate Commerce Commission announces that unanimous agreement has been reached in the selection of a secretary for the commission. The one agreed on has business matters of his own which he is obliged to conclude, and which will prevent him from assuming duties for a few weeks. For reasons involving his personal and business affairs the name of the one selected will not be announced until he is ready to assume the duties of the office." *The Journal of Commerce* Washington correspondent says that indications are that the man referred to is John Marble, who has in the past acted as attorney for the commission, and who is now employed by the Lorimer investigating committee.

Reparation Awarded.

Northern Wisconsin Produce Co. v. Minneapolis, St. Paul & Sault Ste. Marie. Opinion by the commission.

Demurrage was improperly assessed on a car which the complainant was ready to take delivery on. (21 I. C. C., 197.)

Ontario Iron Ore Co. v. New York Central & Hudson River et al. Opinion by Commissioner Prouty.

The present rate of $1.90 per gross ton for carload lots of iron ore from Lakeside, N. Y., to Earlston, Pa., is unreasonable. The reasonable rate is fixed at $1.60 per ton. (21 I. C. C., 204.)

Willamette Pulp & Paper Co. v. Boston & Albany et al. Opinion by the commission.

The rate of $2.60 per hundred pounds on rubber covered iron paper mill rolls in L.C.L. shipments from Boston, Mass., to Portland, Ore., is unreasonable, and $1.75 is found to be a reasonable rate. (21 I. C. C., 178.)

Murphy Brothers v. New York Central & Hudson River. Koolyrite Trucking Co. v. Pennsylvania Railroad et al. Opinion by the commission.

The assessment at New York of track storage charges for the same time during which demurrage charges were waived on account of weather interference is unreasonable. (21 I. C. C., 176.)

Minneapolis Threshing Machine Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Chairman Clements.

The complainant ordered one 50-ft. flat car and the defendant being unable to furnish this size of car forwarded the shipment on two shorter flat cars. In this case the charges should have been assessed on a basis of the rate and minimum applicable to the car ordered. (21 I. C. C., 181.)

American Hay Co. v. Lehigh Valley. Opinion by Chairman Clements.

Defendant charges $2.00 per car for switching and reconsigning at the hay shed of the complainant. The only discrimination shown by the evidence has already been corrected, and the complainant and defendant are ordered to file a statement covering the period when there was discrimination, and on this statement the order for reparation will be based. (21 I. C. C., 166.)

Rates on Malt Reduced.

Texas Brewing Co. v. Atchison, Topeka & Santa Fe et al. Opinion by the commission.

The defendant's rate of 48 cents per hundred pounds on malt in carloads from Chicago and Milwaukee, and 53 cents from Minneapolis, Minn., to Fort Worth, Tex., found unreasonable, and rates of 34½ cents from Chicago, 35½ cents from Milwaukee, and 38 cents from Minneapolis are prescribed. (21 I. C. C., 171.)

Switch Connection Ordered.

Ridgewood Coal Co. v. Lehigh Valley. Opinion by Chairman Clements.

A switch connection with the complainant's coal mine near Wilkesbarre, Pa., asked for by the complainant, can be put in safely, and the commission orders it under Section 1 of the Act to Regulate Commerce. (21 I. C. C., 183.)

Discrimination in Favor of Nashville.

W. S. Duncan & Co. et al. v. Nashville, Chattanooga & St. Louis et al. Opinion by Chairman Clements.

The granting at Nashville, Tenn., of a reconsigning privilege which does not exist anywhere south of the Ohio river and east of the Mississippi river, constitutes a discrimination against other places in favor of Nashville. (21 I. C. C., 186.)

After a Year's Investigation Advanced Rates on Live Stock Permitted.

In re Advance of Rates on Live Stock from Kansas City, Mo., to St. Louis, Mo., and other Mississippi river Crossings. Opinion by Chairman Clements.

The principal carriers operating between the Missouri and Mississippi rivers filed with the commission tariffs which were to become effective August 15, 1910, and on dates subsequent thereto, containing new rates and charges on live stock from Kansas City and points in what is known as Kansas territory to St. Louis and East St. Louis and other Mississippi river crossings. These tariffs are now suspended until June 10, 1911, pending investigation under the provisions of section 15 of the statute as amended June 18, 1910. In so far as the proceeding involves the allegations of unjust discrimination as between the live-stock markets at Kansas City, Omaha, and Chicago, as the commission has before it only the rate from one of these markets, namely, Kansas City, it is manifestly impossible on the issue presented, to come to any conclusion. That in so far as

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1911. (SEE ALSO ISSUES JUNE 9 AND 16.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$78,784	$33,838	$121,771	$22,130	$21,299	$3,393	$50,053	$5,440	$102,315	$19,456	$211	$4,680	$14,987	—$18,141
Ann Arbor	301	103,761	34,353	146,891	30,086.	20,884	4,011	54,422	6,513	115,916	30,975	—1,729	14,265	14,981	—10,121
Arizona Eastern	364[1]	86,962	34,016	127,873	43,855	9,299	1,788	38,062	4,833	97,837	30,036	35	5,212	24,859	—63,840
Atlantic City	167	60,823	66,482	137,681	42,712	18,341	2,236	65,602	1,613	130,504	7,177	—3,223	7,000	—3,046	26,019
Buffalo & Susquehanna *R. R.*	265	128,552	8,477	141,511	23,387	24,590	1,866	56,333	6,890	113,066	28,445	.....	2,600	25,845	—
Buffalo & Susquehanna *Ry.*	91	32,284	7,784	42,014	5,186	26,316	448	21,953	1,710	55,613	—13,599	—6	1,400	—15,005	-
Carolina, Clinchfield & Ohio	236	123,156	10,888	136,852	13,182	20,205	6,278	32,305	8,038	80,008	56,844	.....	5,500	51,344	28,314
Carolina, Clinchfield & Ohio of S. C.	18	9,585	1,335	11,092	595	139	1,005	2,549	492	4,780	6,312	.....	200	6,112	—
Charleston & Western Carolina	340	129,254	25,533	162,116	27,016	15,734	3,350	68,447	4,381	118,928	43,188	.....	4,475	38,713	8,488
Chicago, Peoria & St. Louis	255	90,938	20,675	118,455	17,816	27,303	7,408	59,805	5,529	117,861	594	.....	3,500	—2,906	—13,201
Colorado Midland	337	95,989	18,885	121,665	25,546	31,038	6,523	62,846	5,431	131,384	—9,718	—1,219	8,500	—19,437	—29,681
Detroit, Grand Haven & Milwaukee	190	107,210	35,517	165,199	16,927	29,646	6,154	89,725	4,291	146,743	18,456	—74	3,009	15,373	—19,794
Detroit, Toledo & Ironton	441	102,664	10,403	127,251	33,545	5,852	2,346	65,903	5,323	112,969	14,282	—136	6,712	7,434	13,039
Evansville & Terre Haute	310	115,989	52,332	190,390	27,631	26,455	5,678	66,947	6,941	133,652	56,738	—481	11,295	44,962	—6,830
Georgia Southern & Florida	395	101,203	58,538	189,077	20,503	33,680	5,987	74,233	8,859	143,262	45,815	.....	9,618	36,197	28,058
Grand Trunk Western	347[2]	375,162	131,131	536,606	69,902	85,015	17,230	245,171	12,010	429,328	107,278	—1,327	31,697	74,254	—8,233
Gulf & Ship Island	307	118,686	28,043	160,153	22,160	30,580	1,641	49,861	7,933	112,175	47,978	.....	5,050	42,928	—26,476
International & Great Northern	1,159	474,033	155,970	678,054	121,094	126,702	18,970	324,011	23,096	613,873	64,181	—539	20,000	43,642	5,075
Louisiana & Arkansas	255	92,571	16,126	113,248	20,549	19,132	2,408	32,246	4,438	78,773	34,475	.....	3,240	31,235	—25,308
Louisiana Ry. & Nav. Co	350	101,638	19,946	130,677	15,677	15,013	5,318	54,446	6,069	96,523	34,154	.....	4,400	29,754	2,261
Louisiana Western	207[3]	104,837	58,462	171,757	20,398	25,104	7,221	49,721	7,660	110,104	61,653	291	5,876	56,068	30,408
Midland Valley	324	76,717	36,585	118,791	23,590	16,084	2,968	40,748	6,169	89,559	29,232	14,928	5,475	38,685	—12,162
Missouri Pacific	3,921[4]	1,343,301	340,841	1,883,569	280,036	318,707	56,376	1,071,722	66,322	1,793,163	90,406	—2,089	76,500	11,817	—262,945
New Orleans Great Northern	282	101,199	28,563	139,240	20,141	18,977	2,481	43,089	6,621	91,309	47,931	—38	2,000	45,893	—23,915
New Orleans, Mobile & Chicago	404	106,465	26,066	142,041	18,200	14,651	3,135	47,584	8,173	91,743	50,298	.....	4,773	45,525	—5,505
Northwestern Pacific	376	89,861	143,973	253,535	46,864	46,810	2,910	98,076	9,362	204,022	49,513	.....	12,700	36,813	—10,168
Oregon-Washington R. R. & Nav. Co	1,737	875,839	396,422	1,361,483	155,037	108,602	42,175	487,371	40,022	833,207	528,276	—4,699	54,579	468,998	—
Pecos & Northern Texas	296[5]	103,245	22,420	131,772	17,687	34,170	1,318	48,306	4,894	106,375	25,397	.....	3,197	22,200	5,649
St. Joseph & Grand Island	319	85,547	33,037	129,980	31,343	21,070	5,998	57,507	6,523	122,441	7,539	140	5,711	1,968	55,260
St. Louis, Iron Mtn. & Southern	3,313[6]	1,482,185	477,469	2,148,070	247,534	309,839	49,941	849,334	74,265	1,530,913	617,157	3,333	84,655	529,169	—4,571
Santa Fe, Prescott & Phoenix	364[7]	91,806	35,595	135,627	24,747	12,419	2,251	37,272	5,656	82,345	53,282	.....	103	53,178	—11,013
Southern Kansas Ry. of Texas	125	136,717	14,267	155,571	11,500	32,475	1,207	49,859	4,100	99,141	56,430	.....	1,980	54,450	5,016
Tennessee Central	294	86,488	29,449	123,154	17,109	13,696	4,707	38,106	9,568	83,186	39,968	.....	3,980	35,988	6,501
Trinity & Brazos Valley	463	92,967	25,540	124,057	28,989	16,367	7,994	66,600	9,652	129,602	—5,545	.....	3,500	—9,045	14,027
Western Maryland	543	504,545	63,644	589,789	63,046	71,811	7,768	189,339	13,997	345,961	243,828	—160	21,000	222,668	—65,649
Yazoo & Mississippi Valley	1,372	521,725	200,192	773,486	128,498	111,114	15,064	296,499	24,184	575,359	198,127	179	36,053	162,244	73,687
TEN MONTHS OF FISCAL YEAR, 1911.															
Alabama & Vicksburg	143	$966,337	$412,690	$1,490,685	$207,803	$247,245	$37,366	$509,299	$54,444	$1,056,157	$434,528	$622	$46,787	$388,363	—$19,642
Ann Arbor	301	1,111,227	400,121	1,617,961	207,275	203,405	39,690	558,324	71,569	1,080,263	537,698	—3,286	140,261	394,150	40,749
Arizona Eastern	364[1]	940,371	331,994	1,359,872	328,836	120,035	19,079	380,390	39,334	887,674	472,198	—20	61,031	411,147	—164,860
Atlantic City	167	615,596	939,661	1,638,766	272,209	147,884	27,694	816,951	13,281	1,278,019	360,747	—49,500	70,000	241,247	52,349
Buffalo & Susquehanna *R. R.*	265	1,251,503	81,938	1,388,788	263,003	269,344	17,204	513,792	55,727	1,119,070	269,708	.....	24,071	245,637	—
Buffalo & Susquehanna *Ry.*	91	448,738	93,745	566,828	67,058	284,597	7,109	243,202	27,680	629,647	—62,819	24	15,929	—78,724	—
Carolina, Clinchfield & Ohio	236	1,221,716	130,196	1,388,262	131,862	192,651	56,365	306,679	82,837	770,394	617,868	1,983	55,000	564,851	294,453
Carolina, Clinchfield & Ohio of S. C.	18	71,645	14,723	88,733	6,083	803	9,332	23,121	5,310	44,684	44,084	.....	2,000	42,084	—
Charleston & Western Carolina	340	1,269,181	300,836	1,642,806	287,337	186,795	31,367	561,580	39,149	1,106,228	635,578	.....	44,750	491,828	136,960
Chicago, Peoria & St. Louis	255	1,143,256	256,240	1,471,108	216,226	315,804	72,760	671,933	58,530	1,335,253	135,855	.....	44,000	91,855	—125,680
Colorado Midland	337	1,173,071	273,305	1,621,706	223,504	356,838	51,649	727,813	55,821	1,415,625	206,081	—6,224	83,382	116,475	—144,224
Detroit, Grand Haven & Milwaukee	190	1,009,294	454,690	1,696,722	224,590	233,054	64,082	868,204	45,352	1,435,282	261,440	—414	30,090	230,936	—207,645
Detroit, Toledo & Ironton	441	1,277,738	136,802	1,546,800	323,030	211,396	27,299	820,647	56,426	1,438,798	108,002	—209	67,120	40,673	24,155
Evansville & Terre Haute	310	1,411,857	604,070	2,231,677	277,040	299,339	55,306	729,458	65,284	1,426,427	805,250	—7,384	96,598	701,268	12,355
Georgia Southern & Florida	395	1,105,753	664,113	2,036,990	218,713	404,918	60,252	765,373	89,572	1,538,828	498,162	.....	94,093	404,069	25,354
Grand Trunk Western	347[2]	3,324,044	1,558,511	5,217,774	532,397	776,548	181,122	2,270,510	128,845	3,889,422	1,328,352	—12,500	316,973	998,879	—285,402
Gulf & Ship Island	307	1,227,086	339,676	1,685,010	210,977	296,993	16,144	486,189	79,598	1,089,901	595,109	.....	49,974	545,135	24,334
International & Great Northern	1,159	5,540,291	1,788,506	7,821,795	1,165,178	1,170,574	195,854	3,286,210	221,024	6,038,840	1,782,955	—3,563	214,000	1,565,392	392,903
Louisiana & Arkansas	255	1,003,564	159,505	1,209,130	194,027	169,942	24,200	324,611	44,915	757,695	451,485	.....	27,466	424,019	24,000
Louisiana Ry. & Nav. Co	350	1,090,659	200,912	1,409,189	232,887	172,105	49,593	578,793	61,088	1,094,466	314,723	.....	44,000	270,723	75,767
Louisiana Western	207[3]	1,118,487	564,298	1,765,392	222,793	248,379	64,417	521,145	75,506	1,132,240	633,152	1,091	68,980	565,263	12,530
Midland Valley	324	715,786	345,285	1,124,303	206,700	170,872	22,813	333,641	69,942	803,968	320,335	26,416	54,755	291,996	—34,644
Missouri Pacific	3,921[4]	14,484,814	3,923,025	20,536,708	3,201,104	3,271,346	587,043	9,758,935	699,317	17,517,745	3,018,963	—27,193	828,000	2,163,770	—
New Orleans Great Northern	282	987,071	308,000	1,409,306	208,934	194,365	30,134	407,568	53,819	894,820	514,486	—862	19,511	494,113	39,650
New Orleans, Mobile & Chicago	404	1,160,162	283,847	1,542,640	211,650	126,546	28,594	461,902	82,300	910,992	631,648	.....	43,783	587,865	94,244
Northwestern Pacific	376	1,142,703	1,390,815	2,745,660	498,329	420,452	28,869	1,041,672	92,676	2,081,998	663,662	.....	110,000	553,662	—76,102
Oregon-Washington R. R. & Nav. Co	1,737	3,356,942	1,495,140	5,187,690	642,374	533,106	184,124	2,076,932	184,966	3,621,501	1,566,189	—36,291	295,399	1,234,499	—
Pecos & Northern Texas	296[5]	1,018,974	259,662	1,338,801	187,703	266,162	20,964	455,917	46,216	976,962	361,839	.....	32,350	329,489	—101,433
St. Joseph & Grand Island	319	933,675	381,145	1,432,049	300,847	205,166	64,413	621,217	63,183	1,254,826	177,223	489	59,036	118,676	79,898
St. Louis, Iron Mtn. & Southern	3,313[6]	16,744,924	5,126,229	23,764,929	3,317,965	3,116,231	549,501	8,211,665	761,819	15,957,181	7,807,748	—36,404	792,939	6,978,405	2,655
Santa Fe, Prescott & Phoenix	364[7]	949,373	361,071	1,402,734	247,628	131,413	27,614	428,580	56,774	892,009	510,725	.....	1,050	509,675	—42,408
Southern Kansas Ry. of Texas	125	1,028,229	167,762	1,242,928	146,220	287,033	19,888	421,626	42,055	916,822	326,106	.....	16,879	309,227	—112,417
Tennessee Central	294	857,233	325,205	1,253,867	178,541	132,348	48,705	389,813	82,528	831,935	421,932	.....	39,801	382,131	47,339
Trinity & Brazos Valley	463	1,362,354	313,969	1,744,285	322,740	282,466	80,971	801,315	110,103	1,597,595	146,690	.....	36,185	110,505	18,890
Western Maryland	543	4,928,893	808,720	5,986,636	668,878	716,345	89,590	2,063,730	133,937	3,672,480	2,314,156	—2,973	198,000	2,113,183	—
Yazoo & Mississippi Valley	1,372	6,354,992	2,339,780	9,268,751	1,623,023	1,298,778	149,723	2,926,925	237,284	6,235,733	3,033,018	—3,275	342,151	2,687,592	1,026,487

Mileage operated on April 30, 1910.—[1] 308 miles; [2] 336 miles; [3] 198 miles; [4] 3,883 miles; [5] 198 miles; [6] 3,287 miles; [7] 257 miles. — Indicates Deficits, Losses and Decreases.

the question of the reasonableness of the rates in and of themselves is concerned, that matter directly involves the larger question of the reasonableness of the thorough transportation charges from points west of Kansas City to the consuming centers of the east, and as there are not before the commission the proper parties or the necessary information, no conclusion can be reached on that issue in this proceeding.

For these reasons, the suspension of the rates involved will not be further continued, and the order suspending them is canceled without prejudice to any of the interests involved. (21 I. C. C., 119.)

Rate on Plate Glass Reduced.

Memphis Freight Bureau et al., v. St. Louis & San Francisco et al. Opinion by Commissioner McChord.

This complaint is brought on behalf of two corporations which manufacture mirrors and art glass at Memphis, Tenn., and distribute plate and window glass, rough-ribbed glass, and kindred lines, which was shipped to them from factories at St. Louis, Mo., Valley Park, and Crystal City. The third class rate of 45 cents per 100 lbs. applicable to plate glass in carloads from St. Louis, Mo., to Memphis, Tenn., is found to be unreasonable so far as it exceeds the fourth class rate of 35 cents per 100 lbs., and that the carload rate of 30 cents per 100 lbs. on rough-ribbed glass exceeding one foot square from the same points of origin to Memphis is not shown to be unreasonable. (21 I. C. C., 113.)

Rate on Tin-Plate Scrap Reduced.

Vulcan De-Tinning Co. v. Union Pacific et al. Opinion by the commission:

This complaint was on a shipment of one car of scrap metal sent from Denver, Colo., to Streator, Ill., over the Union Pacific and the Chicago & Alton. The goods were described as scrap tin, but the description should have been scrap tin plate, tin plate being made mostly of iron of very low value. Soon after the shipment was made (at 52½ cents per 100 lbs.), a commodity rate was made of 31¾ cents, but with a higher carload minimum. The commission orders reparation, with interest, declaring that the rate should not be over 31¾ cents, but as this latter rate has been in effect since September, 1909, no order for the future is issued. (21 I. C. C. 93.)

Decision on Transshipment.

In re Transshipment Rates on the Chesapeake & Ohio. Opinion by Commissioner Meyer:

The Interstate Commerce Commission has issued an important decision regarding the operations over the Chesapeake & Ohio and other railways involving the question of "transshipment" rates in connection with water carriers. The decision reverses all previous decisions on this subject, and it is believed that its effect will be felt by the United States Steel Corporation, which transports its ore wholly in the state of Michigan by rail and there transships it by lake carriers, and that other large shippers so situated will be similarly affected.

The commission holds that there is no arrangement for continuous carriage or shipment from one state to another between a carrier by railway and a carrier by water not subject to the act; when shipments by railway, entirely within one state, are consigned in care of a carrier by water which acts as an agent of the consignee at a port in that state and the carrier by water transports said consignments to a point in another state, such ultimate destination not appearing in the rail carrier's bill of lading.

The inquiry in the present instance was instituted by the commission on its own motion into transshipment rates on lime from Eagle Mountain, Va., consigned to "J. B. Flora & Co., care of Elizabeth & Norfolk Steamship Company, Norfolk, Va.," the water carrier taking charge at Norfolk.

Commissioner Lane, concurring:

I concur fully in the substance of the above opinion and in the result reached. I desire to point out, however, that the decision is, in principle, in direct conflict with the view heretofore taken by the commisison after consideration of similar transactions at other ports on the Atlantic ocean and also at ports upon the lakes. There are now on file with this commission a large number of rates described as "transshipment rates." These rates apply from interior points to various ports. They are in each instance less in amount than the local rates from such interior points to such ports, and in substance are identical with the interstate rate of $1.50 mentioned above. It is well known to the commission that such transshipment rates are applied to the rail transportation of commodities which are afterwards transported from such ports by water carriers not operating subject to the act to regulate commerce, and the commission has recognized this as proper. The contracts of transportation under these rates call for delivery at the port, and no carrier beyond is party thereto. Such contracts, by all the tests of the authorities relied upon in the opinion herein, do not give basis for the application of any rate except the open local rate to the port. The fact that after the conclusion of the transportation under such contract a new and further transportation is given to the commodity cannot in law operate as the basis for a distinction in the rail rates from point of origin to the port. This is fully recognized by the commission in its opinion. The parties concerned with the transportation to and from Norfolk, Va., described in the report, are held to compliance with the law as expressed by the Supreme Court in the cases cited. Therefore I am unable to understand how grain moving, for instance, from St. Paul to Gladstone, Mich., for reshipment, under contracts identical in substance with these here considered, may legally be granted a rate less than the local rate to Gladstone because it is afterwards carried from Gladstone to Buffalo under a new contract of transportation by a water carrier not subject to the act, so long as the doctrine of the opinion herein is recognized by the commission. (21 I. C. C. 207.)

Use of Alternative Rates Permissive, Not Compulsory.

Goodman Manufacturing Company v. Pittsburg, Cincinnati, Chicago & St. Louis. Opinion by the commission:

A commodity rate at a prescribed minimum can not be held to be unreasonable solely on the ground that a higher class rate applied to a lower carload minimum would, within certain limits, produce a lower charge. The rule for the alternative application of class or commodity rates when both are published in one and the same tariff is permissive and not compulsory. The fact that the two rates so published take different minima does not modify the rule. Complainant shipped two carloads of machinery from Chicago to Collinsville, Ill. Class rates from Chicago to Collinsville are subject to the Illinois classification, which provides for the application of sixth class rate on machinery in carloads, minimum 24,000 lbs. Subject to this minimum the tariffs of defendant carriers named a sixth class rate of 16.6 cents per 100 lbs. In another tariff publishing commodity rates only, the defendants had established and still maintain a specific commodity rate of 15.5 cents on machinery in carloads, but subject to a minimum weight of 30,000 lbs. The latter rate and minimum were applied to the shipments, each of which weighed 26,000 lbs.

No evidence was adduced by complainant tending to prove the commodity rate and higher minimum to be unreasonable. As a matter of fact, the complainant at the hearing shifted its ground of attack and rested its case upon the claim that the defendants should have provided for the alternative use of the two rates with their different minima so that the shipper might have been charger whichever rate, as its corresponding minimum, would have made the lower charge.

Carriers may, if they choose, publish both class and commodity rates in the same tariff and, under Rule 7-*b* of Tariff Circular 18-A, subject to certain conditions specifically set forth in the rule, they may provide for the alternative use of such rates by including in different sections of one and the same tariff such class and commodity rates. The fact that the two rates so published take different minima does not modify this rule.

The rule referred to was adopted by the commission at the request of many shippers and carriers, and it frequently contributes to simplicity and clearness in tariff construction. Its use is permissive. No requirement is upon the carriers to so construct their tariffs, and the failure to do so in this case raises no presumption that the charge assessed under the commodity rate and minimum was unreasonable, because in excess of the charge which would have accrued under the class rate applied to the minimum weight prescribed by the Illinois classification. It not appearing that the rate charged was unreasonable an order will be entered dismissing the complaint. (21 I. C. C. 95.)

COURT NEWS.

In the federal court at Toledo, Ohio, June 23, the Erie Railroad was fined $200 for two violations of the Safety Appliance Law.

The Carrier Low Company, manufacturer of paper board boxes at Joliet, Ill., was fined $2,000 in the United States district court at Chicago on June 21, for misbilling shipments over the Elgin, Joliet & Eastern. It billed strawboard boxes as strawboard in an effort to obtain a lower than the proper rate.

The Kentucky court of appeals, reversing the decision of the circuit court, has held that the ownership of the Frankfort & Cincinnati by the Louisville & Nashville is unlawful. The constitution of Kentucky provides that one road cannot own another parallel or competing road, and the court finds that this provision is violated in the case of the L. & N. and the Frankfort & Cincinnati.

Union Pacific-Southern Pacific Merger Upheld.

The Union Pacific's ownership of Southern Pacific stock has been adjudged not a violation of the Sherman law in the decision of the U. S. Circuit Court, Eighth district.

Judge Adams delivered the majority opinion, dismissing the suit. Judge Hook dissented.

Empowered by the Hepburn Act of 1906, in January, 1907, the Interstate Commerce Commission began investigation of the relations among the western railways. On the evidence secured, the government, on February 1, 1908, filed a suit in equity in the United States Circuit Court, Eighth district, against Union Pacific and auxiliaries, Southern Pacific, Northern Pacific, Great Northern, Atchison, San Pedro, Los Angeles & Salt Lake, Farmers' Loan & Trust Company, E. H. Harriman, Jacob H. Schiff, Otto Kahn, James Stillman, Henry H. Rogers, Henry C. Frick and William A. Clark.

The basic allegation was that the individuals named conspired to effect a virtual consolidation of the Union Pacific and other transcontinental lines intending unlawfully to restrain transcontinental commerce. The court was asked to adjudge this conspiracy a violation of the Sherman law, and to perpetually enjoin Union Pacific, and its auxiliaries from purchasing, acquiring, receiving, holding, voting, or in any manner acting as owner of any shares of the Southern Pacific, Northern Pacific, Great Northern, Atchison, or Salt Lake line.

At the present time the Harriman lines own no Hill or Atchison stocks. Answering the government's contention that Union Pacific interests blocked construction of an independent line between Los Angeles and Salt Lake, the defendants testified that their blocking tactics were confined to defense of their own right of way which the Clark interests attempted to use without compensation, and that half of the Salt Lake line had been completed by the Harriman roads before the Clark scheme was hatched.

The remaining and cardinal point was the government's contention that under independent control 10 per cent. of the total Union and Southern Pacific traffic would be competitive.

This 10 per cent. includes California traffic. The defendants argued that Union Pacific was not a competitor for California traffic; that it had no control over such traffic by reason of its line to Portland and boats to San Francisco; that this route consumed several days more time, and could not operate at lower rates without prompting Southern Pacific to retaliate by turning a richer eastbound business over to the Rio Grande at Ogden; that for this reason the Southern Pacific absolutely controlled California traffic before the merger; that purchase of a substantial holding of Southern Pacific stock by Union Pacific amounted, therefore, to mere advancement of Southern Pacific's gateway from Ogden to Omaha, and in no wise altered competitive conditions.

Eliminating California traffic the maximum proportion of the Harriman lines' total business which could possibly be considered competitive was placed by the government's exhibits at less than 3 per cent.

The personnel of the court which heard the merger case is as follows: Judge Walter H. Sanborn, of St. Paul; Justice Willis Van Devanter, Washington, D. C.; Judge William C. Hook, of Leavenworth, Kan., and Judge Elmer B. Adams, of St. Louis.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. S. Hobbs, second vice-president and comptroller of the Maine Central, has had his jurisdiction extended over the Portland Terminal Co., and A. B. Ireland has been appointed claim agent, both with offices at Portland, Me.

John M. Whitman, vice-president in charge of construction of the Chicago & North Western, at Chicago, has retired, and E. C. Carter, chief engineer, will hereafter report to the president. Mr. Whitman was born in 1837 at Elbridge, Onondaga county, N. Y., and his first railway work was in 1856 in the engineering department of the Illinois Central. But he remained there only a short time, and from 1858 to 1860 he was a leveler on enlargement work on the Erie canal. Next he became engineer in charge of construction for the Brunswick & Albany, now a part of the Atlantic Coast Line. He was then for one year engineer in charge of construction of the Union Stock Yards, at Chicago, and from 1867 to 1869 was engineer engaged in deepening the Illinois & Michigan canal. In 1869 he became engineer in charge of construction of the Iowa Midland, now a part of the Chicago & North Western, and from 1872 to 1876 was engineer and superintendent of the Chicago & Pacific, now a part of the Chicago, Milwaukee & St. Paul. In the latter year he was appointed receiver and superintendent of that road. In June, 1880, he was appointed superintendent of the Iowa division of the Chicago & North Western, and has been with the North Western system ever since. In February, 1883, he was appointed general superintendent of the Chicago, St. Paul, Minneapolis & Omaha, and in August, 1887, general manager of the Chicago & North Western. He became fourth vice-president in November, 1899, and in January, 1906, he was made vice-president in charge of construction.

Operating Officers.

George Curran has been appointed assistant superintendent of District No. 3 of the Canadian Pacific, at Montreal, Que.

H. R. Hanlin, general superintendent of the Tonopah & Goldfield, with office at Goldfield, Nev., has resigned, and his former position has been abolished.

George H. Bennett has been appointed general superintendent of the Paris & Great Northern, with office at Paris, Tex., succeeding W. H. Upton, resigned.

L. E. McCabe, assistant superintendent of the Illinois Central, at Princeton, Ky., has been appointed superintendent of the Indiana division, with office at Mattoon, Ill., succeeding P. Laden, resigned to go to the Missouri, Oklahoma & Gulf.

H. C. Manchester, superintendent of transportation; V. H. Vaughan, superintendent, and W. B. Drew, superintendent of car service, of the Maine Central, have had their jurisdiction extended over the Portland Terminal Co., all with offices at Portland, Me.

John C. Muir, superintendent of the Chicago & Eastern Illinois at Danville, Ill., has been appointed general superintendent of that road, in addition to his duties as general superintendent of the Evansville & Terre Haute, with office at Danville, the office of general superintendent of the latter road having been transferred from Evansville, Ind. G. H. Trenary, superintendent of the Illinois division of the Chicago & Eastern Illinois at Salem, Ill., has been transferred to the Chicago division, with office at Danville, and P. S. Sampson, trainmaster at Brazil, Ind., succeeds Mr. Trenary at Salem. S. S. Huffman, trainmaster at Danville, succeeds Mr. Sampson.

Traffic Officers.

W. D. Judd has been appointed a general agent of the St. Louis & San Francisco, with office at St. Louis, Mo.

E. J. Bryant has been appointed a traveling passenger agent of the New York Central Lines, at Salt Lake City, Utah.

E. G. Baumer has been appointed a traveling freight agent of the Lehigh Valley, with office at South Bethlehem, Pa., succeeding Ira F. Kurtz, resigned.

R. J. Kennedy, traveling freight agent of the Gulf, Colorado

& Santa Fe at Oklahoma City, Okla., has been appointed colonization agent, with office at Galveston, Tex.

W. K. Sanderson, general freight agent, and H. D. Waldron, general passenger agent of the Maine Central, have had their jurisdiction extended over the Portland Terminal Co., both with offices at Portland, Me.

G. M. Riley, traveling freight agent of the Kansas City Southern, has been appointed general agent, with office at Houston, Tex., succeeding E. E. Elmore, resigned. Henry Moran succeeds Mr. Riley.

A. F. Cleveland, general agent of the Chicago & North Western at Cleveland, Ohio, has been appointed general agent, with office at Pittsburgh, Pa., succeeding O. N. Brown, retired. A. R. Gould succeeds Mr. Cleveland.

G. H. MacRae, assistant general passenger agent of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn., has been appointed general passenger and ticket agent, with office at St. Paul, succeeding T. W. Teasdale, retired.

J. B. Convery, commercial agent of the Illinois Central at Evansville, Ind., has been appointed commercial agent, with office at Houston, Tex. L. W. Hazelton, contracting freight agent at Memphis, Tenn., succeeds Mr. Convery.

Louis N. Snyder has been appointed a traveling passenger agent of the Chicago Great Western, with office at San Francisco, Cal., and G. G. Fraser, district passenger agent, at San Francisco, has resigned to go into other business.

P. C. Patterson, commercial agent of the Mobile & Ohio, at New Orleans, La., has been appointed eastern freight agent, with office at New York. W. B. Ross, soliciting freight agent, at Jacksonville, Fla., succeeds Mr. Patterson, and J. E. Phipps, chief clerk to the commercial agent, at Jacksonville, succeeds Mr. Ross.

Thomas Judd has been appointed district passenger agent of the Chicago Great Western, with office at Des Moines, Iowa, succeeding Harry O. Post, appointed city passenger agent. Louis N. Snyder has been appointed traveling passenger agent, with office at San Francisco, Cal., and G. G. Fraser, district passenger agent at San Francisco, has resigned to engage in other business.

David Cardwell, whose appointment as assistant general freight agent of the Southern Railway, with office at Columbia, S. C., has been announced in these columns, was born February 22, 1846, at Richmond, Va., and was educated in the common schools. He began railway work January 8, 1869, with the Columbia & Augusta, now a part of the Southern Railway, as a clerk for the superintendent, and was later general clerk of the Richmond & Petersburg, now a part of the Atlantic Coast Line, at Richmond. He was then consecutively revenue clerk in the auditor's office of the Charlotte, Columbus & Augusta, now a part of the Southern Railway; manager of the clearing house for the Atlantic Coast Line, and then chief clerk to the general freight and passenger agent of that road. His next position was assistant general freight and passenger agent of the Richmond & Danville, now a part of the Southern Railway, and he was subsequently appointed division freight agent of the Southern Railway, which position he held until his recent appointment as above noted.

Engineering and Rolling Stock Officers.

F. E. Whitcomb, engineer maintenance of signals of the Boston & Albany, has been appointed signal engineer, with office at Boston, Mass., and his former position has been abolished.

B. Violett, roadmaster of the Chicago, Burlington & Quincy, at Jacksonville, Ill., has been transferred to the Beardstown division. J. A. Sullivan, roadmaster at St. Louis, Mo., succeeds Mr. Violett

J. W. Small, superintendent of machinery of the Kansas City Southern at Pittsburg, Kan., has been appointed superintendent of machinery of the Missouri Pacific, with office at St. Louis Mo., succeeding G. W. Smith, resigned.

J. W. Blakeburn, road foreman of engines of the St. Louis Southwestern, at Pine Bluff, Ark., has been appointed master mechanic, with office at Pine Bluff, succeeding E. English, resigned. E. H. McFadden succeeds Mr. Blakeburn.

T. L. Dunn, chief engineer; G. F. Black, engineer maintenance of way; P. M. Hammett, superintendent of motive power, and A. R. Manderson, assistant superintendent of motive power, of the Maine Central, have had their jurisdiction extended over the Portland Terminal Co., all with offices at Portland, Me.

J. T. Robinson, whose appointment as master mechanic of the Missouri Pacific, with office at Osawatomie, Kan., has been announced in these columns, was born in Virginia and received a common school education. He was with the Southern Railway for 15 years as general foreman and master mechanic, with headquarters at different points, and for the past seven years has been master mechanic of the Seaboard Air Line, first at Savannah, Ga., and then at Jacksonville, Fla., which office he held until May, 1911. Effective June 14, he was appointed master mechanic of the Central Kansas division of the Missouri Pacific.

T. N. Ely, chief of motive power of the Pennsylvania lines, both east and west of Pittsburgh, will retire from railway work on July 1, and his position will be abolished. A. W. Gibbs, general superintendent of motive power of lines east of Pittsburgh, has been appointed chief mechanical engineer, succeeding to the duties of Mr. Ely. R. N. Durborow, superintendent of motive power of the Eastern Pennsylvania division, at Altoona, Pa., has been appointed general superintendent motive power of lines east of Pittsburgh and Erie. Robert K. Reading, superintendent of motive power of the Buffalo & Allegheny Valley division at Buffalo, N. Y., succeeds Mr. Durborow, and William Elmer, Jr., master mechanic of the Pittsburgh division, succeeds Mr. Reading.

A. B. Corthell, M. Am. Soc. C. E., who has been connected with the construction work of the Grand Central Terminal, New York, since its beginning in 1902, first as terminal engineer, then as assistant executive of Grand Central station architects, and lately as consulting engineer and secretary of the auxiliary facilities committee, has been appointed chief engineer of the Boston & Maine, with headquarters at Boston, Mass., succeeding J. P. Snow resigned. He will have charge of construction, maintenance of way, maintenance of signals and maintenance of bridges and buildings; and is also consulting engineer of the New York, New Haven & Hartford R. R., reporting to E. H. McHenry, vice-president of the Boston & Maine and vice-president of the New York, New Haven & Hartford R. R.

Andrew Gibson, who has been appointed engineer maintenance of way of the Northern Pacific, with office at St. Paul, Minn., as was previously announced in these columns, was born June 16, 1860, at Ross-shire, Scotland. He was educated in the common schools and at Tain Royal Academy in Scotland, and began railway work with the Northern Pacific in 1883 as a chainman on construction. He was then consecutively rodman, leveler, transitman, and for more than 11 years from October, 1888, he was assistant engineer, having been in charge of masonry work on the Stampede tunnel of the Pacific division, of branch line construction in Clark's Fork Valley in Montana, and of the Clearwater Short Line in Idaho, of branch line construction in Washington and of the docks at Seattle. In April, 1902, he was appointed superintendent of the Yellowstone division, and three years later was transferred to the Rocky Mountain division, where he remained until August, 1907. He was then placed in charge of timber preservation and tie treating plants at Missoula, Mont., from which position he has just been advanced as above.

Purchasing Officers.

Louis Mathiasmier has been appointed division storekeeper of the Atchison, Topeka & Santa Fe, with office at Emporia, Kan., succeeding C. P. Decker.

H. A. Fabian, manager of purchases and supplies of the Maine Central, at Boston, Mass., and C. D. Barrows, purchasing agent, at Portland, Me., have had their jurisdiction extended over the Portland Terminal Co., both with offices at Portland.

OBITUARY.

Clarence A. Knight, president of the Chicago & Oak Park Elevated Railroad at Chicago, died at that city on June 21.

D. R. G. Glascock, assistant engineer of the Public Belt Railroad of New Orleans, La., died at New Orleans on June 22.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE ATCHISON, TOPEKA & SANTA FE has ordered 81 locomotives from the Baldwin Locomotive Works.

THE KANSAS CITY & MEMPHIS has ordered 1 ten-wheel locomotive from the American Locomotive Company. The dimensions of the cylinders will be 18 in. x 24 in.; diameter of the driving wheels will be 56 in., and the total weight in working order will be 134,000 lbs.

THE ST. LOUIS NATIONAL STOCK YARDS has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in.; diameter of the driving wheels will be 51 in., and the total weight in working order will be 121,000 lbs.

CAR BUILDING.

THE ERIE RAILROAD is in the market for 3,300 gondola cars and for 25 passenger cars.

THE ILLINOIS CENTRAL is taking prices on about 2,000 freight cars.

THE CAMBRIA & INDIANA, Philadelphia, Pa., has ordered 200 all-steel 50-ton hopper cars from the Cambria Steel Company.

THE GRAND TRUNK, mentioned in the *Railway Age Gazette* of May 12 as being in the market for 1,000 box cars, has ordered this equipment from the Canadian Car & Foundry Company.

THE NEW YORK CENTRAL LINES, mentioned in the *Railway Age Gazette* of April 28 as being in the market for 7 coaches, has ordered this equipment from the American Car & Foundry Company.

IRON AND STEEL.

THE GREAT NORTHERN has ordered 10,000 tons of rails from the Illinois Steel Company.

THE BALTIMORE & OHIO has ordered 4,000 tons of bridge material from the American Bridge Company.

THE LEHIGH & NEW ENGLAND has ordered 400 tons of bridge material from the American Bridge Company.

THE PITTSBURG & LAKE ERIE has ordered 1,500 tons of bridge material from the American Bridge Company.

THE ATLANTIC COAST LINE has ordered 2,000 tons of structural steel for the bridge at Altamaha, Ga., from the McClintic-Marshall Construction Company.

GENERAL CONDITIONS IN STEEL.—The past week has witnessed a transformation in the steel industry. Confidence on the part of both consumers and producers is at last restored and the price situation is now thoroughly stable. New orders are coming in from an unusually large number of sources and the railways are buying heavily but quietly, especially structural steel. The Steel Corporation is booking orders at the rate of over 30,000 tons a day, and is operating at about 68 per cent. of its capacity.

The Ministers of Finance and Ways of Communications of Russia are submitting to the Council of Ministers the project of P. A. Lipskim and A. V. Bieloff to construct an electric line from Moscow to Sergieff, with branches to Lossino-ostroffsky, Muitischtcham and Puschkino on the northern lines. The total length is put at 42 miles and the cost at $5,204,940. It is proposed to issue $1,440,000 in shares and $4,920,000 in 5 per cent. non-guaranteed debentures. Another electric line which has made similar official progress is the G. K. Uschkoff line, from Sebastopol via Yalta to Aluschta, with branch to Balaklava; estimated cost $16,890,000, and the proposed capital issues are $3,540,000 in shares; and $17,700,000 in non-guaranteed debentures.

Supply Trade News.

The Isthmian Canal Commission will receive bids until July 11 on brass bolts, nuts and set screws. Circular No. 636-D.

The Indian Refining Company, New York, will move its general offices, about July 1, from 133 William street to 17 Battery place.

J. M. Betton, New York, manufacturer of Drucklieb injector sand blast apparatus, will move about July 15 from 178 Washington street to 14 Park place.

The Pennsylvania Equipment Company, Philadelphia, Pa., is in the market for from 5 to 10 second hand standard gage Western Wheeled Scraper Company steel lined dump cars.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Oregon Short Line for four 70-ft. motor cars to be operated between Ogden, Utah, and Salt Lake City. There are now 113 of these cars in daily service in the United States.

The Mulconroy Company, Philadelphia, Pa., has bought all the patents, stock, machinery and business of the Metallic Flexible Tubing Company, Philadelphia. The name and registered brands of the Metallic Flexible Tubing Company will be continued, but the products will be made in a more centrally located factory with improved and additional machinery.

Col. Henry G. Prout, vice-president and general manager of the Union Switch & Signal Company, Swissdale, Pa., and formerly, for 16 years, 1887-1903, editor-in-chief of the *Railroad Gazette*, received this week from the University of Michigan the honorary degree of Doctor of Laws. Colonel Prout graduated from the University of Michigan in 1871, with the degree of C. E., and in 1902 received from Yale the honorary degree of Master of Arts.

The Davis-Bournonville Acetylene Development Company, New York, and the National Pneumatic Company, Chicago, have made the Davis-Bournonville Company, New York, their exclusive selling agent for welding and cutting apparatus, and have increased its working capital and executive ability. The business of the Davis-Bournonville Company will be divided into the eastern department, with offices in its present quarters in New York, and the western department, with offices at 515 Laflin stret, Chicago, the present quarters of the Chicago welding department of the National Pneumatic Company.

The Jones & Laughlin Steel Company, Pittsburgh, Pa., will on July 1 open its own office in the Penobscot building, Detroit, Mich. It has been represented in Detroit heretofore by F. A. Goodrich & Co. Frederick H. Holt, now in charge of the office of F. A. Goodrich & Co., will be district sales manager in Detroit. The Jones & Laughlin company will also open its own office in the Pierce building, St. Louis, Mo., where the F. A. Goodrich Iron & Steel Company has been representing it. E. D. Batchelor, now in the sales department of the general offices of the Jones & Laughlin company, will be district sales manager in St. Louis. A. C. Pollock, in the sales department of the general offices, has been put in charge of the newly established Pittsburgh sales district.

The American Mason Safety Tread Company, Boston, Mass., has shipped to the American Car & Foundry Company, New York, at its Jeffersonville, Ind., shops red Car Karbolith surfacing material for 19,500 sq. ft., and Car Karbolith for 21,000 sq. ft. for new passenger coaches for the Baltimore & Ohio. The same company is shipping to Pressed Steel Car Company, Pittsburgh, Pa., McKees Rocks plant, Car Karbolith for flooring 25 postal cars for the New York Central; also 17,760 sq. ft. of red Karbolith for passenger coaches, and 2,280 sq. ft. of Karbolith for table tops. The Illinois Central freight warehouse at New Orleans, La., will have some Karbolith flooring laid by this company. The Interborough Rapid Transit Company, New York, has recently received several consignments of Karborundum Karbolith surfacing material. The Delaware, Lackawanna & Western uses the lead filled Mason Safety tread on its concrete steps. This product was used in the station at Taylor, Pa., and about 1,400 sq. ft. of it was used at the station at Bloomfield, N. J. The New York Central is installing car-

borundum filled Mason Safety tread at its stations. Shipments have recently been made to Tuckahoe, N. Y.; Tarrytown, Rochester, Spuyten Duyvil, Dobbs Ferry, Melrose Junction, and other points on the line.

William Richard Brixey, founder of the Kerite Insulated Wire & Cable Company, died at Seymour, Conn., on June 9. He was born at Southampton, Eng., May 11, 1851. He was educated at a grammar school and then entered the British mercantile marine in command of his own ship. He came to this country in 1878, became at once an American citizen, and went into business with his brother-in-law, A. G. Day, a pioneer in the American rubber industry and inventor of Kerite. The Day plant was at Seymour, Conn., and there Mr. Brixey became general manager on the death of Mr. Day, and sole proprietor upon the death of his sister, Mrs. Day. Mr. Brixey was not satisfied with the use of his cables in the telegraph and telephone field, or with the early endorsement of such men as Morse, but pushed out into larger developments in other fields. Some of the most noteworthy of these included the supplying and laying of the Alaskan cable, the furnishing of the Panama zone cable, and the furnishing of the wires and cables for the Pennsylvania tunnels and terminal in New York. In 1908 Mr. Brixey incorporated the business as a company, and soon after retired, leaving it to the management of his eldest son, Richard D. Brixey, president of the Kerite Insulated Wire & Cable Company. Mr. Brixey left two other sons, Reginald W Brixey, vice-president, and Austin D. Brixey, secretary of the company. Mr. Brixey was active in public life, being a member of the American Institute of Electrical Engineers, and a member for many years of the Old Guard of New York City, with the rank of captain. He was a member of the Brooklyn Club and a high degree Mason.



W. R. Brixey.

The annual report of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for the fiscal year ended March 31, 1911, shows that that year was the most prosperous in the history of the company, both in gross earnings and in net income. The gross earnings were $38,119,312, as compared with $29,248,682 in 1910, and $33,026,240 in 1907, the previous high record. The net manufacturing profits were $5,608,765, as compared with $3,552,978 in 1910, and $4,179,575 in 1907. The property and plant depreciations charged against income were $371,668. The net income, or surplus for the year, was $4,881,105, as compared with $3,060,664 in 1910, the previous high water mark. The types of apparatus which were particularly developed and improved during the year include alternating and direct current mill and crane motors, high speed turbo-generators and railway equipment. Additional real estate was acquired adjoining the Newark plant and an extension is now under construction which when completed will cover the entire city square and increase the manufacturing floor space by about 30 per cent. The directors of the company feel that the outcome of the pending suit for the alleged violation of the Sherman anti-trust law will not seriously affect the company's lamp business. Last year was not only the most prosperous year for the Westinghouse company, but sets the high record for electrical development throughout the country. This will be more fully realized after an examination of the reports of the General Electric Company, Schenectady, N. Y., and of the Western Electric Company, Chicago. Though last year witnessed such marked success, this year shows no great promise, according to the report. One of the statements of Robert Mather, the chairman, is that "the business taken by the company during February and March, 1911—the last two months of the fiscal year covered by this report—was somewhat less than that taken during the same months of 1910, and the value of the orders booked since the close of the fiscal year does not compare favorably with that of the corresponding period a year ago." On March 31, 1911, the value of unfilled orders was $7,616,058, as compared with $11,256,196 on March 31, 1910. A further reason for expecting a curtailment of earnings is the expiration of the agreement with the General Electric Company whereby each company could use the patents of the other upon payment of royalties and from which the Westinghouse company derived a substantial revenue.

Baldwin Locomotive Works' Reorganization.

The details of the reorganization of the Baldwin Locomotive Works, Philadelphia, Pa., have been completed. William L. Austin, formerly president, has been elected chairman of the board; Alba B. Johnson, president, and Samuel M. Vauclain, vice-president. William Burnham is president of the Standard Steel Works Company. The Baldwin company was incorporated in 1909 to take over the business of the co-partnership, Burnham, Williams & Company, which owned and operated the plant since its beginning in 1832. The new company sold at a premium to its bankers $20,000,000 preferred stock and issued $20,000,000 common stock, a majority of which was issued to the officers and managers of the former company and a minority to the bankers. The officers and managers, therefore, of the former company retained control of the new company, received a certain amount of cash for the equity which they relinquished, and in addition bought back for cash from the bankers $5,900,000 preferred stock of the new company. The new company also bought back from the bankers a certain amount of the preferred and common stock to be used in a profit-sharing plan for its employees.

The new president, Mr. Johnson, has been responsible, with Mr. Vauclain, for the extension of the plant and business of the works during the last 10 years. As a partner, and later as vice-president and treasurer of the company, he did much of the administrative work, relieving Mr. Converse, who for some time prior to his death in May, 1910, gave but little attention to the affairs of the concern. Also, Mr. Johnson has been in direct charge of sales, and his work there is what has made the development of the company possible. He combines the technique of good salesmanship with a character which wins respect, and a disposition which makes friends at first sight. The list of institutions and clubs with which he is identified indicates his good citizenship and his personal popularity. He was born in Pittsburgh, Pa., in 1858. He went to school in Philadelphia, graduating from high school in 1876. He received an honorary degree of LL.D. from Ursinus College in 1909. He went into the Baldwin works as junior clerk the year after he left high school. In 1878 and 1879 he worked in the Edge Moor Iron Works, Wilmington, Del., and then returned to the Baldwin works. He was admitted to partnership in the firm of Burnham, Williams & Company in 1896 and was made vice-president and treasurer of the successor company in 1909. He is a director of the Standard Steel Works Company, the Fourth Street National Bank, the Pennsylvania Company for Insurance on Lives and Granting Annuities, the Philadelphia National Bank, the Railway Business Association, the National Tariff Commission Association, the Young Men's Christian Association and the Executive Council, Philadelphia Board of Trade. He is a trustee of the Jefferson Medical College and Hospital, and a member of the American Philosophical Society, the American Academy of Political & Social Science, the American Railway Master Mechanics' Association, the National Board of Trade, the New York Chamber of Commerce, the National Association of Manufacturers, the Fairmount Park Art Association, the Geographical Society of Philadelphia (president, 1907-1909), the Historical Society of Pennsylvania and the Pennsylvania Society of Sons of the Revolution. He is also a member of the following clubs: Union League, Manufacturers', City (Philadelphia), Contemporary, Five O'clock, Merion Cricket (Haverford, Pa.), Railroad (New York). He was president of the Presbyterian Social Union of Philadelphia, 1906-1907.

As has been mentioned, Mr. Vauclain shares with Mr. Johnson the credit for the recent growth of the locomotive works. He has contributed to the organization his ability as a shop

organizer and manager, and his ingenuity and progressiveness as a locomotive designer. He has steadily increased the output of the works, designing physical extensions to the plant and being quick to improve methods and put in new machinery where needed. His results have been more spectacular than his methods. It was by taking advantage of every opportunity and not by any revolutionary reorganization that he brought the plant up to the seemingly impossible output of a locomotive an hour. Mr. Vauclain was born in Philadelphia in 1856, being French on his father's side and Scotch and German on his mother's. His father's people were killed in the French Revolution. Mr. Vauclain, Sr., worked for Mr. Baldwin from the building of the Ironsides until 1856, when he went to the Pennsylvania Railroad. Mr. Vauclain claims that his own apprenticeship began when he was three years old, when he lent his presence at a test of the first Gifford injector tried on the Pennsylvania Railroad. Officially, his apprenticeship was not begun until 1873, after a public school education and some preliminary apprentice work in the shops. In 1882 he represented the Pennsylvania Railroad at the Baldwin plant in charge of an order for 60 new locomotives. The next year he went to the Baldwin works as foreman of one of the departments. In 1885 he was made superintendent of equipment and in 1886 general superintendent, which position he has held since. Like Mr. Johnson, Mr. Vauclain is a member of many clubs and societies, including the Institute of Civil Engineers, the American Society of Mechanical Engineers, the American Society of Mining Engineers and the American Philosophical Society. He has the honorary degree of Doctor of Science, conferred on him by the University of Pennsylvania.



Alba B. Johnson.



Samuel M. Vauclain.

The Baldwin Locomotive Works was incorporated in June, 1911, under the laws of Pennsylvania, having taken over all of the stock of the Baldwin Locomotive Works organized under the Pennsylvania laws in 1909, which company, beside the plant and property of the predecessor co-partnership, owns the entire capital stock of the Standard Steel Works Company. Drexel & Co., Philadelphia, and White, Weld & Co., New York, are offering $20,000,000 7 per cent. cumulative preferred stock of the new company at 104. This is the total authorized and outstanding preferred stock, and there is in addition $20,000,000 authorized and outstanding common stock. The board of directors is composed of William L. Austin, chairman; Alba B. Johnson, president; Samuel M. Vauclain, vice-president; Wiliam Burnham, president of the Standard Steel Works Company; E. T. Stokesbury, of Drexel & Co.; E. C. Converse, president of the Bankers Trust Company, New York; Thomas DeWitt Cuyler, lawyer; Roland L. Taylor, president of the Philadelphia Trust, Safe Deposit and Insurance Company; Samuel McRoberts, vice-president of the National City Bank, New York; Charles D. Norton, vice-president of the First National Bank, New York; Otis H. Cutler, president of the American Brake Shoe & Foundry Company, and Francis M. Weld, of White, Weld & Co.

The new company is to take over all of the plant and property, including the capital stock of the Standard Steel Works Company, of the older Baldwin Locomotive Works, subject to a first mortgage securing an authorized issue of $15,000,000 5 per cent. sinking fund bonds of May 1, 1910-1940, of which $10,000,000 are now outstanding. The property of the Standard Steel Works Company is subject to a first mortgage securing an authorized issue of $5,000,000 5 per cent. sinking fund bonds, due June 1, 1928, of which $4,300,000 are outstanding and $600,000 have been retired under the sinking fund plan.

The gross sales in 1910 of the Baldwin Locomotive Works amounted to $29,057,999, and of the Standard Steel Works Company to $6,241,845. The average yearly gross sales for the last 10 years of the Baldwin works amounted to $26,285,883, and of the Standard Steel to $4,406,500. The combined income statement of the two companies for the year ended December 31, 1910, showed net earnings of $5,295,132. After the payment of taxes, bond discount and $1,221,425 maintenance and depreciation, and all interest charges and sinking fund against the Standard Steel Works Company bonds, there was a balance available for dividends of $2,706,080. The preferred stock has full voting power and is preferred as to both assets and dividends.

TRADE PUBLICATIONS.

Valve Gear.—The Pilliod Brothers Company, Toledo, Ohio, has issued an illustrated catalog presenting in detail a description of the Pilliod gear.

Grab Buckets.—The C. W. Hunt Company, New York, has published catalog No. 14, describing its grab buckets, coal tubs, valves, chutes, screens, hoisting machinery, etc. Tables and illustrations are included.

Electrical Equipment.—The General Electric Company, Schenectady, N. Y., has devoted bulletin No. 4851 to the descriptions and illustrations of electric station and road equipment of several prominent roads.

Water Tanks and Switch Stands.—The U. S. Wind Engine & Pump Company, Batavia, Ill., has issued its railway catalog No. 17, describing water tanks, water columns, special locomotive watering devices, pumping machinery, switch stands and semaphores.

Oxy-Acetylene Welding.—The Linde Air Products Company, Buffalo, N. Y., has published a very full catalog on acetylene generators, blow pipe regulators and blow pipes for oxy-acetylene welding. The many advantages of this process are clearly enumerated.

Steel Tires.—The Standard Steel Works Company, Philadelphia, Pa., has issued a pithy little booklet on steel tires, giving in detail the specifications which were adopted by the American Society for Testing Materials. Illustrations, diagrams and a dimension blank for orders are included.

Chain Belts.—The Chain Belt Company, Milwaukee, Wis., has published catalog No. 40, illustrating and describing many types of chain belts, conveying devices and their accessories. It is bound in cloth, contains over 275 pages, and includes directions for ordering, photographs of installations and list prices.

Chicago Great Western.—The Tale of Our Limited, a booklet just issued by the passenger department of the Chicago Great Western, gives a detailed description of the Great Western Limited between Chicago, St. Paul and Minneapolis. It also contains interior views of the cars and several condensed time tables.

Denver & Rio Grande.—The passenger department of this line has issued a booklet entitled Camping in the Rockies, written by Edwin L. Sabin, and giving information regarding the most desirable camping places in Colorado, Utah and New Mexico. In connection with this there is given a very complete list of vacation estimates.

Creosoted Materials.—The Wyckoff Pipe & Creosoted Company, New York, has published a small illustrated booklet which goes rather deeply into the subject of wood preservation, particularly by the use of creosote oil. The booklet then tells of the advantages of materials after they have been creosoted. Some of the various products of the company are then described, including creosoted cross arms, wood conduits, ties, etc.

The Hongkong section of the Kowloon-Canton Railway—the line that is to link Hongkong with the Canton-Hankow road, and thus connect the colony with the great interior of China, whose trade in foreign goods going in and in native goods coming out for shipment abroad is now handled almost altogether by water—has been in operation for a portion of a year, and authoritative figures for the cost of the railway as well as its prospects are to be had. The financial returns of the undertaking as well as the railway itself are of especial interest, in that they represent the construction by a colony of about 325,000 population of one of the most expensive transportation systems in the world in proportion to its length, as a public enterprise for the purpose of protecting the colony's trade. The railway consists of 21 miles of track running from Kowloon, the mainland portion of the colony, to the limit of British territory, where it is to connect with the Chinese section and continue on to Canton, some 89 miles farther. The British line was opened in October, 1910; the Chinese section is expected to be ready for traffic in August, 1911.

Railway Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—Bids are wanted up to July 15 by R. S. McCormick, chief engineer, Sault Ste. Marie, Ont., for building an extension from Hobon, on the Canadian Pacific, northerly for 101 miles to the National Trancontinental (Grand Trunk Pacific) at a point about 142 miles west of Cochrane.

Atchison, Topeka & Santa Fe.—A contract has been given to the H. Houser Contracting Company, Los Angeles, Cal., it is said, for excavation and grading new terminal yards at Calwa, Cal., which is about 100 miles from Riverbank.

Bartlett-Florence.—See Bartlett Western.

Bartlett Western.—Organized in Texas to take over the Bartlett-Florence, operating a 11-mile line from Bartlett, Tex., west to Jarrell. It is the intention of the new company to extend the line west to Florence, 12 miles. The general offices of the company are at Bartlett. J. W. Jackson, president, and C. J. Grainger, vice-president and general manager.

Birmingham & Southeastern.—This company has made a mortgage to secure funds for building an extension. The projected route is from Fort Davis, Ala., to Rockford, 58 miles, of which 20 miles to Milstead is mostly completed.

Boston & Albany.—An officer writes that plans have been made to change the alinement of tracks in Becket, Mass., and Middlefield, so as to shift the tracks on a section of over two miles. In some cases the tracks will be moved about 1,000 ft. The improvements are being carried out to do away with two stone arches which now span Westfield river. A third track will also be laid throughout the two-mile stretch.

Boston & Eastern (Electric).—The governor of Massachusetts has signed the bill granting this company a certificate of exigency, and it is understood that construction work will be started soon. The projected route is from Beverly, Mass., to Boston, 41 miles, with a tunnel under Boston harbor. John M. Bickford is the promoting engineer. Arthur Sturger, 110 State street, Boston, may be addressed.

Bruce Mines & Algoma.—An officer writes that this company, which operates a 17-mile line from Bruce Mines, Ont., on Lake Huron, to Rock Lake, proposes to extend the line northerly and easterly through a timber section to the National Transcontinental (Grand Trunk Pacific). Surveys have not yet been finished. There will be some improvements made, including new docks and terminal facilities. The line is to be built to carry timber, ore, and later on farm products. George P. McCallum, president, Sault Ste. Marie, Mich.

California Roads.—The Leonard Company, Sacramento, Cal., will build a line, it is said, from Del Paso, near Sacramento, east to Fairoaks and Orangevale, 17 miles. The company has a capital of $250,000.

Canadian Northern Ontario.—Ewan Mackenzie, Toronto, Ont., who was given the general contract for grading and timber work on the Toronto-Ottawa line between Mile 180 and Mile 200, has sublet some of the work as follows: To P. W. MacLean, Brechin, 2.75 miles; Paul Allan, Chaffie's Lock, 0.5 miles; L. MacLean and R. MacIsaac, Brechin, 1.25 miles; D. J. O'Donnell, Toronto; A. O'Donnell, Beaverton, and S. Mackenzie, Elgin, 4 miles; Stewart & Hart, Portland, 4 miles, and C. A. Cook, Brechin, 4 miles. (June 2, p. 1296.)

Canadian Pacific.—An officer writes that contracts have been given to J. G. Hargrave & Co., Winnipeg, Man., to build 20 miles, and to John Timothy, Edmonton, Alb., for an additional 20 miles, of a branch to be built from Bassano, Alb.

Chouteau & Great Falls.—This company has asked for incorporation in Montana with $100,000 capital, to build about 55 miles of line. The proposed route is between Great Falls, Mont., and Chouteau. The prospects of building the line are good, but contracts are not yet let. There will be one steel bridge and one important trestle. Phil I. Cole, Chouteau, may be addressed.

Clinton & Oklahoma Western.—This company is planning to build an extension, it is said, from Butler, Okla., north to a

connection with the Atchison, Topeka & Santa Fe, at Woodward. The company also has under consideration the question of building an extension west from Butler, through Cheyenne, into Texas.

Davenport & Muscatine (Electric).—An officer writes that contracts have been let to Yale & Regan, Chicago, to build west from Davenport, Iowa, to Muscatine. The Tri-City Railway & Light Company is financing the project.

Erie Railroad.—Work on the Sharon & New Castle division of the Erie Railroad will be started within the next few weeks. The work will be carried out by the Erie Railroad, it is said, and the tracks will be used also by the Pittsburgh & Lake Erie. The Erie agrees to double-track the entire route, which will be over 30 miles. The Pittsburgh & Lake Erie proposes to put up a new station at New Castle. Both these companies are now putting up a large freight station at Sharon, to be used jointly by both roads.

El Paso & Southwestern.—According to press reports, plans are being made to build several important extensions in Arizona and New Mexico. It is understood that the route has been located and contract for the construction work will soon be let for an extension from Benson, Ariz., to Tucson. This line is eventually to be extended to Phoenix. In addition, plans are said to be made to build from El Paso, Tex., up the valley of the Rio Grande to the site of the Elephant Butte dam, and it is expected to have this line finished by the time the government and reclamation project is completed. (May 5, p. 1084.)

Eureka & Palisade.—See this company in Railway Financial News.

Fresno, Coalinga & Monterey (Electric).—An officer writes that this company proposes to build from Fresno, Cal., southwest to Coalinga, 50 miles, and from Coalinga northwest through San Benito county to Hollister, thence west via San Juan and Salinas to the harbor of Monterery, where the government will put up a large breakwater. It is expected that construction work will be started in the near future. Work on the line from Fresno to Coalinga will be very easy, as it is over level plains. There will be several fills across the slough country, with a small cut near Coalinga. Between Coalinga and Hollister there will be about 40 creek crossings. Steel bridges are to be built over the San Benito river and the Salinas river. The line is being built to carry oil, provisions, grain, hay, dairy products, fruit and quicksilver from the mines. T. C. White, president; J. S. Bates, chief engineer, Fresno.

Gilmore & Pittsburgh.—Work will be started soon, it is said, on an extension from Salmon City, Idaho, northwest towards Lewiston.

Hamilton Railway.—Incorporated in Illinois to build from a point on the bridge over the Mississippi river between Hamilton, Ill., and Keokuk, Iowa, to the cities of Hamilton, and Warsaw, in Hancock county, Ill. The headquarters of the company are at Chicago, and the incorporators include: G. Higginson, Jr., Winnetka; J. D. Harvey, Geneva; J. L. Valentine and H. Wells, Chicago, and A. W. O'Hara, Carthage.

Hobart, Cheyenne & Texas Pan Handle.—Incorporated in Oklahoma with $6,000,000 capital, to build from Hobart, Okla., northwest through Cheyenne, across the Texas Panhandle into New Mexico. W. L. Hoyl is superintendent.

Kentucky & Tennessee State Line.—Incorporated in Tennessee with $80,000 capital, and office at Hazel, Ky. The plans call for building a line from the Tennessee river, west along the Kentucky-Tennessee state line, via Hazel to the Mississippi river, about 80 miles. The incorporators include J. N. Hill, W. T. Jackson, C. V. Campbell, J. W. Williams and J. T. Turnbow.

Kokomo, Frankfort & Western Traction.—Organized in Indiana to build from Kokomo, Ind., southwest via West Middleton, Russiaville, Michigantown and Forest to Frankfort, 27 miles. It is intended to have the line finished by January 1, 1912. The offices of the company are at Kokomo. The line is being built by the Kokomo, Marion & Western interests.

Midland Valley.—Track laying has been started on the extension building under the name of the Wichita & Midland Valley, from Arkansas City, Kan., northwest to Wichita, 55 miles. It is expected to have the work finished by the middle of September. M. Tansey, San Saba, Tex., has the grading contract. (April 7, p. 878.)

Missouri, Kansas & Texas.—According to press reports, the 67-mile line from Colmesneil, Tex., west to Trinity, is to be connected with the rest of the system by constructing an extension from Trinity west to Waco, about 125 miles. We are unable to secure official confirmation of this report.

Olympic Peninsula (Electric).—Organized at Seattle, Wash., to build from Lake Crescent, Wash., to a point on Puget sound. David S. Troy, Chimacum, and R. R. Wilson, Seattle, are interested.

Pensacola, Mobile & New Orleans.—An officer writes that this company, which is building from Pensacola, Fla., via Loxley, Ala., to Mobile, has grading work about finished. Track laying is now under way and has been finished on about 11 miles. The line is being built to carry lumber, coal, naval stores, cotton and agricultural products. E. McLaughlin, president, Pensacola.

Pittsburgh & Lake Erie.—See Erie Railroad.

Rock Island, Farwell & Gulf.—An officer writes that this company was organized in Texas to build about 450 miles of railway, from a point on the Rock Island to the San Antonio & Aransas Pass, at Kerrville, Tex. Grading has been finished on 35 miles, and contracts for additional work are to be let at once. Maximum grade will not exceed 1 per cent., and maximum curvature 8 deg. M. J. Healy, president and general manager, Amarillo.

Sand Springs Interurban.—An officer of this company, which recently finished work on a line from Sand Springs, Okla., east to Tulsa, writes regarding the reports that an extension is to be built from Tulsa, northeast to Nowata, 60 miles, that the matter is being taken up with residents along the proposed route who are interested. When the negotiations are completed the extension is to be built. (February 24, p. 369.)

Seattle-Tacoma Short Line (Electric).—This company has been organized and additional capital subscribed. It is understood that the company will soon commence construction work to complete the double-track line between Seattle, Wash., and Tacoma, 30 miles.

Syracuse, Watertown & St. Lawrence River (Electric).—The New York Public Service Commission, Second district, has authorized this company to build an electric line from a point on the Syracuse & South Bay Electric, in the town of Cicero, Onondaga county, N. Y., to Brewerton, on the shore of Oneida lake, 6.33 miles.

Texas, Gulf & Northern.—Incorporated in Texas with $175,000, to build from a point near Bovina, in Parmer county, Tex., on the Pecos & Northern Texas, southerly through Bailey, Cochran, Yoakum, Gaines, Andrews, Ector and Midland counties, to a connection with the Texas & Pacific, at Midland, about 190 miles. The directors include: J. A. Underwood, Honey Grove; J. D. Bedford and R. E. Underwood, Amarillo, and J. F. Sadler, Weatherford.

Texas Roads.—Plans are being made to build from Oakville, Tex., to Kennedy, 30 miles. A bonus of $150,000 has been subscribed and right-of-way donated. A company is soon to be organized to carry out the work. L. A. Whitney, Oakville, is the principal promoter.

Western Maryland.—The extension from Cumberland, Md., to Connellsville, Pa., 87 miles, it is announced, will be finished about August 1, and about two months later the company expects to begin operating through trains to Pittsburgh over the extension and the Pittsburgh & Lake Erie.

Wichita & Midland Valley.—See Midland Valley.

Willamette Pacific.—Incorporated in Oregon with $1,000,000 capital, to build from Eugene, Ore., west to a point on the Pacific coast near Siuslaw river, thence south to Marshfield, with a branch from the main line at Elmira, northeast, and another branch from Swisshome to a point near Junction City. The headquarters of the company are at Portland, and the incorporators include: G. X. Wendling, San Francisco, Cal.; R. M. Cross and S. O. Bodine, Portland, Ore.

RAILWAY STRUCTURES.

Argo, Wash.—The Oregon-Washington Railroad & Navigation Company has given a contract to the Grant Smith Co., Seattle, Wash., for putting up seven concrete shop buildings at Argo. The contract is said to be worth $300,000.

Campbellton, N. B.—A contract has been given to Woods & Co., St. Johns, N. B., for putting up a new station for the Intercolonial Railway at Campbellton.

Calgary, Alb.—The Canadian Pacific, it is understood, will enlarge the station at Calgary. The plans provide for an extension of 300 ft. on the west end, and 65 ft. on the east end. The west wing of the building will be built to within 40 ft. of the new hotel, which will front on Ninth avenue.

Coeur d'Alene, Idaho.—The Northern Pacific, it is said, will build a new freight house at Coeur d'Alene.

Glovis, N. Mex.—The Atchison, Topeka & Santa Fe has plans made, it is said, for a new employees' building at Clovis, to contain a library, museum and sleeping rooms. The estimated cost of the building is $50,000.

Goodrich, Idaho.—The Pacific & Idaho Northern will build a new concrete bridge, it is said, over the Weiser river, between Goodrich and Council.

Halifax, N. S.—Bids are wanted up to July 20 by L. K. Jones, secretary of the Department of Railways and Canals, Ottawa, Ont., for the construction of a reinforced concrete pier and sheds at the deepwater terminus of the Intercolonial Railway at Halifax.

Los Angeles, Cal.—The Southern Pacific, it is said, will build a hospital at Los Angeles for the use of employees, to cost about $100,000.

New Castle, Pa.—See Erie Railroad under Railway Construction.

Oroville, Cal.—The Southern Pacific has started work on a new station at Oroville.

Redditt, Ont.—Bids are wanted until July 11 for putting up two terminal stations on the National Transcontinental (Grand Trunk Pacific); one at Redditt, Ont., and the other at Transcona, Man. P. E. Ryan, secretary, Ottawa.

Reedley, Cal.—The Atchison, Topeka & Santa Fe Coast Lines, it is said, will build a new concrete bridge over Kings river, at Reedley.

Riverbank, Cal.—The Atchison, Topeka & Santa Fe Coast Lines has started work on new car shops and a roundhouse at Riverbank.

Russellville, Ky.—The Louisville & Nashville has started construction work on a passenger station at Russellville, to cost about $25,000. (June 9, p. 1335.)

Scranton, Pa.—The York Bridge Company, who has the general contract for building the Mulberry street viaduct in Scranton, has given a sub-contract to W. H. Lyons, Sunbury, for the substructure. This includes the filling work at the Providence road end, the masonry work, abutments, piers, roadway and paving. (May 26, p. 1225.)

Seligman, Ariz.—The roundhouse of the Atchison, Topeka & Santa Fe was burned on June 10 with an estimated loss of $62,000.

Sharon, Pa.—See Erie Railroad under Railway Construction.

Salt Lake City, Utah.—The Denver & Rio Grande will make alterations, additions and repairs to the Salt Lake shops, at a cost of about $60,000. The shops will be used jointly by the Denver & Rio Grande and the Western Pacific.

Transcona, Man.—See Redditt, Ont.

Tucson, Ariz.—The El Paso & Southwestern is planning to put up a station, freight house and yards at Tucson, it is said, and surveys are being made for an entrance into that city.

Winnipeg, Man.—Bids are wanted by P. E. Ryan, secretary of the National Transcontinental (Grand Trunk Pacific), Ottawa, Ont., for putting up car shops at Winnipeg.

Railway Financial News.

Abilene & Southern.—This company has applied to the Texas railway commission for authority to register $1,700,000 bonds and $70,000 stock to be issued against 54 miles of line completed from Abilene to Ballinger.

Atlanta, Birmingham & Southern.—Clark, Dodge & Co., and White, Weld & Co., both of New York, are offering to extend or refund for one year the $3,250,000 receivers' certificates due July 1. Holders of these certificates are offered either cash or a one-year renewal.

Atlanta, Waycross & Northern.—A press despatch from Waycross, Ga., says that this company is to issue $6,200,000 new securities.

Bartlett-Florence.—See Bartlett Western.

Bartlett Western.—This is the name of the new company which has been incorporated with $41,000 stock to succeed the Bartlett-Florence. The sale of the Bartlett-Florence for $41,000 has been confirmed.

Birmingham & Southeastern.—The *Commercial & Financial Chronicle* says that this company, which until recently was called the Union Springs & Northern, has arranged to make a new mortgage for $3,000,000 to pay for extension of the road. The road runs from Union Springs, Ala., to Fort Davis, 7½ miles. See this company under Railway Construction.

Booneville, St. Louis & Southern.—This road, which has been operated by the Missouri Pacific under a 99-year lease, has been sold to the M. P.

Chicago & Alton.—The directors, at a meeting on June 27, decided to pass the dividend on the preferred stock. The stock has been heretofore on a 4 per cent. annual basis.

Chicago, Indianapolis & Louisville.—Potter, Choate & Prentice, New York, and the First Trust & Savings Bank, Chicago, have bought the $2,300,000 C. I. & L. refunding (now first) mortgage 4 per cent. bonds reserved to retire the Louisville, New Albany & Chicago-Chicago & Indianapolis division first mortgage 6 per cent. bonds of 1881-1911, amounting to $2,300,000, and the bankers are offering to take the old bonds on a 3 per cent. basis in exchange for the refunding bonds at 94½. This yields about 4.30 per cent. on the investment.

Chicago Southern.—The $11,000,000 Southern Indiana common stock, deposited under the Chicago Southern notes, was bought in at auction for $500 on behalf of the Chicago, Terre Haute & Southeastern, the new company.

Chicago, Terre Haute & Southeastern.—See Chicago Southern.

Cleveland, Cincinnati, Chicago & St. Louis.—The Guaranty Trust Co., New York, is offering $10,000,000 4½ per cent. 20-year debentures of the C. C. C. & St. L. at 97½. Part of the proceeds of the sale of these notes has been used by the railway company to pay off the $5,000,000 notes which matured June 1.

Delaware & Eastern.—The sale of this road under foreclosure of the mortgage for $1,000,000 has been ordered for August 11 at Margaretville, N. Y.

Detroit, Toledo & Ironton.—The *Detroit Journal* says that the receiver of the D. T. & I. has asked permission to issue $1,000,000 receiver's certificates to pay operating expenses, etc.

Erie.—The directors are to authorize the sale of $6,000,000 equipment trust notes to pay for equipment, including sixty locomotives, as well as passenger and freight cars. Of the $6,950,000, total cost of the equipment, $5,750,000 will be spent for the Erie Railroad proper, to be paid for by the issue of $5,000,000 notes and $750,000 cash from the company's current funds. The New York, Susquehanna & Western will be allotted $1,200,000 of the equipment, to be paid for by the sale of $1,000,000 equipment trust notes and by the use of $200,000 cash and current funds.

Eureka & Palisade.—In regard to rumors that this property has been sold to the Southern Pacific, an officer writes that

the road was washed out by floods in February and March, 1910, and has not since been operated. The road was sold under foreclosure in November, 1910, to the United States Smelting, Refining & Mining Company. "Before the period of redemption expired, however, it was redeemed by some of its stockholders, and it has not been determined definitely whether to rebuild the line or not."

Frankfort & Cincinnati.—See an item in regard to this company under Court News.

Hocking Valley.—The United States district court at Columbus has vacated the order restraining the Chesapeake & Ohio from voting the Hocking Valley stock. The case has not as yet been fuly tried on its merits, but it is understood that the facts in the case to a large extent came under the district court's notice. It is expected that an appeal will be taken.

Houston Belt & Terminal.—William Salomon & Co., New York, and G. H. Walker & Co., St. Louis, are offering $2,000,000 Houston Belt & Terminal first mortgage 5 per cent. bonds of 1907-1937 at 101. The bonds are secured by a first mortgage on the terminal at Houston, Tex., which is used by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy and the St. Louis & San Francisco. Including the present issue, there are $4,266,000 of these bonds outstanding.

Lehigh & Hudson River.—This company has sold to Drexel & Co., Philadelphia, $945,000 general mortgage 5 per cent. bonds to provide for the payment at maturity, July 1, of $800,000 first mortgage 5 per cent. bonds and $145,000 Warwick Valley first mortgage 4½ per cent. bonds.

Lexington & Eastern.—The $1,000,000 first mortgage 5 per cent. bonds of 1894-July 1, 1911, are to be paid at the office of the Louisville & Nashville, New York.

Louisville & Nashville.—See Lexington & Eastern.

Also see an item in regard to this company under Court News.

Maine Central.—This company has taken over the property and franchises of the Washington County Railway, running from Washington Junction, Me., to Calais, Ayer's Junction to Eastport, and St. Croix Junction to Princeton, a total of 138 miles; the Somerset Railway, running from Oakland, Me., to Kineo Station, 91 miles; and the Sebasticook & Moosehead, running from Pittsfield, Me., to Mainstream, 15 miles. For the new officers see railway officers news column.

See also Portland Terminal Company below.

Michigan Central.—The Detroit terminal and tunnel bonds, of which $16,000,000 were recently taken by a syndicate headed by J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, were secured by a first mortgage and were presumably legal investments for savings banks in a number of states. Attorneys for the insurance companies pointed out that the expenditure on the Detroit river tunnel had not exceeded $9,000,000, and $3,500,000 had been spent for the union passenger station and $1,500,000 had been spent for improvements so that only $14,000,000 had actually been spent on the property mortgaged to secure the bonds; and since the law provides that "adequate security" must be provided for bonds which are legal investments for savings banks, the court might not consider this "adequate security." A deposit of $2,000,000 cash has been arranged for with the bankers to meet this objection.

Philadelphia & Reading.—See Reading Company.

Philadelphia, Baltimore & Washington.—The $1,500,000 6 per cent. bonds of the Baltimore & Potomac of 1871-1911 are to be paid at maturity.

Pensacola, Mobile & New Orleans.—This company has made a mortgage to secure an authorized issue of $750,000 first mortgage 20-year 5 per cent. bonds.

Portland Terminal Company.—This company has taken over all the railway lines and terminal facilities of the Boston & Maine, the Maine Central, and the Portland Union Railway Station Company in Portland, Me., South Portland and Westbrook.

Reading Company.—All three classes of stock—first preferred, second prefered and common—are to have dividends paid quarterly instead of semi-annually as heretofore.

Seaboard Air Line.—Frank A. Vanderlip, president of the National City Bank, New York, has been elected a director.

Southern Pacific.—See an item in regard to this company in Court News.

Union Pacific.—See an item in regard to this company in Court News.

Wabash-Pittsburgh Terminal.—The Wabash Railroad and the Wabash-Pittsburgh Terminal reorganization committee, according to the *Wall Street Journal*, have agreed on a plan of reorganization of the Wheeling & Lake Erie and the Wabash-Pittsburgh Terminal, under the terms of which the Wabash Railroad is to give up all of its claims against the Terminal Railway, also $14,000,000 Pittsburgh Terminal Railroad & Coal Co. stock and $3,800,000 consolidated mortgage bonds of the same company in return for $1,000,000 adjustment 5 per cent. bonds and $3,200,000 5 per cent. non-cumulative preferred stock to be issued by the reorganized and consolidated Wheeling and Terminal Railway properties. All litigation against the Wabash Railroad is to be suspended. Estimated on the basis at which the new securities will be underwritten under the terms of the plan, the Terminal firsts will have an approximate value of 64.50. Several calculations variously make their value as between 58 and 67. On the same basis the seconds, after deducting an assessment of 25 per cent., figure out at around 6¼. Cash requirements will amount to $20,000,000, to be raised by assessments on the Terminal Railway seconds and all of the Wheeling stock and sale of first mortgage bonds. This will be used to pay off the Wheeling & Lake Erie $8,000,000 notes par and interest, receivers' certificates, current obligations and for improvements and betterments.

Total Wheeling & Lake Erie, Pittsburgh Terminal R. R. & Coal Co. and West Side Belt securities remaining undisturbed amount to approximately $17,000,000, with fixed charges of about $1,000,000. Including interest on the initial issue of first mortgage bonds issued in reorganization, the total annual fixed charges will amount to about $1,800,000 annually. Including interest on the adjustments, charges will amount to about $2,800,000. The properties are now earning surplus available for fixed charges close to $2,500,000. Upon the consolidation of the two properties and with new equipment and facilities it is estimated they could immediately earn $3,500,000 or more than enough to pay the full rate on the adjustment bonds.

Wabash Railroad.—On account of developments in respect to the compromise settlement made by the Wabash Railroad with the Wabash-Pittsburg Terminal Railway and also because of the proposed liquidation of the Pacific Express Company, of which the company's stock 40 per cent. is owned by the Wabash Railroad, a readjustment of the latter's financial arrangements in respect to the $5,000,000 extended 4½ per cent. notes will be made. *The Wall Street Journal* says that officials of the company are considering making a new loan of $5,000,000 and calling the $5,000,000 4½ per cent. notes, recently extended for three years by Blair & Co., and Kuhn, Loeb & Co.

The directors have declared a semi-annual dividend of 1 per cent. on the debenture "B," bonds. This places the "B" bonds on a 2 per cent. annual basis as compared with a 4 per cent. annual basis declared heretofore. Regular semi-annual interest of 3 per cent. was declared on debenture "A" bonds. Only $1,276,000 out of an original issue of $26,500,000 Wabash debenture "B" bonds are outstanding, the remainder having been turned in under the offer of the company to exchange for them 72 per cent. in new extended 4 per cent. bonds and 52 per cent. in Wabash preferred and 52 per cent. in common stock.

See Wabash-Pittsburgh Terminal.

Washington, Potomac & Chesapeake.—This company has asked the Maryland Public Service Commission for authority to increase its stock from $500,000 to $2,000,000, and to make its bonded debt $2,000,00. The road runs from Brandywine, Md., to Mechanicsville, 21 miles.

Wheeling & Lake Erie.—See Wabash-Pittsburgh Terminal.

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